MEADOWBANK GOLD MINE

2024 WATER MANAGEMENT PLAN

MARCH 2025

VERSION 14

EXECUTIVE SUMMARY

Agnico Eagle Mines Ltd. Meadowbank Division (Agnico) is operating the Meadowbank Complex Gold Mine (the Mine), located on Inuit-owned surface lands in the Kivalliq region approximately 110 km north of the Hamlet of Baker Lake, Nunavut. The mine is subject to the terms and conditions of both the Project Certificate issued in accordance with the Nunavut Land Claims Agreement Article 12.5.12 on December 30, 2006, and the Nunavut Water Board Water Licence No. 2AM-MEA1530 issued in May 2020.

The Water Management Plan is updated on a yearly basis as required by the Nunavut Water Board Water License 2AM-MEA1530. The full annual update was provided in version 12 of the Water Management Plan including a revised site-wide Water Balance. Version 13 was provided in August 2024 to assess total dissolved solids (TDS) action plan and site-specific water management quality program SSWQO (Appendix F). Recommendations obtained during the 2023 Meadowbank Annual Report Review have been included in Water Management Plan v13 and carried forward into this Water Management Plan v14.

Water Management Plan v14 includes Appendices A through E from Water Management Plan v13 (Water Balance, flow sheets and Water Quality Forecast [Appendix A, B, C], the Freshet Action Plan [Appendix D], and the Ammonia Management Plan (V12, 2024) [Appendix E]). Water Management Plan v14 includes Appendix F (TDS Action Plan and site-specific water quality program). The Freshet Action Plan details the RSF seepage issue at ST-16 and the Assay Road seepage as well as providing revised monitoring.

This water management plan update considers changes in the observed natural pit water inflows, updated tailings deposition parameters, mine and milling life schedule and production rate, tailings management strategy, and pit backfilling strategy.

- The significant updates to this plan are Update of Portage pits and Goose Pit water treatment strategy throughout the Progressive and Closure phases.
- Update of flooding strategy for Vault Pit throughout the Progressive and Closure phases
- Update of water balance and water quality forecast model as per latest tailings deposition plan (including in-pit deposition)

The water management objectives are to keep the different water types separated to the extent practical; to control and minimize contact water; minimize freshwater usage to the extent practical; meet discharge criteria before any site contact water is released to the downstream environment; achieve a reduction in freshwater intake per ton mined and ensure no events of non-compliance related to freshwater withdrawal criteria and effluent loading limits. The water balance update is based on these objectives, and quantitative targets have been added to the plan to help Operations track progress of actions taken to achieve these targets and help identify corrective actions to be implemented. Annual predictions of water quality in the flooded pit (Pit A, Pit E and Goose Pit) during Operations has shown measured concentrations of TDS to be greater than the forecasted model predictions in the flooded pit by more than 20%. Causes associated with the differences between modeled vs measured values have been presented within the latest Annual Report (2023, Appendix 16) and summarized within this plan in Section 4.0. The implications of increasing TDS loadings in the pits could lead to the risk of not being able to meet the Flooded pit water quality criteria at closure. As a result, Agnico Eagle has pre-emptively developed an Action Plan herein (Section 4.1) to address water License conditions Part E, Item 7 beginning with the development of an appropriate site-specific water quality program for effluent release using guidance from Part F, Item 6 of the license (Appendix F).

The Water Balance determines the demand and storage requirements of water over the life of the mine. The storage strategies and required transfers are presented. Closure-related elements remain at a conceptual stage and will be further detailed in the Closure and Reclamation Plan (CRP) update until their designs are presented in the Final Mine Closure and Reclamation Plan to be submitted prior to final closure in accordance with the current Type A Water License.

The freshwater reduction per ton milled objective is achieved by reclaiming contact water from the tailings deposition area while transferring water from the active deposition area to the inactive pit. Pit E was the main area for tailings deposition in 2024. The tailings deposition changed on December 17th, 2024, to Pit A. The action was implemented to manage tailings storage capacities in both Portage pits. A volume of tailings was also deposited in the South Cell in August and September 2023 to improve the landforms for closure purposes. Future deposition planning is detailed in the deposition plan that can be found in the Waster Rock and Tailings Management plan. For the remainder of Mill operations, reclaim water is planned to be pumped from the in-pit.

The current Closure concept involves semi-passive enhancement of the natural degradation of nitrogen compounds by aerating the entire water column of Goose Pit and Pit A, leading to destratification of the flooded pits. A water treatment plant (WTP) for metals is required to treat the metal content in Pit A water before initiating the semi-passive treatment. The treatment targets are based on an analysis of the best available economically achievable technologies, set at 0.03 mg/L for arsenic (As) and 0.05 mg/L for copper (Cu)

For Portage and Goose area flooding at closure, the strategy is to remove as much water as possible from each pit. Once the nitrogen species have reduced to sub-acutely toxic concentration, treated water from Goose Pit and Pit A will be transferred periodically at the base of Vault Pit. Once the water treatment process is completed, Pit A, Pit E and Goose Pit will then be reflooded using a combination of passive and active water inflow (from Third Portage Lake). This is a conservative assumption that will be revised in the Closure and Reclamation Plan (CRP) and Final Closure and Reclamation Plan (FCRP) as further data becomes available on the water treatment design for the in-pit water. Different flooding sequence concepts are being looked at for the reflooding of the Portage and Goose Area to ensure the closure objectives will be met. The final elevation of the reflooding will be the elevation of Third Portage Lake which is around 133.6 meters above sea level (masl) based on available data. The Goose Dike and South Camp Dike will be breached to allow reconnection of the area with Third Portage Lake when the closure objectives for pit flooding will have been achieved. The dikes shall not be breached until the water quality in the re-flooded area meets CCME Water Quality Guidelines for the Protection of Aquatic Life, baseline concentrations, or appropriate site-specific water quality objectives, as per the Water License.

The flooding of the Vault Pit area will involve a combination of passive flooding (runoff) and active flooding at closure using treated water from Goose Pit and Pit A, and water from Wally Lake. The final elevation of the reflooding will be 139.9 masl for Phaser and Vault Lake. The Vault Dike will be breached to allow reconnection of the area with Wally Lake when the closure objectives for pit flooding will be achieved, as per Portage and Goose Pits. BB Phaser Pit and Phaser Lake will be flooded exclusively from their watershed run off inflows until the target elevation of Wally Lake is reached.

The 2024 water quality forecasting model is included in this report. The report identifies certain contaminants of concern which may require removal by treatment for the pit water quality to meet water quality objectives. Water quality model results for flooded pits, mine discharge and closure lakes are presented in the Meadowbank Mine: Water Balance and Water Quality Model Technical Report for the 2024 Annual Report (Lorax, 2025). Effluent predictions for active discharge to Wally Lake are screened against Water Use License (WUL) and Metal Mining Effluent Regulations (MMER) at the end of pipe. Water quality predictions for the receiving environment in Wally Lake are screened against core receiving environment monitoring plan (CREMP) guidelines assuming a dilution factor of 10:1 at the edge of the initial dilution zone (IDZ). Flooded pits will be reconnected with the surrounding surface water environment after the pits are fully flooded and dikes are breached. Prior to breaching the dikes, the Flooded pit water quality will need to meet site-specific water quality objectives (SSWQOs) and/or Canadian Council of Ministers of the Environment (CCME) criteria, as per conditions of Water License 2AM-MEA1530, part E, item 7. The full water quality model results screened against relevant guidelines are provided in Appendix A of Meadowbank Mine: Water Balance and Water Quality Model Technical Report for the 2024 Annual Report (Lorax, 2025). An update on the water treatment concept and pit flooding strategy will be provided in the next CRP update and the final design will be submitted as part of the FCRP.

DOCUMENT CONTROL

Version	Date (YM)	Section	Page	Revision
1	March 2014	ALL	-	Revision for the 2012 Water Management Plan (by SNC) according to the updated LOM and water mgmt strategies
2	March 2015	ALL	-	Revision for the 2013 Water Management Plan (by Agnico) according to the updated LOM and water mgmt strategies
3	October 2015	ALL	-	Update of sections according to Water License renewal conditions
4	March 2016	ALL	-	Revision of the 2014 Water Management Plan (by Agnico) according to the updated LOM and water mgmt strategies
5	March 2017	ALL	-	Revision of the 2015 Water Management Plan (by Agnico) according to the updated LOM and water mgmt strategies
6	March 2018	ALL	-	Revision of the 2016 Water Management Plan (by Agnico) according to the updated LOM and water mgmt strategies
7	March 2019	ALL	-	Revision of the 2017 Water Management Plan (by Agnico) according to the updated LOM and water mgmt strategies
8	March 2020	ALL	-	Revision of the 2018 Water Management Plan (by Agnico) according to the updated LOM and water mgmt strategies
9	April 2021	ALL	-	Revision of the 2019 Water Management Plan (by Agnico) according to the updated LOM and water mgmt strategies
10	April 2022	ALL	-	Revision of the 2020 Water Management Plan (by Agnico) according to the updated LOM and water mgmt strategies. Addition of quantitative water management targets
11	March 2023	Section 3.1, 3.4, 4	-	Section 3.1 water management targets, Section 3.4 pit flooding profiles, Section 4 water quality forecast update
12	March 2024	ALL	-	Revision of the 2023 Water Management Plan (by Agnico) according to the updated LOM and water mgmt strategies. 2.1.1 Climate: updated maximum wind gust recorded. Table 3.1: Added target 2024 for water objectives. 3.3.6 Goose pit: Updated water management strategy information. 3.3.9. Mill seepage collection system: Added information on Assay Road Seep South.

Version	Date (YM)	Section	Page	Revision
				Figure 3.2: RSF seepage area: Changed figure. 3.3.12 Central Dike Seepage: Updated information. 3.4.1 Portage and Goose Area Flooding: Updated information. Table 3.2 and 3.3L: Updated according to the Water balance. Section 4 Water quality forecast: Updated information and add note for ongoing work. Appendix A : Added a note on reported values
13	August, 2024	Sections 3.3.7, 3.3.9 ,4, and 4.1		Updates to reflect the most recent water management strategy for active closure and post closure: 3.3.7 – Updated information 3.3.9 – Updated information Updates to the water quality forecast: 4.0 – 4.1 TDS Action Plan and Site-Specific Water Quality Program details New Appendix F: TDS-Site Specific Water Quality Program Technical Memorandum
14	March, 2025			2.2.1. Portage Pit Area: Update on tailing deposition strategy 2.2.1.2 Stormwater Management Pond: Added Goose Pit to the discharge location point. 3.1 Water Management Objectives and Targets: Updated information 3.2 Water Management Strategy: updated with in-pit treatment and new water transfers strategy 3.3.5 TSF collection Pond: new section 3.3.6. Portage Pit : Added Central Dump hydraulic connection consideration between Pit A and Pit E 3.3.7. Goose Pit: Updated closure concept with semi-passive treatment and discharge to Vault Pit

Version	Date (YM)	Section	Page	Revision
				3.3.8. Goose and Portage In –Pit Aerators : new section 3.3.9. In-Line Treatment: new section 3.3.10. Vault Water Distribution Line: new section 3.3.11. Vault Treatment and Meromixis: new section and merge previous section 3.8.8 Vault Pit Aera.Updated Progressive Closure and Closure phases water management strategy for Phaser, BB Phaser, Vault Attenuation Pond and Vault Pit 3.3.12. Stormwater Management Pond: Added Goose Pit as a discharge location during freshet and open water season. 3.4.1. Portage and Goose Area Flooding: Updated the flooding strategy with the current concept of water management during Progressive Closure and Closure phases 3.4.2.Vault Pit Area Flooding – Updated the flooding strategy with the current concept of water management during Progressive Closure and Closure phases 4. 4 MEADOWBANK WATER QUALITY FORECASTING UPDATE– Updated predictions Appendix A : Note regarding the origin of the 2024 Meadowbank Water Balance Appendix C – Note regarding discrepancy due to updates made at the beginning of 2025.

Approved by:

Eric Haley – Environment & Critical Infrastructure Superintendent

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Appendix F: TDS-Site Specific Water Quality Program Technical Memorandum

1 INTRODUCTION

Agnico Eagle Mines Ltd. (Agnico) has been operating the Meadowbank Complex Gold Mine since 2008, officially beginning production in 2010. The mine is located approximately 110 km north of the Hamlet of Baker Lake, Nunavut. The mine is subject to the terms and conditions of both the Project Certificate issued in accordance with the Nunavut Land Claims Agreement Article 12.5.12 on December 30, 2006, and the Nunavut Water Board Water Licence No. 2AM-MEA1530 issued on May 2020.

This document presents an updated version of the 2024 Water Management Plan with all the same components as the previous version of the plan (V13). Included with this version of the plan is the 2024 revised site-wide water balance and water quality forecast that determines the demand, storage requirements, and quality of water over the life of the mine (LOM). The storage strategies and required transfers are presented. Closure related elements based on the Meadowbank Closure and Reclamation Plan (CRP) remain at a conceptual stage and will be further detailed in the Final Mine Closure and Reclamation Plan (FCRP) to be submitted prior to final closure in accordance with the current Type A Water License.

This water management plan update considers changes in the observed natural pit water inflows, updated tailings deposition parameters, mine and milling life schedule and production rate, tailings management strategy, and pit backfilling strategy that were all captured within V14 of the water management plan.

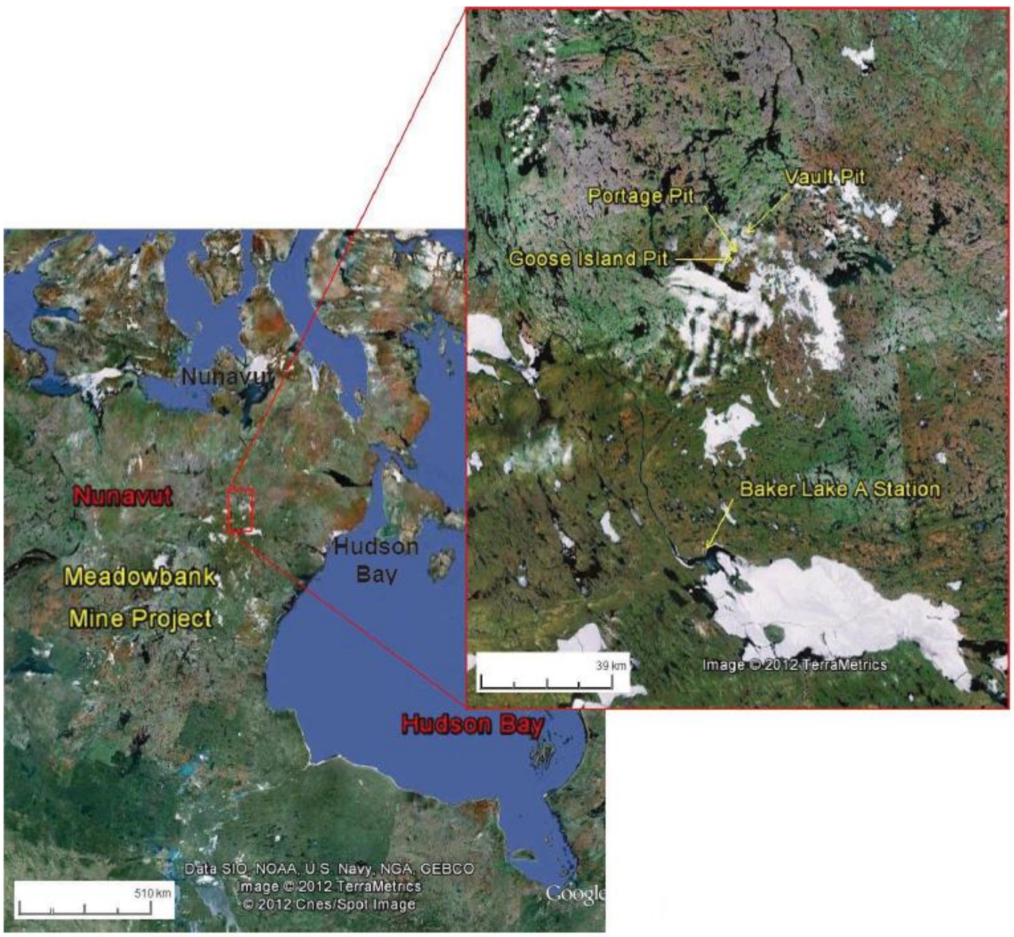
Main updates to this version of the plan include:

- Update of Portage and Goose pits water management and treatment strategy throughout the end of operation and the Closure phases.
- Update of flooding strategy for Vault Pit throughout the end of operations and Closure phases
- Update of water balance and water quality forecast model as per latest tailings deposition plan (including in-pit deposition)

2 BACKGROUND INFORMATION

2.1 SITE CONDITIONS

The location of the Meadowbank mine site is shown below in Figure 2.1. A close-up is also provided to show the location of the Baker Lake A Station used to obtain meteorological data.



Source: Google Earth Pro, 2012

Figure 2.1: Meadowbank mine location

2.1.1 Climate

The Meadowbank mine is located within a low Arctic Eco climate described as one of the coldest and driest regions of Canada. Arctic winter conditions occur from October through May, with temperatures ranging from +5°C to -40°C. Summer temperatures range from -5°C to +25°C with isolated rainfall increasing through September (Table 2-1).

Table 2-1: Estimated average monthly climate data – Baker Lake

Month	Max. Air Temp. (°C)	Min. Air Temp. (°C)	Rainfall (mm)	Snowfall (mm)	Total Precip. (mm)	Lake Evap. (mm)	Min. Relative Humidity (%)	Max. Relative Humidity (%)	Wind Speed (km/h)	Soil Temp. (°C)
January	-29.1	-35.5	0	6.9	6.9	0	67.1	75.9	16.3	-25.5
February	-27.8	-35.2	0	6.0	6.1	0	66.6	76.5	16.0	-28.1
March	-22.3	-30.5	0.0	9.2	9.2	0	68.4	81.4	16.9	-24.9
April	-13.3	-22.5	0.4	13.6	14.0	0	71.3	90.1	17.3	-18.1
May	-3.1	-9.9	5.2	7.7	12.8	0	75.7	97.2	18.9	-8.0
June	7.6	0.0	18.6	3.1	21.7	8.8	62.6	97.2	16.4	2.0
July	16.8	7.2	38.6	0.0	38.6	99.2	47.5	94.3	15.1	10.5
August	13.3	6.4	42.8	0.6	43.4	100.4	59.2	97.7	18.4	9.3
September	5.7	0.9	35.2	6.7	41.9	39.5	70.8	98.6	19.3	3.6
October	-5.0	-10.6	6.5	22.6	29.1	0.1	83.1	97.4	21.4	-2.8
November	-14.8	-22.0	0.2	16.2	16.4	0	80.6	91.1	17.9	-11.7
December	-23.3	-29.9	0	9.4	9.5	0	73.3	82.7	17.7	-19.9

Note: Data from Baker Lake A station is available from 1946 to 2011. During this period, the data quality is good, with the exception of years 1946 to 1949, and 1993, which were removed from the compilation.

The long-term mean annual air temperature for Meadowbank is estimated to be approximately -11.1°C. Air temperatures in the Meadowbank area are, on average, about 0.6°C cooler than Baker Lake air temperatures, and extreme temperatures tend to be larger in magnitude. This climatic difference is thought to be the effect of a moderating maritime influence at Baker Lake.

The prevailing winds at Meadowbank for both the winter and summer months are from the northwest. A maximum daily wind gust of 117 km/h was recorded on November 22nd, 2023. Light to moderate snowfall is accompanied by variable winds up to 70 km/h, creating large, deep drifts and occasional whiteout conditions. Skies tend to be more overcast in winter than in summer.

Table 2-1 presents monthly rainfall, snowfall, and total precipitation values for the mine site. August is the wettest month, with a total precipitation of 43.4 mm, and February is the driest month, with a total precipitation of 6.1 mm. During an average year, the total precipitation is 249.6 mm, split between 147.5 mm of rainfall and 102.1 mm of snowfall precipitation.

2.1.2 Faults

Two main faults are inferred in the Portage deposit area and included in the groundwater model (Golder, 2011) used to estimate groundwater inflows and brackish water upwelling to the pits during mine life. These are the Bay Zone Fault and the Second Portage Fault shown in Figure 2.2 by bright blue lines.

The Second Portage fault trends to the northwest under Central Dike and the Tailings Storage Facilities (TSF), roughly parallel to the orientation of Second Portage Lake. This fault is a potential pathway for the Central Dike Seepage.

The Bay Zone Fault trends from South to North and crosses Third Portage Lake, Goose Pit and Portage Pit. This fault is a potential pathway for water infiltration from Third Portage Lake into Goose Pit.

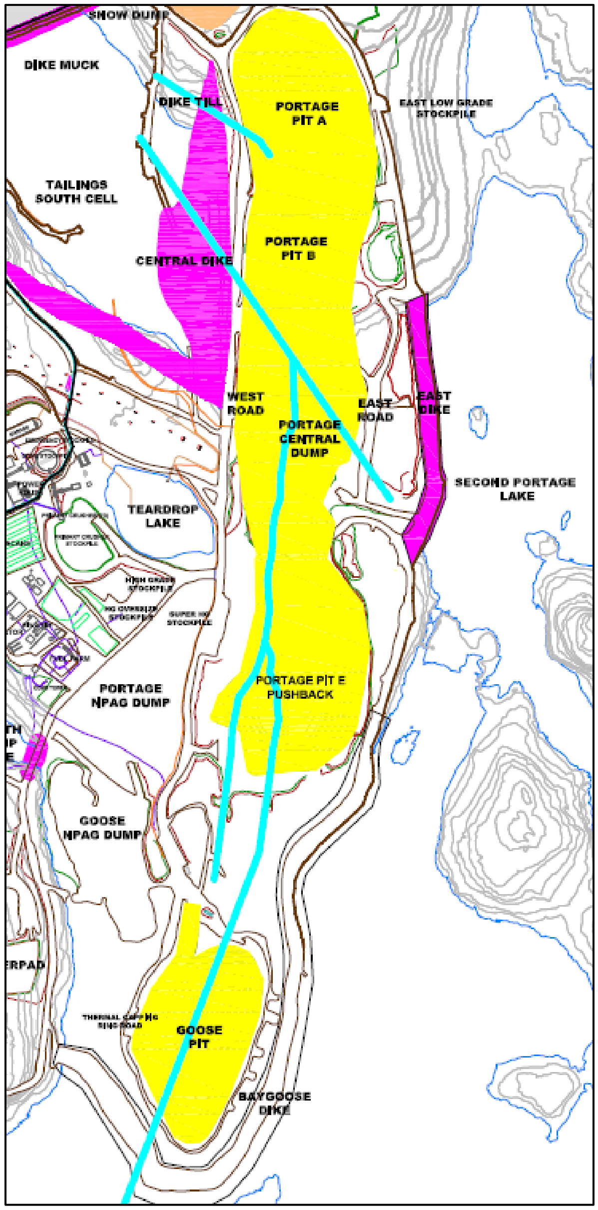


Figure 2.2: Portage Pit area – fault location

2.1.3 Permafrost

The Meadowbank Gold Mine is in an area of continuous permafrost. Lake ice thicknesses of between 1.5 m and 2.5 m have been encountered during geotechnical investigations performed mid to late spring. Talik (areas of permanently unfrozen ground) could be expected where water depth is and/or has been greater than about 2 to 2.5 m. Based on thermal studies and measurements of ground temperatures (Golder, 2003), the depth of permafrost at site is estimated to be in the order of 450 to 550 m, depending on proximity to lakes. The depth of the active layer ranges from about 1 to 1.5 m based on depth of overburden, vegetation and organics, and proximity to lakes.

Based on ground conductivity surveys and compilation of regional data, the ground ice content is expected to be low. Locally on land, ice lenses and ice wedges are present, as indicated by ground conductivity, and by permafrost features such as frost mounds. These areas of local ground ice are generally associated with low-lying areas of poor drainage.

2.1.4 Hydrology

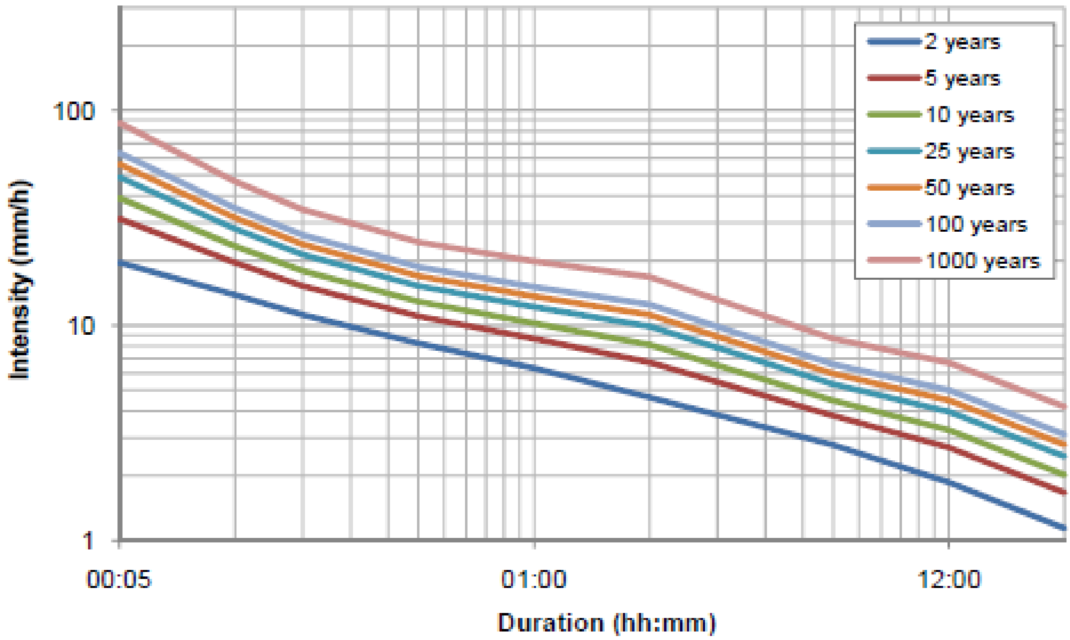
As shown above in Table 2-1, the Baker Lake A meteorological station was used to tabulate the monthly precipitation data. Using this data, SNC-Lavalin completed a Log-Pearson 3 probability distribution to determine the annual precipitation for different return periods. The results of this statistical analysis are presented in Table 2-2.

Table 2-2: Total annual precipitation for varying return periods

Return Period (years)	Precipitation (mm)
2	246
5	295
10	322
20	345
100	391

Source: SNC-Lavalin 2012 Water Management Plan (SNC, 2013)

Intensity duration frequency curves (IDF) computed by SNC-Lavalin (SNC, 2013) from the Baker Lake A meteorological station are presented in Figure 2.3. These IDF curves are for precipitations of short duration (5min-24hrs) based on data between 1987 and 2006.



Source: SNC-Lavalin Water Management Plan 2013 (SNC,2013)

Figure 2.3: Baker Lake A meteorological IDF curves

The beginning of freshet (spring period) varies from year to year however it has been observed that the winter snow accumulation (October to May) usually begins to melt at the beginning of June and continues throughout the month.

2.2 MINING OPERATION DESCRIPTION

The Meadowbank Gold Mine consists of several gold-bearing deposits within close proximity to one another. The three main deposits are Vault (Vault, Phaser and BB Phaser), Portage (South, Center and North Portage deposits), and Goose. Mining of these pits is completed, and no mining activity has been done since 2019 at the Meadowbank site.

The South Portage deposit is located on a peninsula and extends northward under Second Portage Lake (2PL) and southward under Third Portage Lake (3PL). The North Portage deposit is located on the northern shore of 2PL. The South, Center and North Portage deposits are mined as a single pit, termed the Portage Pit, which extends approximately 2 km in a north-south direction. Portage Pit is isolated from the Second Portage Lake by the East Dike built in 2008-2009 and the Bay-Goose Dike (Pit E) built from 2009 to 2011.

The Goose deposit lies approximately 1 km to the south of the Portage deposit, and beneath 3PL. The pit is isolated from the Second Portage Lake and the Third Portage Lake by the Bay-Goose Dike and the South Camp Dike constructed in 2009-2010.

The Vault deposit is located adjacent to Vault Lake, approximately 6 km north of the Portage deposit. The deposit is isolated from Wally Lake by the Vault Dike built in 2013.

2.2.1 Portage Pit Area

The Portage area located between the Third Portage Lake (3PL) and Second Portage Lake (2PL) contains most of the infrastructure of the Meadowbank mine site including but not limited to the Portage Rock Storage Facility (RSF), the North and South Tailings Storage Facilities (NC & SC TSF), the Mill, the camp, and the Stormwater Management Pond. The East Dike was constructed to isolate the north portion of the Portage Pit from the 2PL. Subsequent renaming of the pits led to the nomenclature for each pit (A, B, C, D and E). Mining activities in the Portage area ended in October 2019. Figure 2.4 presents the evolution of the Portage Pit and Figure 2.5 shows the Portage Pit Area and surrounding infrastructures.

Inflow of water into the bottom benches of Pit C and D has been observed before these pits were backfilled. Several areas of these pits are in an inferred talik area and cross a regional fault (Golder, 2009). The water inflow is thus likely a combination of ground and surface water. Pits A and B are in the permafrost and a minimal amount of water has been observed historically. Some water inflow is observed from the Pit E south wall since 2015. This inflow is mixed with other water sources at the bottom of Pit E.

On May 17th, 2019, Agnico received approval of amendment No.3 to the Meadowbank Type A water license 2AM-MEA1526 which permitted in-pit tailings disposal to take place within the Portage Pit. First, tailings were deposited in Goose pit, between July 2019 and August 2020. From August 2020 to December 2024, tailings have been deposited in Pit E. Since the end of December 2024, tailings have been deposited in Pit A and will continue for an estimated duration of one (1) year. An updated Tailings Deposition Plan has been prepared for the 2024 revision of the Water Management Plan. The updated deposition plan is presented in the 2024 version of the Meadowbank Mine Waste Rock and Tailings Management Plan. The latest life of mine exercise presents milling operations until 2028. For more information regarding in-pit tailings disposal please refer to the Waste Rock & Tailings Management Plan.

2.2.1.1 Tailings Storage Facility – North and South Cells

The Tailings Storage Facility (TSF) is located in the Portage Pit Area and consists of the South Cell and the North Cell. These cells are delimited by tailings retaining dikes that were progressively built as capacity was required. More detailed information on the TSF can be found in the Meadowbank Waste Rock and Tailings Management Plan.

Stormwater Dike, constructed in 2009-2010, is an internal dike (El. 150m) that divides the TSF in the North and South Cell.

The peripheral structures of the North Cell are SD1, SD2, RF1 and RF2 built to El. 150 m from 2009 to 2010. In 2018, a North Cell Internal Structure (NCIS) was built in the northern part of the North Cell over the existing tailings (variable El. from 152 to 154 m) to increase the tailings storage capacity.

The peripheral structures of the South Cell are SD3, SD4, SD5 and Central Dike built to El. 145 m from 2012 to 2018.

The diversion ditches (East and West), located around the perimeter of the North Cell TSF and the Portage RSF, are designed to collect the non-contact water runoff from the surrounding watershed. The ditches are divided in two sections – the west and east sections, to divert non-contact water respectively to Third Portage Lake and to NP2 Lake. On the west end of the diversion ditches, an Interception Sump was constructed in 2014-2015. The objective of the interception sump is to collect runoff water from the west section of the diversion ditches and to retain it until the total suspended solids in the water have reached the criteria allowing discharge to the environment.

As part of the construction of the NCIS, a ditch was built during the summer of 2018 in the rockfill capping located downstream of the NCIS, but within the TSF footprint, to avoid ponding of water against the structure. One sump was also built in a natural topographic low point at the north area of the cell and upstream of RF2, within the tailings footprint areas.

A volume of tailings was deposited in the South Cell during August and September 2023 to improve the landforms for closure purposes. Future deposition planning is detailed in the deposition plan that can be found in the Waster Rock and Tailings Management plan.
Stormwater Management Pond

The Stormwater Management Pond (SMP) is a small, shallow, and fishless, water body adjacent to Portage Pit and Goose Pit (Figure 2.5 and Figure 2.6). Treated sewage effluent is discharged to this pond as well as water containing hydrocarbon products. The pond also collects freshet flows within its catchment area, including most of the Primary Crusher area.

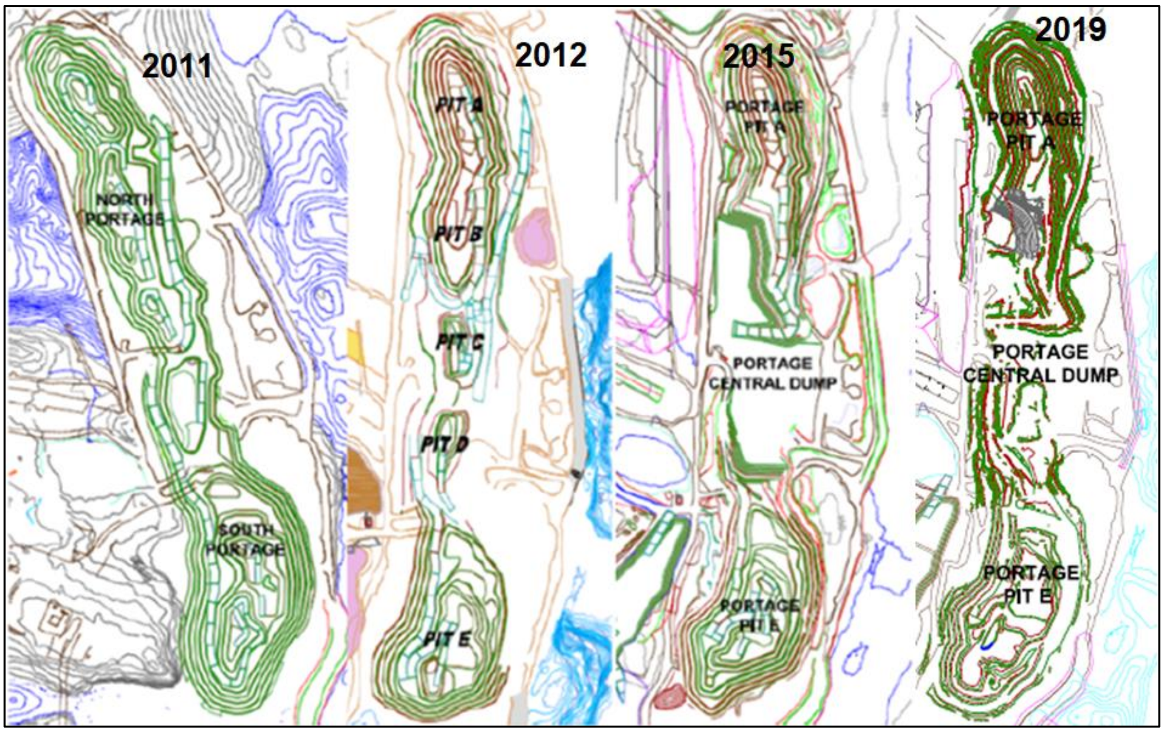


Figure 2.4: Portage Pit terminology

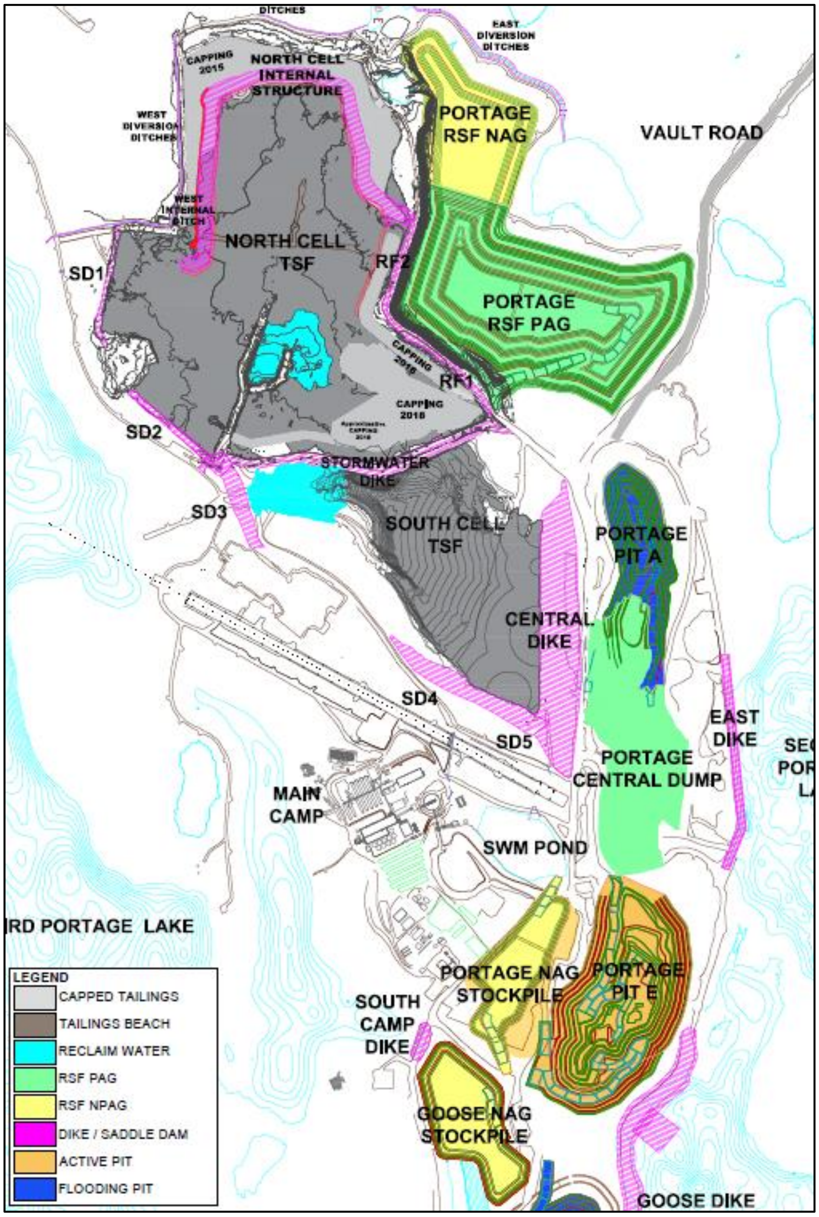


Figure 2.5: Portage Pit area map

2.2.2 Goose Pit Area

The Goose Pit area is located within the dewatered portion of 3PL. Mining in Goose Pit began in 2012 and was completed in April 2015. On May 17th, 2019, Agnico received approval of amendment No.3 to the Meadowbank Type A water license 2AM-MEA1526 which permitted in-pit tailings disposal to take place within the Goose Pit. The Goose Pit area and surrounding infrastructures are illustrated in Figure 2.6. For more information regarding in-pit tailings disposal please refer to the Waste Rock & Tailings Management Plan.

The majority of Goose Pit is located within a talik zone. Historically, the main water inflow into Goose Pit has been observed from the fractured quartzite rock formation located in the South and West wall. No major water inflow has been observed from the eastern wall associated with the iron formation type rock with small volcanic lenses. Between the quartzite and iron formation, there is a large band of ultramafic rock (soapstone).

Since mining was completed in 2015, pumping of water out of the pit has ceased and the inflows are collected in the pit as part of the natural flooding process. As mentioned above, from July 5th, 2019, to August 19th, 2020, tailings have also been deposited in the Goose pit. Water is transferred between Goose Pit and Pit A as required.

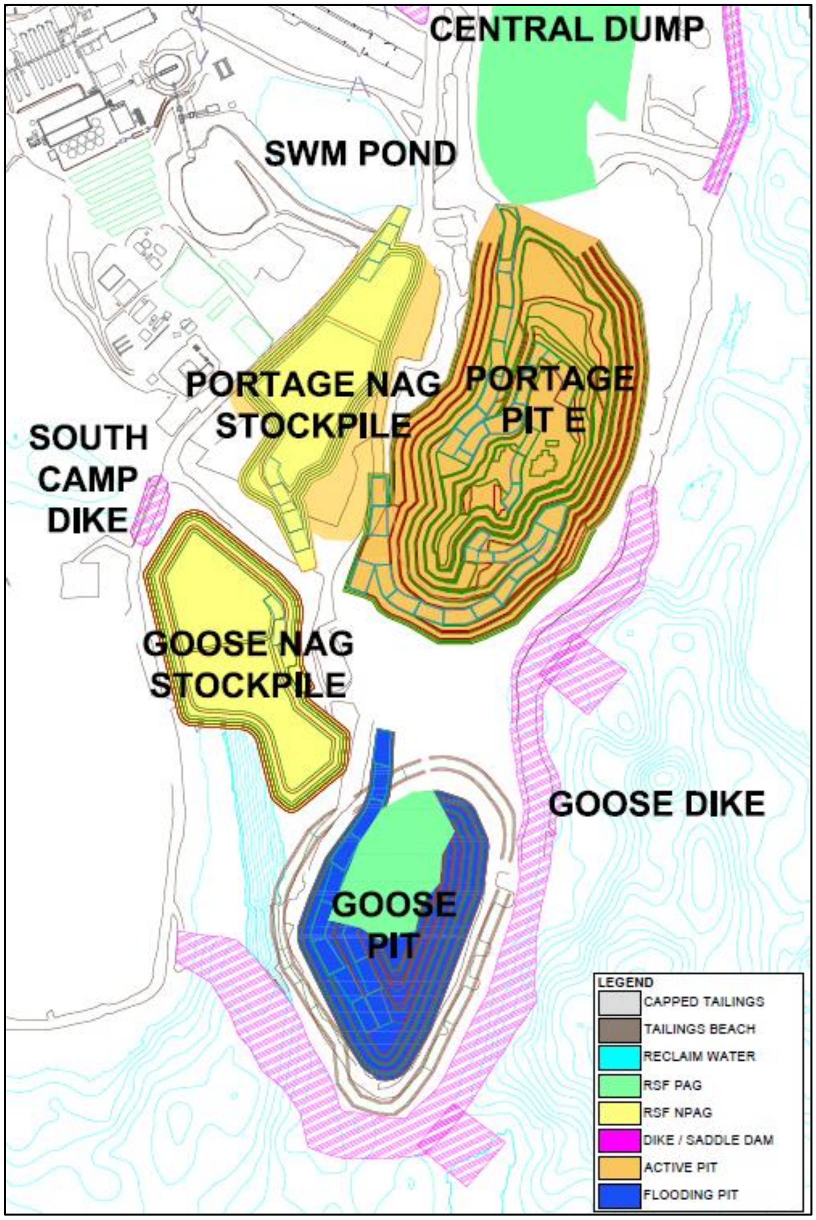


Figure 2.6: Goose Pit area map

2.2.3 Vault Pit Area

The infrastructure of the Vault Pit area includes the Vault RSF, ore and marginal pads, Vault Dike, Vault Pit, Phaser Pit, BB Phaser Pit, Vault attenuation pond and the emergency shelter. Figure 2.7 illustrates the Vault Pit area and surrounding infrastructure.

The Vault Pit, which is located under the former Vault Lake, required the construction of Vault Dike to isolate the mining area from Wally Lake and allow dewatering. Dewatering was undertaken in 2013 and 2014. This allowed for mining of Vault Pit and the creation of the Vault Attenuation Pond (ATP).

The Vault Pit began pre-mining operations in 2013 with active mining, started in 2014 and completed in March 2019. The dewatering of Phaser Lake occurred during summer 2016 in preparation for mining activity in Phaser Pit and BB Phaser Pit. Phaser Pit mining activities were completed in October 2018. BB Phaser mining began in early 2018 and was completed in June 2019.

The Vault Attenuation Pond is comprised of four internal ponds named Pond A, B C & D. These ponds promote natural settling of the suspended solids. Water levels of these ponds are measured by surveying with a GPS at the location indicated by the red crosses on Figure 2.7.

Most of the water migrating into the pits of the Vault area has been observed to be runoff from the surrounding area during the freshet period. A localized water venue from the East wall of Vault Pit was historically above the 109 masl catch bench. During mining operations this inflow was collected in a sump located at the toe of the wall and then pumped into the Vault Attenuation Pond.

Water pumped from Vault Pit during mining operations was directed to the Vault Attenuation Pond (ATP). When required, the water was discharged into Wally Lake in accordance with the Water License and the MDMER. Agnico monitors the water quality of the Vault Attenuation Pond and discharge at sampling locations ST-25 and ST-10 respectively in accordance with the Water License. Water treatment for TSS has not been required to meet MDMER and Water license criteria prior to discharging in Wally Lake.

Since mining operations in the Vault area were completed in 2019, there has been no active water management in that area. Under the current water management scenarios for 2024, active flooding using Goose Pit and Pit A treated water will be ongoing during operation starting in 2026, as presented in section 3.3.10.

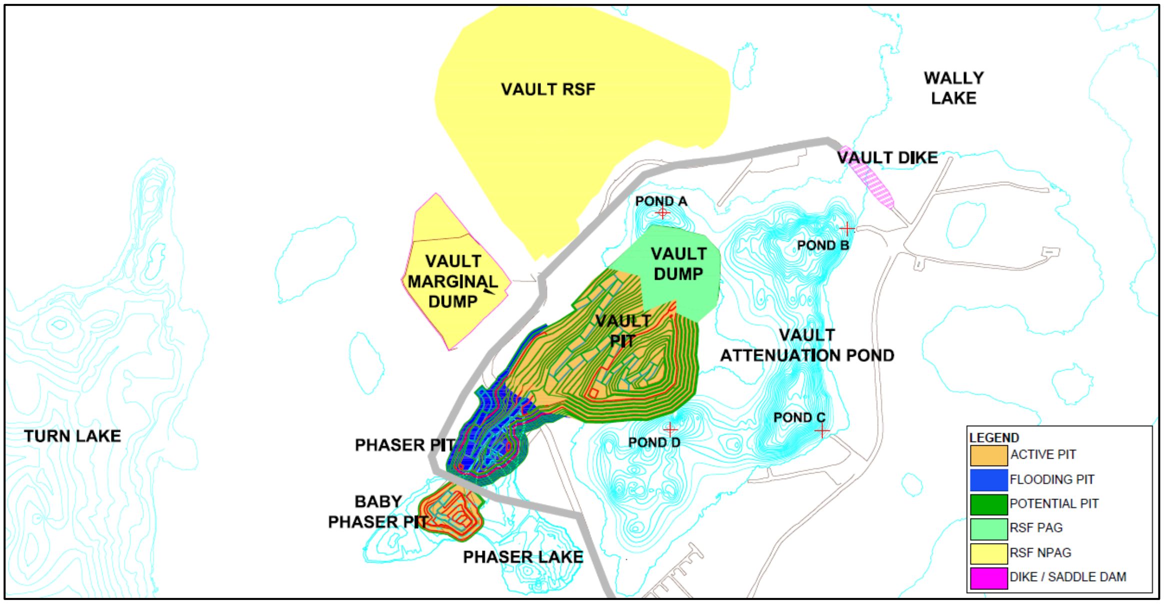


Figure 2.7: Vault Pit area map

2.3 LIFE OF MINE DESCRIPTION

The life-of-mine (LOM) is summarized in Table 3.1 of the 2024 Whale Tail Project Waste Rock Management Plan. The Meadowbank Process Plant will be operational until 2028.

3 WATER MANAGEMENT PLAN AND WATER BALANCE

3.1 WATER MANAGEMENT OBJECTIVES AND TARGETS

The water management objectives for the Meadowbank Site are:

- Keep the different water types (i.e. contact, non-contact, and freshwater) separated to the extent practical
- Control and minimize contact water through diversion and containment.
- Minimize freshwater usage by reclaiming the contact water to the extent practical
- Meet discharge criteria before any site contact water is released to the downstream environment.
- Reduction in freshwater intake per ton mined.
- Implement in-pit semi-passive treatment to enhance the degradation of nitrogen compounds in reclaim water.

- No events of non-compliance.
    - Regulatory/Water License water quality criteria (effluent loading limits);
    - Regulatory/Water License freshwater withdrawal criteria.

The water management targets are summarized in Table 3-1. These targets are aligned with the water objectives of the Meadowbank Complex and go beyond the Water License limits. These targets strive to minimize risk, conserve freshwater, and minimize water usage. The 2025 targets assume continued improvements in the amount of reclaim water withdrawn from the pits to reuse in the Mill which will also decrease the amount of freshwater used per ton processed and increase the amount of water in recirculation. Targets are set to ensure continuous effort is made to improve water management and to encourage all groups to find and pursue opportunities to reduce freshwater consumption.

Table 3--1: 2025 Targeted water hourly consumption per month – for Mill and Camp usage

WATER OBJECTIVE	TARGET 2024	TARGET 2025
Fresh Water Withdrawn from 3PL (Mill and Camp)	900.000 m^3	1,105,000 m^3
Contact Water Withdrawn from Pit (reclaim water to Mill)	3,300,000m^3	3,400,000m^3
Freshwater per ton processed	0.20 m^3/t	0.20 m^3/t
Water discharge (treated)	0 m^3	0 m^3
Water discharge (fresh) – East Dike to 2PL	35,000m^3	35,000 m^3
Water in recirculation (water recycled / total water use)	80.0%	80.0%

3.2 WATER MANAGEMENT STRATEGY

To achieve the above water management objectives and targets the following key strategies are implemented in the Water Management Plan.

- Two levels of catchment disturbance have been defined for the area, namely undisturbed and disturbed. Areas that have been disturbed as part of the mine development are considered disturbed catchments, while the areas left unaffected are considered undisturbed catchments.
- For mine water management, runoff from undisturbed areas is considered non-contact water, while runoff from disturbed catchment areas is considered contact water. Surface water that is diverted around the mine facilities, or groundwater

that does not emerge into a mine facility, is considered non-contact water. Any non-contact water that mixes with contact water becomes contact water.

- Conveyance and storage of contact water is controlled by piping, and containment structures such as sumps and ponds. Sumps are installed in low points surrounding pits, the WRSF, and the TSF. Contact water is diverted in various sumps and water collection ponds and is conveyed to the TSF or the in-pit area.
- Contact water stored in the in-pit is reclaimed for the milling process.
- East Dike seepage is discharged into Second Portage Lake (when discharge criteria is met) or otherwise sent to the in-pit area.
- .
- Non-contact water is intercepted and directed away from disturbed areas by means of natural catchment boundaries and/or diversion structures or pumping systems and will be allowed to flow or to be discharged to the neighboring waterbodies.
- Reclaim water from Pit A and Pit E will undergo metal treatment before being transferred to Goose Pit for in-pit treatment.
- In-Pit treatment of nitrogen compounds in Portage Pits and Goose Pit water by a semi passive water treatment using aerators and phosphorous amendment to promote microbial growth.
- Water transfer from Portage Pits and Goose Pit to Vault Pit, after in-pit treatment of nitrogen compounds.
- Store treated process water permanently under meromictic conditions at the base of Vault Pit.
- Promote meromictic conditions by creating a freshwater cover over the treated water from Portage Pits and Goose Pit
- Transfer water from BB Phaser and Phaser to Vault Attenuation Pond and treat TSS with a Total Suspended Solids and Metals Treatment Plant at Vault
- Discharge and treated water from Total Suspended So lids and Metals Treatment Plant at Vault, to Wally lake if water quality meets discharge criteria
- As per the Water License 2AM-MEA1530, (Part E, Condition 10) Agnico will conduct weekly inspections of all water management structures during periods of flow. This is part of the Freshet Action Plan (Appendix D).

3.3 WATER MANAGEMENT SYSTEM AND WATER BALANCE

The water management system includes the following components below. Additional water management system components can be put in place if required to adapt effectively to the site conditions and meet the water management objectives and targets.

The water management system includes the following components:

- Tailings Storage Facility (North Cell and South Cell) and associated dikes (SD1, SD2, SD3, SD4, SD5, Stormwater Dike, Central Dike, NCIS)
- In-pit tailings disposal area (Portage Pit and Goose Pit)
- In-Pit water storage (Vault Pit)
- Four water retention dikes (East Dike, Bay-Goose Dike, South Camp Dike, Vault Dike)
- Water diversion channel around the North Cell of the TSF (East and West Diversion)
- Seepage Management System (Mill seepage, Central Dike seepage, East Dike seepage)
- Stormwater Management Pond
- Sump for WRSF and TSF contact water management
- Reclaim system to the Process Plant
- Freshwater intake and pump system
- Culverts
- Sewage treatment plant (STP)
- Pipelines and associated pump systems
- Potable WTP
- TSF collection pond
- Aerators (2) in Goose Pit
- Aerator (1) in Pit A
- Aerator (1) in Pit E

- In-line water treatment plant at Pit A (WTP)
- Total Suspended Solids and Metals Treatment Plant with Geotubes
- Vault Area water management system

As per the requirements of Water License 2AM-MEA1530 (Part E, condition 7) the Water Management Plan includes a yearly updated Water Balance according to the water management strategy and the applicable LOM.

The Water Balance is presented in Appendix A of this report. In this Water Management Plan version, revisions/modifications were made to the Water Balance for optimization purposes including:

- Fresh water consumption revision;
- Total daily Mill water requirements;
- Reclaimed water volumes;
- Updated tailings deposition plan for In-Pit Tailings Disposal;
- Water transfer and treatment sequence and volume
- Reflooding sequence and volumes updated as per the latest flooding strategy;
- Update to the seepage section.

3.3.1 Fresh Water from Third Portage Lake

Fresh water from Third Portage Lake is pumped from a freshwater barge. The two primary consumers of fresh water are the Mill and the Camp. The amount pumped from the barge is tracked in the water balance and reported in the Annual Report as per the requirement of the Type A Water License. The freshwater withdrawal limit for Third Portage Lake as per the Type A Water License is 4,935,000 m^3 per year, including use for pit reflooding.

The freshwater consumed at the Mill is used as part of the milling process and is then discharged in the Portage Pit or TSF as slurry with the tailings. Depending on the time of year, 35% – 75% of the total water volume discharged into the pits is available to be recirculated back to the process plant.

The fresh water used in the Camp includes laundry facilities, cleaning, cooking, and drinking water consumption. Most of the Camp fresh water is returned as sewage treatment effluent to the Stormwater Management Pond, which ultimately is transferred to the Portage Pit.

3.3.2 Tailings Deposition Strategy and Reclaim Water

The water management objective related to tailings deposition is to minimize the freshwater per ton processed while maximizing the water in recirculation. This is achieved by reclaiming contact water from the tailings deposition area. More information on the tailings deposition plan can be found in the waste rock and tailings management plan.

For the remainder of Mill operations, reclaim water will continue to come from the in-pit disposal pits Pit A and Pit E.

3.3.3 North Cell

Water inflows in the North Cell include runoff, water from tailings deposition, and water transfers from various sumps as needed (Western Interception Sump, WEP, SD1-2, NCIS, ST-16). As per the design specifications, the level of the North Cell reclaim pond must be maintained with a two-meter freeboard with the peripheral water retaining structures, which are at 150.0 masl elevation. Therefore, the pond must respect an elevation of 148.0 masl. This strategy requires transfers from the North Cell to the South Cell generally from May to October.

Runoff water (non-contact water) from the surrounding North Cell TSF watershed area is captured in the diversion ditches located north of the North Cell TSF. Water from the Western Diversion Ditch is conveyed to the Western Interception Sump. From there, it is pumped into the North Cell or redirected to Third Portage Lake via the West Diversion Ditch if water quality meets the required criteria.

During final tailings deposition and landform cover placement over the TSF, the TSF runoff will be directed to the TSF collection Pond. . Details on the water management for the TSF at closure are available in the Meadowbank Closure and Reclamation Plan and will be further presented in the Mine Closure and Reclamation Plan (CRP).

3.3.4 South Cell

The water management strategy is to keep the water level at a minimum.

Water inflows in the South Cell include runoff, water from tailings deposition, and water transfers from the North Cell, and various sumps (SD3-4-5). As per the design specifications, the level of the South Cell reclaim pond must maintain a two-meter freeboard with peripheral impermeable structures, which are at 145.0 masl elevation. Therefore, the pond must respect an elevation of 143.0 masl. Water is transferred from the South Cell to Pit A and water transfers are planned to comply with the freeboard requirement and to minimize water accumulation. Water management strategies within the Water Balance reflect the tailings deposition plan presented in the 2024 Mine Waste and Tailings Management Plan (Agnico, 2025).

During final tailings deposition and landform cover placement over the TSF, the TSF runoff will be directed to the TSF collection Pond. Details on the water management for the TSF at closure are available in the Meadowbank Closure and Reclamation Plan and will be further presented in the FCRP.

3.3.5 TSF Collection Pond

The TSF collection pond is required in operation to complete the final tailings deposition in the South Cell TSF, as an alternate reclaim water management infrastructure will be needed. The collection pond will also be required once the North and South Cells TSF cover will be in place, to collect the runoff water from the landform cover system. Water from the TSF will be discharged to the collection pond by a channel located on the north-east side of the pond, connecting it to South Cell. Water accumulated in the collection pond during operation and early closure will be pumped to the open pits, until water quality meets the required criteria to be discharged to the environment, upon regulatory approval. The collection pond is also required for safe water management of the TSF runoff and to optimize management of site contact water for the end of operation and closure. The total pond volume required is approximately 525,000 m3. The development of the collection pond will be done in two (2) phases. In 2025, the first phase of the pond will be constructed and have a capacity of approximately 315,200 m3, along with the channel to the South Cell. The second phase of the construction will be completed later during operation.

3.3.6 Portage Pit

The Portage Pit is part of the in-pit tailings disposal facility. The water management strategy is to maximize the reclaim to the Mill to maximize tailings storage capacity.

The pit flooding strategy and sequence will continue to be refined until the CRP submission based on the Water Quality Forecast completed each year (Appendix C).

The Portage Pit inflow is modelled based on measured onsite data including the Central Dike seepage water, Goose Pit transfer, pit wall inflow, runoff water, groundwater, and contribution from the East Dike seepage water (which is pumped back to Second Portage Lake when discharge criteria are met).

It is likely that the water inflow is filling up the porosity voids of the Portage Central Dump to some extent (former Pit C and Pit D).

In August 2024, it was observed that Pit E and Pit A consistently maintained the same water level, indicating they are now connected through the Central Dump. These two pits are now considered as one, starting at 86.5 masl.

Water from Pit A will be transferred to Goose Pit. Two additional aerators are scheduled to be installed in Pit A and Pit E in July 2028 and will operate until June 2030, as described in section

3.3.7 Goose Pit

Goose Pit is part of the in-pit tailings disposal facility. The water management strategy is to transfer water between Goose Pit and Portage Pit to meet requirements for the deposition plan.

As part of the closure concept and to achieve the closure objectives, Goose Pit water will be treated via a semi-passive treatment and discharged in Vault Pit, as described in section 3.3.8. Water from Pit A will be directed to Goose pit for treatment through the same process, after which it will be transferred at the base of Vault Pit. When all the Portage pit water is treated, Goose Pit will be reflooded. The pit flooding strategy and sequence will continue to be refined until the CRP submission based on the Water Quality Forecast completed each year (Appendix C).

The Goose Pit inflow is modelled based on measured onsite data including pit wall inflow, runoff water, Pit A transfer and groundwater. It was historically observed that the pit inflow diminishes during the winter due to the freezing of the pit walls.

3.3.8 Goose and Portage In-Pit Aerators

Decay of nitrogen species in the Goose Pit process water has been observed through water quality monitoring data, facilitated by microbial activity in the flooded pit. This process is being enhanced by an experimental aeration program that began in August 2024. During the summer of 2024, two aerators were installed in Goose Pit. Two additional aerators are scheduled to be installed in Pit A and Pit E in July 2028 and will operate until June 2030. A diffuser array injects compressed air into the flooded pit at depth, causing turnover and complete mixing of the previously stratified lake. The increased oxygen levels, along with small additions of fertilizer, aim to accelerate the destruction of nitrogen species. The goal is to use Goose Pit as a reactor for processing water stored in Pit A and Pit E. Once the nitrogen species are reduced to sub-acutely toxic concentrations, this water will be pumped from Goose Pit to the base of Vault Pit. A flowchart detailing the complete water management plan is available in Appendix B.Pit A In-Line Treatment

The principle of the semi-passive treatment is to utilize microorganisms living in the water to treat nitrogen species. However, some metals, such as copper, can compromise their activities. Therefore, metals should be treated prior to the aeration process. A Metals Water Treatment Plant (WTP) will be installed to treat metals in the water transferred from Pit A to Goose Pit. The treatment targets, based on an analysis of the best available economically achievable technologies, are set at 0.03 mg/L for arsenic (As) and 0.05 mg/L for copper (Cu) (MEND, 2014). The treatment plant will operate at a rate of 1,600 m^3/hour from June 1 to September 30 each year, starting in 2026 and continuing until 2030. A flowchart detailing the complete water management plan is available in Appendix B.

3.3.9 Vault Water Distribution Line

To reduce the water load on the Meadowbank water balance during the Closure, the approach involves transferring treated water from Goose Pit to Vault Pit, where it will be contained by engineered meromixis conditions. The strategy includes installing two pipelines from Goose to Vault over a 10 km distance along the Vault Road, , targeting a maximum flow rate of 1600 m^3/h.

3.3.10 Vault Pit Treatment and Meromixis

No active water management is currently occurring in the Vault Area. At the end of operations, process water in the Goose Pit and Pit A following in-pit treatment will be transferred to the base of Vault Pit from 2026 to September 2033, where it will be isolated under meromictic conditions. Meromictic conditions in a flooded pit refer to a situation where the water column is permanently stratified into layers that do not mix. This means that the deeper layers of water remain isolated from the surface layers, preventing the exchange of oxygen and other substances between them. This stratification can help in isolating contaminants and preventing their spread throughout the water body. The freshwater cover of approximately 15 m will be transferred from Wally Lake. .

The current strategy during Progressive Closure and Closure phases to reduce the volume of water reporting to Vault Pit is to redirect water from Phaser and BB phaser Pits the Vault pit to the Vault Pit Attn Pond. The water will be processed, if necessary, using Geotubes® water treatment plant (WTP) to remove total suspended solids (TSS) before being transferred to Wally Lake. The treatment involves an inline treatment plant where caustic, coagulant, and flocculant are added to the water. These chemicals help to coagulate and flocculate the TSS, making them easier to settle. The treated water will then pass through Geotubes® where the solids will settle and be removed.

The pit flooding strategy and sequence will continue to be refined until the CRP submission based on the Water Quality Forecast completed each year (Appendix C).

A flowchart detailing the complete water management plan is available in Appendix B.

3.3.11 Stormwater Management Pond

The Stormwater Management Pond inflow includes treated sewage effluent, runoff from snow dump melt, and transfers from trucks containing hydrocarbon contaminated water. Stormwater Pond will be directed to Portage or Goose Pits during freshet and open water season as required.

3.3.12 Mill Seepage Collection System

In November 2013, Agnico observed seepage discharging west of the access road in front of the Assay Lab shown on Figure 3.1. The source was determined to be a leak from internal containment structures within the Mill. Third Portage Lake (3PL), approximately 200 m to the west, was identified as a possible sensitive receptor. Remedial measures were undertaken immediately, and this included construction of an impermeable interception/collection trench downstream of the seepage flow path. A comprehensive monitoring system was implemented which included installation of monitoring wells, a recovery well (MW 203) and a water sampling program. Repairs (sealing) were completed within the Mill (containment structures) in 2014 to eliminate the source of contaminants.

On December 15th and December 26th, 2023 Agnico observed water inflow within the Assay Road Seep South retention berm. An investigation was undertaken to identify potential sources of the water, in May of 2024 the source of the water inflow has been identified as originating from the leach pad no water inflow has been observed since. The water inflow was contained within the existing water management infrastructure that was built in 2014. Monitoring of the area is still ongoing. Repairs to the Leach pad structure will be done in summer 2025.

The seepage collected in the trench and recovery well is pumped back to the Mill to be used as process water. The pumping occurs in the warmer months beginning when freshet starts. The recovery well is pumped year-round when water is available.

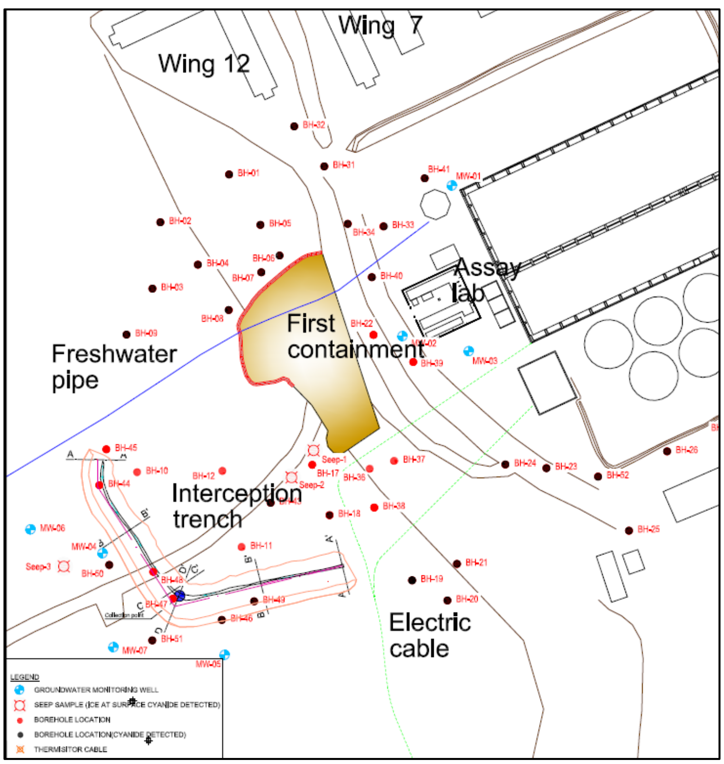


Figure 3.1: Mill seepage area

3.3.13 Portage RSF Water Management

The Portage Rock Storage Facility water management system consists of three sumps located behind the Portage waste dump to collect contact water (WEP-1, WEP-2, and ST-16). The location of these sumps is indicated on Figure 3.2. Water collected from WEP-1 and WEP-2 is pumped to the ST-16 sump and then transferred to either North Cell or pit A.

Low contaminant levels are still observed by the sampling program. The Freshet Action Plan (Appendix D) presents more information on the history, long term monitoring plan, and remedial actions for this location.

Figure 3.2: RSF seepage area

3.3.14 East Dike Seepage Collection

The East Dike seepage system collects the East Dike seepage from Second Portage Lake (2PL). The seepage is collected in two pumping stations (as illustrated in Figure 3.3) and is discharged, as a combined flow, through a diffuser, to 2PL (in accordance with the Water License and the MDMER criteria). When the discharge does not meet the discharge criteria (mainly because of TSS level), the seepage water is pumped to the Portage Pit area (usually at freshet and after large precipitation events in summer) specifically in the Portage Central Waste Rock area, where the water flows in the rock backfill pores towards Pit A and Pit E.

At closure, this seepage water will be an inflow contributing to the natural pit reflooding process.

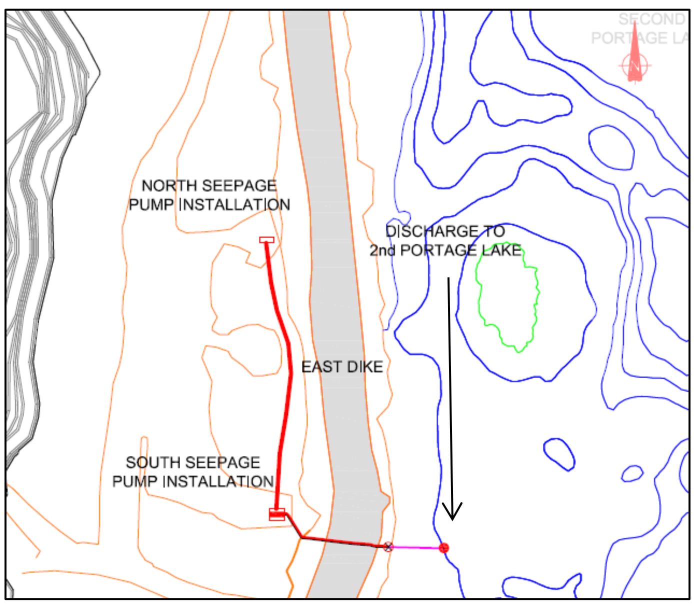


Figure 3.3: East Dike pumping system

3.3.15 Central Dike Seepage

The Central Dike downstream area collects the Central Dike seepage. The source of that seepage includes water from the TSF and a regional component. The water from Central Dike downstream is pumped to the in-pit area (as illustrated in Figure 3.4) as to maintain the downstream seepage collection pond level within the operational levels specified in the OMS Manual. The seepage volume is expected to reduce over time as the water level in Pit A will increase and the TSF North and South cell will be covered.

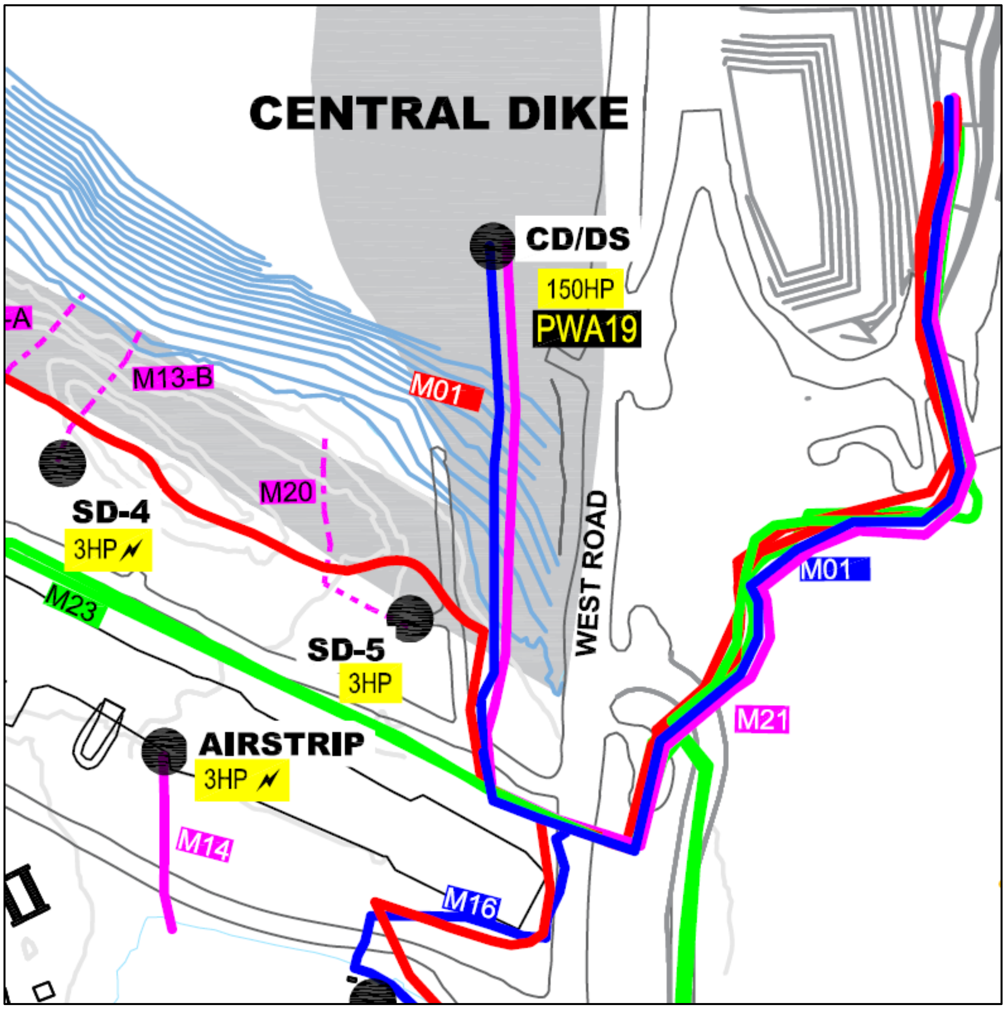


Figure 3.4: Central Dike seepage pumping system

3.4 PIT FLOODING – CLOSURE CONCEPT

As per the water License requirement, Agnico will provide at least 30 days' notice to the Nunavut Water Board and Inspector prior to starting the flooding of each pit from water obtained from Third Portage Lake and Wally Lake.

As prescribed in the Nunavut Water Board Water License No. 2AM-MEA1530 (Part E, Conditions 1 and 2), the use of water from Third Portage Lake, for all purposes, including flooding of the pits, shall not exceed a maximum of 4,935,000 m^3 starting in 2018 through to the expiry of the License 2AM-MEA1530. The use of water from Wally Lake shall not exceed a total of 4,185,000 m^3 per year starting in 2018 through the expiry of the License 2AM-MEA1530.

The reflooding concept of the Portage and Goose area includes management of water from tailings deposition activity, water treatment, passive flooding, water transfers between the pits, and active flooding from Third Portage Lake. More details on the in-pit water treatment strategy and design, including the discharge location and assimilative capability of the receiver is required to advance the Portage area flooding concept. The assimilative capacity of Third Portage Lake and Wally Lake will be assessed with the objective of determining water quality objectives in the receiver and in the final flooded pit post-closure.

Updates on the pit flooding concept will be provided in the next update of the CRP, and the final in-pit water treatment and pit flooding strategy will be submitted as part of the FCRP.

3.4.1 Portage and Goose Area Flooding

The active pit flooding phase spans the period of 2030 to 2036, with specific timelines as follows:

- Goose Pit: 5.29 Mm^3 pumped from Third Portage Lake in 2030 to 2032 (June to September only);
- Pit E: 4.49 Mm^3 pumped from Third Portage Lake in 2032 (June to September only);
- Pit A: 6.81 Mm^3 pumped from Third Portage Lake in 2033 to 2035.
- Combined Pit Freshwater Cap: 1.19 Mm^3 pumped from Third Portage Lake in January to June 2035; and,
- Vault Pit: 43,445 m^3 pumped from Wally Lake in September 2033, resulting in a freshwater cap depth of 13.5 m.

The Portage and Goose area will be connected as one waterbody when the pit water level reaches approximately elevation 131.0 masl. Figure 3.5 shows a concept of the the extent of the flooded area at closure.The flooded pits merge into the Combined Flooded pit will be in June 2034.

At the end of operations, process water in the Goose Pit and Pit A will be treated from nitrogen species through aeration and fertilization and metals will be removed with a WTP.

The process water will be transferred to the base of Vault Pit by September 2033, where it will be isolated under meromictic conditions. The Portage pits will then be flooded with Third Portage Lake water until the water level reaches 133.6 masl (September 2035), at which point the Bay Goose Dike and South Camp Dike will be breached, reconnectiong the Combined Flooded pit with Third Portage Lake.

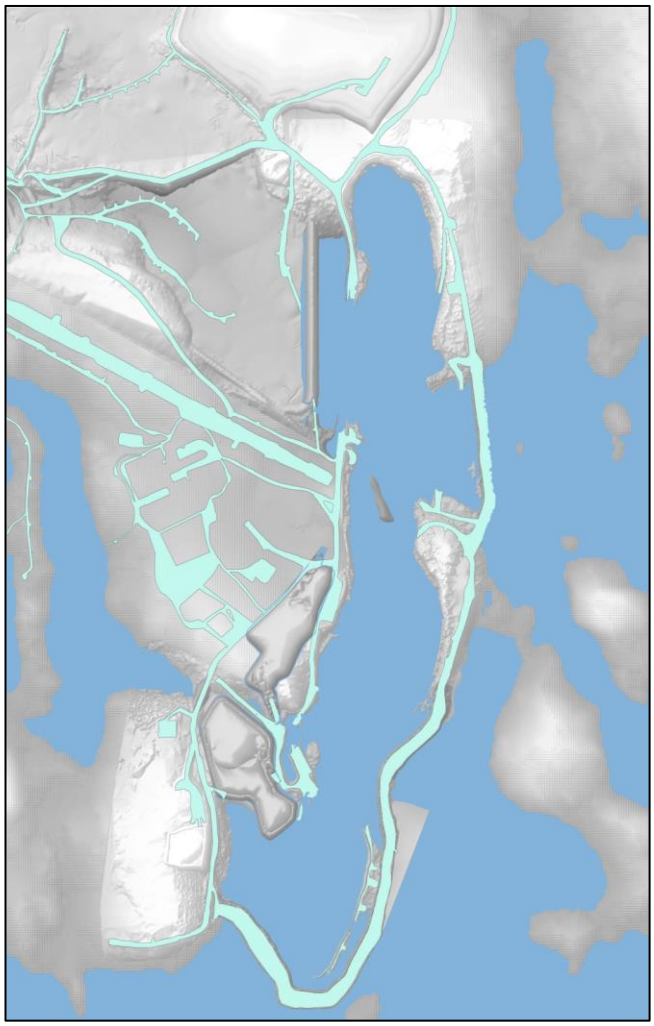


Figure 3.5: Flooded Portage and Goose area at closure

This is a conservative assumption that will be revised in the CRP and FCRP as further data becomes available on the water treatment design for the in-pit water. Different flooding sequence concepts are being looked at for the reflooding of the Portage and Goose Area to ensure the closure objectives will be met. The flooding sequence will be informed by the water treatment strategy that is being established. The location of the discharge, type of treatment, water quality and discharge criteria of the effluent, as well as yearly volume of water to be discharged are being assessed as part of the design of the closure strategy and will impact the pit reflooding strategy. Some of the work associated with the water quality forecast and water treatment plant design is presented in the Meadowbank Mine: Water Balance and Water Quality Model Technical Report for the 2024 Annual Report completed by Lorax Environmental Services Ltd. (Lorax, 2025). An update on the pit flooding concept will be provided in the next CRP update and the final design will be submitted as part of the FCRP.

Agnico is committed to update the Water Quality Forecast Model using up to date data on a yearly basis and to use this model to inform on the water treatment design and re-flooding sequence.

The final elevation of the reflooding will be the elevation of Third Portage Lake which is around 133.7 masl based on available data. The Bay-Goose Dike and South Camp Dike will be breached to allow reconnection of the area with Third Portage Lake once the closure water quality objectives for pit flooding will have been achieved, as per the condition of the Water License 2AM-MEA1530, part E, item 7. The dikes shall not be breached until the water quality in the re-flooded area meets CCME Water Quality Guidelines for the Protection of Aquatic Life, baseline concentrations, or appropriate SSWQO, as per the Water License. It is not planned to breach East Dike and reconnect the area with Second Portage Lake as per the current closure concept, to maintain the water level difference between Second and Third Portage Lake.

Details of the complete mechanical flooding system will be available in the Final Closure and Reclamation Plan and is currently involving syphon systems.

Year	Active Pumping from 3PL to (m3/year):					Wally Lake
	Goose Pit	Pit A	Pit E	Combined Pit	Annual Total	Vault Pit
2030	179,632	0	0	0	179,632	0
2031	4,919,040	0	0	0	4,919,040	0
2032	194,025	0	4,490,826	0	4,684,851	0
2033	0	1,018,080	0	0	1,018,080	43,445
2034	0	4,919,040	0	0	4,919,040	0
2035	0	875,118	0	1,193,619	2,068,737	0

2036	0	0	0	0	0	
Total	5,292,697	6,812,238	4,490,826	1,193,619	17,789,380	43,445

Table 3-2 shows the main volumes for the Portage and Goose Area flooding concept.

Year	Active Pumping from 3PL to (m^3/year):				Wally Lake	
	Goose Pit	Pit A	Pit E	Combined Pit	Annual Total	Vault Pit
2030	179,632	0	0	0	179,632	0
2031	4,919,040	0	0	0	4,919,040	0
2032	194,025	0	4,490,826	0	4,684,851	0
2033	0	1,018,080	0	0	1,018,080	43,445
2034	0	4,919,040	0	0	4,919,040	0
2035	0	875,118	0	1,193,619	2,068,737	0
2036	0	0	0	0	0	
Total	5,292,697	6,812,238	4,490,826	1,193,619	17,789,380	43,445

Table 3-2: Portage and Goose Area flooding profile

3.4.2 Vault Area Flooding

The Vault Pit area is composed of many basins in the former lake (Vault Atteunation Pond) and three pits that are all linked together (Vault Pit Phaser Pit and BB Phaser). The flooding of the Vault Pit area will involve a combination of passive flooding (runoff), active flooding using treated water for nitrogen species and metals from Goose Pit and Pit A and active flooding using water from Wally Lake (while respecting the Water License limit). The concept for the reflooding system is currently including a pumping system from Wally LakeTable 3-3 shows the main assumptions and data for the Vault Area water mangement concept.

Starting in 2026, the Vault Attenuation Pond Water, Phaser Pit and BB Phaser, will be diverted away from Vault, and treated process water from the Portage Area will begin to be transferred into Vault Pit. The treated process water will be pumped to the base of the existing Vault Flooded pit to establish meromictic conditions, permanently isolationg the treated process water from the surface water environment. Vault Pit surface will continue to receive runoff from the surrounding catchment until 2033, when pumping for Wally lake begins. The water level is expected to reach 140 masl by September 2033, at which point Vault Dike will then be breached, reconnecting the Vault Pit surface waters with Wally Lake, as per the condition of the Water License 2AM-MEA1530, part E, item 7. The dikes shall not be breached until the water quality in the re-flooded area meets CCME Water Quality Guidelines for the Protection of Aquatic Life, baseline concentrations, or appropriate site-specific water quality objectives, as per the Water License.

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BB Phaser Pit and Phaser Lake will be flooded exclusively from their watershed run off inflows until the target elevation of Wally is reached.

Table 3-3: Vault Area water management concept

Year	Inflows		Outflows	
	Passive[1]	Phaser Pit	Evaporation	Discharge to Wally Lake
2025	234,238	0	145,583	0
2026	304,112	331,800	142,016	831,600
2027	296,237	277,200	126,195	459,900
2028	296,193	277,200	125,115	447,300
2029	295,561	277,200	125,867	447,300
2030	296,096	277,200	125,914	449,400
2031	296,114	277,200	125,907	447,300
2032	295,784	277,200	125,041	447,300
2033	294,897	197,400	125,824	447,300
2034	295,885	0	127,384	0
2035	302,486	0	137,865	0

4 MEADOWBANK WATER QUALITY FORECASTING UPDATE

An updated water quality forecast report is presented in Appendix C. That update is a continuation of a series of yearly water quality modelling updates, which began in 2012, and will continue until mine closure, as per the Water License part E item 7. The purposes of the report are to identify, through a mass balance approach, the contaminants of concern during the pit flooding process, and to inform water treatment design and requirements for closure activities.

This water quality forecast builds on the work of previous years as new monitoring data is available. Forecasted model values of the prior years are compared with the actual sample results from the following years for model accuracy purposes.

Water quality model results for flooded pits, mine discharge and closure lakes are presented. Effluent predictions for active discharge to Wally Lake are screened against Water Use License (WUL) and Metal Mining Effluent Regulations (MMER) at the end of pipe. Water quality predictions for the receiving environment in Wally Lake are screened against core receiving environment monitoring plan (CREMP) guidelines assuming a dilution factor of 10:1 at the edge of the initial dilution zone (IDZ).

Flooded pits will be reconnected with the surrounding surface water environment after the pits are fully flooded and dikes are breached. Prior to breaching the dikes, the Flooded pit water quality will need to meet site-specific water quality objectives (SSWQOs) and/or Canadian Council of Ministers of the Environment (CCME) criteria, as per conditions of Water License 2AM-MEA1530, part E, item 7.

The full water quality model results screened against relevant guidelines are provided in Appendix A of Meadowbank Mine: Water Balance and Water Quality Model Technical Report for the 2024 Annual Report (Lorax, 2025). Time series predictions for arsenic and TDS are presented in the main sections of this report and are compared against 2023 model results.

Previous model forecasts were completed before the ELOM mine plan extended operations from June 2026 to June 2028, confounding direct comparison of model results after June 2026. Most variations between model iterations for the remaining operational period are due to changes in the mine plan, updates to tailings deposition schedule, and changes in treatment and water management strategies. The complete set of modelled parameters for the 2023 and 2024 Annual Report models are compared in Appendix A of Meadowbank Mine: Water Balance and Water Quality Model Technical Report for the 2024 Annual Report (Lorax, 2025).

Prior to June 2026, most parameters have comparable trends in model forecasts. The predicted concentrations for arsenic have decreased somewhat in Pit A and E during this time period due to changes in source term input. This update was introduced to improve the agreement between model predictions and monitoring data. Note that both models still over-predict most As monitoring data from 2020 to 2025 in pits containing process water. Divergent model results prior to June 2026 are also driven by updates to decay kinetics for total cyanide, nickel and copper. These updates result in an increase in the predicted total cyanide concentrations, and a decrease to Ni and Cu forecasts, most notably in Goose Pit.

After June 2026, model results are not directly comparable. The 2023 Annual Report model predicts that concentrations will stabilize after June 2026 until process water is treated and discharged to Third Portage Lake (2028-2038) prior to reflooding (2039-2041). In the current model forecast, Pit A and Pit E water is influenced by continued tailings deposition until June 2028. A metals WTP is introduced which removes As and Cu in water being transferred to Goose Pit before enhanced passive treatment removes nitrogen species. Concentrations of parameters not influenced by treatment are relatively stable from July 2028 until process water is pumped to the base of Vault Pit and mine pits are reflooded with Third Portage Lake water.

Table 4-1: Summary of Percentage Differences Between Measured and Forecasted TDS in Flooded pits (2020-2023)

Pit	Year	*Forecasted TDS (mg/L)	Measured Mean TDS (mg/L)	%Difference
Pit A (ST-17)	2020	1710	853	-50%
	2021	2659	929	-65%
	2022	2659	1456	-45%
	2023	703	1711	143%
Pit E (ST-19)	2020	3760	833	-78%
	2021	1741	1931	11%
	2022	1741	3130	80%
	2023	793	3742	372%
Goose Pit (ST-20)	2020	884	828	-6%
	2021	282	1134	302%
	2022	282	1114	295%
	2023	241	771	220%

***Forecasted TDS obtained from 2023 Annual Report Appendix 16 - Meadowbank Predicted Water Quantity and Quality (2012-2023)**
***Red font denotes %difference >20% between measured and forecasted TDS**

As the afore-mentioned parameters may be of concern, treatment options for the pit water are being assessed for all other parameters listed above. Updates on the pit flooding and water treatment strategy will be provided in the next CRP update, and the final design will be submitted as part of the FCRP.

As part of the ongoing work on the water treatment concept, a sampling program was performed in the fall of 2023 to sample pit water from various locations and depths within the pits including near the tailings/water interface. Tailings pore water sampling was also completed. The sampling program continued during 2024, and the results will be used in future water quality forecast work.

Agnico is committed to implementing the following strategy related to the water quality forecast:

1. Continue the current monthly monitoring program of all inflows and outflows of the North and South Cells TSF Pond for cyanide, a complete total and dissolved metal scan, ammonia, nitrate, fluoride, chloride, sulphates, total dissolved solids

(TDS) and total suspended solids (TSS). This will provide an indication of the runoff quality that accumulated in these ponds following the end of tailings deposition in these areas.

2. Considering that deposition of the tailings is now occurring in the pits, regularly monitor pit water quality (Portage and Goose), when the site can be safely accessed, and analyze for cyanide, total and dissolved metals, ammonia, nitrate, chloride, fluoride, sulphates, total dissolved solids (TDS), and total suspended solids (TSS). This information will be useful in developing and calibrating a water quality forecast model of the pit water quality based on loadings from the Mill effluent, surface runoff, and possible pit seepages. Consider measuring the conductivity of water in the pits at different depths to detect if there is any stratification occurring in the flooded pits.
3. Once Portage and Goose Pits are hydraulically connected, it is recommended to sample the water at different points in the pit area to evaluate the mixing efficiency over the entire area. The samples should be taken at different depths over the entire area of the flooded pits before and after the filling season.
4. Continue to sample and analyze, as per the Water License requirement, water from the Vault Pit, Vault Attenuation Pond, Phaser Pit, and Phaser Attenuation Pond.
5. Continue bench scale water treatment tests to evaluate the contaminant removal efficiency using treatment approaches such as lime neutralization, coagulation/flocculation with aluminum sulphate or ferric sulphate, and coagulation/flocculation with proprietary coagulants designed for metal removal, as well as alternative treatment options such as biological treatment for ammonia.

4.1.1 TDS Action Plan

As discussed above, the following action plan has been developed by Agnico Eagle to allow water quality at the End of Pipe and in the Receiving Environment to be protective of aquatic life throughout all phases of the project.

One of the closure concepts for flooding Portage and Goose area currently being explored is to move as much water as needed to Vault Pit, treat for any deleterious substances above criteria (if required) by using a water treatment plant (WTP), prior to discharge to Wally Lake (ST-10) through the Vault Attenuation Pond as identified in Part F, Item 4 of the Licence. Pits will be reflooded using a combination of passive and active water inflow (from Wally Lake). This is a conservative assumption that will be revised in the Closure and Reclamation Plan (CRP) as further data becomes available on the water treatment design for the in-pit water. Different flooding sequence concepts are being looked at for the reflooding of the Portage and Goose Area to ensure the closure objectives will be met.

The Goose Dike and South Camp Dike may only be breached to allow reconnection of the area with Third Portage Lake when the closure objectives for pit flooding are achieved. The dikes shall not be breached until the water quality in the re-flooded area meets CCME Water Quality Guidelines for the Protection of Aquatic Life, baseline concentrations, or appropriate SSWQOs, as per Part E, Item 7 of the Water Licence.

To achieve this, Agnico Eagle has developed a site-specific water quality program for TDS which includes an assessment of risk through evaluating acute and chronic toxicity data collected from pit waters from the Meadowbank Mine as well as literature values. An evaluation of assimilative capacity in the receiving environment is also being conducted and will be amended to the application once finalized. A high-level summary of the site-specific water quality program is provided below, further details can be found in Appendix F.

4.1.2 Site Specific Water Quality Program and Risk Assessment

As recommended in Part F, Item 6 of the Water Licence a site-specific water quality program for effluent release has been developed for TDS, details provided in Appendix F. Through this program an interim SSWQO for acute and chronic exposures to TDS was developed. Final EQC and SSWQO benchmarks for TDS will be developed and provided to the NWB in an addendum to Appendix F once site-specific chronic toxicity to Rainbow Trout and the assimilative capacity of the receiving environment have been completed in Q4, 2024.

Literature and site-specific toxicity data were compiled, evaluated, and used to derive interim EQC for effluent at the end-of-pipe evaluated to assess TDS concentrations that are safe to aquatic life at the end of pipe and within the receiving environment at the edge of the mixing zone (SSWQO) details are provided in the attached Technical Memorandum in Appendix F.

Site-specific toxicity of TDS was evaluated from controlled studies in the laboratory using samples prepared to simulate future predicted exposure conditions. Toxicological studies to support development of the proposed benchmarks were undertaken to validate literature-based data. The objectives of the site-specific toxicological studies were to:

a) Evaluate the acute toxicity of synthesized site effluent blends of TDS to the acute regulatory test species *Daphnia magna* (48-hr exposure) and Rainbow Trout (*Oncorhynchus mykiss*; 96-hr exposure).
b) Evaluate the chronic toxicity of TDS, under future exposure conditions simulating the edge of the mixing zone during effluent discharge, using a battery of sensitive, surrogate laboratory test species: the water flea *Ceriodaphnia dubia*, an algae *Raphidocelis subcapitata*, and early life stage Rainbow Trout.

The information gathered from the site-specific toxicity program was integrated with literature data for comparable TDS mixtures to establish proposed benchmarks that are protective of aquatic life under acute (EQC) and chronic (SSWQO) exposure conditions. Site-specific data were used as the primary line of evidence to establish the benchmarks, with supplementary literature data providing additional evidence to evaluate concurrence or divergence in toxicity benchmarks for TDS under comparable exposure scenarios.

4.1.3 Acute Toxicity (EQG)

The proposed site-specific EQC benchmark for TDS lies between 4,000 to 10,000 mg/L (as calculated TDS). Refinement of the EQC to a single numerical value will be informed by evaluation of assimilation capacity in the receiving environment (i.e., confirmation that the proposed SSWQO that can be met at the edge of the mixing zone given a specified EQC). The collective lines of evidence presented in the attached Technical Memorandum (Appendix F, Section 3.1) provide high confidence that no acute lethality is expected at the point of discharge at TDS concentrations below 4,000 mg/L, therefore the interim Maximum Allowable Concentration (MAC) for the Meadowbank Mine could be set at 4,000 mg/L to ensure the protection of aquatic life.

Given the conservatism of the assessment, the results could support an extension of the EQC above 4,000 mg/L, providing assimilative capacity conditions are met. However, at this stage, the lower end of the proposed range has been advanced as the interim benchmark, providing a margin of safety for operations.

4.1.4 Chronic Toxicity (SSWQO)

The proposed interim SSWQO benchmark for TDS for the Meadowbank Mine was indicated to be 1,000 mg/L (as calculated TDS) to be protective against chronic toxicity in the receiving environment. The proposed SSWQO of 1000 mg/L is supported by the weight of evidence outlined in detail in the Technical Memorandum (Appendix F, Section 3.2) showing negligible chronic toxicity of flooded pit water to sensitive invertebrate (*C.dubia*) and algae(*R.subcapitata*) species; that the ionic matrix of the flooded pit water at closure and post-closure at the Meadowbank Complex was favorable for not exhibiting chronic toxicity to aquatic life at TDS concentrations below 1,000 mg/L; and the literature review of other mine sites also supported the interim SSWQO of 1,000 mg/L.

This proposed SSWQO of 1,000 mg/L TDS is an interim value pending confirmation of:

a) no chronic toxicity to Rainbow Trout in the planned fall 2024 toxicity test program; and
b) confirmation of assimilative capacity in the receiving environment.

The TDS action plan is presented in this current version of the Water Management Plan update (V14). Conclusions of the above studies and analyses will be presented as an addendum to a future update of this Plan.

4.1.5 Proposed Interim Acute (EQC) and Chronic (SSWQO) Toxicity Benchmarks

Interim acute (EQC) and chronic (SSWQO) toxicity benchmarks proposed to be protective of aquatic life at the end of pipe and in the receiving environment are outlined in **Table 4-2**, described in section 4.1.2 and 4.1.3 above, and detailed in Appendix F.

Table 4-2: Proposed EQC and SSWQO Benchmarks for TDS

Toxicity Evaluation	Benchmark Type	Interim Benchmark (mg/L)
Acute	EQC (End of Pipe)	4,000
Chronic	SSWQO (Receiving Environment)	1,000

5 REFERENCES

1. Agnico (2025) – 2024 Mine Waste and Tailings Management Plan
2. Environment Canada (2011a) - National Climate Data and Information Archive, http://climat.meteo.gc.ca/advanceSearch/searchHistoricData_f.html.
   14. Nunavut Water Board, Water Licence NO: 2AM-MEA0815, June 9, 2008, to May 3, 2015.
3. Golder Associates Ltd. (Golder), 2003. Report on Permafrost Thermal Regime Baseline Studies, Meadowbank Project. December 18, 2003.
4. Golder (2009) – Meadowbank Gold Project Updated Water Management Plan. Golder Associates Limited. July 2009.
5. SNC (2013) – Water Management Plan 2012. SNC Lavalin. March 2013.
6. Lorax Environmental Services Ltd., 2025 - Meadowbank Mine: Water Balance and Water Quality Model Technical Report for the 2024 Annual Report. March 2025

APPENDIX A – 2024 WATER BALANCE UPDATE

Note: The Meadowbank water balance presented in this report was developed by Lorax Environmental Services Ltd. (Lorax) via Goldsim v14 software platform.

Result:	Water_level_ A_cal	Water_level_ E_cal	Water_level_ Goose_cal	Water_Level_ Vault_Surface	Vault Pit Base Water Level	Vault Pit Surface Water Level	VaultAP_ Water_Level	Combined Portage Pit
Unit:	m	m	m	m	m	m	m	m
2025-01-31	106.2	106.3	119.2	58.6	-45.0	58.6	138.2	0.0
2025-02-28	106.9	106.4	119.2	58.6	-45.0	58.6	138.2	0.0
2025-03-31	107.5	106.6	119.2	58.6	-45.0	58.6	138.2	0.0
2025-04-30	107.4	107.1	119.2	58.6	-45.0	58.6	138.2	0.0
2025-05-31	107.6	107.6	119.2	58.7	-45.0	58.7	138.2	0.0
2025-06-30	109.1	108.8	119.7	62.4	-45.0	62.4	138.4	0.0
2025-07-31	109.2	109.4	119.7	62.8	-45.0	62.8	138.4	0.0
2025-08-31	110.0	110.2	119.7	63.0	-45.0	63.0	138.4	0.0
2025-09-30	111.2	110.9	119.9	64.3	-45.0	64.3	138.4	0.0
2025-10-31	111.5	111.6	119.9	64.4	-45.0	64.4	138.5	0.0
2025-11-30	111.9	112.1	119.9	64.4	-45.0	64.4	138.5	0.0
2025-12-31	112.4	112.4	119.9	64.4	-45.0	64.4	138.5	0.0
2026-01-31	113.0	112.7	119.9	64.4	-45.0	64.4	138.5	0.0
2026-02-28	113.4	113.1	119.9	64.4	-45.0	64.4	138.5	0.0
2026-03-31	113.9	113.5	119.9	64.4	-45.0	64.4	138.5	0.0
2026-04-30	114.1	114.0	119.9	64.4	-45.0	64.4	138.5	0.0
2026-06-30	116.2	115.7	111.4	65.8	9.8	72.2	138.7	0.0
2026-07-31	116.4	116.7	99.9	65.9	28.9	78.4	138.3	0.0
2026-08-31	117.1	117.3	86.4	65.9	41.9	83.9	137.7	0.0
2026-09-30	118.2	118.0	81.1	66.3	45.8	85.9	137.8	0.0
2026-10-31	118.5	118.6	81.1	66.3	45.8	85.9	137.8	0.0
2026-11-30	118.7	119.2	81.1	66.3	45.8	85.9	137.8	0.0
2026-12-31	118.8	119.8	81.1	66.3	45.8	85.9	137.8	0.0
2027-01-31	118.8	120.4	81.1	66.3	45.8	85.9	137.8	0.0
2027-02-28	118.9	121.0	81.1	66.3	45.8	85.9	137.8	0.0
2027-03-31	119.0	121.6	81.1	66.3	45.8	85.9	137.8	0.0
2027-04-30	119.0	122.1	81.1	66.3	45.8	85.9	137.8	0.0
2027-05-31	119.2	122.7	81.2	66.4	45.8	85.9	137.8	0.0
2027-06-30	121.1	120.0	95.9	67.5	45.8	86.7	138.1	0.0
2027-07-31	119.7	118.5	108.1	67.6	45.8	86.8	137.6	0.0
2027-08-31	115.4	119.0	118.0	67.6	45.8	86.8	137.5	0.0
2027-09-30	114.1	119.8	122.7	68.0	45.8	87.1	137.8	0.0
2027-10-31	114.5	120.4	122.7	68.0	45.8	87.1	137.8	0.0
2027-11-30	114.7	120.9	122.7	68.0	45.8	87.1	137.8	0.0
2027-12-31	114.8	121.5	122.7	68.0	45.8	87.1	137.8	0.0
2028-01-31	114.9	122.1	122.7	68.0	45.8	87.1	137.8	0.0
2028-02-29	115.0	122.7	122.7	68.0	45.8	87.1	137.8	0.0
2028-03-31	115.1	123.3	122.7	68.0	45.8	87.1	137.8	0.0
2028-04-30	115.2	123.9	122.7	68.0	45.8	87.1	137.8	0.0
2028-05-31	115.4	124.4	122.7	68.1	45.8	87.1	137.8	0.0
2028-06-30	121.3	121.8	123.6	69.2	46.6	88.2	138.1	0.0
2028-07-31	119.0	121.2	121.7	69.2	55.8	92.7	137.6	0.0
2028-08-31	119.7	121.1	121.6	69.2	55.9	92.8	137.5	0.0
2028-09-30	120.6	121.2	121.8	69.6	55.9	93.0	137.8	0.0
2028-10-31	120.9	121.2	121.8	69.7	55.9	93.0	137.8	0.0
2028-11-30	121.0	121.2	121.8	69.7	55.9	93.0	137.8	0.0
2028-12-31	121.1	121.2	121.8	69.7	55.9	93.0	137.8	0.0
2029-01-31	121.2	121.2	121.8	69.7	55.9	93.0	137.8	0.0
2029-02-28	121.2	121.2	121.8	69.7	55.9	93.0	137.8	0.0
2029-03-31	121.3	121.2	121.8	69.7	55.9	93.0	137.8	0.0
2029-04-30	121.3	121.2	121.8	69.7	55.9	93.0	137.8	0.0
2029-05-31	121.5	121.2	121.8	69.7	55.9	93.1	137.8	0.0
2029-06-30	118.9	121.5	124.0	70.7	61.9	96.8	138.1	0.0
2029-07-31	119.5	121.4	121.5	70.8	64.3	98.1	137.6	0.0
2029-08-31	120.1	121.4	121.5	70.8	64.3	98.1	137.5	0.0
2029-09-30	120.4	121.5	122.8	71.2	64.3	98.3	137.8	0.0
2029-10-31	120.6	121.5	123.0	71.2	64.3	98.4	137.8	0.0
2029-11-30	120.7	121.5	123.0	71.2	64.3	98.4	137.8	0.0
2029-12-31	120.8	121.5	123.0	71.2	64.3	98.4	137.8	0.0
2030-01-31	120.9	121.5	123.0	71.2	64.3	98.4	137.8	0.0
2030-02-28	120.9	121.5	123.0	71.2	64.3	98.4	137.8	0.0
2030-03-31	121.0	121.5	123.0	71.2	64.3	98.4	137.8	0.0
2030-04-30	121.0	121.5	123.0	71.2	64.3	98.4	137.8	0.0
2030-05-31	121.2	121.5	123.0	71.3	64.3	98.4	137.8	0.0
2030-06-30	123.1	121.7	114.9	72.3	70.9	102.8	138.1	0.0
2030-07-31	123.5	121.7	104.2	72.3	77.2	106.6	137.6	0.0
2030-08-31	124.0	121.6	91.6	72.3	82.8	110.2	137.5	0.0
2030-09-30	124.1	121.3	82.7	72.7	87.5	113.5	137.8	0.0
2030-10-31	124.5	121.3	83.2	72.8	87.6	113.6	137.8	0.0
2030-11-30	124.6	121.3	83.2	72.8	87.6	113.6	137.8	0.0
2030-12-31	124.6	121.3	83.2	72.8	87.6	113.6	137.8	0.0
2031-01-31	124.7	121.3	83.2	72.8	87.6	113.6	137.8	0.0
2031-02-28	124.7	121.3	83.2	72.8	87.6	113.6	137.8	0.0
2031-03-31	124.7	121.3	83.2	72.8	87.6	113.6	137.8	0.0
2031-04-30	124.8	121.3	83.2	72.8	87.6	113.6	137.8	0.0
2031-05-31	124.9	121.3	83.3	72.8	87.6	113.6	137.8	0.0
2031-06-30	125.3	117.9	101.5	73.8	91.8	117.2	138.1	0.0
2031-07-31	121.4	117.7	113.5	73.9	96.1	120.4	137.6	0.0
2031-08-31	119.1	117.6	123.1	73.9	98.5	122.2	137.5	0.0
2031-09-30	120.1	117.7	130.1	74.3	98.5	122.4	137.8	0.0
2031-10-31	120.4	117.7	130.2	74.3	98.5	122.4	137.8	0.0
2031-11-30	120.6	117.7	130.2	74.3	98.5	122.4	137.8	0.0
2031-12-31	120.6	117.7	130.2	74.3	98.5	122.4	137.8	0.0
2032-01-31	120.7	117.7	130.2	74.3	98.5	122.4	137.8	0.0
2032-02-29	120.7	117.7	130.2	74.3	98.5	122.4	137.8	0.0
2032-03-31	120.8	117.7	130.2	74.3	98.5	122.4	137.8	0.0
2032-04-30	120.9	117.7	130.2	74.3	98.5	122.4	137.8	0.0
2032-05-31	121.0	117.7	130.2	74.3	98.5	122.4	137.8	0.0

Result:	Water_level_ A_cal	Water_level_ E_cal	Water_level_ Goose_cal	Water_Level_ Vault_Surface	Vault Pit Base Water Level	Vault Pit Surface Water Level	VaultAP_ Water_Level	Combined Portage Pit
Unit:	m	m	m	m	m	m	m	m
2032-06-30	118.5	121.1	131.0	75.3	102.3	125.7	138.1	0.0
2032-07-31	114.1	124.8	131.0	75.4	106.1	128.6	137.6	0.0
2032-08-31	109.6	128.0	130.9	75.4	109.7	131.3	137.5	0.0
2032-09-30	104.9	128.0	131.0	75.7	113.0	133.7	137.8	0.0
2032-10-31	105.4	128.0	131.0	75.7	113.0	133.8	137.8	0.0
2032-11-30	105.6	128.0	131.0	75.7	113.0	133.8	137.8	0.0
2032-12-31	105.8	128.0	131.0	75.7	113.0	133.8	137.8	0.0
2033-01-31	105.9	128.0	131.0	75.7	113.0	133.8	137.8	0.0
2033-02-28	106.0	128.0	131.0	75.7	113.0	133.8	137.8	0.0
2033-03-31	106.1	128.0	131.0	75.7	113.0	133.8	137.8	0.0
2033-04-30	106.2	128.0	131.0	75.7	113.0	133.8	137.8	0.0
2033-05-31	106.5	128.0	131.0	75.8	113.0	133.8	137.8	0.0
2033-06-30	103.2	128.0	131.0	76.7	116.1	136.0	138.1	0.0
2033-07-31	97.1	127.9	131.0	76.8	119.3	137.6	137.6	0.0
2033-08-31	90.7	127.9	130.9	76.8	122.4	139.0	137.5	0.0
2033-09-30	88.0	128.0	131.0	77.0	124.6	140.0	137.8	83.7
2033-10-31	88.9	128.0	131.0	77.0	124.6	140.0	137.8	83.7
2033-11-30	89.3	128.0	131.0	77.0	124.6	140.0	137.8	83.7
2033-12-31	89.4	128.0	131.0	77.0	124.6	140.0	137.8	83.7
2034-01-31	89.6	128.0	131.0	77.0	124.6	140.0	137.8	83.7
2034-02-28	89.7	128.0	131.0	77.0	124.6	140.0	137.8	83.7
2034-03-31	89.9	128.0	131.0	77.0	124.6	140.0	137.8	83.7
2034-04-30	90.0	128.0	131.0	77.0	124.6	140.0	137.8	83.7
2034-05-31	90.4	128.0	131.0	77.0	124.6	140.0	137.8	83.7
2034-06-30	101.1	128.0	131.0	77.0	124.6	140.0	138.1	85.3
2034-07-31	108.9	127.9	131.0	77.0	124.6	140.0	138.0	85.2
2034-08-31	115.4	127.9	130.9	77.0	124.6	140.0	138.0	85.1
2034-09-30	121.4	128.0	131.0	77.0	124.6	140.0	138.1	85.2
2034-10-31	121.8	128.0	131.0	77.0	124.6	140.0	138.1	85.2
2034-11-30	121.9	128.0	131.0	77.0	124.6	140.0	138.1	85.2
2034-12-31	122.0	128.0	131.0	77.0	124.6	140.0	138.1	85.2
2035-01-31	122.1	128.0	131.0	77.0	124.6	140.0	138.1	85.2
2035-02-28	122.1	128.0	131.0	77.0	124.6	140.0	138.1	85.2
2035-03-31	122.2	128.0	131.0	77.0	124.6	140.0	138.1	85.2
2035-04-30	122.2	128.0	131.0	77.0	124.6	140.0	138.1	85.2
2035-05-31	122.4	128.0	131.0	77.0	124.6	140.0	138.1	85.2
2035-06-30	127.6	128.0	131.0	77.0	124.6	140.0	138.3	87.2
2035-07-31	128.0	127.9	131.0	77.0	124.6	140.0	138.3	132.5
2035-08-31	128.0	127.9	131.0	77.0	124.6	140.0	138.3	133.4
2035-09-30	128.0	128.0	131.0	77.0	124.6	140.0	138.4	133.6
2035-10-31	128.0	128.0	131.0	77.0	124.6	140.0	138.4	133.6
2035-11-30	128.0	128.0	131.0	77.0	124.6	140.0	138.4	133.6
2035-12-31	128.0	128.0	131.0	77.0	124.6	140.0	138.4	133.6

Result:	Pit_A_Surface_RainSnowmelt	PitA_wall_Runoff	Pit_A_Disturbed_Runoff	PitA_WasteRock_Runoff	SC_Runoffs_to_PitA	CD_to_A	ED_to_PitA	ProcessWtr_fromMill_toA_Delay	Pump_E_to_A_Closure	RSF_to_Pit_A_TS	PitA_TailingsVol
Unit:	m3/month	m3/month	m3/month	m3/month	m3/month	m3/month	m3/month	m3/month	m3/month	m3/month	m3/month
Jan-25	0	0	0	0	0	26388	0	380135	0	0	239575
Feb-25	0	0	0	0	0	16629	0	319680	0	0	201894
Mar-25	0	0	0	0	0	23933	0	380360	0	0	239575
Apr-25	0	0	0	0	0	21380	0	307679	0	0	193365
May-25	1583	0	1305	144	8914	46639	0	359327	0	0	226413
Jun-25	36608	0	43512	4798	297309	125308	15877	356012	0	15108	224154
Jul-25	8416	0	6527	720	44597	70573	22711	380475	0	24713	239575
Aug-25	5659	0	4099	452	28009	142373	21770	369553	0	6052	232579
Sep-25	24545	0	17375	1916	118718	87300	20187	356091	0	5285	224154
Oct-25	403	0	423	47	2893	93279	0	320639	0	2504	201602
Nov-25	0	0	0	0	0	46323	0	335630	0	0	211417
Dec-25	0	0	0	0	0	24547	0	380306	0	0	239575
Jan-26	0	0	0	0	0	26388	0	378016	0	0	237966
Feb-26	0	0	0	0	0	16629	0	335872	0	0	214937
Mar-26	0	0	0	0	0	23933	0	377971	0	0	237966
Apr-26	0	0	0	0	0	21380	0	3049	0	0	0
May-26	1933	0	1305	144	8914	46639	0	0	0	0	0
Jun-26	44265	0	43545	4802	297531	122047	15877	0	0	15108	0
Jul-26	9829	0	6524	719	44576	66239	22711	0	0	24713	0
Aug-26	6182	0	4075	449	27844	128815	21770	0	0	6052	0
Sep-26	26488	0	17338	1912	118469	75039	20187	0	0	5285	0
Oct-26	438	0	423	47	2893	76457	0	0	0	2504	0
Nov-26	0	0	0	0	0	37366	0	0	0	0	0
Dec-26	0	0	0	0	0	19646	0	0	0	0	0
Jan-27	0	0	0	0	0	21001	0	0	0	0	0
Feb-27	0	0	0	0	0	13172	0	0	0	0	0
Mar-27	0	0	0	0	0	18873	0	0	0	0	0
Apr-27	0	0	0	0	0	16775	0	0	0	0	0
May-27	2030	0	1305	144	8914	36318	0	0	0	0	0
Jun-27	46371	0	43518	4799	297351	91612	15877	0	1152000	15108	0
Jul-27	10334	0	6524	719	44576	48102	22711	0	652800	24713	0
Aug-27	6248	0	4073	449	27833	123518	21770	0	0	6052	0
Sep-27	25547	0	17363	1915	118641	87237	20187	0	0	5285	0
Oct-27	421	0	423	47	2893	93279	0	0	0	2504	0
Nov-27	0	0	0	0	0	46323	0	0	0	0	0
Dec-27	0	0	0	0	0	24547	0	0	0	0	0
Jan-28	0	0	0	0	0	26388	0	0	0	0	0
Feb-28	0	0	0	0	0	17222	0	0	0	0	0
Mar-28	0	0	0	0	0	23892	0	0	0	0	0
Apr-28	0	0	0	0	0	21235	0	0	0	0	0
May-28	3077	0	2055	227	14044	45958	0	0	0	0	0
Jun-28	44387	0	42780	4718	292308	101420	15877	0	1152000	15108	0
Jul-28	10344	0	6557	723	44806	51326	22711	0	163200	24713	0
Aug-28	7172	0	4602	508	31447	108944	21770	0	0	6052	0
Sep-28	26076	0	16685	1840	114002	63208	20187	0	0	5285	0
Oct-28	449	0	423	47	2893	64254	0	0	0	2504	0
Nov-28	0	0	0	0	0	31412	0	0	0	0	0
Dec-28	0	0	0	0	0	16519	0	0	0	0	0
Jan-29	0	0	0	0	0	17662	0	0	0	0	0
Feb-29	0	0	0	0	0	11078	0	0	0	0	0
Mar-29	0	0	0	0	0	15876	0	0	0	0	0
Apr-29	0	0	0	0	0	14113	0	0	0	0	0
May-29	2077	0	1305	144	8914	30559	0	0	0	0	0
Jun-29	46529	0	43512	4798	297309	90785	15877	0	0	15108	0
Jul-29	10149	0	6524	719	44577	54553	22711	0	0	24713	0
Aug-29	6373	0	4073	449	27829	105778	21770	0	0	6052	0
Sep-29	27329	0	17364	1915	118644	61645	20187	0	0	5285	0
Oct-29	448	0	423	47	2893	65879	0	0	0	2504	0
Nov-29	0	0	0	0	0	32206	0	0	0	0	0
Dec-29	0	0	0	0	0	16936	0	0	0	0	0
Jan-30	0	0	0	0	0	18107	0	0	0	0	0
Feb-30	0	0	0	0	0	11357	0	0	0	0	0
Mar-30	0	0	0	0	0	16275	0	0	0	0	0
Apr-30	0	0	0	0	0	14468	0	0	0	0	0
May-30	2071	0	1305	144	8914	31327	0	0	0	0	0
Jun-30	47359	0	43518	4799	297352	77578	15877	0	0	15108	0
Jul-30	10592	0	6524	719	44576	38912	22711	0	0	24713	0
Aug-30	6646	0	4073	449	24907	75141	20190	0	0	6052	0
Sep-30	28382	0	17363	1915	0	44501	0	0	144000	5285	0
Oct-30	467	0	423	47	0	46266	0	0	0	2504	0
Nov-30	0	0	0	0	0	22625	0	0	0	0	0
Dec-30	0	0	0	0	0	11902	0	0	0	0	0
Jan-31	0	0	0	0	0	12728	0	0	0	0	0
Feb-31	0	0	0	0	0	7985	0	0	0	0	0
Mar-31	0	0	0	0	0	11445	0	0	0	0	0
Apr-31	0	0	0	0	0	10177	0	0	0	0	0
May-31	2154	0	1305	144	0	22044	0	0	0	0	0
Jun-31	48915	0	43518	4799	0	57956	0	0	1152000	15108	0
Jul-31	10655	0	6524	719	15114	38563	13920	0	48000	24713	0
Aug-31	6377	0	4073	449	27833	106914	21770	0	0	6052	0
Sep-31	27076	0	17363	1915	118641	65730	20187	0	0	5285	0
Oct-31	447	0	423	47	2893	66776	0	0	0	2504	0
Nov-31	0	0	0	0	0	32643	0	0	0	0	0
Dec-31	0	0	0	0	0	17166	0	0	0	0	0
Jan-32	0	0	0	0	0	18352	0	0	0	0	0
Feb-32	0	0	0	0	0	11922	0	0	0	0	0
Mar-32	0	0	0	0	0	16494	0	0	0	0	0
Apr-32	0	0	0	0	0	14662	0	0	0	0	0

Result:	Pit_A_Surface_RainSnowmelt	PitA_wall_Runoff	Pit_A_Disturbed_Runoff	PitA_WasteRock_Runoff	SC_Runoffs_to_PitA	CD_to_A	ED_to_PitA	ProcessWtr_fromMill_toA_Delay	Pump_E_to_A_Closure	RSF_to_Pit_A_TS	PitA_TailingsVol
Unit:	m3/month	m3/month	m3/month	m3/month	m3/month	m3/month	m3/month	m3/month	m3/month	m3/month	m3/month
May-32	3257	0	2055	227	14044	31745	0	0	0	0	0
Jun-32	45063	0	42785	4718	292338	93924	15877	0	0	15108	0
Jul-32	9929	0	6541	721	44691	65462	22711	0	0	24713	0
Aug-32	6581	0	4606	508	31471	142373	21770	0	0	6052	0
Sep-32	20089	0	16708	1842	114159	87300	20187	0	0	5285	0
Oct-32	271	0	381	42	2603	93279	0	0	0	2504	0
Nov-32	0	0	0	0	0	46323	0	0	0	0	0
Dec-32	0	0	0	0	0	24547	0	0	0	0	0
Jan-33	0	0	0	0	0	26388	0	0	0	0	0
Feb-33	0	0	0	0	0	16629	0	0	0	0	0
Mar-33	0	0	0	0	0	23933	0	0	0	0	0
Apr-33	0	0	0	0	0	21380	0	0	0	0	0
May-33	2493	0	2077	229	14192	46639	0	0	0	0	0
Jun-33	34010	0	42764	4716	292196	125308	15877	0	0	15108	0
Jul-33	7460	0	6539	721	44680	70573	22711	0	0	24713	0
Aug-33	4965	17	4600	507	31428	142373	21770	0	0	6052	0
Sep-33	14590	1193	16615	1832	113524	87300	20187	0	0	5285	0
Oct-33	264	23	423	47	2890	93279	0	0	0	2504	0
Nov-33	0	0	0	0	0	46323	0	0	0	0	0
Dec-33	0	0	0	0	0	24547	0	0	0	0	0
Jan-34	0	0	0	0	0	26388	0	0	0	0	0
Feb-34	0	0	0	0	0	16629	0	0	0	0	0
Mar-34	0	0	0	0	0	23933	0	0	0	0	0
Apr-34	0	0	0	0	0	21380	0	0	0	0	0
May-34	1340	23	1298	143	8871	46639	0	0	0	0	0
Jun-34	32292	80	43539	4801	297494	125308	15877	0	0	15108	0
Jul-34	7680	0	6507	718	44462	70573	22711	0	0	24713	0
Aug-34	5808	0	4052	447	27685	142227	21770	0	0	6052	0
Sep-34	26861	0	17370	1916	118687	70776	20187	0	0	5285	0
Oct-34	450	0	421	46	2879	59717	0	0	0	2504	0
Nov-34	0	0	0	0	0	29198	0	0	0	0	0
Dec-34	0	0	0	0	0	15356	0	0	0	0	0
Jan-35	0	0	0	0	0	16418	0	0	0	0	0
Feb-35	0	0	0	0	0	10299	0	0	0	0	0
Mar-35	0	0	0	0	0	14760	0	0	0	0	0
Apr-35	0	0	0	0	0	13122	0	0	0	0	0
May-35	2086	0	1298	143	8868	28414	0	0	0	0	0
Jun-35	48939	0	43547	4802	42079	56900	4499	0	0	15108	0
Jul-35	11251	0	6533	720	0	21286	0	0	0	24713	0
Aug-35	6976	0	4051	447	0	42865	0	0	0	6052	0
Sep-35	30020	0	17476	1927	0	26284	0	0	0	5285	0
Oct-35	490	0	423	47	0	28084	0	0	0	2504	0
Nov-35	0	0	0	0	0	13947	0	0	0	0	0
Dec-35	0	0	0	0	0	7391	0	0	0	0	0

Result:	Pitlake_A.Total_ Outflow	Pitlake_A.to_ evap	Pitlake_A.to_ Tailings	Pitlake_A.Rebalance _to_PitE	Pitlake_A.WTPPump_ toGoose	Pitlake_A.to_Vault_ via_WTP	Pitlake_A. Overflow
Unit:	m3/month	m3/month	m3/month	m3/month	m3/month	m3/month	m3/month
Jan-25	583337	0	139337	444000	0	0	0
Feb-25	443224	0	143224	300000	0	0	0
Mar-25	568047	0	196047	372000	0	0	0
Apr-25	572701	0	194701	378000	0	0	0
May-25	612215	0	240215	372000	0	0	0
Jun-25	859041	19660	263381	576000	0	0	0
Jul-25	815399	24995	310403	480000	0	0	0
Aug-25	684604	20986	147618	516000	0	0	0
Sep-25	624282	9535	140747	474000	0	0	0
Oct-25	576061	0	132061	444000	0	0	0
Nov-25	542188	0	140188	402000	0	0	0
Dec-25	547653	0	157653	390000	0	0	0
Jan-26	548468	0	158468	390000	0	0	0
Feb-26	522455	0	138455	384000	0	0	0
Mar-26	561881	0	165881	396000	0	0	0
Apr-26	0	0	0	0	0	0	0
May-26	0	0	0	0	0	0	0
Jun-26	113637	23562	0	90075	0	0	0
Jul-26	118797	28797	0	90000	0	0	0
Aug-26	23342	23342	0	0	0	0	0
Sep-26	10358	10358	0	0	0	0	0
Oct-26	0	0	0	0	0	0	0
Nov-26	0	0	0	0	0	0	0
Dec-26	0	0	0	0	0	0	0
Jan-27	0	0	0	0	0	0	0
Feb-27	0	0	0	0	0	0	0
Mar-27	0	0	0	0	0	0	0
Apr-27	0	0	0	0	0	0	0
May-27	0	0	0	0	0	0	0
Jun-27	1176702	24702	0	0	1152000	0	0
Jul-27	1220633	30233	0	0	1190400	0	0
Aug-27	1213979	23579	0	0	1190400	0	0
Sep-27	566816	10016	0	0	556800	0	0
Oct-27	0	0	0	0	0	0	0
Nov-27	0	0	0	0	0	0	0
Dec-27	0	0	0	0	0	0	0
Jan-28	0	0	0	0	0	0	0
Feb-28	0	0	0	0	0	0	0
Mar-28	0	0	0	0	0	0	0
Apr-28	0	0	0	0	0	0	0
May-28	0	0	0	0	0	0	0
Jun-28	216403	24403	0	0	192000	0	0
Jul-28	913013	29813	0	0	883200	0	0.00E+00
Aug-28	23694	23694	0	0	0	0	0.00E+00
Sep-28	10419	10419	0	0	0	0	0.00E+00
Oct-28	0	0	0	0	0	0	0
Nov-28	0	0	0	0	0	0	0
Dec-28	0	0	0	0	0	0	0
Jan-29	0	0	0	0	0	0	0
Feb-29	0	0	0	0	0	0	0
Mar-29	0	0	0	0	0	0	0
Apr-29	0	0	0	0	0	0	0
May-29	0	0	0	0	0	0	0
Jun-29	1157480	24680	0	0	1132800	0	0.00E+00
Jul-29	29724	29724	0	0	0	0	0.00E+00
Aug-29	24077	24077	0	0	0	0	0.00E+00
Sep-29	193070	10670	0	0	182400	0	0.00E+00
Oct-29	0	0	0	0	0	0	0
Nov-29	0	0	0	0	0	0	0
Dec-29	0	0	0	0	0	0	0
Jan-30	0	0	0	0	0	0	0
Feb-30	0	0	0	0	0	0	0
Mar-30	0	0	0	0	0	0	0
Apr-30	0	0	0	0	0	0	0
May-30	0	0	0	0	0	0	0
Jun-30	25231	25231	0	0	0	0	0.00E+00
Jul-30	31021	31021	0	0	0	0	0.00E+00
Aug-30	25104	25104	0	0	0	0	0.00E+00
Sep-30	164692	11092	0	0	0	153600	0.00E+00
Oct-30	0	0	0	0	0	0	0
Nov-30	0	0	0	0	0	0	0
Dec-30	0	0	0	0	0	0	0
Jan-31	0	0	0	0	0	0	0
Feb-31	0	0	0	0	0	0	0
Mar-31	0	0	0	0	0	0	0
Apr-31	0	0	0	0	0	0	0
May-31	0	0	0	0	0	0	0
Jun-31	1178008	26008	0	0	0	1152000	0.00E+00
Jul-31	1221450	31050	0	0	0	1190400	0.00E+00
Aug-31	705680	24080	0	0	0	681600	0.00E+00
Sep-31	10573	10573	0	0	0	0	0.00E+00
Oct-31	0	0	0	0	0	0	0
Nov-31	0	0	0	0	0	0	0
Dec-31	0	0	0	0	0	0	0
Jan-32	0	0	0	0	0	0	0
Feb-32	0	0	0	0	0	0	0

Result:	Pitlake_A.Total_ Outflow	Pitlake_A.to_ evap	Pitlake_A.to_ Tailings	Pitlake_A.Rebalance _to_PitE	Pitlake_A.WTPPump_ toGoose	Pitlake_A.to_Vault_ via_WTP	Pitlake_A. Overflow
Unit:	**m3/month**	**m3/month**	**m3/month**	**m3/month**	**m3/month**	**m3/month**	**m3/month**
Mar-32	0	0	0	0	0	0	0
Apr-32	0	0	0	0	0	0	0
May-32	0	0	0	0	0	0	0
Jun-32	1176573	24573	0	0	0	1152000	0.00E+00
Jul-32	1219075	28675	0	0	0	1190400	0.00E+00
Aug-32	1212245	21845	0	0	0	1190400	0.00E+00
Sep-32	1160142	8142	0	0	0	1152000	0.00E+00
Oct-32	0	0	0	0	0	0	0
Nov-32	0	0	0	0	0	0	0
Dec-32	0	0	0	0	0	0	0
Jan-33	0	0	0	0	0	0	0
Feb-33	0	0	0	0	0	0	0
Mar-33	0	0	0	0	0	0	0
Apr-33	0	0	0	0	0	0	0
May-33	0	0	0	0	0	0	0
Jun-33	1170540	18540	0	0	0	1152000	0
Jul-33	1212076	21676	0	0	0	1190400	0
Aug-33	1207030	16630	0	0	0	1190400	0
Sep-33	888568	5368	0	0	0	883200	0
Oct-33	0	0	0	0	0	0	0
Nov-33	0	0	0	0	0	0	0
Dec-33	0	0	0	0	0	0	0
Jan-34	0	0	0	0	0	0	0
Feb-34	0	0	0	0	0	0	0
Mar-34	0	0	0	0	0	0	0
Apr-34	0	0	0	0	0	0	0
May-34	0	0	0	0	0	0	0
Jun-34	0	0	0	0	0	0	0
Jul-34	0	0	0	0	0	0	0
Aug-34	0	0	0	0	0	0	0
Sep-34	0	0	0	0	0	0	0
Oct-34	0	0	0	0	0	0	0
Nov-34	0	0	0	0	0	0	0
Dec-34	0	0	0	0	0	0	0
Jan-35	0	0	0	0	0	0	0
Feb-35	0	0	0	0	0	0	0
Mar-35	0	0	0	0	0	0	0
Apr-35	0	0	0	0	0	0	0
May-35	0	0	0	0	0	0	0
Jun-35	0	0	0	0	0	0	0
Jul-35	0	0	0	0	0	0	63152.65
Aug-35	0	0	0	0	0	0	60389.87
Sep-35	0	0	0	0	0	0	80991.9
Oct-35	0	0	0	0	0	0	31548.37
Nov-35	0	0	0	0	0	0	13946.59
Dec-35	0	0	0	0	0	0	7390.502

Result:	Pit_E_Surface_ RainSnowmelt	Pit_E_Disturbed_ Runoff	PitE_WasteRock_ Runoff	ProcessWtr_fromMill_ toE_Delay	Closure_Pump_3rdPL_ to_PitE	PitA_Rebalance_to_ PitE_Delay	PitE_ TailingsVol
Unit:	m3/month	m3/month	m3/month	m3/month	m3/month	m3/month	m3/month
Jan-25	0	0	0	0	0	450000	0
Feb-25	0	0	0	0	0	300000	0
Mar-25	0	0	0	0	0	366000	0
Apr-25	0	0	0	0	0	378000	0
May-25	2026	965	359	0	0	378000	0
Jun-25	46092	32187	11968	0	0	570000	0
Jul-25	10365	4828	1795	0	0	480000	0
Aug-25	6548	3032	1127	0	0	516000	0
Sep-25	28468	12853	4779	0	0	474000	0
Oct-25	475	313	116	0	0	444000	0
Nov-25	0	0	0	0	0	408000	0
Dec-25	0	0	0	0	0	390000	0
Jan-26	0	0	0	0	0	390000	0
Feb-26	0	0	0	0	0	384000	0
Mar-26	0	0	0	0	0	396000	0
Apr-26	0	0	0	339115	0	0	215269
May-26	2251	965	359	353364	0	0	222445
Jun-26	51283	32211	11977	341965	0	84075	215269
Jul-26	11404	4826	1794	377489	0	96000	237755
Aug-26	7154	3014	1121	377685	0	0	237755
Sep-26	30518	12826	4769	364629	0	0	230086
Oct-26	504	313	116	354494	0	0	223042
Nov-26	0	0	0	342884	0	0	215847
Dec-26	0	0	0	354313	0	0	223042
Jan-27	0	0	0	376357	0	0	237966
Feb-27	0	0	0	334531	0	0	214938
Mar-27	0	0	0	376486	0	0	237966
Apr-27	0	0	0	340821	0	0	215270
May-27	2403	965	359	351977	0	0	222445
Jun-27	53816	32191	11969	340623	0	0	215269
Jul-27	11618	4826	1794	376007	0	0	237755
Aug-27	7242	3013	1120	376202	0	0	237755
Sep-27	30956	12844	4776	363193	0	0	230086
Oct-27	510	313	116	353101	0	0	223042
Nov-27	0	0	0	341536	0	0	215847
Dec-27	0	0	0	352921	0	0	223042
Jan-28	0	0	0	376346	0	0	237966
Feb-28	0	0	0	348905	0	0	222614
Mar-28	0	0	0	376507	0	0	237966
Apr-28	0	0	0	340821	0	0	215270
May-28	3895	1520	565	351977	0	0	222444
Jun-28	53468	31645	11766	340623	0	0	215270
Jul-28	11885	4851	1804	2839	0	0	0
Aug-28	8336	3404	1266	0	0	0	0
Sep-28	30056	12342	4589	0	0	0	0
Oct-28	516	313	116	0	0	0	0
Nov-28	0	0	0	0	0	0	0
Dec-28	0	0	0	0	0	0	0
Jan-29	0	0	0	0	0	0	0
Feb-29	0	0	0	0	0	0	0
Mar-29	0	0	0	0	0	0	0
Apr-29	0	0	0	0	0	0	0
May-29	2365	965	359	0	0	0	0
Jun-29	53698	32187	11968	0	0	0	0
Jul-29	11849	4826	1794	0	0	0	0
Aug-29	7393	3013	1120	0	0	0	0
Sep-29	31446	12844	4776	0	0	0	0
Oct-29	517	313	116	0	0	0	0
Nov-29	0	0	0	0	0	0	0
Dec-29	0	0	0	0	0	0	0
Jan-30	0	0	0	0	0	0	0
Feb-30	0	0	0	0	0	0	0
Mar-30	0	0	0	0	0	0	0
Apr-30	0	0	0	0	0	0	0
May-30	2370	965	359	0	0	0	0
Jun-30	53834	32192	11969	0	0	0	0
Jul-30	11879	4826	1794	0	0	0	0
Aug-30	7412	3013	1120	0	0	0	0
Sep-30	31523	12844	4776	0	0	0	0
Oct-30	516	313	116	0	0	0	0
Nov-30	0	0	0	0	0	0	0
Dec-30	0	0	0	0	0	0	0
Jan-31	0	0	0	0	0	0	0
Feb-31	0	0	0	0	0	0	0
Mar-31	0	0	0	0	0	0	0
Apr-31	0	0	0	0	0	0	0
May-31	2366	965	359	0	0	0	0
Jun-31	53044	32191	11969	0	0	0	0
Jul-31	11515	4826	1794	0	0	0	0
Aug-31	7186	3013	1120	0	0	0	0
Sep-31	30561	12844	4776	0	0	0	0
Oct-31	502	313	116	0	0	0	0
Nov-31	0	0	0	0	0	0	0
Dec-31	0	0	0	0	0	0	0
Jan-32	0	0	0	0	0	0	0
Feb-32	0	0	0	0	0	0	0
Mar-32	0	0	0	0	0	0	0
Apr-32	0	0	0	0	0	0	0

Result:	Pit_E_Surface_ RainSnowmelt	Pit_E_Disturbed_ Runoff	PitE_WasteRock_ Runoff	ProcessWtr_fromMill_ toE_Delay	Closure_Pump_3rdPL_ to_PitE	PitA_Rebalance_to_ PitE_Delay	PitE_ TailingsVol
Unit:	**m3/month**	**m3/month**	**m3/month**	**m3/month**	**m3/month**	**m3/month**	**m3/month**
May-32	3629	1520	565	0	0	0	0
Jun-32	51328	31649	11768	0	1018080	0	0
Jul-32	12059	4838	1799	0	1249920	0	0
Aug-32	9003	3407	1267	0	1139040	0	0
Sep-32	33215	12359	4595	0	0	0	0
Oct-32	459	282	105	0	0	0	0
Nov-32	0	0	0	0	0	0	0
Dec-32	0	0	0	0	0	0	0
Jan-33	0	0	0	0	0	0	0
Feb-33	0	0	0	0	0	0	0
Mar-33	0	0	0	0	0	0	0
Apr-33	0	0	0	0	0	0	0
May-33	4154	1536	571	0	0	0	0
Jun-33	57571	31633	11762	0	0	0	0
Jul-33	13079	4837	1799	0	0	0	0
Aug-33	9199	3402	1265	0	0	0	0
Sep-33	33040	12290	4570	0	0	0	0
Oct-33	568	313	116	0	0	0	0
Nov-33	0	0	0	0	0	0	0
Dec-33	0	0	0	0	0	0	0
Jan-34	0	0	0	0	0	0	0
Feb-34	0	0	0	0	0	0	0
Mar-34	0	0	0	0	0	0	0
Apr-34	0	0	0	0	0	0	0
May-34	2597	960	357	0	0	0	0
Jun-34	59244	32207	11975	0	0	0	0
Jul-34	13015	4813	1790	0	0	0	0
Aug-34	8104	2997	1114	0	0	0	0
Sep-34	34654	12849	4778	0	0	0	0
Oct-34	565	312	116	0	0	0	0
Nov-34	0	0	0	0	0	0	0
Dec-34	0	0	0	0	0	0	0
Jan-35	0	0	0	0	0	0	0
Feb-35	0	0	0	0	0	0	0
Mar-35	0	0	0	0	0	0	0
Apr-35	0	0	0	0	0	0	0
May-35	2596	960	357	0	0	0	0
Jun-35	59259	32213	11977	0	0	0	0
Jul-35	13067	4833	1797	0	0	0	0
Aug-35	8102	2996	1114	0	0	0	0
Sep-35	34865	12927	4807	0	0	0	0
Oct-35	569	313	116	0	0	0	0
Nov-35	0	0	0	0	0	0	0
Dec-35	0	0	0	0	0	0	0

Result:	PitLake_E.Total_ Outflow	PitLake_E.to_ Mill	PitLake_E.to_ Tailings	PitLake_E.to_ evap	PitLake_E.to_A_ Closure	PitLake_ E.Overflow
Unit:	m3/month	m3/month	m3/month	m3/month	m3/month	m3/month
Jan-25	300458	300458	0	0	0	0
Feb-25	253225	253225	0	0	0	0
Mar-25	300485	300485	0	0	0	0
Apr-25	242526	242526	0	0	0	0
May-25	283977	283977	0	0	0	0
Jun-25	305701	281143	0	24557	0	0
Jul-25	330762	300485	0	30277	0	0
Aug-25	316431	291710	0	24721	0	0
Sep-25	292259	281143	0	11116	0	0
Oct-25	252857	252857	0	0	0	0
Nov-25	265168	265168	0	0	0	0
Dec-25	300485	300485	0	0	0	0
Jan-26	298441	298441	0	0	0	0
Feb-26	269583	269583	0	0	0	0
Mar-26	298467	298467	0	0	0	0
Apr-26	395216	269999	125217	0	0	0
May-26	408377	278999	129378	0	0	0
Jun-26	422640	269999	125391	27250	0	0
Jul-26	468668	298202	137078	33388	0	0
Aug-26	462217	298202	137007	27008	0	0
Sep-26	433018	288583	132493	11942	0	0
Oct-26	409389	279748	129641	0	0	0
Nov-26	396123	270724	125399	0	0	0
Dec-26	409285	279748	129537	0	0	0
Jan-27	433833	296982	136851	0	0	0
Feb-27	391912	268242	123670	0	0	0
Mar-27	423738	296982	126755	0	0	0
Apr-27	393793	268656	125138	0	0	0
May-27	406979	277611	129368	0	0	0
Jun-27	1574468	268656	125281	28531	1152000	0
Jul-27	1120781	296718	137298	33965	652800	0
Aug-27	451456	296718	127383	27355	0	0
Sep-27	433174	287147	133931	12096	0	0
Oct-27	408810	278356	130454	0	0	0
Nov-27	385262	269377	115885	0	0	0
Dec-27	408547	278356	130191	0	0	0
Jan-28	434623	296982	137641	0	0	0
Feb-28	396804	277822	118982	0	0	0
Mar-28	434796	296982	137814	0	0	0
Apr-28	394656	268656	126000	0	0	0
May-28	397189	277611	119577	0	0	0
Jun-28	1575686	268656	125900	29129	1152000	0
Jul-28	197628	0	0	34428	163200	0
Aug-28	27544	0	0	27544	0	0
Sep-28	12022	0	0	12022	0	0
Oct-28	0	0	0	0	0	0
Nov-28	0	0	0	0	0	0
Dec-28	0	0	0	0	0	0
Jan-29	0	0	0	0	0	0
Feb-29	0	0	0	0	0	0
Mar-29	0	0	0	0	0	0
Apr-29	0	0	0	0	0	0
May-29	0	0	0	0	0	0
Jun-29	28549	0	0	28549	0	0
Jul-29	34683	0	0	34683	0	0
Aug-29	27926	0	0	27926	0	0
Sep-29	12294	0	0	12294	0	0
Oct-29	0	0	0	0	0	0
Nov-29	0	0	0	0	0	0
Dec-29	0	0	0	0	0	0
Jan-30	0	0	0	0	0	0
Feb-30	0	0	0	0	0	0
Mar-30	0	0	0	0	0	0
Apr-30	0	0	0	0	0	0
May-30	0	0	0	0	0	0
Jun-30	28613	0	0	28613	0	0
Jul-30	34770	0	0	34770	0	0
Aug-30	27994	0	0	27994	0	0
Sep-30	156322	0	0	12322	144000	0
Oct-30	0	0	0	0	0	0
Nov-30	0	0	0	0	0	0
Dec-30	0	0	0	0	0	0
Jan-31	0	0	0	0	0	0
Feb-31	0	0	0	0	0	0
Mar-31	0	0	0	0	0	0
Apr-31	0	0	0	0	0	0
May-31	0	0	0	0	0	0
Jun-31	1180117	0	0	28117	1152000	0
Jul-31	81705	0	0	33705	48000	0
Aug-31	27142	0	0	27142	0	0
Sep-31	11949	0	0	11949	0	0
Oct-31	0	0	0	0	0	0
Nov-31	0	0	0	0	0	0
Dec-31	0	0	0	0	0	0
Jan-32	0	0	0	0	0	0
Feb-32	0	0	0	0	0	0
Mar-32	0	0	0	0	0	0
Apr-32	0	0	0	0	0	0

Result:	PitLake_E.Total_ Outflow	PitLake_E.to_ Mill	PitLake_E.to_ Tailings	PitLake_E.to_ evap	PitLake_E.to_A_ Closure	PitLake_ E.Overflow
Unit:	m3/month	m3/month	m3/month	m3/month	m3/month	m3/month
May-32	0	0	0	0	0	0
Jun-32	28122	0	0	28122	0	0
Jul-32	35230	0	0	35230	0	0
Aug-32	29688	0	0	29688	0	5383
Sep-32	13274	0	0	13274	0	37962
Oct-32	0	0	0	0	0	0
Nov-32	0	0	0	0	0	0
Dec-32	0	0	0	0	0	0
Jan-33	0	0	0	0	0	0
Feb-33	0	0	0	0	0	0
Mar-33	0	0	0	0	0	0
Apr-33	0	0	0	0	0	0
May-33	0	0	0	0	0	6040
Jun-33	31448	0	0	31448	0	73669
Jul-33	38192	0	0	38192	0	0
Aug-33	30777	0	0	30777	0	0
Sep-33	13545	0	0	13545	0	0
Oct-33	0	0	0	0	0	0
Nov-33	0	0	0	0	0	0
Dec-33	0	0	0	0	0	0
Jan-34	0	0	0	0	0	0
Feb-34	0	0	0	0	0	0
Mar-34	0	0	0	0	0	0
Apr-34	0	0	0	0	0	0
May-34	0	0	0	0	0	1729
Jun-34	31454	0	0	31454	0	76148
Jul-34	38195	0	0	38195	0	0
Aug-34	30779	0	0	30779	0	0
Sep-34	13545	0	0	13545	0	0
Oct-34	0	0	0	0	0	0
Nov-34	0	0	0	0	0	0
Dec-34	0	0	0	0	0	0
Jan-35	0	0	0	0	0	0
Feb-35	0	0	0	0	0	0
Mar-35	0	0	0	0	0	0
Apr-35	0	0	0	0	0	0
May-35	0	0	0	0	0	2325
Jun-35	31451	0	0	31451	0	76171
Jul-35	38192	0	0	38192	0	0
Aug-35	30771	0	0	30771	0	0
Sep-35	13545	0	0	13545	0	0
Oct-35	0	0	0	0	0	0
Nov-35	0	0	0	0	0	0
Dec-35	0	0	0	0	0	0

Result:	Goose_Pit_Surface_ RainSnowmelt	Goose_Pitwall_ Runoff	Goose_Pit_Disturbed_ Runoff	Goose_Stockpile_ Runoff	ED_to_ Goose	WTP_Pump_A_to_ Goose	Closure_Pump_ 3rdPL_to_Goose	SC_Runoffs_to_ Goose
Unit:	m3/month	m3/month	m3/month	m3/month	m3/month	m3/month	m3/month	m3/month
Jan-25	0	0	0	0	0	0	0	0
Feb-25	0	0	0	0	0	0	0	0
Mar-25	0	0	0	0	0	0	0	0
Apr-25	0	0	0	0	0	0	0	0
May-25	855	52	1346	272	0	0	0	0
Jun-25	19433	1711	44898	9058	0	0	0	0
Jul-25	4302	252	6735	1359	0	0	0	0
Aug-25	2702	159	4230	853	0	0	0	0
Sep-25	11435	668	17928	3617	0	0	0	0
Oct-25	188	16	437	88	0	0	0	0
Nov-25	0	0	0	0	0	0	0	0
Dec-25	0	0	0	0	0	0	0	0
Jan-26	0	0	0	0	0	0	0	0
Feb-26	0	0	0	0	0	0	0	0
Mar-26	0	0	0	0	0	0	0	0
Apr-26	0	0	0	0	0	0	0	0
May-26	862	50	1346	272	0	0	0	0
Jun-26	18882	2100	44931	9065	0	0	0	0
Jul-26	3497	541	6732	1358	0	0	0	0
Aug-26	1936	428	4205	848	0	0	0	0
Sep-26	6422	2467	17891	3610	0	0	0	0
Oct-26	106	60	437	88	0	0	0	0
Nov-26	0	0	0	0	0	0	0	0
Dec-26	0	0	0	0	0	0	0	0
Jan-27	0	0	0	0	0	0	0	0
Feb-27	0	0	0	0	0	0	0	0
Mar-27	0	0	0	0	0	0	0	0
Apr-27	0	0	0	0	0	0	0	0
May-27	484	186	1346	272	0	0	0	0
Jun-27	12749	5023	44904	9060	0	1152000	0	0
Jul-27	3310	609	6732	1358	0	1190400	0	0
Aug-27	2521	216	4203	848	0	1190400	0	0
Sep-27	11806	531	17916	3615	0	556800	0	0
Oct-27	196	12	437	88	0	0	0	0
Nov-27	0	0	0	0	0	0	0	0
Dec-27	0	0	0	0	0	0	0	0
Jan-28	0	0	0	0	0	0	0	0
Feb-28	0	0	0	0	0	0	0	0
Mar-28	0	0	0	0	0	0	0	0
Apr-28	0	0	0	0	0	0	0	0
May-28	1419	56	2121	428	0	0	0	0
Jun-28	19963	1102	44143	8906	0	192000	0	0
Jul-28	4625	145	6766	1365	0	883200	0	0
Aug-28	3112	150	4749	958	0	0	0	0
Sep-28	11232	537	17216	3473	0	0	0	0
Oct-28	193	13	437	88	0	0	0	0
Nov-28	0	0	0	0	0	0	0	0
Dec-28	0	0	0	0	0	0	0	0
Jan-29	0	0	0	0	0	0	0	0
Feb-29	0	0	0	0	0	0	0	0
Mar-29	0	0	0	0	0	0	0	0
Apr-29	0	0	0	0	0	0	0	0
May-29	885	41	1346	272	0	0	0	0
Jun-29	20928	890	44898	9058	0	1132800	0	0
Jul-29	4434	204	6732	1358	0	0	0	0
Aug-29	2750	134	4203	848	0	0	0	0
Sep-29	11712	565	17917	3615	0	182400	0	0
Oct-29	198	11	437	88	0	0	0	0
Nov-29	0	0	0	0	0	0	0	0
Dec-29	0	0	0	0	0	0	0	0
Jan-30	0	0	0	0	0	0	0	0
Feb-30	0	0	0	0	0	0	0	0
Mar-30	0	0	0	0	0	0	0	0
Apr-30	0	0	0	0	0	0	0	0
May-30	907	34	1346	272	0	0	0	0
Jun-30	19477	1801	44904	9060	0	0	0	0
Jul-30	3856	412	6732	1358	0	0	0	0
Aug-30	2027	394	4203	848	1580	0	0	2926
Sep-30	6712	2369	17916	3615	20187	0	161280	118641
Oct-30	108	59	437	88	0	0	0	2893
Nov-30	0	0	0	0	0	0	0	0
Dec-30	0	0	0	0	0	0	0	0
Jan-31	0	0	0	0	0	0	0	0
Feb-31	0	0	0	0	0	0	0	0
Mar-31	0	0	0	0	0	0	0	0
Apr-31	0	0	0	0	0	0	0	0
May-31	495	182	1346	272	0	0	0	8914
Jun-31	13565	4636	44904	9060	15877	0	1209600	297351
Jul-31	3561	518	6732	1358	8791	0	1249920	29462
Aug-31	2639	174	4203	848	0	0	1249920	0
Sep-31	16149	21	17916	3615	0	0	1209600	0
Oct-31	324	0	437	88	0	0	0	0
Nov-31	0	0	0	0	0	0	0	0
Dec-31	0	0	0	0	0	0	0	0
Jan-32	0	0	0	0	0	0	0	0
Feb-32	0	0	0	0	0	0	0	0
Mar-32	0	0	0	0	0	0	0	0
Apr-32	0	0	0	0	0	0	0	0
May-32	2338	0	2121	428	0	0	0	0
Jun-32	33789	0	44147	8907	0	0	182736	0
Jul-32	7691	0	6749	1362	0	0	0	0
Aug-32	5416	0	4753	959	0	0	0	0
Sep-32	19527	0	17240	3478	0	0	0	0

Result:	Goose_Pit_Surface_RainSnowmelt	Goose_Pitwall_Runoff	Goose_Pit_Disturbed_Runoff	Goose_Stockpile_Runoff	ED_to_Goose	WTP_Pump_A_to_Goose	Closure_Pump_3rdPL_to_Goose	SC_Runoffs_to_Goose
Unit:	**m3/month**	**m3/month**	**m3/month**	**m3/month**	**m3/month**	**m3/month**	**m3/month**	**m3/month**
Oct-32	270	0	393	79	0	0	0	0
Nov-32	0	0	0	0	0	0	0	0
Dec-32	0	0	0	0	0	0	0	0
Jan-33	0	0	0	0	0	0	0	0
Feb-33	0	0	0	0	0	0	0	0
Mar-33	0	0	0	0	0	0	0	0
Apr-33	0	0	0	0	0	0	0	0
May-33	2442	0	2143	432	0	0	0	0
Jun-33	33845	0	44126	8903	0	0	0	0
Jul-33	7689	0	6747	1361	0	0	0	0
Aug-33	5408	0	4746	958	0	0	0	0
Sep-33	19423	0	17144	3459	0	0	0	0
Oct-33	334	0	436	88	0	0	0	0
Nov-33	0	0	0	0	0	0	0	0
Dec-33	0	0	0	0	0	0	0	0
Jan-34	0	0	0	0	0	0	0	0
Feb-34	0	0	0	0	0	0	0	0
Mar-34	0	0	0	0	0	0	0	0
Apr-34	0	0	0	0	0	0	0	0
May-34	1527	0	1340	270	0	0	0	0
Jun-34	34829	0	44926	9064	0	0	0	0
Jul-34	7651	0	6714	1355	0	0	0	0
Aug-34	4764	0	4181	843	0	0	0	0
Sep-34	20372	0	17923	3616	0	0	0	0
Oct-34	332	0	435	88	0	0	0	0
Nov-34	0	0	0	0	0	0	0	0
Dec-34	0	0	0	0	0	0	0	0
Jan-35	0	0	0	0	0	0	0	0
Feb-35	0	0	0	0	0	0	0	0
Mar-35	0	0	0	0	0	0	0	0
Apr-35	0	0	0	0	0	0	0	0
May-35	1526	0	1339	270	0	0	0	0
Jun-35	34838	0	44934	9066	11379	0	0	255469
Jul-35	7682	0	6742	1360	22711	0	0	44642
Aug-35	4763	0	4180	843	21770	0	0	27677
Sep-35	20497	0	18032	3638	20187	0	0	119409
Oct-35	335	0	437	88	0	0	0	2893
Nov-35	0	0	0	0	0	0	0	0
Dec-35	0	0	0	0	0	0	0	0

Result:	Goose_PitLake.to_evap	Goose_PitLake.to_Vault_Dewater	Goose_PitLake.to_Vault_Ops	Goose_PitLake.Overflow
Unit:	m3/month	m3/month	m3/month	m3/month
Jan-25	0	0	0	0
Feb-25	0	0	0	0
Mar-25	0	0	0	0
Apr-25	0	0	0	0
May-25	0	0	0	0
Jun-25	10337	0	0	0
Jul-25	12589	0	0	0
Aug-25	10139	0	0	0
Sep-25	4467	0	0	0
Oct-25	0	0	0	0
Nov-25	0	0	0	0
Dec-25	0	0	0	0
Jan-26	0	0	0	0
Feb-26	0	0	0	0
Mar-26	0	0	0	0
Apr-26	0	0	0	0
May-26	0	0	0	0
Jun-26	9957	1152000	0	0
Jul-26	10199	1190400	0	0
Aug-26	7273	1190400	0	0
Sep-26	2538	377442	0	0
Oct-26	0	0	0	0
Nov-26	0	0	0	0
Dec-26	0	0	0	0
Jan-27	0	0	0	0
Feb-27	0	0	0	0
Mar-27	0	0	0	0
Apr-27	0	0	0	0
May-27	0	0	0	0
Jun-27	6919	0	0	0
Jul-27	9772	0	0	0
Aug-27	9375	0	0	0
Sep-27	4565	0	0	0
Oct-27	0	0	0	0
Nov-27	0	0	0	0
Dec-27	0	0	0	0
Jan-28	0	0	0	0
Feb-28	0	0	0	0
Mar-28	0	0	0	0
Apr-28	0	0	0	0
May-28	0	0	0	0
Jun-28	10952	0	115200	0
Jul-28	13367	0	1180800	0
Aug-28	10282	0	0	0
Sep-28	4492	0	0	0
Oct-28	0	0	0	0
Nov-28	0	0	0	0
Dec-28	0	0	0	0
Jan-29	0	0	0	0
Feb-29	0	0	0	0
Mar-29	0	0	0	0
Apr-29	0	0	0	0
May-29	0	0	0	0
Jun-29	11150	0	892800	0
Jul-29	12999	0	345600	0
Aug-29	10388	0	0	0
Sep-29	4582	0	0	0
Oct-29	0	0	0	0
Nov-29	0	0	0	0
Dec-29	0	0	0	0
Jan-30	0	0	0	0
Feb-30	0	0	0	0
Mar-30	0	0	0	0
Apr-30	0	0	0	0
May-30	0	0	0	0
Jun-30	10274	1152000	0	0

Result:	Goose_PitLake.to_evap	Goose_PitLake.to_Vault_Dewater	Goose_PitLake.to_Vault_Ops	Goose_PitLake.Overflow
Unit:	m3/month	m3/month	m3/month	m3/month
Jul-30	10961	1190400	0	0
Aug-30	7642	1190400	0	0
Sep-30	2756	963464	0	0
Oct-30	0	0	0	0
Nov-30	0	0	0	0
Dec-30	0	0	0	0
Jan-31	0	0	0	0
Feb-31	0	0	0	0
Mar-31	0	0	0	0
Apr-31	0	0	0	0
May-31	0	0	0	0
Jun-31	7314	0	0	0
Jul-31	10674	0	0	0
Aug-31	10007	0	0	0
Sep-31	5869	0	0	0
Oct-31	0	0	0	0
Nov-31	0	0	0	0
Dec-31	0	0	0	0
Jan-32	0	0	0	0
Feb-32	0	0	0	0
Mar-32	0	0	0	0
Apr-32	0	0	0	0
May-32	0	0	0	0
Jun-32	18467	0	0	66102.65
Jul-32	22328	0	0	1453.798
Aug-32	17879	0	0	0
Sep-32	7804	0	0	15835.02
Oct-32	0	0	0	184.4556
Nov-32	0	0	0	0
Dec-32	0	0	0	0
Jan-33	0	0	0	0
Feb-33	0	0	0	0
Mar-33	0	0	0	0
Apr-33	0	0	0	0
May-33	0	0	0	5017.897
Jun-33	18487	0	0	70825.68
Jul-33	22453	0	0	1422.793
Aug-33	18093	0	0	0
Sep-33	7963	0	0	15179.15
Oct-33	0	0	0	243.535
Nov-33	0	0	0	0
Dec-33	0	0	0	0
Jan-34	0	0	0	0
Feb-34	0	0	0	0
Mar-34	0	0	0	0
Apr-34	0	0	0	0
May-34	0	0	0	3136.563
Jun-34	18491	0	0	72782.01
Jul-34	22454	0	0	774.1624
Aug-34	18094	0	0	0
Sep-34	7963	0	0	16199.58
Oct-34	0	0	0	335.647
Nov-34	0	0	0	0
Dec-34	0	0	0	0
Jan-35	0	0	0	0
Feb-35	0	0	0	0
Mar-35	0	0	0	0
Apr-35	0	0	0	0
May-35	0	0	0	3135.337
Jun-35	18489	0	0	338051.1
Jul-35	22452	0	0	59827.99
Aug-35	18090	0	0	41143.33
Sep-35	7963	0	0	173799.2
Oct-35	0	0	0	3752.202
Nov-35	0	0	0	0
Dec-35	0	0	0	0

Result:	Vault_Pit_Surface_ RainSnowmelt	Vault_Pit_ wall_Runoff	Vault_Pit_ Natural_Runoff	Vault_Pit_ Disturbed_Runoff	Vault_Pit_ WasteRock_Runoff	VaultAP_ to_VaultPit	BBPhaser_ to_VaultPit	Phaser_ to_VaultPit	Closure_Pump_ from_Wally_Delay	Goose_Dewater_ to_Vault	Goose_Ops_ to_Vault	PitA_Closure_ to_Vault
Unit:	m3/month	m3/month	m3/month	m3/month	m3/month	m3/month	m3/month	m3/month	m3/month	m3/month	m3/month	m3/month
Jan-25	0	0	24	0	0	19	0	45	0	0	0	0
Feb-25	0	0	12	0	0	10	0	22	0	0	0	0
Mar-25	0	0	7	0	0	6	0	14	0	0	0	0
Apr-25	0	0	4	0	0	3	0	7	0	0	0	0
May-25	1082	637	5766	346	1722	8722	0	11689	0	0	0	0
Jun-25	25514	20641	86099	11532	57424	172683	0	186744	0	0	0	0
Jul-25	5766	3059	8845	1730	8614	28295	0	16653	0	0	0	0
Aug-25	3629	1919	4392	1086	5410	16751	0	7374	0	0	0	0
Sep-25	15443	8095	26343	4605	22930	77234	0	61134	0	0	0	0
Oct-25	256	196	4041	112	559	4251	0	7745	0	0	0	0
Nov-25	0	0	81	0	0	65	0	148	0	0	0	0
Dec-25	0	0	45	0	0	36	0	83	0	0	0	0
Jan-26	0	0	24	0	0	19	0	45	0	0	0	0
Feb-26	0	0	12	0	0	10	0	22	0	0	0	0
Mar-26	0	0	7	0	0	6	0	14	0	0	0	0
Apr-26	0	0	4	0	0	3	0	7	0	0	0	0
May-26	1175	603	5766	346	1722	8884	0	11689	0	0	0	0
Jun-26	26987	19931	86181	11541	57467	0	0	0	0	1152000	0	0
Jul-26	6032	2961	8848	1729	8610	0	0	0	0	1190400	0	0
Aug-26	3770	1849	4366	1080	5378	0	0	0	0	1190400	0	0
Sep-26	16100	7830	26272	4595	22882	0	0	0	0	377442	0	0
Oct-26	267	190	4039	112	559	0	0	0	0	0	0	0
Nov-26	0	0	81	0	0	0	0	0	0	0	0	0
Dec-26	0	0	45	0	0	0	0	0	0	0	0	0
Jan-27	0	0	24	0	0	0	0	0	0	0	0	0
Feb-27	0	0	12	0	0	0	0	0	0	0	0	0
Mar-27	0	0	7	0	0	0	0	0	0	0	0	0
Apr-27	0	0	4	0	0	0	0	0	0	0	0	0
May-27	1227	585	5766	346	1722	0	0	0	0	0	0	0
Jun-27	28304	19193	86093	11534	57432	0	0	0	0	0	0	0
Jul-27	6345	2848	8848	1729	8610	0	0	0	0	0	0	0
Aug-27	3963	1778	4365	1080	5376	0	0	0	0	0	0	0
Sep-27	16910	7557	26316	4602	22915	0	0	0	0	0	0	0
Oct-27	279	184	4041	112	559	0	0	0	0	0	0	0
Nov-27	0	0	81	0	0	0	0	0	0	0	0	0
Dec-27	0	0	45	0	0	0	0	0	0	0	0	0
Jan-28	0	0	24	0	0	0	0	0	0	0	0	0
Feb-28	0	0	12	0	0	0	0	0	0	0	0	0
Mar-28	0	0	7	0	0	0	0	0	0	0	0	0
Apr-28	0	0	4	0	0	0	0	0	0	0	0	0
May-28	2016	891	5998	545	2713	0	0	0	0	0	0	0
Jun-28	28488	18394	86337	11338	56458	0	0	0	0	0	115200	0
Jul-28	6533	2807	9024	1738	8654	0	0	0	0	0	1180800	0
Aug-28	4586	1970	4593	1220	6074	0	0	0	0	0	0	0
Sep-28	16565	7128	26210	4422	22019	0	0	0	0	0	0	0
Oct-28	285	180	3951	112	559	0	0	0	0	0	0	0
Nov-28	0	0	80	0	0	0	0	0	0	0	0	0
Dec-28	0	0	45	0	0	0	0	0	0	0	0	0
Jan-29	0	0	24	0	0	0	0	0	0	0	0	0
Feb-29	0	0	12	0	0	0	0	0	0	0	0	0
Mar-29	0	0	7	0	0	0	0	0	0	0	0	0
Apr-29	0	0	4	0	0	0	0	0	0	0	0	0
May-29	1307	556	5766	346	1722	0	0	0	0	0	0	0
Jun-29	29795	18440	85429	11532	57424	0	0	0	0	0	892800	0
Jul-29	6605	2755	8845	1729	8610	0	0	0	0	0	345600	0
Aug-29	4123	1720	4365	1079	5375	0	0	0	0	0	0	0
Sep-29	17564	7321	26317	4602	22916	0	0	0	0	0	0	0
Oct-29	289	178	4041	112	559	0	0	0	0	0	0	0
Nov-29	0	0	81	0	0	0	0	0	0	0	0	0
Dec-29	0	0	45	0	0	0	0	0	0	0	0	0
Jan-30	0	0	24	0	0	0	0	0	0	0	0	0
Feb-30	0	0	12	0	0	0	0	0	0	0	0	0
Mar-30	0	0	7	0	0	0	0	0	0	0	0	0
Apr-30	0	0	4	0	0	0	0	0	0	0	0	0
May-30	1327	549	5766	346	1722	0	0	0	0	0	0	0
Jun-30	30269	18190	86109	11534	57432	0	0	0	0	1152000	0	0
Jul-30	6715	2715	8848	1729	8610	0	0	0	0	1190400	0	0
Aug-30	4193	1695	4365	1080	5376	0	0	0	0	1190400	0	0
Sep-30	17871	7210	26316	4602	22915	0	0	0	0	963464	0	153600
Oct-30	295	175	4041	112	559	0	0	0	0	0	0	0
Nov-30	0	0	81	0	0	0	0	0	0	0	0	0
Dec-30	0	0	45	0	0	0	0	0	0	0	0	0
Jan-31	0	0	24	0	0	0	0	0	0	0	0	0
Feb-31	0	0	12	0	0	0	0	0	0	0	0	0
Mar-31	0	0	7	0	0	0	0	0	0	0	0	0
Apr-31	0	0	4	0	0	0	0	0	0	0	0	0
May-31	1352	540	5766	346	1722	0	0	0	0	0	0	0
Jun-31	30952	17805	86108	11534	57432	0	0	0	0	0	0	1152000
Jul-31	6909	2645	8848	1729	8610	0	0	0	0	0	0	1190400
Aug-31	4315	1651	4366	1080	5376	0	0	0	0	0	0	681600
Sep-31	18427	7010	26317	4602	22915	0	0	0	0	0	0	0
Oct-31	305	170	4041	112	559	0	0	0	0	0	0	0
Nov-31	0	0	81	0	0	0	0	0	0	0	0	0
Dec-31	0	0	45	0	0	0	0	0	0	0	0	0
Jan-32	0	0	24	0	0	0	0	0	0	0	0	0
Feb-32	0	0	12	0	0	0	0	0	0	0	0	0
Mar-32	0	0	7	0	0	0	0	0	0	0	0	0
Apr-32	0	0	4	0	0	0	0	0	0	0	0	0
May-32	2203	824	5998	545	2713	0	0	0	0	0	0	0
Jun-32	31138	16980	86349	11339	56464	0	0	0	0	0	0	1152000
Jul-32	7120	2583	8980	1734	8632	0	0	0	0	0	0	1190400
Aug-32	5014	1819	4608	1221	6079	0	0	0	0	0	0	1190400
Sep-32	18113	6584	26249	4428	22049	0	0	0	0	0	0	1152000
Oct-32	251	150	3960	101	503	0	0	0	0	0	0	0
Nov-32	0	0	79	0	0	0	0	0	0	0	0	0
Dec-32	0	0	44	0	0	0	0	0	0	0	0	0
Jan-33	0	0	24	0	0	0	0	0	0	0	0	0
Feb-33	0	0	12	0	0	0	0	0	0	0	0	0
Mar-33	0	0	7	0	0	0	0	0	0	0	0	0
Apr-33	0	0	4	0	0	0	0	0	0	0	0	0

Result:	Vault_Pit_Surface_ RainSnowmelt	Vault_Pit_ wall_Runoff	Vault_Pit_ Natural_Runoff	Vault_Pit_ Disturbed_Runoff	Vault_Pit_ WasteRock_Runoff	VaultAP_ to_VaultPit	BBPhaser_ to_VaultPit	Phaser_ to_VaultPit	Closure_Pump_ from_Wally_Delay	Goose_Dewater_ to_Vault	Goose_Ops_ to_Vault	PitA_Closure_ to_Vault
Unit:	**m3/month**	**m3/month**	**m3/month**	**m3/month**	**m3/month**	**m3/month**	**m3/month**	**m3/month**	**m3/month**	**m3/month**	**m3/month**	**m3/month**
May-33	2272	816	6120	551	2741	0	0	0	0	0	0	0
Jun-33	31646	16696	85505	11334	56436	0	0	0	0	0	0	1152000
Jul-33	7224	2544	8958	1733	8630	0	0	0	0	0	0	1190400
Aug-33	5082	1789	4585	1219	6070	0	0	0	0	0	0	1190400
Sep-33	18274	6454	26001	4403	21927	0	0	0	8548	0	0	883200
Oct-33	315	164	3940	112	558	0	0	0	0	0	0	0
Nov-33	0	0	79	0	0	0	0	0	0	0	0	0
Dec-33	0	0	45	0	0	0	0	0	0	0	0	0
Jan-34	0	0	24	0	0	0	0	0	0	0	0	0
Feb-34	0	0	12	0	0	0	0	0	0	0	0	0
Mar-34	0	0	7	0	0	0	0	0	0	0	0	0
Apr-34	0	0	4	0	0	0	0	0	0	0	0	0
May-34	1437	504	5627	344	1713	0	0	0	0	0	0	0
Jun-34	32794	16900	85477	11539	57460	0	0	125330	0	0	0	0
Jul-34	7204	2526	8838	1725	8588	0	0	16623	0	0	0	0
Aug-34	4485	1573	4332	1074	5347	0	0	7223	0	0	0	0
Sep-34	19182	6742	26317	4604	22924	0	0	61083	0	0	0	0
Oct-34	313	164	4043	112	556	0	0	7746	0	0	0	0
Nov-34	0	0	81	0	0	0	0	148	0	0	0	0
Dec-34	0	0	45	0	0	0	0	83	0	0	0	0
Jan-35	0	0	24	0	0	0	0	45	0	0	0	0
Feb-35	0	0	12	0	0	0	0	22	0	0	0	0
Mar-35	0	0	7	0	0	0	0	14	0	0	0	0
Apr-35	0	0	4	0	0	0	0	7	0	0	0	0
May-35	1437	504	5616	344	1713	0	0	11408	0	0	0	0
Jun-35	32803	16903	86279	11541	57470	0	0	187105	0	0	0	0
Jul-35	7233	2536	8874	1732	8622	0	0	16710	0	0	0	0
Aug-35	4484	1573	4338	1074	5346	0	0	7233	0	0	0	0
Sep-35	19299	6783	26525	4632	23063	0	0	61554	0	0	0	0
Oct-35	315	164	4047	112	559	0	0	7756	0	0	0	0
Nov-35	0	0	81	0	0	0	0	149	0	0	0	0
Dec-35	0	0	45	0	0	0	0	84	0	0	0	0

Result:	Vault_Pit.to_evap	Vault_Pit.Overflow
Unit:	m3/month	m3/month
Jan-25	0	0
Feb-25	0	0
Mar-25	0	0
Apr-25	0	0
May-25	0	0
Jun-25	13602	0
Jul-25	16876	0
Aug-25	13622	0
Sep-25	6026	0
Oct-25	0	0
Nov-25	0	0
Dec-25	0	0
Jan-26	0	0
Feb-26	0	0
Mar-26	0	0
Apr-26	0	0
May-26	0	0
Jun-26	14365	0
Jul-26	17659	0
Aug-26	14235	0
Sep-26	6295	0
Oct-26	0	0
Nov-26	0	0
Dec-26	0	0
Jan-27	0	0
Feb-27	0	0
Mar-27	0	0
Apr-27	0	0
May-27	0	0
Jun-27	15086	0
Jul-27	18577	0
Aug-27	14971	0
Sep-27	6607	0
Oct-27	0	0
Nov-27	0	0
Dec-27	0	0
Jan-28	0	0
Feb-28	0	0
Mar-28	0	0
Apr-28	0	0
May-28	0	0
Jun-28	15582	0
Jul-28	18922	0
Aug-28	15154	0
Sep-28	6624	0
Oct-28	0	0
Nov-28	0	0
Dec-28	0	0
Jan-29	0	0
Feb-29	0	0
Mar-29	0	0
Apr-29	0	0
May-29	0	0
Jun-29	15852	0
Jul-29	19334	0
Aug-29	15576	0
Sep-29	6865	0
Oct-29	0	0
Nov-29	0	0
Dec-29	0	0
Jan-30	0	0
Feb-30	0	0
Mar-30	0	0
Apr-30	0	0
May-30	0	0
Jun-30	16103	0
Jul-30	19659	0
Aug-30	15839	0
Sep-30	6984	0

Result:	Vault_Pit.to_evap	Vault_Pit.Overflow
Unit:	m3/month	m3/month
Oct-30	0	0
Nov-30	0	0
Dec-30	0	0
Jan-31	0	0
Feb-31	0	0
Mar-31	0	0
Apr-31	0	0
May-31	0	0
Jun-31	16488	0
Jul-31	20228	0
Aug-31	16298	0
Sep-31	7197	0
Oct-31	0	0
Nov-31	0	0
Dec-31	0	0
Jan-32	0	0
Feb-32	0	0
Mar-32	0	0
Apr-32	0	0
May-32	0	0
Jun-32	17030	0
Jul-32	20673	0
Aug-32	16554	0
Sep-32	7236	0
Oct-32	0	0
Nov-32	0	0
Dec-32	0	0
Jan-33	0	0
Feb-33	0	0
Mar-33	0	0
Apr-33	0	0
May-33	0	0
Jun-33	17300	0
Jul-33	21098	0
Aug-33	17001	0
Sep-33	7489	33558
Oct-33	0	5039
Nov-33	0	79
Dec-33	0	45
Jan-34	0	24
Feb-34	0	12
Mar-34	0	7
Apr-34	0	4
May-34	0	9626
Jun-34	17411	312090
Jul-34	21141	27981
Aug-34	17034	7750
Sep-34	7498	128986
Oct-34	0	12933
Nov-34	0	229
Dec-34	0	128
Jan-35	0	69
Feb-35	0	34
Mar-35	0	21
Apr-35	0	11
May-35	0	21021
Jun-35	17409	374691
Jul-35	21139	28168
Aug-35	17030	7779
Sep-35	7498	129995
Oct-35	0	12954
Nov-35	0	230
Dec-35	0	129

Result:	**VaultAP_Surface_RainSnowmelt**	**VaultAP_wall_Runoff**	**VaultAP_Natural_Runoff**	**Phaser_Pump_to_VaultAP**
Unit:	**m3/month**	**m3/month**	**m3/month**	**m3/month**
Jan-25	0	0	19.49761	0
Feb-25	0	0	9.718988	0
Mar-25	0	0	5.973493	0
Apr-25	0	0	3.133017	0
May-25	3202.937	904.1778	4614.529	0
Jun-25	75475.88	28300.61	68906.95	0
Jul-25	17069	4147.314	7079.085	0
Aug-25	10580.21	2654.975	3515.338	0
Sep-25	44991.7	11159.26	21082.91	0
Oct-25	751.4515	265.043	3234.317	0
Nov-25	0	0	64.56068	0
Dec-25	0	0	36.25567	0
Jan-26	0	0	19.47328	0
Feb-26	0	0	9.706861	0
Mar-26	0	0	5.96604	0
Apr-26	0	0	3.129108	0
May-26	3457.168	812.6545	4614.526	0
Jun-26	81,360.43	25,249.88	68,973.01	250,942.70
Jul-26	17,557.85	3,966.38	7,081.63	8,400.00
Aug-26	9549.76	2987.917	3494.346	0
Sep-26	36504.98	14164.38	21025.87	81900
Oct-26	624.1041	333.2607	3232.372	0
Nov-26	0	0	64.46436	0
Dec-26	0	0	36.20161	0
Jan-27	0	0	19.44425	0
Feb-27	0	0	9.692389	0
Mar-27	0	0	5.957145	0
Apr-27	0	0	3.124443	0
May-27	2870.486	1023.86	4614.521	0
Jun-27	68512.91	31961.55	68902.27	197400
Jul-27	14897.63	4924.212	7080.885	8400
Aug-27	8457.202	3378.607	3493.781	0
Sep-27	36397.71	14242.44	21061.69	82102.5
Oct-27	626.4559	332.0009	3233.765	0
Nov-27	0	0	64.53651	0
Dec-27	0	0	36.24212	0
Jan-28	0	0	19.466	0
Feb-28	0	0	9.958982	0
Mar-28	0	0	5.845425	0
Apr-28	0	0	3.065847	0
May-28	4542.428	1605.848	4800.385	0
Jun-28	66993.59	31247.4	69097.66	199500
Jul-28	15090.37	4907.776	7222.511	8400
Aug-28	9558.495	3816.298	3676.028	0
Sep-28	34927.05	13660.56	20976.08	84000
Oct-28	627.2661	331.5668	3162.224	0
Nov-28	0	0	64.21915	0
Dec-28	0	0	36.06231	0
Jan-29	0	0	19.36942	0
Feb-29	0	0	9.655091	0
Mar-29	0	0	5.934221	0
Apr-29	0	0	3.11242	0
May-29	2884.922	1018.663	4614.511	0
Jun-29	68711.73	31850.88	68370.59	195300
Jul-29	14932.88	4911.723	7079.079	8400
Aug-29	8458.212	3377.388	3493.336	0
Sep-29	36392.68	14245.02	21062.11	84000
Oct-29	627.1053	331.653	3233.782	0
Nov-29	0	0	64.5374	0
Dec-29	0	0	36.24261	0
Jan-30	0	0	19.46627	0
Feb-30	0	0	9.703366	0
Mar-30	0	0	5.963892	0
Apr-30	0	0	3.127981	0
May-30	2884.255	1018.903	4614.525	0
Jun-30	68723.32	31856.3	68915.38	195300

Result:	VaultAP_Surface_RainSnowmelt	VaultAP_wall_Runoff	VaultAP_Natural_Runoff	Phaser_Pump_to_VaultAP
Unit:	m3/month	m3/month	m3/month	m3/month
Jul-30	14932.82	4911.544	7080.863	8400
Aug-30	8459.467	3377.801	3493.773	0
Sep-30	36406.59	14239.22	21061.66	82102.5
Oct-30	626.6024	331.9224	3233.764	0
Nov-30	0	0	64.53645	0
Dec-30	0	0	36.24208	0
Jan-31	0	0	19.46598	0
Feb-31	0	0	9.703224	0
Mar-31	0	0	5.963805	0
Apr-31	0	0	3.127936	0
May-31	2881.948	1019.734	4614.525	0
Jun-31	68721.19	31855.58	68914.55	197400
Jul-31	14934.49	4910.915	7080.958	8400
Aug-31	8460.4	3377.499	3493.852	0
Sep-31	36410.37	14237.88	21061.74	82102.5
Oct-31	626.6644	331.8891	3233.767	0
Nov-31	0	0	64.53661	0
Dec-31	0	0	36.24217	0
Jan-32	0	0	19.46603	0
Feb-32	0	0	9.958999	0
Mar-32	0	0	5.845435	0
Apr-32	0	0	3.065852	0
May-32	4543.936	1605.305	4800.385	0
Jun-32	67029.46	31236.59	69107.44	199500
Jul-32	15056.49	4893.477	7186.963	8400
Aug-32	9559.813	3821.438	3687.812	0
Sep-32	34944.52	13686.62	21007.82	84000
Oct-32	505.6207	298.4759	3169.3	0
Nov-32	0	0	63.3462	0
Dec-32	0	0	35.57017	0
Jan-33	0	0	19.10509	0
Feb-33	0	0	9.523327	0
Mar-33	0	0	5.853236	0
Apr-33	0	0	3.069944	0
May-33	4593.467	1621.659	4897.745	0
Jun-33	66932.23	31250.39	68431.46	197400
Jul-33	15038.24	4897.576	7169.023	8400
Aug-33	9545.683	3816.527	3669.237	0
Sep-33	34733.37	13620.07	20809.03	81900
Oct-33	625.1273	331.9083	3153.192	0
Nov-33	0	0	63.54605	0
Dec-33	0	0	35.68425	0
Jan-34	0	0	19.16636	0
Feb-34	0	0	9.553871	0
Mar-34	0	0	5.872009	0
Apr-34	0	0	3.07979	0
May-34	2865.336	1015.792	4503.44	0
Jun-34	67585.31	32570.87	68409.23	0
Jul-34	15241.91	4773.801	7073.495	0
Aug-34	9372.647	3014.907	3467.225	0
Sep-34	40367.62	12821.03	21062.37	0
Oct-34	670.5969	304.3289	3235.432	0
Nov-34	0	0	64.51339	0
Dec-34	0	0	36.22907	0
Jan-35	0	0	19.45899	0
Feb-35	0	0	9.69974	0
Mar-35	0	0	5.961663	0
Apr-35	0	0	3.126812	0
May-35	3091.976	933.4016	4494.552	0
Jun-35	73401.34	29467.95	69050.84	0
Jul-35	16616.68	4320.41	7101.753	0
Aug-35	10169.36	2726.44	3471.568	0
Sep-35	44034.33	11664.38	21228.9	0
Oct-35	731.5418	275.7082	3239.043	0
Nov-35	0	0	64.80679	0
Dec-35	0	0	36.39381	0

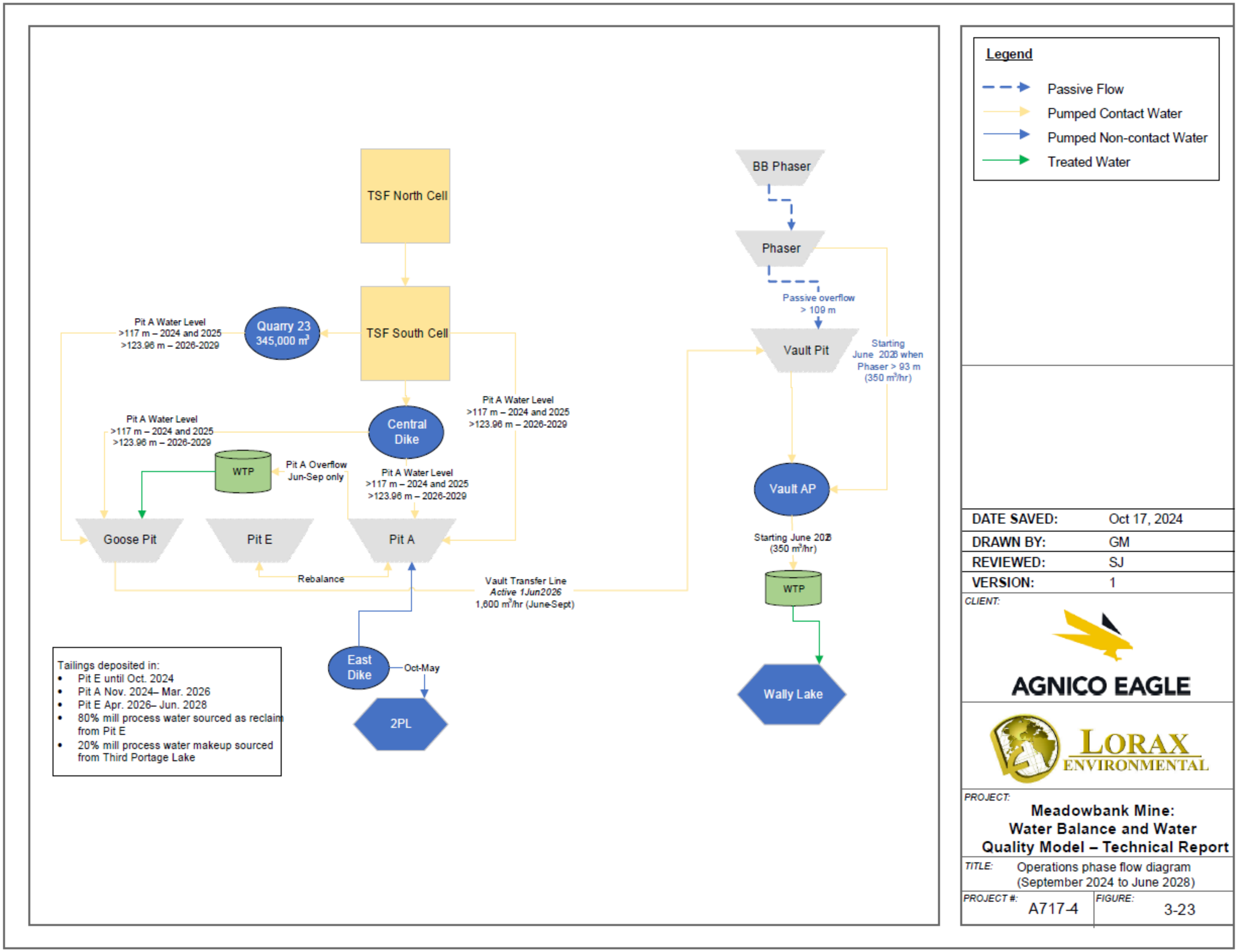
Result:	VaultAP_Surface_RainSnowmelt	VaultAP_wall_Runoff	VaultAP_Natural_Runoff
Unit:	m3/month	m3/month	m3/month
Jan-25	0	0	0
Feb-25	0	0	0
Mar-25	0	0	0
Apr-25	0	0	0
May-25	0	0	0
Jun-25	40337	0	0
Jul-25	49902	0	0
Aug-25	39723	0	0
Sep-25	17528	0	0
Oct-25	0	0	0
Nov-25	0	0	0
Dec-25	0	0	0
Jan-26	0	0	0
Feb-26	0	0	0
Mar-26	0	0	0
Apr-26	0	0	0
May-26	0	0	0
Jun-26	43416	250943	0
Jul-26	50794	260400	0
Aug-26	35995	260400	0
Sep-26	14390	123900	0
Oct-26	0	0	0
Nov-26	0	0	0
Dec-26	0	0	0
Jan-27	0	0	0
Feb-27	0	0	0
Mar-27	0	0	0
Apr-27	0	0	0
May-27	0	0	0
Jun-27	36625	151200	0
Jul-27	43134	260400	0
Aug-27	31999	37800	0
Sep-27	14184	0	0
Oct-27	0	0	0
Nov-27	0	0	0
Dec-27	0	0	0
Jan-28	0	0	0
Feb-28	0	0	0
Mar-28	0	0	0
Apr-28	0	0	0
May-28	0	0	0
Jun-28	36787	155400	0
Jul-28	43051	260400	0
Aug-28	31669	44100	0
Sep-28	13932	0	0
Oct-28	0	0	0
Nov-28	0	0	0
Dec-28	0	0	0
Jan-29	0	0	0
Feb-29	0	0	0
Mar-29	0	0	0
Apr-29	0	0	0
May-29	0	0	0
Jun-29	36742	155400	0
Jul-29	43229	260400	0
Aug-29	32018	42000	0
Sep-29	14185	0	0
Oct-29	0	0	0
Nov-29	0	0	0
Dec-29	0	0	0
Jan-30	0	0	0
Feb-30	0	0	0
Mar-30	0	0	0
Apr-30	0	0	0
May-30	0	0	0
Jun-30	36737	155400	0
Jul-30	43230	260400	0

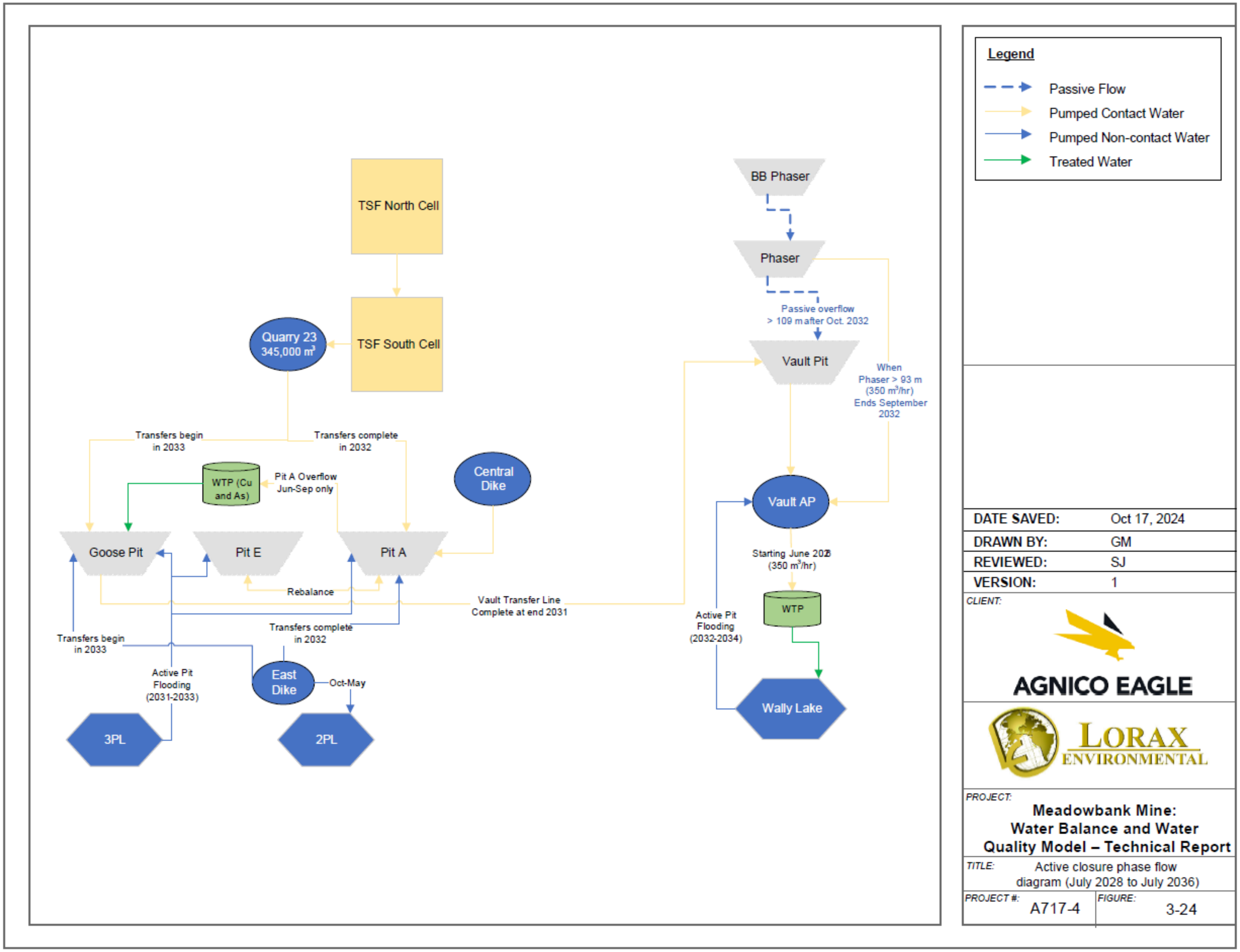
Result:	VaultAP_Surface_RainSnowmelt	VaultAP_wall_Runoff	VaultAP_Natural_Runoff
Unit:	m3/month	m3/month	m3/month
Aug-30	32019	42000	0
Sep-30	14188	0	0
Oct-30	0	0	0
Nov-30	0	0	0
Dec-30	0	0	0
Jan-31	0	0	0
Feb-31	0	0	0
Mar-31	0	0	0
Apr-31	0	0	0
May-31	0	0	0
Jun-31	36736	155400	0
Jul-31	43233	260400	0
Aug-31	32022	42000	0
Sep-31	14189	0	0
Oct-31	0	0	0
Nov-31	0	0	0
Dec-31	0	0	0
Jan-32	0	0	0
Feb-32	0	0	0
Mar-32	0	0	0
Apr-32	0	0	0
May-32	0	0	0
Jun-32	36802	155400	0
Jul-32	43063	260400	0
Aug-32	31654	46200	0
Sep-32	13925	0	0
Oct-32	0	0	0
Nov-32	0	0	0
Dec-32	0	0	0
Jan-33	0	0	0
Feb-33	0	0	0
Mar-33	0	0	0
Apr-33	0	0	0
May-33	0	0	0
Jun-33	36749	155400	0
Jul-33	43261	260400	0
Aug-33	32023	44100	0
Sep-33	14201	0	0
Oct-33	0	0	0
Nov-33	0	0	0
Dec-33	0	0	0
Jan-34	0	0	0
Feb-34	0	0	0
Mar-34	0	0	0
Apr-34	0	0	0
May-34	0	0	0
Jun-34	36101	0	0
Jul-34	44699	0	0
Aug-34	35612	0	0
Sep-34	15725	0	0
Oct-34	0	0	0
Nov-34	0	0	0
Dec-34	0	0	0
Jan-35	0	0	0
Feb-35	0	0	0
Mar-35	0	0	0
Apr-35	0	0	0
May-35	0	0	0
Jun-35	39182	0	0
Jul-35	48528	0	0
Aug-35	38639	0	0
Sep-35	17053	0	0
Oct-35	0	0	0
Nov-35	0	0	0
Dec-35	0	0	0

Result:	PitA_waterVolume	PitE_waterVolume	GoosePit_waterVolume	Vault Pit Freshwater	Vault Pit Base	Vault Pit Total	Vault_AttPond	Combined Portage Pit
Unit:	m3	m3	m3	m3	m3	m3	m3	m3
1/31/2025	7,436,092	2,996,897	3,768,458	5,615,959	0	5,620,959	1,920,115	0
2/28/2025	7,256,175	3,148,624	3,768,458	5,616,013	0	5,621,013	1,920,127	0
3/31/2025	7,077,229	3,279,701	3,768,458	5,616,046	0	5,621,046	1,920,134	0
4/30/2025	7,010,728	3,317,702	3,768,458	5,616,063	0	5,621,063	1,920,138	0
5/31/2025	6,884,021	3,467,586	3,770,230	5,640,093	0	5,645,093	1,927,259	0
6/30/2025	6,779,712	3,931,155	3,799,768	5,971,848	0	5,976,848	1,991,759	0
7/31/2025	6,865,234	3,973,250	3,797,992	6,015,080	0	6,020,080	1,968,244	0
8/31/2025	6,977,305	4,031,814	3,794,181	6,039,189	0	6,044,188	1,944,613	0
9/30/2025	7,109,211	4,182,323	3,818,646	6,244,982	0	6,249,982	2,004,438	0
10/31/2025	7,036,626	4,310,317	3,819,213	6,262,610	0	6,267,610	2,008,645	0
11/30/2025	6,929,687	4,407,550	3,819,213	6,262,906	0	6,267,906	2,008,710	0
12/31/2025	6,738,573	4,542,881	3,819,213	6,263,073	0	6,268,073	2,008,747	0
1/31/2026	6,535,808	4,695,841	3,819,213	6,263,162	0	6,268,162	2,008,766	0
2/28/2026	6,382,313	4,799,600	3,819,213	6,263,207	0	6,268,207	2,008,776	0
3/31/2026	6,176,063	4,946,618	3,819,213	6,263,235	0	6,268,234	2,008,782	0
4/30/2026	5,995,709	5,079,571	3,819,213	6,263,249	0	6,268,249	2,008,785	0
5/31/2026	5,838,403	5,248,683	3,820,987	6,287,390	0	6,292,390	2,015,980	0
6/30/2026	6,004,206	5,592,464	2,746,019	6,477,404	1,133,000	7,610,404	2,150,543	0
7/31/2026	6,091,161	5,624,338	1,555,663	6,488,046	2,323,400	8,811,446	1,876,032	0
8/31/2026	6,550,280	5,310,363	363,849	6,489,393	3,513,800	10,003,190	1,595,030	0
9/30/2026	7,065,241	5,055,869	80,441	6,560,130	3,820,474	10,380,600	1,666,752	0
10/31/2026	7,142,705	4,990,919	80,991	6,565,391	3,820,474	10,385,860	1,670,941	0
11/30/2026	7,174,264	4,934,752	80,991	6,565,473	3,820,474	10,385,950	1,671,006	0
12/31/2026	7,190,822	4,876,649	80,991	6,565,519	3,820,474	10,385,990	1,671,043	0
1/31/2027	7,208,167	4,817,427	80,991	6,565,543	3,820,474	10,386,020	1,671,063	0
2/28/2027	7,219,167	4,756,812	80,991	6,565,556	3,820,474	10,386,030	1,671,073	0
3/31/2027	7,234,707	4,686,436	80,991	6,565,563	3,820,474	10,386,040	1,671,079	0
4/30/2027	7,248,611	4,632,010	80,991	6,565,567	3,820,474	10,386,040	1,671,082	0
5/31/2027	7,321,377	4,581,767	82,569	6,573,294	3,820,474	10,393,770	1,678,011	0
6/30/2027	6,685,396	4,604,580	1,253,754	6,759,408	3,820,474	10,579,880	1,850,885	0
7/31/2027	5,636,432	4,531,875	2,444,478	6,769,514	3,820,474	10,589,990	1,581,544	0
8/31/2027	5,132,625	3,928,827	3,631,796	6,770,380	3,820,474	10,590,850	1,516,511	0
9/30/2027	5,445,338	3,281,130	4,265,841	6,841,013	3,820,474	10,661,490	1,654,100	0
10/31/2027	5,545,153	3,229,362	4,266,411	6,846,270	3,820,474	10,666,740	1,658,283	0
11/30/2027	5,592,442	3,177,370	4,266,411	6,846,352	3,820,474	10,666,830	1,658,349	0
12/31/2027	5,617,459	3,135,769	4,266,411	6,846,398	3,820,474	10,666,870	1,658,385	0
1/31/2028	5,643,810	3,075,705	4,266,411	6,846,422	3,820,474	10,666,900	1,658,405	0
2/29/2028	5,661,192	3,014,062	4,266,411	6,846,435	3,820,474	10,666,910	1,658,415	0
3/31/2028	5,684,930	2,943,191	4,266,411	6,846,442	3,820,474	10,666,920	1,658,421	0
4/30/2028	5,706,161	2,898,040	4,266,411	6,846,446	3,820,474	10,666,920	1,658,424	0
5/31/2028	5,796,253	2,847,888	4,268,535	6,854,917	3,820,474	10,675,390	1,666,046	0
6/30/2028	7,181,599	1,742,063	4,397,996	7,040,706	3,940,700	10,981,410	1,844,746	0
7/31/2028	6,888,680	993,200	4,396,383	7,050,558	5,131,473	12,182,030	1,575,856	0
8/31/2028	6,739,685	977,063	4,103,721	7,052,380	5,750,074	12,802,450	1,518,936	0
9/30/2028	6,976,971	1,008,742	4,127,369	7,121,732	5,750,074	12,871,810	1,655,167	0
10/31/2028	7,048,667	1,009,472	4,127,939	7,126,877	5,750,074	12,876,950	1,659,261	0
11/30/2028	7,081,176	1,009,472	4,127,939	7,126,959	5,750,074	12,877,030	1,659,326	0
12/31/2028	7,098,232	1,009,472	4,127,939	7,127,005	5,750,074	12,877,080	1,659,363	0
1/31/2029	7,116,099	1,009,472	4,127,939	7,127,029	5,750,074	12,877,100	1,659,383	0
2/28/2029	7,127,430	1,009,472	4,127,939	7,127,041	5,750,074	12,877,120	1,659,392	0
3/31/2029	7,143,437	1,009,472	4,127,939	7,127,048	5,750,074	12,877,120	1,659,398	0
4/30/2029	7,157,758	1,009,472	4,127,939	7,127,053	5,750,074	12,877,130	1,659,402	0
5/31/2029	7,231,408	1,012,237	4,129,728	7,134,833	5,750,074	12,884,910	1,666,323	0
6/30/2029	6,604,522	1,073,130	4,439,902	7,320,228	6,609,735	13,929,960	1,842,835	0
7/31/2029	6,735,609	1,056,123	4,103,452	7,329,405	6,950,074	14,279,480	1,573,637	0
8/31/2029	6,899,609	1,038,546	4,099,293	7,329,453	6,950,074	14,279,530	1,517,020	0
9/30/2029	6,942,588	1,071,560	4,311,981	7,400,396	6,950,074	14,350,470	1,654,671	0
10/31/2029	6,991,437	1,072,287	4,345,193	7,405,658	6,950,074	14,355,730	1,658,856	0
11/30/2029	7,024,525	1,072,287	4,345,193	7,405,740	6,950,074	14,355,810	1,658,921	0
12/31/2029	7,041,887	1,072,287	4,345,193	7,405,785	6,950,074	14,355,860	1,658,958	0
1/31/2030	7,060,072	1,072,287	4,345,193	7,405,810	6,950,074	14,355,880	1,658,977	0
2/28/2030	7,071,605	1,072,287	4,345,193	7,405,823	6,950,074	14,355,900	1,658,987	0
3/31/2030	7,087,898	1,072,287	4,345,193	7,405,830	6,950,074	14,355,900	1,658,993	0
4/30/2030	7,102,474	1,072,287	4,345,193	7,405,834	6,950,074	14,355,910	1,658,996	0
5/31/2030	7,176,664	1,075,054	4,346,997	7,413,628	6,950,074	14,363,700	1,665,917	0
6/30/2030	7,658,236	1,135,999	3,271,503	7,599,707	8,078,624	15,678,330	1,842,990	0
7/31/2030	7,774,312	1,118,962	2,081,032	7,608,659	9,268,474	16,877,130	1,575,862	0
8/31/2030	7,896,286	1,101,355	899,438	7,608,513	10,458,870	18,067,390	1,517,140	0
9/30/2030	7,940,304	987,296	218,400	7,679,485	11,604,950	19,284,440	1,652,654	0
10/31/2030	8,027,636	964,023	247,509	7,684,748	11,628,950	19,313,700	1,656,837	0
11/30/2030	8,050,462	964,023	247,509	7,684,829	11,628,950	19,313,780	1,656,903	0
12/31/2030	8,062,434	964,023	247,509	7,684,875	11,628,950	19,313,820	1,656,939	0
1/31/2031	8,074,978	964,023	247,509	7,684,900	11,628,950	19,313,850	1,656,959	0
2/28/2031	8,082,935	964,023	247,509	7,684,912	11,628,950	19,313,860	1,656,969	0
3/31/2031	8,094,178	964,023	247,509	7,684,919	11,628,950	19,313,870	1,656,975	0
4/30/2031	8,104,238	964,023	247,509	7,684,923	11,628,950	19,313,870	1,656,978	0
5/31/2031	8,161,500	966,785	256,452	7,692,727	11,628,950	19,321,680	1,663,898	0
6/30/2031	8,148,918	58,900	1,808,723	7,878,769	12,757,500	20,636,270	1,843,062	0
7/31/2031	7,058,414	42,454	3,076,162	7,887,452	13,947,350	21,834,800	1,575,932	0
8/31/2031	6,683,082	25,400	4,322,262	7,887,073	14,489,750	22,376,820	1,517,212	0
9/30/2031	6,926,525	57,939	5,558,989	7,958,167	14,489,750	22,447,920	1,652,760	0
10/31/2031	6,999,222	58,657	5,584,843	7,963,431	14,489,750	22,453,180	1,656,944	0
11/30/2031	7,032,232	58,657	5,584,843	7,963,513	14,489,750	22,453,260	1,657,010	0
12/31/2031	7,049,552	58,657	5,584,843	7,963,559	14,489,750	22,453,310	1,657,046	0
1/31/2032	7,067,694	58,657	5,584,843	7,963,584	14,489,750	22,453,330	1,657,066	0
2/29/2032	7,079,606	58,657	5,584,843	7,963,596	14,489,750	22,453,350	1,657,076	0
3/31/2032	7,095,857	58,657	5,584,843	7,963,604	14,489,750	22,453,350	1,657,082	0
4/30/2032	7,110,397	58,657	5,584,843	7,963,607	14,489,750	22,453,360	1,657,085	0
5/31/2032	7,186,321	61,871	5,587,498	7,972,151	14,489,750	22,461,900	1,664,706	0
6/30/2032	6,552,033	1,112,436	5,785,307	8,157,910	15,617,980	23,775,880	1,843,503	52,020
7/31/2032	5,505,086	2,345,570	5,776,535	8,166,425	16,808,750	24,975,170	1,574,582	45,222
8/31/2032	4,521,319	3,577,620	5,767,489	8,167,132	17,998,550	26,165,680	1,517,659	39,540
9/30/2032	3,625,923	4,607,260	5,786,702	8,236,579	19,150,550	27,387,130	1,653,639	50,644
10/31/2032	2,534,905	4,607,905	5,787,224	8,241,602	20,340,950	28,582,550	1,657,590	49,985

Result:	PitA_waterVolume	PitE_waterVolume	GoosePit_waterVolume	Vault Pit Freshwater	Vault Pit Base	Vault Pit Total	Vault_AttPond	Combined Portage Pit
Unit:	m3	m3	m3	m3	m3	m3	m3	m3
11/30/2032	2,558,194	4,607,905	5,787,224	8,241,682	20,364,950	28,606,630	1,657,654	49,944
12/31/2032	2,583,211	4,607,905	5,787,224	8,241,727	20,364,950	28,606,680	1,657,690	49,943
1/31/2033	2,609,562	4,607,905	5,787,224	8,241,751	20,364,950	28,606,700	1,657,709	49,943
2/28/2033	2,626,351	4,607,905	5,787,224	8,241,763	20,364,950	28,606,710	1,657,719	49,943
3/31/2033	2,650,173	4,607,905	5,787,224	8,241,771	20,364,950	28,606,720	1,657,725	49,924
4/30/2033	2,671,590	4,607,905	5,787,224	8,241,774	20,364,950	28,606,720	1,657,728	49,391
5/31/2033	2,762,197	4,608,229	5,787,224	8,250,424	20,364,950	28,615,370	1,665,414	52,591
6/30/2033	2,154,469	4,604,964	5,785,304	8,435,298	21,493,080	29,928,380	1,843,506	174,001
7/31/2033	1,119,355	4,584,946	5,776,424	8,443,256	22,683,920	31,127,180	1,574,302	167,007
8/31/2033	141,774	4,565,733	5,767,154	8,081,206	23,873,750	31,954,960	1,516,993	161,150
9/30/2033	1,272,871	4,599,395	5,786,657	7,960,175	23,994,770	31,954,950	1,572,694	166,928
10/31/2033	1,806,096	4,600,167	5,787,224	7,960,181	23,994,770	31,954,960	1,576,763	166,280
11/30/2033	2,256,585	4,600,167	5,787,224	7,960,181	23,994,770	31,954,960	1,576,827	166,236
12/31/2033	2,698,242	4,600,167	5,787,224	7,960,181	23,994,770	31,954,960	1,576,863	166,235
1/31/2034	3,141,233	4,600,167	5,787,224	7,960,181	23,994,770	31,954,960	1,576,882	166,235
2/28/2034	3,534,343	4,600,167	5,787,224	7,960,181	23,994,770	31,954,960	1,576,892	166,235
3/31/2034	3,974,805	4,600,167	5,787,224	7,960,181	23,994,770	31,954,960	1,576,898	166,216
4/30/2034	4,399,421	4,600,167	5,787,224	7,960,181	23,994,770	31,954,960	1,576,901	165,673
5/31/2034	4,905,214	4,603,191	5,787,224	7,960,181	23,994,770	31,954,960	1,583,768	165,129
6/30/2034	6,641,055	4,604,914	5,785,275	7,960,181	23,994,770	31,954,960	1,718,408	282,457
7/31/2034	8,034,112	4,584,903	5,785,960	7,957,128	23,994,770	31,951,900	1,702,286	275,131
8/31/2034	8,963,193	4,564,653	5,787,224	7,955,406	23,994,770	31,950,180	1,682,692	19,989,820
9/30/2034	8,963,193	4,600,142	5,787,224	7,960,181	23,994,770	31,954,960	1,741,076	21,114,110
10/31/2034	8,963,193	4,600,921	5,787,224	7,960,181	23,994,770	31,954,960	1,745,262	21,103,810
11/30/2034	8,963,193	4,600,921	5,787,224	7,960,181	23,994,770	31,954,960	1,745,327	21,103,000
12/31/2034	8,963,193	4,600,921	5,787,224	7,960,181	23,994,770	31,954,960	1,745,364	21,102,990
1/31/2035	8,963,193	4,600,921	5,787,224	7,960,181	23,994,770	31,954,960	1,745,383	21,102,990
2/28/2035	8,963,193	4,600,921	5,787,224	7,960,181	23,994,770	31,954,960	1,745,393	21,102,990
3/31/2035	8,963,193	4,600,921	5,787,224	7,960,181	23,994,770	31,954,960	1,745,399	21,102,640
4/30/2035	8,963,193	4,600,921	5,787,224	7,960,181	23,994,770	31,954,960	1,745,402	21,092,770
5/31/2035	8,963,193	4,603,945	5,787,224	7,960,181	23,994,770	31,954,960	1,752,380	21,051,400
6/30/2035	8,963,193	4,604,916	5,786,553	7,960,181	23,994,770	31,954,950	1,887,366	21,105,630
7/31/2035	8,963,193	4,584,932	5,787,224	7,957,136	23,994,770	31,951,910	1,868,437	21,036,210
8/31/2035	8,963,193	4,564,583	5,787,224	7,955,382	23,994,770	31,950,160	1,846,329	20,966,010
9/30/2035	8,963,193	4,600,182	5,787,224	7,960,181	23,994,770	31,954,960	1,905,681	21,084,660
10/31/2035	8,963,193	4,600,961	5,787,224	7,960,181	23,994,770	31,954,960	1,909,883	21,074,360
11/30/2035	8,963,193	4,600,961	5,787,224	7,960,181	23,994,770	31,954,960	1,909,948	21,073,550
12/31/2035	8,963,193	4,600,961	5,787,224	7,960,181	23,994,770	31,954,960	1,909,985	21,073,540

APPENDIX B – WATER MANAGEMENT SCHEMATIC FLOWSHEETS


TSF North Cell
TSF South Cell
Quarry 23
345,000 m³
Pit A Water Level
>117 m – 2024 and 2025
>123.96 m – 2026-2029
Central Dike
Pit A Water Level
>117 m – 2024 and 2025
>123.96 m – 2026-2029
Pit A Water Level
>117 m – 2024 and 2025
>123.96 m – 2026-2029
WTP
Pit A Overflow
Jun-Sep only
Pit A Water Level
>117 m – 2024 and 2025
>123.96 m – 2026-2029
Goose Pit
Pit E
Pit A
Rebalance
Vault Transfer Line
Active 1Jun2026
1,600 m³/hr (June-Sept)
East Dike
Oct-May
2PL
Tailings deposited in:
• Pit E until Oct. 2024
• Pit A Nov. 2024– Mar. 2026
• Pit E Apr. 2026– Jun. 2028
• 80% mill process water sourced as reclaim from Pit E
• 20% mill process water makeup sourced from Third Portage Lake
BB Phaser
Phaser
Passive overflow
> 109 m
Vault Pit
Starting
June 2028 when
Phaser > 93 m
(350 m³/hr)
Vault AP
Starting June 2028
(350 m³/hr)
WTP
Wally Lake
Legend
Passive Flow
Pumped Contact Water
Pumped Non-contact Water
Treated Water
DATE SAVED: Oct 17, 2024
DRAWN BY: GM
REVIEWED: SJ
VERSION: 1
CLIENT:
AGNICO EAGLE
LORAX ENVIRONMENTAL
PROJECT:
Meadowbank Mine:
Water Balance and Water
Quality Model – Technical Report
TITLE: Operations phase flow diagram
(September 2024 to June 2028)
PROJECT #: A717-4
FIGURE: 3-23


Legend
Passive Flow
Pumped Contact Water
Pumped Non-contact Water
Treated Water
TSF North Cell
TSF South Cell
Quarry 23
345,000 m³
BB Phaser
Phaser
Passive overflow
> 109 m after Oct. 2032
Vault Pit
When
Phaser > 93 m
(350 m³/hr)
Ends September
2032
Transfers begin
in 2033
Transfers complete
in 2032
WTP (Cu
and As)
Pit A Overflow
Jun-Sep only
Central
Dike
Goose Pit
Pit E
Pit A
Rebalance
Vault Transfer Line
Complete at end 2031
Vault AP
Starting June 2033
(350 m³/hr)
WTP
Active Pit
Flooding
(2032-2034)
Transfers complete
in 2032
Transfers begin
in 2033
Active Pit
Flooding
(2031-2033)
East
Dike
Oct-May
3PL
2PL
Wally Lake
DATE SAVED: Oct 17, 2024
DRAWN BY: GM
REVIEWED: SJ
VERSION: 1
CLIENT:
AGNICO EAGLE
LORAX
ENVIRONMENTAL
PROJECT:
Meadowbank Mine:
Water Balance and Water
Quality Model – Technical Report
TITLE:
Active closure phase flow
diagram (July 2028 to July 2036)
PROJECT #: A717-4
FIGURE: 3-24

APPENDIX C – 2024 MEADOWBANK WATER QUALITY FORECASTING UPDATE

Please note that some information in the Water Quality Forecast (WQF) differs slightly from the Water Management Plan data. This discrepancy is due to updates made at the beginning of 2025. Due to time constraints, the WQF initiated in late 2024 has not been updated to reflect slight changes made to the tailings deposition plan completed in 2025 and the observations regarding the hydraulic connection between Pit A and Pit E via Central Dump. However, the overall volume of tailings and water remains the same.

Meadowbank Mine: Water Balance and Water Quality Model Technical Report for the 2024 Annual Report

Prepared for:
Agnico Eagle Mines Limited - Meadowbank Division
Suite 540
Baker Lake, NU
X0C 0A0

Prepared by:
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305-1770 West 7th Avenue
Vancouver, B.C., V6J 4Y6

Project No. A634-5
18 March 2025

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LIST OF TABLES

Acronyms and Abbreviations

AGNICO EAGLE

Acronyms and Abbreviations

Terminology used in this document is defined where it is first used. The following list will assist readers who may choose to review only portions of the document.

Agnico Eagle	Agnico Eagle Mines Ltd.
AP	Attenuation Pond
CCME	Canadian Council of Ministers of the Environment - Canadian Water Quality Guidelines for the Protection of Aquatic Life
CREMP	Core Receiving Environment Monitoring Program
DOC	Dissolved organic carbon
EOM	End of mining/end of Operations
Lorax	Lorax Environmental Services Ltd.
ktpd	Kilo tonnes per day
masl	Meters above sea level
MAP	Mean annual precipitation
MDMER	Metal and Diamond Mining Effluent Regulations
ML	Metal leaching
Mm^3	Million meters cubed
NML	Non-metal leaching
NPAG	Non-potentially acid generating
NWB	Nunavut Water Board
PAG	Potentially acid generating
QA/QC	Quality assurance/quality control
SSWQO	Site-specific water quality objectives
STP	Sewage treatment plant
SWMP	Stormwater Management Pond

TDS	Total dissolved solids
TSS	Total suspended solids
TSF	Tailings Storage Facility
WBM	Site-wide water balance model
WBWQM	Site-side water balance and water quality model
WUL	Water Use License
WQM	Site-wide water quality model
WRSF	Waste rock storage facility
WSC	Water Survey of Canada

1. Introduction

AGNICO EAGLE

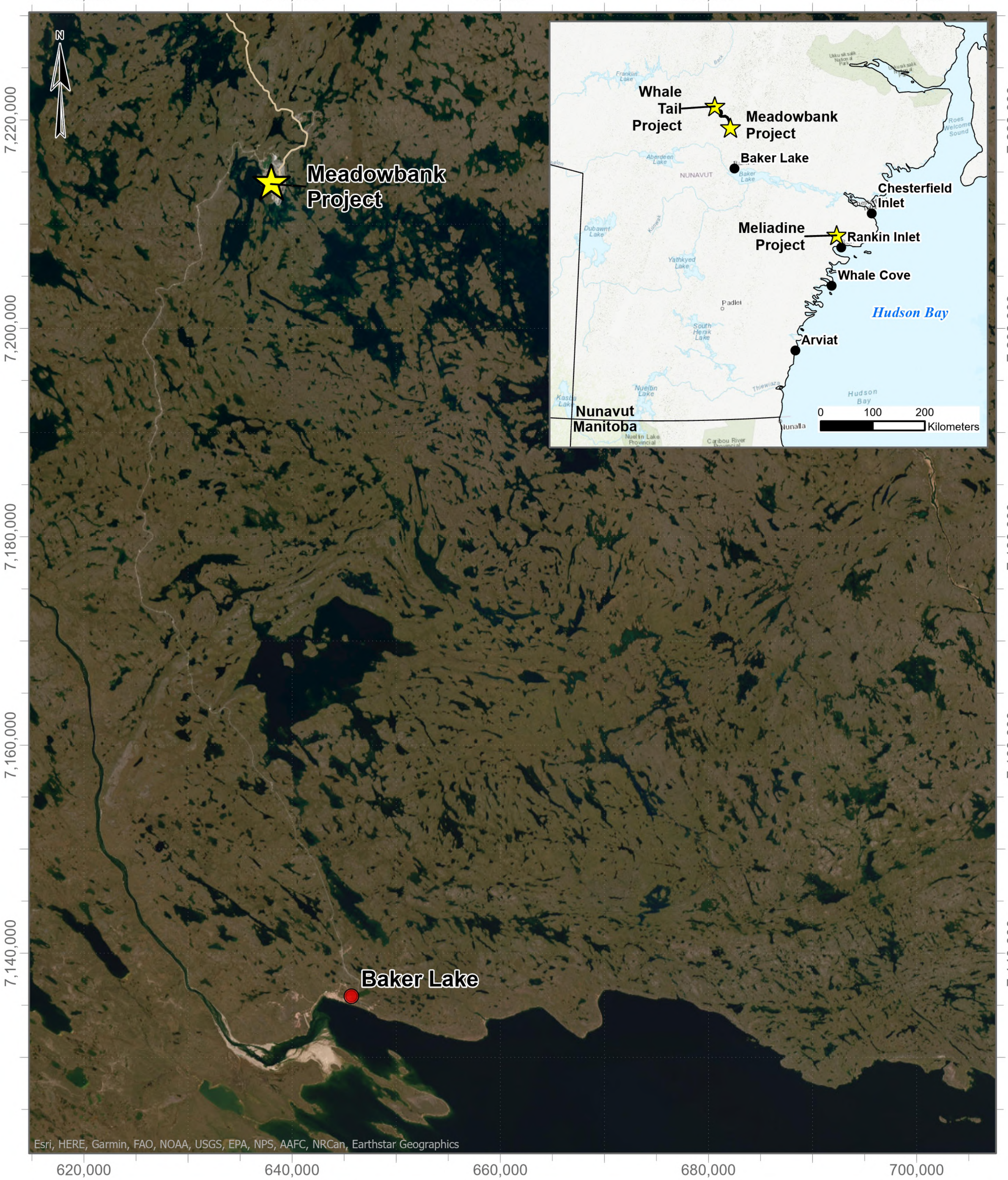
1. Introduction

Agnico Eagle Mines Limited (Agnico Eagle) operates the Meadowbank Complex located in the Kivalliq region of Nunavut approximately 110 km North of the Hamlet of Baker Lake (Figure 1-1). The complex consists of the Meadowbank mine and mill (the focus of this report) and the Whale Tail Mine, located 50 km northwest of the Meadowbank mine (the Mine). The Mine is subject to the terms and conditions of both the Project Certificate No. 004, Amendment 3, and the Nunavut Water Board Water Licence 2AM-MEA1530, which was last amended in May 2020.

The Meadowbank Mine began commercial ore production in 2010 and mining operations continued until 2019, with tailings deposited subaerially in the tailings storage facility (TSF). The Mine consists of three open pits at the main site (Portage Site) (Pit A, Pit E and Goose Pit) and three pits 7 km to the north at the Vault Site (Vault Pit, Phaser Pit and BB Phaser Pit). The mill is located at the Portage Site and processes ore at 12 ktpd utilizing a whole ore cyanide (CN) leach circuit followed by SO_2 air detoxification. Active mining at Meadowbank ceased in 2019, and since then, tailing slurry has been discharged into Pit E and Goose Pit located adjacent to the mill. The mine is currently operated as a zero-discharge facility, with all contact water being directed or passively draining into the mined-out pits at the Portage Site and Vault Site.

The mill will process ore from the Whale Tail Mine and continue producing tailings at 12 ktpd until June 2028, at which point milling operations at Meadowbank will cease. The Mine will then transition into the Active Closure phase, with the ultimate objective of reconnecting the fully flooded pits with the surrounding lakes in Post-Closure, once water quality objectives are met in the flooded pits.

The current closure concept is based upon semi-passive treatment and engineered meromixis of contact water within the flooded pits. In this context, semi-passive treatment involves enhancing the natural degradation of nitrogen species via aeration of the entire water column (destratification) and/or aeration of lake bottom waters only (hypolimnetic aeration). Conversely, engineered meromixis describes a condition of permanent stratification in the water column, in which contact water (relatively high density) at depth does not mix appreciably with fresh water (relatively low density) in the surface layer of the flooded pit. In this manner, contact water can be isolated and stored in the base of the pits in perpetuity.



LEGEND

- ☆ Project Location
- ● Municipality

DATE SAVED:	Sep 20, 2024
DRAWN BY:	DM
REVIEWED:	SJ
VERSION:	1

Coordinate System: NAD 1983 UTM Zone 14N
Projection: Transverse Mercator
Datum: North American 1983
Units: Metre

1:500,000

0 5,000 10,000 Metres

CLIENT: AGNICO EAGLE

LORAX ENVIRONMENTAL

PROJECT: **Meadowbank WB/WQM Report**

TITLE: Project Location Map

PROJECT #: A717-4

FIGURE: 1-1

P:\@Drafting\Meadowbank\Drafting Figures\APRX\WBWQM Report 2024\WBWQM Report 2024\WBWQM Report 2024.aprx

Lorax Environmental Services Ltd. (Lorax) was retained by Agnico Eagle to update the site-wide water balance and water quality model (WBWQM) in support of annual reporting requirements for the Meadowbank Mine. The modelling effort described in this report builds on previous models completed for this site, most recently (Lorax 2024).

1.1 Model Objectives, Structure and Key Inputs

The site-wide water balance and water quality model (WBWQM) is built in the GoldSim v15 software platform and is set-up to run on a daily time-step. The primary modelling objective is the prediction of water and solute load transfers within the mine site, and to the receiving environment during the remainder of the Operations phase, Active Closure phase and Post-Closure phase. Water volumes and loads are tracked on a daily time-step throughout the model, with all ponds, sumps and open pits (and flooded pits) represented by 'pool' elements in GoldSim. The pool element allows the model to track multiple inflows and outflows simultaneously. All mixing is assumed to occur instantly, and all mass is conserved throughout the model (*i.e.*, no attenuation is applied to any of the parameters that are tracked).

Key model inputs are as follows:

- Pump rates for water management infrastructure currently in place as of December 2024 (Section 2.4);
- Water treatment plant effluent water quality targets (described in Section 2.5);
- Meadowbank mine layout and associated sub-catchment areas (Section 3.2);
- Watershed model sub-module generated runoff (described in Section 3.3 and 3.6);
- Daily climate data for representative repeating average precipitation year, and dry- and wet-year sensitivities for the remainder of the Operations phase (2025-2028) (Section 3.4);
- Derived runoff coefficients for waste rock storage facilities (WRSFs), open pits, and the tailings storage facility (TSF; Section 3.7);
- Water management activities for the remainder of Operations and Active Closure (Sections 3.9 and 3.10);
- Non-contact water quality and geochemical source terms (described in Section 4);

1.2 Report Structure

Following this introduction, the report is structured as follows:

- Section 2 describes the model input sources, including the mine plan, mine water management system, source terms, dike, and groundwater seepage rates.
- Section 3 summarizes the key inputs and assumptions for the site-wide water balance model (WBM) and the modelling approach, including catchment delineation, the conceptual watershed model, evaporation algorithm, and mine component water balances (*e.g.*, pits, WRSFs, TSF flows), calibration exercise, and the Active Closure and Post-closure assumptions.
- Section 4 describes the water quality model, including key assumptions, background water quality, geochemical source terms, and model validation.
- Section 5 summarizes the forward model projections for the water balance model.
- Section 6 summarizes the forward model projections for the water quality model; and,
- Section 7 provides a summary of key findings.

2. Model Input Sources

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2. Model Input Sources

Key model inputs are described in this section, including the milling and tailings deposition plan, planned water treatment and water management.

2.1 Mine Plan

The model is encoded according to the overall mine plan, as follows:

- Operations: Present to end-June 2028. Defined by duration of Whale Tail ore milling at the Meadowbank site.
- Active Closure: July 2028 to June 2036. Defined by in pit treatment, transfers of Portage pit water to the base of Vault Pit, and active pit flooding with fresh water from Third Portage Lake and Wally Lake (for Vault Pit).
- Post-Closure: July 2036 onwards. Defined by the establishment of a freshwater cap in all pits and breaching of dikes once flooded pit surface water quality meets criteria.

2.2 Milling and In-Pit Tailings Deposition

Milling of Whale Tail ore at the Meadowbank mill continues until June 2028, with tailings deposited in the North and South Cells of the TSF, Goose Pit, Pit A and Pit E (Table 2-1 and Figure 2-1). At end-of-mine life (EOM), Pit A will have 3.45 Mm^3 of consolidated tailings and 2.53 Mm^3 of entrained water. Goose Pit will have 1.75 Mm^3 of tailings and 858,000m^3 of process water entrained in tailings void spaces. Pit E will have 14.95 Mm^3 of consolidated tailings and 8.39 Mm^3 of entrained water (Table 2-1), reflective of a 49% void space by volume in the deposited tailings. The tailings will occupy the base of Goose Pit, Pit E and Pit A to an elevation of 79 masl, 114 masl and 82 masl, respectively. The tailings will remain 19.6 to 54.6 m below the average water level of Third Portage Lake (133.6 masl) (Figure 2-2).

The majority of mill reclaim water (80%) is sourced from these flooded pits, with the remaining 20% comprised of makeup water pumped from Third Portage Lake (3PL; Figure 2-3).

Table 2-1:
Meadowbank Mine Annual In-Pit Tailings Deposition Plan, Backfill Volumes, and Tailings Pore Water Losses

Year	Pit A						
	Reclaim Water (m^3)	Process Water (m^3)	Tailings Deposited (t)	Tailings Pore Water Losses (m^3)	Waste Rock Pore Water Losses (m^3)	Cumulative Consolidated Tailings (m^3)*	Cumulative Entrained Water (m^3)*
2024	887,788	388,371	172,213	54,144	1,286	110,393	54,144
2025	0	3,209,833	3,094,278	1,171,549	199,629	2,093,905	1,425,322
2026	0	2,126,141	2,115,627	886,748	222,225	3,450,076	2,534,295
2027	0	0	0	0	0	3,450,076	2,534,295
2028**	0	0	0	0	0	3,450,076	2,534,295
Year	**Pit E**						
2024	2,794,455	4,710,441	3,924,182	1,232,596	205,047	10,227,444	5,690,856
2025	3,371,840	0	0	0	0	10,227,444	5,690,856
2026	3,386,422	1,031,324	1,024,896	321,922	60,499	10,884,428	6,073,277
2027	3,408,843	4,287,403	4,233,027	1,329,605	220,120	13,597,907	7,623,002
2028**	1,708,630	2,146,580	2,115,627	664,524	104,407	14,954,078	8,391,933

Notes:
*Consolidated tailings density of 1.56 t/m^3 and porosity of 0.49.
**2028 values provided for January - June 2028

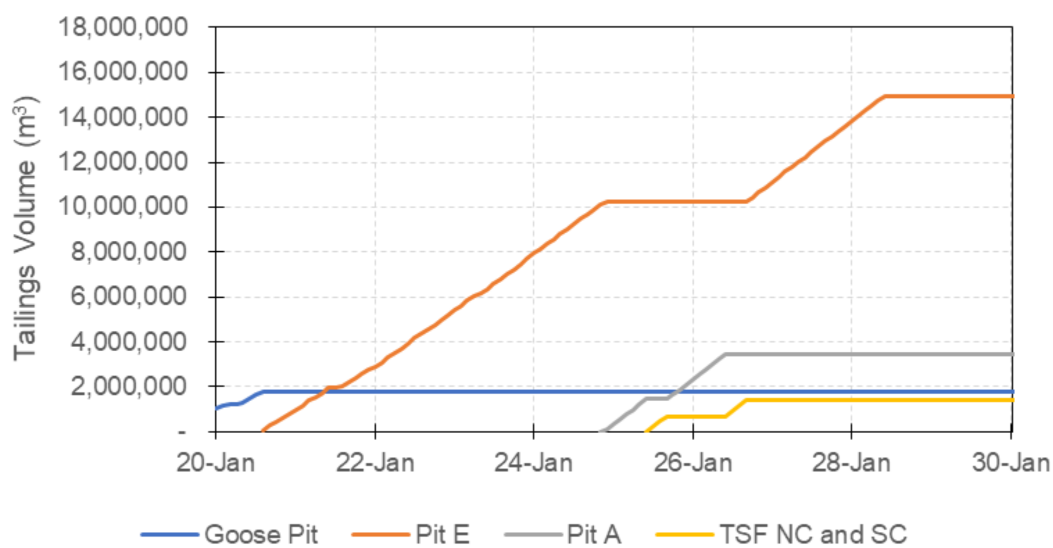

Figure 2-1: Volume of consolidated tailings backfill in mine pits.

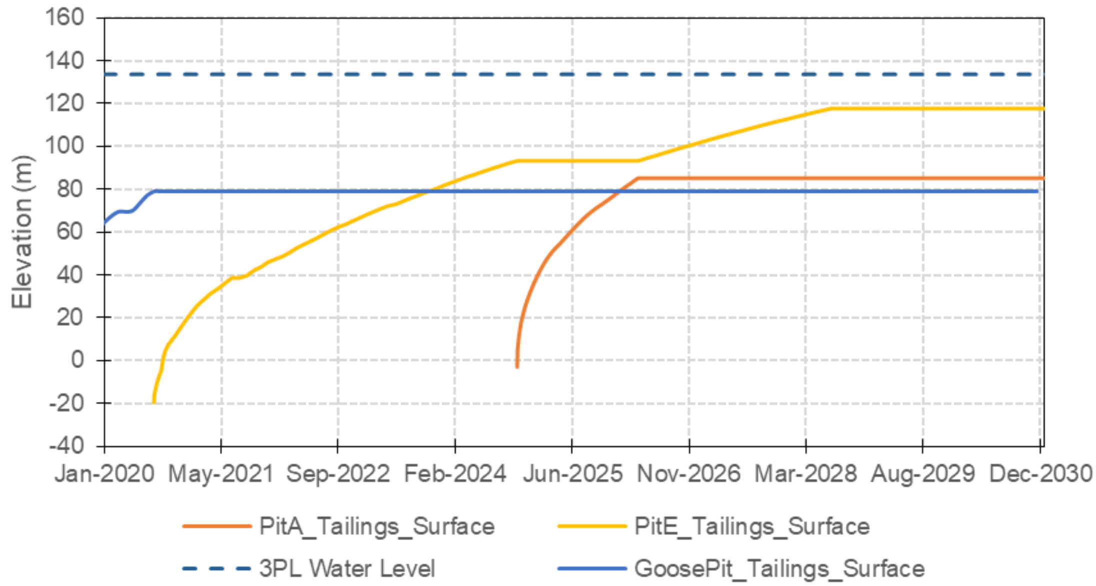

Figure 2-2: Average tailings elevation in backfilled mine pits and Third Portage Lake (TPL) water level.

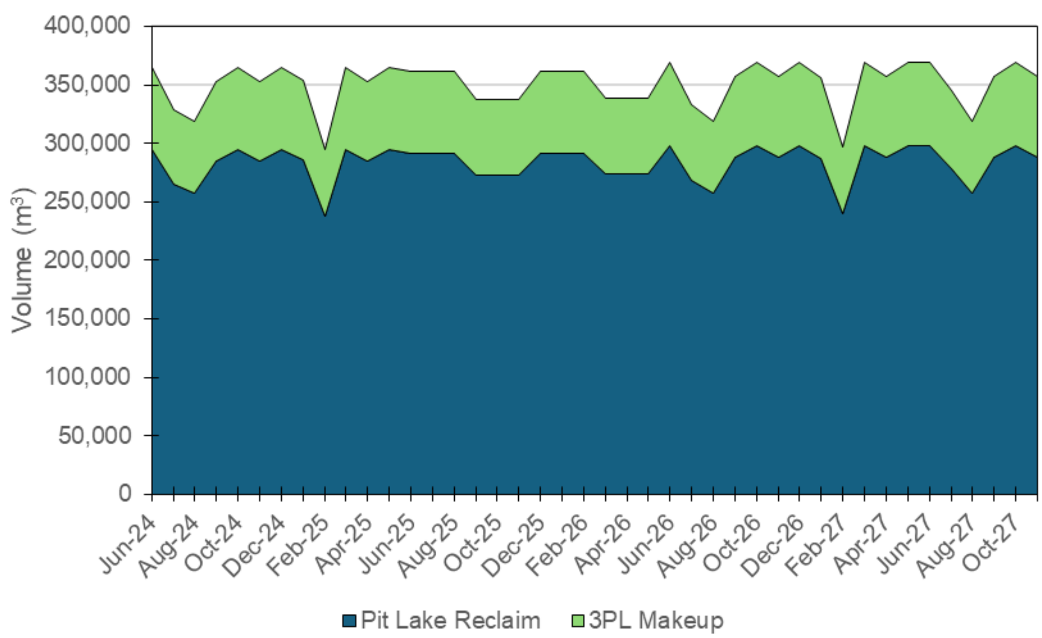

Figure 2-3: Monthly mill reclaim and makeup water withdrawal volumes.

2.3 Waste Rock In-Pit Backfill

Waste rock has been backfilled into the Goose Pit (Goose Pit Backfill), the Vault Pit (Vault Pit Backfill), between the Vault Pit and Phaser Pit (causeway fill), and in mine pits occupying the central area between Pit E and Pit A (Central Dump). A total of 12.9 Mm^3 of waste rock has been backfilled with an assumed porosity of 0.3, resulting in a total pore volume of 3.9 Mm^3 (Table 2-2). Waste rock pore water above the tailings backfill elevation is assumed to freely mix with pond water. Waste rock pore space below the tailings elevation will no longer mix freely with the overlying pond, and is modelled as a waste rock pore water loss similar to water entrained in tailings pore space (Table 2-1).

Table 2-2:
Waste Rock Backfill Volume and Porosity

Open Pit	Waste Rock Volume (m^3)	Pore Volume (m^3)
Goose Pit	1,217,942	365,383
Pit A	5,527,843	1,658,353
Pit E	4,463,575	1,339,072
Vault/Phaser	1,701,500	510,450
Total	12,910,860	3,873,258

2.4 Water Management Assumptions and Inputs

The current mine water management plan is based upon several guiding principles:

- diverting clean (non-contact) water away from mine infrastructure where possible;
- storing process water in the existing flooded pits; and,
- minimizing mill makeup withdrawals from Third Portage Lake by maximizing reclaim of process water from the Portage pits.

The current water management plan is presented in Figure 2-4, and shows the various passive and pumped flows reporting to the collection sumps, TSF, Central Dike and open pits. Currently, there is no active discharge from the Vault Area or Portage Area. Active discharge of intercepted runoff from the Phaser area via the Vault AP to Wally Lake is planned to resume in June 2026. Measured historical active transfers (*i.e.*, pumped) are represented in the model as monthly volumes.

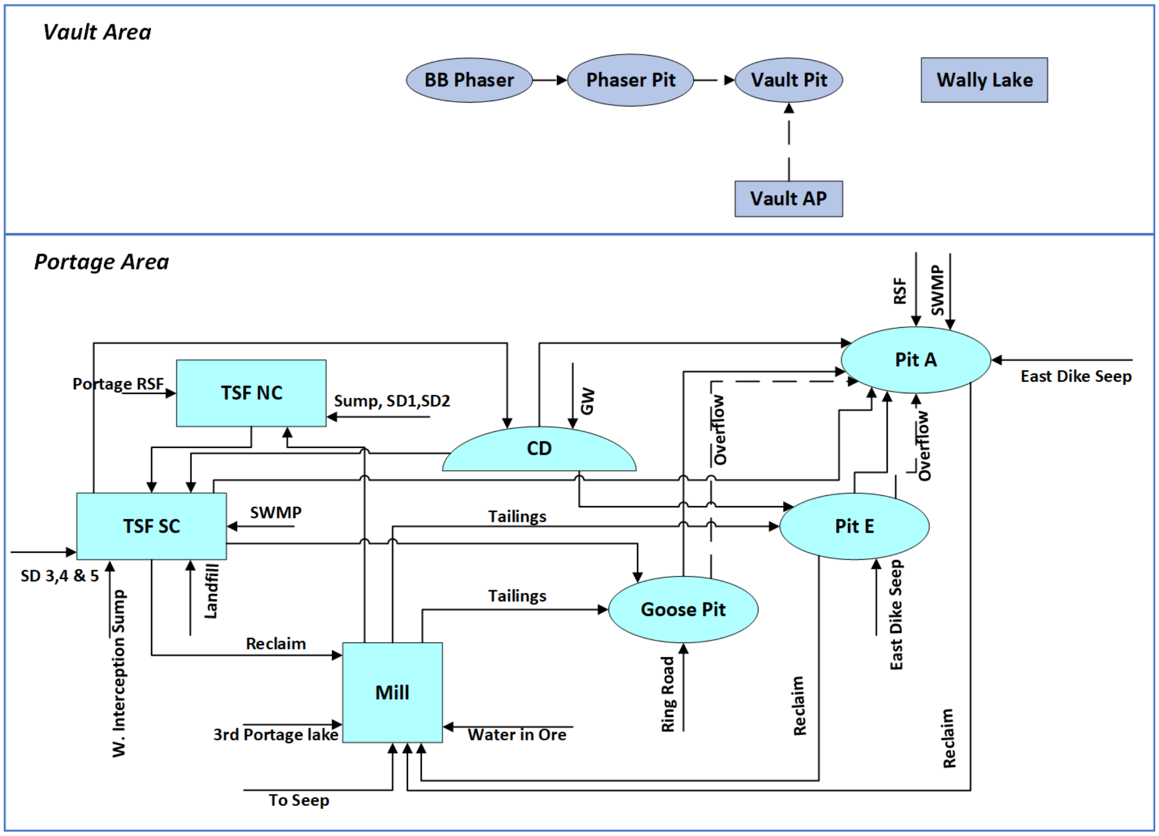

Figure 2-4: Current (as of 2024) water management schematic

2.4.1 Consumptive Freshwater Uses

Consumptive freshwater withdrawals from Third Portage Lake to provide mill process makeup requirements, and for potable water use in camp are not explicitly encoded in the model. Rather, they are included in the process water volumes routed to Pit A and Pit E, and in the volumes pumped from the Stormwater Management Pond (SWMP).

2.5 Water Treatment

2.5.1 Metals Water Treatment Plant (WTP)

A water treatment plant will treat for metals in Pit A water transferred to Goose Pit. The treatment targets are set based on an analysis of best available technologies economically achievable for As and Cu of 0.03 and 0.05 mg/L, respectively (MEND, 2014). The treatment plant will operate at a rate of 1,600 m^3/hour for the period of June 1 to September 30 of each year, beginning in 2026 and running until 2030.

2.5.2 Total Suspended Solids Treatment Plant

A water treatment plant will be used to treat TSS prior to discharge to Wally Lake. The treatment plant will operate at a rate of 360 m^3/hour for the period of June 1 to September 30 of each year, beginning in 2026 and running until 2033.

2.5.3 Sewage Treatment Plant

Treated camp water is discharged to the Stormwater Management Pond (SWMP) at an average rate of 5 m^3/hour.

2.5.4 Enhanced Natural Degradation of Nitrogen Species

As part of closure planning, a destratification system has been installed to enhance the natural degradation rates of nitrogen species in Goose Pit. This approach is modeled on the successful aeration program conducted in Zone 2 Pit at the Colomac Mine, located 220 km north of Yellowknife, Northwest Territories (Chapmen *et al.*, 2007; Pieters *et al*., 2014). Operations of the diffuser array and fertilizer amendments will maintain elevated oxygen, temperature, and nutrient concentrations to promote nitrification:

$$NH_4^+ + 3/2\ O_2 \rightarrow 2H^+ + H_2O + NO_2$$

$$NO_2^- + ½\ O_2 \rightarrow NO_3^-$$

Destratification of Goose Pit began on August 25, 2024. A bubble plume surrounding the aerator was immediately visible, indicating upwelling of hypolimnetic water and displacement of the green surface waters (Figure 2-5). The treatment objective is to reduce concentrations of ammonia (NH_3-N) below acutely toxic concentrations (i.e., 20 mg/L) prior to transfer to the base of Vault Pit for long term storage. The diffuser array will be operated in Goose Pit for the remainder of Operations. Aeration will occur in Pit A, Pit E and Goose Pit from the end of operations until June 2030.

Figure 2-5: Aerial photograph of Goose Pit during initial operation in August 2024 of Diffuser/Raft 1 showing upswelling of dark hypolimnetic water into green surface waters around the aerator raft.

2.6 Mine Closure Approach

At the end of operations process water in Goose Pit, Pit A and Pit E will be treated for nitrogen species by enhanced natural degradation and metals (via metals WTP) prior to transfer to the base of Vault Pit. Process water will be permanently stored under meromictic conditions at the base of Vault Pit. The Portage pits will be actively reflooded by pumping water from Third Portage Lake at a maximum rate of 4,935,000 m^3 per year, and the remainder of Vault Pit above the treated Portage Pit water will be reflooded by pumping water from Wally Lake at a maximum rate of 4,185,000 m^3 per year, as specified in License 2AM-MEA1530.

Passive flooding of the pits from surrounding catchment runoff and meteoric inputs will continue throughout the active flooding phase. A minimum of 8 m of freshwater will be present on the surface of each flooded pit at the end of the Active Closure period to prevent tailings re-suspension. The water cover will range from 19.6 to 54.6 m average depth under the current tailings deposition plan (Figure 2-2). The dikes separating the pits from Third Portage Lake and Wally Lake will not be breached until water quality in the flooded pits reaches levels that will maintain the reconnected lakes below the CCME water quality guidelines, background water quality, or site specific water quality objectives (SSWQOs), per condition of the Water License 2AM-MEA1530, part E, item 7.

3. Water Balance Model Methods

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3. Water Balance Model Methods

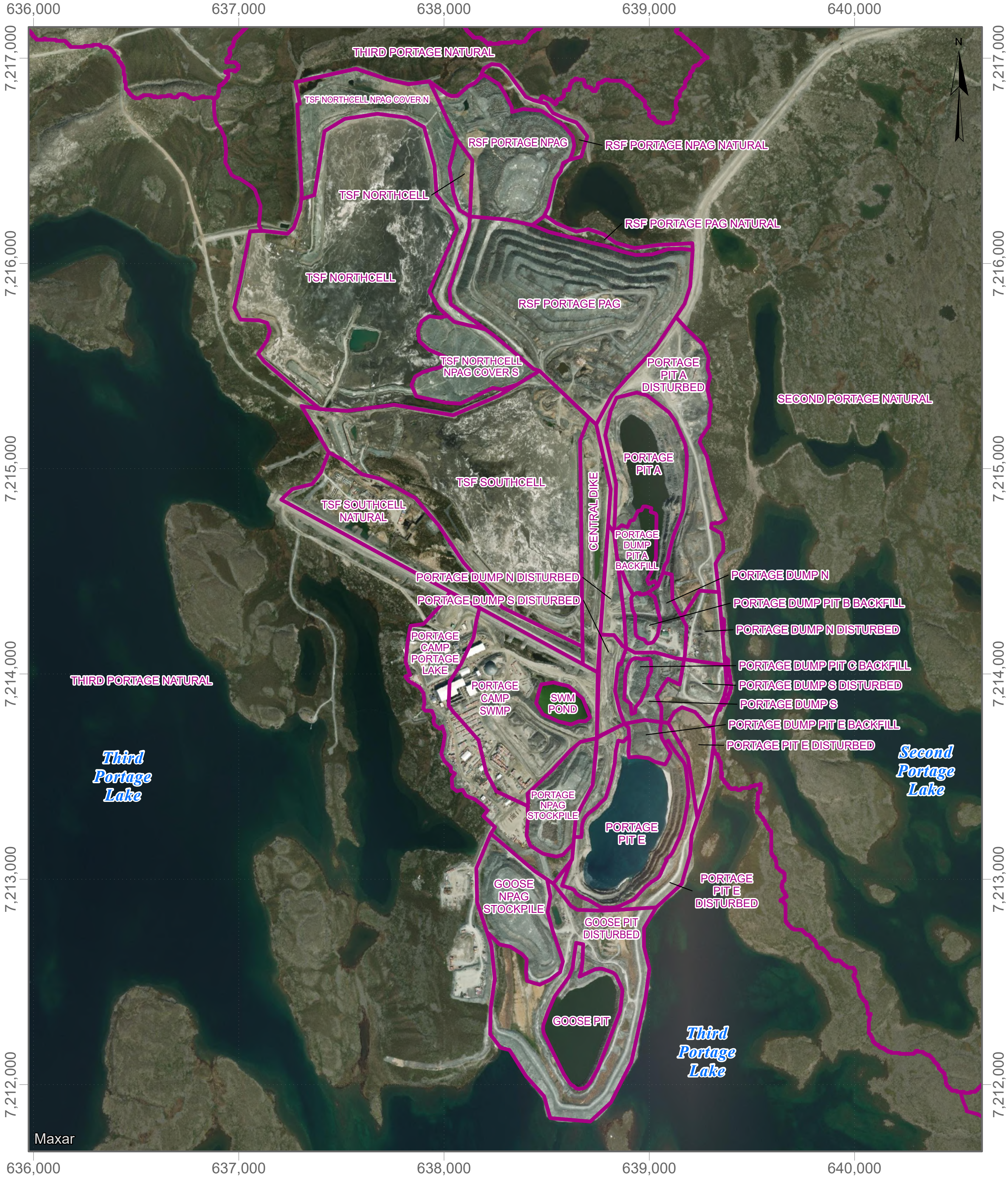
This section summarizes the approach, assumptions, conceptual model, and inputs used to construct the site-wide water balance model.

3.1 Approach and Assumptions

The site-wide WBM is set-up to represent the interaction of the local climatic regime with the mine plan and water management plan, and based on these interactions, to predict the volumes of various water types (*i.e.*, non-contact, surface contact and process water) requiring management, treatment and discharge to the receiving environment. Given the potential for upset conditions to occur on sub-monthly time scales (*i.e.*, high magnitude rainfall events, rapid freshet), and the operational necessity of managing mine contact waters on a daily basis, the WBM is set-up to run on a daily time-step.

3.2 Sub-catchment Delineation

In order to generate water volume estimates from precipitation inputs, the delineation of both the natural and mine-altered watershed areas was necessary for modelling locations of interest at the Meadowbank Mine. The annual mine layouts were provided by Agnico Eagle in .dxf file format, and the sub-catchment delineations for each mine component were completed in the AutoCAD2023 software package. The defined subcatchment areas are shown for the Portage area in Figure 3-1, and for the Vault area in Figure 3-2. Catchment areas are provided in Table 3-1.



LEGEND

Catchment Area

DATE SAVED:	Sep 27, 2024
DRAWN BY:	DM
REVIEWED:	SJ
VERSION:	1

Coordinate System: NAD 1983 CSRS UTM Zone 14N
Projection: Transverse Mercator
Datum: North American 1983 CSRS
Units: Metre

1:25,000

0 250 500 Metres

CLIENT:

AGNICO EAGLE

LORAX ENVIRONMENTAL

PROJECT:

Meadowbank WB/WQM Report

TITLE:

Portage WB/WQM Operations Layout

PROJECT #: A717-4

FIGURE: 3-1

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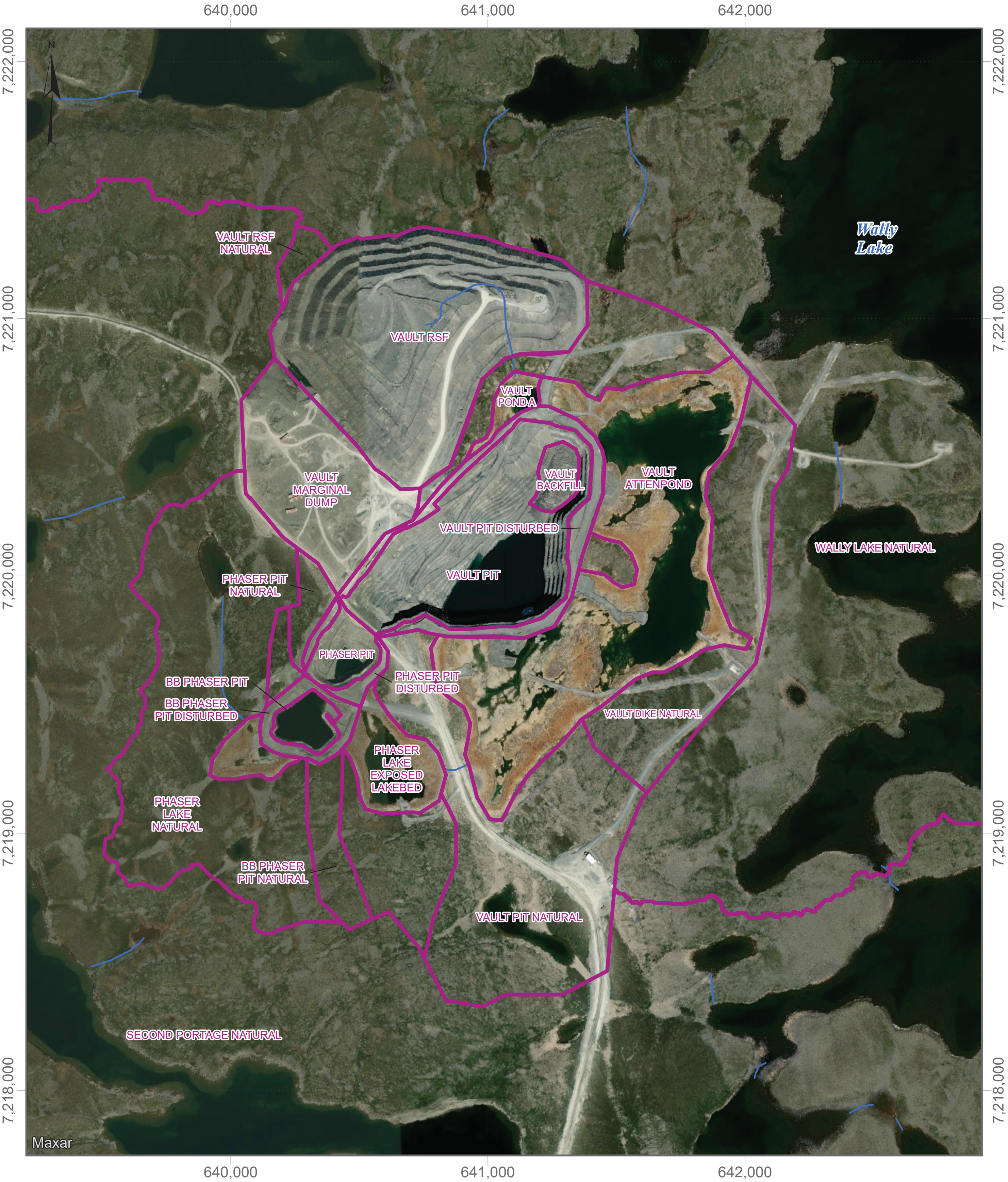

LEGEND

Catchment Area

DATE SAVED:	Oct 09, 2024
DRAWN BY:	DM
REVIEWED:	SJ
VERSION:	1

Coordinate System: NAD 1983 CSRS UTM Zone 14N
Projection: Transverse Mercator
Datum: North American 1983 CSRS
Units: Metre

1:20,000

0 200 400 Metres

CLIENT: AGNICO EAGLE

LORAX ENVIRONMENTAL

PROJECT: **Meadowbank WB/WQM Report**

TITLE: Vault WB/WQM Operations Layout

PROJECT #: A717-4

FIGURE: 3-2

P:\@Drafting\Meadowbank\Drafting Figures\APRX\WBWQM Report 2024\WBWQM Report 2024\WBWQM Report 2024.aprx Figure 2-3 Vault WBWQM Operations Layout

Table 3-1:
Mine site sub-catchment areas encoded into water balance model

Catchment Name	Area (m^2)	Runoff Type	Drains To:
BB PHASER_PIT	43,534	Pit Wall	*Collection Node*
BB PHASER_PIT_DISTURBED	44,779	Disturbed	BB PHASER_PIT
BB PHASER_PIT_NATURAL	119,772	Natural	BB PHASER_PIT
CENTRAL_DIKE	130,761	Disturbed	*Collection Node*
GOOSE_NPAG_STOCKPILE	176,457	RSF	GOOSE_PIT
GOOSE_PIT	155,933	Pit Wall	*Collection Node*
GOOSE_PIT_DISTURBED	419,809	Disturbed	GOOSE_PIT
PHASER_LAKE_NATURAL	183,001	Natural	PHASER_PIT
PHASER_PIT	59,088	Pit Wall	*Collection Node*
PHASER_PIT_DISTURBED	24,818	Disturbed	PHASER_PIT
PHASER_PIT_NATURAL	44,271	Natural	PHASER_PIT
PHASERLAKE_EXPOSEDLAKEBED	162,167	Disturbed	PHASER_PIT
PHASERLAKE_NATURAL	1,067,892	Natural	BB PHASER_PIT
PORTAGE_CAMP_PORTAGELAKE	263,779	Disturbed	3PL
PORTAGE_CAMP_SWMP	384,478	Disturbed	SWM_POND
PORTAGE_DUMP_N	67,587	RSF	PORTAGE_PIT_A
PORTAGE_DUMP_N_DISTURBED	100,221	Disturbed	PORTAGE_PIT_A
PORTAGE_DUMP_PIT_A_BACKFILL	63,240	RSF	PORTAGE_PIT_A
PORTAGE_DUMP_PIT_B_BACKFILL	25,883	RSF	PORTAGE_PIT_A
PORTAGE_DUMP_PIT_C_BACKFILL	23,486	RSF	PORTAGE_PIT_E
PORTAGE_DUMP_PIT_E_BACKFILL	32,579	RSF	PORTAGE_PIT_E
PORTAGE_DUMP_S	58,408	RSF	PORTAGE_PIT_E
PORTAGE_DUMP_S_DISTURBED	118,844	Disturbed	PORTAGE_PIT_E
PORTAGE_NPAG_STOCKPILE	118,655	RSF	PORTAGE_PIT_E
PORTAGE_PIT_A	220,219	Pit Wall	*Collection Node*
PORTAGE_PIT_A_DISTURBED	306,632	Disturbed	PORTAGE_PIT_A
PORTAGE_PIT_E	305,116	Pit Wall	*Collection Node*
PORTAGE_PIT_E_DISTURBED	182,114	Disturbed	PORTAGE_PIT_E
RSF_PORTAGE_NPAG	285,857	RSF	ST-16
RSF_PORTAGE_NPAG_NATURAL	39,441	Natural	ST-16
RSF_PORTAGE_PAG	690,790	RSF	ST-16
RSF_PORTAGE_PAG_NATURAL	31,614	Natural	ST-16
SWM_POND	36,942	Open water	*Collection Node*
TSF_NORTHCELL	1,099,463	TSF	TSF_SOUTHCELL
TSF_NORTHCELL_NPAG_COVER_N	262,360	RSF	TSF_NORTHCELL
TSF_NORTHCELL_NPAG_COVER_S	155,663	RSF	TSF_NORTHCELL
TSF_SOUTHCELL	906,235	TSF	PORTAGE_PIT_A
TSF_SOUTHCELL_NATURAL	301,705	Natural	SWM_POND
VAULT_ATTENPOND	891,048	Open water	*Collection Node*
VAULT_BACKFILL	35,733	RSF	VAULT_PIT
VAULT_DIKE_NATURAL	616,063	Natural	VAULT_ATP
VAULT_MARGINAL_DUMP	320,190	RSF	VAULT_PIT
VAULT_PIT	444,552	Pit Wall	*Collection Node*
VAULT_PIT_DISTURBED	107,830	Disturbed	VAULT_PIT
VAULT_PIT_NATURAL	741,463	Natural	VAULT_PIT
VAULT_POND_A	31,159	Open water	VAULT_PIT
VAULT_RSF	762,684	RSF	VAULT_PIT
VAULT_RSF_NATURAL	28,305	Natural	VAULT_PIT
SECOND_PORTAGE_USMINE	1,199,534	Natural	*Collection Node*

3.3 Conceptual Watershed Model

The streamflow regime in the Mine area is strongly nival (snowmelt dominated), with freshet typically occurring between the end of May and mid-June. Additional peak flow events are common throughout the open water season (May through early October), driven by large rainfall events. Significant volumes of water may be delivered to the local watercourses in the span of 2 days yet may subsequently be followed by prolonged dry periods where surface flows diminish to the point where active layer discharge is the main determinant of streamflow.

As the open water season progresses, active layer melt can contribute increasing discharge volumes to local watersheds, expressed as an increasing baseflow signature throughout the summer. Finally, average winter temperatures are well below zero, and surface flow in all local watersheds is reduced to zero as lake outlets and stream channels freeze during winter.

A customized site-wide water balance model was constructed in the GoldSim modeling environment to allow the seasonally variable baseline conditions in the Mine area to be accurately represented. Figure 3-3 shows the commonly accepted components of streamflow in natural catchments with surface volumes of water reporting with one of three signatures:

- Quick flow – generated by storm or snowmelt events and often resulting in peak flow events. For tributaries local to the Meadowbank Mine, water contributed via this mechanism may report to creeks in less than 2 days time;
- Interflow – this refers to the lateral movement of infiltrated meteoric water through the shallow overburden and active layer to the lakes and stream channels. Flow reporting to watercourses along this pathway is often referred to as vadose or unsaturated zone flow; and,
- Baseflow – the portion of surface flow derived from groundwater discharge. In the Mine area, this flow component is understood to be negligible, and largely consists of water introduced via active layer melt.

The watershed model assembled to replicate the streamflow regime in the Mine area incorporates this understanding of streamflow composition and response directly into the model architecture. Accordingly, surface runoff, interflow, active layer melt and baseflow, are all represented in the site-wide WBM, which is a modified version of the Birkenes model. This model was developed as part of a research program to understand linkages between stream chemistry and flow in a small (< 1 km^2) catchment in southern Norway (*e.g.,* Christophersen and Seip, 1982; Seip *et al*., 1985). The modelling approach is depicted as a conceptual diagram in Figure 3-4.

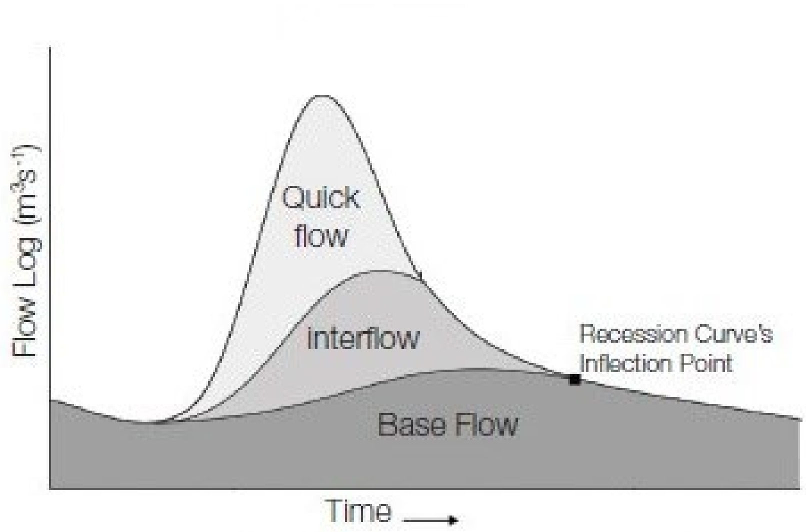

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Figure 3-3: Conceptual hydrograph showing runoff partitioning.

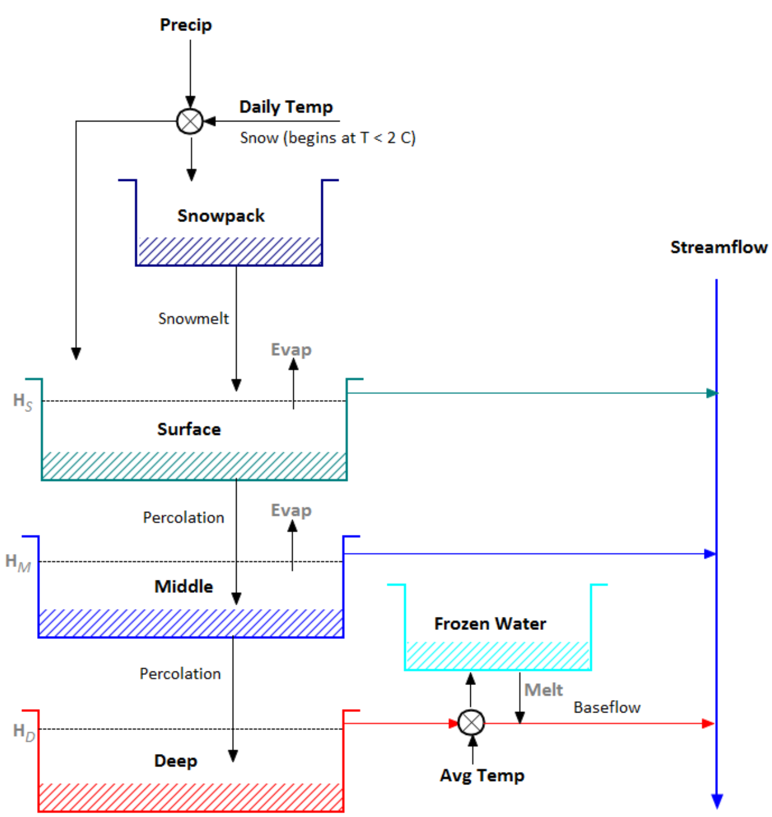


Figure 3-4: Schematic presenting an overview of the three-reservoir water balance model in conceptual format.

Conceptually, incoming precipitation is partitioned in the WBM watershed model between rain and snow based on air temperature thresholds. Incident precipitation is partitioned between snow and rainfall at the 0°C mean daily air temperature. Sublimation losses are set at a constant of 0.3 mm/day, which equals approximately 73 mm over the course of a winter season, or 41% of average annual snowfall. Rainfall is then directed into the Surface reservoir, which represents the quickflow runoff response shown in Figure 3-3. The volume of water routed from this reservoir to streamflow at each time-step is governed by a constant draindown parameter. As the reservoir volume decreases, the rate of outflow decreases, and thus the draindown curve approximates a negative exponential function.

Excess water contained within the Surface reservoir percolates at a rate proportionate to the Surface volume into the Middle reservoir, representative of the interflow runoff component in Figure 3-3. The proportions of Middle reservoir water routed to streamflow and to the Deep reservoir are governed by the same functions as for the Surface reservoir but have different parameter values to reflect the slower unsaturated flow response to infiltrating meteoric inputs. Figure 3-4 shows that when the Deep reservoir fills, slow recession flow from the reservoir reports to baseflow (and fractionally to channel ice formation in winter). Where channel ice has been modelled (based on air temperature) to freeze completely to bed during the winter months, streamflow is zero. In the model, evaporation is withdrawn from both surface reservoirs (Surface and Middle). The Deep reservoir is protected from evaporation (described in Section 3.4) and provides a source for winter baseflow and ice formation. Finally, snowmelt and melting of channel ice are indexed to the daily mean air temperature. Channel ice is assumed to melt at 20% of the snowmelt rate, due to its higher density and location in the shaded valley bottoms.

Additional information pertaining to the three-reservoir watershed model, including specific parameter values and assumptions are detailed in Section 3.6.

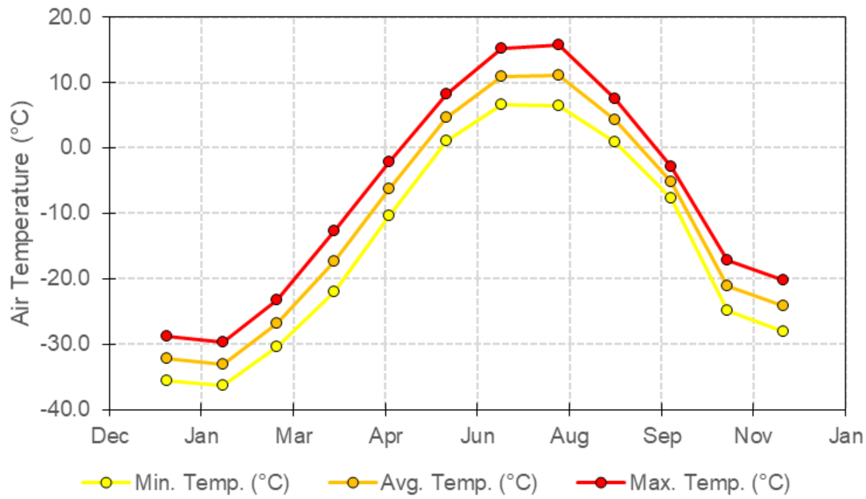
3.4 Climate Inputs

The climate input series is based upon a repeating representative average precipitation year (359 mm; Okane, 2024), represented by daily climate data from the year 2015.

While typically snow falls in all months except July and August, the higher precipitation received during the summer months results in an average annual split of 58% snow to 42% rain. The annual average air temperature is -11.3°C, with minimum and maximum mean monthly temperatures of -36.4°C in February and 15.2°C in July, respectively (Table 3-2; Figure 3-5).

Table 3-2:
Average monthly climate conditions at the Meadowbank Mine

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Min. Temp. (°C)	-35.6	-36.4	-30.5	-22.0	-10.3	1.1	6.5	6.5	1.0	-7.6	-24.8	-28.0	-36.4
Avg. Temp. (°C)	-32.2	-33.1	-26.9	-17.4	-6.2	4.7	10.9	11.2	4.2	-5.2	-21.0	-24.1	-11.3
Max. Temp. (°C)	-28.8	-29.7	-23.3	-12.8	-2.1	8.3	15.2	15.8	7.5	-2.8	-17.2	-20.2	15.8
Precipitation (mm)	15.2	10.8	13.9	37.2	9.4	34.1	31.9	18.9	85.7	17.2	31.2	53.0	358.6
Rain (mm)	0.0	0.0	0.0	0.0	5.0	33.8	31.9	17.2	30.9	1.2	0.0	0.0	150.6
% Rain	0%	0%	0%	0%	53%	99%	100%	91%	36%	7%	0%	0%	42%
Snow (mm)	15.2	10.8	13.9	37.2	4.4	0.3	0.0	1.7	54.9	16.0	31.2	53.0	208.0
% Snow	100%	100%	100%	100%	47%	1%	0%	9%	64%	93%	100%	100%	58%



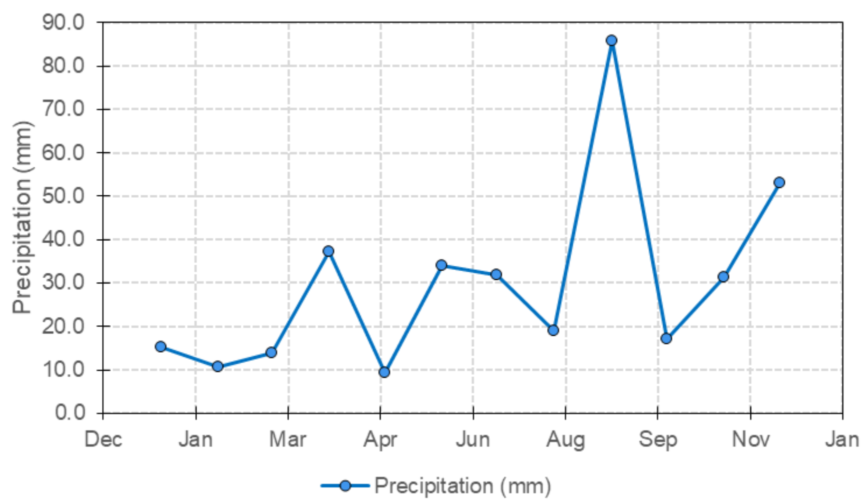


Figure 3-5: Mean monthly minimum, mean, and maximum air temperature (top panel) and precipitation (bottom panel) for the representative average year.

3.4.1 Dry- and Wet-Year Sensitivities

The influence of drier or wetter than average climate conditions on the WBWQM predictions was tested by inserting repeating dry-years (10th percentile historical precipitation; 277 mm) and repeating wet-years (90th percentile historical precipitation; 449 mm) into the model for the remainder of the Operations phase (2025-2028; Figure 3-6).

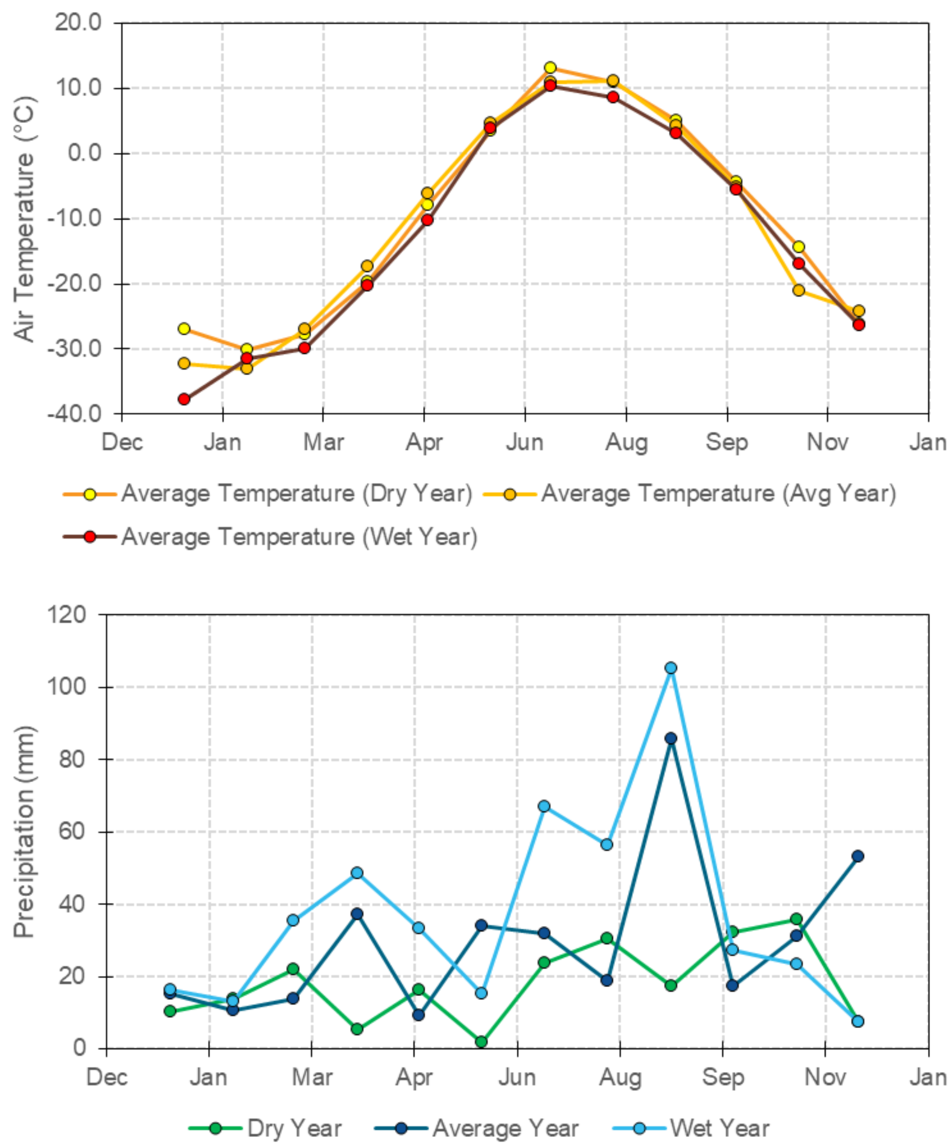


Figure 3-6: Mean monthly air temperature (top panel) and precipitation (bottom panel) for the representative dry, average, and wet year climate inputs.

3.5 Potential Evapotranspiration

Most physically based evaporation models (*e.g.,* Penman-Monteith model, Priestley-Taylor formulation) used to estimate evaporation based on the site climate record require solar radiation, relative humidity and wind speed as inputs – parameters that are difficult to generate synthetic estimates for due to topographical influences on wind speeds and data availability. To address this issue, the Hargreaves-Samani method (Hargreaves and Samani 1985) was used to develop estimates of potential evaporation, using the long-term daily record of minimum, average and maximum daily temperatures, as well as factors related to potential solar insolation (*e.g.*, latitude [65.03°] and day of year).

On an average annual basis, PE is estimated to be 294 mm, varying from near zero in November through April, to an annual maximum of 89 mm in July (Figure 3-7). Dry-year PE is estimated to equal 291 mm, and wet-year PE is estimated to equal 289.

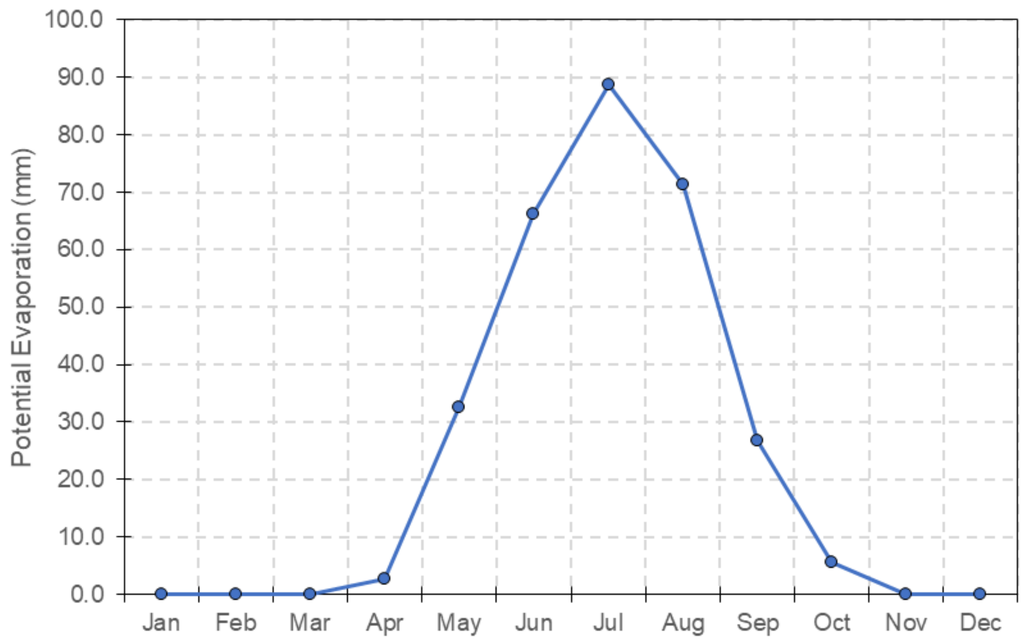


Figure 3-7: Monthly average potential evapotranspiration

3.6 Watershed Model Calibration

The watershed model was calibrated in two stages:

- Calibration to regional streamflow records collected by the Water Survey of Canada in representative small catchments; and,
- Calibration to measured flooded pit water levels over the 2019-2024 period.

3.6.1 Regional Streamflow Calibration

The majority of flow data collected around the Mine site reflects pumped transfers between collection ponds and flooded pits, with the runoff response from undisturbed areas contributing relatively lower flow volumes to the mine water collection system. Given the paucity of open channel flow data in the Mine area, the watershed model described in Section 3.3 was calibrated to streamflow data collected in a small, lake dominated catchment located approximately 80 km north of the Mine site. Most hydrometric records for the region represent large basins (> 1,000 km^2), which present a different streamflow response than would be expected of the small, lake dominated catchments of interest at the Mine site. However, three seasonal hydrometric stations located on small (< 1 km^2) catchments were operated by the Water Survey of Canada (WSC) from 1978-1981 in the vicinity of Saqvaqjuac Inlet, located north of the entrance to Chesterfield Inlet (Table 3-3). The limited records available for these stations are reflective of the expected runoff response from undisturbed catchments in the Mine area (Figure 3-8). These streamflow records are complimented by the long-term climate record from the Chesterfield station (2300700) operated by Environment Canada.

Table 3-3:
Representative regional hydrometric stations

Station ID	Station Name	Latitude (°)	Longitude (°)	Area (km^2)	Record Period
06OA002	Meadow Creek above Saqvaqjuac Inlet	63°38’45”	90°42’10”	0.16	1978 – 1981
06OA003	Far Creek at Far Lake Outlet	63°41’40”	90°40’30”	0.21	1978 – 1981
06OA004	P/N Lake Outlet	63°39’55”	90°40’00”	0.36	1978 – 1981

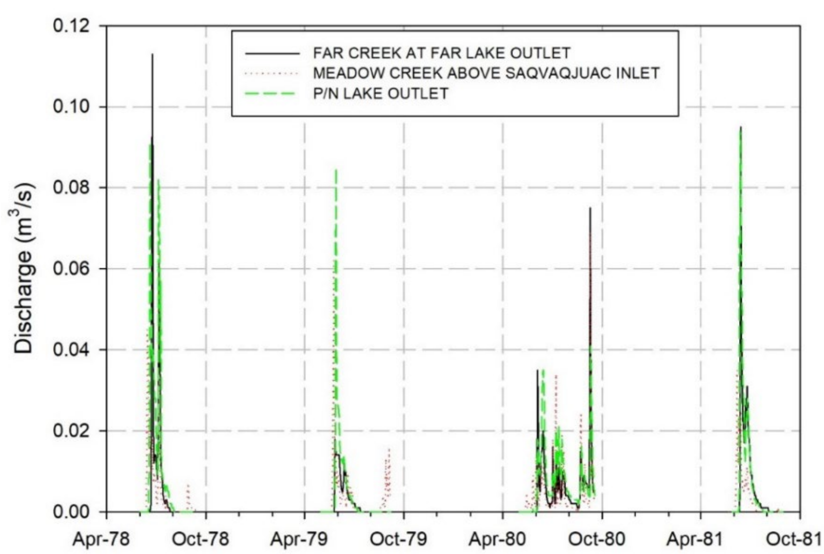


Figure 3-8: Regional streamflow data used to inform watershed model calibration.

The runoff response is consistent across all three catchments, with a strong and rapid freshet signature, followed by a rapid recession to low-flows, punctuated by periodic rainfall driven runoff events. Zero-flow conditions persist from late-September through to mid-May. Given the strong consistency between stations, the Meadow Creek above Saqvaqjuac Inlet station (06OA002; 0.16 km^2) was selected as the calibration target for the watershed model.

Calibration of the watershed model focused on replicating the timing and magnitude of peak flows in response to snowmelt and rainfall, as well as the shape of the draindown curve following these events, and the transition to zero surface flow conditions during the winter months. Model skill was evaluated by visual means, including streamflow time-series matching (Figure 3-9) and flow duration curves showing the probability of exceedance for a given flow value (Figure 3-10). This process was complicated by uncertain basin areas provided by the Water Survey of Canada, so for this stage of the calibration, the focus was placed on replicating the general regional discharge pattern. The tuned parameter set (Table 3-4) is reflective of the limited storage available in the active layer, and the rapid runoff response to snowmelt and rainfall that results. On an annual water year basis, the effective runoff coefficient (runoff depth/precipitation) averages 0.50, however this value ranges between 0.30 to 0.75 in response to the meteoric forcing.

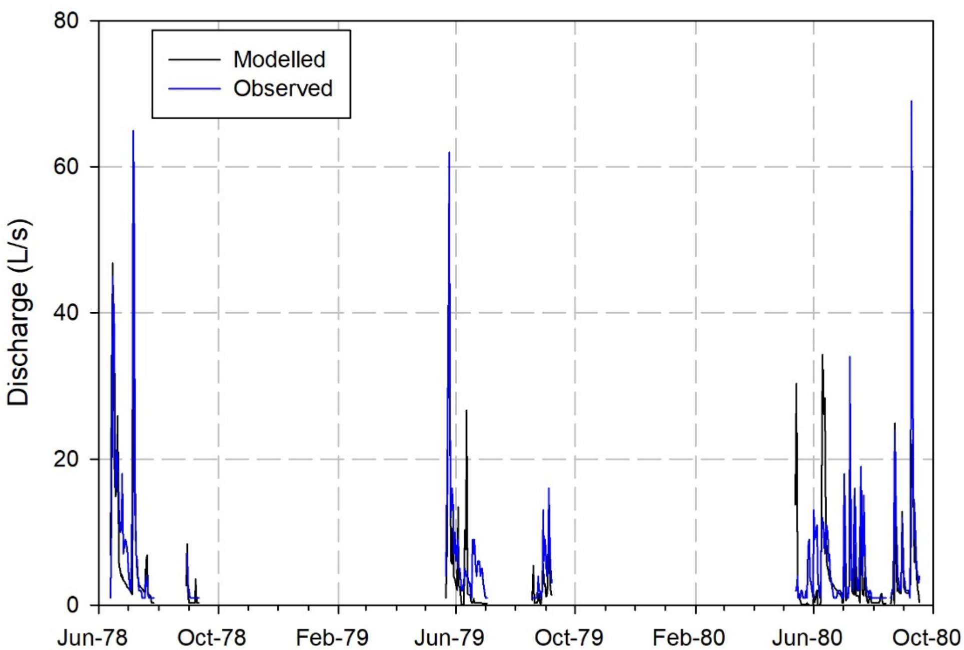


Figure 3-9: Modelled and measured streamflow at the Meadow Creek above Saqvaqjuac Inlet station (06OA002).

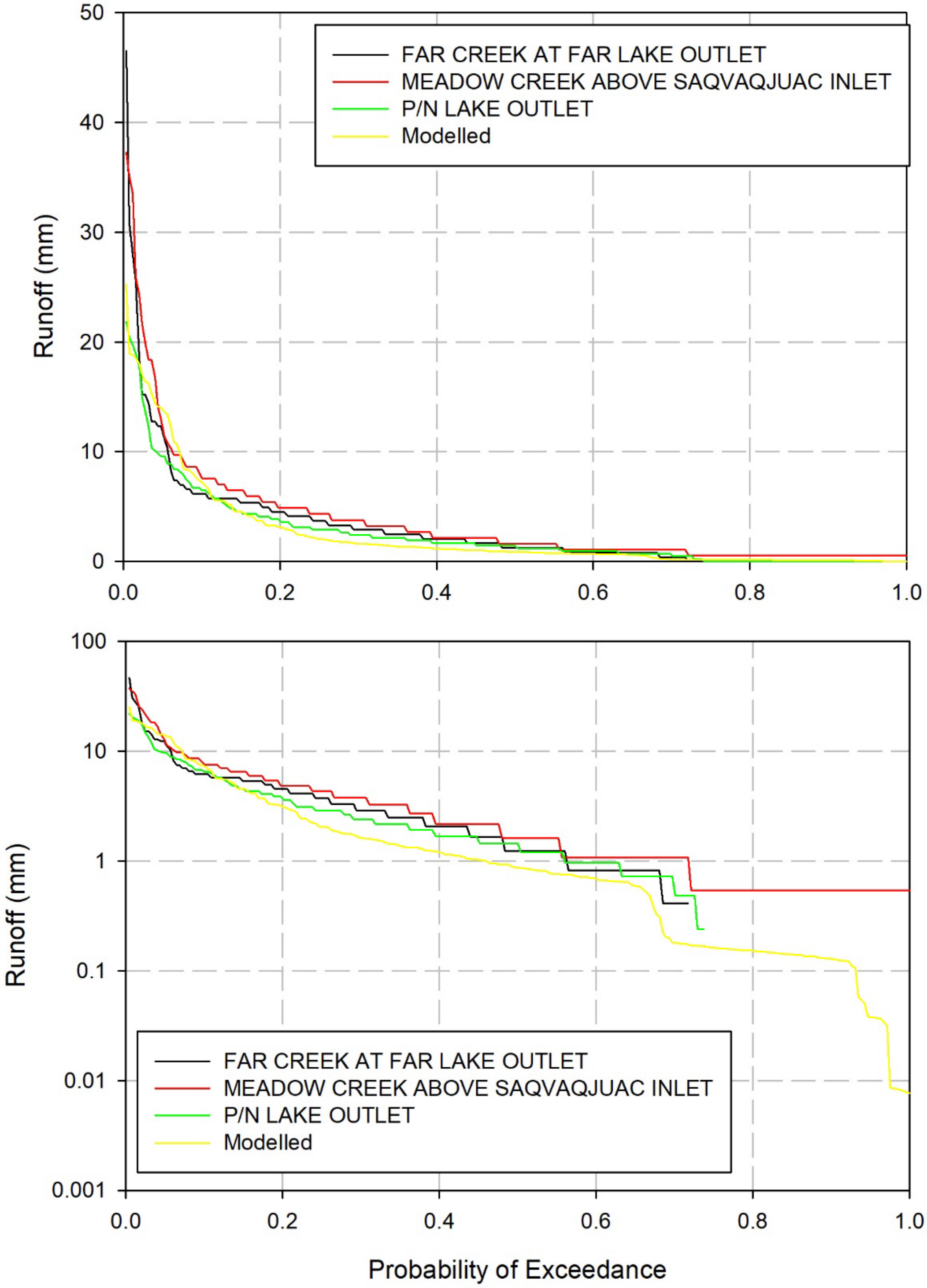


Figure 3-10: Modelled and measured regional runoff flow duration curves shown with linear (top) and logarithmic y-axis (bottom).

Table 3-4:
Watershed model calibrated parameter set.

Bucket	Depth (mm)	Discharge (day^{-1})	Percolation (to next deepest bucket) (day^{-1})
Surface	1	0.46	50%
Middle	5	0.10	20%
Deep	9	0.07	-

3.6.2 Lake Water Balances

The water balances for the Second Portage Lake, Third Portage Lake and Wally Lake are represented in the WBWQM to allow the effects of active flooded pit filling on the surrounding lake water balances to be assessed. All lakes are represented within the WBWQM by GoldSim pool elements. Inputs and outputs are tracked and resolved on a daily timestep, with the former consisting of surface runoff, direct incident precipitation, and pumped flows (lake dewatering and discharge from WTP to Wally Lake), and outputs represented by outlet discharges to downstream water bodies and evaporation from the lake surface. The lake water balances are resolved in pool elements using the specific volume-elevation-area curves (Figure 3-11 through Figure 3-13), which allow changes in lake volume to be converted to changes in lake surface area and water elevations. The outlet discharges are generated by rating curves based on standard stream outlet rating curves from Nunavut and calibrated first to the baseline water level from the bathymetric surveys, and next to the measured lake water levels (Figure 3-14 and Figure 3-15).

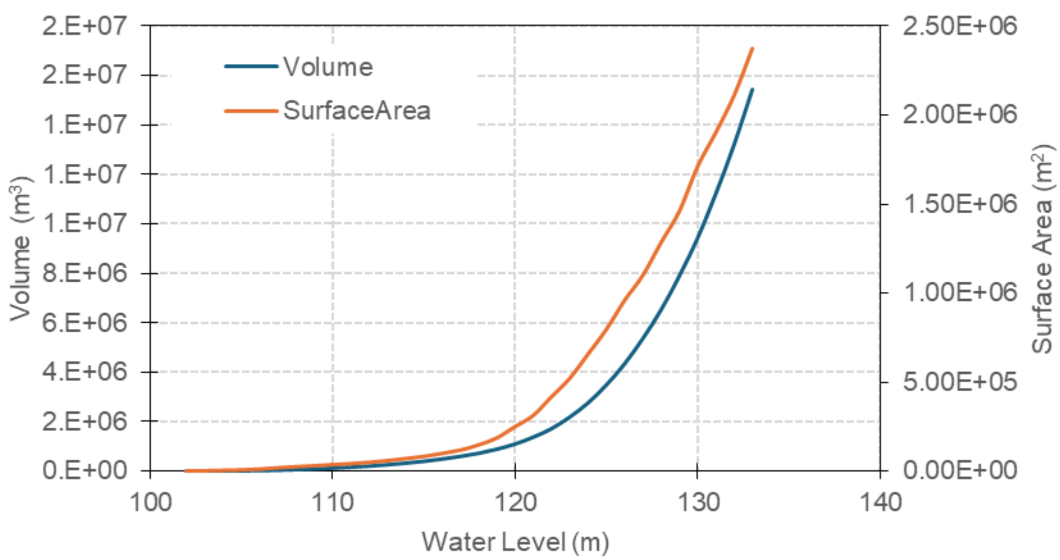


Figure 3-11: Second Portage Lake volume-elevation-area curves

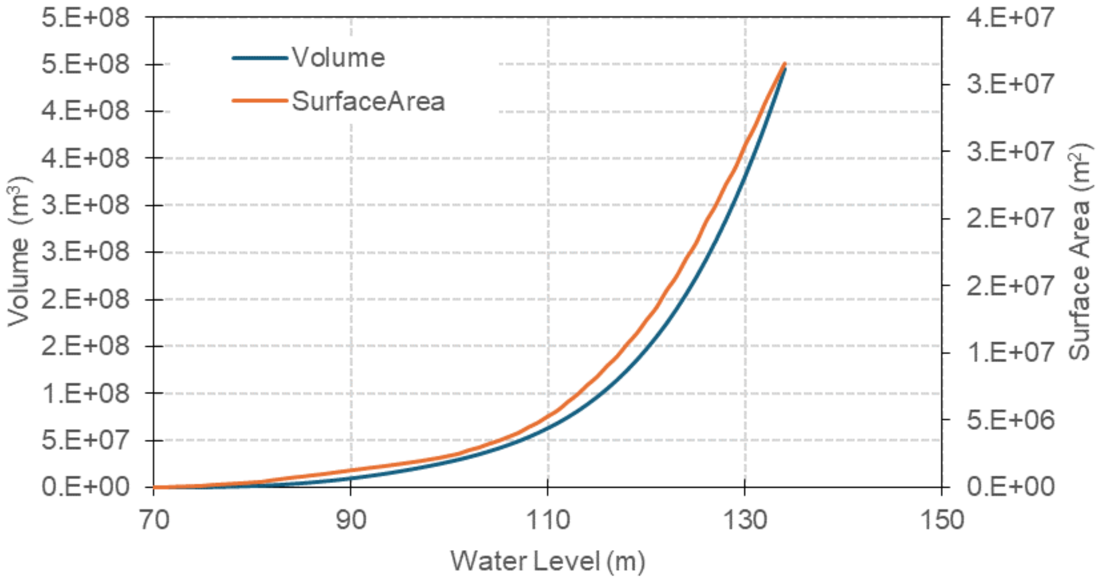


Figure 3-12: Third Portage Lake volume-elevation-area curves

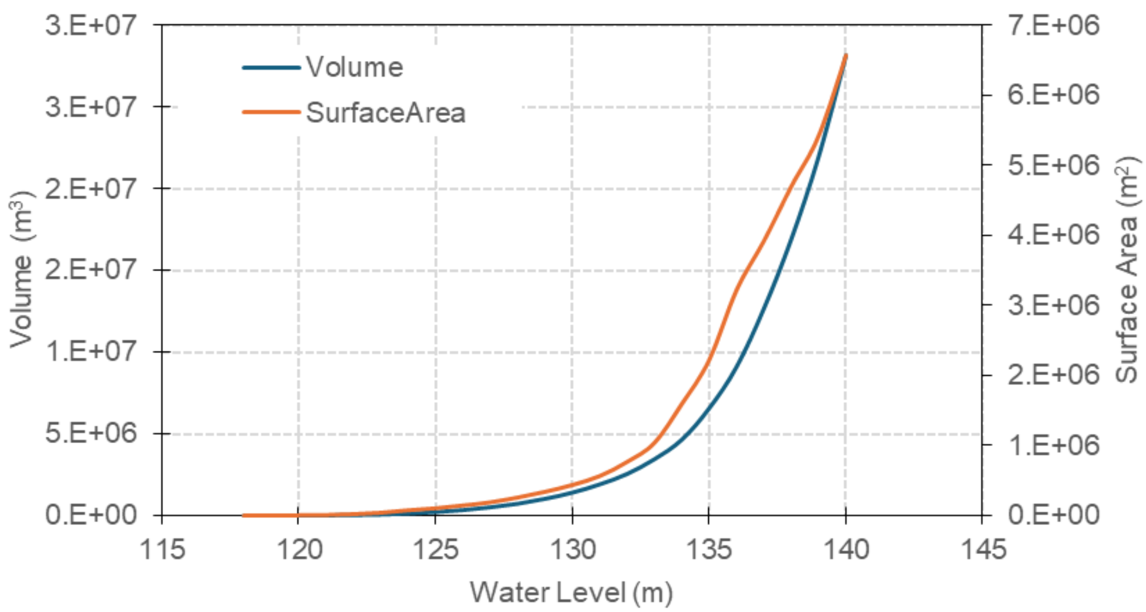


Figure 3-13: Wally Lake volume-elevation-area curves

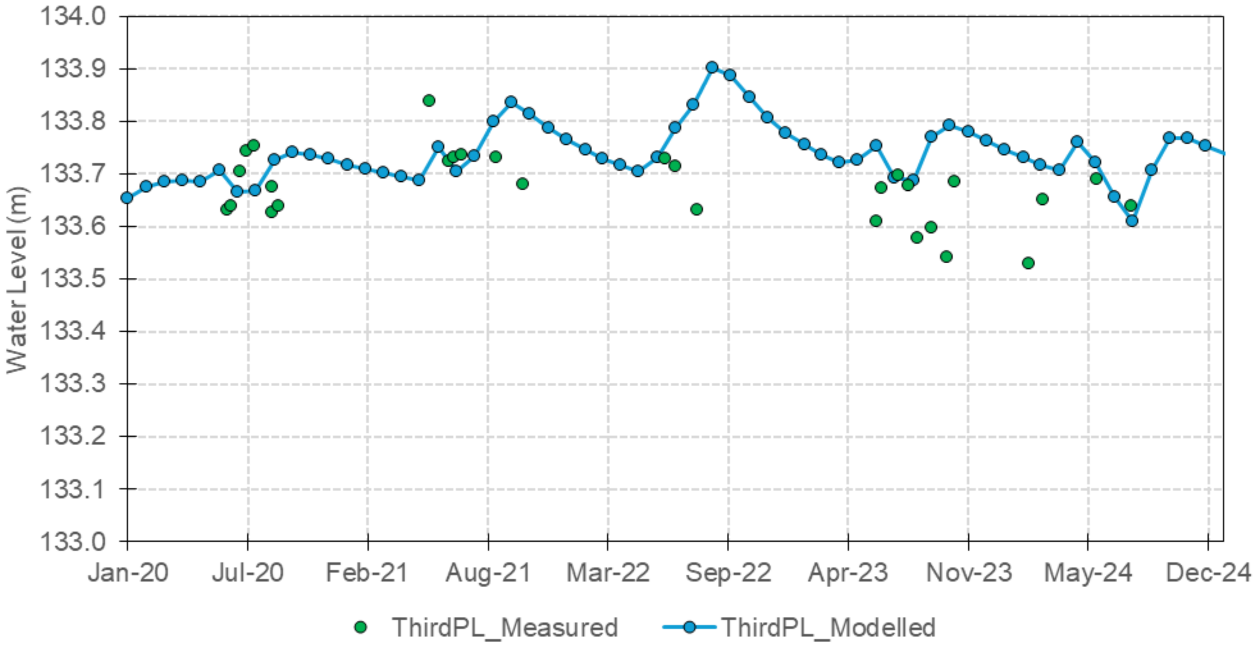


Figure 3-14: Measured and modelled Third Portage Lake water levels (2020-2024)

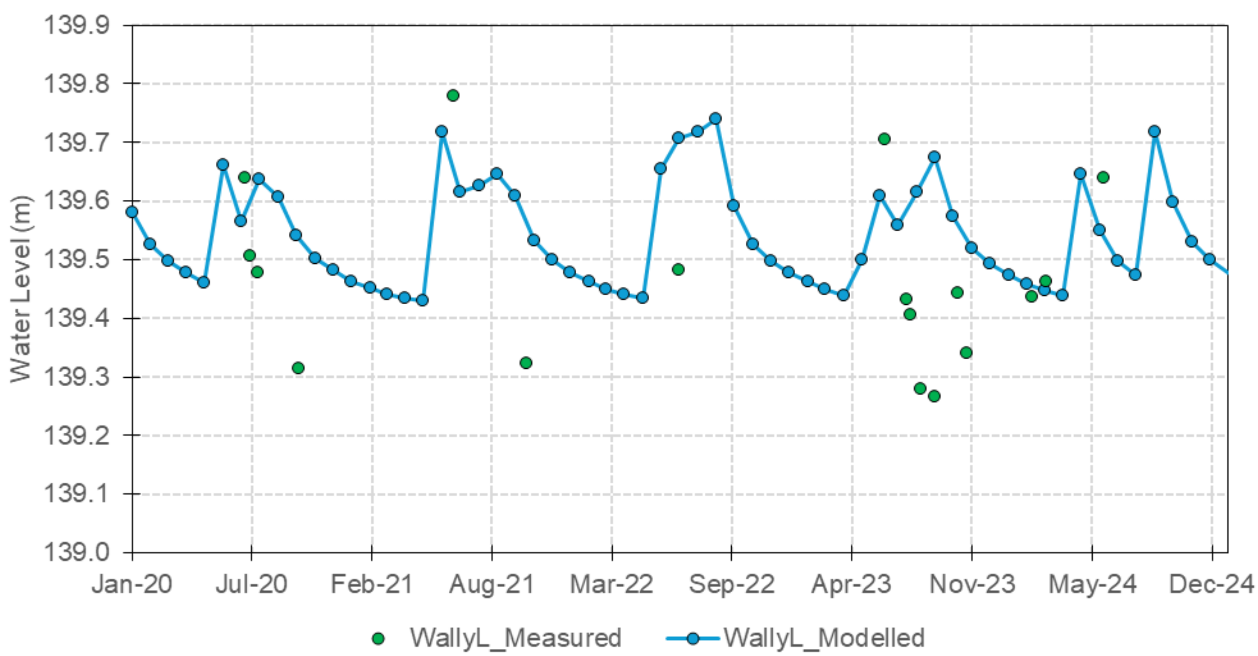


Figure 3-15: Measured and modelled Wally Lake water levels (2020-2024)

3.7 Mine Component Water Balances

There are five categories of mine infrastructure associated with geochemical loadings:

- Waste Rock Storage Facilities (WRSFs; Section 3.7.1)
- Tailings Storage Facility (TSF; Section 3.7.2)
- Mill (Section 2.1)
- Open pits (Section 3.7.3); and,
- Disturbed Areas.

At the time of writing, 10+ years of pumping and water level data was available to constrain estimates of surface contact water volume generated by the WRSFs, TSF and disturbed areas. As the pits have been used as contact and process water repositories since 2019, the focus of the mine site water balance model calibration was on matching measured flooded pit water level evolution over time. For the purposes of the Meadowbank WBWQM, 'process water' refers to water in the mill effluent (including tailings pore water) discharged to the open pits, and pore water draindown from the TSF reporting to the Central Dike Downstream Pond. 'Contact water' refers to runoff and interflow from WRSFs (Vault, Portage and Central Dump), as well as surface runoff from disturbed areas, the TSF surface and roadbeds.

3.7.1 Waste Rock Storage Facilities

Monthly pumping data and waste rock storage facility (WRSF) areas were used to constrain the runoff coefficients used for forward modelling. Sumps WEP-1 and WEP-2 collect runoff and interflow from the NPAG Portage RSF, and are routed to sump ST-16, which collects runoff and interflow from the PAG Portage RSF (Figure 3-16 and Figure 3-17). Accounting for the minimal additional catchment area reporting to these sumps, annual water year (October to September) runoff coefficients were calculated and averaged (Table 3-5). The average runoff coefficient of 0.25 was used to generate waste rock contact water volumes in the WBWQM.

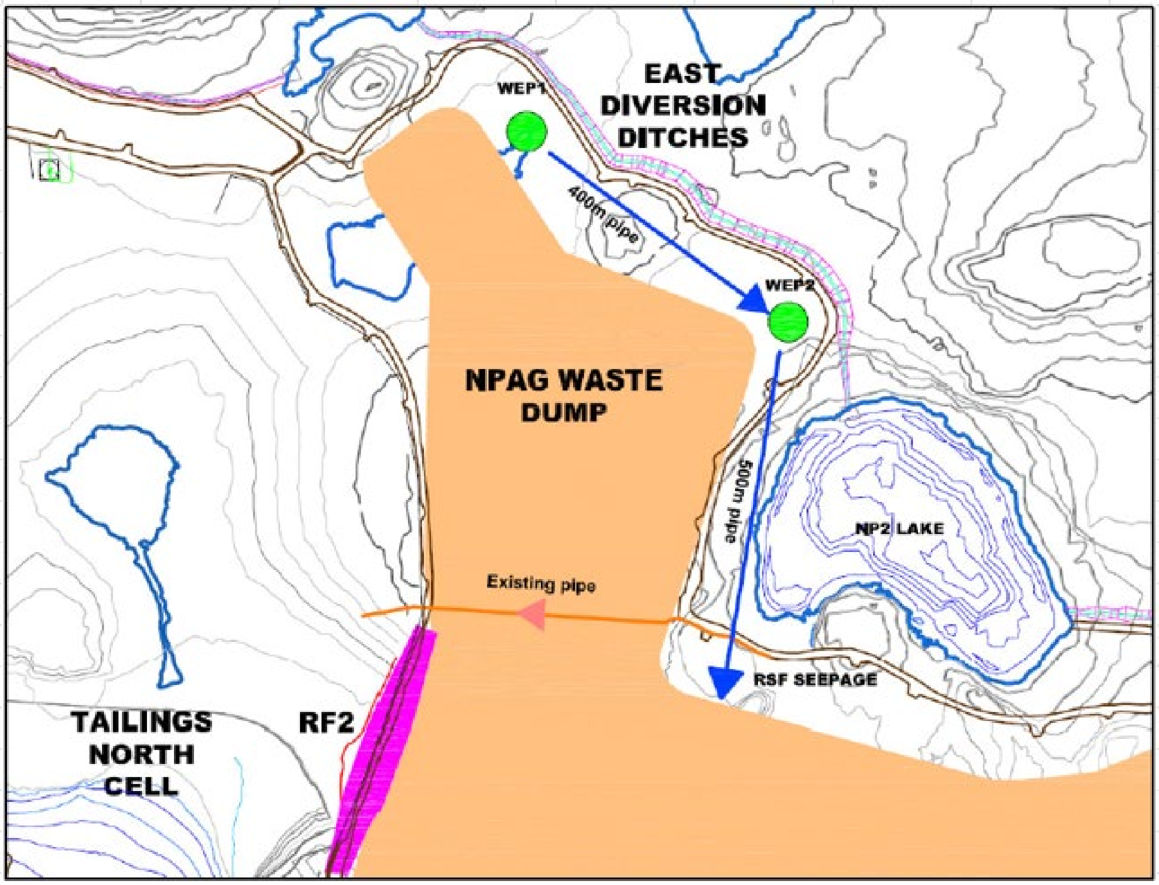


Figure 3-16: Portage RSF sumps.

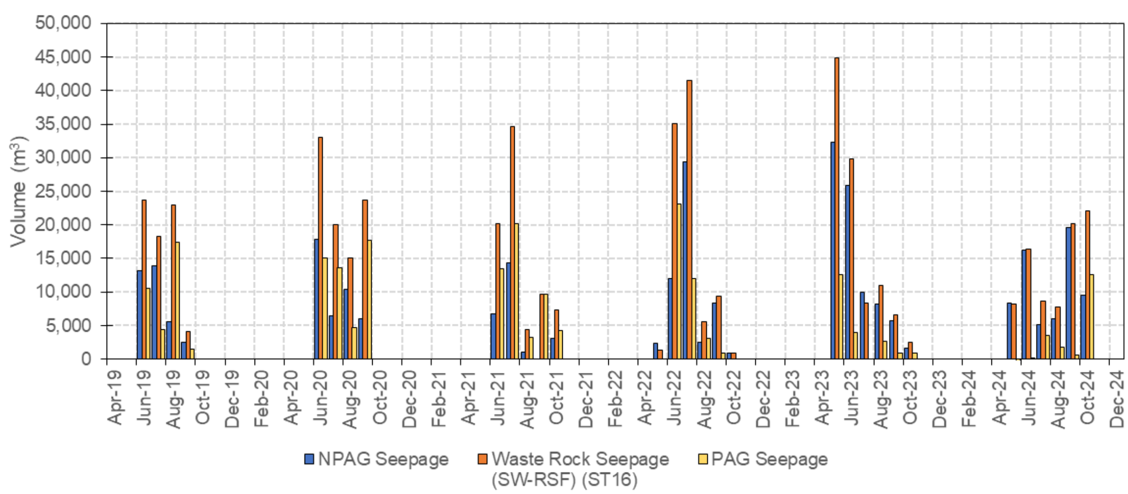


Figure 3-17: Pumped waste rock runoff and interflow volumes.

Table 3-5:
Calculated waste rock storage facility runoff coefficients

Water Year	Precipitation (mm)	Adjusted Pumped Volume* (m^3)	Runoff Coefficient
2018-2019	0.437	33,782	0.14
2019-2020	0.452	82,743	0.19
2020-2021	0.366	84,022	0.23
2021-2022	0.283	96,489	0.35
2022-2023	0.292	98,554	0.35
2023-2024	0.366	33,785	0.23
Average	**0.366**	**77,651**	**0.25**

*Total pumped volumes adjusted to account for surrounding catchment (non-waste rock) runoff.

3.7.2 Tailings Storage Facility

The TSF water balance representation is split into three distinct periods:

- Calibration Period – (prior to December 2024) represented by pumping record from the TSF South Cell;
- Ongoing Depositional Period (January 2025 to December 2026) – represented by a runoff coefficient calculated from pumping data reflective of the post-depositional period and porewater draindown from freshly placed tailings in July to September 2025 (North Cell) and July to September 2026 (South Cell); and,
- Covered TSF (January 2027 onwards) – water balance is reflective of a NPAG cover, with two distinct flow types through the waste rock cover and through shallow surface pathways in the tailings.

3.7.2.1 Calibration and Ongoing Depositional Periods

Similar to the WRSF sumps, extensive monthly pumping records exist for the key TSF collection points (North Cell and South Cell). The pumping records used in calibration were limited to the post-depositional period (2019 to 2024) to remove the influence of high volumes of process water being introduced into the TSF. Water balances for the North Cell and South Cell were calculated separately, with water year precipitation converted to runoff via the contributing area and a calibrated runoff coefficient. Pumped inputs from the surrounding seepage capture sumps were accounted for, as were the pumped transfers from the North Cell to South Cell Reclaim Pond. The total inputs (pumped sump flows plus estimated runoff derived from the runoff coefficients) were compared to the total pumped outputs, and the runoff coefficients adjusted to achieve the closest agreement between the two datasets (Figure 3-18). A runoff coefficient of 0.51 led to the best match between the estimated total inflows to each cell, and the corresponding volumes pumped out. Note that this method does not explicitly include evaporative losses from the reclaim pond surfaces but given that these ponds are managed at relatively low levels (and therefore surface areas), these losses are expected to be negligible relative to the overall volumes. The North Cell values show close correspondence between estimated inputs and measured outputs, while the South Cell values generally track well, but the inputs are slightly overestimated. This could be due to the aforementioned reclaim pond evaporative losses or be an artefact of the pumped inflows from the North Cell.

Deposition of tailings in the North Cell in 2025 is expected to introduce an additional 773,000 m^3 of consolidation water, while tailings deposition in the South Cell in 2026 is projected to result in 826,000 m^3 of consolidation water.

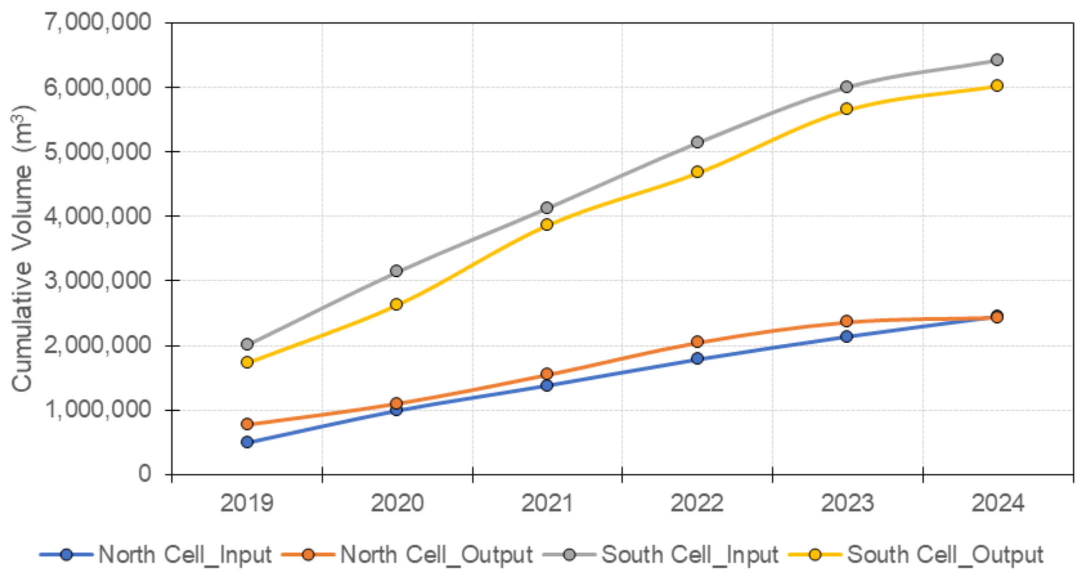


Figure 3-18: Estimated cumulative inflows compared to measured cumulative pumped outflows for the North Cell and South Cell of the TSF.

3.7.2.2 Covered TSF

The closure plan includes placement of an NPAG waste rock cover on the TSF, in place and operational by January 2027. Design of the TSF cover, corresponding water balance model results and source terms for unoxidized tailings (discussed in Section 4.2) were provided by Okane Consultants (Okane, 2024). Overall, net infiltration is predicted to be equal to 51% of mean annual precipitation (MAP), with 65% of net infiltration (33% MAP) transiting the base of the NPAG rockfill, and the remaining 35% of net infiltration (18% MAP) following a shallow flow path through the unoxidized surface tailings (Figure 3-19 and Table 3-6).

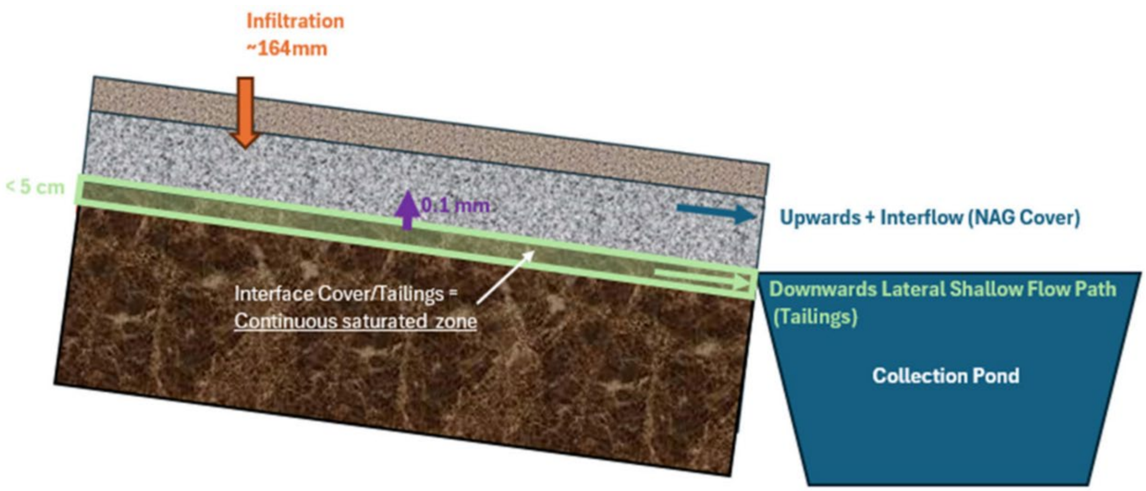


Figure 3-19: Annual flow distribution for cover system and unoxidized shallow tailings (Okane 2024).

Table 3-6:
Tailings Storage Facility cover water balance metrics for an average climate year

Parameter	Value
Total Precipitation on TSF (m^3)	718,200
Net Infiltration (51% MAP; m^3)	373,920
Cover Storage (m^3)	6,840
Upwards (m^3)	228
Interflow (NPAG cover; m^3)	237,120
Interflow (NPAG cover; % net infiltration)	63%
Interflow (NPAG cover; % MAP)	33%
Downward (Tailings; m^3)	127,680
Downward (Tailings; % net infiltration))	34%
Downward (Tailings; % MAP)	18%

3.7.3 Open Pits

As of December 2024, the Portage Pits are estimated to hold 14.2 Mm^3 of retrievable water, with an additional 5.6 Mm^3 stored in Vault Pit. Retrievable water is defined as pond water above the tailings as well as waste rock pore water above tailings. Un-retrievable water consists of tailings pore water and waste rock pore water contained below the tailings surface elevation, and for the purpose of this modelling assessment is considered unavailable for water management strategies for the remainder of operations and the duration of post-closure.

Inputs to the open pits include tailings and mill water, along with runoff from the disturbed area catchments surrounding each pit and measured pumped transfers from the TSF South Cell, Central Dike Downstream Pond, East Dike Pond, Stormwater Management Pond, and the Portage WRSF (ST-16) were accounted for in the model. Given the zero-discharge nature of the facility, flooded pit losses are limited to evaporation from lake surfaces and mill reclaim withdrawals.

3.7.3.1 Pit Wall Runoff

Multiple pumped inputs to the Meadowbank Mine pits make derivation of pit wall runoff coefficients challenging. To address this issue, pit sump pumping records from the Whale Tail Mine were used to constrain the volumes of water reporting to the pits on a monthly basis. These records were used in conjunction with annual pit contributing area estimates (controlling for upstream catchment runoff) to develop a representative runoff coefficient. Based on this analysis, a constant runoff coefficient of 0.42 was assumed for the Whale Tail Pit, and 0.34 for the IVR Pit over the calibration period (2020-2022), and a weighted average pit wall runoff coefficient of 0.40 was applied for the forward-looking model (Table 3-7). The same runoff coefficient was applied to all Meadowbank pit walls.

Table 3-7:
Calculated pit catchment runoff coefficients

Open Pit	Variable	2020	2021	2022	2023	2024	Average
Whale Tail Pit	Water Year Precipitation (mm)	363	344	235	265	235	288
	Water Year Runoff (mm)	119	138	124	15	103	79
	Runoff Coefficient	0.33	0.40	0.53	0.06	0.44	0.35
IVR Pit	Water Year Precipitation (mm)	--	344	235	265	235	270
	Water Year Runoff (mm)	--	137	67	46	28	74
	Runoff Coefficient	--	0.40	0.29	0.17	0.12	0.26

3.7.3.2 Groundwater Inflows

Groundwater inflows to the flooded pits are assumed to be negligible for the following reasons:

- Seepage from the Vault Attenuation Pond (AP) into Vault Pit is evident as a glaciated deposit on the south pit wall. This seepage is associated with a closed talik connecting Vault AP with Vault Pit and is understood to represent seepage from Vault AP, rather than seepage from the deep (sub-permafrost) groundwater system.

The flows via the closed talik originate from the surface water system reporting to Vault AP and are therefore captured by the surface water balance.

- Seepage from Third Portage Lake through the dikes surrounding the Portage Pits is managed primarily via the East Dike Pond which is routed to Pit A during June to September of each year, and to Second Portage Lake in October to May (when water quality criteria are met).
- Seepage into Goose Pit is driven by the relative difference in water levels between the flooded pits and Third Portage Lake. Given that Goose Pit water level is nearing the existing lake water level and is maintained at or near the 125 m elevation for most of the model run (except during the two periods where Goose Pit water is pumped to the base of Vault Pit in June to September of 2026 and 2030), seepage is expected to be minimal.

The water levels in mine pits were able to be reproduced based on measured pumping records and estimates of surface runoff from surrounding catchments (Section 3.8). Any outstanding groundwater inflow entering the mine pits is not of sufficient magnitude to impact the overall flooded pits water balance.

3.7.3.3 Tailings Deposition and Pore Water Losses

A monthly schedule of tailings deposition in Goose Pit, Pit A and Pit E was provided by Agnico, along with monthly volumes of pore water entrained in the tailings void spaces and reclaim volumes sent to the mill (Figure 3-20).

The WBWQM is encoded with volume-elevation-area-curves (VEACs) for each pit that account for tailings and waste rock deposition within the pit shell. Tailings and waste rock are assumed to have 49% and 30% void space by volume respectively, and water losses to entrapment within these pore spaces are also accounted for within the model. Water above the tailings surface is assumed to equal the ‘free’ volume, and it is this volume that is available for pumping and treatment. Modelled flooded pit water levels reflect the total volume taken up by tailings, waste rock, entrained pore space water and free water above the tailings.

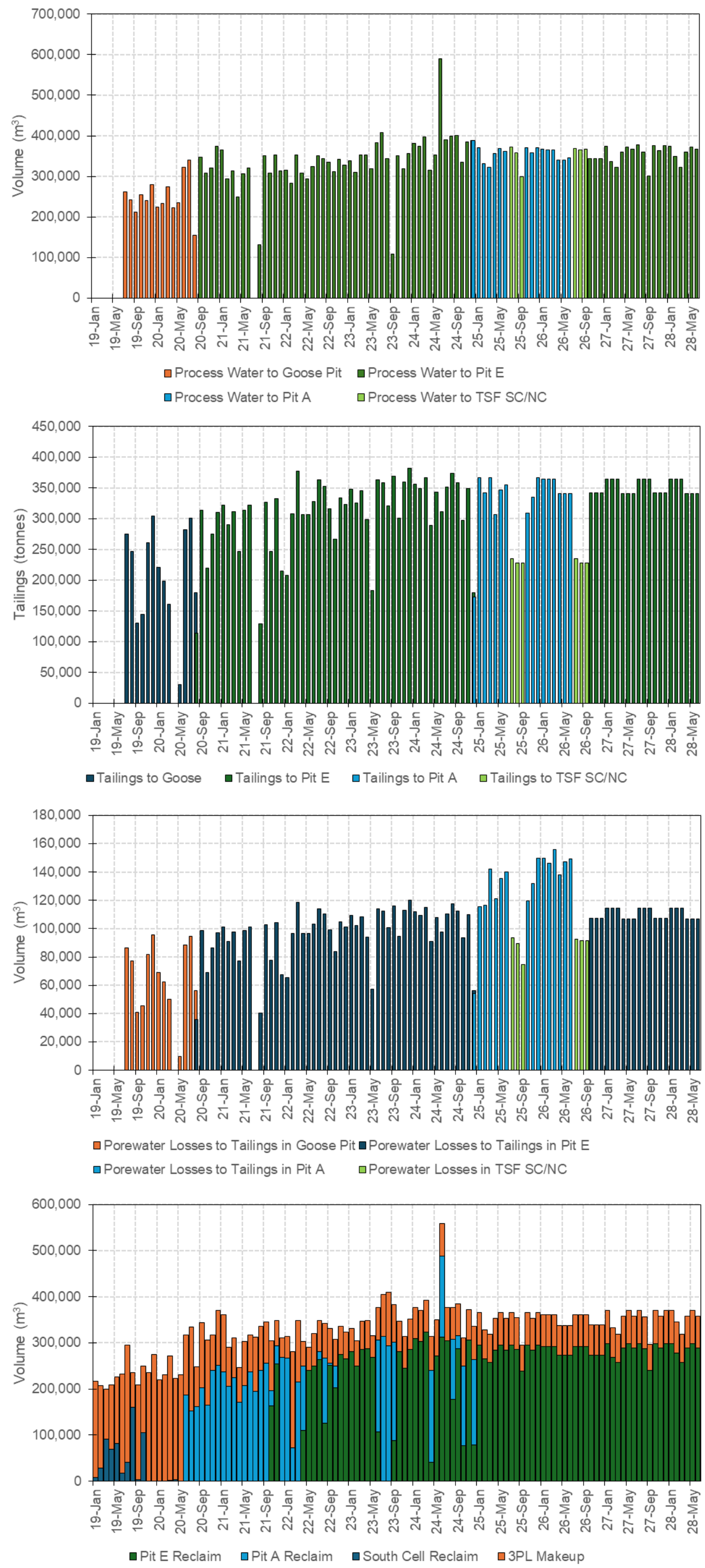
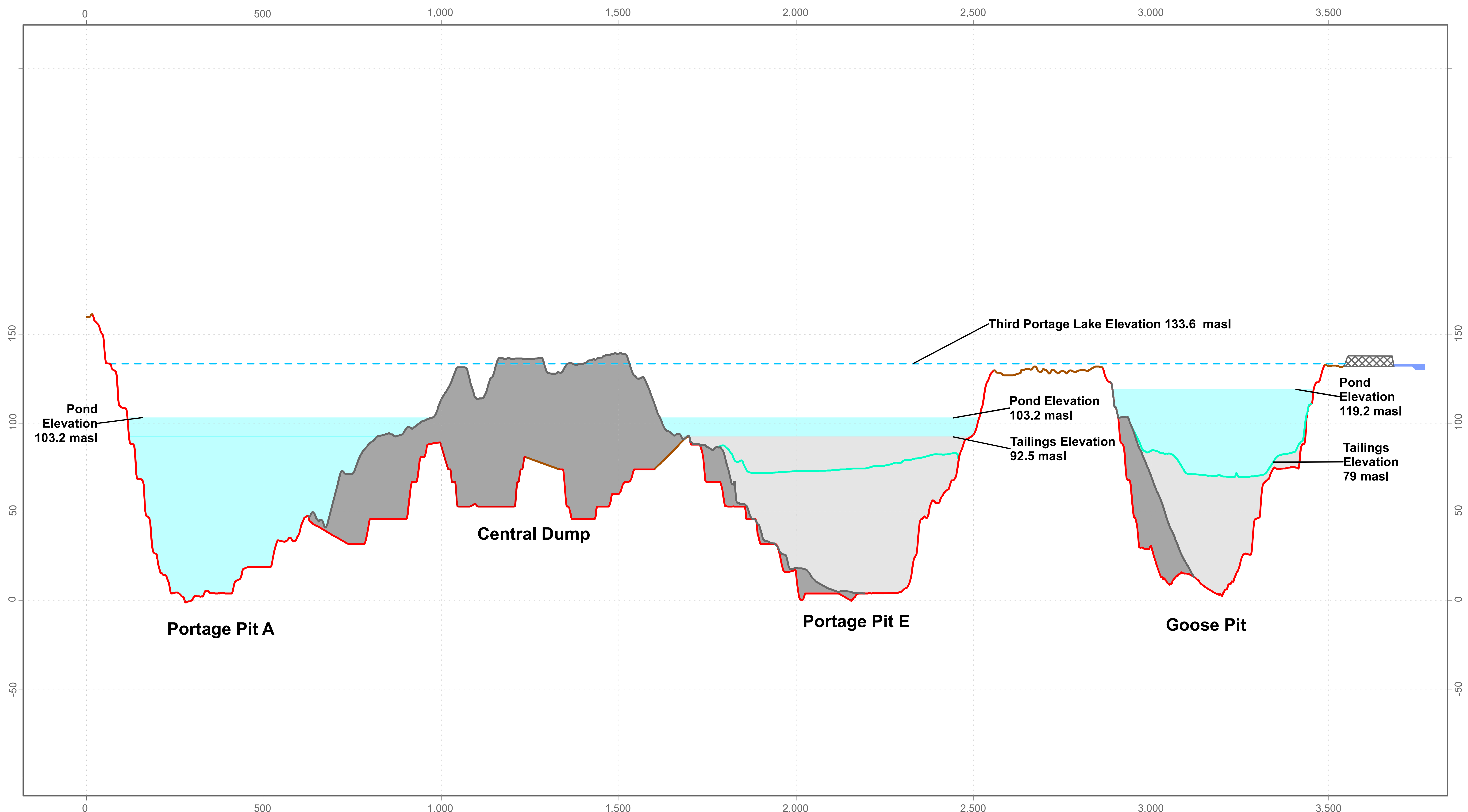


Figure 3-20: Monthly volumes of mill process water (top), tailings deposition (second), porewater losses (third) and reclaim water (bottom).



LEGEND

- Third Portage (133.6 masl)
- Tailings Surface 2023
- Waste Rock Surface
- Natural Ground
- Pit Surface
- Contact Water
- Tailings
- Waste Rock
- Third Portage Lake
- Dike

DATE SAVED:	Oct 09, 2024
DRAWN BY:	DM
REVIEWED:	SJ
VERSION:	1

Vertical Exaggeration 5X

CLIENT: AGNICO EAGLE

LORAX ENVIRONMENTAL

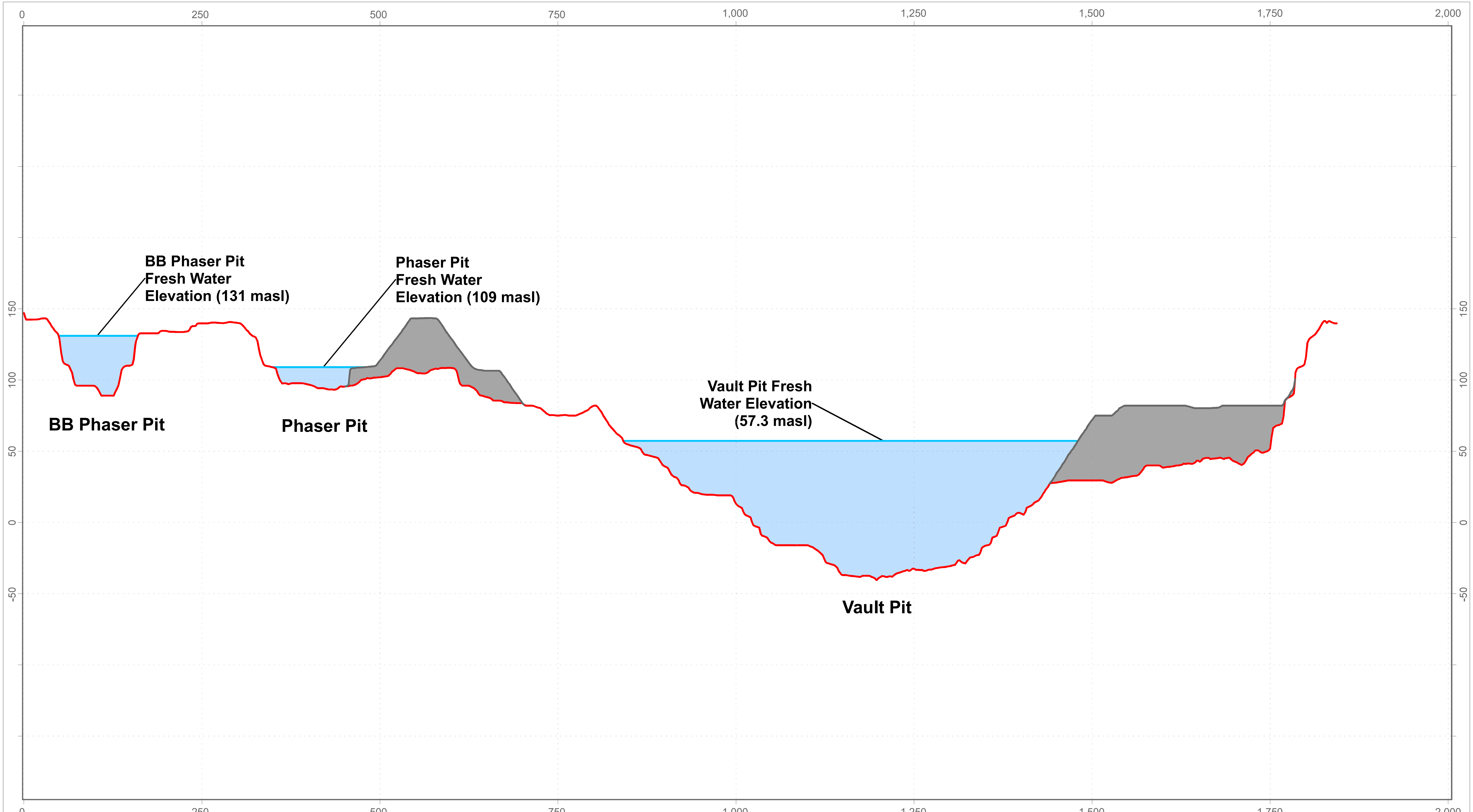
PROJECT: **Meadowbank**

TITLE: Portage Pit A, Pit E, and Goose Pit Cross-section for Current Conditions (Sept. 2024)

PROJECT #: A717-4

FIGURE: 3-21

P:\@Drafting\Meadowbank\Drafting Figures\APRX\Portage Goose Pit Cross-section - May 2024\Portage Goose Pit CS.aprx Figure 3-21 Portage A E Goose Current Conditions (Sept 2024)



LEGEND

- Fresh Water Elevation
- Pit Surface
- Waste Rock Surface
- Fresh Water
- Waste Rock

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VERSION:	1

Vertical Exaggeration 2X

CLIENT: AGNICO EAGLE

LORAX ENVIRONMENTAL

PROJECT: Meadowbank

TITLE: Vault Pit, Phaser Pit, and BB Phaser Pit-Cross-section for Current Conditions (Sept. 2024)

PROJECT #: A717-4

FIGURE: 3-22

P:\@Drafting\Meadowbank\Drafting Figures\APRX\Vault Pit Cross-section - May 2024\Vault Pit Cross-section.aprx Figure 3-20 VP PP BBPP CS Current Conditions (Sept. 2024)

3.7.3.4 Pit Water Level Restrictions

To maintain water management structures (*i.e.*, dikes and berms) interacting with the open pit shells within design specifications, the Portage area flooded pit water levels must be maintained below the elevations specified by year in Table 3-8. At closure, all mine pits will be flooded until the water levels are equivalent with Third Portage Lake (*i.e.,* 133.6 masl).

Table 3-8:
Portage Flooded Pit Water Level Targets

Year	Target Pit Lake Water Levels (m)		
	Pit A	Pit E	Goose Pit
2024	117.00	124.22	123.59
2025	117.00	124.22	123.59
2026	123.96	124.22	123.59
2027	123.96	124.22	123.59
2028	123.96	124.22	123.59
2029	123.96	124.22	125.00
Closure	133.60	133.60	133.60

3.7.3.5 Pit Water Transfers

Water transfers between pits are generally constrained to the open water season (June 1 to September 30) and are completed via pumps and pipelines. With the exception of passive catchment and pit wall runoff, Goose Pit has been isolated from the larger site water balance (*i.e.*, no process water or sumps pumped to Goose Pit) since August 2020. The exception is 514,428 m^3 pumped from Pit A to Goose Pit in September to November 2023.

Since 2020, Pit E has primarily received contact water from the Central Dike, with several recent transfers from the TSF South Cell in 2024 and tailings deposition throughout 2024. East Dike seepage is also routed to Pit E. Pit A is the primary receiver of contact water at the Portage site, with pumped inputs from Pit E, Central Dike, the TSF South Cell, Goose Pit, the Stormwater Management Pond and ST-16 (WRSF sump).

Vault Pit receives passive inflows from the BB Phaser and Phaser catchments, with the Phaser Pit lake spilling into Vault Pit above the 109 m elevation, through the all-weather haul road base. Passive runoff from the Vault WRSF also reports to the Vault Pit, as does runoff collected in the Vault AP.

Going forward, Goose Pit will receive pumped transfers from Pit A to manage water levels within the target ranges in Table 3-8, and transfers of Pit A water via the WTP from June

2027 onwards, but will otherwise receive no additional pumped contact water inputs while the aeration to enhance natural degradation of nitrogen species is ongoing. Specific details on the water management plan for the remainder of the Operations phase and Active Closure are provided in Sections 3.9 and 3.10 respectively.

3.8 Validation to Flooded Pit Water Balances

The WBM was calibrated to measured flooded pit water levels for the period January 2020 to December 2024. This period coincides with tailings deposition within the pit shells, operation of the Meadowbank Mine as a zero-discharge facility, and both passive and active flow transfers to the flooded pits. Given these conditions, the flooded pits act as the final repository for all mine contact water and almost all tailings deposited since 2019, and therefore the model must accurately reflect the evolution of flooded pit volumes and resultant water levels within over time. The volumes of contact water within the pits at the end-of-mine will determine the pumping, treatment and storage requirements during the Active Closure phase, and therefore the mine site water balance model considers all components listed in previous sections, and the comparison of modelled and measured water levels. The calibration for the Goose Pit, Pit E, Pit A and Vault Pit water levels is presented in Figure 3-23, and displays very good agreement between the measured and modelled water levels, indicating that the model is well calibrated.

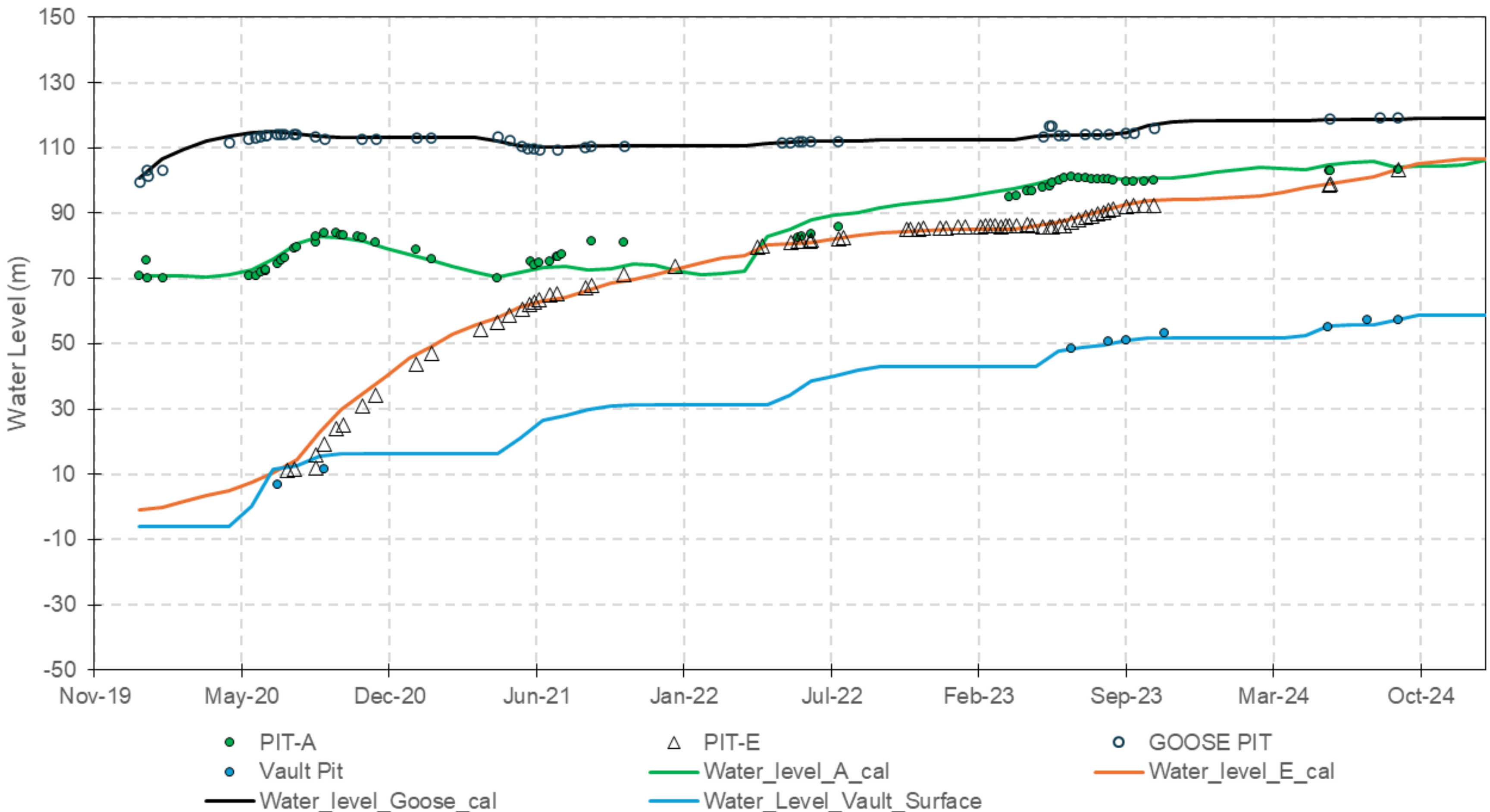


Figure 3-23: Measured and modelled flooded pit water levels.

3.9 Operations Phase Water Management

The Operations phase is expected to end in June 2028 as milling of ore from the Whale Tail Mine ceases. The following list summarizes key water management activities for the Meadowbank Mine over the period of 2025 to June 2028:

2025

- Tailings and process water deposited in Pit A January through December 2025, and in the TSF North Cell July through September 2025;
- Mill process water requirements are largely reclaimed from Pit E (80% of total), with the remaining makeup sourced from Third Portage Lake (20%);
- Excess water from the TSF South Cell, Central Dike Downstream Pond and East Dike Pond is pumped to Pit A;
- Aeration of Goose Pit initiated in August 2024 to continue, with active water transfers to this pit restricted;
- Portage flooded pits maintained below target water levels described in Section 3.7.3.4;
- Excess water is rebalanced from Pit A to Pit E to maintain flooded pits within water level restrictions, and to supply mill process water demands from Pit E;

2026

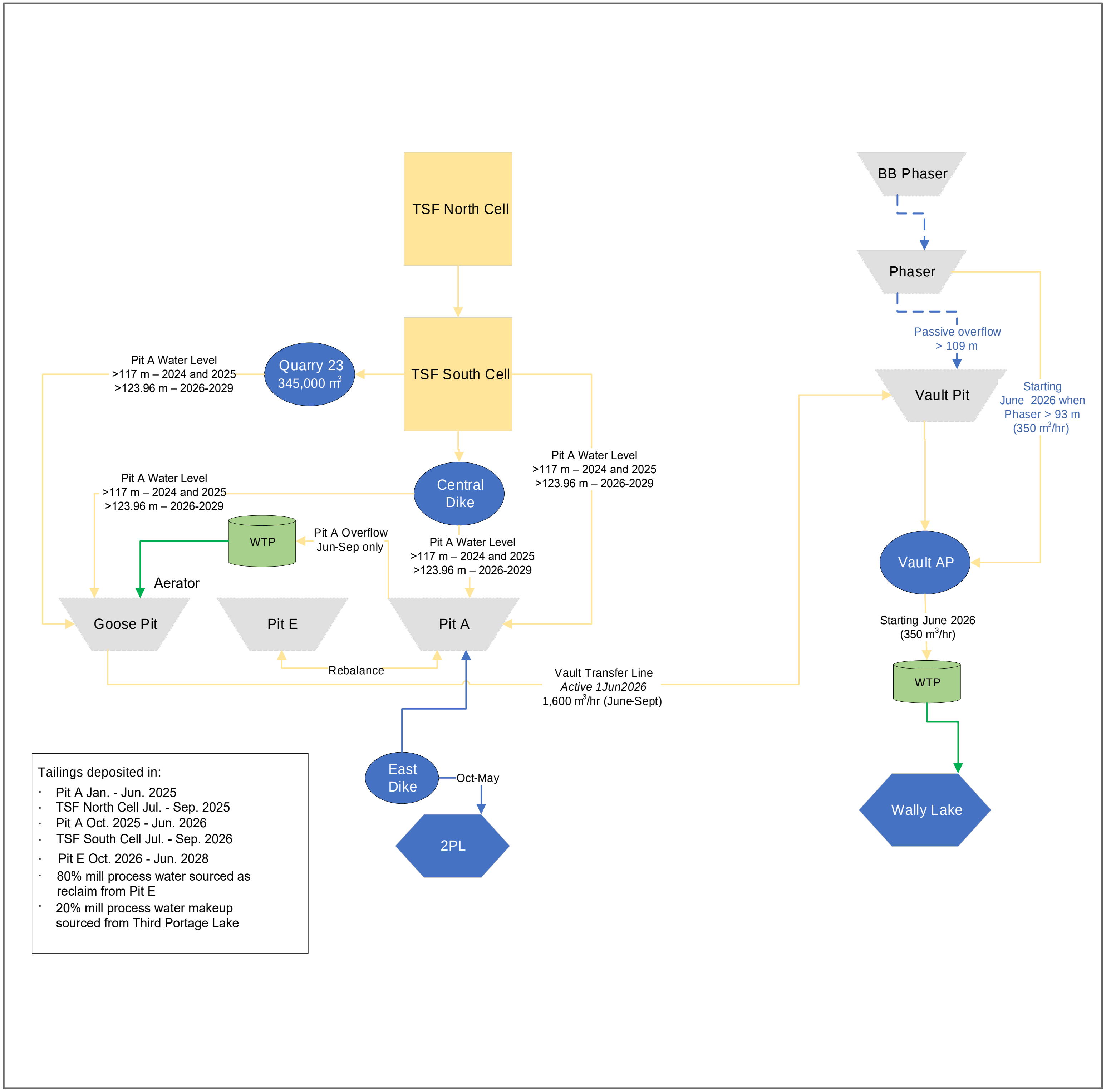
- Tailings and process water deposited in Pit A January through March 2026, then in the TSF South Cell in July through September 2026 followed by continued deposition in Pit E in October through December 2026;
- Mill process water requirements are largely reclaimed from Pit E (80% of total), with the remaining makeup sourced from Third Portage Lake (20%);
- Excess water from the TSF South Cell, Central Dike Downstream Pond and East Dike Pond is pumped to Pit A;
- Aeration of Goose Pit continues until June 2026, after which the majority of treated water in Goose Pit is pumped to the base of Vault Pit below the existing freshwater lake at a rate of 1,600 m^3/hour, from June 1 to September 30, 2026;
- A water treatment plant is online to treat metals (specifically copper and arsenic) in water transferred from Pit A to Goose Pit;
- Excess water is rebalanced from Pit A to Pit E to maintain flooded pit within water level restrictions, and to supply mill process water demands from Pit E;
- Excess water from the Phaser Pit (and upstream catchments including BB Phaser Pit) is pumped to the Vault AP for treatment and discharge to Wally Lake at a maximum rate of 350 m^3/hour;

2027

- Tailings and process water deposited in Pit E January through December 2027;
- Mill process water requirements are largely reclaimed from Pit E (80% of total), with the remaining makeup sourced from Third Portage Lake (20%);
- Excess water is rebalanced from Pit E to Pit A to maintain flooded pit within water level restrictions;
- The NPAG cover is assumed to be in place over the TSF and completed in Q2 2027;
- Excess water from the TSF South Cell (via the TSF Collection Pond, located in the former Quarry 23), Central Dike Downstream Pond and East Dike Pond is pumped to Pit A;
- Water is transferred from Pit A to Goose Pit via a WTP to reduce copper and arsenic concentrations beginning June 1, 2027;
- Aeration of the transferred Pit A water begins in Goose Pit once water transfer complete;
- Excess water from the Phaser Pit (and upstream catchments including BB Phaser Pit) is pumped to the Vault AP for treatment and discharge to Wally Lake at a maximum rate of 350 m^3/hour;

2028

- Tailings and process water deposited in Pit E January through June 2028;
- Mill process water requirements are largely reclaimed from Pit E (80% of total), with the remaining makeup sourced from Third Portage Lake (20%);
- Excess water is rebalanced from Pit E to Pit A to maintain flooded pit within water level restrictions;
- Excess water from the TSF South Cell (via the TSF Collection Pond), Central Dike Downstream Pond and East Dike Pond is pumped to Pit A;
- Excess water is pumped from Goose Pit to the base of Vault Pit at a maximum rate of 1,600 m^3/hour to maintain Goose Pit water levels within the target elevations;
- Excess water from the Phaser Pit (and upstream catchments including BB Phaser Pit) is pumped to the Vault AP for treatment and discharge to Wally Lake at a maximum rate of 350 m^3/hour.



Legend

- Passive Flow
- Pumped Contact Water
- Pumped Non-contact Water
- Treated Water

DATE SAVED:	Feb. 24, 2025
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REVIEWED:	SJ
VERSION:	2

CLIENT:

AGNICO EAGLE

LORAX ENVIRONMENTAL

PROJECT:

Meadowbank Mine: Water Balance and Water Quality Model – Technical Report

TITLE: Operations phase flow diagram (September 2024 to June 2028)

PROJECT #: A767-4

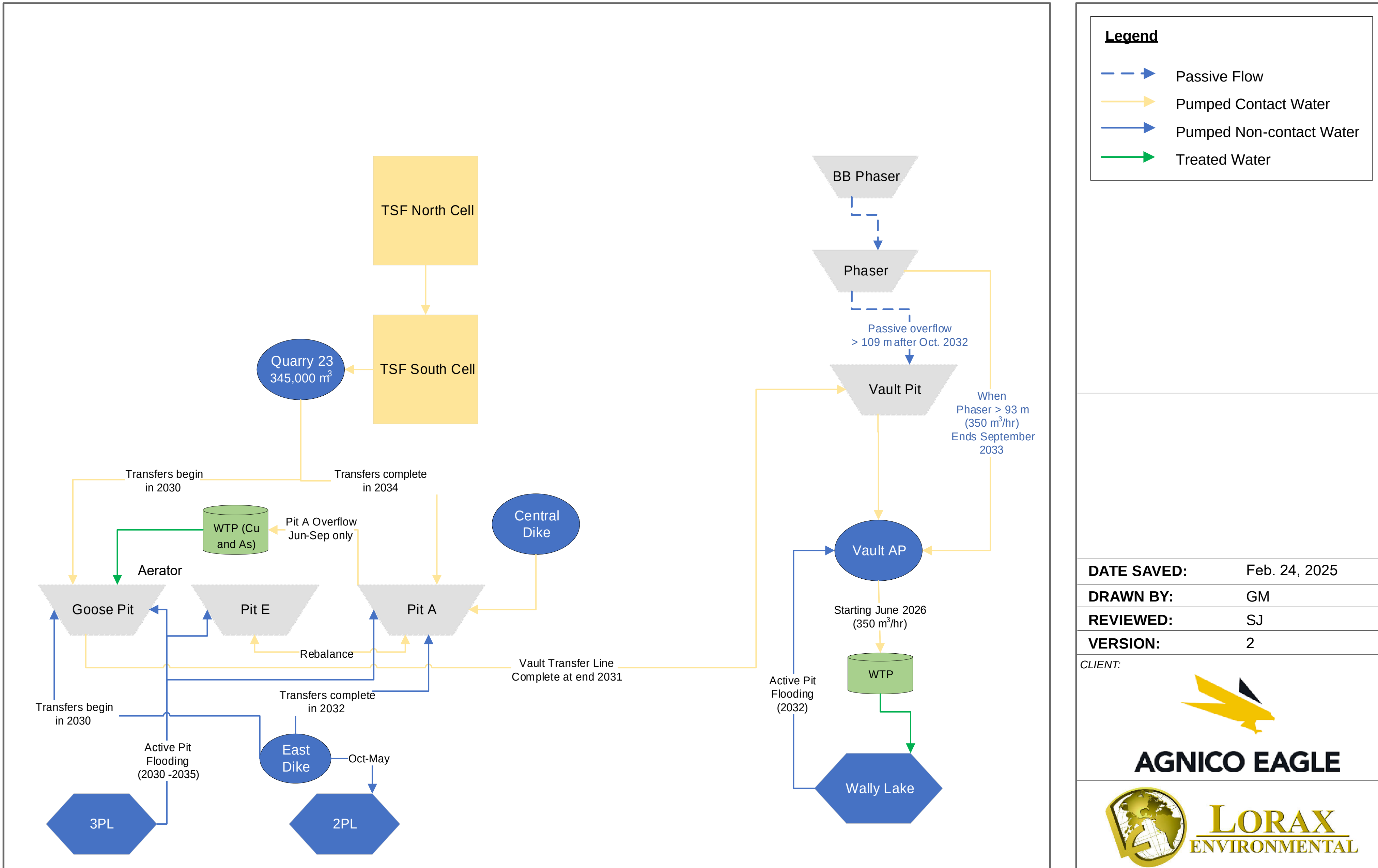
FIGURE: 3-24

3.10 Active Closure and Post-Closure Water Management

The Active Closure phase begins in July 2028 upon cessation of milling. Specific water management activities expected during this phase are listed below, and with reference to the average year climate scenario:

- Aeration of Goose Pit water continues until June 2030.
- Aeration of Pit A and Pit E will occur from July 2028 until June 2030.
- Central Dike Downstream Pond, TSF and ED inflows to Pit A continue;
- Excess water in Pit A is transferred to Goose Pit via the WTP for the remainder of 2027 through 2029;
- Excess water is pumped from Goose Pit to the base of Vault Pit to maintain Goose Pit water levels within the target elevations;
- Water transfer from Pit A, Pit E and Goose Pit to the base of Vault Pit occurs from June 2028 to September 2033 at a pumping rate of 1,600 m^3/hr (June to September).
- Goose Pit is actively flooded with water pumped from Third Portage Lake from September 2030 to June 2032;
- Pit E is actively flooded with water pumped from Third Portage Lake from June 2032 to September 2032;
- Pit A is actively flooded with water pumped from Third Portage Lake from September 2033 to August 2034, and at a reduced rate over-winter in 2033 to 2034;
- The three Portage Area pits conjoin in September 2034 into a single combined water body 'Combined Flooded Pit' which continues to be filled to an elevation of 133.6 m by September 2035, at which point the Bay Goose Dike and South Camp Dike are breached to connect Third Portage Lake with the Combined Flooded Pit; and,
- The freshwater cap in Vault Pit is augmented with water pumped from Wally Lake in September 2033 to bring the Vault Pit water elevation up to 140 m, at which point the dike is breached to connect Wally Lake with the conjoined flooded Vault Pit. In practice, the water management strategy will continue to be improved to optimize freshwater use and manage adequately contact water to ensure the freshwater cover in the flooded Vault Pit will be achievable.

The model is run until the water levels in the Combined Pit and Vault Pit become equivalent with Third Portage Lake (el.133.6 m) and Wally Lake (el.140 m), respectively. The dikes would then be breached in accordance with Water License 2AM-MEA1530, part E, item 7 (Figure 3-26 and Figure 3-27). Cross sections of the flooded pits in closure showing flooded pit surface elevations, contact water elevation, and tailings elevations are shown in Figure 3-26 and Figure 3-27.



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VERSION:	2

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LORAX ENVIRONMENTAL

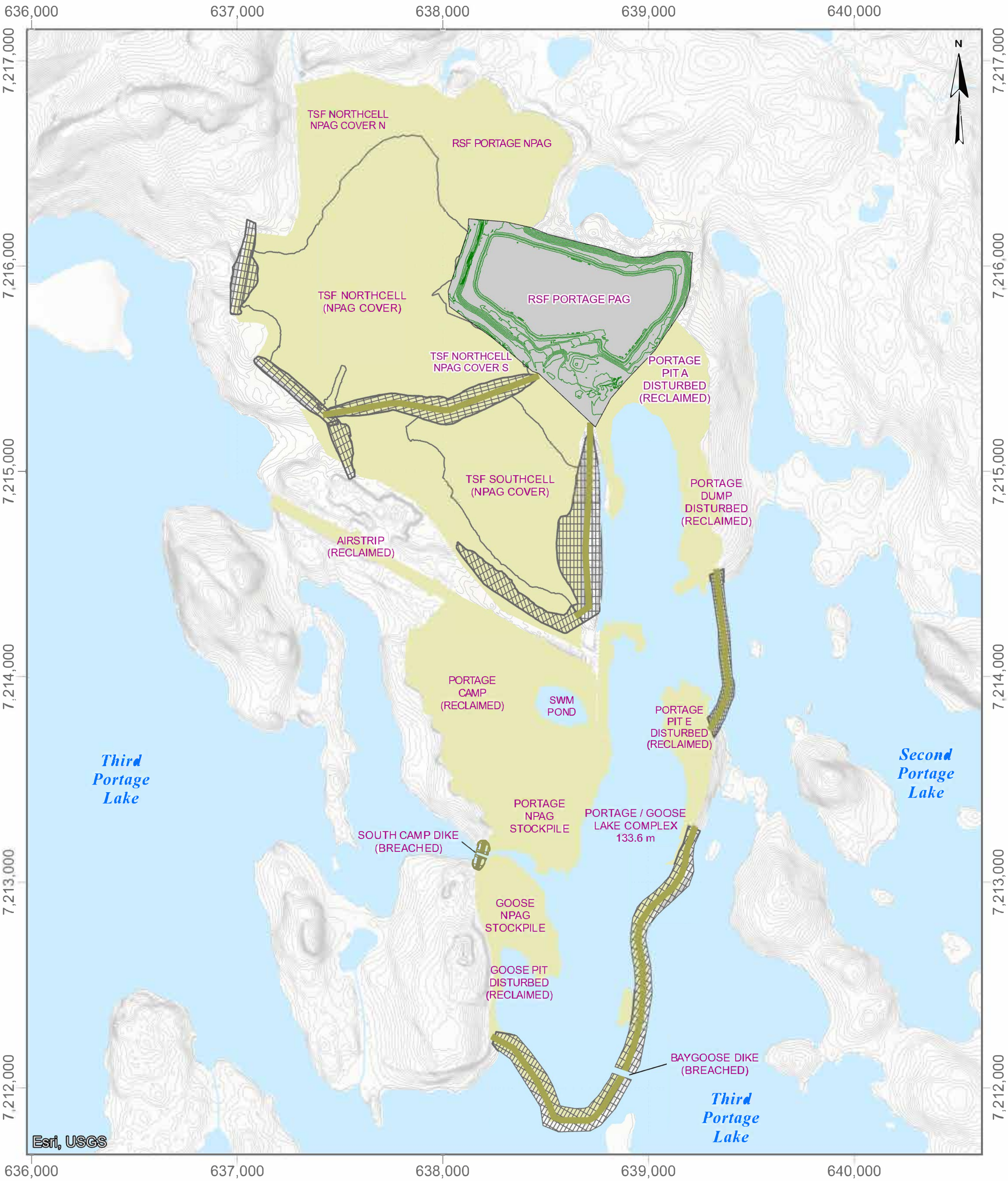
PROJECT:

Meadowbank Mine: Water Balance and Water Quality Model – Technical Report

TITLE: Active closure phase flow diagram (July 2028 to July 2036)

PROJECT #: A767-1

FIGURE: 3-25



LEGEND

- Reclaimed Mine Infrastructure
- Dike
- Waterbody
- Watercourse
- 1m Contours

DATE SAVED:	Oct 04, 2024
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VERSION:	1

Coordinate System: NAD 1983 CSRS UTM Zone 14N
Projection: Transverse Mercator
Datum: North American 1983 CSRS
Units: Metre

1:25,000

0 250 500 Metres

CLIENT: AGNICO EAGLE

LORAX ENVIRONMENTAL

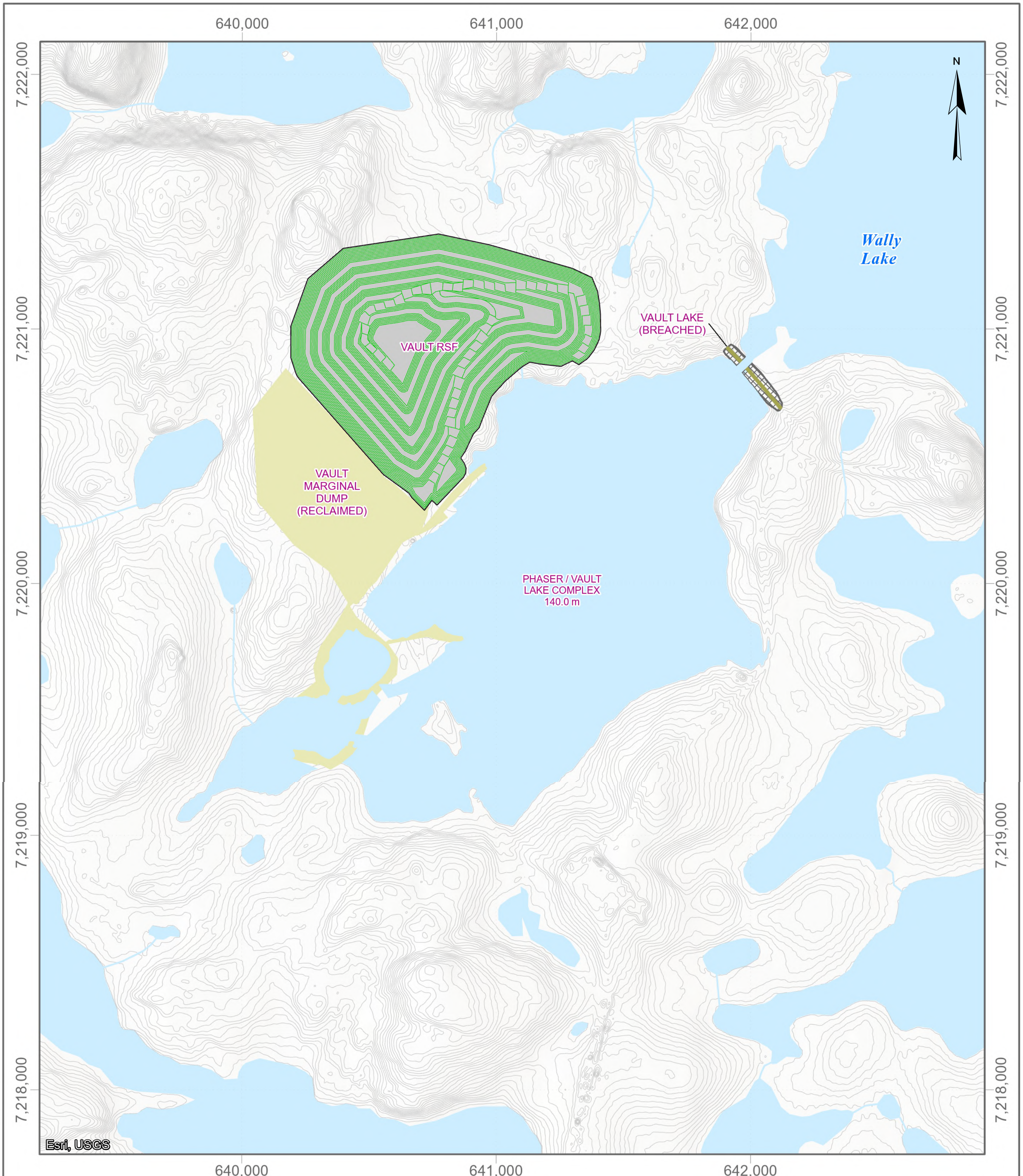
PROJECT: **Meadowbank WB/WQM Report**

TITLE: Portage Are Post-Closure Layout with Approximate Dike Breach Locations

PROJECT #: A717-4

FIGURE: 3-26

P:\@Drafting\Meadowbank\Drafting Figures\APRX\WBWQM Report 2024\WBWQM Report 2024\WBWQM Report 2024.aprx   Figure 2-4 Portage WBWQM Post-Closure Phase Layout



LEGEND

- Reclaimed Mine Infrastructure
- Waste Rock Storage Facility
- Dike
- Waterbody
- Watercourse
- 1m Contours

DATE SAVED:	Oct 04, 2024
DRAWN BY:	DM
REVIEWED:	SJ
VERSION:	1

Coordinate System: NAD 1983 CSRS UTM Zone 14N
Projection: Transverse Mercator
Datum: North American 1983 CSRS
Units: Metre

1:20,000

0 200 400 Metres

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LORAX ENVIRONMENTAL

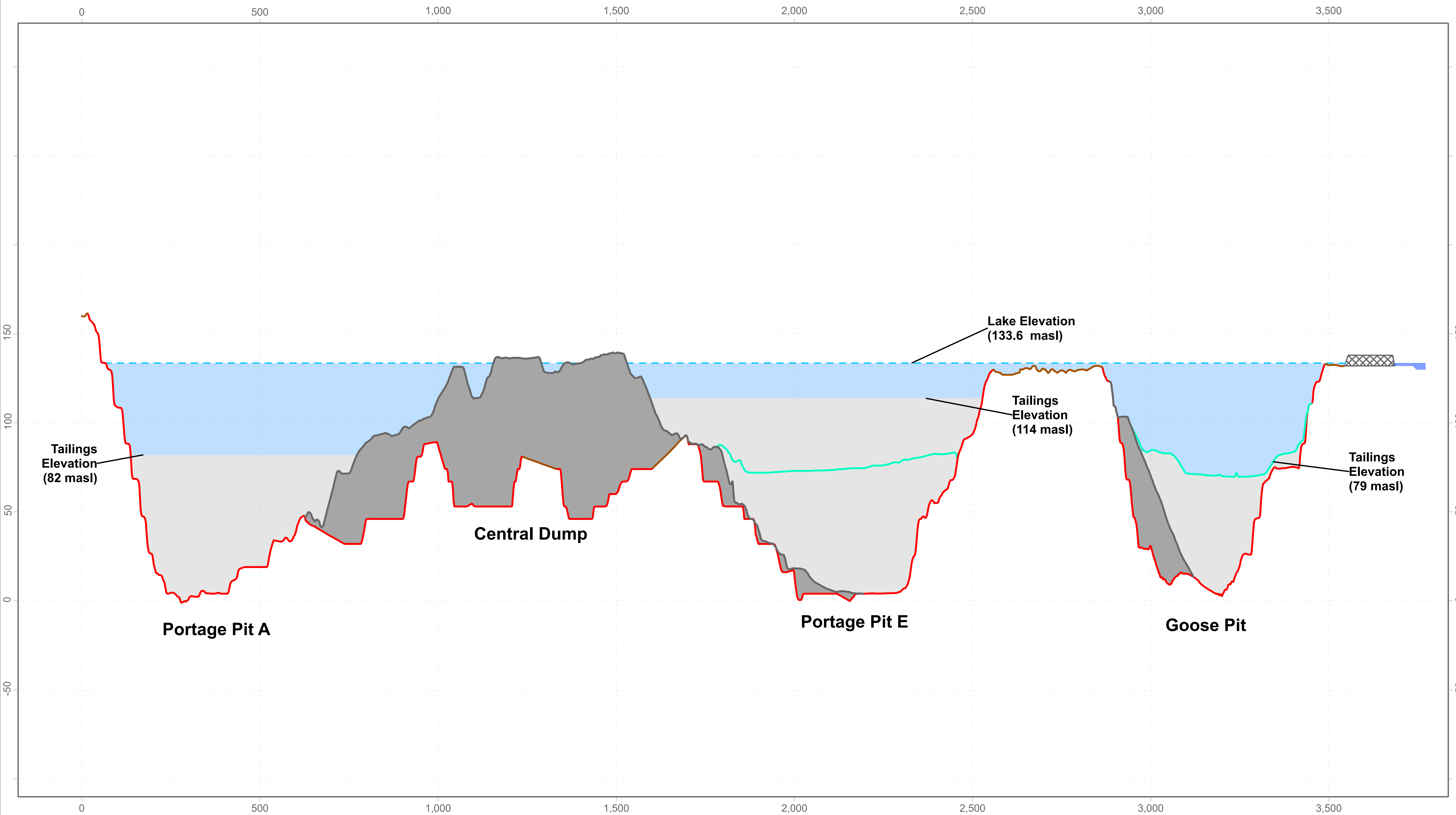
PROJECT: **Meadowbank WB/WQM Report**

TITLE: Vault WB/WQM Post-Closure Layout

PROJECT #: A717-4

FIGURE: 3-27

P:\@Drafting\Meadowbank\Drafting Figures\APRX\WBWQM Report 2024\WBWQM Report 2024\WBWQM Report 2024.aprx   Figure 2-5 Vault WBWQM Post-Closure Phase Layout



LEGEND

- 3PL (133.6 masl)
- Tailings Surface 2023
- Waste Rock Surface
- Natural Ground
- Pit Surface
- Fresh Water
- Contact Water
- Tailings
- Waste Rock
- Third Portage Lake
- Dike

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Vertical Exaggeration 5X

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LORAX ENVIRONMENTAL

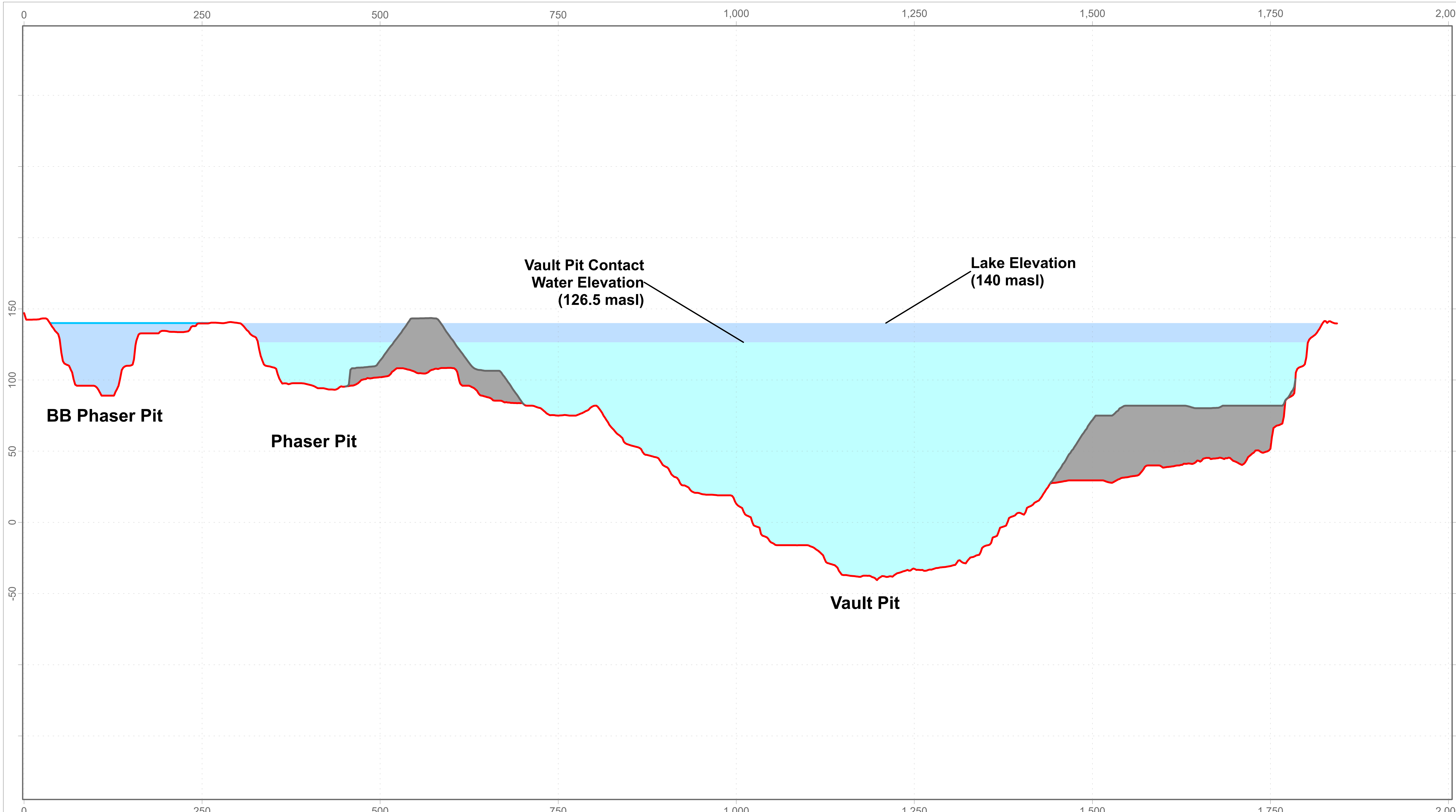
PROJECT: **Meadowbank**

TITLE: Cross Section Showing Goose Pit Pit A, and Pit E Closure Configuration

PROJECT #: A717-4

FIGURE: 3-28

P:\@Drafting\Meadowbank\Drafting Figures\APRX\Portage Goose Pit Cross-section - May 2024\Portage Goose Pit CS.aprx Figure 3-27 Cross section showing Goose Pit Pit A and Pit E



LEGEND

- Fresh Water Elevation
- Pit Surface
- Waste Rock Surface
- Fresh Water
- Contact Water
- Waste Rock

DATE SAVED:	Feb 25, 2025
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VERSION:	1

Vertical Exaggeration 2X

CLIENT: AGNICO EAGLE

LORAX ENVIRONMENTAL

PROJECT: **Meadowbank**

TITLE: Cross Section Showing Vault Pit Closure Configuration

PROJECT #: A717-4

FIGURE: 3-29

P:\@Drafting\Meadowbank\Drafting Figures\APRX\Vault Pit Cross-section - Sep 2024.aprx   Fig 5-9_Vault Pit Post Closure

4. Water Quality Model Methods

4. Water Quality Model Methods

Water quality inputs for the 2024 Annual Report model are based on historic monitoring data of mine water and non-contact water. Water quality parameters tracked in the current modelling are those listed in the Water License or presented in previous Annual Report water quality models. These parameters are listed in Table 4-1.

Table 4-1:
Water Quality Parameters Tracked in Annual Report Model

Parameter	
Total CN	Se
Al	Zn
As	NH_3-N
Cd	NO_3-N
Cu	TDS
Fe	Cl
Pb	SO_4
Hg	F
Ni	

4.1 Natural Lakes, non-contact Runoff and Attenuation Pond

The chemistry of Third Portage Lake, Wally Lake, non-contact runoff and the initial concentration of Vault AP are defined based on historic monitoring data. At these locations, trace metals are often present below method detection limits (MDL). When a majority of measurements at a given monitoring station are below MDL concentrations, 50% of the minimum MDL is applied.

- Third Portage Lake is defined by the median of historic monitoring data from stations TPS, TPN and TPE from August 2020 to September 2023.
- Wally Lake is assigned the same chemistry as Third Portage Lake.
- Vault AP is defined using the median concentration observed from June 2020 to September 2023 at ST-25.
- Non-contact runoff reporting to the Portage Area and the Vault Area is assigned Third Portage Lake and Vault AP water quality, respectively (Table 4-2).

**Table 4-2:
Water Quality of Third Portage Lake and Vault Attenuation Pond Utilized in the WQM.**

Parameter	Units	Third Portage Lake	Vault Attenuation Pond
Total Dissolved Solids	mg/L	19.6	95
Total Ammonia-N	mg/L	0.0106	0.025
Nitrate-N	mg/L	0.00555	0.27
Total Cyanide	mg/L	0	0
Chloride	mg/L	0.79	3.6
Fluoride	mg/L	0.069	0.05
Sulphate	mg/L	4.55	44
Aluminum	mg/L	0.002	0.0246
Arsenic	mg/L	0.00022	0.00051
Cadmium	mg/L	0.0000025	0.000013
Copper	mg/L	0.0004	0.001635
Iron	mg/L	0.005	0.038
Mercury	mg/L	0.0000025	0.000005
Nickel	mg/L	0.00025	0.002
Lead	mg/L	0.000025	0.000085
Selenium	mg/L	0.000025	0.00005
Zinc	mg/L	0.0005	0.0025

4.2 Tailings Storage Facility

Tailings produced at Meadowbank were deposited as a tailings slurry into the TSF North and South Cells for the first 10 years of operations (2010 to 2019). Since August 2019, tailings have primarily been backfilled into Goose Pit or Pit E, with tailings deposition into the TSF only briefly resumed for 2 months in 2020 (July-August to North Cell) and 2 months in 2023 (August-September to South Cell). Additional tailings deposition is planned to TSF North Cell in July to September 2025 and to the TSF South Cell in July to September 2026.

The closure concept for the TSF is to install a non-acid generating (NPAG) waste rock cover on the North and South Cells tailings. Progressive construction of the closure cover began in 2015, with completion expected by the end of 2027.

4.2.1 TSF Surface Water

Surface runoff from the TSF North Cell is collected in the TSF North Cell Pond which is then pumped to the TSF South Cell Pond along with other mine contact waters (Figure 2-4). Water from the TSF South Cell Pond is currently pumped to Pit A, which will continue to receive TSF water until the mine pits are flooded at closure.

The TSF South Cell pond monitored at ST-21-S is used to define water pumped from the TSF South Cell prior to completion of the closure cover (2027). Annual median values are applied from 2020- 2024 when historic monitoring data is available (Table 4-3). The source terms for 2025 and 2026 were defined using 2022 to 2024 monitoring data from station ST-21-S.

Process water associated with tailings deposition in 2025 and 2026 is defined by the mill source term descried in Section 4.6. This water is managed with TSF surface runoff to Pit A during these years.

Starting in 2027, the closure cover will be complete and a new 'closure cover' source term will be applied. Two distinct flows and source terms are defined for the closure cover: surface water that only interacts with the NPAG waste rock cover; and tailings interflow which interacts with shallow tailings at the NPAG waste rock cover interface. Source terms for tailings interflow were provided by Okane Consultants (Okane, 2024). NPAG WRSF source terms were used for the TSF cover based on the median historic monitoring data observed at stations ST-30 and ST-31 collecting runoff from NPAG WRSF. The TSF closure cover source terms are provided in Table 4-3.

Table 4-3:
Tailings Storage Facility Source Terms

Parameter	Units	TSF South Cell						TSF Cover	
		2020	2021	2022	2023	2024	2025-2026	Shallow Tailings	NPAG WRSF
Total Dissolved Solids	mg/L	768	1200	836	840	565	836	5000	145
Total Ammonia	mg-N/L	3.9	16	3.5	1.4	0.71	1.4	10	0.068
Nitrate	mg-N/L	4.55	7.81	2.3	6.01	3.48	3.48	0.2	0.39
Total Cyanide	mg/L	0.0205	0.056	0.0249	0.0126	0.0165	0.0165	0.045	0.0035
Chloride	mg/L	35.8	63	25	15	8.8	15	97	2.13
Fluoride	mg/L	0.28	0.26	0.18	0.23	0.17	0.18	0.23	0.15
Sulphate	mg/L	368	580	470	470	330	470	3150	39.9
Aluminum	mg/L	0.006	0.014	0.01	0.00694	0.00986	0.00986	0.015	0.01075
Arsenic	mg/L	0.009	0.048	0.038	0.0433	0.0441	0.0433	0.044	0.0037
Cadmium	mg/L	0.00002	0.000071	0.000081	0.0000853	0.0000568	0.000805	0.00063	0.0000089
Copper	mg/L	0.017	0.37	0.017	0.009595	0.00629	0.00960	0.011	0.0039
Iron	mg/L	0.01	0.016	0.012	0.0071	0.0072	0.0072	0.18	0.31
Mercury	mg/L	0.00001	0.0001	0.0001	0.00001	0.00001	0.00001	0.00012	0.00001
Nickel	mg/L	0.028	0.41	0.13	0.132	0.108	0.125	0.48	0.0026
Lead	mg/L	0.00017	0.00025	0.00011	0.000115	0.0000385	0.00011	0.00031	0.0001
Selenium	mg/L	0.001	0.033	0.0079	0.0021	0.00119	0.00215	0.0021	0.00018
Zinc	mg/L	0.0015	0.0025	0.0029	0.0026	0.00259	0.00263	0.048	0.0015

4.2.2 TSF Seepage to Central Dike Downstream Pond

Seepage from the south-eastern perimeter of the TSF accumulates at the base of the Central Dike in the Central Dike Downstream Pond (CDDP). This water is currently being transferred to Pit A and will continue to be managed in this manner until mine pits are flooded at closure.

The median annual concentrations observed in the CDDP (ST-S-5) are shown in Table 4-4 and are applied to the Central Dike seepage in the model. Total dissolved solids and other parameters associated with process water show a declining trend over time, consistent with the reduction of tailings deposition to the TSF since 2019. Parameters associated with process water is expected to decline over time, as tailings consolidate and residual process water is flushed from the impoundment.

The source term for Central Dike seepage is assigned the median annual observed concentrations for the historic operations period from 2020-2024 (Table 4-4). The most recent (2024) concentrations are applied to the remainder of the model horizon.

Table 4-4:
Geochemical Source Terms for Central Dike Seepage.

Parameter	Units	2020	2021	2022	2023	2024 Onwards
Total Dissolved Solids	mg/L	2246	2590	1990	2020	2100
Total Ammonia	mg-N/L	31	31	23	22	18
Nitrate	mg-N/L	0.12	0.10	0.10	0.10	0.10
Total Cyanide	mg/L	0.056	0.072	0.051	0.032	0.046
Chloride	mg/L	270	240	170	145	110
Fluoride	mg/L	0.54	0.48	0.51	0.49	0.048
Sulphate	mg/L	1560	1500	1300	1250	1250
Aluminum	mg/L	0.00005	0.00002	0.00002	0.00002	0.00002
Arsenic	mg/L	0.00865	0.0163	0.0131	0.0609	0.0522
Cadmium	mg/L	0.00001	0.00001	0.00001	0.00001	0.00001
Copper	mg/L	0.00025	0.0002	0.00084	0.00071	0.0015
Iron	mg/L	0.02	0.355	0.114	2.02	0.98
Mercury	mg/L	0.000005	0.000005	0.000005	0.000005	0.000005
Nickel	mg/L	0.0089	0.0041	0.0041	0.0020	0.0038
Lead	mg/L	0.00015	0.00020	0.00020	0.00020	0.00020
Selenium	mg/L	0.001	0.00062	0.00084	0.00043	0.00103
Zinc	mg/L	0.0005	0.005	0.005	0.005	0.005

4.3 Disturbed Areas

The catchment area immediately surrounding mine pits and attenuation ponds has been disturbed by mining activities. These areas include the airstrip, the mill area, the campsite area, haul roads and other mine facilities constructed on waste rock pads. Runoff from the campsite area and airstrip are directed towards the stormwater management pond (SWMP) along with STP effluent. The contribution of the disturbed area runoff to the SWMP can be estimated by assuming a conservative mass balance using the following equation (Eq. 4.1):

$$C_{Disturbed} = \frac{C_{SWMP} * V_{SWMP} - C_{STP} * V_{STP} - C_{Precip} * V_{Precip}}{V_{Disturbed}} \tag{4.1}$$

Where:

- $C_{Disturbed}$ is the disturbed area concentration (mg/L)
- C_{SWMP} is the water quality (mg/L) of SWMP
- V_{SWMP} is the volume (L) of SWMP
- C_{STP} is the water quality (mg/L) of STP
- V_{STP} is the volume (L) of STP input to SWMP

- C_{Precip} is the water quality (mg/L) of precipitation
- V_{Precip} is the volume (L) of precipitation input to SWMP
- $V_{Disturbed}$ is the volume (L) of disturbed area runoff reporting to SWMP

The water quality of SWMP was defined using the yearly median of historic monitoring data from July 2019 to December 2024. Water quality for STP was defined using the median of monitoring data from stations STP-SEP, STP-IN and ST-LJ-MIX from August 2019 to December 2024 and precipitation was assumed to have a negligible impact on the water quality of SWMP. The source terms for the disturbed area runoff used in the WQM were calculated on a yearly basis with the exception of 2021, where an average of 2020 and 2022 was used instead due to the limited monitoring data. Disturbed area runoff source terms for forward modelling are an average of 2023 and 2024 disturbed area source terms. The source terms used for the disturbed area runoff in the WBWQ model are presented in Table 4-5.

Table 4-5:
Geochemical Source Terms for Disturbed Area Runoff.

Parameter	Units	2020	2021	2022	2023	2024	2025 Onwards
Total Dissolved Solids	mg/L	304	406	509	242	244	243
Total Ammonia	mg-N/L	0.055	0.055	0.055	0.055	0.055	0.055
Nitrate	mg-N/L	2.24	2.24	2.24	0.202	0.135	0.168
Total Cyanide	mg/L	0	0	0	0	0	0
Chloride	mg/L	79.64	83.70	87.77	57.58	72.45	65.02
Fluoride	mg/L	0.45	0.41	0.38	0.18	0.21	0.20
Sulphate	mg/L	59.27	127.7	196.1	88.0	62.5	75.24
Aluminum	mg/L	0.041	0.032	0.024	0.041	0.035	0.038
Arsenic	mg/L	0.028	0.034	0.040	0.028	0.056	0.042
Cadmium	mg/L	0.000015	0.000023	0.000031	0.000011	0.00000094	0.0000060
Copper	mg/L	0.0048	0.0079	0.011	0.0028	0.018	0.010
Iron	mg/L	0.13	0.12	0.11	0.044	0.037	0.041
Mercury	mg/L	0.000011	0.0000096	0.0000084	0.0000046	0.0000045	0.0000045
Nickel	mg/L	0.022	0.024	0.026	0.012	0.016	0.014
Lead	mg/L	0.00023	0.00015	0.000065	0.00012	0.000066	0.000093
Selenium	mg/L	0.00066	0.00066	0.00066	0.000084	0.00040	0.00024
Zinc	mg/L	0.0012	0.0018	0.0024	0.0054	0.0013	0.0034

4.4 Pit Wall Rock

Pit wall rock refers to rock exposures within the open pit including the pit floor, benches, blast damaged rock and blast fractured rock on bench surfaces. This loading source is best represented by mine-pit sump monitoring data during active mining when diversions were in place and pits were fully dewatered. Due to the potential influence of groundwater in Pit E and Goose Pit sump monitoring, and the limited monitoring data available for Vault Pit, the source term for pit wall runoff was based on Pit A monitoring data (ST-19). The average of the yearly median historic monitoring data prior to the flooding of Pit A (*i.e.*, July 2015 to September 2017) was used to develop this source term. The pit wall source term is presented in Table 4-6.

Table 4-6:
Pit Wall Runoff Source Terms.

Parameter	Units	Pit Wall
Total Dissolved Solids	mg/L	447
Total Ammonia	mg-N/L	2.2
Nitrate	mg-N/L	11.6
Total Cyanide	mg/L	0
Chloride	mg/L	18.7
Fluoride	mg/L	0.38
Sulphate	mg/L	194
Aluminum	mg/L	0.0085
Arsenic	mg/L	0.017
Cadmium	mg/L	0.00010
Copper	mg/L	0.00068
Iron	mg/L	0.01
Mercury	mg/L	0.00003
Nickel	mg/L	0.03
Lead	mg/L	0.0003
Selenium	mg/L	0.0012
Zinc	mg/L	0.001

4.5 Waste Rock Storage Facilities

Portage WRSF side slopes are covered with NPAG rockfill and its runoff is monitored at station ST-16, which also receives runoff from the surrounding catchment between the toe of the WRSF and East Diversion Ditch. The relative contribution of these flows is estimated by the site wide water balance, allowing the WRSF runoff source term to be derived using the same conservative mass balance described in Section 4.3. The annual WRSF runoff source term is provided in Table 4-7. WRSF source terms were calculated on an annual basis and the median of 2020 to 2024 was applied to forward modelling (*i.e.,* 2025 onwards).

Table 4-7:
Waste Rock Storage Facility Source Terms

Parameter	Units	2020	2021	2022	2023	2024	2025 Onwards
Total Dissolved Solids	mg/L	213	133	213	223	241	213
Total Ammonia	mg-N/L	0.059	0.053	0.091	0.053	0.060	0.059
Nitrate	mg-N/L	2.68	1.89	2.24	1.01	0.94	1.89
Total Cyanide	mg/L	0	0	0	0	0	0
Chloride	mg/L	2.23	2.50	3.74	0.94	1.54	2.23
Fluoride	mg/L	0.20	0.19	0.21	0.21	0.24	0.21
Sulphate	mg/L	69.8	52.7	73.3	64.7	102.5	69.8
Aluminum	mg/L	0.0025	0.0062	0.010	0.0089	0.0082	0.0082
Arsenic	mg/L	0.0040	0.035	0.0078	0.016	0.0070	0.0078
Cadmium	mg/L	0.0000084	0.0000030	0.0000029	0.0000060	0.0000019	0.0000030
Copper	mg/L	0.0097	0.0058	0.0058	0.0047	0.0073	0.0058
Iron	mg/L	0.045	0.052	0.073	0.12	0.14	0.073
Mercury	mg/L	0.0000042	0.0000043	0.0000043	0.0000044	0.0000040	0.0000043
Nickel	mg/L	0.012	0.0071	0.013	0.0051	0.0074	0.0074
Lead	mg/L	0.000880	0.000073	0.000260	0.000075	0.000058	0.000075
Selenium	mg/L	0.00042	0.00270	0.00271	0.00269	0.00281	0.00270
Zinc	mg/L	0.00050	0.00073	0.00036	0.00049	0.00039	0.00049

4.6 Mill Process Water

The process water source term represents the liquid component of the tailings slurry discharged from the mill. Process water chemistry is influenced by the source of mill reclaim, the proportion of freshwater makeup, the geochmical load released from ore/tailings surfaces, and reagents used in the carbon-in-pulp gold process and SO_2-air cyanide destruction circuit.

The composition of ore and mill reagents will remain relatively constant for the remainder of mine life. However, the process water chemistry will still evolve over time as parameters released from the mill accumulate in reclaim water sources. The degree to which accumulation will occur depends on the solubility of a given parameter within the mill environment. That is, the high pH maintained by the mill (pH > 10.5) and subsequent SO_2 air cyanide destruction circuit will limit the accumulation of most metals, cyanide species, and metals associated with WAD-CN complexes (*e.g.,* Ni and Cu), while most major ions and nitrogen species will remain relatively soluble.

For parameters that are solubility limited within the mill, the average concentration observed in mill effluent is applied as a constant concentration source term for the remainder of operations. For parameters that will accumulate within the mill, the concentration released by the mill are estimated from the difference between reclaim water and process water observed in historic monitoring data. For example, the difference in TDS between mill influent and effluent is 2705 mg/L on average. This concentration is added to the mill reclaim influent concentration to predict the mill source term, as illustrated in Figure 4-1. This approach allows process water chemistry to fluctuate with reclaim water sources, which has been observed in historic monitoring data (Figure 4-1). The mill source terms are listed in Table 4-8.

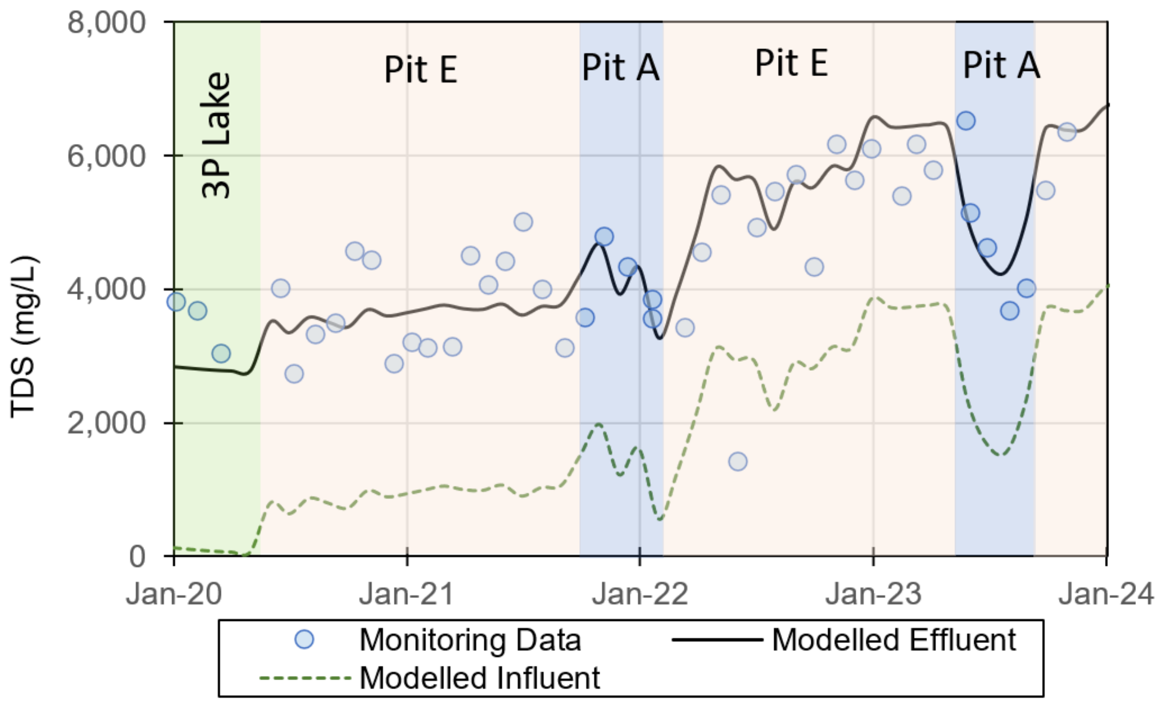

Figure 4-1: Total dissolved solids concentrations in mill water. Figures show influent concentrations estimated based on reclaim water sources, the primary source of mill makeup water, tailings slurry monitoring results, and the calculated mill effluent source terms.

Table 4-8:
Source Terms for Mill Process Water

Parameter	Units	Mill Water
Total Dissolved Solids[1]	mg/L	2705
Total Ammonia-N	mg-N/L	45.6
Nitrate-N[1]	mg-N/L	7.86
Total Cyanide	mg/L	24
Chloride[1]	mg/L	727
Fluoride	mg/L	0.17
Sulphate[1]	mg/L	1065
Aluminum	mg/L	0.024
Arsenic	mg/L	0.379
Cadmium	mg/L	0.00026
Copper	mg/L	10.2
Iron	mg/L	0.075
Mercury	mg/L	0.00001
Nickel	mg/L	1.33
Lead	mg/L	0.0006
Selenium[1]	mg/L	0.171
Zinc	mg/L	0.002

[1]Concentrations added to reclaim concentration (i.e., mill influent) to estimated mill effluent. Other parameters modelled as constant concentration in mill effluent.

4.7 Kinetic Decay Rates of Reactive Species

Nitrogen species will enter the tailings ponds through the mill process water from reagent use and to a lesser extent from residual blasting residue released from tailings and waste rock. Total cyanide (T-CN) and ammonia (NH_3) are unstable in aerobic pond environments and will naturally decay over time. Model inputs for these parameters can be summarized as follows:

- T-CN losses are modelled using a first order decay rate derived from monitoring data at station ST-20. Decay of T-CN is assumed to result in the generation of NH_4 at a stoichiometric ratio of 1:1;
- Ammonia decay is modelled using a first order decay rate derived from tote tests initiated in 2024 using water from Goose Pit, NH_3-N results in NO_3-N generation at a 1:1 stoichiometric ratio; and
- Copper and nickel concentrations are modelled based on their relationship with pit concentrations of T-CN.

Derivation of rate equations is described in the sections below.

4.7.1 Total Cyanide

Residual CN will be present in the tailing process water after SO_2 air destruction in the mill. Cyanide will degrade within the ponds primarily through volatilization (Eqn. 4.2) and oxidation (Eqn. 4.3) to NH_4 as per the following two reactions:

$$CN^- + H_2O \leftrightarrow HCN(g) + OH^- \quad (4.2)$$

$$CN^- + 0.5O_2 + 3H_2O \leftrightarrow NH_4^+ + HCO_3 + OH \quad (4.3)$$

The degradation of T-CN was calculated using a first order decay rate from derived from monitoring data at ST-20. The rate equation developed can be expressed as follows:

$$R = k[A] \quad (4.4)$$

Where R is the reaction rate (mg/L/day); A is the concentration in the flooded pit (mg/L); and k is the reaction constant (days^{-1}) (Figure 4-2). The rate constant of 0.0036 days^{-1} was calculated based on the decline in T-CN concentrations since tailings deposition ended in Goose Pit (*i.e.,* September 2020). Decay of CN species in the pond results in the generation of NH_3 at a stoichiometric ratio of 1:1.

4.7.2 Ammonia

Degradation of NH_3 during aeration periods will occur through a combination of oxidation, algal uptake, adsorption and volatilization. The portion of NH_3 which is consumed by algal growth and volatilization will be removed from solution, while the portion that is oxidized will be converted to NO_3:

$$NH_4^+ + 2O_2 \leftrightarrow NO_3^- + 2H^+ + H_2O \quad (4.5)$$

The portion of NH_4 that is oxidized to NO_3 versus volatilization, adsorption or algal uptake is difficult to constrain, and will depend on a number of site-specific conditions. In the model, ammonia degradation is dependent on pit aeration. When no aeration of the flooded pits is occurring, it is assumed that ammonia will not decay and no reaction rate is assigned. During active aeration periods, ammonia decay is modelled using a first order (concentration dependent) decay rate. Ammonia decay rates during the aeration period are based on tote tests, initiated in 2024, designed to investigate nitrification rates in Goose Pit, Pit A and Pit E. Decay rates have been scaled to 8°C to account for temperature differences between experimental conditions and flooded pit temperatures. Tote tests are ongoing, but based on preliminary results ammonia decay was modelled using a first order decay equation (4.4) with a temperature corrected rate constant of 0.004353 days^{-1}.

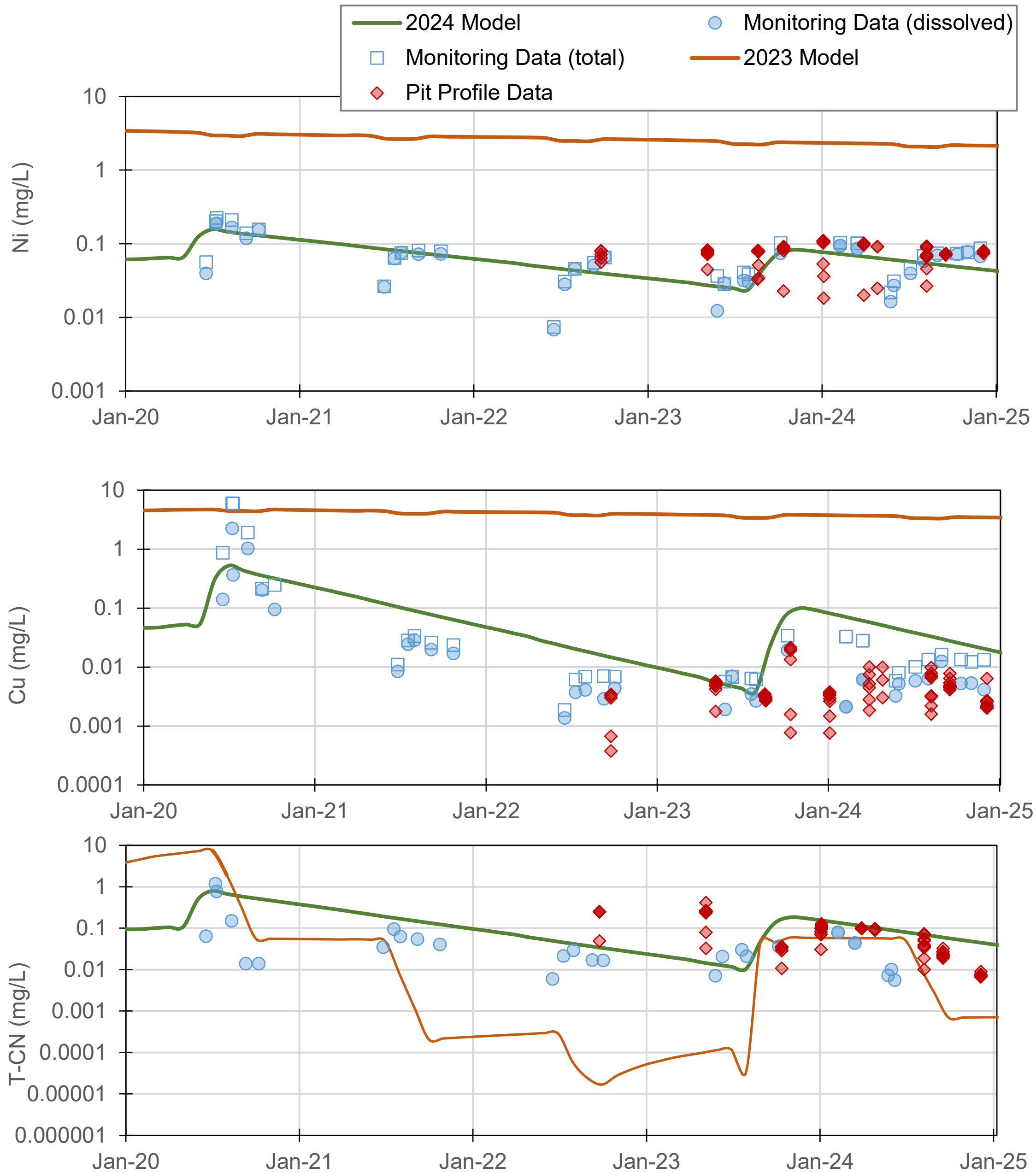

Figure 4-2: Water quality monitoring and model results for nickel (top) copper (middle) and total cyanide (bottom) in Goose Pit over the calibration period.

Decay of NH_3-N in the flooded pit water results in the generation of NO_3-N at a stoichiometric ratio of 1:1. No decay of ammonia is allowed to occur when SCN is present in the flooded pit above 4.5 mg/L.

4.7.3 Copper and Nickel

The concentrations of copper and nickel in the flooded pits are dependent are the T-CN concentrations due to the formation of weak CN complexes. The relationship between T-CN and metal concentrations is calibrated based on Goose Pit monitoring data after tailings deposition stopped in September 2020 (Figure 4-2). The model uses the following equations to determine copper and nickel concentrations:

$$Cu = 0.6812 \times (\text{T-CN})^{1.1365} \tag{4.7}$$

$$Ni = 0.1735 \times (\text{T-CN})^{0.4366} \tag{4.8}$$

Once the concentration of T-CN in the flooded pits falls below 0.01 mg/L, the concentration of Cu and Ni are modelled as conservative and are no longer dependent on T-CN concentrations.

4.8 Validation of Water Quality Model and Comparison to Previous Forecasts

To validate the water quality model, predicted concentrations are compared to actual monitoring data at mine pits from 2020 to 2024. Model predictions include the 2024 Annual Report model (current) and last years 2023 Annual Report Model. Validation results compared against monitoring data from Goose Pit, Pit E, Pit A and Vault Pit for arsenic and TDS are shown in Figure 4-3 and Figure 4-4, respectively. All other parameters are shown in Appendix A. Model forecasts are compared to both total and dissolved concentrations (where applicable) in these figures. Dissolved concentrations are considered more representative of geochemical loading and metal leaching processes, as the difference between total and dissolved concentrations are mainly due to incomplete tailings settling and TSS disturbances.

In general, 2024 Annual Report predictions are similar to, or overestimate, monitoring data. The validation results indicate that the water quality model can conservatively re-produce historic monitoring data in early Operations, providing confidence in the accuracy of forward model predictions.

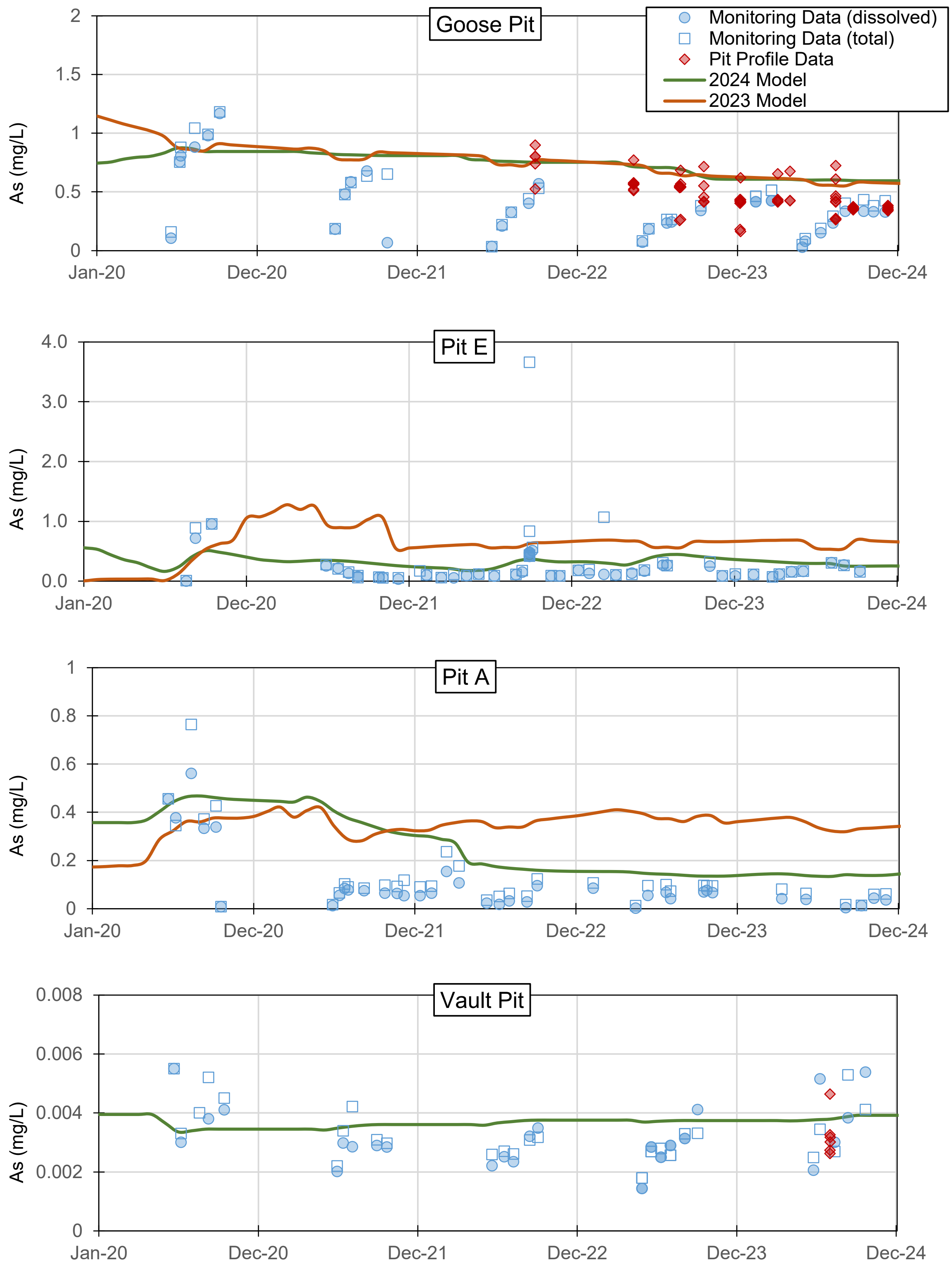

Figure 4-3: Water quality model validation results for arsenic at Goose Pit, Pit E, Pit A and Vault Pit. Model forecasts show predictions from the 2023 Annual Report and the 2024 Annual Report.

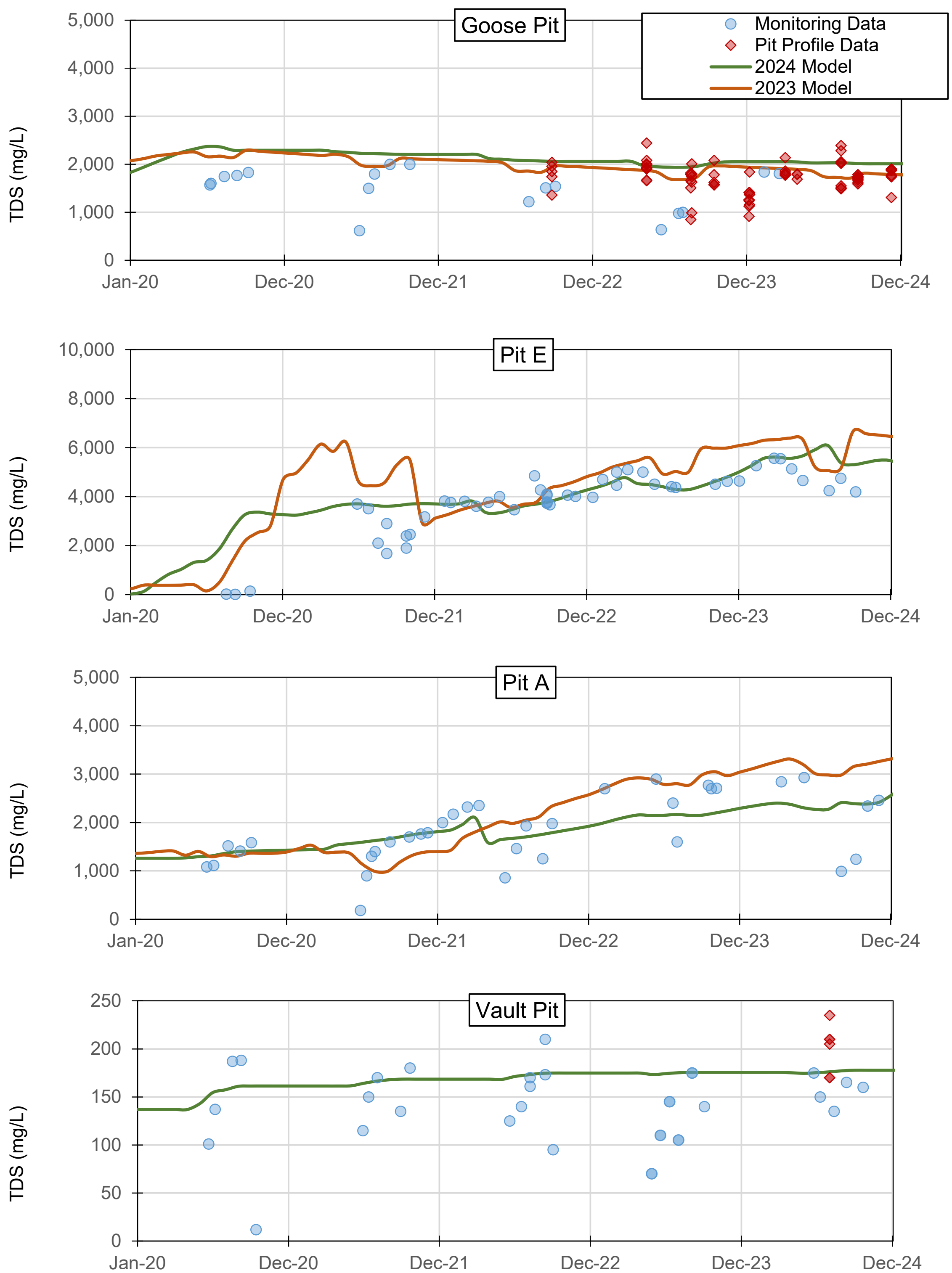

Figure 4-4: Water quality model validation results for total dissolved solids at Goose Pit, Pit E, Pit A and Vault Pit. Model forecasts show predictions from the 2023 Annual Report and the 2024 Annual Report.

5. Water Balance Model Results

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5. Water Balance Model Results

The water balance model predictions for key nodes and all mine phases for the average climate scenario are presented in this section. Results are provided for collection ponds, open mine pits, water treatment plant discharge volumes, and Active Closure pit flooding and water management. The Portage Pits (Goose, Pit E and Pit A) are managed to ensure flooded pit water levels remain below the thresholds specified in Table 3-8. Flooded pit water levels are shown in Figure 5-1.

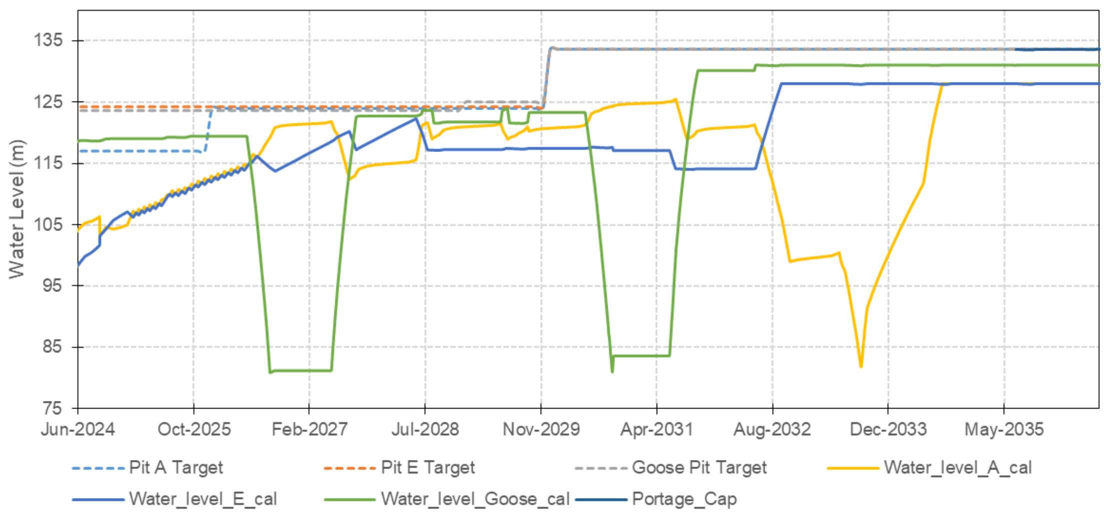

Figure 5-1: Modelled water levels and target water levels in the Portage Pits.

5.1 Goose Pit

For the remainder of the Operations phase, pumped inflows to Goose Pit will be limited to transfers from Pit A, with limited surrounding catchment runoff (118,000 m^3/year) augmenting the water balance. The Goose Pit water will continue to be aerated to treat nitrogen species until June 2026, at which time 3.82 Mm^3 of treated water will be pumped from Goose Pit to the base of Vault Pit over the open water season of 2026 (Figure 5-2 and Table 5-1).

An additional 4.11 Mm^3 will be transferred from Pit A via the WTP (to reduce Cu and As concentrations) in the open water season of 2027, followed by an additional 1.72 and 1.34 Mm^3 in 2028 and 2029, respectively, to maintain Pit A below the water level thresholds specified in Table 3-8. The 3.06 Mm^3 transferred from Pit A to Goose Pit in 2028 and 2029 is transferred directly to Vault Pit via the Vault transfer line in the same year.

In pit treatment of nitrogen species will continue in Goose Pit from 2027 to 2029, with 4.5 Mm^3 transferred from Goose Pit to the base of Vault Pit in 2029 (Figure 5-2 and Table 5-1). A total of 8.32 Mm^3 of process water is predicted to be aerated in Goose Pit and transferred to the base of Vault Pit over the 2024 to 2030 period. Of that, 7.17 Mm^3 of the total aerated volume in Goose Pit will have been transferred from Pit A via the WTP.

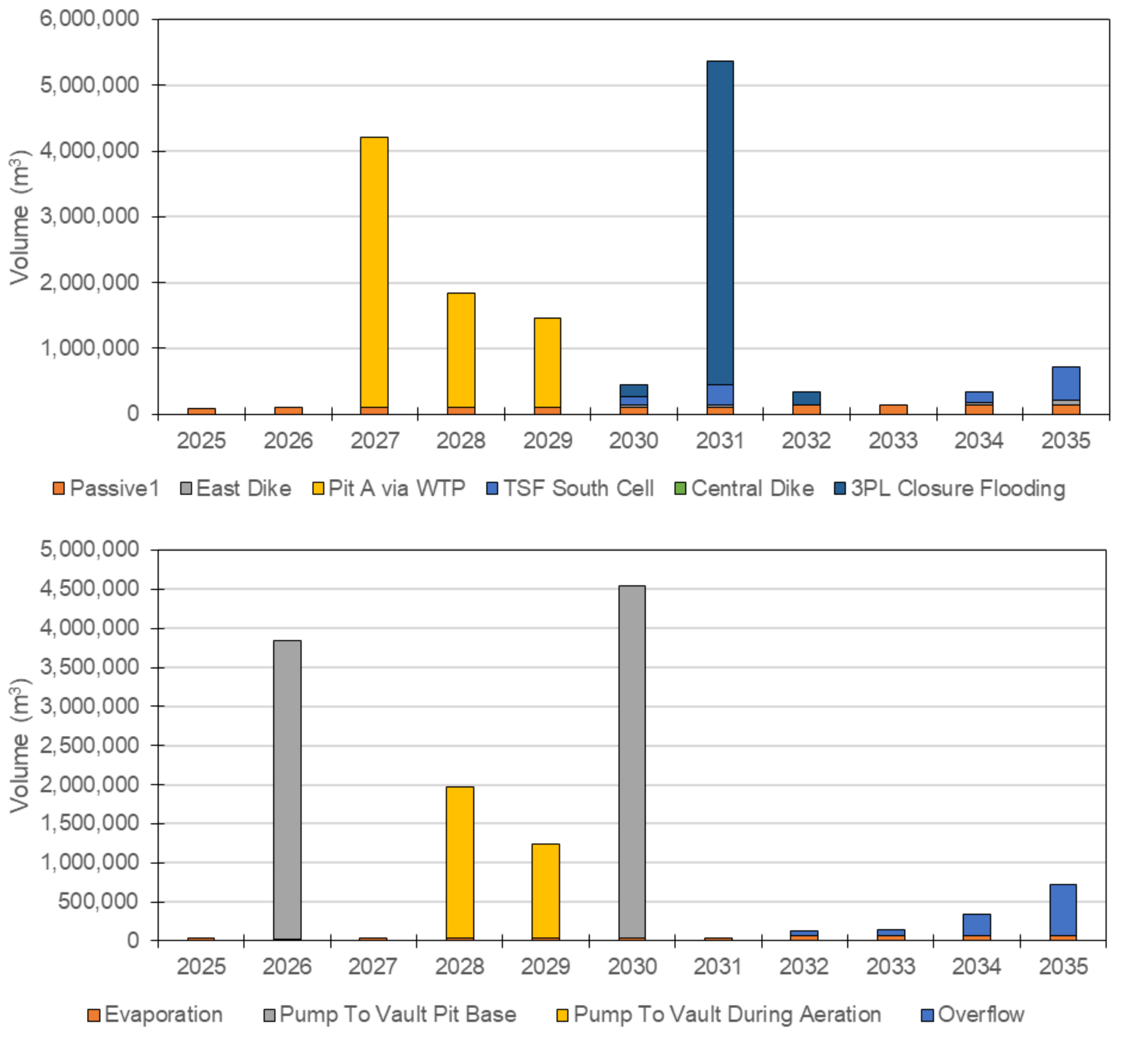

Figure 5-2: Goose Pit annual inflows (top) and outflows (bottom).

Table 5-1:
Goose Pit Annual Water Balance. All values in m^3/year.

Year	Inflows						Outflows			
	Passive[1]	East Dike	Pit A via WTP	TSF South Cell	Central Dike	3PL Closure Flooding	Evaporation	Pump To Vault Pit During Aeration	Pump To Vault - Operations[2]	Overflow[3]
2025	88,098	0	0	0	0	0	37,343	0	0	0
2026	106,904	0	0	0	0	0	29,652	3,815,474	0	0
2027	107,225	0	4,108,800	0	0	0	30,606	0	0	0
2028	112,120	0	1,718,400	0	0	0	39,392	0	1,929,600	0
2029	112,359	0	1,344,000	0	0	0	39,105	0	1,200,000	0
2030	107,834	28,789	0	125,604	0	179,632	31,745	4,507,798	0	0
2031	111,866	21,372	0	318,934	0	4,919,040	33,878	0	0	0
2032	138,382	0	0	0	0	194,025	66,473	0	0	63,552
2033	138,551	0	0	0	0	0	66,994	0	0	71,557
2034	139,133	45,070	0	156,266	0	0	67,003	0	0	273,466
2035	139,184	80,545	0	500,398	0	0	67,000	0	0	653,128

Notes:
[1] Passive inflows include rainfall and snowmelt on flooded pit surface, surrounding catchment runoff, and pit wall runoff
[2] Additional transfer of Goose Pit water to Vault Pit required to maintain Goose Pit water level within target elevations
[3] Additional overflow from Goose Pit is retained within the Portage Pit conjoined lake

5.2 Pit E

The primary inputs to the Pit E water balance over the remaining years of the Operations phase are process water from the mill (7.47 Mm^3) and water rebalanced from Pit A (7.73 Mm^3) to maintain that flooded pit within the water level targets specified in Table 3-8. Passive runoff averages 163,000 m^3/year over the model run (Figure 5-3 and Table 5-2). Deposited tailings consume another 5.11 Mm^3 of pit storage volume.

The primary losses from the Pit E lake are as follows, in order of magnitude:

- Mill reclaim: 11.87 Mm^3
- Rebalance to Pit A: 4.13 Mm^3
- Tailings pore water entrapment: 2.70 Mm^3

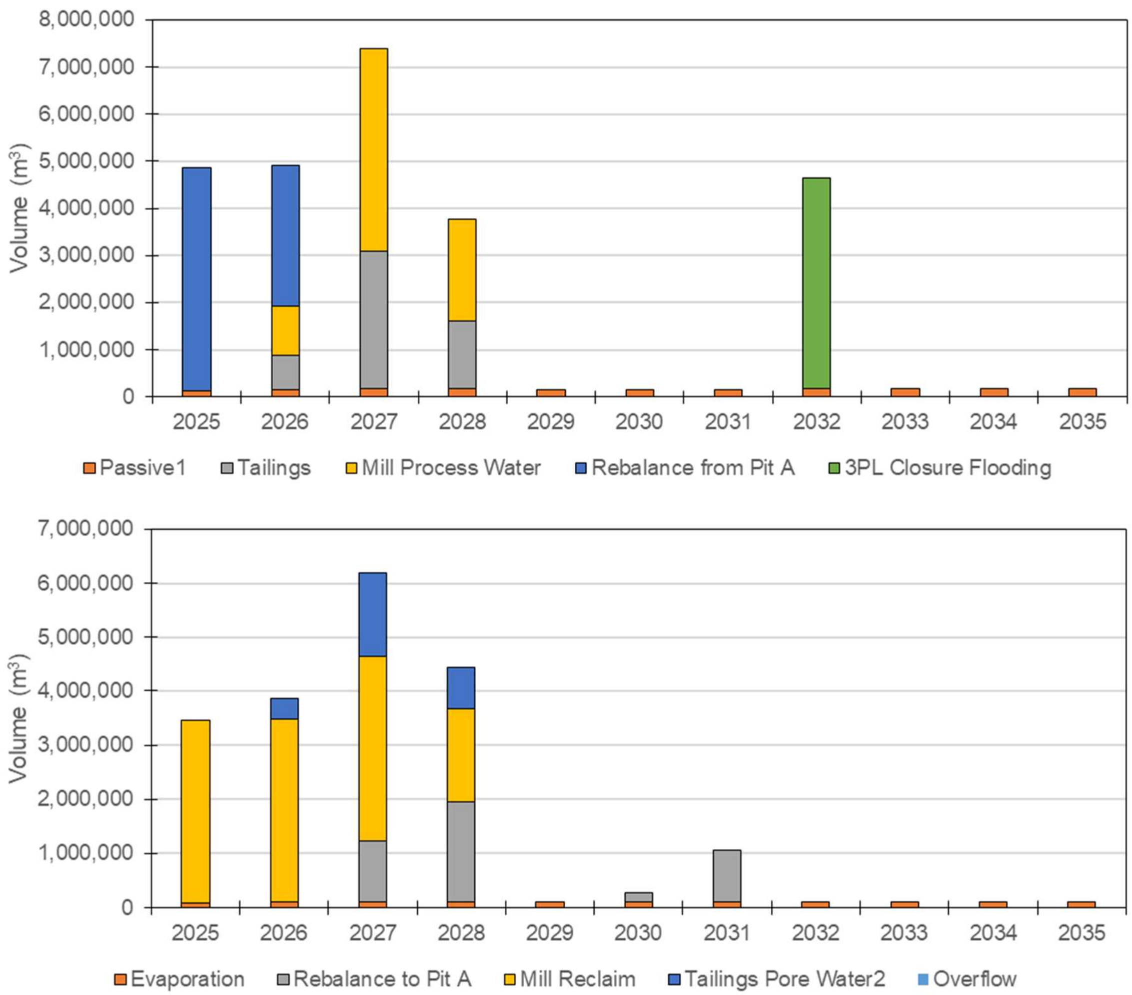

Figure 5-3: Pit E annual inflows (top) and outflows (bottom).

Table 5-2:
Pit E Annual Water Balance. All values in m^3/year.

Year	Inflows					Outflows				
	Passive[1]	Tailings	Mill Process Water	Rebalance from Pit A	3PL Closure Flooding	Evaporation	Rebalance to Pit A	Mill Reclaim	Tailings Pore Water[2]	Overflow
2025	120,798	0	1,627	4,734,000	0	92,510	0	3,372,173	0	0
2026	161,276	722,885	1,036,263	2,994,000	0	98,796	0	3,383,802	385,299	0
2027	164,082	2,931,297	4,287,471	0	0	101,744	1,132,800	3,409,055	1,548,493	0
2028	164,316	1,455,801	2,142,495	0	0	100,400	1,862,400	1,702,955	766,521	0
2029	163,155	0	0	0	0	100,340	0	0	0	0
2030	163,294	0	0	0	0	100,480	171,078	0	0	0
2031	161,234	0	0	0	0	98,073	968,527	0	0	0
2032	165,781	0	0	0	4,490,826	102,626	0	0	0	0
2033	176,533	0	0	0	0	113,959	0	0	0	0
2034	177,351	0	0	0	0	113,973	0	0	0	0
2035	177,419	0	0	0	0	113,968	0	0	0	0

Notes:
[1] Passive inflows include rainfall and snowmelt on flooded pit surface, surrounding catchment runoff, and pit wall runoff
[2] Accounts for process water lost to interstitial tailings pore spaces

5.3 Pit A

Pit A receives several pumped contact water streams in addition to tailings deposition (3.74 Mm^3) and mill process water (5.31 Mm^3). Runoff from the TSF South Cell (which includes runoff from the TSF North Cell) averages 591,000 m^3/year over the 2025 to 2034 period (Figure 5-4 and Table 5-3). Pumping from the Central Dike Downstream Pond contributes an average of 571,000 m^3 per year, East Dike seepage contributes 71,000 m^3/year, the Portage RSF contributes 54,000 m^3 per year from Sump ST-16, and the SWMP contributes 71,000 m^3 per year. This results in a combined average annual pumped contact water inflow of 1.3 Mm^3, for a total of 14.4 Mm^3 over the 2025 to 2035 period. Passive runoff contributes an additional 147,000 m^3/year.

An additional 4.13 Mm^3 is pumped from Pit E over 2027 to 2031 to maintain flooded pit water levels within the water level targets specified in Table 3-8.

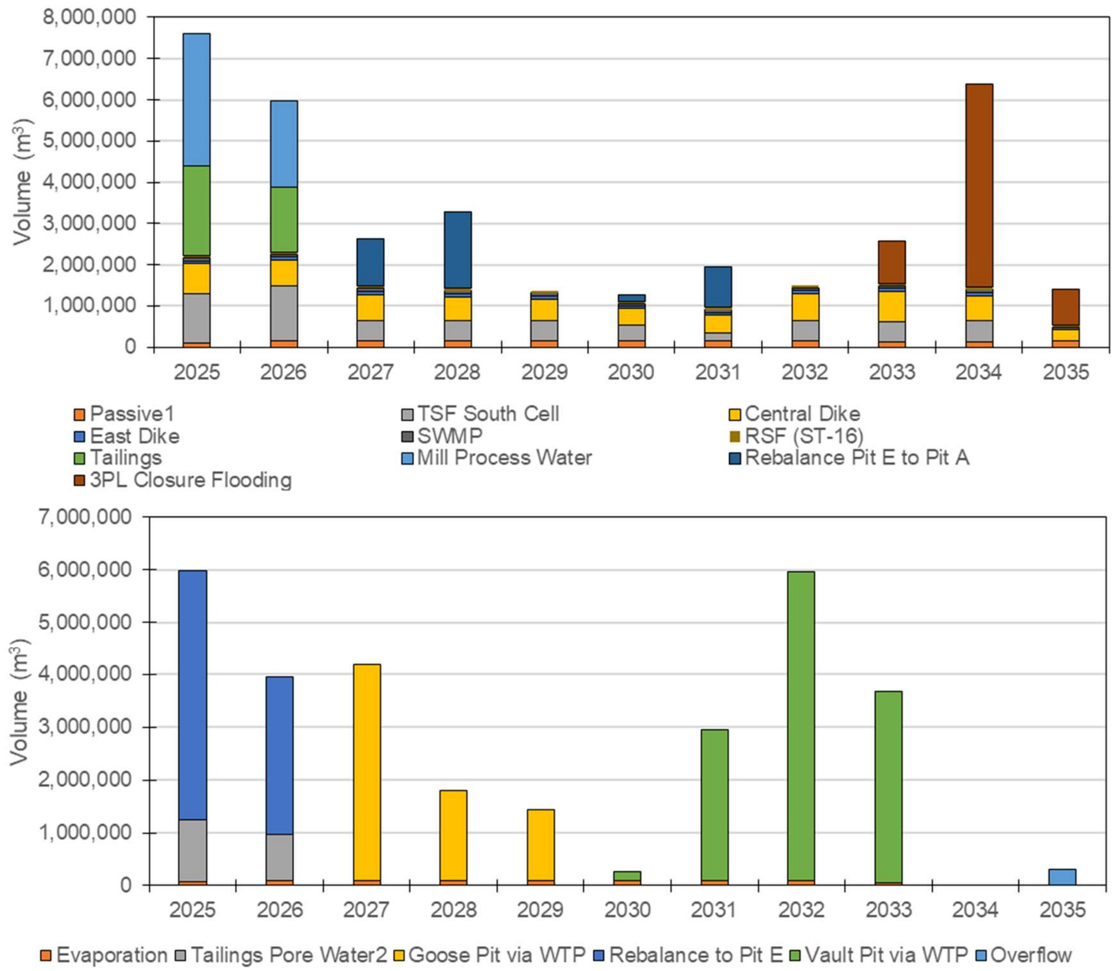

Figure 5-4: Pit A annual inflows (top) and outflows (bottom).

Table 5-3:
Pit A Annual Water Balance. All values in m^3/year.

Year	Inflows										Outflows					
	Passive[1]	TSF South Cell	Central Dike	East Dike	SWMP	RSF (ST-16)	Tailings	Mill Process Water	Rebalance Pit E to Pit A	3PL Closure Flooding	Evaporation	Tailings Pore Water[2]	Goose Pit via WTP	Rebalance to Pit E	Vault Pit via WTP	Overflow
2025	110,695	1,183,338	724,670	80,545	70,910	53,662	2,177,370	3,199,600	0	0	78,431	1,168,806	0	4,740,000	0	0
2026	150,692	1,332,484	618,247	80,545	70,910	53,662	1,564,632	2,109,855	0	0	86,582	879,266	0	2,988,000	0	0
2027	151,305	500,018	632,670	80,545	70,910	53,662	0	0	1,132,800	0	86,305	0	4,108,800	0	0	0
2028	152,292	499,457	568,442	80,545	70,910	53,662	0	0	1,862,400	0	88,694	0	1,718,400	0	0	0
2029	153,689	500,126	517,907	80,545	70,910	53,662	0	0	0	0	89,179	0	1,344,000	0	0	0
2030	156,347	374,505	405,792	51,756	70,910	53,662	0	0	171,078	0	92,532	0	0	0	171,078	0
2031	156,467	181,231	449,581	59,173	70,910	53,662	0	0	968,527	0	91,529	0	0	0	2,860,800	0
2032	146,081	498,859	642,585	80,545	70,910	53,662	0	0	0	0	83,631	0	0	0	5,875,200	0
2033	122,777	498,789	724,670	80,545	70,910	53,662	0	0	0	1,018,080	52,660	0	0	0	3,629,824	0
2034	137,367	500,262	616,780	80,545	70,910	53,662	0	0	0	4,919,040	0	0	0	0	0	0
2035	161,523	0	255,792	0	70,910	53,662	0	0	0	875,118	0	0	0	0	0	303,035

Notes:
[1] Passive inflows include rainfall and snowmelt on flooded pit surface, surrounding catchment runoff, and pit wall runoff
[2] An additional 1.4 Mm^3 is pumped from Third Portage Lake to fill the combined freshwater cap over Goose Pit, Pit E and Pit A in August-September 2034.
[3] Accounts for process water lost to interstitial tailings pore spaces

Outflows from Pit A are dominated by process water pumped to Goose Pit for treatment (7.17 Mm^3), rebalancing to Pit E (3.86 Mm^3), and transfers to the base of Vault Pit (12.54 Mm^3). A further 2.05 Mm^3 is lost as interstitial tailings pore water in 2025 and 2026 (Figure 5-4 and Table 5-3).

5.4 Vault Pit

The Vault Pit is employed as the long-term repository for treated process water from the Portage Pits beginning in 2026, following the first transfer of water (3.82 Mm^3) from Goose Pit (Figure 5-6 and Table 5-4). The second transfer of treated water from Goose Pit takes place in June to September of 2030 (4.51 Mm^3). Finally, an additional 12.54 Mm^3 is transferred directly from Pit A to the base of Vault Pit from 2030 to 2033, as shown by the increasing volume and water levels in Vault Pit (Figure 5-5). In total, 23.99 Mm^3 of process water is transferred to the base of Vault Pit from the Portage Pits, consisting of 8.32 Mm^3 of treated water from Goose Pit, and 12.54 Mm^3 of process water from Pit A (Figure 5-6 and Table 5-4).

Once the bypass system from the Phaser Pit to the Vault AP is in place in 2026, the average annual passive inflows to Vault Pit drop from 696,000 m^3 to an average of 339,000 m^3 until the Vault Pit water level reaches the ultimate elevation of 140 m with a freshwater cap depth of 13.5 m, and the bypass system is decommissioned in 2034 (Table 5-4 and Figure 5-5).

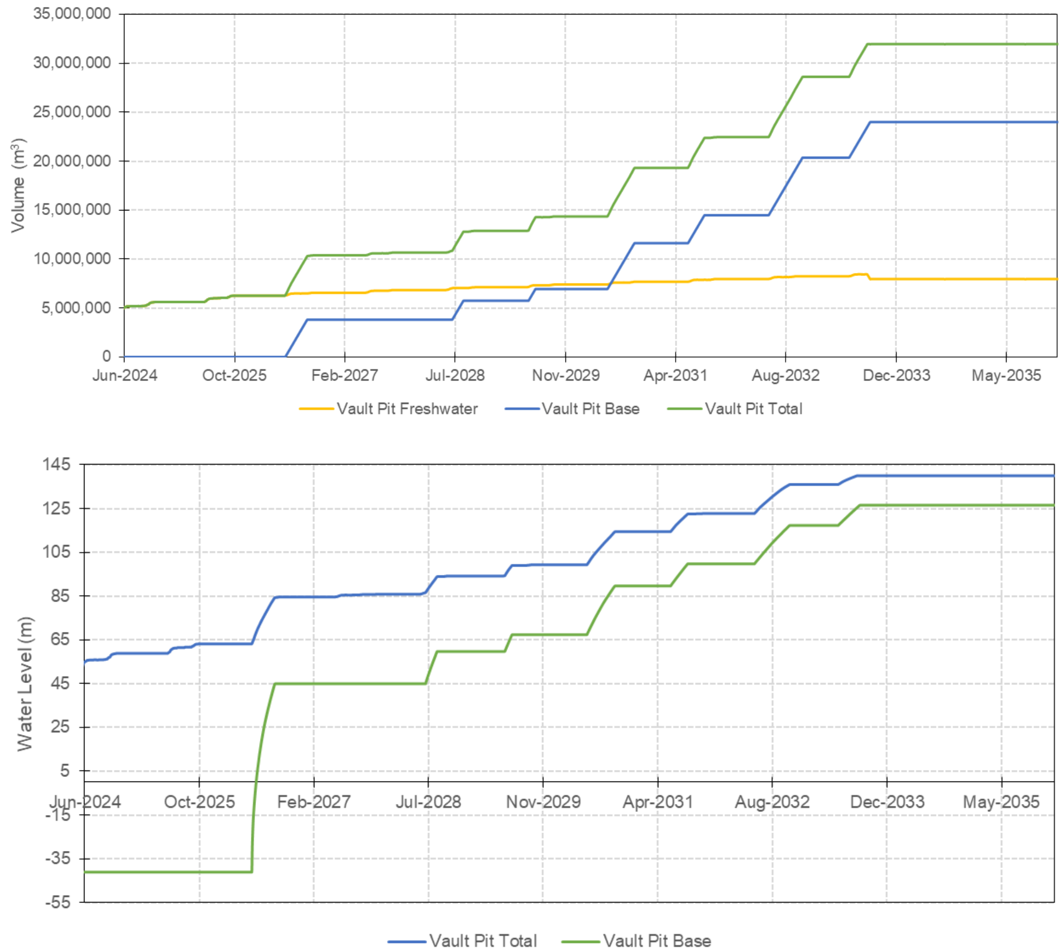

Figure 5-5: Modelled volumes (top) and water levels (bottom) (Base = process water; freshwater cap, and total flooded pit water level) for the period 2024-2035.

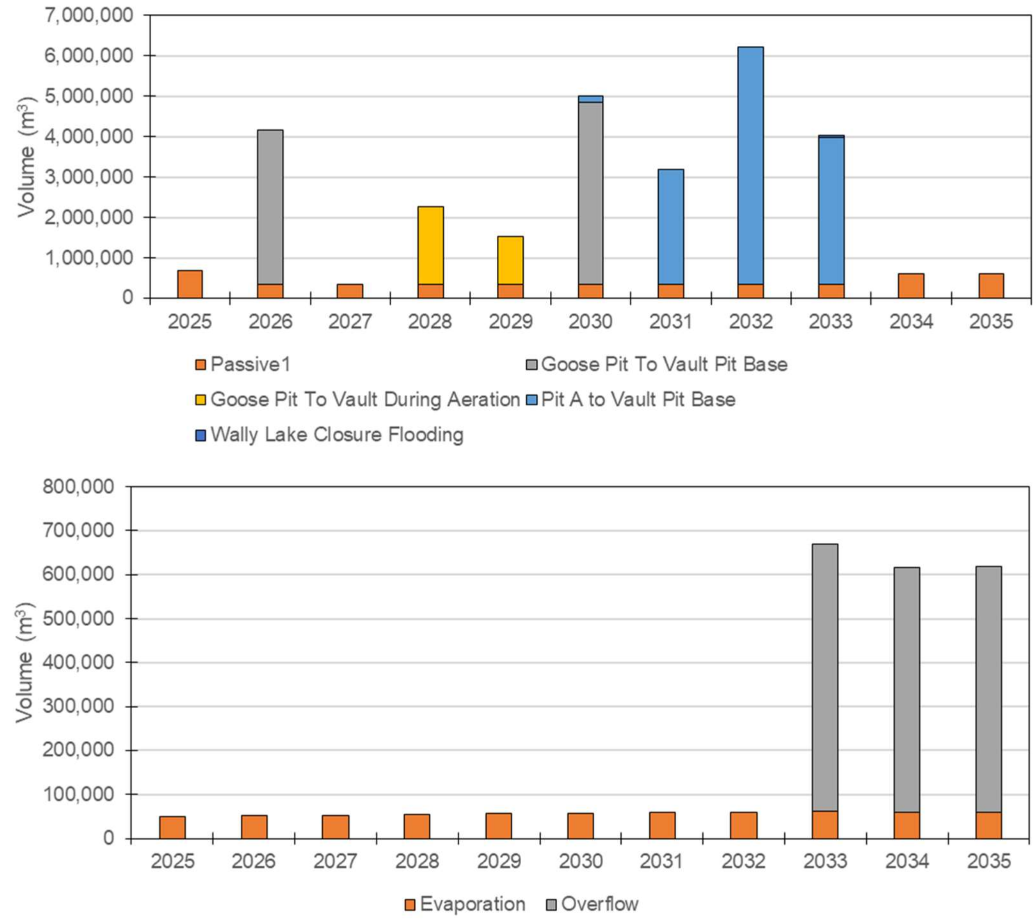

Figure 5-6: Vault Pit annual inflows (top) and outflows (bottom).

Table 5-4:
Vault Pit Annual Water Balance. All values in m^3/year.

Year	Inflows					Outflows	
	Passive[1]	Goose Pit to Vault Pit Base During Aeration	Goose Pit to Vault - Operations[2]	Pit A to Vault Pit Base	Wally Lake Closure Flooding	Evaporation	Overflow
2025	696,831	0	0	0	0	49,610	0
2026	353,695	3,815,474	0	0	0	51,252	0
2027	334,124	0	0	0	0	53,245	0
2028	335,859	0	1,929,600	0	0	55,252	0
2029	335,699	0	1,200,000	0	0	56,918	0
2030	336,880	4,507,798	0	171,078	0	57,791	0
2031	337,477	0	0	2,860,800	0	58,793	0
2032	338,298	0	0	5,875,200	0	60,130	0
2033	344,861	0	0	3,629,824	43,445	61,671	608,181
2034	615,365	0	0	0	0	59,253	556,112
2035	617,826	0	0	0	0	59,250	558,576

Notes:
[1] Passive inflows include rainfall and snowmelt on pit lake surface, surrounding catchment runoff, and pit wall runoff
[2] Accounts for process water lost to interstitial tailings pore spaces

5.4.1 Vault Attenuation Pond Discharge to Wally Lake

To limit additional inflows to Vault Pit while treated process water is being transferred from the Portage Pits, all runoff from the Phaser Pit catchment (including runoff reporting to the BB Phaser Pit) is pumped from Phaser Pit to the Vault AP for treatment and discharge to Wally Lake. This begins in June 2026 and is in place until September 2033, at an average rate of 274,000 m^3/year, over the open water season (June to September; Table 5-5 and Figure 5-7). The transferred volume from Phaser Pit is higher in 2026 (332,000 m^3) due to the Phaser Pit water level being drawn down in advance of the 2027 freshet.

The corresponding treated discharges to Wally Lake are provided in Table 5-5and following a higher discharge rate in 2026 (832,000 m^3) to bring the system into equilibrium, average 449,000 m^3/year over 2027 to 2033.

Table 5-5:
Vault Attenuation Pond Annual Water Balance All values in m^3/year.

Year	Inflows		Outflows	
	Passive	Phaser Pit	Evaporation	Discharge to Wally Lake
2025	234,238	0	145,583	0
2026	304,112	331,800	142,016	831,600
2027	296,237	277,200	126,195	459,900
2028	296,193	277,200	125,115	447,300
2029	295,561	277,200	125,867	447,300
2030	296,096	277,200	125,914	449,400
2031	296,114	277,200	125,907	447,300
2032	295,784	277,200	125,041	447,300
2033	294,897	197,400	125,824	447,300
2034	295,885	0	127,384	0
2035	302,486	0	137,865	0

Note: Vault Attenuation Pond expected to overflow to Wally Lake in 2045

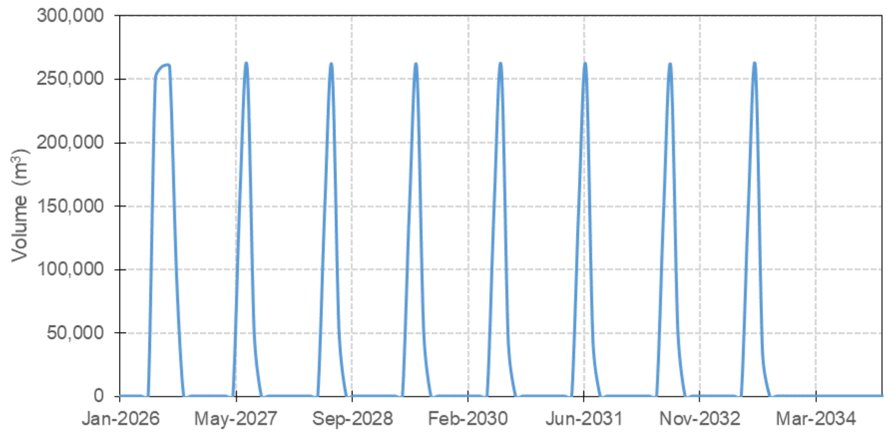

Figure 5-7: Monthly treated Vault Attenuation Pond discharge to Wally Lake.

5.5 Active Pit Flooding and Lake Water Balances

The active pit flooding phase spans the period of 2030 to 2036 (Table 5-6), with pit specific timelines as follows:

- Goose Pit: 5.29 Mm^3 pumped from Third Portage Lake in 2030 to 2032 (June to September only);
- Pit E: 4.49 Mm^3 pumped from Third Portage Lake in 2032 (June to September only);
- Pit A: 6.81 Mm^3 pumped from Third Portage Lake in 2033 to 2035;
- Combined Pit Freshwater Cap: 1.19 Mm^3 pumped from Third Portage Lake in January to June 2035; and,
- Vault Pit: 43,445 m^3 pumped from Wally Lake in September 2033, resulting in a freshwater cap depth of 13.5 m (Table 5-7).

The total annual volumes pumped from the surrounding lakes to actively flood the open pits remain within the licensed withdrawal rates for the duration of the Active Closure phase. A total of 18.2 Mm^3 is pumped from Third Portage Lake to fill the Portage Pits.

The predicted dates that each flooded pit is filled to the final water elevation (133.6 m for the Portage Pits, and 140 m for Vault Pit) are as follows, and as shown in Figure 5-1:

- Goose Pit: June 2032
- Pit E: June 2035
- Pit A: August 2034
- Combined Flooded pit (to 133.6 m elevation): June 2035
- Vault Pit: September 2033

Table 5-6:
Annual summary of water volumes pumped from Third Portage Lake and Wally Lake to actively flood pits

Year	Active Pumping from 3PL to (m^3/year):					Wally Lake
	Goose Pit	Pit A	Pit E	Combined Pit	Annual Total	Vault Pit
2030	179,632	0	0	0	179,632	0
2031	4,919,040	0	0	0	4,919,040	0
2032	194,025	0	4,490,826	0	4,684,851	0
2033	0	1,018,080	0	0	1,018,080	43,445
2034	0	4,919,040	0	0	4,919,040	0
2035	0	875,118	0	1,193,619	2,068,737	0
2036	0	0	0	0	0	
Total	5,292,697	6,812,238	4,490,826	1,193,619	17,789,380	43,445

Table 5-7:
Final flooded pit water levels and depth of freshwater

Pit	Final Water Level (m)	Freshwater Depth (m)
Goose Pit	133.6	52.7
Pit E	133.6	19.6
Pit A	133.6	51.8
Vault Pit	140.0	13.5

The withdrawal of water from Third Portage Lake and Wally Lake to flood the pits to the final closure elevation has the potential to impact the existing lake water balances, and by extension, downstream receiving waters fish habitat. To mitigate these potential impacts, annual withdrawal volumes are restricted by current license conditions and limited to open water season (June to September) withdrawals. Withdrawals are deducted from lake volumes in the GoldSim pool elements (as described in Section 3.6.2) and compared to a threshold defined by the 90th percentile baseline lake volume (equivalent to a 10% reduction in total lake volume on any given day).

The modelled lake volumes over the active pit flooding period show minimal reductions from the baseline condition and never drop below the 90th percentile baseline volume (Figure 5-8 and Figure 5-9).

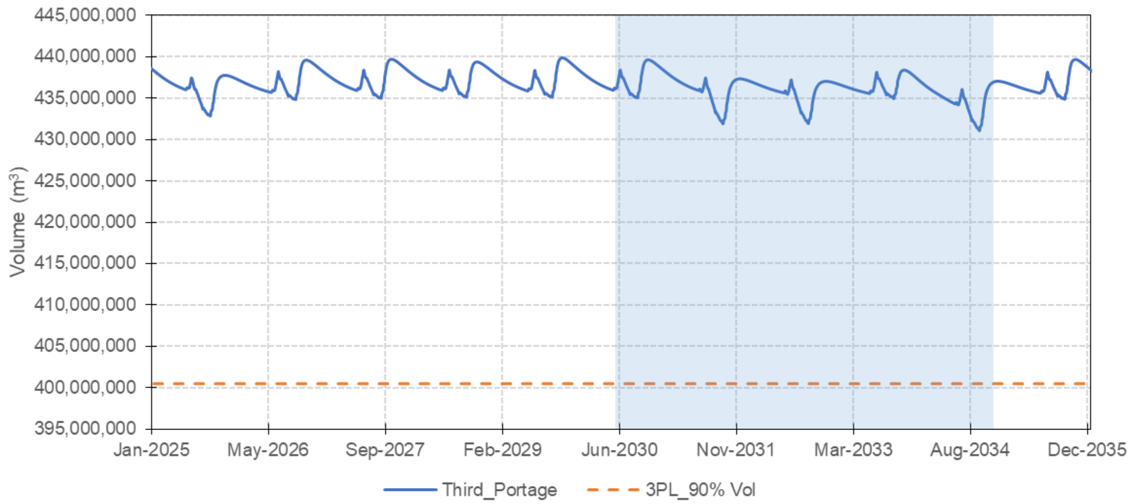

Figure 5-8: Third Portage Lake volume over pit flooding period (shown in blue) compared to 90th percentile volume.

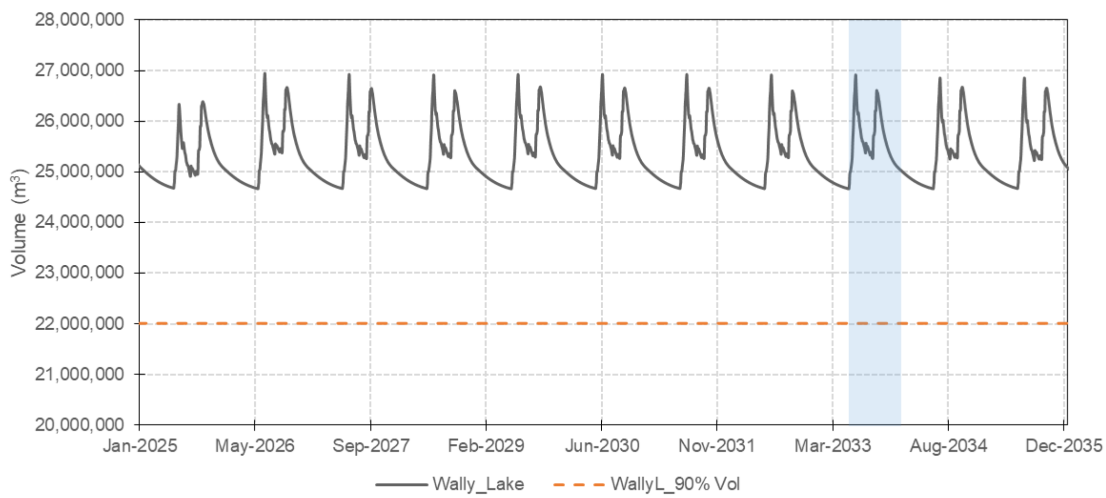

Figure 5-9: Wally Lake volume over pit flooding period (shown in blue) compared to 90th percentile volume.

5.6 Dry- and Wet-Year Scenarios

As described in Section 3.4.1, the remainder of the Operations phase (2025-2028) was run with representative dry- and wet-year air temperature and precipitation inputs. As the majority of the pit water balances are driven by mill outputs (tailings and process water), there is little variability (0.2%) in the volumes of water requiring treatment in Goose Pit, or transfer to Vault Pit (Table 5-8).

**Table 5-8:
Total volumes transferred to Vault Pit over remainder of the Operations phase for climate sensitivities. All values in m³.**

Model Scenario	Goose Pit To Vault Pit Base	Goose Pit To Vault During Aeration	Pit A to Vault Pit Base
Dry Year	8,266,747	1,670,400	12,506,212
Average Year	8,323,271	3,129,600	12,536,902
Wet Year	8,427,769	3,869,375	12,527,847

Minimal difference in average annual treated discharges from the Vault Attenuation Pond to Wally Lake are predicted for the average year and wet-year scenarios, while the dry-year scenario shows a five-fold reduction in treated effluent discharges relative to the other two scenarios.

**Table 5-9:
Average annual treated volumes discharged from Vault Attenuation Pond to Wally Lake for climate sensitivities. All values in m^3/year.**

Model Scenario	Vault Attenuation Pond Discharge to Wally Lake
Dry Year	92,925
Average Year	449,400
Wet Year	483,296

Similarly, the predicted volumes of water pumped from Third Portage Lake to the Portage Pits varies very little between the scenarios (0 to 0.1%; Table 5-10). There is greater variability in the volumes of water pumped from Wally Lake to complete the filling of Vault Pit between the climate scenarios.

**Table 5-10:
Total volumes pumped to Portage Pits from Third Portage Lake and to Vault Pit from Wally Lake for climate sensitivities. All values in m³.**

Model Scenario	Active Pumping from 3PL to (m^3/year):					Wally Lake
	Goose Pit	Pit A	Pit E	Combined Portage Cap	Annual Total	Vault Pit
Dry Year	5,295,819	6,812,238	4,488,411	1,193,619	17,790,087	1,517,246
Average Year	5,292,697	6,812,238	4,490,826	1,193,619	17,789,380	43,445
Wet Year	5,284,264	6,812,238	4,489,059	1,193,619	17,779,180	37,207

6. Water Quality Model Results

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6. Water Quality Model Results

Water quality model results for flooded pits, mine discharge and closure lakes are presented in this section. Effluent predictions for active discharge to Wally Lake are screened against Water Use License (WUL) and Metal Mining Effluent Regulations (MMER) at the end of pipe. Water quality predictions for the receiving environment in Wally Lake are screened against core receiving environment monitoring plan (CREMP) guidelines assuming a dilution factor of 10:1 at the edge of the initial dilution zone (IDZ).

Flooded pits will be reconnected with the surrounding surface water environment after the pits are fully flooded and dikes are breached. Prior to breaching the dikes, the Flooded pit water quality will need to meet site-specific water quality objectives (SSWQOs) and/or Canadian Council of Ministers of the Environment (CCME) criteria, as per conditions of Water License 2AM-MEA1530, part E, item 7.

The full water quality model results screened against relevant guidelines are provided in Appendix A. Time series predictions for arsenic and TDS are presented in the following sections and are compared against 2023 model results.

6.1 Vault Pit and Vault Attenuation Pond

6.1.1 Vault Attenuation Pond Discharge to Wally Lake

The Vault AP currently collects non-contact water from surrounding catchments and passively drains into the Vault Pit. In June 2026, BB Phaser and Phaser Pit water will begin to be diverted into Vault Attenuation Pond, treated, and then discharged to Wally Lake. This discharge will continue until August 2033, when Vault Pit is flooded in closure.

Vault AP water quality predictions are screened against relevant criteria during the discharge period (June 2026 – August 2033) and are shown in Table 6-1. An increasing trend in Vault AP water quality is expected starting in 2026 owing to diversion of water from the satellite pits (Figure 6-1), however, predicted concentrations remain significantly (>10x) below Vault AP discharge limits for the duration of the discharge period (Table 6-1).

Table 6-1: Vault Attenuation Pond during discharge period to Wally Lake (June 2026 to August 2033) screened against 10xCREMP, WUL and MMER water quality criteria.

Parameter	Units	Model Results (Jun. 2026 to Aug. 2033)			Screening Criteria		
		Min	Mean	Max	10X CREMP[1]	Discharge to Wally Lake (WUL)	Discharge to Wally (MMER)
Total Dissolved Solids	mg/L	97.0	101.7	103.9	-	-	-
Total Ammonia-N	mg/L	0.0258	0.0270	0.0275	1.26	20	-
Nitrate-N	mg/L	0.289	0.304	0.310	30	50	-
Total Cyanide	mg/L	0	0	0	-	-	0.5
Chloride	mg/L	4.28	6.30	7.10	1200	500	-
Fluoride	mg/L	0.0530	0.0593	0.0608	1.2	-	-
Sulphate	mg/L	44.5	45.5	46.1	1280	-	-
Aluminum	mg/L	0.0247	0.0251	0.0254	1	1	-
Arsenic	mg/L	0.0010	0.0024	0.0029	0.25	0.1	0.5
Cadmium	mg/L	0.0000124	0.0000127	0.0000132	0.0004	0.002	-
Copper	mg/L	0.00178	0.00211	0.00220	0.02	0.1	0.3
Iron	mg/L	0.0366	0.0372	0.0383	3.0	-	-
Mercury	mg/L	0.0000051	0.0000052	0.0000053	0.00026	0.004	-
Nickel	mg/L	0.00220	0.00268	0.00280	0.25	0.2	0.5
Lead	mg/L	0.0000871	0.0000891	0.0000902	0.01	0.1	0.2
Selenium	mg/L	0.0000541	0.0000624	0.0000642	0.01	0	-
Zinc	mg/L	0.00243	0.00248	0.00253	0.04	0.2	0.5

1. Core receiving environment guidelines (CREMP) multiplied by estimated initial dilution zone of 10:1 in Wally Lake.

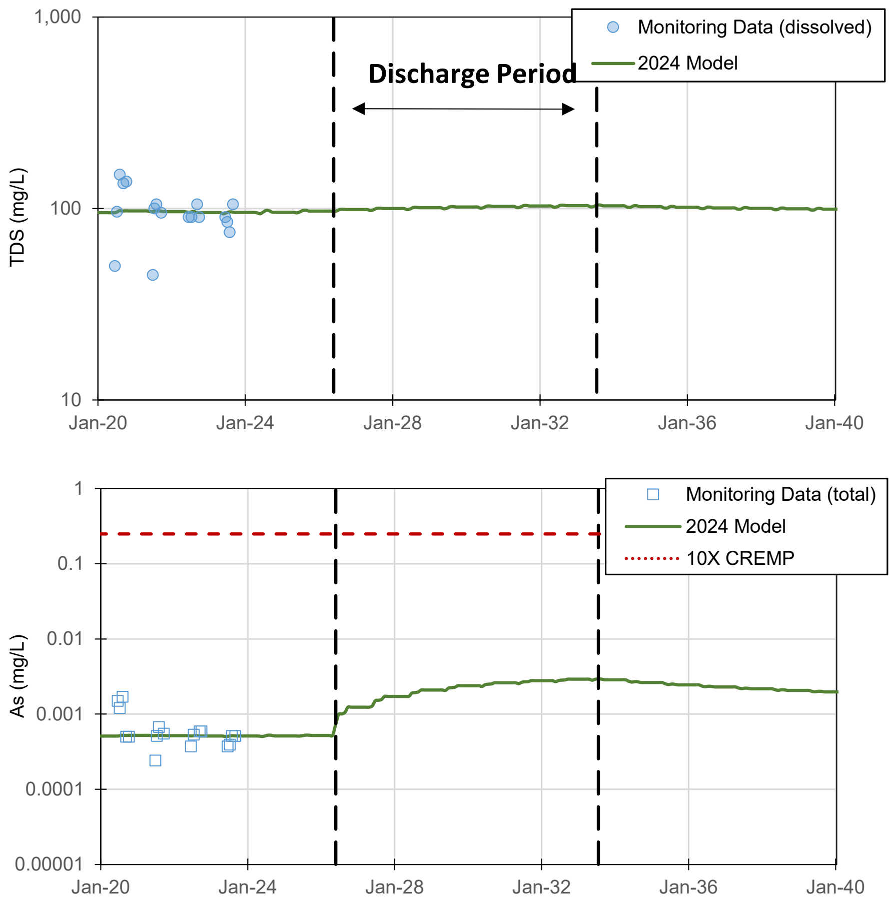


Figure 6-1: Water quality model results for TDS (top) and As (bottom) in Vault Attenuation Pond plotted alongside available monitoring data. Dashed black lines bracket the time period that discharge to Wally Lake occurs. Dashed red line shows 10X CREMP guidelines.

6.1.2 Vault Pit

The Vault Pit is currently passively flooding with runoff from the surrounding catchment. Starting in 2026, the Vault AP water, Phaser Pit and BB Phaser Pit will be diverted away from Vault Pit, and treated process water from the Portage Area will begin to be transferred into Vault Pit. The treated process water will be pumped to the base of the existing Vault Pit to establish meromictic conditions, permanently isolating the treated process water from the surface water environment. In the current WQM, the surface waters above the mixolimnion (*i.e.*, upper layer of meromictic lake which periodically circulates) is tracked separately from process water stored below the mixolimnion and no interaction is assumed. Vault Pit surface water will continue to receive runoff from the surrounding catchment until 2033, when pumping from Wally Lake begins. The water level is expected to reach 140 masl by September 2033, at which point the Vault Dike will then be breached reconnecting the Vault Pit surface waters with Wally Lake (Figure 3-27). Note that Vault Dike will not be breached until water quality in the flooded pit surface waters reaches levels that will maintain the reconnected lakes below the CCME water quality guidelines, background water quality, or site specific water quality objectives (SSWQOs), per condition of the Water License 2AM-MEA1530, part E, item 7.

The concentration trends in Vault Pit surface waters show a modest increase over time prior to September 2033, owing to removal of flows from BB Phaser, Phaser Pit, and Vault AP, and continued loading from remaining Vault Pit wall rock exposures and the Vault WRSF (Figure 6-2). Despite these trends, the water quality model predicts all parameters will remain below guideline concentrations at the date of reconnection with Wally Lake in September 2033 Water quality results for the Vault Pit surface waters at the point of dike breaching (September 2033) are screened against relevant water quality criteria in Table 6-3.

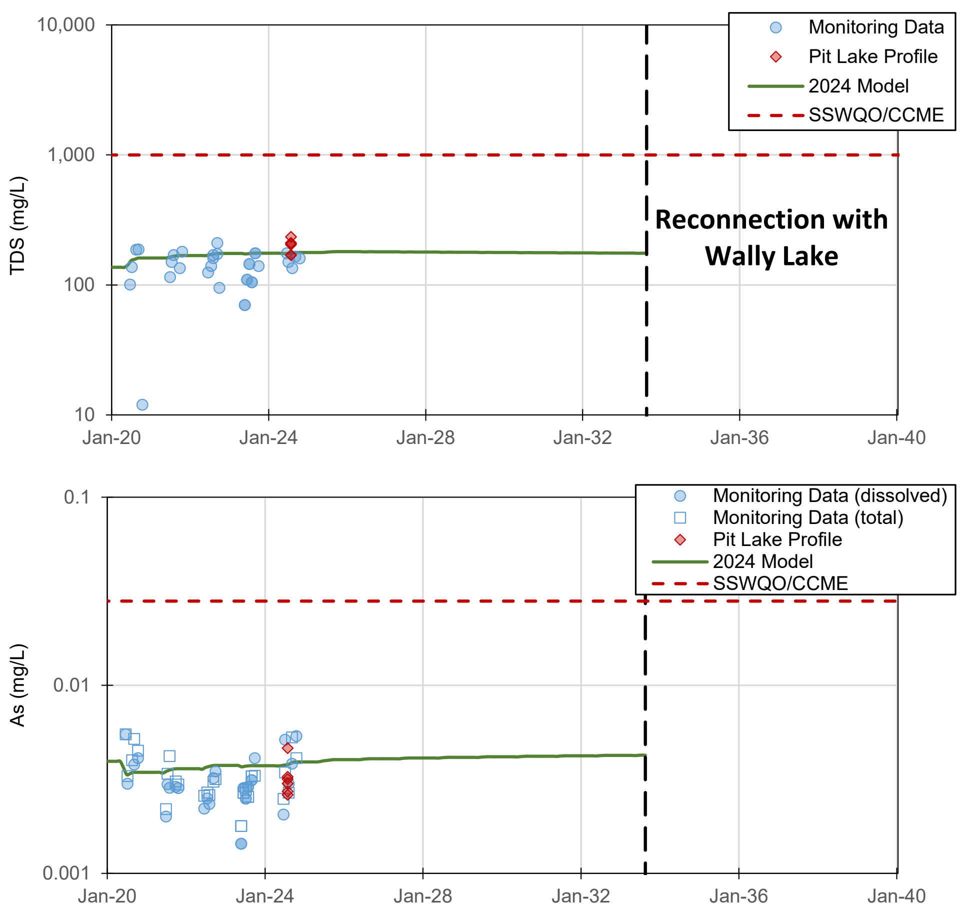


Figure 6-2: Water quality model results for TDS (top) and As (bottom) for Vault Pit surface waters plotted alongside available monitoring data. Dashed black line shows the date when Vault Pit is reconnected with Wally Lake. Dashed red line shows SSWQO/CCME guidelines.

Table 6-2:
Water quality model results for Vault Pit surface waters in September 2033 when Vault Dike is breached, screened against SSWQO/CCME, WUL and MMER water quality criteria.

Parameter	Units	Vault Pit Surface Water Quality September 2033	Screening Guidelines		
			SSWQO/CCME[1]	Discharge to Wally Lake (WUL)	MMER
Total Dissolved Solids	mg/L	175.0	1000	-	-
Total Ammonia-N	mg/L	0.161	1.3	20	-
Nitrate-N	mg/L	1.34	45	50	-
Total Cyanide	mg/L	0.000638	-	-	0.5
Chloride	mg/L	6.97	128	500	-
Fluoride	mg/L	0.097	0.12	-	-
Sulphate	mg/L	67.5	128	-	-
Aluminum	mg/L	0.0231	0.1	1	-
Arsenic	mg/L	0.00425	0.028	0.1	0.5
Cadmium	mg/L	0.0000196	0.00019	0.002	-
Copper	mg/L	0.00200	0.0023 – 0.0056	0.1	0.3
Iron	mg/L	0.0318	0.3	-	-
Mercury	mg/L	0.00000846	0.000026	0.004	-
Molybdenum	mg/L	0.0112	0.073	-	-
Nickel	mg/L	0.00443	0.113	0.2	0.5
Lead	mg/L	0.000134	0.00421	0.1	0.2
Selenium	mg/L	0.000227	0.001	-	-
Zinc	mg/L	0.00374	0.0216	0.2	0.5

1. CCME guidelines assuming 90th percentile pH of 7.73 and water temperature of 16°C observed in Third Portage Lake, and predicted hardness of 148 mg/L. Copper guideline is based on biotic ligand model assuming Wally Lake baseline conditions (2.3 to 5.6 µg/L).

6.2 Goose Pit, Pit A and Pit E

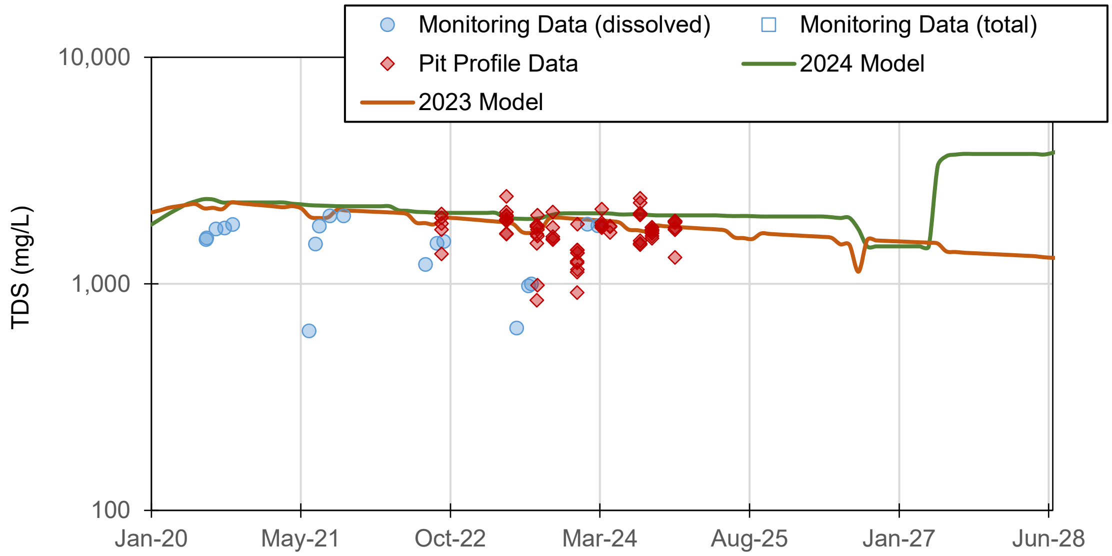
6.2.1 Operations

Tailings slurry has been stored in Pit A, Goose Pit and Pit E since active mining at Meadowbank ceased in 2019. Tailings will continue to be discharged to Pit E and Pit A, for the remainder of mine life and the flooded pits will be managed as zero discharge facilities. Pit A and Goose Pit will also continue to receive water from the Central Dike, SWMP and the TSF South Cell.

Goose Pit will not receive additional tailings discharge for the remainder of operations. An active aeration system is deployed in this pit to reduce concentrations of nitrogen species which will remain in operation until 2030. The concentration of non-nitrogen species is expected to remain relatively stable in Goose Pit until 2027, when process water from Pit A is transferred to Goose Pit via a metals water treatment plant. This will result in a decrease in arsenic which is treated by the metals WTP, and an increase in TDS and other untreated parameters associated with process water (Figure 6-3).

Pit A will receive tailings slurry and process water from December 2024 to June 2025, and from October 2025 to June 2026. This will result in an increase in arsenic and TDS concentrations over this time period. Concentrations will then stabilize until the final month of operations, when substantial quantities of Pit E water are pumped into Pit A (1.1 Mm^3 transferred in June 2028) resulting in an uptick in TDS concentrations immediately before closure (Figure 6-4).

Pit E will receive tailings slurry from October 2026 until the end of operations in June 2028. The primary inflow to Pit E from now until October 2026 is water transfers from Pit A. This will result in a modest decline in concentrations over this time period, as Pit A has lower concentrations than the process water which accumulated in Pit E prior to December 2024. This trend will be reversed in October 2026 when tailings slurry discharge resumes in Pit E and concentrations will increase from this point until the end of operations (Figure 6-5).



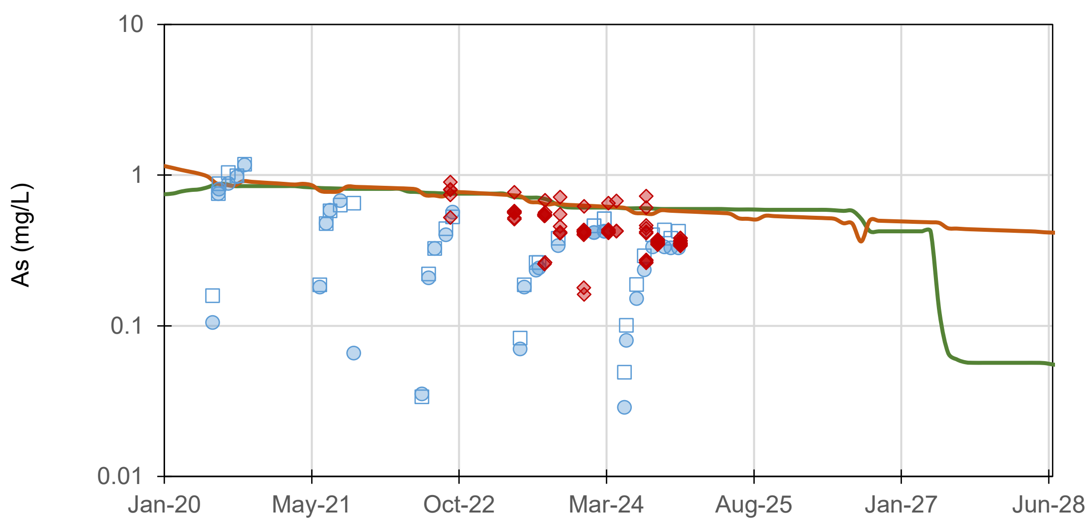


Figure 6-3: Water quality model results for TDS (top) and As (bottom) in Goose Pit during Operations Phase plotted alongside available monitoring data.

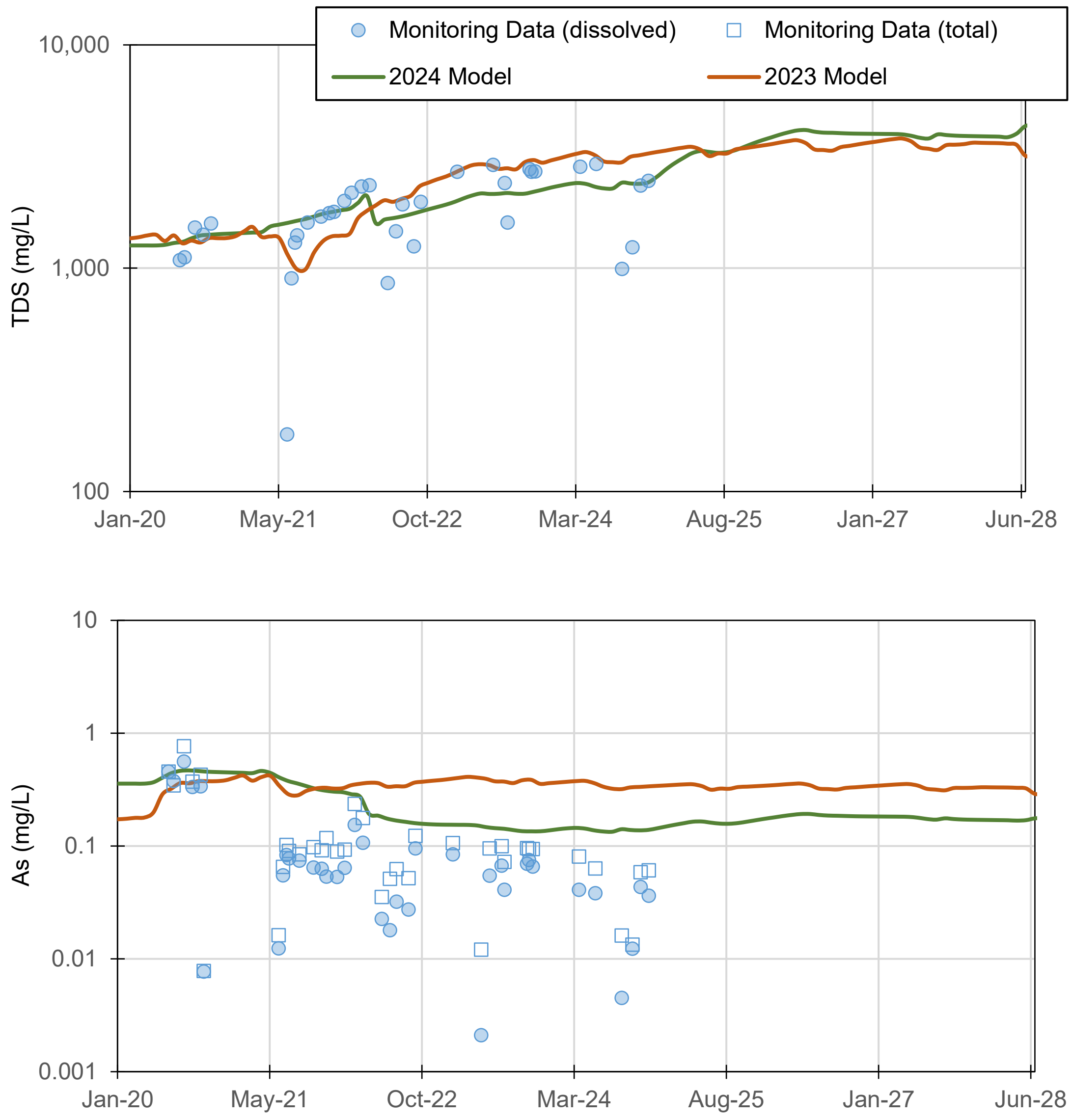


Figure 6-4: Water quality model results for TDS (top) and As (bottom) in Pit A during Operations Phase plotted alongside available monitoring data.

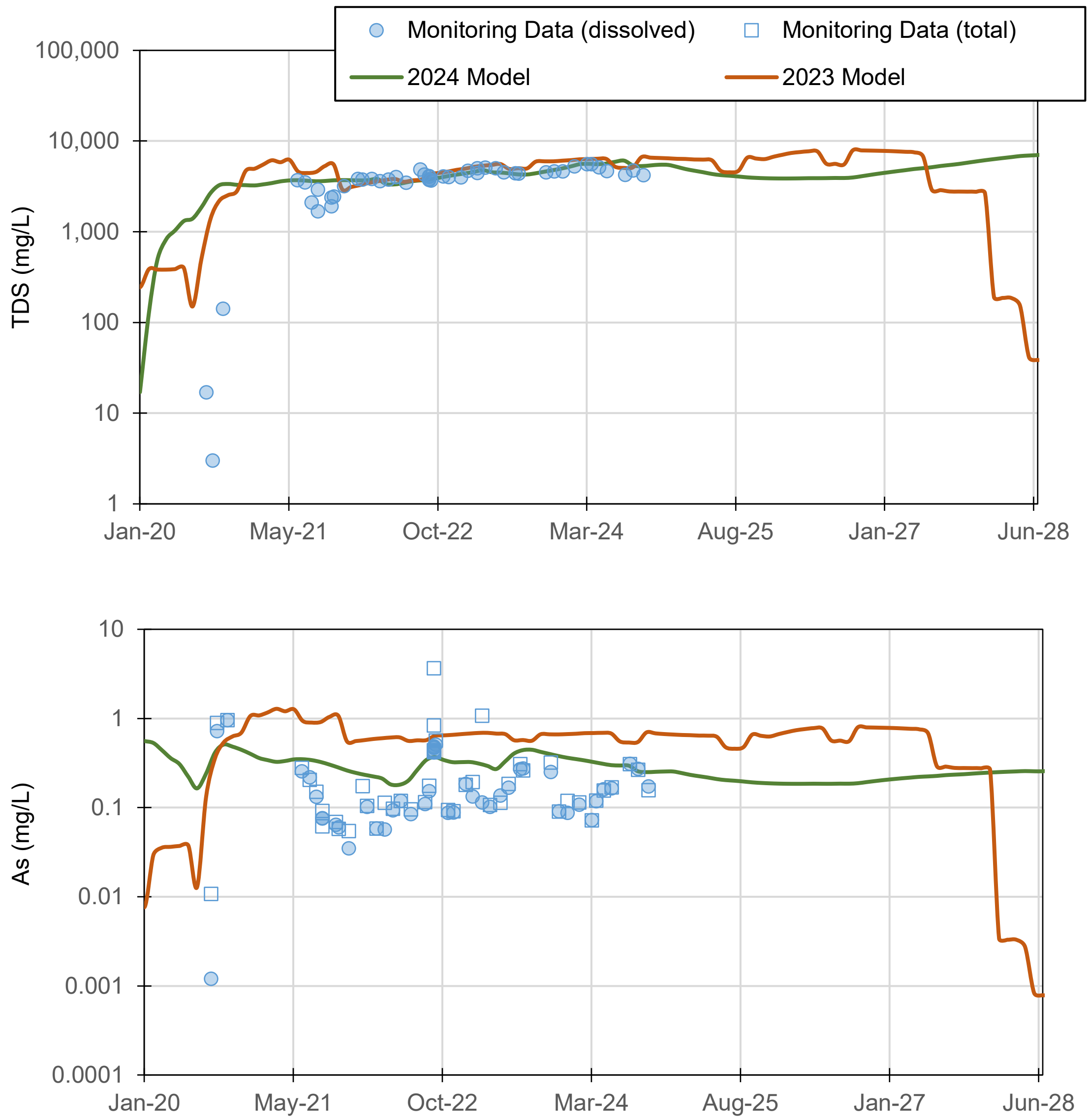


Figure 6-5: Water quality model results for TDS (top) and As (bottom) in Pit E during Operations Phase plotted alongside available monitoring data.

6.2.2 Closure

At the end of operations, process water in Goose Pit, Pit E and Pit A will be treated in-situ for nitrogen species through aeration, fertilization and with the metals WTP. All process water will be transferred to the base of Vault Pit by September 2033, where it will be isolated under meromictic conditions. The Portage pits will then be flooded with Third Portage Lake water until the water level reaches 133.6 masl, at which point the Bay Goose Dike and South Camp Dike will be breached reconnecting the Combined Flooded Pit with Third Portage Lake (Figure 6-5). Note that the dikes separating the pits from Third Portage Lake will not be breached until water quality in the flooded pits reaches levels that will maintain the reconnected lakes below the CCME water quality guidelines, background water quality, or site specific water quality objectives (SSWQOs), per condition of the Water License 2AM-MEA1530, part E, item 7.

Concentrations of TDS and arsenic remain relatively constant in Active Closure until reflooding with Third Portage Lake, initially to Goose Pit, begins in June 2030. Pit E is reflooded in 2032 and Pit A is reflooded in 2033 and 2034. Prior to formation of the Combined Flooded Pit, Pit A concentrations are expected to be elevated relative to Pit E or Goose Pit owing to the continued pumping of Central Dike and TSF runoff into Pit A during the reflooding period. The pit lakes merge into the Combined Pit Lake in September 2034, the concentrations then show a modest increase in 2035 associated with freshet flows before the final flooding elevation is reached in September 2035, at which point all parameters are forecasted to be below CCME and SSWQO guidelines.

Concentration trends during the Active Closure Phase Water quality results for the Combined Flooded Pit at the point of dike breaching (September 2035) are screened against relevant water quality criteria in Table 6-2 and results from the 2023 Annual Report Model are provided in Figure 6-6 for comparison.

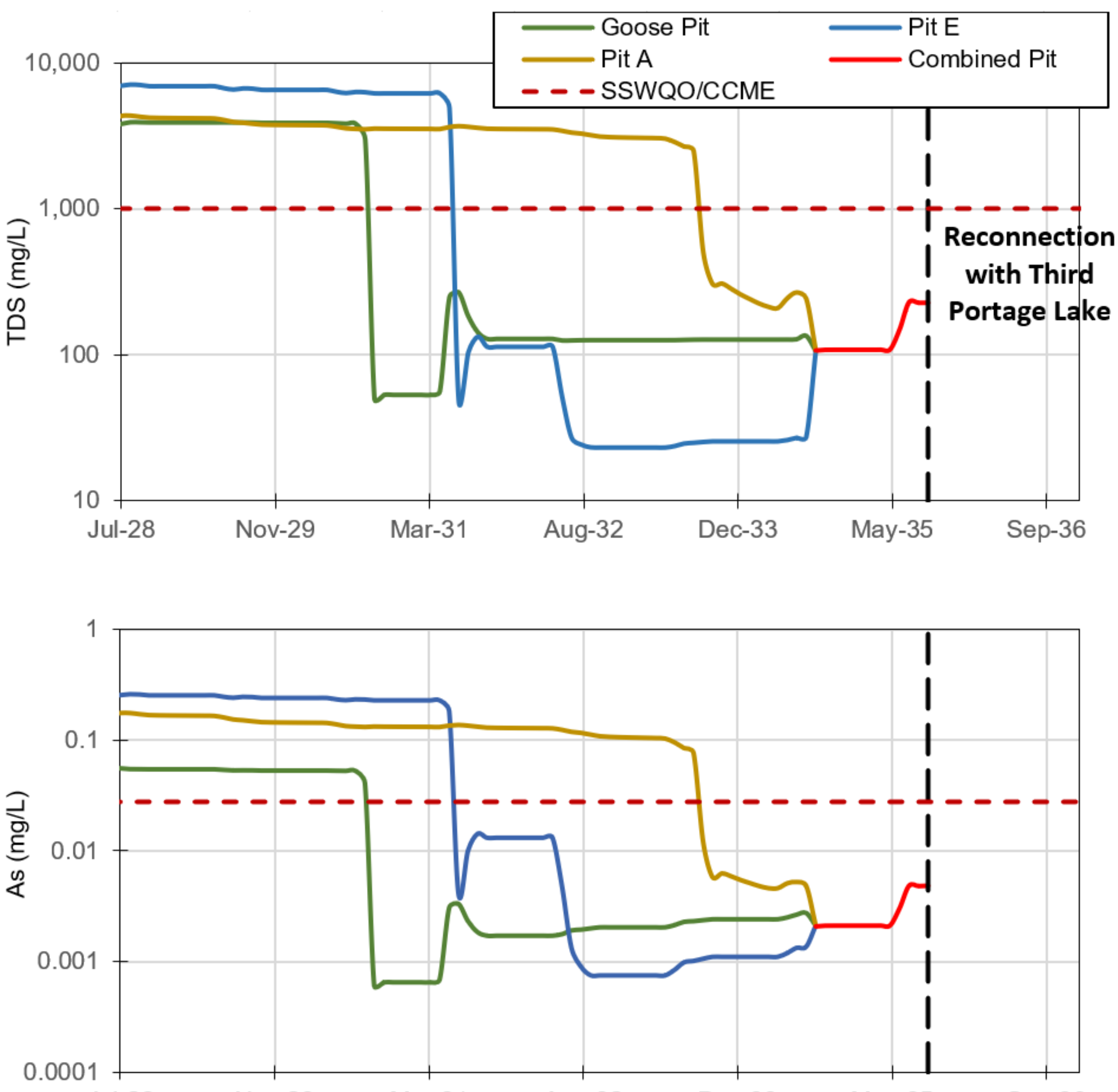


Figure 6-6: Water quality model results for TDS (top) and As (bottom) in Portage Pits during the re-flooding period. In September 2035, Goose Pit, Pit E and Pit A merge into the Combined Flooded Pit. The dashed black line shows the date that dikes are breached and the Combined Flooded Pit is reconnected with Third Portage Lake. Dashed red line shows SSWQO/CCME guidelines.

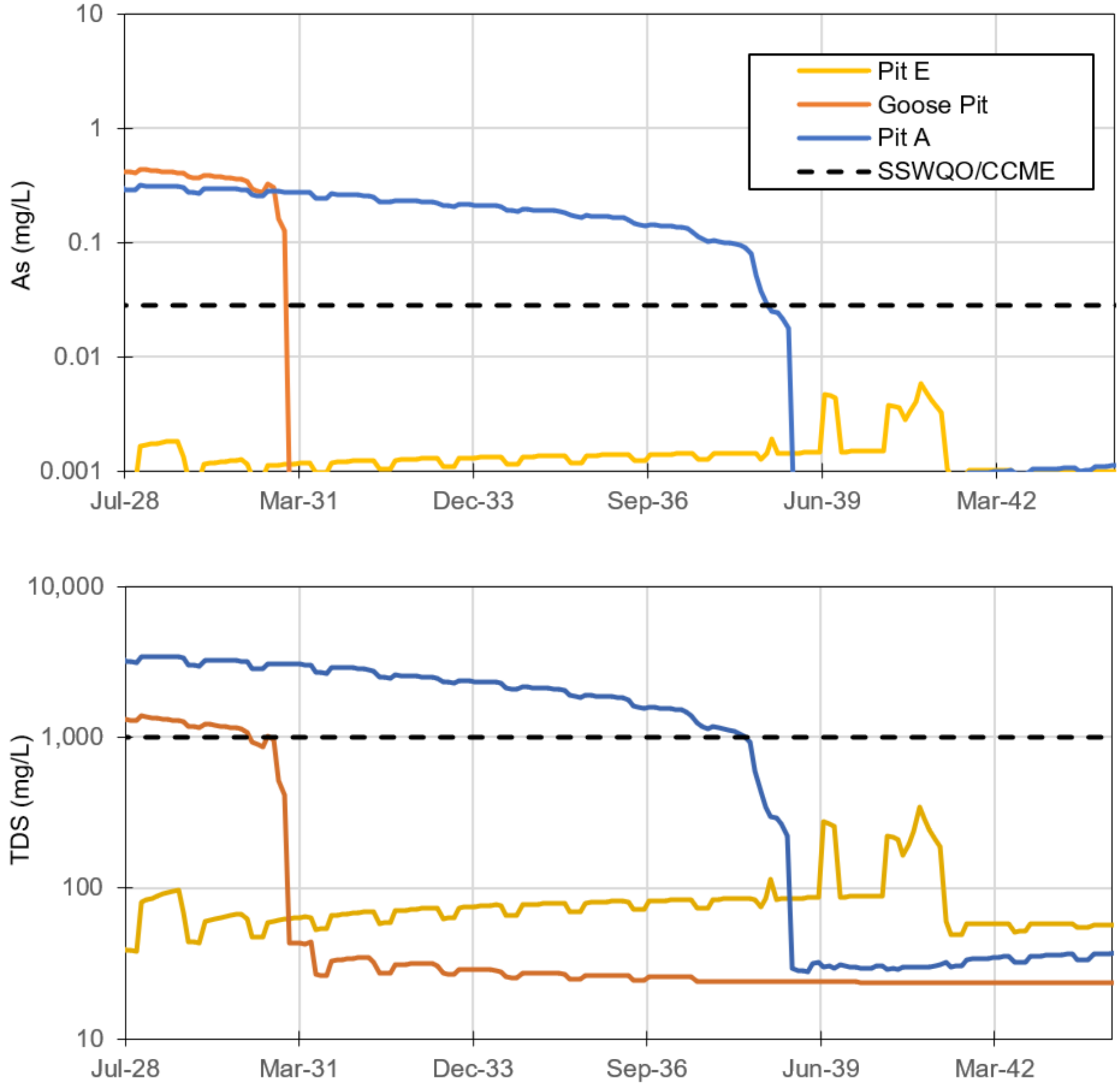


Figure 6-7: Water quality model results for As (top) and TDS (bottom) in Pit A, Pit E and Goose Pit during the active closure and Post Closure period from 2023 Annual Report model forecast.

**Table 6-3:
Water quality model results for the Combined Flooded Pit in September 2035 when Bay Goose Dike and South Camp Dike are breached. Model predictions are screened against SSWQO/CCME, WUL and MMER water quality criteria.**

Parameter	Units	Combined Flooded Pit Water Quality Sept. 2035	Screening Guidelines		
			SSWQO/CCME[1]	Discharge to Third Portage Lake (WUL)	MMER
Total Dissolved Solids	mg/L	226.5	1000	1400	-
Total Ammonia-N	mg/L	1.092	1.3	16	-
Nitrate-N	mg/L	0.0506	45	20	-
Total Cyanide	mg/L	0.00102	-	0.5	0.5
Chloride	mg/L	9.90	128	1000	-
Fluoride	mg/L	0.0910	0.12	-	-
Sulphate	mg/L	66.2	128	-	-
Aluminum	mg/L	0.00441	0.1	1	-
Arsenic	mg/L	0.00483	0.028	0.3	0.5
Cadmium	mg/L	0.0000927	0.00014	0.002	-
Copper	mg/L	0.001236	0.0015 – 0.0037	0.1	0.3
Iron	mg/L	0.0669	0.3	-	-
Mercury	mg/L	0.00000581	0.000026	0.0004	-
Molybdenum	mg/L	0.00446	0.073	-	-
Nickel	mg/L	0.01014	0.085	0.2	0.5
Lead	mg/L	0.0000763	0.0026	0.1	0.2
Selenium	mg/L	0.0001555	0.001	-	-
Zinc	mg/L	0.00184	0.015	0.4	0.5

1. CCME guidelines assuming 90th percentile pH of 7.73 and water temperature of 16°C observed in Third Portage Lake, and predicted hardness of 52 mg/L. Copper guideline is based on ligand model assuming Third Portage Lake baseline conditions (1.5 to 3.7 µg/L).

6.3 Dry- and Wet-Year Sensitivity

The remaining Operations phase (2025-2028) was run with representative dry- and wet-year air temperature and precipitation inputs. These impact end of-pipe discharges at Vault Attenuation Pond by increasing the ratio of non-contact runoff and Vault WRSF runoff. The maximum concentrations in Vault Attenuation Pond during discharge to Wally Lake are screened against guidelines in Table 6-5 for the dry- and wet-year sensitivities. The results show that most concentrations increase during the dry-year due to reduced flows, however, all concentrations remain below end-of pipe and 10x CREMP discharge limits.

Table 6-4:
Vault Attenuation Pond sensitivity model results during discharge period (June 2026 to August 2033) to Wally Lake screened against 10xCREMP, WUL and MMER water quality criteria.

Parameter	Units	Model Results (Jun. 2026 to Aug. 2033)		Screening Criteria		
		Dry Sensitivity Max	Wet Sensitivity Max	10X CREMP	Discharge to Wally Lake (WUL)	Discharge to Wally Lake (MMER)
Total Dissolved Solids	mg/L	112.2	102.5	-	-	-
Total Ammonia-N	mg/L	0.0295	0.0270	1.26	20	-
Nitrate-N	mg/L	0.319	0.294	30	50	-
Total Cyanide	mg/L	0	0	-	-	-
Chloride	mg/L	4.25	7.17	1200	500	-
Fluoride	mg/L	0.0591	0.0599	1.2	-	-
Sulphate	mg/L	52.0	45.4	1280	-	-
Aluminum	mg/L	0.0291	0.0250	1	1	-
Arsenic	mg/L	0.0006	0.0030	0.25	0.1	0.5
Cadmium	mg/L	0.0000154	0.0000127	0.0004	0.002	-
Copper	mg/L	0.00193	0.00218	0.02	0.1	0.3
Iron	mg/L	0.0449	0.0370	3	-	-
Mercury	mg/L	0.00000591	0.00000508	0.00026	0.004	-
Molybdenum	mg/L	0.00472	0.00393	0.73	-	-
Nickel	mg/L	0.00236	0.00277	0.25	0.2	0.5
Lead	mg/L	0.0001004	0.0000871	0.01	0.1	0.2
Selenium	mg/L	0.0000591	0.0000632	0.01	-	-
Zinc	mg/L	0.00295	0.00247	0.04	0.2	0.5

*CCME guidelines assuming 90th percentile pH of 7.73 and temp of 16C observed in Third Portage Lake, and predicted hardness of 148 mg/L. Copper Guideline based on ligand model assuming Wally Lake baseline conditions.

6.4 Comparison of Model Forecasts

Previous model forecasts were completed before the ELOM mine plan extended operations from June 2026 to June 2028, confounding direct comparison of model results after June 2026. Most variations between model iterations for the remaining operational period are due to changes in the mine plan, updates to tailings deposition schedule, and changes in treatment and water management strategies. The complete set of modelled parameters for the 2023 and 2024 Annual Report models are compared in Appendix A.

Prior to June 2026, most parameters have comparable trends in model forecasts. The predicted concentrations for arsenic have decreased somewhat in Pit A and E during this time period due to changes in source term input (Figure 6-3, Figure 6-4 and Figure 6-5). This update was introduced to improve the agreement between model predictions and monitoring data. Note that both models still over-predict most As monitoring data from 2020 to 2025 in pits containing process water. Divergent model results prior to June 2026 are also driven by updates to decay kinetics for total cyanide, nickel and copper. These updates result in an increase in the predicted total cyanide concentrations, and a decrease to Ni and Cu forecasts, most notably in Goose Pit (Section 4.7).

After June 2026, model results are not directly comparable (Figure 6-7 and Figure 6-6). The 2023 Annual Report model predicts that concentrations will stabilize after June 2026 until process water is treated and discharged to Third Portage Lake (2028-2038) prior to reflooding (2039-2041). In the current model forecast, Pit A and Pit E water is influenced by continued tailings deposition until June 2028. A metals WTP is introduced which removes As and Cu in water being transferred to Goose Pit before enhanced passive treatment removes nitrogen species. Concentrations of parameters not influenced by treatment are relatively stable from July 2028 until process water is pumped to the base of Vault Pit and mine pits are reflooded with Third Portage Lake water.

7. Summary

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7. Summary

A daily time-step water balance and water quality model was set up for the Meadowbank Mine and calibrated to water quality and flooded pit water level monitoring data collected over the 2020 to 2024 period.

This model was used to inform the proposed water management for the closure of the Meadowbank Mine site. The key components of the remaining Operations phase and Active Closure phase water management plan that are replicated in the WBWQM are:

- Tailings deposition in the North and South Cells of the TSF, Pit A and Pit E;
- Mill process water makeup sourced from Pit E;
- In-pit treatment of process water nitrogen species in Goose Pit and Pit A;
- Metals water treatment plant to reduce metal content of process water stored in mine pits;
- Diversion of Phaser Pit and BB Phaser Pit inflows to the Vault AP for treatment and discharge to Wally Lake; and,
- Transfers of treated process water stored in Goose Pit, Pit E and Pit A to the base of Vault Pit.

Overall, under dry-year, average and wet-year climate conditions, the flooded pits can be maintained below the target elevations for the remainder of the Operations phase. All process water stored in the Portage Pits at EOM (June 2028) can be stored at the base of Vault Pit with a 13.5 m freshwater cap in place under all climate scenarios. All transfers to Vault Pit are expected to be completed by August 2033, and all pits are expected to be flooded to their final flooded pit water elevations by June 2035.

Starting in June 2026, BB Phaser and Phaser Pit water will begin to be diverted into Vault AP, treated, and then discharged to Wally Lake. This discharge will continue until August 2033, when Vault Pit is flooded in closure. Water quality model results show that discharge from Vault AP to Wally Lake will meet WUL/MMER end-of-pipe requirements for Wally Lake, and CREMP water quality criteria at the edge of the IDZ within Wally Lake. This is the only active discharge that is currently planned during mine operations and active closure.

At the end of active closure, pits will be flooded with water pumped from Wally Lake and Third Portage Lake. Once the final water level is reached, dikes will be breached and the pit lakes will be re-connected with the surrounding natural lakes (*i.e.*, Wally Lake and Third

Portage Lake). Prior to breaching these dikes, the flooded pit water quality will need to meet SSWQO and CCME water quality criteria, as per conditions of Water License 2AM-MEA1530, part E, item 7.

The process water currently contained in Goose Pit, Pit E and Pit A will be treated and transferred to the base of Vault Pit, and the three pits at the main site will be reflooded with Third Portage Lake water. Goose Pit, Pit E and Pit A will merge into a single Combined Flooded Pit prior to reaching the final water level of 133.6 masl, which is expected to occur in September 2035. The water quality model predicts that the Combined Flooded Pit will meet all water quality criteria in September 2035.

The Vault Pit is currently filling passively with runoff from the surrounding catchment entering the pit void. Starting in 2026, the Vault AP water, Phaser Pit and BB Phaser Pit will be diverted away from Vault Pit to Wally Lake, and treated process water from the Portage Area will begin to be transferred into Vault Pit. The treated process water will be pumped to the base of the existing Vault Pit water to establish meromictic conditions; thus permanently isolating the process water from the surface water (*e.g.*, discharge or overflow water) environment. At the end of active closure, water from Wally Lake will be pumped into Vault pit until the water level reaches 140 masl and the Vault Dike is breached, which is expected to occur in September 2033. The water quality model predicts all parameters will remain within guideline concentrations in Vault Pit surface waters in September 2033.

8. Closure

AGNICO EAGLE

8. Closure

We trust that this report meets your requirements at this time. Please contact us should you have any questions or concerns or require additional information in support of this work.

Yours sincerely,

LORAX ENVIRONMENTAL SERVICES LTD.

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Appendix A: Water Quality Model Results and Validation

A.1 Goose Pit Operations

A.2 Goose Pit Closure

A.3 Pit A Operations

A.4 Pit A Closure

A.5 Pit E Operations

A.6 Pit E Closure

A.7 Vault Pit Surface Water Operations

A.8 Vault Pit Surface Water Closure

AGNICO EAGLE

A.1 Goose Pit Operations

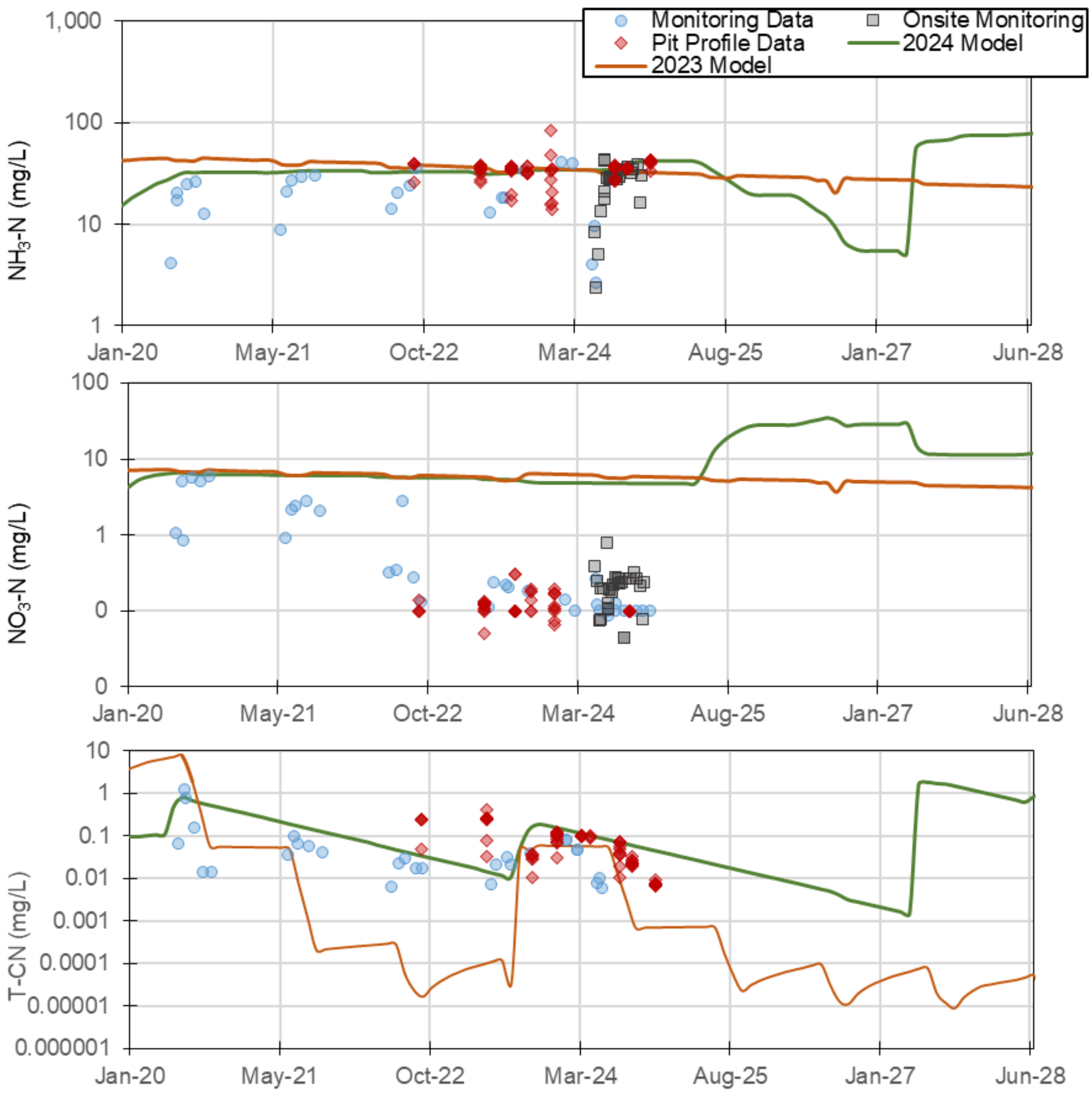

Figure A1: Water quality model validation results for total ammonia, nitrate and total cyanide at Goose Pit during Operations.

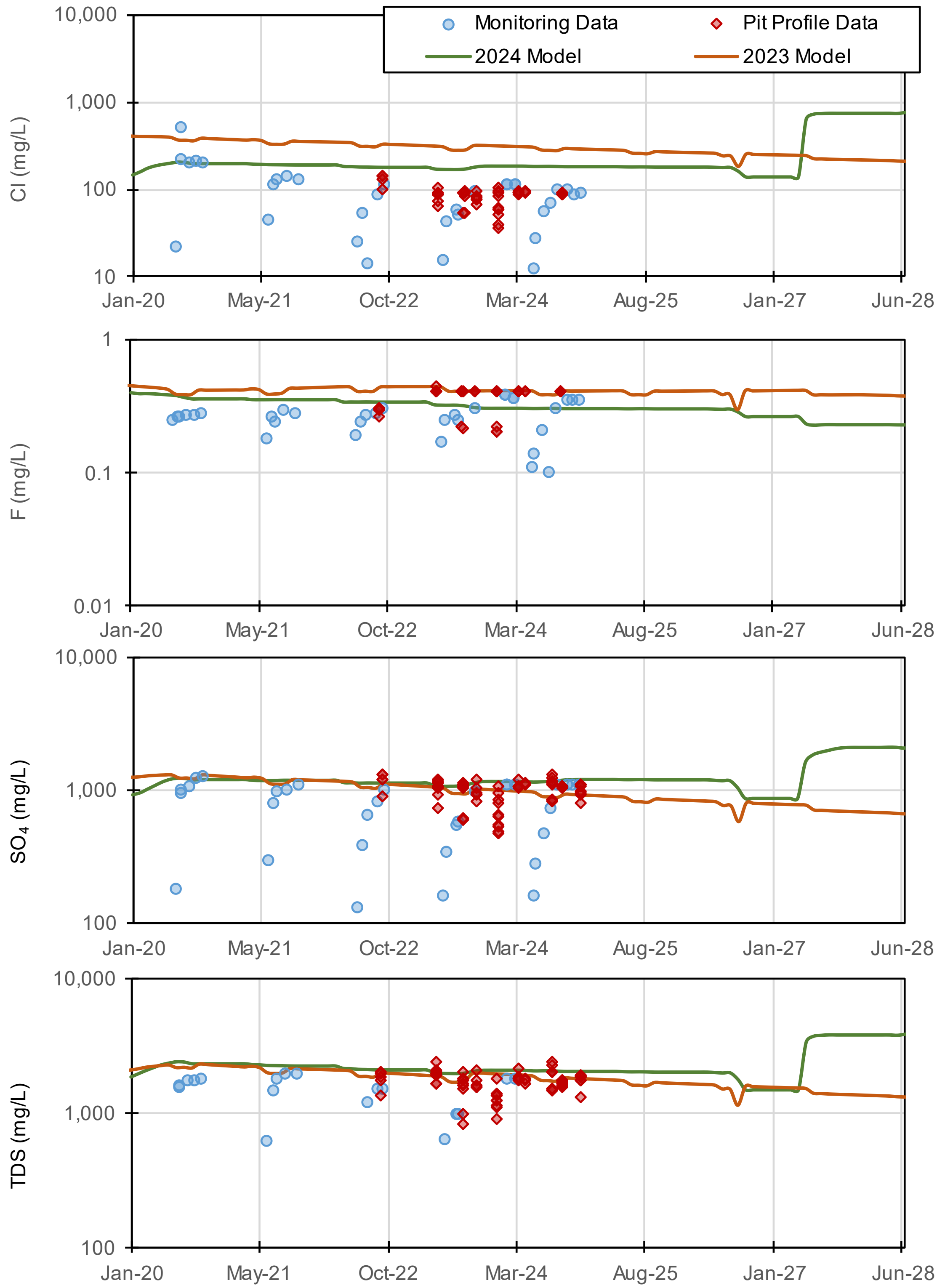

Figure A2: Water quality model validation results for chloride, fluoride, sulphate and total dissolved solids at Goose Pit during Operations.

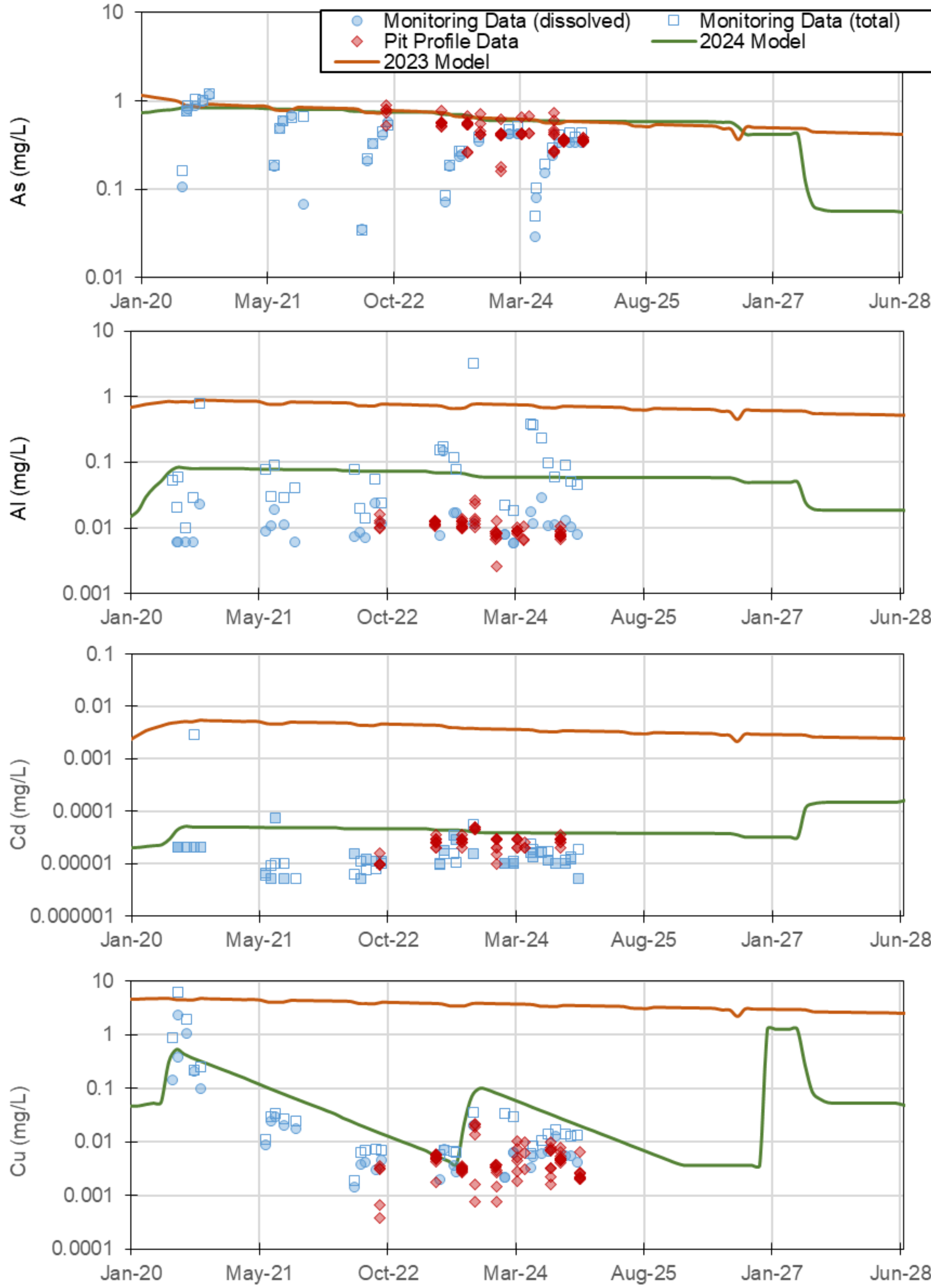

Figure A3: Water quality model validation results for arsenic, aluminum, cadmium and copper at Goose Pit during Operations.

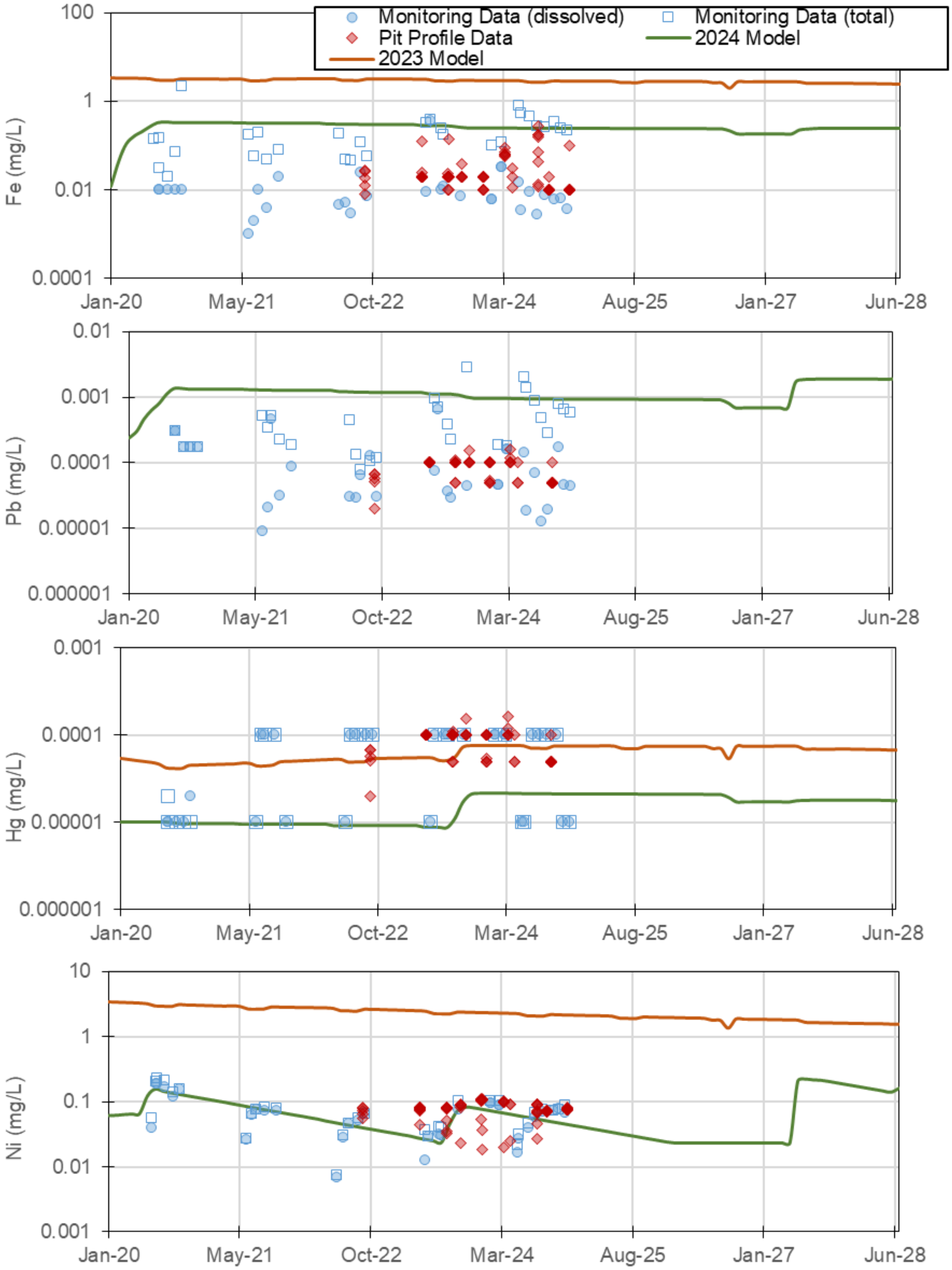

Figure A4: Water quality model validation results for iron, lead, mercury and nickel at Goose Pit during Operations.

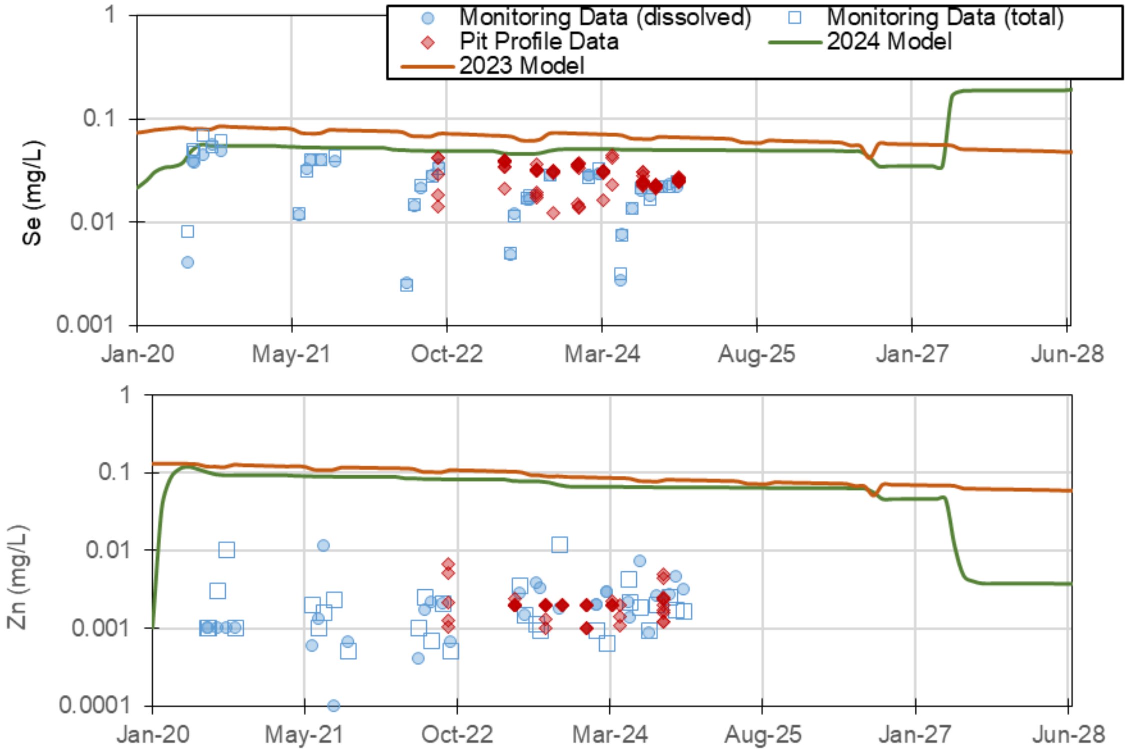

Figure A5: Water quality model validation results for selenium and zinc at Goose Pit during Operations.

A.2 Goose Pit Closure

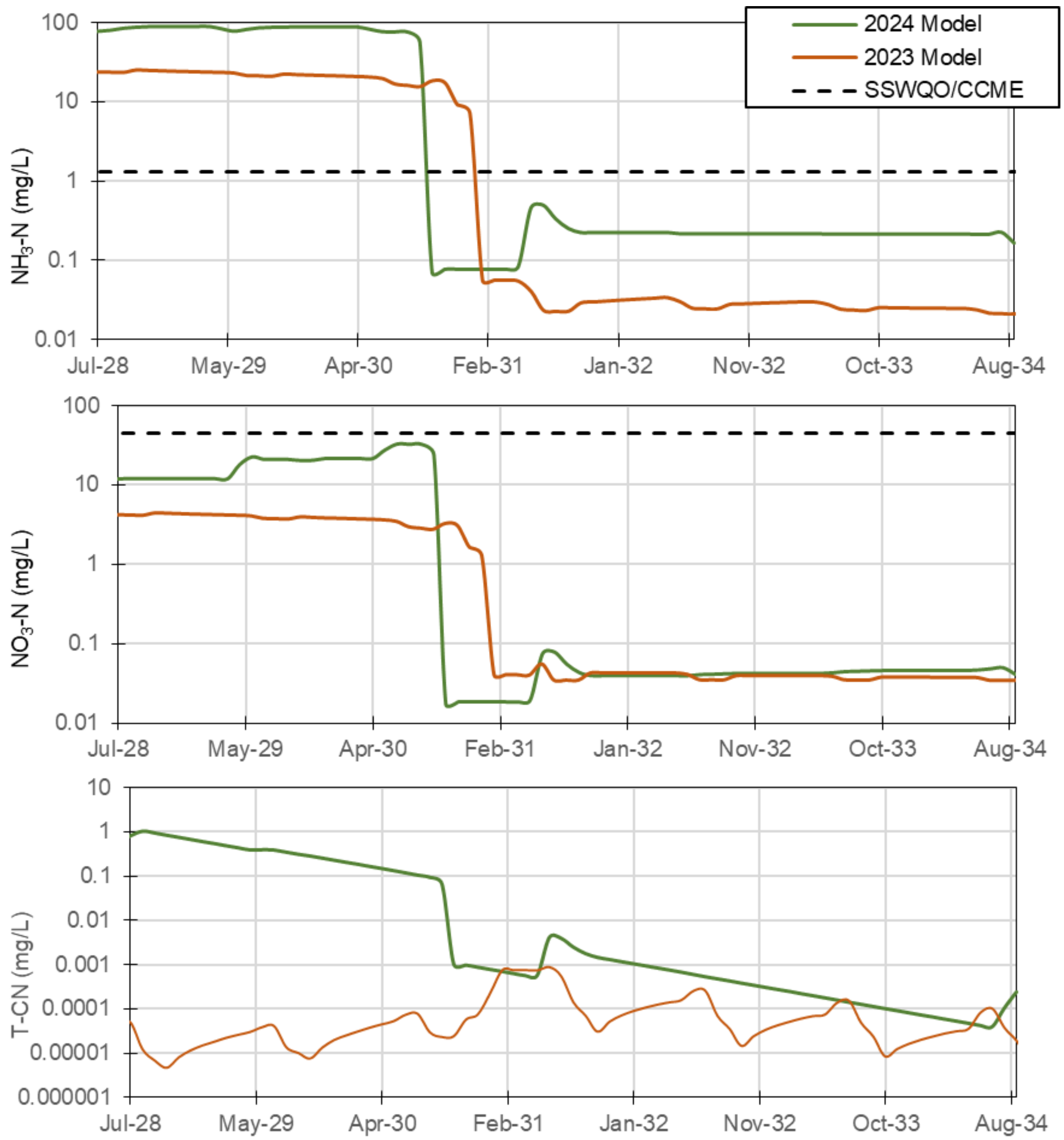

Figure A6: **Water quality model validation results for ammonia, nitrate and total cyanide at Goose Pit during Closure. Dashed line represents SSWQO/CCME guidelines.**

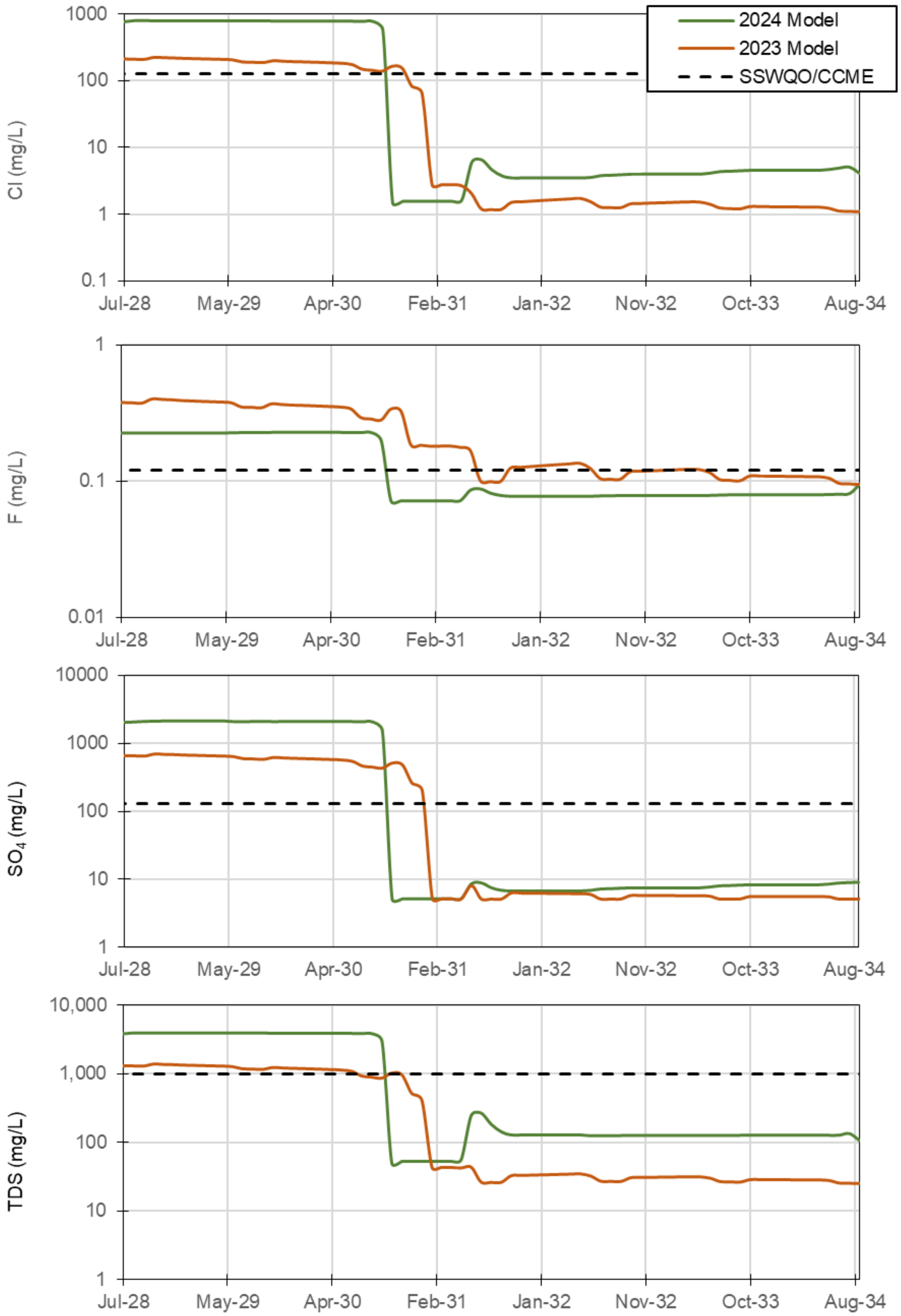

Figure A7: Water quality model validation results for chloride, fluoride, sulphate and TDS at Goose Pit in Closure. Dashed line represents SSWQO/CCME guidelines.

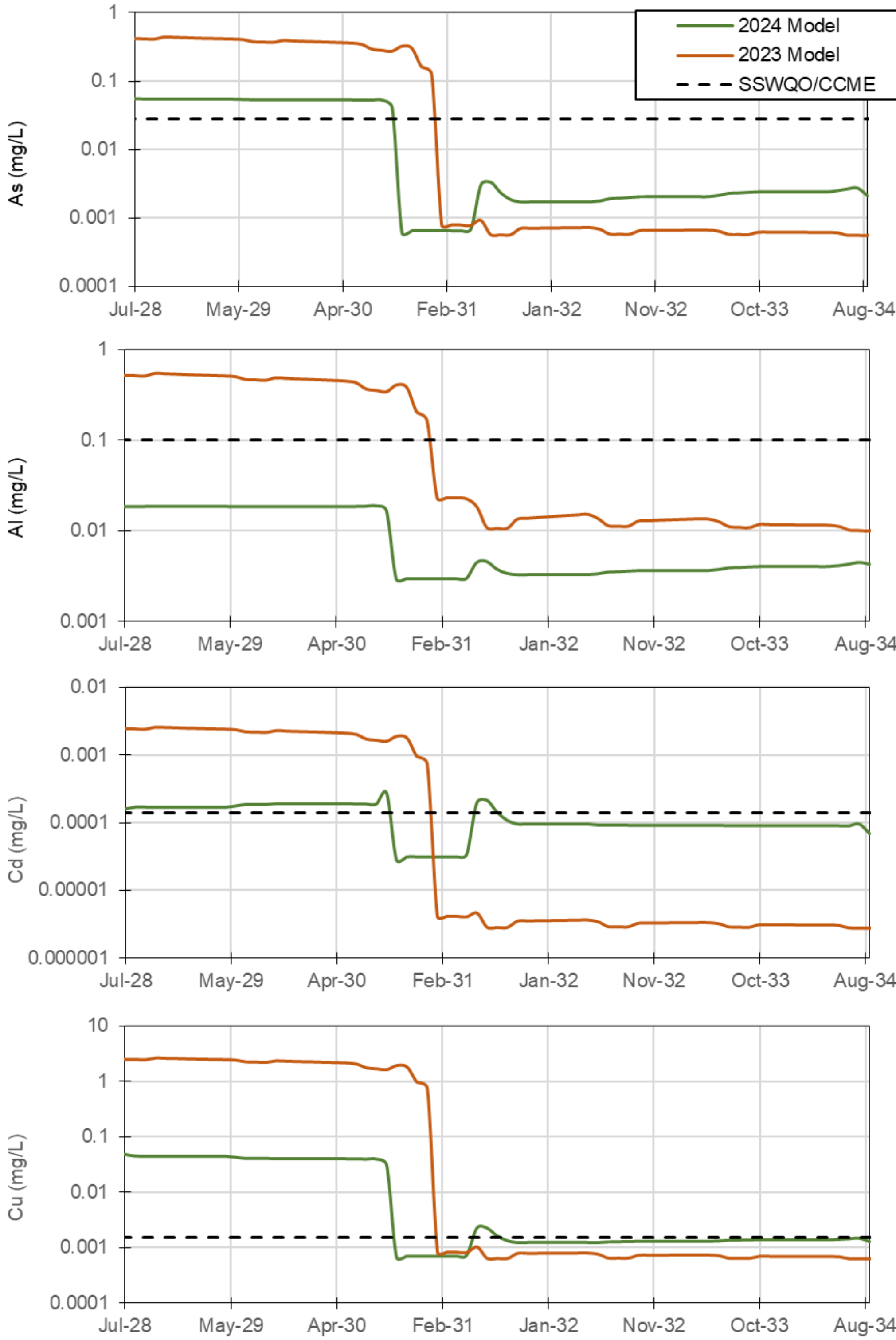

Figure A8: Water quality model validation results for arsenic, aluminum, cadmium and copper at Goose Pit during Closure. Dashed line represents SSWQO/CCME guidelines.

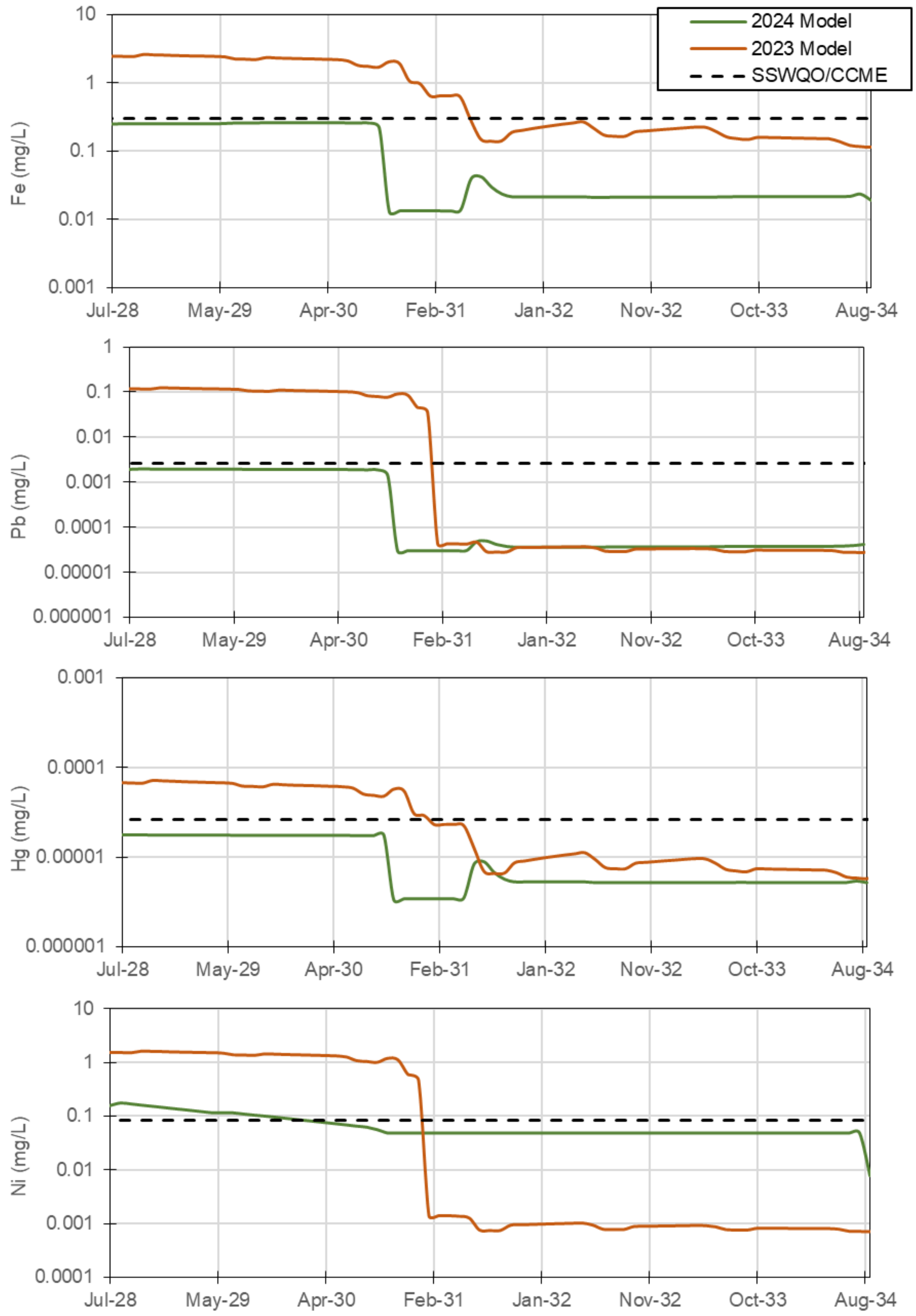

Figure A9: Water quality model validation results for iron, lead, mercury and nickel at Goose Pit during Closure. Dashed line represents SSWQO/CCME guidelines.

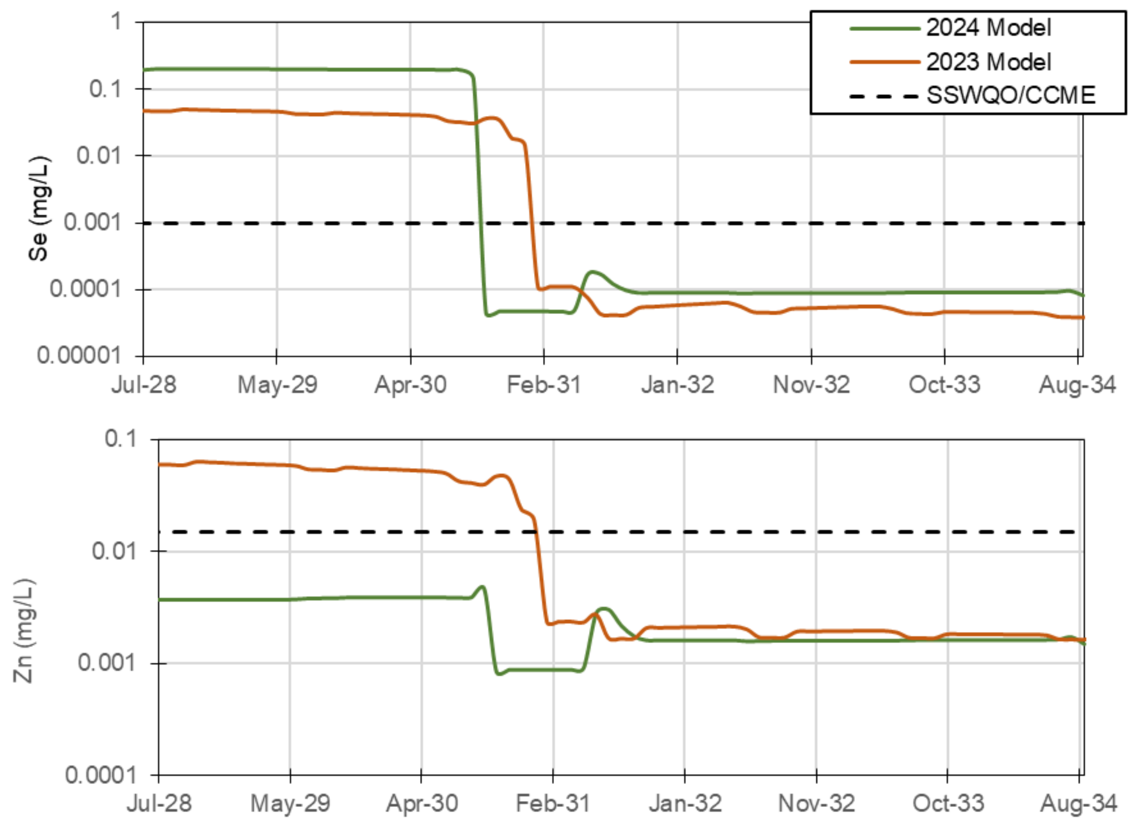

Figure A10: Water quality model validation results for selenium and zinc at Goose Pit during Closure. Dashed line represents SSWQO/CCME guidelines.

A.3 Pit A Operations

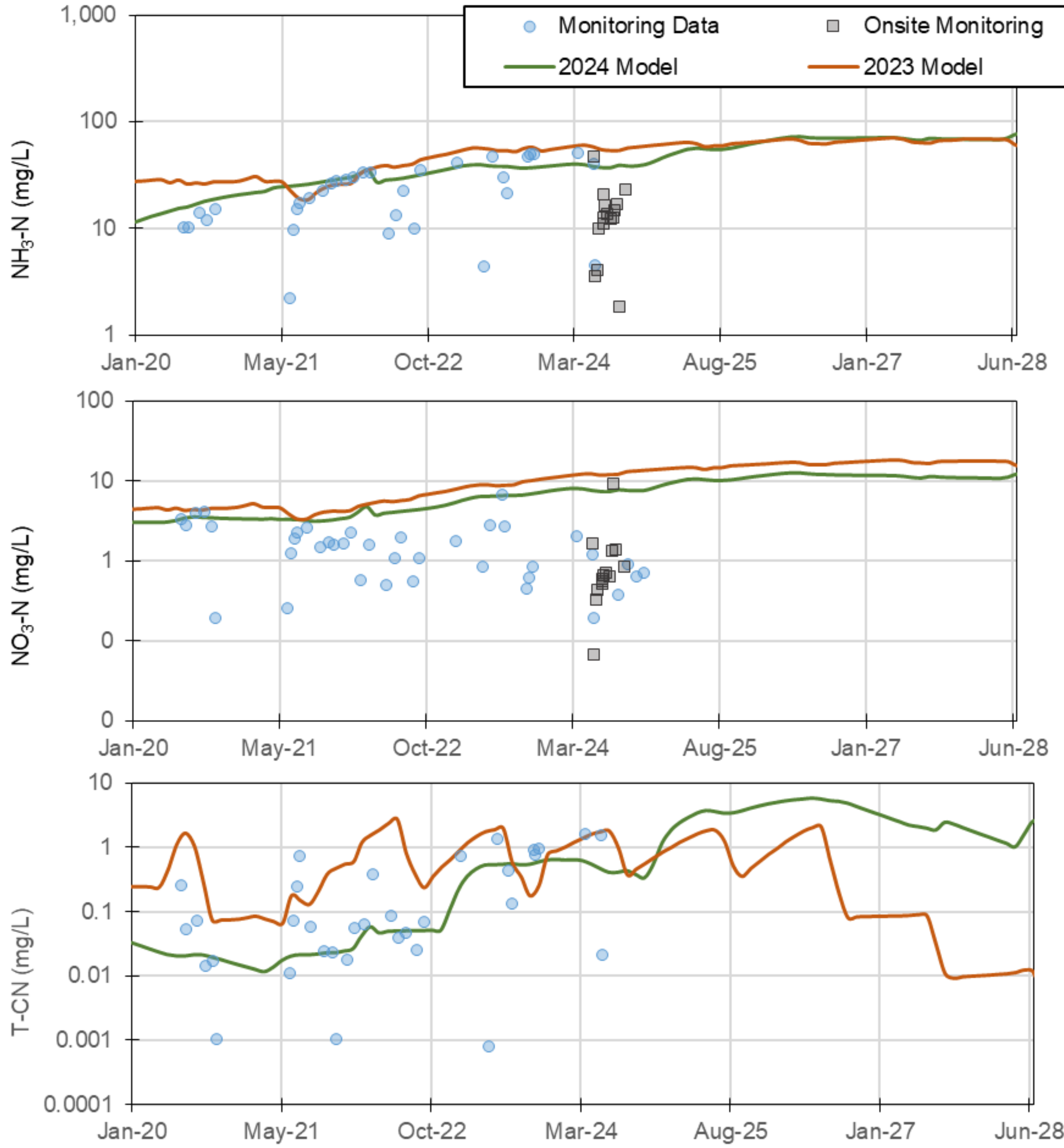

Figure A11: Water quality model validation results for ammonia, nitrate and total cyanide at Pit A during Operations.

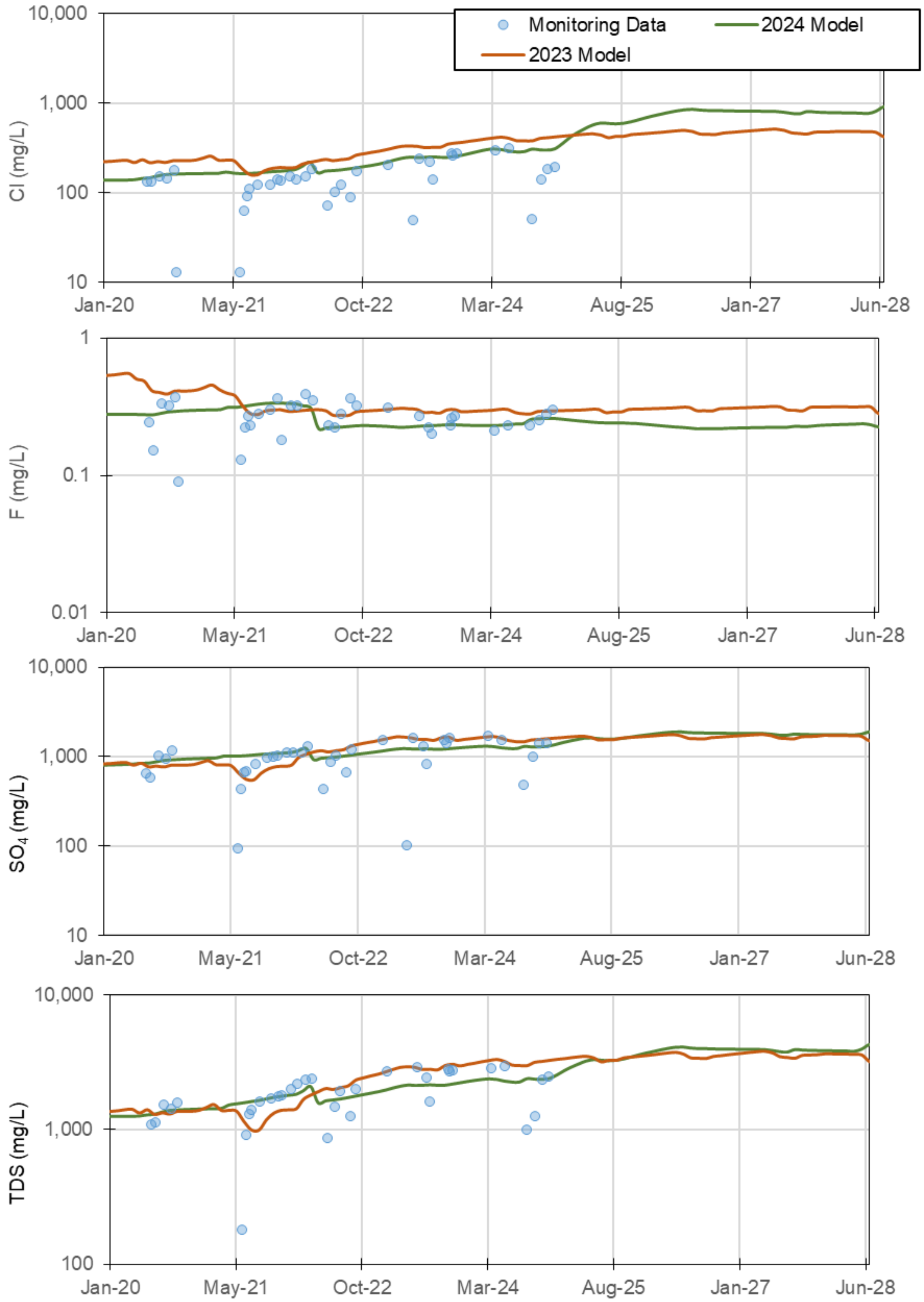

Figure A12: Water quality model validation results for chloride, fluoride, sulphate and total dissolved solids at Pit A during Operations.

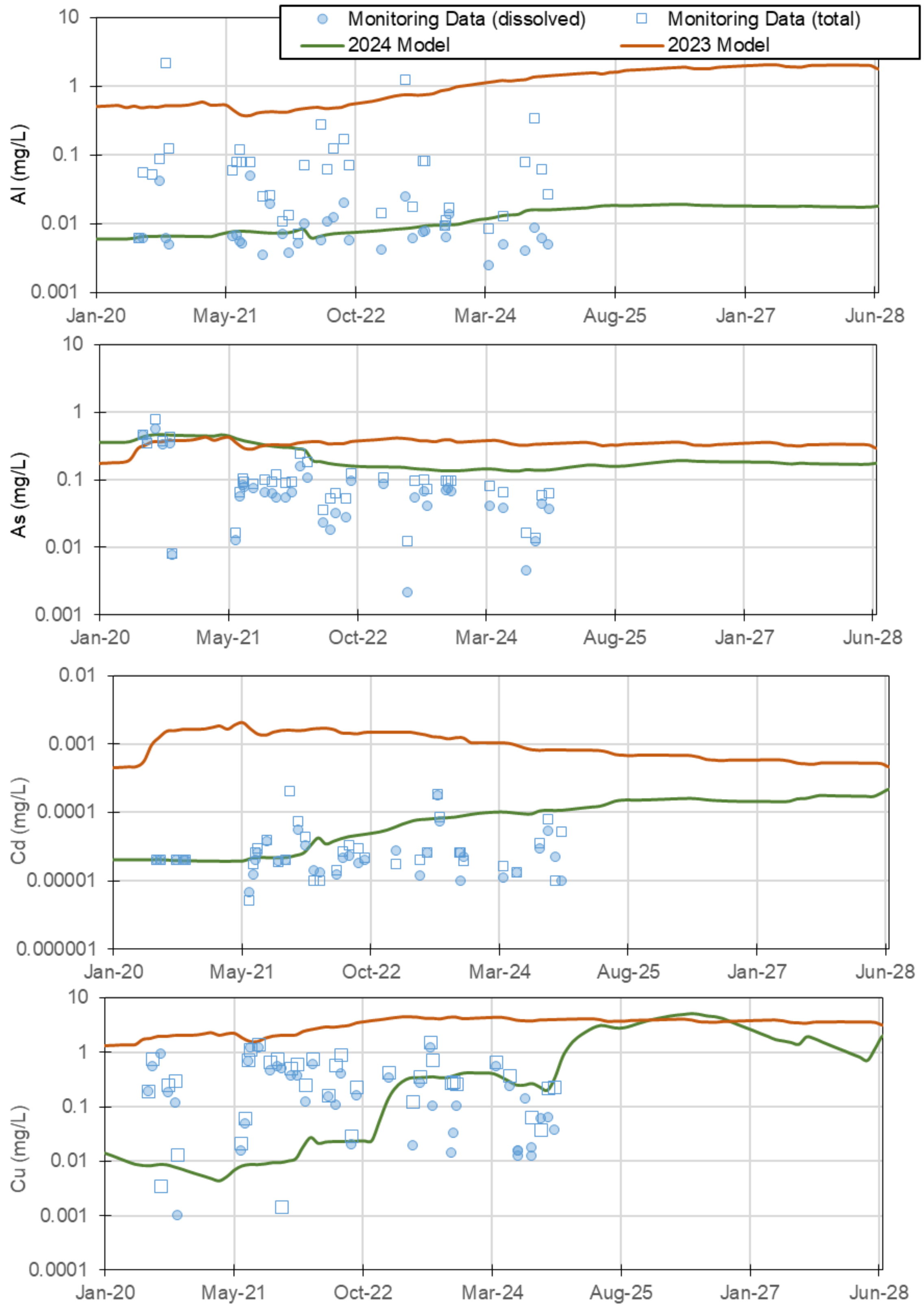

Figure A13: Water quality model validation results for arsenic, aluminum, cadmium and copper at Pit A during Operations.

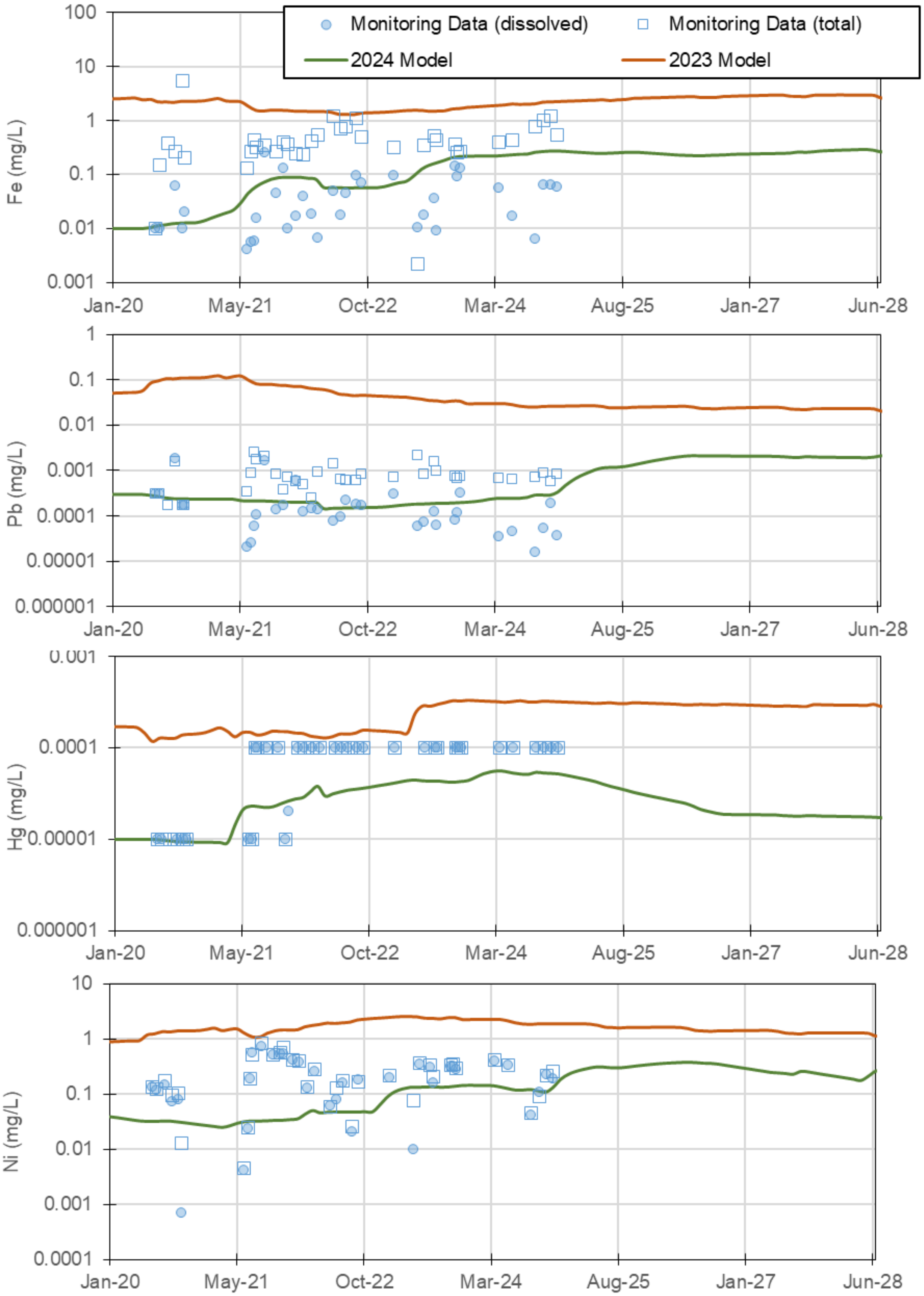

Figure A14: Water quality model validation results for iron, lead, mercury and nickel at Pit A during Operations.

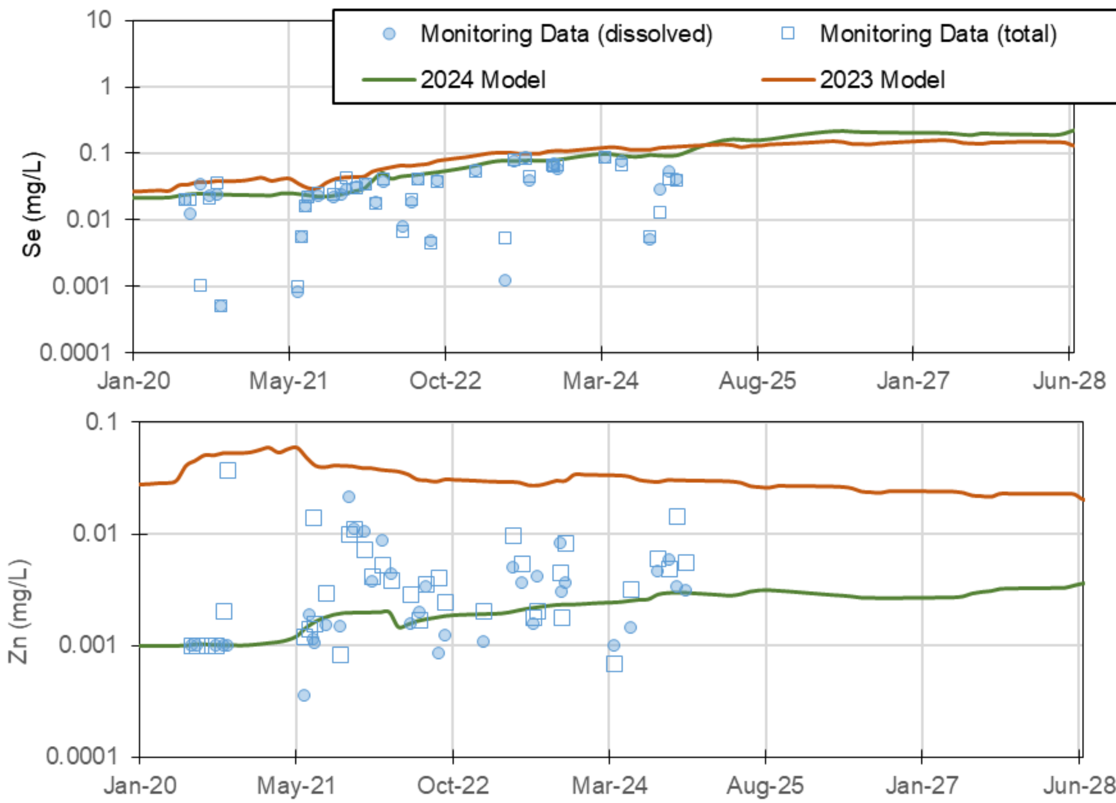

Figure A15: Water quality model validation results for selenium and zinc at Pit A during Operations.

A.4 Pit A Closure

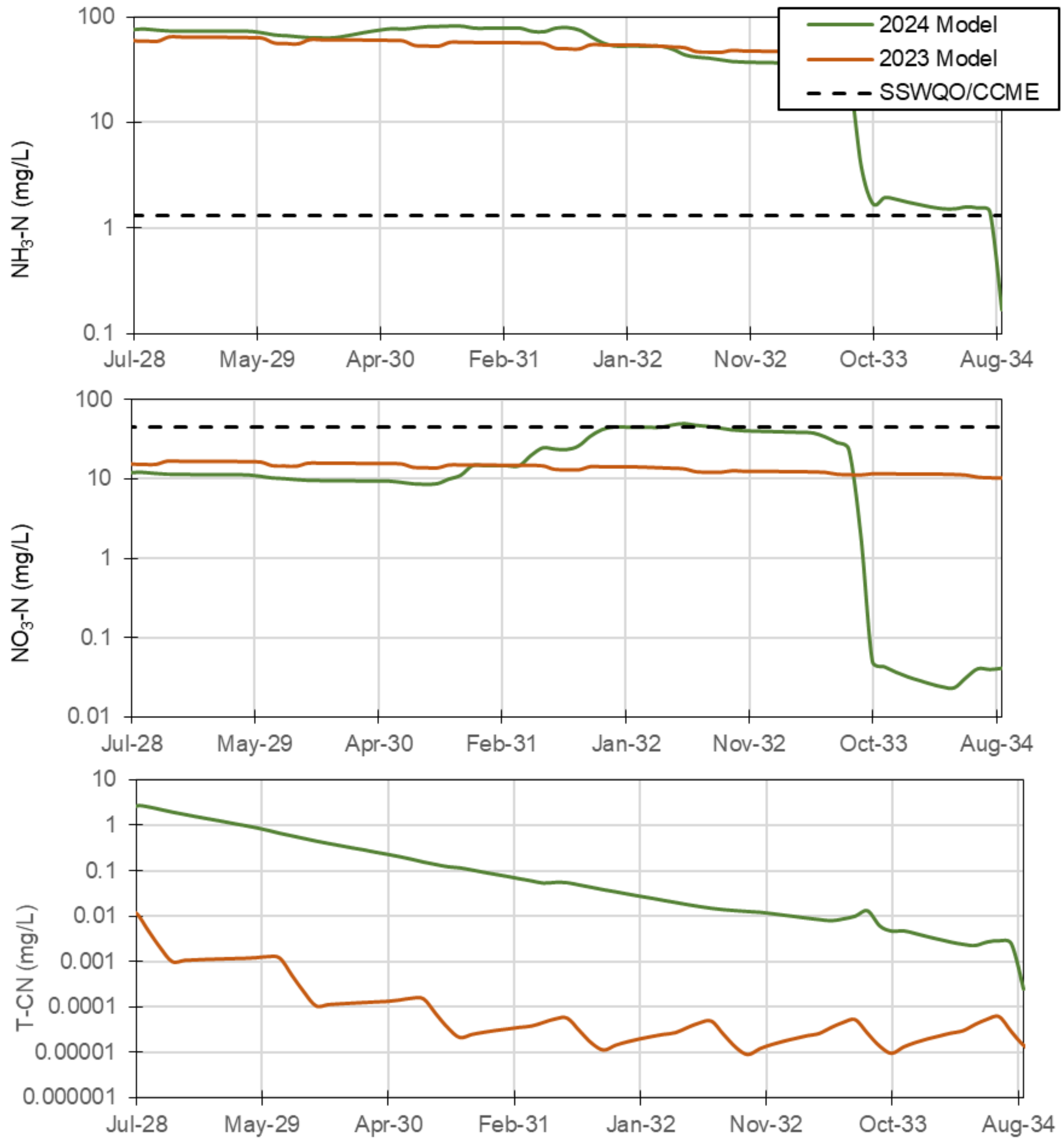

Figure A16: Water quality model validation results for ammonia, nitrate and total cyanide in Pit A during Closure. Dashed line represents SSWQO/CCME guidelines.

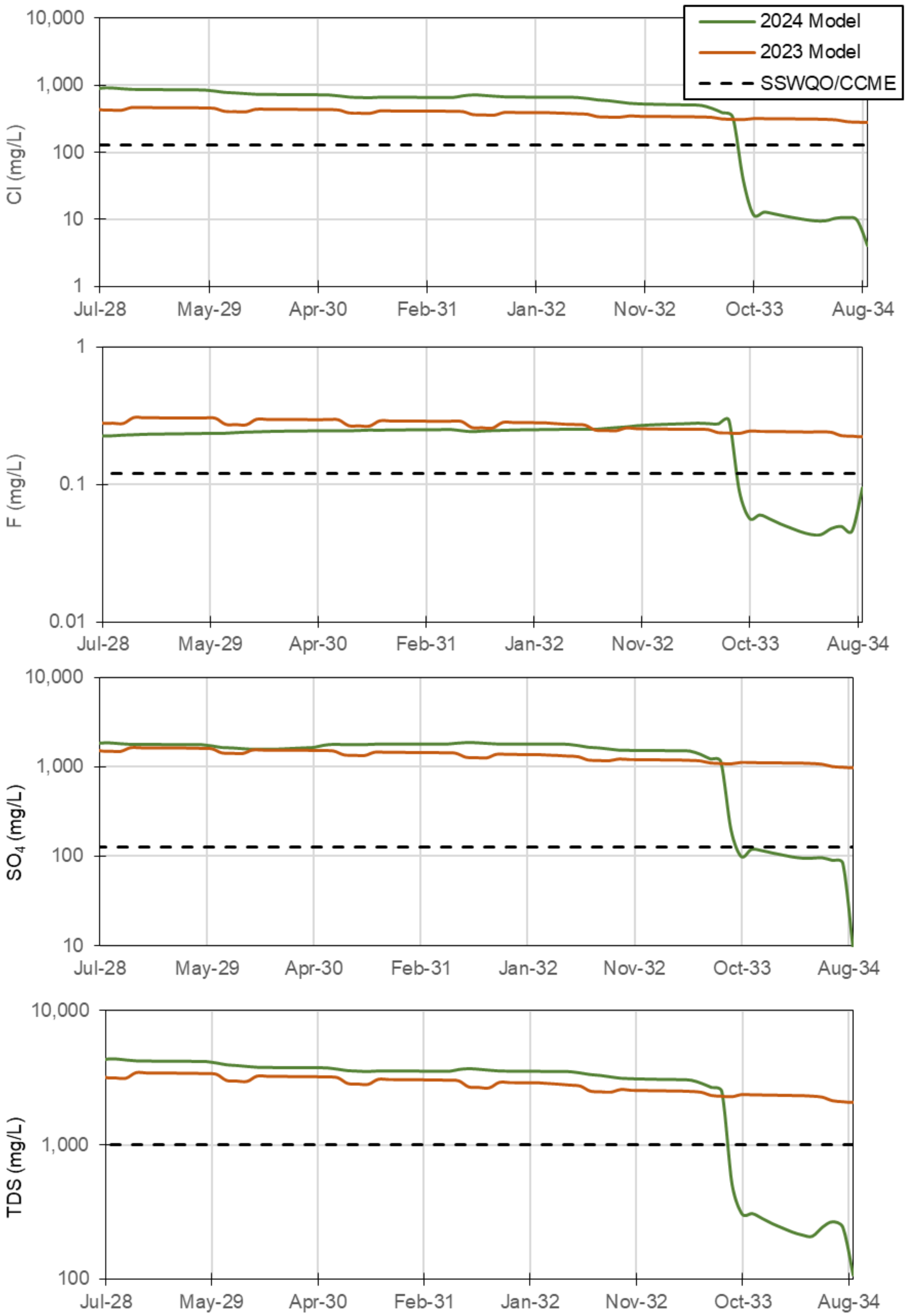

Figure A17: Water quality model validation results for chloride, fluoride, sulphate and total dissolved solids in Pit A during Closure. Dashed line represents SSWQO/CCME guidelines.

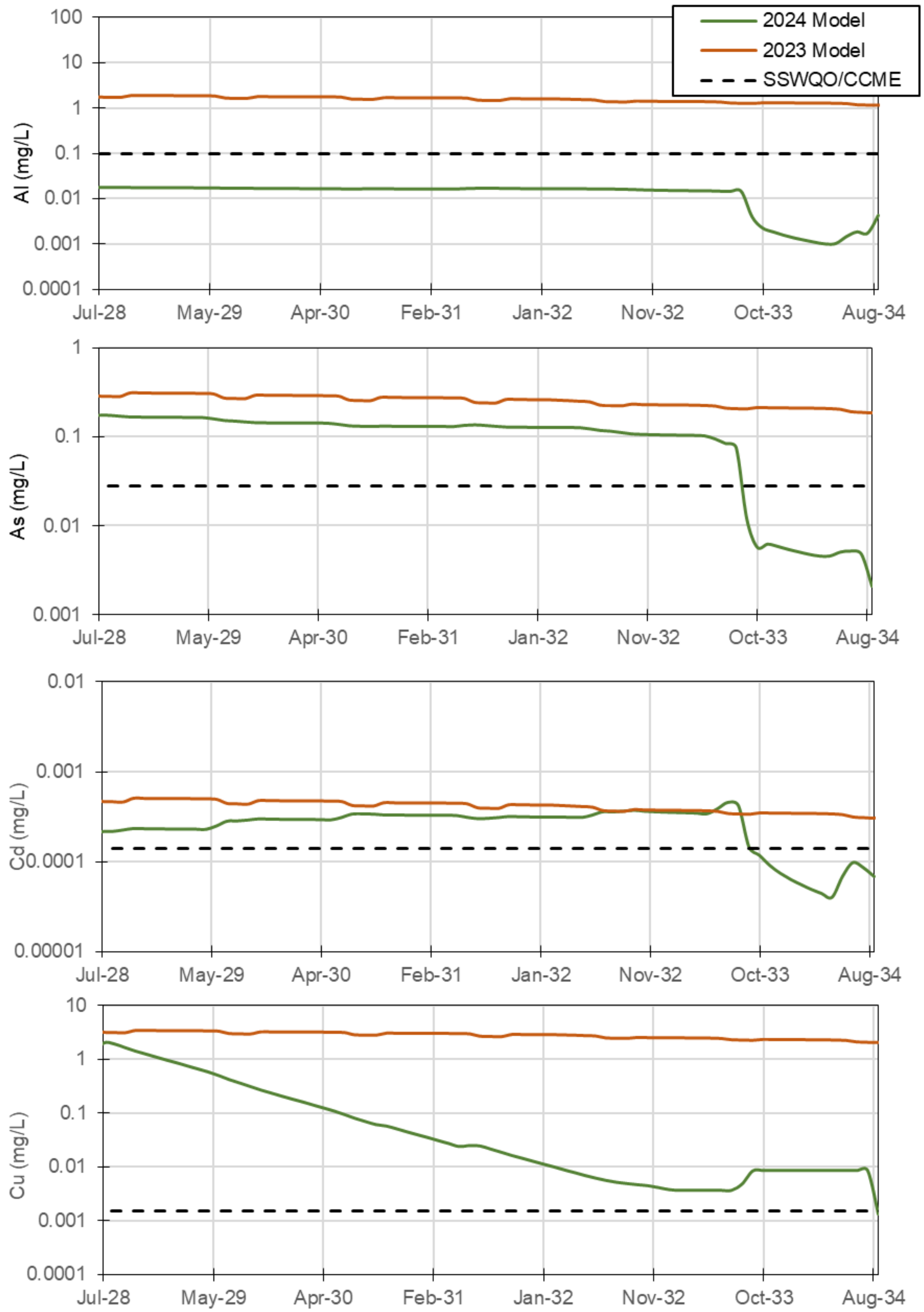

Figure A18: Water quality model validation results for arsenic, aluminum, cadmium and copper in Pit A during Closure. Dashed line represents SSWQO/CCME guidelines.

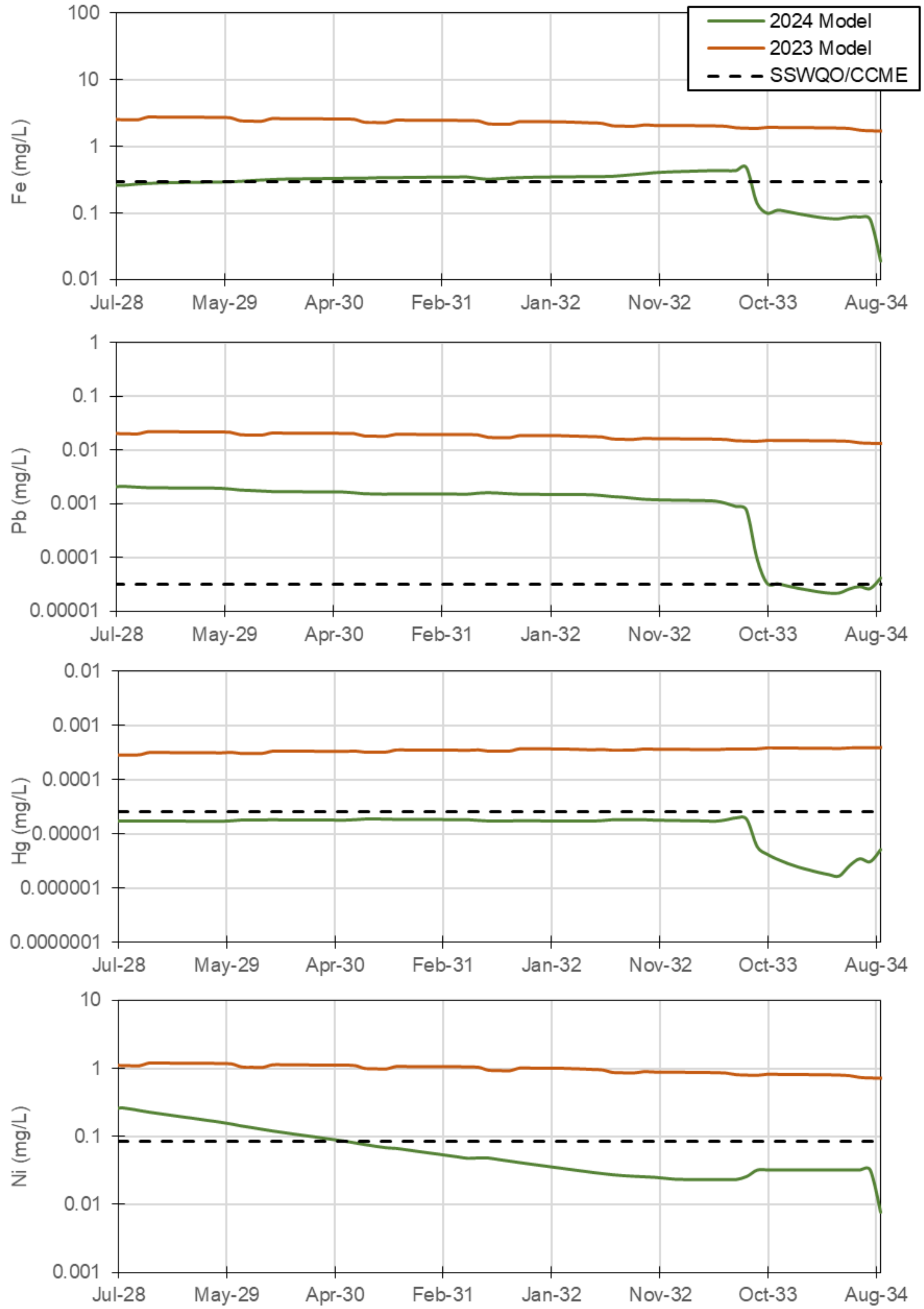

Figure A19: Water quality model validation results for iron, lead, mercury and nickel in Vault surface water during Operations. Dashed line represents SSWQO/CCME guidelines.

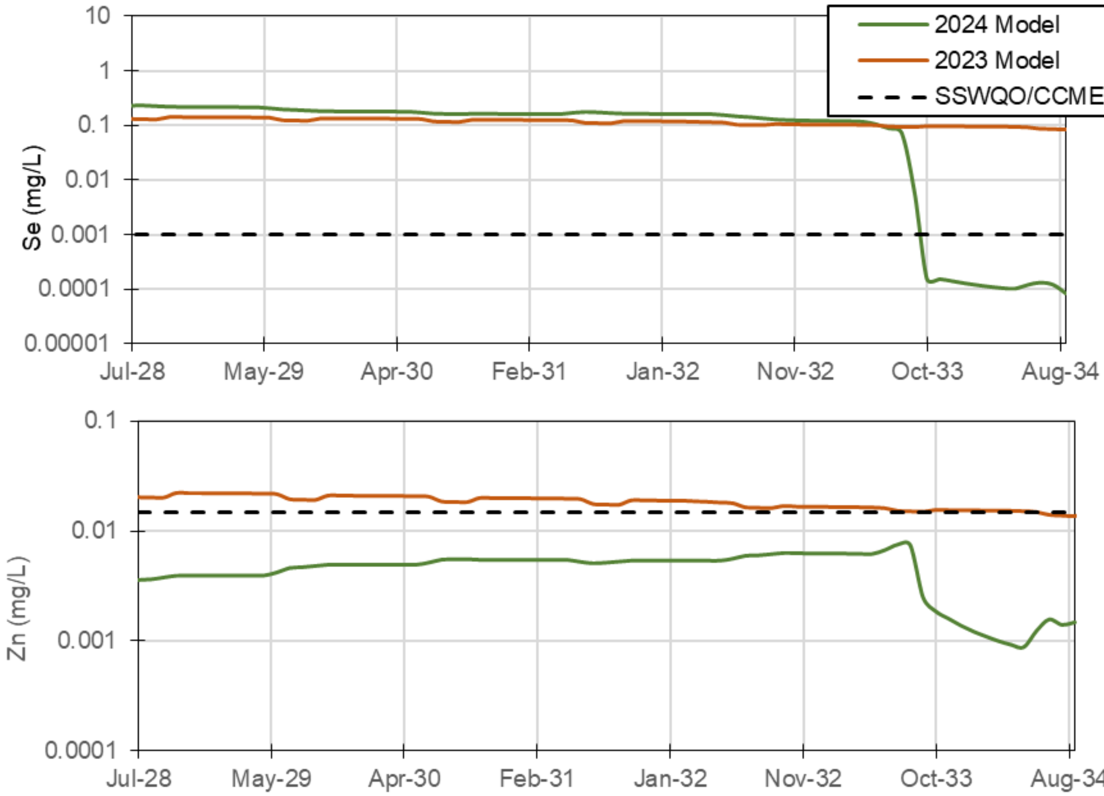

Figure A20: Water quality model validation results for selenium and zinc in Pit A during Closure. Dashed line represents SSWQO/CCME guidelines.

A.5 Pit E Operations

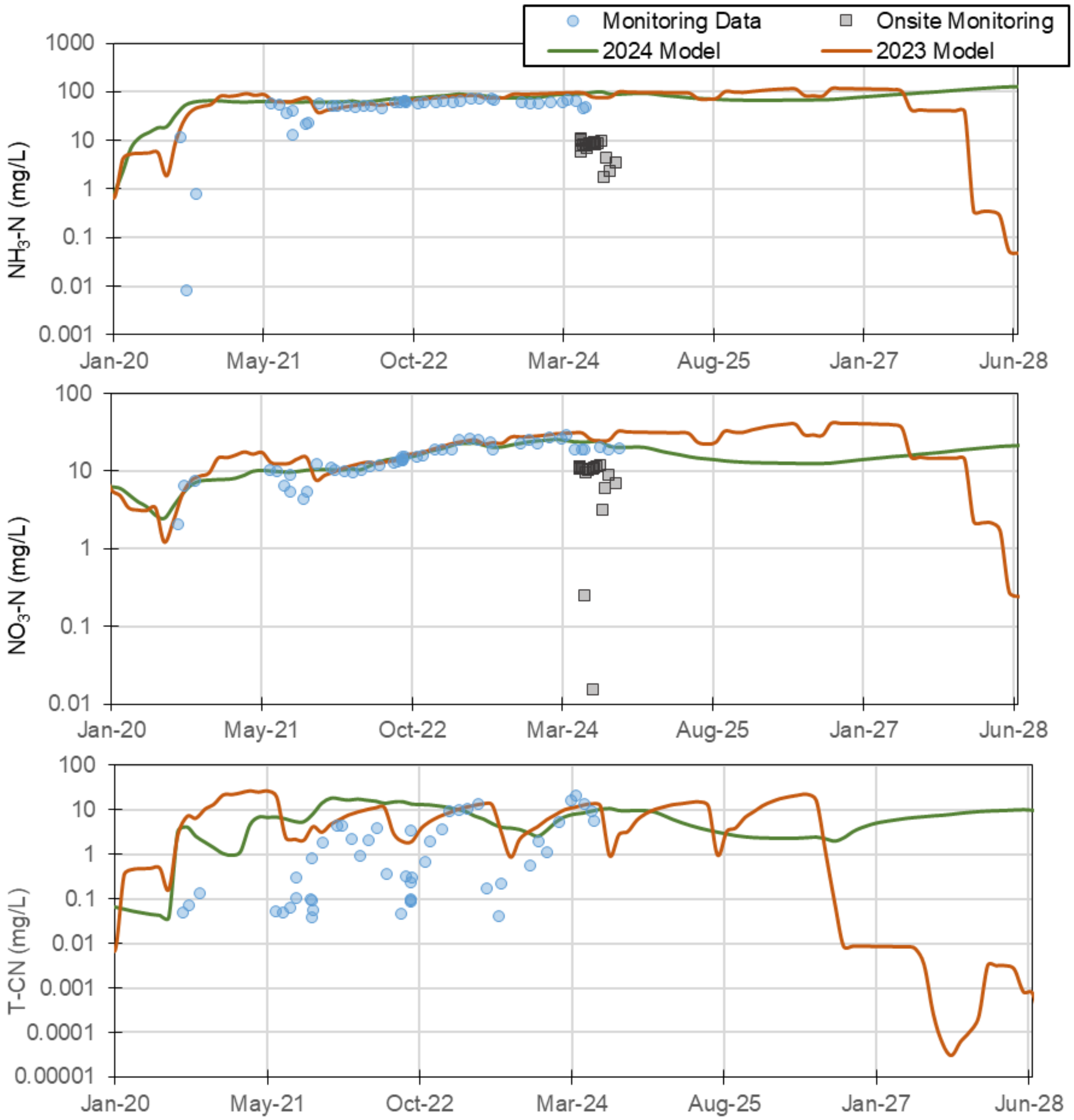

Figure A21: Water quality model validation results for ammonia, nitrate and total cyanide at Pit E during Operations.

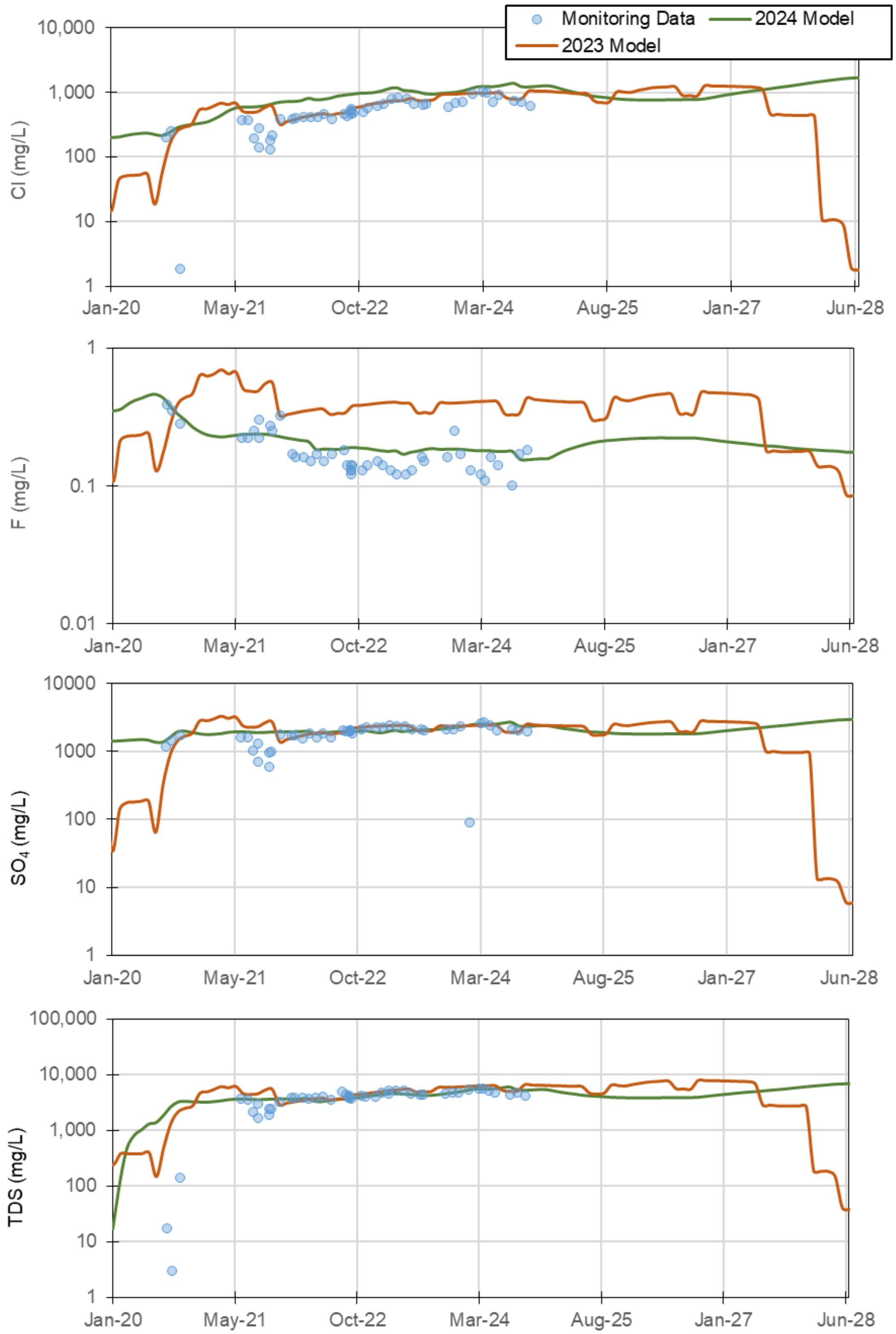

Figure A22: Water quality model validation results for chloride, fluoride, sulphate and total dissolved solids at Pit E during Operations.

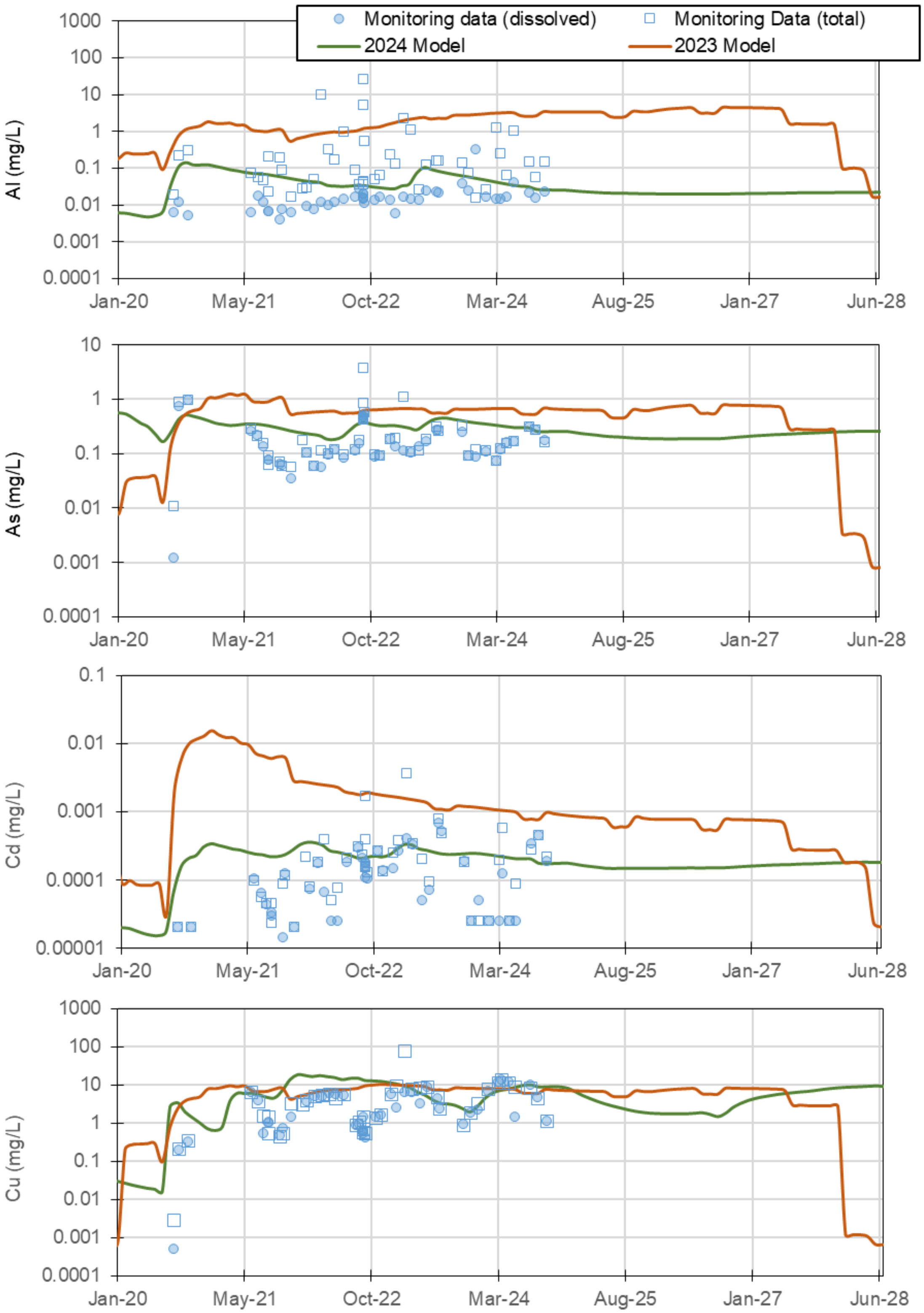

Figure A23: Water quality model validation results for arsenic, aluminum, cadmium and copper at Pit E during Operations.

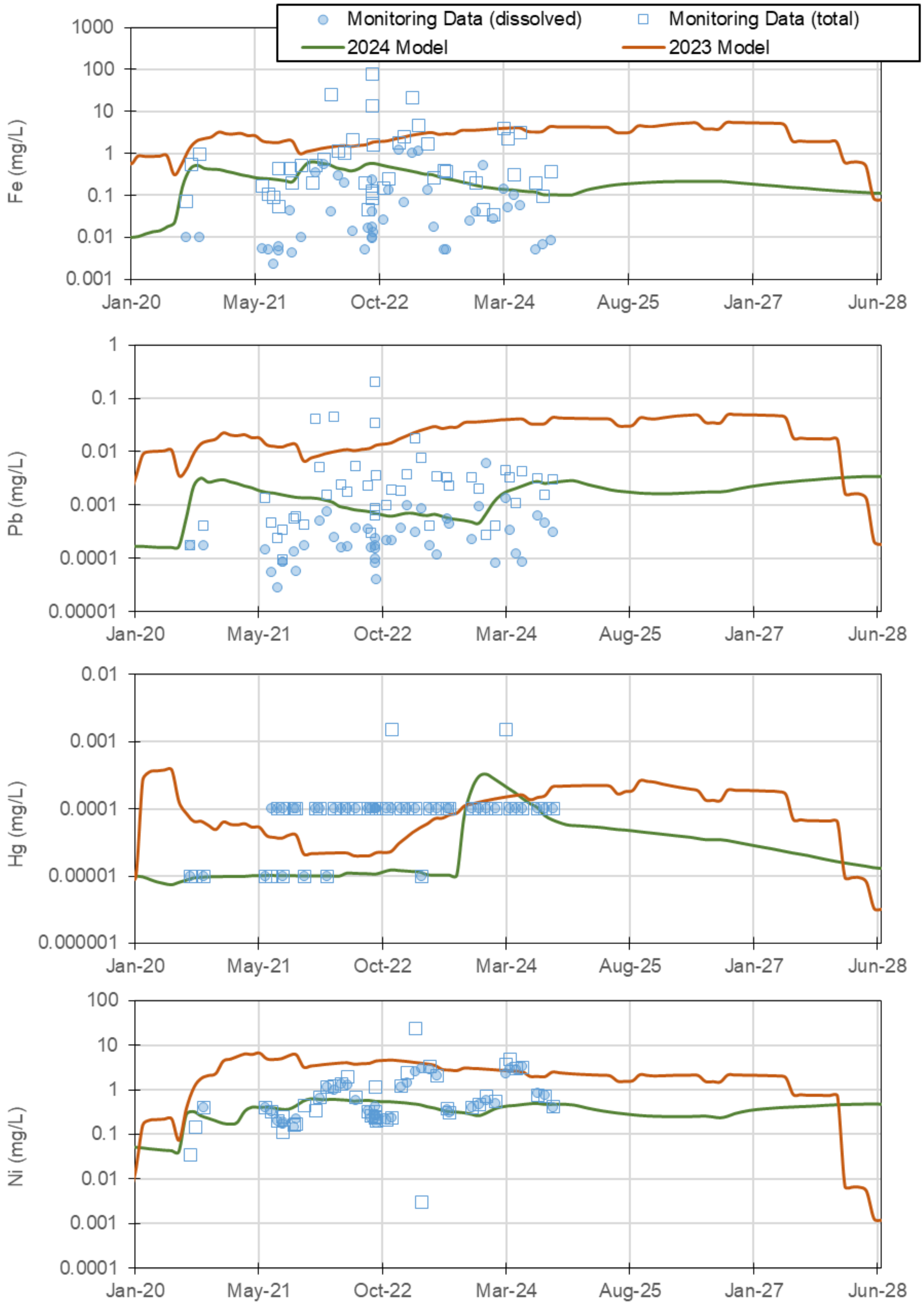

Figure A24: Water quality model validation results for iron, lead, mercury and nickel at Pit E during Operations.

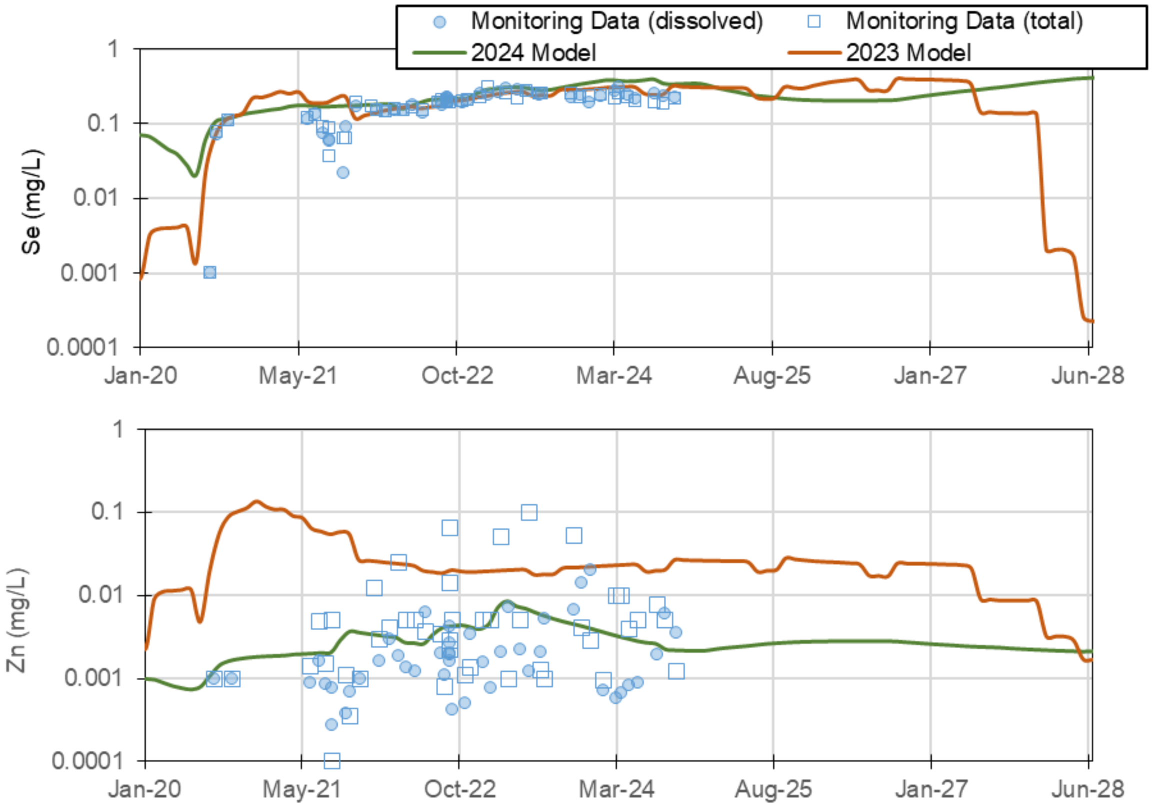

Figure A25: Water quality model validation results for selenium and zinc at Pit E during Operations.

A.6 Pit E Closure

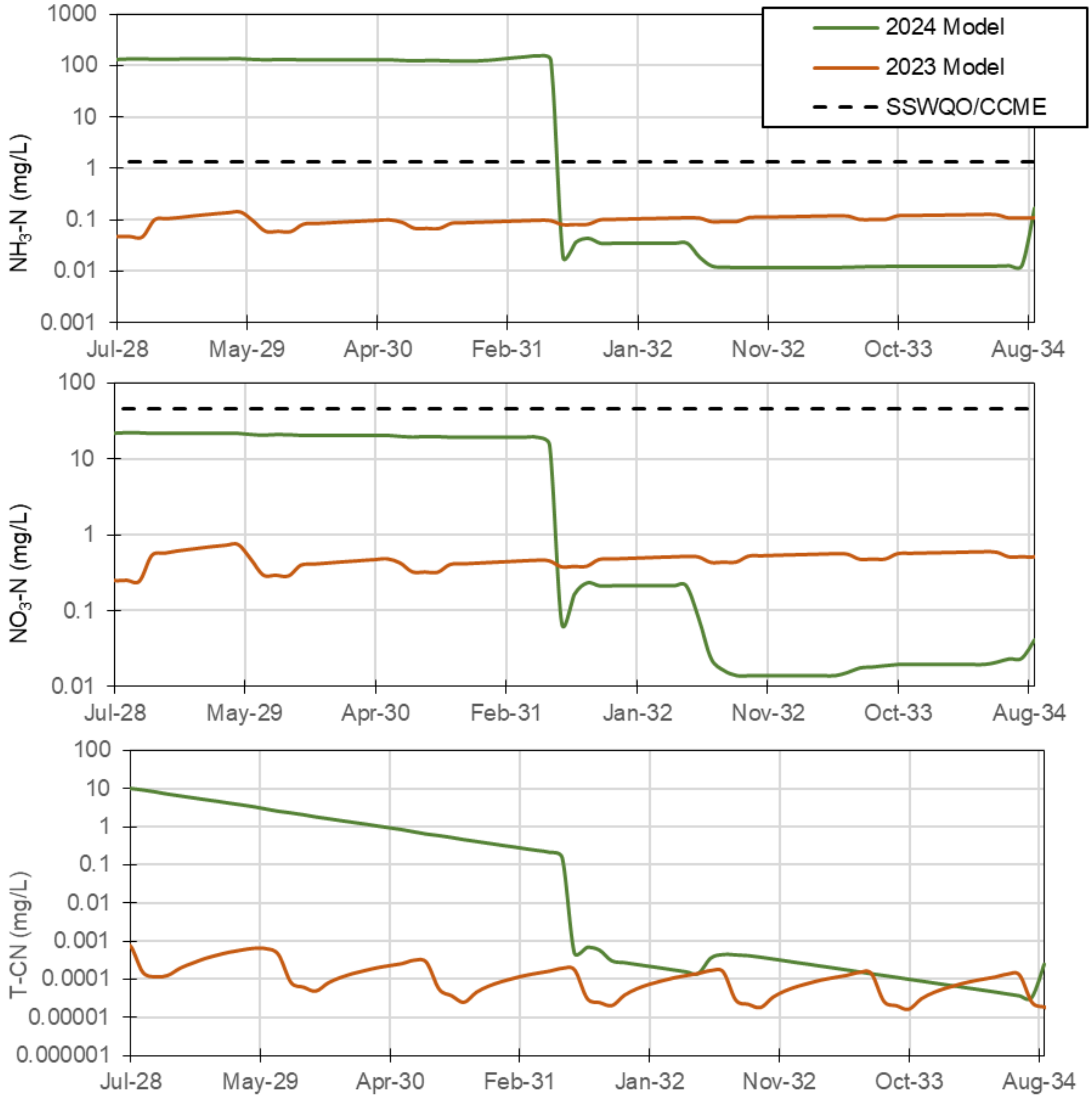

Figure A26: Water quality model validation results for ammonia, nitrate and total cyanide at Pit E during Closure. Dashed line represents SSWQO/CCME guidelines.

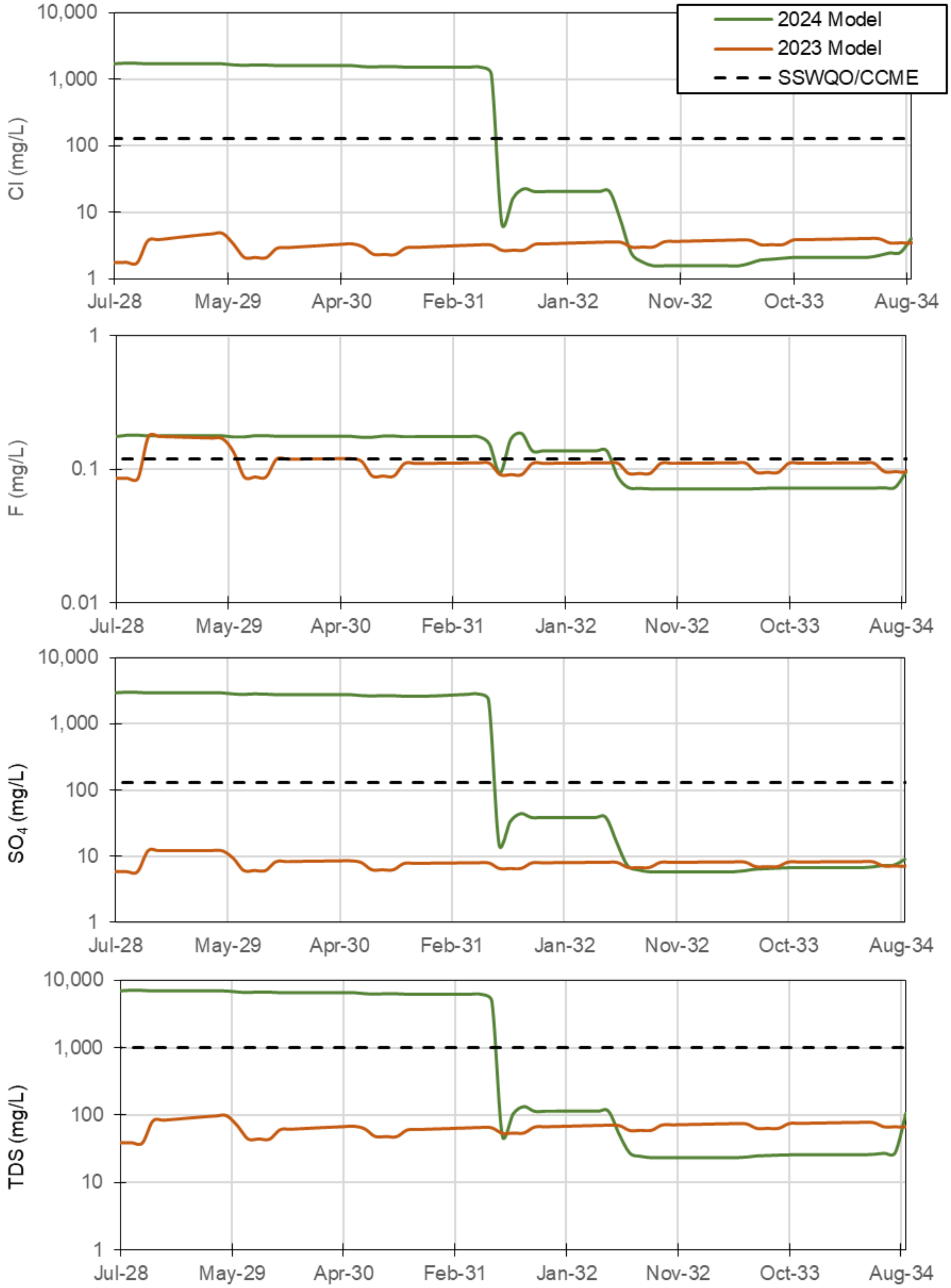

Figure A27: Water quality model validation results for chloride, fluoride, sulphate and total dissolved solids at Pit E during Closure. Dashed line represents SSWQO/CCME guidelines.

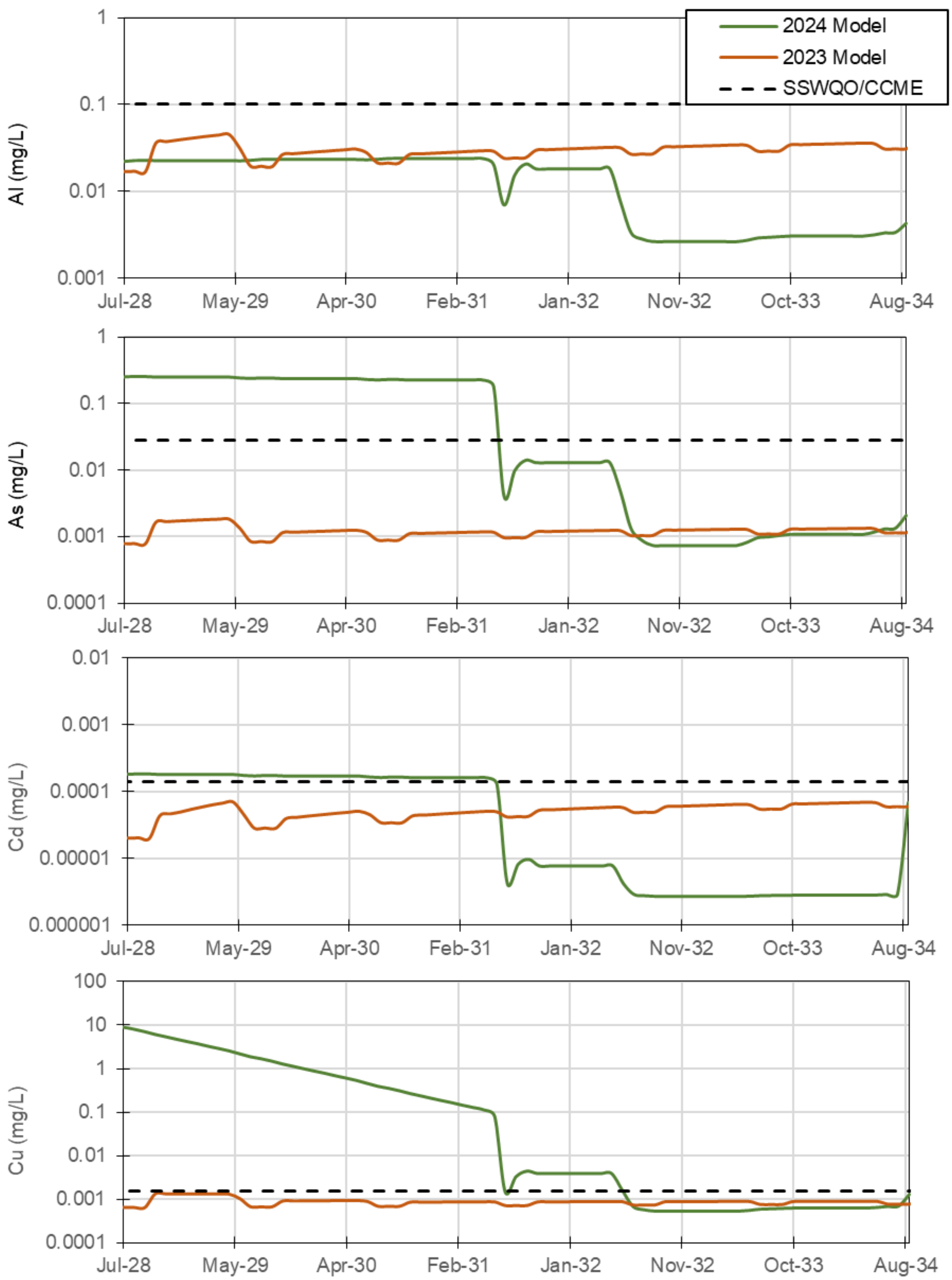

Figure A28: Water quality model validation results for arsenic, aluminum, cadmium and copper at Pit E during Closure. Dashed line represents SSWQO/CCME guidelines.

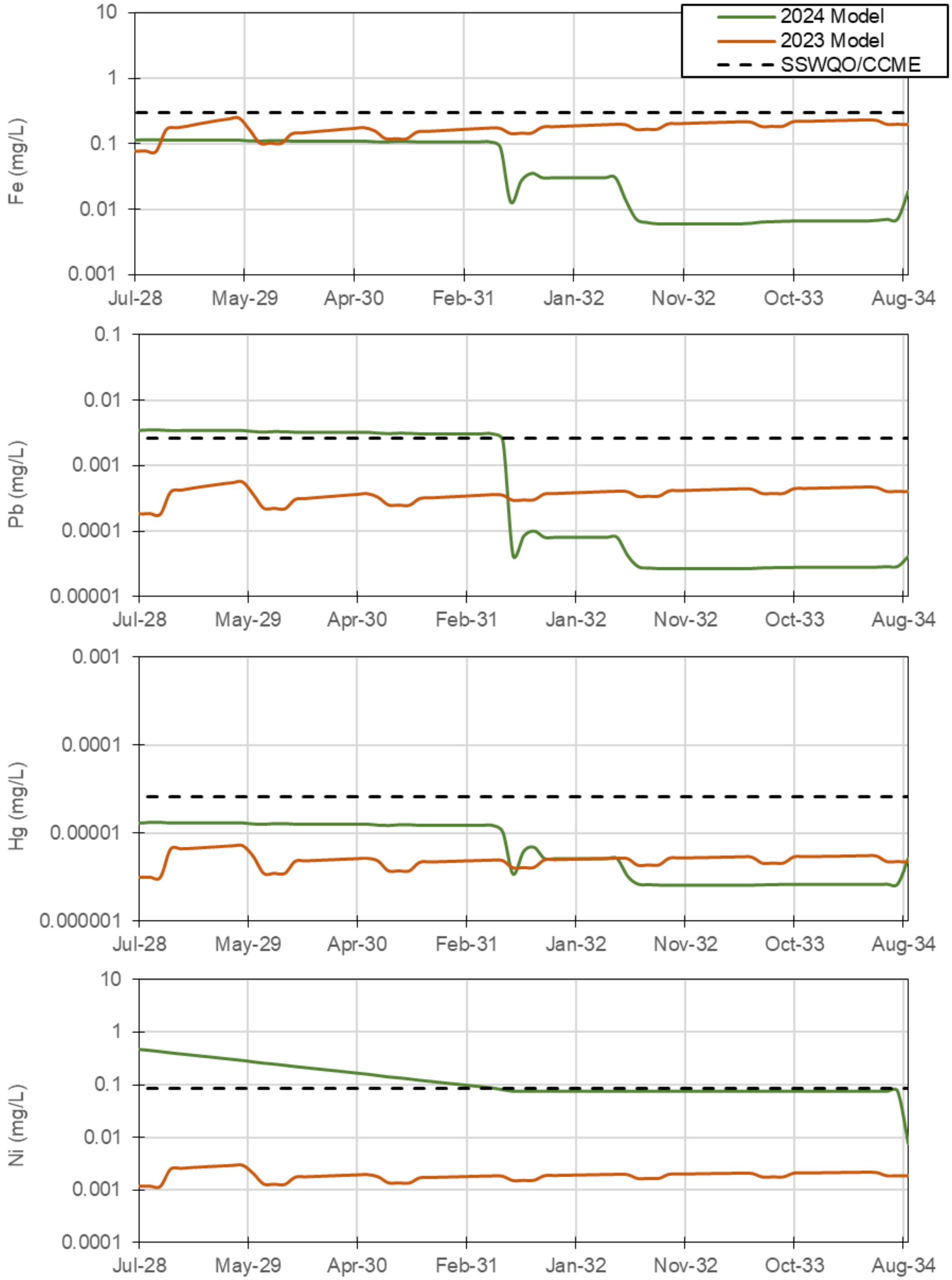

Figure A29: Water quality model validation results for iron, lead, mercury, and nickel at Pit E during Closure. Dashed line represents SSWQO/CCME guidelines.

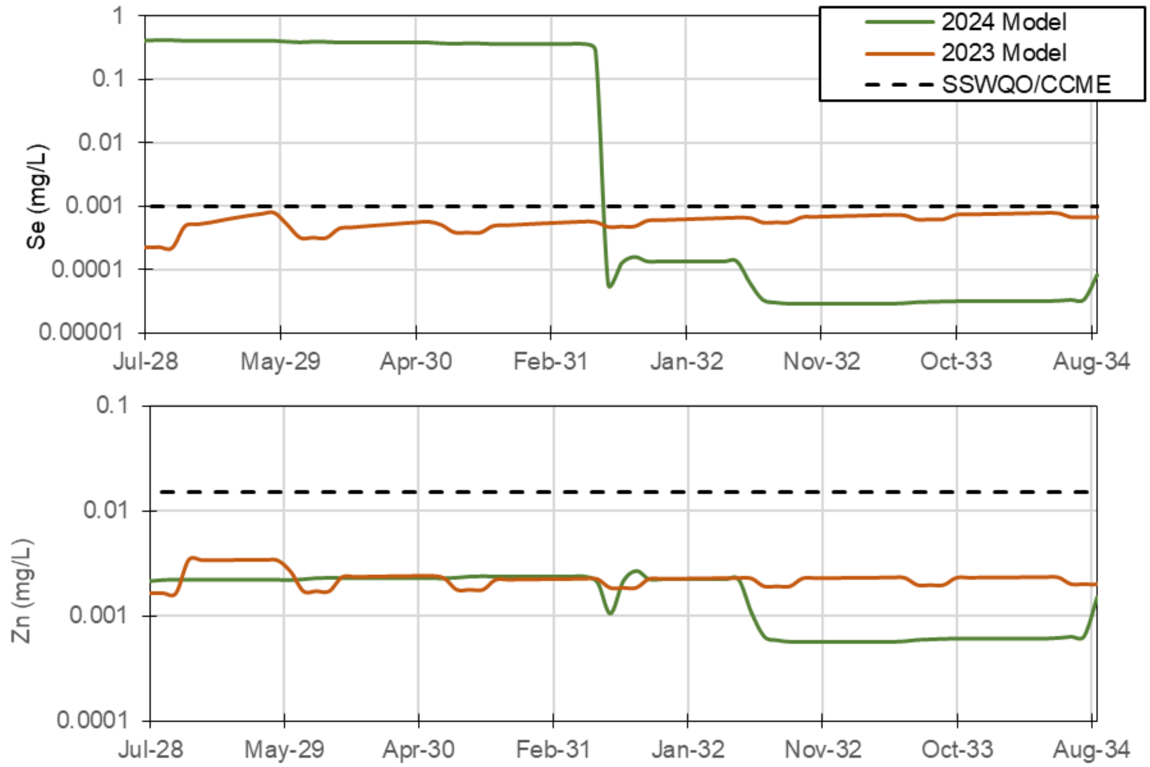

Figure A30: Water quality model validation results for selenium and zinc at Pit E during Closure. Dashed line represents SSWQO/CCME guidelines.

A.7 Vault Pit Surface Water Operations

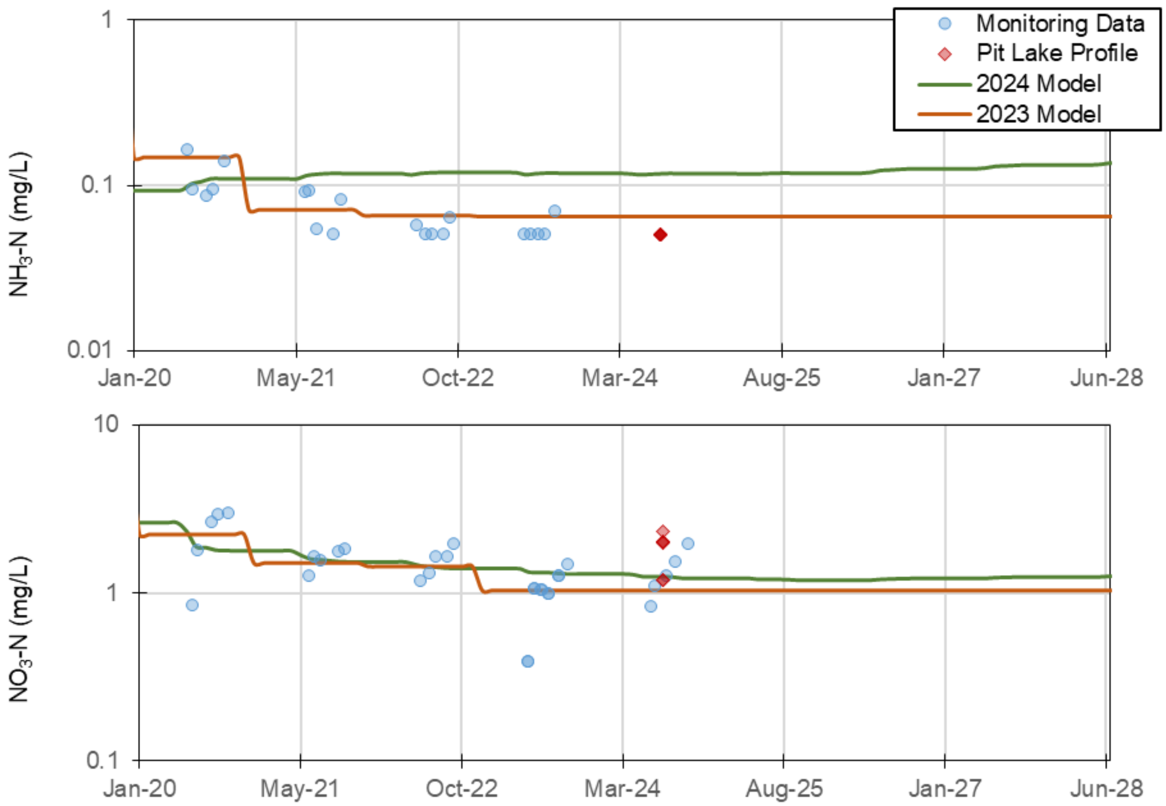

Figure A31: Water quality model validation results for ammonia and nitrate in Vault Pit surface waters during Operations.

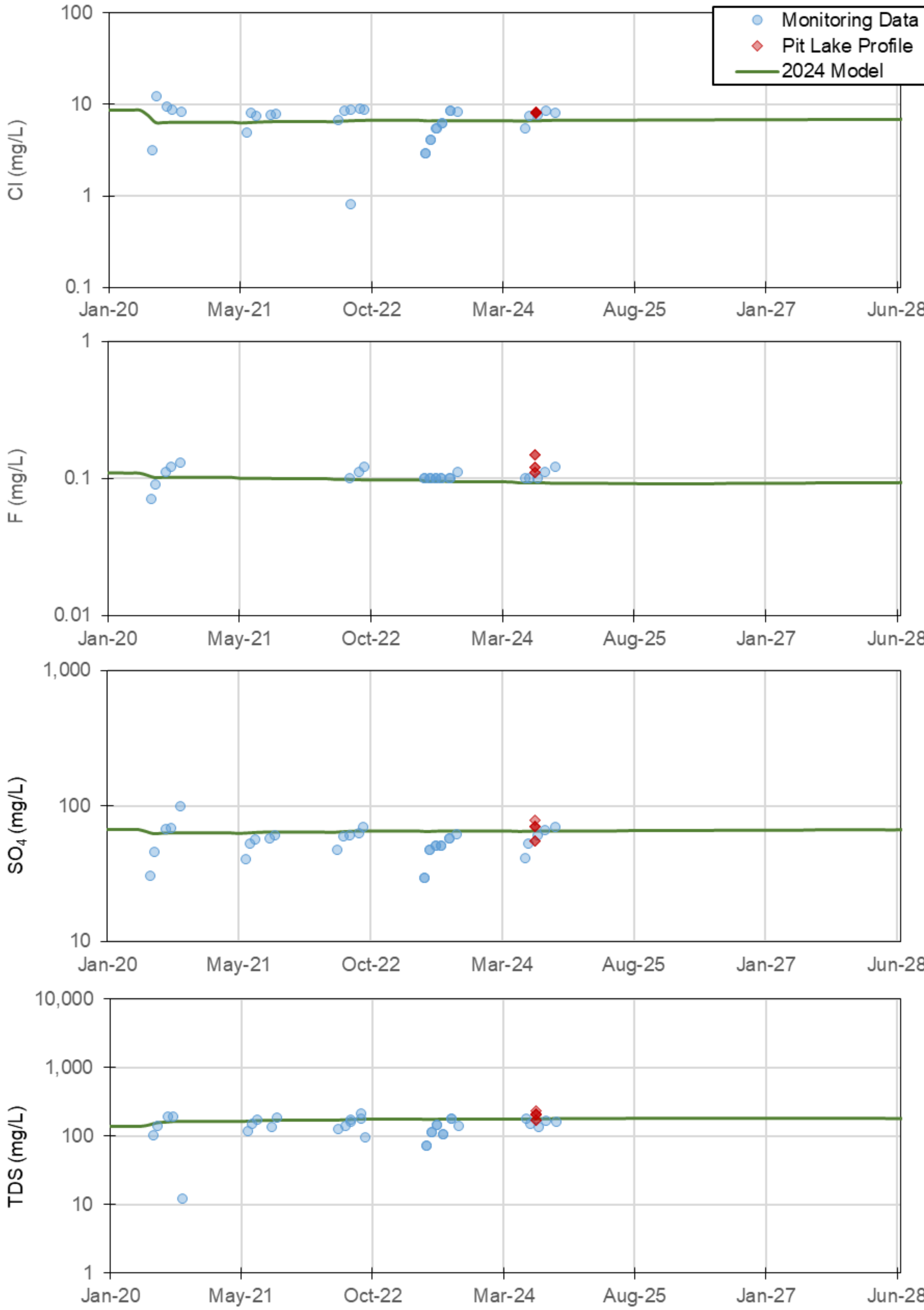

Figure A32: Water quality model validation results for chloride, fluoride, sulphate and total dissolved solids at Vault Pit surface waters during Operations.

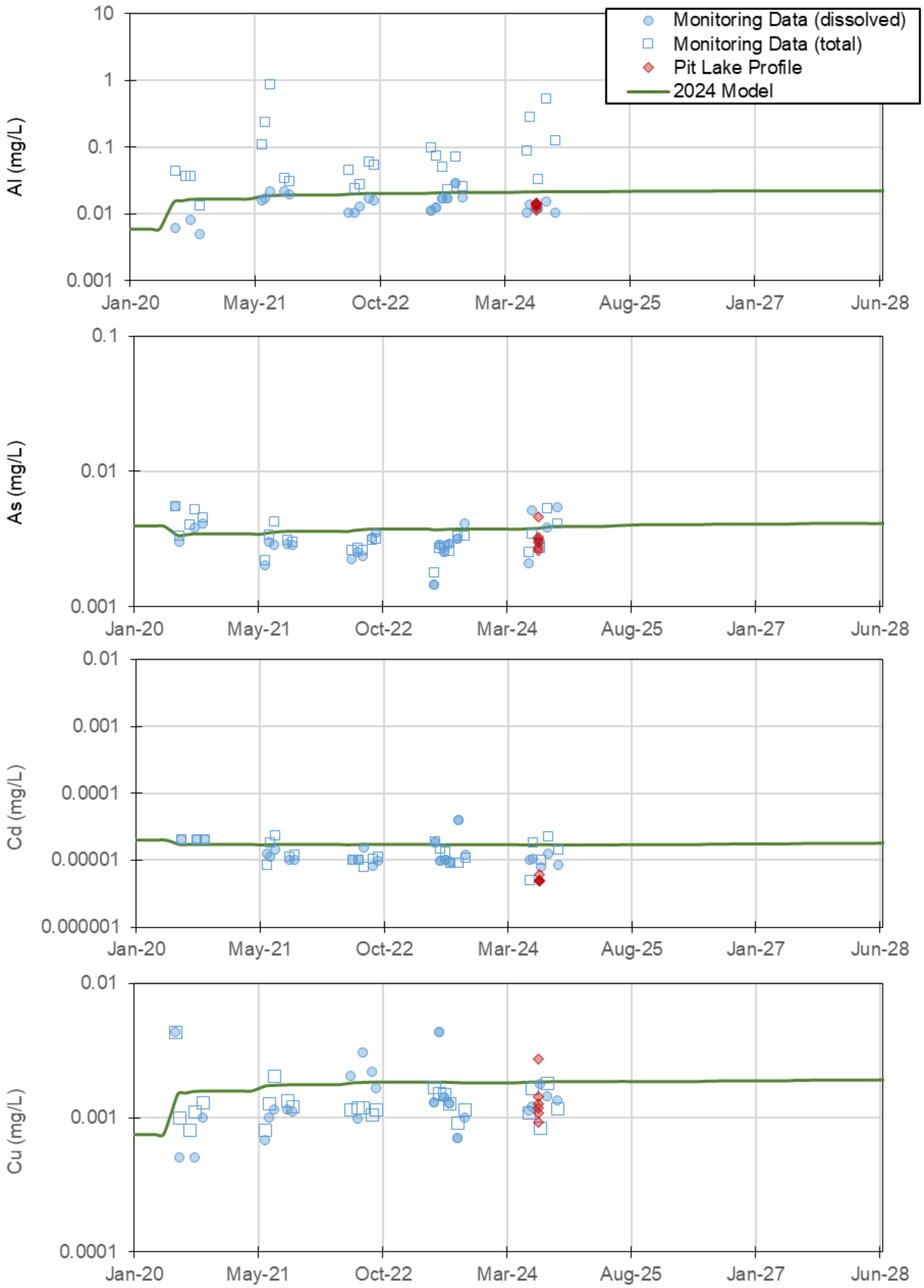

Figure A33: Water quality model validation results for arsenic, aluminum, cadmium and copper at Vault Pit surface waters during Operations.

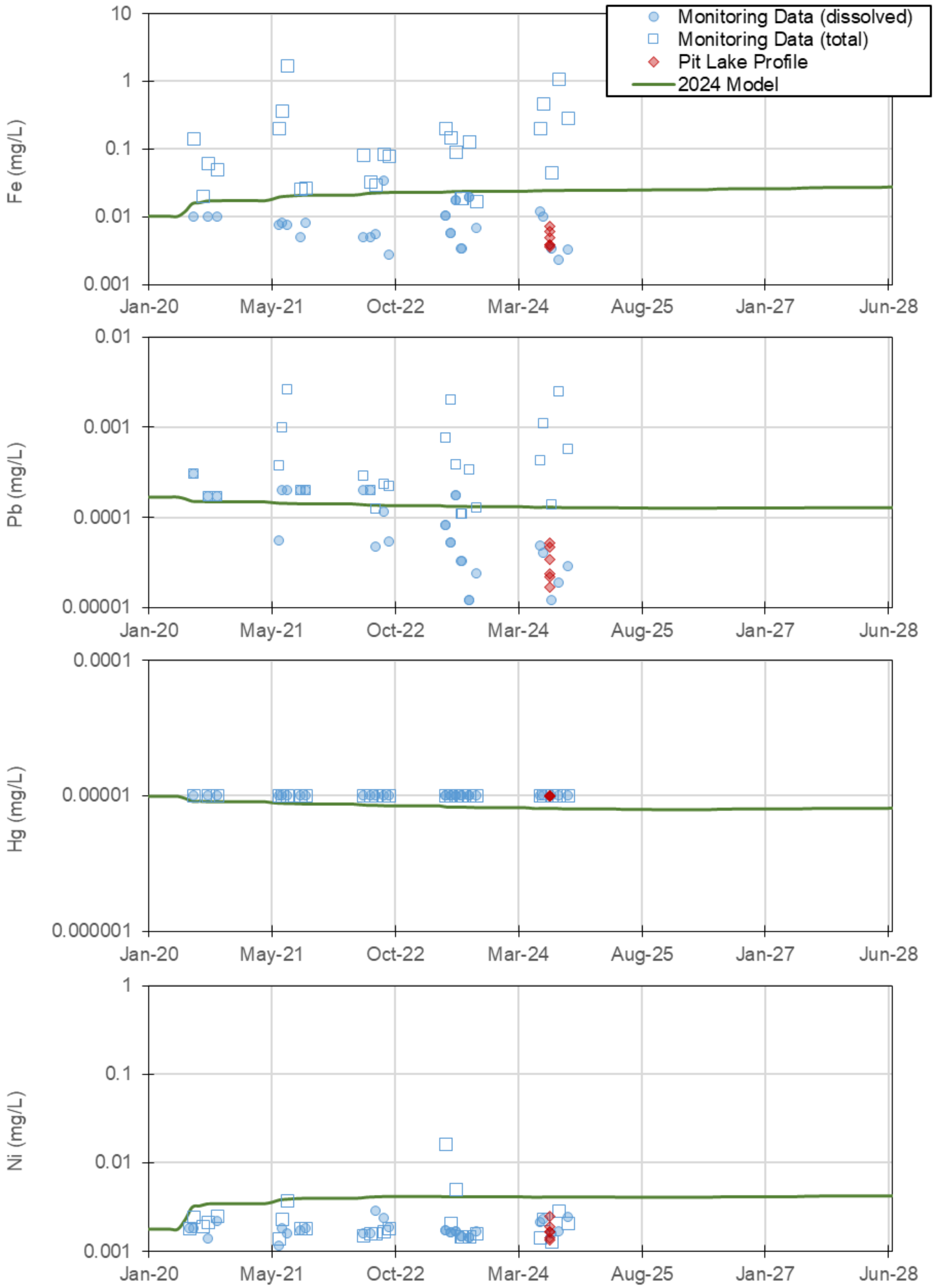

Figure A34: Water quality model validation results for iron, lead, mercury and nickel at Vault Pit surface waters during Operations.

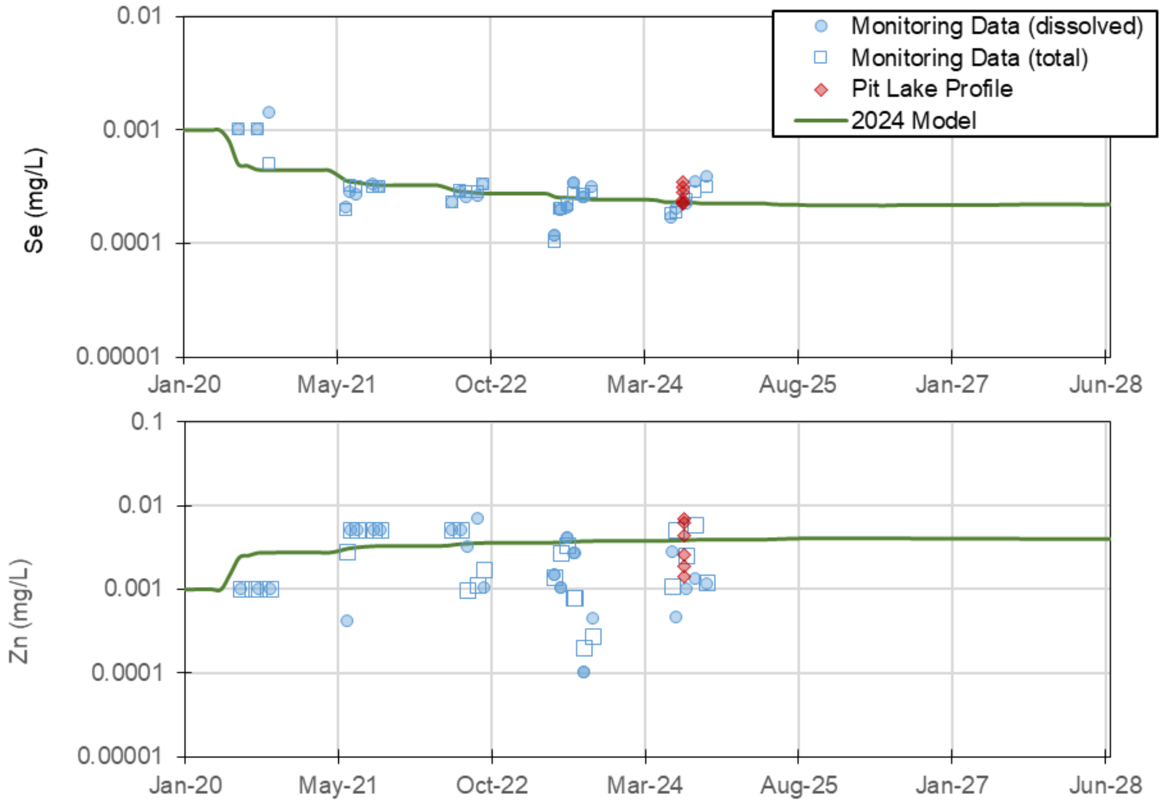

Figure A35: Water quality model validation results for selenium and zinc at Vault Pit surface waters during Operations.

A.8 Vault Pit Surface Water Closure

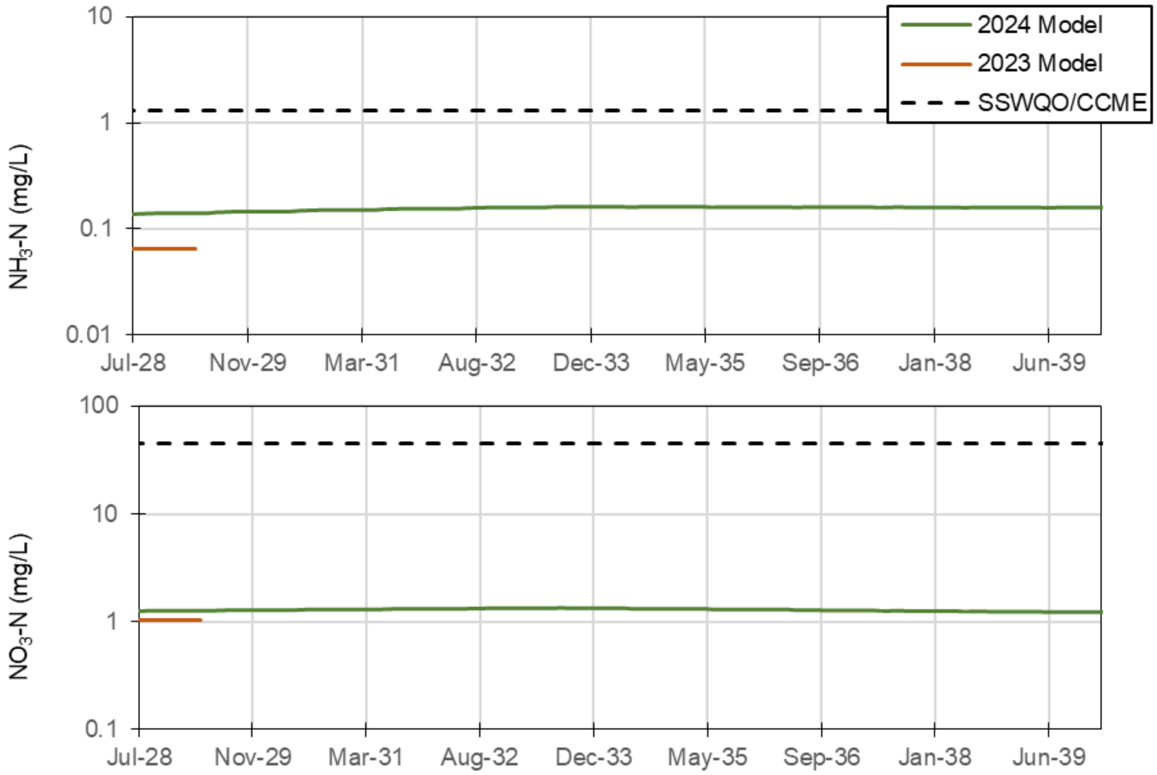

Figure A36: Water quality model validation results for ammonia, nitrate and total cyanide in Vault Pit surface water during Closure. Dashed line represents SSWQO/CCME guidelines.

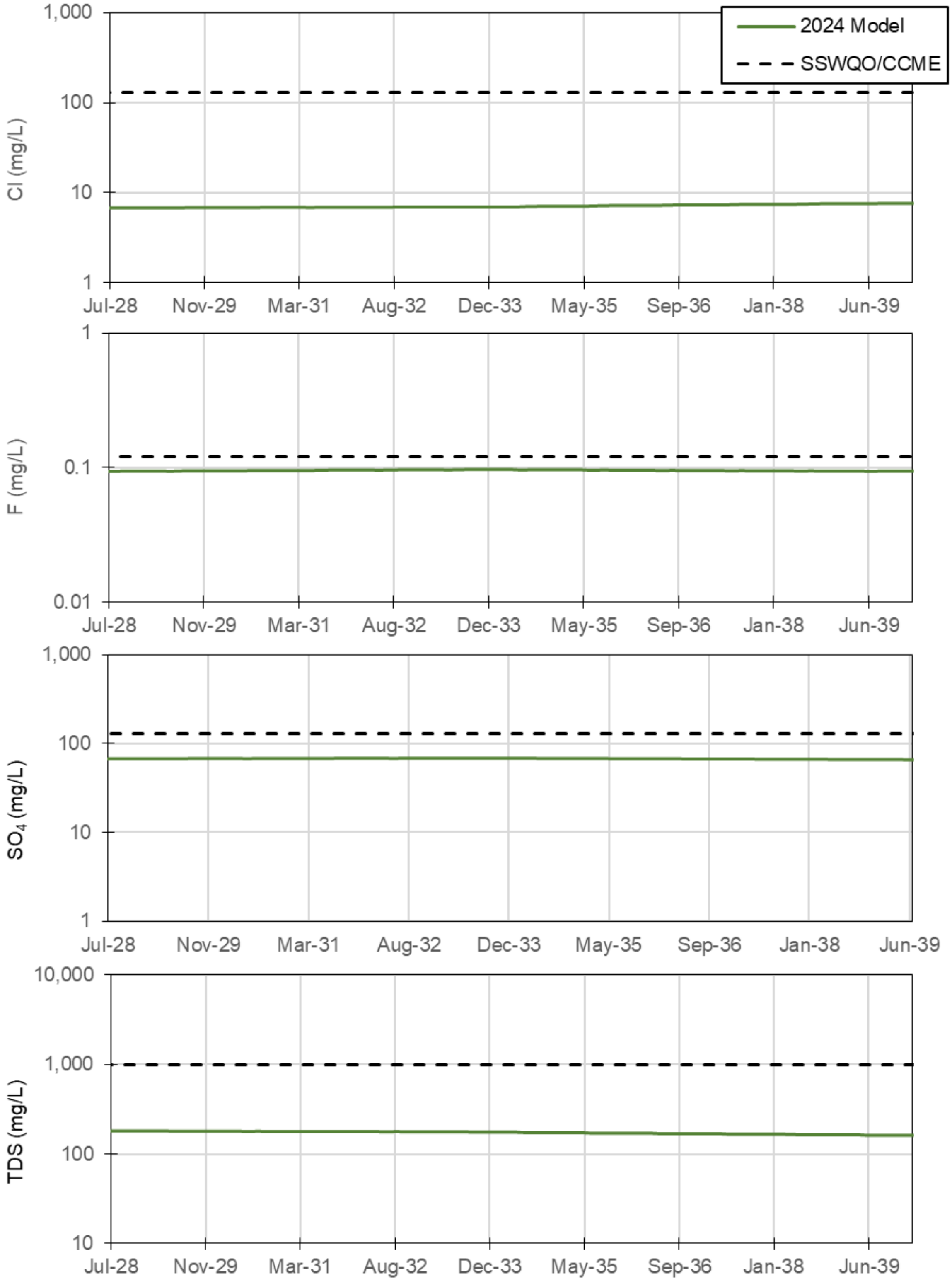

Figure A37: Water quality model validation results for chloride, fluoride, sulphate and total dissolved solids in Vault Pit surface water during Closure. Dashed line represents SSWQO/CCME guidelines.

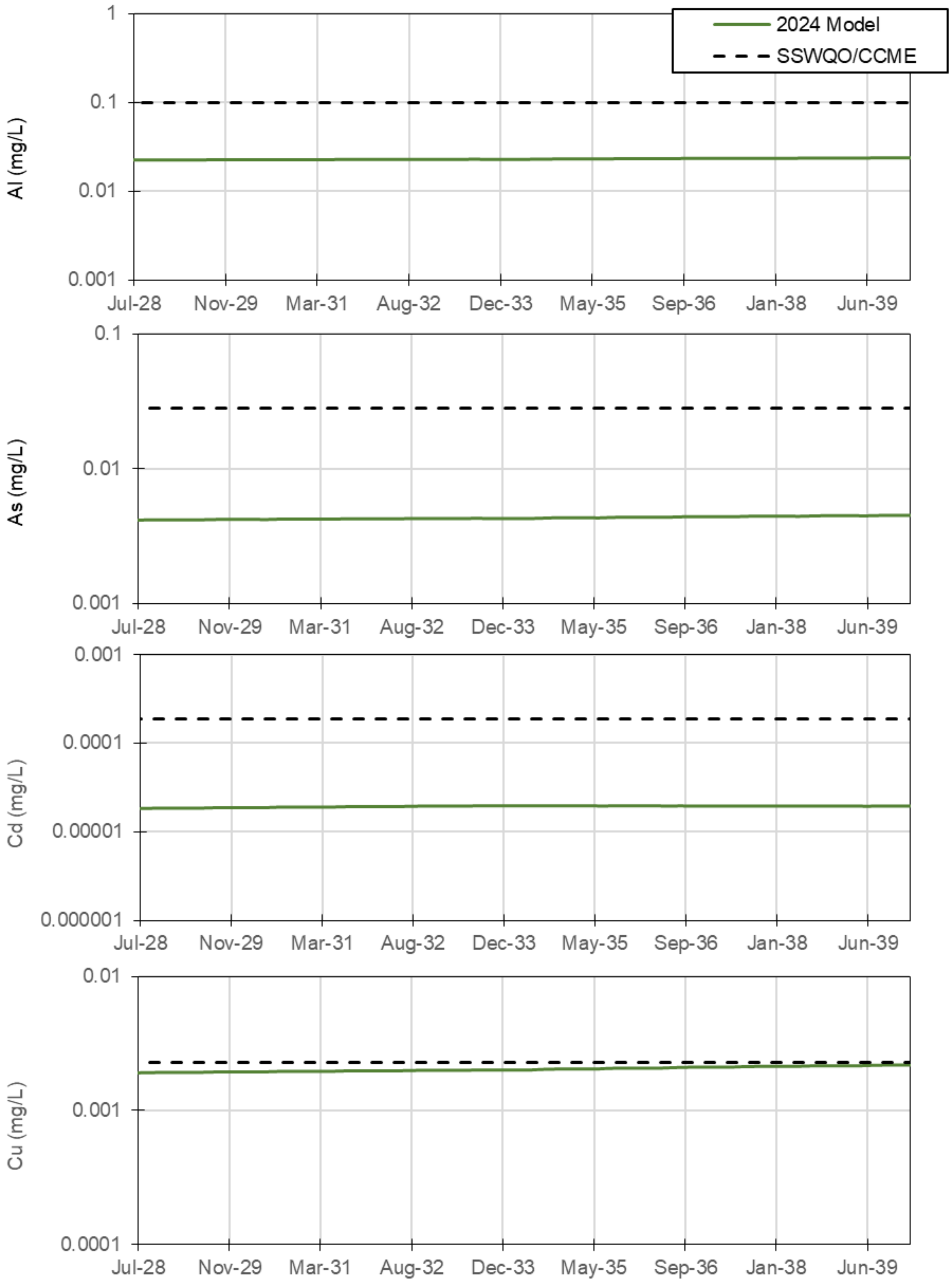

Figure A38: Water quality model validation results for arsenic, aluminum, cadmium and copper in Vault Pit surface water during Closure. Dashed line represents SSWQO/CCME guidelines.

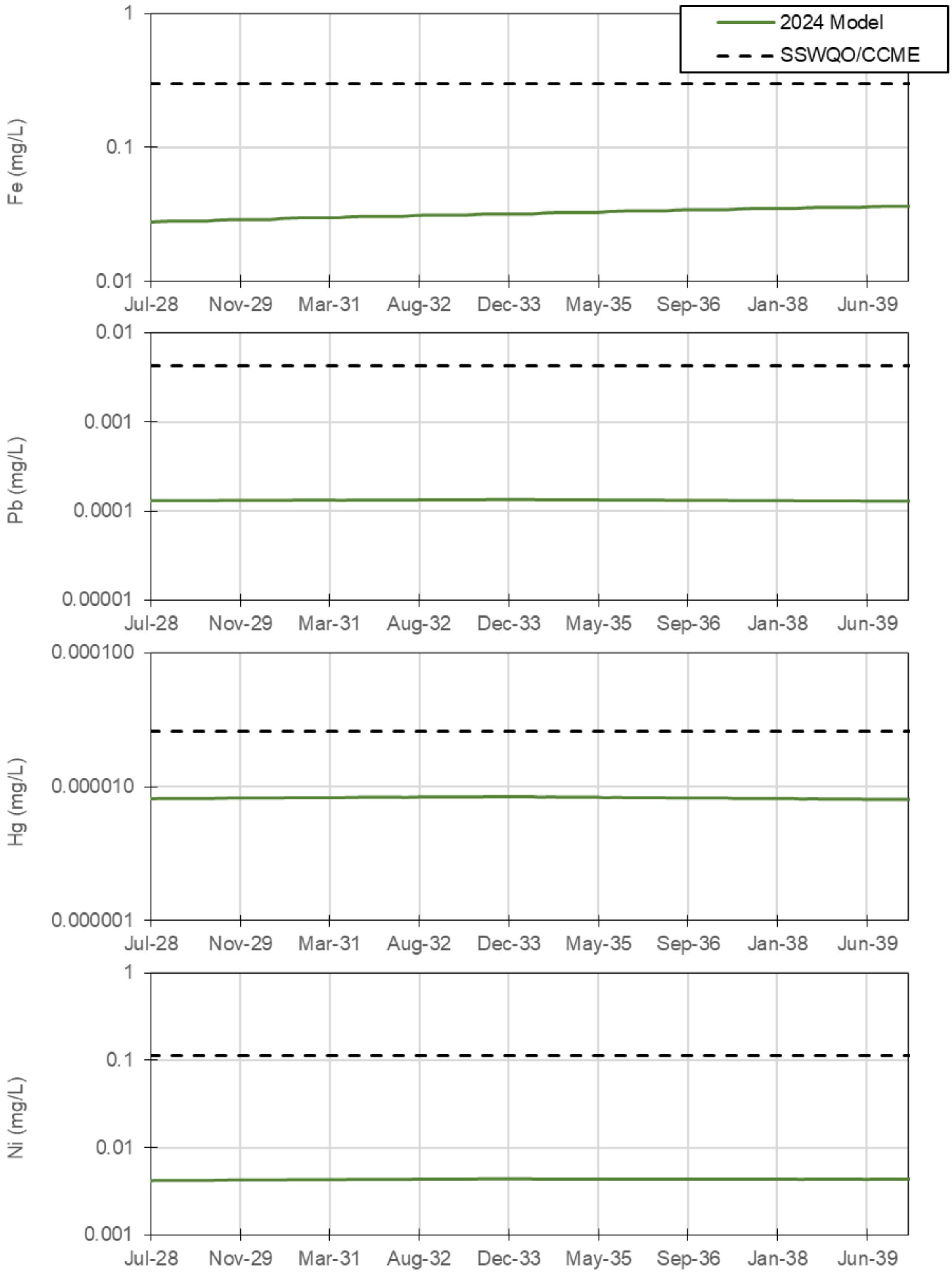

Figure A39: Water quality model validation results for iron, lead, mercury and nickel during Closure. Dashed line represents SSWQO/CCME guidelines.

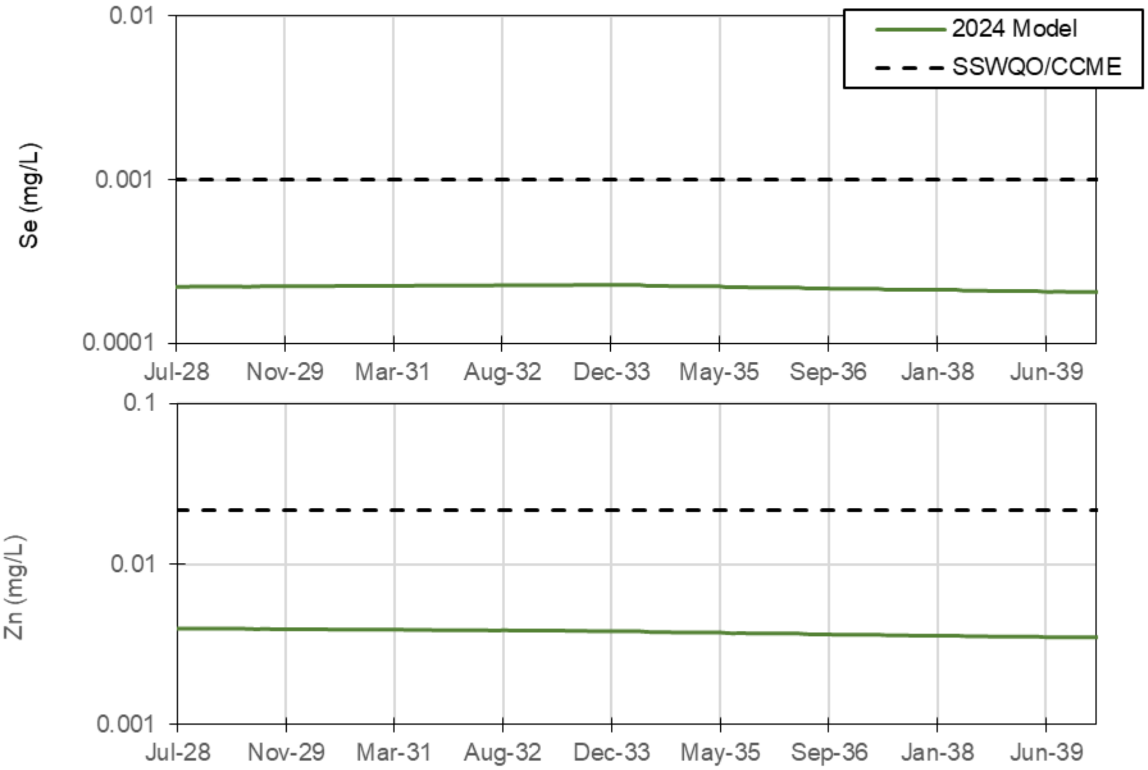

Figure A40: Water quality model validation results for selenium and zinc in Vault Pit surface water during Closure. Dashed line represents SSWQO/CCME guidelines.

APPENDIX D – 2025 FRESHET ACTION PLAN

MEADOWBANK COMPLEX

MEADOWBANK FRESHET ACTION PLAN

MARCH 2025

VERSION 13

1. EXECUTIVE SUMMARY

The purpose of this Freshet Action Plan is to identify areas of concern around the Meadowbank mine site and the AWAR that need to be managed in an organized and timely manner during the annual freshet period to prevent adverse environmental and operational impacts. The Plan outlines specified actions that will be taken by Agnico to manage and mitigate areas where environmental incidents could occur, as well as addressing historical incidents, specifically seepage on the north-east side of the Portage Waste Rock Storage area, known as sampling location ST-16 (2013) and seepage from the mill (inside) containment structures through the Assay Road southwest of the mill (Mill Seepage - 2013). Any future incidents that have the potential to affect off-site water or land will be added and would include any specific mitigation and monitoring actions.

The freshet period is initiated during the annual snow and ice melt, around mid-May. During this period excess water is created and must be managed through additional pumping and management practices at vulnerable areas around the site. Mitigation techniques, timeframes and specified roles and responsibilities are outlined in this document for each area of concern.

The main areas of concern are the excavated pits (Pit A, Pit E, Goose Pit and Vault Pit), the North and South Cell TSF surrounding infrastructures (East and West diversion ditches, Saddle Dam 1 corner, Saddle Dam 2 sump, Saddle Dam 3 sump, Saddle Dam 4-5 downstream, Central Dike downstream pond (ST-S-5), Stormwater Dike), the areas around the Portage Waste Rock Storage Facility (RSF) (the northern portions of the NAG waste rock extension, the two collection ponds known as WEP1 and WEP2), Vault Road culverts, Vault Waste Rock Storage Facility, AWAR culverts near the site and along the road to Baker Lake, RSF – ST-16 Seepage, and the Assay Road (Mill) Seepage.

It is important for all water management and associated infrastructure to be in good working order and adequate to manage the expected water flows associated with the freshet period; this includes but is not limited to pumps, ditch, culvert and sump maintenance, critical piping system installation and inspection, as well as adequate resource allocation for preparative work. A concise summary of the 2025 preparation works and roles and responsibilities are presented in the attached Appendix 1 (2025 Freshet Action Plan Procedures). Appendix 1 will be updated yearly to reflect changes in conditions at the Meadowbank site. Appendix 2 contains diagrams depicting the areas of concern and incident response locations.

DOCUMENT CONTROL

Revision				Pages Revised	Remarks
#	Prep.	Rev.	Date		
01	Agnico	Internal	April 2014	All	
02	Agnico	Internal	May 2015	All	Comprehensive update from 2014 Plan
03	Agnico	Internal	October 2015	All	Comprehensive update from May 2015 Plan
04	Agnico	Internal	March 2016	All	2016 Comprehensive review
05	Agnico	Internal	March 2017	All	Comprehensive update from May 2016 Plan
06	Agnico	Internal	March 2018	All	Comprehensive update from 2017 Plan
07	Agnico	Internal	March 2019	All	Comprehensive update from 2018 Plan
08	Agnico	Internal	March 2020	All	Comprehensive update from 2019 Plan
09	Agnico	Internal	March 2021	All	Comprehensive update from 2020 Plan
10	Agnico	Internal	March 2022	All	Comprehensive update from 2021 Plan
11	Agnico	Internal	March 2023	3	2.1.3 Water transfers into Pit A were added
				2	Figure 2-1, Figure 2-2, Figure 2-3, Figure 2-4, Figure 2-6, Figure 2-7 were updated
				15	Section 2.9 was added
				Appendix 1	Section 2.9 was added
				Appendix 3	Snow management map was updated
				Appendix 4	Freshet flowchart and plan view was updated
12	Agnico	Internal	March 2024	8	Section 2.3.1.1 was updated
				11	Section 2.3.1.5 was updated
				15	Section 2.8 was updated
				15	Section 2.10 and Figure 2-10 were added
				Appendix 1	Section 2.10 was added
				Appendix 3	Snow management map was updated
				Appendix 4	Freshet flowchart and plan view were updated
13	Agnico	Internal	March 2025	3, 6, 7, 9, 10, 12, 15, 16	Sections 2.1.1 / 2.1.2 / 2.1.4 / 2.2.2 / 2.3.1.1 / 2.3.1.2 / 2.3.1.4 / 2.3.2.1 / 2.8 / 2.9 /2.11 were updated
				14	Section 2.6 was added
				Appendix 3	Snow management map was updated
				Appendix 4	Freshet flowchart and plan view were updated

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Approved by:

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1. INTRODUCTION

The purpose of this Freshet Action Plan is to ensure that Agnico can address and manage excess water associated with the freshet season at the Meadowbank site in a manner to minimize environmental risks, and to ensure Agnico has implemented specific management and mitigation measures in response to environmental incidents with potential for offsite impacts to water or land.

The freshet season is loosely defined as starting approximately May 15^{th} and in some cases, actions and mitigation measures can extend into early fall when freezing re-occurs. There are many areas around the site that are vulnerable to excess water; the goal is to identify these areas and develop a clear plan with defined roles and responsibilities (amongst Agnico Eagle Departments), and to manage the freshet flows.

In addition, several guiding principles are applicable to the formation of this plan. The highest priority principles are:

1) to ensure that the health and safety of Agnico employees is protected, especially with respect to mining operations when excess water is present.
2) to ensure that mine contact water from runoff or seepage is managed to prevent adverse environmental impacts; and
3) to ensure the site is compliant with the Nunavut Water Board (NWB) License, Part D, Item 19 and Part E, Item 10.

The plan will identify the areas of concern and discuss the potential risks as well as mitigation measures necessary to address the identified issues. Appendix 1 contains the actual defined 2025 procedures, the roles and responsibilities and associated timelines. Agnico's intent is to update the Procedural Appendix on a yearly basis. For example, there may be additional mitigation measures for a defined problem area, or, in some cases, a previously defined issue may be permanently rectified.

The main areas of concern are:

- IPD pits and Vault area Pits.
- Area around the Portage Waste Rock Storage Facility (RSF) including the northern portions of the NAG waste rock extension, which include the collection ponds known as WEP 1 and WEP 2.
- Vault Waste Rock Storage Facility.
- North and South Cell TSF surrounding areas:
    - East and West diversion ditches.
    - Saddle Dam 1 corner.
    - Saddle Dam 2 downstream toe.
    - Saddle Dam 3 downstream toe.
    - Saddle Dam 4-5 downstream.
    - North Cell Internal Structure.
- East Dike Seepage.

- Vault Road culverts.
- Stormwater Management Pond.
- Fuel Tank Farms.
- AWAR culverts near the site and along the road to Baker Lake.
- RSF – ST-16 Seepage.
- Assay Road (Mill) Seepage.
- Central Dike D/S Seepage.
- Monitoring Station at KM87 (ST-44)
- Baker Lake Marshalling Facilities

Each area identified above will be discussed in detail below. All areas of concern are considered priorities based on the guiding principles.

2 AREAS OF CONCERN

2.1 IPD Pits, Vault Pits

All active ramps and ditches must be cleared of all ice and snow before May in order to access the shoreline of the filling pits. All pumps must be checked and serviced to be in working order prior to May. In addition, a check must be completed confirming that all piping systems starting at the different pits are in working order (leak free).

2.1.1 *Goose Pit*

Mining in Goose Pit was completed in 2015. Tailings deposition began in July 2019. Water accumulating in the surface area around Goose Pit (Bay Goose Dike ring road, NPAG stockpile, Goose sump) will be pumped to Goose Pit as required.

2.1.2 *Pit E*

Mining in Pit E was completed in 2019. Tailings deposition began in August 2020. Runoff water accumulated at the Pit E crest will be pumped into Pit E as required. The Pit E3 ramp requires proper trenching and snow clearing to ensure safe condition for the planned operations of the tailing deposition and mill reclaim systems. Water accumulating in the pit is either reclaimed for the mill process or transferred to Pit A as needed.

2.1.3 *Pit A*

Mining in Pit A was completed in 2018. The pit is now part of the in-pit deposition plan. The Pit A ramp requires proper trenching and snow clearing to ensure safe operations of the tailing deposition and mill reclaim systems.

Water from the South Cell, Central Dike seepage, East Dike Seepage (depending on water quality) and Stormwater Pond will be directed to Portage Pit A during freshet, whereas accumulating water in Pit A will be reclaimed for mill process, as required.

2.1.4 *Vault & Phaser Pits*

Mining activities were completed in the Vault area (including Phaser and BB Phaser) in 2019. As a result of all mining activity of Vault area being completed, passive pit reflooding has begun, with natural runoff being the only inflow. For safety reasons the area is restricted. Procedures are in place to safely access the area for sampling purposes.

Figure 2-1: View of Vault area and the surrounding area

2.2 Waste Rock Storage Area

2.2.1 *Portage RSF*

The Portage Rock Storage Facility (RSF) will require weekly inspections around the perimeter beginning as soon as the freshet starts until it freezes up to identify any seepage. As will be noted in the following section, seepage was identified in 2013 at location ST-16. In the event that additional seepage is observed from the RSF, it must be reported to the Environment Department and samples must be taken to determine the water quality and source. A mitigation plan will be prepared and implemented if necessary.

Active pumping at the Portage RSF towards the North Cell and Pit A is planned at ST-16 (Section 2.2.1.1), WEP1 (Section 2.3.1.2), and WEP 2 (Section 2.3.1.2).

2.2.1.1 ST-16 Seepage

In July 2013, a seepage from the Rock Storage Facility (RSF) was noted (see ST-16 on Figure 2-3). The seepage contained elevated copper, nickel, ammonia and cyanide. It was determined through investigation that the likely source of the contaminants was reclaim water from the North Cell TSF. Further details and discussion can be found in the Agnico Annual Report (Section 8.5.3.1.7).

Water ponding in ST-16 will be pumped to the North Cell Tailings Storage facility and Portage Pit A. Daily inspections will be undertaken in May until freshet is complete and after rain events to ensure water remains contained within ST-16. Water levels in ST-16 must remain below the till plug. Once the lake or seep area is ice free, the sample monitoring program will commence. If samples detect any concerns or elevated levels, Agnico will review the monitoring plan immediately, including downstream lakes. Pumped volumes will be documented, and daily inspections of the area will be undertaken. In addition, snow will be removed from the ditches and culvert at the outlet of NP- 2 to NP-1 Lake to ensure freshet flows do not back up and overflow into the ST-16 seep location and that the north watershed non-contact runoff flows freely through to NP-1 Lake and further downstream (Dogleg Lake).

In the event that seepage water flows through the rockfill road reaching NP-2 Lake, the Environmental Department will notify authorities.

Figure 2-2. View ST-16 station and surrounding area.

2.2.1.2 Waste Extension Pool (WEP) sumps

WEP1 and WEP2 sumps were constructed in September 2015 to manage water around the northeast side of the RSF to ensure all water ponding is transferred to the North Cell TSF (see Figure 2-3). The WEP1 and WEP 2 sumps were replaced in 2016 with the WEP collection system. Water collected at WEP1 and WEP2 will be pumped to ST-16. Daily inspections will be undertaken in May until freshet is complete and after rain events to ensure water remains contained within WEP1 and WEP2 and does not enter the East Diversion Ditch. Both sumps WEP1 (ST-30) and WEP2 (ST-31) will be sampled as per the monitoring plan.

2.2.1.3 North Portion of NAG Waste Rock Expansion

The northwestern area of the RSF, which consists entirely of NAG material, extends towards the East Diversion ditch as shown in Figure 2-3. Runoff from this area, while not anticipated to be contaminated, could, if significant, discharge to NP-2 lake after crossing the tundra. The Environmental Department will conduct daily visual inspections during freshet. Sample monitoring will be undertaken when water is observed in order to determine water quality. Contaminated water must be kept from reaching NP-2 Lake; and if required, water will be pumped or diverted.

2.2.2 *Vault RSF*

The Vault RSF requires monitoring during the freshet period to ensure adequate water management. Weekly inspections around the RSF perimeter will be conducted to identify any seepage as soon as the freshet starts. In the event that seepage is observed, the Environment Department must be notified and samples taken to determine water quality. The sample monitoring will be in accordance with the Water License requirements. No water quality issues are anticipated as primary drainage is towards the Vault Pit and the waste rock stored in the RSF is primarily NAG.

2.3 North and South Cell Tailings Storage Facility

Water management around both the North and South Cell Tailings Storage Facility (TSF) is required to maintain integrity of the tailings management infrastructure and to prevent any adverse environmental impacts. Water from the North Cell will be transferred to the South Cell which will then be pumped toward Portage Pit A. This section describes the infrastructure in place to control runoff water and reduce possible impact on both the tailings storage facility and the receiving environment. Tailings were last discharged in the North Cell in 2021, while tailings were last discharged in the South Cell in 2023.

2.3.1 *Diversion Ditches*

The East and West Diversion ditches were constructed in 2012 around the North Cell TSF and the Portage RSF. The diversion ditches are designed to redirect the fresh water from the northern area watershed away from the tailings pond and RSF and direct it to Second and Third Portage Lakes. As seen in Figure 2-3, five zones associated with the diversion ditches have been identified where actions will be taken during or before freshet as required:

1. AWAR culvert – Discharge to Third Portage Lake (ST-6).
2. West Diversion Ditch elbow.
3. Northwest corner of North Cell TSF;
4. East Diversion Ditch Outlet to NP-2 Lake (ST-5).
5. Vault road culvert – NP-2 Lake exit to NP-1 Lake.

Figure 2-3: Location of the areas of interest for the 2023 Freshet Action Plan

2.3.1.1 AWAR culvert – discharge to Third Portage Lake

Ditch outflows are important to ensure proper flow of freshet drainage. The culvert under the AWAR (Figure 2-3) is a critical section of the West Diversion Ditch. Snow removal must be performed to avoid ponding and damage to the ditch/trench structure as well as to maintain the integrity of the AWAR which, in turn, is critical to transportation at the Meadowbank mine site. Figure 2-4 illustrates this culvert. Snow and/or ice must be removed on each side of the culvert to allow water to flow through to prevent upstream ponding prior to freshet to prevent any back up in the West Diversion ditch. If not completed, this could increase water levels upstream in the ditch causing problems discussed in Section 2.3.1.2. The culvert may need to be steamed if blocked by ice. Before starting the cleaning operation, it is important to ensure that the electrical cable (5kV) location has been visually identified.

Figure 2-4: West diversion ditch area of interest

Daily inspections will be conducted starting in May until Freshet is complete and after rain events. Sample monitoring will commence when open water is present in accordance with the Water License (ST-6). Sampling frequency of ST-6 may be increased if TSS results are near 30 mg/L (grab) and 15 mg/L (monthly average), or visually elevated. If a discharge of TSS occurs, the Environment Department will notify ECCC and NWB.

In September 2024 a turbid plume of water was observed on the shore of Third Portage Lake, Near ST-6 sampling point. As a result, alternative erosion control equipment has been purchased, on a trial basis, to prevent an event from recurring. Following a geotechnical field investigation, a few additional water management options were identified and will be evaluated further in 2025.

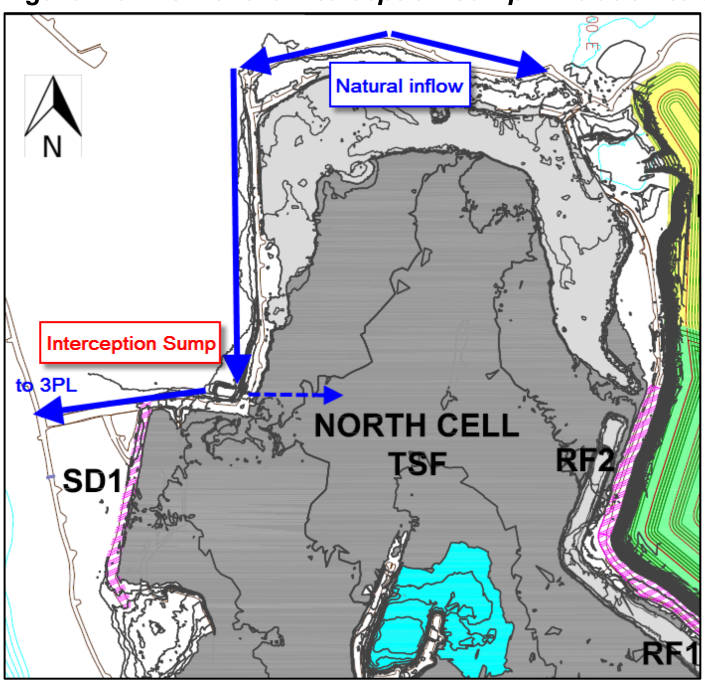
2.3.1.2 West Diversion Ditch Elbow

One of the deepest sections of the West Diversion ditch is located in the corner next to the Saddle Dam 1– see Figure 2-4 and Figure 2-5. In early May of each year, Agnico will remove the snow accumulation to allow the water to flow freely, preventing the water upstream from increasing in level and hydraulic head pressure. In addition, large flows can scour the ditch system causing sediment migration through the ditches which could impact Third Portage Lake.

As a precaution, Agnico constructed an interception sump located at the west diversion ditch elbow location in 2014. The sump has a capacity of 3,000 m³. These measures will prevent any contaminated water from reaching Third Portage Lake. This sump will also act as a settling pond to prevent water with elevated TSS from reaching Third Portage Lake.

Daily inspections will be conducted from May until freshet is complete and after rain events. Sample monitoring will also be conducted. It is planned to let natural overflow to Third Portage Lake, if results are compliant. A pump will be installed preventively and ready to pump water into the North Cell TSF.

Figure 2-5. View of the Interception Sump in relation to the Diversion Ditches



2.3.1.3 Northwest Corner of North Cell TSF

The construction access road at the Northwest corner of the North Cell TSF (see Figure 2-4) was vulnerable to damage from the freshet water flow from the northern watershed (see watercourse flow in Figure 2-5 denoted by blue line). The start of the West Diversion ditch is also located in this area and is designed to collect the freshet. Ponding is limited in this area once the freshet is done.

Agnico will continue to monitor and conduct visual inspections of this area in May until freshet is complete and after rain events.

2.3.1.4 East Diversion ditch outlet to NP-2 Lake

This area of the East Diversion ditch, see Figure 2-6, acts as the outflow of the North part of the East Diversion ditch into NP-2 Lake. This outlet must be cleared of obstructions – snow and ice – in early May to promote drainage through the ditch and into NP-2 Lake. The presence of ice blocks could be mitigated using the steam machine to melt away the obstruction. Daily inspections will be conducted starting in May until freshet is complete and after rain events. Sample monitoring will be conducted monthly during open water in accordance with the Water License (location ST-5). Sampling frequency of ST-5 may be increased if TSS results are near 30 mg/L (grab) and 15 mg/L (monthly average), or visually elevated If a discharge of TSS occurs, the Environmental Department will notify ECCC and NWB (CIRNAC water Inspector).

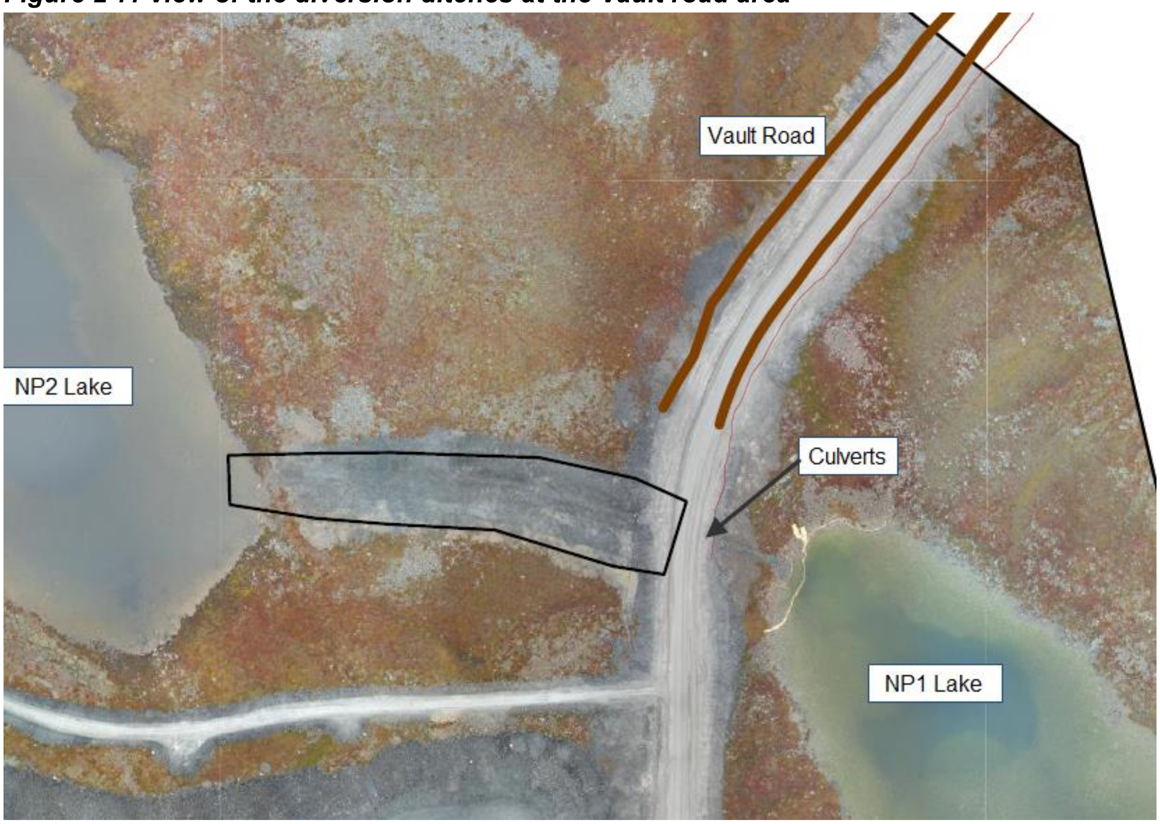
Figure 2-6: View of the East Diversion ditch outlet into NP-2 Lake

2.3.1.5 NP-2 Outlet, Vault Road Culvert and NP1

This area of the East Diversion ditch acts as the outflow of NP-2 Lake through the Vault Road culvert (see Figure 2-3). The culvert connects the East Diversion ditch from Lake NP-2 to NP-1. Snow and ice must be removed from the culvert area, including upstream at the exit of NP-2 Lake, in early May, to ensure that the outlet of NP-2 flows freely to NP-1 and ultimately to Dogleg Lake. Back up could cause an upstream water raise in Lake NP-2, which could cause overflow into the RSF ST-16 sump. First, snow from the ditch between NP1 and the road will be removed in early May. Next, the culvert will be steamed, if necessary, to remove any ice/snow. If needed snow/ice around the outlet of NP2 Lake would be removed to allow free flow of melt water. Daily inspections will commence in May until freshet is complete and after rain events. TSS sample monitoring will be conducted monthly and as needed for turbidity. Sampling frequency may be increased if TSS results are near 30 mg/L (grab) and 15 mg/L (monthly average), or visually elevated. If a discharge of TSS occurs, the Environmental Department will notify ECCC and NWB (CIRNAC Water Inspector).

A snow management plan has been implemented, ensuring no large accumulations of stored snow in this area, to minimize runoff.

Figure 2-7: View of the diversion ditches at the Vault road area



2.3.2 Tailings and Dewatering Dikes

2.3.2.1 Saddle Dam 1

This peripheral dam of the North Cell TSF is required for tailings containment. Regular inspections, starting in May until water freezes, will be required for Saddle Dam 1 (SD1) to ensure runoff water does not pool against the toe of the structure. Backfill material has been placed in 2023 at the downstream toe of the dike and sloped to passively redirect snowmelt and runoff away from the dam, following the natural topography of the area. This water management improvement measure is replacing the pumping station. As a result of this modification monthly sampling will not be conducted at (ST-S-2), however sampling will be conducted if sediment transport is observed towards the downstream lake.

2.3.2.2 Saddle Dam 2

This peripheral dike is located South of SD1, is required for tailings containment. Historically, this structure has not had any issues with water pooling at the toe, therefore monthly inspections starting May until water freezes will be required for Saddle Dam 2 (SD2) to ensure that water does not pool against the toe of the dike. If water is observed at the toe it will be pumped back in the North Cell and a water sample could be taken.

2.3.2.3 Saddle Dam 3

This peripheral dike of the South Cell was built in 2015 for water and tailings containment. A permanent sump was established in 2017 at a low spot that facilitates water management at freshet. The downstream area of the SD3 embankment will be pumped to the South Cell TSF to avoid water ponding against the structure. This pumping station must be operational once water is observed at the toe to pump the water to the TSF. The pumping system will be checked in early May to ensure proper operation. Monthly sampling will be conducted at this station (ST-32) during open water conditions in accordance with the Water License.

2.3.2.4 Saddle Dam 4-5

Since their initial construction in 2015, ponding in the downstream area is minimal. Localized pooling ponds are sometimes present during the freshet period and will be pumped into the South Cell TSF footprint on their upstream side.

2.3.2.5 North Cell Internal Structure (NCIS)

This internal structure was built as an upstream raise in the North Cell in 2018 and allowed for increased tailings storage capacity. Additional sump (NC-E) were implemented within the footprint of the North Cell in strategic point at the downstream of this structure to ensure proper water management. Water reporting to these sumps is pumped in the North Cell to reach the main water management station in the North Cell.

2.3.2.6 Central Dike

Central Dike seepage, monitoring station ST-S-5, is located at the downstream area of the Central Dike embankment, a peripheral structure of the South Cell used for tailings retention. A permanent pumping system is in place to manage the seeping water beneath the dike by keeping the downstream pond at a constant elevation. More details are to be found in the Meadowbank Water Management Plan. Water in this sump is pumped to Portage Pit A. Weekly inspections of the area will be held by environment. Environment department will also conduct monthly sample as per the Water License.

2.3.2.7 Stormwater Dike

The Stormwater dike separates the North Cell from the South Cell and is required for tailings containment. A small pump is installed on the Western edge of the dike to collect water and pump it in the North Cell. This will prevent pooling of water against the toe of the dike. The pumping system will be installed and checked in early May to ensure proper operation.

2.3.2.8 East Dike

The water quality of the East Dike seepage is monitored throughout the year. When the criteria for discharge are met, the water is Discharged into Second Portage lake, otherwise it is sent to the Portage Pits. Historically, at freshet, the water quality of the East Dike seepage does not meet TSS requirement.

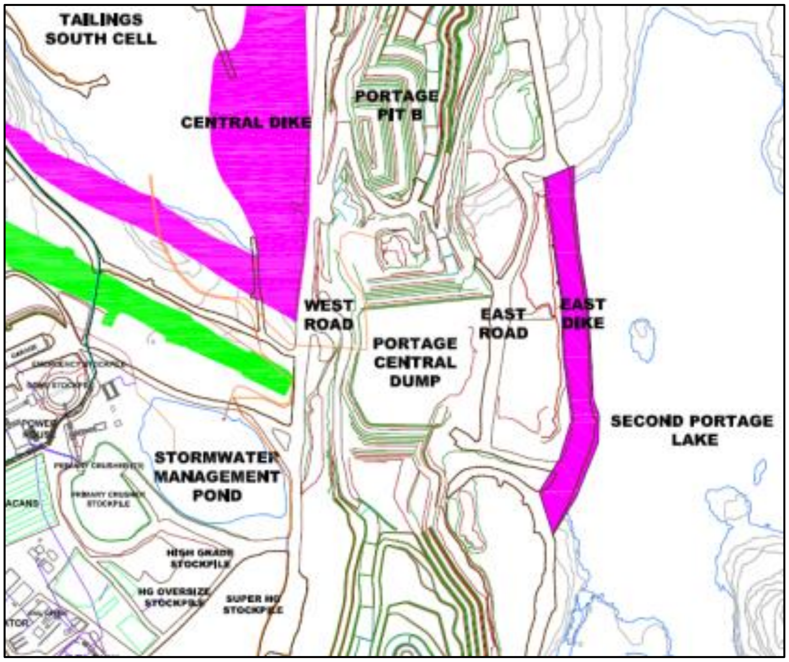
2.4 Vault Road Culvert

The Vault road crosses over a connection between two water bodies, Turn Lake and Drill Tail Lake, at approximately km 113. Beginning in May, until freshet is complete and after rain events, it will be important to complete daily inspections. In the case that excessive TSS is observed, samples will be taken and analyzed. In the case, where the TSS levels go beyond 30 mg/L (grab) and 15 mg/L (monthly average), a report will be made to the ECCC and NWB (CIRNAC Water Inspector). Turbidity barriers will be installed as a mitigation measure if needed.

2.5 Stormwater Management Pond

The Stormwater Management Pond (SWMP) is a small shallow and fishless waterbody that can be seen in Figure 2-8 adjacent to Portage Pit. Treated sewage is discharged into this pond before being transferred to one of the tailing storage facility. The quantity of water transferred each year is recorded. Weekly inspections in the spring and fall are undertaken to determine the commencement of pumping.

Figure 2-8: Portage Pit area with the Stormwater Management Pond



2.6 Quarry 23 / Collection Pond 23

Collection Pond 23 (CP23) will be located in the former Quarry 23, north of the airstrip and south of Saddle Dam Road. It will be constructed in winter 2025 and will be available for the upcoming freshet. The storage capacity of this pond will be increased over the coming years with drill and blast activities. Water that reported to South Cell will be conveyed to Collection Pond 23 through a spillway originating from South Cell. Water from CP23 will then be pumped to the portage pits.

2.7 Bulk Fuel Storage Facilities

2.7.1 Meadowbank Tank Farm

Snow and ice accumulation within the fuel tank farm must be adequately managed to prevent overflow to the environment and/or damage to the fuel handling systems. The Energy and Infrastructure Department will advise the Environmental Department of their intent to pump the containment area once ice/snow begins to melt. Water samples will be taken in accordance with the Water License to ensure compliance prior to its release. A notice must be provided to the Inspector 10 days prior to this pumping activity. Once sample results have been obtained, the Environmental Department will advise the Energy and Infrastructure Department if pumping can begin. If sample results permit, the pumping may begin to direct water to the tundra/ground in a way to prevent erosion. In the event that the water sample results do not meet discharge criteria, the water shall be sent to the Stormwater Management Pond.

2.7.2 Baker Lake Tank Farms

Snow and ice accumulation within the fuel tank farms at Baker Lake must be adequately managed to prevent overflow to the environment and/or damage to the fuel handling systems. The Energy and Infrastructure Department will advise the Environmental Department of their intent to pump the containment area once ice/snow begins to melt. Water samples will be taken in accordance with the Water License to ensure compliance prior to its release. A notice must be provided to the Inspector 10 days prior to this pumping activity. Once sample results have been obtained, the Environmental Department will advise the Energy and Infrastructure Department if pumping can begin. If sample results permit, water can be directed to the tundra, but the flow rate shall be such to avoid erosion or damage to the tundra. Environmental inspection of the setup is required prior to starting the discharge. In the event that the water sample results do not meet discharge criteria, the water cannot be pumped to the tundra. If this occurs the water will be pumped to a tanker and transported to the Meadowbank site to be disposed of in the TSF or placed in containers for shipment south as hazmat.

2.8 AWAR Culverts and Bridges

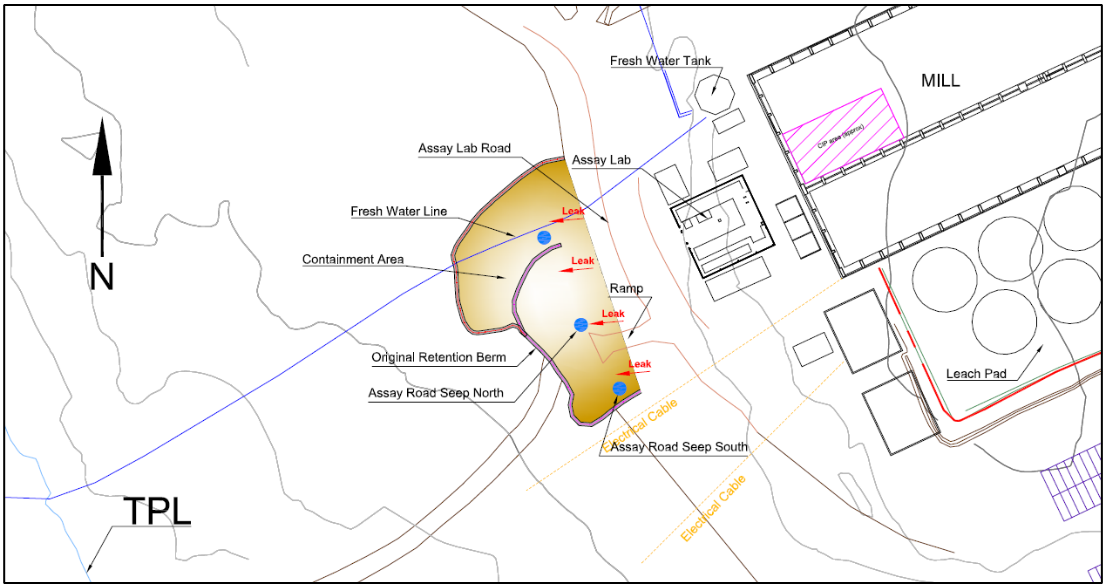
Weekly inspections will be undertaken starting in May at all culverts along the AWAR to ensure that water during freshet is flowing freely, free of aggregate and no erosion is occurring. Bridges and abutments will be maintained in a way the prevents the addition of aggregate to the water course. If elevated TSS/Turbidity levels are observed, sampling will occur, and the results assessed. Turbidity barrier will be installed if required. The Energy and Infrastructure department will also be advised if severe erosion/scouring is observed. In addition, snow and ice removal may be required to allow the water to flow as per design specifications. Inspections will be performed during the freshet period by the Environment department.

2.9 Mill Seepage

In November 2013, Agnico observed seepage containing cyanide and copper at a location west of the access road in front of the Assay Lab (see Figure 2-9). An investigation determined the source was several containments areas within the mill. Repairs to seal all the mill sumps and containment areas were completed in 2014 thus stopping the source of the seep. An interception/collection trench between the mill and TPL was built in 2014. The seepage appears to have been effectively contained, and the source area has been repaired. Additional information and discussion surrounding previous sample results are available in the Annual Report in Section 8.5.8.1.6.

On December 15, 2023, Agnico observed water inflow within the Assay Road Seep South retention berm. An investigation was undertaken to identify potential sources of the water; to date the exact source of the water inflow has not been identified On May 20 and 21st, 2024 evidence of seepage was observed on the west side of the assay lab road. Following a dye test, the source was identified, and after consultation with an engineering firm, repairs were completed in October 2024, to restore the containments functionality in the short-term. A comprehensive evaluation of a more resilient and long-term solution has been completed and is planned to be completed in the summer of 2025.,During both events water inflow was contained within the existing water management infrastructure that was built in 2014. Agnico will continue to monitor the downstream area and keep the secondary containment as dry as possible.

Figure 2-9. View of the mill seepage area and initial retention berm construction



Regular inspections will be conducted of the pumping, collection systems and perimeter area and the pumped volumes will continue to be recorded.

2.10 Monitoring Station at KM87 (ST-44)

In November 2022, a tractor trailer overturned at kilometer 87 on the AWAR resulting in a spill of diesel fuel. A downstream monitoring location, ST-44, will be sampled weekly during freshet and the results assessed. Additional internal sampling points may be identified during the monitoring. Routine visual inspections of the partially excavated contamination zone and collection sump(s) will occur. The inspections will include petroleum testing of any ponding water using test strips and PID. In the event of a positive result for petroleum or the presence of a visible sheen the collection sump(s) will be monitored daily, and contaminated water collected and sent to the Stormwater Management Pond or TSF.

2.11 Baker Lake Marshalling Facilities

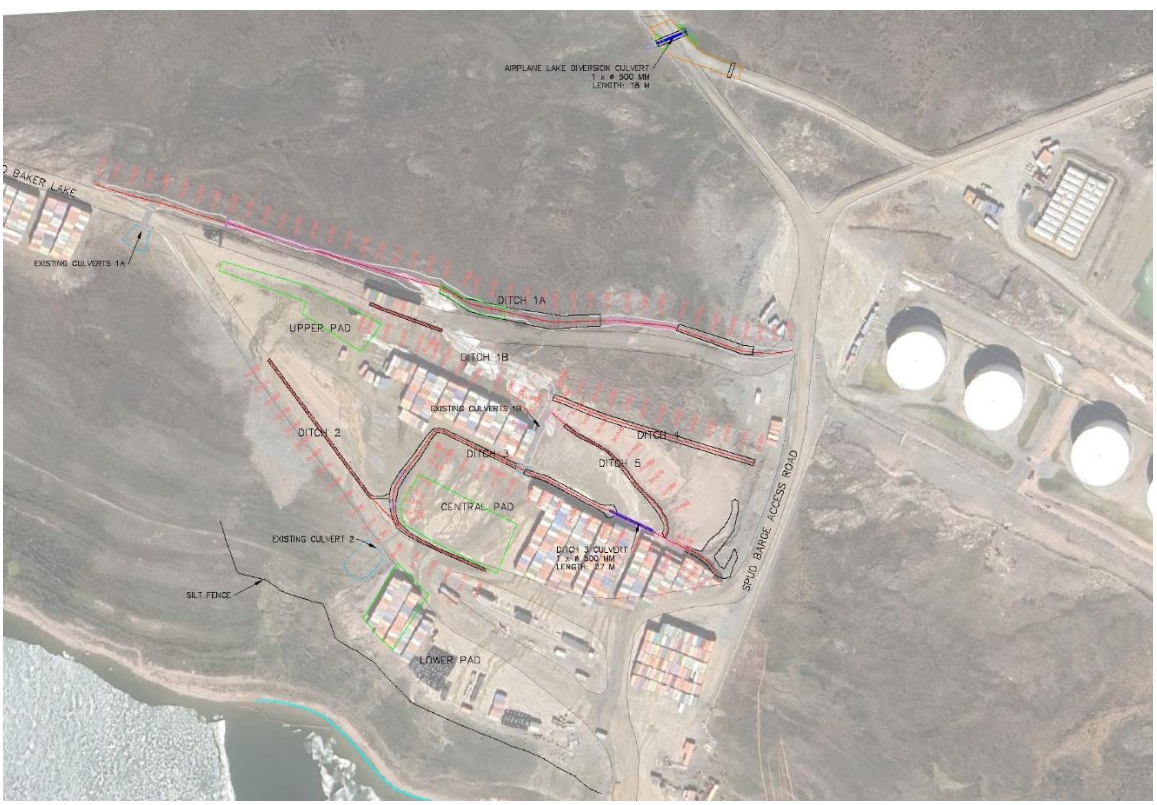
In June 2022, a turbid flow of water was observed travelling through the Agnico Eagle facilities towards Baker Lake, resulting in a plume of total suspended solids (TSS) along the shore. Agnico Eagle received authorization to build a water diversion ditch in March of 2023 and construction of the first phase was completed in Fall 2023. A TSS event occurred in June 2024, with Agnico Eagle receiving recommendations from the Government of Nunavut to conduct additional remediations of the existing water management infrastructure. In Fall 2024, Agnico Eagle conducted various earthwork activities to improve existing diversion ditches and culvert systems. This work included:

- Cleaning and improving existing Ditches 1A, 1B, 2, and 3
- Excavation of new Ditches 4 and 5
- Installation of 2 new culverts for seepage diversion at Ditch 3 and the Airplane Lake Diversion

The northern access road towards local hunting cabins was also remediated during the installation of the Airplane Lake Diversion culvert. In October 2024, a temporary silt fence was installed at the southern boundary of the Baker Lake Marshalling Facilities.

Snow management practices at the marshalling facilities are in place to ensure the snow melt reports to the diversion ditch. Periodic inspections will be conducted during the winter months to ensure snow management compliance. Weekly inspections will be undertaken starting in May of the Baker Lake Marshalling Facilities and the remediated water management infrastructure to ensure that water during freshet is being collected, flowing to the intended locations and the infrastructure is operating as intended. If flow within a ditch during freshet is observed to be impeded by snow, then excavation of the snow will take place within the ditch as required to help guide flow towards the diversion culverts. If elevated TSS/Turbidity levels are observed, sampling will occur, and the results assessed. Additional turbidity barriers will be installed downstream of the diversion ditch outlets, if required.

Figure 2-10. Updated Water Management Infrastructure at the Baker Lake Marshalling Facilities



2. SNOW MANAGEMENT

The snow management procedure developed internally in 2015 and updated annually is illustrated in Appendix 3. Temporary snow storage dumps and snow accumulation areas of concern are identified on the map.

APPENDIX 1

2025 Freshet Action Plan Procedure

Section	Area of Concern	Role/Action	Responsibilities	Dates
2.1	**IPD Pits, Vault Pit and Pit Walls**			
2.1	IPD Pits, Vault Pit and Pit Walls – General	1) Clean all ice, mud and snow on all ramps, etc.	E&I	Before May
2.1.1	**Goose Pit**			
2.1.1	Goose Pit	1) Ensure pipes and pumps are serviced and ready to operate. 2) Give guidance as to when and where (Pit E or Pit A) water is to be pumped.	E&I ENV	Early May Early May
2.1.2	**Pit E**			
2.1.2	Pit E	1) Runoff water accumulated in ponds GP-4 and GP-5 will be pumped into Goose pit or Pit E;	E&I	During Freshet Early May
2.1.2	**Pit A**			
2.1.2	Pit A	1) Ensure pipes and pumps are serviced and ready to operate.	E&I	Early May
2.1.3	**Vault Pit Area**			
2.1.3	Vault & Phaser Pits	1) No further action in this area during the freshet period as mining is complete in Goose Pit. Water and/or ice will remain as part of the pit reflooding activity.	ENV	N/A

2.2	WASTE ROCK STORAGE FACILITY			
2.2.1	Portage RSF Inspection	1) Weekly inspection around the RSF perimeter to identify any seepage.	ENV	May - as soon as freshet starts until freeze up
		2) If seepage observed notify Eng and Env Department AND sample for CN and Water License Parameters – ST-16.	ENV	May - as soon as freshet starts until freeze up
2.2.1.1	ST-16	1) Check Piping from pump to discharge area at North Cell TSF.	ENV and E&I	Early May
		2) If the snow accumulation is judged to be too great, then snow must be removed.	ENV to coordinate with E&I	Early May
		3) Perform daily inspections or inspections as required and keep records.	ENV	May - as soon as freshet starts until freeze
		4) Notify Eng. Dept and E&I when water present and pumping can start. **Water level to be maintained, as a minimum, below the till plug elevation. Water should not pond against the Till plug for extended**	ENV	May/early June - as soon as free water present and ice has melted until freeze
		5) **time periods - i.e. < 2 - 3 hours. For emergencies the water truck can be requested. Start pumping.**		
		6) Any seepage through rockfill road to NP-2 must immediately be reported to Env Dept and authorities.	ENV and E&I	May/early June - as soon as water is present until freeze

2.2.1.2	Waste Extension Pool sumps	1) Snow removal to allow free water flow.	ENV to coordinate with E&I	Early May
		2) Perform daily inspections or inspections as required and keep records.	ENV	May - until Freshet complete and after rain events
		3) Sample monthly during open water as per Water License ST-30 (WEP1) and ST-31(WEP2)	ENV	May - until Freshet complete and after rain events
2.2.1.3	North portion of NAG Waste Rock Expansion	1) Perform daily inspections or inspections as required and keep records.	ENV	May - until Freshet complete and after rain events
		2) Sample for ST-S-XX when water observed; sample upstream (background) in diversion ditch for same parameters and compare results (rush analysis). If results indicate potential for impact, i.e. results are > background, meet with engineering and determine necessity of ditching	ENV	May - as soon as freshet starts until freeze up
		3) Prevent **contaminated** contact water from reaching NP-2.	ENV	May - as soon as freshet starts until freeze up
2.2.2	Vault RSF Inspection	1) Weekly inspection around the RSF perimeter to identify any seepage.	ENV	May - as soon as freshet starts until freeze up
		2) If seepage observed notify Eng and Env Department AND sample for Water License Parameters – ST-24.	ENV	May - as soon as freshet starts until freeze up

2.3	**NORTH AND SOUTH CELL TAILINGS STORAGE FACILITY**			
2.3.1	**Diversion Ditch**			
2.3.1.1	AWAR Culvert - West Diversion ditch exit to TPL	1) Snow and/or ice must be removed with an excavator on each side of the culvert to allow water flow.	ENV to coordinate with E&I	Before May 20
		2) If needed, steam to free any ice blockage.	ENV to coordinate with E&I	Before May 20
		3) Before starting snow clearing operation, make sure the electrical cable location has been visually identified in the field.	ENV to coordinate with E&I	Before May 20
		4) Perform daily inspections or inspections as required and keep records.	ENV	May - until Freshet complete and after rain events
		5) ST-6 sampling as per Water License and TSF weekly inspection (keep record).	ENV	Monthly as soon as freshet starts (open water) and continue until freeze
		6) Increase frequency of ST-6 sampling if TSS near 30 mg/L (grab) and 15 mg/L (monthly average), or visually elevated. Any extra samples to external lab.	ENV	TSS result dependent
		7) Have turbidity and silt barriers in place at TPL (2) and maintain.	ENV	May - before freshet starts and until water freezes
		8) Report any discharge of TSS to ECCC/NWB (grab > 30 mg/L).	ENV	May - as soon as freshet starts and until water freezes

2.3.1.2	West Diversion Ditch elbow near SD1	1) Snow and/or ice must be removed with an excavator to allow water flow and prevent ponding upstream.	ENV to coordinate with E&I	Early May
		2) Perform daily inspections or inspections as required and keep records.	ENV	May - until Freshet complete and after rain events
		3) Sample for TSS monthly (external Lab) and as needed for Turbidity	ENV	May - until Freshet complete and after rain events
2.3.1.3	Northwest corner of North Cell TSF (West Diversion ditch)	1) Perform daily inspections or inspections as required and keep records.	ENV	May - until Freshet complete and after rain events
2.3.1.4	East Diversion ditch outlet to NP-2 Lake	1) Snow and/or ice must be removed with an excavator on each side of the culvert to allow water flow.	ENV to coordinate with E&I	Early May
		2) If needed, steam to free any ice blockage.	ENV to coordinate with E&I	Before May 20
		3) Perform daily inspections or inspections as required and keep records.	ENV	May - until Freshet complete and after rain events
		4) ST-5 sampling as per Water License and TSF Weekly inspection (keep record).	ENV	Monthly as soon as freshet starts and until water freezes
		5) Increase frequency of ST-5 sampling if TSS near 30 mg/L (grab) and 15 mg/L (monthly average). Extra samples to external lab if necessary.	ENV	TSS result dependent

		6) Install turbidity barriers in NP-2, if needed, and maintain.	ENV	May - before freshet starts and until freeze up or water clears
		7) Report any discharge of TSS to ECCC/NWB (if grab > 30 mg/L).	ENV	May - as soon as freshet starts and until water freezes
2.3.1.5	East Diversion Ditch - NP2 Outlet and Vault Road culvert.	1) Snow and/or ice must be removed with an excavator on each side of the culvert and upstream at the exit of NP-2 Lake to allow water flow.	ENV to coordinate with E&I	Early May
		2) If needed, steam culvert to free any ice/snow blockage.	ENV to coordinate with E&I	Before May 20
		3) Daily inspection - keep record.	ENV	May - until Freshet complete and after rain events
		4) Install turbidity barriers in NP-1, if needed, and maintain.	ENV	May - before freshet starts and until freeze
		5) Sample for TSS monthly (external lab) and as needed for Turbidity. Increase frequency of sampling if TSS near 30 mg/L (grab) and 15 mg/L (monthly average). Multi Lab for any increased sampling frequency.	ENV	May - until Freshet complete and after rain events
		6) Report any discharge of TSS to ECCCO/NWB (if grab > 30 mg/L).	ENV	May - as soon as freshet starts and until water freezes

2.3.2	TSF Dikes			
2.3.2.1	Saddle Dam 1	1) Inspect pumping system	E&I	Early May
		2) Perform daily inspections or inspections as required and keep records.	ENV and E&I	May and until water freezes
		3) Start pumping to TSF when water observed. Keep volume pumped out.	ENV and E&I	May until water freezes
		4) ST-S-2 sampling as per Water License.	ENV	Monthly as soon as freshet starts and until water freezes
2.3.2.2	Saddle Dam 2	1) Prepare pumping system	E&I	Early May
		2) Weekly Inspection - keep record.	ENV	May and until water freezes
		3) Start pumping to TSF when water observed. Keep volume pumped out.	ENV and E&I	May until water freezes
2.3.2.3	Saddle Dam 3	1) Inspect pumping system	E&I	Early May
		2) Perform daily inspections or inspections as required and keep records.	GENV and E&I	May and until water freezes
		3) Start pumping to TSF when water observed. Keep volume pumped out.	ENV and E&I	After May and until water freezes
		4) ST-32 sampling as per Water License.	ENV	Monthly as soon as freshet starts and until water freezes

2.3.2.4	Saddle Dam 4-5	1) Prepare pumping system	E&I	Early May
		2) Monthly Inspection - keep record.	ENV	May until water freezes
		3) Start pumping to TSF when water observed. Keep volume pumped out.	ENV and E&I	May until water freezes
2.3.2.5	North Cell Internal Structure	1) Prepare pumping system	E&I	Early May
		2) Weekly Inspection - keep record.	ENV	May and until water freezes
		3) Start pumping to TSF when water observed. Keep volume pumped out.	ENV and E&I	May until water freezes
2.3.2.6	Central Dike ST-S-5	1) Pump water to the South Cell TSF - volumes documented.	E&I and ENV	All year round
		2) Daily inspection of pumping, collection systems, bermed areas and perimeter area – keep record.	E&I & ENV	All year round
2.3.2.7	Stormwater Dike	1) Prepare pumping system	E&I	Early May
		2) Weekly Inspection - keep record.	ENV	May and until water freezes
		3) Start pumping to TSF when water observed. Keep volume pumped out.	ENV and E&I	May until water freezes
2.3.2.8	East Dike	1) Monitor East dike water quality & coordinate with E&I to stop SPL discharge	ENV & E&I	All year long

2.4	**VAULT ROAD CULVERT**			
2.4	Vault road culvert from Turn Lake to Drill Trail Lake (~km 2 on Vault road)	1) Perform daily inspections or inspections as required and keep records.	ENV	May - until Freshet complete and after rain events
		2) Install turbidity barriers, if needed (elevated TSS observed), and maintain	ENV	May - until freshet complete and after rain events
		3) Sample monitoring for TSS, if excess turbidity observed - use external lab.	ENV	May - until freshet complete and after rain events
		4) Report any discharge of TSS to Drill Tail to ECCC/NWB (if grab > 30 mg/L).	ENV	May - until freshet complete and after rain events
2.5	**STORMWATER MANAGEMENT POND**			
2.5	Stormwater Management Pond	1) Pump Stormwater to applicable TSF in Spring/Fall - pumped volume must be kept.	E&I and ENV	When required in Spring and/or Fall
2.6	**FUEL TANK FARMS**			
2.6.1	Meadowbank Tank Farm	1) E&I Dept to advise Env Dept in advance of intent to pump once ice melts in containment area.	E&I and ENV	As required during summer
		2) Sample water in accordance with Water License to ensure compliance with limits prior to release.	ENV	As required during summer
		3) Provide notice to Inspector 10 days prior to pumping.	ENV	As required during summer

		4) Advise Energy and Infrastructure Dept if pumping can begin based on sample results.	ENV	As required during summer
		5) Pump to tundra/ground or Stormwater Management Pond (note pumping to Stormwater Management Pond does not require compliance with limits - at Meadowbank only). **NOTE: The water cannot be pumped out to the tundra if it does not meet the Water License criteria.**	E&I	Following ENV. Authorization & inspection
2.6.2	Baker Lake Tank Farms	1) E&I Dept to advise Env Dept in advance of intent to pump once ice melts in containment area.	E&I and ENV	As required during summer
		2) Sample water in accordance with Water License to ensure compliance with limits prior to release.	ENV	As required during summer
		3) Provide notice to Inspector 10 days prior to pumping.	ENV	As required during summer
		4) Advise Energy and Infrastructure Dept if pumping can begin based on sample results.	ENV	As required during summer
		5) Once approval given by Env Dept, E&I Dept can pump to tundra but must avoid erosion during pumping, i.e., low flow, the volume must also be determined by E&I Dept personnel. **NOTE: The water cannot be pumped out to the tundra if it does not meet the Water License criteria. Any wastewater unsuitable for discharge will be transported back to Meadowbank for disposal in the TSF or shipped south for disposal.**	E&I Dept ENV	Following ENV. Authorization & Inspection

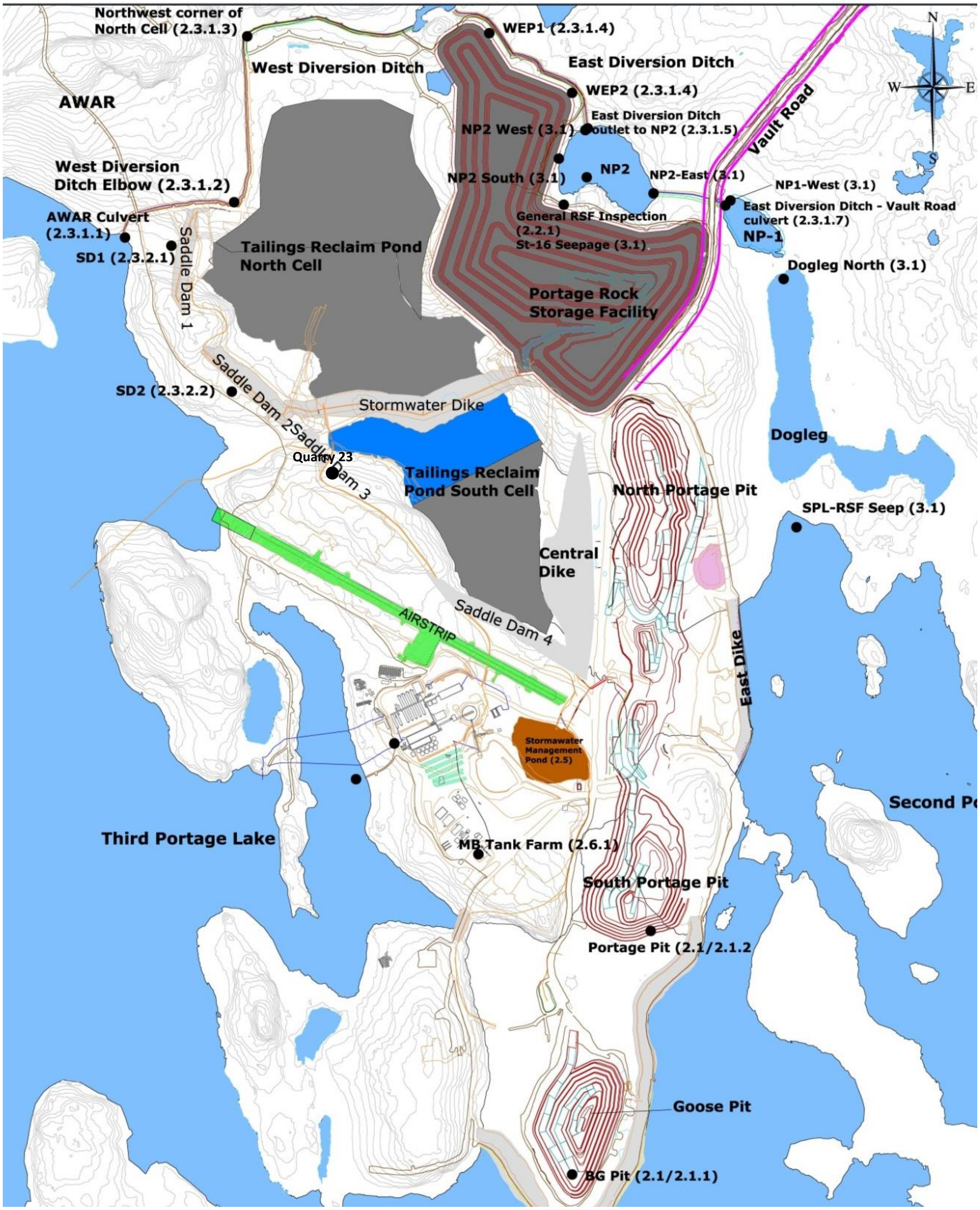
2.7	**AWAR CULVERTS ON THE BAKER LAKE PORTION**			
2.7	AWAR Culverts on the Baker Lake Portion	1) Weekly inspection of culverts along AWAR to Baker Lake.	ENV	May
		2) Sample for TSS and Turbidity if elevated TSS observed.	ENV	May - until freeze
		3) Notify E&I Dept if severe erosion/scouring observed - for repair action.	ENV	May - until freeze
		4) Install turbidity barriers if required.	ENV	May - until freeze
2.8	**Mill Seepage**			
2.8	Mill Seepage	1) Pump water from the trench to the mill - volumes documented.	ENV and E&I	Start May/early June when water present until freeze
		2) Daily inspection of pumping, collection systems, bermed areas and perimeter area – keep record. **For emergencies the water truck can be requested.**	ENV	Start May/early June when water present until freeze

2.9	**Monitoring Station at**	**KM87 (ST-44)**		
2.9	Monitoring Station at KM87 (ST-44)	1) Weekly sampling of downstream monitoring station ST-44	ENV	Start of May/early June when water present until freeze
		2) Pumping and removal of contaminated/contact water	E&I	As required during the summer
		3) Visual Inspection and testing of collection sump and contaminated area (Every second day)	ENV	Start of May/early June when water present until freeze or until location is deemed remediated
		4) Monthly soil sampling of spill location	ENV	Start of thaw until snow cover or until results are compliant
2.10	**Baker Lake Marshalling Facilities**			
2.10	Baker Lake Marshalling Facilities	1) Weekly inspection of Baker Lake Marshalling Facilities	ENV	May - until freeze
		2) Sample for TSS and Turbidity if elevated TSS observed.	ENV	May - until freeze
		3) Install turbidity barriers downstream of the diversion ditch outlet, if needed (elevated TSS observed), and maintain	ENV	May - until freeze

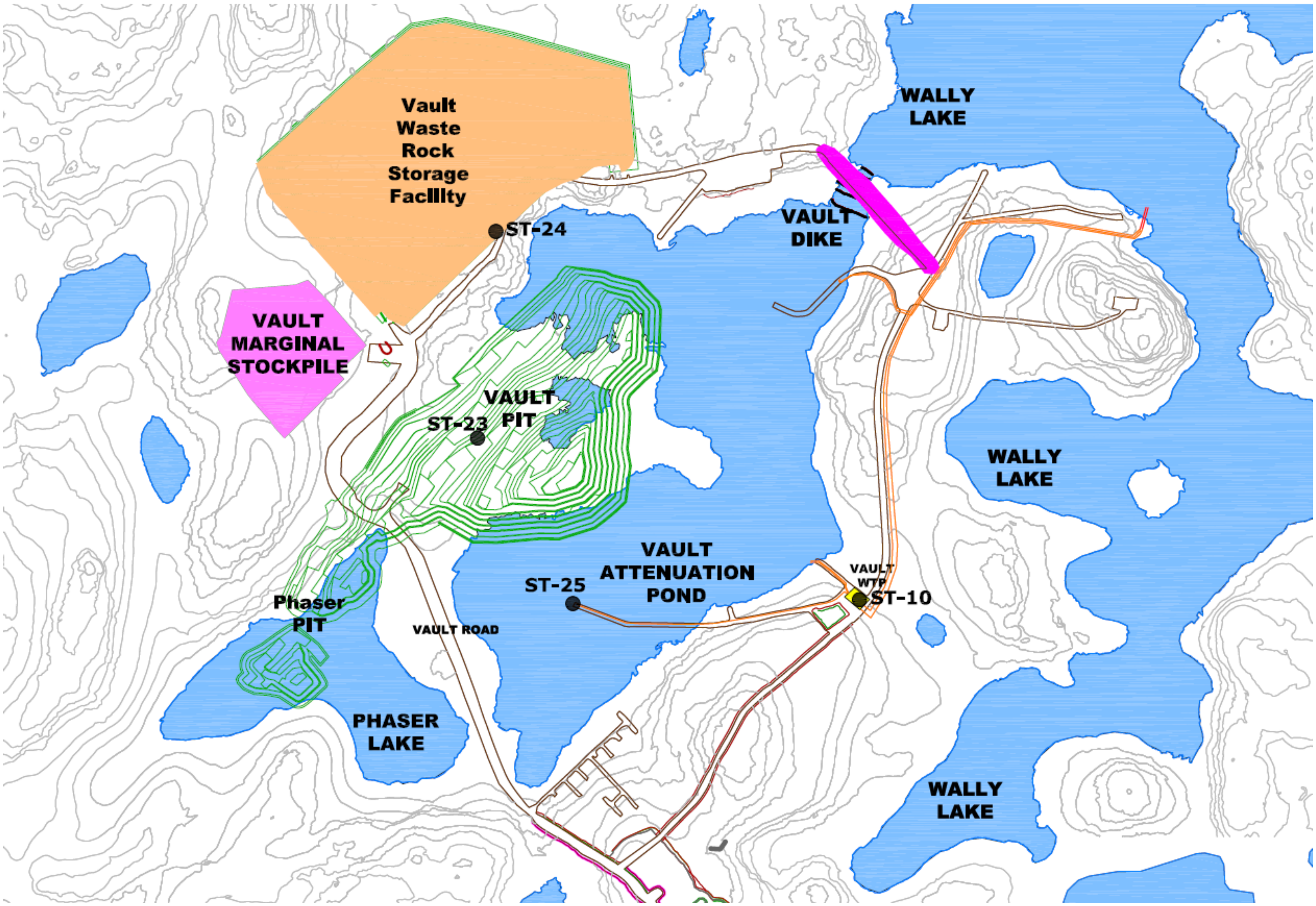
APPENDIX 2

2025 Monitoring Locations and Areas of Concern for the Freshet Action

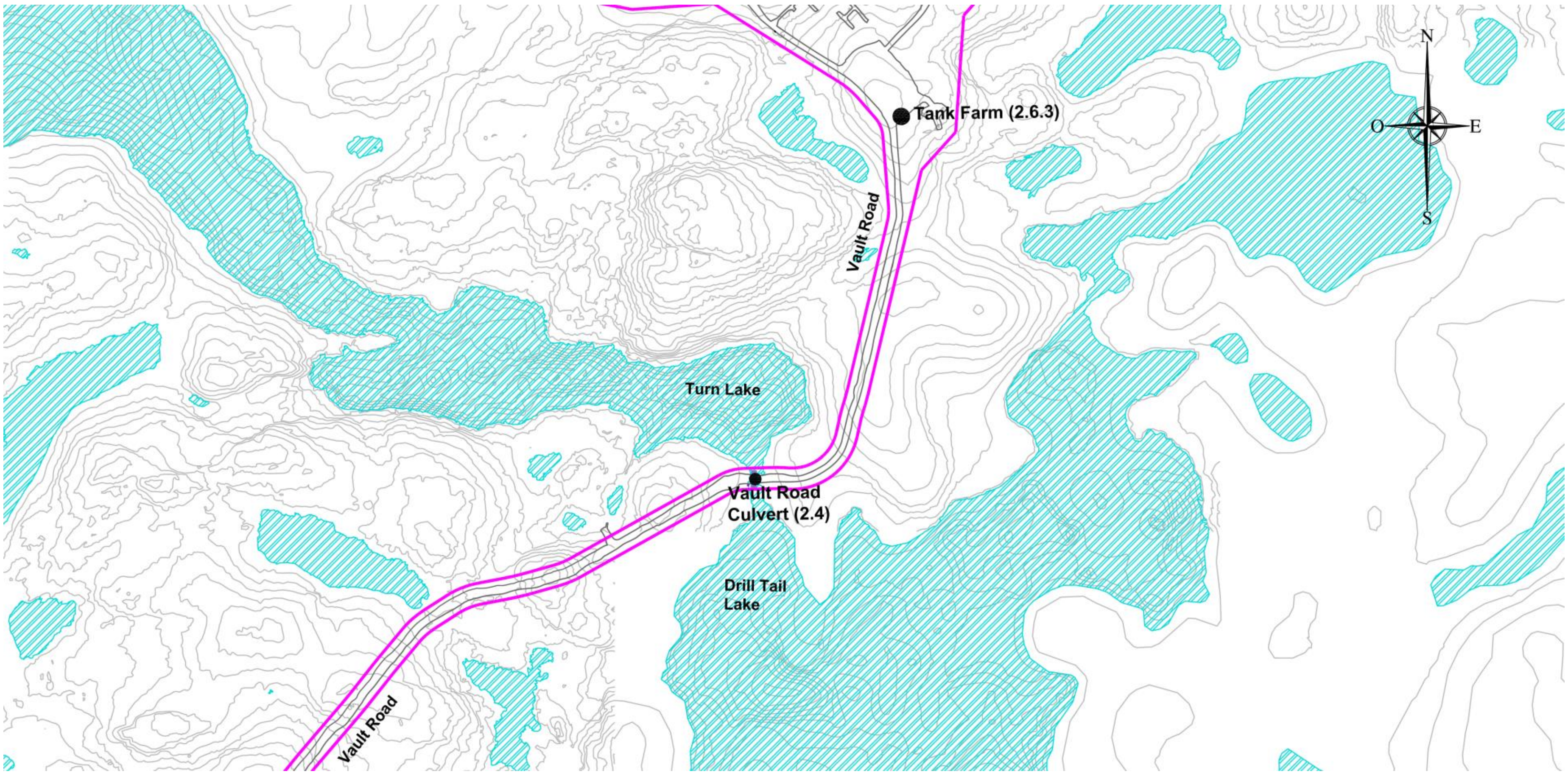
Meadowbank Areas of Concern and Monitoring Locations



Vault areas of concern



<u>**Vault Road areas of concern**</u>



APPENDIX 3

2024-2025 Snow management

DRAWING NO.

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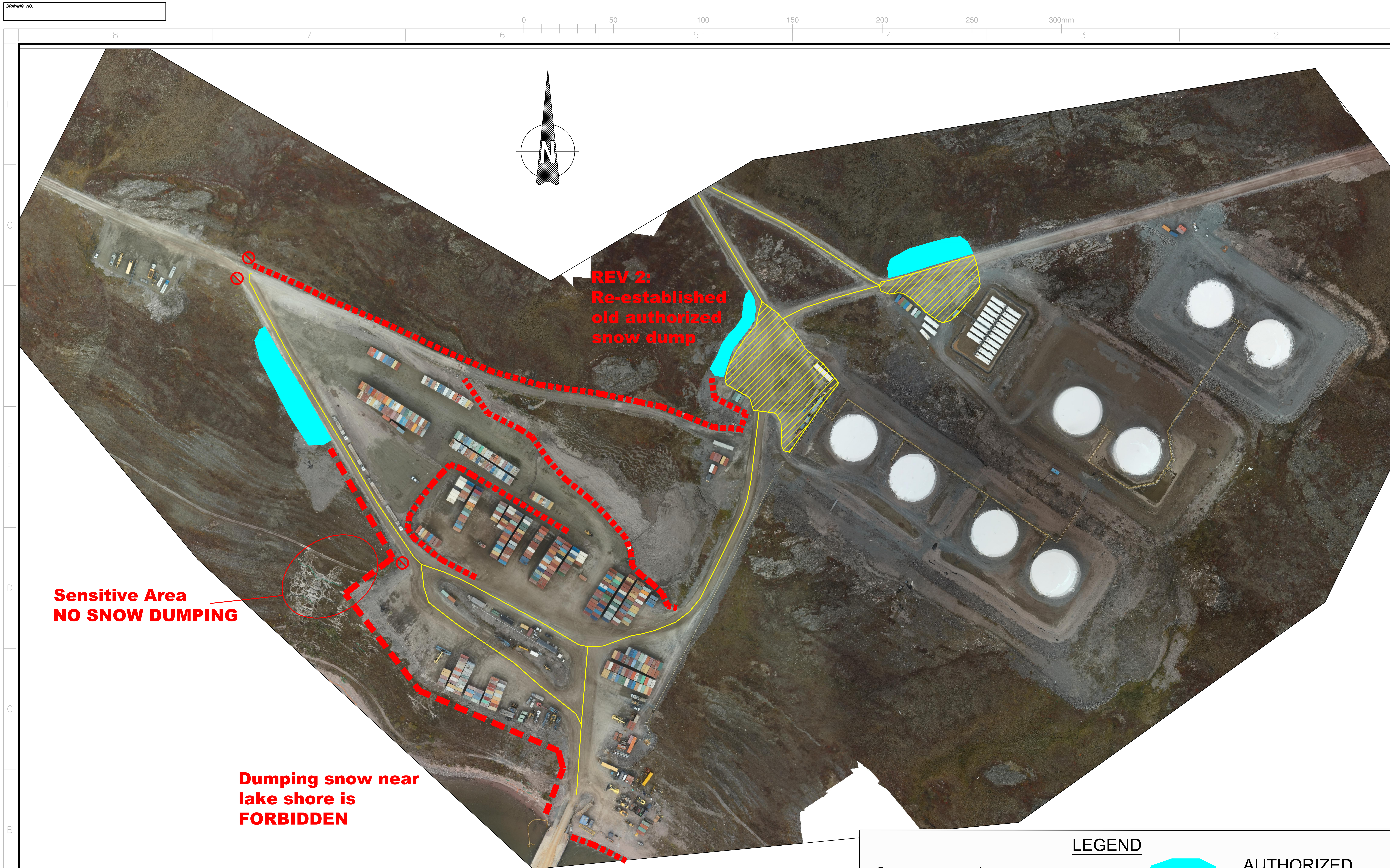


LEGEND

Snow removal			AUTHORIZED SNOW DUMP
	E & I		NO SNOW DUMP
			NO SNOW DUMP (CULVERT)

KEY PLAN

GENERAL NOTES

TITLE	# DWG

REFERENCE DRAWINGS

REV.	DATE	DESCRIPTION	BY	APP.	CLIENT
2	2025-01-17	Snow Clearing Map 2024 - Rev 2	MS		
1	2024-09-12	Snow Clearing Map 2024	CP		

REVISIONS

AGNICO EAGLE
MEADOWBANK

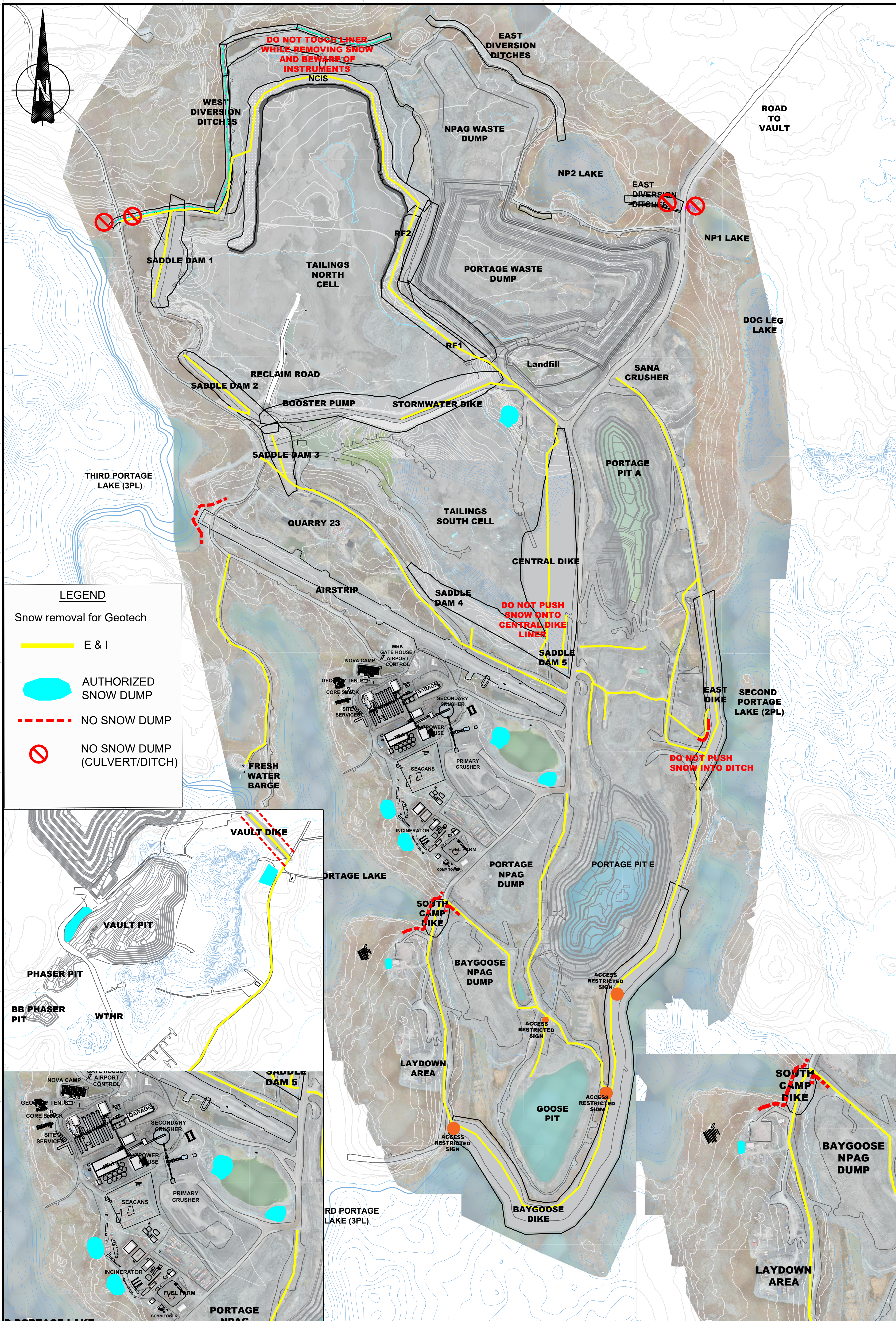
TITLE
AGNICO-EAGLE – MEADOWBANK DIVISION
SNOW CLEARING MAP
2024 – REV 2
BAKER LAKE

DRAWN BY M. Sadler	DATE 2025-01-17
CHECKED BY	
APPROVED BY	
SCALE N.T.S.	DATE
DRAWING NO.	
PROJECT NO.	REVISION / SHEET 1 / 1

C:\Users\MICHEL~1.WES\AppData\Local\Temp\AcPublish_3928\Baker lake Snow Clearing Map 2024 Rev2.dwg, 17 Jan 2025

FILE NO. .DWG

FORMAT ANSI B–PORTRAIT



TECHNICAL SPECIFICATION		DRAWN BY	DATE	MODIFIED BY	DATE	MEADOWBANK DIVISION
None	AGNICO EAGLE MEADOWBANK	SURVEY CHECK	DATE	C. Pelletier	2024-09-12	GEOTECH REQUIREMENTS
		GEOLOGY CHECK	DATE			MBK SNOW CLEARING MAP
		ENGINEERING CHECK	DATE			2024-2025
						SCALE / DATE / FILE .DWG

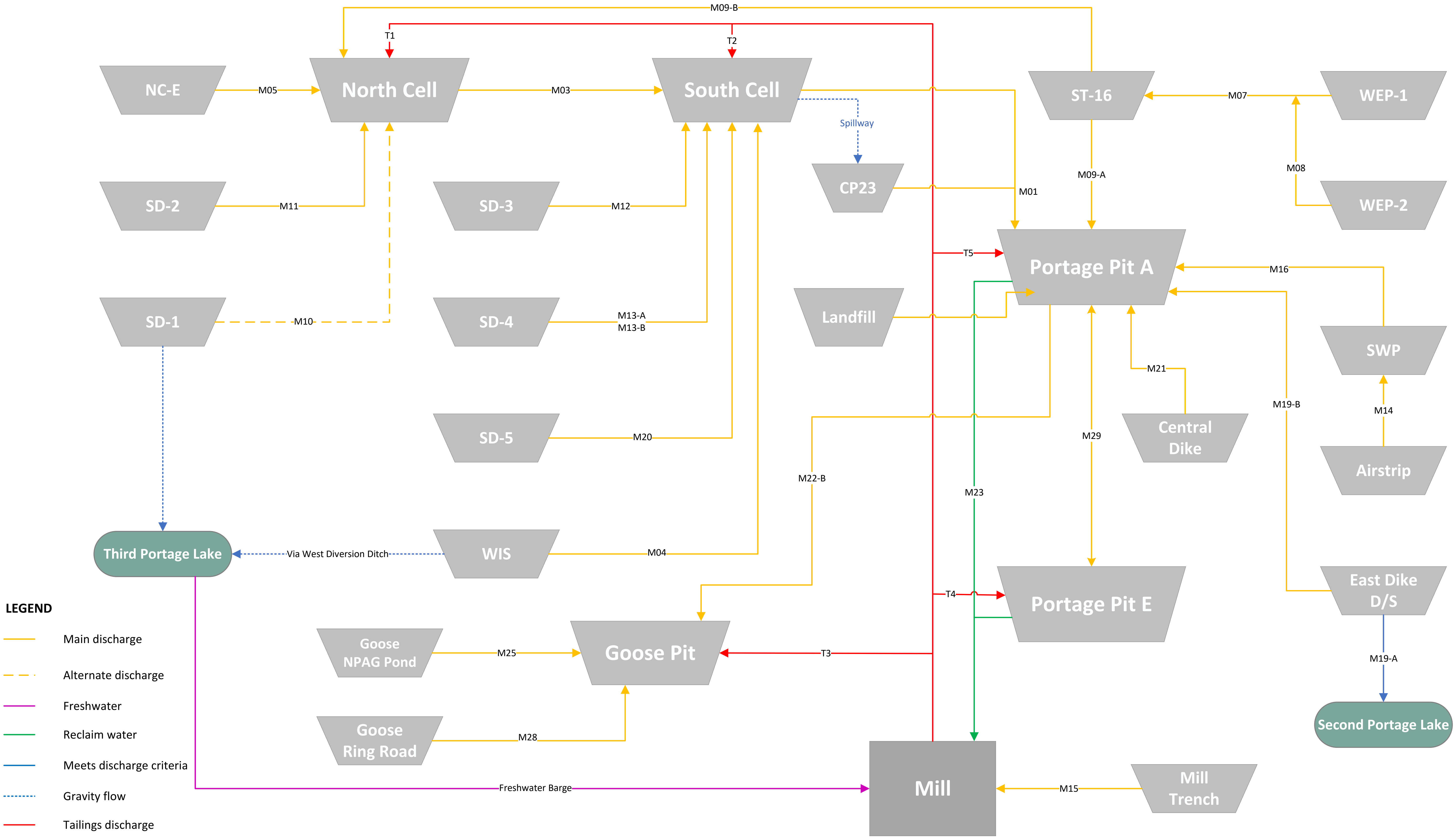
P:\Engineering\05-Geotechnic\05-WaterManagement\Snow Management\2024\MBK Snow Plowing Map for 2024.dwg, 12 Sep 2024

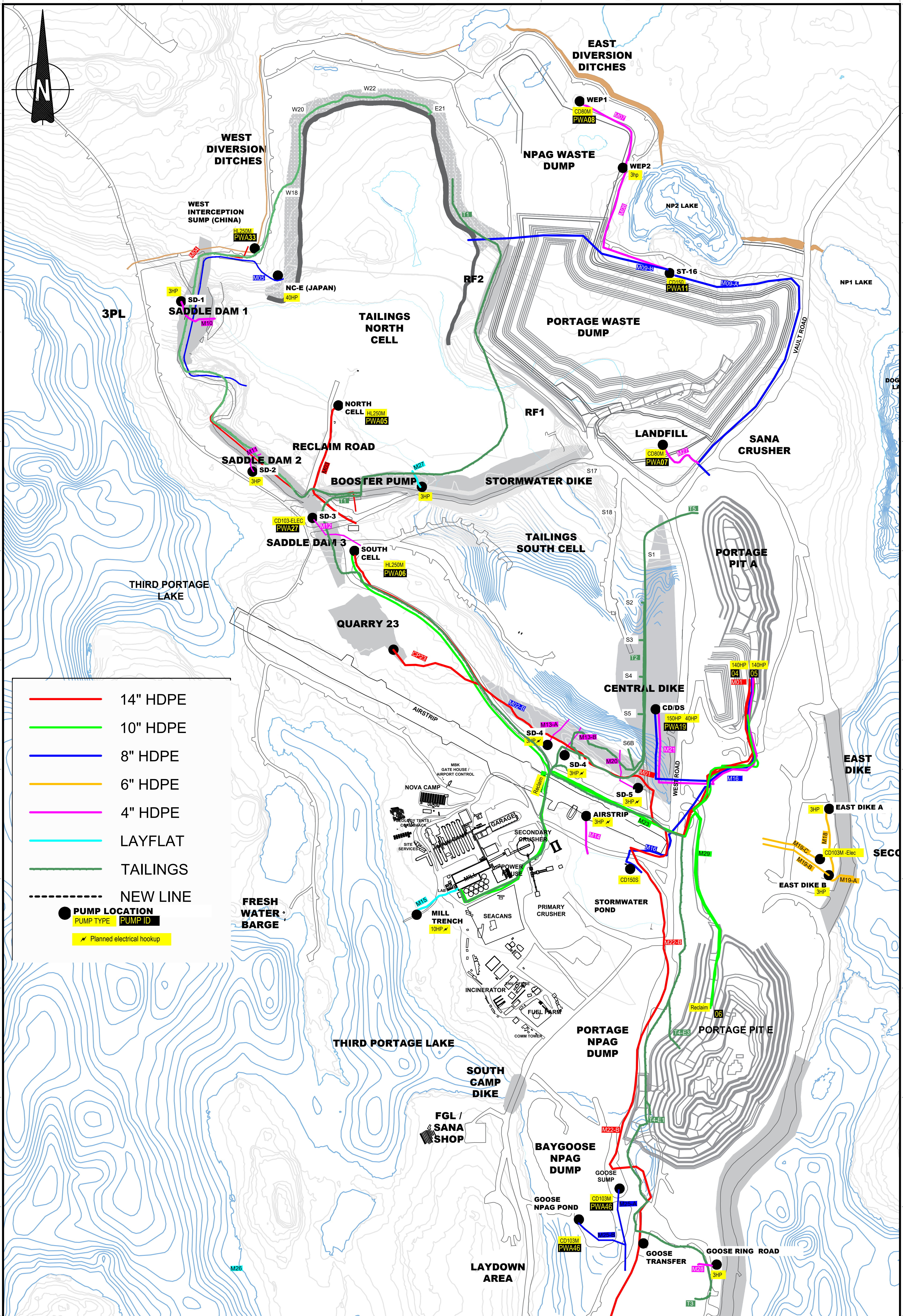
APPENDIX 4

2025 Freshet flowchart and plan view

Updated by : C. Pelletier
Date: 2025-01-03

Meadowbank Freshet Detailed Flowsheet - 2025





TECHNICAL SPECIFICATION

None

AGNICO EAGLE MEADOWBANK

DRAWN BY	DATE	MODIFIED BY	DATE
SURVEY CHECK	DATE	OE	2025-02-26
GEOLOGY CHECK	DATE		
ENGINEERING CHECK	DATE		

MEADOWBANK DIVISION

ENGINEERING - GEOTECH

MBK DEWATERING MAPS

FRESHET 2025

Revision1

SCALE 1:12500 | DATE | FILE .DWG

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APPENDIX E –AMMONIA MANAGEMENT PLAN

MEADOWBANK COMPLEX

AMMONIA MANAGEMENT PLAN

JANUARY 2024

VERSION 5

EXECUTIVE SUMMARY

In accordance with the Type A Water Licenses (2AM-MEA1530 & 2AM-WTP1830) Agnico Eagle is updating the Ammonia Management at the Meadowbank and Whale Tail sites (e.g., the Meadowbank Complex), which includes monitoring for ammonia in all mine pit sumps, storage pond, tailings storage facility, seeps, etc. Furthermore, Agnico Eagle has implemented a comprehensive, regular inspection program related to explosives management within the mine pits, conducts regular inspections at the explosives manufacturing facility (Dyno Nobel) to ensure all explosive products are stored in locked, sealed containers prior to use, and continues to perform continuous review of analysis results such that mitigation measures can be implemented when increasing trends of ammonia are determined. Agnico Eagle has not exceeded any ammonia discharge criteria (Water License or MDMER) to date.

This Ammonia Management Plan (AMP) is a companion document to the Spill Contingency Plan, the Water Management Plan and the Water Quality and Flow Monitoring Plan and has been updated to provide guidance for monitoring ammonia levels at the Meadowbank and Whale Tail mine sites, as part of the conditions applying to waste disposal and management listed in the Water Licenses.

DOCUMENT CONTROL

Revision				Pages Revised	Remarks
#	Prep.	Rev.	Date		
00	SNC		February 2013	All	
01	Agnico Eagle	1	March 2016	13	Table 1 update
				16	Add section 6
				Appendix 1	Add Memorandum to address comments made during water license renewal process
WT	Agnico Eagle	WT	June 2016		Included Whale Tail Pit operations in the updated plan
02_NIRB	Agnico Eagle	2	Dec 2018		For WT Expansion permitting process
02_NWB	Agnico Eagle	2	April 2019		For WT Expansion permitting process
02	Agnico Eagle	2	April 2020	All	Comprehensive review of the plan + incorporates WT
03	Agnico Eagle	3	March 2021	All	Comprehensive update to reflect the current operation
04	Agnico Eagle	4	December 2021	Appendix 5, p.27 Section 2.1.1, p.9	Update inspection sheet Update to reflect WT emulsion plan construction
05	Agnico Eagle	5	January 2024	Section 2.1.1 and 2.1.2, p.9 Appendix 1, p.21 Appendix 3, p.25 Appendix 4, p.26	Updated to reflect current operation Updated Figures Updated Emergency Response Plan Updated MSDS

Prepared By: Environmental Department

Approved by: Eric Haley
Environment and Critical Infrastructures Superintendent

TABLE OF CONTENTS

List of Appendix

ACRONYMNS

Agnico Eagle	Agnico Eagle Mines Limited
AMP	Ammonia Management Plan
AN	Ammonium Nitrate
ANFO	Ammonium nitrate – fuel oil
AWAR	All-weather Access Road
CCME	Canadian Council of Ministers of the Environment
CIRNAC	Crown-Indigenous Relations and Northern Affairs Canada
CNO-	Cyanate
CREMP	Core Receiving Environmental Monitoring Program
KivIA	Kivalliq Inuit Association
MDMER	Metal and diamond Mining Effluent Regulations
NIRB	Nunavut Impact Review Board
NWB	Nunavut Water Board
TSF	Tailings Storage Facility
WMP	Water Management Plan
WRSF	Waste Rock Storage Facility
WTHR	Whale Tail Haul Road

1 INTRODUCTION

The Meadowbank Mine Water Management Plan (WMP) was first prepared in 2009. This version was subsequently updated in preparation for the Type-A Water License Application for the Meadowbank Mine. The WMP was then updated in 2011. In 2015 WMP update, a technical note was added as an appendix, which was the first iteration of the Ammonia Management Plan (AMP) for the Meadowbank Mine. As an extension of the Meadowbank Mine, the 2016 update of the AMP includes measures to manage and monitor ammonia at the Whale Tail satellite open pit operations. Other facilities that are part of the Meadowbank Mine are the Baker Lake facility, the All-weather Access Road (AWAR) between Baker Lake and the Meadowbank Mine, the Meadowbank Mine Camp, the Meadowbank Tailings Storage Facility, the Whale Tail Haul Road (WTHR) between the Whale Tail and the Meadowbank Mine sites.

The Ammonia Management Plan (AMP) was updated in March 2016 in response to concerns raised during the Water License renewal process (January, 2015 – NWB Technical Meetings – Baker Lake) and was re-issued as part of the management plans update process. These concerns from interveners centered on ammonia loading resulting from mine infrastructure in particular from cyanidation in the Tailings Storage Facility (TSF), the use and management of explosives, and the management of treated sewage. In addition, there was a request for loading calculations of ammonia to the receiving environment. These comments are addressed in the Ammonia Management Plan Version 2 March 2016 and specifically in the SNC 2016 Technical Memorandum – WGFU, which was appended to the revised plan. It should be noted that there is no further planned discharge of mine contact water into Third Portage Lake from the Portage Attenuation Pond. The onsite Core Receiving Environmental Monitoring Program (CREMP), takes into account the overall ammonia levels in Third Portage Lake and to date Agnico Eagle has not reached any level of concern (no trigger levels have been reached for ammonia).

Ammonia management at Whale Tail site follows the same practices as outlined in this approved plan and similarly includes conducting routine monitoring in the receiving environment at the Whale Tail site under the CREMP.

This AMP is a companion document to the Spill Contingency Plan, the Water Management Plan and the Water Quality and Flow Monitoring Plan and has been updated to provide guidance for monitoring ammonia levels at the Meadowbank and Whale Tail mine sites, as part of the conditions applying to waste disposal and management listed in the water license. This includes monitoring for ammonia in all mine pit sumps, attenuation ponds, TSF, seeps, etc. in accordance with the Type A Water Licenses. Furthermore, Agnico Eagle implemented a comprehensive, regular inspection program related to explosives management within the mine open pits, conduct regular inspections at the explosives manufacturing facility (Dyno Nobel) to ensure all explosive products are stored in locked, sealed containers prior to use, and continue to perform continuous review of analytical results such that mitigation measures can be implemented when increasing trends of ammonia are noted. Agnico Eagle has not exceeded any ammonia discharge criteria (Water License or MDMER) to date.

Ammonia is a naturally occurring nitrogen compound found in the environment. However, there are two sources at the mine site that can contribute to the mobilization of ammonia in the groundwater or surface runoff:

1. Blasting of ammonium-nitrate (AN) explosives is typically the primary source of ammonia in areas of mining operations. AN readily absorbs water and dissolves easily, thereby mobilizing ammonia in either groundwater or surface runoff.

2. In gold mine operations using a cyanidation process to extract the gold from the ore, the cyanide in solution is oxidized to cyanate (CNO^-) using a sulfur dioxide (SO_2) air process before discharge to the TSF. The cyanate can then hydrolyze to ammonia in the TSF reclaim pond.

Ammonia dissolved in water exists in equilibrium of interchanging un-ionized (NH_3) and ionized (NH_4^+) forms. The equilibrium is influenced by pH, temperature, and ionic strength (salinity) where the amount of un-ionized ammonia is favored as the pH becomes more basic or as the water temperature or salinity increases. Un-ionized ammonia can readily pass across the gill surface and enter into the bloodstream of fish, while ionized ammonia passes with greater difficulty. Once inside the fish, both forms of ammonia can cause toxic effects (CCME, 2010). Furthermore, it should be noted that ammonia oxidizes to nitrite (NO_2) and nitrate (NO_3), the former being particularly toxic to fish and humans. Both nitrite and nitrate have CCME guidelines to ensure the Protection of Aquatic Life.

In addition to ammonia, monitoring of nitrate and nitrite is also considered in the AMP, as both water quality parameters are signature compounds of AN explosives. NO_3 has a discharge criteria threshold specified in the conditions applying to waste disposal and management in the Meadowbank and Whale Tail Water Licenses. This AMP proposes monitoring of blasting practices for the assessment of explosive quantity used and blast performance, as well as monitoring of water quality to determine ammonia levels in waters within the mine sites. The monitoring results can be used to review and adjust blasting practices or water management if ammonia levels need to be reduced.

2 EXPLOSIVE MANAGEMENT AND BLASTING PRACTICES

2.1 SITE DESCRIPTION

2.1.1 Explosive Storage

The primary storage area of explosive products is located at the Whale Tail emulsion plant areas (see Appendix 1). The explosive products arrive by barge at the Baker Lake marshalling area. They are then transported by ground to the Whale Tail emulsion plant. There is no explosive storage at Meadowbank since the beginning of 2022.

Explosive products at the plant facilities are packaged in supplier provided containers, which limit the possibility of spillage into the environment. The products are only removed from these containers prior to use at the emulsion plant areas. Surface areas are graded to collect water runoff within the storage facilities.

The emulsion plant area at Meadowbank is located north of the Meadowbank mill, pits, and camp site and approximately 76 km from Whale Tail Mine. The storage area is accessible from the AWAR. Some ammonium nitrate prill containers are temporary stored at the Meadowbank emulsion plant (no longer in operation) and brought to Whale Tail as needed due to the limited storage capacity on Whale Tail site. The Whale Tail Emulsion Plant is located in a remote area of Whale Tail Mine, southwest of the pits and the main camp. The plant was commissioned in January 2022. The infrastructure presently consists of an emulsion plant for the preparation of bulk emulsion explosives, two buildings for the storage of AN, a nitrate pad and seven explosive magazines along the access road to the plant.

Similar to the previous Meadowbank operations, the emulsion is trucked to Whale Tail Pit, IVR Pit and Underground operation. The current plan for emulsion delivery is to directly deliver to the open pits and underground however, emulsion is also stored in a remote emulsion storage building located where the Whale Tail mine explosives magazines are stored. In the case of road closures, inclement weather or other operational constraints, the remote emulsion storage will supply emulsion to the Whale Tail Pit, IVR Pit and underground.

2.1.2 Roads

The AWAR and the WTHR are use to transport explosive products from the Baker Lake site facilities to Whale Tail Mine.

Agnico Eagle will continue to enforce restricted access from km 85 north to the Meadowbank Mine and will enforce the same restrictions along the WTHR (refer to the Whale Tail Haul Road Management Plan).

Spillage control protocols, procedures and handling of spilled material, and explosive management for both storage and transport have been established by Dyno Nobel Inc. (Dyno) and are provided in Appendix 2. Explosive products and spills on the AWAR/WTHR are referenced in the Spill Contingency Plan.

2.1.3 Pits and Underground Operations

The development sequence of the mine site is provided in the Meadowbank Mine Waste Rock and Tailings Management Plan and the Whale Tail Waste Rock Management Plan. Explosives are used for the excavation of waste rock and mining of the ore at the Portage, Goose and Vault pits at Meadowbank before depletion, and at the Whale Tail Pit, IVR Pit, and underground mines.

2.2 AMMONIA PATHWAYS

Emulsion not fully detonated in pit blasting operations provides several pathways for ammonia mobilization. Water from drainage runoff is the primary mechanism of mobilization for ammonia residuals remaining within open pits. This water, being at Meadowbank or Whale Tail, is collected at pit sumps and then is pumped to the associated Attenuation Ponds.

Blasting residuals are also expected to be attached to waste rock and ore materials, which are transported from the open pits to their respective storage and processing facilities. Residuals from waste rock may be washed off by precipitation and be ultimately conveyed to the attenuation ponds. Residuals from the ore may be carried in the tailings to the TSF. All these pathways (mine sumps, attenuation ponds, TSF) are monitored in accordance with the Water License.

At Whale Tail operations, if blasting residues on waste rock are mobilized, they will collect in the Waste Rock Storage Facility (WRSF) pond, which is downslope of the WRSF, or the IVR WRSF contact water collection system. For ore stored within the dewatered portion of Whale Tail Lake, drainage would flow to the attenuation pond. The locations of the WSRF and the storage ponds are shown in the figure for Whale Tail site in Appendix 1.

To avoid any case of poor or incomplete detonation, Agnico Eagle employs the following measures:

- inspection of drilling depth to ensure it is in accordance with blast design;
- inspection of quantity of explosives in each drillhole to ensure it is in accordance with blast design;
- inspection of blast tie-in execution; and
- reporting of any anomalies during loading and priming of explosives to correct situations prior to initiation.

These measures will be reviewed should ongoing cases of poor or incomplete detonation be encountered. This will be included in the next revision of the AMP.

2.3 EXPLOSIVES AND BLASTING

Based on experience at Meadowbank and at other open pit mines in the Canadian Arctic, the largest potential source of ammonia in mine water will be explosive residue from blasting. Depending on the wetness of the site, water may leach explosives from blastholes prior to the blast. Other forms of ammonia released from AN are explosives flowing into cracks and fissures in the rock and not detonating or leading to an incomplete detonation of the explosive column and misfired blastholes. An ammonium-nitrate based emulsion is used as a blasting agent at the Meadowbank and Whale Tail sites. This material is designed to repel water thus minimizing the potential for ammonia to impact mine water.

Blasting operations on site include monitoring of explosive quantities, blast design, procedures, and practices. The results of this assessment are used to adjust blasting practices as needed to:

a) Optimize the use of explosives; and

b) Increase the completion and efficiency of explosive detonations.

Any modifications to blast design are intended to decrease the amount of ammonia that may become available for mobilization in mine water.

2.3.1 Explosive Products

Explosive products used at the mine site include bulk explosives (bulk emulsion), packaged explosives, cast boosters, detonating cords, non-electric delay detonators and non-electric lead lines. The material safety data sheets (MSDS) for these products are provided in Appendix 4. Of these products, the greatest potential for water contamination comes from the bulk explosives. Meadowbank and Whale Tail use emulsion as the primary bulk explosive for blasting operations.

Bulk emulsions typically contain some or all of the following components:

- Ammonium, sodium and/or calcium nitrate;
- Fuel and/or mineral oil;
- Methylamine nitrate;
- Emulsifiers; and
- Ethylene glycol.

Although bulk emulsions are water resistant, contaminants can be leached from the product if it is left in contact with standing or flowing water for extended periods of time. The performance of the explosive, and hence the potential for post-blast contaminations, deteriorates with the length of time that the emulsion remains in the blasthole after it has been loaded (i.e., sleep time). Blast procedures currently in use are designed to minimize sleep time so that standing or flowing water is not in contact with the bulk emulsion for extended periods of time.

2.3.2 Procedures and Practices

Quality control procedures are in place to verify AN content in bulk explosives. Quality control procedures for the emulsion occur at the plant and density tests are done at the blast site (on the trucks). Loading procedures specify that blastholes be loaded with emulsion from the bottom of the blastholes to provide a continuous explosive column. Details on the explosive quality control and loading procedures have been established by Dyno Nobel and are provided in Appendix 2.

The primary factors that may reduce the amount of ammonia available for mobilization in mine water are:

- Explosives handling; and
- Completeness of detonation

Bulk emulsion spillage during blasthole loading could (as bulk emulsion is resistant to water) be a source of ammonia that could be carried by water collected in the pits. Spillage control protocols, procedures and handling of spilled material, and explosive management for storage and transport, as well as the emergency response plan, have been established by Dyno and are provided in Appendix 2 and 3.

Incomplete detonation results in higher ammonia residue on the blasted rock. Evidence of incomplete detonation is often observed as an orange fume after a blast and sometimes an orange pigment on the blasted rock. Explosives that have failed to detonate may be observed in the muck pile. Muck piles are routinely inspected by Meadowbank and Whale Tail staff for signs of incomplete detonation.

3 MONITORING

Monitoring of explosive handling and blasting is as follows:

a) Explosive quantities: Records of explosive quantities used for in-pit blasting are kept for each blasting event and will be conserved throughout the mine life. Furthermore, a record of blast location (i.e., pit and elevation), blast date, and bulk explosive type and name used (emulsion, with the corresponding ratio of AN over emulsion) is kept for all events.

b) Design parameters: Blast design parameters, as well as changes in the blast design parameters from the standard are recorded and dated.

c) Loading instructions: Loading instruction forms are completed for each blast event and provide a record of the as-loaded parameters for all blastholes in the blast pattern including:
   - Hole depth
   - Collar height
   - Priming (single or double)
   - Other observations made by the blast crew (e.g., wetness of holes, use of liners, collapsing holes or difficulty loading)

d) Video footage: Videos are taken of each blast. This practice provides a visual, qualitative record of the results of each blast and provides insight into potential problems such as incomplete detonation (e.g., orange fumes) and misfires, as well as areas of poor muck pile heave and forward movement.

e) Blast audits: Blast audits are conducted on a monthly basis to ensure that best practices are being followed in the field (audits may be adjusted to a lesser frequency if low ammonia levels are consistently observed, or conversely may be adjusted to a higher frequency if high ammonia levels are consistently observed).

An additional monitoring technique commonly used is the measurement of the Velocity of Detonation (VOD), which has been shown to be directly related to the volumetric fraction of the explosive that has been consumed. This technique will be implemented if poor or incomplete detonation is consistently suspected.

4 MILL EFFLUENT

4.1 SITE DESCRIPTION

The mill effluent consists of tailings produced at the mill that is pumped as slurry and deposited in the TSF/in-pit disposal where the tailings particles can settle and consolidate. The reclaim water is pumped back to the mill for re-use. Prior to discharge of the mill effluent to the TSF, the effluent is sent to the cyanide destruction process. The cyanide destruction process at Meadowbank uses the sulfur dioxide (SO_2) and air process to oxidize weak acid dissociable cyanide (CN-WAD) to a less toxic form: cyanate (CNO^-) based on the following reactions:

$$SO_2 + O_2 + H_2O + CN\text{-}WAD \rightarrow CNO^- + H_2SO_4$$

The process can also use sodium metabisulfite ($Na_2S_2O_5$) instead of sulfur dioxide in case there are operating issues with the dosing of sulfur dioxide gas in the process. This ensures that chemicals required for the cyanide destruction process (either SO_2 or $Na_2S_2O_5$) are always available.

4.2 AMMONIA PATHWAY

Cyanate produced from the oxidation of CN-WAD can readily hydrolyze to ammonia (NH_3) and carbon dioxide (CO_2) based on the following reaction:

$$CNO^- + H^+ + H_2O \rightarrow NH_3 + CO_2$$

Thus, the mill effluent provides an ammonia loading to the TSF reclaim water.

During the operation of the TSF, the reclaim water will be pumped to the mill for re-use in a closed loop system. Consequently, there will be no discharge of reclaim water to the environment during this period. Furthermore, it is expected that the ammonia concentration will gradually increase in the TSF/in-pit reclaim pond over time, even though (1) there may be some slight attenuation of ammonia due to microbial/algae activity in the summer and (2) ammonia may oxidize to nitrite and nitrate, particularly near the top of the pond where oxygen is most present.

Annual Water Quality Forecasting provides a forecast of the concentration for ammonia in the TSF reclaim pond during the life of the mine. Furthermore, the report provides a forecast of the ammonia concentration in the Portage and Goose Pit flooding activities This modeling has been updated for Whale Tail operations to include predictions for Portage and Goose Pit end pit water quality and will be updated according to the Type A Water License requirements.

4.3 MONITORING

Concentrations of ammonia, nitrate and nitrite are parameters that are monitored on a monthly basis as part of this sampling campaign of the TSF/in-pit reclaim water.

In the Water Quality Forecasting, a maximum ammonia concentration in the TSF reclaim water is evaluated in order to meet the Type A Water License criteria which for benchmarking are compared to CCME guidelines for the Protection of Aquatic Life in the Portage and Goose Pits once in-pit disposal and flooding activities are completed. If this concentration is exceeded before the end of the flooding operation, measures could be undertaken to lower the ammonia concentration, as well as nitrate and nitrite if required, in the TSF reclaim pond prior to the transfer of TSF reclaim water to the pits.

Ammonia treatment technologies that could be further investigated, if the need arises, include:

i) Biological nitrification / denitrification during the summer months.

ii) In-situ volatilization of ammonia during the summer months.

iii) Ammonia removal by snow making.

5 WATER MANAGEMENT

For details on the site wide water management, please refer to the Meadowbank Water Management Report and Plan and the Whale Tail Water Management Plan.

In addition to controlling contact water through design, the Meadowbank Water Quality and Flow Monitoring Plans and Type A Water License requires monitoring stations that are used for the monitoring of ammonia loadings around the mine site and waste rock storage areas from explosive residuals, as well as ammonia concentration found in the reclaim pond. These monitoring requirements ensure contact water that may contain elevated ammonia, nitrates or nitrites are managed, treated if necessary and do not impact the receiving environment. Monitoring at Whale Tail site is presented in the Whale Tail Water Quality and Flow Monitoring Plan and in the Type A Water License.

In addition to the monitoring listed in the Water Quality and Flow Monitoring Plan, the following actions are undertaken at Meadowbank and Whale Tail as part of the AMP:

- If runoff or seepage is detected at the rock storage facility, water samples collected at the Portage, Vault, Whale Tail, or IVR WRSFs during late operations will also be analyzed for nitrate and nitrite to complete the suite of signature compounds found in explosive residuals.
- Tailings slurry volumes and density from the mill pumping facility to the TSF are recorded on a monthly basis.
- The records of water volumes pumped from the Meadowbank and Whale Tail sumps or WRSF pond to the attenuation ponds are recorded on a monthly basis.
- The records of water volumes pumped from the attenuation or storage ponds to the receiving environment will be recorded on a monthly basis.

Sampling frequency at the pit sump will also be increased if high variability is identified in observed constituent concentrations as a result of the blasting schedule.

The WRSF ponds at Whale Tail will collect all drainage from the WRSFs. Any drainage from the ore storage area will collect in the Whale Tail/IVR Attenuation Ponds. The open pit, water storage ponds and the Attenuation Ponds at Whale Tail and IVR Pits are shown in Appendix 1.

6 REPORTING

Reporting of ammonia concentrations at the Type A sampling stations listed is included as part of the requirement of the Water License. The reporting frequency is prescribed by the Nunavut Impact Review Board (NIRB) Kivalliq Inuit Association (KivIA), and Nunavut Water Board (NWB) and include, but may not be limited to:

- Brief monthly reports of the compiled water quality monitoring results, sent to the NWB, the CIRNAC Water License Inspector and to the KivIA; and
- An annual report submitted to the NWB, KivIA, CIRNAC, NIRB, Government of Nunavut, and other interested parties. This report summarizes monitoring results for each sampling station, annual seep water chemistry results, annual groundwater monitoring results, receiving water monitoring results, spills and any accidental releases, measured flow volumes, effluent volumes and loadings, and results of QA/QC analytical data.

Mine operation personnel reviews on a monthly basis the data gathered from the sampling stations in the Type A Water License and from the monitoring action proposed under the AMP. If the data indicates that further studies and/or significant changes to the water management infrastructure are required to assess or control ammonia concentrations, Agnico Eagle will notify the NWB and KivIA as early as practical. Results of these further studies and/or changes to the AMP monitoring actions will be transmitted to the NWB for review.

7 INSPECTION

On a weekly basis, the environment department will conduct inspection in the blasting area to ensure that the Dyno Nobel loading procedures are being implemented (this will minimize blasting residues). In addition, inspections will be undertaken at explosive product storage facilities (Dyno Nobel) to ensure that explosives products are stored in sealed containers and there is no spillage. If any non-conformities are observed follow up action will be undertaken, and corrective measures will be put in place. See Appendix 5 for copy of the Emulsion plant inspection form.

8 REVIEW OF AMMONIA MANAGEMENT PLAN

Review of the results of the site water quality and AMP monitoring during the year may provide new information, and/or indications that changes to the AMP are necessary. When revisions are warranted, an updated AMP will be submitted to the NWB for review.

9 REFERENCES

Agnico Eagle (2020), Meadowbank Water Quality and Flow Monitoring Plan. July 2020.

Agnico Eagle (2016), Whale Tail Pit Project FEIS and Type A application documents. Volume 8 – Monitoring and Mitigation and Management Plans. June 2016.

CCME (2010), Canadian Water Quality Guidelines for the Protection of Aquatic Life, Ammonia.

Golder (2009). Updated Water Management Plan. Agnico-Eagle Mines. July 2009

Golder (2011), Updated Water Management Plan, Agnico-Eagle Mines, July 2011

NWB (2020). Water License No: 2AM-MEA1530. Agnico- Eagle Mines Ltd. March 2020.

NWB (2020). Water License No: 2AM-WTP1830. Agnico- Eagle Mines Ltd. March 2020.

SLI (2012). Water Management Plan 2012. Agnico-Eagle Mines. Document No. 610756- 0000-40ER-0001, Rev. 02. March 2013.

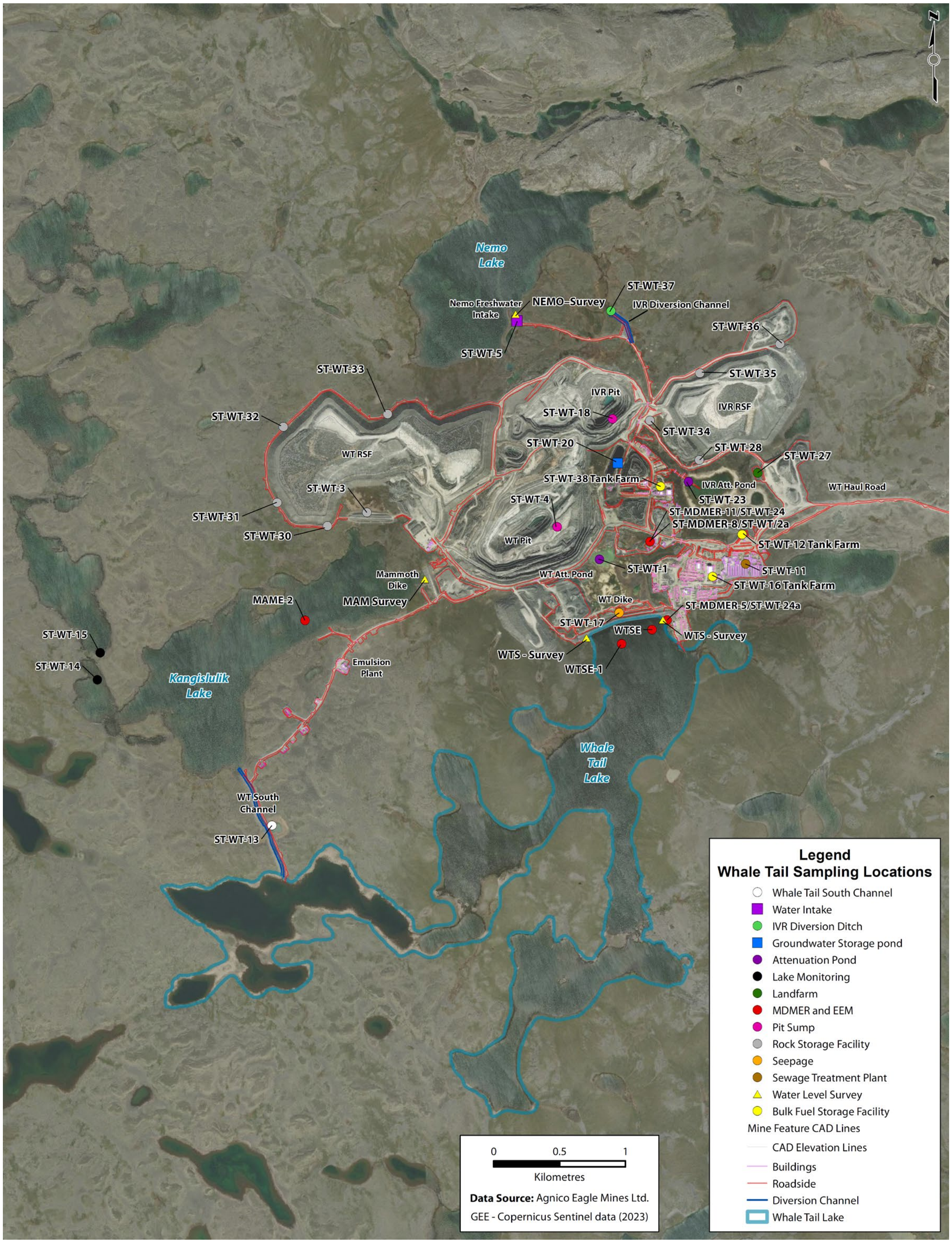
SLI (2012). Water Quality Forecasting for the Portage Area 2012-2025. Agnico-Eagle Mines. Document No. 610756-0000-40ER-0002, Rev. 01. March 2013

APPENDIX 1

ENVIRONMENT FIELD STATIONS – MINE SITE VIEW

Meadowbank Mine Site Layout Area

Whale Tail Mine Site Layout Area



APPENDIX 2

SPILL CONTROL AND LOADING PROCEDURE PLAN

Dyno Spill Control and Loading Procedure Plan

1) All trucks are washed inside shop to contain any residue that may have contacted trucks. The water from the washing of the trucks and or the shop floors themselves is then picked up by the AEM e vacuum and disposed of in the onsite Stormwater Management Pond.

2) A.N. Prill is brought to the Emulsion Plant site in 20 ft Seacans and is stored in the Seacans on the A.N. Pad for the site till it is needed. It is then taken out of the Seacan /s and brought into the Plant for use. Sometimes enough product for the next batch is stored outside to speed up Batching time when it is necessary. A.N. Prill is not left outside if weather looks like it is going to be damp or raining to prevent the leaching of Prill through the Tote bags and on to the ground surface.

3) Any A.N. spills that occur are promptly cleaned up and disposed of in 1 of 2 ways:
    i. Any contaminated prill is put into containment barrels or buckets inside Plant, depending on amount, and put into the next Ansol batch to be made.
    ii. Any contaminated Prill is put in Barrels or Buckets (depending on amount) and then transferred from barrels to buckets for the Emulsion Truck Operators to take to the Blast Pattern and placed into the boreholes after they have been loaded (disposal via blast).

   Any spills that are too difficult (some of our drummed Products) to take care of in this manner are placed in Metal Drums or HAZMAT bins etc. with absorbing materials, sealed and sent to AEM HAZMAT AREA (for shipment south).

4) Emulsion waste (with contaminants) is also either contained in drums or bins until it can be transferred into buckets and taken to Blast patterns and placed into boreholes for disposal (disposal via blasting).
   Any non contaminated Emulsion is put back through the system and on to Trucks.
   When Trucks need to be de-contaminated or process lines of trucks or plant need to be cleaned out, the excess water is strained through a Sack (this allows the water to go through, but contains the Emulsion) to minimize nitrites in our plant sump containment.

5) When an Emulsion Truck has completed loading on a blast pattern the remaining emulsion is flushed out of the loading hose by running water through the hose (water holding tank on trucks) until water discharges out the end of the hose into the borehole.
   This does not completely remove all of the Emulsion out of the Hose; there is still a residue amount left in the hose. Thus, when the Truck operator starts up on the next blast pattern, the hose is put into the borehole and the Operator primes the hose and all the residue Emulsion is contained in borehole and disposed of when hole/s are blasted.

APPENDIX 3

DYNO NOBEL EMERGENCY RESPONSE PLAN

Dyno Nobel

DYNO NOBEL CANADA

EMERGENCY RESPONSE PLAN

AMARUQ NUNAVUT

REVISION STATUS

Revision #	Date	Revision Description	By	Checked by	Approved by	Revision Due
1.0	July 31, 2019	New Standard	P.St-Georges	D. Wall; P. Piprell	T. Medak	
1.1	October 26, 2020	Site Manager change		P.Piprell a& Shanno Ryan	T.Medak	
1.2	October 26, 2021	Review ERP	PSt-G.			October 2022
1.3	October 26, 2022	Review ERP Mod. In Blue*	P.St-G.			October 2023
1.4	October 17, 2023	Review ERP Mod. In Blue*	P.St-G.			October 2024

* Modification done in the site ERP are in blue

Approved for release by:

Signature: Patrick Piprell ______________ Date: October 17, 2023

Title: Site Supervisor

CONTENTS

External Reports

All incident involving the manufacturing, importation, exportation, sales or storage of explosives and restricted components, and the use of fireworks, must be reported to the Chief Inspector of Explosives as soon as circumstances permit. For accident involving fatality, serious injuries or major property damage, call 1-855-912-0012 as soon as possible. All other accident/incidents must be reported to 1-613-948-5200. The completed Explosive Incident Report form F07-01 should be sent by email to ERDmms@nrcan.gc.ca or by fax to 613-948-5195. The inspector of explosives responsible for your area should also be contacted.

1.0 SITE INFORMATION

The entrance to the site is south of AMARUQ mine site at the Explosive Manufacturing Road (EMR).
Latitude (North): 65° 23'43.45"N
Longitude (West): 96° 44'1.00"W
Office: +1 819 759-3555 ext 4606808

2.0 PURPOSE

The purpose of the 'Emergency Response Plan' is to provide guidelines for the protection of all employees and company property in the event of an emergency occurring on company premises. It outlines the setting up of emergency control within the site and the emergency procedures in place to ensure the safety and protection of people, property and the environment.

- Notifying all on-site personnel of emergencies.
- Organizing the site based emergency response, where applicable.
- Facilitating communications with Emergency Services.
- The plan provides procedures for:
  - ➢ Training of site personnel in emergency response.
  - ➢ Reviewing and updating emergency procedures.
  - ➢ Facilitating recovery operations.

To provide a management system for Dyno Nobel Canada and stakeholders, to deal with emergencies to protect people, property and the environment.

Objectives:

- To minimize adverse effects on people, property and the environment
- To control or limit the effects of an emergency
- To facilitate an emergency response and to provide appropriate assistance to the emergency services
- To communicate vital information to all relevant persons as soon as possible
- To provide for competency-based training so that a high level of preparedness can be continually maintained
- To provide a basis for updating and reviewing emergency procedures
- To provide a system to manage an emergency
- To link current site plans with the corporate plan
- To identify and utilize an effective communication system

3.0 SCOPE

This plan has been prepared for Dyno Nobel Canada Inc. The plan covers the emergency response requirements for Dyno Nobel's AMARUQ Operations.

SCOPE OF OPERATION

Bulk Explosives Factory Site includes;

Emulsion Manufacturing site
storage of emulsion, Ammonium Nitrate 182,500 NEQ
- 50,000 liters of diesel;

4.0 REFERENCES

- Site Emergency Response Plan (Template)
- Emergency Risk Assessment Worksheet
- IPL HSE MS Element 9.1, Emergency Response Planning
- CSA-Z731-03 Standard – Emergency Procedures
- Regulatory Agencies, Groups, Industry and Community
- Environmental Emergency Regulation – Environment Canada

The regulatory agencies administering explosives are:

- Transportation of Dangerous Goods (TDG)
- Natural Resource Canada (NRC)
- Explosives Regulatory Division (ERD)
- Environment Canada (EC)

5.0 EMERGENCIES COVERED UNDER THE PLAN

Based on a risk assessment conducted the following natural or man made disasters could impact our business:

On-site Emergencies

- White outs
- High Winds
- Explosion – equipment (boiler/fuel or other)
- Fire in plant
- Injury or illness
- Wildlife interaction (wolverine; bear; caribou; other)
- Environmental contamination
- Spills
- Severe weather
- Product shortage
- Raw ingredient shortage
- Critical replacement parts unavailable
- NOX gas release possible.

Off-site Emergencies (including transportation)

- Transportation incident rollover or collision
- Blast pattern incident with drill
- Blast pattern incident near highwall
- Blast patten incident – lightning
- Fire –threat to vehicle
- Fire – toxic fumes
- Explosion – product detonation
- Security
- Injury or illness
- Wildlife interaction (wolverine; bear; caribou; other)
- Spills
- Severe weather
- NOX gas release possible.

6.0 HAZARDOUS OPERATIONS

The following zones, activities and equipment are hazardous and may require an emergency response:

The following is a prioritized list of hazardous operations and storage areas.

	Operation	Comments / Instructions
1.	Manufacture Emulsion	Plant and emulsion storage with chemicals. Emulsion storage in ISO tank.
2.	Operating loader	Yard; site access road
3.	Fuel storage area (bulk)	Bulk tank in yard
4.	Product delivery to blast pattern	Plant; Site yard; Mine road; pit
5.	Driving on a pattern	Pit
6.	Transferring chemicals	Plant; Process vehicles
7.	PTW activities	Confined Space Entry; Working at Height; Hot Work; Loading and unloading (Emulsion, Traces, Fuel); Lockout/Tagout; Critical Lifts

7.0 HAZARD CHEMICALS AND MATERIALS

The following is a prioritized list of or hazardous chemicals, materials and intermediates of significant quanities on site or transported by site:

	Chemical / Material	Quanties	Location
1.	Fuel oil	50,000L	Outside plant
2.	Trace 1 (citric acid)	284 L	
3.	Trace 2 (sodium nitrite)	284 L	
4.	ANP	120,000 kg	Outside

8.0 EMERGENCY CONTACT INFORMATION

Dial 6-9-1-1 in an emergency or call CODE 1 – CODE 1 – CODE 1

Non-Emergency Police / Fire

- Baker Lake RCMP (867) 93-1111

Regulatory Contacts: (NRCan via H&S or Regulatory Compliance Manager)

- H&S: Seamus Kilcommons Cell: 403 815-4066
- Reg: Pierre St-Georges Cell: 613 677-1051

DN Title	Name	Cell Phone	Work Phone	Home Phone
Manager of the Site	Patrick Piprell & Shannon Ryan	NA	819 759-3555 EXT 4606608	
Operations Manager	Krisnar Cruz	587-839-0654	587-839-0654	
General Manager	Jim O'Brien	913-940-5170	913-940-5170	
HSEC Manager	Seamus Kilcommons	403-837-2685	403-723-7547	
Emergency Supervisor (ES)	Shannon Ryan Patrick Piprell		819-759-3555 EXT: 4606808	

Local Emergency Services may be required to take control of the emergency situation. Dyno Nobel personnel will assist the Local Emergency Services with information and advice and will ensure that the Emergency Services are briefed with all appropriate information when attempting to take control of the situation.

9.0 EMERGENCY FUNCTIONS AND RESPONSIBILITIES

The following people will participate in emergency planning and crisis management.

Name	Role / Responsibitlies
	Responsible for updating emergency response plan
Patrick Piprell & Shannon Ryan	Site Supervisors will be the EMERGENCY MANAGER, or in his/her absence the next most senior manager on site will assume this role. Responsibilities are to ensure ERP is site specific: Lead drills twice a year
Jim O'Brien	General Manager: Overall reviewer and sign off. General Manager; Media Liaison.
Krisnar Cruz	Operations Manager: responsible to review and ensure adequate: review of drills conducted; Bulk Site Operations Advisor
Seamus Kilcommons	HSEC Manager: responsible to review and ensure adequate: review of drills conducted; Liaison with regulatory authorities

Benoit Choquette	Environment Manager; Liaison with relevant regulatory authorities
Pierre St Georges	Regulatory Compliance Manager; Liaison with all relevant regulatory authorities

Emergency response responsibilities for all personnel on site are describe as follows:

Roles	Responsibilities
Emergency Manager (EM)	This position will usually be filled by the Site Supervisor / Acting Site Supervisor and will be responsible for: • Overall responsibility for management of the emergency. • Contact with other external organizations (e.g. Police) • Contact with employees and relatives • Declaration of "All clear" to approve re-entry • Implementation of the DNA Crisis Communication Plan
Emergency Supervisor (ES)	This position will usually be filled by the one of the operators or designate and will be responsible for: • Liaison with the EM. • Arrange the removal of equipment (e.g. truck explosives). • On-site security. • Collect visitors book during evacuation (if safe to do so) • Conducting head count of all personnel on site In the event that there is only 1 person on site then that person will assume responsibilities of both the EM & ES.
Other personnel on site	This position will usually be filled by any other employee on site. • If safe to do so, personnel holding appropriate licenses will attempt to remove all explosive trucks from the vicinity of the fire and shut down all equipment. • Follow the direction by EM to control the situation (e.g. extinguish fire) if directed • Make their way to the nearest designated evacuation point. • Visitors and contractors must proceed directly to the evacuation / muster point: The scale house.

10.0 ALARM COMMUNICATION SYSTEM

- Type of warning/alarm system (including back-up): Alarms tied into AMARUQ mine site Notified system to security / ERT
- The communication system used: Two way radios and phone
- Location of Alarms: Emulsion plant and office – Internal and external alarms

- We will communicate an on-site in an emergency situation to employees by:
- Alarm System Bell. In the event of a disaster we will communicate with employees by: Two way radio
- In case of an emergency the triggered alarm communicate with the bitshop, crusher pad, magazines pads. The employees will gather at the muster point where a head count will be performed.
- In event no one is on site, the alarm system will activate by: Automatic alarm: sensored for smoke and heat??
- We will test the warning system and record results at least __1___ time per year. Results are recorded by the mine. Mine owns the Dyno Nobel building

11.0 EMERGENCY RESPONSE EQUIPMENT

The following emergency response equipment is located on site:

Location	Equipment
Emulsion plant	**Spill Kits; Fire extinguishers; First Aid Kits**
Process Vehicles	**Spill Kits; Fire extinguishers; First Aid Kits**
Pickup trucks	**Fire extinguishers; First Aid Kits**

EMERGENCY RESPONSE KITS & MATERIAL

All DNCI worksites will maintain the following emergency response equipment, that is appropriately packaged, stored and easily loaded onto a pick-up truck and / or aircraft for immediate transfer to an accident scene:

VERIFY WHAT IS READILY AVAILABLE IN SPILL KITS AS PER LIST BELOW

I - Spill Recovery Material
1000 ft. of 3 inch fluorescent yellow security tape
3 explosion-proof lanterns / flashlights
1 roll (200 ft.) of 10 mil. clear plastic for ground or product cover
3 "explosives" signs plus assorted 1.1 / 1.5 "placards and labels"
4 polyethylene / non-ferrous 45 gal. drums with removable lids
1 doz. large heavy duty garbage bags (to line drums and for trash)
3 non-ferrous shovels
1 spill kit containing 1 - 25 lb. bag of granular absorbent material
30 ft. of 5 in. sorbent booms
10 ft of 3 in. sorbent socks

1 case of sorbent pads
1 - 3 ft. x 3 ft. neoprene sheet (drain seal)
6 heavy-duty cardboard boxes for repackaging broken boxes
2 rolls of 3" duct tape
2 rolls of 3" packing tape
1 push broom
6 blank (TDG) shipping documents

II – Personal Protective Equipment
6 reflective safety vests
6 safety "goggles"
6 particulate respirators (dust masks)
1 doz. disposable ear plugs
6 pr. nitrile gloves
6 pr. cotton gloves
Industrial First Aid Kit

(Note: all DNCI Emergency Responders must wear CSA approved protective footwear and Type II (lateral protection) hard hats when on the job. As well, a camera should be readily available to photograph the scene of an accident and remedial measures for inclusion in the accident investigation report).

An inventory list of the emergency response kit/material will be kept with the cache, which must be inspected quarterly, to ensure the contents are present and in good working order (note: Emergency response kit cache may be witness/lock-wired closed, in which case only an annual verification that the contents are present and in good working order is necessary, so long as the witness/lock-wire is present and unbroken).

12.0 EMERGENCY CONTROL CENTER

The Site Manager or Supervisor will nominate the most appropriate location of the Site Emergency Control Centre when all site personnel, contractors and visitors have mustered at the designed evacuation area. The Site Emergency Control Centre will depend upon type and location of the emergency.

In the event of an emergency that requires all personnel to be evacuated from the site, the Site Emergency Control Center will be located at the main gate.

13.0 EMERGENCY INSTRUCTIONS

- Ring the alarm.
- Evacuation Procedure.
- Evacuation of people includes alarms, designation of staging areas and alternative routes/assembly points, and a system of head counts to determine if all individuals have been evacuated.

- Activating the emergency plan.
- Activating the emergency services.
- Terminating the emergency.
- Health and safety functions, such as roll call and search and rescue.
- To identify those responsible for conducting this work and detail procedure to clean and contain spills.

13.1 EXTREME TEMPERATURES

Working in cold environments can be not only hazardous to your health but also life threatening. It is critical that the body be able to preserve core body temperature steady at + 37°C (+ 98.6°F). This thermal balance must be maintained to preserve normal body functioning as well as provide energy for activity (or work!). The body's mechanisms for generating heat (its metabolism) has to meet the challenge presented by low temperature, wind and wetness - the three major challenges of cold environments.

Uncomfortably cold working conditions can lead to lower work efficiency and higher accident rates. Cold impairs the performance of complex mental tasks. Manual tasks are also impaired because the sensitivity and dexterity of fingers are reduced in the cold. At even lower temperatures, the cold affects the deeper muscles resulting in reduced muscular strength and stiffened joints. Mental alertness is reduced due to cold-related discomfort. For all these reasons accidents are more likely to occur in very cold working conditions.

Protective clothing is needed for work at or below 4°C. Clothing should be selected to suit the temperature, weather conditions (e.g., wind speed, rain), the level and duration of activity, and job design. These factors are important to consider so that you can regulate the amount of heat and perspiration you generate while working. If the work pace is too fast or if the type and amount of clothing are not properly selected, excessive sweating may occur. The clothing next to body will become wet and the insulation value of the clothing will decrease dramatically. This increases the risk for cold injuries.

13.2 INJURY/ILLNESS

Medical emergencies may arise due to serious injury caused by machinery, entrapment, heart stoke. Limited first aid is available on site and casualties would likely be transferred by ambulance to nearess Hospital for treatment. A transport vehicle is always readily available on site for transportation needs. The site is accesible to local emergency services at all time.

A means of communication is mandatory for all employees working on site at all time. For emergencies requiring immediate medical attention, quickly assess the scene then call for assistance. Qualified Site First Aiders will assess the casualty, and if required, **call 6911** or CODE 1 – CODE 1 – CODE 1 on Two Way radio

The site has several trained first aid attendants and these people will be the first to assist in an emergency.

FIRST AID ATTENDANTS	EXPIRY DATE
Chris Paul	
Patrick Piprell	
Shannon Ryan	
Aubrey Chaulk	
Billy Harrison	

*** Report incident details in SHAERS database when the Emergency is over.**

13.3 EXPLOSION / FIRE CONTROL PROCEDURE

EXPLOSION

All site personnel should be evacuated as soon as possible. In the event of an explosion the Emergency Services should be contacted immediately and the evacuated personnel assembled at the Muster area. No personnel should enter the site until at least one hour after the explosion or until the resultant fire has burnt out.

Dyno Nobel personnel should restrict access to the plant and nearby area until the Police and emergency services arrive at which time all access roads should be blocked off at a suitable distance. Emergency services should be advised not to enter the site but if they choose to do so they should be fully briefed before entering.

The Dyno Nobel Compliance Manager shall be notified of any explosion immediately so as to inform Government authorities of any incident that has occurred. There should be no attempt made at clean up or repair of the site until authorisation from the appropriate authorities has been received.

13.3 EXPLOSION / FIRE CONTROL PROCEDURE (Continued)

FIRE CONTROL PROCEDURES

Fires will vary in location and the materials involved. Each kind of fire shall have inherent risks associated with them. In general the following guidelines should be adhered to:

- Do not fight a fire that has become established which involves explosives or precursors used in the manufacture of explosives;
- Proceed with extreme caution when fighting fires involving Oxidizing agents as toxic fumes may be evolved;
- Never fight a fire unless you are comfortable to do so and have the correct equipment;
- Always leave an escape route when approaching or fighting a fire; and
- Always fight a fire from upwind.

IF YOU ARE UNABLE TO CONTAIN THE FIRE WITH A FIRE EXTINGUISHER THEN YOU MUST EVACUATE THE AREA.

13.4 SECURITY

The Site can be secured by a locked gate at the main entrance (main emergency exit and gathering point) of the site. Due to 24 hour operation the gate is not locked to allow access for DYNO personell and mine blasters. A sign in, sign out book is located at the main entrance for visitor and employee manlimits as per the site ERD Factory License. Only Dyno Employee's have keys to the locked gate.

'A' & 'B'. Sign includes ; Danger - Explosives, No Trespassing, Penalty-Section 18, Canada Explosives Act, $ 5,000.00 fine. Man Limit. No smoking. A match/lighter box. PPE requirements, and a 24 hour Emergency Contact Number.

13.5 BOMB THREAT

In the event of a "Bomb" threat the telephone operator or other person receiving the call should obtain as much information as possible. Where practicable the person receiving the call should have access to the "Bomb Threat Checklist".

Action if bomb or other explosive device is found:
If object or parcel, suspected of being a "bomb" or other type of explosive device is found by anyone, the following action should be taken:

- Do not touch, tilt or otherwise tamper with the object, whether it is a bomb, improvised explosive device (IED) or other suspect object.
- Immediately evacuate the area surrounding the object.

13.5 BOMB THREAT (Continued)

- Consider the consequential damage and effect - both on site and off site -if process equipment, storages or pipelines are involved.

Use the following guidelines:

- Evacuate the area concerned.
- The possibility of shrapnel must be considered.
- Evacuate all persons to the emergency evacuation area. Safety perimeters must be maintained until the device is rendered safe.
- Quick detailed observations should be taken of a suspected IED. Time spent near an IED must be kept to absolute minimum.

Observations should include:

- Exact location and proximity to hazards such as dangerous chemicals or substances.
- Size, shape and colour of object.
- Any writings or labels appended to the device.
- Any other peculiarities.
- Notify Police simultaneously with the commencement of evacuation.
- approach police upon their arrival to supply all details of information.
- Police will, upon their arrival, coordinate and control all necessary procedures.

13.6 CHEMICAL SPILL/RELEASE

Spills of materials on site are most likely to originate from damaged containers and drums whilst unloading raw materials. The action taken to deal with a spill is dependent on the type of material spilt and the associated hazards with that material.

Environmental considerations should be taken into account when cleaning up a spill. To ensure that the appropriate action is taken to clean up a spill the MSDS (Material Safety Data Sheet) should always be consulted before any clean up attempt is made.

Care should also be taken that the spill does not mix with other raw materials as violent reactions or the generation of toxic fumes may be possible. In the case of reactions or fume generation the emergency services should be called and the area evacuated.

The Ministry of Environment is to be notified. Contact Dyno Nobel Canada Environmental Manager.

13.7 TRESPASSING/VANDALISM

If there has been a breech of security or obvious signs of trespassers, notify the police. Do not disturb scene.

Determine if there has been any damage or theft. Follow instructions of the mine security or police. If there has been a theft of explosive materials proceed to the appropriate section of this Plan.

Take temporary actions to prevent recurrence until permanent actions can be implemented.

13.8 LOSS/THEFT OF EXPLOSIVES

LOSS

Determine the nature of the loss. **Implement** the appropriate sections of the Notification Plan. **Retrace** all routes of travel. **Verify** security and inventory level with personnel at the place of origin and destination. **If material cannot** be accounted for, the HSE Advisor and Site Manager shall notify ERD & the RCMP.

THEFT OF EXPLOSIVES

Immediately call the police. **Implement** the Emergency Notification Plan.

The Site Manager, HSE Advisor or Regional Operations Manager will call, as soon as possible and within 24 hours, the RCMP & ERD. **Determine** exactly what product, how much and code date(s) was stolen from the magazine(s). **Be careful** not to disturb the magazine or its contents so as not to destroy evidence such as fingerprints, shoe marks, etc. **Do not** handle tools or equipment that may have been used to break in. **Allow** Police personnel access but protect the scene from others that may disturb the evidence.

Do not permit news media personnel or any other non-company personnel (excluding Police) to enter the site. **Do not** make any statements to the media or non-company personnel. Refer the media to the Company Spokesperson. **The** Site Manager shall be the direct liaison between the company and the police and regulatory agencies. **Keep a log,** (documentation), of all activities regarding the break-in investigation for the company record. **The** Regional Operations Manager, HSE Advisor, and Site Manager will review all information and determine prevention measures to be taken to deter future break-ins.

13.9 PROCESS LOSS/INTERRUPTION

The possibility of a power outage on the site is very thin. The site has a generator.

13.11 TRANSPORTATION VEHICLE ACCIDENT

Ensure the accident scene is safe. Check if there are injuries. Whether the victim is conscious. Ask someone to call emergency assistance. Provide First aid and take control of the scene of an accident. Take care of the victims until help arrives.

13.12 TRANSPORTATION VEHICLE BREAKDOWN

Call **911** and contact
Regulatory Manager Pierre St-Georges at (613) 677-1051.
Environment manager Benoit Choquette at (514) 249-6285

13.13 BLAST SITE INCIDENT

If the emergency involves a blasting incident, the crew at the blast site shall follow the emergency instructions outlined in the Blasting Guidelines and Procedures. This site shall implement the appropriate sections of the Notification Plan as directed. The site shall support the blasting crew with personnel and equipment as needed.

13.14 TRANSPORTATION CHEMICAL SPILL

Initiate the ERAP by calling 1-800-367-4629 and call 911. The Emergency Response Advisor will contact the authorities.

Determine what material(s) has spilled or leaked and secure the area. Do not walk through the spilled material. **Put** on appropriate Personal Protective Equipment.

Protect the area from ignition sources. If a vehicle is involved, engage the battery disconnect switch. **Keep** unauthorized persons away.

Make every effort to confine and contain the spill, using spill kit and all available resources. **Determine** the source of the spill, and stop the leak if possible. **Make** every attempt to see that the material does not reach any waterway. **Prevent** rain or water from coming in contact with the product. Diking may be possible with gravel, soil or any ground material. **Use** what resources you have to begin cleaning up the product, outside equipment may be required. **Return** uncontaminated product to the original containers.

If the material has spilled into a waterway, an outside clean-up contractor will be called to assist with the clean-up operation. Call the main office as soon as possible. Seek corporate counsel as soon as the situation is stable.

13.15 TRANSPORTATION FIRE/EXPLOSION INCIDENT

Should there be explosive detonations, or the risk of detonations due to the presence of fire or other detonating factors, advise the First Responders (or anyone within the immediate vicinity if First Responders are not at the scene) of the risk of an explosion. Help organize perimeter guards to prevent people from entering the evacuation zone. The minimal distance to evacuate for a 20,000 kg tanker is 1.2 km or 4000 feet.

14.0 AMMONIUM NITRATE (E2 REGULATION)

14.1 Physical and chemical properties

Ammonium nitrate in solid form (prill) is of a light or off-light color and is commercially available in small beads of various sizes. It gives off a light ammonia smell. It is considered an oxidizer (risk class 5.1). Its density varies between 0.72 and 1.0 g/cc. Its solubility in water is high at 192 g/100 ml at 20°C. Its boiling point (decomposition) varies between 177 and 210 °C and its fusion point is 170°C.

Ammonium nitrate is stable in normal conditions. However, when involved in a fire, it will give off toxic compounds of nitrogen oxides and may emit ammonia vapors in the air. When confined or exposed at high temperatures, it can explode. It becomes more sensitive to explosion when contaminated by organic matters or other combustible materials.

14.2 Potential environmental impact

Ammonium nitrate is a fertilizer composed of nitrate ion (NO_3^-) and ammonium nitrogen ion (NH_4^+). Nitrate is essential to life. Most crop requires a large quantity of nitrates to support growth. In moderate quantities, nitrate is a harmless component of food and water. The nitrate ions are very soluble in water. They are easily solubilized and transported by surface and groundwater. Ammonium nitrogen is a reduced form of nitrogen which has the potential in water to release ammonia gas and be toxic to aquatic life. This ion is not very mobile in soils. This ion normally stays attached to clay or humus soil particles. Ammonium nitrogen will normally be converted in nitrates by soil bacteria in a few weeks.

A high level of nutrients (nitrates) combined with the presence of phosphorus in water support the rapid growth of algae and aquatic plants in water. It may reduce dissolved oxygen level in water. Insufficient oxygen levels may create dead zones where fish species requiring cold and well oxygenated water could no longer live in. Nitrates can therefore contribute to the eutrophication phenomena of lakes and rivers. The closest water bodies that can be impacted by a spill are located within a kilometer of the plant site and testing is completed by Meadowbank environment regularly. No potable water wells are present at the site.

14.3 What to do in case of a spill

In case of a spill, the product must be recovered rapidly to avoid exposure to water. Protect it with tarp and build berms around it if necessary to avoid exposure to surface water and rain. Avoid any contact with a flame. The product can be recovered manually using plastic shovels or brooms and put into plastic bags or containers. A HEPA filter can also be used if desired. In case of a very large spill, the product can be recovered using a mechanical shovel or loader and put in a sealed steel (20 cubic yards) bin equipped with a cover. The bin must be clean and not contaminated by any organic material.

In low concentrations in water, nitrates will be absorbed by surrounding vegetation and will support their growth. If there are water wells nearby, there is a potential to contaminate the potable water. The drinking water standards for nitrates is 10 mg/l (as N). Therefore, prevent contaminated water to enter sanitary and surface water drains. Recovered product can be re-used if clean, recycled as a fertilizer or disposed off-site as an oxidizer to an approved waste disposal company. Do not fight fires involving ammonium nitrate because of the risks of explosion.

14.4 Maximum quantity planned during the year:

10,000,000 kg.

14.5 Location of the subtance :

In seacans at plant site (EMR)

14.6 Training required for emergency responders

- First aid
- Transportation of Dangerous Goods
- WHMIS
- Emergency Response Plan (this plan)

Emergency Response equipment

- Danger tape
- Tote bags with internal plastic liner
- Plastic shovels
- Drain cover
- Brooms
- Polyethylene tarps

Note: equipment must be readily available at the Quaatuq location.

14.7 <u>Personnel Protective Equipment</u>

- Reflective vests
- Safety Glasses
- Dust masks
- Plastic gloves
- Safety boots
- First aid kit

Note: equipment must be readily available at the Quaatuq site location.

15.0 TRAFFIC CONTROL

In the event of an emergency it is essential that the traffic movements to the site be limited to essential vehicles only. The control of traffic will be achieved by posting sentries at the evacuation point. The sentry shall use the company vehicles onsite so that they can stay in contact via cell phone with the Emergency Manager or Emergency Services Coordinator.

During an emergency the only vehicles that will be allowed to enter the site will be:

- Emergency Services;
- Any equipment providers which have been requested to attend to the emergency; and
- Dyno Nobel personnel that are directly involved in the response effort.

Any other entry to site will require the permission of the Emergency Manager after consultation with the Emergency Services Coordinator.

If an employee or visitor is injured and can safely be transported to the mine without incurring additional harm to the employee/worker, or posing any additional risk to the safety of the person, Dyno vehilces can be used to transport.
Where specific stabilization of an injured person is required, or where moving an injured person may result more serious injury or life threatening concerns, the injured person is to be stabilized as per first aid training and AMARUQ emergency services dispatched to site.

In the event that there is a chance of an explosion or release of toxic fumes roadblocks should be at least **1200m** from the scene.

The Mine security or local Police are the only personnel authorised to close any public roads, as a result, the need to close the road should be established early. The road would need to be closed at a distance of no less than **1200m** from the facility in order to prevent damage to vehicles or people outside the site.

16.0 PROTECTION OF VITAL ASSETS / EMERGENCY SHUTDOWN

Under no circumstance are lives to be put at unacceptable risk in order to preserve material assets or intellectual property.

To avoid knock on effects of an emergency such as escalated destruction or business disruption, consideration should be given to preserve critical company assets by shutdown or removal of equipment such as:

- Mobile Processing Units (MPU's)
- Raw Materials/Handling equipment

Materials handling equipment and energy sources should be shutdown or isolated by activating emergency stop buttons or closing valves on the following systems:

- Electrical

Isolation are clearly identified by color coded labeling. All personnel must know location and operation of these devices.

- Switches

The decision to isolate energy sources or remove assets may be made at the time of evacuation notification or post evacuation by the Emergency Manager or Supervisor. Either way, this action must not be made if it is considered that it will not delay the evacuation process or put personnel at an unacceptable level of risk in terms personal injury or health.

Energy Source / Equipment	Type of Isolation	Location
Electrical Systems & Equipment	Switch	

17.0 SEARCH AND RESCUE

Search and rescue shall be the responsibility of emergency services only as Dyno Nobel are not equipped to carry out search and rescue operations in a safe manner.

Search and rescue operations should only be conducted if it is safe to do so and if there is no potential of an explosion occurring. Very careful consideration should be made to limiting casualties.

Before attempting search and rescue, personnel must be knowledgeable of the following:

- Site layout;
- Hazardous effects from hazardous substances;
- Fumes/poisoning;
- Explosion;
- Burns;
- Use of proper PPE;
- Breathing apparatus;
- Fire extinguishers;
- Recovery gear;
- Practiced search and rescue techniques; and
- Possible casualties.

18.0 RECOVERY PLAN

The Emergency Manager has the responsibility to declare the emergency over after consultation and agreement with Local Emergency Services:

- When the damage is localised to the extent that normal operations could resume in unaffected areas;
- Work in unaffected areas will not contaminate the emergency scene and destroy causal evidence;
- Affected areas are secure with actual or potential energy sources neutralized and controlled; and
- The all clear / re-entry approval should be communicated to all personnel in consideration of any special conditions.

19.0 CLEAN UP

Environmental aspects and impacts need to be considered when dealing with chemical waste and approval for disposal of chemicals must be obtained before disposal.

20.0 RESUMPTION OF BUSINESS

The EM will carry out the following:

- Arrange for appropriate personnel to complete a risk assessment of the area and assess the impact of the emergency; and
- Provide DNA appropriate personnel with an update as soon as practicable.

In conjunction with Dyno Nobel's VP of HSEQ and VP of Operations, the Emergency Manager shall develop an action plan to ensure that:

- The site is secure and safe for all personnel;
- Pollution due to leaking storages and firewater run-off is minimised;
- Production facilities are re-established; and
- Supply contingencies are activated.

Senior Management shall be informed of any loss and they will ensure that the underwriters are informed. It is essential that all costs of recovery and increased costs due to the incident be identified.

21.0 CRISIS COMMUNICATION PLAN

The Site Media plan is only activated if the media has arrived at your site and is asking questions.

If the media is contacting you by phone, fax or email, refer them to Diana Roising, Crisis Media Advisor in Salt Lake City, cell: 801- 321 5338 or office: 801 328 6536

IF THE MEDIA HAS ARRIVED AT YOUR SITE

The First Critical Statement may be made by a trained spokesperson (generally the Manager on Site) who has received permission from a member of the DNA Crisis Management Team. ***In most cases Media contact will be referred to the General Manager, Mike Soter, or his designate.***

If permission is granted, the Supervisor of the Site should fill in the information in the First Critical Statement template

After the statement is presented to the media on site, it is important <u>not</u> to attempt to answer additional questions. All other information will be done at the direction of the DNA Crisis Management Team, unless otherwise directed.

If additional personnel are available, have an assistant to this spokesperson remain behind to gather business cards and write down questions while the spokesperson leaves. This person must NOT answer any questions

Fax/email a copy of the Statement to DNA Crisis Management Team member and wait for further instructions

When the Media Arrives at Your Site Say <u>ONLY</u> the following:

Site Media Statement

At approximately _________ am/pm on ___________ we experienced

____

____

(Only obvious facts - No explanation - No elaboration)

This is all I can confirm at the present time. I am sure you understand that we are assessing the situation so we can provide the most accurate information.

Our company spokesperson will be in touch with you and other media representatives as soon as possible to provide more information. In the interim, we ask for your patience as we conduct our investigation.

(You are now free to turn and walk away.

(If you are asked additional questions, make the following statement:)

22.0 TRAINING

All Dyno Nobel employees will be trained to cope with an outbreak of fire in the site and MPU operation, at minimum all DNCI employees should be fully trained in the use of fire extinguishers.

All employees shall be trained in the roles they are expected to play during an emergency and/or an evacuation.

Regular evacuation and emergency drills shall be conducted in order to evaluate the effectiveness of the overall strategy and identify any deficiencies in the procedures. Emergency drills should be conducted every six months for DNCI internal drills with at least one of these involving local Emergency Service teams. Local Emergency Service providers shall be briefed on potential site emergencies by the Site Management team.

After conducting drills has a meeting shall be conducted to identify the gaps found during the emergency drill.

Training shall include:

- Fire extinguisher training;
- WHMIS;
- Transportation of Dangerous Goods,
- Emergency Response Training.

23.0 INFORMATION

Emergency procedures are posted on the Safety board. A copy of the Emergency Response Plan was provided to all employees during the Training.

Information on this Emergency Response Plan is recorded electronically on NEXUS.

APPENDIX I – BOMB THREAT

INITIAL INFORMATION:	
Date :	
Person receiving call:	
Exact time of call:	
Time of the call end:	
Exact words of caller :	

QUESTIONS TO ASK	
Where is the bomb?	
When is bomb going to explode?	
What does it look like?	
Did you place the bomb?	
Why?	
Where are you calling from?	
Are you an employee?	
Caller Gender : F / M	Age :

CALLER'S VOICE (circle)				
Calm	Fast	Distinct	Joker	Throat clearing
Angry	Soft	Lisp	Disguised	Deep breathing
Excited	Mocking	Nasal	Loud	Stuttering
Slow	Crying	Irregular	Deep	Mumble

LANGUAGE OF THE CALLER				
Articulate	Educated	Coarse	Irrational	Incoherent
Recorded	Message read by the author of the threat			

BACKGROUND NOISES					
Traffic	Telephone booth	House sound	Music	Motor	Dishes
Soft	Long Distance/Local call	Machinery	Static	None	Animal
Others :					

APPENDIX II – EMPLOYEE ACKNOWLEDGEMENT, REVIEW & TRAINING CERTIFICATION RECORD

Signature indicates that person has been given an opportunity to review and make comments regarding this safe work instruction and revisions. Signature indicates that person has received training about and understands the information contained in this document, related operating procedures, and requirements imposed by this program.

PRINT NAME	SIGNATURE	DATE

APPENDIX 4

MSDS FOR BULK EMULSION AND SENATEL

1. MSDS – Dyno Bulk Emulsion

2. MSDS – Senatel

Safety Data Sheet

SECTION 1 – IDENTIFICATION

Name, Address, and Telephone of the Responsible Party

Dyno Nobel Inc.
2795 East Cottonwood Parkway, Suite 500
Salt Lake City, Utah 84121
Phone: 801-364-4800 Fax 801-321-6703
E-Mail: dnna.hse@am.dynonobel.com www.dynonobel.com

SDS #: 1052
Date: 10/02/2018
Supersedes: 06/10/2016

Product Identifier
Product Form: Mixture
Product Name: Bulk Emulsion

Other Means of Identification
Synonyms:

DYNO GOLD®
DYNO GOLD® LITE
EXTRAMITE 1000
RUG-1 (Canada Only)
TITAN® 1000
TITAN® 1000 GREEN
TITAN® 1000G
TITAN® 1000G GREEN
TITAN® XL1000
SMS 1116, 1116A, 1126P, 1136P, 1146P
DX5037
TITAN® 2000
TITAN® 2000G
TITAN® PB 1000
TITAN® PB 2000
TITAN® PB 2000 HF
TITAN® SME 1000
TITAN® SME 1000 GREEN
TITAN® XL1000 GREEN
TITAN® HD
TITAN® SME 2000
TITAN® 5000
TITAN® 5000 G

Intended Use of the Product
Industrial blasting applications as emulsion explosive precursor

Emergency Telephone Number
FOR 24 HOUR EMERGENCY, CALL CHEMTREC (USA) 800-424-9300
CANUTEC (CANADA) 613-996-6666

SECTION 2 – HAZARD(S) IDENTIFICATION

Classification of the Substance or Mixture
Classification (GHS-US)

Ox. Liq. 2	H272
Acute Tox. 4 (Oral)	H302
Skin Irrit. 2	H315
Carc. 2	H351
STOT RE 2	H373
Asp. Tox. 1	H304
Eye Irrit. 2B	H320

Label Elements
GHS-US Labeling
Hazard Pictograms (GHS-US) :

Signal Word (GHS-US) : Danger

Hazard Statements (GHS-US) : H272 - May intensify fire; oxidizer
H302 - Harmful if swallowed
H304 – May be fatal if swallowed and enters airways
H315 - Causes skin irritation
H320 – Causes eye irritation
H351 - Suspected of causing cancer
H373 - May cause damage to organs through prolonged or repeated exposure

Precautionary Statements (GHS-US) : P201 - Obtain special instructions before use
P202 - Do not handle until all safety precautions have been read and understood
P210 - Keep away from heat, hot surfaces, open flames, sparks. - No smoking
P220 - Keep/Store away from clothing, combustible materials, combustibles
P221 - Take any precaution to avoid mixing with combustible materials, clothing, combustibles
P233 - Keep container tightly closed
P260 - Do not breathe dust, fume, mist, spray, vapors
P264 - Wash exposed areas thoroughly after handling
P270 - Do not eat, drink or smoke when using this product
P273 - Avoid release to the environment
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P301+P310 - IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician
P302+P352 - IF ON SKIN: Wash with plenty of soap and water
P305+P351+P338 - If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P308+P313 - If exposed or concerned: Get medical advice/attention
P332+P313 - If skin irritation occurs: Get medical advice/attention
P362 - Take off contaminated clothing and wash before reuse
P370+P378 - In case of fire: Use appropriate media to extinguish
P403+P235 - Store in a well-ventilated place. Keep cool
P405 - Store locked up
P501 - Dispose of contents/container according to local, regional, national, and international regulations

Other Hazards
Hazards Not Otherwise Classified (HNOC): Not available
Other Hazards: Exposure may aggravate those with pre-existing eye, skin, or respiratory conditions.

SECTION 3 - COMPOSITION/INFORMATION ON INGREDIENTS

Mixture

Name	Product identifier	% (w/w)	Ingredient Classification (GHS-US)
Ammonium nitrate	(CAS No) 6484-52-2	45 - 80	Ox. Sol. 3, H272 Eye Irrit. 2A, H319
Calcium nitrate	(CAS No) 10124-37-5	0.1 - 35	Ox. Sol. 3, H272 Acute Tox. 4 (Oral), H302 Eye Dam. 1, H318
Sodium nitrate	(CAS No) 7631-99-4	0.1 - 18	Ox. Sol. 3, H272

			Acute Tox. 4 (Oral), H302 Eye Irrit. 2A, H319
*Methylamine nitrate	(CAS No) 22113-87-7	0.1 – 3	Expl. 1.5, H205 Skin Corr. 1A, H314 Eye Dam. 1 – H318
**Fuels, diesel, no. 2	(CAS No) 68476-34-6	0.1 - 10	Flam. Liq. 4, H227 Acute Tox. 4 (Inhalation), H332 Skin Irrit. 2, H315 Carc. 2, H351 STOT RE 2, H373 Asp. Tox. 1, H304
Distillates, petroleum, chemically neutralized light naphthenic	(CAS No) 64742-35-4	0.1 - 6	Asp. Tox. 1, H304

* This ingredient is not used in most products, including in GREEN-named products.
** This ingredient is not used in GREEN-named products.
Ingredients, other than those mentioned above, as used in this product are not hazardous as defined under current Department of Labor regulations or are present in deminimus concentrations (less than 0.1% for carcinogens, less than 1.0% for other hazardous materials).
Full text of H-phrases: see section 16

SECTION 4 - FIRST AID MEASURES

Description of First Aid Measures

General: Never give anything orally to an unconscious person. If you feel unwell, seek medical advice (provide this Safety Data Sheet to medical personnel).

Inhalation: If symptoms occur, go into fresh air and ventilate suspected area. Seek medical attention.

Skin Contact: Remove contaminated clothing. Wash with soap and water followed by rinsing with water. Seek medical attention if irritation develops or persists. Wash contaminated clothing before reuse.

Eye Contact: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing for at least 15 minutes. Obtain medical attention if irritation develops or persists.

Ingestion: Rinse mouth. Do NOT induce vomiting. Seek medical attention immediately.

Most Important Symptoms and Effects Both Acute and Delayed

General: May be harmful if swallowed. May cause eye or skin irritation.

Inhalation: May cause respiratory irritation.

Skin Contact: May cause skin irritation.

Eye Contact: May cause eye irritation.

Ingestion: Likely to be harmful if swallowed.

Chronic Symptoms: Contains an ingredient which may cause cancer. Causes damage to organs through prolonged or repeated exposure.

Indication of Any Immediate Medical Attention and Special Treatment Needed

If symptoms occur, seek medical attention.

SECTION 5 - FIRE-FIGHTING MEASURES

Extinguishing Media

Suitable Extinguishing Media: Do not attempt to fight fires involving explosive materials or emulsion explosive precursors. Evacuate all personnel to a predetermined safe location, no less than 1/2 mile (800 meters) in all directions.

Unusual Fire and Explosion Hazards: May explode or detonate under fire conditions. Burning material may produce toxic vapors.

Unsuitable Extinguishing Media: Not available

Special Hazards Arising from the Substance or Mixture

In large, intense fires the emulsion can behave more like an explosive and detonate from confinement or strong shocks. Evacuation of at least 1 mile is recommended if a largeamount of emulsion is involved in a large fire.

Fire Hazard: May intensify fire; oxidizer. Will burn if exposed to heat, and in addition, will accelerate the burning of other combustibles, resulting in more rapid spread of fire.
Explosion Hazard: Heat may build pressure, rupturing closed containers, spreading fire and increasing risk of burns and injuries. May explode when subjected to fire, supersonic shock or high-energy projectile impact, especially when confined or in large quantities.
Reactivity: May cause or intensify fire; oxidizer. May accelerate the burning of other combustible materials.
Advice for Firefighters
Precautionary Measures Fire: DO NOT ATTEMPT TO FIGHT FIRES INVOLVING EXPLOSIVE MATERIALS. Evacuate all personnel to a predetermined safe location, no less than 1/2 mile (800 meters) in all directions. Can explode or detonate under fire conditions. Burning material may produce toxic vapors.

Firefighting Instructions: DO NOT ATTEMPT TO FIGHT FIRE. Immediately evacuate all personnel from the area to a safe distance. Guard against re-entry. Thermal decomposition can lead to release of irritating gases and vapors.
Protection During Firefighting: When controlling fire before involvement of explosives or explosive precursors, fire-fighters should wear positive pressure self-containing breathing apparatus (SCBA) and full turnout gear.
Hazardous Combustion Products: Nitrogen oxides. Carbon oxides (CO, CO_2). Ammonia.
Other information: Do not attempt to fight fires involving explosive materials or emulsion explosive precursors. Evacuate all personnel to a predetermined safe location, no less than 1/2 mile (800 meters) in all directions.
Reference to Other Sections: Refer to section 9 for flammability properties.

SECTION 6 - ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment and Emergency Procedures
General Measures: Avoid all contact with skin, eyes, or clothing. Avoid breathing dust, mist, or spray. Keep away from heat/sparks/open flames/hot surfaces. No smoking. Eliminate every possible source of ignition. Evacuate danger area.
For Non-Emergency Personnel
Protective Equipment: Use appropriate personal protection equipment (PPE).
Emergency Procedures: Evacuate unnecessary personnel.
For Emergency Personnel
Protective Equipment: Use appropriate personal protection equipment (PPE).
Emergency Procedures: Ventilate area.

Environmental Precautions
Prevent entry to sewers and public waters.

Methods and Material for Containment and Cleaning Up
For Containment: Contain any spills with dikes as necessary to prevent migration and entry into sewers or streams. Do not take up in combustible material such as: saw dust or cellulosic material.
Methods for Cleaning Up: Collect spillage for possible reuse. Clean up spills immediately and dispose of waste in accordance with appropriate state, federal and local regulations.
Reference to Other Sections
See heading 8, Exposure Controls and Personal Protection

SECTION 7 - HANDLING AND STORAGE

Precautions for Safe Handling
It is recommended that users of explosives material be familiar with the Institute of Makers of Explosives Safety Library publications.
Additional Hazards When Processed: When heated to decomposition, emits toxic fumes. Do not puncture or incinerate containers.
Hygiene Measures: Handle in accordance with good industrial hygiene and safety procedures. Wash hands and other exposed areas with mild soap and water before eating, drinking, or smoking and again when leaving work.
Conditions for Safe Storage, Including Any Incompatibilities

Storage Conditions: Store in a dry, cool and well-ventilated place. Keep container closed when not in use. Keep /store away from combustible materials, extremely high or low temperatures, direct sunlight, ignition sources, incompatible materials.
Incompatible Materials: Corrosives, strong acids, strong bases and alkalis.

SECTION 8 - EXPOSURE CONTROLS/PERSONAL PROTECTION

Control Parameters

Occupational Exposure Limits

Ingredients:	Product identifier:	ACGIH TLV-TWA	OSHA PEL-TWA
Ammonium nitrate	(CAS No) 6484-52-2	None	None
Sodium nitrate	(CAS No) 7631-99-4	None	None
Calcium nitrate	(CAS No) 10124-37-5	None	None
Methylamine nitrate	(CAS No) 22113-87-7	None	None
Fuels, diesel, no. 2	(CAS No) 68476-34-6	100 ppm	None
Distillates, petroleum, chemically neutralized light naphthenic	(CAS No) 64742-35-4	5 mg/m^3 (mist)	None

Exposure Controls
Under normal conditions of use, over-exposure is not expected to occur.
Appropriate Engineering Controls: Ensure all national/local regulations are observed. Ensure adequate ventilation, especially in confined areas. Keep containers tightly sealed.
Personal Protective Equipment: Protective goggles. Gloves. Protective clothing.

Materials for Protective Clothing: Chemically resistant materials and fabrics.
Hand Protection: Wear chemically resistant protective gloves.
Eye Protection: Chemical goggles or face shield.
Skin and Body Protection: Not available.
Respiratory Protection: Use NIOSH-approved air-purifying or supplied-air respirator where airborne concentrations of vapor or mist are expected to exceed exposure limits. Under normal conditions of use and handling there is minimal likelihood for the this exposure limit to be reached.
Other Information: When using or handling, do not eat, drink or smoke.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

Information on Basic Physical and Chemical Properties

Physical State	:	Liquid
Appearance	:	Translucent to opaque viscous liquid.
Odor	:	Fuel
Odor Threshold	:	Not available
pH	:	Not available
Relative Evaporation Rate (butylacetate=1)	:	< 1
Melting Point	:	Not available
Freezing Point	:	Not available
Boiling Point	:	Not available
Flash Point	:	Not available
Auto-ignition Temperature	:	Not available

Decomposition Temperature	:	Not available
Flammability (solid, gas)	:	Not available
Lower Flammable Limit	:	Not available
Upper Flammable Limit	:	Not available
Vapor Pressure	:	Not available
Relative Vapor Density at 20 °C	:	Not available
Relative Density	:	Not available
Specific Gravity	:	0.8 - 1.5 g/cc
Solubility	:	Water: Nitrate salts are completely soluble, but emulsion dissolution is very slow.
Partition coefficient: n-octanol/water	:	Not available
Viscosity	:	Not available
Explosion Data – Sensitivity to Mechanical Impact	:	Not sensitive to mechanical impact. May be sensitive to supersonic explosively driven projectile impacts.
Explosion Data – Sensitivity to Static Discharge	:	Not sensitive to static discharge.

SECTION 10 - STABILITY AND REACTIVITY

Reactivity: May cause or intensify fire. May accelerate the burning of other combustible materials.

Chemical Stability: May intensify fire. May explode when subjected to fire, supersonic shock or high-energy projectile impact, especially when confined or in large quantities.

Possibility of Hazardous Reactions: Hazardous polymerization will not occur.

Conditions to Avoid: Direct sunlight. Extremely high temperatures. Heat. Sparks. Overheating. Open flame. Combustible materials. Sources of ignition. Incompatible materials.

Incompatible Materials: Corrosives, strong acids, strong bases and alkalis.

Hazardous Decomposition Products: Does not decompose when used and stored as recommended. Thermal decomposition or combustion products may include the following substances: Nitrogen oxides. Toxic vapors. Ammonia. Carbon monoxide.

SECTION 11 - TOXICOLOGICAL INFORMATION

Under normal conditions of use, over-exposure is not expected to occur. Minor skin exposure is most likely.

Information on Toxicological Effects - Product

Acute Toxicity: Harmful if swallowed.

LD50 and LC50 Data: ATE Oral 1,510 (mg/kg)

Skin Corrosion/Irritation: Causes skin irritation.

Serious Eye Damage/Irritation: May cause eye irritation

Respiratory or Skin Sensitization: Not classified

Germ Cell Mutagenicity: Not classified

Teratogenicity: Not available

Carcinogenicity: Contains a substance which has been shown to cause cancer in laboratory animals. IARC Group 2A Probably carcinogenic to humans.

Specific Target Organ Toxicity (Repeated Exposure): May cause damage to organs through prolonged or repeated exposure.

Reproductive Toxicity: Not classified
Specific Target Organ Toxicity (Single Exposure): Not classified
Aspiration Hazard: May be fatal if swallowed and enters airways.
Symptoms/Injuries After Inhalation: May cause respiratory irritation.
Symptoms/Injuries After Skin Contact: May cause skin irritation.
Symptoms/Injuries After Eye Contact: May cause eye irritation.
Symptoms/Injuries After Ingestion: May be harmful if swallowed. May be harmful if swallowed and enters airways. Aspiration into the lungs can occur during ingestion or vomiting and may cause lung injury.
Chronic Symptoms: May cause cancer. May cause damage to organs through prolonged or repeated exposure.

Information on Toxicological Effects - Ingredient(s)

LD50 and LC50 Data:

Ammonium nitrate (6484-52-2)	
LD50 Oral Rat	2217 mg/kg (REACH dossier 2950 mg/kg)
LC50 Inhalation Rat	> 88.8 mg/l/4h
ATE CLP (oral)	2217.000 mg/kg body weight

Sodium nitrate (7631-99-4)	
LD50 Oral Rat	1267 mg/kg (REACH dossier 3430 mg/kg)
ATE CLP (oral)	1267.000 mg/kg body weight

Fuels, diesel, no. 2 (68476-34-6)	
ATE CLP (vapors)	11.000 mg/l/4h

Distillates, petroleum, chemically neutralized light naphthenic (64742-35-4)	
LD50 Oral Rat	> 5000 mg/kg
LD50 Dermal Rabbit	> 2000 mg/kg

SECTION 12: ECOLOGICAL INFORMATION

Toxicity Harmful to aquatic life with long lasting effects.

Ammonium nitrate (6484-52-2)	
LC50 Fish 1	95-102 mg/l (Exposure time: 48 h - Cyprinus carpio (Common carp))
EC 50 Aquatic Invertebrates	490 mg/l (Exposure time 48 h - Daphnia magna)

Sodium nitrate (7631-99-4)	
LC50 Fish 1	2000 mg/l (Exposure time: 96 h - Species: Lepomis macrochirus [static])
LC 50 Fish 2	994.4 - 1107 mg/l (Exposure time: 96 h - Species: Oncorhynchus mykiss [static])

Fuels, diesel, no. 2 (68476-34-6)	
LC50 Fish 1	35 mg/l (Exposure time: 96 h - Species: Pimephales promelas [flow-through])

Calcium nitrate (10124-37-5)	
LC50 Fish 1	10000 mg/l (Exposure time: 96 h - Species: Lepomis macrochirus [static])

Persistence and Degradability

Bulk Emulsion	
Persistence and Degradability	Not established.

Sodium nitrate (7631-99-4)	
Persistence and Degradability	**Readily biodegradable in water.**

Bioaccumulative Potential	
Bulk Emulsion	
Bioaccumulative Potential	Not established.
Ammonium nitrate (6484-52-2)	
BCF fish 1	(no bioaccumulation expected)
Log Pow	-3.1 (at 25 °C)
Sodium nitrate (7631-99-4)	
Log Pow	-3.8 (at 25 °C)
Bioaccumulative Potential	Not expected to bioaccumulate.

Mobility in Soil Not available

Other Adverse Effects

Other Information: Avoid release to the environment.

SECTION 13 – DISPOSAL CONSIDERATIONS

Waste Treatment Methods: Contact manufacturer for advice on proper disposal methods.

Waste Disposal Recommendations: Collect spillage for possible reuse. Dispose of waste material in accordance with all local, regional, national, provincial, territorial and international regulations.

Additional Information: Clean up even minor leaks or spills if possible without unnecessary risk.

SECTION 14 - TRANSPORT INFORMATION

14.1 In Accordance with DOT

Proper Shipping Name : AMMONIUM NITRATE EMULSION
Hazard Class : 5.1
Identification Number : UN3375
Label Codes : 5.1

Packing Group : II
ERG Number : 140

14.2 In Accordance with IMDG

Proper Shipping Name : AMMONIUM NITRATE EMULSION
Hazard Class : 5.1
Identification Number : UN3375
Packing Group : II
Label Codes : 5.1
EmS-No. (Fire) : F-H
EmS-No. (Spillage) : S-Q

14.3 In Accordance with IATA

Proper Shipping Name : AMMONIUM NITRATE EMULSION
Identification Number : UN3375
Hazard Class : 5
Label Codes : 5.1

ERG Code (IATA) : 5L

14.4 In Accordance with TDG

No UN number exists for blasting intermediates for Transport Canada (use the following for Canadian shipments)

Proper Shipping Name : EXPLOSIVE, BLASTING, TYPE E
Packing Group : II
Hazard Class : 1.5D
Identification Number : UN0332

Safety Data Sheet

Label Codes	: 1.5D

SECTION 15 - REGULATORY INFORMATION

US Federal Regulations

Bulk Emulsion	
SARA Section 311/312 Hazard Classes	Immediate (acute) health hazard Reactive hazard Delayed (chronic) health hazard Fire hazard

Ammonium nitrate (6484-52-2)
Listed on the United States TSCA (Toxic Substances Control Act) inventory

Sodium nitrate (7631-99-4)
Listed on the United States TSCA (Toxic Substances Control Act) inventory

Fuels, diesel, no. 2 (68476-34-6)
Listed on the United States TSCA (Toxic Substances Control Act) inventory

Calcium nitrate (10124-37-5)
Listed on the United States TSCA (Toxic Substances Control Act) inventory

Distillates, petroleum, chemically neutralized light naphthenic (64742-35-4)
Listed on the United States TSCA (Toxic Substances Control Act) inventory

US State Regulations

Ammonium nitrate (6484-52-2)
U.S. – California – Air Toxics "Hot Spots" (A-I) U.S. - Massachusetts - Right To Know List U.S. - New Jersey - Right to Know Hazardous Substance List U.S. - Pennsylvania - RTK (Right to Know) - Environmental Hazard List U.S. - Pennsylvania - RTK (Right to Know) List U.S. – Rhode Island – RTK (Right to Know) List

Sodium nitrate (7631-99-4)
U.S. - Massachusetts - Right To Know List U.S. - Pennsylvania - RTK (Right to Know) List U.S. – Rhode Island – RTK (Right to Know) List

Fuels, diesel, no. 2 (68476-34-6)
U.S. - New Jersey - Right to Know Hazardous Substance List

Calcium nitrate (10124-37-5)
U.S. - New Jersey - Right to Know Hazardous Substance List

Canadian Regulations

Bulk Emulsion	
WHMIS Classification	**Note: Explosives are not regulated under WHMIS. They are subject to the regulations of the Explosives Act of Canada.**

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the SDS contains all of the information required by CPR.

SECTION 16: OTHER INFORMATION, INCLUDING DATE OF PREPARATION OR LAST REVISION

Revision date	: 10/02/2018
Other Information	: This document has been prepared in accordance with the SDS requirements of the OSHA Hazard Communication Standard 29 CFR 1910.1200.

GHS Full Text Phrases:

Acute Tox. 4 (Inhalation)	Acute toxicity (inhalation) Category 4
Acute Tox. 4 (Oral)	Acute toxicity (oral) Category 4
Asp. Tox. 1	Aspiration hazard Category 1
Carc. 2	Carcinogenicity Category 2
Eye Dam. 1	Serious eye damage/eye irritation Category 1
Eye Irrit. 2A	Serious eye damage/eye irritation Category 2A
Flam. Liq. 3	Flammable liquids Category 3
Ox. Liq. 2	Oxidizing liquids Category 2
Ox. Sol. 3	Oxidizing solids Category 3
Skin Irrit. 2	Skin corrosion/irritation Category 2
STOT RE 2	Specific target organ toxicity (repeated exposure) Category 2
H205	May mass explode in fire
H227	Combustible liquid
H272	May intensify fire; oxidizer
H302	Harmful if swallowed
H304	May be fatal if swallowed and enters airways
H314	Causes severe skin burns and eye damage
H315	Causes skin irritation
H318	Causes serious eye damage
H319	Causes serious eye irritation
H332	Harmful if inhaled
H351	Suspected of causing cancer
H373	May cause damage to organs through prolonged or repeated exposure
H373	May cause damage to organs (Thymus, Liver, bone marrow) through prolonged or repeated exposure

Party Responsible for the Preparation of This Document

Dyno Nobel Inc.
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Salt Lake City, Utah 84121
Phone: 801-364-4800

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Dyno Nobel SDS

Safety Data Sheet

SECTION 1 – IDENTIFICATION

Name, Address, and Telephone of the Responsible Party

Dyno Nobel Inc.
6440 S. Millrock Drive, Suite 150
Salt Lake City, Utah 84121
Phone: 801-364-4800 Fax 801-321-6703
E-Mail: dnna.hse@am.dynonobel.com www.dynonobel.com

SDS #: 1062
Date: 07/20/2020
Supersedes: 11/01/2018

Product Identifier
Product Form: Mixture
Product Name: Bulk Emulsion Explosive

Other Means of Identification
Synonyms:

DYNO® RU	TITAN® 2000 LD
DYNO® RU Alaska	TITAN® 2000 SD
DYNO® RU SX	TITAN® PB 2000 LD
DYNO® RU Uphole	TITAN® PB 2000 SD
EXTRAMITE 2000	TITAN® 7000 RU
FRAGMITE	TITAN® 7000 RU-A
TITAN® 1000 LD-E2	TITAN® 7000 RU-SX
TITAN® 1000 LD	TITAN® 5000 LD
TITAN® 1000 LD GREEN	TITAN® 7000
TITAN® 1000 SD	TITAN® 7000 A
TITAN® 1000 SD GREEN	TITAN® 7000 SX
TITAN® PB 1000 LD	DX5103
TITAN® PB 1000 SD	DX5108

Intended Use of the Product
Industrial applications

Emergency Telephone Number
FOR 24 HOUR EMERGENCY, CALL CHEMTREC (USA) 800-424-9300
CANUTEC (CANADA) 613-996-6666

SECTION 2 – HAZARD(S) IDENTIFICATION

Classification of the Substance or Mixture
Classification (GHS-US)

Expl. 1.5	H205
Acute Tox. 4 (Oral)	H302
Skin Irrit. 2	H315
Eye Irrit. 2B	H320
Carc. 2	H351
STOT RE 2	H373
Asp. Tox. 1	H304

Label Elements
GHS-US Labeling
Hazard Pictograms (GHS-US) :

GHS07 GHS08

Signal Word (GHS-US) : Danger
Hazard Statements (GHS-US) : H205 - May mass explode in fire
H302 - Harmful if swallowed

H304 - May be fatal if swallowed and enters airways
H315 - Causes skin irritation
H320 - Causes eye irritation
H351 - Suspected of causing cancer
H373 - May cause damage to organs through prolonged or repeated exposure

Precautionary Statements (GHS-US) : P201 - Obtain special instructions before use
P202 - Do not handle until all safety precautions have been read and understood
P210 - Keep away from heat, hot surfaces, open flames, sparks. - No smoking
P220 - Keep/Store away from clothing, combustible materials, combustibles
P221 - Take any precaution to avoid mixing with combustible materials, clothing, combustibles
P233 - Keep container tightly closed
P260 - Do not breathe dust, fume, mist, spray, vapors
P264 - Wash exposed areas thoroughly after handling
P270 - Do not eat, drink or smoke when using this product
P273 - Avoid release to the environment
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P301+P310 - IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician
P302+P352 - IF ON SKIN: Wash with plenty of soap and water
P305+P351+P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P370+P380 - In case of fire: Evacuate area
P372 - Explosion risk in case of fire
P373 - DO NOT fight fire when fire reaches explosives
P401 - Store local, regional, national, and international regulations
P403+P235 - Store in a well-ventilated place. Keep cool
P405 - Store locked up
P501 - Dispose of contents/container according to local, regional, national, and international regulations

Other Hazards
Hazards Not Otherwise Classified (HNOC): Not available
Other Hazards: Exposure may aggravate those with pre-existing eye, skin, or respiratory conditions.

SECTION 3 - COMPOSITION/INFORMATION ON INGREDIENTS

Mixture

Name	Product identifier	% (w/w)	Ingredient Classification (GHS-US)
Ammonium nitrate	(CAS No) 6484-52-2	30 - 80	Ox. Sol. 3, H272 Eye Irrit. 2A, H319
Calcium nitrate	(CAS No) 10124-37-5	0.1 - 35	Ox. Sol. 3, H272 Acute Tox. 4 (Oral), H302 Eye Dam. 1, H318
Sodium nitrate	(CAS No) 7631-99-4	0.1 - 18	Ox. Sol. 3, H272 Acute Tox. 4 (Oral), H302 Eye Irrit. 2A, H319
*Fuels, diesel, no. 2	(CAS No) 68476-34-6	0.1 - 8	Flam. Liq. 3, H226 Acute Tox. 4 (Inhalation), H332

			Skin Irrit. 2, H315 Carc. 2, H351 STOT RE 2, H373 Asp. Tox. 1, H304
Distillates, petroleum, chemically neutralized light naphthenic	(CAS No) 64742-35-4	0.1 - 6	Asp. Tox. 1, H304

* This ingredient is not used in GREEN-named products.
Ingredients, other than those mentioned above, as used in this product are not hazardous as defined under current Department of Labor regulations, or are present in deminimus concentrations (less than 0.1% for carcinogens, less than 1.0% for other hazardous materials).

Full text of H-phrases: see section 16

SECTION 4 - FIRST AID MEASURES

Description of First Aid Measures

General: Never give anything by mouth to an unconscious person. If you feel unwell, seek medical advice (show the label where possible).

Inhalation: If symptoms occur, go into fresh air and ventilate suspected area. Seek medical attention.

Skin Contact: Remove contaminated clothing. Wash with soap and water followed by rinsing with water. Seek medical attention if irritation develops or persists. Wash contaminated clothing before reuse.

Eye Contact: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Obtain medical attention if irritation develops or persists.

Ingestion: Rinse mouth. Do NOT induce vomiting. Seek medical attention immediately.

Most Important Symptoms and Effects Both Acute and Delayed

General: May be harmful if swallowed. Causes serious eye damage. Skin irritation.

Inhalation: May cause respiratory irritation.

Skin Contact: May cause skin irritation.

Eye Contact: Causes eye irritation.

Ingestion: May be harmful if swallowed. May be harmful if swallowed and enters airways.

Chronic Symptoms: Contains an ingredient that may cause cancer. Causes damage to organs through prolonged or repeated exposure.

Indication of Any Immediate Medical Attention and Special Treatment Needed

If symptoms occur, seek medical attention.

SECTION 5 - FIRE-FIGHTING MEASURES

Extinguishing Media

Suitable Extinguishing Media: DO NOT FIGHT FIRES INVOLVING EXPLOSIVES.

Unsuitable Extinguishing Media: Not available

Special Hazards Arising from the Substance or Mixture

Fire Hazard: In case of fire involving explosives: Evacuate area. DO NOT fight fires involving explosives. Consult the most current Emergency Response Guidebook (ERG), Guide 112 for additional information. Extreme risk of explosion from shock, friction, fire or other sources of ignition.

Explosion Hazard: Extreme risk of explosion by shock, friction, fire, impact, heat or other sources of ignition.

Reactivity: Accelerates the rate of burning materials.

Advice for Firefighters

Precautionary Measures Fire: DO NOT ATTEMPT TO FIGHT FIRES INVOLVING EXPLOSIVE MATERIALS. Evacuate all personnel to a predetermined safe location, no less than 2,500 feet in all directions. Can explode or detonate under fire conditions. Burning material may produce toxic vapors. It is recommended that users of explosives material be familiar with the Institute of Makers of Explosives Safety Library publications.

Hazardous Combustion Products: Nitrogen oxides. Carbon oxides (CO, CO_2). Ammonia.

Other information: Do not attempt to fight fires involving explosive materials. Evacuate all personnel to a predetermined safe location, no less than 2,500 feet in all directions.

Reference to Other Sections: Refer to section 9 for flammability properties.

SECTION 6 - ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment and Emergency Procedures
General Measures: Evacuate all non-essential personnel from immediate area and establish a "regulated zone" with site control and security.
For Non-Emergency Personnel
Protective Equipment: Use appropriate personal protection equipment (PPE).
Emergency Procedures: Evacuate unnecessary personnel.
For Emergency Personnel
Protective Equipment: Use appropriate personal protection equipment (PPE).
Emergency Procedures: Ventilate area.

Environmental Precautions
Prevent entry to sewers and public waters.

Methods and Material for Containment and Cleaning Up
For Containment: Contain any spills with dikes as necessary to prevent migration and entry into sewers or streams. Do not take up in combustible material such as: saw dust or cellulosic material.
Methods for Cleaning Up: Collect spillage for possible reuse. Clean up spills immediately and dispose of waste in accordance with appropriate State, Federal and local regulations.
Reference to Other Sections
See heading 8, Exposure Controls and Personal Protection

SECTION 7 - HANDLING AND STORAGE

Precautions for Safe Handling: It is recommended that users of explosives material be familiar with the Institute of Makers of Explosives Safety Library publications.
Additional Hazards When Processed: When heated to decomposition, emits toxic fumes. Do not puncture or incinerate container.
Hygiene Measures: Handle in accordance with good industrial hygiene and safety procedures. Wash hands and other exposed areas with mild soap and water before eating, drinking, or smoking and again when leaving work.
Conditions for Safe Storage, Including Any Incompatibilities
Storage Conditions: Store in a dry, cool and well-ventilated place. Keep container closed when not in use. Keep/Store away from combustible materials, extremely high temperatures, direct sunlight, ignition sources, incompatible materials.
Incompatible Materials: Corrosives, strong acids, strong bases and alkalis.

SECTION 8 - EXPOSURE CONTROLS/PERSONAL PROTECTION

Control Parameters

Fuels, diesel, no. 2 (68476-34-6)		
USA ACGIH	ACGIH TWA (mg/m³)	100 mg/m³
Alberta	OEL TWA (mg/m³)	100 mg/m³
British Columbia	OEL TWA (mg/m³)	100 mg/m³
Manitoba	OEL TWA (mg/m³)	100 mg/m³
Newfoundland & Labrador	OEL TWA (mg/m³)	100 mg/m³
Nova Scotia	OEL TWA (mg/m³)	100 mg/m³
Ontario	OEL TWA (mg/m³)	100 mg/m³
Prince Edward Island	OEL TWA (mg/m³)	100 mg/m³
Saskatchewan	OEL STEL (mg/m³)	150 mg/m³
Saskatchewan	OEL TWA (mg/m³)	100 mg/m³

Exposure Controls
Appropriate Engineering Controls: Ensure all national/local regulations are observed. Ensure adequate ventilation,

especially in confined areas.

Personal Protective Equipment: Protective goggles. Gloves. Insufficient ventilation: wear respiratory protection. Protective clothing.

Materials for Protective Clothing: Chemically resistant materials and fabrics.

Hand Protection: Wear chemically resistant protective gloves.

Eye Protection: Chemical goggles or face shield.

Skin and Body Protection: Not available

Respiratory Protection: Use NIOSH-approved air-purifying or supplied-air respirator where airborne concentrations of vapor or mist are expected to exceed exposure limits.

Other Information: When using, do not eat, drink or smoke.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

Information on Basic Physical and Chemical Properties

Physical State	: Liquid
Appearance	: White, yellow or pink opaque viscous liquid.
Odor	: Slight fuel oil odor.
Odor Threshold	: Not available
pH	: Not available
Relative Evaporation Rate (butylacetate=1)	: < 1
Melting Point	: Not available
Freezing Point	: Not available
Boiling Point	: Not available
Flash Point	: Not available
Auto-ignition Temperature	: Not available
Decomposition Temperature	: Not available
Flammability (solid, gas)	: Not available
Lower Flammable Limit	: Not available
Upper Flammable Limit	: Not available
Vapor Pressure	: Not available
Relative Vapor Density at 20 °C	: Not available
Relative Density	: Not available
Specific Gravity	: 1.00 - 1.45 g/cc
Solubility	: Water: Nitrate salts are completely soluble, but emulsion dissolution is very slow.
Partition coefficient: n-octanol/water	: Not available
Viscosity	: Not available
Explosion Data – Sensitivity to Mechanical Impact	: Not sensitive to mechanical impact. May be sensitive to supersonic explosively driven projectile impacts.
Explosion Data – Sensitivity to Static Discharge	: Not sensitive to static discharge.

SECTION 10 - STABILITY AND REACTIVITY

Reactivity: Accelerates the rate of burning materials. Oxidizer. May react violently with strong acids, strong oxidizing and reducing agents.
Chemical Stability: May intensify fire; oxidizer. May explode when subjected to fire, supersonic shock or high-energy projectile impact, especially when confined or in large quantities.
Possibility of Hazardous Reactions: Hazardous polymerization will not occur.
Conditions to Avoid: Direct sunlight. Extremely high temperatures. Heat. Sparks. Overheating. Open flame. Combustible materials. Sources of ignition. Incompatible materials.
Incompatible Materials: Corrosives, strong acids, strong bases and alkalis.
Hazardous Decomposition Products: Nitrogen oxides. Toxic vapors. Ammonia. Carbon monoxide.

SECTION 11 - TOXICOLOGICAL INFORMATION

Information on Toxicological Effects - Product
Acute Toxicity: Harmful if swallowed.
LD50 and LC50 Data: Not available
Skin Corrosion/Irritation: Not classified
Serious Eye Damage/Irritation: Causes serious eye irritation.
Respiratory or Skin Sensitization: Not classified
Germ Cell Mutagenicity: Not classified
Teratogenicity: Not available
Carcinogenicity: Contains an ingredient suspected of causing cancer.
Specific Target Organ Toxicity (Repeated Exposure): May cause damage to organs through prolonged or repeated exposure.
Reproductive Toxicity: Not classified
Specific Target Organ Toxicity (Single Exposure): Not classified
Aspiration Hazard: May be fatal if swallowed and enters airways.
Symptoms/Injuries After Inhalation: May cause respiratory irritation.
Symptoms/Injuries After Skin Contact: May cause skin irritation.
Symptoms/Injuries After Eye Contact: Causes eye irritation.
Symptoms/Injuries After Ingestion: May be harmful if swallowed. May be harmful if swallowed and enters airways. Aspiration into the lungs can occur during ingestion or vomiting and may cause lung injury.
Chronic Symptoms: Contains an ingredient that may cause cancer. Causes damage to organs through prolonged or repeated exposure.
Information on Toxicological Effects - Ingredient(s)
LD50 and LC50 Data:

Ammonium nitrate (6484-52-2)	
LD50 Oral Rat	2217 mg/kg
LC50 Inhalation Rat	> 88.8 mg/l/4h
ATE CLP (oral)	2217.000 mg/kg body weight
Sodium nitrate (7631-99-4)	
LD50 Oral Rat	1267 mg/kg
ATE CLP (oral)	1267.000 mg/kg body weight
Fuels, diesel, no. 2 (68476-34-6)	
ATE CLP (vapors)	11.000 mg/l/4h
Distillates, petroleum, chemically neutralized light naphthenic (64742-35-4)	
LD50 Oral Rat	> 5000 mg/kg
LD50 Dermal Rabbit	> 2000 mg/kg

SECTION 12: ECOLOGICAL INFORMATION

Toxicity Not classified

Sodium nitrate (7631-99-4)	
LC50 Fish 1	2000 mg/l (Exposure time: 96 h - Species: Lepomis macrochirus [static])
LC 50 Fish 2	994.4 - 1107 mg/l (Exposure time: 96 h - Species: Oncorhynchus mykiss [static])

Calcium nitrate (10124-37-5)	
LC50 Fish 1	10000 mg/l (Exposure time: 96 h - Species: Lepomis macrochirus [static])

Fuels, diesel, no. 2 (68476-34-6)	
LC50 Fish 1	35 mg/l (Exposure time: 96 h - Species: Pimephales promelas [flow-through])

Persistence and Degradability

Bulk Emulsion	
Persistence and Degradability	Not established.

Sodium nitrate (7631-99-4)	
Persistence and Degradability	**Readily biodegradable in water.**

Bioaccumulative Potential

Bulk Emulsion	
Bioaccumulative Potential	Not established.

Ammonium nitrate (6484-52-2)	
BCF fish 1	(no bioaccumulation expected)
Log Pow	-3.1 (at 25 °C)

Sodium nitrate (7631-99-4)	
Log Pow	-3.8 (at 25 °C)
Bioaccumulative Potential	Not expected to bioaccumulate.

Mobility in Soil Not available

Other Adverse Effects

Other Information: Avoid release to the environment.

SECTION 13 – DISPOSAL CONSIDERATIONS

Waste Treatment Methods: Contact manufacturer for advice on proper disposal methods.
Waste Disposal Recommendations: Collect spillage for possible reuse. Dispose of waste material in accordance with all local, regional, national, provincial, territorial and international regulations.
Additional Information: Clean up even minor leaks or spills if possible without unnecessary risk.

SECTION 14 - TRANSPORT INFORMATION

14.1 In Accordance with DOT

Proper Shipping Name : EXPLOSIVE, BLASTING, TYPE Eor Agent blasting, Type E
Hazard Class : 1.5D
Identification Number : UN0332
Label Codes : 1.5D

Packing Group : II
ERG Number : 140

14.2 In Accordance with IMDG

Proper Shipping Name : EXPLOSIVE, BLASTING, TYPE E (AGENT, BLASTING, TYPE E)
Hazard Class : 1.5D
Identification Number : UN0332
Label Codes : 1.5D
EmS-No. (Fire) : F-B
EmS-No. (Spillage) : S-Y

Safety Data Sheet

14.3 In Accordance with IATA

Proper Shipping Name	:	AGENT, BLASTING TYPE E
Identification Number	:	UN0332
Hazard Class	:	1
Label Codes	:	1.5D
ERG Code (IATA)	:	1L

14.4 In Accordance with TDG

Proper Shipping Name	:	EXPLOSIVE, BLASTING, TYPE E
Packing Group	:	II
Hazard Class	:	1.5D
Identification Number	:	UN0332
Label Codes	:	1.5D

SECTION 15 - REGULATORY INFORMATION

US Federal Regulations

Bulk Emulsion

SARA Section 311/312 Hazard Classes	Immediate (acute) health hazard Reactive hazard Delayed (chronic) health hazard Fire hazard

Ammonium nitrate (6484-52-2)

Listed on the United States TSCA (Toxic Substances Control Act) inventory

Sodium nitrate (7631-99-4)

Listed on the United States TSCA (Toxic Substances Control Act) inventory

Calcium nitrate (10124-37-5)

Listed on the United States TSCA (Toxic Substances Control Act) inventory

Fuels, diesel, no. 2 (68476-34-6)

Listed on the United States TSCA (Toxic Substances Control Act) inventory

Distillates, petroleum, chemically neutralized light naphthenic (64742-35-4)

Listed on the United States TSCA (Toxic Substances Control Act) inventory

US State Regulations

Ammonium nitrate (6484-52-2)

U.S. - Massachusetts - Right To Know List
U.S. - New Jersey - Right to Know Hazardous Substance List
U.S. - Pennsylvania - RTK (Right to Know) - Environmental Hazard List
U.S. - Pennsylvania - RTK (Right to Know) List

Sodium nitrate (7631-99-4)

U.S. - Massachusetts - Right To Know List
U.S. - Pennsylvania - RTK (Right to Know) List

Calcium nitrate (10124-37-5)

U.S. - New Jersey - Right to Know Hazardous Substance List

Fuels, diesel, no. 2 (68476-34-6)

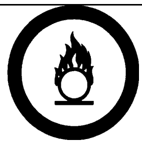
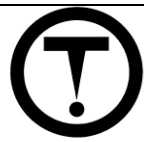
U.S. - New Jersey - Right to Know Hazardous Substance List

Canadian Regulations

Bulk Emulsion

WHMIS Classification	Class C - Oxidizing Material Class D Division 2 Subdivision B - Toxic material causing other toxic effects

Safety Data Sheet

Ammonium nitrate (6484-52-2)	
Listed on the Canadian DSL (Domestic Substances List) inventory.	
WHMIS Classification	Class C - Oxidizing Material Class D Division 2 Subdivision B - Toxic material causing other toxic effects
Sodium nitrate (7631-99-4)	
Listed on the Canadian DSL (Domestic Substances List) inventory. Listed on the Canadian Ingredient Disclosure List	
WHMIS Classification	Class C - Oxidizing Material Class D Division 2 Subdivision B - Toxic material causing other toxic effects
Calcium nitrate (10124-37-5)	
Listed on the Canadian DSL (Domestic Substances List) inventory.	
Fuels, diesel, no. 2 (68476-34-6)	
Listed on the Canadian DSL (Domestic Substances List) inventory.	
Distillates, petroleum, chemically neutralized light naphthenic (64742-35-4)	
Listed on the Canadian DSL (Domestic Substances List) inventory.	
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the SDS contains all of the information required by CPR.	

SECTION 16: OTHER INFORMATION, INCLUDING DATE OF PREPARATION OR LAST REVISION

Revision date : 07/20/2020

Other Information : This document has been prepared in accordance with the SDS requirements of the OSHA Hazard Communication Standard 29 CFR 1910.1200.

GHS Full Text Phrases:

Acute Tox. 4 (Inhalation)	Acute toxicity (inhalation) Category 4
Acute Tox. 4 (Oral)	Acute toxicity (oral) Category 4
Asp. Tox. 1	Aspiration hazard Category 1
Carc. 2	Carcinogenicity Category 2
Expl. 1.5	Explosive Category 1.5
Eye Dam. 1	Serious eye damage/eye irritation Category 1
Eye Irrit. 2A	Serious eye damage/eye irritation Category 2A
Skin Corr. 1A	Skin corrosion/irritation Category 1A
Skin Irrit. 2	Skin corrosion/irritation Category 2
STOT RE 2	Specific target organ toxicity (repeated exposure) Category 2
H205	May mass explode in fire
H302	Harmful if swallowed
H304	May be fatal if swallowed and enters airways
H315	Causes skin irritation
H320	Causes eye irritation
H332	Harmful if inhaled
H351	Suspected of causing cancer
H373	May cause damage to organs through prolonged or repeated exposure

Safety Data Sheet

Party Responsible for the Preparation of This Document
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Salt Lake City, Utah 84121
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Dyno Nobel SDS

Senatel Powersplit

Safety Data Sheet

According To Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules And Regulations And According To The Hazardous Products Regulation (February 11, 2015).

Revision Date: 02/08/2017 Date of Issue: 06/15/2011 Supersedes Date: 11/12/2013 Version: 2.0

SECTION 1: IDENTIFICATION

Product Identifier

Product Form: Mixture

Product Name: Senatel Powersplit

Product Code: 3020

Synonyms: Magnum Powersplit

Intended Use of the Product

A detonator sensitive emulsion explosive. For professional use only.

Name, Address, and Telephone of the Responsible Party

USA:
Orica USA Inc.
33101 E. Quincy Avenue
Watkins, CO 80137-9406
For SDS Requests: 1-855-26-ORICA (1-855-266-7422)
sds.na@orica.com

Canada:
Orica Canada Inc.
301 Rue Hotel-de-Ville
Brownsburg-Chatham, QC
J8G 3B5
For SDS Requests:
1-855-26-ORICA (1-855-266-7422)
sds.na@orica.com
www.oricaminingservices.com

Emergency Telephone Number

Emergency Number : **Canada:** 1-877-561-3636 (Orica Transportation Emergency Response)
USA: 1-800-424-9300 (CHEMTREC)

FOR CHEMICAL EMERGENCIES (24 HOUR) INVOLVING TRANSPORTATION, SPILL, LEAK, RELEASE, FIRE OR ACCIDENTS: **IN CANADA CALL:** THE ORICA TRANSPORTATION EMERGENCY RESPONSE SYSTEM AT **1-877-561-3636. IN THE U.S. CALL: CHEMTREC 1-800-424-9300. IN THE U.S.:** FOR LOST, STOLEN, OR MISPLACED EXPLOSIVES CALL: BATF **1-800-800-3855.** FORM ATF F 5400.5 MUST BE COMPLETED AND LOCAL AUTHORITIES (STATE/MUNICIPAL POLICE, ETC.) MUST BE ADVISED.

SECTION 2: HAZARDS IDENTIFICATION

Classification of the Substance or Mixture

GHS-US/CA Classification

The explosive classification below only applies to US 29 CFR 1910.1200 (HCS/HazCom 2012). The explosive classification is excluded from Canada Hazardous Products Regulations (HPR, SOR/2015-17), it is regulated under the Canada Explosives Act (R.S.C., 1985, c. E-17).

Explosives, Division 1.1	H201
Ox. Liq. 3	H272
Acute Tox. 4 (Oral)	H302
Eye Irrit. 2A	H319
Carc. 1B	H350
STOT RE 2	H373
Aquatic Acute 3	H402
Aquatic Chronic 3	H412

Full text of hazard classes and H-statements : see section 16

Label Elements

GHS-US/CA Labeling

Any labeling elements (pictograms, signal word, hazard, and precautionary statements) related to explosive classifications apply to the OSHA Hazard Communication Standard (HCS, 29 CFR 1910.1200) only and are excluded from Canada's Hazardous Products Regulations (HPR, SOR/2015-17).

Hazard Pictograms (GHS-US/CA) :

GHS01 GHS03 GHS07 GHS08

Signal Word (GHS-US/CA) : Danger

Hazard Statements (GHS-US/CA) : H201 - Explosive; mass explosion hazard.
H272 - May intensify fire; oxidizer.
H302 - Harmful if swallowed.
H319 - Causes serious eye irritation.
H350 - May cause cancer.
H373 - May cause damage to organs through prolonged or repeated exposure.
H402 - Harmful to aquatic life.
H412 - Harmful to aquatic life with long lasting effects.

Precautionary Statements (GHS-US/CA) : P201 - Obtain special instructions before use.
P202 - Do not handle until all safety precautions have been read and understood.
P210 - Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P220 - Keep away from clothing and other combustible materials.
P260 - Do not breathe fumes, vapors, mist, or spray.
P264 - Wash hands, forearms, and other exposed areas thoroughly after handling.
P270 - Do not eat, drink or smoke when using this product.
P273 - Avoid release to the environment.
P280 - Wear protective gloves, protective clothing, and eye protection.
P301+P312 - IF SWALLOWED: Call a POISON CENTER or doctor if you feel unwell.
P305+P351+P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P308+P313 - If exposed or concerned: Get medical advice/attention.
P314 - Get medical advice/attention if you feel unwell.
P330 - Rinse mouth.
P337+P313 - If eye irritation persists: Get medical advice/attention.
P405 - Store locked up.
P501 - Dispose of contents/container in accordance with the Explosives Act of Canada and the provisions of the Bureau of Alcohol, Tobacco and Firearms regulations contained in 27 CFR part 555.
P240 - Ground/bond container and receiving equipment.
P250 - Do not subject to friction, grinding, shock.
P370+P380 - In case of fire: Evacuate area.
P372 - Explosion risk in case of fire.
P373 - DO NOT fight fire when fire reaches explosives.
P401 - Store in accordance with the Explosives Act of Canada and the provisions of the Bureau of Alcohol, Tobacco and Firearms regulations contained in 27 CFR part 555.

Other Hazards

Exposure may aggravate pre-existing eye, skin, or respiratory conditions. Overexposure may cause methemoglobinemia. Initial manifestation of methemoglobinemia is cyanosis, characterized by navy lips, tongue and mucous membranes, with skin color being slate grey. Further manifestation is characterized by headache, weakness, dyspnea, dizziness, stupor, respiratory distress and death due to anoxia.

Unknown Acute Toxicity (GHS-US/CA)

No data available

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

Mixture

Name	Product Identifier	% *
Ammonium nitrate	(CAS No) 6484-52-2	70 - 80

Sodium nitrate	(CAS No) 7631-99-4	7 - 13
Sodium perchlorate	(CAS No) 7601-89-0	5 - 10
Petroleum	(CAS No) 8002-05-9	3 - 7
Pentaerythrite tetranitrate	(CAS No) 78-11-5	0.5 - 2

*Percentages are listed in weight by weight percentage (w/w%) for liquid and solid ingredients. Gas ingredients are listed in volume by volume percentage (v/v%).

SECTION 4: FIRST AID MEASURES

Description of First-aid Measures

General: Never give anything by mouth to an unconscious person. If you feel unwell, seek medical advice (show the label where possible).

Inhalation: When symptoms occur: go into open air and ventilate suspected area. Obtain medical attention if breathing difficulty persists.

Skin Contact: Remove contaminated clothing. Drench affected area with water for at least 15 minutes. Obtain medical attention if irritation develops or persists.

Eye Contact: Rinse cautiously with water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Obtain medical attention.

Ingestion: Rinse mouth. Do NOT induce vomiting. Obtain medical attention.

Most Important Symptoms and Effects Both Acute and Delayed

General: Causes serious eye irritation. Harmful if swallowed. There are potential chronic health effects to consider. Overexposure to this material may result in methemoglobinemia. Methemoglobinemia decreases the blood's ability to carry oxygen and results in symptoms such as dizziness, drowsiness, headache, shortness of breath, blue skin and lips, rapid heart rate, unconsciousness, and possibly death.

Inhalation: Prolonged exposure may cause irritation.

Skin Contact: Prolonged exposure may cause skin irritation.

Eye Contact: Contact causes severe irritation with redness and swelling of the conjunctiva.

Ingestion: This material is harmful orally and can cause adverse health effects or death in significant amounts.

Chronic Symptoms: May cause cancer. May cause damage to organs through prolonged or repeated exposure.

Indication of Any Immediate Medical Attention and Special Treatment Needed

If exposed or concerned, get medical advice and attention. If medical advice is needed, have product container or label at hand.

SECTION 5: FIRE-FIGHTING MEASURES

Extinguishing Media

Suitable Extinguishing Media: DO NOT FIGHT FIRES INVOLVING EXPLOSIVES. Water may be applied through fixed extinguishing system (sprinklers) as long as people need not be present for the system to operate.

Unsuitable Extinguishing Media: DO NOT fight fires involving explosives.

Special Hazards Arising From the Substance or Mixture

Fire Hazard: Explosive, could cause fire and secondary explosions. May intensify fire; oxidizer.

Explosion Hazard: Explosives, Division 1.1 - Chemicals and items which have a mass explosion hazard (a mass explosion is one which affects almost the entire quantity present virtually instantaneously). Heat may build pressure, rupturing closed containers, spreading fire and increasing risk of burns and injuries.

Reactivity: Extreme risk of explosion by shock, friction, fire or other sources of ignition. Oxidizer: increases the burning rate of combustible materials.

Advice for Firefighters

Precautionary Measures Fire: Exercise caution when fighting any chemical fire. This product is an explosive with mass detonation hazard. DO NOT FIGHT FIRES INVOLVING EXPLOSIVE MATERIALS.

Firefighting Instructions: DO NOT ATTEMPT TO FIGHT FIRE. Immediately evacuate all personnel from the area to a safe distance. Guard against re-entry. Thermal decomposition can lead to release of irritating gases and vapors. In case of major fire and large quantities: Evacuate area. Fight fire remotely due to the risk of explosion.

Protection During Firefighting: Do not enter fire area without proper protective equipment, including respiratory protection.

Hazardous Combustion Products: Carbon oxides (CO, CO_2), hydrocarbons, nitrogen oxides. At temperatures above 210 °C (410 °F), decomposition may be explosive, especially if confined.

Other Information: Do not allow run-off from fire fighting to enter drains or water courses.

Reference to Other Sections

Refer to Section 9 for flammability properties.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment and Emergency Procedures

General Measures: Keep away from heat, sparks, open flames, hot surfaces. – No smoking. Do not get in eyes, on skin, or on clothing. Do not breathe vapor, mist or spray. Evacuate danger area. Keep away from heat, hot surfaces, sparks, open flames, and other ignition sources. No smoking. Keep away from combustible material. Avoid all contact with skin, eyes, or clothing.

For Non-Emergency Personnel

Protective Equipment: Use appropriate personal protective equipment (PPE).

Emergency Procedures: Evacuate unnecessary personnel. Evacuate danger area.

For Emergency Personnel

Protective Equipment: Equip cleanup crew with proper protection.

Emergency Procedures: Upon arrival at the scene, a first responder is expected to recognize the presence of dangerous goods, protect oneself and the public, secure the area, and call for the assistance of trained personnel as soon as conditions permit. Ventilate area. Eliminate ignition sources.

Environmental Precautions

Prevent entry to sewers and public waters. Avoid release to the environment.

Methods and Materials for Containment and Cleaning Up

For Containment: Contain any spills with dikes or absorbents to prevent migration and entry into sewers or streams. Absorb and contain with inert material. Place contents in suitable container for disposal. Use only non-sparking tools.

Methods for Cleaning Up: Use only non-sparking tools. Be careful to avoid shock, friction, and contact with grit. Collect product for recovery or disposal. For release to land, contain discharge by constructing dykes or applying inert absorbent; for release to water, utilize damming and/or water diversion to minimize the spread of contamination. Collect contaminated soil and water, and absorbent for proper disposal. Notify applicable government authority if release is reportable or could adversely affect the environment. Absorb and/or contain spill with inert material, then place in suitable container. Do not take up in combustible material such as: saw dust or cellulosic material.

Reference to Other Sections

See Section 8 for exposure controls and personal protection and Section 13 for disposal considerations.

SECTION 7: HANDLING AND STORAGE

Precautions for Safe Handling

Additional Hazards When Processed: May cause or intensify fire; oxidizer.

Precautions for Safe Handling: Wash hands and other exposed areas with mild soap and water before eating, drinking or smoking and when leaving work. Keep away from sources of ignition - No smoking. Keep away from extremely high or low temperatures, ignition sources, and incompatible materials. - No smoking. Handle empty containers with care because they may still present a hazard. Do not get in eyes, on skin, or on clothing. Do not handle until all safety precautions have been read and understood. Do not breathe fumes, vapors, mist, spray. Avoid contact with skin, eyes and clothing.

Hygiene Measures: This product is an explosive and should only be used under the supervision of trained and licensed personnel. Handle in accordance with good industrial hygiene and safety procedures. Wash hands and other exposed areas with mild soap and water before eating, drinking, or smoking and again when leaving work.

Conditions for Safe Storage, Including Any Incompatibilities

Technical Measures: Comply with applicable regulations. Proper grounding procedures to avoid static electricity should be followed. Ground/bond container and receiving equipment.

Storage Conditions: Store under moderate temperatures recommended by competent authority. Store under dry conditions in a well ventilated magazine that has been approved for either detonator storage or explosive storage. Do NOT store explosives in a detonator magazine or detonators in an explosive magazine. Keep away from heat, spark and flames. Keep containers closed. Explosives should be kept well away from initiating explosives; protected from physical damage; separated from oxidizing materials, combustibles, and sources of heat. Isolate from incompatibles. . Keep/Store away from combustible materials, organic material, ignition sources, incompatible materials. Keep in fireproof place.

Incompatible Materials: Oxidizable materials, metal powder, bronze & copper alloys, fuels (e.g. lubricants, machine oils), fluorocarbon lubricants, acids, corrosive liquids, chlorate, sulphur, sodium nitrite, charcoal, coke and other finely divided combustibles. Strong oxidizing and reducing agents.

Special Rules on Packaging: Keep only in the original container.

Specific End Use(s)

A detonator sensitive emulsion explosive. For professional use only.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

Control Parameters

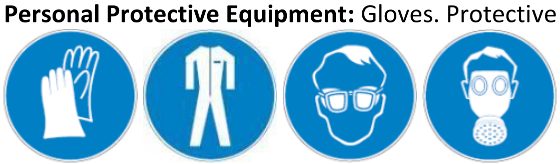
For substances listed in section 3 that are not listed here, there are no established Exposure limits from the manufacturer, supplier, importer, or the appropriate advisory agency including: ACGIH (TLV), AIHA (WEEL), NIOSH (REL), OSHA (PEL), or Canadian provincial governments.

Petroleum (8002-05-9)		
USA OSHA	OSHA PEL (TWA) (mg/m³)	2000 mg/m³
USA OSHA	OSHA PEL (TWA) (ppm)	500 ppm
USA NIOSH	NIOSH REL (TWA) (mg/m³)	350 mg/m³
USA NIOSH	NIOSH REL (ceiling) (mg/m³)	1800 mg/m³ (15 min)
USA IDLH	US IDLH (ppm)	1100 ppm (10% LEL)

Exposure Controls

Appropriate Engineering Controls: Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure. Ensure adequate ventilation, especially in confined areas. Ensure all national/local regulations are observed. Proper grounding procedures to avoid static electricity should be followed. Product to be handled in a closed system and under strictly controlled conditions. Use explosion-proof equipment. Gas detectors should be used when flammable gases or vapors may be released.

Personal Protective Equipment: Gloves. Protective clothing. Protective goggles. Insufficient ventilation: wear respiratory protection.



Materials for Protective Clothing: Chemically resistant materials and fabrics. Wear fire/flame resistant/retardant clothing.

Hand Protection: Wear protective gloves.

Eye Protection: Chemical safety goggles.

Skin and Body Protection: Wear suitable protective clothing.

Respiratory Protection: If exposure limits are exceeded or irritation is experienced, approved respiratory protection should be worn. In case of inadequate ventilation, oxygen deficient atmosphere, or where exposure levels are not known wear approved respiratory protection.

Other Information: When using, do not eat, drink or smoke

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Information on Basic Physical and Chemical Properties

Physical State	:	Liquid
Appearance	:	Viscous. String of plastic wrapped material traced internally with detonating cord. If the outer plastic is perforated, the exposed product appears putty-like.
Odor	:	Odorless
Odor Threshold	:	Not available
pH	:	Not available
Evaporation Rate	:	Not available
Melting Point	:	Not available
Freezing Point	:	Not available
Boiling Point	:	Not available
Flash Point	:	Not available
Auto-ignition Temperature	:	Not available
Decomposition Temperature	:	Detonating Cord 70 °C (158 °F) / Ammonium Nitrate 210 °C (410 °F)
Flammability (solid, gas)	:	Not available
Lower Flammable Limit	:	Not available

Upper Flammable Limit	:	Not available
Vapor Pressure	:	0 mm Hg @ 20 °C (68 °F)
Relative Vapor Density at 20°C	:	Not available
Relative Density	:	1.2 - 1.3
Density	:	1.2 - 1.3 g/cc
Specific Gravity	:	1.2 - 1.3
Solubility	:	Slightly soluble in standard organic solvents. Insoluble in water.
Partition Coefficient: N-Octanol/Water	:	Not available
Viscosity	:	Not available
Explosive Properties	:	Explosives, Division 1.1 - Chemicals and items which have a mass explosion hazard (a mass explosion is one which affects almost the entire quantity present virtually instantaneously)

SECTION 10: STABILITY AND REACTIVITY

Reactivity: Extreme risk of explosion by shock, friction, fire or other sources of ignition. Oxidizer: increases the burning rate of combustible materials.

Chemical Stability: Extreme risk of explosion by shock, friction, fire or other sources of ignition. May intensify fire; oxidizer.

Possibility of Hazardous Reactions: Hazardous polymerization will not occur.

Conditions to Avoid: Keep away from open flames, hot surfaces and sources of ignition. Incompatible materials. Direct sunlight, extremely high or low temperatures, ignition sources, combustible materials, incompatible materials.

Incompatible Materials: Oxidizable materials, metal powder, bronze & copper alloys, fuels (e.g. lubricants, machine oils), fluorocarbon lubricants, acids, corrosive liquids, chlorate, sulphur, sodium nitrite, charcoal, coke and other finely divided combustibles. Strong oxidizing and reducing agents.

Hazardous Decomposition Products: None expected under normal conditions of use.

SECTION 11: TOXICOLOGICAL INFORMATION

Information on Toxicological Effects - Product

Acute Toxicity (Oral): Oral: Harmful if swallowed.
Acute Toxicity (Dermal): Not classified
Acute Toxicity (Inhalation): Not classified
LD50 and LC50 Data:

Senatel Powersplit	
ATE US/CA (oral)	1,733.41 mg/kg body weight

Skin Corrosion/Irritation: Not classified

Eye Damage/Irritation: Causes serious eye irritation.

Respiratory or Skin Sensitization: Not classified

Germ Cell Mutagenicity: Not classified

Carcinogenicity: May cause cancer.

Specific Target Organ Toxicity (Repeated Exposure): May cause damage to organs through prolonged or repeated exposure.

Reproductive Toxicity: Not classified

Specific Target Organ Toxicity (Single Exposure): Not classified

Aspiration Hazard: Not classified

Symptoms/Injuries After Inhalation: Prolonged exposure may cause irritation.
Symptoms/Injuries After Skin Contact: Prolonged exposure may cause skin irritation.
Symptoms/Injuries After Eye Contact: Contact causes severe irritation with redness and swelling of the conjunctiva.
Symptoms/Injuries After Ingestion: This material is harmful orally and can cause adverse health effects or death in significant amounts.
Chronic Symptoms: May cause cancer. May cause damage to organs through prolonged or repeated exposure.

Information on Toxicological Effects - Ingredient(s)

LD50 and LC50 Data:

Ammonium nitrate (6484-52-2)	
LD50 Oral Rat	2217 mg/kg

LC50 Inhalation Rat	> 88.8 mg/l/4h

Petroleum (8002-05-9)	
LD50 Oral Rat	> 4300 mg/kg
LD50 Dermal Rabbit	> 2000 mg/kg
LC50 Inhalation Rat	2.18 mg/l/4h

Sodium nitrate (7631-99-4)	
LD50 Oral Rat	> 2000 mg/kg

Sodium perchlorate (7601-89-0)	
LD50 Oral Rat	2100 mg/kg
ATE US/CA (oral)	500.00 mg/kg body weight

Pentaerythrite tetranitrate (78-11-5)	
LD50 Oral Rat	1660 mg/kg

Petroleum (8002-05-9)	
IARC Group	3

SECTION 12: ECOLOGICAL INFORMATION

Toxicity

Ecology - General: Harmful to aquatic life with long lasting effects.

Ammonium nitrate (6484-52-2)	
LC50 Fish 1	542 mg/l
EC50 Daphnia 1	555 mg/l

Petroleum (8002-05-9)	
LC50 Fish 1	< 7.1 mg/l (Species: Pimephales promelas, Exposure time 96 h)
LC50 Other Aquatic Organisms 1	2.7 mg/l LL50 96 hr (Kelp forest mysid shrimp)
EC50 Daphnia 1	6.9 mg/l (Exposure time: 48 h)

Sodium nitrate (7631-99-4)	
LC50 Fish 1	2000 mg/l (Exposure time: 96 h - Species: Lepomis macrochirus [static])
LC50 Fish 2	994.4 - 1107 mg/l (Exposure time: 96 h - Species: Oncorhynchus mykiss [static])

Persistence and Degradability

Senatel Powersplit	
Persistence and Degradability	May cause long-term adverse effects in the environment.

Sodium nitrate (7631-99-4)	
Persistence and Degradability	Readily biodegradable in water.

Bioaccumulative Potential

Senatel Powersplit	
Bioaccumulative Potential	Not established.

Ammonium nitrate (6484-52-2)	
BCF Fish 1	(no bioaccumulation expected)
Log Pow	-3.1 (at 25 °C)

Sodium nitrate (7631-99-4)	
Log Pow	-3.8 (at 25 °C)
Bioaccumulative Potential	Not expected to bioaccumulate.

Mobility in Soil

Not available

Other Adverse Effects

Other Information: Avoid release to the environment.

SECTION 13: DISPOSAL CONSIDERATIONS

Waste Disposal Recommendations: Dispose of contents/container in accordance with the Explosives Act of Canada and the provisions of the Bureau of Alcohol, Tobacco and Firearms regulations contained in 27 CFR part 555

Additional Information: Container may remain hazardous when empty. Continue to observe all precautions.

Ecology - Waste Materials: Avoid release to the environment. This material is hazardous to the aquatic environment. Keep out of sewers and waterways.

SECTION 14: TRANSPORT INFORMATION

The shipping description(s) stated herein were prepared in accordance with certain assumptions at the time the SDS was authored, and can vary based on a number of variables that may or may not have been known at the time the SDS was issued.

In Accordance with DOT

Proper Shipping Name : EXPLOSIVE, BLASTING, TYPE E
Hazard Class : 1.1D
Identification Number : UN0241
Label Codes : 1.1D

Packing Group : II
ERG Number : 112

In Accordance with IMDG

Proper Shipping Name : EXPLOSIVE, BLASTING, TYPE E
Hazard Class : 1.1D
Identification Number : UN0241
Label Codes : 1.1D

EmS-No. (Fire) : F-B
EmS-No. (Spillage) : S-X
MFAG Number : 112

In Accordance with IATA

Proper Shipping Name : EXPLOSIVE, BLASTING, TYPE E
Identification Number : 1.1D
Hazard Class : UN0241
ERG Code (IATA) : 1L

In Accordance with TDG

Proper Shipping Name : EXPLOSIVE, BLASTING, TYPE E
Hazard Class : 1.1D
Identification Number : UN0241
Label Codes : 1.1D

Packing Group : II

SECTION 15: REGULATORY INFORMATION

US Federal Regulations

Senatel Powersplit	
SARA Section 311/312 Hazard Classes	Sudden release of pressure hazard Fire hazard Immediate (acute) health hazard Delayed (chronic) health hazard

Ammonium nitrate (6484-52-2)
Listed on the United States TSCA (Toxic Substances Control Act) inventory

Petroleum (8002-05-9)
Listed on the United States TSCA (Toxic Substances Control Act) inventory

Sodium nitrate (7631-99-4)
Listed on the United States TSCA (Toxic Substances Control Act) inventory

Sodium perchlorate (7601-89-0)
Listed on the United States TSCA (Toxic Substances Control Act) inventory

Pentaerythrite tetranitrate (78-11-5)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory	
EPA TSCA Regulatory Flag	T - T - indicates a substance that is the subject of a Section 4 test rule under TSCA

US State Regulations

Ammonium nitrate (6484-52-2)
U.S. - Massachusetts - Right To Know List
U.S. - New Jersey - Right to Know Hazardous Substance List
U.S. - Pennsylvania - RTK (Right to Know) - Environmental Hazard List
U.S. - Pennsylvania - RTK (Right to Know) List

Petroleum (8002-05-9)
U.S. - Massachusetts - Right To Know List
U.S. - New Jersey - Right to Know Hazardous Substance List
U.S. - Pennsylvania - RTK (Right to Know) List

Sodium nitrate (7631-99-4)
U.S. - Massachusetts - Right To Know List
U.S. - Pennsylvania - RTK (Right to Know) List

Sodium perchlorate (7601-89-0)
U.S. - Massachusetts - Right To Know List
U.S. - New Jersey - Right to Know Hazardous Substance List
U.S. - Pennsylvania - RTK (Right to Know) List

Pentaerythrite tetranitrate (78-11-5)
U.S. - New Jersey - Right to Know Hazardous Substance List

Canadian Regulations

Ammonium nitrate (6484-52-2)
Listed on the Canadian DSL (Domestic Substances List)

Petroleum (8002-05-9)
Listed on the Canadian DSL (Domestic Substances List)

Sodium nitrate (7631-99-4)
Listed on the Canadian DSL (Domestic Substances List)

Sodium perchlorate (7601-89-0)
Listed on the Canadian DSL (Domestic Substances List)

Pentaerythrite tetranitrate (78-11-5)
Listed on the Canadian DSL (Domestic Substances List)

SECTION 16: OTHER INFORMATION, INCLUDING DATE OF PREPARATION OR LAST REVISION

Revision Date : 02/08/2017

Other Information : This document has been prepared in accordance with the SDS requirements of the OSHA Hazard Communication Standard 29 CFR 1910.1200 and Canada’s Hazardous Products Regulations (HPR).

GHS Full Text Phrases:

Acute Tox. 4 (Oral)	Acute toxicity (oral) Category 4
Aquatic Acute 3	Hazardous to the aquatic environment - Acute Hazard Category 3
Aquatic Chronic 3	Hazardous to the aquatic environment - Chronic Hazard Category 3
Carc. 1B	Carcinogenicity Category 1B
Expl. 1.1	Explosive Category 1.1
Eye Irrit. 2A	Serious eye damage/eye irritation Category 2A
Ox. Liq. 3	Oxidizing liquids Category 3
STOT RE 2	Specific target organ toxicity (repeated exposure) Category 2
H201	Explosive; mass explosion hazard
H272	May intensify fire; oxidizer
H302	Harmful if swallowed
H319	Causes serious eye irritation

H350	May cause cancer
H373	May cause damage to organs through prolonged or repeated exposure
H402	Harmful to aquatic life
H412	Harmful to aquatic life with long lasting effects

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NA GHS SDS 2015 (Can, US)

APPENDIX 5

EMULSION PLAN / BLAST AREA INSPECTION SHEET

Environmental Inspection Report for the Emulsion Plant Area and the Loading of Blast Holes

Date:
Time:
Location: Emulsion Plant

Inspected By:

Weekly Inspection

In Compliance with	Subject	Conform	Non-conform	N/A	Comments
NWB Part B Item 10	Sign posted to inform of a waste disposal facility				
NWB Part D Item 17 MBK SCP MBK NIRB Condition 26	Are there any visual spills?				
NWB Part F Item 10	All Hazardous Waste disposal is located 30m from the ordinary high water mark.				
NWB Part H Item 2	Resources in place to prevent any chemicals, petroleum products, or unauthorized Wastes from entering a water body.				
NWB Part H Item 3 Ammonia Management Plan	Is secondary containment for chemical storage provided.				
NWB Part I Item 7	Monitoring signs are posted in English, French, and Inuktitut.				
MBK SCP	Spill Kits Present				
MBK NIRB Condition 26	Ensure that spills, if any, are cleaned up immediately and that the site is kept clean of debris, including wind-blown debris.				
MBK NIRB Condition 25	Management and control waste in a manner that reduces or eliminates the attraction to carnivores and/or raptors.				

MBK NIRB Condition 27 Ammonia Management Plan	Ensure the hazardous material are contained using environmentally protective methods based on practical best management practices				
Hazardous Management Plan	Are storage containers clearly labelled to identify Hazardous substance?				
Ammonia Management Plan	Are storage containers in good condition? Is there any visible damage or leaks? Can the doors be sealed shut?				
Ammonia Management Plan	Where necessary – Are containers with product stored in an upright position?				
Ammonia Management Plan	Do you see any potential environmental hazards posed by these HAZARDOUS containers/materials?				
BMP	Are there any additional environmental hazards/potential impacts that require attention?				
MINE ACT	Are there any Health and Safety issues that should be addressed to prevent injury to workers?				

Pit Location: **Blast Pattern:**

In Compliance with	Subject	Conform	Non-conform	N/A	Comments
NWB Part D Item 17 MBK SCP MBK NIRB Condition 26	Are there any visual spills, including emulsion?				
Ammonia Management Plan	Is there presence of Emulsion outside of the holes that are being loaded?				
NWB Part F Item 10	All Hazardous Waste disposals are located 30m from the ordinary high water mark.				

NWB Part H Item 2	Resources in place to prevent any chemicals, petroleum products, or unauthorized Wastes from entering a water body.				
NWB Part H Item 3 Ammonia Management Plan	Is secondary containment for chemical storage provided?				
MBK NIRB Condition 27 Ammonia Management Plan	Ensure the hazardous material are contained using environmentally protective methods based on practical best management practices				

Comments/Recommendations:

Environmental Personnel Name:

Actions Corrected: None

____
____
____
____
____

Dyno Nobel Supervisor Name: ____

Signature: ____

APPENDIX F – TDS-SITE-SPECIFIC WATER QUALITY PROGRAM TECHNICAL MEMORANDUM

TECHNICAL MEMORANDUM

DATE February 20, 2025 **Reference No.** CA0031499.3639-MBK2024_020-TM-Rev2

TO Lisa Ramilo, Permitting Lead Water & Waste
Agnico Eagle Mines Limited

CC Sarah Crabbe

FROM Chelsea Grimard; Connor Pettem; Gary Lawrence **EMAIL chelsea.grimard@wsp.com**

SITE SPECIFIC BENCHMARKS FOR TOTAL DISSOLVED SOLIDS IN SUPPORT OF WATER LICENSE SUBMISSION AND FINAL CLOSURE AND RECLAMATION PLAN FOR MEADOWBANK MINE COMPLEX

1.0 INTRODUCTION

This technical memorandum presents the proposed benchmark for total dissolved solids (TDS) for application to future discharge conditions at Meadowbank Mine Complex (the Mine) located in the Kivalliq Region of Nunavut. The benchmark was derived to support the Human Health and Ecological Risk Assessment under the Final Closure and Reclamation Plan (FCRP) for the Mine and to support a Water License amendment.

TDS was identified as both an acute and chronic constituent of concern for benchmark[1] development under:

- Meadowbank Mine Type A Water License 2AMMEA1530 per Items 7[2] and 9[3].
- Human Health and Ecological Risk Assessment, in the absence of a promulgated water quality guideline for screening of TDS.

Within this document, two types of site-specific benchmarks for TDS were developed:

- Acute Toxicity Effluent Quality Criterion (EQC)—to apply at the end-of-pipe at the point of discharge for treated effluent, as a mitigation against acute toxicity of TDS.
- Site-Specific Water Quality Objective (SSWQO)—to apply at the edge of the mixing zone in the receiving environment, as a mitigation against chronic toxicity of TDS.

[1] The term benchmark is used in this document as a general term for science-based numerical values for water quality screening, including effluent quality criteria and site-specific water quality objectives; benchmarks are intended to support water management, are candidate values for regulatory consideration for both Water License approvals, and are recommended for use in initial screening of water quality predictions.

[2] The Licensee shall submit a Water Management Plan on an annual basis to the Board for review following the commencement of Operations. The Plan must include an updated Water Balance. The Water Management Plan shall include an action plan to be implemented if predicted re-flooded pit water quality indicates that treatment is necessary. The Licensee shall not breach dikes until the water quality in the re flooded area meets CCME Water Quality Guidelines for the Protection of Aquatic Life, baseline concentrations, or appropriate site-specific water quality objectives. Subject to the Board approval, if water quality parameters are above CCME Guidelines, a site-specific risk assessment must be conducted to identify water quality objectives that are protective of the aquatic environment.

[3] The Licensee shall, on an annual basis during Operations and Closure, compare the predicted water quantity and quality within the pits to the measured water quantity and quality. Should the difference between the predicted and measured values be 20% or greater, then the cause(s) of the difference(s) shall be identified, and the implications of the difference shall be assessed and reported to the Board.

The acute toxicity EQC and SSWQO collectively satisfy the Type A Water License requirement that a site-specific risk assessment must be conducted to identify water quality objectives that are protective of the aquatic environment. The guiding principles for developing benchmarks are that they should be developed to be protective of the environment, satisfy regulatory requirements, be based on science (rather than strictly on considerations of policy or precedent), and be customized to the site-specific conditions of water quality and quantity. Adoption of fixed numerical benchmarks across sites or for all water compositions, either as static effluent limits or generic water quality guidelines, is unlikely to satisfy some parts of the guiding principle. Site-specific benchmarks can, however, be developed using a toxicity-based approach that satisfies all the above conditions.

The development of site-specific benchmarks has three main components for acceptability as stipulated in the Water License (Part F, Item 6):

- no acute toxicity at the point of discharge
- no unacceptable chronic toxicity at the edge of the mixing zone
- suitable assimilation capacity in the receiving environment

Rather than rely on uncertain generic numerical values for TDS, site-specific benchmarks were developed to manage TDS in the effluent and receiving environment (to apply at the edge of the mixing zone) that meet the above conditions through incorporation of site-specific exposure conditions and confirmation through site-specific toxicity testing. Evaluation of assimilative capacity in the receiving environment resulted in a proposed maximum average concentrations (MAC) EQC and maximum grab concentrations (MGC) EQC for Wally Lake of 1,608 and 3,217 mg/L, respectively (Appendix A, Assimilative Capacity Report, WSP 2025). A potential range for the acute toxicity EQC is presented herein and incorporates consideration of both the site-specific benchmarks and the mixing and assimilation properties of the effluent in the receiving environment.

This memo presents a summary of the methods (Section 2.0, results (Section 3.0), and conclusions (Section 4.0) for the proposed TDS benchmarks for acute (EQC) and chronic (SSWQO) toxicity. Supplementary desktop-based literature and site-specific information are presented in Attachment 1, and site-specific toxicological study methodology and results are presented in Attachment 2.

2.0 METHODS

Literature and site-specific toxicity data were compiled, evaluated, and used to derive proposed benchmarks for effluent at the end-of-pipe (acute toxicity EQC) and at the edge of the mixing zone within the receiving environment (SSWQO). Detailed methods and results are provided for the desktop-based supplementary information (including literature reviews of TDS toxicity) in Attachment 1 and technical findings of the site-specific toxicity testing are provided in Attachment 2. The literature and site-specific data were considered as complementary lines of evidence in deriving proposed benchmarks, using the following steps:

1) Characterization of the TDS composition in effluent and in the receiving environment under future effluent discharge conditions. The ionic composition has relevance to toxic potency and was evaluated based on water quality characteristics for modelled and measured pit chemistry and draft modelled effluent chemistry (Attachment 1, Section 1-2).

2) Compilation of acute and chronic thresholds for TDS toxicity to sensitive, site-relevant aquatic test species using endpoint responses obtained from the literature; test results were screened for relevance to exposure conditions (e.g., balance of ions, sulphate proportion, hardness) reflective of Meadowbank Mine (Attachment 1, Sections 1-3 and 1-4).

3) Compilation of TDS acute toxicity EQC and SSWQO values derived for other northern mines sites that have a similar TDS composition to Meadowbank Mine (Attachment 1, Sections 1-3 and 1-4).

4) Evaluation of site-specific toxicity of TDS for controlled studies in the laboratory using samples prepared to simulate future exposure conditions specific to Meadowbank Mine conditions. Toxicological studies to support development of the proposed benchmarks were undertaken to validate literature-based data (Table 1 Attachment 2). The objectives of the site-specific toxicological studies were to:

   a. Evaluate the acute toxicity of synthesized site effluent blends of TDS to the acute regulatory test species *Daphnia magna* (48-hr exposure) and Rainbow Trout (*Oncorhynchus mykiss*; 96-hr exposure). These test species provide data consistent with Metal and Diamond Mining Effluent Regulations (MDMER) used routinely to regulate the deposit of effluent from metal and diamond mines into water frequented by fish under subsection 36(3) of the *Fisheries Act*.

   b. Evaluate the chronic toxicity of TDS, under future exposure conditions simulating the edge of the mixing zone during effluent discharge, using a battery of sensitive, surrogate laboratory test species: the water flea *Ceriodaphnia dubia*, an algae *Raphidocelis subcapitata*, and early life stage *Pimephales promelas* (Fathead Minnow). These species were identified to be reliable, relevant, and sensitive indicators of chronic toxicity from TDS to freshwater aquatic species.

Table 1: Overview of Toxicity Testing Programs for Total Dissolved Solids

Toxicity Testing Program	Dilution Water	Laboratory Toxicity Test				
		Daphnia magna **Survival Test (48-h)**	**Rainbow Trout Survival Test (96-h)**	***Raphidocelis subcapitata*** **Growth (72-h)**	***Ceriodaphnia dubia*** **Survival and Reproduction (7 to 8-d)**	**Fathead Minnow Survival, Development, and Growth (32-d)**
Acute TDS	Pit E cryo-concentrated water	☑	☑	—	—	—
Chronic TDS	Site-collected water	—	—	☑	☑	—
	Synthetic laboratory water	—	—	—	—	☑

Notes: TDS = total dissolved solids; ☑ = toxicity test performed; — = not tested or not applicable.

The information gathered from the site-specific toxicity program was integrated with literature data for comparable TDS mixtures to establish proposed benchmarks that are protective of aquatic life under acute (EQC) and chronic (SSWQO) exposure conditions. Site-specific data were used as the primary line of evidence to establish the benchmarks, with supplementary literature data providing additional evidence to evaluate concurrence or divergence in toxicity benchmarks for TDS under comparable exposure scenarios.

3.0 RESULTS

3.1 Proposed Acute Toxicity Effluent Quality Criteria Range

The proposed acute toxicity EQC for TDS at Meadowbank Mine ranges from 4,000 to ~10,293 mg/L (as calculated TDS[4]). Evaluation of assimilative capacity in the receiving environment resulted in a proposed MAC EQC and MGC EQC for Wally Lake of 1,608 and 3,217 mg/L, respectively (Appendix A, Assimilative Capacity Report, WSP 2025). The lines of evidence presented below collectively provide high confidence that no acute lethality is expected at the point of discharge at TDS concentrations below 4,000 mg/L. Given the conservatism of the assessment, the results could support an extension of the proposed acute toxicity EQC above 4,000 mg/L, providing assimilative capacity conditions are met. However, at this stage, the lower end of the proposed range has been advanced as the proposed benchmark, providing a margin of safety for management. The evidence in support of a confident determination of no acute toxicity comes from the following sources:

- Information from other mine sites with comparable TDS mixtures indicated no acute toxicity (i.e., 100% survival) at maximum evaluated TDS concentrations of ~4,000 mg/L.
  - At Faro Mine site, no acute toxicity to *D. magna* and Rainbow Trout was observed with maximum tested calculated TDS ranging from 3,870 to 3,960 mg/L for calcium-sulphate dominant TDS mixtures (Attachment 1, Section 1-3).
  - At Meliadine Mine site, no acute toxicity to the cladoceran *Ceriodaphnia dubia* was observed (LC_{50} >4,250 mg/L TDS) with exposure to a sodium-sulphate-chloride dominant TDS mixture (Attachment 1, Section 1-3). The *C. dubia* survival endpoint is not routinely applied as a measure of acute toxicity under effluent discharge regulations, as it is a chronic test and more sensitive than the standard tests used to evaluate acute toxicity in undiluted effluent (i.e., Rainbow Trout and *D. magna*). As such, confirmation of an LC_{50} for *C. dubia* for a TDS mixture broadly comparable to Meadowbank Mine, and for a sensitive aquatic species, provides an additional line of evidence indicating that no acute toxicity is expected at calculated TDS concentrations of ~4,000 mg/L.
- Site-specific acute toxicity data indicated no acute lethality[5] to regulatory test species *D. magna* and Rainbow Trout at calculated TDS concentrations ranging from 2,382 up to 4,050 mg/L (measured TDS of 2,480 to 4,000 mg/L), with exposure to Pit E water collected from Meadowbank Mine. These findings have been validated over eight rounds of testing. Pit E water is predicted to have the highest TDS concentrations on average relative to the other pits (Attachment 1; Section 1-3).
- Acute toxicity data from the site-specific toxicological study indicated no acute lethality to *D. magna* and Rainbow Trout exposed to cryo-concentrated Pit E waters (sodium-sulphate dominant) with calculated TDS concentrations ranging from 4,577 to 10,293 mg/L (measured TDS of 4,590 to 10,100 mg/L). Minor immobility effects (12% to 20% immobility) were observed in the *D. magna* tests with calculated TDS >8,836 mg/L (measured TDS of >8,710 mg/L), but this response did not reach the threshold of a 50% effect level (Attachment 2).

[4] TDS (mg/L) is calculated as the sum of calcium, chloride, fluoride, magnesium, potassium, sodium, sulphate, alkalinity as carbonate (calculated 0.6 × total alkalinity as $CaCO_3$), and nitrate as NO_3 (calculated 4.427 × nitrate as N; APHA 2012).

[5] Acute lethality is defined as more than 50% mortality in a test population during exposure over a defined period (e.g., 48 hours for *D. magna* and 96 hours for Rainbow Trout).

3.2 Chronic Site-Specific Water Quality Objectives

3.2.1 Literature Data Compilation

The detailed literature review is presented in Attachment 1 (Section 1-4), and a summary of key findings is as follows:

- There are no federal, provincial, and territorial water quality guidelines for TDS in Canada. However, several other sites have developed chronic benchmarks applicable for Meadowbank (i.e., sulphate-dominant TDS mixtures); these benchmarks range from 500 mg/L to 1,500 mg/L calculated TDS.
- Effect concentrations for sensitive, aquatic receptors (phytoplankton, benthic invertebrates and zooplankton, and fish) from the literature for comparable TDS mixtures (sulphate-dominant) were generally above 1,000 mg/L as calculated TDS.

3.2.2 Site-Specific Chronic Toxicity Testing

The detailed methods and results of the site-specific chronic TDS toxicity test program are presented in Attachment 2, and a summary of key findings is as follows:

- Overall, the magnitude of effect to the tested species observed was negligible (*R. subcapitata*) or small in magnitude (*C. dubia* and Fathead Minnow) across a wide range of tested concentrations (i.e., exceeding 2,000 mg/L calculated TDS for all three test species).
- No statistically significant reduction in *R. subcapitata* growth was observed with exposure to calculated TDS concentrations up to 2,217 mg/L (unbounded no observable effect concentration; NOEC).
- No statistically significant reduction in *C. dubia* survival was observed with exposure to calculated TDS concentrations up to 2,226 mg/L (unbounded NOEC). A statistically significant reduction in *C. dubia* reproduction was observed in the 2,296 mg/L calculated TDS treatments, with a NOEC of 1,745 mg/L calculated TDS and LOEC of 1,745 mg/L calculated TDS. The IC_{10} estimate was 976 mg/L calculated TDS and the IC_{20} estimate was 1,354 mg/L calculated TDS, which aligns with expectations based on the review of literature data (i.e., negligible chronic toxicity at concentrations ≤1,000 mg/L calculated TDS; Section 3.2.1).
- No statistically significant reduction in Fathead Minnow overall and post-hatch survival, proportion normal, hatch rate, and length was observed with exposure to calculated TDS concentrations up to 2,211 mg/L (unbounded NOEC). A low-level statistically significant reduction in Fathead Minnow dry weight was observed in the 600 to 2,211 mg/L calculated TDS treatments, with a NOEC of 487 mg/L calculated TDS and LOEC of 600 mg/L calculated TDS for the dry weight endpoint. However, a concentration-response model could not be fit to the dry weight data and the effect sizes for dry weight in these treatments were small (equal to or less than 10%). The concentration-response pattern was also considered atypical as there was no apparent trend to the reductions, indicating the reduction in dry weight may be (in part) driven by a factor other than TDS. As such, the NOEC for dry weight is not suitable for choice of the “most appropriate EC_X/IC_X representing a no-effects threshold” per CCME (2007) guidance.

3.2.3 Species Sensitivity Distribution

A species sensitivity distribution (SSD) for chronic TDS toxicity was derived using CCME (2007) guidance. The detailed SSD is presented in Attachment 1 (Section 1-5), and a summary of key findings is as follows:

- Chronic toxicity data for 11 species were retained for an SSD: three fish, three non-insect invertebrates, three freshwater bivalves, one aquatic insect, and one alga. The minimum dataset requirements were satisfied for the derivation of a Type A SSD derivation for freshwater environments as defined by CCME (2007).
- Following CCME (2007) guidance, the resulting hazardous concentration to 5% of the tested species (HC_5) for TDS was 979 mg/L. The HC_5 is just below the proposed SSWQO for TDS of 1,000 mg/L (as calculated TDS) with confidence limits overlapping 1,000 mg/L TDS (752 to 1,297 mg/L TDS). The HC_5 value and is driven by a site-specific IC_{10} of 976 mg/L calculated TDS for *C. dubia*, followed by a conservatively derived site-specific NOEC geomean of 1,038 mg/L calculated TDS for Fathead Minnow. These values are highly conservative and have moderate uncertainty regarding their relevance for TDS toxicity (Attachment 2). As discussed above, site-specific testing for these species generally indicates negligible chronic toxicity at concentrations ≤1,000 mg/L calculated TDS.
- A bounding analysis was conducted to investigate the implications the uncertainty in the *C. dubia* and Fathead Minnow effect concentrations have on the HC_5 where the *C. dubia* reproduction IC_{10} was replaced with the IC_{20} of 1,354 mg/L calculated TDS and the Fathead Minnow dry weight NOEC was replaced with the length NOEC[6] of >2,211 mg/L calculated TDS. The resulting HC_5 for TDS was 1,220 mg/L with confidence limits above 1,000 mg/L TDS (1,038 to 1,462 mg/L TDS).

3.2.4 Proposed Chronic Site-Specific Water Quality Objective

A proposed SSWQO for TDS of 1,000 mg/L (as calculated TDS) to apply in the receiving environment of Third Portage Lake (North Basin) or Wally Lake at the edge of the mixing zone[7] is proposed for protection against chronic toxicity to representative aquatic species.

The proposed SSWQO of 1,000 mg/L is supported by the following considerations:

- Favourable ionic balance— Effect concentrations reported in the compiled dataset were derived from exposures using a balanced TDS mixture; the later has been demonstrated to be favourable for preventing aquatic toxicity relative to mixtures dominated by a single ion. Meadowbank Mine TDS during treated effluent discharge is expected to contain primarily calcium and sodium cations; these dominant ions are among the least toxic according to Mount et al. (1997) and have been identified as key components of TDS that ameliorate toxicity of other ions (Mount et al. 2016; Mount et al. 2019). The information from the ionic composition analysis and comparison to the TDS toxicity dataset for comparable mixtures (Attachment 1; Section 1-2) suggests that the Meadowbank Mine TDS mixture would not exhibit chronic toxicity from TDS components at concentrations of TDS below approximately 1,000 mg/L.

[6] No statistically significant reduction in Fathead Minnow overall survival, post-hatch survival, proportion normal, and hatch rate endpoints were also observed for the site-specific tests (Attachment 2).

[7] The mixing zones for Third Portage Lake and Wally Lake were as defined in WSP (2023a,b).

- Comparability to validated benchmarks at other sites and the literature—Effect concentrations derived from validation of site-specific benchmarks at other mine sites and reported in the literature generally indicate negligible chronic effects to surrogate species at TDS concentrations below 1,000 mg/L for comparable mixtures (Attachment 1; Section 1-4). Meadowbank Mine TDS ionic composition broadly resembles the ionic composition evaluated during the validation of site-specific TDS/sulphate benchmarks for these comparable sites; the latter have been assigned TDS limits of ~1,000 mg/L (or benchmarks for sulphate with corresponding TDS of ~1,000 mg/L).

- Site-specific toxicity study with negligible chronic toxicity—Effect concentrations for *R. subcapitata*, *C. dubia,* and Fathead Minnow (sensitive algae, invertebrate, and fish species) from the site-specific chronic TDS study (Attachment 2) were generally similar to, or higher, than the chronic benchmarks from other sites that are applicable for Meadowbank Mine. The effect concentrations were also higher than the corresponding effect concentrations reported in the literature for phytoplankton. This provides site-specific validation that the Meadowbank mixtures are not more toxicity than other mixtures used to support assigned TDS limits of ~1,000 mg/L.

- Conservatism of test endpoints—Effect concentrations for *C. dubia* (sensitive invertebrate) tend to be among the lowest (i.e., most sensitive) chronic benchmark values from standardized testing of TDS exposures to freshwater aquatic life. Mount et al. (2019) have used this species and endpoint as a model species for the evaluation of chronic toxicity to mixtures of ions in chronic exposures, and Teck Coal Ltd. (2014) has based environmental effects concentrations for sulphate (in a similar mine-related ionic composition) on *C. dubia* reproduction.

- Species sensitivity distribution—The proposed TDS SSWQO of 1,000 mg/L (as calculated TDS) is between the conservatively-derived HC_5 of 979 mg/L TDS following CCME (2007) protocol and the HC_5 of 1,220 mg/L TDS derived using the bounding analysis (Attachment 1, Section 1-5). The HC_5 of 979 mg/L TDS derived following the CCME (2007) protocol is just below the proposed TDS SSWQO. However, all effect concentrations for species used in the SSD are above the HC_5 of 979 mg/L TDS, except the IC_{10} (976 mg/L calculated TDS) for *C. dubia*, which is approximately equal to the HC_5. Site-specific toxicity testing with *C. dubia* indicated that meaningful chronic toxicity does not occur until much higher concentrations of calculated TDS are reached (IC_{20} = 1,354 mg/L calculated TDS).

The proposed TDS SSWQO relies on the following assumption:

- Ionic composition will reflect the composition estimated based on current modelling and measured chemistry data available at the time of this review; it is further assumed the composition will remain relatively stable over time. The benchmark was derived from the anticipated ionic composition for Meadowbank Mine based on monitoring data in the receiving environment and a conservative (upper bound) modelling scenario for effluent. Modelling data are subject to change pending revisions to the mine management plan, requiring confirmation that ionic mixtures will remain consistent in terms of proportions of major ions. If future effluent quality with respect to TDS constituents is markedly different, then re-evaluation of the dataset underlying the proposed TDS benchmark may be warranted.

4.0 CONCLUSION

The review completed herein provides an indication of the proposed ranges of benchmarks for TDS, including the acute toxicity EQC (4,000 to 10,293 mg/L; calculated) and SSWQO (1,000 mg/L; calculated). We trust the information provided in this report is sufficient for your present needs. Should you have any questions regarding this report or require additional information, please do not hesitate to contact the undersigned.

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ATTACHMENT 1

Supplementary Information to Support Proposed Total Dissolved Solids Site-Specific Water Quality Objectives

This attachment presents the supporting technical information for derivations of proposed benchmarks for total dissolved solids (TDS), including for the effluent at the end-of-pipe (acute toxicity EQC; Section 3.1 of the main report) and at the edge of the mixing zone (SSWQO; Section 3.2 of the main report).

1-1.0 CHARACTERISTICS OF TDS

1-1.1 Definition

The TDS parameter is defined as the sum of the concentrations of all common dissolved ions in freshwaters (e.g., sodium [Na^+], calcium [Ca^{2+}], magnesium [Mg^+], potassium [K^+], sulphate [$SO_4{}^{2-}$], bicarbonate [HCO^{3-}], chloride [Cl^-], nitrate [NO^{3-}], fluoride [F^-], and silicate [$SiO_3{}^{2-}$]), and is essentially an expression of salinity. TDS can be calculated using the following equation (APHA 2005):

$$TDS_{calculated\ (mg/L)} = \sum[Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, F^-, SO_4^{2-}, SiO_3^{2-}, 4.42 \times NO_3^-\ (as\ N), 0.6 \times total\ alkalinity\ (as\ CaCO_3)]$$

Concentrations of TDS may also be measured gravimetrically by analytical laboratories (i.e., measured TDS). However, calculated TDS is used herein as the primary basis for derivation of targets for TDS and screening because:

- Laboratory interference can reduce the accuracy of measured TDS (Evaristo-Cordero 2011). In particular, waters with high calcium, magnesium, and chloride concentrations can form hydroscopic residues that absorb water under normal laboratory conditions, potentially biasing the measured TDS higher than actual concentrations (APHA 2005; Evaristo-Cordero 2011). In contrast, calculated TDS is based on the major ions that can measurably contribute to TDS and is therefore not influenced by any changes that may occur from those ions being taken out of solution.
- Calculated TDS incorporates explicit consideration of the ionic composition, which is important for evaluating the toxicity of the TDS mixture (as discussed below).

1-1.2 General Fate and Effects

Dissolved solids occur naturally in water, with the composition and concentration of individual ion constituents varying by location based on natural factors, such as the geology and soil in the watershed, atmospheric precipitation, and the water balance (evaporation-precipitation) (Weber-Scannell and Duffy 2007). Anthropogenic activities can alter the concentration of TDS in the aquatic environment, with effluent from mining or industrial treatment of water identified as common sources of elevated TDS (Soucek 2007; Weber-Scannell and Duffy 2007). Differences in the ratios of calcium to magnesium (Ca:Mg) or relative contribution of sulphate or chloride to the total TDS concentration are common indicators of anthropogenic influence. A review of the literature indicates that when accounting for toxicity for TDS the following observations apply as summarized by Chapman and McPherson (2015):

- TDS toxicity is lower with the presence of more than one cation (i.e., balanced mixtures tend to be less toxic relative to individual ions in isolation).
- Hardness may ameliorate TDS toxicity and the toxicity of individual ions (e.g., chloride and sulphate).
- The relative ratios of ions within the TDS mixture may affect TDS toxicity (e.g., Ca^{2+}:Mg^{2+}).

More recent research by Mount et al. (2016) supports the conclusions by Chapman and McPherson (2015). Following extensive toxicity testing exposing *C. dubia* to different salt mixtures, Mount et al. (2016) concluded that inferring toxicity from individual ions is difficult due in part to interdependence among ions. Buchwalter (2013) concluded that TDS toxicity is complicated by the findings that:

- individual ions vary in toxicity
- some ions in solution can modify the toxicity of other ions
- relative toxicities of ions are not consistent across species

The results from Mount et al. (2016) also support the conclusion that toxicity of TDS mixtures varies by ionic composition, and that the characteristics of the TDS mixture influence the toxicity of other ions in the mixture.

1-2.0 SITE-SPECIFIC TDS COMPOSITION

The following general attributes are anticipated to influence toxicity of TDS for the site-specific mixture:

- **Balance of ions**—the predicted concentrations of ions of the TDS mixture were estimated using several datasets:
  - For treated effluent (at end-of-pipe) under a high TDS concentration[1], the composition of major ions was predicted to be dominated by sulphate (49%), chloride (16%), calcium (10%), sodium (10%), and potassium (4%), with a smaller relative proportion of alkalinity, nitrate, fluoride, and magnesium (Table 1-1; Figure 1-1). This composition represented the modelled “base waters” for the snapshot year 2040 during active closure and was selected as a conservative upper bound of modelled major ion conditions.
  - For treated effluent (at end-of-pipe) under a low TDS concentration[2], the composition of major ions was predicted to be dominated by alkalinity (35%), sulphate (26%), calcium (16%), chloride (7%), magnesium (5%), sodium (5%), nitrate (3%), and potassium (3%), with a smaller relative proportion of fluoride (Table 1-1; Figure 1-1). This composition represented the modelled “base waters” for 2038 to 2060 during periods of discharge (May to October) and was selected as a lower bound of modelled major ion conditions.
  - For receiving environment without discharge, measured chemistry in Wally Lake and TPL (Figure 1-2) was reviewed and the dominant cations were identified calcium and sodium with dominant anions of sulphate and total alkalinity. Total alkalinity is predominant under the baseline TDS composition in Wally Lake and TPL, but this applies under conditions of calculated TDS <40 mg/L; with treated mine effluent discharge, it is expected that the relative proportion of total alkalinity would decline with corresponding increases of calcium, sodium, and sulphate.

[1] Draft treated effluent predictions modelled by Lorax Environmental Services Ltd. for the Vault Pit (base waters; active closure, October 2040) were provided to WSP by Agnico on 30 March 2024 (V0.4.3).

[2] Draft treated effluent predictions modelled by Lorax Environmental Services Ltd. for the Vault Pit were provided to WSP by Agnico on 12 June 2024 (V0.4.5).

- For future conditions at the edge of the mixing zone, the concentrations of ions and ionic composition were estimated by applying a 0.75 dilution factor to the effluent predictions to target an upper bound for edge of mixing zone as a simulated scenario of 2,000 mg/L TDS (Table 1-1) with an ionic composition dominated by sulphate (49%), chloride (16%), sodium (10%), calcium (10%), nitrate (10%), and potassium (4%), with a smaller relative proportion of alkalinity, fluoride, and magnesium (Figure 1-1). It is expected that the edge of mixing zone conditions will be between the measured conditions for the receiving environments without effluent discharge and this simulated scenario.[3]
- The primary exposure and toxicity modifying factor (ETMF) for TDS is ionic composition, reflecting the fact that individual ionic components exhibit different potential to exert toxicity. In general, a balanced mixture of ions results in lower toxicity than strong dominance by an individual ion, particularly dominance by an individual ion with relatively high toxicity. Mount et al. (1997) reported that the relative ion toxicity to freshwater biota was generally potassium > carbonate ≈ magnesium > chloride > sulphate, with calcium and sodium exhibiting relatively low toxicity. Therefore, the toxicity of a TDS mixture depends largely on the composition of ions within the mixture, rather than the total TDS concentration, which on its own is not an accurate predictor of toxicity.

- **Sulphate proportion**—sulphate is one of the dominant individual ions, based on review of model predictions and measured pit chemistry. This is broadly similar to site water composition at several other northern mining projects in Canada, including effluent at Faro Mine and in the Elk Valley, which have sulphate-dominant TDS compositions.
- **Hardness**—Hardness may modify ion-specific toxicity, thereby ameliorating the toxicity of a mixture by reducing the toxicity of individual ions (Kennedy et al. 2005). For example, calcium has been identified as a specific component of hardness that ameliorates sulphate toxicity (Davies and Hall 2007; Mount et al. 2016). Hardness is not considered a ETMF in the case of TDS, because hardness is a component of the TDS mixture and is therefore not an independent factor distinct from ionic composition. However, hardness can be considered for the evaluation of ion-specific toxicity, given that some ions (e.g., sulphate, chloride) are less toxic in hard water. Water hardness was calculated as calcium carbonate ($CaCO_3$) using the following equation:

$$[CaCO_3] = 2.5 \times [Ca^{2+}] + 4.1 \times [Mg^{2+}]$$

[3] Edge of mixing zone predictions generated from assimilative capacity modelling results are anticipated to be available in summer or fall 2024.

Table 1-1: Simulated ion concentrations in effluent and estimated ion concentrations at the edge of the mixing zone

Constituent	Units	Effluent Predictions		Simulated Edge of Mixing Zone[c]
		Vault Pit Predictions Version 4.3[a]	Vault Pit Predictions Version 4.5[b]	
TDS (calculated)	mg/L	2,655	82	2,000
Sulphate	mg/L	1,303	21	982
Chloride	mg/L	415	5.7	313
Calcium	mg/L	260	13	196
Magnesium	mg/L	21	3.9	16
Sodium	mg/L	276	4.5	208
Total Alkalinity	mg/L as $CaCO_3$	27	29	20
Potassium	mg/L	107	2.3	81
Fluoride	mg/L	0.28	0.095	0.21
Nitrate (as N)	mg/L as N	58	0.53	43
Hardness	mg/L as $CaCO_3$	737	48	555

Notes: TDS (mg/L) is calculated as the sum of calcium, chloride, fluoride, magnesium, potassium, sodium, sulphate, alkalinity as carbonate (calculated 0.6 × total alkalinity as $CaCO_3$), and nitrate as NO_3 (calculated 4.427 x nitrate as N; APHA 2012).

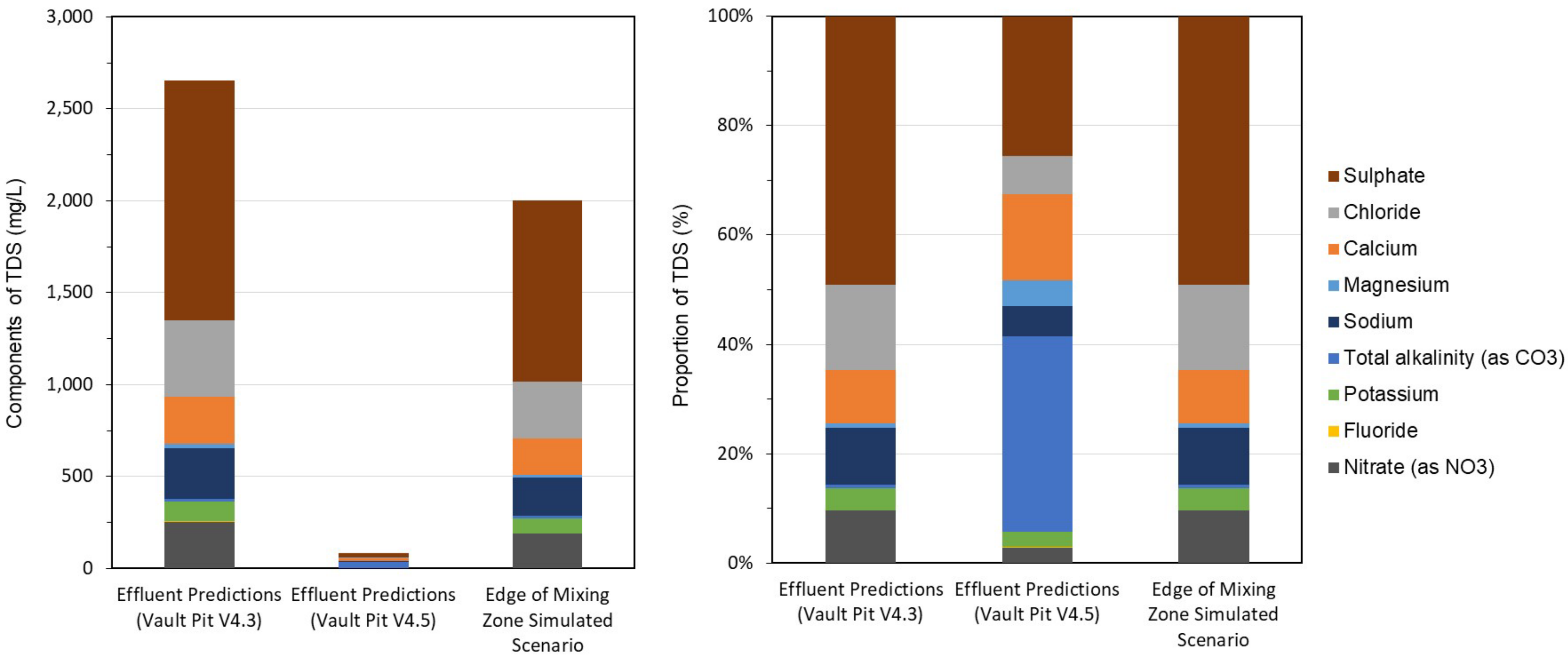
TDS = total dissolved solids; mg/L = milligrams per litre; N = nitrogen; $CaCO_3$ = calcium carbonate.

(a) Draft treated effluent predictions were provided by Lorax for the Vault Pit to WSP by Agnico on March 30 2024.

(b) Draft treated effluent predictions were provided by Lorax for the Vault Pit to WSP by Agnico on June 12 2024.

(c) The simulated edge of mixing zone scenario was generated by applying a dilution factor of 0.75 to the effluent predictions to reach TDS of 2,000 mg/L. The dilution factor of 0.75 (1.33:1) was chosen to be a "worst-case scenario" given that the predicted minimum dilution factor (as provided by Tetra Tech Canada Incorporated to Agnico Eagle) for Wally Lake is estimated to be closer to 0.5 (2:1), and 0.077 (13:1) for Third Portage Lake (see table below). For the 2024 investigations, a higher level of conservatism was taken and assumed a lower level of dilution than is expected (greater exposure concentrations).

Figure 1-1: Total dissolved solid concentration (left) and composition (right) in simulated effluent and estimated edge of the mixing zone

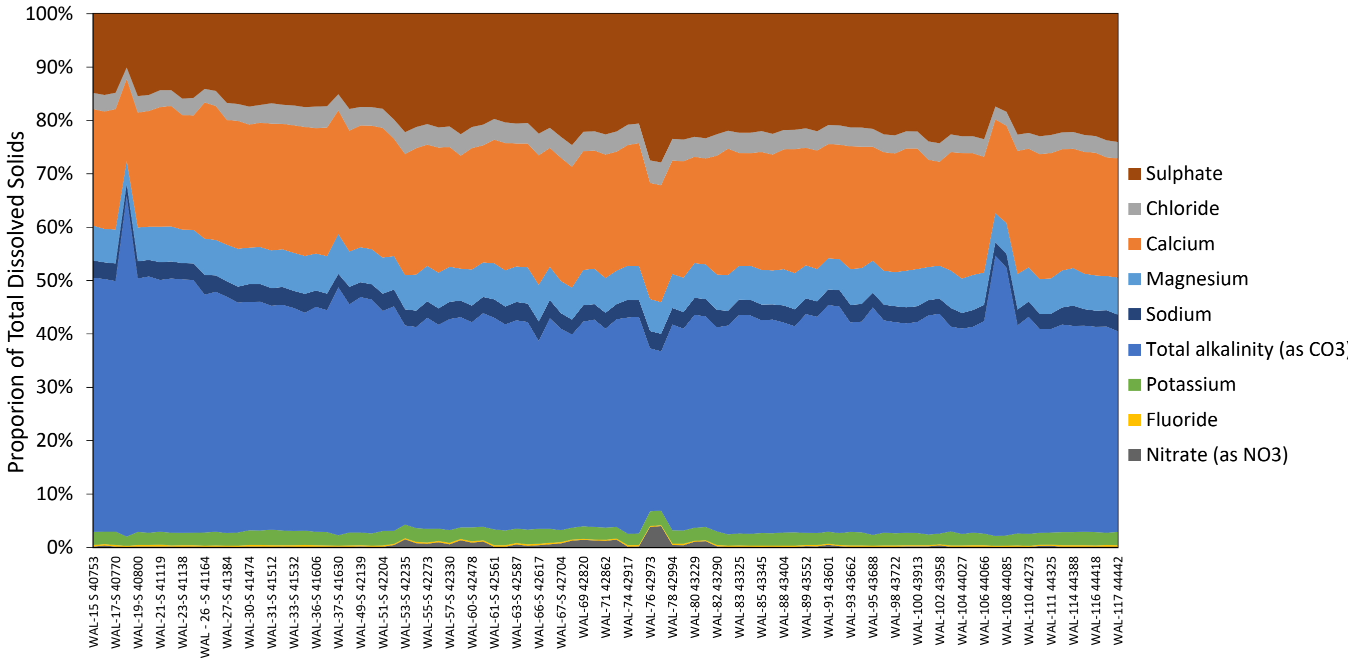


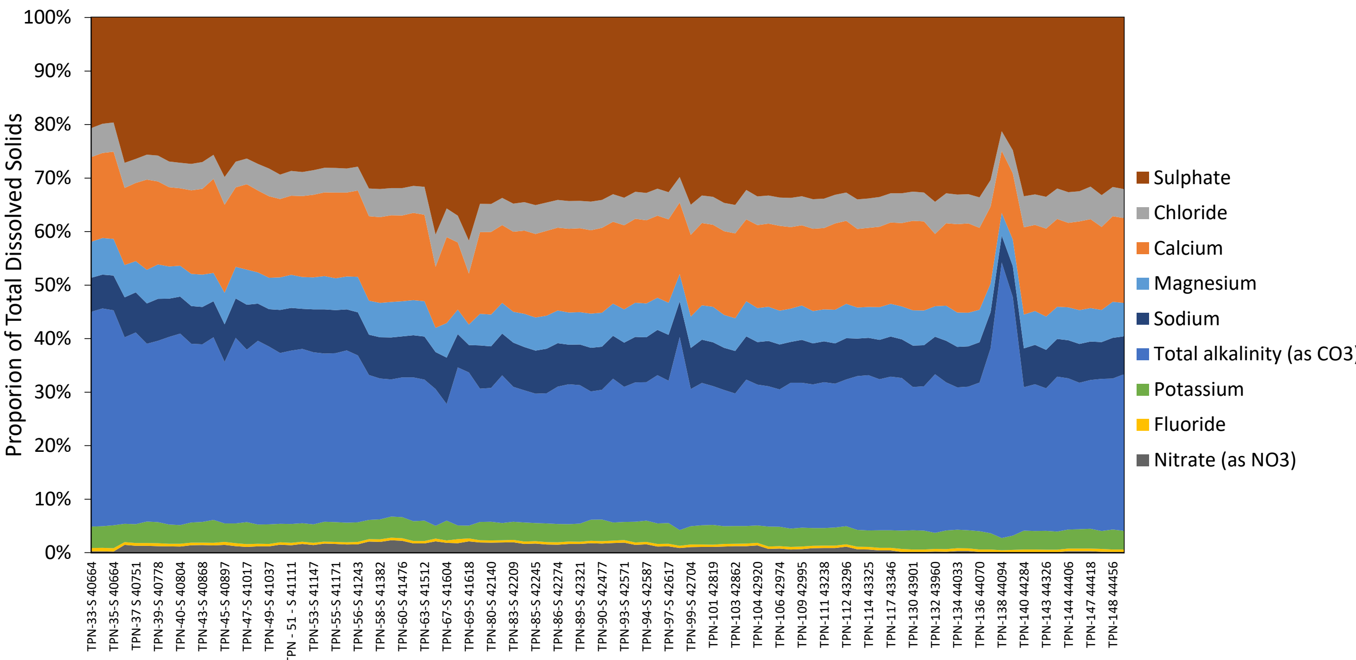
Notes: The simulated edge of mixing zone scenario was generated by applying a dilution factor of 0.75 to the V.3 effluent predictions to reach TDS of 2,000 mg/L.

TDS (mg/L) is calculated as the sum of calcium, chloride, fluoride, magnesium, potassium, sodium, sulphate, alkalinity as carbonate (calculated 0.6 × total alkalinity as $CaCO_3$), and nitrate as NO_3 (calculated 4.427 x nitrate as N; APHA 2012).

TDS = total dissolved solids; V = version; CO_3 = carbonate ion; NO_3 = nitrate ion; mg/L = milligrams per litre.

Figure 1-2: Measured total dissolved solid composition in Wally Lake (top) and Third Portage Lake (north basin; bottom), 2010 to 2021





Notes: Monitoring data was obtained from Azimuth (2022) CREMP environmental monitoring database. Data were included for all stations sampled within Wally Lake and Third Portage Lake (north basin) from 2010 to 2021. Data collected prior to 2010 either did not measure the full suite of major ions or had atypically high detection limits relative to the bulk of the dataset.

Data on the x-axis represent samples collected at each station within a year from 2010 to 2021.

1-3.0 ACUTE TOXICITY DATA FOR TDS

Acute toxicity testing data and corresponding water chemistry data were collected by Veolia (2022) and Agnico Eagle as part of a Mock Effluent evaluation of the treatment efficiency in ameliorating acute lethality in Pit E water (ST-19). Pit E water is predicted to have the highest TDS concentrations on average relative to the other pits. Acute toxicity tests performed were:

- Biological Test Method: Reference Method for Determining Acute Lethality of Effluent to *Daphnia magna* (ECCC 2000a).
- Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout (ECCC 2000b).

Acute toxicity test species include the standard protocols (*D. magna* and Rainbow Trout) used to assess compliance for acute lethality under the Metal and Diamond Mining Effluent Regulations (MDMER; Government of Canada 2002). Acute toxicity test results and corresponding water chemistry data for TDS (measured and calculated) and sulphate are presented in Table 1-2, ionic composition are presented in Figure 1-3, and raw laboratory results are provided in Appendix A.

Acute toxicity testing conducted from 2022 to 2023 with treated Pit E water has indicated no acute toxicity per regulatory definition (i.e., LC_{50} >100% vol/vol) to *D. magna* or Rainbow Trout survival with measured TDS concentrations up to and including 4,000 mg/L (calculated TDS concentrations of 4,050 mg/L). Smaller magnitude responses, which did not trigger acute toxicity per the Metal and Diamond Mining Effluent Regulations definition, were occasionally observed:

- Reduced survival in D. magna (40% in full-strength sample) and Rainbow Trout (20% in full-strength sample) was observed in a sample collected November 7, 2022, at measured TDS concentrations of 2,900 mg/L (calculated TDS concentrations of 2,834 mg/L).
- Reduced survival in Rainbow Trout (20% in full-strength sample) was observed in a sample collected December 7, 2022, at measured TDS concentrations of 3,500 mg/L (calculated TDS concentrations of 2,382 mg/L).
- In both cases, mortality did not exceed 50%, and several other unamended samples have since been tested with measured TDS concentrations greater than 2,812 mg/L, all of which indicated no acutely toxic effects to Rainbow Trout and D. magna.

Collectively, this review of available acute toxicity data for Meadowbank Mine indicates that acute lethality to regulatory test species *D. magna* and Rainbow Trout is not expected at end-of-pipe with measured TDS concentrations of less than or equal to 4,000 mg/L. This conclusion is strengthened by results of testing of even higher concentrations of simulated effluent (achieved through cryo-concentration in the laboratory) which validated the expected of non-lethality to at least 4,000 mg/L, if not greater.

Table 1-2: Acute toxicity data for Mock Treated Effluent (Pit E, ST-19), Meadowbank Mine

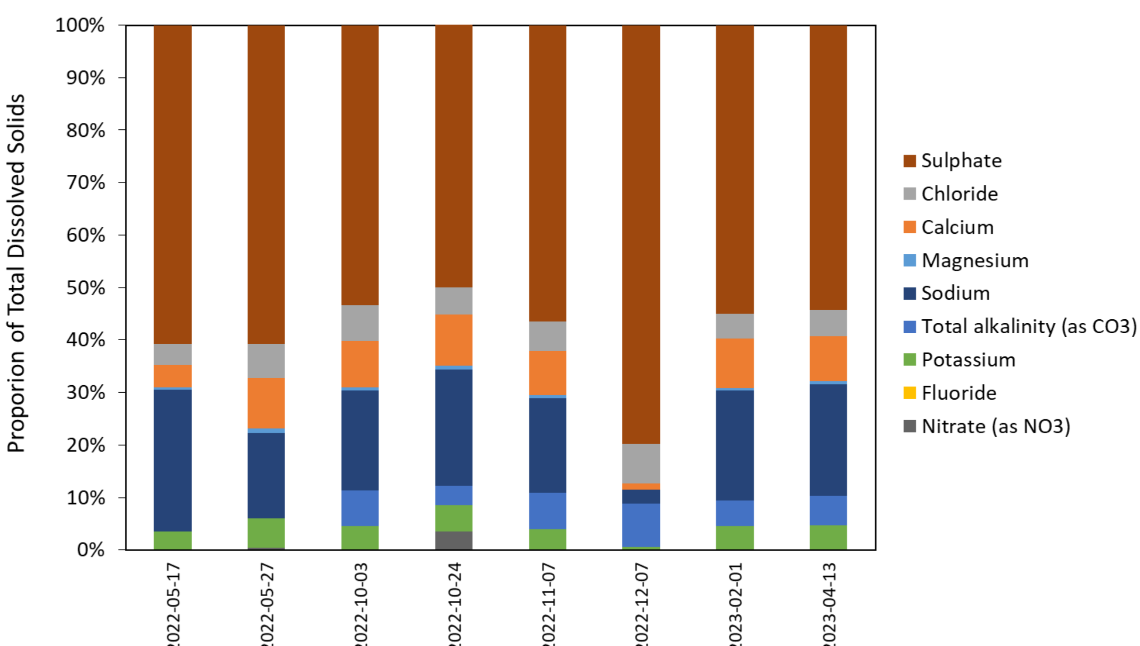
Sample Date	Acute Toxicity				Water Chemistry (mg/L)			
	Daphnia magna		Rainbow Trout *Oncorhynchus mykiss*					
	48-hour Survival in Full-Strength Sample (%)	48-hour Survival LC_{50} (% vol/vol)	96-hour Survival in Full-Strength Sample (%)	96-hour Survival LC_{50} (% vol/vol)	Measured TDS	Calculated TDS	Sulphate	Total Hardness
May 17 2022	100	>100	100	>100	2,490	3,079	1,870	395
May 27 2022	100	>100	100	>100	2,480	2,963[(a)]	1,800	819
October 3 2022	100	>100	100	>100	3,200	2,812	1,500	707
October 24 2022	100	>100	100	>100	3,500	3,606	1,800	992
November 7 2022	60	>100	80	>100	2,900	2,834	1,600	672
December 7 2022	100	>100	80	>100	3,500	2,382	1,900	75
February 1 2023	100	>100	100	>100	3,900	3,817	2,100	990
April 13 2023	100	>100	100	>100	4,000	4,050	2,200	970

Notes: Hardness is reported as calcium carbonate.

TDS = total dissolved solids; mg/L = milligrams per litre; LC_X = lethal concentration causing a lethal effect to x% of the test population; vol/vol = volume per volume.

(a) Dissolved calcium, magnesium, potassium, and sodium were not analyzed, therefore TDS was calculated using the total fraction of these constituents.

Figure 1-3: Measured total dissolved solid composition in Mock Treated Effluent Blends of Pit E water, 2022 to 2023



Notes: Total dissolved solid composition from treated Pit E water (ST-19) collected by Veoila (2022) and Agnico (T. Gentry) between 2022 to 2023 using benchtop-scale treatment.

Additional lines of evidence compiled from the literature to support evaluation of acute lethality to these test species for comparable TDS mixtures are:

- **Meliadine Mine (Golder 2021)**— a series of toxicity tests were conducted to support validation of the TDS acute toxicity EQC and SSWQO established for Meliadine Mine. As part of this work, toxicity identification evaluation (TIE) testing was conducted with the cladoceran *C. dubia* to evaluate if effects on the survival endpoint changed with a shift in the ionic composition while the TDS concentration was held constant. Meliadine Mine TDS composition is chloride-dominant, but one of the mixtures evaluated in the TIE involved reduction of the relative proportion of chloride by replacing with increased relative proportion of sulphate. The 7-d LC_{50} for *C. dubia* shifted from 3,581 mg/L TDS in the chloride-dominant TDS mixtures (~50% chloride as TDS; ~8% sulphate as TDS) to no effect (i.e., 100% survival) with an unbounded LC_{50} of >4,250 mg/L in a sulphate-dominant TDS mixture (~35% sulphate as TDS; ~23% chloride as TDS). The *C. dubia* survival endpoint is a highly sensitive indicator of short-term toxicity and is not routinely applied as a measure of acute toxicity under the MDMER or other effluent discharge regulations, as it is a classified as chronic test, and has been demonstrated to be more sensitive than the standard tests used to evaluate acute toxicity in undiluted effluent (i.e., Rainbow Trout and *D. magna*). Confirmation of an LC_{50} for *C. dubia* for a TDS mixture broadly comparable to Meadowbank Mine, for a highly sensitive aquatic species, and for a longer test duration relative to *D. magna*, provides an additional margin of safety confirming no expectation of acute toxicity at TDS concentrations ~4,000 mg/L.
- **Faro Mine (CIRNAC 2020)**— Site-specific testing programs were conducted using mock treated effluent waters for the Faro Mine Site to evaluate short-term sulphate effluent quality criteria (as a surrogate for TDS) developed for the site. The ionic composition of site waters used in testing was calcium-sulphate dominant. Acute toxicity testing was conducted with Rainbow Trout (96-hr exposure) and *D. magna* (48-hr exposure). Testing was conducted under high water hardness conditions (>250 mg/L as $CaCO_3$). No acute toxicity was observed to either test species at the highest tested sulphate concentration of 2,890 mg/L, corresponding to a calculated TDS concentration ranging from 3,870 to 3,960 mg/L.

1-4.0 CHRONIC TOXICITY DATA FOR TDS

This review of chronic toxicity data from the literature and other sites was drawn from recent work completed for other projects. The dataset was screened to reflect exposure conditions broadly representative of the expected TDS composition at Meadowbank as informed by the current modelled predictions and measured chemistry data:

- Ionic composition—as ionic composition is the most important factor for evaluating TDS toxicity, data were retained from the literature and other sites with a broadly comparable (i.e., sulphate-dominant) ionic composition to Meadowbank Mine. Based on review of calcium and magnesium concentrations in the pit lakes and receiving environment lakes for Meadowbank Mine, it is expected that the calcium to magnesium (Ca:Mg) ratio will be greater than 1.0. Therefore, only data from the literature and other sites evaluating a Ca:Mg ratio of >1.0 were retained herein. If the ionic composition was not reported or could not be discerned from the information provided by the authors, then the study was excluded.

- Hardness—although hardness is not the primary exposure toxicity modifying factor for TDS toxicity, it is important for evaluating individual ion toxicity for sulphate. Therefore, the dataset was also tailored based on hardness conditions. Data were retained where the nominal hardness levels were ≥100 mg/L as $CaCO_3$.

Currently, there are no federal, Provincial, or Territorial water quality guidelines for TDS in Canada. Several other sites have developed criteria/benchmarks/SSWQO that are applicable for Meadowbank (i.e., sulphate-dominant TDS mixtures):

- **Alaska Criteria (ADEC 2009; Brix et al. 2010)**—TDS criteria range from 500 to 1,500 mg/L (ADEC 2009), depending on the TDS composition and whether the receiving environment is potential salmon spawning habitat. Permits are required for discharges to receiving water that result in an increase in TDS concentration in the waterbody between 500 and 1,000 mg/L. Chapman et al. (2000) reported that studies conducted for Coeur Alaska's Kensington Mine site resulted in the first site-specific TDS permit in Alaska. The permit states that TDS may not exceed 1,000 mg/L in Sherman Creek, the receiving waterbody of Kensington Mine effluent (ADEC 2017). Alaska also granted a site-specific permit for Red Dog Mine effluent (ADEC 2013; Brix et al. 2010). Concentrations of TDS up to 1,500 mg/L are permitted during periods when salmonids are not spawning, provided calcium is greater than 50% by weight of the total cations (ADEC 2013; Brix et al. 2010). During spawning periods only, the limit was set at 500 mg/L (Brix et al. 2010). The studies used to establish the Alaskan TDS water quality criterion were based on ionic compositions dominated by calcium sulphate, which is relevant for Meadowbank Mine.

- **IDNR Criteria (IDNR 2009)**—In 2004, the Iowa Department of Natural Resources (IDNR) adopted an interim TDS standard of 1,000 mg/L in receiving streams; the standard was used as a screening value to determine whether site-specific toxicity testing was required (IDNR 2009). However, IDNR since recommended replacing the TDS standard with numerical sulphate and chloride criteria (IDNR 2009) under the assumption that the individual ions provide a more defensible basis for evaluating toxicity relative to the sum of the ions.

- **Faro Mine (CIRNAC 2020)**—Site-specific testing programs were conducted using waters from the Faro Mine Site in the Yukon, Canada to evaluate a long-term sulphate SSWQO (as a surrogate for TDS) developed for the site. The ionic composition of site waters used in testing was calcium-sulphate dominant. Chronic toxicity testing was conducted with early lifestage Fathead Minnow (*Pimephales promelas*; 7-d exposure), *C. dubia* neonates (<24-hr old, 3 brood exposure), and alga *Pseudokirchneriella subcapitata* (72-hr growth inhibition). Testing was conducted under high water hardness conditions (>250 mg/L as $CaCO_3$). No chronic toxicity to Fathead Minnow was observed with a NOEC of 2,106 mg/L TDS (1,480 mg/L sulphate). The most sensitive endpoint was *C. dubia* reproduction (EC_{20} = 1,744 mg/L TDS; 1,154 mg/L sulphate), followed by *P. subcapitata* growth (EC_{20} = 1,796 mg/L TDS; 1,211 mg/L sulphate). Based on this, Faro Mine established an SSWQO of sulphate of up to 800 mg/L at hardness of 432 mg/L (as $CaCO_3$), which corresponds to a TDS composition of ~1,143 to 1,212 mg/L (assuming 66% to 70% SO_4 as TDS).

- **Elk Valley Coal Mining Operations (Teck 2014)**—Site-specific testing programs were conducted using waters from the Elk Valley in southeastern British Columbia in support of the Elk Valley Water Quality Plan (Teck 2014). Testing programs evaluated the sensitivity of sulphate to crustaceans and other invertebrates, and to fish. Site-specific toxicity testing conducted in support of the Elk Valley Water Quality Plan consisted of two programs: the Phase 1 Mixture Toxicity Study (Golder and Nautilus 2013) and the Fall 2013 testing program (Teck 2014). The ionic composition of the exposure waters in all of these studies was calcium sulphate dominant.
  - The Phase 1 Mixture Toxicity Study evaluated sulphate toxicity under high hardness conditions (>500 mg/L as $CaCO_3$) to Rainbow Trout (*Oncorhynchus mykiss*) embryo-alevin (28-d exposure), *C. dubia* neonates (<24-hr old, 7-d exposure), and mayfly *Centroptilum triangulifer* (28-d exposure). The most sensitive endpoint was for Rainbow Trout development with an IC_{20} of 530 mg/L at a hardness concentration of 830 mg/L. The next most sensitive endpoint reported by Golder and Nautilus (2013) was for *C. dubia* reproduction with an IC_{20} of 595 mg/L at a hardness concentration of 910 mg/L. Based on the lowest reported chronic endpoints, Golder and Nautilus (2013) concluded that the benchmark for chronic toxic effects from sulphate in the very hard site-specific water was between 500 and 600 mg/L SO_4, with associated TDS concentrations approximately equal to or greater than 1,000 mg/L.
  - The Fall 2013 testing program evaluated sulphate toxicity under high hardness conditions (>100 mg/L as $CaCO_3$) to Rainbow Trout swim-up fry (28-d exposure), early life stage Fathead Minnow (7-d exposure), *C. dubia* neonates (<24-hr old, 3 brood exposure), and the amphipod *Hyalella azteca* (14-d exposure). Sulphate was not toxic to *C. dubia*, *H. azteca*, Fathead Minnow, or Rainbow Trout up to the maximum sulphate concentrations tested (approximately 1,100 to 1,200 mg/L) corresponding to TDS of >1,000 mg/L. Individual replicates for some tests exhibited performance for survival, growth, or reproduction that were below reference responses, but overall patterns indicated weak or non-existent concentration responses across the range of sulphate concentrations.

In addition to the derived benchmarks for other sites, literature data were compiled from studies that met the screening criteria presented earlier (Table 1-3). The following trends were identified for generic TDS mixture-based tests amended with multiple salts[4] conducted for other sites and reported in the literature data:

- Phytoplankton—effect concentrations for phytoplankton are generally higher than 1,000 mg/L. One study indicated lower tolerance of phytoplankton below 1,000 mg/L (LeBlond and Duffy 2001), but this was with a TDS composition of 70% sulphate as TDS. For TDS mixtures with composition closer to Meadowbank Mine, the TDS effect concentrations were higher than 1,000 mg/L.
- Benthic invertebrates and zooplankton—in general, adverse effect concentrations were above 1,000 mg/L, with the following exceptions. Kunz et al. (2013) reported lower (estimated) TDS effect concentrations for the amphipod *H. azteca* (MATC ~787 mg/L TDS) and the cladoceran *C. dubia* (MATC ~790 mg/L TDS) relative to the rest of the dataset. This study reported hypothesis-based endpoints from a limited number (n=4) of treatments; the significant reduction in the test endpoints occurred between two treatments with a more than four-fold difference in test concentrations. In the absence of regression-based endpoints, the maximum allowable toxicant concentration (MATC) was calculated as the geometric mean of the no observed effect concentration (NOEC)[5] and lowest observed effect concentration (LOEC)[6] reported in the study; the MATC is a more preferred endpoint for benchmark derivation than a NOEC or LOEC (CCME 2007). Because of the study design (i.e., wide concentration series), the MATC for these two species is highly uncertain. Data from two other studies for *H. azteca* and five other studies for *C. dubia* reported TDS effect concentration greater than 1,000 mg/L.
- Fish—Fish were similarly or less sensitive to TDS toxicity than zooplankton and plants, with effect concentrations for ranging from 1,116 mg/L to 2,039 mg/L TDS (geometric means).

[4] Lower effect concentrations have been reported for individual ions for select species (grey shaded rows of Table 1-3), but these tests reflect exposure conditions accounting for a single ion, and not a balanced TDS mixture representative of most field conditions. As discussed earlier, TDS toxicity is dependent on the characteristics of the mixture and therefore inferring TDS toxicity from individual ions is difficult due in part to interdependence among ions.

[5] Highest test concentration with no significant difference in test endpoint relative to control.

[6] Lowest test concentration with a significant difference in test endpoint relative to control.

Table 1-3: Chronic toxicity test dataset for sulphate-dominant total dissolved solid mixtures

Receptor	Test Species	Common Name	Life Stage	Test Duration	Endpoint	Test Statistic	Geomean TDS (mg/L)[a]	Result (mg/L)		Hardness (mg/L as $CaCO_3$)	Ca:Mg Ratio	TDS Composition	Amendment Salt	Reference
								TDS[b]	Sulphate					
Fish	*Oncorhynchus tshawytscha*	Chinook salmon	eyed eggs to alevin	28 d	survival	LC_{10}	1,980	1,980	1,287	263	2.3	Sodium-sulphate dominant	Sodium sulphate	Teck 2014 (Annex F, Appendix D, PESC in BC MOE 2013)
Fish	*Oncorhynchus mykiss*	Rainbow Trout	fry	7 d	mortality and growth	NOEC	>2,039	>1,999	>1,399	1,412	13	Calcium-sulphate dominant (70% SO_4 as TDS)	Calcium, magnesium, and potassium salts	Chapman et al. 2000 (Red Dog mine)
Fish	*Oncorhynchus mykiss*	Rainbow Trout	fry	7 d	mortality and growth	NOEC		>2,080	>1,040	1,256	14	Calcium-sulphate dominant (50% SO_4 as TDS)	Calcium, magnesium, and potassium salts	Chapman et al. 2000 (Kensington mine)
Fish	*Oncorhynchus mykiss*	Rainbow Trout	embryos	7 d	viability	NOEC	>1,999	>1,999	>1,399	1,261	13	Calcium-sulphate dominant (70% SO_4 as TDS)	Calcium, magnesium, and potassium salts	Chapman et al. 2000 (Red Dog mine)
Fish	*Oncorhynchus mykiss*	Rainbow Trout	embryo-alevin	7 d	survival, growth, and biomass	EC_{10}	>1,214	>1,113	>945	206	3.3	Bicarbonate-calcium-sulphate dominant	Calcium sulphate and magnesium sulphate	Teck 2014 (Fall 2013)
Fish	*Oncorhynchus mykiss*	Rainbow Trout	embryo-alevin	7 d	survival, growth, and biomass	EC_{10}		>1,058	>905	161	4.5	Bicarbonate-calcium-sulphate dominant	Calcium sulphate and magnesium sulphate	Teck 2014 (Fall 2013)
Fish	*Oncorhynchus mykiss*	Rainbow Trout	embryo-alevin	7 d	survival, growth, and biomass	EC_{10}		>1,430	>1,140	480	2.1	Bicarbonate-calcium-sulphate dominant	Calcium sulphate and magnesium sulphate	Teck 2014 (Fall 2013)
Fish	*Oncorhynchus mykiss*	Rainbow Trout	embryo-alevin	7 d	survival, growth, and biomass	EC_{10}		>1,289	>1,050	364	2.5	Bicarbonate-calcium-sulphate dominant	Calcium sulphate and magnesium sulphate	Teck 2014 (Fall 2013)
Fish	*Oncorhynchus mykiss*	Rainbow Trout	<24 h old gametes	29 d	survival	EC_{25}	1,437	2,316	1,621	54 to ~1,900	2.5	Calcium-sulphate dominant[c]	Calcium sulphate and magnesium sulphate	Van Geest et al. 2018a[d]
Fish	*Oncorhynchus mykiss*	Rainbow Trout	<24 h old gametes	29 d	survival	EC_{25}		1,895	1,232	54 to ~1,900	2.5	Calcium-sulphate dominant[c]	Calcium sulphate and magnesium sulphate	Van Geest et al. 2018a[d]
Fish	*Oncorhynchus mykiss*	Rainbow Trout	embryo-alevin	28 d	survival, growth, and biomass	IC_{20}		923	530	830	2.6	Bicarbonate-calcium-sulphate dominant	Calcium sulphate and magnesium sulphate	Teck 2014 (PI MTS)
Fish	*Oncorhynchus mykiss*	Rainbow Trout	embryo-alevin	28 d	survival, growth, and biomass	IC_{20}		1,052	622	946	2.6	Bicarbonate-calcium-sulphate dominant	Calcium sulphate and magnesium sulphate	Teck 2014 (PI MTS)
Fish	*Oncorhynchus mykiss*	Rainbow Trout	embryo-alevin	28 d	normal alevins	EC_{10}	1,802	1,802	1,187	1,559	5.1	Calcium-sulphate dominant	Calcium sulphate and magnesium sulphate	CIRNAC 2020
Fish	*Oncorhynchus mykiss*	Rainbow Trout	embryo-alevin	55 d	survival, growth	LOEC	4,836	4,836	>3,240	103	3.1	Sodium-sulphate dominant	Sodium sulphate	Wang et al. 2020
Fish	*Oncorhynchus mykiss*	Rainbow Trout	embryo-alevin	21 d	survival	LC_{10}	512	371	162	104	4.9	Sodium-sulphate dominant	Sodium sulphate	Teck 2014 (Annex F, Appendix D, PESC in BC MOE 2013)
Fish	*Oncorhynchus mykiss*	Rainbow Trout	embryo-alevin	21 d	survival	LC_{10}		707	191	257	4.9	Sodium-sulphate dominant	Sodium sulphate	Teck 2014 (Annex F, Appendix D, PESC in BC MOE 2013)
Fish	*Pimephales promelas*	Fathead Minnow	<24 h post-hatch	7 d	survival and growth	EC_{10}	1,454	2,106	1,480	1,559	4.8	Calcium-sulphate dominant	Calcium sulphate and magnesium sulphate	CIRNAC 2020
Fish	*Pimephales promelas*	Fathead Minnow	<24 h post-hatch	7 d	survival	EC_{10}		>1,096	>947	161	4.5	Bicarbonate-calcium-sulphate dominant	Calcium sulphate and magnesium sulphate	Teck 2014
Fish	*Pimephales promelas*	Fathead Minnow	<24 h post-hatch	7 d	survival	EC_{10}		>1,440	>1,150	485	2.1	Bicarbonate-calcium-sulphate dominant	Calcium sulphate and magnesium sulphate	Teck 2014
Fish	*Pimephales promelas*	Fathead Minnow	<24 h post-hatch	7 d	survival	EC_{10}		>1,346	>1,100	378	2.5	Bicarbonate-calcium-sulphate dominant	Calcium sulphate and magnesium sulphate	Teck 2014
Fish	*Pimephales promelas*	Fathead Minnow	<24 h post-hatch	7 d	survival	EC_{20}	>1,116	>1,116	>948	245	3.3	Bicarbonate-calcium-sulphate dominant	Calcium sulphate and magnesium sulphate	Teck 2014
Fish	*Pimephales promelas*	fathead minnow	<24 h embryos	34 d	survival	IC_{10}	968	455	250	106	2.9	Sodium-sulphate dominant	Sodium sulphate	Wang et al. 2016
Fish	*Pimephales promelas*	fathead minnow	<24 h embryos	34 d	survival	IC_{10}		768	430	103	2.9	Sodium-sulphate dominant	Sodium sulphate	Wang et al. 2016
Fish	*Pimephales promelas*	fathead minnow	<24 h embryos	14 d	survival	IC_{10}		845	507	108	3.0	Sodium-sulphate dominant	Sodium sulphate	Wang et al. 2016

Table 1-3: Chronic toxicity test dataset for sulphate-dominant total dissolved solid mixtures

Receptor	Test Species	Common Name	Life Stage	Test Duration	Endpoint	Test Statistic	Geomean TDS (mg/L)[(a)]	Result (mg/L)		Hardness (mg/L as $CaCO_3$)	Ca:Mg Ratio	TDS Composition	Amendment Salt	Reference
								TDS[(b)]	Sulphate					
Fish	*Pimephales promelas*	fathead minnow	<24 h embryos	14 d	survival	IC_{10}		1,640	1,066	103	1.3	Sodium-sulphate dominant	Sodium sulphate	Wang et al. 2016
Fish	*Pimephales promelas*	fathead minnow	<24 h embryos	7 d	survival	IC_{10}		783	470	110	3.0	Sodium-sulphate dominant	Sodium sulphate	Wang et al. 2016
Fish	*Pimephales promelas*	fathead minnow	<24 h embryos	7 d	survival	IC_{10}		1,411	917	100	1.3	Sodium-sulphate dominant	Sodium sulphate	Wang et al. 2016
Fish	*Pimephales promelas*	fathead minnow	<24 h embryos	7 d	survival	IC_{10}		1,684	1,078	108	1.2	Sodium-sulphate dominant	Sodium sulphate	Wang et al. 2016
Fish	*Pimephales promelas*	fathead minnow	<24 h embryos	7 d	survival	IC_{10}		1,661	1,063	109	2.9	Sodium-sulphate dominant	Sodium sulphate	Wang et al. 2016
Fish	*Pimephales promelas*	fathead minnow	<1 d embryos	34 d	biomass	IC_{10}		500	265	102	2.9	Sodium-sulphate dominant	Sodium sulphate	Wang et al. 2016
Fish	*Pimephales promelas*	fathead minnow	larvae (<24 hour post-hatch)	7 d	survival	LC_{10}	2,722	1,857	1,120	117	4.8	Sodium-sulphate dominant	Sodium sulphate	Teck 2014 (Annex F, Appendix D, PESC in BC MOE 2013)
Fish	*Pimephales promelas*	fathead minnow	larvae (<24 hour post-hatch)	7 d	biomass	LC_{10}		3,989	2,969	317	5.7	Sodium-sulphate dominant	Sodium sulphate	Teck 2014 (Annex F, Appendix D, PESC in BC MOE 2013)
Invertebrate	*Ceriodaphnia dubia*	water flea	<24 h old neonates	8 d	reproduction	EC_{25}	1,511	2,193	>1,535	54 to ~1,900	2.5	Calcium-sulphate dominant[(c)]	Calcium sulphate and magnesium sulphate	Van Geest et al. 2018a[(d)]
Invertebrate	*Ceriodaphnia dubia*	water flea	<24 h old neonates	8 d	reproduction	EC_{25}		2,286	>1,600	54 to ~1,900	2.5	Calcium-sulphate dominant[(c)]	Calcium sulphate and magnesium sulphate	Van Geest et al. 2018a[(d)]
Invertebrate	*Ceriodaphnia dubia*	water flea	<24 h neonate	3-brood	reproduction	EC_{20}		1,744	1,154	1,481	4.7	Calcium-sulphate dominant	Calcium sulphate and magnesium sulphate	CIRNAC 2020
Invertebrate	*Ceriodaphnia dubia*	water flea	<24 h old neonates	7 d	reproduction	EC_{20}		1,019	452	779	75	Calcium-chloride-sulphate dominant	Calcium sulphate and calcium chloride	Mount et al. 2019
Invertebrate	*Ceriodaphnia dubia*	water flea	<24h neonate	8 d	reproduction	IC_{20}		1,012	595	910	2.6	Bicarbonate-calcium-sulphate dominant	Calcium sulphate and magnesium sulphate	Teck 2014 (PI MTS)
Invertebrate	*Ceriodaphnia dubia*	water flea	<24h neonate	8 d	reproduction	IC_{20}		1,322	840	1,189	2.3	Bicarbonate-calcium-sulphate dominant	Calcium sulphate and magnesium sulphate	Teck 2014 (PI MTS)
Invertebrate	*Ceriodaphnia dubia*	water flea	<24h neonate	8 d	reproduction	EC_{10}	>1,222	>1,092	>894	245	3.3	Bicarbonate-calcium-sulphate dominant	Calcium sulphate and magnesium sulphate	Teck 2014 (Fall 2013)
Invertebrate	*Ceriodaphnia dubia*	water flea	<24h neonate	8 d	reproduction	EC_{10}		>1,100	>951	245	3.3	Bicarbonate-calcium-sulphate dominant	Calcium sulphate and magnesium sulphate	Teck 2014 (Fall 2013)
Invertebrate	*Ceriodaphnia dubia*	water flea	<24h neonate	8 d	reproduction	EC_{10}		>1,455	>1,165	245	3.3	Bicarbonate-calcium-sulphate dominant	Calcium sulphate and magnesium sulphate	Teck 2014 (Fall 2013)
Invertebrate	*Ceriodaphnia dubia*	water flea	<24h neonate	8 d	reproduction	EC_{10}		>1,276	>1,030	245	3.3	Bicarbonate-calcium-sulphate dominant	Calcium sulphate and magnesium sulphate	Teck 2014 (Fall 2013)
Invertebrate	*Ceriodaphnia dubia*	water flea	<24 h old neonates	7 d	reproduction (mean offspring per female)	MATC[(e)]	790	790	411	235 to 1,461	1.7	Sodium-sulphate dominant	Multiple salts	Kunz et al. 2013
Invertebrate	*Ceriodaphnia dubia*	water flea	<24 h old neonates	7 d	reproduction	EC_{10}	1,409	1,327	849	106	2.9	Sodium-sulphate dominant	Sodium sulphate	Wang et al. 2016
Invertebrate	*Ceriodaphnia dubia*	water flea	<24 h old neonates	7 d	reproduction	EC_{10}		1,497	958	105	2.9	Sodium-sulphate dominant	Sodium sulphate	Wang et al. 2016
Invertebrate	*Ceriodaphnia dubia*	water flea	<24 h old neonates	7 d	reproduction	EC_{20}	853	853	546	607	58	Calcium-sulphate dominant	Calcium sulphate	Mount et al. 2019
Invertebrate	*Hyalella azteca*	amphipod	2 to 9 d old	14 d	growth (average dry weight)	EC_{25}	1,527	868	564	54 to ~1,900	2.5	Calcium-sulphate dominant[(c)]	Calcium sulphate and magnesium sulphate	Van Geest et al. 2018a[(d)]
Invertebrate	*Hyalella azteca*	amphipod	2 to 9 d old	14 d	growth (average dry weight)	EC_{25}		2,685	>1,745	54 to ~1,900	2.5	Calcium-sulphate dominant[(c)]	Calcium sulphate and magnesium sulphate	Van Geest et al. 2018a[(d)]

Table 1-3: Chronic toxicity test dataset for sulphate-dominant total dissolved solid mixtures

Receptor	Test Species	Common Name	Life Stage	Test Duration	Endpoint	Test Statistic	Geomean TDS (mg/L)[a]	Result (mg/L)		Hardness (mg/L as $CaCO_3$)	Ca:Mg Ratio	TDS Composition	Amendment Salt	Reference
								TDS[b]	Sulphate					
Invertebrate	*Hyalella azteca*	amphipod	-	14 d	survival, growth, and biomass	EC_{10}	>1,250	>1,148	>950	245	3.3	Bicarbonate-calcium-sulphate dominant	Calcium sulphate and magnesium sulphate	Teck 2014 (Fall 2013)
Invertebrate	*Hyalella azteca*	amphipod	-	14 d	survival, growth, and biomass	EC_{10}		>1,096	>947	161	4.5	Bicarbonate-calcium-sulphate dominant	Calcium sulphate and magnesium sulphate	Teck 2014 (Fall 2013)
Invertebrate	*Hyalella azteca*	amphipod	-	14 d	survival, growth, and biomass	EC_{10}		>1,440	>1,150	485	2.1	Bicarbonate-calcium-sulphate dominant	Calcium sulphate and magnesium sulphate	Teck 2014 (Fall 2013)
Invertebrate	*Hyalella azteca*	amphipod	-	14 d	survival, growth, and biomass	EC_{10}		>1,346	>1,100	378	2.5	Bicarbonate-calcium-sulphate dominant	Calcium sulphate and magnesium sulphate	Teck 2014 (Fall 2013)
Invertebrate	*Hyalella azteca*	amphipod	~7 d old	28 d	biomass (mean dry weight of survivors)	MATC[e]	787	787	346	193 to 1,495	1.6	Sodium-sulphate dominant	Calcium, magnesium, potassium, and sodium salts	Kunz et al. 2013
Invertebrate	*Hyalella azteca*	Amphipod	2 to 9 d old	28 d	biomass	LC_{10}	1,163	1,216	437	233	3.2	Sodium-sulphate dominant	Sodium sulphate	Teck 2014 (Annex F, Appendix D, PESC in BC MOE 2013)
Invertebrate	*Hyalella azteca*	Amphipod	2 to 9 d old	28 d	biomass	LC_{10}		1,113	682	117	3.4	Sodium-sulphate dominant	Sodium sulphate	Teck 2014 (Annex F, Appendix D, PESC in BC MOE 2013)
Invertebrate	*Centroptilum triangulifer*	mayfly	-	28 d	survival and biomass	IC_{20}	1,427	1,398	885	1,257	2.5	Bicarbonate-calcium-sulphate dominant	Calcium sulphate and magnesium sulphate	Teck 2014 (PI MTS)
Invertebrate	*Centroptilum triangulifer*	mayfly	larvae to subimago stage	life cycle	survival (as% emergence)	EC_{25}		2,025	1,439	87 to 1,605	2.7	Calcium-sulphate dominant	Calcium sulphate and magnesium sulphate	Buchwalter et al. 2018[d]
Invertebrate	*Centroptilum triangulifer*	mayfly	larvae to subimago stage	life cycle	survival (as% emergence)	EC_{25}		1,168	841	55 to 1,574	2.7	Calcium-sulphate dominant	Calcium sulphate and magnesium sulphate	Buchwalter et al. 2018[d]
Invertebrate	*Centroptilum triangulifer*	mayfly	first instar; ≤48 hr old	~35 d	survival and biomass	NOEC[e][f]		1,255	~>640	NR	NR	Sodium-sulphate dominant	Calcium, magnesium, potassium, and sodium salts	Kunz et al. 2013
Invertebrate	*Centroptilum triangulifer*	mayfly	larvae to subimago stage	life cycle	survival (as% emergence)	EC_{20}	1,300	1,300	145	95	3.6	Sodium-sulphate dominant	Sodium sulphate	Soucek and Dickinson 2015
Invertebrate	*Chironomus dilutus*	midge	larvae	10 d	mortality	MATC	1,499	1,461	~731	~1,145	17	Calcium-sulphate dominant (50% SO_4 as TDS)	Calcium, magnesium, and potassium salts	Chapman et al. 2000 (Kensington mine)
Invertebrate	*Chironomus dilutus*	midge	larvae	10 d	growth	MATC		1,539	~1,077	~1,414	13	Calcium-sulphate dominant (70% SO_4 as TDS)	Calcium, magnesium, and potassium salts	Chapman et al. 2000 (Red Dog mine)
Invertebrate	*Chironomus dilutus*	midge	larvae	28 d	biomass	IC_{10}	1,676	1,367	875	105	2.9	Sodium-sulphate dominant	Sodium sulphate	Wang et al. 2016
Invertebrate	*Chironomus dilutus*	midge	larvae	41 d	emergence time	IC_{10}		2,055	1,315	103	2.9	Sodium-sulphate dominant	Sodium sulphate	Wang et al. 2016
Invertebrate	*Lampsilis siliquoidea*	fatmucket clam	~2 months old	28 d	individual length	NOEC[e]	1,245	1,265	>645	217 to 1,461	1.6	Sodium-sulphate dominant	Calcium, magnesium, potassium, and sodium salts	Kunz et al. 2013
Invertebrate	*Lampsilis siliquoidea*	fatmucket clam	~2 months old	28 d	biomass	IC_{10}	853	853	503	105	2.9	Sodium-sulphate dominant	Sodium sulphate	Wang et al. 2020
Invertebrate	*Villosa iris*	rainbow mussel	juvenile (>3.5 months)	55 d	survival	NOEC	>645	>441[g]	>118	205	2.5	Bicarbonate-sulphate dominant	Calcium, magnesium, potassium, and sodium salts	Ciparis et al. 2015
Invertebrate	*Villosa iris*	rainbow mussel	juvenile (>3.5 months)	55 d	survival	NOEC		>944[g]	>434	381	1.7	Bicarbonate-sulphate dominant	Calcium, magnesium, potassium, and sodium salts	Ciparis et al. 2015
Invertebrate	*Villosa iris*	rainbow mussel	40 d juveniles	28 d	individual dry weight	IC_{10}	502	502	271	105	2.9	Sodium-sulphate dominant	Sodium sulphate	Wang et al. 2020
Invertebrate	*Elliptio complanata*	Mussel	juvenile	28 d	survival	LC_{10}	1,573	1,241	676	288	5.1	Sodium-sulphate dominant	Sodium sulphate	Teck 2014 (Annex F, Appendix D, PESC in BC MOE 2013)
Invertebrate	*Elliptio complanata*	Mussel	juvenile	28 d	survival	LC_{10}		1,995	1,125	250	5.2	Sodium-sulphate dominant	Sodium sulphate	Teck 2014 (Annex F, Appendix D, PESC in BC MOE 2013)
Invertebrate	*Lampsilis abrupta*	pink mucket	40 d old juvenile	28 d	length, weight, biomass	MATC	1,871	1,871	1,197	105	2.9	Sodium-sulphate dominant	Sodium sulphate	Wang et al. 2016
Plant	*Raphidocelis subcapitata*	green algae	-	96 h	growth	NOEC	>2,000	>2,000	~>1,000	—	—	Calcium-sulphate dominant (50% SO_4 as TDS)	Calcium, magnesium, and potassium salts	Chapman et al. 2000 (Kensington mine)

Table 1-3: Chronic toxicity test dataset for sulphate-dominant total dissolved solid mixtures

Receptor	Test Species	Common Name	Life Stage	Test Duration	Endpoint	Test Statistic	Geomean TDS (mg/L)[(a)]	Result (mg/L)		Hardness (mg/L as $CaCO_3$)	Ca:Mg Ratio	TDS Composition	Amendment Salt	Reference
								TDS[(b)]	Sulphate					
Plant	*Raphidocelis subcapitata*	green algae	-	72 h	growth	EC_{20}	995	551	~385	—	—	Calcium-sulphate dominant (70% SO_4 as TDS)	Calcium, magnesium, and potassium salts	LeBlond and Duffy 2001 (Red Dog Mine)
Plant	*Raphidocelis subcapitata*	green algae	-	72 h	growth	EC_{20}		1,796	1,211	1,461	4.5	Calcium-sulphate dominant	Calcium sulphate and magnesium sulphate	CIRNAC 2020

Notes: Grey-shaded rows indicate the tests were amended with a single salt. These effect concentrations should be interpreted for TDS toxicity with caution because TDS toxicity is dependent on the characteristics of the mixture and therefore inferring TDS toxicity from individual ions is difficult due in part to interdependence among ions.

(a) The geometric mean was calculated for each species for comparable biological endpoints and test statistics per Chapman (2015).

(b) Most studies reported effect concentrations in terms of sulphate. The effect concentration in terms of TDS was calculated herein if not reported by the author(s). Calculation used measured water chemistry reported during the test in the treatment corresponding to the test statistic to calculate TDS or estimate the percent sulphate as TDS in the treatments bounding the test statistic and then dividing the reported result as sulphate by percent sulphate as total dissolved solids to obtain the estimated test statistic as TDS.

(c) Ionic composition estimated from TDS composition figures for *Ceriodaphnia dubia*. The same mixture was evaluated across test species and therefore, the ionic composition for *C. dubia* was assumed to apply to the other test species.

(d) Regression based endpoints were not reported by Buchwalter et al. (2018) but were estimated from figures presented in Van Geest et al. (2018a).

(e) NOEC and LOEC values are reported by the authors as volumetric concentration (% v/v) of the dilution series used for the exposure. Therefore, NOEC and LOEC for sulphate were determined by cross-referencing volumetric exposure concentration for the NOEC and LOEC with measured sulphate concentrations presented in Table S4.

(f) The survival NOEC for *Centroptilum triangulifer* (now *Neocloeon triangulifer*) was extracted from discussion in Soucek and Dickinson (2015) paper.

(g) Survival at this unbounded NOEC was greater than 95%.

TDS = total dissolved solids; Ca;Mg = calcium to magnesium mass ratio; mg/L = milligrams per litre; $CaCO_3$ = calcium carbonate; NOEC = no observable effects concentration; LOEC = lowest observable effects concentration; IC_X = inhibitory concentration that results in x% reduction in sublethal endpoint; LC_X = lethal concentration that results in x% lethality to test population; EC_X = effects concentration that results in x% effect in test population; ~ = approximately.

1-5.0 CHRONIC SPECIES SENSITIVITY DISTRIBUTION FOR TDS

1-5.1 Methods

A species sensitivity distribution (SSD) for chronic TDS toxicity was derived using CCME (2007) guidance as outlined below.

Receptors

The minimum dataset requirements for the derivation of Type A SSD for long-term SSWQOs, as defined by CCME (2007), are provided in Table 1-4.

Table 1-4: Minimum Dataset Requirements for the Derivation of SSD-based (Type A) Guidelines

Receptor Group	Long-Term Site-Specific Water Quality Objective
Fish	Three fish species, including at least one salmonid and one non salmonid. Exposure periods involving juvenile or adult stages of at least 21 days in duration, or periods involving eggs and larvae of 7 days or more are considered long-term exposures.
Aquatic invertebrates	Three aquatic or semi aquatic invertebrates, at least one of which must be a planktonic crustacean. Long-term exposures are defined to include nonlethal endpoints from test durations of at least 96 hours for shorter-lived invertebrates (e.g., *Ceriodaphnia dubia*), nonlethal endpoints of at least 7 days in duration for longer-lived invertebrates (e.g., crayfish), or lethal endpoints from tests of at least 21 days in duration for longer-lived invertebrates.
Aquatic plants	At least one study on a freshwater vascular plant of freshwater algal species. Additional representation of macrophytes and algae are required for substances that have phytotoxicity as a dominant process. All tests for *Lemna* sp. following standard test protocols, as well as all tests with algae greater than 24 hours, are considered long-term exposures.
Amphibians	Toxicity data for amphibians are highly desirable, but not necessary. Exposure periods involving juvenile or adult stages of at least 21 days in duration, or periods involving eggs and larvae of at least 7 days are considered long-term exposures.

SSD = species sensitivity distribution.

Endpoint Selection

Chronic toxicity data from the literature and other sites were compiled per Section 1-4.0 and site-specific toxicity data were compiled from Attachment 2. Statistical endpoint selections were reviewed according to the CCME (2007) preference ranking for selecting endpoints for a Type A derivation, specifically in decreasing order of preference:

- EC_X (concentration causing X% effect) or IC_X (concentration causing X% inhibition) representing a no-effects threshold—this is the preferred approach where the value of X can be determined to be meaningful from a statistical and biological relevance perspective.
- EC_{10}/IC_{10}—the 10% magnitude of response is commonly applied as a no-effect benchmark, given that most toxicity endpoints cannot discriminate beyond this level of precision
- $EC_{11\text{-}25}/IC_{11\text{-}25}$—the adoption of magnitude of response greater than 10% is supported where the statistical power of the experiment cannot provide reliable EC10/IC10 and where the response can safely be accommodated at the local population level.
- Maximum Acceptable Toxicant Concentration (MATC)—the MATC is often calculated as the geometric mean between the No Observed Effect Concentration (NOEC) and Lowest Observed Effect Concentration (LOEC).

- NOEC—defined based on highest tested concentration for which there are no statistically significant difference of effect ($p<0.05$) when compared to the control group.
- LOEC—the lowest concentration where a statistically significant effect has been observed in chronic ecotoxicity studies.
- EC_{26-40}/IC_{26-49}—larger effect sizes with increase potential to affect populations are less preferred, although some toxicity endpoints (e.g., plant or algae growth or frond count) can adopted higher response sizes.
- nonlethal EC_{50}/IC_{50}—50% responses are the largest possible magnitude for non-lethal endpoints; for mortality, no more than 25% adverse effect size is acceptable.[7]

According to this protocol, “a threshold level for no negative effect is generally defined as an effect level of 10% or less of the exposed individuals of a species (i.e., EC_{10}), unless a more appropriate no effects threshold is defined for the test species in a generally accepted standardized test protocol” (CCME 2007). The determination of whether a 10% adverse response is the most appropriate effect size depends on considerations of statistical power, test reliability, and acceptable control response for a valid test.

Additionally, preference was given to endpoints derived using tests amended with multiple salts because TDS toxicity is dependent on the characteristics of the mixture and therefore, inferring TDS toxicity from individual ions is difficult due in part to interdependence among ions.

Species Mean Values

Geometric means were used to calculate species mean chronic values (SMCVs) where multiple effect concentrations were available for a particular species, provided that the test endpoints are comparable in terms of endpoint type, magnitude, and exposure conditions. Following CCME (2007) guidance, it is appropriate to combine these effect concentrations using a geometric mean (i.e., effects concentrations are combined for comparable endpoint types and statistical endpoints). In some cases, professional judgment is required to distinguish comparable versus non-comparable endpoints. Guidance provided by Chapman (2015) was followed for cases where endpoint data were sufficiently similar in terms of endpoint type or magnitude to warrant aggregation using a geometric mean. It is not necessary that the endpoints be for identical biological and statistical endpoints and identical exposures to warrant combining with a geometric mean; rather, the endpoints should be for broadly comparable biological endpoints and effect sizes conducted on the same species and using similar protocols.

[7] EC_X = effective concentration causing X% reduction in sublethal endpoint with binomial outcomes for individual organisms, such as survival or normal development; IC_X = the concentration that results in a magnitude of effect of X% over a specified period of time; MATC = maximum acceptable toxicant concentration (calculated as the geometric mean of the no observed effect concentration and lowest observed effect concentration.

Species Sensitivity Distribution Model

The British Columbia Ministry of Environment and Parks (BC ENV) SSDtools package (Thorley and Schwarz 2018) in R (version 4.2.1; R Core Team 2022) was used to develop SSDs using the species mean chronic values. Per Schwarz and Tillman (2019), SSDs were fit using a maximum likelihood estimation with a model averaging approach, in which models with a corrected Akaike information criterion (AICC) score within 2 (indicated by the delta) of the lowest AICC score were retained for model averaging and weighted relative to their AICC scores. The predict function was used to generate a line of best fit and 95% confidence intervals, and the SSD hc function was used to derive the hazardous concentration to 5% of the tested species (HC_5). The 95% confidence intervals are generated using the bootstrap resampling method. As a result, confidence intervals will fluctuate between SSD model runs using the BC ENV SSD tool and may differ from what is presented in the SSD summary statistic table.

1-5.2 Results

Derivation using CCME (2007) Protocol

Chronic toxicity data for 11 species were retained for an SSD (Table 1-5): three fish (two salmonid and one non salmonid), three non-insect invertebrates (a crustacean, a chironomid, and an amphipod), three freshwater bi-valves, one aquatic insect, and one alga. The following species was excluded from the SSD:

- The unbounded NOEC (geomean >645 mg/L TDS) for *Villosa iris* (rainbow mussel) reported by Ciparis et al. 2015 was excluded because the unbounded concentration was not above identified effect concentrations for other sensitive organisms (e.g., *C. dubia*). Per CCME (2007) guidance, the toxic threshold for an unbounded concentration must be clearly above identified thresholds for other sensitive organisms to warrant inclusion in an SSD.

The bullets below provide rationale for the endpoints and effect concentrations selected for each species included in the SSD:

- Only one study that met data quality criteria was available for *Oncorhynchus tshawytscha* (Chinook Salmon), *Elliptio complanate* (mussel), and *Lampsilis abrupta* (pink mucket mussel). The tests in these studies were amended with a single salt (sodium sulphate) but were retained to meet the requirements of a Type A SSD derivation.
- For Rainbow Trout, *Hyalella azteca*, *Centroptilum triangulifer Chironomus dilutus*, and *Lampsilis siliquoidea*, the selected endpoints aligned with the CCME (2007) preference ranking for selecting endpoints for a Type A SSD derivation, as described in Section 1-5.1. Preference was given to studies that used multiple salts[8] and effect concentrations that were bounded[9].

[8] For example, for *C. dilutus*, the MATC reported by Chapman et al. 2000 calculated from tests amended with multiple salts (geomean = 1,499 mg/L TDS) was selected in preference to the IC_{10} reported by Wang et al. 2016 calculated from tests amended with only sodium sulphate (geomean = 1,676 mg/L TDS) because TDS toxicity is dependent on the characteristics of the mixture and therefore inferring TDS toxicity from individual ions is difficult due in part to interdependence among ions.

[9] For example, for *H. azteca,* the EC_{25} reported by Van Geest et al. 2018 (geomean = 1,527 mg/L TDS) was selected in preference to the unbounded EC_{10} reported by Teck 2014 (geomean >1,250 mg/L TDS).

- For *R. subcapitata*, *C. dubia*, and Fathead Minnow, effect concentrations from site-specific testing (Attachment 2) were used instead of literature data because the site-specific testing program used highly relevant synthetic waters that closely matched site-specific mixtures of water quality characteristics. As a result, effect concentrations from the site-specific program are most representative of conditions on site. The rationale for each site-specific endpoint is described in the bullets below.
  - For *R. subcapitata*, no statistically significant reduction in *R. subcapitata* growth was observed in the site-specific tests. The NOEC of >2,217 mg/L calculated TDS was retained as the most reliable and relevant endpoint.
  - For *C. dubia*, reproduction was significantly reduced in the 2,296 mg/L calculated TDS treatment in the site-specific tests. An IC_{10} of 976 mg/L calculated TDS and IC_{20} of 1,354 mg/L calculated TDS were derived from the concentration-response. However, there is elevated uncertainty in the IC_{10} and IC_{20} effects estimates because the estimated effects are below the NOEC (1,745 mg/L calculated TDS) and because the PMSD relative to the site-collected reference (34%) was greater than the estimated effect sizes (i.e., 10% and 20%; Attachment 2). Therefore, IC_{10} and IC_{20} estimates have low statistical reliability and should be used and interpreted with caution. The IC_{10} of 976 mg/L calculated TDS was conservatively retained for the SSD to increase confidence the HC_5 estimate would not be overestimated. However, in consideration of the uncertainty described above, the IC_{20} of 1,354 mg/L calculated TDS could be considered. Implications of including the alternative IC_{20} endpoint on the HC_5 is presented in a bounding analysis below.
  - For Fathead Minnow, no statistically significant reduction in Fathead Minnow overall survival, post-hatch survival, proportion normal, hatch rate, and length in the site-specific tests yielding a NOEC of >2,211 mg/L calculated TDS. However, dry weight was significantly reduced yielding a NOEC of 487 mg/L calculated TDS. There is elevated uncertainty in the dry weight NOEC because an atypical concentration response was observed for dry weight where an apparent low-magnitude response (9.7% effect on dry weight) was observed in the highest exposure treatment, but the effects were flat (i.e., not concentration-dependent) for the remaining dilutions. These results indicate the reduction in dry weight may be (in part) driven by a factor other than TDS. Additionally, low inter-replicate variances were observed for dry weight which resulted in low magnitude responses, and both the NOEC and LOEC calculations yield values below 10% magnitude of effect. Such small differences are unlikely to be biologically meaningful, especially in the absence of a clear concentration-response profile. The dry weight NOEC was conservatively retained for the SSD to increase confidence the HC_5 estimate would not be overestimated. However, in consideration of the uncertainty described above, the dry weight NOEC could be replaced with the NOEC for length of >2,211 mg/L TDS. Implications of replacing the dry weight NOEC on the HC_5 is presented in a bounding analysis below.

Table 1-5: Chronic toxicity test dataset for total dissolved solids species sensitivity distribution

Receptor	Test Species	Common Name	Life Stage	Test Duration	Endpoint	Test Statistic	Geomean TDS (mg/L)[a]	Result (mg/L)		Hardness (mg/L as $CaCO_3$)	Ca:Mg Ratio	TDS Composition	Salt Amendment	Reference
								TDS[b]	Sulphate					
Invertebrate	*Ceriodaphnia dubia*	water flea	<24 h old neonates	7 d	reproduction	IC_{10}	976	976	~390	~290	~6.4	Sodium-sulphate dominant	Calcium, magnesium, potassium, and sodium salts	Site-specific testing (Attachment 2)
Fish	*Pimephales promelas*	Fathead Minnow	<24 h post-hatch	32 d	growth (length)[c]	NOEC	1,038	>2,211	1,020	840	10	Sodium-sulphate dominant	Calcium, magnesium, potassium, and sodium salts	Site-specific testing (Attachment 2)
					growth (dry weight)			487	195	225	4.4			
Invertebrate	*Lampsilis siliquoidea*	fatmucket clam	~2 months old	28 d	individual length	NOEC[d]	1,265	1,265	>645	217 to 1,461	1.6	Sodium-sulphate dominant	Calcium, magnesium, potassium, and sodium salts	Kunz et al. 2013
Invertebrate	*Centroptilum triangulifer*	mayfly	-	28 d	survival and biomass	IC_{20}	1,427	1,398	885	1,257	2.5	Bicarbonate-calcium-sulphate dominant	Calcium sulphate and magnesium sulphate	Teck 2014 (PI MTS)
			larvae to subimago stage	life cycle	survival (as% emergence)	EC_{25}		2,025	1,439	87 to 1,605	2.7	Calcium-sulphate dominant	Calcium sulphate and magnesium sulphate	Buchwalter et al. 2018[d]
								1,168	841	55 to 1,574			Calcium sulphate and magnesium sulphate	
			first instar; ≤48 hr old	~35 d	survival and biomass	NOEC[d][f]		1,255	~>640	NR	NR	Sodium-sulphate dominant	Calcium, magnesium, potassium, and sodium salts	Kunz et al. 2013
Invertebrate	*Chironomus dilutus*	midge	larvae	10 d	mortality	MATC	1,499	1,461	~731	~1,145	17	Calcium-sulphate dominant (50% SO_4 as TDS)	Calcium, magnesium, and potassium salts	Chapman et al. 2000 (Kensington mine)
					growth			1,539	~1,077	~1,414	13	Calcium-sulphate dominant (70% SO_4 as TDS)		Chapman et al. 2000 (Red Dog mine)
Invertebrate	*Hyalella azteca*	amphipod	2 to 9 d old	14 d	growth (average dry weight)	EC_{25}	1,527	868	564	54 to ~1,900	2.5	Calcium-sulphate dominant[g]	Calcium sulphate and magnesium sulphate	Van Geest et al. 2018a[d]
								2,685	>1,745					
Invertebrate	*Elliptio complanata*	mussel	juvenile	28 d	survival	LC_{10}	1,573	1,241	676	288	5.1	Sodium-sulphate dominant	Sodium sulphate	Teck 2014 (Annex F, Appendix D, PESC in BC MOE 2013)
								1,995	1,125	250	5.2			
Fish	*Oncorhynchus mykiss*	Rainbow Trout	embryo-alevin	28 d	normal alevins	EC_{10}	1,802	1,802	1,187	1,559	5.1	Calcium-sulphate dominant	Calcium sulphate and magnesium sulphate	CIRNAC 2020
Invertebrate	*Lampsilis abrupta*	pink mucket mussel	40 d juvenile	28 d	length, weight, biomass	MATC	1,871	1,871	1,197	105	2.9	Sodium-sulphate dominant	Sodium sulphate	Wang et al. 2016
Fish	*Oncorhynchus tshawytscha*	Chinook Salmon	eyed eggs to alevin	28 d	survival	LC_{10}	1,980	1,980	1,287	263	2.3	Sodium-sulphate dominant	Sodium sulphate	Teck 2014 (PESC in BC MOE 2013)
Plant	*Raphidocelis subcapitata*	green algae	-	96 h	growth	NOEC	>2,217	>2,217	1,020	840	10	Sodium-sulphate dominant	Calcium, magnesium, potassium, and sodium salts	Site-specific testing (Attachment 2)

Notes: Grey shaded rows indicate the tests were amended with a single salt. These effect concentrations should be interpreted for TDS toxicity with caution because TDS toxicity is dependent on the characteristics of the mixture and therefore inferring TDS toxicity from individual ions is difficult due in part to interdependence among ions.

(a) The geometric mean was calculated for each species for comparable biological endpoints and test statistics per Chapman (2015).

(b) Most studies reported effect concentrations in terms of sulphate. The effect concentration in terms of TDS was calculated herein if not reported by the author(s). Calculation used measured water chemistry reported during the test in the treatment corresponding to the test statistic to calculate TDS or estimate the percent sulphate as TDS in the treatments bounding the test statistic and then dividing the reported result as sulphate by percent sulphate as total dissolved solids to obtain the estimated test statistic as TDS.

(c) No statistically significant reduction in Fathead Minnow overall survival, post-hatch survival, proportion normal, hatch rate endpoints were also observed for the site-specific tests (Attachment 2).

(d) NOEC and LOEC values are reported by the authors as volumetric concentration (% v/v) of the dilution series used for the exposure. Therefore, NOEC and LOEC for sulphate were determined by cross-referencing volumetric exposure concentration for the NOEC and LOEC with measured sulphate concentrations presented in Table S4.

(e) Regression based endpoints were not reported by Buchwalter et al. (2018) but were estimated from figures presented in Van Geest et al. (2018a).

(f) The survival NOEC for *Centroptilum triangulifer* (now *Neocloeon triangulifer*) was extracted from discussion in Soucek and Dickinson (2015) paper.

(g) Ionic composition estimated from TDS composition figures for *Ceriodaphnia dubia*. The same mixture was evaluated across test species and therefore, the ionic composition for *C. dubia* was assumed to apply to the other test species.

TDS = total dissolved solids; Ca;Mg = calcium to magnesium mass ratio; mg/L = milligrams per litre; $CaCO_3$ = calcium carbonate; NOEC = no observable effects concentration; LOEC = lowest observable effects concentration; IC_X = inhibitory concentration that results in x% reduction in sublethal endpoint; LC_X = lethal concentration that results in x% lethality to test population; EC_X = effects concentration that results in x% effect in test population; ~ = approximately.

The minimum dataset requirements were satisfied for the derivation of a Type A SSD derivation for freshwater environments as defined by CCME (2007). The chronic toxicity data in Table 1-5 were used to develop an SSD using the BC ENV SSDtools package (Thorley and Schwarz 2018) in R (version 4.2.1; R Core Team 2022) as described in Section 1-5.1. The resulting HC_5 for TDS was 979 mg/L (Table 1-6; Figure 1-4).

Table 1-6: Chronic total dissolved solids species sensitivity distribution summary statistics

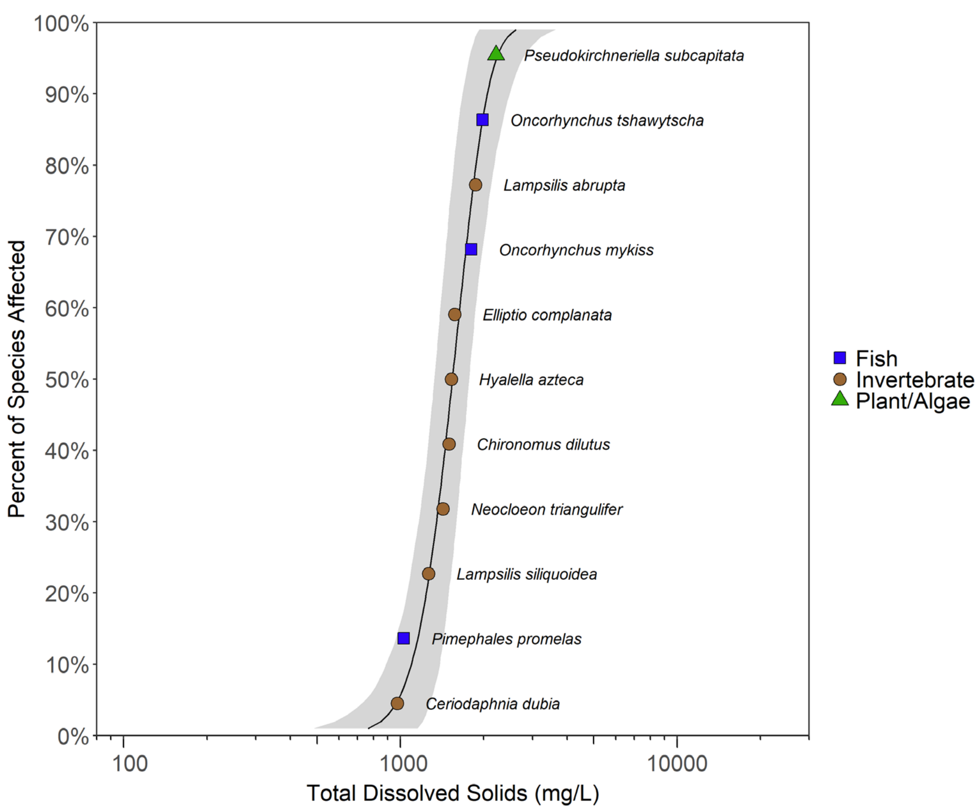
Distribution	Delta	Predicted HC_5 (mg/L)	95% LCL (mg/L)	95% UCL (mg/L)	Weight	Weighted HC_5 (mg/L)
Gamma	0.076	999	787	1,298	0.28	280
Log-logistic	0.94	1,005	758	1,288	0.18	183
Log-normal	0.33	1,012	822	1,300	0.25	249
Weibull	0	916	654	1,298	0.29	267
					Final HC_5[(a)] =	**979 (752–1,297)**

Notes:

(a) Final HC_5 is the sum of weight HC_5 for the individual models with lower and upper confidence intervals presented in brackets. The 95% confidence intervals are generated using the bootstrap resampling method and may fluctuate between SSD runs using the BC ENV SSD tool.

HC_5 = hazardous concentration to 5% of the tested species, or the concentration that protects 95% of the tested species; LCL = lower confidence interval; UCL = upper confidence interval; SSD = species sensitivity distribution; mg/L = milligram per litre.

Figure 1-4: Species sensitivity distribution curve for chronic total dissolved solids toxicty data



Notes: mg/L = milligrams per litre.

Derivation using Bounding Analysis

The HC_5 is dependent on the endpoints selected for the SSD. As discussed above, the *C. dubia* reproduction IC_{10} and Fathead Minnow dry weight NOEC from site-specific testing have moderate uncertainty regarding their relevance for TDS toxicity (Attachment 2). In the face of this uncertainty, highly conservative assumptions have been made for the selection of the preferred statistical endpoints for site-specific toxicity tests. To investigate the implications this uncertainty has on the HC_5, a bounding analysis was conducted where the C. *dubia* reproduction IC_{10} was replaced with the IC_{20} of 1,354 mg/L calculated TDS and the Fathead Minnow dry weight NOEC was replaced with the length NOEC[10] of >2,211 mg/L calculated TDS. For *C. dubia*, the IC_{20} was selected because site-specific testing does not show significantly reduced *C. dubia* reproduction until concentrations exceeding 1,000 mg/L calculated TDS (Attachment 2). For Fathead Minnow, the length NOEC was selected because, as discussed above, site-specific testing showed an atypical concentration response for dry weight yielding low magnitude responses (equal to or less than 10%) which are unlikely to be biologically meaningful. Therefore, the length NOEC was considered the more relevant and reliable endpoint for representing effects of TDS to Fathead Minnow (Attachment 2). The resulting HC_5 for TDS was 1,220 mg/L (Table 1-7; Figure 1-5).

Table 1-7: Chronic total dissolved solids species sensitivity distribution summary statistics using the bounding analysis

Distribution	Delta	Predicted HC_5 (mg/L)	95% LCL (mg/L)	95% UCL (mg/L)	Weight	Weighted HC_5 (mg/L)
Gamma	0.21	1,219	1,013	1,472	0.23	277
Log-gumbel	0	1,285	1,172	1,449	0.25	324
Log-logistic	1.1	1,192	957	1,453	0.14	172
Log-normal	0.067	1,235	1,071	1,475	0.24	301
Weibull	1.3	1,100	851	1,454	0.13	146
					Final HC_5[(a)] =	**1,220 (1,038–1,462)**

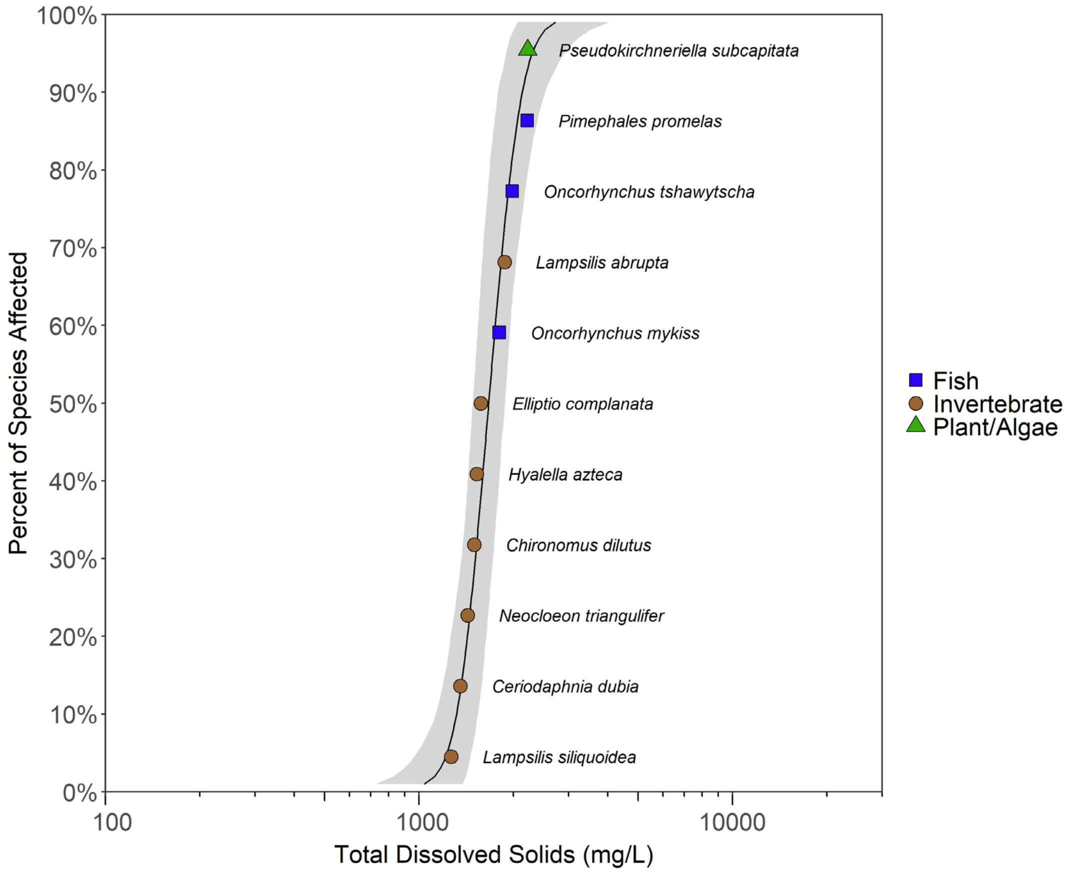
Notes:

(a) Final HC_5 is the sum of weight HC_5 for the individual models with lower and upper confidence intervals presented in brackets. The 95% confidence intervals are generated using the bootstrap resampling method and may fluctuate between SSD runs using the BC ENV SSD tool.

HC_5 = hazardous concentration to 5% of the tested species, or the concentration that protects 95% of the tested species; LCL = lower confidence interval; UCL = upper confidence interval; SSD = species sensitivity distribution; mg/L = milligram per litre.

10 No statistically significant reduction in Fathead Minnow overall survival, post-hatch survival, proportion normal, hatch rate endpoints were also observed for the site-specific tests (Attachment 2).

Figure 1-5: Species sensitivity distribution curve for chronic total dissolved solids toxicty data using the bounding analysis



Notes: mg/L = milligrams per litre.

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APPENDIX A

Acute Mock Effluent Toxicity Testing Reports

AGNICO EAGLE LIMITED, MEADOWBANKS

Attention: Thomas Genty, Eng.
Environmental Engineer – Agnico Eagle

FINAL REPORT

TOTAL AMMONIA REMOVAL EMPLOYING MBBR TECHNOLOGY

DECEMBER 09, 2022, REVISION 1

PREPARED BY:
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SECTION 1. INTRODUCTION

Veolia Water Technologies Canada Inc. (VEOLIA) has performed a laboratory bench scale trial on AEM Meadowbank Raw Water mine effluent where the contaminants of concern were metals and nitrogen species (cyanide containing compounds (thiocyanate, cyanate), ammonia, and nitrate). The trial has been performed at VEOLIA's laboratory, located in Montréal, QC.

The aim of the study was to validate the proposed treatment chain and confirm the chemical dosages required for metals precipitation. This study started with an ACTIFLO clarification stage to remove metals, followed by a biological treatment system to reduce nitrogen compounds, and ended with an ACTIFLO clarification step to remove suspended solids. A volume of 1000 liters of raw water sample from the mining site was received in February 2022 at VEOLIA's laboratory. The test stages are as follows:

- Step 1: Metals precipitation using the ACTIFLO process;

- Step 2: The MBBR biological process (Moving Bed Biofilm Reactor):
    - A cyanate and thiocyanate removal reactor;
    - A nitrification reactor;
    - A denitrification reactor;
    - A Re-oxygenation and removal of excess chemical organic demand (Re-Oxygenation) reactor.

- Step 3: A polishing step for total suspended solids removal.

Throughout the trial, the following nomenclature will be used for the samples appellation:

- Sample received from AEM: Raw Water
- Raw water after metal treatment: Clarified Raw Water
- Clarified Raw water after MBBR treatment: MBBR Effluent Water
- MBBR Effluent after clarification: Clarified MBBR Water.

The laboratory tests began in February, 2022. The received sample was completely treated by the ACTIFLO process in order to reduce the concentration of metals (Step 1) on a batch process. In order to demonstrate the effectiveness and stability of the step 2 treatment in different operating temperature, this step of the laboratory study was carried out in two phases. The first stabilization phase took place at room temperature. During the second phase, the temperature was gradually lowered to 7-8°C. The step two was based on a continuous operation. During the step 3, the MBBR Effluent Water was polished using another ACTIFLO stage that produced the Clarified MBBR Water in a batch process.

The non-toxicity of the Clarified MBBR Water was validated by acute toxicity tests on aquatic species including *Daphnia magna* and *Oncorhynchus mykiss* (rainbow trout). This report presents the Clarified MBBR Water qualities issued from the biological and metal removal treatment trial, and the following sections are included in this report:

- Objectives;
- Process Description;
- Material & Methods;
- Results and Discussion;
- Conclusion.

SECTION 2. OBJECTIVES

The laboratory test aimed to validate the performance of the proposed biological process as well as the ACTIFLO clarification steps necessary to achieve the treatment objectives presented in Table *1*. More specifically, the objectives were:

- Validate the metals upstream (especially copper) of the biological process by sulfide precipitation followed with ACTIFLO clarification (STEP 1);
- Validate the reduction of cyanate, thiocyanate, ammonia and nitrates through MBBR (STEP 2).
- Limit the suspended solids in the Clarified MBBR Water to 15 mg/L using the ACTIFLO clarification (STEP 3);
- Prove that the Clarified MBBR Water is non-toxic for the *Oncorhynchus mykiss* (rainbow trout) and *Daphnia magna* species at room temperature, as well as at lower temperature.

Table *1 Treatment objectives as provided by AEM*

Parameters	***Units***	***Maximum Monthly Average Concentrations***	***Maximum Allowable Grab Sample Concentration***
pH	--	6.0 – 9.0	6.0 to 9.0
Total Dissolved Solids	mg/L	1400	1400
Total Suspended Solids	mg/L	15	30
Turbidity	mg/L	15	15
Total Aluminum	mg/L	1.5	1.5
Dissolved Aluminum	mg/L	1.0	1.0
Total Arsenic	mg/L	0.3	0.6
Total Cadmium	mg/L	0.002	0.004
Total Cyanides	mg/L	0.5	1.0
Total Copper	mg/L	0.1	0.2
Total Mercury	mg/L	0.0004	0.008
Nitrogen ammonia	mg/L	16	32
Total Nickel	mg/L	0.2	0.4
Nitrates	mg/L	20	40
Total Lead	mg/L	0.1	0.2
Total Phosphorous	mg/L	1.0	2.0
Total Zinc	mg/L	0.4	0.8
Total Chlorides	mg/L	1000	2000
Acute lethality to rainbow trout	--	Non-lethal	
Acute lethality to *Daphnia magna*	--	Non-lethal	

In addition to the treatment objectives, Table 2 show some examples of toxicity level found in the literature for rainbow trout and *Daphnia magna.*

Table 2 Toxicity level for rainbow trout and *Daphnia magna*

Parameters	Units	Typical toxicity level for rainbow trout	Typical toxicity level for *Daphnia magna*
Total Aluminum	mg/L	6.6 to 8	3.9 to 7.6
Total Arsenic	mg/L	ND*	7.4
Total Cadmium	mg/L	0.0005 to 0.006	0.065
Total Cyanides	mg/L	ND	0.09
Total Copper	mg/L	0.02 to 0.09	0.01 to 0.02
Total Mercury	mg/L	ND	0.005
Unionized ammonia	mg NH3/L	0.158 to 1.09	0.5 to 4.9
Total Nickel	mg/L	20	0.51 to 1.4
Nitrates	mg N/L	1355	323 to 611
Nitrites	mg N/L	0.2 to 0.4	10
Total Zinc	mg/L	0.1 to 0.3	0.3
Total Chlorides	mg/L	6030	3100 to 3600
Cyanate	mg/L	10 to 100	18
Thiocyanate	mg/L	94 to 300	16 to 32

*No Data

SECTION 3. PROCESS DESCRIPTION

The proposed treatment is presented in Figure 1.

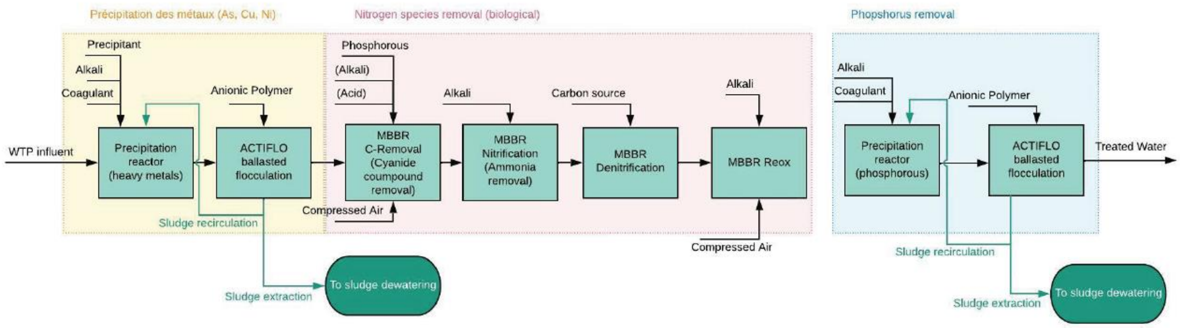

Figure 1 *Proposed treatment*

3.1 METAL PRECIPITATION REACTOR AND ACTIFLO BALLASTED SAND CLARIFIER

The metal precipitation reactor is designed to precipitate the dissolved metals in the Raw Water. This process includes pH adjustment and adding a sulfide based metal precipitant; the process also requires a ferric based coagulant for particle coagulation. The ACTIFLO process is a high rate settling process that combines the advantages of ballasted flocculation and lamella clarification. Coagulant and polymer are added to form flocs and microsand is added to increase the flocs weight for fast settling. In fact, the flocculation and settling process in the ACTIFLO are more efficient due to the density and the shape of the microsand particles. In rapid mixing tanks, the microsand significantly increases the probability of contact between particles. Therefore, it is faster and easier to create strong flocs, even when lighter and smaller solids are found in the Raw Water. Once the floc is formed and attached to microsand, the settling velocity of the floc-microsand aggregation becomes considerably higher allowing high rise rate. The process is very robust since it is not affected by the nature of the floc or water temperature variations.

3.2 MOVING BED BIOFILM REACTOR (MBBR)

VEOLIA's MBBR grows biomass on submerged carriers (see Figure 2). The MBBR's efficiency increases due to utilizing the specially designed carriers. These carriers are designed to have a protected interior for biofilm growth and remain in constant movement in the reactor. The constant movement of MBBR carriers is generated by an aeration system or mechanical mixers in the reactor. The mixing also supports the designed fill fraction of MBBR reactors.

The carriers constantly collide and subject to hydrodynamic shear forces. These processes act as a self-cleaning mechanism for the carriers and hence enable a consistent healthy biofilm. The self-cleaning mechanism eliminates the need for backwashing and all in-tank components (aeration grid and carrier retention sieves) are designed to be maintenance free. These attributes allow the MBBR to provide a significant increase in treatment capacity and maintain a simple and robust operation.

Figure 2: Seeded AnoxKaldnes K5™ carriers

In addition to its simple operation, the MBBR is significantly more resistant to acutely toxic events and changing water quality as compared to conventional suspended growth biological treatment. The robustness and stability are achieved through the inherently long biomass retention time (fixed film) and the natural benefits of diffusion based substrate transfers. These attributes collectively make the MBBR an ideal fit for mining applications; the bench scale tests will simulate the MBBR nitrification and the denitrification process to treat the Clarified Raw Water at room temperature (temperature to be lowered in the second phase).

3.1 ACTIFLO BALLASTED SAND CLARIFIER FOR P REMOVAL

Residual P and TSS from biological activity is removed with a coagulant (ferric salt based) and polymer within a reactor and a polishing ACTIFLO.

The ACTIFLO process is a high rate settling process that combines the advantages of ballasted flocculation and lamella clarification. Coagulant and polymer are added to form flocs and microsand is added to increase the flocs weight for fast settling. In fact, the flocculation and settling process in the ACTIFLO are more efficient due to the density and the shape of the microsand particles. In rapid mixing tanks, the microsand significantly increases the probability of contact between particles. Therefore, it is faster and easier to create strong flocs, even when lighter and smaller solids are found in the raw water. Once the floc is formed and attached to microsand, the settling velocity of the floc-microsand aggregation becomes considerably higher allowing high rise rate. The process is not affected by the nature of the floc or water temperature variations.

SECTION 4. METHODOLOGY

This section presents the methods used to carry out the trial and analyses as part of the laboratory test.

4.1 METAL PRECIPITATION AND ACTIFLO BALLASTED FLOCCULATION

4.1.1 Material used for metals and TSS removal

Several tests were completed in order to optimize chemical dosages and to test different products. Through many years of experience, VEOLIA has developed a laboratory procedure to accurately simulate the ACTIFLO process. The procedure uses a standard Phipps & Bird jar tester and 1 L cylindrical beakers as shown in Figure 3. The RPMs, time sequence of chemical / Actisand and settling time are optimized for the desired full-scale operation velocity.

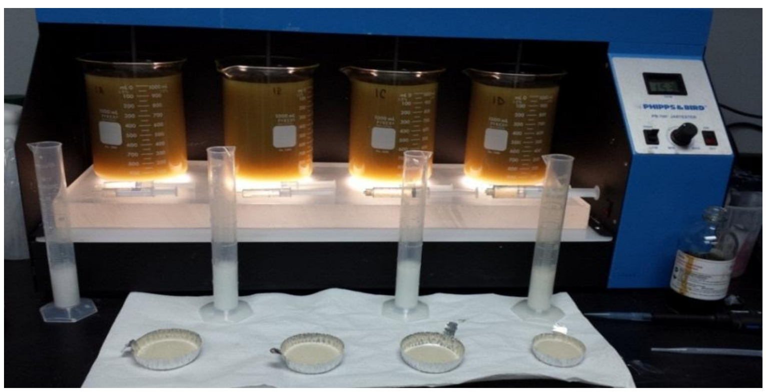

Figure 3: Bench scale jar tester

The jar test program is designed to reproduce the retention time expected in the selected ACTIFLO unit available. The test procedure used to simulate the actual ACTIFLO unit performance with the concentration process solution for copper removal was as follows:

1. Coagulants Hydrex 3253 and organo-sulfide based metal precipitant were added to the sample;
2. pH was adjusted with NaOH to the desired value if needed;
3. Polymer and microsand were added at the end of contact time for coagulation to start the ballasted flocculation process and to complete the suspended solids removal;
4. Sample is settles and Clarified Raw Water is collected.

Contact times for the ACTIFLO at 60 m/h including a contact time upstream the ACTIFLO for copper removal:

- Time 0 min: Coagulant, metal precipitant* and NaOH are added:
- Time 20:00 min: Sand and addition of 50% of the polymer dosage;
- Time 23:20 min: Addition of the remain 50% polymer dosage;
- Time 25:20 min: Mixing is stopped;
- Time 26:20 min: sampling of the supernatant.

*To be noted that both metals precipitants Hydrex 6909 and sodium sulfide were tested for metals precipitation during laboratory clarification tests; moreover, the sodium sulfide was used for the clarification of the 1000 liters sample (feed of the MBBR process).

4.1.2 Chemicals

The chemicals used during the clarification tests are shown in Table 3

Table 3 Chemicals used for the clarification

Chemicals	Formula	Type/Concentration	Description/Purpose
Iron-based Coagulant	Hydrex 3253	Liquid, 12.2 % Fe	Coagulation
Metal chelating agent*	Hydrex 6909	Liquid	Metals precipitation
Metal precipitant	Na_2S	Liquid, 10 g/L	Metals precipitation
Anionic Polymer	Hydrex 3543	Dry based, 1.0 g/L	Flocculation
Microsand	Actisand	--	Ballast settling

*The chelating power comes from a sulfur derivative functionality (dithiocarbamate) grafted onto an organic molecule.

4.2 MBBR TRIAL AT LABORATORY SCALE

The lab scale MBBR consists of a series of four connected reactors. Reactors 1, 2 and 4 were aerated, whereas reactor 2 had anoxic condition. The biological treatment is subdivided into 4 stages:

- Cyanate and thiocyanate removal (reactor 1);
- Nitrification (reactor 2);
- Denitrification (reactor 3);
- Re-oxygenation and removal of excess chemical organic demand (reactor 4).

The first-stage MBBR was dedicated to cyanate and thiocyanate removal. In this reactor, the media is colonized mainly by heterotrophic bacteria and the thiocyanate is oxidized into ammonia while the cyanate is hydrolysed into ammonia following these biochemical reactions:

$$SCN^- + 3H_2O + O_2 \rightarrow NH_4^+ + CO_2 + SO_4^{2-}$$
$$OCN^- + 3H_2O \rightarrow NH_4^+ + HCO_3^+ + OH^-$$

The second-stage MBBR was dedicated to ammonia nitrogen oxidation and was containing media colonized mainly by two types of autotrophic bacteria (*Nitrosomonas* and *Nitrobacter*). The nitrification reaction consumes oxygen and produces acidity by the process in the equations below:

$$NH_4^+ + 1.5O_2 \rightarrow NO_2^- + H_2O + 2H^+ \text{ (by Nitrosomonas)}$$
$$NO_2^- + 0.5O_2 \rightarrow NO_3^- \text{ (by Nitrobacter)}$$

The nitrification reaction uses inorganic ammonia and nitrite as an energy source (electron donor) corresponding to autotrophic bacterial growth. The nitrification reaction transforms ammonia to nitrite which is subsequently oxidized to nitrate.

In order to add oxygen to the systems, the first two MBBR reactors were aerated. Nitrification reaction generates hydrogen ions which decrease the pH in the reactor. Depending on water quality variation and state of the process (steady-state or transient state), all the reactions described can happen in either of the reactor. Thus, sodium hydroxide (NaOH) was dosed to reactors 1 and 2 to maintain an optimal pH level for the nitrifying biomass. The third MBBR reactor was mechanically mixed under anoxic conditions (low dissolved oxygen environment) for denitrification process. In this step, supplemental carbon (glucose) was added for heterotrophic bacteria growth to reduce nitrite and nitrate to nitrogen gas. The redox potential of the reactor was measured in order to validate that the proper environment was maintained.

The fourth MBBR reactor was used to re-oxygenate the effluent from reactor 3 and biologically oxidize any residual chemical organic demand Figure 4 illustrates the Meadowbank's laboratory MBBR set-up at VEOLIA's laboratory.

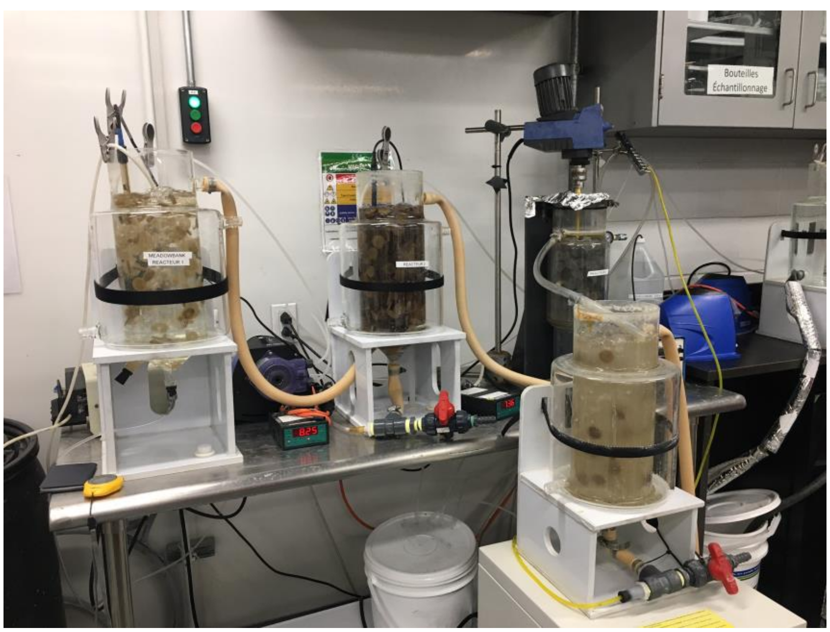

Figure 4 **: Laboratory MBBR set-up**

The laboratory set-up was composed of the following equipment:

- 1 double-walled 5 liters glass reactor for cyanates and thiocyanates removal;
- 1 double-walled 5 liters glass reactor for nitrification;
- 1 double-walled 3 liters reactor for denitrification;
- 1 double-walled 5 liters for Re-oxygenation and removal of excess chemical organic demand;
- 1 air pump with accessories;
- 1 mechanical laboratory stirrer;
- 1 drum and a Masterflex peristaltic pump for mine water supply (feed);
- 1 Chem-tech peristaltic pump for phosphorous source;
- 1 Chem-Tech peristaltic pump for carbon source;
- 1 pH online analyser with dosing setpoint for pH control in nitrification reactor;
- 1 Chem-Tech peristaltic pump for alkali (NaOH) dosing in nitrification reactor (controlled by the pH analyser);
- Tubing and connector;
- 1 industrial chiller for temperature control (not used during room temperature testing).

4.2.1 Chemicals

Table 4 shows chemicals used during the laboratory scale tests for the MBBR system where NaOH is used to maintain a pH value within nitrification range in Reactor 1 (in the vicinity of 7), and sodium hexametaphosphate (Reactor 1) as well as a carbon source (Reactor 3) are both used as nutrients for the bacteria.

Table 4 Chemicals used during the MBBR trial

Chemicals	Formula	Concentration	Description/Use	Consumption
Hydrex 9550	NaOH	Liquid, 0.1N	Alkali source	1.09 L/d
Sodium hexametaphosphate	$(NaPO_3)_6$	Liquid, 0.1 g/L	Phosphorous source	1.25 L/d
Carbon source	Glucose	Liquid, 9.10 g COD/L	Nutrient for the denitrification step	1.26 L/d

4.2.2 Operation parameters for MBBR system

Table 5 presents the MBBR trial operational parameters.

Table 5 Conditions applied to the bench scale MBBR to produce the desired pathway

Parameter	Units	Reactor 1: Cyanate and thiocyanate removal	Reactor 2: Nitrification	Reactor 3: Denitrification*	Reactor 4: Re-oxygenation
Target nitrogen species	-	CN, SCN, CNO	NH_4	NO_3^-	-
Type of carrier	-	K5™	K5™	K5™	K5™
Type of mixing	-	Aeration	Aeration	Mechanical*	Aeration
Dissolved Oxygen	mg O_2/L	> 4.0	> 4.0	< 1.0	> 4.0

The MBBRs were seeded with carriers from a previous trial (from another mine).The flow rate was slowly increased to promote efficient biomass growth. Once the process was stable at a reasonable flow, water from each reactor was collected for validation of the process performances.

4.3 P REMOVAL AND POLISHING

4.3.1 Material used for P and TSS removal

Several tests were completed in order to optimize chemical dosages and to test different products. The jar test program is designed to reproduce the retention time expected in the selected ACTIFLO unit available. The test procedure used to simulate the actual ACTIFLO unit performance with the concentration process solution was as follows:

1. Coagulants Hydrex 3253 was added to the sample;
2. pH was adjusted with NaOH to the desired value if needed;
3. Polymer and microsand were added at the end of contact time for coagulation to start the ballasted flocculation process and to complete the suspended solids removal;
4. Sample is settles and Clarified MBBR Water is collected.

Contact times for the ACTIFLO at 60 m/h including a contact time upstream the ACTIFLO for total suspended solids removal:

- Time 0 min: Coagulant addition;
- Time 1:20 min: Sand and addition of 50% of the polymer dosage;
- Time 4:40 min: Addition of the remain 50% polymer dosage;
- Time 6:40 min: Mixing is stopped;
- Time 8:40 min: sampling of the supernatant

The chemicals used during the clarification tests are shown in Table 6

Table 6 Chemicals used for the clarification

Chemicals	Formula	Concentration	Description/Purpose
Iron-based Coagulant	Hydrex 3253	Liquid, 12.2% Fe	Coagulation
Anionic Polymer	Hydrex 3543	Dry, 1.0 g/L	Flocculation
Microsand	Actisand	--	Ballast settling

4.4 ANALYTICAL MONITORING

4.4.1 Internal MBBR follow-up

The analytical monitoring performed on the MBBR set-up is shown in Table 7. This analytical monitoring is completed in VEOLIA's laboratory on a regular basis.

Table 7 Internal analysis program completed in VEOLIA's laboratory

Parameters	Units	Influent	Reactor 1 Cyanate and thiocyanate removal	Reactor 2 Nitrification	Reactor 3 De-nitrification	Reactor 4 Re-Ox
Flow	L/d	X	--	--	--	--
Dissolved oxygen, DO	mg O_2/L	--	X	X	--	X
Temperature	°C	--	X	X	X	X
pH	--	X	X	X	X	X
Thiocyanates (SCN-)	mg N/L	X	X	X	X	X
Chemical organic demand	mg/L	X	X	X	X	X
Ammonia(NH_4-N)	mg N/L	X	X	X	X	X
Nitrates (NO_3-N) *	mg N/L	X	X	--	X	X
Nitrites (NO_2-N)	mg N/L	X	X	X	X	X
Ortho-phosphates, O-PO_4	mg P/L	X	X	X	X	X

The complete analytical methods performed for the follow-up are detailed in Table 8.

Table 8 Analytical methods used by VEOLIA during the trials

Parameters	Units	Apparatus	Method
pH	--	HACH HQ-40	PHC10101
Dissolved Oxygen	mg/L	HACH HQ-40	LDO10101
Temperature	º C	HACH HQ-40	With pH probe
Ammonia	mg N/L	HACH DR5000	Hach 10031
Nitrite	mg N/L	HACH DR5000	Hach 8507
Nitrate	mg N/L	HACH DR5000	Hach 10020
Orthophosphate	mg P/L	HACH DR5000	Hach 8048

4.4.2 External Analyses and Sampling

Some parameters, such as metal concentrations, cannot be efficiently measured in VEOLIA's laboratory due to the stringent criteria and low detection limits required. For this reason, part of the analyses needs to be completed by an external laboratory. Samples were collected for these analyses and sent to an external accredited laboratory. All external laboratories were ISO/IEC 17025 accredited from the Standards Council of Canada.

Once the process was fully optimized, a complete characterization was done on the Clarified MBBR Water at both temperatures. The complete characterization includes the following parameters:

- Ammonia, Total;
- Cyanides compounds (CN, SCN, CNO)
- Total metals scan;
- Anions scan (NO_3, NO_2, Cl, SO_4);
- Acute lethality test on *Daphnia magna* and rainbow trout

All results from the external laboratory are presented in APPENDIX B.

SECTION 5. RESULTS AND DISCUSSION

5.1 RAW WATER CHARACTERISTICS

Upon reception of the 1 m^3 effluent from AEM-Meadowbank Raw Water, a sample was sent to an accredited laboratory for a full characterization. Table 9 presents the Meadowbank Raw Water parameters, as validated by an accredited external laboratory.

Table 9 AEM_Meadowbank Raw Rater

Parameters	Units	ST-19 Source (As received)	Maximum Monthly Average Concentration
pH	--	7.4	6.0 – 9.0
Total suspended solids	mg/L	23.8	15
Total dissolved solids	mg/L	2640	1400
Ammonia, Total (as N)	mg N/L	**41.3**	16
Bromide	mg/L	<0.50	
Chloride	mg/L	188	1000
Fluoride	mg/L	<0.10	
Nitrate (as N)	mg N/L	9.79	20
Nitrite (as N)	mg N/L	0.173	
Sulfate (as SO_4)	mg/L	1380	
Orthophosphates	mg/L	<0.0030	
Phosphorous, Total	mg/L	0.0113	1.0
Total organic carbon	mg/L	105	
Dissolved organic carbon	mg/L	98	
Cyanides, Total	mg/L	0.0312	0.5
Cyanate	mg/L	**115**	
Thiocyanates	mg/L	**147**	
Aluminium (Al)	mg/L	0.054	1.5
Antimony (Sb)	mg/L	0.0174	
Arsenic (As)	mg/L	0.0979	0.3
Barium (Ba)	mg/L	0.0561	
Beryllium (Be)	mg/L	<0.0010	
Bismuth (Bi)	mg/L	<0.00050	
Boron (B)	mg/L	0.26	
Cadmium (Cd)	mg/L	<0.000060	0.002
Calcium (Ca)	mg/L	285	
Cesium (Cs)	mg/L	<0.00010	
Chromium (Cr)	mg/L	<0.0050	
Cobalt (Co)	mg/L	0.464	
Copper (Cu)	mg/L	**0.811**	0.1
Iron (Fe)	mg/L	0.21	
Lead (Pb)	mg/L	0.00060	0.1
Lithium (Li)	mg/L	<0.010	

Parameters	Units	ST-19 Source (As received)	Maximum Monthly Average Concentration
Magnesium (Mg)	mg/L	23.5	
Manganese (Mn)	mg/L	0.0230	
Molybdenum (Mo)	mg/L	0.124	
Nickel (Ni)	mg/L	0.338	0.2
Phosphorous (as P)	mg/L	<0.50	
Potassium (K)	mg/L	173	
Rubidium (Rb)	mg/L	0.0502	
Selenium (Se)	mg/L	0.137	
Silicon (Si)	mg/L	3.0	
Silver (Ag)	mg/L	0.00057	
Sodium (Na)	mg/L	434	
Strontium (Sr)	mg/L	1.03	
Sulfur (S)	mg/L	619	
Tellurium	mg/L	<0.0020	
Thallium (Tl)	mg/L	<0.00010	
Thorium (Th)	mg/L	<0.0010	
Tin (Sn)	mg/L	<0.0010	
Titanium(Ti)	mg/L	<0.0030	
Tungsten (W)	mg/L	0.0072	
Uranium (U)	mg/L	0.0145	
Vanadium (V)	mg/L	<0.0050	
Zinc (Zn)	mg/L	<0.030	0.4
Zirconium	mg/L	<0.0020	

All external laboratory certificates of analyses are provided in APPENDIX A for reference.

Parameter of concerns are highlighted: TSS, TDS, ammonia, copper and nickel. Parameters in bold are likely to cause lethality to either freshwater control species.

This study aims to reduce all parameter of concern (from the regulation or that fails toxicity tests) except TDS that needs further treatment such as Reverse Osmosis or Evaporation to treat it.

5.1.1 METAL PRETREATMENT

The Raw Water was pre-treated with the ACTIFLO process to precipitate the metals present in it, especially the copper. The tote tank received from AEM-Meadowbank had to be treated with the ACTIFLO metal precipitation step in order to remove some metals, especially copper. Since copper concentration were at 0.811 mg/L and at this concentration, the copper is toxic for the biomass. The dosages applied for the clarification of the Raw Water were:

- Coagulant Hydrex 3253 liquid coagulant (12.2% Fe): 465 mg/ L;
- NaOH: 30 mg/L (liquid solution at 1N);
- Na_2S : 20 mg/L (10.0 g/L,dry based);
- Anionic polymer Hydrex 3543: 1.0 mg/L (dry based);
- Optimal pH in the vicinity of 7.0.

After the ACTIFLO clarification process, the Clarified Raw Water turbidity was in the vicinity of 0.5 NTU; as for the copper concentration, the result obtained for copper was 18 µg/L.

5.2 MBBR TESTING TIMELINE

Laboratory testing on MBBR technology for the treatment of the Clarified Raw Water was started on March 3, 2022.

Case history of the MBBR treatability testing:

- 2022-03-03: The MBBR system was started with a very low flow (2 L/d). It allows media to acclimate with the Clarified Raw Water which has low copper concentration (0.18 mg/L) and is rich with cyanates, thiocyanates and nitrogen compounds. The media put in the reactors 2, 3 and 4 was recovered from a previous trial. For the first reactor, municipal wastewater was used to seed the media.
- 2022-03-15: System was in control**:** nitrate, nitrite and total ammonia concentrations are below treatment objectives. The flow was slightly increased to 4.8 L/d.;
- 2022-03-23: The flow was again increased to 6.8 L/d since all the parameters were in control;
- 2022-03-25: For an unexplained reason, the pH dropped in the denitrification reactor, a pH loop was installed to prevent a low pH and inhibit the treatment;
- 2022-03-30 and 2022-03-31: One drop of phosphoric acid was added manually in the denitrification reactor, since on the previous days, there was a peak of nitrite and nitrate concentrations. Because the Ortho-phosphates were consumed by the biomass, and the lack of phosphorous content caused deficient denitrification process;
- 2022-04-01 to 2022-04-11: The addition of a phosphorous source had an immediate effect, and the system regained satisfying denitrification level, the nitrate and nitrite concentrations were within the discharge criteria. The flow was then gradually increased until it reached 8.64 L/d;
- 2022-04-11: A problem occurred during the week-end with the caustic pump that feeds the nitrification reactor resulting very low pH and the inhibition of the nitrifying bacteria; after the

correction and the replenishing of the caustic, the system was in control within 48 hours and the flow was increased to 9.1 L/d;

- 2022-04-15: The temperatures were lowered from 20 °C to 15 °C in order to proceed with the first toxicity analyses and full data analysis;
- 2022-04-20: On the week-end, the feed tube came out of the barrel, the system deprived for two days while the denitrification reactor was still fed with glucose. It caused vast development of biomass and massive quantity of total suspended solids in this reactor. Thus, TSS increased in the reoxygenation reactor;
- 2022-04-20 to 2022-04-25: Several manipulations were carried out in order to recover the treatment, including stopping the chiller, and cleaning of the reactors. At the end, reactor 4 was emptied to refill it with the effluent from R3. When the system regained its stability; the chiller was re-started;
- 2022-04-28: There was a clough in the outlet tube of reactor 1, causing the reactor to overflow;
- 2022-05-04: Temperatures were lowered to 15 °C;
- 2022-04-29 to 2022-05-10: It was difficult to keep the control of the system during this period, especially in denitrification reactor. Several adjustments such as addition of phosphoric acid, increase of the glucose dosage, reduction of the flow were carried out in order to regain control of the system;
- 2022-05-11: System was in control and at 15 °C, the MBBR Effluent Water was sampled and clarified with the ACTIFLO process to produce the Clarified MBBR Water and to do acute toxicity analyses as well as a full water characterization, the Clarified MBBR Water came back non-toxic and within all the targeted parameters (except TDS);
- 2022-05-13 to 2022-05-23: The flow was reduced and the temperatures were gradually lowered to achieve 8 °C, the system was in full control;
- 2022-05-24: A second sampling was carried out and, MBBR Effluent Water was clarified, and samples were sent for the same analyses performed on May 11th. Another time, all the parameters came back within objectives treatment (except TDS);
- 2022-05-25: Project was closed.

5.2.1 DISCUSSION ON MBBR OPERATION

The efficiency of the MBBR process is tributary from several operation parameters such as contaminants load (proportional to the flow rate), dissolved oxygen concentration and pH in each reactor. Each biological reactor has proper optimal parameters that should be monitored to promote optimal bacterial growth.

The biological process was started on March 3, 2022 with the Clarified Raw Water at a moderate flowrate with four reactors; one for cyanates and thiocyanates, the second one for nitrification, the third one for denitrification, and finally the fourth one for polishing the nitrates concentrations as well as oxidize the residual COD concentrations. When nitrification was well established, the flow rate was gradually increased while stabilizing the performance of the ammonia and nitrate removal at room temperature (in the vicinity of 20 °C). The temperature was lowered gradually to 15 °C for the first phase of the trial, and to 8 °C for the final phase.

The flowrate is equal in each reactor due to the hydraulic gravity profile of the MBBR bench scale unit set-up. The flowrate was gradually increased through the first phase of the laboratory testing and had reached up to 9.2 L/d. The flowrate evolution during the first phase of laboratory testing, held at room temperature, is illustrated in Figure 5.

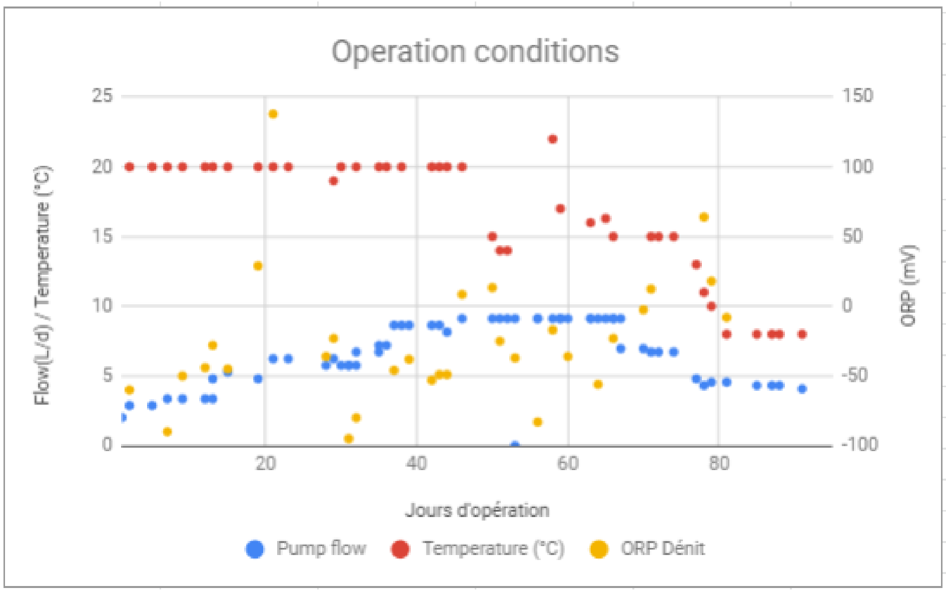

Figure 5 **: Flowrate and operation temperature for the MBBR set-up**

The reactor 1 efficiently removed thiocyanates in the Clarified Raw Water, even at low temperature such as 3 to 4 ºC. Figure 6 shows thiocyanates removal during trials.

As is seen in this Figure, thiocyanate removal is effective in reactor 1 under the given conditions. Throughout the trial, thiocyanate concentration in reactor 2 was closed to 0 mg/L as expected.

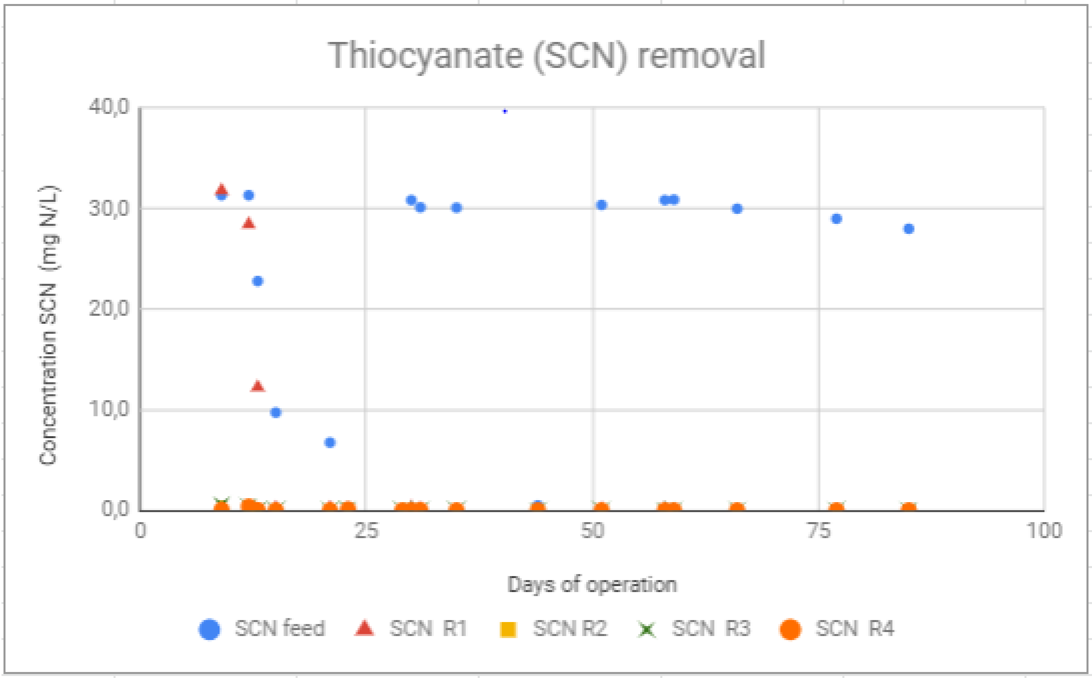

Figure 6 **: Thiocyanate removal by the MBBR process**

Low ammonia concentrations were recorded during most of the laboratory trial. The nitrification process was well established almost immediately after the beginning of the trial. The rare occasion of raising of NH_4 concentration occurred on April 11, 2022 (day 42) after malfunctioning of the caustic pump. The nitrification process is well recuperated after the correction of the issue.

Otherwise, the ammonia concentrations were totally in control in the system throughout the MBBR test, lowering the temperatures had no impact on the nitrification process. See Figure 7 for the ammonia concentrations profile in the MBBR system.

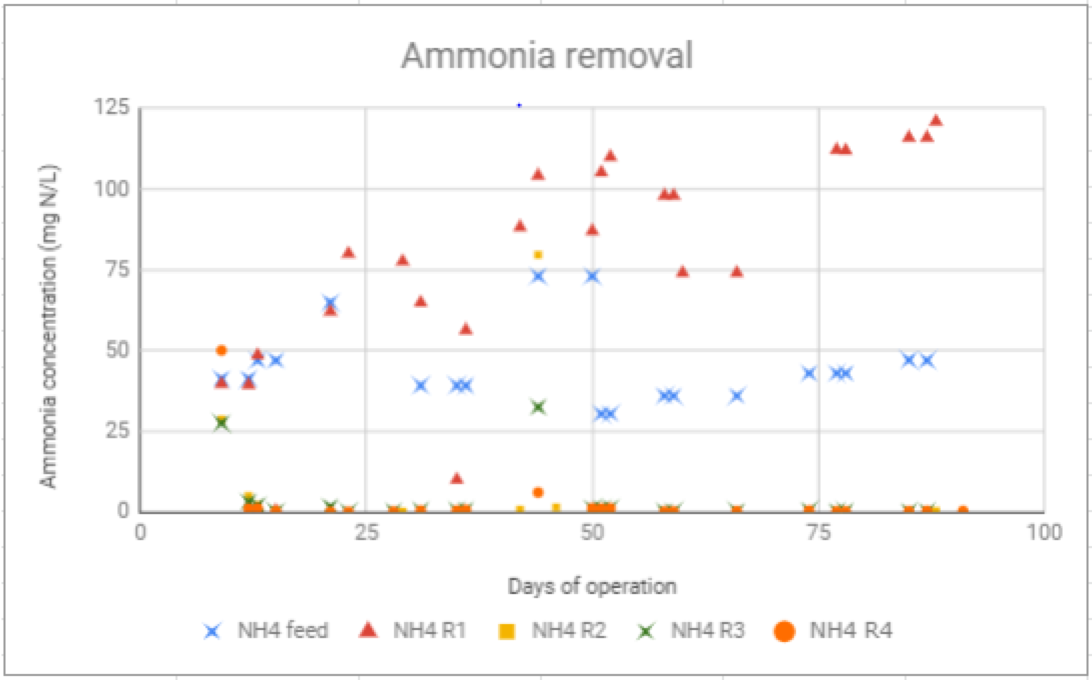

Figure 7: Total Ammonia profile across the MBBR system

Anoxic conditions in the third reactor allows nitrates reduction. Nitrates are produced in reactor 2 as the ammonia is oxidized to nitrite, and then nitrite to nitrate (final nitrification product). As for the nitrate and nitrite concentrations, the four MBBR and the MBBR Effluent Water shows values within discharge criteria most of the time. However, on day 23, it was noticed that the nitrate/nitrite concentrations started to increase in the denitrification reactor, resulting high values in the MBBR Effluent Water. It was determined that a phosphorus deficiency was the cause of this phenomenon. One drop of phosphoric acid was injected directly in the denitrification reactor to enhance the biological reaction and improve the denitrification process. A second episode of high concentrations occurred on days 56 to 66 due to mechanical issues, the system was back to normal in a few days after the correction of the issues.

Monitoring nitrite and nitrate validates that the nitrification and denitrification reactions were fulfilled. As shown in Figure 8 and Figure 9 , nitrate and nitrite were mostly produced in reactor 2 by ammonia-oxidizing bacteria that oxide total ammonia to nitrite; in a second stage nitrites are transformed to gaseous nitrogen. Nitrites concentrations were practically non-existing in Raw Water received from the mine while the nitrates concentrations were in the vicinity of 10 mg N/L. Nitrite and nitrate produced by reactor 2 were then eliminated in reactor 3 due to activity of the anoxic bacteria, which are practically not existing on reactor 4. Results showed that lowering the temperatures have no effect on the nitrate removal, the concentrations were below the toxicity range, even when 8° C was reached. Figure 8 and Figure 9 present nitrate and nitrite evolution on each reactor during trials.

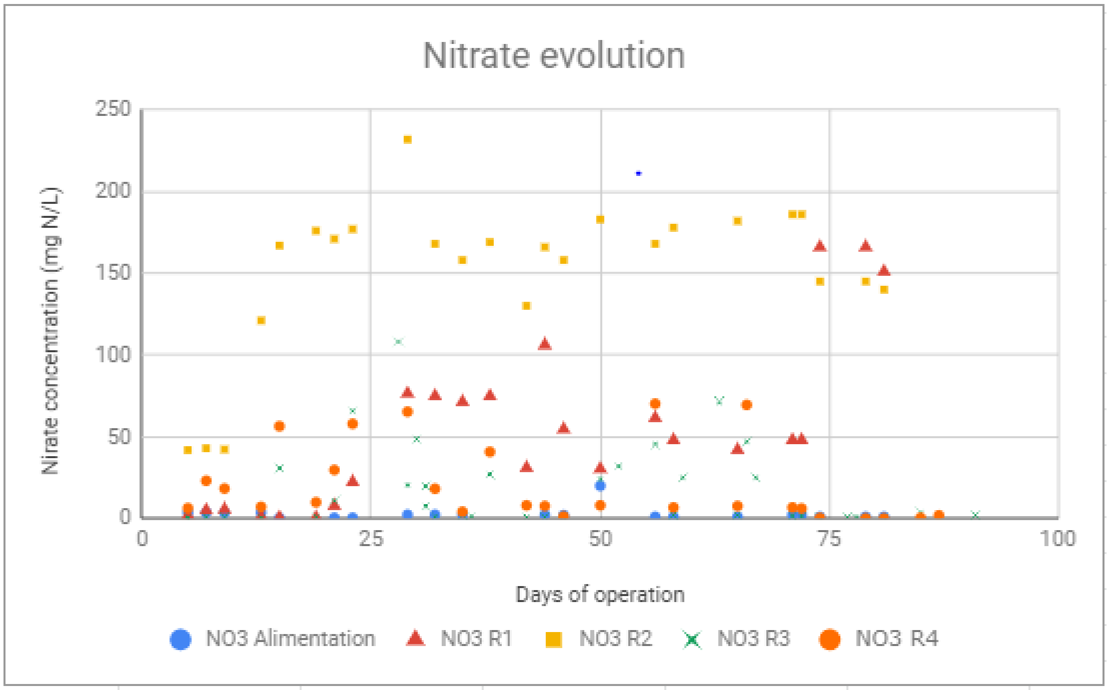

Figure 8 Nitrate evolution across the MBBR system

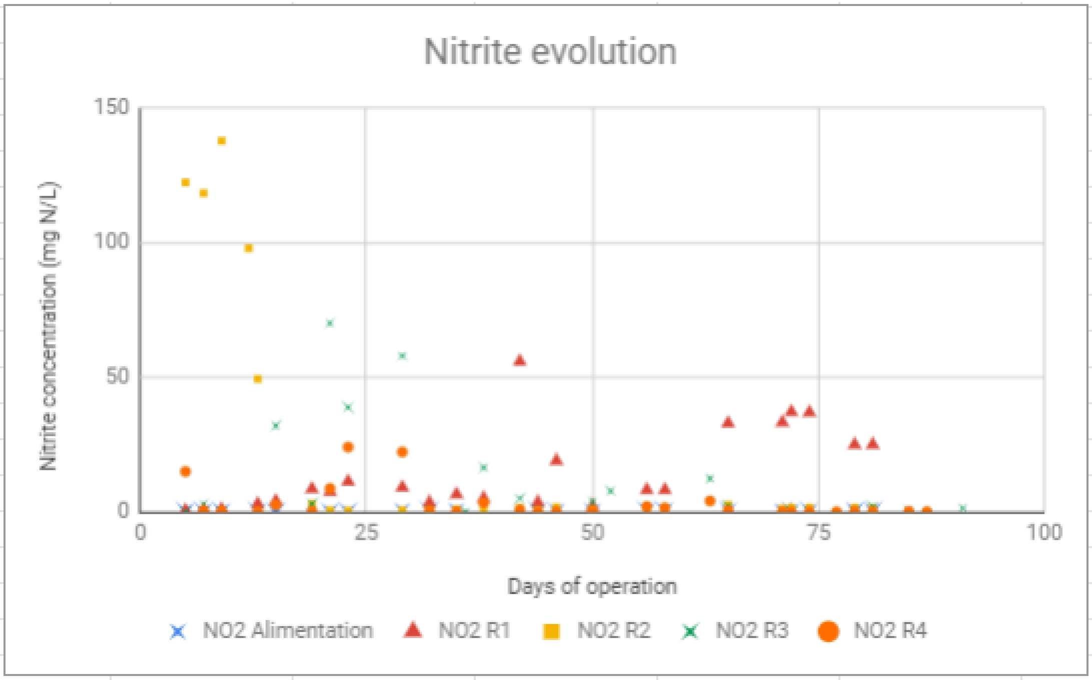

Figure 9 Nitrite evolution throughout the MBBR trial

Reduction of the ammonia and nitrate concentrations in the Clarified Raw Water results in total nitrogen reduction. The global nitrogen concentration evolution for each reactor is presented in Figure 10.

Complete nitrogen removal requires good efficiency of cyanides compounds (OCN, SNC), nitrification (occurring under aerobic conditions) and denitrification (occurring under anoxic conditions) to convert ammonium to nitrate and then nitrate to nitrogen gas. The data presented in Figure 10 is compatible with expected results; high concentrations of total nitrogen were observed in the Raw Water and reactor 1 (where nitrogen was converted but not removed). A significant reduction of the total nitrogen could be seen in reactor 3, as the denitrification process converts nitrates to nitrogen gas, thus removal of the total nitrogen load to the water phase. The offset presented in Figure 10 concerning the nitrates concentration at the end of the trial of the laboratory testing is also seen in the total nitrogen evolution as the denitrification reaction is the main key for total nitrogen removal in the Raw Water.

Therefore, the MBBR process allows significant nitrogen compounds removal during the second part of the laboratory testing, in which the water temperature was progressively decreased down to 8 °C.

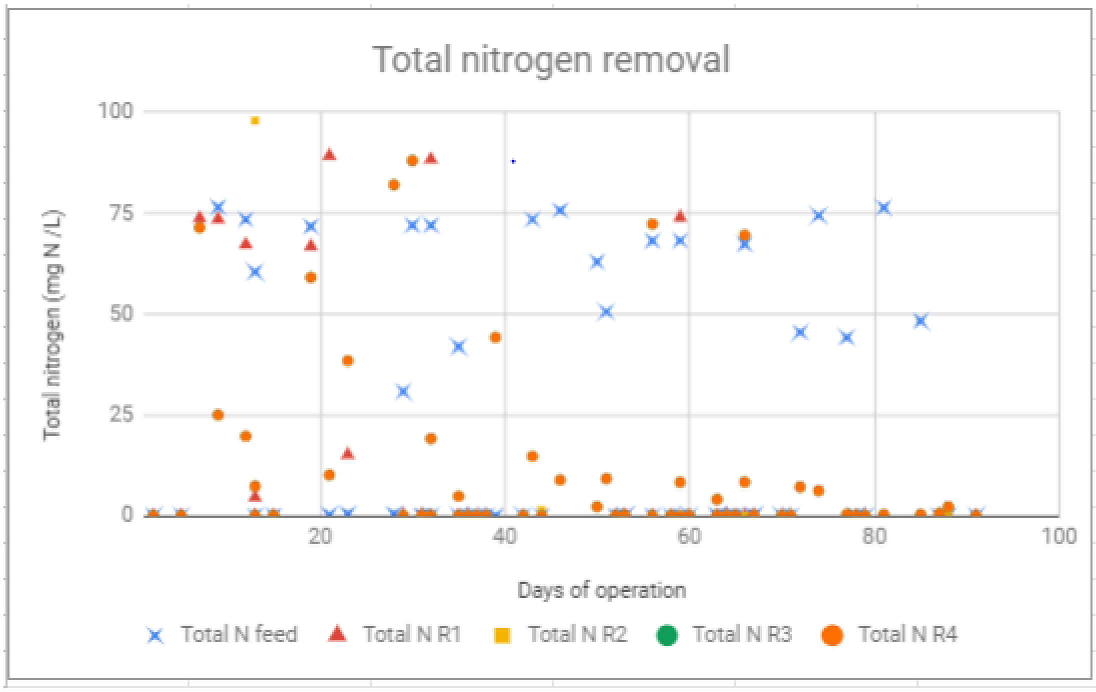

Figure 10 Total nitrogen ammonia removal

Evaluation of the performance of a MBBR process is based on its capacity to remove ammonia and nitrate on a known basis. For MBBR this is usually the media surface, and is typically expressed as g N/d/m2 of media. This allows for comparison of different media that may have different specific areas, expressed as m2 of surface area per m3 of media. The Surface Area Removal Rate (SARR) for ammonia was calculated for Meadowbanks MBBR bench test. However the maximum capacity of the system was not tested. Indeed, loading rates were kept on the safe side to promote nitrite oxidation and prevent further nitrite accumulation, which could have led to further nitrification inhibition by reducing the efficiency of ammonia oxidation to nitrite.

The ammonia and nitrate removal rates are expressed as SARR (Surface Area Removal Rate). Since removals were still complete at the highest loading rate achieved and that the system hasn't been pushed further during these tests, loading rate limitation is not known for this application and the observed SARR given are not to be used for design purpose. See Figures 11 and 12 for the removals during the trial. These figures shows the evolution of the SARR and the SALR (Surface Area Loading Rate) observed during the trial.

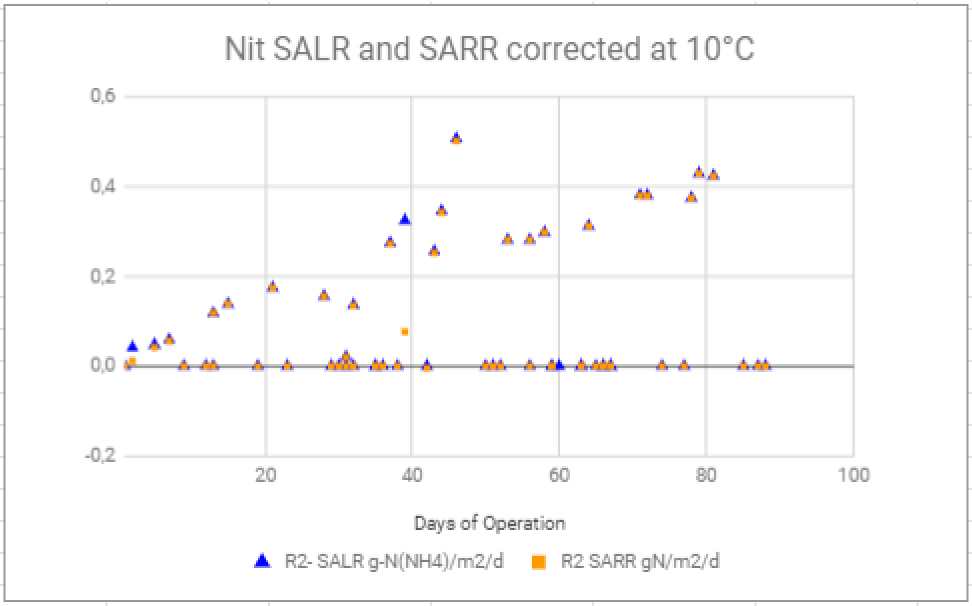

Figure 11 Nitrification SALR and SARR

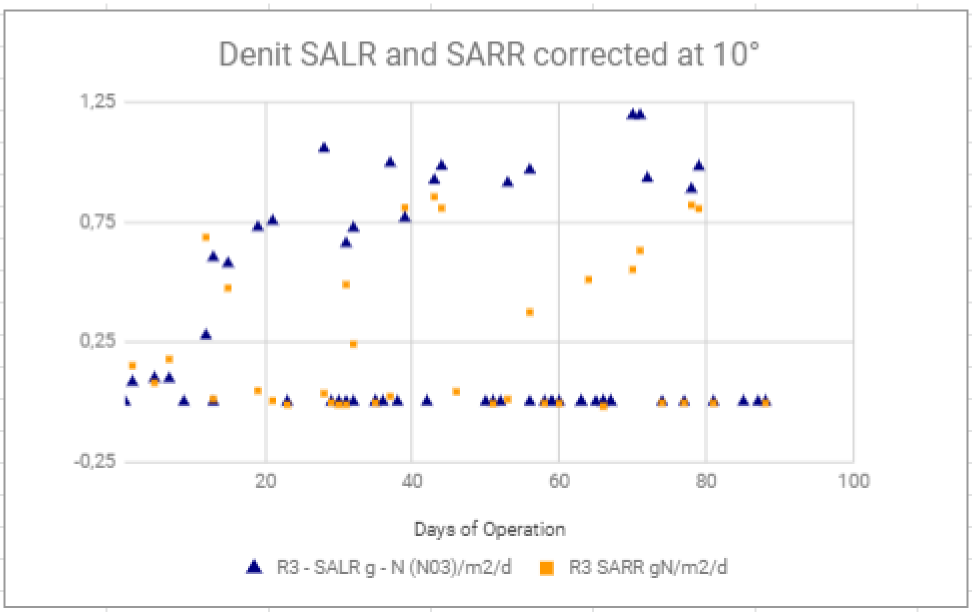

Figure 12 Denitrification SALR and SARR

5.2.2 SOLIDS CLARIFICATION AND P REMOVAL USING ACTIFLO TECHNOLOGY

During the MBBR trials at both temperature, MBBR Effluent Water samples were collected and clarified with the ACTIFLO process in order to determine the optimum chemical dosages necessary to reach optimal clarification. Thirty litres of MBBR Effluent Water were then collected and treated with the ACTIFLO process, using a ferric coagulant, caustic soda and an anionic polymer producing the Clarified MBBR Water. The optimum dosages for the Clarified MBBR Water, treated at 15 °C and 8 °C, were:

For the 15 °C sample:

- Coagulant Hydrex 3253 liquid coagulant (12.2% Fe): 265 mg/L;
- NaOH : 240 mg/L (liquid solution at 1N);
- pH : in the vicinity of 7.0;
- Anionic polymer Hydrex 3543: 4.0 mg/L (dry based).

For the 8 °C sample:

- Coagulant Hydrex 3253 liquid coagulant (12.2% Fe): 300 mg/L;
- NaOH : 288 mg/L (liquid solution at 1N);
- pH : in the vicinity of 7.0;
- Anionic polymer Hydrex 3543: 4.0 mg/L (dry based).

Twenty litres of Clarified MBBR Water were sent to a specialized accredited external laboratory;

- One sample for acute lethality testing, single concentration, to both rainbow trout and *Daphnia magna*;
- One sample for a full characterization of the treated water.

Samples from the Clarified Raw Water were also sent for a final scan. The resulting characterization is presented in Table 10. Complete water characterization sent to the accredited external laboratories can be found in APPENDIX A.

Table 10 Clarified MBBR characterization of the laboratory testing at 15 °C

Parameters	Units	Criteria	Clarified Raw Water 15 °C	Clarified MBBR Water 15 °C
pH	--	6.0 – 9.0	7.59	7.15
Total Dissolved Solids*	mg/L	1400	2440	2490
Total Suspended Solids	mg/L	15	<3.0	6.3
Turbidity	mg/L	15	--	1.20
Total Aluminum	mg/L	1.5	<0.050	<0.050
Dissolved Aluminum	mg/L	1.0	<0.050	<0.050
Total Arsenic	mg/L	0.3	0.0015	<0.0010
Total Cadmium	mg/L	0.002	<0.000050	0.000058
Total Cyanide	mg/L	0.5	0.0403	0.0188
Cyanates	mg/L	--	17	<10
Total Copper	mg/L	0.1	0.0084	<0.0050
Total Mercury	mg/L	0.0004	--	--
Ammonia, Total	mg N/L	16	47.4	2.96
Total Nickel	mg/L	0.2	0.135	0.0454
Nitrates	mg N/L	20	9.37	<0.20
Nitrites	mg N/L	--	0.46	<10
Thiocyanate	mg N/L	--	138	<0.5
Total Lead	mg/L	0.1	<0.00050	<0.00050
Total Phosphorous	mg/L	1.0	<0.50	<0.50
Total Zinc	mg/L	0.4	<0.030	<0.030
Total Chlorides	mg/L	1000	188	121
Acute lethality to Rainbow trout	--	Pass/Fail	--	Non-lethal
Acute lethality to *Daphnia magna*	--	Pass/Fail	--	Non-lethal

*****The MBBR treatment cannot reduce the TDS concentrations, the TDS treatment can be done through a membrane and evaporation chain.

On day 74, the temperatures were gradually lowered to 8 °C to proceed with the second toxicity analysis and complete characterization. The decrease of the temperatures in the four reactors had no impact on the treatment, all the targeted parameters were within objectives. On May 24th, 2022, the Raw Water as well as the Clarified MBBR Water treated with the ACTIFLO process were collected and sent to Bureau Veritas in Montréal, QC and Aquatox Quelph, ON. A sample of the MBBR Effluent Water (from R4) was tested for the same parameters. See Table 11 for the characterization of these three sources.

Table 11 Clarified MBBR Water characterization of the laboratory testing at 8 °C

Parameters	Units	Criteria	Clarified Raw Water 8 °C	MBBR Effluent Water 8 °C	Clarified MBBR Water 8 °C
pH	--	6.0 – 9.0	7.84	7.76	6.98
Total Dissolved Solids	mg/L	1400	6.3	<u>2110</u>	<u>2600</u>
Total Suspended Solids	mg/L	15	6.3	<u>346</u>	<3.8
Turbidity	mg/L	15	--	-	2.74
Total Aluminum	mg/L	1.5	0.0464	<0.03	<0.03
Total Arsenic	mg/L	0.3	0.00169	<0.001	<0.001
Total Cadmium	mg/L	0.002	<0.0005	<0.0006	<0.0005
Total Cyanides	mg/L	0.5	0.0617	0.0144	0.0282
Cyanate	mg/L	--	30	<2	<1
Total Copper	mg/L	0.1	0.00832	0.018	<0.005
Total Mercury	mg/L	0.0004	--	--	--
Ammonia, Total	mg N/L	16	<u>64.4</u>	0.0352	3.94
Total Nickel	mg/L	0.2	0.142	0.0647	0.0546
Nitrates	mg N/L	20	2.96	<0.1	<0.2
Nitrites	mg N/L	--	5.19	<0.05	<0.1
Thiocyanate	mg/L	--	**124**	<0.5	<0.5
Total Lead	mg/L	0.1	<0.0005	<0.0005	<0.0005
Total Phosphorous	mg/L	1.0	<0.5	8.95	<0.5
Total Zinc	mg/L	0.4	<0.03	<0.0316	<0.03
Total Chlorides	mg/L	1000	193	100	112
Acute lethality to Rainbow trout	--	Pass/Fail	--	--	Non-toxic
Acute lethality to *Daphnia magna*	--	Pass/Fail	--	--	Non-toxic

This table show that all the parameters are met on the Clarified MBBR Water, except for TDS.

SECTION 6. CONCLUSIONS

Raw Water was received from Meadowbank mine; the Raw Water was first treated for metals with the ACTIFLO process. The Clarified Raw Water was then treated with the MBBR process to produce the MBBR Effluent Water. The laboratory test was split into two distinct phases:

- Treatment at 15 °C;
- Treatment at 8 °C.

Testing results from both phases, at both temperature, have confirmed the efficiency of the biological treatment proposed (MBBR) for cyanates, thiocyanate, total ammonia and nitrate removal in four distinct reactors:

- Reactor 1: Cyanates and Thiocyanates removal;
- Reactor 2: Nitrification;
- Reactor 3: Denitrification;
- Reactor 4: Re-oxygenation and removal of excess chemical organic demand

The MBBR Effluent Water, the final effluents from reactor 4, were treated to remove phosphorus and TSS using a ballasted flocculation and clarification (ACTIFLO) process. The Clarified MBBR Water was meeting all objectives on Meadowbank effluent. All of the metal targets were met as well as the targeted pollutants.

The main conclusions for the bench scale MBBR trial performed at room and low temperature (8°) at VEOLIA laboratory are:

- Cyanates and thiocyanates were removed in the first reactor;
- The nitrification process was fulfilled and the treated water meets the objective of 16.0 mg N/L;
- The denitrification process reduced the nitrates present in the water as the results of the nitrification reaction. It also produced water with low nitrite concentration;
- The re-oxygenation and biological polishing reactor allowed for the elimination of the excess carbon left from denitrification step. It also increased the oxygen concentration in the water before its release into the environment to prevent toxicity in the Clarified MBBR Water;
- pH was maintained in the nitrification and denitrification reactors using sodium hydroxide, and a phosphorous source was needed in the feed (added at the beginning of the trial in the raw water source and later directly to the reactors);
- Following TSS removal, the Clarified MBBR Water, was not acutely lethal for both *Daphnia magna* and *Oncorhynchus mykiss* (rainbow trout);
- The TSS, phosphorous and all metals in the Clarified MBBR Water meet the discharge criteria.

APPENDIX A. MBBR FOLLOW-UP

MBBR Lab Study Results

Project: Meadowbank

Date	Hour	Days	Pump flow	Pump flow	pH					Temperature (°C)				Dissolved oxygen (mg O2/L)				ORP	Ortho-Phosphate-P (mg PO4 - P/L)				
			L/h	L/d	Feed	R1	R2	R3	R4	R1	R2	R3	R4	R1	R2	R3	R4	ORP Denit	Feed	R1	R2	R3	R4
2022-03-03	13h30	1	0,08	2,02																			
2022-03-04	11h00	2	0,12	2,88	7,40	7,75	7,65	7,24	8,63	20	20	20	20	8,75	8,36	0,45	8,23						
2022-03-07	9h00	5	0,12	2,88	8,38	7,60	7,10	7,50	8,02	20	20	20	20	8,51	6,42	0,45	7,56	-60	0,4	7,1	6,1	2,1	3,1
2022-03-09	9h00	7	0,14	3,36	8,30	8,14	6,93	7,88	8,20	20	20	20	20	8,48	8,01	0,43	8,02						
2022-03-11	9h00	9	0,14	3,36	8,12	8,02	7,21	7,65	8,52	20	20	20	20	8,42	6,80	0,39	7,98	-90					
2022-03-14	10h00	12	0,14	3,36		8,21	7,64	7,59	8,67	20	20	20	20	8,74	6,60	0,41	8,07	-50					
2022-03-15	9h00	13	0,14	3,36	8,12	8,16	7,24	7,55	8,60	20	20	20	20	8,74	6,55	0,35	8,23	-44					
2022-03-15	16h00	13	0,20	4,80																			
2022-03-17	9h00	15	0,22	5,28	8,03	8,1	7,38	7,11	8,46	20	20	20	20	8,5	5,57	0,35	8,12	-28					
2022-03-21	9h00	19	0,20	4,80		7,99	7,28	7,29	8,36	20	20	20	20	8,67	6,67	0,37	8,24	-45					
2022-03-23	9h00	21	0,26	6,24	8,25	7,94	7,34	6,80	8,38	20	20	20	20	8,69	4,97	0,37	8,16	29					
2022-03-25	9h00	23	0,26	6,24		7,01	7,21	5,70	8,08	20	20	20	20	8,34	5,76	1,79	7,51	138		1,69	1,12	0,62	0,16
2022-03-28	9h00	28	0,24	5,76												0,56							
2022-03-29	9h00	29	0,26	6,24	8,20	7,17	7,28	7,43	8,02	19	19	19	19	7,26	7,93	0,72	8,16	-36					
2022-03-30	9h00	30	0,24	5,76		6,97	7,28	7,25	8,22	20	20	20	20	7,08	6,87	0,55	8,22	-23				0,0	
2022-03-31	9h00	31	0,24	5,76		7,00	7,48	7,29						6,78	6,72	0,50	8,01					0,13	
2022-03-31	15h30	31	0,24	5,76																		3,0	
2022-04-01	9h00	32	0,24	5,76	8,20	7,07	7,58	7,15		20	20	20	20	6,48	6,70	0,38	7,51	-95					
2022-04-01	11h00	32	0,28	6,72																			
2022-04-04	9h00	35	0,28	6,72		7,06	7,26	7,05	8,41	20	20	20	20	6,56	6,98	0,33	8,09	-80				0,04	
2022-04-04	16h20	35	0,30	7,20																			
2022-04-05	16h00	36	0,30	7,20		7,01	7,37	7,35	8,31	20	20	20	20	6,51	6,81	0,40	8,03						
2022-04-06	16h00	37	0,36	8,64																			
2022-04-07	9h00	38	0,36	8,64		7,19	7,38	7,15	8,15	20	20	20	20	6,28	6,67	0,41	8,01	-46				0,02	
2022-04-08	9h00	39	0,36	8,64																			
2022-04-11	9h00	42	0,36	8,64	7,24	7,46	7,21	7,04	8,06	20	20	20	20	6,13	5,30	0,34	6,77	-38	0,63	0,95	2,12	0,04	0,04
2022-04-12	9h00	43	0,36	8,64		6,91	7,12	7,14	8,32	20	20	20	20	5,80	5,76	0,36	7,31	-53					
2022-04-13	9h00	44	0,34	8,16		7,11	7,99	7,18	8,43	20	20	20	20	5,82	6,50	0,35	7,53	-49					
2022-04-15	9h00	46	0,38	9,12	8,18	7,20	7,39	7,11	8,20	20	20	20	20	5,38	6,17	0,34	7,63	-49					
2022-04-19	9h00	50	0,38	9,12		7,19	7,49	7,02	8,24	15	15	15	15	6,36	7,17	0,38	8,38	8,5		0,42	0,66	0,04	0,02
2022-04-20	9h00	51	0,38	9,12		7,00	7,70	7,16	8,21	14	14	14	14	5,88	7,42	0,56	8,56	13,4					
2022-04-21	9h00	52	0,38	9,12		7,08	7,64	7,14	8,19	14	14	14	14	6,53	7,35	1,25	8,72	-25					
2022-04-22	8H00	53	0,38	9,12																			
2022-04-22	12h00	53		0,00																			
2022-04-25	8h00	56	0,38	9,12		7,04	7,29	7,03		22	22	22	22	5,50	6,95	0,37	8,44	-37					
2022-04-25	10h00	56	0,38	9,12																			
2022-04-27	9h00	58	0,38	9,12		7,26	7,47	7,2		22	22	22	22	4,86	6,22	0,32	7,35	-83,0					
2022-04-28	9h00	59	0,38	9,12		7,03	7,43	8,22		17	17	17	17	6,69	6,97	0,6	6,92	-17					
2022-04-28	17h00	59	0,38	9,12																			
2022-04-29	10h00	60	0,38	9,12																			
2022-05-02	9h00	63	0,38	9,12		7,2	7,52	7,12		16	16	16	16	7,30	6,58	0,69	8,42	-36				0,02	
2022-05-02	13h00	63	0,38	9,12																			
2022-05-03	9H00	64	0,38	9,12												0,43							
2022-05-04	9h00	65	0,38	9,12	7,80	7,3	7,39	7,09	8,62	16,2	16,3	16,3	16,3	7,71	7,07	0,41	8,53	-56				0,10	
2022-05-05	9h00	66	0,38	9,12						15	15	15	15									2,77	
2022-05-05	10h00	66	0,38	9,12																			
2022-05-06	9h00	67	0,38	9,12										8,08	7,35	0,45	8,70	-23				0,64	
2022-05-06	11h00	67	0,29	6,96																			
2022-05-09	9h00	70	0,29	6,96																			
2022-05-10	9h00	71	0,28	6,72		7,49	7,60	7,03		15	15	15	15	8,26	8,16	0,42	8,67	-2,5					
2022-05-11	9h00	72	0,28	6,72	7,59	7,59	7,48	7,21	8,48	15	15	15	15	8,17	7,95	0,34	8,38	12,4				0,80	
2022-05-13	9h00	74	0,28	6,72						15	15	15	15										
2022-05-16	9h00	77	0,20	4,80						13	13	13	13										
2022-05-17	9h00	78	0,18	4,32						11	11	11	11										
2022-05-18	11h00	79	0,19	4,56	7,14	7,66	7,31	7,01	7,86	10	10	10	10	9,63	9,25	0,37	9,18	64				0,9	
2022-05-20	9h00	81	0,19	4,56		7,84	8,07	7,03	7,76	8	8	8	8	9,80	9,44	0,36	9,31	18					
2022-05-24	9h00	85	0,18	4,32		7,31	7,88	7,01	7,88	8	8	8	8	10,23	10,24	0,45	10,10	-8				0,0	

Date	Hour	DCO soluble (mg/L)					NH4 Feed	NH4 R1	NH4 R2	NH4 R3	NH4 R4	NO2 Feed	NO2 R1	NO2 R2	NO2 R3	NO2 R4	NO3 Feed	NO3 R1	NO3 R2	NO3 R3	NO3 R4	OCN Feed	OCN R1	OCN R2	OCN R3	OCN R4	SCN Feed	SCN R1	SCN R2	SCN R3	SCN R4
		Feed	R1	R2	R3	R4	mg N/L	mg N/L	mg N/L	mg N/L	mg N/L	mg N/L	mg N/L	mg N/L	mg N/L	mg N/L	mg N/L	mg N/L	mg N/L	mg N/L	mg N/L	mg N/L	mg/L	mg N/L	mg N/L	mg N/L	mg N/L	mg N/L	mg N/L	mg N/L	mg N/L
2022-03-03	13h30																														
2022-03-04	11h00																														
2022-03-07	9h00	376	376	202	161	62	41,3	39,7	28,7	27,5	50,1	0,26	0,48	122,5	0,00	15,0	3,6	1,8	41,9	0,4	6,3	30,0					31,3	31,8	0,6	0,5	0,0
2022-03-09	9h00				37	39	41,3	39,4	4,9	3,1	1,0	0,26	0,73	118,5	2,8	0,54	3,6	5,0	43,0	0,9	23,1						31,3	28,4	0,1	0,4	0,4
2022-03-11	9h00	376	241	183	42	43	47,0	48,6	2,2	2,0	1,1	0,10	0,91	138	0,13	0,32	3,6	5,5	42,3	0,4	18,3						22,8	12,3	0,0	0,0	0,0
2022-03-14	10h00				98									98,0																	
2022-03-15	9h00				40	46	47,0	0,3	0,3	0,1	0,1	0,10	2,93	49,5	0,016	0,12	3,6	1,1	121,0	0,3	7,1						9,7	0,2	0,1	0,0	0,0
2022-03-15	16h00																														
2022-03-17	9h00	376	241	183	104	25	64,8	62,0	0,0	1,6	0,0	0,005	3,98	2,4	32,0	2,6	0,2	0,6	167	30,8	56,5						6,7	0,3	0,0	0,0	0,0
2022-03-21	9h00							80,0	0	0	0,0		8,52	3,0	2,98	0,13		0,6	176	0,9	9,9						0,2	0,2	0,1	0,1	0,1
2022-03-23	9h00	181	189	55	197	58			0,1	0,1	0,1	0,03	7,45	0,55	70,0	8,7	0,4	7,7	171	10,8	29,7										
2022-03-25	9h00				847	74		77,6	0,1			0,03	11,3	0,45	39,0	24,1	0,4	22,3	177	66,1	58						0,0	0,0	0,0	0,0	0,0
2022-03-28	9h00				761															108,0							30,9	0,2	0,0	0,0	0,0
2022-03-29	9h00				148	94	39,2	64,8	0,3	0,4	0,4	0,43	9,1	0,6	58,0	22,30	2,3	76,6	232	20,4	65,4						30,1	0,2	0,1	0,0	0,0
2022-03-30	9h00				236															48,7											
2022-03-31	9h00				93															19,8											
2022-03-31	15h30																			7,4											
2022-04-01	9h00	275	55	21	75	66	39,2	10,0	0,4	0,4	0,4	0,43	3,4	0,5	0,25	0,5	2,3	75,0	168	1,0	18,2						30,1	0,0	0,0	0,0	0,0
2022-04-01	11h00																														
2022-04-04	9h00				236	55	39,2	56,2	0,6	0,6	0,6	0,43	6,52	1,00	0,23	0,14	2,3	71,4	158	2,2	4,1										
2022-04-04	16h20																														
2022-04-05	16h00				200										0,07					1,1											
2022-04-06	16h00				132																										
2022-04-07	9h00				163	37		88,2	0,7				5	1,12	16,5	3,4		75	169	27	40,8										
2022-04-08	9h00																														
2022-04-11	9h00				648	67	73,0	104,2	79,6	32,5	6		56	1,50	5,00	0,75		31	130	0,7	8				0,0		0,5	0,0	0,0	0,0	0,0
2022-04-12	9h00				53				1,4																						
2022-04-13	9h00				90	50	73,0	87,0	1,1	1,1	1,1	0,43	3,5	0,55	0,23	0,17	2,3	106	166	0,8	7,6										
2022-04-15	9h00				180	36	30,4	105,2	1,0	1,0	1,0	0,18	19,0	1,74	0,01	0,04	2,0	54,7	158	0,9	1,2						30,4	0,1	0,0	0,0	0,0
2022-04-19	9h00				681	197	30,4	110,0	1,1	1,2	1,1	0,18	2,02	1	3,8	0,12	20	30,4	183,0	24,1	8,0										
2022-04-20	9h00				421																										
2022-04-21	9h00				532										7,69					32,1											
2022-04-22	8H00																														
2022-04-22	12h00																														
2022-04-25	8h00				46	40	36,0	98,0	0,1	0,1	0,1	0,34	8,15	1,44	4,4	1,98	1,0	61,6	168	45,6	70,3				0,0		30,9	0,1	0,0	0,0	0,0
2022-04-25	10h00																														
2022-04-27	9h00						36,0	98,0	0,06	0,1	0,1	0,34	8,15	1,40	0,69	1,50	1,0	48	178	1,9	6,7						30,9	0,0	0,0	0,0	0,0
2022-04-28	9h00				1000	248		74												24,9											
2022-04-28	17h00																														
2022-04-29	10h00																														
2022-05-02	9h00				70	29			ND						12,4	4,05				71,4											
2022-05-02	13h00																														
2022-05-03	9H00																														
2022-05-04	9h00				66	55	36,0	74,0	0,1	0,1	0,23	0,34	33,0	2,61	2,25	0,52	1,0	42,0	182	2,1	7,6						30,0	0,0	0,0	0,0	0,0
2022-05-05	9h00				39															>70	69,6										
2022-05-05	10h00																			47											
2022-05-06	9h00				60															25											
2022-05-06	11h00																														
2022-05-09	9h00																														
2022-05-10	9h00				130	46	43,0	>70	0,37	0,40	0,40	0,18	33,3	1,22	0,32	0,045	2,3	48,0	186	1,6	6,7										
2022-05-11	9h00				184	46	43,0	112,2	0,30	0,16	0,10	0,18	37,2	1,62	0,00	0,01	2,3	48,0	186	1,4	6,1						29,0	0,0	0,0	0,0	0,0
2022-05-13	9h00				310	40	43	112	0,3	0,2	0,1	0,20	37,0	1,6	0,05	0,00	1,0	166	145	0,5	0,3										
2022-05-16	9h00				276	47									0,00	0,00				0,8											
2022-05-17	9h00				432															0,8											
2022-05-18	11h00				503	53	47,1	116,0	0,2	0,2	0,2	0,30	25,0	1,60	0,30	0,10	1,0	166	145	0,8	0,0						28,0	0,0	0,0	0,0	0,0
2022-05-20	9h00				449	67	47,0	116	0,1	0,2	0,3	0,3	25,0	1,4	1,90	0,02	1,0	151	140	0,9	0										
2022-05-24	9h00				577	163		121	0,28						0,67	0,17				3,40	0,40										

APPENDIX B. CERTIFICATE OF ANALYSIS

CERTIFICATE OF ANALYSIS

Work Order	: **WT2204627**	Page	: 1 of 4
Client	: **Veolia Water Technologies Canada**	Laboratory	: Waterloo - Environmental
Contact	: Josee Lalonde	Account Manager	: Peter Stastny
Address	: 4105 Sartelon Ville St-Laurent QC Canada H4S 2B3	Address	: 60 Northland Road, Unit 1 Waterloo ON Canada N2V 2B8
Telephone	: 514 334 7230	Telephone	: +1 519 886 6910
Project	: ----	Date Samples Received	: 30-May-2022 09:30
PO	: 5000196035.606300.21030003	Date Analysis Commenced	: 30-May-2022
C-O-C number	: ----	Issue Date	: 09-Jun-2022 16:19
Sampler	: CLIENT		
Site	: ----		
Quote number	: Veolia, Quebec Standing Offer 2022		
No. of samples received	: 1		
No. of samples analysed	: 1		

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

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*
Jon Fisher	Department Manager - Inorganics	Inorganics, Waterloo, Ontario
Jon Fisher	Department Manager - Inorganics	Metals, Waterloo, Ontario
Tracy Harley	Supervisor - Water Quality Instrumentation	Inorganics, Burnaby, British Columbia

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*
mg/L	milligrams per litre

<: 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*
CNI	*Test result for Total Cyanide may be biased high due to interference from high nitrite in this sample. Nitrite can cause false positives for T-CN at up to ~ 0.8% of the nitrite concentration. Interpret result as a maximum possible value.*
DLDS	*Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.*
DLHC	*Detection Limit Raised: Dilution required due to high concentration of test analyte(s).*
DLM	*Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).*

Analytical Results

Sub-Matrix: **Water**

(Matrix: **Water**)

				Client sample ID	196035-RW-8.C	----	----	----	----
				Client sampling date / time	27-May-2022	----	----	----	----
Analyte	CAS Number	Method	LOR	Unit	WT2204627-001	--------	--------	--------	--------
					Result	----	----	----	----
Physical Tests									
solids, total dissolved [TDS]	----	E162	10	mg/L	2480 DLDS	----	----	----	----
solids, total suspended [TSS]	----	E160	3.0	mg/L	6.3	----	----	----	----
Anions and Nutrients									
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	64.4 DLHC	----	----	----	----
bromide	24959-67-9	E235.Br	0.10	mg/L	<1.00 DLDS	----	----	----	----
chloride	16887-00-6	E235.Cl	0.50	mg/L	193 DLDS	----	----	----	----
cyanate	88402-73-7	E343	0.20	mg/L	30.0 DLHC, DLM	----	----	----	----
fluoride	16984-48-8	E235.F	0.020	mg/L	<0.200 DLDS	----	----	----	----
nitrate (as N)	14797-55-8	E235.NO3	0.020	mg/L	2.96 DLDS	----	----	----	----
nitrite (as N)	14797-65-0	E235.NO2	0.010	mg/L	5.19 DLDS	----	----	----	----
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-T	0.0030	mg/L	<0.0030	----	----	----	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	1800 DLDS	----	----	----	----
Cyanides									
thiocyanate	302-04-5	E344	0.50	mg/L	124 DLM	----	----	----	----
cyanide, strong acid dissociable (total)	----	E333	0.0020	mg/L	0.0617 CNI	----	----	----	----
Organic / Inorganic Carbon									
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	80.5	----	----	----	----
carbon, total organic [TOC]	----	E355-L	0.50	mg/L	92.0	----	----	----	----
Total Metals									
aluminum, total	7429-90-5	E420	0.0030	mg/L	0.0464 DLHC	----	----	----	----
antimony, total	7440-36-0	E420	0.00010	mg/L	0.00746 DLHC	----	----	----	----
arsenic, total	7440-38-2	E420	0.00010	mg/L	0.00169 DLHC	----	----	----	----
barium, total	7440-39-3	E420	0.00010	mg/L	0.0290 DLHC	----	----	----	----
beryllium, total	7440-41-7	E420	0.000020	mg/L	<0.000200 DLHC	----	----	----	----
bismuth, total	7440-69-9	E420	0.000050	mg/L	<0.000500 DLHC	----	----	----	----
boron, total	7440-42-8	E420	0.010	mg/L	0.263 DLHC	----	----	----	----
cadmium, total	7440-43-9	E420	0.0000050	mg/L	<0.0000500 DLHC	----	----	----	----
calcium, total	7440-70-2	E420	0.050	mg/L	286 DLHC	----	----	----	----
cesium, total	7440-46-2	E420	0.000010	mg/L	<0.000100 DLHC	----	----	----	----
chromium, total	7440-47-3	E420	0.00050	mg/L	<0.00500 DLHC	----	----	----	----
cobalt, total	7440-48-4	E420	0.00010	mg/L	0.447 DLHC	----	----	----	----

Analytical Results

Sub-Matrix: **Water**

(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	196035-RW-8.C	----	----	----	----
				Client sampling date / time	27-May-2022	----	----	----	----
					WT2204627-001	--------	--------	--------	--------
					Result	----	----	----	----
Total Metals									
copper, total	7440-50-8	E420	0.00050	mg/L	0.00832 DLHC	----	----	----	----
iron, total	7439-89-6	E420	0.010	mg/L	0.190 DLHC	----	----	----	----
lead, total	7439-92-1	E420	0.000050	mg/L	<0.000500 DLHC	----	----	----	----
lithium, total	7439-93-2	E420	0.0010	mg/L	<0.0100 DLHC	----	----	----	----
magnesium, total	7439-95-4	E420	0.0050	mg/L	23.1 DLHC	----	----	----	----
manganese, total	7439-96-5	E420	0.00010	mg/L	0.0238 DLHC	----	----	----	----
molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.0906 DLHC	----	----	----	----
nickel, total	7440-02-0	E420	0.00050	mg/L	0.142 DLHC	----	----	----	----
phosphorus, total	7723-14-0	E420	0.050	mg/L	<0.500 DLHC	----	----	----	----
potassium, total	7440-09-7	E420	0.050	mg/L	166 DLHC	----	----	----	----
rubidium, total	7440-17-7	E420	0.00020	mg/L	0.0448 DLHC	----	----	----	----
selenium, total	7782-49-2	E420	0.000050	mg/L	0.123 DLHC	----	----	----	----
silicon, total	7440-21-3	E420	0.10	mg/L	1.57 DLHC	----	----	----	----
silver, total	7440-22-4	E420	0.000010	mg/L	<0.000100 DLHC	----	----	----	----
sodium, total	7440-23-5	E420	0.050	mg/L	482 DLHC	----	----	----	----
strontium, total	7440-24-6	E420	0.00020	mg/L	1.04 DLHC	----	----	----	----
sulfur, total	7704-34-9	E420	0.50	mg/L	649 DLHC	----	----	----	----
tellurium, total	13494-80-9	E420	0.00020	mg/L	<0.00200 DLHC	----	----	----	----
thallium, total	7440-28-0	E420	0.000010	mg/L	<0.000100 DLHC	----	----	----	----
thorium, total	7440-29-1	E420	0.00010	mg/L	<0.00100 DLHC	----	----	----	----
tin, total	7440-31-5	E420	0.00010	mg/L	<0.00100 DLHC	----	----	----	----
titanium, total	7440-32-6	E420	0.00030	mg/L	<0.00300 DLHC	----	----	----	----
tungsten, total	7440-33-7	E420	0.00010	mg/L	<0.00100 DLHC	----	----	----	----
uranium, total	7440-61-1	E420	0.000010	mg/L	0.00869 DLHC	----	----	----	----
vanadium, total	7440-62-2	E420	0.00050	mg/L	<0.00500 DLHC	----	----	----	----
zinc, total	7440-66-6	E420	0.0030	mg/L	<0.0300 DLHC	----	----	----	----
zirconium, total	7440-67-7	E420	0.00020	mg/L	<0.00200 DLHC	----	----	----	----

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

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **WT2204627**	Page	: 1 of 9
Client	: **Veolia Water Technologies Canada**	Laboratory	: Waterloo - Environmental
Contact	: Josee Lalonde	Account Manager	: Peter Stastny
Address	: 4105 Sartelon Ville St-Laurent QC Canada H4S 2B3	Address	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
Telephone	: 514 334 7230	Telephone	: +1 519 886 6910
Project	: ----	Date Samples Received	: 30-May-2022 09:30
PO	: 5000196035.606300.21030003	Issue Date	: 09-Jun-2022 16:19
C-O-C number	: ----		
Sampler	: CLIENT		
Site	: ----		
Quote number	: Veolia, Quebec Standing Offer 2022		
No. of samples received	: 1		
No. of samples analysed	: 1		

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)

- No Analysis Holding Time Outliers exist.

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 : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) 196035-RW-8.C	E298	27-May-2022	30-May-2022	----	----		31-May-2022	28 days	5 days	✓
Anions and Nutrients : Bromide in Water by IC										
HDPE [ON MECP] 196035-RW-8.C	E235.Br	27-May-2022	----	----	----		02-Jun-2022	28 days	7 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE [ON MECP] 196035-RW-8.C	E235.Cl	27-May-2022	----	----	----		02-Jun-2022	28 days	7 days	✓
Anions and Nutrients : Cyanate by Ion Selective Electrode										
HDPE [ON MECP] 196035-RW-8.C	E343	27-May-2022	----	----	----		03-Jun-2022	----	----	
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (0.003 mg/L)										
HDPE [ON MECP] 196035-RW-8.C	E378-T	27-May-2022	----	----	----		31-May-2022	7 days	4 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE [ON MECP] 196035-RW-8.C	E235.F	27-May-2022	----	----	----		02-Jun-2022	28 days	7 days	✓
Anions and Nutrients : Nitrate in Water by IC										
HDPE [ON MECP] 196035-RW-8.C	E235.NO3	27-May-2022	----	----	----		02-Jun-2022	7 days	7 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
Anions and Nutrients : Nitrite in Water by IC										
HDPE [ON MECP] 196035-RW-8.C	E235.NO2	27-May-2022	----	----	----		02-Jun-2022	7 days	7 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE [ON MECP] 196035-RW-8.C	E235.SO4	27-May-2022	----	----	----		02-Jun-2022	28 days	7 days	✓
Cyanides : Thiocyanate by Colourimetry										
HDPE (nitric acid) 196035-RW-8.C	E344	27-May-2022	----	----	----		06-Jun-2022	14 days	11 days	✓
Cyanides : Total Cyanide										
HDPE - total (sodium hydroxide) 196035-RW-8.C	E333	27-May-2022	----	----	----		07-Jun-2022	14 days	12 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
HDPE [ON MECP] 196035-RW-8.C	E358-L	27-May-2022	30-May-2022	3 days	4 days	✓	01-Jun-2022	28 days	2 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) 196035-RW-8.C	E355-L	27-May-2022	30-May-2022	----	----		31-May-2022	28 days	5 days	✓
Physical Tests : TDS by Gravimetry										
HDPE [ON MECP] 196035-RW-8.C	E162	27-May-2022	----	----	----		01-Jun-2022	7 days	6 days	✓
Physical Tests : TSS by Gravimetry										
HDPE [ON MECP] 196035-RW-8.C	E160	27-May-2022	----	----	----		02-Jun-2022	7 days	6 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) 196035-RW-8.C	E420	27-May-2022	----	----	----		31-May-2022	180 days	5 days	✓

Legend & Qualifier Definitions

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)							
Ammonia by Fluorescence	E298	504433	1	18	5.5	5.0	✓
Bromide in Water by IC	E235.Br	506135	1	2	50.0	5.0	✓
Chloride in Water by IC	E235.Cl	506137	1	6	16.6	5.0	✓
Cyanate by Ion Selective Electrode	E343	510689	1	1	100.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	504389	1	20	5.0	5.0	✓
Dissolved Orthophosphate by Colourimetry (0.003 mg/L)	E378-T	505218	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	506136	1	2	50.0	5.0	✓
Nitrate in Water by IC	E235.NO3	506133	1	18	5.5	5.0	✓
Nitrite in Water by IC	E235.NO2	506134	1	4	25.0	5.0	✓
Sulfate in Water by IC	E235.SO4	506132	1	3	33.3	5.0	✓
TDS by Gravimetry	E162	507016	1	19	5.2	5.0	✓
Thiocyanate by Colourimetry	E344	513209	1	7	14.2	5.0	✓
Total Cyanide	E333	513898	1	18	5.5	5.0	✓
Total Metals in Water by CRC ICPMS	E420	504833	1	12	8.3	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	504434	1	2	50.0	5.0	✓
TSS by Gravimetry	E160	508156	1	19	5.2	4.7	✓
Laboratory Control Samples (LCS)							
Ammonia by Fluorescence	E298	504433	1	18	5.5	5.0	✓
Bromide in Water by IC	E235.Br	506135	1	2	50.0	5.0	✓
Chloride in Water by IC	E235.Cl	506137	1	6	16.6	5.0	✓
Cyanate by Ion Selective Electrode	E343	510689	1	1	100.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	504389	1	20	5.0	5.0	✓
Dissolved Orthophosphate by Colourimetry (0.003 mg/L)	E378-T	505218	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	506136	1	2	50.0	5.0	✓
Nitrate in Water by IC	E235.NO3	506133	1	18	5.5	5.0	✓
Nitrite in Water by IC	E235.NO2	506134	1	4	25.0	5.0	✓
Sulfate in Water by IC	E235.SO4	506132	1	3	33.3	5.0	✓
TDS by Gravimetry	E162	507016	1	19	5.2	5.0	✓
Thiocyanate by Colourimetry	E344	513209	1	7	14.2	5.0	✓
Total Cyanide	E333	513898	1	18	5.5	5.0	✓
Total Metals in Water by CRC ICPMS	E420	504833	1	12	8.3	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	504434	1	2	50.0	5.0	✓
TSS by Gravimetry	E160	508156	1	19	5.2	4.7	✓
Method Blanks (MB)							
Ammonia by Fluorescence	E298	504433	1	18	5.5	5.0	✓
Bromide in Water by IC	E235.Br	506135	1	2	50.0	5.0	✓
Chloride in Water by IC	E235.Cl	506137	1	6	16.6	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							
Cyanate by Ion Selective Electrode	E343	510689	1	1	100.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	504389	1	20	5.0	5.0	✓
Dissolved Orthophosphate by Colourimetry (0.003 mg/L)	E378-T	505218	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	506136	1	2	50.0	5.0	✓
Nitrate in Water by IC	E235.NO3	506133	1	18	5.5	5.0	✓
Nitrite in Water by IC	E235.NO2	506134	1	4	25.0	5.0	✓
Sulfate in Water by IC	E235.SO4	506132	1	3	33.3	5.0	✓
TDS by Gravimetry	E162	507016	1	19	5.2	5.0	✓
Thiocyanate by Colourimetry	E344	513209	1	7	14.2	5.0	✓
Total Cyanide	E333	513898	1	18	5.5	5.0	✓
Total Metals in Water by CRC ICPMS	E420	504833	1	12	8.3	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	504434	1	2	50.0	5.0	✓
TSS by Gravimetry	E160	508156	1	19	5.2	4.7	✓
Matrix Spikes (MS)							
Ammonia by Fluorescence	E298	504433	1	18	5.5	5.0	✓
Bromide in Water by IC	E235.Br	506135	1	2	50.0	5.0	✓
Chloride in Water by IC	E235.Cl	506137	1	6	16.6	5.0	✓
Cyanate by Ion Selective Electrode	E343	510689	1	1	100.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	504389	1	20	5.0	5.0	✓
Dissolved Orthophosphate by Colourimetry (0.003 mg/L)	E378-T	505218	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	506136	1	2	50.0	5.0	✓
Nitrate in Water by IC	E235.NO3	506133	1	18	5.5	5.0	✓
Nitrite in Water by IC	E235.NO2	506134	1	4	25.0	5.0	✓
Sulfate in Water by IC	E235.SO4	506132	1	3	33.3	5.0	✓
Thiocyanate by Colourimetry	E344	513209	1	7	14.2	5.0	✓
Total Cyanide	E333	513898	1	18	5.5	5.0	✓
Total Metals in Water by CRC ICPMS	E420	504833	1	12	8.3	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	504434	1	2	50.0	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
TSS by Gravimetry	E160 Waterloo - 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 Waterloo - 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.
Bromide in Water by IC	E235.Br Waterloo - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Chloride in Water by IC	E235.Cl Waterloo - 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 Waterloo - 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 Waterloo - 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 Waterloo - 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 Waterloo - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Ammonia by Fluorescence	E298 Waterloo - Environmental	Water	J. Environ. Monit., 2005, 7, 37-42 (mod)	Ammonia in water is analyzed by flow-injection analysis with fluorescence detection after reaction with orthophthaldialdehyde (OPA).

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Total Cyanide	E333 Waterloo - Environmental	Water	ISO 14403 (mod)	Total or Strong Acid Dissociable (SAD) Cyanide is determined by Continuous Flow Analyzer (CFA) with in-line UV digestion followed by colourmetric analysis. Method Limitation: High levels of thiocyanate (SCN) may cause positive interference (up to 0.5% of SCN concentration).
Cyanate by Ion Selective Electrode	E343 Waterloo - Environmental	Water	APHA 4500-CN L (mod)	This analysis is carried out using procedures adapted from APHA method 4500-CN "Cyanide". Cyanate is determined by the Cyanate hydrolysis method using an ammonia selective electrode
Thiocyanate by Colourimetry	E344 Vancouver - Environmental	Water	APHA 4500-CN M (mod)	Thiocyanate is determined by the ferric nitrate colourimetric method. Water samples containing high levels of hexavalent chromium, cyanide (together with sulfide), reducing agents, or hydrocarbons may cause negative or positive interferences with this method.
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L Waterloo - Environmental	Water	APHA 5310 B (mod)	Total Organic Carbon (Non-Purgeable), also known as NPOC (total), is a direct measurement of TOC after an acidified sample has been purged to remove inorganic carbon (IC). Analysis is by high temperature combustion with infrared detection of CO2. NPOC does not include volatile organic species that are purged off with IC. For samples where the majority of total carbon (TC) is comprised of IC (which is common), this method is more accurate and more reliable than the TOC by subtraction method (i.e. TC minus TIC).
Dissolved Organic Carbon by Combustion (Low Level)	E358-L Waterloo - Environmental	Water	APHA 5310 B (mod)	Dissolved Organic Carbon (Non-Purgeable), also known as NPOC (dissolved), is a direct measurement of DOC after a filtered (0.45 micron) sample has been acidified and purged to remove inorganic carbon (IC). Analysis is by high temperature combustion with infrared detection of CO2. NPOC does not include volatile organic species that are purged off with IC. For samples where the majority of DC (dissolved carbon) is comprised of IC (which is common), this method is more accurate and more reliable than the DOC by subtraction method (i.e. DC minus DIC).
Dissolved Orthophosphate by Colourimetry (0.003 mg/L)	E378-T Waterloo - Environmental	Water	APHA 4500-P E (mod)	Dissolved Orthophosphate is determined colourimetrically on a water sample that has been lab or field filtered through a 0.45 micron membrane filter. Field filtration is recommended to ensure test results represent conditions at time of sampling.
Total Metals in Water by CRC ICPMS	E420 Waterloo - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Preparation for Ammonia	EP298 Waterloo - Environmental	Water		Sample preparation for Preserved Nutrients Water Quality Analysis.
Preparation for Total Organic Carbon by Combustion	EP355 Waterloo - Environmental	Water		Preparation for Total Organic Carbon by Combustion

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Preparation for Dissolved Organic Carbon for Combustion	EP358 Waterloo - Environmental	Water	APHA 5310 B (mod)	Preparation for Dissolved Organic Carbon

QUALITY CONTROL REPORT

Work Order	: **WT2204627**	Page	: 1 of 14
Client	: Veolia Water Technologies Canada	Laboratory	: Waterloo - Environmental
Contact	: Josee Lalonde	Account Manager	: Peter Stastny
Address	: 4105 Sartelon Ville St-Laurent QC Canada H4S 2B3	Address	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
Telephone	: 514 334 7230	Telephone	: +1 519 886 6910
Project	: ----	Date Samples Received	: 30-May-2022 09:30
PO	: 5000196035.606300.21030003	Date Analysis Commenced	: 30-May-2022
C-O-C number	: ----	Issue Date	: 09-Jun-2022 16:19
Sampler	: CLIENT		
Site	: ----		
Quote number	: Veolia, Quebec Standing Offer 2022		
No. of samples received	: 1		
No. of samples analysed	: 1		

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*
Jon Fisher	Department Manager - Inorganics	Waterloo Inorganics, Waterloo, Ontario
Jon Fisher	Department Manager - Inorganics	Waterloo Metals, Waterloo, Ontario
Tracy Harley	Supervisor - Water Quality Instrumentation	Vancouver Inorganics, Burnaby, British Columbia

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: 507016)											
WT2204562-001	Anonymous	solids, total dissolved [TDS]	----	E162	20	mg/L	313	371	17.0%	20%	----
Physical Tests (QC Lot: 508156)											
WT2204615-023	Anonymous	solids, total suspended [TSS]	----	E160	3.0	mg/L	8.3	7.7	0.6	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 504433)											
WT2204564-008	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	0.0941	0.0937	0.426%	20%	----
Anions and Nutrients (QC Lot: 505218)											
WT2204586-001	Anonymous	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-T	0.0030	mg/L	0.0033	<0.0030	0.0003	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 506132)											
WT2204645-004	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	1.50	mg/L	249	249	0.136%	20%	----
Anions and Nutrients (QC Lot: 506133)											
WT2204645-004	Anonymous	nitrate (as N)	14797-55-8	E235.NO3	0.100	mg/L	<0.100	<0.100	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 506134)											
WT2204645-004	Anonymous	nitrite (as N)	14797-65-0	E235.NO2	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 506135)											
WT2204645-004	Anonymous	bromide	24959-67-9	E235.Br	0.50	mg/L	<0.50	<0.50	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 506136)											
WT2204645-004	Anonymous	fluoride	16984-48-8	E235.F	0.100	mg/L	0.673	0.677	0.004	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 506137)											
WT2204645-004	Anonymous	chloride	16887-00-6	E235.Cl	2.50	mg/L	388	389	0.177%	20%	----
Anions and Nutrients (QC Lot: 510689)											
WT2204627-001	196035-RW-8.C	cyanate	88402-73-7	E343	10.0	mg/L	30.0	28.5	1.50	Diff <2x LOR	----
Cyanides (QC Lot: 513209)											
WR2200492-010	Anonymous	thiocyanate	302-04-5	E344	10.0	mg/L	<10.0	<10.0	0	Diff <2x LOR	----
Cyanides (QC Lot: 513898)											
CG2206592-001	Anonymous	cyanide, strong acid dissociable (total)	----	E333	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
Organic / Inorganic Carbon (QC Lot: 504389)											
WT2204557-001	Anonymous	carbon, dissolved organic [DOC]	----	E358-L	2.50	mg/L	57.6	64.5	11.3%	20%	----
Organic / Inorganic Carbon (QC Lot: 504434)											
WT2204627-001	196035-RW-8.C	carbon, total organic [TOC]	----	E355-L	0.50	mg/L	92.0	87.2	5.28%	20%	----
Total Metals (QC Lot: 504833)											
WT2204620-001	Anonymous	aluminum, total	7429-90-5	E420	0.0030	mg/L	0.0093	0.0084	0.0009	Diff <2x LOR	----

Sub-Matrix: **Water**

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
					Laboratory Duplicate (DUP) Report						
Total Metals (QC Lot: 504833) - continued											
WT2204620-001	Anonymous	antimony, total	7440-36-0	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		arsenic, total	7440-38-2	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		barium, total	7440-39-3	E420	0.00010	mg/L	0.0421	0.0421	0.0269%	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	0.071	0.073	0.001	Diff <2x LOR	----
		cadmium, total	7440-43-9	E420	0.0000050	mg/L	0.0000087	0.0000107	0.0000020	Diff <2x LOR	----
		calcium, total	7440-70-2	E420	0.050	mg/L	52.2	51.7	0.980%	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	<0.00050	<0.00050	0	Diff <2x LOR	----
		cobalt, total	7440-48-4	E420	0.00010	mg/L	0.00020	0.00022	0.00001	Diff <2x LOR	----
		copper, total	7440-50-8	E420	0.00050	mg/L	0.00087	0.00085	0.00001	Diff <2x LOR	----
		iron, total	7439-89-6	E420	0.010	mg/L	0.502	0.502	0.183%	20%	----
		lead, total	7439-92-1	E420	0.000050	mg/L	0.000329	0.000328	0.0000002	Diff <2x LOR	----
		lithium, total	7439-93-2	E420	0.0010	mg/L	0.0057	0.0057	0.00006	Diff <2x LOR	----
		magnesium, total	7439-95-4	E420	0.0050	mg/L	7.72	7.52	2.64%	20%	----
		manganese, total	7439-96-5	E420	0.00010	mg/L	0.220	0.219	0.866%	20%	----
		molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.000572	0.000565	1.23%	20%	----
		nickel, total	7440-02-0	E420	0.00050	mg/L	0.00067	0.00069	0.00002	Diff <2x LOR	----
		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	1.04	1.03	0.245%	20%	----
		rubidium, total	7440-17-7	E420	0.00020	mg/L	0.00131	0.00136	0.00005	Diff <2x LOR	----
		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	7.50	7.45	0.650%	20%	----
		silver, total	7440-22-4	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		sodium, total	7440-23-5	E420	0.050	mg/L	20.9	21.0	0.144%	20%	----
		strontium, total	7440-24-6	E420	0.00200	mg/L	2.38	2.42	1.92%	20%	----
		sulfur, total	7704-34-9	E420	0.50	mg/L	18.2	18.0	1.15%	20%	----
		tellurium, total	13494-80-9	E420	0.00020	mg/L	0.00031	0.00033	0.00002	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	0.00043	0.00045	0.00002	Diff <2x LOR	----
		tungsten, total	7440-33-7	E420	0.00010	mg/L	0.00038	0.00039	0.000007	Diff <2x LOR	----
		uranium, total	7440-61-1	E420	0.000010	mg/L	0.000201	0.000204	1.28%	20%	----

Sub-Matrix: **Water**

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Laboratory Duplicate (DUP) Report						
					LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Total Metals (QC Lot: 504833) - continued											
WT2204620-001	Anonymous	vanadium, total	7440-62-2	E420	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, total	7440-66-6	E420	0.0030	mg/L	0.0070	0.0066	0.0004	Diff <2x LOR	----
		zirconium, total	7440-67-7	E420	0.00020	mg/L	<0.00020	<0.00020	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: 507016)						
solids, total dissolved [TDS]	----	E162	10	mg/L	<10	----
Physical Tests (QCLot: 508156)						
solids, total suspended [TSS]	----	E160	3	mg/L	<3.0	----
Anions and Nutrients (QCLot: 504433)						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 505218)						
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-T	0.003	mg/L	<0.0030	----
Anions and Nutrients (QCLot: 506132)						
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 506133)						
nitrate (as N)	14797-55-8	E235.NO3	0.02	mg/L	<0.020	----
Anions and Nutrients (QCLot: 506134)						
nitrite (as N)	14797-65-0	E235.NO2	0.01	mg/L	<0.010	----
Anions and Nutrients (QCLot: 506135)						
bromide	24959-67-9	E235.Br	0.1	mg/L	<0.10	----
Anions and Nutrients (QCLot: 506136)						
fluoride	16984-48-8	E235.F	0.02	mg/L	<0.020	----
Anions and Nutrients (QCLot: 506137)						
chloride	16887-00-6	E235.Cl	0.5	mg/L	<0.50	----
Anions and Nutrients (QCLot: 510689)						
cyanate	88402-73-7	E343	0.2	mg/L	<0.20	----
Cyanides (QCLot: 513209)						
thiocyanate	302-04-5	E344	0.5	mg/L	<0.50	----
Cyanides (QCLot: 513898)						
cyanide, strong acid dissociable (total)	----	E333	0.002	mg/L	<0.0020	----
Organic / Inorganic Carbon (QCLot: 504389)						
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	<0.50	----
Organic / Inorganic Carbon (QCLot: 504434)						
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	<0.50	----
Total Metals (QCLot: 504833)						
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	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 504833) - continued						
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	----
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	----

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: 507016)									
solids, total dissolved [TDS]	----	E162	10	mg/L	1000 mg/L	115	85.0	115	----
Physical Tests (QCLot: 508156)									
solids, total suspended [TSS]	----	E160	3	mg/L	150 mg/L	93.2	85.0	115	----
Anions and Nutrients (QCLot: 504433)									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.2 mg/L	102	85.0	115	----
Anions and Nutrients (QCLot: 505218)									
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-T	0.003	mg/L	0.0196 mg/L	110	80.0	120	----
Anions and Nutrients (QCLot: 506132)									
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	99.6	90.0	110	----
Anions and Nutrients (QCLot: 506133)									
nitrate (as N)	14797-55-8	E235.NO3	0.02	mg/L	2.5 mg/L	98.6	90.0	110	----
Anions and Nutrients (QCLot: 506134)									
nitrite (as N)	14797-65-0	E235.NO2	0.01	mg/L	0.5 mg/L	97.6	90.0	110	----
Anions and Nutrients (QCLot: 506135)									
bromide	24959-67-9	E235.Br	0.1	mg/L	0.5 mg/L	103	85.0	115	----
Anions and Nutrients (QCLot: 506136)									
fluoride	16984-48-8	E235.F	0.02	mg/L	1 mg/L	100.0	90.0	110	----
Anions and Nutrients (QCLot: 506137)									
chloride	16887-00-6	E235.Cl	0.5	mg/L	100 mg/L	99.6	90.0	110	----
Anions and Nutrients (QCLot: 510689)									
cyanate	88402-73-7	E343	0.2	mg/L	1 mg/L	86.4	85.0	115	----
Cyanides (QCLot: 513209)									
thiocyanate	302-04-5	E344	0.5	mg/L	10 mg/L	101	85.0	115	----
Cyanides (QCLot: 513898)									
cyanide, strong acid dissociable (total)	----	E333	0.002	mg/L	0.25 mg/L	98.2	80.0	120	----
Organic / Inorganic Carbon (QCLot: 504389)									
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	8.57 mg/L	102	80.0	120	----
Organic / Inorganic Carbon (QCLot: 504434)									
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	8.57 mg/L	111	80.0	120	----
Total Metals (QCLot: 504833)									

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: 504833) - continued									
aluminum, total	7429-90-5	E420	0.003	mg/L	0.1 mg/L	101	80.0	120	----
antimony, total	7440-36-0	E420	0.0001	mg/L	0.05 mg/L	99.6	80.0	120	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	0.05 mg/L	100	80.0	120	----
barium, total	7440-39-3	E420	0.0001	mg/L	0.0125 mg/L	100	80.0	120	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	0.005 mg/L	99.7	80.0	120	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	0.05 mg/L	98.9	80.0	120	----
boron, total	7440-42-8	E420	0.01	mg/L	0.05 mg/L	91.4	80.0	120	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	0.005 mg/L	102	80.0	120	----
calcium, total	7440-70-2	E420	0.05	mg/L	2.5 mg/L	97.5	80.0	120	----
cesium, total	7440-46-2	E420	0.00001	mg/L	0.0025 mg/L	95.4	80.0	120	----
chromium, total	7440-47-3	E420	0.0005	mg/L	0.0125 mg/L	98.8	80.0	120	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	0.0125 mg/L	96.5	80.0	120	----
copper, total	7440-50-8	E420	0.0005	mg/L	0.0125 mg/L	97.1	80.0	120	----
iron, total	7439-89-6	E420	0.01	mg/L	0.05 mg/L	98.2	80.0	120	----
lead, total	7439-92-1	E420	0.00005	mg/L	0.025 mg/L	99.3	80.0	120	----
lithium, total	7439-93-2	E420	0.001	mg/L	0.0125 mg/L	93.0	80.0	120	----
magnesium, total	7439-95-4	E420	0.005	mg/L	2.5 mg/L	106	80.0	120	----
manganese, total	7439-96-5	E420	0.0001	mg/L	0.0125 mg/L	96.2	80.0	120	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	0.0125 mg/L	95.0	80.0	120	----
nickel, total	7440-02-0	E420	0.0005	mg/L	0.025 mg/L	97.4	80.0	120	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	0.5 mg/L	99.0	70.0	130	----
potassium, total	7440-09-7	E420	0.05	mg/L	2.5 mg/L	95.4	80.0	120	----
rubidium, total	7440-17-7	E420	0.0002	mg/L	0.005 mg/L	94.2	80.0	120	----
selenium, total	7782-49-2	E420	0.00005	mg/L	0.05 mg/L	108	80.0	120	----
silicon, total	7440-21-3	E420	0.1	mg/L	0.5 mg/L	101	60.0	140	----
silver, total	7440-22-4	E420	0.00001	mg/L	0.005 mg/L	89.2	80.0	120	----
sodium, total	7440-23-5	E420	0.05	mg/L	2.5 mg/L	103	80.0	120	----
strontium, total	7440-24-6	E420	0.0002	mg/L	0.0125 mg/L	96.9	80.0	120	----
sulfur, total	7704-34-9	E420	0.5	mg/L	2.5 mg/L	99.7	80.0	120	----
tellurium, total	13494-80-9	E420	0.0002	mg/L	0.005 mg/L	101	80.0	120	----
thallium, total	7440-28-0	E420	0.00001	mg/L	0.05 mg/L	97.6	80.0	120	----
thorium, total	7440-29-1	E420	0.0001	mg/L	0.005 mg/L	97.4	80.0	120	----
tin, total	7440-31-5	E420	0.0001	mg/L	0.025 mg/L	96.4	80.0	120	----
titanium, total	7440-32-6	E420	0.0003	mg/L	0.0125 mg/L	95.6	80.0	120	----
tungsten, total	7440-33-7	E420	0.0001	mg/L	0.005 mg/L	95.0	80.0	120	----
uranium, total	7440-61-1	E420	0.00001	mg/L	0.00025 mg/L	102	80.0	120	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	0.025 mg/L	100	80.0	120	----
zinc, total	7440-66-6	E420	0.003	mg/L	0.025 mg/L	101	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: 504833) - continued									
zirconium, total	7440-67-7	E420	0.0002	mg/L	0.005 mg/L	93.9	80.0	120	----

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: 504433)										
WT2204564-008	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0973 mg/L	0.1 mg/L	97.3	75.0	125	----
Anions and Nutrients (QCLot: 505218)										
WT2204586-001	Anonymous	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-T	0.0173 mg/L	0.0196 mg/L	88.5	70.0	130	----
Anions and Nutrients (QCLot: 506132)										
WT2204645-004	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	519 mg/L	500 mg/L	104	75.0	125	----
Anions and Nutrients (QCLot: 506133)										
WT2204645-004	Anonymous	nitrate (as N)	14797-55-8	E235.NO3	12.3 mg/L	12.5 mg/L	98.7	75.0	125	----
Anions and Nutrients (QCLot: 506134)										
WT2204645-004	Anonymous	nitrite (as N)	14797-65-0	E235.NO2	2.54 mg/L	2.5 mg/L	102	75.0	125	----
Anions and Nutrients (QCLot: 506135)										
WT2204645-004	Anonymous	bromide	24959-67-9	E235.Br	5.06 mg/L	5 mg/L	101	75.0	125	----
Anions and Nutrients (QCLot: 506136)										
WT2204645-004	Anonymous	fluoride	16984-48-8	E235.F	5.02 mg/L	5 mg/L	100	75.0	125	----
Anions and Nutrients (QCLot: 506137)										
WT2204645-004	Anonymous	chloride	16887-00-6	E235.Cl	518 mg/L	500 mg/L	104	75.0	125	----
Anions and Nutrients (QCLot: 510689)										
WT2204627-001	196035-RW-8.C	cyanate	88402-73-7	E343	ND mg/L	2 mg/L	ND	70.0	130	----
Cyanides (QCLot: 513209)										
WR2200492-011	Anonymous	thiocyanate	302-04-5	E344	9.46 mg/L	10 mg/L	94.6	75.0	125	----
Cyanides (QCLot: 513898)										
CG2206592-001	Anonymous	cyanide, strong acid dissociable (total)	----	E333	0.247 mg/L	0.25 mg/L	98.7	70.0	130	----
Organic / Inorganic Carbon (QCLot: 504389)										
WT2204557-001	Anonymous	carbon, dissolved organic [DOC]	----	E358-L	ND mg/L	5 mg/L	ND	70.0	130	----
Organic / Inorganic Carbon (QCLot: 504434)										
WT2204627-001	196035-RW-8.C	carbon, total organic [TOC]	----	E355-L	ND mg/L	5 mg/L	ND	70.0	130	----
Total Metals (QCLot: 504833)										
WT2204620-002	Anonymous	aluminum, total	7429-90-5	E420	0.0890 mg/L	0.1 mg/L	89.0	70.0	130	----
		antimony, total	7440-36-0	E420	0.0471 mg/L	0.05 mg/L	94.1	70.0	130	----

Sub-Matrix: **Water**

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
					Concentration	Target	MS	Low	High	Qualifier
Total Metals (QCLot: 504833) - continued										
WT2204620-002	Anonymous	arsenic, total	7440-38-2	E420	0.0479 mg/L	0.05 mg/L	95.9	70.0	130	----
		barium, total	7440-39-3	E420	ND mg/L	0.0125 mg/L	ND	70.0	130	----
		beryllium, total	7440-41-7	E420	0.00455 mg/L	0.005 mg/L	90.9	70.0	130	----
		bismuth, total	7440-69-9	E420	0.0457 mg/L	0.05 mg/L	91.5	70.0	130	----
		boron, total	7440-42-8	E420	ND mg/L	0.05 mg/L	ND	70.0	130	----
		cadmium, total	7440-43-9	E420	0.00479 mg/L	0.005 mg/L	95.8	70.0	130	----
		calcium, total	7440-70-2	E420	ND mg/L	2.5 mg/L	ND	70.0	130	----
		cesium, total	7440-46-2	E420	0.00234 mg/L	0.0025 mg/L	93.7	70.0	130	----
		chromium, total	7440-47-3	E420	0.0122 mg/L	0.0125 mg/L	97.8	70.0	130	----
		cobalt, total	7440-48-4	E420	0.0116 mg/L	0.0125 mg/L	92.5	70.0	130	----
		copper, total	7440-50-8	E420	ND mg/L	0.0125 mg/L	ND	70.0	130	----
		iron, total	7439-89-6	E420	ND mg/L	0.05 mg/L	ND	70.0	130	----
		lead, total	7439-92-1	E420	0.0223 mg/L	0.025 mg/L	89.2	70.0	130	----
		lithium, total	7439-93-2	E420	0.0103 mg/L	0.0125 mg/L	82.3	70.0	130	----
		magnesium, total	7439-95-4	E420	ND mg/L	2.5 mg/L	ND	70.0	130	----
		manganese, total	7439-96-5	E420	ND mg/L	0.0125 mg/L	ND	70.0	130	----
		molybdenum, total	7439-98-7	E420	0.0118 mg/L	0.0125 mg/L	94.4	70.0	130	----
		nickel, total	7440-02-0	E420	0.0232 mg/L	0.025 mg/L	92.9	70.0	130	----
		phosphorus, total	7723-14-0	E420	0.481 mg/L	0.5 mg/L	96.2	70.0	130	----
		potassium, total	7440-09-7	E420	2.24 mg/L	2.5 mg/L	89.6	70.0	130	----
		rubidium, total	7440-17-7	E420	0.00456 mg/L	0.005 mg/L	91.3	70.0	130	----
		selenium, total	7782-49-2	E420	0.0481 mg/L	0.05 mg/L	96.2	70.0	130	----
		silicon, total	7440-21-3	E420	ND mg/L	0.5 mg/L	ND	70.0	130	----
		silver, total	7440-22-4	E420	0.00423 mg/L	0.005 mg/L	84.7	70.0	130	----
		sodium, total	7440-23-5	E420	ND mg/L	2.5 mg/L	ND	70.0	130	----
		strontium, total	7440-24-6	E420	ND mg/L	0.0125 mg/L	ND	70.0	130	----
		sulfur, total	7704-34-9	E420	ND mg/L	2.5 mg/L	ND	70.0	130	----
		tellurium, total	13494-80-9	E420	0.00448 mg/L	0.005 mg/L	89.7	70.0	130	----
		thallium, total	7440-28-0	E420	0.0447 mg/L	0.05 mg/L	89.5	70.0	130	----
		thorium, total	7440-29-1	E420	0.00476 mg/L	0.005 mg/L	95.3	70.0	130	----
		tin, total	7440-31-5	E420	0.0236 mg/L	0.025 mg/L	94.3	70.0	130	----
		titanium, total	7440-32-6	E420	0.0114 mg/L	0.0125 mg/L	91.4	70.0	130	----
		tungsten, total	7440-33-7	E420	0.00451 mg/L	0.005 mg/L	90.2	70.0	130	----
		uranium, total	7440-61-1	E420	0.000236 mg/L	0.00025 mg/L	94.4	70.0	130	----
		vanadium, total	7440-62-2	E420	0.0243 mg/L	0.025 mg/L	97.2	70.0	130	----
		zinc, total	7440-66-6	E420	ND mg/L	0.025 mg/L	ND	70.0	130	----
		zirconium, total	7440-67-7	E420	0.00464 mg/L	0.005 mg/L	92.8	70.0	130	----

Chain of Custody (COC) / Analytical Request Form

ALS www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here (lab use only)

COC Number: 17 - -

Page of

Report To — Contact and company name below will appear on the final report

Company:	Veolia Water Technologies (26895)
Contact:	Josee Lalonde
Phone:	
	Company address below will appear on the final report
Street:	4105 Sartelon
City/Province:	Ville St-Laurent
Postal Code:	H2S 2B3

Invoice To

Same as Report To	☑ YES ☐ NO
Copy of Invoice with Report	☐ YES ☐ NO
Company:	
Contact:	

Report Format / Distribution

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

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

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

Select Distribution: ☐ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax josee.lalonde@veolia.com

Email 2

Email 3

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax vwtcanada_payables@veolia.com

Email 2

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

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

PRIORITY (Business Days): 4 day [P4-20%] ☐ 3 day [P3-25%] ☐ 2 day [P2-50%] ☐

EMERGENCY: 1 Business day [E - 100%] ☐ Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] ☐

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

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

Project Information

ALS Account # / Quote #:

Job #:

PO / AFE: 5000196035.606300.21030003

LSD:

Oil and Gas Required Fields (client use)

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

ALS Lab Work Order # (lab use only): WT2204627

ALS Contact:

Sampler:

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

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	metal scan	TDS	TSS	NH4	TOC	DOC	COD soluble	Anion scan	Cyanates	cyanides	thiocyanate	Anion scan	NO2 + NO3	O-PO4	SAMPLES ON HOLD	SUSPECTED HAZARD (see Special Instructions)
	196035-RW-@·C	20220527		WW	8	X	X	X	X	X	X	X	X	X	X	X	X	X	X		

Environmental Division
Waterloo
Work Order Reference
WT2204627
Telephone : +1 519 886 6910

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

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

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

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

SAMPLE CONDITION

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C

FINAL COOLER TEMPERATURES °C 18.9

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: EHT	Date: 2022-05-27	Time:	Received by:	Date:	Time:	Received by:	Date: 08/30/22	Time: 930

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

NOV 2018 FRONT

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

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

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **WT2204557**	Page	: 1 of 5
Client	: **Veolia Water Technologies Canada**	Laboratory	: Waterloo - Environmental
Contact	: Josee Lalonde	Account Manager	: Peter Stastny
Address	: 4105 Sartelon Ville St-Laurent QC Canada H4S 2B3	Address	: 60 Northland Road, Unit 1 Waterloo ON Canada N2V 2B8
Telephone	: 514 334 7230	Telephone	: +1 519 886 6910
Project	: 196035_MD	Date Samples Received	: 27-May-2022 11:00
PO	: 5000196035.606300.21030001	Date Analysis Commenced	: 27-May-2022
C-O-C number	: ----	Issue Date	: 09-Jun-2022 16:12
Sampler	: CLIENT		
Site	: ----		
Quote number	: Veolia, Quebec Standing Offer 2022		
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

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*
Greg Pokocky	Supervisor - Inorganic	Inorganics, Waterloo, Ontario
Greg Pokocky	Supervisor - Inorganic	Metals, Waterloo, Ontario
Jon Fisher	Department Manager - Inorganics	Inorganics, Waterloo, Ontario
Lindsay Gung	Supervisor - Water Chemistry	Inorganics, Burnaby, British Columbia

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*
mg/L	milligrams per litre

<: 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*
DLDS	*Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.*
DLHC	*Detection Limit Raised: Dilution required due to high concentration of test analyte(s).*
DLIS	*Detection Limit Adjusted due to insufficient sample.*
DLM	*Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).*
SFT	*Sample was filtered due to turbidity interference. Result reflects soluble analyte concentration.*

Analytical Results

Sub-Matrix: **Water**

(Matrix: **Water**)

				Client sample ID	196035_MD_R4_8C	196035_MD_CW_8C	----	----	----
				Client sampling date / time	26-May-2022	26-May-2022	----	----	----
Analyte	CAS Number	Method	LOR	Unit	WT2204557-001	WT2204557-002	--------	--------	--------
					Result	Result	----	----	----
Physical Tests									
solids, total dissolved [TDS]	----	E162	10	mg/L	2110 DLM	2600 DLM	----	----	----
solids, total suspended [TSS]	----	E160	3.0	mg/L	346 DLHC	<3.8	----	----	----
Anions and Nutrients									
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	0.0352	3.94 DLHC	----	----	----
bromide	24959-67-9	E235.Br	0.10	mg/L	<0.50 DLDS	<1.00 DLDS	----	----	----
chloride	16887-00-6	E235.Cl	0.50	mg/L	100 DLDS	112 DLDS	----	----	----
cyanate	88402-73-7	E343	0.20	mg/L	<2.00 DLIS	<1.00 DLIS	----	----	----
fluoride	16984-48-8	E235.F	0.020	mg/L	<0.100 DLDS	<0.200 DLDS	----	----	----
nitrate (as N)	14797-55-8	E235.NO3	0.020	mg/L	<0.100 DLDS	<0.200 DLDS	----	----	----
nitrite (as N)	14797-65-0	E235.NO2	0.010	mg/L	<0.050 DLDS	<0.100 DLDS	----	----	----
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-T	0.0030	mg/L	2.76 DLHC	<0.0030	----	----	----
phosphorus, total	7723-14-0	E372-U	0.0020	mg/L	6.45 DLM	0.0038	----	----	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	944 DLDS	1790 DLDS	----	----	----
Cyanides									
thiocyanate	302-04-5	E344	0.50	mg/L	<0.50 SFT	<0.50	----	----	----
cyanide, strong acid dissociable (total)	----	E333	0.0020	mg/L	0.0144	0.0282	----	----	----
Organic / Inorganic Carbon									
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	57.6 DLM	41.0 DLM	----	----	----
carbon, total organic [TOC]	----	E355-L	0.50	mg/L	143 DLM	43.5 DLM	----	----	----
Total Metals									
aluminum, total	7429-90-5	E420	0.0030	mg/L	<0.0300 DLHC	<0.0300 DLHC	----	----	----
antimony, total	7440-36-0	E420	0.00010	mg/L	0.00313 DLHC	<0.00100 DLHC	----	----	----
arsenic, total	7440-38-2	E420	0.00010	mg/L	<0.00100 DLHC	<0.00100 DLHC	----	----	----
barium, total	7440-39-3	E420	0.00010	mg/L	0.0169 DLHC	0.00840 DLHC	----	----	----
beryllium, total	7440-41-7	E420	0.000020	mg/L	<0.000200 DLHC	<0.000200 DLHC	----	----	----
bismuth, total	7440-69-9	E420	0.000050	mg/L	<0.000500 DLHC	<0.000500 DLHC	----	----	----
boron, total	7440-42-8	E420	0.010	mg/L	0.143 DLHC	0.144 DLHC	----	----	----
cadmium, total	7440-43-9	E420	0.0000050	mg/L	<0.000600 DLHC, DLM	<0.0000500 DLHC	----	----	----
calcium, total	7440-70-2	E420	0.050	mg/L	150 DLHC	84.2 DLHC	----	----	----
cesium, total	7440-46-2	E420	0.000010	mg/L	<0.000100 DLHC	<0.000100 DLHC	----	----	----
chromium, total	7440-47-3	E420	0.00050	mg/L	<0.00500 DLHC	<0.00500 DLHC	----	----	----

Analytical Results

Sub-Matrix: **Water**

(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	196035_MD_R4_8C	196035_MD_CW_8C	----	----	----
				Client sampling date / time	26-May-2022	26-May-2022	----	----	----
					WT2204557-001	WT2204557-002	--------	--------	--------
					Result	Result	----	----	----
Total Metals									
cobalt, total	7440-48-4	E420	0.00010	mg/L	0.249 DLHC	0.255 DLHC	----	----	----
copper, total	7440-50-8	E420	0.00050	mg/L	0.0108 DLHC	<0.00500 DLHC	----	----	----
iron, total	7439-89-6	E420	0.010	mg/L	0.180 DLHC	2.02 DLHC	----	----	----
lead, total	7439-92-1	E420	0.000050	mg/L	<0.000500 DLHC	<0.000500 DLHC	----	----	----
lithium, total	7439-93-2	E420	0.0010	mg/L	<0.0100 DLHC	<0.0100 DLHC	----	----	----
magnesium, total	7439-95-4	E420	0.0050	mg/L	12.2 DLHC	13.3 DLHC	----	----	----
manganese, total	7439-96-5	E420	0.00010	mg/L	0.0159 DLHC	0.142 DLHC	----	----	----
molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.0481 DLHC	0.000792 DLHC	----	----	----
nickel, total	7440-02-0	E420	0.00050	mg/L	0.0647 DLHC	0.0546 DLHC	----	----	----
phosphorus, total	7723-14-0	E420	0.050	mg/L	8.95 DLHC	<0.500 DLHC	----	----	----
potassium, total	7440-09-7	E420	0.050	mg/L	96.9 DLHC	97.7 DLHC	----	----	----
rubidium, total	7440-17-7	E420	0.00020	mg/L	0.0263 DLHC	0.0261 DLHC	----	----	----
selenium, total	7782-49-2	E420	0.000050	mg/L	0.0396 DLHC	0.0155 DLHC	----	----	----
silicon, total	7440-21-3	E420	0.10	mg/L	<1.00 DLHC	<1.00 DLHC	----	----	----
silver, total	7440-22-4	E420	0.000010	mg/L	<0.000100 DLHC	<0.000100 DLHC	----	----	----
sodium, total	7440-23-5	E420	0.050	mg/L	607 DLHC	795 DLHC	----	----	----
strontium, total	7440-24-6	E420	0.00020	mg/L	0.572 DLHC	0.469 DLHC	----	----	----
sulfur, total	7704-34-9	E420	0.50	mg/L	337 DLHC	596 DLHC	----	----	----
tellurium, total	13494-80-9	E420	0.00020	mg/L	<0.00200 DLHC	<0.00200 DLHC	----	----	----
thallium, total	7440-28-0	E420	0.000010	mg/L	<0.000100 DLHC	<0.000100 DLHC	----	----	----
thorium, total	7440-29-1	E420	0.00010	mg/L	<0.00100 DLHC	<0.00100 DLHC	----	----	----
tin, total	7440-31-5	E420	0.00010	mg/L	<0.00100 DLHC	<0.00100 DLHC	----	----	----
titanium, total	7440-32-6	E420	0.00030	mg/L	<0.00300 DLHC	<0.00300 DLHC	----	----	----
tungsten, total	7440-33-7	E420	0.00010	mg/L	<0.00100 DLHC	<0.00100 DLHC	----	----	----
uranium, total	7440-61-1	E420	0.000010	mg/L	0.00330 DLHC	<0.000100 DLHC	----	----	----
vanadium, total	7440-62-2	E420	0.00050	mg/L	<0.00500 DLHC	<0.00500 DLHC	----	----	----
zinc, total	7440-66-6	E420	0.0030	mg/L	0.0316 DLHC	<0.0300 DLHC	----	----	----
zirconium, total	7440-67-7	E420	0.00020	mg/L	<0.00200 DLHC	<0.00200 DLHC	----	----	----
Aggregate Organics									
chemical oxygen demand [COD], soluble	----	E560-L	10	mg/L	161	112	----	----	----

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

QUALITY CONTROL REPORT

Work Order	: **WT2204557**	Page	: 1 of 14
Client	: Veolia Water Technologies Canada	Laboratory	: Waterloo - Environmental
Contact	: Josee Lalonde	Account Manager	: Peter Stastny
Address	: 4105 Sartelon Ville St-Laurent QC Canada H4S 2B3	Address	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
Telephone	: 514 334 7230	Telephone	: +1 519 886 6910
Project	: 196035_MD	Date Samples Received	: 27-May-2022 11:00
PO	: 5000196035.606300.21030001	Date Analysis Commenced	: 27-May-2022
C-O-C number	: ----	Issue Date	: 09-Jun-2022 16:12
Sampler	: CLIENT		
Site	: ----		
Quote number	: Veolia, Quebec Standing Offer 2022		
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*
Greg Pokocky	Supervisor - Inorganic	Waterloo Inorganics, Waterloo, Ontario
Greg Pokocky	Supervisor - Inorganic	Waterloo Metals, Waterloo, Ontario
Jon Fisher	Department Manager - Inorganics	Waterloo Inorganics, Waterloo, Ontario
Lindsay Gung	Supervisor - Water Chemistry	Vancouver Inorganics, Burnaby, British Columbia

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 sample ID	Client sample ID	Analyte	CAS Number	Method	Laboratory Duplicate (DUP) Report						
					LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Physical Tests (QC Lot: 505807)											
WT2204471-001	Anonymous	solids, total suspended [TSS]	----	E160	3.0	mg/L	212	215	1.22%	20%	----
Physical Tests (QC Lot: 505814)											
WT2204471-001	Anonymous	solids, total dissolved [TDS]	----	E162	20	mg/L	342	334	2.22%	20%	----
Anions and Nutrients (QC Lot: 502949)											
WT2204540-030	Anonymous	chloride	16887-00-6	E235.Cl	0.50	mg/L	<0.50	<0.50	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 502950)											
WT2204540-030	Anonymous	bromide	24959-67-9	E235.Br	0.10	mg/L	<0.10	<0.10	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 502951)											
WT2204540-030	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	3.45	3.45	0.0332%	20%	----
Anions and Nutrients (QC Lot: 502952)											
WT2204540-030	Anonymous	nitrite (as N)	14797-65-0	E235.NO2	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 502953)											
WT2204540-030	Anonymous	nitrate (as N)	14797-55-8	E235.NO3	0.020	mg/L	0.061	0.061	0.00006	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 502954)											
WT2204540-030	Anonymous	fluoride	16984-48-8	E235.F	0.020	mg/L	0.036	0.036	0.0007	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 504229)											
WT2204549-001	Anonymous	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-T	0.0030	mg/L	<0.0030	<0.0030	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 504430)											
WT2204551-001	Anonymous	phosphorus, total	7723-14-0	E372-U	0.0020	mg/L	0.409	0.414	1.16%	20%	----
Anions and Nutrients (QC Lot: 504432)											
WT2204559-001	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0100	mg/L	0.734	0.753	2.58%	20%	----
Anions and Nutrients (QC Lot: 509275)											
WT2204632-005	Anonymous	cyanate	88402-73-7	E343	0.20	mg/L	0.81	0.75	0.06	Diff <2x LOR	----
Cyanides (QC Lot: 506457)											
VA22B1539-001	Anonymous	thiocyanate	302-04-5	E344	2.50	mg/L	<2.50	<2.50	0	Diff <2x LOR	----
Cyanides (QC Lot: 513898)											
CG2206592-001	Anonymous	cyanide, strong acid dissociable (total)	----	E333	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
Organic / Inorganic Carbon (QC Lot: 504389)											
WT2204557-001	196035_MD_R4_8C	carbon, dissolved organic [DOC]	----	E358-L	2.50	mg/L	57.6	64.5	11.3%	20%	----
Organic / Inorganic Carbon (QC Lot: 504431)											
WT2204557-002	196035_MD_CW_8C	carbon, total organic [TOC]	----	E355-L	2.50	mg/L	43.5	45.7	5.08%	20%	----

Sub-Matrix: **Water**

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Laboratory Duplicate (DUP) Report						
					LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Total Metals (QC Lot: 503812)											
WT2204557-001	196035_MD_R4_8C	aluminum, total	7429-90-5	E420	0.0300	mg/L	<0.0300	<0.0300	0	Diff <2x LOR	----
		antimony, total	7440-36-0	E420	0.00100	mg/L	0.00313	0.00320	0.00007	Diff <2x LOR	----
		arsenic, total	7440-38-2	E420	0.00100	mg/L	<0.00100	<0.00100	0	Diff <2x LOR	----
		barium, total	7440-39-3	E420	0.00100	mg/L	0.0169	0.0166	1.39%	20%	----
		beryllium, total	7440-41-7	E420	0.000200	mg/L	<0.000200	<0.000200	0	Diff <2x LOR	----
		bismuth, total	7440-69-9	E420	0.000500	mg/L	<0.000500	<0.000500	0	Diff <2x LOR	----
		boron, total	7440-42-8	E420	0.100	mg/L	0.143	0.141	0.003	Diff <2x LOR	----
		cadmium, total	7440-43-9	E420	0.000600	mg/L	<0.000600	<0.000600	0	Diff <2x LOR	----
		calcium, total	7440-70-2	E420	0.500	mg/L	150	151	0.105%	20%	----
		cesium, total	7440-46-2	E420	0.000100	mg/L	<0.000100	<0.000100	0	Diff <2x LOR	----
		chromium, total	7440-47-3	E420	0.00500	mg/L	<0.00500	<0.00500	0	Diff <2x LOR	----
		cobalt, total	7440-48-4	E420	0.00100	mg/L	0.249	0.249	0.223%	20%	----
		copper, total	7440-50-8	E420	0.00500	mg/L	0.0108	0.0114	0.00062	Diff <2x LOR	----
		iron, total	7439-89-6	E420	0.100	mg/L	0.180	0.186	0.006	Diff <2x LOR	----
		lead, total	7439-92-1	E420	0.000500	mg/L	<0.000500	<0.000500	0	Diff <2x LOR	----
		lithium, total	7439-93-2	E420	0.0100	mg/L	<0.0100	<0.0100	0	Diff <2x LOR	----
		magnesium, total	7439-95-4	E420	0.0500	mg/L	12.2	12.3	0.474%	20%	----
		manganese, total	7439-96-5	E420	0.00100	mg/L	0.0159	0.0153	3.82%	20%	----
		molybdenum, total	7439-98-7	E420	0.000500	mg/L	0.0481	0.0497	3.12%	20%	----
		nickel, total	7440-02-0	E420	0.00500	mg/L	0.0647	0.0647	0.118%	20%	----
		phosphorus, total	7723-14-0	E420	0.500	mg/L	8.95	9.01	0.620%	20%	----
		potassium, total	7440-09-7	E420	0.500	mg/L	96.9	97.4	0.610%	20%	----
		rubidium, total	7440-17-7	E420	0.00200	mg/L	0.0263	0.0259	1.22%	20%	----
		selenium, total	7782-49-2	E420	0.000500	mg/L	0.0396	0.0406	2.66%	20%	----
		silicon, total	7440-21-3	E420	1.00	mg/L	<1.00	<1.00	0	Diff <2x LOR	----
		silver, total	7440-22-4	E420	0.000100	mg/L	<0.000100	<0.000100	0	Diff <2x LOR	----
		sodium, total	7440-23-5	E420	0.500	mg/L	607	604	0.592%	20%	----
		strontium, total	7440-24-6	E420	0.00200	mg/L	0.572	0.604	5.40%	20%	----
		sulfur, total	7704-34-9	E420	5.00	mg/L	337	342	1.50%	20%	----
		tellurium, total	13494-80-9	E420	0.00200	mg/L	<0.00200	<0.00200	0	Diff <2x LOR	----
		thallium, total	7440-28-0	E420	0.000100	mg/L	<0.000100	<0.000100	0	Diff <2x LOR	----
		thorium, total	7440-29-1	E420	0.00100	mg/L	<0.00100	<0.00100	0	Diff <2x LOR	----
		tin, total	7440-31-5	E420	0.00100	mg/L	<0.00100	<0.00100	0	Diff <2x LOR	----
		titanium, total	7440-32-6	E420	0.00300	mg/L	<0.00300	<0.00300	0	Diff <2x LOR	----
		tungsten, total	7440-33-7	E420	0.00100	mg/L	<0.00100	<0.00100	0	Diff <2x LOR	----

Sub-Matrix: **Water**

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Laboratory Duplicate (DUP) Report						
					LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Total Metals (QC Lot: 503812) - continued											
WT2204557-001	196035_MD_R4_8C	uranium, total	7440-61-1	E420	0.000100	mg/L	0.00330	0.00329	0.279%	20%	----
		vanadium, total	7440-62-2	E420	0.00500	mg/L	<0.00500	<0.00500	0	Diff <2x LOR	----
		zinc, total	7440-66-6	E420	0.0300	mg/L	0.0316	0.0342	0.0026	Diff <2x LOR	----
		zirconium, total	7440-67-7	E420	0.00200	mg/L	<0.00200	<0.00200	0	Diff <2x LOR	----
Aggregate Organics (QC Lot: 502107)											
WT2204557-001	196035_MD_R4_8C	chemical oxygen demand [COD], soluble	----	E560-L	10	mg/L	161	160	0.685%	20%	----

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: 505807)						
solids, total suspended [TSS]	----	E160	3	mg/L	<3.0	----
Physical Tests (QCLot: 505814)						
solids, total dissolved [TDS]	----	E162	10	mg/L	<10	----
Anions and Nutrients (QCLot: 502949)						
chloride	16887-00-6	E235.Cl	0.5	mg/L	<0.50	----
Anions and Nutrients (QCLot: 502950)						
bromide	24959-67-9	E235.Br	0.1	mg/L	<0.10	----
Anions and Nutrients (QCLot: 502951)						
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 502952)						
nitrite (as N)	14797-65-0	E235.NO2	0.01	mg/L	<0.010	----
Anions and Nutrients (QCLot: 502953)						
nitrate (as N)	14797-55-8	E235.NO3	0.02	mg/L	<0.020	----
Anions and Nutrients (QCLot: 502954)						
fluoride	16984-48-8	E235.F	0.02	mg/L	<0.020	----
Anions and Nutrients (QCLot: 504229)						
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-T	0.003	mg/L	<0.0030	----
Anions and Nutrients (QCLot: 504430)						
phosphorus, total	7723-14-0	E372-U	0.002	mg/L	<0.0020	----
Anions and Nutrients (QCLot: 504432)						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 509275)						
cyanate	88402-73-7	E343	0.2	mg/L	<0.20	----
Cyanides (QCLot: 506457)						
thiocyanate	302-04-5	E344	0.5	mg/L	<0.50	----
Cyanides (QCLot: 513898)						
cyanide, strong acid dissociable (total)	----	E333	0.002	mg/L	<0.0020	----
Organic / Inorganic Carbon (QCLot: 504389)						
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	<0.50	----
Organic / Inorganic Carbon (QCLot: 504431)						
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	<0.50	----
Total Metals (QCLot: 503812)						
aluminum, total	7429-90-5	E420	0.003	mg/L	<0.0030	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 503812) - continued						
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	----
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	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 503812) - continued						
zinc, total	7440-66-6	E420	0.003	mg/L	<0.0030	----
zirconium, total	7440-67-7	E420	0.0002	mg/L	<0.00020	----
Aggregate Organics (QCLot: 502107)						
chemical oxygen demand [COD], soluble	----	E560-L	10	mg/L	<10	----

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: 505807)									
solids, total suspended [TSS]	----	E160	3	mg/L	150 mg/L	94.0	85.0	115	----
Physical Tests (QCLot: 505814)									
solids, total dissolved [TDS]	----	E162	10	mg/L	1000 mg/L	105	85.0	115	----
Anions and Nutrients (QCLot: 502949)									
chloride	16887-00-6	E235.Cl	0.5	mg/L	100 mg/L	99.6	90.0	110	----
Anions and Nutrients (QCLot: 502950)									
bromide	24959-67-9	E235.Br	0.1	mg/L	0.5 mg/L	103	85.0	115	----
Anions and Nutrients (QCLot: 502951)									
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	99.7	90.0	110	----
Anions and Nutrients (QCLot: 502952)									
nitrite (as N)	14797-65-0	E235.NO2	0.01	mg/L	0.5 mg/L	99.4	90.0	110	----
Anions and Nutrients (QCLot: 502953)									
nitrate (as N)	14797-55-8	E235.NO3	0.02	mg/L	2.5 mg/L	99.0	90.0	110	----
Anions and Nutrients (QCLot: 502954)									
fluoride	16984-48-8	E235.F	0.02	mg/L	1 mg/L	101	90.0	110	----
Anions and Nutrients (QCLot: 504229)									
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-T	0.003	mg/L	0.0196 mg/L	109	80.0	120	----
Anions and Nutrients (QCLot: 504430)									
phosphorus, total	7723-14-0	E372-U	0.002	mg/L	0.431 mg/L	99.8	80.0	120	----
Anions and Nutrients (QCLot: 504432)									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.2 mg/L	101	85.0	115	----
Anions and Nutrients (QCLot: 509275)									
cyanate	88402-73-7	E343	0.2	mg/L	1 mg/L	93.2	85.0	115	----
Cyanides (QCLot: 506457)									
thiocyanate	302-04-5	E344	0.5	mg/L	10 mg/L	99.7	85.0	115	----
Cyanides (QCLot: 513898)									
cyanide, strong acid dissociable (total)	----	E333	0.002	mg/L	0.25 mg/L	98.2	80.0	120	----
Organic / Inorganic Carbon (QCLot: 504389)									
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	8.57 mg/L	102	80.0	120	----
Organic / Inorganic Carbon (QCLot: 504431)									
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	8.57 mg/L	113	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: 503812)									
aluminum, total	7429-90-5	E420	0.003	mg/L	0.1 mg/L	98.9	80.0	120	----
antimony, total	7440-36-0	E420	0.0001	mg/L	0.05 mg/L	101	80.0	120	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	0.05 mg/L	98.3	80.0	120	----
barium, total	7440-39-3	E420	0.0001	mg/L	0.0125 mg/L	101	80.0	120	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	0.005 mg/L	91.9	80.0	120	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	0.05 mg/L	98.3	80.0	120	----
boron, total	7440-42-8	E420	0.01	mg/L	0.05 mg/L	86.9	80.0	120	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	0.005 mg/L	99.5	80.0	120	----
calcium, total	7440-70-2	E420	0.05	mg/L	2.5 mg/L	95.4	80.0	120	----
cesium, total	7440-46-2	E420	0.00001	mg/L	0.0025 mg/L	97.2	80.0	120	----
chromium, total	7440-47-3	E420	0.0005	mg/L	0.0125 mg/L	98.3	80.0	120	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	0.0125 mg/L	95.8	80.0	120	----
copper, total	7440-50-8	E420	0.0005	mg/L	0.0125 mg/L	96.4	80.0	120	----
iron, total	7439-89-6	E420	0.01	mg/L	0.05 mg/L	98.7	80.0	120	----
lead, total	7439-92-1	E420	0.00005	mg/L	0.025 mg/L	98.5	80.0	120	----
lithium, total	7439-93-2	E420	0.001	mg/L	0.0125 mg/L	85.7	80.0	120	----
magnesium, total	7439-95-4	E420	0.005	mg/L	2.5 mg/L	103	80.0	120	----
manganese, total	7439-96-5	E420	0.0001	mg/L	0.0125 mg/L	98.6	80.0	120	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	0.0125 mg/L	97.3	80.0	120	----
nickel, total	7440-02-0	E420	0.0005	mg/L	0.025 mg/L	97.0	80.0	120	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	0.5 mg/L	95.6	70.0	130	----
potassium, total	7440-09-7	E420	0.05	mg/L	2.5 mg/L	94.6	80.0	120	----
rubidium, total	7440-17-7	E420	0.0002	mg/L	0.005 mg/L	98.4	80.0	120	----
selenium, total	7782-49-2	E420	0.00005	mg/L	0.05 mg/L	97.5	80.0	120	----
silicon, total	7440-21-3	E420	0.1	mg/L	0.5 mg/L	98.9	60.0	140	----
silver, total	7440-22-4	E420	0.00001	mg/L	0.005 mg/L	90.4	80.0	120	----
sodium, total	7440-23-5	E420	0.05	mg/L	2.5 mg/L	101	80.0	120	----
strontium, total	7440-24-6	E420	0.0002	mg/L	0.0125 mg/L	97.9	80.0	120	----
sulfur, total	7704-34-9	E420	0.5	mg/L	2.5 mg/L	92.5	80.0	120	----
tellurium, total	13494-80-9	E420	0.0002	mg/L	0.005 mg/L	96.4	80.0	120	----
thallium, total	7440-28-0	E420	0.00001	mg/L	0.05 mg/L	97.0	80.0	120	----
thorium, total	7440-29-1	E420	0.0001	mg/L	0.005 mg/L	99.9	80.0	120	----
tin, total	7440-31-5	E420	0.0001	mg/L	0.025 mg/L	98.7	80.0	120	----
titanium, total	7440-32-6	E420	0.0003	mg/L	0.0125 mg/L	95.7	80.0	120	----
tungsten, total	7440-33-7	E420	0.0001	mg/L	0.005 mg/L	95.4	80.0	120	----
uranium, total	7440-61-1	E420	0.00001	mg/L	0.00025 mg/L	101	80.0	120	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	0.025 mg/L	99.3	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: 503812) - continued									
zinc, total	7440-66-6	E420	0.003	mg/L	0.025 mg/L	99.2	80.0	120	----
zirconium, total	7440-67-7	E420	0.0002	mg/L	0.005 mg/L	96.5	80.0	120	----
Aggregate Organics (QCLot: 502107)									
chemical oxygen demand [COD], soluble	----	E560-L	10	mg/L	100 mg/L	107	85.0	115	----

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: 502949)										
WT2204540-030	Anonymous	chloride	16887-00-6	E235.Cl	101 mg/L	100 mg/L	101	75.0	125	----
Anions and Nutrients (QCLot: 502950)										
WT2204540-030	Anonymous	bromide	24959-67-9	E235.Br	0.50 mg/L	0.5 mg/L	100	75.0	125	----
Anions and Nutrients (QCLot: 502951)										
WT2204540-030	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	102 mg/L	100 mg/L	102	75.0	125	----
Anions and Nutrients (QCLot: 502952)										
WT2204540-030	Anonymous	nitrite (as N)	14797-65-0	E235.NO2	0.508 mg/L	0.5 mg/L	102	75.0	125	----
Anions and Nutrients (QCLot: 502953)										
WT2204540-030	Anonymous	nitrate (as N)	14797-55-8	E235.NO3	2.49 mg/L	2.5 mg/L	99.8	75.0	125	----
Anions and Nutrients (QCLot: 502954)										
WT2204540-030	Anonymous	fluoride	16984-48-8	E235.F	1.02 mg/L	1 mg/L	102	75.0	125	----
Anions and Nutrients (QCLot: 504229)										
WT2204549-001	Anonymous	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-T	0.0185 mg/L	0.0196 mg/L	94.4	70.0	130	----
Anions and Nutrients (QCLot: 504430)										
WT2204551-001	Anonymous	phosphorus, total	7723-14-0	E372-U	ND mg/L	0.1 mg/L	ND	70.0	130	----
Anions and Nutrients (QCLot: 504432)										
WT2204559-001	Anonymous	ammonia, total (as N)	7664-41-7	E298	ND mg/L	0.1 mg/L	ND	75.0	125	----
Anions and Nutrients (QCLot: 509275)										
WT2204632-005	Anonymous	cyanate	88402-73-7	E343	1.56 mg/L	2 mg/L	78.0	70.0	130	----
Cyanides (QCLot: 506457)										
VA22B1539-002	Anonymous	thiocyanate	302-04-5	E344	196 mg/L	200 mg/L	98.1	75.0	125	----
Cyanides (QCLot: 513898)										
CG2206592-001	Anonymous	cyanide, strong acid dissociable (total)	----	E333	0.247 mg/L	0.25 mg/L	98.7	70.0	130	----
Organic / Inorganic Carbon (QCLot: 504389)										
WT2204557-001	196035_MD_R4_8C	carbon, dissolved organic [DOC]	----	E358-L	ND mg/L	5 mg/L	ND	70.0	130	----
Organic / Inorganic Carbon (QCLot: 504431)										
WT2204557-002	196035_MD_CW_8C	carbon, total organic [TOC]	----	E355-L	ND mg/L	5 mg/L	ND	70.0	130	----
Total Metals (QCLot: 503812)										

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: 503812) - continued										
WT2204557-002	196035_MD_CW_8C	aluminum, total	7429-90-5	E420	0.105 mg/L	0.1 mg/L	105	70.0	130	----
		antimony, total	7440-36-0	E420	0.0504 mg/L	0.05 mg/L	101	70.0	130	----
		arsenic, total	7440-38-2	E420	0.0508 mg/L	0.05 mg/L	102	70.0	130	----
		barium, total	7440-39-3	E420	0.0115 mg/L	0.0125 mg/L	92.0	70.0	130	----
		beryllium, total	7440-41-7	E420	0.00473 mg/L	0.005 mg/L	94.5	70.0	130	----
		bismuth, total	7440-69-9	E420	0.0490 mg/L	0.05 mg/L	98.0	70.0	130	----
		boron, total	7440-42-8	E420	ND mg/L	0.05 mg/L	ND	70.0	130	----
		cadmium, total	7440-43-9	E420	0.00499 mg/L	0.005 mg/L	99.8	70.0	130	----
		calcium, total	7440-70-2	E420	ND mg/L	2.5 mg/L	ND	70.0	130	----
		cesium, total	7440-46-2	E420	0.00251 mg/L	0.0025 mg/L	100	70.0	130	----
		chromium, total	7440-47-3	E420	0.0126 mg/L	0.0125 mg/L	101	70.0	130	----
		cobalt, total	7440-48-4	E420	ND mg/L	0.0125 mg/L	ND	70.0	130	----
		copper, total	7440-50-8	E420	0.0118 mg/L	0.0125 mg/L	94.5	70.0	130	----
		iron, total	7439-89-6	E420	ND mg/L	0.05 mg/L	ND	70.0	130	----
		lead, total	7439-92-1	E420	0.0239 mg/L	0.025 mg/L	95.7	70.0	130	----
		lithium, total	7439-93-2	E420	0.0119 mg/L	0.0125 mg/L	95.0	70.0	130	----
		magnesium, total	7439-95-4	E420	ND mg/L	2.5 mg/L	ND	70.0	130	----
		manganese, total	7439-96-5	E420	ND mg/L	0.0125 mg/L	ND	70.0	130	----
		molybdenum, total	7439-98-7	E420	0.0132 mg/L	0.0125 mg/L	105	70.0	130	----
		nickel, total	7440-02-0	E420	ND mg/L	0.025 mg/L	ND	70.0	130	----
		phosphorus, total	7723-14-0	E420	0.509 mg/L	0.5 mg/L	102	70.0	130	----
		potassium, total	7440-09-7	E420	ND mg/L	2.5 mg/L	ND	70.0	130	----
		rubidium, total	7440-17-7	E420	ND mg/L	0.005 mg/L	ND	70.0	130	----
		selenium, total	7782-49-2	E420	0.0485 mg/L	0.05 mg/L	97.0	70.0	130	----
		silicon, total	7440-21-3	E420	ND mg/L	0.5 mg/L	ND	70.0	130	----
		silver, total	7440-22-4	E420	0.00446 mg/L	0.005 mg/L	89.2	70.0	130	----
		sodium, total	7440-23-5	E420	ND mg/L	2.5 mg/L	ND	70.0	130	----
		strontium, total	7440-24-6	E420	ND mg/L	0.0125 mg/L	ND	70.0	130	----
		sulfur, total	7704-34-9	E420	ND mg/L	2.5 mg/L	ND	70.0	130	----
		tellurium, total	13494-80-9	E420	0.00472 mg/L	0.005 mg/L	94.5	70.0	130	----
		thallium, total	7440-28-0	E420	0.0466 mg/L	0.05 mg/L	93.2	70.0	130	----
		thorium, total	7440-29-1	E420	0.00463 mg/L	0.005 mg/L	92.5	70.0	130	----
		tin, total	7440-31-5	E420	0.0255 mg/L	0.025 mg/L	102	70.0	130	----
		titanium, total	7440-32-6	E420	0.0114 mg/L	0.0125 mg/L	91.1	70.0	130	----
		tungsten, total	7440-33-7	E420	0.00493 mg/L	0.005 mg/L	98.7	70.0	130	----
		uranium, total	7440-61-1	E420	0.000248 mg/L	0.00025 mg/L	99.3	70.0	130	----
		vanadium, total	7440-62-2	E420	0.0264 mg/L	0.025 mg/L	105	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: 503812) - continued										
WT2204557-002	196035_MD_CW_8C	zinc, total	7440-66-6	E420	0.0252 mg/L	0.025 mg/L	101	70.0	130	----
		zirconium, total	7440-67-7	E420	0.00487 mg/L	0.005 mg/L	97.5	70.0	130	----
Aggregate Organics (QCLot: 502107)										
WT2204557-001	196035_MD_R4_8C	chemical oxygen demand [COD], soluble	----	E560-L	ND mg/L	100 mg/L	ND	75.0	125	----

ALS www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here (lab use only)

COC Number: 17 - -

Page of

A

Report To	Contact and company name below will appear on the final report
Company:	Veolia Water Technologies (26895)
Contact:	Josee Lalonde
Phone:	
	Company address below will appear on the final report
Street:	4105 Sartelon
City/Province:	Ville St-Laurent
Postal Code:	H2S 2B3
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☐ NO
Company:	
Contact:	

Report Format / Distribution

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

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

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

Select Distribution: ☐ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax josee.lalonde@veolia.com

Email 2

Email 3

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax vwtcanada_payables@veolia.com

Email 2

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

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

PRIORITY (Business Days): 4 day [P4-20%] ☐ 3 day [P3-25%] ☐ 2 day [P2-50%] ☐

EMERGENCY: 1 Business day [E - 100%] ☐ Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] ☐

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

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

Project Information

ALS Account # / Quote #:

Job #: 196635_MD

PO / AFE: 500196035.606300.21030001

LSD:

Oil and Gas Required Fields (client use)

AFE/Cost Center: PO#

Major/Minor Code: Routing Code:

Requisitioner:

Location:

ALS Lab Work Order # (lab use only): WT2204557

ALS Contact: Sampler:

Analysis Request

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

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	Metals scan (Low Limits)	CND, CN, SCN	Anions scan	ortho-phosphates	PT	TOC, DOC	COD soluble	TSS, TDS	NO_2	NO_3	NH_4	SAMPLES ON HOLD	SUSPECTED HAZARD (see Special Instructions)
	196035_MD R4 8°C	2022-05-26			8	X	X	X	X	X	X	X	X	X	X	X		
	196035_MD-CW_8°C	~			8	X	X	X	X	X	X	X	X	X	X	X		

Environmental Division
Waterloo
Work Order Reference
WT2204557

Telephone : +1 519 886 6910

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

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

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

Special Instructions / Specify Criteria ... below

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C | FINAL COOLER TEMPERATURES °C 17.7

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: EHT	Date: 2022.05.26	Time:	Received by:	Date:	Time:	Received by: BB	Date: May 27/22	Time: 11:10

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

NOV 2018 FRONT

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

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

Veolia Water Technologies Canada (Saint-Laurent)
ATTN: Josee Lalonde
4105 Sartelon
Ville St-Laurent QC H2S 2B3

Date Received: 17-MAY-22
Report Date: 27-MAY-22 14:57 (MT)
Version: FINAL

Client Phone: 514-334-7230

Certificate of Analysis

Lab Work Order #: L2706977

Project P.O. #: 5000196035_606300.21030001
Job Reference: 196035_MD
C of C Numbers:
Legal Site Desc:

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2706977-1 196035_MD_RW Sampled By: CLIENT on 16-MAY-22 Matrix: WATER							
Physical Tests							
Total Suspended Solids	<3.0		3.0	mg/L	19-MAY-22	20-MAY-22	R5785735
Total Dissolved Solids	2440	DLM	40	mg/L		20-MAY-22	R5786369
Anions and Nutrients							
Ammonia, Total (as N)	47.4	DLHC	1.0	mg/L		20-MAY-22	R5786193
Bromide (Br)	1.1	DLDS	1.0	mg/L		19-MAY-22	R5785583
Chloride (Cl)	188	DLDS	5.0	mg/L		19-MAY-22	R5785583
Fluoride (F)	<0.20	DLDS	0.20	mg/L		19-MAY-22	R5785583
Nitrate (as N)	9.37	DLDS	0.20	mg/L		19-MAY-22	R5785583
Nitrite (as N)	0.46	DLDS	0.10	mg/L		19-MAY-22	R5785583
Orthophosphate-Dissolved (as P)	<0.0030		0.0030	mg/L		18-MAY-22	R5784431
Phosphorus, Total	0.0055		0.0030	mg/L	19-MAY-22	19-MAY-22	R5785119
Sulfate (SO4)	1670	DLDS	3.0	mg/L		19-MAY-22	R5785583
Cyanides							
Cyanide, Total	0.0403		0.0020	mg/L		18-MAY-22	R5785001
Cyanate	17	DLIS	10	mg/L		20-MAY-22	R5785873
Thiocyanate (SCN)	138		5.0	mg/L		22-MAY-26	R5788598
Organic / Inorganic Carbon							
Dissolved Carbon Filtration Location	FIELD					18-MAY-22	R5783638
Dissolved Carbon Filtration Location	lab	PEHT				21-MAY-22	R5785945
Dissolved Organic Carbon	86.5	DLM	2.5	mg/L	21-MAY-22	24-MAY-22	R5786276
Total Organic Carbon	85	DLM	10	mg/L		24-MAY-22	R5786669
Total Metals							
Aluminum (Al)-Total	<0.050	DLHC	0.050	mg/L	18-MAY-22	18-MAY-22	R5784424
Antimony (Sb)-Total	0.0074	DLHC	0.0010	mg/L	18-MAY-22	18-MAY-22	R5784424
Arsenic (As)-Total	0.0015	DLHC	0.0010	mg/L	18-MAY-22	18-MAY-22	R5784424
Barium (Ba)-Total	0.0301	DLHC	0.0010	mg/L	18-MAY-22	18-MAY-22	R5784424
Beryllium (Be)-Total	<0.0010	DLHC	0.0010	mg/L	18-MAY-22	18-MAY-22	R5784424
Bismuth (Bi)-Total	<0.00050	DLHC	0.00050	mg/L	18-MAY-22	18-MAY-22	R5784424
Boron (B)-Total	0.25	DLHC	0.10	mg/L	18-MAY-22	18-MAY-22	R5784424
Cadmium (Cd)-Total	<0.000050	DLHC	0.000050	mg/L	18-MAY-22	18-MAY-22	R5784424
Calcium (Ca)-Total	280	DLHC	0.50	mg/L	18-MAY-22	18-MAY-22	R5784424
Cesium (Cs)-Total	<0.00010	DLHC	0.00010	mg/L	18-MAY-22	18-MAY-22	R5784424
Chromium (Cr)-Total	<0.0050	DLHC	0.0050	mg/L	18-MAY-22	18-MAY-22	R5784424
Cobalt (Co)-Total	0.425	DLHC	0.0010	mg/L	18-MAY-22	18-MAY-22	R5784424
Copper (Cu)-Total	0.0084	DLHC	0.0050	mg/L	18-MAY-22	18-MAY-22	R5784424
Iron (Fe)-Total	0.17	DLHC	0.10	mg/L	18-MAY-22	18-MAY-22	R5784424
Lead (Pb)-Total	<0.00050	DLHC	0.00050	mg/L	18-MAY-22	18-MAY-22	R5784424
Lithium (Li)-Total	<0.010	DLHC	0.010	mg/L	18-MAY-22	18-MAY-22	R5784424
Magnesium (Mg)-Total	21.7	DLHC	0.050	mg/L	18-MAY-22	18-MAY-22	R5784424
Manganese (Mn)-Total	0.0242	DLHC	0.0050	mg/L	18-MAY-22	18-MAY-22	R5784424
Molybdenum (Mo)-Total	0.0887	DLHC	0.00050	mg/L	18-MAY-22	18-MAY-22	R5784424
Nickel (Ni)-Total	0.135	DLHC	0.0050	mg/L	18-MAY-22	18-MAY-22	R5784424

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2706977-1 196035_MD_RW							
Sampled By: CLIENT on 16-MAY-22							
Matrix: WATER							
Total Metals							
Phosphorus (P)-Total	<0.50	DLHC	0.50	mg/L	18-MAY-22	18-MAY-22	R5784424
Potassium (K)-Total	165	DLHC	0.50	mg/L	18-MAY-22	18-MAY-22	R5784424
Rubidium (Rb)-Total	0.0452	DLHC	0.0020	mg/L	18-MAY-22	18-MAY-22	R5784424
Selenium (Se)-Total	0.128	DLHC	0.00050	mg/L	18-MAY-22	18-MAY-22	R5784424
Silicon (Si)-Total	1.5	DLHC	1.0	mg/L	18-MAY-22	18-MAY-22	R5784424
Silver (Ag)-Total	<0.00050	DLHC	0.00050	mg/L	18-MAY-22	18-MAY-22	R5784424
Sodium (Na)-Total	416	DLHC	0.50	mg/L	18-MAY-22	18-MAY-22	R5784424
Strontium (Sr)-Total	1.00	DLHC	0.010	mg/L	18-MAY-22	18-MAY-22	R5784424
Sulfur (S)-Total	635	DLHC	5.0	mg/L	18-MAY-22	18-MAY-22	R5784424
Tellurium (Te)-Total	<0.0020	DLHC	0.0020	mg/L	18-MAY-22	18-MAY-22	R5784424
Thallium (Tl)-Total	<0.00010	DLHC	0.00010	mg/L	18-MAY-22	18-MAY-22	R5784424
Thorium (Th)-Total	<0.0010	DLHC	0.0010	mg/L	18-MAY-22	18-MAY-22	R5784424
Tin (Sn)-Total	<0.0010	DLHC	0.0010	mg/L	18-MAY-22	18-MAY-22	R5784424
Titanium (Ti)-Total	<0.0030	DLHC	0.0030	mg/L	18-MAY-22	18-MAY-22	R5784424
Tungsten (W)-Total	<0.0010	DLHC	0.0010	mg/L	18-MAY-22	18-MAY-22	R5784424
Uranium (U)-Total	0.00924	DLHC	0.00010	mg/L	18-MAY-22	18-MAY-22	R5784424
Vanadium (V)-Total	<0.0050	DLHC	0.0050	mg/L	18-MAY-22	18-MAY-22	R5784424
Zinc (Zn)-Total	<0.030	DLHC	0.030	mg/L	18-MAY-22	18-MAY-22	R5784424
Zirconium (Zr)-Total	<0.0020	DLHC	0.0020	mg/L	18-MAY-22	18-MAY-22	R5784424
Dissolved Metals							
Dissolved Metals Filtration Location	LAB					24-MAY-22	R5786219
Aluminum (Al)-Dissolved	<0.050	DLHC	0.050	mg/L	24-MAY-22	24-MAY-22	R5786474
Antimony (Sb)-Dissolved	0.0079	DLHC	0.0010	mg/L	24-MAY-22	24-MAY-22	R5786474
Arsenic (As)-Dissolved	0.0015	DLHC	0.0010	mg/L	24-MAY-22	24-MAY-22	R5786474
Barium (Ba)-Dissolved	0.0327	DLHC	0.0010	mg/L	24-MAY-22	24-MAY-22	R5786474
Beryllium (Be)-Dissolved	<0.0010	DLHC	0.0010	mg/L	24-MAY-22	24-MAY-22	R5786474
Bismuth (Bi)-Dissolved	<0.00050	DLHC	0.00050	mg/L	24-MAY-22	24-MAY-22	R5786474
Boron (B)-Dissolved	0.26	DLHC	0.10	mg/L	24-MAY-22	24-MAY-22	R5786474
Cadmium (Cd)-Dissolved	<0.000050	DLHC	0.000050	mg/L	24-MAY-22	24-MAY-22	R5786474
Calcium (Ca)-Dissolved	306	DLHC	0.50	mg/L	24-MAY-22	24-MAY-22	R5786474
Cesium (Cs)-Dissolved	<0.00010	DLHC	0.00010	mg/L	24-MAY-22	24-MAY-22	R5786474
Chromium (Cr)-Dissolved	<0.0050	DLHC	0.0050	mg/L	24-MAY-22	24-MAY-22	R5786474
Cobalt (Co)-Dissolved	0.435	DLHC	0.0010	mg/L	24-MAY-22	24-MAY-22	R5786474
Copper (Cu)-Dissolved	0.0060	DLHC	0.0020	mg/L	24-MAY-22	24-MAY-22	R5786474
Iron (Fe)-Dissolved	<0.10	DLHC	0.10	mg/L	24-MAY-22	24-MAY-22	R5786474
Lead (Pb)-Dissolved	<0.00050	DLHC	0.00050	mg/L	24-MAY-22	24-MAY-22	R5786474
Lithium (Li)-Dissolved	<0.010	DLHC	0.010	mg/L	24-MAY-22	24-MAY-22	R5786474
Magnesium (Mg)-Dissolved	22.1	DLHC	0.050	mg/L	24-MAY-22	24-MAY-22	R5786474
Manganese (Mn)-Dissolved	0.0234	DLHC	0.0050	mg/L	24-MAY-22	24-MAY-22	R5786474
Molybdenum (Mo)-Dissolved	0.0937	DLHC	0.00050	mg/L	24-MAY-22	24-MAY-22	R5786474
Nickel (Ni)-Dissolved	0.138	DLHC	0.0050	mg/L	24-MAY-22	24-MAY-22	R5786474

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2706977-1 196035_MD_RW Sampled By: CLIENT on 16-MAY-22 Matrix: WATER							
Dissolved Metals							
Phosphorus (P)-Dissolved	<0.50	DLHC	0.50	mg/L	24-MAY-22	24-MAY-22	R5786474
Potassium (K)-Dissolved	165	DLHC	0.50	mg/L	24-MAY-22	24-MAY-22	R5786474
Rubidium (Rb)-Dissolved	0.0484	DLHC	0.0020	mg/L	24-MAY-22	24-MAY-22	R5786474
Selenium (Se)-Dissolved	0.129	DLHC	0.00050	mg/L	24-MAY-22	24-MAY-22	R5786474
Silicon (Si)-Dissolved	1.57	DLHC	0.50	mg/L	24-MAY-22	24-MAY-22	R5786474
Silver (Ag)-Dissolved	<0.00050	DLHC	0.00050	mg/L	24-MAY-22	24-MAY-22	R5786474
Sodium (Na)-Dissolved	429	DLHC	0.50	mg/L	24-MAY-22	24-MAY-22	R5786474
Strontium (Sr)-Dissolved	1.05	DLHC	0.010	mg/L	24-MAY-22	24-MAY-22	R5786474
Sulfur (S)-Dissolved	688	DLHC	5.0	mg/L	24-MAY-22	24-MAY-22	R5786474
Tellurium (Te)-Dissolved	<0.0020	DLHC	0.0020	mg/L	24-MAY-22	24-MAY-22	R5786474
Thallium (Tl)-Dissolved	<0.00010	DLHC	0.00010	mg/L	24-MAY-22	24-MAY-22	R5786474
Thorium (Th)-Dissolved	<0.0010	DLHC	0.0010	mg/L	24-MAY-22	24-MAY-22	R5786474
Tin (Sn)-Dissolved	<0.0010	DLHC	0.0010	mg/L	24-MAY-22	24-MAY-22	R5786474
Titanium (Ti)-Dissolved	<0.0030	DLHC	0.0030	mg/L	24-MAY-22	24-MAY-22	R5786474
Tungsten (W)-Dissolved	<0.0010	DLHC	0.0010	mg/L	24-MAY-22	24-MAY-22	R5786474
Uranium (U)-Dissolved	0.00892	DLHC	0.00010	mg/L	24-MAY-22	24-MAY-22	R5786474
Vanadium (V)-Dissolved	<0.0050	DLHC	0.0050	mg/L	24-MAY-22	24-MAY-22	R5786474
Zinc (Zn)-Dissolved	<0.010	DLHC	0.010	mg/L	24-MAY-22	24-MAY-22	R5786474
Zirconium (Zr)-Dissolved	<0.0020	DLHC	0.0020	mg/L	24-MAY-22	24-MAY-22	R5786474
L2706977-2 196035_MD_R1 Sampled By: CLIENT on 16-MAY-22 Matrix: WATER							
Anions and Nutrients							
Ammonia, Total (as N)	133	DLHC	5.0	mg/L		24-MAY-22	R5786193
Bromide (Br)	1.0	DLDS	1.0	mg/L		19-MAY-22	R5785583
Chloride (Cl)	181	DLDS	5.0	mg/L		19-MAY-22	R5785583
Fluoride (F)	<0.20	DLDS	0.20	mg/L		19-MAY-22	R5785583
Nitrate (as N)	32.0	DLDS	0.20	mg/L		19-MAY-22	R5785583
Nitrite (as N)	48.2	DLDS	0.10	mg/L		19-MAY-22	R5785583
Orthophosphate-Dissolved (as P)	1.90	DLHC	0.30	mg/L		18-MAY-22	R5784431
Sulfate (SO4)	1830	DLDS	3.0	mg/L		19-MAY-22	R5785583
Cyanides							
Cyanide, Total	0.0352	CNI	0.0020	mg/L		19-MAY-22	R5785001
Thiocyanate (SCN)	1.22		0.50	mg/L		22-MAY-26	R5788598
L2706977-3 196035_MD_R2 Sampled By: CLIENT on 16-MAY-22 Matrix: WATER							
Anions and Nutrients							
Ammonia, Total (as N)	0.967	DLHC	0.050	mg/L		24-MAY-22	R5786193
Bromide (Br)	<1.0	DLDS	1.0	mg/L		19-MAY-22	R5785583
Chloride (Cl)	145	DLDS	5.0	mg/L		19-MAY-22	R5785583
Fluoride (F)	<0.20	DLDS	0.20	mg/L		19-MAY-22	R5785583

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2706977-3 196035_MD_R2 Sampled By: CLIENT on 16-MAY-22 Matrix: WATER							
Anions and Nutrients							
Nitrate (as N)	174	DLDS	0.20	mg/L		19-MAY-22	R5785583
Nitrite (as N)	0.46	DLDS	0.10	mg/L		19-MAY-22	R5785583
Orthophosphate-Dissolved (as P)	2.42	DLHC	0.30	mg/L		18-MAY-22	R5784431
Sulfate (SO4)	1470	DLDS	3.0	mg/L		19-MAY-22	R5785583
Cyanides							
Cyanide, Total	0.0205		0.0020	mg/L		18-MAY-22	R5785001
Thiocyanate (SCN)	<0.50		0.50	mg/L		22-MAY-26	R5788598
L2706977-4 196035_MD_R3 Sampled By: CLIENT on 16-MAY-22 Matrix: WATER							
Anions and Nutrients							
Ammonia, Total (as N)	0.096		0.010	mg/L		24-MAY-22	R5786193
Bromide (Br)	<1.0	DLDS	1.0	mg/L		19-MAY-22	R5785583
Chloride (Cl)	127	DLDS	5.0	mg/L		19-MAY-22	R5785583
Fluoride (F)	<0.20	DLDS	0.20	mg/L		19-MAY-22	R5785583
Nitrate (as N)	0.99	DLDS	0.20	mg/L		19-MAY-22	R5785583
Nitrite (as N)	<0.10	DLDS	0.10	mg/L		19-MAY-22	R5785583
Orthophosphate-Dissolved (as P)	0.0220		0.0030	mg/L		18-MAY-22	R5784431
Sulfate (SO4)	1080	DLDS	3.0	mg/L		19-MAY-22	R5785583
Cyanides							
Cyanide, Total	0.0164		0.0020	mg/L		18-MAY-22	R5785001
Thiocyanate (SCN)	<0.50		0.50	mg/L		22-MAY-26	R5788598
L2706977-5 196035_MD_CW15°C Sampled By: CLIENT on 16-MAY-22 Matrix: WATER							
Physical Tests							
Total Suspended Solids	6.3		3.0	mg/L	19-MAY-22	20-MAY-22	R5785735
Total Dissolved Solids	2490	DLM	80	mg/L		20-MAY-22	R5786369
Anions and Nutrients							
Ammonia, Total (as N)	4.17	DLHC	0.10	mg/L		24-MAY-22	R5786193
Bromide (Br)	<1.0	DLDS	1.0	mg/L		19-MAY-22	R5785583
Chloride (Cl)	121	DLDS	5.0	mg/L		19-MAY-22	R5785583
Fluoride (F)	<0.20	DLDS	0.20	mg/L		19-MAY-22	R5785583
Nitrate (as N)	<0.20	DLDS	0.20	mg/L		19-MAY-22	R5785583
Nitrite (as N)	<0.10	DLDS	0.10	mg/L		19-MAY-22	R5785583
Orthophosphate-Dissolved (as P)	<0.0030		0.0030	mg/L		18-MAY-22	R5784431
Phosphorus, Total	0.0309		0.0030	mg/L	19-MAY-22	19-MAY-22	R5785119
Sulfate (SO4)	1870	DLDS	3.0	mg/L		19-MAY-22	R5785583
Cyanides							
Cyanide, Total	0.0188		0.0020	mg/L		18-MAY-22	R5785001
Cyanate	<10	DLIS	10	mg/L		20-MAY-22	R5785873
Thiocyanate (SCN)	<0.50		0.50	mg/L		22-MAY-26	R5788598
Organic / Inorganic Carbon							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2706977-5 196035_MD_CW15°C Sampled By: CLIENT on 16-MAY-22 Matrix: WATER							
Organic / Inorganic Carbon							
Dissolved Carbon Filtration Location	lab	PEHT				21-MAY-22	R5785945
Dissolved Carbon Filtration Location	FIELD					18-MAY-22	R5783638
Dissolved Organic Carbon	12.3	DLM	2.5	mg/L	21-MAY-22	24-MAY-22	R5786276
Total Organic Carbon	15.6	DLM	2.5	mg/L		24-MAY-22	R5786669
Total Metals							
Aluminum (Al)-Total	<0.050	DLHC	0.050	mg/L	18-MAY-22	18-MAY-22	R5784424
Antimony (Sb)-Total	<0.0010	DLHC	0.0010	mg/L	18-MAY-22	18-MAY-22	R5784424
Arsenic (As)-Total	<0.0010	DLHC	0.0010	mg/L	18-MAY-22	18-MAY-22	R5784424
Barium (Ba)-Total	0.0072	DLHC	0.0010	mg/L	18-MAY-22	18-MAY-22	R5784424
Beryllium (Be)-Total	<0.0010	DLHC	0.0010	mg/L	18-MAY-22	18-MAY-22	R5784424
Bismuth (Bi)-Total	<0.00050	DLHC	0.00050	mg/L	18-MAY-22	18-MAY-22	R5784424
Boron (B)-Total	0.16	DLHC	0.10	mg/L	18-MAY-22	18-MAY-22	R5784424
Cadmium (Cd)-Total	0.000058	DLHC	0.000050	mg/L	18-MAY-22	18-MAY-22	R5784424
Calcium (Ca)-Total	134	DLHC	0.50	mg/L	18-MAY-22	18-MAY-22	R5784424
Cesium (Cs)-Total	<0.00010	DLHC	0.00010	mg/L	18-MAY-22	18-MAY-22	R5784424
Chromium (Cr)-Total	<0.0050	DLHC	0.0050	mg/L	18-MAY-22	18-MAY-22	R5784424
Cobalt (Co)-Total	0.281	DLHC	0.0010	mg/L	18-MAY-22	18-MAY-22	R5784424
Copper (Cu)-Total	<0.0050	DLHC	0.0050	mg/L	18-MAY-22	18-MAY-22	R5784424
Iron (Fe)-Total	3.12	DLHC	0.10	mg/L	18-MAY-22	18-MAY-22	R5784424
Lead (Pb)-Total	<0.00050	DLHC	0.00050	mg/L	18-MAY-22	18-MAY-22	R5784424
Lithium (Li)-Total	<0.010	DLHC	0.010	mg/L	18-MAY-22	18-MAY-22	R5784424
Magnesium (Mg)-Total	13.4	DLHC	0.050	mg/L	18-MAY-22	18-MAY-22	R5784424
Manganese (Mn)-Total	0.135	DLHC	0.0050	mg/L	18-MAY-22	18-MAY-22	R5784424
Molybdenum (Mo)-Total	0.00749	DLHC	0.00050	mg/L	18-MAY-22	18-MAY-22	R5784424
Nickel (Ni)-Total	0.0454	DLHC	0.0050	mg/L	18-MAY-22	18-MAY-22	R5784424
Phosphorus (P)-Total	<0.50	DLHC	0.50	mg/L	18-MAY-22	18-MAY-22	R5784424
Potassium (K)-Total	103	DLHC	0.50	mg/L	18-MAY-22	18-MAY-22	R5784424
Rubidium (Rb)-Total	0.0284	DLHC	0.0020	mg/L	18-MAY-22	18-MAY-22	R5784424
Selenium (Se)-Total	0.0257	DLHC	0.00050	mg/L	18-MAY-22	18-MAY-22	R5784424
Silicon (Si)-Total	<1.0	DLHC	1.0	mg/L	18-MAY-22	18-MAY-22	R5784424
Silver (Ag)-Total	<0.00050	DLHC	0.00050	mg/L	18-MAY-22	18-MAY-22	R5784424
Sodium (Na)-Total	729	DLHC	0.50	mg/L	18-MAY-22	18-MAY-22	R5784424
Strontium (Sr)-Total	0.530	DLHC	0.010	mg/L	18-MAY-22	18-MAY-22	R5784424
Sulfur (S)-Total	605	DLHC	5.0	mg/L	18-MAY-22	18-MAY-22	R5784424
Tellurium (Te)-Total	<0.0020	DLHC	0.0020	mg/L	18-MAY-22	18-MAY-22	R5784424
Thallium (Tl)-Total	<0.00010	DLHC	0.00010	mg/L	18-MAY-22	18-MAY-22	R5784424
Thorium (Th)-Total	<0.0010	DLHC	0.0010	mg/L	18-MAY-22	18-MAY-22	R5784424
Tin (Sn)-Total	<0.0010	DLHC	0.0010	mg/L	18-MAY-22	18-MAY-22	R5784424
Titanium (Ti)-Total	<0.0030	DLHC	0.0030	mg/L	18-MAY-22	18-MAY-22	R5784424
Tungsten (W)-Total	<0.0010	DLHC	0.0010	mg/L	18-MAY-22	18-MAY-22	R5784424
Uranium (U)-Total	0.00055	DLHC	0.00010	mg/L	18-MAY-22	18-MAY-22	R5784424

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2706977-5 196035_MD_CW15°C Sampled By: CLIENT on 16-MAY-22 Matrix: WATER							
Total Metals							
Vanadium (V)-Total	<0.0050	DLHC	0.0050	mg/L	18-MAY-22	18-MAY-22	R5784424
Zinc (Zn)-Total	<0.030	DLHC	0.030	mg/L	18-MAY-22	18-MAY-22	R5784424
Zirconium (Zr)-Total	<0.0020	DLHC	0.0020	mg/L	18-MAY-22	18-MAY-22	R5784424
Dissolved Metals							
Dissolved Metals Filtration Location	LAB					19-MAY-22	R5785349
Aluminum (Al)-Dissolved	<0.050	DLHC	0.050	mg/L	19-MAY-22	20-MAY-22	R5786123
Antimony (Sb)-Dissolved	<0.0010	DLHC	0.0010	mg/L	19-MAY-22	20-MAY-22	R5786123
Arsenic (As)-Dissolved	<0.0010	DLHC	0.0010	mg/L	19-MAY-22	20-MAY-22	R5786123
Barium (Ba)-Dissolved	0.0067	DLHC	0.0010	mg/L	19-MAY-22	20-MAY-22	R5786123
Beryllium (Be)-Dissolved	<0.0010	DLHC	0.0010	mg/L	19-MAY-22	20-MAY-22	R5786123
Bismuth (Bi)-Dissolved	<0.00050	DLHC	0.00050	mg/L	19-MAY-22	20-MAY-22	R5786123
Boron (B)-Dissolved	0.17	DLHC	0.10	mg/L	19-MAY-22	20-MAY-22	R5786123
Cadmium (Cd)-Dissolved	<0.000050	DLHC	0.000050	mg/L	19-MAY-22	20-MAY-22	R5786123
Calcium (Ca)-Dissolved	133	DLHC	0.50	mg/L	19-MAY-22	20-MAY-22	R5786123
Cesium (Cs)-Dissolved	<0.00010	DLHC	0.00010	mg/L	19-MAY-22	20-MAY-22	R5786123
Chromium (Cr)-Dissolved	<0.0050	DLHC	0.0050	mg/L	19-MAY-22	20-MAY-22	R5786123
Cobalt (Co)-Dissolved	0.302	DLHC	0.0010	mg/L	19-MAY-22	20-MAY-22	R5786123
Copper (Cu)-Dissolved	<0.0020	DLHC	0.0020	mg/L	19-MAY-22	20-MAY-22	R5786123
Iron (Fe)-Dissolved	0.76	DLHC	0.10	mg/L	19-MAY-22	20-MAY-22	R5786123
Lead (Pb)-Dissolved	<0.00050	DLHC	0.00050	mg/L	19-MAY-22	20-MAY-22	R5786123
Lithium (Li)-Dissolved	<0.010	DLHC	0.010	mg/L	19-MAY-22	20-MAY-22	R5786123
Magnesium (Mg)-Dissolved	14.6	DLHC	0.050	mg/L	19-MAY-22	20-MAY-22	R5786123
Manganese (Mn)-Dissolved	0.147	DLHC	0.0050	mg/L	19-MAY-22	20-MAY-22	R5786123
Molybdenum (Mo)-Dissolved	0.00681	DLHC	0.00050	mg/L	19-MAY-22	20-MAY-22	R5786123
Nickel (Ni)-Dissolved	0.0480	DLHC	0.0050	mg/L	19-MAY-22	20-MAY-22	R5786123
Phosphorus (P)-Dissolved	<0.50	DLHC	0.50	mg/L	19-MAY-22	20-MAY-22	R5786123
Potassium (K)-Dissolved	107	DLHC	0.50	mg/L	19-MAY-22	20-MAY-22	R5786123
Rubidium (Rb)-Dissolved	0.0298	DLHC	0.0020	mg/L	19-MAY-22	20-MAY-22	R5786123
Selenium (Se)-Dissolved	0.0242	DLHC	0.00050	mg/L	19-MAY-22	20-MAY-22	R5786123
Silicon (Si)-Dissolved	0.56	DLHC	0.50	mg/L	19-MAY-22	20-MAY-22	R5786123
Silver (Ag)-Dissolved	<0.00050	DLHC	0.00050	mg/L	19-MAY-22	20-MAY-22	R5786123
Sodium (Na)-Dissolved	832	DLHC	0.50	mg/L	19-MAY-22	20-MAY-22	R5786123
Strontium (Sr)-Dissolved	0.533	DLHC	0.010	mg/L	19-MAY-22	20-MAY-22	R5786123
Sulfur (S)-Dissolved	652	DLHC	5.0	mg/L	19-MAY-22	20-MAY-22	R5786123
Tellurium (Te)-Dissolved	<0.0020	DLHC	0.0020	mg/L	19-MAY-22	20-MAY-22	R5786123
Thallium (Tl)-Dissolved	<0.00010	DLHC	0.00010	mg/L	19-MAY-22	20-MAY-22	R5786123
Thorium (Th)-Dissolved	<0.0010	DLHC	0.0010	mg/L	19-MAY-22	20-MAY-22	R5786123
Tin (Sn)-Dissolved	<0.0010	DLHC	0.0010	mg/L	19-MAY-22	20-MAY-22	R5786123
Titanium (Ti)-Dissolved	<0.0030	DLHC	0.0030	mg/L	19-MAY-22	20-MAY-22	R5786123
Tungsten (W)-Dissolved	<0.0010	DLHC	0.0010	mg/L	19-MAY-22	20-MAY-22	R5786123
Uranium (U)-Dissolved	0.00047	DLHC	0.00010	mg/L	19-MAY-22	20-MAY-22	R5786123

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2706977-5 196035_MD_CW15°C Sampled By: CLIENT on 16-MAY-22 Matrix: WATER							
Dissolved Metals							
Vanadium (V)-Dissolved	<0.0050	DLHC	0.0050	mg/L	19-MAY-22	20-MAY-22	R5786123
Zinc (Zn)-Dissolved	<0.010	DLHC	0.010	mg/L	19-MAY-22	20-MAY-22	R5786123
Zirconium (Zr)-Dissolved	<0.0020	DLHC	0.0020	mg/L	19-MAY-22	20-MAY-22	R5786123

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Chloride (Cl)	MS-B	L2706977-1, -2, -3, -4, -5
Matrix Spike	Thiocyanate (SCN)	MS-B	L2706977-1, -2, -3, -4, -5
Matrix Spike	Dissolved Organic Carbon	MS-B	L2706977-1, -5
Matrix Spike	Aluminum (Al)-Dissolved	MS-B	L2706977-5
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2706977-1
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2706977-5
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2706977-1
Matrix Spike	Iron (Fe)-Dissolved	MS-B	L2706977-5
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2706977-1
Matrix Spike	Silicon (Si)-Dissolved	MS-B	L2706977-5
Matrix Spike	Silicon (Si)-Dissolved	MS-B	L2706977-1
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2706977-1
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2706977-5
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2706977-1
Matrix Spike	Uranium (U)-Dissolved	MS-B	L2706977-1
Matrix Spike	Barium (Ba)-Total	MS-B	L2706977-1, -5
Matrix Spike	Calcium (Ca)-Total	MS-B	L2706977-1, -5
Matrix Spike	Iron (Fe)-Total	MS-B	L2706977-1, -5
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2706977-1, -5
Matrix Spike	Manganese (Mn)-Total	MS-B	L2706977-1, -5
Matrix Spike	Silicon (Si)-Total	MS-B	L2706977-1, -5
Matrix Spike	Sodium (Na)-Total	MS-B	L2706977-1, -5
Matrix Spike	Strontium (Sr)-Total	MS-B	L2706977-1, -5
Matrix Spike	Sulfur (S)-Total	MS-B	L2706977-1, -5
Matrix Spike	Uranium (U)-Total	MS-B	L2706977-1, -5
Matrix Spike	Total Organic Carbon	MS-B	L2706977-1, -5

Sample Parameter Qualifier key listed:

Qualifier	Description
CNI	Test result for Total Cyanide may be biased high due to interference from high nitrite in this sample. Nitrite can cause false positives for T-CN at up to ~ 0.8% of the nitrite concentration. Interpret result as a maximum possible value.
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
DLIS	Detection Limit Adjusted: Insufficient Sample
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
PEHT	Parameter Exceeded Recommended Holding Time Prior to Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
BR-IC-N-WT	Water	Bromide in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

ALS Test Code	Matrix	Test Description	Method Reference**
CL-IC-N-WT	Water	Chloride by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

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

ALS Test Code	Matrix	Test Description	Method Reference**
CN-CNO-WT	Water	Cyanate	APHA 4500-CN-L

This analysis is carried out using procedures adapted from APHA method 4500-CN "Cyanide". Cyanate is determined by the Cyanate hydrolysis method using an ammonia selective electrode

ALS Test Code	Matrix	Test Description	Method Reference**
CN-SCN-VA	Water	Thiocyanate by Colour	APHA 4500-CN CYANIDE

This analysis is carried out using procedures adapted from APHA Method 4500-CN- M "Thiocyanate" Thiocyanate is determined by the ferric nitrate colourimetric method.
Water samples containing high levels of hexavalent chromium, cyanide (together with sulfide), reducing agents, or hydrocarbons may cause negative or positive interferences with this method. Contact ALS for additional information if required.

Reference Information

CN-TOT-WT	Water	Cyanide, Total	ISO 14403-2

Total cyanide is determined by the combination of UV digestion and distillation. Cyanide is converted to cyanogen chloride by reacting with chloramine-T, the cyanogen chloride then reacts with a combination of barbituric acid and isonicotinic acid to form a highly colored complex.

When using this method, high levels of thiocyanate in samples can cause false positives at ~1-2% of the thiocyanate concentration. For samples with detectable cyanide analyzed by this method, ALS recommends analysis for thiocyanate to check for this potential interference

DOC-WT	Water	Dissolved Organic Carbon	APHA 5310B

Sample is filtered through a 0.45um filter, then injected into a heated reaction chamber which is packed with an oxidative catalyst. The water is vaporized and the organic carbon is oxidized to carbon dioxide. The carbon dioxide is transported in a carrier gas and is measured by a non-dispersive infrared detector.

EC-SCREEN-WT	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

F-IC-N-WT	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

MET-D-CCMS-WT	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

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

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

MET-T-CCMS-WT	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

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

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

NH3-F-WT	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-IC-WT	Water	Nitrite in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-IC-WT	Water	Nitrate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-COL-WT	Water	Total P in Water by Colour	APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is deteremined colourimetrically after persulphate digestion of the sample.

PO4-DO-COL-WT	Water	Diss. Orthophosphate in Water by Colour	APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.

SO4-IC-N-WT	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

SOLIDS-TDS-WT	Water	Total Dissolved Solids	APHA 2540C

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

Reference Information

SOLIDS-TSS-WT	Water	Suspended solids	APHA 2540 D-Gravimetric

A well-mixed sample is filtered through a weighed standard glass fibre filter and the residue retained is dried in an oven at 104–1°C for a minimum of four hours or until a constant weight is achieved.

TOC-WT	Water	Total Organic Carbon	APHA 5310B

Sample is injected into a heated reaction chamber which is packed with an oxidative catalyst. The water is vaporized and the organic cabon is oxidized to carbon dioxide. The carbon dioxide is transported in a carrier gas and is measured by a non-dispersive infrared detector.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid weight of sample
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Workorder: L2706977 Report Date: 27-MAY-22

Client: Veolia Water Technologies Canada (Saint-Laurent)
4105 Sartelon
Ville St-Laurent QC H2S 2B3

Contact: Josee Lalonde

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
BR-IC-N-WT	**Water**							
Batch R5785583								
WG3729578-12 LCS								
Bromide (Br)			102.8		%		85-115	19-MAY-22
WG3729578-11 MB								
Bromide (Br)			<0.10		mg/L		0.1	19-MAY-22
CL-IC-N-WT	**Water**							
Batch R5785583								
WG3729578-12 LCS								
Chloride (Cl)			102.1		%		90-110	19-MAY-22
WG3729578-11 MB								
Chloride (Cl)			<0.50		mg/L		0.5	19-MAY-22
CN-CNO-WT	**Water**							
Batch R5785873								
WG3730231-2 LCS								
Cyanate			92.0		%		85-115	20-MAY-22
WG3730231-1 MB								
Cyanate			<0.20		mg/L		0.2	20-MAY-22
CN-SCN-VA	**Water**							
Batch R5788598								
WG3732009-2 LCS								
Thiocyanate (SCN)			98.9		%		85-115	22-MAY-26
WG3732009-1 MB								
Thiocyanate (SCN)			<0.50		mg/L		0.5	22-MAY-26
CN-TOT-WT	**Water**							
Batch R5785001								
WG3729075-12 LCS								
Cyanide, Total			105.4		%		80-120	18-MAY-22
WG3729075-7 LCS								
Cyanide, Total			104.2		%		80-120	18-MAY-22
WG3729075-11 MB								
Cyanide, Total			<0.0020		mg/L		0.002	18-MAY-22
WG3729075-6 MB								
Cyanide, Total			<0.0020		mg/L		0.002	18-MAY-22
DOC-WT	**Water**							
Batch R5786276								
WG3730305-2 LCS								
Dissolved Organic Carbon			116.2		%		80-120	24-MAY-22
WG3730305-1 MB								

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
DOC-WT	**Water**							
Batch R5786276								
WG3730305-1 MB								
Dissolved Organic Carbon			<0.50		mg/L		0.5	24-MAY-22
F-IC-N-WT	**Water**							
Batch R5785583								
WG3729578-12 LCS								
Fluoride (F)			101.1		%		90-110	19-MAY-22
WG3729578-11 MB								
Fluoride (F)			<0.020		mg/L		0.02	19-MAY-22
MET-D-CCMS-WT	**Water**							
Batch R5786123								
WG3729634-2 LCS								
Aluminum (Al)-Dissolved			99.1		%		80-120	20-MAY-22
Antimony (Sb)-Dissolved			95.7		%		80-120	20-MAY-22
Arsenic (As)-Dissolved			99.4		%		80-120	20-MAY-22
Barium (Ba)-Dissolved			104.5		%		80-120	20-MAY-22
Beryllium (Be)-Dissolved			92.3		%		80-120	20-MAY-22
Bismuth (Bi)-Dissolved			100.8		%		80-120	20-MAY-22
Boron (B)-Dissolved			89.7		%		80-120	20-MAY-22
Cadmium (Cd)-Dissolved			101.5		%		80-120	20-MAY-22
Calcium (Ca)-Dissolved			99.7		%		80-120	20-MAY-22
Cesium (Cs)-Dissolved			102.5		%		80-120	20-MAY-22
Chromium (Cr)-Dissolved			96.0		%		80-120	20-MAY-22
Cobalt (Co)-Dissolved			94.8		%		80-120	20-MAY-22
Copper (Cu)-Dissolved			94.3		%		80-120	20-MAY-22
Iron (Fe)-Dissolved			96.5		%		80-120	20-MAY-22
Lead (Pb)-Dissolved			100.5		%		80-120	20-MAY-22
Lithium (Li)-Dissolved			92.5		%		80-120	20-MAY-22
Magnesium (Mg)-Dissolved			102.0		%		80-120	20-MAY-22
Manganese (Mn)-Dissolved			96.3		%		80-120	20-MAY-22
Molybdenum (Mo)-Dissolved			92.0		%		80-120	20-MAY-22
Nickel (Ni)-Dissolved			95.4		%		80-120	20-MAY-22
Phosphorus (P)-Dissolved			98.4		%		80-120	20-MAY-22
Potassium (K)-Dissolved			96.0		%		80-120	20-MAY-22
Rubidium (Rb)-Dissolved			106.8		%		80-120	20-MAY-22
Selenium (Se)-Dissolved			96.5		%		80-120	20-MAY-22

ALS Environmental

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R5786123								
WG3729634-2 LCS								
Silicon (Si)-Dissolved			96.1		%		60-140	20-MAY-22
Silver (Ag)-Dissolved			89.9		%		80-120	20-MAY-22
Sodium (Na)-Dissolved			101.5		%		80-120	20-MAY-22
Strontium (Sr)-Dissolved			99.3		%		80-120	20-MAY-22
Sulfur (S)-Dissolved			90.8		%		80-120	20-MAY-22
Tellurium (Te)-Dissolved			99.3		%		80-120	20-MAY-22
Thallium (Tl)-Dissolved			103.5		%		80-120	20-MAY-22
Thorium (Th)-Dissolved			98.4		%		80-120	20-MAY-22
Tin (Sn)-Dissolved			97.8		%		80-120	20-MAY-22
Titanium (Ti)-Dissolved			94.3		%		80-120	20-MAY-22
Tungsten (W)-Dissolved			97.9		%		80-120	20-MAY-22
Uranium (U)-Dissolved			101.2		%		80-120	20-MAY-22
Vanadium (V)-Dissolved			98.1		%		80-120	20-MAY-22
Zinc (Zn)-Dissolved			97.3		%		80-120	20-MAY-22
Zirconium (Zr)-Dissolved			93.9		%		80-120	20-MAY-22
WG3729634-1 MB								
Aluminum (Al)-Dissolved			<0.0050		mg/L		0.005	20-MAY-22
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	20-MAY-22
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	20-MAY-22
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	20-MAY-22
Beryllium (Be)-Dissolved			<0.00010		mg/L		0.0001	20-MAY-22
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	20-MAY-22
Boron (B)-Dissolved			<0.010		mg/L		0.01	20-MAY-22
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	20-MAY-22
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	20-MAY-22
Cesium (Cs)-Dissolved			<0.000010		mg/L		0.00001	20-MAY-22
Chromium (Cr)-Dissolved			<0.00050		mg/L		0.0005	20-MAY-22
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	20-MAY-22
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	20-MAY-22
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	20-MAY-22
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	20-MAY-22
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	20-MAY-22
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	20-MAY-22
Manganese (Mn)-Dissolved			<0.00050		mg/L		0.0005	20-MAY-22

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R5786123								
WG3729634-1 MB								
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	20-MAY-22
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	20-MAY-22
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	20-MAY-22
Potassium (K)-Dissolved			<0.050		mg/L		0.05	20-MAY-22
Rubidium (Rb)-Dissolved			<0.00020		mg/L		0.0002	20-MAY-22
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	20-MAY-22
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	20-MAY-22
Silver (Ag)-Dissolved			<0.000050		mg/L		0.00005	20-MAY-22
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	20-MAY-22
Strontium (Sr)-Dissolved			<0.0010		mg/L		0.001	20-MAY-22
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	20-MAY-22
Tellurium (Te)-Dissolved			<0.00020		mg/L		0.0002	20-MAY-22
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	20-MAY-22
Thorium (Th)-Dissolved			<0.00010		mg/L		0.0001	20-MAY-22
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	20-MAY-22
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	20-MAY-22
Tungsten (W)-Dissolved			<0.00010		mg/L		0.0001	20-MAY-22
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	20-MAY-22
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	20-MAY-22
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	20-MAY-22
Zirconium (Zr)-Dissolved			<0.00020		mg/L		0.0002	20-MAY-22
Batch R5786474								
WG3730658-2 LCS								
Aluminum (Al)-Dissolved			107.5		%		80-120	24-MAY-22
Antimony (Sb)-Dissolved			104.4		%		80-120	24-MAY-22
Arsenic (As)-Dissolved			102.9		%		80-120	24-MAY-22
Barium (Ba)-Dissolved			109.0		%		80-120	24-MAY-22
Beryllium (Be)-Dissolved			106.2		%		80-120	24-MAY-22
Bismuth (Bi)-Dissolved			101.2		%		80-120	24-MAY-22
Boron (B)-Dissolved			97.9		%		80-120	24-MAY-22
Cadmium (Cd)-Dissolved			104.6		%		80-120	24-MAY-22
Calcium (Ca)-Dissolved			104.9		%		80-120	24-MAY-22
Cesium (Cs)-Dissolved			110.9		%		80-120	24-MAY-22
Chromium (Cr)-Dissolved			99.2		%		80-120	24-MAY-22

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R5786474								
WG3730658-2 LCS								
Cobalt (Co)-Dissolved			98.5		%		80-120	24-MAY-22
Copper (Cu)-Dissolved			97.4		%		80-120	24-MAY-22
Iron (Fe)-Dissolved			102.4		%		80-120	24-MAY-22
Lead (Pb)-Dissolved			103.7		%		80-120	24-MAY-22
Lithium (Li)-Dissolved			105.8		%		80-120	24-MAY-22
Magnesium (Mg)-Dissolved			105.3		%		80-120	24-MAY-22
Manganese (Mn)-Dissolved			102.7		%		80-120	24-MAY-22
Molybdenum (Mo)-Dissolved			103.1		%		80-120	24-MAY-22
Nickel (Ni)-Dissolved			97.8		%		80-120	24-MAY-22
Phosphorus (P)-Dissolved			103.3		%		80-120	24-MAY-22
Potassium (K)-Dissolved			103.2		%		80-120	24-MAY-22
Rubidium (Rb)-Dissolved			109.9		%		80-120	24-MAY-22
Selenium (Se)-Dissolved			97.5		%		80-120	24-MAY-22
Silicon (Si)-Dissolved			103.8		%		60-140	24-MAY-22
Silver (Ag)-Dissolved			97.3		%		80-120	24-MAY-22
Sodium (Na)-Dissolved			101.2		%		80-120	24-MAY-22
Strontium (Sr)-Dissolved			108.9		%		80-120	24-MAY-22
Sulfur (S)-Dissolved			104.9		%		80-120	24-MAY-22
Tellurium (Te)-Dissolved			101.2		%		80-120	24-MAY-22
Thallium (Tl)-Dissolved			102.3		%		80-120	24-MAY-22
Thorium (Th)-Dissolved			105.1		%		80-120	24-MAY-22
Tin (Sn)-Dissolved			104.4		%		80-120	24-MAY-22
Titanium (Ti)-Dissolved			102.2		%		80-120	24-MAY-22
Tungsten (W)-Dissolved			103.5		%		80-120	24-MAY-22
Uranium (U)-Dissolved			106.9		%		80-120	24-MAY-22
Vanadium (V)-Dissolved			102.4		%		80-120	24-MAY-22
Zinc (Zn)-Dissolved			102.0		%		80-120	24-MAY-22
Zirconium (Zr)-Dissolved			105.5		%		80-120	24-MAY-22
WG3730658-1 MB								
Aluminum (Al)-Dissolved			<0.0050		mg/L		0.005	24-MAY-22
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	24-MAY-22
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	24-MAY-22
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	24-MAY-22
Beryllium (Be)-Dissolved			<0.00010		mg/L		0.0001	24-MAY-22

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R5786474								
WG3730658-1 MB								
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	24-MAY-22
Boron (B)-Dissolved			<0.010		mg/L		0.01	24-MAY-22
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	24-MAY-22
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	24-MAY-22
Cesium (Cs)-Dissolved			<0.000010		mg/L		0.00001	24-MAY-22
Chromium (Cr)-Dissolved			<0.00050		mg/L		0.0005	24-MAY-22
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	24-MAY-22
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	24-MAY-22
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	24-MAY-22
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	24-MAY-22
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	24-MAY-22
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	24-MAY-22
Manganese (Mn)-Dissolved			<0.00050		mg/L		0.0005	24-MAY-22
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	24-MAY-22
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	24-MAY-22
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	24-MAY-22
Potassium (K)-Dissolved			<0.050		mg/L		0.05	24-MAY-22
Rubidium (Rb)-Dissolved			<0.00020		mg/L		0.0002	24-MAY-22
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	24-MAY-22
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	24-MAY-22
Silver (Ag)-Dissolved			<0.000050		mg/L		0.00005	24-MAY-22
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	24-MAY-22
Strontium (Sr)-Dissolved			<0.0010		mg/L		0.001	24-MAY-22
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	24-MAY-22
Tellurium (Te)-Dissolved			<0.00020		mg/L		0.0002	24-MAY-22
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	24-MAY-22
Thorium (Th)-Dissolved			<0.00010		mg/L		0.0001	24-MAY-22
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	24-MAY-22
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	24-MAY-22
Tungsten (W)-Dissolved			<0.00010		mg/L		0.0001	24-MAY-22
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	24-MAY-22
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	24-MAY-22
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	24-MAY-22
Zirconium (Zr)-Dissolved			<0.00020		mg/L		0.0002	24-MAY-22

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R5784424								
WG3728545-2 LCS								
Aluminum (Al)-Total			98.0		%		80-120	18-MAY-22
Antimony (Sb)-Total			103.7		%		80-120	18-MAY-22
Arsenic (As)-Total			97.6		%		80-120	18-MAY-22
Barium (Ba)-Total			99.7		%		80-120	18-MAY-22
Beryllium (Be)-Total			93.7		%		80-120	18-MAY-22
Bismuth (Bi)-Total			98.4		%		80-120	18-MAY-22
Boron (B)-Total			93.5		%		80-120	18-MAY-22
Cadmium (Cd)-Total			100.2		%		80-120	18-MAY-22
Calcium (Ca)-Total			93.0		%		80-120	18-MAY-22
Chromium (Cr)-Total			97.4		%		80-120	18-MAY-22
Cesium (Cs)-Total			103.9		%		80-120	18-MAY-22
Cobalt (Co)-Total			96.6		%		80-120	18-MAY-22
Copper (Cu)-Total			96.2		%		80-120	18-MAY-22
Iron (Fe)-Total			100.0		%		80-120	18-MAY-22
Lead (Pb)-Total			103.9		%		80-120	18-MAY-22
Lithium (Li)-Total			90.4		%		80-120	18-MAY-22
Magnesium (Mg)-Total			99.6		%		80-120	18-MAY-22
Manganese (Mn)-Total			96.3		%		80-120	18-MAY-22
Molybdenum (Mo)-Total			97.0		%		80-120	18-MAY-22
Nickel (Ni)-Total			96.7		%		80-120	18-MAY-22
Phosphorus (P)-Total			97.8		%		70-130	18-MAY-22
Potassium (K)-Total			97.7		%		80-120	18-MAY-22
Rubidium (Rb)-Total			100.8		%		80-120	18-MAY-22
Selenium (Se)-Total			100.8		%		80-120	18-MAY-22
Silicon (Si)-Total			95.5		%		60-140	18-MAY-22
Silver (Ag)-Total			92.4		%		80-120	18-MAY-22
Sodium (Na)-Total			97.5		%		80-120	18-MAY-22
Strontium (Sr)-Total			97.9		%		80-120	18-MAY-22
Sulfur (S)-Total			95.5		%		80-120	18-MAY-22
Thallium (Tl)-Total			103.3		%		80-120	18-MAY-22
Tellurium (Te)-Total			101.4		%		80-120	18-MAY-22
Thorium (Th)-Total			103.7		%		80-120	18-MAY-22
Tin (Sn)-Total			97.0		%		80-120	18-MAY-22
Titanium (Ti)-Total			90.8		%		80-120	18-MAY-22

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R5784424								
WG3728545-2 LCS								
Tungsten (W)-Total			100.1		%		80-120	18-MAY-22
Uranium (U)-Total			107.0		%		80-120	18-MAY-22
Vanadium (V)-Total			97.5		%		80-120	18-MAY-22
Zinc (Zn)-Total			96.0		%		80-120	18-MAY-22
Zirconium (Zr)-Total			94.4		%		80-120	18-MAY-22
WG3728545-1 MB								
Aluminum (Al)-Total			<0.0050		mg/L		0.005	18-MAY-22
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	18-MAY-22
Arsenic (As)-Total			<0.00010		mg/L		0.0001	18-MAY-22
Barium (Ba)-Total			<0.00010		mg/L		0.0001	18-MAY-22
Beryllium (Be)-Total			<0.00010		mg/L		0.0001	18-MAY-22
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	18-MAY-22
Boron (B)-Total			<0.010		mg/L		0.01	18-MAY-22
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	18-MAY-22
Calcium (Ca)-Total			<0.050		mg/L		0.05	18-MAY-22
Chromium (Cr)-Total			<0.00050		mg/L		0.0005	18-MAY-22
Cesium (Cs)-Total			<0.000010		mg/L		0.00001	18-MAY-22
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	18-MAY-22
Copper (Cu)-Total			<0.00050		mg/L		0.0005	18-MAY-22
Iron (Fe)-Total			<0.010		mg/L		0.01	18-MAY-22
Lead (Pb)-Total			<0.000050		mg/L		0.00005	18-MAY-22
Lithium (Li)-Total			<0.0010		mg/L		0.001	18-MAY-22
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	18-MAY-22
Manganese (Mn)-Total			<0.00050		mg/L		0.0005	18-MAY-22
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	18-MAY-22
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	18-MAY-22
Phosphorus (P)-Total			<0.050		mg/L		0.05	18-MAY-22
Potassium (K)-Total			<0.050		mg/L		0.05	18-MAY-22
Rubidium (Rb)-Total			<0.00020		mg/L		0.0002	18-MAY-22
Selenium (Se)-Total			<0.000050		mg/L		0.00005	18-MAY-22
Silicon (Si)-Total			<0.10		mg/L		0.1	18-MAY-22
Silver (Ag)-Total			<0.000050		mg/L		0.00005	18-MAY-22
Sodium (Na)-Total			<0.050		mg/L		0.05	18-MAY-22
Strontium (Sr)-Total			<0.0010		mg/L		0.001	18-MAY-22

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R5784424								
WG3728545-1 MB								
Sulfur (S)-Total			<0.50		mg/L		0.5	18-MAY-22
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	18-MAY-22
Tellurium (Te)-Total			<0.00020		mg/L		0.0002	18-MAY-22
Thorium (Th)-Total			<0.00010		mg/L		0.0001	18-MAY-22
Tin (Sn)-Total			<0.00010		mg/L		0.0001	18-MAY-22
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	18-MAY-22
Tungsten (W)-Total			<0.00010		mg/L		0.0001	18-MAY-22
Uranium (U)-Total			<0.000010		mg/L		0.00001	18-MAY-22
Vanadium (V)-Total			<0.00050		mg/L		0.0005	18-MAY-22
Zinc (Zn)-Total			<0.0030		mg/L		0.003	18-MAY-22
Zirconium (Zr)-Total			<0.00020		mg/L		0.0002	18-MAY-22
NH3-F-WT	**Water**							
Batch R5786193								
WG3729971-2 LCS								
Ammonia, Total (as N)			104.6		%		85-115	20-MAY-22
WG3729971-1 MB								
Ammonia, Total (as N)			<0.010		mg/L		0.01	20-MAY-22
NO2-IC-WT	**Water**							
Batch R5785583								
WG3729578-12 LCS								
Nitrite (as N)			102.4		%		90-110	19-MAY-22
WG3729578-11 MB								
Nitrite (as N)			<0.010		mg/L		0.01	19-MAY-22
NO3-IC-WT	**Water**							
Batch R5785583								
WG3729578-12 LCS								
Nitrate (as N)			100.8		%		90-110	19-MAY-22
WG3729578-11 MB								
Nitrate (as N)			<0.020		mg/L		0.02	19-MAY-22
P-T-COL-WT	**Water**							
Batch R5785119								
WG3729112-2 LCS								
Phosphorus, Total			98.9		%		80-120	19-MAY-22
WG3729112-1 MB								
Phosphorus, Total			<0.0030		mg/L		0.003	19-MAY-22

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PO4-DO-COL-WT	**Water**							
Batch R5784431								
WG3728910-2 LCS								
Orthophosphate-Dissolved (as P)			100.6		%		80-120	18-MAY-22
WG3728910-1 MB								
Orthophosphate-Dissolved (as P)			<0.0030		mg/L		0.003	18-MAY-22
SO4-IC-N-WT	**Water**							
Batch R5785583								
WG3729578-12 LCS								
Sulfate (SO4)			102.6		%		90-110	19-MAY-22
WG3729578-11 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	19-MAY-22
SOLIDS-TDS-WT	**Water**							
Batch R5786369								
WG3729480-2 LCS								
Total Dissolved Solids			87.2		%		85-115	20-MAY-22
WG3729480-1 MB								
Total Dissolved Solids			<10		mg/L		10	20-MAY-22
SOLIDS-TSS-WT	**Water**							
Batch R5785735								
WG3729472-2 LCS								
Total Suspended Solids			96.0		%		85-115	20-MAY-22
WG3729472-1 MB								
Total Suspended Solids			<3.0		mg/L		3	20-MAY-22
TOC-WT	**Water**							
Batch R5786669								
WG3730139-2 LCS								
Total Organic Carbon			92.3		%		80-120	24-MAY-22
WG3730139-1 MB								
Total Organic Carbon			<0.50		mg/L		0.5	24-MAY-22

Quality Control Report

Legend:

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

Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Cyanides							
Thiocyanate by Colour							
	1	16-MAY-22	22-MAY-26 23:25	14	1467	days	EHT
	2	16-MAY-22	22-MAY-26 23:25	14	1467	days	EHT
	3	16-MAY-22	22-MAY-26 23:25	14	1467	days	EHT
	4	16-MAY-22	22-MAY-26 23:25	14	1467	days	EHT
	5	16-MAY-22	22-MAY-26 23:25	14	1467	days	EHT

Legend & Qualifier Definitions:

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

Notes*:
Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2706977 were received on 17-MAY-22 10:00.

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

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

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

Chain of Custody (COC) / Analytical Request Form

ALS www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2706977-COFC

COC Number: 17 - -

Page of

Report To	Contact and company name below will appear on the final report
Company:	Veolia Water Technologies (26895)
Contact:	Josee Lalonde
Phone:	
	Company address below will appear on the final report
Street:	4105 Sartelon
City/Province:	Ville St-Laurent
Postal Code:	H2S 2B3
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☐ NO
Company:	
Contact:	

Report Format / Distribution

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

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

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

Select Distribution: ☐ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax josee.lalonde@veolia.com

Email 2

Email 3

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax vwtcanada_payables@veolia.com

Email 2

Contact your AM to confirm all E&P TATs (surcharges may apply)

TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4-20%] ☐ 3 day [P3-25%] ☐ 2 day [P2-50%] ☐

EMERGENCY: 1 Business day [E - 100%] ☐ Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] ☐

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

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

Project Information

ALS Account # / Quote #:

Job #: 196035 - MD

PO / AFE: 5000196035-606300.21030001

LSD:

ALS Lab Work Order # (lab use only): L2706977

Oil and Gas Required Fields (client use)

AFE/Cost Center: PO#

Major/Minor Code: Routing Code:

Requisitioner:

Location:

ALS Contact: Sampler:

Analysis Request

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

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	Metal Scan	CNO	CN	SCN	Anions Scan	O-PO4	P	TOC	DOC soluble	TSS	TDS	SAMPLES ON HOLD	SUSPECTED HAZARD (see Special Instructions)
	196035-MD-RW	20220516		WW	8	X	X	X	X	X	X	X	X	X	X	X		
	196035-MD-R1	↓		↓	4		X		X	X	X	X						
	196035-MD-R2	↓		↓	4		X		X	X	X	X						
	196035-MD-R3	↓		↓	4		X		X	X	X	X						
	196035-MD-CW 15°C	↓		↓	8	X	X	X	X	X	X	X	X	X	X	X		

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

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

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

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

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C:

FINAL COOLER TEMPERATURES °C: 16.6

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: JL	Date: 22-5-13	Time:	Received by:	Date:	Time:	Received by: BB	Date: May 17 /22	Time: 11AM

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

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

Veolia Water Technologies Canada (Saint-Laurent)
ATTN: Josee Lalonde
4105 Sartelon
Ville St-Laurent QC H2S 2B3

Date Received: 17-MAY-22
Report Date: 27-MAY-22 14:57 (MT)
Version: FINAL

Client Phone: 514-334-7230

Certificate of Analysis

Lab Work Order #: L2706977

Project P.O. #: 5000196035_606300.21030001
Job Reference: 196035_MD
C of C Numbers:
Legal Site Desc:

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2706977-1 196035_MD_RW Sampled By: CLIENT on 16-MAY-22 Matrix: WATER							
Physical Tests							
Total Suspended Solids	<3.0		3.0	mg/L	19-MAY-22	20-MAY-22	R5785735
Total Dissolved Solids	2440	DLM	40	mg/L		20-MAY-22	R5786369
Anions and Nutrients							
Ammonia, Total (as N)	47.4	DLHC	1.0	mg/L		20-MAY-22	R5786193
Bromide (Br)	1.1	DLDS	1.0	mg/L		19-MAY-22	R5785583
Chloride (Cl)	188	DLDS	5.0	mg/L		19-MAY-22	R5785583
Fluoride (F)	<0.20	DLDS	0.20	mg/L		19-MAY-22	R5785583
Nitrate (as N)	9.37	DLDS	0.20	mg/L		19-MAY-22	R5785583
Nitrite (as N)	0.46	DLDS	0.10	mg/L		19-MAY-22	R5785583
Orthophosphate-Dissolved (as P)	<0.0030		0.0030	mg/L		18-MAY-22	R5784431
Phosphorus, Total	0.0055		0.0030	mg/L	19-MAY-22	19-MAY-22	R5785119
Sulfate (SO4)	1670	DLDS	3.0	mg/L		19-MAY-22	R5785583
Cyanides							
Cyanide, Total	0.0403		0.0020	mg/L		18-MAY-22	R5785001
Cyanate	17	DLIS	10	mg/L		20-MAY-22	R5785873
Thiocyanate (SCN)	138		5.0	mg/L		22-MAY-26	R5788598
Organic / Inorganic Carbon							
Dissolved Carbon Filtration Location	FIELD					18-MAY-22	R5783638
Dissolved Carbon Filtration Location	lab	PEHT				21-MAY-22	R5785945
Dissolved Organic Carbon	86.5	DLM	2.5	mg/L	21-MAY-22	24-MAY-22	R5786276
Total Organic Carbon	85	DLM	10	mg/L		24-MAY-22	R5786669
Total Metals							
Aluminum (Al)-Total	<0.050	DLHC	0.050	mg/L	18-MAY-22	18-MAY-22	R5784424
Antimony (Sb)-Total	0.0074	DLHC	0.0010	mg/L	18-MAY-22	18-MAY-22	R5784424
Arsenic (As)-Total	0.0015	DLHC	0.0010	mg/L	18-MAY-22	18-MAY-22	R5784424
Barium (Ba)-Total	0.0301	DLHC	0.0010	mg/L	18-MAY-22	18-MAY-22	R5784424
Beryllium (Be)-Total	<0.0010	DLHC	0.0010	mg/L	18-MAY-22	18-MAY-22	R5784424
Bismuth (Bi)-Total	<0.00050	DLHC	0.00050	mg/L	18-MAY-22	18-MAY-22	R5784424
Boron (B)-Total	0.25	DLHC	0.10	mg/L	18-MAY-22	18-MAY-22	R5784424
Cadmium (Cd)-Total	<0.000050	DLHC	0.000050	mg/L	18-MAY-22	18-MAY-22	R5784424
Calcium (Ca)-Total	280	DLHC	0.50	mg/L	18-MAY-22	18-MAY-22	R5784424
Cesium (Cs)-Total	<0.00010	DLHC	0.00010	mg/L	18-MAY-22	18-MAY-22	R5784424
Chromium (Cr)-Total	<0.0050	DLHC	0.0050	mg/L	18-MAY-22	18-MAY-22	R5784424
Cobalt (Co)-Total	0.425	DLHC	0.0010	mg/L	18-MAY-22	18-MAY-22	R5784424
Copper (Cu)-Total	0.0084	DLHC	0.0050	mg/L	18-MAY-22	18-MAY-22	R5784424
Iron (Fe)-Total	0.17	DLHC	0.10	mg/L	18-MAY-22	18-MAY-22	R5784424
Lead (Pb)-Total	<0.00050	DLHC	0.00050	mg/L	18-MAY-22	18-MAY-22	R5784424
Lithium (Li)-Total	<0.010	DLHC	0.010	mg/L	18-MAY-22	18-MAY-22	R5784424
Magnesium (Mg)-Total	21.7	DLHC	0.050	mg/L	18-MAY-22	18-MAY-22	R5784424
Manganese (Mn)-Total	0.0242	DLHC	0.0050	mg/L	18-MAY-22	18-MAY-22	R5784424
Molybdenum (Mo)-Total	0.0887	DLHC	0.00050	mg/L	18-MAY-22	18-MAY-22	R5784424
Nickel (Ni)-Total	0.135	DLHC	0.0050	mg/L	18-MAY-22	18-MAY-22	R5784424

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2706977-1 196035_MD_RW Sampled By: CLIENT on 16-MAY-22 Matrix: WATER							
Total Metals							
Phosphorus (P)-Total	<0.50	DLHC	0.50	mg/L	18-MAY-22	18-MAY-22	R5784424
Potassium (K)-Total	165	DLHC	0.50	mg/L	18-MAY-22	18-MAY-22	R5784424
Rubidium (Rb)-Total	0.0452	DLHC	0.0020	mg/L	18-MAY-22	18-MAY-22	R5784424
Selenium (Se)-Total	0.128	DLHC	0.00050	mg/L	18-MAY-22	18-MAY-22	R5784424
Silicon (Si)-Total	1.5	DLHC	1.0	mg/L	18-MAY-22	18-MAY-22	R5784424
Silver (Ag)-Total	<0.00050	DLHC	0.00050	mg/L	18-MAY-22	18-MAY-22	R5784424
Sodium (Na)-Total	416	DLHC	0.50	mg/L	18-MAY-22	18-MAY-22	R5784424
Strontium (Sr)-Total	1.00	DLHC	0.010	mg/L	18-MAY-22	18-MAY-22	R5784424
Sulfur (S)-Total	635	DLHC	5.0	mg/L	18-MAY-22	18-MAY-22	R5784424
Tellurium (Te)-Total	<0.0020	DLHC	0.0020	mg/L	18-MAY-22	18-MAY-22	R5784424
Thallium (Tl)-Total	<0.00010	DLHC	0.00010	mg/L	18-MAY-22	18-MAY-22	R5784424
Thorium (Th)-Total	<0.0010	DLHC	0.0010	mg/L	18-MAY-22	18-MAY-22	R5784424
Tin (Sn)-Total	<0.0010	DLHC	0.0010	mg/L	18-MAY-22	18-MAY-22	R5784424
Titanium (Ti)-Total	<0.0030	DLHC	0.0030	mg/L	18-MAY-22	18-MAY-22	R5784424
Tungsten (W)-Total	<0.0010	DLHC	0.0010	mg/L	18-MAY-22	18-MAY-22	R5784424
Uranium (U)-Total	0.00924	DLHC	0.00010	mg/L	18-MAY-22	18-MAY-22	R5784424
Vanadium (V)-Total	<0.0050	DLHC	0.0050	mg/L	18-MAY-22	18-MAY-22	R5784424
Zinc (Zn)-Total	<0.030	DLHC	0.030	mg/L	18-MAY-22	18-MAY-22	R5784424
Zirconium (Zr)-Total	<0.0020	DLHC	0.0020	mg/L	18-MAY-22	18-MAY-22	R5784424
Dissolved Metals							
Dissolved Metals Filtration Location	LAB					24-MAY-22	R5786219
Aluminum (Al)-Dissolved	<0.050	DLHC	0.050	mg/L	24-MAY-22	24-MAY-22	R5786474
Antimony (Sb)-Dissolved	0.0079	DLHC	0.0010	mg/L	24-MAY-22	24-MAY-22	R5786474
Arsenic (As)-Dissolved	0.0015	DLHC	0.0010	mg/L	24-MAY-22	24-MAY-22	R5786474
Barium (Ba)-Dissolved	0.0327	DLHC	0.0010	mg/L	24-MAY-22	24-MAY-22	R5786474
Beryllium (Be)-Dissolved	<0.0010	DLHC	0.0010	mg/L	24-MAY-22	24-MAY-22	R5786474
Bismuth (Bi)-Dissolved	<0.00050	DLHC	0.00050	mg/L	24-MAY-22	24-MAY-22	R5786474
Boron (B)-Dissolved	0.26	DLHC	0.10	mg/L	24-MAY-22	24-MAY-22	R5786474
Cadmium (Cd)-Dissolved	<0.000050	DLHC	0.000050	mg/L	24-MAY-22	24-MAY-22	R5786474
Calcium (Ca)-Dissolved	306	DLHC	0.50	mg/L	24-MAY-22	24-MAY-22	R5786474
Cesium (Cs)-Dissolved	<0.00010	DLHC	0.00010	mg/L	24-MAY-22	24-MAY-22	R5786474
Chromium (Cr)-Dissolved	<0.0050	DLHC	0.0050	mg/L	24-MAY-22	24-MAY-22	R5786474
Cobalt (Co)-Dissolved	0.435	DLHC	0.0010	mg/L	24-MAY-22	24-MAY-22	R5786474
Copper (Cu)-Dissolved	0.0060	DLHC	0.0020	mg/L	24-MAY-22	24-MAY-22	R5786474
Iron (Fe)-Dissolved	<0.10	DLHC	0.10	mg/L	24-MAY-22	24-MAY-22	R5786474
Lead (Pb)-Dissolved	<0.00050	DLHC	0.00050	mg/L	24-MAY-22	24-MAY-22	R5786474
Lithium (Li)-Dissolved	<0.010	DLHC	0.010	mg/L	24-MAY-22	24-MAY-22	R5786474
Magnesium (Mg)-Dissolved	22.1	DLHC	0.050	mg/L	24-MAY-22	24-MAY-22	R5786474
Manganese (Mn)-Dissolved	0.0234	DLHC	0.0050	mg/L	24-MAY-22	24-MAY-22	R5786474
Molybdenum (Mo)-Dissolved	0.0937	DLHC	0.00050	mg/L	24-MAY-22	24-MAY-22	R5786474
Nickel (Ni)-Dissolved	0.138	DLHC	0.0050	mg/L	24-MAY-22	24-MAY-22	R5786474

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2706977-1 196035_MD_RW Sampled By: CLIENT on 16-MAY-22 Matrix: WATER							
Dissolved Metals							
Phosphorus (P)-Dissolved	<0.50	DLHC	0.50	mg/L	24-MAY-22	24-MAY-22	R5786474
Potassium (K)-Dissolved	165	DLHC	0.50	mg/L	24-MAY-22	24-MAY-22	R5786474
Rubidium (Rb)-Dissolved	0.0484	DLHC	0.0020	mg/L	24-MAY-22	24-MAY-22	R5786474
Selenium (Se)-Dissolved	0.129	DLHC	0.00050	mg/L	24-MAY-22	24-MAY-22	R5786474
Silicon (Si)-Dissolved	1.57	DLHC	0.50	mg/L	24-MAY-22	24-MAY-22	R5786474
Silver (Ag)-Dissolved	<0.00050	DLHC	0.00050	mg/L	24-MAY-22	24-MAY-22	R5786474
Sodium (Na)-Dissolved	429	DLHC	0.50	mg/L	24-MAY-22	24-MAY-22	R5786474
Strontium (Sr)-Dissolved	1.05	DLHC	0.010	mg/L	24-MAY-22	24-MAY-22	R5786474
Sulfur (S)-Dissolved	688	DLHC	5.0	mg/L	24-MAY-22	24-MAY-22	R5786474
Tellurium (Te)-Dissolved	<0.0020	DLHC	0.0020	mg/L	24-MAY-22	24-MAY-22	R5786474
Thallium (Tl)-Dissolved	<0.00010	DLHC	0.00010	mg/L	24-MAY-22	24-MAY-22	R5786474
Thorium (Th)-Dissolved	<0.0010	DLHC	0.0010	mg/L	24-MAY-22	24-MAY-22	R5786474
Tin (Sn)-Dissolved	<0.0010	DLHC	0.0010	mg/L	24-MAY-22	24-MAY-22	R5786474
Titanium (Ti)-Dissolved	<0.0030	DLHC	0.0030	mg/L	24-MAY-22	24-MAY-22	R5786474
Tungsten (W)-Dissolved	<0.0010	DLHC	0.0010	mg/L	24-MAY-22	24-MAY-22	R5786474
Uranium (U)-Dissolved	0.00892	DLHC	0.00010	mg/L	24-MAY-22	24-MAY-22	R5786474
Vanadium (V)-Dissolved	<0.0050	DLHC	0.0050	mg/L	24-MAY-22	24-MAY-22	R5786474
Zinc (Zn)-Dissolved	<0.010	DLHC	0.010	mg/L	24-MAY-22	24-MAY-22	R5786474
Zirconium (Zr)-Dissolved	<0.0020	DLHC	0.0020	mg/L	24-MAY-22	24-MAY-22	R5786474
L2706977-2 196035_MD_R1 Sampled By: CLIENT on 16-MAY-22 Matrix: WATER							
Anions and Nutrients							
Ammonia, Total (as N)	133	DLHC	5.0	mg/L		24-MAY-22	R5786193
Bromide (Br)	1.0	DLDS	1.0	mg/L		19-MAY-22	R5785583
Chloride (Cl)	181	DLDS	5.0	mg/L		19-MAY-22	R5785583
Fluoride (F)	<0.20	DLDS	0.20	mg/L		19-MAY-22	R5785583
Nitrate (as N)	32.0	DLDS	0.20	mg/L		19-MAY-22	R5785583
Nitrite (as N)	48.2	DLDS	0.10	mg/L		19-MAY-22	R5785583
Orthophosphate-Dissolved (as P)	1.90	DLHC	0.30	mg/L		18-MAY-22	R5784431
Sulfate (SO4)	1830	DLDS	3.0	mg/L		19-MAY-22	R5785583
Cyanides							
Cyanide, Total	0.0352	CNI	0.0020	mg/L		19-MAY-22	R5785001
Thiocyanate (SCN)	1.22		0.50	mg/L		22-MAY-26	R5788598
L2706977-3 196035_MD_R2 Sampled By: CLIENT on 16-MAY-22 Matrix: WATER							
Anions and Nutrients							
Ammonia, Total (as N)	0.967	DLHC	0.050	mg/L		24-MAY-22	R5786193
Bromide (Br)	<1.0	DLDS	1.0	mg/L		19-MAY-22	R5785583
Chloride (Cl)	145	DLDS	5.0	mg/L		19-MAY-22	R5785583
Fluoride (F)	<0.20	DLDS	0.20	mg/L		19-MAY-22	R5785583

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2706977-3 196035_MD_R2 Sampled By: CLIENT on 16-MAY-22 Matrix: WATER							
Anions and Nutrients							
Nitrate (as N)	174	DLDS	0.20	mg/L		19-MAY-22	R5785583
Nitrite (as N)	0.46	DLDS	0.10	mg/L		19-MAY-22	R5785583
Orthophosphate-Dissolved (as P)	2.42	DLHC	0.30	mg/L		18-MAY-22	R5784431
Sulfate (SO4)	1470	DLDS	3.0	mg/L		19-MAY-22	R5785583
Cyanides							
Cyanide, Total	0.0205		0.0020	mg/L		18-MAY-22	R5785001
Thiocyanate (SCN)	<0.50		0.50	mg/L		22-MAY-26	R5788598
L2706977-4 196035_MD_R3 Sampled By: CLIENT on 16-MAY-22 Matrix: WATER							
Anions and Nutrients							
Ammonia, Total (as N)	0.096		0.010	mg/L		24-MAY-22	R5786193
Bromide (Br)	<1.0	DLDS	1.0	mg/L		19-MAY-22	R5785583
Chloride (Cl)	127	DLDS	5.0	mg/L		19-MAY-22	R5785583
Fluoride (F)	<0.20	DLDS	0.20	mg/L		19-MAY-22	R5785583
Nitrate (as N)	0.99	DLDS	0.20	mg/L		19-MAY-22	R5785583
Nitrite (as N)	<0.10	DLDS	0.10	mg/L		19-MAY-22	R5785583
Orthophosphate-Dissolved (as P)	0.0220		0.0030	mg/L		18-MAY-22	R5784431
Sulfate (SO4)	1080	DLDS	3.0	mg/L		19-MAY-22	R5785583
Cyanides							
Cyanide, Total	0.0164		0.0020	mg/L		18-MAY-22	R5785001
Thiocyanate (SCN)	<0.50		0.50	mg/L		22-MAY-26	R5788598
L2706977-5 196035_MD_CW15°C Sampled By: CLIENT on 16-MAY-22 Matrix: WATER							
Physical Tests							
Total Suspended Solids	6.3		3.0	mg/L	19-MAY-22	20-MAY-22	R5785735
Total Dissolved Solids	2490	DLM	80	mg/L		20-MAY-22	R5786369
Anions and Nutrients							
Ammonia, Total (as N)	4.17	DLHC	0.10	mg/L		24-MAY-22	R5786193
Bromide (Br)	<1.0	DLDS	1.0	mg/L		19-MAY-22	R5785583
Chloride (Cl)	121	DLDS	5.0	mg/L		19-MAY-22	R5785583
Fluoride (F)	<0.20	DLDS	0.20	mg/L		19-MAY-22	R5785583
Nitrate (as N)	<0.20	DLDS	0.20	mg/L		19-MAY-22	R5785583
Nitrite (as N)	<0.10	DLDS	0.10	mg/L		19-MAY-22	R5785583
Orthophosphate-Dissolved (as P)	<0.0030		0.0030	mg/L		18-MAY-22	R5784431
Phosphorus, Total	0.0309		0.0030	mg/L	19-MAY-22	19-MAY-22	R5785119
Sulfate (SO4)	1870	DLDS	3.0	mg/L		19-MAY-22	R5785583
Cyanides							
Cyanide, Total	0.0188		0.0020	mg/L		18-MAY-22	R5785001
Cyanate	<10	DLIS	10	mg/L		20-MAY-22	R5785873
Thiocyanate (SCN)	<0.50		0.50	mg/L		22-MAY-26	R5788598
Organic / Inorganic Carbon							

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2706977-5 196035_MD_CW15°C Sampled By: CLIENT on 16-MAY-22 Matrix: WATER							
Organic / Inorganic Carbon							
Dissolved Carbon Filtration Location	lab	PEHT				21-MAY-22	R5785945
Dissolved Carbon Filtration Location	FIELD					18-MAY-22	R5783638
Dissolved Organic Carbon	12.3	DLM	2.5	mg/L	21-MAY-22	24-MAY-22	R5786276
Total Organic Carbon	15.6	DLM	2.5	mg/L		24-MAY-22	R5786669
Total Metals							
Aluminum (Al)-Total	<0.050	DLHC	0.050	mg/L	18-MAY-22	18-MAY-22	R5784424
Antimony (Sb)-Total	<0.0010	DLHC	0.0010	mg/L	18-MAY-22	18-MAY-22	R5784424
Arsenic (As)-Total	<0.0010	DLHC	0.0010	mg/L	18-MAY-22	18-MAY-22	R5784424
Barium (Ba)-Total	0.0072	DLHC	0.0010	mg/L	18-MAY-22	18-MAY-22	R5784424
Beryllium (Be)-Total	<0.0010	DLHC	0.0010	mg/L	18-MAY-22	18-MAY-22	R5784424
Bismuth (Bi)-Total	<0.00050	DLHC	0.00050	mg/L	18-MAY-22	18-MAY-22	R5784424
Boron (B)-Total	0.16	DLHC	0.10	mg/L	18-MAY-22	18-MAY-22	R5784424
Cadmium (Cd)-Total	0.000058	DLHC	0.000050	mg/L	18-MAY-22	18-MAY-22	R5784424
Calcium (Ca)-Total	134	DLHC	0.50	mg/L	18-MAY-22	18-MAY-22	R5784424
Cesium (Cs)-Total	<0.00010	DLHC	0.00010	mg/L	18-MAY-22	18-MAY-22	R5784424
Chromium (Cr)-Total	<0.0050	DLHC	0.0050	mg/L	18-MAY-22	18-MAY-22	R5784424
Cobalt (Co)-Total	0.281	DLHC	0.0010	mg/L	18-MAY-22	18-MAY-22	R5784424
Copper (Cu)-Total	<0.0050	DLHC	0.0050	mg/L	18-MAY-22	18-MAY-22	R5784424
Iron (Fe)-Total	3.12	DLHC	0.10	mg/L	18-MAY-22	18-MAY-22	R5784424
Lead (Pb)-Total	<0.00050	DLHC	0.00050	mg/L	18-MAY-22	18-MAY-22	R5784424
Lithium (Li)-Total	<0.010	DLHC	0.010	mg/L	18-MAY-22	18-MAY-22	R5784424
Magnesium (Mg)-Total	13.4	DLHC	0.050	mg/L	18-MAY-22	18-MAY-22	R5784424
Manganese (Mn)-Total	0.135	DLHC	0.0050	mg/L	18-MAY-22	18-MAY-22	R5784424
Molybdenum (Mo)-Total	0.00749	DLHC	0.00050	mg/L	18-MAY-22	18-MAY-22	R5784424
Nickel (Ni)-Total	0.0454	DLHC	0.0050	mg/L	18-MAY-22	18-MAY-22	R5784424
Phosphorus (P)-Total	<0.50	DLHC	0.50	mg/L	18-MAY-22	18-MAY-22	R5784424
Potassium (K)-Total	103	DLHC	0.50	mg/L	18-MAY-22	18-MAY-22	R5784424
Rubidium (Rb)-Total	0.0284	DLHC	0.0020	mg/L	18-MAY-22	18-MAY-22	R5784424
Selenium (Se)-Total	0.0257	DLHC	0.00050	mg/L	18-MAY-22	18-MAY-22	R5784424
Silicon (Si)-Total	<1.0	DLHC	1.0	mg/L	18-MAY-22	18-MAY-22	R5784424
Silver (Ag)-Total	<0.00050	DLHC	0.00050	mg/L	18-MAY-22	18-MAY-22	R5784424
Sodium (Na)-Total	729	DLHC	0.50	mg/L	18-MAY-22	18-MAY-22	R5784424
Strontium (Sr)-Total	0.530	DLHC	0.010	mg/L	18-MAY-22	18-MAY-22	R5784424
Sulfur (S)-Total	605	DLHC	5.0	mg/L	18-MAY-22	18-MAY-22	R5784424
Tellurium (Te)-Total	<0.0020	DLHC	0.0020	mg/L	18-MAY-22	18-MAY-22	R5784424
Thallium (Tl)-Total	<0.00010	DLHC	0.00010	mg/L	18-MAY-22	18-MAY-22	R5784424
Thorium (Th)-Total	<0.0010	DLHC	0.0010	mg/L	18-MAY-22	18-MAY-22	R5784424
Tin (Sn)-Total	<0.0010	DLHC	0.0010	mg/L	18-MAY-22	18-MAY-22	R5784424
Titanium (Ti)-Total	<0.0030	DLHC	0.0030	mg/L	18-MAY-22	18-MAY-22	R5784424
Tungsten (W)-Total	<0.0010	DLHC	0.0010	mg/L	18-MAY-22	18-MAY-22	R5784424
Uranium (U)-Total	0.00055	DLHC	0.00010	mg/L	18-MAY-22	18-MAY-22	R5784424

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2706977-5 196035_MD_CW15°C Sampled By: CLIENT on 16-MAY-22 Matrix: WATER							
Total Metals							
Vanadium (V)-Total	<0.0050	DLHC	0.0050	mg/L	18-MAY-22	18-MAY-22	R5784424
Zinc (Zn)-Total	<0.030	DLHC	0.030	mg/L	18-MAY-22	18-MAY-22	R5784424
Zirconium (Zr)-Total	<0.0020	DLHC	0.0020	mg/L	18-MAY-22	18-MAY-22	R5784424
Dissolved Metals							
Dissolved Metals Filtration Location	LAB					19-MAY-22	R5785349
Aluminum (Al)-Dissolved	<0.050	DLHC	0.050	mg/L	19-MAY-22	20-MAY-22	R5786123
Antimony (Sb)-Dissolved	<0.0010	DLHC	0.0010	mg/L	19-MAY-22	20-MAY-22	R5786123
Arsenic (As)-Dissolved	<0.0010	DLHC	0.0010	mg/L	19-MAY-22	20-MAY-22	R5786123
Barium (Ba)-Dissolved	0.0067	DLHC	0.0010	mg/L	19-MAY-22	20-MAY-22	R5786123
Beryllium (Be)-Dissolved	<0.0010	DLHC	0.0010	mg/L	19-MAY-22	20-MAY-22	R5786123
Bismuth (Bi)-Dissolved	<0.00050	DLHC	0.00050	mg/L	19-MAY-22	20-MAY-22	R5786123
Boron (B)-Dissolved	0.17	DLHC	0.10	mg/L	19-MAY-22	20-MAY-22	R5786123
Cadmium (Cd)-Dissolved	<0.000050	DLHC	0.000050	mg/L	19-MAY-22	20-MAY-22	R5786123
Calcium (Ca)-Dissolved	133	DLHC	0.50	mg/L	19-MAY-22	20-MAY-22	R5786123
Cesium (Cs)-Dissolved	<0.00010	DLHC	0.00010	mg/L	19-MAY-22	20-MAY-22	R5786123
Chromium (Cr)-Dissolved	<0.0050	DLHC	0.0050	mg/L	19-MAY-22	20-MAY-22	R5786123
Cobalt (Co)-Dissolved	0.302	DLHC	0.0010	mg/L	19-MAY-22	20-MAY-22	R5786123
Copper (Cu)-Dissolved	<0.0020	DLHC	0.0020	mg/L	19-MAY-22	20-MAY-22	R5786123
Iron (Fe)-Dissolved	0.76	DLHC	0.10	mg/L	19-MAY-22	20-MAY-22	R5786123
Lead (Pb)-Dissolved	<0.00050	DLHC	0.00050	mg/L	19-MAY-22	20-MAY-22	R5786123
Lithium (Li)-Dissolved	<0.010	DLHC	0.010	mg/L	19-MAY-22	20-MAY-22	R5786123
Magnesium (Mg)-Dissolved	14.6	DLHC	0.050	mg/L	19-MAY-22	20-MAY-22	R5786123
Manganese (Mn)-Dissolved	0.147	DLHC	0.0050	mg/L	19-MAY-22	20-MAY-22	R5786123
Molybdenum (Mo)-Dissolved	0.00681	DLHC	0.00050	mg/L	19-MAY-22	20-MAY-22	R5786123
Nickel (Ni)-Dissolved	0.0480	DLHC	0.0050	mg/L	19-MAY-22	20-MAY-22	R5786123
Phosphorus (P)-Dissolved	<0.50	DLHC	0.50	mg/L	19-MAY-22	20-MAY-22	R5786123
Potassium (K)-Dissolved	107	DLHC	0.50	mg/L	19-MAY-22	20-MAY-22	R5786123
Rubidium (Rb)-Dissolved	0.0298	DLHC	0.0020	mg/L	19-MAY-22	20-MAY-22	R5786123
Selenium (Se)-Dissolved	0.0242	DLHC	0.00050	mg/L	19-MAY-22	20-MAY-22	R5786123
Silicon (Si)-Dissolved	0.56	DLHC	0.50	mg/L	19-MAY-22	20-MAY-22	R5786123
Silver (Ag)-Dissolved	<0.00050	DLHC	0.00050	mg/L	19-MAY-22	20-MAY-22	R5786123
Sodium (Na)-Dissolved	832	DLHC	0.50	mg/L	19-MAY-22	20-MAY-22	R5786123
Strontium (Sr)-Dissolved	0.533	DLHC	0.010	mg/L	19-MAY-22	20-MAY-22	R5786123
Sulfur (S)-Dissolved	652	DLHC	5.0	mg/L	19-MAY-22	20-MAY-22	R5786123
Tellurium (Te)-Dissolved	<0.0020	DLHC	0.0020	mg/L	19-MAY-22	20-MAY-22	R5786123
Thallium (Tl)-Dissolved	<0.00010	DLHC	0.00010	mg/L	19-MAY-22	20-MAY-22	R5786123
Thorium (Th)-Dissolved	<0.0010	DLHC	0.0010	mg/L	19-MAY-22	20-MAY-22	R5786123
Tin (Sn)-Dissolved	<0.0010	DLHC	0.0010	mg/L	19-MAY-22	20-MAY-22	R5786123
Titanium (Ti)-Dissolved	<0.0030	DLHC	0.0030	mg/L	19-MAY-22	20-MAY-22	R5786123
Tungsten (W)-Dissolved	<0.0010	DLHC	0.0010	mg/L	19-MAY-22	20-MAY-22	R5786123
Uranium (U)-Dissolved	0.00047	DLHC	0.00010	mg/L	19-MAY-22	20-MAY-22	R5786123

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2706977-5 196035_MD_CW15°C Sampled By: CLIENT on 16-MAY-22 Matrix: WATER							
Dissolved Metals							
Vanadium (V)-Dissolved	<0.0050	DLHC	0.0050	mg/L	19-MAY-22	20-MAY-22	R5786123
Zinc (Zn)-Dissolved	<0.010	DLHC	0.010	mg/L	19-MAY-22	20-MAY-22	R5786123
Zirconium (Zr)-Dissolved	<0.0020	DLHC	0.0020	mg/L	19-MAY-22	20-MAY-22	R5786123

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Chloride (Cl)	MS-B	L2706977-1, -2, -3, -4, -5
Matrix Spike	Thiocyanate (SCN)	MS-B	L2706977-1, -2, -3, -4, -5
Matrix Spike	Dissolved Organic Carbon	MS-B	L2706977-1, -5
Matrix Spike	Aluminum (Al)-Dissolved	MS-B	L2706977-5
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2706977-1
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2706977-5
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2706977-1
Matrix Spike	Iron (Fe)-Dissolved	MS-B	L2706977-5
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2706977-1
Matrix Spike	Silicon (Si)-Dissolved	MS-B	L2706977-5
Matrix Spike	Silicon (Si)-Dissolved	MS-B	L2706977-1
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2706977-1
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2706977-5
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2706977-1
Matrix Spike	Uranium (U)-Dissolved	MS-B	L2706977-1
Matrix Spike	Barium (Ba)-Total	MS-B	L2706977-1, -5
Matrix Spike	Calcium (Ca)-Total	MS-B	L2706977-1, -5
Matrix Spike	Iron (Fe)-Total	MS-B	L2706977-1, -5
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2706977-1, -5
Matrix Spike	Manganese (Mn)-Total	MS-B	L2706977-1, -5
Matrix Spike	Silicon (Si)-Total	MS-B	L2706977-1, -5
Matrix Spike	Sodium (Na)-Total	MS-B	L2706977-1, -5
Matrix Spike	Strontium (Sr)-Total	MS-B	L2706977-1, -5
Matrix Spike	Sulfur (S)-Total	MS-B	L2706977-1, -5
Matrix Spike	Uranium (U)-Total	MS-B	L2706977-1, -5
Matrix Spike	Total Organic Carbon	MS-B	L2706977-1, -5

Sample Parameter Qualifier key listed:

Qualifier	Description
CNI	Test result for Total Cyanide may be biased high due to interference from high nitrite in this sample. Nitrite can cause false positives for T-CN at up to ~ 0.8% of the nitrite concentration. Interpret result as a maximum possible value.
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
DLIS	Detection Limit Adjusted: Insufficient Sample
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
PEHT	Parameter Exceeded Recommended Holding Time Prior to Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
BR-IC-N-WT	Water	Bromide in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CL-IC-N-WT	Water	Chloride by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

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

CN-CNO-WT	Water	Cyanate	APHA 4500-CN-L

This analysis is carried out using procedures adapted from APHA method 4500-CN "Cyanide". Cyanate is determined by the Cyanate hydrolysis method using an ammonia selective electrode

CN-SCN-VA	Water	Thiocyanate by Colour	APHA 4500-CN CYANIDE

This analysis is carried out using procedures adapted from APHA Method 4500-CN- M "Thiocyanate" Thiocyanate is determined by the ferric nitrate colourimetric method.
Water samples containing high levels of hexavalent chromium, cyanide (together with sulfide), reducing agents, or hydrocarbons may cause negative or positive interferences with this method. Contact ALS for additional information if required.

Reference Information

CN-TOT-WT	Water	Cyanide, Total	ISO 14403-2

Total cyanide is determined by the combination of UV digestion and distillation. Cyanide is converted to cyanogen chloride by reacting with chloramine-T, the cyanogen chloride then reacts with a combination of barbituric acid and isonicotinic acid to form a highly colored complex.

When using this method, high levels of thiocyanate in samples can cause false positives at ~1-2% of the thiocyanate concentration. For samples with detectable cyanide analyzed by this method, ALS recommends analysis for thiocyanate to check for this potential interference

DOC-WT	Water	Dissolved Organic Carbon	APHA 5310B

Sample is filtered through a 0.45um filter, then injected into a heated reaction chamber which is packed with an oxidative catalyst. The water is vaporized and the organic carbon is oxidized to carbon dioxide. The carbon dioxide is transported in a carrier gas and is measured by a non-dispersive infrared detector.

EC-SCREEN-WT	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

F-IC-N-WT	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

MET-D-CCMS-WT	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

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

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

MET-T-CCMS-WT	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

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

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

NH3-F-WT	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-IC-WT	Water	Nitrite in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-IC-WT	Water	Nitrate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-COL-WT	Water	Total P in Water by Colour	APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is deteremined colourimetrically after persulphate digestion of the sample.

PO4-DO-COL-WT	Water	Diss. Orthophosphate in Water by Colour	APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.

SO4-IC-N-WT	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

SOLIDS-TDS-WT	Water	Total Dissolved Solids	APHA 2540C

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

Reference Information

SOLIDS-TSS-WT	Water	Suspended solids	APHA 2540 D-Gravimetric

A well-mixed sample is filtered through a weighed standard glass fibre filter and the residue retained is dried in an oven at 104–1°C for a minimum of four hours or until a constant weight is achieved.

TOC-WT	Water	Total Organic Carbon	APHA 5310B

Sample is injected into a heated reaction chamber which is packed with an oxidative catalyst. The water is vaporized and the organic cabon is oxidized to carbon dioxide. The carbon dioxide is transported in a carrier gas and is measured by a non-dispersive infrared detector.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid weight of sample
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Client: Veolia Water Technologies Canada (Saint-Laurent)
4105 Sartelon
Ville St-Laurent QC H2S 2B3

Contact: Josee Lalonde

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
BR-IC-N-WT	**Water**							
Batch R5785583								
WG3729578-12 LCS								
Bromide (Br)			102.8		%		85-115	19-MAY-22
WG3729578-11 MB								
Bromide (Br)			<0.10		mg/L		0.1	19-MAY-22
CL-IC-N-WT	**Water**							
Batch R5785583								
WG3729578-12 LCS								
Chloride (Cl)			102.1		%		90-110	19-MAY-22
WG3729578-11 MB								
Chloride (Cl)			<0.50		mg/L		0.5	19-MAY-22
CN-CNO-WT	**Water**							
Batch R5785873								
WG3730231-2 LCS								
Cyanate			92.0		%		85-115	20-MAY-22
WG3730231-1 MB								
Cyanate			<0.20		mg/L		0.2	20-MAY-22
CN-SCN-VA	**Water**							
Batch R5788598								
WG3732009-2 LCS								
Thiocyanate (SCN)			98.9		%		85-115	22-MAY-26
WG3732009-1 MB								
Thiocyanate (SCN)			<0.50		mg/L		0.5	22-MAY-26
CN-TOT-WT	**Water**							
Batch R5785001								
WG3729075-12 LCS								
Cyanide, Total			105.4		%		80-120	18-MAY-22
WG3729075-7 LCS								
Cyanide, Total			104.2		%		80-120	18-MAY-22
WG3729075-11 MB								
Cyanide, Total			<0.0020		mg/L		0.002	18-MAY-22
WG3729075-6 MB								
Cyanide, Total			<0.0020		mg/L		0.002	18-MAY-22
DOC-WT	**Water**							
Batch R5786276								
WG3730305-2 LCS								
Dissolved Organic Carbon			116.2		%		80-120	24-MAY-22
WG3730305-1 MB								

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
DOC-WT	**Water**							
Batch R5786276								
WG3730305-1 MB								
Dissolved Organic Carbon			<0.50		mg/L		0.5	24-MAY-22
F-IC-N-WT	**Water**							
Batch R5785583								
WG3729578-12 LCS								
Fluoride (F)			101.1		%		90-110	19-MAY-22
WG3729578-11 MB								
Fluoride (F)			<0.020		mg/L		0.02	19-MAY-22
MET-D-CCMS-WT	**Water**							
Batch R5786123								
WG3729634-2 LCS								
Aluminum (Al)-Dissolved			99.1		%		80-120	20-MAY-22
Antimony (Sb)-Dissolved			95.7		%		80-120	20-MAY-22
Arsenic (As)-Dissolved			99.4		%		80-120	20-MAY-22
Barium (Ba)-Dissolved			104.5		%		80-120	20-MAY-22
Beryllium (Be)-Dissolved			92.3		%		80-120	20-MAY-22
Bismuth (Bi)-Dissolved			100.8		%		80-120	20-MAY-22
Boron (B)-Dissolved			89.7		%		80-120	20-MAY-22
Cadmium (Cd)-Dissolved			101.5		%		80-120	20-MAY-22
Calcium (Ca)-Dissolved			99.7		%		80-120	20-MAY-22
Cesium (Cs)-Dissolved			102.5		%		80-120	20-MAY-22
Chromium (Cr)-Dissolved			96.0		%		80-120	20-MAY-22
Cobalt (Co)-Dissolved			94.8		%		80-120	20-MAY-22
Copper (Cu)-Dissolved			94.3		%		80-120	20-MAY-22
Iron (Fe)-Dissolved			96.5		%		80-120	20-MAY-22
Lead (Pb)-Dissolved			100.5		%		80-120	20-MAY-22
Lithium (Li)-Dissolved			92.5		%		80-120	20-MAY-22
Magnesium (Mg)-Dissolved			102.0		%		80-120	20-MAY-22
Manganese (Mn)-Dissolved			96.3		%		80-120	20-MAY-22
Molybdenum (Mo)-Dissolved			92.0		%		80-120	20-MAY-22
Nickel (Ni)-Dissolved			95.4		%		80-120	20-MAY-22
Phosphorus (P)-Dissolved			98.4		%		80-120	20-MAY-22
Potassium (K)-Dissolved			96.0		%		80-120	20-MAY-22
Rubidium (Rb)-Dissolved			106.8		%		80-120	20-MAY-22
Selenium (Se)-Dissolved			96.5		%		80-120	20-MAY-22

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R5786123								
WG3729634-2 LCS								
Silicon (Si)-Dissolved			96.1		%		60-140	20-MAY-22
Silver (Ag)-Dissolved			89.9		%		80-120	20-MAY-22
Sodium (Na)-Dissolved			101.5		%		80-120	20-MAY-22
Strontium (Sr)-Dissolved			99.3		%		80-120	20-MAY-22
Sulfur (S)-Dissolved			90.8		%		80-120	20-MAY-22
Tellurium (Te)-Dissolved			99.3		%		80-120	20-MAY-22
Thallium (Tl)-Dissolved			103.5		%		80-120	20-MAY-22
Thorium (Th)-Dissolved			98.4		%		80-120	20-MAY-22
Tin (Sn)-Dissolved			97.8		%		80-120	20-MAY-22
Titanium (Ti)-Dissolved			94.3		%		80-120	20-MAY-22
Tungsten (W)-Dissolved			97.9		%		80-120	20-MAY-22
Uranium (U)-Dissolved			101.2		%		80-120	20-MAY-22
Vanadium (V)-Dissolved			98.1		%		80-120	20-MAY-22
Zinc (Zn)-Dissolved			97.3		%		80-120	20-MAY-22
Zirconium (Zr)-Dissolved			93.9		%		80-120	20-MAY-22
WG3729634-1 MB								
Aluminum (Al)-Dissolved			<0.0050		mg/L		0.005	20-MAY-22
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	20-MAY-22
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	20-MAY-22
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	20-MAY-22
Beryllium (Be)-Dissolved			<0.00010		mg/L		0.0001	20-MAY-22
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	20-MAY-22
Boron (B)-Dissolved			<0.010		mg/L		0.01	20-MAY-22
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	20-MAY-22
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	20-MAY-22
Cesium (Cs)-Dissolved			<0.000010		mg/L		0.00001	20-MAY-22
Chromium (Cr)-Dissolved			<0.00050		mg/L		0.0005	20-MAY-22
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	20-MAY-22
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	20-MAY-22
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	20-MAY-22
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	20-MAY-22
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	20-MAY-22
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	20-MAY-22
Manganese (Mn)-Dissolved			<0.00050		mg/L		0.0005	20-MAY-22

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R5786123								
WG3729634-1 MB								
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	20-MAY-22
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	20-MAY-22
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	20-MAY-22
Potassium (K)-Dissolved			<0.050		mg/L		0.05	20-MAY-22
Rubidium (Rb)-Dissolved			<0.00020		mg/L		0.0002	20-MAY-22
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	20-MAY-22
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	20-MAY-22
Silver (Ag)-Dissolved			<0.000050		mg/L		0.00005	20-MAY-22
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	20-MAY-22
Strontium (Sr)-Dissolved			<0.0010		mg/L		0.001	20-MAY-22
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	20-MAY-22
Tellurium (Te)-Dissolved			<0.00020		mg/L		0.0002	20-MAY-22
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	20-MAY-22
Thorium (Th)-Dissolved			<0.00010		mg/L		0.0001	20-MAY-22
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	20-MAY-22
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	20-MAY-22
Tungsten (W)-Dissolved			<0.00010		mg/L		0.0001	20-MAY-22
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	20-MAY-22
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	20-MAY-22
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	20-MAY-22
Zirconium (Zr)-Dissolved			<0.00020		mg/L		0.0002	20-MAY-22
Batch R5786474								
WG3730658-2 LCS								
Aluminum (Al)-Dissolved			107.5		%		80-120	24-MAY-22
Antimony (Sb)-Dissolved			104.4		%		80-120	24-MAY-22
Arsenic (As)-Dissolved			102.9		%		80-120	24-MAY-22
Barium (Ba)-Dissolved			109.0		%		80-120	24-MAY-22
Beryllium (Be)-Dissolved			106.2		%		80-120	24-MAY-22
Bismuth (Bi)-Dissolved			101.2		%		80-120	24-MAY-22
Boron (B)-Dissolved			97.9		%		80-120	24-MAY-22
Cadmium (Cd)-Dissolved			104.6		%		80-120	24-MAY-22
Calcium (Ca)-Dissolved			104.9		%		80-120	24-MAY-22
Cesium (Cs)-Dissolved			110.9		%		80-120	24-MAY-22
Chromium (Cr)-Dissolved			99.2		%		80-120	24-MAY-22

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R5786474								
WG3730658-2 LCS								
Cobalt (Co)-Dissolved			98.5		%		80-120	24-MAY-22
Copper (Cu)-Dissolved			97.4		%		80-120	24-MAY-22
Iron (Fe)-Dissolved			102.4		%		80-120	24-MAY-22
Lead (Pb)-Dissolved			103.7		%		80-120	24-MAY-22
Lithium (Li)-Dissolved			105.8		%		80-120	24-MAY-22
Magnesium (Mg)-Dissolved			105.3		%		80-120	24-MAY-22
Manganese (Mn)-Dissolved			102.7		%		80-120	24-MAY-22
Molybdenum (Mo)-Dissolved			103.1		%		80-120	24-MAY-22
Nickel (Ni)-Dissolved			97.8		%		80-120	24-MAY-22
Phosphorus (P)-Dissolved			103.3		%		80-120	24-MAY-22
Potassium (K)-Dissolved			103.2		%		80-120	24-MAY-22
Rubidium (Rb)-Dissolved			109.9		%		80-120	24-MAY-22
Selenium (Se)-Dissolved			97.5		%		80-120	24-MAY-22
Silicon (Si)-Dissolved			103.8		%		60-140	24-MAY-22
Silver (Ag)-Dissolved			97.3		%		80-120	24-MAY-22
Sodium (Na)-Dissolved			101.2		%		80-120	24-MAY-22
Strontium (Sr)-Dissolved			108.9		%		80-120	24-MAY-22
Sulfur (S)-Dissolved			104.9		%		80-120	24-MAY-22
Tellurium (Te)-Dissolved			101.2		%		80-120	24-MAY-22
Thallium (Tl)-Dissolved			102.3		%		80-120	24-MAY-22
Thorium (Th)-Dissolved			105.1		%		80-120	24-MAY-22
Tin (Sn)-Dissolved			104.4		%		80-120	24-MAY-22
Titanium (Ti)-Dissolved			102.2		%		80-120	24-MAY-22
Tungsten (W)-Dissolved			103.5		%		80-120	24-MAY-22
Uranium (U)-Dissolved			106.9		%		80-120	24-MAY-22
Vanadium (V)-Dissolved			102.4		%		80-120	24-MAY-22
Zinc (Zn)-Dissolved			102.0		%		80-120	24-MAY-22
Zirconium (Zr)-Dissolved			105.5		%		80-120	24-MAY-22
WG3730658-1 MB								
Aluminum (Al)-Dissolved			<0.0050		mg/L		0.005	24-MAY-22
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	24-MAY-22
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	24-MAY-22
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	24-MAY-22
Beryllium (Be)-Dissolved			<0.00010		mg/L		0.0001	24-MAY-22

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R5786474								
WG3730658-1 MB								
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	24-MAY-22
Boron (B)-Dissolved			<0.010		mg/L		0.01	24-MAY-22
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	24-MAY-22
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	24-MAY-22
Cesium (Cs)-Dissolved			<0.000010		mg/L		0.00001	24-MAY-22
Chromium (Cr)-Dissolved			<0.00050		mg/L		0.0005	24-MAY-22
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	24-MAY-22
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	24-MAY-22
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	24-MAY-22
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	24-MAY-22
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	24-MAY-22
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	24-MAY-22
Manganese (Mn)-Dissolved			<0.00050		mg/L		0.0005	24-MAY-22
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	24-MAY-22
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	24-MAY-22
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	24-MAY-22
Potassium (K)-Dissolved			<0.050		mg/L		0.05	24-MAY-22
Rubidium (Rb)-Dissolved			<0.00020		mg/L		0.0002	24-MAY-22
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	24-MAY-22
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	24-MAY-22
Silver (Ag)-Dissolved			<0.000050		mg/L		0.00005	24-MAY-22
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	24-MAY-22
Strontium (Sr)-Dissolved			<0.0010		mg/L		0.001	24-MAY-22
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	24-MAY-22
Tellurium (Te)-Dissolved			<0.00020		mg/L		0.0002	24-MAY-22
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	24-MAY-22
Thorium (Th)-Dissolved			<0.00010		mg/L		0.0001	24-MAY-22
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	24-MAY-22
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	24-MAY-22
Tungsten (W)-Dissolved			<0.00010		mg/L		0.0001	24-MAY-22
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	24-MAY-22
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	24-MAY-22
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	24-MAY-22
Zirconium (Zr)-Dissolved			<0.00020		mg/L		0.0002	24-MAY-22

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R5784424								
WG3728545-2 LCS								
Aluminum (Al)-Total			98.0		%		80-120	18-MAY-22
Antimony (Sb)-Total			103.7		%		80-120	18-MAY-22
Arsenic (As)-Total			97.6		%		80-120	18-MAY-22
Barium (Ba)-Total			99.7		%		80-120	18-MAY-22
Beryllium (Be)-Total			93.7		%		80-120	18-MAY-22
Bismuth (Bi)-Total			98.4		%		80-120	18-MAY-22
Boron (B)-Total			93.5		%		80-120	18-MAY-22
Cadmium (Cd)-Total			100.2		%		80-120	18-MAY-22
Calcium (Ca)-Total			93.0		%		80-120	18-MAY-22
Chromium (Cr)-Total			97.4		%		80-120	18-MAY-22
Cesium (Cs)-Total			103.9		%		80-120	18-MAY-22
Cobalt (Co)-Total			96.6		%		80-120	18-MAY-22
Copper (Cu)-Total			96.2		%		80-120	18-MAY-22
Iron (Fe)-Total			100.0		%		80-120	18-MAY-22
Lead (Pb)-Total			103.9		%		80-120	18-MAY-22
Lithium (Li)-Total			90.4		%		80-120	18-MAY-22
Magnesium (Mg)-Total			99.6		%		80-120	18-MAY-22
Manganese (Mn)-Total			96.3		%		80-120	18-MAY-22
Molybdenum (Mo)-Total			97.0		%		80-120	18-MAY-22
Nickel (Ni)-Total			96.7		%		80-120	18-MAY-22
Phosphorus (P)-Total			97.8		%		70-130	18-MAY-22
Potassium (K)-Total			97.7		%		80-120	18-MAY-22
Rubidium (Rb)-Total			100.8		%		80-120	18-MAY-22
Selenium (Se)-Total			100.8		%		80-120	18-MAY-22
Silicon (Si)-Total			95.5		%		60-140	18-MAY-22
Silver (Ag)-Total			92.4		%		80-120	18-MAY-22
Sodium (Na)-Total			97.5		%		80-120	18-MAY-22
Strontium (Sr)-Total			97.9		%		80-120	18-MAY-22
Sulfur (S)-Total			95.5		%		80-120	18-MAY-22
Thallium (Tl)-Total			103.3		%		80-120	18-MAY-22
Tellurium (Te)-Total			101.4		%		80-120	18-MAY-22
Thorium (Th)-Total			103.7		%		80-120	18-MAY-22
Tin (Sn)-Total			97.0		%		80-120	18-MAY-22
Titanium (Ti)-Total			90.8		%		80-120	18-MAY-22

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R5784424								
WG3728545-2 LCS								
Tungsten (W)-Total			100.1		%		80-120	18-MAY-22
Uranium (U)-Total			107.0		%		80-120	18-MAY-22
Vanadium (V)-Total			97.5		%		80-120	18-MAY-22
Zinc (Zn)-Total			96.0		%		80-120	18-MAY-22
Zirconium (Zr)-Total			94.4		%		80-120	18-MAY-22
WG3728545-1 MB								
Aluminum (Al)-Total			<0.0050		mg/L		0.005	18-MAY-22
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	18-MAY-22
Arsenic (As)-Total			<0.00010		mg/L		0.0001	18-MAY-22
Barium (Ba)-Total			<0.00010		mg/L		0.0001	18-MAY-22
Beryllium (Be)-Total			<0.00010		mg/L		0.0001	18-MAY-22
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	18-MAY-22
Boron (B)-Total			<0.010		mg/L		0.01	18-MAY-22
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	18-MAY-22
Calcium (Ca)-Total			<0.050		mg/L		0.05	18-MAY-22
Chromium (Cr)-Total			<0.00050		mg/L		0.0005	18-MAY-22
Cesium (Cs)-Total			<0.000010		mg/L		0.00001	18-MAY-22
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	18-MAY-22
Copper (Cu)-Total			<0.00050		mg/L		0.0005	18-MAY-22
Iron (Fe)-Total			<0.010		mg/L		0.01	18-MAY-22
Lead (Pb)-Total			<0.000050		mg/L		0.00005	18-MAY-22
Lithium (Li)-Total			<0.0010		mg/L		0.001	18-MAY-22
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	18-MAY-22
Manganese (Mn)-Total			<0.00050		mg/L		0.0005	18-MAY-22
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	18-MAY-22
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	18-MAY-22
Phosphorus (P)-Total			<0.050		mg/L		0.05	18-MAY-22
Potassium (K)-Total			<0.050		mg/L		0.05	18-MAY-22
Rubidium (Rb)-Total			<0.00020		mg/L		0.0002	18-MAY-22
Selenium (Se)-Total			<0.000050		mg/L		0.00005	18-MAY-22
Silicon (Si)-Total			<0.10		mg/L		0.1	18-MAY-22
Silver (Ag)-Total			<0.000050		mg/L		0.00005	18-MAY-22
Sodium (Na)-Total			<0.050		mg/L		0.05	18-MAY-22
Strontium (Sr)-Total			<0.0010		mg/L		0.001	18-MAY-22

ALS Environmental

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R5784424								
WG3728545-1 MB								
Sulfur (S)-Total			<0.50		mg/L		0.5	18-MAY-22
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	18-MAY-22
Tellurium (Te)-Total			<0.00020		mg/L		0.0002	18-MAY-22
Thorium (Th)-Total			<0.00010		mg/L		0.0001	18-MAY-22
Tin (Sn)-Total			<0.00010		mg/L		0.0001	18-MAY-22
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	18-MAY-22
Tungsten (W)-Total			<0.00010		mg/L		0.0001	18-MAY-22
Uranium (U)-Total			<0.000010		mg/L		0.00001	18-MAY-22
Vanadium (V)-Total			<0.00050		mg/L		0.0005	18-MAY-22
Zinc (Zn)-Total			<0.0030		mg/L		0.003	18-MAY-22
Zirconium (Zr)-Total			<0.00020		mg/L		0.0002	18-MAY-22
NH3-F-WT	**Water**							
Batch R5786193								
WG3729971-2 LCS								
Ammonia, Total (as N)			104.6		%		85-115	20-MAY-22
WG3729971-1 MB								
Ammonia, Total (as N)			<0.010		mg/L		0.01	20-MAY-22
NO2-IC-WT	**Water**							
Batch R5785583								
WG3729578-12 LCS								
Nitrite (as N)			102.4		%		90-110	19-MAY-22
WG3729578-11 MB								
Nitrite (as N)			<0.010		mg/L		0.01	19-MAY-22
NO3-IC-WT	**Water**							
Batch R5785583								
WG3729578-12 LCS								
Nitrate (as N)			100.8		%		90-110	19-MAY-22
WG3729578-11 MB								
Nitrate (as N)			<0.020		mg/L		0.02	19-MAY-22
P-T-COL-WT	**Water**							
Batch R5785119								
WG3729112-2 LCS								
Phosphorus, Total			98.9		%		80-120	19-MAY-22
WG3729112-1 MB								
Phosphorus, Total			<0.0030		mg/L		0.003	19-MAY-22

ALS Environmental

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PO4-DO-COL-WT	**Water**							
Batch R5784431								
WG3728910-2 LCS								
Orthophosphate-Dissolved (as P)			100.6		%		80-120	18-MAY-22
WG3728910-1 MB								
Orthophosphate-Dissolved (as P)			<0.0030		mg/L		0.003	18-MAY-22
SO4-IC-N-WT	**Water**							
Batch R5785583								
WG3729578-12 LCS								
Sulfate (SO4)			102.6		%		90-110	19-MAY-22
WG3729578-11 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	19-MAY-22
SOLIDS-TDS-WT	**Water**							
Batch R5786369								
WG3729480-2 LCS								
Total Dissolved Solids			87.2		%		85-115	20-MAY-22
WG3729480-1 MB								
Total Dissolved Solids			<10		mg/L		10	20-MAY-22
SOLIDS-TSS-WT	**Water**							
Batch R5785735								
WG3729472-2 LCS								
Total Suspended Solids			96.0		%		85-115	20-MAY-22
WG3729472-1 MB								
Total Suspended Solids			<3.0		mg/L		3	20-MAY-22
TOC-WT	**Water**							
Batch R5786669								
WG3730139-2 LCS								
Total Organic Carbon			92.3		%		80-120	24-MAY-22
WG3730139-1 MB								
Total Organic Carbon			<0.50		mg/L		0.5	24-MAY-22

Quality Control Report

Legend:

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

Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Cyanides							
Thiocyanate by Colour							
	1	16-MAY-22	22-MAY-26 23:25	14	1467	days	EHT
	2	16-MAY-22	22-MAY-26 23:25	14	1467	days	EHT
	3	16-MAY-22	22-MAY-26 23:25	14	1467	days	EHT
	4	16-MAY-22	22-MAY-26 23:25	14	1467	days	EHT
	5	16-MAY-22	22-MAY-26 23:25	14	1467	days	EHT

Legend & Qualifier Definitions:

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

Notes*:
Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2706977 were received on 17-MAY-22 10:00.

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

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

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

ALS www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L2706977-COFC

COC Number: 17 - -

Page of

Report To	Contact and company name below will appear on the final report
Company:	Veolia Water Technologies (26895)
Contact:	Josee Lalonde
Phone:	
	Company address below will appear on the final report
Street:	4105 Sartelon
City/Province:	Ville St-Laurent
Postal Code:	H2S 2B3
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☐ NO
Company:	
Contact:	

Report Format / Distribution

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

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

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

Select Distribution: ☐ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax josee.lalonde@veolia.com

Email 2

Email 3

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax vwtcanada_payables@veolia.com

Email 2

Contact your AM to confirm all E&P TATs (surcharges may apply)

TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4-20%] ☐ 3 day [P3-25%] ☐ 2 day [P2-50%] ☐

EMERGENCY: 1 Business day [E - 100%] ☐ Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] ☐

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

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

Project Information

ALS Account # / Quote #:

Job #: 196035 - MD

PO / AFE: 5000196035-606300.21030001

LSD:

ALS Lab Work Order # (lab use only): L2706977

Oil and Gas Required Fields (client use)

AFE/Cost Center: PO#

Major/Minor Code: Routing Code:

Requisitioner:

Location:

ALS Contact: Sampler:

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

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	Metal Scan	CNO	CN	SCN	Anions Scan	o-PO4	P	TOC	DOC Soluble	TSS	TDS	SAMPLES ON HOLD	SUSPECTED HAZARD (see Special Instructions)
	196035-MD-RW	20220516		WW	8	X	X	X	X	X	X	X	X	X	X	X		
	196035-MD-R1	↓		↓	4		X		X	X	X	X						
	196035-MD-R2	↓		↓	4		X		X	X	X	X						
	196035-MD-R3	↓		↓	4		X		X	X	X	X						
	196035-MD-CW 15°C	↓		↓	8	X	X	X	X	X	X	X	X	X	X	X		

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

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

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

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

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C

FINAL COOLER TEMPERATURES °C: 16.6

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: JL	Date: 22-5-13	Time:	Received by:	Date:	Time:	Received by: BB	Date: May 17 '22	Time: 11AM

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

NOV 2018 FRONT

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

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

Veolia Water Technologies Canada (Saint-Laurent)
ATTN: Josee Lalonde
4105 Sartelon
Ville St-Laurent QC H2S 2B3

Date Received: 17-FEB-22
Report Date: 17-FEB-22 14:59 (MT)
Version: FINAL

Client Phone: 514-334-7230

Certificate of Analysis

Lab Work Order #: L2686613

Project P.O. #: 5000196035.606300.21030003
Job Reference: 196035_MD
C of C Numbers:
Legal Site Desc:

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2686613-1 196035_MD_RW_SPIKED AS Sampled By: CLIENT on 15-FEB-22 Matrix: WATER							
Total Metals							
Arsenic (As)-Total	1.00	DLHC	0.0010	mg/L	17-FEB-22	17-FEB-22	R5726857
Copper (Cu)-Total	0.357	DLHC	0.0050	mg/L	17-FEB-22	17-FEB-22	R5726857
Nickel (Ni)-Total	0.316	DLHC	0.0050	mg/L	17-FEB-22	17-FEB-22	R5726857
L2686613-2 196035_MD_RW_1A Sampled By: CLIENT on 15-FEB-22 Matrix: WATER							
Total Metals							
Arsenic (As)-Total	0.0055	DLHC	0.0010	mg/L	17-FEB-22	17-FEB-22	R5726857
Copper (Cu)-Total	0.0221	DLHC	0.0050	mg/L	17-FEB-22	17-FEB-22	R5726857
Nickel (Ni)-Total	0.0704	DLHC	0.0050	mg/L	17-FEB-22	17-FEB-22	R5726857
L2686613-3 196035_MD_RW_1B Sampled By: CLIENT on 15-FEB-22 Matrix: WATER							
Total Metals							
Arsenic (As)-Total	0.0051	DLHC	0.0010	mg/L	17-FEB-22	17-FEB-22	R5726857
Copper (Cu)-Total	0.0078	DLHC	0.0050	mg/L	17-FEB-22	17-FEB-22	R5726857
Nickel (Ni)-Total	0.0291	DLHC	0.0050	mg/L	17-FEB-22	17-FEB-22	R5726857
L2686613-4 196035_MD_RW_1C Sampled By: CLIENT on 15-FEB-22 Matrix: WATER							
Total Metals							
Arsenic (As)-Total	0.0038	DLHC	0.0010	mg/L	17-FEB-22	17-FEB-22	R5726857
Copper (Cu)-Total	<0.0050	DLHC	0.0050	mg/L	17-FEB-22	17-FEB-22	R5726857
Nickel (Ni)-Total	0.0105	DLHC	0.0050	mg/L	17-FEB-22	17-FEB-22	R5726857
L2686613-5 196035_MD_RW_2A Sampled By: CLIENT on 15-FEB-22 Matrix: WATER							
Total Metals							
Arsenic (As)-Total	0.0060	DLHC	0.0010	mg/L	17-FEB-22	17-FEB-22	R5726857
Copper (Cu)-Total	0.0168	DLHC	0.0050	mg/L	17-FEB-22	17-FEB-22	R5726857
Nickel (Ni)-Total	0.0938	DLHC	0.0050	mg/L	17-FEB-22	17-FEB-22	R5726857
L2686613-6 196035_MD_RW_2B Sampled By: CLIENT on 15-FEB-22 Matrix: WATER							
Total Metals							
Arsenic (As)-Total	0.0065	DLHC	0.0010	mg/L	17-FEB-22	17-FEB-22	R5726857
Copper (Cu)-Total	<0.0050	DLHC	0.0050	mg/L	17-FEB-22	17-FEB-22	R5726857
Nickel (Ni)-Total	0.0131	DLHC	0.0050	mg/L	17-FEB-22	17-FEB-22	R5726857
L2686613-7 196035_MD_RW_2C Sampled By: CLIENT on 15-FEB-22 Matrix: WATER							
Total Metals							
Arsenic (As)-Total	0.0058	DLHC	0.0010	mg/L	17-FEB-22	17-FEB-22	R5726857
Copper (Cu)-Total	<0.0050	DLHC	0.0050	mg/L	17-FEB-22	17-FEB-22	R5726857

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2686613-7 196035_MD_RW_2C Sampled By: CLIENT on 15-FEB-22 Matrix: WATER							
Total Metals							
Nickel (Ni)-Total	0.0066	DLHC	0.0050	mg/L	17-FEB-22	17-FEB-22	R5726857
L2686613-8 196035_MD_RW_3A Sampled By: CLIENT on 15-FEB-22 Matrix: WATER							
Total Metals							
Arsenic (As)-Total	0.0053	DLHC	0.0010	mg/L	17-FEB-22	17-FEB-22	R5726857
Copper (Cu)-Total	0.0117	DLHC	0.0050	mg/L	17-FEB-22	17-FEB-22	R5726857
Nickel (Ni)-Total	0.133	DLHC	0.0050	mg/L	17-FEB-22	17-FEB-22	R5726857
L2686613-9 196035_MD_RW_3B Sampled By: CLIENT on 15-FEB-22 Matrix: WATER							
Total Metals							
Arsenic (As)-Total	0.0050	DLHC	0.0010	mg/L	17-FEB-22	17-FEB-22	R5726857
Copper (Cu)-Total	0.0053	DLHC	0.0050	mg/L	17-FEB-22	17-FEB-22	R5726857
Nickel (Ni)-Total	0.138	DLHC	0.0050	mg/L	17-FEB-22	17-FEB-22	R5726857
L2686613-10 196035_MD_RW_3C Sampled By: CLIENT on 15-FEB-22 Matrix: WATER							
Total Metals							
Arsenic (As)-Total	0.0049	DLHC	0.0010	mg/L	17-FEB-22	17-FEB-22	R5726857
Copper (Cu)-Total	<0.0050	DLHC	0.0050	mg/L	17-FEB-22	17-FEB-22	R5726857
Nickel (Ni)-Total	0.128	DLHC	0.0050	mg/L	17-FEB-22	17-FEB-22	R5726857
L2686613-11 196035_MD_RW_4A Sampled By: CLIENT on 15-FEB-22 Matrix: WATER							
Total Metals							
Arsenic (As)-Total	0.0072	DLHC	0.0010	mg/L	17-FEB-22	17-FEB-22	R5726857
Copper (Cu)-Total	<0.0050	DLHC	0.0050	mg/L	17-FEB-22	17-FEB-22	R5726857
Nickel (Ni)-Total	0.202	DLHC	0.0050	mg/L	17-FEB-22	17-FEB-22	R5726857
L2686613-12 196035_MD_RW_4B Sampled By: CLIENT on 15-FEB-22 Matrix: WATER							
Total Metals							
Arsenic (As)-Total	0.0077	DLHC	0.0010	mg/L	17-FEB-22	17-FEB-22	R5726857
Copper (Cu)-Total	<0.0050	DLHC	0.0050	mg/L	17-FEB-22	17-FEB-22	R5726857
Nickel (Ni)-Total	0.217	DLHC	0.0050	mg/L	17-FEB-22	17-FEB-22	R5726857
L2686613-13 196035_MD_RW_4C Sampled By: CLIENT on 15-FEB-22 Matrix: WATER							
Total Metals							
Arsenic (As)-Total	0.0079	DLHC	0.0010	mg/L	17-FEB-22	17-FEB-22	R5726857
Copper (Cu)-Total	<0.0050	DLHC	0.0050	mg/L	17-FEB-22	17-FEB-22	R5726857
Nickel (Ni)-Total	0.204	DLHC	0.0050	mg/L	17-FEB-22	17-FEB-22	R5726857

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Sample Parameter Qualifier key listed:

Qualifier	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
MET-T-CCMS-WT	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

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

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

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid weight of sample
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Client: Veolia Water Technologies Canada (Saint-Laurent)
4105 Sartelon
Ville St-Laurent QC H2S 2B3

Contact: Josee Lalonde

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R5726857								
WG3697307-2 LCS								
Arsenic (As)-Total			101.1		%		80-120	17-FEB-22
Copper (Cu)-Total			97.9		%		80-120	17-FEB-22
Nickel (Ni)-Total			98.1		%		80-120	17-FEB-22
WG3697307-1 MB								
Arsenic (As)-Total			<0.00010		mg/L		0.0001	17-FEB-22
Copper (Cu)-Total			<0.00050		mg/L		0.0005	17-FEB-22
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	17-FEB-22

Legend:

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

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

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

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

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

ALS www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L2686613-COFC

COC Number: 17 - -

Page of

Report To	Contact and company name below will appear on the final report
Company:	Veolia Water Technologies (26895)
Contact:	Josee Lalonde
Phone:	
	Company address below will appear on the final report
Street:	4105 Sartelon
City/Province:	Ville St-Laurent
Postal Code:	H2S 2B3
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☐ NO
Company:	
Contact:	

Report Format / Distribution

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

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

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

Select Distribution: ☐ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax josee.lalonde@veolia.com

Email 2

Email 3

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax vwtcanada_payables@veolia.com

Email 2

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

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

PRIORITY (Business Days): 4 day [P4-20%] ☐ · 3 day [P3-25%] ☐ · 2 day [P2-50%] ☐

EMERGENCY: 1 Business day [E - 100%] ☒ · Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] ☐

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

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

Project Information

ALS Account # / Quote #:

Job #: 196035-MD

PO / AFE: 5000196035.606300.21030003

LSD:

ALS Lab Work Order # (lab use only): L2686613

Oil and Gas Required Fields (client use)

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

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

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	AS	CU	Zn	SAMPLES ON HOLD	SUSPECTED HAZARD (see Special Instructions)
	196035_MD_RW_Spiked AS	2022-02-15			1	X	X	X		
	196035_MD_1A									
	196035_MD_1B									
	196035_MD_1C									
	196035_MD_2A									
	196035_MD_2B									
	196035_MD_2C									
	196035_MD_3A									
	196035_MD_3B									
	196035_MD_3C									
	196035_MD_4A									
	196035_MD_4B									
	196035_MD_4C									

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

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

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

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

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C | FINAL COOLER TEMPERATURES °C: 13.5

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: EHT	Date: 2022-02-16	Time:	Received by:	Date:	Time:	Received by: AP	Date: 17 Feb 22	Time: 10:30

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

NOV 2015 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.

Veolia Water Technologies Canada (Saint-Laurent)
ATTN: Josee Lalonde
4105 Sartelon
Ville St-Laurent QC H2S 2B3

Date Received: 14-FEB-22
Report Date: 24-FEB-22 08:15 (MT)
Version: FINAL

Client Phone: 514-334-7230

Certificate of Analysis

Lab Work Order #: L2685466

Project P.O. #: 5000196035.606300.21030003
Job Reference: 196035-MD
C of C Numbers:
Legal Site Desc:

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2685466-1 196035-MD-RW Sampled By: CLIENT on 11-FEB-22 Matrix: WATER							
Physical Tests							
Total Suspended Solids	23.8		3.0	mg/L	14-FEB-22	15-FEB-22	R5723306
Total Dissolved Solids	2640	DLDS	20	mg/L		14-FEB-22	R5724121
Anions and Nutrients							
Bromide (Br)	<0.50	DLDS	0.50	mg/L		15-FEB-22	R5725167
Chloride (Cl)	188	DLDS	2.5	mg/L		15-FEB-22	R5725167
Fluoride (F)	<0.10	DLDS	0.10	mg/L		15-FEB-22	R5725167
Nitrate (as N)	9.79	DLDS	0.10	mg/L		15-FEB-22	R5725167
Nitrite (as N)	0.173	DLDS	0.050	mg/L		15-FEB-22	R5725167
Orthophosphate-Dissolved (as P)	<0.0030		0.0030	mg/L		15-FEB-22	R5723310
Phosphorus, Total	0.0113		0.0030	mg/L	16-FEB-22	17-FEB-22	R5726921
Sulfate (SO4)	1380	DLDS	1.5	mg/L		15-FEB-22	R5725167
Cyanides							
Cyanide, Total	0.0312		0.0020	mg/L		15-FEB-22	R5725716
Cyanate	115	SP	2.0	mg/L		16-FEB-22	R5725719
Thiocyanate (SCN)	147		5.0	mg/L		23-FEB-22	R5728813
Organic / Inorganic Carbon							
Dissolved Carbon Filtration Location	LAB	PEHT				16-FEB-22	R5724856
Dissolved Organic Carbon	98	DLM	10	mg/L	16-FEB-22	16-FEB-22	R5726517
Total Organic Carbon	105	DLM	10	mg/L		16-FEB-22	R5726319
Total Metals							
Aluminum (Al)-Total	0.054	DLHC	0.050	mg/L	14-FEB-22	14-FEB-22	R5722282
Antimony (Sb)-Total	0.0174	DLHC	0.0010	mg/L	14-FEB-22	14-FEB-22	R5722282
Arsenic (As)-Total	0.0979	DLHC	0.0010	mg/L	14-FEB-22	14-FEB-22	R5722282
Barium (Ba)-Total	0.0561	DLHC	0.0010	mg/L	14-FEB-22	14-FEB-22	R5722282
Beryllium (Be)-Total	<0.0010	DLHC	0.0010	mg/L	14-FEB-22	14-FEB-22	R5722282
Bismuth (Bi)-Total	<0.00050	DLHC	0.00050	mg/L	14-FEB-22	14-FEB-22	R5722282
Boron (B)-Total	0.26	DLHC	0.10	mg/L	14-FEB-22	14-FEB-22	R5722282
Cadmium (Cd)-Total	<0.000060	DLM	0.000060	mg/L	14-FEB-22	14-FEB-22	R5722282
Calcium (Ca)-Total	285	DLHC	0.50	mg/L	14-FEB-22	14-FEB-22	R5722282
Cesium (Cs)-Total	<0.00010	DLHC	0.00010	mg/L	14-FEB-22	14-FEB-22	R5722282
Chromium (Cr)-Total	<0.0050	DLHC	0.0050	mg/L	14-FEB-22	14-FEB-22	R5722282
Cobalt (Co)-Total	0.464	DLHC	0.0010	mg/L	14-FEB-22	14-FEB-22	R5722282
Copper (Cu)-Total	0.811	DLHC	0.0050	mg/L	14-FEB-22	14-FEB-22	R5722282
Iron (Fe)-Total	0.21	DLHC	0.10	mg/L	14-FEB-22	14-FEB-22	R5722282
Lead (Pb)-Total	0.00060	DLHC	0.00050	mg/L	14-FEB-22	14-FEB-22	R5722282
Lithium (Li)-Total	<0.010	DLHC	0.010	mg/L	14-FEB-22	14-FEB-22	R5722282
Magnesium (Mg)-Total	23.5	DLHC	0.050	mg/L	14-FEB-22	14-FEB-22	R5722282
Manganese (Mn)-Total	0.0230	DLHC	0.0050	mg/L	14-FEB-22	14-FEB-22	R5722282
Molybdenum (Mo)-Total	0.124	DLHC	0.00050	mg/L	14-FEB-22	14-FEB-22	R5722282
Nickel (Ni)-Total	0.338	DLHC	0.0050	mg/L	14-FEB-22	14-FEB-22	R5722282
Phosphorus (P)-Total	<0.50	DLHC	0.50	mg/L	14-FEB-22	14-FEB-22	R5722282
Potassium (K)-Total	173	DLHC	0.50	mg/L	14-FEB-22	14-FEB-22	R5722282

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2685466-1 196035-MD-RW Sampled By: CLIENT on 11-FEB-22 Matrix: WATER							
Total Metals							
Rubidium (Rb)-Total	0.0502	DLHC	0.0020	mg/L	14-FEB-22	14-FEB-22	R5722282
Selenium (Se)-Total	0.137	DLHC	0.00050	mg/L	14-FEB-22	14-FEB-22	R5722282
Silicon (Si)-Total	3.0	DLHC	1.0	mg/L	14-FEB-22	14-FEB-22	R5722282
Silver (Ag)-Total	0.00057	DLHC	0.00050	mg/L	14-FEB-22	14-FEB-22	R5722282
Sodium (Na)-Total	434	DLHC	0.50	mg/L	14-FEB-22	14-FEB-22	R5722282
Strontium (Sr)-Total	1.03	DLHC	0.010	mg/L	14-FEB-22	14-FEB-22	R5722282
Sulfur (S)-Total	619	DLHC	5.0	mg/L	14-FEB-22	14-FEB-22	R5722282
Tellurium (Te)-Total	<0.0020	DLHC	0.0020	mg/L	14-FEB-22	14-FEB-22	R5722282
Thallium (Tl)-Total	<0.00010	DLHC	0.00010	mg/L	14-FEB-22	14-FEB-22	R5722282
Thorium (Th)-Total	<0.0010	DLHC	0.0010	mg/L	14-FEB-22	14-FEB-22	R5722282
Tin (Sn)-Total	<0.0010	DLHC	0.0010	mg/L	14-FEB-22	14-FEB-22	R5722282
Titanium (Ti)-Total	<0.0030	DLHC	0.0030	mg/L	14-FEB-22	14-FEB-22	R5722282
Tungsten (W)-Total	0.0072	DLHC	0.0010	mg/L	14-FEB-22	14-FEB-22	R5722282
Uranium (U)-Total	0.0145	DLHC	0.00010	mg/L	14-FEB-22	14-FEB-22	R5722282
Vanadium (V)-Total	<0.0050	DLHC	0.0050	mg/L	14-FEB-22	14-FEB-22	R5722282
Zinc (Zn)-Total	<0.030	DLHC	0.030	mg/L	14-FEB-22	14-FEB-22	R5722282
Zirconium (Zr)-Total	<0.0020	DLHC	0.0020	mg/L	14-FEB-22	14-FEB-22	R5722282
Dissolved Metals							
Dissolved Metals Filtration Location	LAB					14-FEB-22	R5723063
Aluminum (Al)-Dissolved	<0.050	DLHC	0.050	mg/L	14-FEB-22	14-FEB-22	R5723036
Antimony (Sb)-Dissolved	0.0119	DLHC	0.0010	mg/L	14-FEB-22	14-FEB-22	R5723036
Arsenic (As)-Dissolved	0.0595	DLHC	0.0010	mg/L	14-FEB-22	14-FEB-22	R5723036
Barium (Ba)-Dissolved	0.0255	DLHC	0.0010	mg/L	14-FEB-22	14-FEB-22	R5723036
Beryllium (Be)-Dissolved	<0.0010	DLHC	0.0010	mg/L	14-FEB-22	14-FEB-22	R5723036
Bismuth (Bi)-Dissolved	<0.00050	DLHC	0.00050	mg/L	14-FEB-22	14-FEB-22	R5723036
Boron (B)-Dissolved	0.19	DLHC	0.10	mg/L	14-FEB-22	14-FEB-22	R5723036
Cadmium (Cd)-Dissolved	<0.000050	DLHC	0.000050	mg/L	14-FEB-22	14-FEB-22	R5723036
Calcium (Ca)-Dissolved	141	DLHC	0.50	mg/L	14-FEB-22	14-FEB-22	R5723036
Cesium (Cs)-Dissolved	<0.00010	DLHC	0.00010	mg/L	14-FEB-22	14-FEB-22	R5723036
Chromium (Cr)-Dissolved	<0.0050	DLHC	0.0050	mg/L	14-FEB-22	14-FEB-22	R5723036
Cobalt (Co)-Dissolved	0.327	DLHC	0.0010	mg/L	14-FEB-22	14-FEB-22	R5723036
Copper (Cu)-Dissolved	0.144	DLHC	0.0020	mg/L	14-FEB-22	14-FEB-22	R5723036
Iron (Fe)-Dissolved	<0.10	DLHC	0.10	mg/L	14-FEB-22	14-FEB-22	R5723036
Lead (Pb)-Dissolved	<0.00050	DLHC	0.00050	mg/L	14-FEB-22	14-FEB-22	R5723036
Lithium (Li)-Dissolved	<0.010	DLHC	0.010	mg/L	14-FEB-22	14-FEB-22	R5723036
Magnesium (Mg)-Dissolved	16.3	DLHC	0.050	mg/L	14-FEB-22	14-FEB-22	R5723036
Manganese (Mn)-Dissolved	0.0099	DLHC	0.0050	mg/L	14-FEB-22	14-FEB-22	R5723036
Molybdenum (Mo)-Dissolved	0.0852	DLHC	0.00050	mg/L	14-FEB-22	14-FEB-22	R5723036
Nickel (Ni)-Dissolved	0.223	DLHC	0.0050	mg/L	14-FEB-22	14-FEB-22	R5723036
Phosphorus (P)-Dissolved	<0.50	DLHC	0.50	mg/L	14-FEB-22	14-FEB-22	R5723036
Potassium (K)-Dissolved	132	DLHC	0.50	mg/L	14-FEB-22	14-FEB-22	R5723036

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2685466-1 196035-MD-RW Sampled By: CLIENT on 11-FEB-22 Matrix: WATER							
Dissolved Metals							
Rubidium (Rb)-Dissolved	0.0373	DLHC	0.0020	mg/L	14-FEB-22	14-FEB-22	R5723036
Selenium (Se)-Dissolved	0.0953	DLHC	0.00050	mg/L	14-FEB-22	14-FEB-22	R5723036
Silicon (Si)-Dissolved	1.96	DLHC	0.50	mg/L	14-FEB-22	14-FEB-22	R5723036
Silver (Ag)-Dissolved	<0.00050	DLHC	0.00050	mg/L	14-FEB-22	14-FEB-22	R5723036
Sodium (Na)-Dissolved	318	DLHC	0.50	mg/L	14-FEB-22	14-FEB-22	R5723036
Strontium (Sr)-Dissolved	0.540	DLHC	0.010	mg/L	14-FEB-22	14-FEB-22	R5723036
Sulfur (S)-Dissolved	373	DLHC	5.0	mg/L	14-FEB-22	14-FEB-22	R5723036
Tellurium (Te)-Dissolved	<0.0020	DLHC	0.0020	mg/L	14-FEB-22	14-FEB-22	R5723036
Thallium (Tl)-Dissolved	<0.00010	DLHC	0.00010	mg/L	14-FEB-22	14-FEB-22	R5723036
Thorium (Th)-Dissolved	<0.0010	DLHC	0.0010	mg/L	14-FEB-22	14-FEB-22	R5723036
Tin (Sn)-Dissolved	<0.0010	DLHC	0.0010	mg/L	14-FEB-22	14-FEB-22	R5723036
Titanium (Ti)-Dissolved	<0.0030	DLHC	0.0030	mg/L	14-FEB-22	14-FEB-22	R5723036
Tungsten (W)-Dissolved	0.0050	DLHC	0.0010	mg/L	14-FEB-22	14-FEB-22	R5723036
Uranium (U)-Dissolved	0.00944	DLHC	0.00010	mg/L	14-FEB-22	14-FEB-22	R5723036
Vanadium (V)-Dissolved	<0.0050	DLHC	0.0050	mg/L	14-FEB-22	14-FEB-22	R5723036
Zinc (Zn)-Dissolved	<0.010	DLHC	0.010	mg/L	14-FEB-22	14-FEB-22	R5723036
Zirconium (Zr)-Dissolved	<0.0020	DLHC	0.0020	mg/L	14-FEB-22	14-FEB-22	R5723036

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Phosphorus (P)-Total	MES	L2685466-1
Matrix Spike	Cyanate	MS-B	L2685466-1
Matrix Spike	Dissolved Organic Carbon	MS-B	L2685466-1
Matrix Spike	Arsenic (As)-Dissolved	MS-B	L2685466-1
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2685466-1
Matrix Spike	Boron (B)-Dissolved	MS-B	L2685466-1
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2685466-1
Matrix Spike	Cobalt (Co)-Dissolved	MS-B	L2685466-1
Matrix Spike	Copper (Cu)-Dissolved	MS-B	L2685466-1
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2685466-1
Matrix Spike	Molybdenum (Mo)-Dissolved	MS-B	L2685466-1
Matrix Spike	Nickel (Ni)-Dissolved	MS-B	L2685466-1
Matrix Spike	Potassium (K)-Dissolved	MS-B	L2685466-1
Matrix Spike	Rubidium (Rb)-Dissolved	MS-B	L2685466-1
Matrix Spike	Selenium (Se)-Dissolved	MS-B	L2685466-1
Matrix Spike	Silicon (Si)-Dissolved	MS-B	L2685466-1
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2685466-1
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2685466-1
Matrix Spike	Sulfur (S)-Dissolved	MS-B	L2685466-1
Matrix Spike	Tungsten (W)-Dissolved	MS-B	L2685466-1
Matrix Spike	Uranium (U)-Dissolved	MS-B	L2685466-1
Matrix Spike	Arsenic (As)-Total	MS-B	L2685466-1
Matrix Spike	Barium (Ba)-Total	MS-B	L2685466-1
Matrix Spike	Boron (B)-Total	MS-B	L2685466-1
Matrix Spike	Calcium (Ca)-Total	MS-B	L2685466-1
Matrix Spike	Cobalt (Co)-Total	MS-B	L2685466-1
Matrix Spike	Copper (Cu)-Total	MS-B	L2685466-1
Matrix Spike	Iron (Fe)-Total	MS-B	L2685466-1
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2685466-1
Matrix Spike	Manganese (Mn)-Total	MS-B	L2685466-1
Matrix Spike	Molybdenum (Mo)-Total	MS-B	L2685466-1
Matrix Spike	Nickel (Ni)-Total	MS-B	L2685466-1
Matrix Spike	Potassium (K)-Total	MS-B	L2685466-1
Matrix Spike	Rubidium (Rb)-Total	MS-B	L2685466-1
Matrix Spike	Selenium (Se)-Total	MS-B	L2685466-1
Matrix Spike	Silicon (Si)-Total	MS-B	L2685466-1
Matrix Spike	Sodium (Na)-Total	MS-B	L2685466-1
Matrix Spike	Strontium (Sr)-Total	MS-B	L2685466-1
Matrix Spike	Sulfur (S)-Total	MS-B	L2685466-1
Matrix Spike	Tungsten (W)-Total	MS-B	L2685466-1
Matrix Spike	Uranium (U)-Total	MS-B	L2685466-1
Matrix Spike	Total Organic Carbon	MS-B	L2685466-1

Qualifiers for Sample Submission Listed:

Qualifier	Description
SRPF	Sample received partially frozen

Sample Parameter Qualifier key listed:

Qualifier	Description
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
MES	Data Quality Objective was marginally exceeded (by < 10% absolute) for < 10% of analytes in a Multi-Element Scan / Multi-Parameter Scan (considered acceptable as per OMOE & CCME).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Reference Information

PEHT	Parameter Exceeded Recommended Holding Time Prior to Analysis
SP	Sample was Preserved at the laboratory

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
BR-IC-N-WT	Water	Bromide in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CL-IC-N-WT	Water	Chloride by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

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

CN-CNO-WT	Water	Cyanate	APHA 4500-CN-L

This analysis is carried out using procedures adapted from APHA method 4500-CN "Cyanide". Cyanate is determined by the Cyanate hydrolysis method using an ammonia selective electrode

CN-SCN-VA	Water	Thiocyanate by Colour	APHA 4500-CN CYANIDE

This analysis is carried out using procedures adapted from APHA Method 4500-CN- M "Thiocyanate" Thiocyanate is determined by the ferric nitrate colourimetric method.
Water samples containing high levels of hexavalent chromium, cyanide (together with sulfide), reducing agents, or hydrocarbons may cause negative or positive interferences with this method. Contact ALS for additional information if required.

CN-TOT-WT	Water	Cyanide, Total	ISO 14403-2

Total cyanide is determined by the combination of UV digestion and distillation. Cyanide is converted to cyanogen chloride by reacting with chloramine-T, the cyanogen chloride then reacts with a combination of barbituric acid and isonicotinic acid to form a highly colored complex.

When using this method, high levels of thiocyanate in samples can cause false positives at ~1-2% of the thiocyanate concentration. For samples with detectable cyanide analyzed by this method, ALS recommends analysis for thiocyanate to check for this potential interference

DOC-WT	Water	Dissolved Organic Carbon	APHA 5310B

Sample is filtered through a 0.45um filter, then injected into a heated reaction chamber which is packed with an oxidative catalyst. The water is vaporized and the organic carbon is oxidized to carbon dioxide. The carbon dioxide is transported in a carrier gas and is measured by a non-dispersive infrared detector.

EC-SCREEN-WT	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

F-IC-N-WT	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

MET-D-CCMS-WT	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

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

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

MET-T-CCMS-WT	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

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

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

NO2-IC-WT	Water	Nitrite in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

Reference Information

NO3-IC-WT	Water	Nitrate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-COL-WT	Water	Total P in Water by Colour	APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is deteremined colourimetrically after persulphate digestion of the sample.

PO4-DO-COL-WT	Water	Diss. Orthophosphate in Water by Colour	APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.

SO4-IC-N-WT	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

SOLIDS-TDS-WT	Water	Total Dissolved Solids	APHA 2540C

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

SOLIDS-TSS-WT	Water	Suspended solids	APHA 2540 D-Gravimetric

A well-mixed sample is filtered through a weighed standard glass fibre filter and the residue retained is dried in an oven at 104–1°C for a minimum of four hours or until a constant weight is achieved.

TOC-WT	Water	Total Organic Carbon	APHA 5310B

Sample is injected into a heated reaction chamber which is packed with an oxidative catalyst. The water is vaporized and the organic cabon is oxidized to carbon dioxide. The carbon dioxide is transported in a carrier gas and is measured by a non-dispersive infrared detector.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid weight of sample
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Client: Veolia Water Technologies Canada (Saint-Laurent)
4105 Sartelon
Ville St-Laurent QC H2S 2B3
Contact: Josee Lalonde

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
BR-IC-N-WT	**Water**							
Batch R5725167								
WG3696311-7 LCS								
Bromide (Br)			103.3		%		85-115	15-FEB-22
WG3696311-6 MB								
Bromide (Br)			<0.10		mg/L		0.1	15-FEB-22
CL-IC-N-WT	**Water**							
Batch R5725167								
WG3696311-7 LCS								
Chloride (Cl)			101.8		%		90-110	15-FEB-22
WG3696311-6 MB								
Chloride (Cl)			<0.50		mg/L		0.5	15-FEB-22
CN-CNO-WT	**Water**							
Batch R5725719								
WG3696986-3 DUP		**L2685466-1**						
Cyanate		115	3.5		mg/L	0.4	20	16-FEB-22
WG3696986-2 LCS								
Cyanate			96.1		%		85-115	16-FEB-22
WG3696986-1 MB								
Cyanate			<0.20		mg/L		0.2	16-FEB-22
WG3696986-4 MS		**L2685466-1**						
Cyanate			N/A	MS-B	%		-	16-FEB-22
CN-SCN-VA	**Water**							
Batch R5728813								
WG3699275-3 DUP		**L2685466-1**						
Thiocyanate (SCN)		147	147		mg/L	0.0	20	23-FEB-22
WG3699275-2 LCS								
Thiocyanate (SCN)			102.3		%		85-115	23-FEB-22
WG3699275-1 MB								
Thiocyanate (SCN)			<0.50		mg/L		0.5	23-FEB-22
CN-TOT-WT	**Water**							
Batch R5725716								
WG3696431-2 LCS								
Cyanide, Total			96.3		%		80-120	15-FEB-22
WG3696431-1 MB								
Cyanide, Total			<0.0020		mg/L		0.002	15-FEB-22
DOC-WT	**Water**							

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
DOC-WT	**Water**							
Batch R5726517								
WG3696667-2 LCS								
Dissolved Organic Carbon			104.5		%		80-120	16-FEB-22
WG3696667-1 MB								
Dissolved Organic Carbon			<0.50		mg/L		0.5	16-FEB-22
F-IC-N-WT	**Water**							
Batch R5725167								
WG3696311-7 LCS								
Fluoride (F)			101.3		%		90-110	15-FEB-22
WG3696311-6 MB								
Fluoride (F)			<0.020		mg/L		0.02	15-FEB-22
MET-D-CCMS-WT	**Water**							
Batch R5723036								
WG3696019-2 LCS								
Aluminum (Al)-Dissolved			104.0		%		80-120	14-FEB-22
Antimony (Sb)-Dissolved			101.2		%		80-120	14-FEB-22
Arsenic (As)-Dissolved			102.6		%		80-120	14-FEB-22
Barium (Ba)-Dissolved			103.7		%		80-120	14-FEB-22
Beryllium (Be)-Dissolved			100.9		%		80-120	14-FEB-22
Bismuth (Bi)-Dissolved			104.1		%		80-120	14-FEB-22
Boron (B)-Dissolved			95.7		%		80-120	14-FEB-22
Cadmium (Cd)-Dissolved			102.7		%		80-120	14-FEB-22
Calcium (Ca)-Dissolved			100.9		%		80-120	14-FEB-22
Cesium (Cs)-Dissolved			106.3		%		80-120	14-FEB-22
Chromium (Cr)-Dissolved			102.7		%		80-120	14-FEB-22
Cobalt (Co)-Dissolved			104.3		%		80-120	14-FEB-22
Copper (Cu)-Dissolved			101.9		%		80-120	14-FEB-22
Iron (Fe)-Dissolved			103.2		%		80-120	14-FEB-22
Lead (Pb)-Dissolved			104.2		%		80-120	14-FEB-22
Lithium (Li)-Dissolved			104.2		%		80-120	14-FEB-22
Magnesium (Mg)-Dissolved			103.0		%		80-120	14-FEB-22
Manganese (Mn)-Dissolved			102.3		%		80-120	14-FEB-22
Molybdenum (Mo)-Dissolved			99.0		%		80-120	14-FEB-22
Nickel (Ni)-Dissolved			103.1		%		80-120	14-FEB-22
Phosphorus (P)-Dissolved			108.2		%		80-120	14-FEB-22
Potassium (K)-Dissolved			103.4		%		80-120	14-FEB-22
Rubidium (Rb)-Dissolved			107.4		%		80-120	14-FEB-22

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R5723036								
WG3696019-2 LCS								
Selenium (Se)-Dissolved			100.2		%		80-120	14-FEB-22
Silicon (Si)-Dissolved			102.9		%		60-140	14-FEB-22
Silver (Ag)-Dissolved			105.0		%		80-120	14-FEB-22
Sodium (Na)-Dissolved			104.7		%		80-120	14-FEB-22
Strontium (Sr)-Dissolved			104.1		%		80-120	14-FEB-22
Sulfur (S)-Dissolved			101.0		%		80-120	14-FEB-22
Tellurium (Te)-Dissolved			101.8		%		80-120	14-FEB-22
Thallium (Tl)-Dissolved			103.8		%		80-120	14-FEB-22
Thorium (Th)-Dissolved			103.4		%		80-120	14-FEB-22
Tin (Sn)-Dissolved			102.4		%		80-120	14-FEB-22
Titanium (Ti)-Dissolved			98.5		%		80-120	14-FEB-22
Tungsten (W)-Dissolved			101.5		%		80-120	14-FEB-22
Uranium (U)-Dissolved			105.7		%		80-120	14-FEB-22
Vanadium (V)-Dissolved			103.2		%		80-120	14-FEB-22
Zinc (Zn)-Dissolved			101.1		%		80-120	14-FEB-22
Zirconium (Zr)-Dissolved			101.0		%		80-120	14-FEB-22
WG3696019-1 MB								
Aluminum (Al)-Dissolved			<0.0050		mg/L		0.005	14-FEB-22
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	14-FEB-22
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	14-FEB-22
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	14-FEB-22
Beryllium (Be)-Dissolved			<0.00010		mg/L		0.0001	14-FEB-22
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	14-FEB-22
Boron (B)-Dissolved			<0.010		mg/L		0.01	14-FEB-22
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	14-FEB-22
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	14-FEB-22
Cesium (Cs)-Dissolved			<0.000010		mg/L		0.00001	14-FEB-22
Chromium (Cr)-Dissolved			<0.00050		mg/L		0.0005	14-FEB-22
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	14-FEB-22
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	14-FEB-22
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	14-FEB-22
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	14-FEB-22
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	14-FEB-22
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	14-FEB-22

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R5723036								
WG3696019-1 MB								
Manganese (Mn)-Dissolved			<0.00050		mg/L		0.0005	14-FEB-22
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	14-FEB-22
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	14-FEB-22
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	14-FEB-22
Potassium (K)-Dissolved			<0.050		mg/L		0.05	14-FEB-22
Rubidium (Rb)-Dissolved			<0.00020		mg/L		0.0002	14-FEB-22
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	14-FEB-22
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	14-FEB-22
Silver (Ag)-Dissolved			<0.000050		mg/L		0.00005	14-FEB-22
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	14-FEB-22
Strontium (Sr)-Dissolved			<0.0010		mg/L		0.001	14-FEB-22
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	14-FEB-22
Tellurium (Te)-Dissolved			<0.00020		mg/L		0.0002	14-FEB-22
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	14-FEB-22
Thorium (Th)-Dissolved			<0.00010		mg/L		0.0001	14-FEB-22
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	14-FEB-22
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	14-FEB-22
Tungsten (W)-Dissolved			<0.00010		mg/L		0.0001	14-FEB-22
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	14-FEB-22
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	14-FEB-22
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	14-FEB-22
Zirconium (Zr)-Dissolved			<0.00020		mg/L		0.0002	14-FEB-22
MET-T-CCMS-WT	**Water**							
Batch R5722282								
WG3695996-2 LCS								
Aluminum (Al)-Total			105.6		%		80-120	14-FEB-22
Antimony (Sb)-Total			106.4		%		80-120	14-FEB-22
Arsenic (As)-Total			106.4		%		80-120	14-FEB-22
Barium (Ba)-Total			108.2		%		80-120	14-FEB-22
Beryllium (Be)-Total			101.1		%		80-120	14-FEB-22
Bismuth (Bi)-Total			107.0		%		80-120	14-FEB-22
Boron (B)-Total			95.7		%		80-120	14-FEB-22
Cadmium (Cd)-Total			105.8		%		80-120	14-FEB-22
Calcium (Ca)-Total			102.2		%		80-120	14-FEB-22

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R5722282								
WG3695996-2 LCS								
Chromium (Cr)-Total			105.4		%		80-120	14-FEB-22
Cesium (Cs)-Total			110.8		%		80-120	14-FEB-22
Cobalt (Co)-Total			107.3		%		80-120	14-FEB-22
Copper (Cu)-Total			106.6		%		80-120	14-FEB-22
Iron (Fe)-Total			106.4		%		80-120	14-FEB-22
Lead (Pb)-Total			107.4		%		80-120	14-FEB-22
Lithium (Li)-Total			102.3		%		80-120	14-FEB-22
Magnesium (Mg)-Total			104.6		%		80-120	14-FEB-22
Manganese (Mn)-Total			104.1		%		80-120	14-FEB-22
Molybdenum (Mo)-Total			103.9		%		80-120	14-FEB-22
Nickel (Ni)-Total			106.1		%		80-120	14-FEB-22
Phosphorus (P)-Total			107.4		%		70-130	14-FEB-22
Potassium (K)-Total			105.1		%		80-120	14-FEB-22
Rubidium (Rb)-Total			109.6		%		80-120	14-FEB-22
Selenium (Se)-Total			102.9		%		80-120	14-FEB-22
Silicon (Si)-Total			102.4		%		60-140	14-FEB-22
Silver (Ag)-Total			108.1		%		80-120	14-FEB-22
Sodium (Na)-Total			107.1		%		80-120	14-FEB-22
Strontium (Sr)-Total			105.5		%		80-120	14-FEB-22
Sulfur (S)-Total			102.6		%		80-120	14-FEB-22
Thallium (Tl)-Total			107.2		%		80-120	14-FEB-22
Tellurium (Te)-Total			104.0		%		80-120	14-FEB-22
Thorium (Th)-Total			109.0		%		80-120	14-FEB-22
Tin (Sn)-Total			106.4		%		80-120	14-FEB-22
Titanium (Ti)-Total			99.7		%		80-120	14-FEB-22
Tungsten (W)-Total			105.6		%		80-120	14-FEB-22
Uranium (U)-Total			109.2		%		80-120	14-FEB-22
Vanadium (V)-Total			106.2		%		80-120	14-FEB-22
Zinc (Zn)-Total			104.7		%		80-120	14-FEB-22
Zirconium (Zr)-Total			104.8		%		80-120	14-FEB-22
WG3695996-1 MB								
Aluminum (Al)-Total			<0.0050		mg/L		0.005	14-FEB-22
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	14-FEB-22
Arsenic (As)-Total			<0.00010		mg/L		0.0001	14-FEB-22

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R5722282								
WG3695996-1 MB								
Barium (Ba)-Total			<0.00010		mg/L		0.0001	14-FEB-22
Beryllium (Be)-Total			<0.00010		mg/L		0.0001	14-FEB-22
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	14-FEB-22
Boron (B)-Total			<0.010		mg/L		0.01	14-FEB-22
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	14-FEB-22
Calcium (Ca)-Total			<0.050		mg/L		0.05	14-FEB-22
Chromium (Cr)-Total			<0.00050		mg/L		0.0005	14-FEB-22
Cesium (Cs)-Total			<0.000010		mg/L		0.00001	14-FEB-22
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	14-FEB-22
Copper (Cu)-Total			<0.00050		mg/L		0.0005	14-FEB-22
Iron (Fe)-Total			<0.010		mg/L		0.01	14-FEB-22
Lead (Pb)-Total			<0.000050		mg/L		0.00005	14-FEB-22
Lithium (Li)-Total			<0.0010		mg/L		0.001	14-FEB-22
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	14-FEB-22
Manganese (Mn)-Total			<0.00050		mg/L		0.0005	14-FEB-22
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	14-FEB-22
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	14-FEB-22
Phosphorus (P)-Total			<0.050		mg/L		0.05	14-FEB-22
Potassium (K)-Total			<0.050		mg/L		0.05	14-FEB-22
Rubidium (Rb)-Total			<0.00020		mg/L		0.0002	14-FEB-22
Selenium (Se)-Total			<0.000050		mg/L		0.00005	14-FEB-22
Silicon (Si)-Total			<0.10		mg/L		0.1	14-FEB-22
Silver (Ag)-Total			<0.000050		mg/L		0.00005	14-FEB-22
Sodium (Na)-Total			<0.050		mg/L		0.05	14-FEB-22
Strontium (Sr)-Total			<0.0010		mg/L		0.001	14-FEB-22
Sulfur (S)-Total			<0.50		mg/L		0.5	14-FEB-22
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	14-FEB-22
Tellurium (Te)-Total			<0.00020		mg/L		0.0002	14-FEB-22
Thorium (Th)-Total			<0.00010		mg/L		0.0001	14-FEB-22
Tin (Sn)-Total			<0.00010		mg/L		0.0001	14-FEB-22
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	14-FEB-22
Tungsten (W)-Total			<0.00010		mg/L		0.0001	14-FEB-22
Uranium (U)-Total			<0.000010		mg/L		0.00001	14-FEB-22
Vanadium (V)-Total			<0.00050		mg/L		0.0005	14-FEB-22

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R5722282								
WG3695996-1 MB								
Zinc (Zn)-Total			<0.0030		mg/L		0.003	14-FEB-22
Zirconium (Zr)-Total			<0.00020		mg/L		0.0002	14-FEB-22
NO2-IC-WT	**Water**							
Batch R5725167								
WG3696311-7 LCS								
Nitrite (as N)			101.0		%		90-110	15-FEB-22
WG3696311-6 MB								
Nitrite (as N)			<0.010		mg/L		0.01	15-FEB-22
NO3-IC-WT	**Water**							
Batch R5725167								
WG3696311-7 LCS								
Nitrate (as N)			101.7		%		90-110	15-FEB-22
WG3696311-6 MB								
Nitrate (as N)			<0.020		mg/L		0.02	15-FEB-22
P-T-COL-WT	**Water**							
Batch R5726921								
WG3696623-2 LCS								
Phosphorus, Total			100.5		%		80-120	17-FEB-22
WG3696623-1 MB								
Phosphorus, Total			<0.0030		mg/L		0.003	17-FEB-22
PO4-DO-COL-WT	**Water**							
Batch R5723310								
WG3696141-2 LCS								
Orthophosphate-Dissolved (as P)			105.6		%		80-120	15-FEB-22
WG3696141-1 MB								
Orthophosphate-Dissolved (as P)			<0.0030		mg/L		0.003	15-FEB-22
SO4-IC-N-WT	**Water**							
Batch R5725167								
WG3696311-7 LCS								
Sulfate (SO4)			103.7		%		90-110	15-FEB-22
WG3696311-6 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	15-FEB-22
SOLIDS-TDS-WT	**Water**							

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SOLIDS-TDS-WT	**Water**							
Batch R5724121								
WG3695613-6 LCS								
Total Dissolved Solids			95.5		%		85-115	14-FEB-22
WG3695613-5 MB								
Total Dissolved Solids			<10		mg/L		10	14-FEB-22
SOLIDS-TSS-WT	**Water**							
Batch R5723306								
WG3695881-2 LCS								
Total Suspended Solids			95.3		%		85-115	15-FEB-22
WG3695881-1 MB								
Total Suspended Solids			<3.0		mg/L		3	15-FEB-22
TOC-WT	**Water**							
Batch R5726319								
WG3696266-2 LCS								
Total Organic Carbon			98.7		%		80-120	16-FEB-22
WG3696266-1 MB								
Total Organic Carbon			<0.50		mg/L		0.5	16-FEB-22

Legend:

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

Sample Parameter Qualifier Definitions:

Qualifier	Description
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Quality Control Report

Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Organic / Inorganic Carbon							
Dissolved Organic Carbon							
	1	11-FEB-22	16-FEB-22 00:00	3	5	days	EHTL

Legend & Qualifier Definitions:

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

Notes*:
Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2685466 were received on 14-FEB-22 09:45.

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

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

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

Chain of Custody (COC) / Analytical Request Form

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2685466-COFC

COC Number: 17 -

Page of

Report To	Contact and company name below will appear on the final report	Report Format / Distribution	
Company:	Veolia Water Technologies (26895)	Select Report Format:	
Contact:	Josee Lalonde	Quality Control (QC) Report with Report	☐ YES ☐ NO
Phone:		☐ Compare Results to Criteria on Report - provide details below if box checked	
	Company address below will appear on the final report	Select Distribution:	☐ EMAIL ☐ MAIL ☐ FAX
Street:	4105 Sarteton	Email 1 or Fax	josee.lalonde@veolia.com
City/Province:	Ville St-Laurent	Email 2	
Postal Code:	H2S 2B3	Email 3	

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

☑ Standard TAT if received by 3 pm - business days - no surcharges apply

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

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

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

Invoice To		Invoice Distribution	
Same as Report To	☑ YES ☐ NO	Select Invoice Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Copy of Invoice with Report	☐ YES ☐ NO	Email 1 or Fax	vwtcanada_payables@veolia.com
Company:		Email 2	
Contact:			

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:		AFE/Cost Center:	PO#
Job #:	196035- MD	Major/Minor Code:	Routing Code:
PO / AFE:	5000196035.606300.21030003	Requisitioner:	
LSD:		Location:	
ALS Lab Work Order # (lab use only):	L2685466 AP	ALS Contact:	Sampler:

Analysis Request

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

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	metals total *	metals dissolved	CNO	CN	SCN	Anions scan	P total + O-PO4	TOC	DOC	TSS	TDS	SAMPLES ON HOLD	SUSPECTED HAZARD (see Special Instructions)
	196035-MD-RW				8	X	X	X	X	X	X	X	X	X	X	X		

* 24hrs for total metals only

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)
Are samples taken from a Regulated DW System? ☐ YES ☐ NO	
Are samples for human consumption/ use? ☐ YES ☐ NO	

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☑ SIF Observations Yes ☐ No ☐

Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C

FINAL COOLER TEMPERATURES °C: -1.6

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by: AP	Date: 14-Feb-22	Time: 9:45

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

NOV 2018 FRONT

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

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

Veolia Water Technologies Canada (Saint-Laurent)
ATTN: Josee Lalonde
4105 Sartelon
Saint-Laurent QC H4S 2B3

Date Received: 23-FEB-22
Report Date: 24-FEB-22 08:17 (MT)
Version: FINAL

Client Phone: 514-334-7230

Certificate of Analysis

Lab Work Order #: L2687682

Project P.O. #: 500019035.606300.24030003
Job Reference: 196035-MD
C of C Numbers:
Legal Site Desc:

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2687682-1 CW-TOTE							
Sampled By: CLIENT on 22-FEB-22							
Matrix: WATER							
Total Metals in Water by CRC ICPMS							
Aluminum (Al)-Total	<0.050	DLHC	0.050	mg/L	23-FEB-22	23-FEB-22	R5728523
Antimony (Sb)-Total	0.0078	DLHC	0.0010	mg/L	23-FEB-22	23-FEB-22	R5728523
Arsenic (As)-Total	0.0019	DLHC	0.0010	mg/L	23-FEB-22	23-FEB-22	R5728523
Barium (Ba)-Total	0.0316	DLHC	0.0010	mg/L	23-FEB-22	23-FEB-22	R5728523
Beryllium (Be)-Total	<0.0010	DLHC	0.0010	mg/L	23-FEB-22	23-FEB-22	R5728523
Bismuth (Bi)-Total	<0.00050	DLHC	0.00050	mg/L	23-FEB-22	23-FEB-22	R5728523
Boron (B)-Total	0.26	DLHC	0.10	mg/L	23-FEB-22	23-FEB-22	R5728523
Cadmium (Cd)-Total	<0.000050	DLHC	0.000050	mg/L	23-FEB-22	23-FEB-22	R5728523
Calcium (Ca)-Total	303	DLHC	0.50	mg/L	23-FEB-22	23-FEB-22	R5728523
Chromium (Cr)-Total	<0.0050	DLHC	0.0050	mg/L	23-FEB-22	23-FEB-22	R5728523
Cesium (Cs)-Total	<0.00010	DLHC	0.00010	mg/L	23-FEB-22	23-FEB-22	R5728523
Cobalt (Co)-Total	0.463	DLHC	0.0010	mg/L	23-FEB-22	23-FEB-22	R5728523
Copper (Cu)-Total	0.0068	DLHC	0.0050	mg/L	23-FEB-22	23-FEB-22	R5728523
Iron (Fe)-Total	0.37	DLHC	0.10	mg/L	23-FEB-22	23-FEB-22	R5728523
Lead (Pb)-Total	<0.00050	DLHC	0.00050	mg/L	23-FEB-22	23-FEB-22	R5728523
Lithium (Li)-Total	<0.010	DLHC	0.010	mg/L	23-FEB-22	23-FEB-22	R5728523
Magnesium (Mg)-Total	23.6	DLHC	0.050	mg/L	23-FEB-22	23-FEB-22	R5728523
Manganese (Mn)-Total	0.0264	DLHC	0.0050	mg/L	23-FEB-22	23-FEB-22	R5728523
Molybdenum (Mo)-Total	0.0928	DLHC	0.00050	mg/L	23-FEB-22	23-FEB-22	R5728523
Nickel (Ni)-Total	0.151	DLHC	0.0050	mg/L	23-FEB-22	23-FEB-22	R5728523
Phosphorus (P)-Total	<0.50	DLHC	0.50	mg/L	23-FEB-22	23-FEB-22	R5728523
Potassium (K)-Total	173	DLHC	0.50	mg/L	23-FEB-22	23-FEB-22	R5728523
Rubidium (Rb)-Total	0.0478	DLHC	0.0020	mg/L	23-FEB-22	23-FEB-22	R5728523
Selenium (Se)-Total	0.131	DLHC	0.00050	mg/L	23-FEB-22	23-FEB-22	R5728523
Silicon (Si)-Total	1.7	DLHC	1.0	mg/L	23-FEB-22	23-FEB-22	R5728523
Silver (Ag)-Total	<0.00050	DLHC	0.00050	mg/L	23-FEB-22	23-FEB-22	R5728523
Sodium (Na)-Total	477	DLHC	0.50	mg/L	23-FEB-22	23-FEB-22	R5728523
Strontium (Sr)-Total	1.07	DLHC	0.010	mg/L	23-FEB-22	23-FEB-22	R5728523
Sulfur (S)-Total	664	DLHC	5.0	mg/L	23-FEB-22	23-FEB-22	R5728523
Thallium (Tl)-Total	<0.00010	DLHC	0.00010	mg/L	23-FEB-22	23-FEB-22	R5728523
Tellurium (Te)-Total	<0.0020	DLHC	0.0020	mg/L	23-FEB-22	23-FEB-22	R5728523
Thorium (Th)-Total	<0.0010	DLHC	0.0010	mg/L	23-FEB-22	23-FEB-22	R5728523
Tin (Sn)-Total	<0.0010	DLHC	0.0010	mg/L	23-FEB-22	23-FEB-22	R5728523
Titanium (Ti)-Total	<0.0030	DLHC	0.0030	mg/L	23-FEB-22	23-FEB-22	R5728523
Tungsten (W)-Total	<0.0010	DLHC	0.0010	mg/L	23-FEB-22	23-FEB-22	R5728523
Uranium (U)-Total	0.00894	DLHC	0.00010	mg/L	23-FEB-22	23-FEB-22	R5728523
Vanadium (V)-Total	<0.0050	DLHC	0.0050	mg/L	23-FEB-22	23-FEB-22	R5728523
Zinc (Zn)-Total	<0.030	DLHC	0.030	mg/L	23-FEB-22	23-FEB-22	R5728523
Zirconium (Zr)-Total	<0.0020	DLHC	0.0020	mg/L	23-FEB-22	23-FEB-22	R5728523

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Sample Parameter Qualifier Key:

Qualifier	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
MET-T-CCMS-WT	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

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

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

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Client: Veolia Water Technologies Canada (Saint-Laurent)
4105 Sartelon
Saint-Laurent QC H4S 2B3
Contact: Josee Lalonde

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R5728523								
WG3699165-4 DUP		**WG3699165-3**						
Aluminum (Al)-Total		<0.050	<0.050	RPD-NA	mg/L	N/A	20	23-FEB-22
Antimony (Sb)-Total		0.0078	0.0080		mg/L	1.7	20	23-FEB-22
Arsenic (As)-Total		0.0019	0.0021		mg/L	8.6	20	23-FEB-22
Barium (Ba)-Total		0.0316	0.0318		mg/L	0.5	20	23-FEB-22
Beryllium (Be)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	23-FEB-22
Bismuth (Bi)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	23-FEB-22
Boron (B)-Total		0.26	0.26		mg/L	1.5	20	23-FEB-22
Cadmium (Cd)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	23-FEB-22
Calcium (Ca)-Total		303	308		mg/L	1.7	20	23-FEB-22
Chromium (Cr)-Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	23-FEB-22
Cesium (Cs)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	23-FEB-22
Cobalt (Co)-Total		0.463	0.460		mg/L	0.7	20	23-FEB-22
Copper (Cu)-Total		0.0068	0.0076		mg/L	11	20	23-FEB-22
Iron (Fe)-Total		0.37	0.36		mg/L	1.9	20	23-FEB-22
Lead (Pb)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	23-FEB-22
Lithium (Li)-Total		<0.010	<0.010	RPD-NA	mg/L	N/A	20	23-FEB-22
Magnesium (Mg)-Total		23.6	23.5		mg/L	0.1	20	23-FEB-22
Manganese (Mn)-Total		0.0264	0.0271		mg/L	2.5	20	23-FEB-22
Molybdenum (Mo)-Total		0.0928	0.0943		mg/L	1.7	20	23-FEB-22
Nickel (Ni)-Total		0.151	0.151		mg/L	0.1	20	23-FEB-22
Phosphorus (P)-Total		<0.50	<0.50	RPD-NA	mg/L	N/A	20	23-FEB-22
Potassium (K)-Total		173	173		mg/L	0.0	20	23-FEB-22
Rubidium (Rb)-Total		0.0478	0.0479		mg/L	0.1	20	23-FEB-22
Selenium (Se)-Total		0.131	0.132		mg/L	0.4	20	23-FEB-22
Silicon (Si)-Total		1.7	1.6		mg/L	3.5	20	23-FEB-22
Silver (Ag)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	23-FEB-22
Sodium (Na)-Total		477	476		mg/L	0.2	20	23-FEB-22
Strontium (Sr)-Total		1.07	1.09		mg/L	2.2	20	23-FEB-22
Sulfur (S)-Total		664	665		mg/L	0.1	20	23-FEB-22
Thallium (Tl)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	23-FEB-22
Tellurium (Te)-Total		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	23-FEB-22
Thorium (Th)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	23-FEB-22
Tin (Sn)-Total		<0.0010	<0.0010		mg/L			23-FEB-22

Quality Control Report

Client: Veolia Water Technologies Canada (Saint-Laurent)
4105 Sartelon
Saint-Laurent QC H4S 2B3
Contact: Josee Lalonde

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R5728523								
WG3699165-4 DUP		**WG3699165-3**						
Tin (Sn)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	23-FEB-22
Titanium (Ti)-Total		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	23-FEB-22
Tungsten (W)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	23-FEB-22
Uranium (U)-Total		0.00894	0.00908		mg/L	1.6	20	23-FEB-22
Vanadium (V)-Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	23-FEB-22
Zinc (Zn)-Total		<0.030	<0.030	RPD-NA	mg/L	N/A	20	23-FEB-22
Zirconium (Zr)-Total		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	23-FEB-22
WG3699165-2 LCS								
Aluminum (Al)-Total			103.7		%		80-120	23-FEB-22
Antimony (Sb)-Total			104.6		%		80-120	23-FEB-22
Arsenic (As)-Total			104.3		%		80-120	23-FEB-22
Barium (Ba)-Total			105.4		%		80-120	23-FEB-22
Beryllium (Be)-Total			101.8		%		80-120	23-FEB-22
Bismuth (Bi)-Total			99.2		%		80-120	23-FEB-22
Boron (B)-Total			94.7		%		80-120	23-FEB-22
Cadmium (Cd)-Total			105.7		%		80-120	23-FEB-22
Calcium (Ca)-Total			101.3		%		80-120	23-FEB-22
Chromium (Cr)-Total			104.3		%		80-120	23-FEB-22
Cesium (Cs)-Total			106.8		%		80-120	23-FEB-22
Cobalt (Co)-Total			102.5		%		80-120	23-FEB-22
Copper (Cu)-Total			103.3		%		80-120	23-FEB-22
Iron (Fe)-Total			104.3		%		80-120	23-FEB-22
Lead (Pb)-Total			103.0		%		80-120	23-FEB-22
Lithium (Li)-Total			98.9		%		80-120	23-FEB-22
Magnesium (Mg)-Total			103.3		%		80-120	23-FEB-22
Manganese (Mn)-Total			102.3		%		80-120	23-FEB-22
Molybdenum (Mo)-Total			102.2		%		80-120	23-FEB-22
Nickel (Ni)-Total			102.5		%		80-120	23-FEB-22
Phosphorus (P)-Total			104.5		%		70-130	23-FEB-22
Potassium (K)-Total			104.6		%		80-120	23-FEB-22
Rubidium (Rb)-Total			105.5		%		80-120	23-FEB-22
Selenium (Se)-Total			101.4		%		80-120	23-FEB-22
Silicon (Si)-Total			101.6		%		60-140	23-FEB-22

Quality Control Report

Client: Veolia Water Technologies Canada (Saint-Laurent)
4105 Sartelon
Saint-Laurent QC H4S 2B3
Contact: Josee Lalonde

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R5728523								
WG3699165-2 LCS								
Silver (Ag)-Total			98.5		%		80-120	23-FEB-22
Sodium (Na)-Total			104.0		%		80-120	23-FEB-22
Strontium (Sr)-Total			103.9		%		80-120	23-FEB-22
Sulfur (S)-Total			93.1		%		80-120	23-FEB-22
Thallium (Tl)-Total			102.8		%		80-120	23-FEB-22
Tellurium (Te)-Total			99.7		%		80-120	23-FEB-22
Thorium (Th)-Total			101.8		%		80-120	23-FEB-22
Tin (Sn)-Total			103.9		%		80-120	23-FEB-22
Titanium (Ti)-Total			100.9		%		80-120	23-FEB-22
Tungsten (W)-Total			103.4		%		80-120	23-FEB-22
Uranium (U)-Total			104.2		%		80-120	23-FEB-22
Vanadium (V)-Total			105.1		%		80-120	23-FEB-22
Zinc (Zn)-Total			104.7		%		80-120	23-FEB-22
Zirconium (Zr)-Total			101.6		%		80-120	23-FEB-22
WG3699165-1 MB								
Aluminum (Al)-Total			<0.0050		mg/L		0.005	23-FEB-22
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	23-FEB-22
Arsenic (As)-Total			<0.00010		mg/L		0.0001	23-FEB-22
Barium (Ba)-Total			<0.00010		mg/L		0.0001	23-FEB-22
Beryllium (Be)-Total			<0.00010		mg/L		0.0001	23-FEB-22
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	23-FEB-22
Boron (B)-Total			<0.010		mg/L		0.01	23-FEB-22
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	23-FEB-22
Calcium (Ca)-Total			<0.050		mg/L		0.05	23-FEB-22
Chromium (Cr)-Total			<0.00050		mg/L		0.0005	23-FEB-22
Cesium (Cs)-Total			<0.000010		mg/L		0.00001	23-FEB-22
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	23-FEB-22
Copper (Cu)-Total			<0.00050		mg/L		0.0005	23-FEB-22
Iron (Fe)-Total			<0.010		mg/L		0.01	23-FEB-22
Lead (Pb)-Total			<0.000050		mg/L		0.00005	23-FEB-22
Lithium (Li)-Total			<0.0010		mg/L		0.001	23-FEB-22
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	23-FEB-22
Manganese (Mn)-Total			<0.00050		mg/L		0.0005	23-FEB-22
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	23-FEB-22

Quality Control Report

Client: Veolia Water Technologies Canada (Saint-Laurent)
4105 Sartelon
Saint-Laurent QC H4S 2B3

Contact: Josee Lalonde

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R5728523								
WG3699165-1 MB								
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	23-FEB-22
Phosphorus (P)-Total			<0.050		mg/L		0.05	23-FEB-22
Potassium (K)-Total			<0.050		mg/L		0.05	23-FEB-22
Rubidium (Rb)-Total			<0.00020		mg/L		0.0002	23-FEB-22
Selenium (Se)-Total			<0.000050		mg/L		0.00005	23-FEB-22
Silicon (Si)-Total			<0.10		mg/L		0.1	23-FEB-22
Silver (Ag)-Total			<0.000050		mg/L		0.00005	23-FEB-22
Sodium (Na)-Total			<0.050		mg/L		0.05	23-FEB-22
Strontium (Sr)-Total			<0.0010		mg/L		0.001	23-FEB-22
Sulfur (S)-Total			<0.50		mg/L		0.5	23-FEB-22
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	23-FEB-22
Tellurium (Te)-Total			<0.00020		mg/L		0.0002	23-FEB-22
Thorium (Th)-Total			<0.00010		mg/L		0.0001	23-FEB-22
Tin (Sn)-Total			<0.00010		mg/L		0.0001	23-FEB-22
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	23-FEB-22
Tungsten (W)-Total			<0.00010		mg/L		0.0001	23-FEB-22
Uranium (U)-Total			<0.000010		mg/L		0.00001	23-FEB-22
Vanadium (V)-Total			<0.00050		mg/L		0.0005	23-FEB-22
Zinc (Zn)-Total			<0.0030		mg/L		0.003	23-FEB-22
Zirconium (Zr)-Total			<0.00020		mg/L		0.0002	23-FEB-22
WG3699165-5 MS		**WG3699165-3**						
Aluminum (Al)-Total			125.9		%		70-130	23-FEB-22
Antimony (Sb)-Total			109.4		%		70-130	23-FEB-22
Arsenic (As)-Total			109.3		%		70-130	23-FEB-22
Barium (Ba)-Total			N/A	MS-B	%		-	23-FEB-22
Beryllium (Be)-Total			105.9		%		70-130	23-FEB-22
Bismuth (Bi)-Total			100.4		%		70-130	23-FEB-22
Boron (B)-Total			N/A	MS-B	%		-	23-FEB-22
Cadmium (Cd)-Total			104.6		%		70-130	23-FEB-22
Calcium (Ca)-Total			N/A	MS-B	%		-	23-FEB-22
Chromium (Cr)-Total			106.2		%		70-130	23-FEB-22
Cesium (Cs)-Total			107.6		%		70-130	23-FEB-22
Cobalt (Co)-Total			N/A	MS-B	%		-	23-FEB-22
Copper (Cu)-Total			104.0		%		70-130	23-FEB-22

Quality Control Report

Client: Veolia Water Technologies Canada (Saint-Laurent)
4105 Sartelon
Saint-Laurent QC H4S 2B3
Contact: Josee Lalonde

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R5728523								
WG3699165-5 MS		**WG3699165-3**						
Iron (Fe)-Total			N/A	MS-B	%		-	23-FEB-22
Lead (Pb)-Total			103.3		%		70-130	23-FEB-22
Lithium (Li)-Total			101.8		%		70-130	23-FEB-22
Magnesium (Mg)-Total			N/A	MS-B	%		-	23-FEB-22
Manganese (Mn)-Total			N/A	MS-B	%		-	23-FEB-22
Molybdenum (Mo)-Total			N/A	MS-B	%		-	23-FEB-22
Nickel (Ni)-Total			N/A	MS-B	%		-	23-FEB-22
Phosphorus (P)-Total			127.4		%		70-130	23-FEB-22
Potassium (K)-Total			N/A	MS-B	%		-	23-FEB-22
Rubidium (Rb)-Total			N/A	MS-B	%		-	23-FEB-22
Selenium (Se)-Total			N/A	MS-B	%		-	23-FEB-22
Silicon (Si)-Total			N/A	MS-B	%		-	23-FEB-22
Silver (Ag)-Total			94.2		%		70-130	23-FEB-22
Sodium (Na)-Total			N/A	MS-B	%		-	23-FEB-22
Strontium (Sr)-Total			N/A	MS-B	%		-	23-FEB-22
Sulfur (S)-Total			N/A	MS-B	%		-	23-FEB-22
Thallium (Tl)-Total			102.7		%		70-130	23-FEB-22
Tellurium (Te)-Total			108.1		%		70-130	23-FEB-22
Thorium (Th)-Total			94.6		%		70-130	23-FEB-22
Tin (Sn)-Total			107.3		%		70-130	23-FEB-22
Titanium (Ti)-Total			101.0		%		70-130	23-FEB-22
Tungsten (W)-Total			106.6		%		70-130	23-FEB-22
Uranium (U)-Total			N/A	MS-B	%		-	23-FEB-22
Vanadium (V)-Total			109.3		%		70-130	23-FEB-22
Zinc (Zn)-Total			N/A	MS-B	%		-	23-FEB-22
Zirconium (Zr)-Total			101.1		%		70-130	23-FEB-22

Client: Veolia Water Technologies Canada (Saint-Laurent)
4105 Sartelon
Saint-Laurent QC H4S 2B3

Contact: Josee Lalonde

Legend:

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

Sample Parameter Qualifier Definitions:

Qualifier	Description
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

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

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

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

ALS www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L2687682-COFC

COC Number: 17 -

Page of

Report To	Contact and company name below will appear on the final report
Company:	Veolia Water Technologies (26895)
Contact:	Josee Lalonde
Phone:	
	Company address below will appear on the final report
Street:	4105 Sartelon
City/Province:	Ville St-Laurent
Postal Code:	H2S 2B3
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	
Contact:	

Report Format

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

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

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

Select Distribution: ☐ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax josee.lalonde@veolia.com

Email 2

Email 3

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax vwtcanada_payables@veolia.com

Email 2

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

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

PRIORITY (Business Days): 4 day [P4-20%] ☐ / 3 day [P3-25%] ☐ / 2 day [P2-50%] ☐

EMERGENCY: 1 Business day [E - 100%] ☑ / Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] ☐

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

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

Project Information

ALS Account # / Quote #:

Job #: 196035-MD

PO / AFE: 5000196035.606300.~~2~~20030003

LSD:

Oil and Gas Required Fields (client use)

AFE/Cost Center: | PO#

Major/Minor Code: | Routing Code:

...itioner:

...tion:

ALS Lab Work Order # (lab use only): L2687682 JD

ALS Contact:

Sampler:

Analysis Request

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

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	~~Cen~~	~~Hg~~	Metal Scan (Low Limit)	SAMPLES ON HOLD	SUSPECTED HAZARD (see Special Instructions)
	CW-TOTE	22/2/22		WW				X		

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

Are samples taken from a Regulated DW System?

☐ YES ☐ NO

Are samples for human consumption/ use?

☐ YES ☐ NO

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

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C | FINAL COOLER TEMPERATURES °C: 14.1

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by: [signature]	Date: Feb 23/22	Time: 10:00

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION WHITE - LABORATORY COPY YELLOW - CLIENT COPY NOV 2016 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.

AquaTox Testing & Consulting Inc.
B-11 Nicholas Beaver Road
Puslinch, ON N0B 2J0
Tel. (519) 763-4412
Fax. (519) 763-4419

TOXICITY TEST REPORT

Daphnia magna
EPS 1/RM/14

Work Order :	248516
Sample Number :	72838

SAMPLE IDENTIFICATION

Company :	Veolia Water Technologies Canada Inc.	Sample Date :	2022-05-27
Location :	Saint-Laurent QC	Time Collected :	10:00
Substance :	196035_MD_CW_8C	Date Received :	2022-05-30
Sampling Method :	Not provided	Time Received :	09:40
Sampled By :	J. Lalonde	Temperature at Receipt :	20 °C
Sample Description :	Clear, pale yellow with brown settled solids.	Date Tested :	2022-05-30

Test Method : Reference Method for Determining Acute Lethality of Effluents to *Daphnia magna* . Environment Canada EPS 1/RM/14 (Second Edition, December 2000, with February 2016 amendments).

48-HOUR TEST RESULTS

Substance	Effect	Value
Control	Mean Immobility	0.0 %
	Mean Mortality	0.0 %
100%	Mean Immobility	0.0 %
	Mean Mortality	0.0 %

The results reported relate only to the sample tested and as received.

TEST ORGANISM

Species :	*Daphnia magna*	Time to First Brood :	8.4 days
Organism Batch :	Dm22-10	Average Brood Size :	28.4 young
Culture Mortality :	0.4% (previous 7 days)		

TEST CONDITIONS

Sample Treatment :	None	Number of Replicates :	3
pH Adjustment :	None	Organisms / Replicate :	10
Pre-aeration Rate :	~30 mL/min/L	Organisms / Test Level :	30
Duration of Pre-Aeration :	0 minutes	Organism Loading Rate :	15.0 mL/organism
Test Aeration :	None	Impaired Control Organisms :	0.0%
Hardness Adjustment :	None	Test Method Deviation(s) :	None

REFERENCE TOXICANT DATA

Toxicant :	Sodium Chloride	Historical Mean LC50 :	6.5 g/L
Date Tested :	2022-05-24	Warning Limits (± 2SD) :	5.8 - 7.2 g/L
LC50 :	6.4 g/L	Organism Batch :	Dm22-10
95% Confidence Limits :	6.2 - 6.6 g/L	Analyst(s) :	JJ
Statistical Method :	Spearman-Kärber		

COMMENTS

All test validity criteria as specified in the test method were satisfied.

Approved By : ______________________

Project Manager

Work Order : 248516
Sample Number : 72838

TEST DATA

	pH	Dissolved O_2 (mg/L)	Conductivity (µmhos/cm)	Temperature (°C)	O_2 Saturation (%)*	Hardness (as $CaCO_3$)
Initial Chemistry (100%) :	7.2	8.2	3970	21	97	290 mg/L

0 HOURS

Date & Time 2022-05-30 11:40
Analyst(s) : CH (SV)

Concentration (%)	Replicate	Dead	Immobile	pH	Dissolved O_2	Conductivity	Temperature	O_2 Saturation*	Hardness
100	A	0	0	7.2	8.2	3970	21	97	290
100	B	0	0	7.2	8.2	3970	21	97	290
100	C	0	0	7.2	8.2	3970	21	97	290
Control	A	0	0	8.4	8.5	580	20	100	160
Control	B	0	0	8.4	8.5	580	20	100	160
Control	C	0	0	8.4	8.5	580	20	100	160

Notes:

24 HOURS

Date & Time 2022-05-31 11:40
Analyst(s) : JCS

Concentration (%)	Replicate	Dead	Immobile	pH	Dissolved O_2	Conductivity	Temperature
100	A	–	0	–	–	–	21
100	B	–	0	–	–	–	21
100	C	–	0	–	–	–	21
Control	A	–	0	–	–	–	21
Control	B	–	0	–	–	–	21
Control	C	–	0	–	–	–	21

Notes:

48 HOURS

Date & Time 2022-06-01 11:40
Analyst(s) : CH (NM)

Concentration (%)	Replicate	Dead	Immobile	pH	Dissolved O_2	Conductivity	Temperature
100	A	0	0	8.2	8.1	4010	21
100	B	0	0	8.2	8.1	4000	21
100	C	0	0	8.2	8.1	4010	21
Control	A	0	0	8.4	8.4	581	21
Control	B	0	0	8.4	8.4	581	21
Control	C	0	0	8.4	8.4	584	21

Notes:

Number immobile does not include number dead.

"–" = not measured/not required
* adjusted for temperature and barometric pressure

Test Data Reviewed By : JL
Date : 2022-06-06

AquaTox Testing & Consulting Inc.
B-11 Nicholas Beaver Road
Puslinch, ON N0B 2J0
Tel. (519) 763-4412
Fax. (519) 763-4419

TOXICITY TEST REPORT
Rainbow Trout
EPS 1/RM/13

Work Order :	248516
Sample Number :	72838

SAMPLE IDENTIFICATION

Company :	Veolia Water Technologies Canada Inc.	Sample Date :	2022-05-27
Location :	Saint-Laurent QC	Time Collected :	10:00
Substance :	196035_MD_CW_8C	Date Received :	2022-05-30
Sampling Method :	Not provided	Time Received :	09:40
Sampled By :	J. Lalonde	Temperature at Receipt :	20 °C
Sample Description :	Clear, pale yellow with brown settled solids.	Date Tested :	2022-05-30

Test Method(s) : Reference Method for Determining Acute Lethality of Liquid Effluents to Rainbow Trout. Environment Canada, EPS 1/RM/13 (2nd Edition, December 2000, with May 2007 and February 2016 amendments).

96-HOUR TEST RESULTS

Substance	Effect	Value
Control	Mean Impairment	0.0 %
	Mean Mortality	0.0 %
100%	Mean Impairment	0.0 %
	Mean Mortality	0.0 %

The results reported relate only to the sample tested and as received.

TEST ORGANISM

Test Organism :	*Oncorhynchus mykiss*	Average Fork Length (± 2 SD) :	44.2 mm (±6.0)
Organism Batch :	T22-11	Range of Fork Lengths :	39 - 47 mm
Control Sample Size :	10	Average Wet Weight (± 2 SD) :	0.84 g (±0.30)
Cumulative stock tank mortality rate :	0% (previous 7 days)	Range of Wet Weights :	0.60 - 1.01 g
Control organisms showing stress :	0 (at test completion)	Organism Loading Rate :	0.5 g/L

TEST CONDITIONS

Sample Treatment :	None	Volume Tested (L) :	18
pH Adjustment :	None	Number of Replicates :	1
Test Aeration :	Yes	Organisms Per Replicate :	10
Pre-aeration/Aeration Rate :	6.5 ± 1 mL/min/L	Organisms Per Test Level :	10
Duration of Pre-Aeration :	30 minutes	Test Method Deviation(s) :	None

REFERENCE TOXICANT DATA

Toxicant :	Potassium Chloride	Date Tested :	2022-05-11
Organism Batch :	T22-11	Analyst(s) :	PC, CN, JW
LC50 :	4068 mg/L	Historical Mean LC50 :	3700 mg/L
95% Confidence Limits :	3733 - 4470 mg/L	Warning Limits (± 2SD) :	2777 - 4929 mg/L
Statistical Method :	Linear Regression (MLE)		

COMMENTS

•All test validity criteria as specified in the test method were satisfied.

Approved By : ____________________

Project Manager

AQUATOX

TOXICITY TEST REPORT
Rainbow Trout
EPS 1/RM/13

Work Order : 248516
Sample Number : 72838

TEST DATA

	pH	Dissolved O_2 (mg/L)	Conductivity (µmhos/cm)	Temperature (°C)	O_2 Saturation (%)*
Initial Water Chemistry (100%) :	7.1	8.4	4021	16	92
After 30 min pre-aeration :	7.2	8.8	4070	16	96

0 HOURS

Date & Time 2022-05-30 12:40
Analyst(s) : JCS (SV)/JD (SV)

Concentration	Dead	Impaired	pH	Dissolved O_2	Conductivity	Temperature	O_2 Saturation*
100%	0	0	7.2	8.8	4070	16	96
Control	0	0	8.2	9.5	849	15	100

Notes:

24 HOURS

Date & Time 2022-05-31 12:40
Analyst(s) : JD (SV)

Concentration	Dead	Impaired	pH	Dissolved O_2	Conductivity	Temperature
100%	0	0	–	–	–	15
Control	0	0	–	–	–	15

Notes:

48 HOURS

Date & Time 2022-06-01 12:40
Analyst(s) : JCS (KP)

Concentration	Dead	Impaired	pH	Dissolved O_2	Conductivity	Temperature
100%	0	0	–	–	–	14
Control	0	0	–	–	–	14

Notes:

72 HOURS

Date & Time 2022-06-02 12:40
Analyst(s) : JCS (SV)

Concentration	Dead	Impaired	pH	Dissolved O_2	Conductivity	Temperature
100%	0	0	–	–	–	15
Control	0	0	–	–	–	15

Notes:

96 HOURS

Date & Time 2022-06-03 12:40
Analyst(s) : JCS (KP)

Concentration	Dead	Impaired	pH	Dissolved O_2	Conductivity	Temperature
100%	0	0	8.1	8.9	4076	15
Control	0	0	8.4	9.1	800	15

Notes:

"–" = not measured/not required

Number impaired does not include number dead.

* adjusted for temperature and barometric pressure

Test Data Reviewed By : JL

Date : 2022-06-06

CHAIN OF CUSTODY RECORD

AQUATOX

AquaTox Work Order No: 248516

Shipping Address: AquaTox Testing & Consulting Inc.
B-11 Nicholas Beaver Road
Puslinch, Ontario Canada N0B 2J0

Voice: (519) 763-4412 Fax: (519) 763-4419

P.O. Number:	500019603S.606300.21030003
Field Sampler Name (print):	J. Lalonde
Signature:	
Affiliation:	Fridge
Sample Storage (prior to shipping):	
Custody Relinquished by:	
Date/Time Shipped:	2022-05-27

Client:	VEOLIA Veolia Water Technologies Canada 4105 Sartelon Saint-Laurent, QC H4S 2B3 Tel. 514-334-7230
Phone:	
Fax:	
Contact:	J. Lalonde

Sample Identification					Analyses Requested										Sample Method and Volume		
Date Collected (yyyy-mm-dd)	Time Collected (e.g. 14:30, 24 hr clock)	Sample Name	AquaTox Sample Number	Temp. on arrival	Rainbow Trout Single Concentration	Rainbow Trout LC50	Daphnia magna Single Concentration	Daphnia magna LC50	Fathead Minnow Survival & Growth	Ceriodaphnia dubia Survival & Reproduction	Lemna minor Growth	Pseudokirchneriella subcapitata Growth	Other (please specify below)	Grab	Composite	# of Containers and Volume (eg. 2 x 1L, 3 x 10L, etc.)
22-05-27	10:00	196035_MD_CW_8°C	72838	20°C	X		X									

For Lab Use Only

Received By:	JP/BC
Date:	2022-05-30
Time:	9:40
Storage Location:	
Storage Temp.(°C)	

Please list any special requests or instructions:

AquaTox Testing & Consulting Inc.
B-11 Nicholas Beaver Road
Puslinch, ON N0B 2J0
Tel. (519) 763-4412
Fax. (519) 763-4419

PRELIMINARY

ACUTE LETHALITY REPORT SUMMARY

Work Order : 248516

Josée Lalonde
Veolia Water Technologies Canada Inc.
4105 Sartelon
Saint-Laurent QC
H4S 2B3

RESULTS

Substance	Date Collected	Date Tested	Species / Test	LC50	Mortality in 100% Concentration (%)
196035_MD_CW_8C	2022-05-27	2022-05-30	Dm SC	-	0
	2022-05-27	2022-05-30	RBT SC	-	0

RBT = rainbow trout
Dm = *Daphnia magna*
* = pH Stabilized
SC = single concentration

Test Protocols

Reference Method for Determining Acute Lethality of Effluents to Daphnia magna. Environment Canada EPS 1/RM/14 (Second Edition, December 2000, with February 2016 amendments)

Reference Method for Determining Acute Lethality of Liquid Effluents to Rainbow Trout. Environment Canada, EPS 1/RM/13 (2nd Edition, December 2000, with May 2007 and February 2016 amendments) .

Although test results are generated under strict QA/QC protocols, the results provided herein, along with any unsigned test reports, faxes, or emails are considered preliminary.

AquaTox Testing & Consulting Inc.
B-11 Nicholas Beaver Road
Puslinch, ON N0B 2J0
Tel. (519) 763-4412
Fax. (519) 763-4419

TOXICITY TEST REPORT

Daphnia magna

EPS 1/RM/14

Work Order :	248414
Sample Number :	72702

SAMPLE IDENTIFICATION

Company :	Veolia Water Technologies Canada Inc.	Sample Date :	2022-05-17
Location :	Saint-Laurent QC	Time Collected :	12:00
Substance :	196035_MD_CW15C	Date Received :	2022-05-18
Sampling Method :	Not provided	Time Received :	12:05
Sampled By :	J. Lalonde	Temperature on Receipt :	17 °C
Sample Description :	Clear, yellow.	Date Tested :	2022-05-18

Test Method : Reference Method for Determining Acute Lethality of Effluents to *Daphnia magna* . Environment Canada EPS 1/RM/14 (Second Edition, December 2000, with February 2016 amendments).

48-HOUR TEST RESULTS

Substance	Effect	Value
Control	Mean Immobility	0.0 %
	Mean Mortality	0.0 %
100%	Mean Immobility	0.0 %
	Mean Mortality	0.0 %

The results reported relate only to the sample tested and as received.

TEST ORGANISM

Species :	*Daphnia magna*	Time to First Brood :	8.2 days
Organism Batch :	Dm22-09	Average Brood Size :	32.7 young
Culture Mortality :	3.0% (previous 7 days)		

TEST CONDITIONS

Sample Treatment :	None	Number of Replicates :	3
pH Adjustment :	None	Organisms / Replicate :	10
Pre-aeration Rate :	~30 mL/min/L	Organisms / Test Level :	30
Duration of Pre-Aeration :	0 minutes	Organism Loading Rate :	15.0 mL/organism
Test Aeration :	None	Impaired Control Organisms :	0.0%
Hardness Adjustment :	None	Test Method Deviation(s) :	None

REFERENCE TOXICANT DATA

Toxicant :	Sodium Chloride	Historical Mean LC50 :	6.5 g/L
Date Tested :	2022-05-10	Warning Limits (± 2SD) :	5.8 - 7.2 g/L
LC50 :	6.3 g/L	Organism Batch :	Dm22-09
95% Confidence Limits :	5.8 - 6.8 g/L	Analyst(s) :	JJ
Statistical Method :	Binomial		

COMMENTS

All test validity criteria as specified in the test method were satisfied.

Approved By : ______________________

Project Manager

Work Order : 248414
Sample Number : 72702

TEST DATA

	pH	Dissolved O_2 (mg/L)	Conductivity (µmhos/cm)	Temperature (°C)	O_2 Saturation (%)*	Hardness (as $CaCO_3$)
Initial Chemistry (100%) :	7.2	8.4	4310	20	100	400 mg/L

0 HOURS

Date & Time 2022-05-18 12:55
Analyst(s) : CH (NM)/NM

Concentration (%)	Replicate	Dead	Immobile	pH	Dissolved O_2	Conductivity	Temperature	O_2 Saturation*	Hardness
100	A	0	0	7.2	8.4	4310	20	100	400
100	B	0	0	7.2	8.4	4310	20	100	400
100	C	0	0	7.2	8.4	4310	20	100	400
Control	A	0	0	8.5	8.8	557	20	100	160
Control	B	0	0	8.5	8.8	557	20	100	160
Control	C	0	0	8.5	8.8	557	20	100	160

Notes:

24 HOURS

Date & Time 2022-05-19 12:55
Analyst(s) : JGR (NM)

Concentration (%)	Replicate	Dead	Immobile	pH	Dissolved O_2	Conductivity	Temperature
100	A	–	0	–	–	–	20
100	B	–	0	–	–	–	20
100	C	–	0	–	–	–	20
Control	A	–	0	–	–	–	20
Control	B	–	0	–	–	–	20
Control	C	–	0	–	–	–	20

Notes:

48 HOURS

Date & Time 2022-05-20 12:55
Analyst(s) : JCS/JGR (KP)

Concentration (%)	Replicate	Dead	Immobile	pH	Dissolved O_2	Conductivity	Temperature
100	A	0	0	8.5	7.4	4310	22
100	B	0	0	8.3	7.3	4290	22
100	C	0	0	8.4	7.4	4340	22
Control	A	0	0	8.3	8.2	567	22
Control	B	0	0	8.4	8.1	568	22
Control	C	0	0	8.4	8.3	569	22

Notes:

Number immobile does not include number dead.

"–" = not measured/not required
* adjusted for temperature and barometric pressure

Test Data Reviewed By : FS
Date : 2022-05-27

AquaTox Testing & Consulting Inc.
B-11 Nicholas Beaver Road
Puslinch, ON N0B 2J0
Tel. (519) 763-4412
Fax. (519) 763-4419

TOXICITY TEST REPORT

Rainbow Trout
EPS 1/RM/13

Work Order :	248414
Sample Number :	72702

SAMPLE IDENTIFICATION

Company :	Veolia Water Technologies Canada Inc.	Sample Date :	2022-05-17
Location :	Saint-Laurent QC	Time Collected :	12:00
Substance :	196035_MD_CW15C	Date Received :	2022-05-18
Sampling Method :	Not provided	Time Received :	12:05
Sampled By :	J. Lalonde	Temperature on Receipt :	17 °C
Sample Description :	Clear, yellow.	Date Tested :	2022-05-18

Test Method(s) : Reference Method for Determining Acute Lethality of Liquid Effluents to Rainbow Trout. Environment Canada, EPS 1/RM/13 (2nd Edition, December 2000, with May 2007 and February 2016 amendments).

96-HOUR TEST RESULTS

Substance	Effect	Value
Control	Mean Impairment	0.0 %
	Mean Mortality	0.0 %
100%	Mean Impairment	0.0 %
	Mean Mortality	0.0 %

The results reported relate only to the sample tested and as received.

TEST ORGANISM

Test Organism :	*Oncorhynchus mykiss*	Average Fork Length (± 2 SD) :	41.2 mm (±5.9)
Organism Batch :	T22-11	Range of Fork Lengths :	36 - 44 mm
Control Sample Size :	10	Average Wet Weight (± 2 SD) :	0.66 g (±0.30)
Cumulative stock tank mortality rate :	0% (previous 7 days)	Range of Wet Weights :	0.42 - 0.87 g
Control organisms showing stress :	0 (at test completion)	Organism Loading Rate :	0.4 g/L

TEST CONDITIONS

Sample Treatment :	None	Volume Tested (L) :	18
pH Adjustment :	None	Number of Replicates :	1
Test Aeration :	Yes	Organisms Per Replicate :	10
Pre-aeration/Aeration Rate :	6.5 ± 1 mL/min/L	Organisms Per Test Level :	10
Duration of Pre-Aeration :	30 minutes	Test Method Deviation(s) :	None

REFERENCE TOXICANT DATA

Toxicant :	Potassium Chloride	Date Tested :	2022-05-11
Organism Batch :	T22-11	Analyst(s) :	PC, CN, JW
LC50 :	4068 mg/L	Historical Mean LC50 :	3700 mg/L
95% Confidence Limits :	3733 - 4470 mg/L	Warning Limits (± 2SD) :	2777 - 4929 mg/L
Statistical Method :	Linear Regression (MLE)		

COMMENTS

•All test validity criteria as specified in the test method were satisfied.

Approved By : ______________________

Project Manager

Work Order : 248414
Sample Number : 72702

TEST DATA

	pH	Dissolved O_2 (mg/L)	Conductivity (µmhos/cm)	Temperature (°C)	O_2 Saturation (%)*
Initial Water Chemistry (100%) :	7.0	8.7	4360	15	94
After 30 min pre-aeration :	7.2	8.9	4365	15	96

0 HOURS

Date & Time 2022-05-18 13:25
Analyst(s) : JW/BC (JW)

Concentration	Dead	Impaired	pH	Dissolved O_2	Conductivity	Temperature	O_2 Saturation*
100%	0	0	7.2	8.9	4365	15	96
Control	0	0	8.3	9.6	819	14	100

Notes:

24 HOURS

Date & Time 2022-05-19 13:25
Analyst(s) : JCS (KP)

Concentration	Dead	Impaired	pH	Dissolved O_2	Conductivity	Temperature
100%	0	0	–	–	–	15
Control	0	0	–	–	–	15

Notes:

48 HOURS

Date & Time 2022-05-20 13:25
Analyst(s) : JCS (JW)

Concentration	Dead	Impaired	pH	Dissolved O_2	Conductivity	Temperature
100%	0	0	–	–	–	14
Control	0	0	–	–	–	14

Notes:

72 HOURS

Date & Time 2022-05-21 13:25
Analyst(s) : JCS (JL)

Concentration	Dead	Impaired	pH	Dissolved O_2	Conductivity	Temperature
100%	0	0	–	–	–	14
Control	0	0	–	–	–	14

Notes:

96 HOURS

Date & Time 2022-05-22 13:25
Analyst(s) : JCS (SV)

Concentration	Dead	Impaired	pH	Dissolved O_2	Conductivity	Temperature
100%	0	0	8.5	9.1	4377	14
Control	0	0	8.4	9.3	761	14

Notes:

"–" = not measured/not required
Number impaired does not include number dead.
* adjusted for temperature and barometric pressure

Test Data Reviewed By : EM
Date : 2022-05-24

CHAIN OF CUSTODY RECORD

AQUATOX

AquaTox Work Order No: 248414

Shipping Address: AquaTox Testing & Consulting Inc.
B-11 Nicholas Beaver Road
Puslinch, Ontario Canada N0B 2J0

Voice: (519) 763-4412 **Fax:** (519) 763-4419

P.O. Number:	5000196035.606300.21030003
Field Sampler Name (print):	J. LALANDE
Signature:	
Affiliation:	Fridge
Sample Storage (prior to shipping):	
Custody Relinquished by:	
Date/Time Shipped:	2022.05.17

Client:	VWT 4105 Sartelon St-Laurent QC H4S 2B3
Phone:	514-607-5930
Fax:	
Contact:	J. Lalonde

Date Collected (yyyy-mm-dd)	Time Collected (e.g. 14:30, 24 hr clock)	Sample Name	AquaTox Sample Number	Temp. on arrival	Rainbow Trout Single Concentration	Rainbow Trout LC50	*Daphnia magna* Single Concentration	*Daphnia magna* LC50	Fathead Minnow Survival & Growth	*Ceriodaphnia dubia* Survival & Reproduction	*Lemna minor* Growth	*Pseudokirchneriella subcapitata* Growth	Other (please specify below)	Grab	Composite	# of Containers and Volume (eg. 2 x 1L, 3 x 10L, etc.)
2022.05.17	12:00	196035.MD-CW15°C	72702	17°C	X		X									

For Lab Use Only

Received By:	JW / BC
Date:	2022-05-18
Time:	12:05
Storage Location:	
Storage Temp.(°C)	

Please list any special requests or instructions:

APPENDIX C. SAFETY DATA SHEETS

SAFETY DATA SHEET

1. Identification

Product identifier **HYDREX 3253**

Other means of identification None.

Recommended use Potable Water Coagulant
Odor Control Treatment

Recommended restrictions PROFESSIONAL USE ONLY

Manufacturer/Importer/Supplier/Distributor information

Supplier Veolia Water Technologies Canada Inc.

Address 2000 Argentia Road, Plaza IV, Suite 430
Mississauga, ON L5N 1W1
Canada

Contact Person Hydrex Product Specialist

Telephone (905) 286-4846

Fax (905) 286-0488

e-mail vwtcanada-hydrex@veolia.com

24-Hour Emergency telephone 24 Hour Number: +1-760-476-3962 (Code:333239)

Supplier Not available.

2. Hazard(s) identification

Physical hazards	Corrosive to metals	Category 1
Health hazards	Acute toxicity, oral	Category 4
	Skin corrosion/irritation	Category 1
	Serious eye damage/eye irritation	Category 1
Environmental hazards	Hazardous to the aquatic environment, acute hazard	Category 3

Label elements

Signal word Danger

Hazard statement May be corrosive to metals. Harmful if swallowed. Causes severe skin burns and eye damage. Causes serious eye damage. Harmful to aquatic life.

Precautionary statement

Prevention Keep only in original packaging. Do not breathe mist or vapor. Wash thoroughly after handling. Do not eat, drink or smoke when using this product. Avoid release to the environment. Wear protective gloves/protective clothing/eye protection/face protection.

Response IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water. IF INHALED: Remove person to fresh air and keep comfortable for breathing. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER/doctor. Wash contaminated clothing before reuse. Absorb spillage to prevent material-damage.

Storage Store in a corrosion resistant container with a resistant inner liner.

Disposal Dispose of contents/container in accordance with local/regional/national/international regulations.

Other hazards None known.

Supplemental information None.

3. Composition/information on ingredients

Mixtures

Chemical name	Common name and synonyms	CAS number	%
IRON, WATER-SOLUBLE SALTS, N.O.S.		10028-22-5	40 - < 60
FERROUS SULPHATE		7720-78-7	< 1
Other components below reportable levels			40 - < 60

All concentrations are in percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

4. First-aid measures

Inhalation	Move to fresh air. Call a physician if symptoms develop or persist.
Skin contact	Take off immediately all contaminated clothing. Rinse skin with water/shower. Call a physician or poison control center immediately. Chemical burns must be treated by a physician. Wash contaminated clothing before reuse.
Eye contact	Immediately flush eyes with plenty of water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Call a physician or poison control center immediately.
Ingestion	Call a physician or poison control center immediately. Rinse mouth. Do not induce vomiting. If vomiting occurs, keep head low so that stomach content doesn't get into the lungs.
Most important symptoms/effects, acute and delayed	Nausea, vomiting. Abdominal pain. Diarrhea. Burning pain and severe corrosive skin damage. Causes serious eye damage. Symptoms may include stinging, tearing, redness, swelling, and blurred vision. Permanent eye damage including blindness could result.
Indication of immediate medical attention and special treatment needed	Provide general supportive measures and treat symptomatically. Chemical burns: Flush with water immediately. While flushing, remove clothes which do not adhere to affected area. Call an ambulance. Continue flushing during transport to hospital. Keep victim warm. Keep victim under observation. Symptoms may be delayed.
General information	Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. Show this safety data sheet to the doctor in attendance.

5. Fire-fighting measures

Suitable extinguishing media	Water fog. Foam. Dry chemical powder. Carbon dioxide (CO2).
Unsuitable extinguishing media	Not available.
Specific hazards arising from the chemical	During fire, gases hazardous to health may be formed.
Special protective equipment and precautions for firefighters	Self-contained breathing apparatus and full protective clothing must be worn in case of fire.
Fire fighting equipment/instructions	Move containers from fire area if you can do so without risk.
Specific methods	Use standard firefighting procedures and consider the hazards of other involved materials.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

Keep unnecessary personnel away. Keep people away from and upwind of spill/leak. Wear appropriate protective equipment and clothing during clean-up. Do not breathe mist or vapor. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Ensure adequate ventilation. Local authorities should be advised if significant spillages cannot be contained. For personal protection, see section 8 of the SDS.

Methods and materials for containment and cleaning up

Should not be released into the environment. Prevent entry into waterways, sewer, basements or confined areas.

Large Spills: Stop the flow of material, if this is without risk. Dike the spilled material, where this is possible. Absorb spillage to prevent material damage. Use a non-combustible material like vermiculite, sand or earth to soak up the product and place into a container for later disposal. Following product recovery, flush area with water.

Small Spills: Wipe up with absorbent material (e.g. cloth, fleece). Clean surface thoroughly to remove residual contamination.

Never return spills to original containers for re-use. For waste disposal, see section 13 of the SDS.

Environmental precautions Avoid release to the environment. Inform appropriate managerial or supervisory personnel of all environmental releases. Prevent further leakage or spillage if safe to do so. Do not contaminate water. Avoid discharge into drains, water courses or onto the ground.

7. Handling and storage

Precautions for safe handling Avoid forming spray/aerosol mists. Do not breathe mist or vapor. Do not get in eyes, on skin, or on clothing. Do not taste or swallow. Avoid prolonged exposure. When using, do not eat, drink or smoke. Provide adequate ventilation. Wear appropriate personal protective equipment. Wash hands thoroughly after handling. Avoid release to the environment. Observe good industrial hygiene practices.

Conditions for safe storage, including any incompatibilities Store in a cool, dry place out of direct sunlight. Store in corrosive resistant container with a resistant inner liner. Store in original tightly closed container. Keep only in the original container. Store away from incompatible materials (see Section 10 of the SDS). Store in cool, dry place.

8. Exposure controls/personal protection

Occupational exposure limits

US. ACGIH Threshold Limit Values

Components	Type	Value
FERROUS SULPHATE (CAS 7720-78-7)	TWA	1 mg/m3
IRON, WATER-SOLUBLE SALTS, N.O.S. (CAS 10028-22-5)	TWA	1 mg/m3

Canada. Alberta OELs (Occupational Health & Safety Code, Schedule 1, Table 2)

Components	Type	Value
FERROUS SULPHATE (CAS 7720-78-7)	TWA	1 mg/m3
IRON, WATER-SOLUBLE SALTS, N.O.S. (CAS 10028-22-5)	TWA	1 mg/m3

Canada. British Columbia OELs. (Occupational Exposure Limits for Chemical Substances, Occupational Health and Safety Regulation 296/97, as amended)

Components	Type	Value
FERROUS SULPHATE (CAS 7720-78-7)	STEL	2 mg/m3
	TWA	1 mg/m3
IRON, WATER-SOLUBLE SALTS, N.O.S. (CAS 10028-22-5)	STEL	2 mg/m3
	TWA	1 mg/m3

Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act)

Components	Type	Value
FERROUS SULPHATE (CAS 7720-78-7)	TWA	1 mg/m3
IRON, WATER-SOLUBLE SALTS, N.O.S. (CAS 10028-22-5)	TWA	1 mg/m3

Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents)

Components	Type	Value
FERROUS SULPHATE (CAS 7720-78-7)	TWA	1 mg/m3
IRON, WATER-SOLUBLE SALTS, N.O.S. (CAS 10028-22-5)	TWA	1 mg/m3

Canada. Quebec OELs. (Ministry of Labor - Regulation Respecting the Quality of the Work Environment)

Components	Type	Value
FERROUS SULPHATE (CAS 7720-78-7)	TWA	1 mg/m3

Canada. Quebec OELs. (Ministry of Labor - Regulation Respecting the Quality of the Work Environment)

Components	Type	Value
IRON, WATER-SOLUBLE SALTS, N.O.S. (CAS 10028-22-5)	TWA	1 mg/m3

Biological limit values No biological exposure limits noted for the ingredient(s).

Appropriate engineering controls Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. Eye wash facilities and emergency shower must be available when handling this product.

Individual protection measures, such as personal protective equipment

Eye/face protection Chemical goggles and face shield are recommended. Wear safety glasses with side shields (or goggles).

Skin protection

Hand protection Chemical resistant gloves.

Other Wear appropriate chemical resistant clothing. Chemical resistant gloves.

Respiratory protection In case of insufficient ventilation, wear suitable respiratory equipment. Avoid forming spray/aerosol mists.

Thermal hazards Wear appropriate thermal protective clothing, when necessary.

General hygiene considerations Keep away from food and drink. Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

9. Physical and chemical properties

Appearance

Physical state Liquid.

Form Liquid.

Color Red brown.

Odor Acid odor

Odor threshold Not available.

pH < 1

Melting point/freezing point 5 °F (-15 °C)

Initial boiling point and boiling range 221 °F (105 °C)

Flash point Not available.

Evaporation rate Not available.

Flammability (solid, gas) Not applicable.

Upper/lower flammability or explosive limits

Flammability limit - lower (%) Not available.

Flammability limit - upper (%) Not available.

Explosive limit - lower (%) Not available.

Explosive limit - upper (%) Not available.

Vapor pressure Not available.

Vapor density Not available.

Relative density Not available.

Solubility(ies)

Solubility (water) 100 %

Partition coefficient (n-octanol/water) < 3

Auto-ignition temperature	Not available.
Decomposition temperature	599 °F (315 °C)
Viscosity	30 mPa·s dynamic 20°c
Other information	
Density	1.55 g/cm³
Explosive properties	Not explosive.
Oxidizing properties	Not oxidizing.
Shelf life	3 months
Specific gravity	1.51 - 1.61

10. Stability and reactivity

Reactivity	Reacts violently with strong alkaline substances. This product may react with reducing agents. May be corrosive to metals.
Chemical stability	Material is stable under normal conditions.
Possibility of hazardous reactions	Hazardous polymerization does not occur.
Conditions to avoid	Avoid temperatures exceeding the decomposition temperature. Contact with incompatible materials. Do not mix with other chemicals.
Incompatible materials	Bases. Strong oxidizing agents. Oxidizing agents. Reducing agents. Metals. Avoid contact with metals reactant with acids : for instance aluminium, copper and iron.
Hazardous decomposition products	Sulphur oxides.

11. Toxicological information

Information on likely routes of exposure

Inhalation	May cause irritation to the respiratory system. Prolonged inhalation may be harmful.
Skin contact	Causes severe skin burns.
Eye contact	Causes serious eye damage.
Ingestion	Causes digestive tract burns. Harmful if swallowed.
Symptoms related to the physical, chemical and toxicological characteristics	Nausea, vomiting. Abdominal pain. Diarrhea. Burning pain and severe corrosive skin damage. Causes serious eye damage. Symptoms may include stinging, tearing, redness, swelling, and blurred vision. Permanent eye damage including blindness could result.

Information on toxicological effects

Acute toxicity	Harmful if swallowed.

Product	Species	Test Results
HYDREX 3253		
Acute		
Dermal		
LD50	Rat	19375 mg/kg
Oral		
LD50	Rat	500 mg/kg calculated

* Estimates for product may be based on additional component data not shown.

Skin corrosion/irritation	Causes severe skin burns and eye damage.
Serious eye damage/eye irritation	Causes serious eye damage.

Respiratory or skin sensitization

Canada - Alberta OELs: Irritant

FERROUS SULPHATE (CAS 7720-78-7)	Irritant
IRON, WATER-SOLUBLE SALTS, N.O.S. (CAS 10028-22-5)	Irritant

Respiratory sensitization	Not a respiratory sensitizer.
Skin sensitization	This product is not expected to cause skin sensitization.
Germ cell mutagenicity	No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.

Carcinogenicity	Not available.
Reproductive toxicity	This product is not expected to cause reproductive or developmental effects.
Specific target organ toxicity - single exposure	Not classified.
Specific target organ toxicity - repeated exposure	Not classified.
Aspiration hazard	Not an aspiration hazard.
Chronic effects	Prolonged inhalation may be harmful.

12. Ecological information

Ecotoxicity Harmful to aquatic life. Because of the low pH of this product, it would be expected to produce significant ecotoxicity upon exposure to aquatic organisms and aquatic systems.

Product		**Species**	**Test Results**
HYDREX 3253			
Aquatic			
Fish	LC50	Fish	79 mg/l, 96 hours calculated
Acute			
Crustacea	EC50	Daphnia	>= 100 mg/l, 48 hours calculated
Fish	LC50	Mosquitofish (Gambusia affinis affinis)	37.2 mg/l, 96 hours

* Estimates for product may be based on additional component data not shown.

Persistence and degradability No data is available on the degradability of any ingredients in the mixture.

Bioaccumulative potential

Partition coefficient n-octanol / water (log Kow)

< 3

Mobility in soil No data available.

Other adverse effects No other adverse environmental effects (e.g. ozone depletion, photochemical ozone creation potential, endocrine disruption, global warming potential) are expected from this component.

13. Disposal considerations

Disposal instructions	Collect and reclaim or dispose in sealed containers at licensed waste disposal site. Do not allow this material to drain into sewers/water supplies. Do not contaminate ponds, waterways or ditches with chemical or used container. Dispose of contents/container in accordance with local/regional/national/international regulations.
Local disposal regulations	Dispose in accordance with all applicable regulations.
Hazardous waste code	D002: Waste Corrosive material [pH <=2 or =>12.5, or corrosive to steel] The waste code should be assigned in discussion between the user, the producer and the waste disposal company.
Waste from residues / unused products	Dispose of in accordance with local regulations. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe manner (see: Disposal instructions).
Contaminated packaging	Since emptied containers may retain product residue, follow label warnings even after container is emptied. Empty containers should be taken to an approved waste handling site for recycling or disposal.

14. Transport information

TDG

UN number	UN3264
UN proper shipping name	CORROSIVE LIQUID, ACIDIC, INORGANIC, N.O.S. (IRON, WATER-SOLUBLE SALTS, N.O.S.)
Transport hazard class(es)	
Class	8
Subsidiary risk	-
Packing group	III
Environmental hazards	Marine pollutant only when containing 10% or more substances identified as marine pollutants or severe marine pollutant when containing 1% or more substances identified as severe marine pollutants

Special precautions for user Read safety instructions, SDS and emergency procedures before handling.

IATA

UN number UN3264

UN proper shipping name Corrosive liquid, acidic, inorganic, n.o.s. (IRON, WATER-SOLUBLE SALTS, N.O.S.)

Transport hazard class(es)

Class 8

Subsidiary risk -

Packing group III

Environmental hazards No.

ERG Code 8L

Special precautions for user Read safety instructions, SDS and emergency procedures before handling.

Other information

Passenger and cargo aircraft Allowed with restrictions.

Cargo aircraft only Allowed with restrictions.

IMDG

UN number UN3264

UN proper shipping name CORROSIVE LIQUID, ACIDIC, INORGANIC, N.O.S. (IRON, WATER-SOLUBLE SALTS, N.O.S.)

Transport hazard class(es)

Class 8

Subsidiary risk -

Packing group III

Environmental hazards

Marine pollutant No.

EmS F-A, S-B

Special precautions for user Read safety instructions, SDS and emergency procedures before handling.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code Not established.

IATA; IMDG; TDG

15. Regulatory information

Canadian regulations This product has been classified in accordance with the hazard criteria of the HPR and the SDS contains all the information required by the HPR.

Controlled Drugs and Substances Act

Not regulated.

Export Control List (CEPA 1999, Schedule 3)

Not listed.

Greenhouse Gases

Not listed.

Precursor Control Regulations

Not regulated.

International regulations

Stockholm Convention

Not applicable.

Rotterdam Convention

Not applicable.

Kyoto protocol

Not applicable.

Montreal Protocol

Not applicable.

Basel Convention

Not applicable.

International Inventories

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	Yes
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
Taiwan	Taiwan Toxic Chemical Substances (TCS)	No
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

*A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)
A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

16. Other information

Issue date 09-12-2018

Version # 01

Disclaimer Veolia Water Technologies is not able to anticipate all conditions under which this information and its product, or the products of other manufacturers in combination with its product, may be used. It is the user’s responsibility to ensure safe conditions for handling, storage and disposal of the product, and to assume liability for loss, injury, damage or expense due to improper use and or non respect of Veolia Water Technologies’ requirement.

Revision information

Product and Company Identification: Product Review
Composition / Information on Ingredients: Ingredients
Physical & Chemical Properties: Multiple Properties
Toxicological Information: Toxicological Data
Ecological Information: Ecotoxicity
Transport Information: Proper Shipping Name/Packing Group
Material Attributes & Uses; Experimental Data: Experimental Data
GHS: Classification

SAFETY DATA SHEET

1. Identification

Product identifier **Hydrex 3543**

Other means of identification None.

Recommended use Potable Water Treatment
PROFESSIONAL USE ONLY

Recommended restrictions No other uses are advised.

Manufacturer/Importer/Supplier/Distributor information

Supplier Veolia Water Technologies Canada Inc.

Address 2000 Argentia Road, Plaza IV, Suite 430
Mississauga, ON L5N 1W1
Canada

Contact Person Hydrex Product Specialist

Telephone (905) 286-4846

Fax (905) 286-0488

e-mail vwtcanada-hydrex@veolia.com

24-Hour Emergency telephone 24 Hour Number: +1-760-476-3962 (Code:333239)

Supplier Not available.

2. Hazard identification

Physical hazards Not classified.

Health hazards Not classified.

Environmental hazards Not classified.

Label elements

Hazard symbol None.

Signal word None.

Hazard statement The mixture does not meet the criteria for classification.

Precautionary statement

Prevention Observe good industrial hygiene practices.

Response Wash hands after handling.

Storage Store away from incompatible materials.

Disposal Dispose of waste and residues in accordance with local authority requirements.

Other hazards None known.

Supplemental information None.

3. Composition/information on ingredients

Mixtures

Chemical name	Common name and synonyms	CAS number	%
Polyacrylamide copolymer		69418-26-4	88 - < 92
Other components below reportable levels			10 - < 20

All concentrations are in percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

4. First-aid measures

Inhalation Move to fresh air. Call a physician if symptoms develop or persist.

Skin contact Wash off with soap and water. Get medical attention if irritation develops and persists.

Eye contact Rinse with water. Get medical attention if irritation develops and persists.

Ingestion Rinse mouth. Get medical attention if symptoms occur.

Most important symptoms/effects, acute and delayed	Direct contact with eyes may cause temporary irritation.
Indication of immediate medical attention and special treatment needed	Treat symptomatically.
General information	Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

5. Fire-fighting measures

Suitable extinguishing media	Water fog. Foam. Dry chemical powder. Carbon dioxide (CO_2).
Unsuitable extinguishing media	Not available.
Specific hazards arising from the chemical	Material can be slippery when wet. During fire, gases hazardous to health may be formed.
Special protective equipment and precautions for firefighters	Self-contained breathing apparatus and full protective clothing must be worn in case of fire.
Fire fighting equipment/instructions	Use water spray to cool unopened containers.
Specific methods	Use standard firefighting procedures and consider the hazards of other involved materials.
General fire hazards	No unusual fire or explosion hazards noted.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures	Keep unnecessary personnel away. For personal protection, see section 8 of the SDS. Slippery when wet.
Methods and materials for containment and cleaning up	This product is miscible in water. Stop the flow of material, if this is without risk. Following product recovery, flush area with water. For waste disposal, see section 13 of the SDS.
Environmental precautions	Avoid discharge into drains, water courses or onto the ground.

7. Handling and storage

Precautions for safe handling	Material can be slippery when wet. Avoid prolonged exposure. Observe good industrial hygiene practices.
Conditions for safe storage, including any incompatibilities	Protect from sunlight. Store in tightly closed container. Store away from incompatible materials (see Section 10 of the SDS). Store in cool, dry place.

8. Exposure controls/personal protection

Occupational exposure limits	No exposure limits noted for ingredient(s).
Biological limit values	No biological exposure limits noted for the ingredient(s).
Appropriate engineering controls	Not available.

Individual protection measures, such as personal protective equipment

Eye/face protection	Avoid contact with eyes. Wear safety glasses with side shields (or goggles). Use face shield in case of splash risk.
Skin protection	
Hand protection	Wear appropriate chemical resistant gloves.
Other	Wear suitable protective clothing. Wear apron or protective clothing in case of splashes.
Respiratory protection	In case of insufficient ventilation, wear suitable respiratory equipment.
Thermal hazards	Not applicable.
General hygiene considerations	Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

9. Physical and chemical properties

Appearance

Physical state	Solid.
Form	Crystalline powder.
Color	White.
Odor	Not available.
Odor threshold	Not available.
pH	6 - 8 (0,5 % solution)
Melting point/freezing point	Not available.
Initial boiling point and boiling range	Not available.
Flash point	Not Flammable
Evaporation rate	Not available.
Flammability (solid, gas)	Not available.
Upper/lower flammability or explosive limits	
Flammability limit - lower (%)	Not available.
Flammability limit - upper (%)	Not available.
Explosive limit - lower (%)	Not available.
Explosive limit - upper (%)	Not available.
Vapor pressure	Not available.
Vapor density	Not available.
Relative density	600 - 900 kg/m3
Solubility(ies)	
Solubility (water)	Limited by viscosity
Partition coefficient (n-octanol/water)	Not available.
Auto-ignition temperature	Not available.
Decomposition temperature	Not available.
Viscosity	Not available.
Other information	
Explosive properties	Not explosive.
Oxidizing properties	Not oxidizing.

10. Stability and reactivity

Reactivity	The product is stable and non-reactive under normal conditions of use, storage and transport.
Chemical stability	Material is stable under normal conditions.
Possibility of hazardous reactions	No dangerous reaction known under conditions of normal use.
Conditions to avoid	Contact with incompatible materials.
Incompatible materials	Strong oxidizing agents. Strong acids. Strong bases.
Hazardous decomposition products	No dangerous reaction known under conditions of normal use. Thermal decomposition can emit : Toxic gas.

11. Toxicological information

Information on likely routes of exposure

Inhalation	Prolonged inhalation may be harmful.	
Skin contact	No adverse effects due to skin contact are expected.	
Hydrex 3543		OECD 404 Result: Not irritating Species: Rabbit
Eye contact	Direct contact with eyes may cause temporary irritation.	

Ingestion	Expected to be a low ingestion hazard.
Symptoms related to the physical, chemical and toxicological characteristics	Direct contact with eyes may cause temporary irritation.

Information on toxicological effects

Acute toxicity

Product	Species	Test Results
Hydrex 3543		
Acute		
Oral		
LD50	Rat	> 5000 mg/kg OECD 401

Components	Species	Test Results
Polyacrylamide copolymer (CAS 69418-26-4)		
Acute		
Oral		
LD50	Rat	> 11000 mg/kg

Skin corrosion/irritation	Prolonged skin contact may cause temporary irritation.
Serious eye damage/eye irritation	Direct contact with eyes may cause temporary irritation.
Respiratory or skin sensitization	
Respiratory sensitization	Not a respiratory sensitizer.
Skin sensitization	This product is not expected to cause skin sensitization.
Germ cell mutagenicity	No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.
Carcinogenicity	Not classifiable as to carcinogenicity to humans.
Reproductive toxicity	This product is not expected to cause reproductive or developmental effects.
Specific target organ toxicity - single exposure	Not classified.
Specific target organ toxicity - repeated exposure	Not classified.
Aspiration hazard	Not an aspiration hazard.
Chronic effects	Prolonged inhalation may be harmful.

12. Ecological information

Ecotoxicity The product is not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Product		Species	Test Results
Hydrex 3543			
Aquatic			
Acute			
Crustacea	LC50	Daphnia magna	> 100 mg/l, 48 hours
Fish	LC50	Oncorhynchus mykiss	> 100 mg/l, 96 hours

Persistence and degradability	No data is available on the degradability of any ingredients in the mixture.
Bioaccumulative potential	
Mobility in soil	No data available.
Other adverse effects	No other adverse environmental effects (e.g. ozone depletion, photochemical ozone creation potential, endocrine disruption, global warming potential) are expected from this component.

13. Disposal considerations

Disposal instructions	Collect and reclaim or dispose in sealed containers at licensed waste disposal site.
Local disposal regulations	Dispose in accordance with all applicable regulations.

Hazardous waste code	The waste code should be assigned in discussion between the user, the producer and the waste disposal company.
Waste from residues / unused products	Dispose of in accordance with local regulations. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe manner (see: Disposal instructions).
Contaminated packaging	Since emptied containers may retain product residue, follow label warnings even after container is emptied. Empty containers should be taken to an approved waste handling site for recycling or disposal.

14. Transport information

TDG

Not regulated as dangerous goods.

IATA

Not regulated as dangerous goods.

IMDG

Not regulated as dangerous goods.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code Not applicable.

15. Regulatory information

Canadian regulations This product has been classified in accordance with the hazard criteria of the HPR and the SDS contains all the information required by the HPR.

Controlled Drugs and Substances Act

Not regulated.

Export Control List (CEPA 1999, Schedule 3)

Not listed.

Greenhouse Gases

Not listed.

Precursor Control Regulations

Not regulated.

International regulations

Stockholm Convention

Not applicable.

Rotterdam Convention

Not applicable.

Kyoto protocol

Not applicable.

Montreal Protocol

Not applicable.

Basel Convention

Not applicable.

International Inventories

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Industrial Chemicals (AICIS)	No
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	No
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	Yes
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes

Country(s) or region	Inventory name	On inventory (yes/no)*
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
Taiwan	Taiwan Chemical Substance Inventory (TCSI)	No
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

*A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)
A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

16. Other information

Issue date 04-01-2022

Version # 01

Disclaimer Veolia Water Technologies is not able to anticipate all conditions under which this information and its product, or the products of other manufacturers in combination with its product, may be used. It is the user's responsibility to ensure safe conditions for handling, storage and disposal of the product, and to assume liability for loss, injury, damage or expense due to improper use and or non respect of Veolia Water Technologies' requirement.

Revision information Product and Company Identification: Alternate Trade Names
Physical & Chemical Properties: Multiple Properties
GHS: Classification

SAFETY DATA SHEET

1. Identification

Product identifier	**HYDREX 6909**
Other means of identification	None.
Recommended use	Wastewater Metal Precipitant PROFESSIONAL USE ONLY
Recommended restrictions	No other uses are advised.

Manufacturer/Importer/Supplier/Distributor information

Supplier	Veolia Water Technologies Canada Inc.
Address	2000 Argentia Road, Plaza IV, Suite 430 Mississauga, ON L5N 1W1 Canada
Contact Person	Hydrex Product Specialist
Telephone	(905) 286-4846
Fax	(905) 286-0488
e-mail	vwtcanada-hydrex@veolia.com
24-Hour Emergency telephone	24 Hour Number: +1-760-476-3962 (Code:333239)
Supplier	Not available.

2. Hazard identification

Physical hazards	Not classified.	
Health hazards	Not classified.	
Environmental hazards	Hazardous to the aquatic environment, acute hazard	Category 3

Label elements

Hazard symbol	None.
Signal word	None.
Hazard statement	Harmful to aquatic life.
Precautionary statement	
Prevention	Avoid release to the environment.
Response	Wash hands after handling.
Storage	Protect from sunlight. Store in a well-ventilated place.
Disposal	Dispose of contents/container in accordance with local/regional/national/international regulations.
Other hazards	Material can be slippery when wet.
Supplemental information	None.

3. Composition/information on ingredients

Mixtures

Chemical name	Common name and synonyms	CAS number	%
Polyethyleneimine dithiocarbamate		189326-02-1	15 - 50
Other components below reportable levels			50 - < 70

All concentrations are in percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

4. First-aid measures

Inhalation	Move to fresh air. Call a physician if symptoms develop or persist.
Skin contact	Wash off with soap and water. Get medical attention if irritation develops and persists.
Eye contact	Rinse with water. Get medical attention if irritation develops and persists.
Ingestion	Rinse mouth. Get medical attention if symptoms occur.

Most important symptoms/effects, acute and delayed Direct contact with eyes may cause temporary irritation.

Indication of immediate medical attention and special treatment needed Treat symptomatically.

General information Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

5. Fire-fighting measures

Suitable extinguishing media Water spray, fog or mist.

Unsuitable extinguishing media None known.

Specific hazards arising from the chemical Material can be slippery when wet. During fire, gases hazardous to health may be formed.

Special protective equipment and precautions for firefighters Self-contained breathing apparatus and full protective clothing must be worn in case of fire.

Fire fighting equipment/instructions Move containers from fire area if you can do so without risk. Do not use water jet as an extinguisher, as this will spread the fire.

Specific methods Use standard firefighting procedures and consider the hazards of other involved materials.

General fire hazards No unusual fire or explosion hazards noted.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures Keep unnecessary personnel away. Keep people away from and upwind of spill/leak. Wear appropriate protective equipment and clothing during clean-up. Ensure adequate ventilation. Local authorities should be advised if significant spillages cannot be contained. For personal protection, see section 8 of the SDS. Slippery when wet.

Methods and materials for containment and cleaning up This product is miscible in water. Prevent product from entering drains.

Large Spills: Stop the flow of material, if this is without risk. Dike the spilled material, where this is possible. Absorb in vermiculite, dry sand or earth and place into containers. Following product recovery, flush area with water.

Small Spills: Wipe up with absorbent material (e.g. cloth, fleece). Clean surface thoroughly to remove residual contamination.

Never return spills to original containers for re-use. For waste disposal, see section 13 of the SDS.

Environmental precautions Avoid release to the environment. Inform appropriate managerial or supervisory personnel of all environmental releases. Prevent further leakage or spillage if safe to do so. Avoid discharge into drains, water courses or onto the ground.

7. Handling and storage

Precautions for safe handling Avoid forming spray/aerosol mists. Material can be slippery when wet. Provide adequate ventilation. Wear appropriate personal protective equipment. Avoid release to the environment. Observe good industrial hygiene practices.

Conditions for safe storage, including any incompatibilities Protect from sunlight. Store in tightly closed container. Store away from incompatible materials (see Section 10 of the SDS). Store in cool, dry place.

8. Exposure controls/personal protection

Occupational exposure limits No exposure limits noted for ingredient(s).

Biological limit values No biological exposure limits noted for the ingredient(s).

Appropriate engineering controls Not available.

Individual protection measures, such as personal protective equipment

Eye/face protection Wear safety glasses with side shields (or goggles). Avoid contact with eyes.
Provide an emergency eye wash fountain and quick drench shower in the immediate work area.
Use face shield in case of splash risk.

Skin protection	
Hand protection	Wear appropriate chemical resistant gloves.
Other	Wear an apron. Chemical resistant boots.
Respiratory protection	In case of insufficient ventilation, wear suitable respiratory equipment. Avoid forming spray/aerosol mists.
Thermal hazards	Not applicable.
General hygiene considerations	Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

9. Physical and chemical properties

Appearance	
Physical state	Liquid.
Form	Liquid.
Color	Red Colored product.
Odor	Rotten-egg like.
Odor threshold	Not available.
pH	10 - 11.5
Melting point/freezing point	< 26.6 °F (< -3 °C)
Initial boiling point and boiling range	> 212 °F (> 100 °C)
Flash point	Non flammable aqueous solution
Evaporation rate	Not available.
Flammability (solid, gas)	Not applicable.
Upper/lower flammability or explosive limits	
Flammability limit - lower (%)	Not available.
Flammability limit - upper (%)	Not available.
Explosive limit - lower (%)	Not available.
Explosive limit - upper (%)	Not available.
Vapor pressure	2.3 kPa @ 20°C
Vapor density	0.804 g/l @ 20°C
Relative density	Not available.
Solubility(ies)	
Solubility (water)	100 g/g Complete in water
Partition coefficient (n-octanol/water)	< 0
Auto-ignition temperature	Not available.
Decomposition temperature	> 302 °F (> 150 °C)
Viscosity	< 500 mPa·s
Other information	
Density	1.00 - 1.30 g/cm³
Explosive properties	Not explosive.
Oxidizing properties	Not oxidizing.
Specific gravity	1 - 1.3

10. Stability and reactivity

Reactivity	The product is stable and non-reactive under normal conditions of use, storage and transport.
Chemical stability	Material is stable under normal conditions.

Possibility of hazardous reactions	No dangerous reaction known under conditions of normal use.
Conditions to avoid	Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. Temperatures above 35 °C Avoid temperatures exceeding the decomposition temperature. Contact with incompatible materials. Protect against direct sunlight.
Incompatible materials	Strong acids.
Hazardous decomposition products	Sulfur oxides Carbon oxides. Nitrogen oxides (NOx). Hydrogen cyanide (hydrocyanic acid).

11. Toxicological information

Information on likely routes of exposure

Inhalation	No adverse effects due to inhalation are expected.
Skin contact	No adverse effects due to skin contact are expected.
Eye contact	Direct contact with eyes may cause temporary irritation.
Ingestion	Expected to be a low ingestion hazard.
Symptoms related to the physical, chemical and toxicological characteristics	Direct contact with eyes may cause temporary irritation.

Information on toxicological effects

Acute toxicity	Not known.

Product	Species	Test Results
HYDREX 6909		
Acute		
Dermal		
LD50	Rat	> 5000 mg/kg
Oral		
LD50	Rat	> 5000 mg/kg

Skin corrosion/irritation	Prolonged skin contact may cause temporary irritation.
Serious eye damage/eye irritation	Direct contact with eyes may cause temporary irritation.
Respiratory or skin sensitization	
Respiratory sensitization	Not a respiratory sensitizer.
Skin sensitization	This product is not expected to cause skin sensitization.
Germ cell mutagenicity	No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.
Carcinogenicity	This product is not considered to be a carcinogen by IARC, ACGIH, NTP, or OSHA. Not classifiable as to carcinogenicity to humans.
Reproductive toxicity	This product is not expected to cause reproductive or developmental effects.
Specific target organ toxicity - single exposure	Not classified.
Specific target organ toxicity - repeated exposure	Not classified.
Aspiration hazard	Not an aspiration hazard.

12. Ecological information

Ecotoxicity	Harmful to aquatic life.

Product		Species	Test Results
HYDREX 6909			
Aquatic			
Acute			
Algae	IC50	Algae	10 - 100 mg/l, 72 hours
Crustacea	EC50	Daphnia magna	10 - 100 mg/l, 48 hours
Fish	LC50	Fish	10 - 100 mg/l, 96 hours

Persistence and degradability Not readily degradable.

Bioaccumulative potential It is expected to be nonbiodegradable and unlikely to bioconcentrate.

Partition coefficient n-octanol / water (log Kow)

HYDREX 6909	< 0

Mobility in soil The product is not expected to migrate through soil.

Other adverse effects No other adverse environmental effects (e.g. ozone depletion, photochemical ozone creation potential, endocrine disruption, global warming potential) are expected from this component.

13. Disposal considerations

Disposal instructions Collect and reclaim or dispose in sealed containers at licensed waste disposal site. Do not allow this material to drain into sewers/water supplies. Do not contaminate ponds, waterways or ditches with chemical or used container.

Local disposal regulations Dispose in accordance with all applicable regulations.

Hazardous waste code The waste code should be assigned in discussion between the user, the producer and the waste disposal company.

Waste from residues / unused products Dispose of in accordance with local regulations. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe manner (see: Disposal instructions).

Contaminated packaging Since emptied containers may retain product residue, follow label warnings even after container is emptied. Empty containers should be taken to an approved waste handling site for recycling or disposal.

14. Transport information

TDG

Not regulated as dangerous goods.

IATA

Not regulated as dangerous goods.

IMDG

Not regulated as dangerous goods.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code Not established.

15. Regulatory information

Canadian regulations This product has been classified in accordance with the hazard criteria of the HPR and the SDS contains all the information required by the HPR.

Controlled Drugs and Substances Act

Not regulated.

Export Control List (CEPA 1999, Schedule 3)

Not listed.

Greenhouse Gases

Not listed.

Precursor Control Regulations

Not regulated.

International regulations This Safety Data Sheet complies with the requirements of Regulation (EC) No 1907/2006, as amended. Regulation (EC) No 1272/2008 on classification, labeling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006. Regulation (EU) No 453/2010 amending Regulation (EC) No 1907/2006 on the Registration, Evaluation, Authorization and Restriction of Chemicals (REACH).

Stockholm Convention

Not applicable.

Rotterdam Convention

Not applicable.

Kyoto protocol

Not applicable.

Montreal Protocol

Not applicable.

Basel Convention

Not applicable.

International Inventories

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	No
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	No
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	No
Korea	Existing Chemicals List (ECL)	No
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
Taiwan	Taiwan Chemical Substance Inventory (TCSI)	No
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

*A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)
A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

16. Other information

Issue date 01-30-2017

Revision date 09-04-2020

Version # 02

List of abbreviations

ACGIH: American Conference of Governmental Industrial Hygienists.
ADN: European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways (Accord européen relatif au transport international des marchandises dangereuses par voies de navigation intérieures).
ADR: European agreement concerning the international carriage of dangerous goods by road (Accord européen relatif transport des merchandises dangereuses par route).
AFNOR: French Institute for Standards (Association Française de Normalisation).
ANSI: American National Standards Institute.
ASTM: ASTM International.
CAS: Chemical Abstract Service.
DNEL: Derived No Effect Level.
EC50: Effective Concentration 50%.
ECHA: European Chemical Agency.
EINECS: European Inventory of Existing Commercial Chemical Substances.
IARC: International Agency for Research on Cancer.
IATA: International Air Transport Association.
IMDG Code: International Maritime Dangerous Goods Code.
IUCLID: International Uniform Chemical Information Database.
IUPAC: International Union for Pure Applied Chemistry.
LC50: Lethal Concentration 50%.
NFPA: National Fire Protection Association.
NOEC: No observed effect concentration.
NOEL: No observed effect level.
PBT: Persistent, bioaccumulative, toxic.
PNEC: Predicted No Effect Concentration.
REACH: Registration, Evaluation and Authorization of Chemicals (REGULATION (EC) No 1907/2006 concerning Registration, Evaluation Authorization and Restriction of Chemicals).
RID: Regulations concerning the international carriage of dangerous goods by rail (Règlement International concernant le transport de marchandises dangereuses par chemin de fer).
STEL: Short-Term Exposure Limit.
TLV-STEL: Threshold limit value - Short-term exposure limit / Technical reference concentration - short-time value (TRK-Kzw = Technische Richtkonzentration - Kurzzeitwert).
TLV: Threshold Limit Value.
TSCA: Toxic Substance Control Act.
TWA: Time Weighted Average Value.
vPvB: very Persistent, very Bioaccumulative.
WEL-STEL: Workplace Exposure Limit-Short term exposure limit (15-minute reference period).

Disclaimer

Veolia Water Technologies is not able to anticipate all conditions under which this information and its product, or the products of other manufacturers in combination with its product, may be used. It is the user’s responsibility to ensure safe conditions for handling, storage and disposal of the product, and to assume liability for loss, injury, damage or expense due to improper use and or non respect of Veolia Water Technologies’ requirement.

Revision information

This document has undergone significant changes and should be reviewed in its entirety.

SAFETY DATA SHEET

Version 6.4
Revision Date 06.09.2022
Print Date 06.12.2022

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name	:	Sodium sulfide
Product Number	:	407410
Brand	:	Aldrich
Index-No.	:	016-009-00-8
CAS-No.	:	1313-82-2

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company : SIGMA-ALDRICH CANADA LTD.
2149 WINSTON PARK DRIVE
OAKVILLE ON L6H 6J8
CANADA

Telephone : +1 905 829-9500
Fax : +1 905 829-9292

1.4 Emergency telephone

Emergency Phone # : 800-424-9300 CHEMTREC (USA)
+1-703-527-3887 CHEMTREC (International)
24 Hours/day; 7 Days/week

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

GHS Classification in accordance with Hazardous Products Regulations (HPR) (SOR/2015-17)

Self-heating substances and mixtures (Category 1), H251
Corrosive to Metals (Category 1), H290
Acute toxicity, Oral (Category 3), H301
Acute toxicity, Dermal (Category 3), H311
Skin corrosion (Category 1B), H314
Serious eye damage (Category 1), H318
Short-term (acute) aquatic hazard (Category 1), H400

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram	
Signal Word	Danger

Hazard statement(s)

H251	Self-heating; may catch fire.
H290	May be corrosive to metals.
H301 + H311	Toxic if swallowed or in contact with skin.
H314	Causes severe skin burns and eye damage.
H400	Very toxic to aquatic life.

Precautionary statement(s)

P234	Keep only in original packaging.
P235	Keep cool.
P260	Do not breathe dust.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P310 + P330	IF SWALLOWED: Immediately call a POISON CENTER/ doctor. Rinse mouth.
P301 + P330 + P331	IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water.
P304 + P340 + P310	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER/ doctor.
P305 + P351 + P338 + P310	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER/ doctor.
P361 + P364	Take off immediately all contaminated clothing and wash it before reuse.
P390	Absorb spillage to prevent material damage.
P391	Collect spillage.
P403 + P235	Store in a well-ventilated place. Keep cool.
P405	Store locked up.
P407	Maintain air gap between stacks or pallets.
P420	Store separately.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS

Contact with acids liberates toxic gas.
Corrosive to the respiratory tract.
Contact with acids liberates toxic gas.

SECTION 3: Composition/information on ingredients

3.1 Substances

Formula	:	Na_2S
Molecular weight	:	78.04 g/mol
CAS-No.	:	1313-82-2
EC-No.	:	215-211-5

Index-No. : 016-009-00-8

Component	Classification	Concentration *
Sodium sulphide		
	Self-heat. 1; Met. Corr. 1; Acute Tox. 3; Skin Corr. 1B; Eye Dam. 1; Aquatic Acute 1; H251, H290, H301, H311, H314, H318, H400 M-Factor - Aquatic Acute: 10	<= 100 %
* Weight %		

For the full text of the H-Statements mentioned in this Section, see Section 16.

SECTION 4: First aid measures

4.1 Description of first-aid measures

General advice
First aiders need to protect themselves. Show this material safety data sheet to the doctor in attendance.

If inhaled
After inhalation: fresh air. Call in physician.

In case of skin contact
In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower. Call a physician immediately.

In case of eye contact
After eye contact: rinse out with plenty of water. Immediately call in ophthalmologist. Remove contact lenses.

If swallowed
If swallowed: give water to drink (two glasses at most). Seek medical advice immediately. In exceptional cases only, if medical care is not available within one hour, induce vomiting (only in persons who are wide awake and fully conscious), administer activated charcoal (20 - 40 g in a 10% slurry) and consult a doctor as quickly as possible. Do not attempt to neutralise.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

Unsuitable extinguishing media
For this substance/mixture no limitations of extinguishing agents are given.

5.2 Special hazards arising from the substance or mixture
Sulfur oxides
Sodium oxides
Not combustible.
Ambient fire may liberate hazardous vapours.

5.3 Advice for firefighters
Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

5.4 Further information
Suppress (knock down) gases/vapors/mists with a water spray jet. Prevent fire extinguishing water from contaminating surface water or the ground water system.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures
Advice for non-emergency personnel: Avoid generation and inhalation of dusts in all circumstances. Avoid substance contact. Ensure adequate ventilation. Evacuate the danger area, observe emergency procedures, consult an expert.
For personal protection see section 8.

6.2 Environmental precautions
Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up
Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up carefully. Dispose of properly. Clean up affected area. Avoid generation of dusts.

6.4 Reference to other sections
For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Storage conditions
No metal containers.
Tightly closed. Keep away from heat and sources of ignition. Keep locked up or in an area accessible only to qualified or authorized persons.
Do not store near acids.

Storage stability
Recommended storage temperature
2 - 8 °C

hygroscopic Air and light sensitive.

Storage class
Storage class (TRGS 510): 4.2: Pyrophoric and self-heating hazardous materials

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters
Contains no substances with occupational exposure limit values.

8.2 Exposure controls

Appropriate engineering controls
Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.

Personal protective equipment

Eye/face protection
Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU). Tightly fitting safety goggles

Body Protection
protective clothing

Respiratory protection
required when dusts are generated.
Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

Control of environmental exposure
Do not let product enter drains.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: solid Color: yellow
b)	Odor	No data available
c)	Odor Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: 950 °C (1742 °F) - lit.

f)	Initial boiling point and boiling range	No data available
g)	Flash point	()Not applicable
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapor pressure	No data available
l)	Vapor density	No data available
m)	Density	1.86 g/mL at 25 °C (77 °F) - lit.
	Relative density	1.6421.1 °C - OECD Test Guideline 109
n)	Water solubility	178 g/l at 20 °C (68 °F) - OECD Test Guideline 105 - completely soluble
o)	Partition coefficient: n-octanol/water	Not applicable for inorganic substances
p)	Autoignition temperature	Self-heating; may catch fire.
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	none

9.2 Other safety information
No data available

SECTION 10: Stability and reactivity

10.1 Reactivity
Self-heating; may catch fire.
Contact with acids liberates toxic gas.

10.2 Chemical stability
The product is chemically stable under standard ambient conditions (room temperature) .

10.3 Possibility of hazardous reactions
Generates dangerous gases or fumes in contact with:
Acids

10.4 Conditions to avoid
Air Avoid moisture. Light.
no information available

10.5 Incompatible materials
Oxidizing agents, Copper, Zinc, Acids

10.6 Hazardous decomposition products

In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - 208 mg/kg
Remarks: (RTECS)
Inhalation: No data available
Inhalation: Corrosive to respiratory system.
Acute toxicity estimate Dermal - Expert judgment - 300 mg/kg
No data available

Skin corrosion/irritation
Causes skin burns. Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)

Serious eye damage/eye irritation
Causes serious eye damage.

Respiratory or skin sensitization
No data available

Germ cell mutagenicity
Test Type: Ames test
Test system: Salmonella typhimurium
Metabolic activation: with and without metabolic activation
Method: OECD Test Guideline 471
Result: negative
Test Type: In vitro mammalian cell gene mutation test
Test system: mouse lymphoma cells
Metabolic activation: with and without metabolic activation
Method: OECD Test Guideline 476
Result: negative

Test Type: Micronucleus test
Species: Mouse
Cell type: Bone marrow
Application Route: Intraperitoneal injection
Method: OECD Test Guideline 474
Result: negative

Carcinogenicity
No data available

Reproductive toxicity
No data available

Specific target organ toxicity - single exposure
Corrosive to the respiratory tract.

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

11.2 Additional Information

RTECS: WE1905000
Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin., Cough, Shortness of breath, Headache, Nausea
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish	flow-through test LC50 - Fish - 0.0027 mg/l - 96 h (OECD Test Guideline 203) Remarks: (in analogy to similar products) The value is given in analogy to the following substances: Disodium sulphide nonahydrate
Toxicity to daphnia and other aquatic invertebrates	LC50 - Daphnia magna (Water flea) - 2.1 mg/l - 48 h Remarks: (ECOTOX Database)
Toxicity to algae	Growth inhibition ErC50 - Chlorella pyrenoidosa - 75 mg/l - 96 h Remarks: (ECOTOX Database)

12.2 Persistence and degradability

The methods for determining the biological degradability are not applicable to inorganic substances.

12.3 Bioaccumulative potential

No data available

12.4 Mobility in soil

No data available

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Endocrine disrupting properties

No data available

12.7 Other adverse effects

No data available

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product
Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself. See www.retrologistik.com for processes regarding the return of chemicals and containers, or contact us there if you have further questions.

SECTION 14: Transport information

TDG
UN number: 1385 Class: 4.2 Packing group: II
Proper shipping name: SODIUM SULPHIDE, ANHYDROUS
Labels: 4.2
ERG Code: 135
Marine pollutant: no

IMDG
UN number: 1385 Class: 4.2 Packing group: II EMS-No: F-A, S-J
Proper shipping name: SODIUM SULPHIDE, ANHYDROUS
Marine pollutant : yes

IATA
UN number: 1385 Class: 4.2 Packing group: II
Proper shipping name: Sodium sulphide, anhydrous

SECTION 15: Regulatory information

This product has been classified in accordance with the hazard criteria of the Hazardous Products Regulations (HPR) and the SDS contains all the information required by the HPR.

SECTION 16: Other information

Further information
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

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Version: 6.4 Revision Date: 06.09.2022 Print Date: 06.12.2022

SAFETY DATA SHEET

1. Identification

Product identifier HYDREX 9550

Other means of identification None.

Recommended use Water Treatment Chemical

Recommended restrictions PROFESSIONAL USE ONLY

Manufacturer/Importer/Supplier/Distributor information

Supplier Veolia Water Technologies Canada Inc.

Address 2000 Argentia Road, Plaza IV, Suite 430
Mississauga, ON L5N 1W1
Canada

Contact Person Hydrex Product Specialist

Telephone (905) 286-4846

Fax (905) 286-0488

e-mail vwtcanada-hydrex@veolia.com

24-Hour Emergency telephone 24 Hour Number: +1-760-476-3962 (Code:333239)

Supplier Not available.

2. Hazard(s) identification

Physical hazards	Corrosive to metals	Category 1
Health hazards	Acute toxicity, oral	Category 4
	Skin corrosion/irritation	Category 1
	Serious eye damage/eye irritation	Category 1
Environmental hazards	Hazardous to the aquatic environment, acute hazard	Category 3
	Hazardous to the aquatic environment, long-term hazard	Category 3

Label elements

Signal word Danger

Hazard statement May be corrosive to metals. Harmful if swallowed. Causes severe skin burns and eye damage. Causes serious eye damage. Harmful to aquatic life with long lasting effects.

Precautionary statement

Prevention Keep only in original packaging. Do not breathe mist or vapor. Wash thoroughly after handling. Do not eat, drink or smoke when using this product. Avoid release to the environment. Wear protective gloves/protective clothing/eye protection/face protection.

Response IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water. IF INHALED: Remove person to fresh air and keep comfortable for breathing. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER/doctor. Wash contaminated clothing before reuse. Absorb spillage to prevent material-damage.

Storage Store in a corrosion resistant container with a resistant inner liner.

Disposal Dispose of contents/container in accordance with local/regional/national/international regulations.

Other hazards None known.

Supplemental information None.

3. Composition/information on ingredients

Mixtures

Chemical name	Common name and synonyms	CAS number	%
SODIUM HYDROXIDE		1310-73-2	50
Other components below reportable levels			50

All concentrations are in percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

4. First-aid measures

Inhalation Move to fresh air. Call a physician if symptoms develop or persist.

Skin contact Take off immediately all contaminated clothing. Rinse skin with water/shower. Call a physician or poison control center immediately. Chemical burns must be treated by a physician. Wash contaminated clothing before reuse.

Eye contact Immediately flush eyes with plenty of water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Call a physician or poison control center immediately.

Ingestion Call a physician or poison control center immediately. Rinse mouth. Do not induce vomiting. If vomiting occurs, keep head low so that stomach content doesn't get into the lungs.

Most important symptoms/effects, acute and delayed Burning pain and severe corrosive skin damage. Causes serious eye damage. Symptoms may include stinging, tearing, redness, swelling, and blurred vision. Permanent eye damage including blindness could result.

Indication of immediate medical attention and special treatment needed Provide general supportive measures and treat symptomatically. Chemical burns: Flush with water immediately. While flushing, remove clothes which do not adhere to affected area. Call an ambulance. Continue flushing during transport to hospital. Keep victim warm. Keep victim under observation. Symptoms may be delayed.

General information Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. Show this safety data sheet to the doctor in attendance.

5. Fire-fighting measures

Suitable extinguishing media Water fog. Foam. Dry chemical powder. Carbon dioxide (CO2).

Unsuitable extinguishing media Not available.

Specific hazards arising from the chemical During fire, gases hazardous to health may be formed.

Special protective equipment and precautions for firefighters Self-contained breathing apparatus and full protective clothing must be worn in case of fire.

Fire fighting equipment/instructions Move containers from fire area if you can do so without risk.

Specific methods Use standard firefighting procedures and consider the hazards of other involved materials.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures Keep unnecessary personnel away. Keep people away from and upwind of spill/leak. Wear appropriate protective equipment and clothing during clean-up. Do not breathe mist or vapor. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Ensure adequate ventilation. Local authorities should be advised if significant spillages cannot be contained. For personal protection, see section 8 of the SDS.

Methods and materials for containment and cleaning up Prevent entry into waterways, sewer, basements or confined areas.

Large Spills: Stop the flow of material, if this is without risk. Dike the spilled material, where this is possible. Absorb spillage to prevent material damage. Use a non-combustible material like vermiculite, sand or earth to soak up the product and place into a container for later disposal. Following product recovery, flush area with water.

Small Spills: Wipe up with absorbent material (e.g. cloth, fleece). Clean surface thoroughly to remove residual contamination.

Never return spills to original containers for re-use. For waste disposal, see section 13 of the SDS.

Environmental precautions Avoid release to the environment. Inform appropriate managerial or supervisory personnel of all environmental releases. Prevent further leakage or spillage if safe to do so. Avoid discharge into drains, water courses or onto the ground.

7. Handling and storage

Precautions for safe handling	Avoid forming spray/aerosol mists. Do not breathe mist or vapor. Do not get in eyes, on skin, or on clothing. Do not taste or swallow. Avoid prolonged exposure. When using, do not eat, drink or smoke. Provide adequate ventilation. Wear appropriate personal protective equipment. Wash hands thoroughly after handling. Avoid release to the environment. Observe good industrial hygiene practices.
Conditions for safe storage, including any incompatibilities	Store in a cool, dry place out of direct sunlight. Store in corrosive resistant container with a resistant inner liner. Store in original tightly closed container. Keep only in the original container. Store away from incompatible materials (see Section 10 of the SDS). Store in cool, dry place.

8. Exposure controls/personal protection

Occupational exposure limits

US. ACGIH Threshold Limit Values

Components	Type	Value
SODIUM HYDROXIDE (CAS 1310-73-2)	Ceiling	2 mg/m3

Canada. Alberta OELs (Occupational Health & Safety Code, Schedule 1, Table 2)

Components	Type	Value
SODIUM HYDROXIDE (CAS 1310-73-2)	Ceiling	2 mg/m3

Canada. British Columbia OELs. (Occupational Exposure Limits for Chemical Substances, Occupational Health and Safety Regulation 296/97, as amended)

Components	Type	Value
SODIUM HYDROXIDE (CAS 1310-73-2)	Ceiling	2 mg/m3

Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act)

Components	Type	Value
SODIUM HYDROXIDE (CAS 1310-73-2)	Ceiling	2 mg/m3

Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents)

Components	Type	Value
SODIUM HYDROXIDE (CAS 1310-73-2)	Ceiling	2 mg/m3

Canada. Quebec OELs. (Ministry of Labor - Regulation Respecting the Quality of the Work Environment)

Components	Type	Value
SODIUM HYDROXIDE (CAS 1310-73-2)	Ceiling	2 mg/m3

Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21)

Components	Type	Value
SODIUM HYDROXIDE (CAS 1310-73-2)	Ceiling	2 mg/m3

Biological limit values	No biological exposure limits noted for the ingredient(s).
Appropriate engineering controls	Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. Eye wash facilities and emergency shower must be available when handling this product.

Individual protection measures, such as personal protective equipment

Eye/face protection	Chemical goggles and face shield are recommended. Wear safety glasses with side shields (or goggles).
Skin protection	
Hand protection	Chemical resistant gloves. Butyl rubber gloves are recommended. PVC gloves are recommended. Neoprene gloves are recommended. Rubber gloves are recommended.
Other	Wear appropriate chemical resistant clothing. Chemical resistant gloves. Rubber or plastic apron. The use of neoprene gloves is recommended.

Respiratory protection	In case of insufficient ventilation, wear suitable respiratory equipment. Avoid forming spray/aerosol mists.
Thermal hazards	Wear appropriate thermal protective clothing, when necessary.
General hygiene considerations	Keep away from food and drink. Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

9. Physical and chemical properties

Appearance	
Physical state	Liquid.
Form	Liquid.
Color	Colorless
Odor	Odorless.
Odor threshold	Not available.
pH	14 (20°C)
Melting point/freezing point	39.92 °F (4.4 °C)
Initial boiling point and boiling range	Not available.
Flash point	Non flammable aqueous solution
Evaporation rate	Not available.
Flammability (solid, gas)	Not applicable.
Upper/lower flammability or explosive limits	
Flammability limit - lower (%)	Not available.
Flammability limit - upper (%)	Not available.
Explosive limit - lower (%)	Not available.
Explosive limit - upper (%)	Not available.
Vapor pressure	21 hPa (20°C)
Vapor density	Not available.
Relative density	Not available.
Solubility(ies)	
Solubility (water)	100 %
Partition coefficient (n-octanol/water)	Not available.
Auto-ignition temperature	Not available.
Decomposition temperature	Not available.
Viscosity	Not available.
Other information	
Density	1.53 g/cm³
Explosive properties	Not explosive.
Oxidizing properties	Not oxidizing.
Specific gravity	1.5 - 1.6

10. Stability and reactivity

Reactivity	Reacts violently with strong acids. This product may react with oxidizing agents. May be corrosive to metals.
Chemical stability	Material is stable under normal conditions.
Possibility of hazardous reactions	No dangerous reaction known under conditions of normal use. Hazardous polymerization does not occur.
Conditions to avoid	Heat, flames and sparks. Contact with incompatible materials. Do not mix with other chemicals.

Incompatible materials	Strong acids. Acids. Strong oxidizing agents. Oxidizing agents. Metals. Halogenated materials. Alcohols.
Hazardous decomposition products	Hydrogen.

11. Toxicological information

Information on likely routes of exposure

Inhalation	May cause irritation to the respiratory system. Prolonged inhalation may be harmful.
Skin contact	Causes severe skin burns.
Eye contact	Causes serious eye damage.
Ingestion	Causes digestive tract burns. Harmful if swallowed.
Symptoms related to the physical, chemical and toxicological characteristics	Burning pain and severe corrosive skin damage. Causes serious eye damage. Symptoms may include stinging, tearing, redness, swelling, and blurred vision. Permanent eye damage including blindness could result.

Information on toxicological effects

Acute toxicity Harmful if swallowed.

Product	Species	Test Results
HYDREX 9550		
Acute		
Oral		
Liquid		
LDL0	Rabbit	400 mg/kg

* Estimates for product may be based on additional component data not shown.

Skin corrosion/irritation	Causes severe skin burns and eye damage.
Serious eye damage/eye irritation	Causes serious eye damage.

Respiratory or skin sensitization

Canada - Alberta OELs: Irritant

SODIUM HYDROXIDE (CAS 1310-73-2)	Irritant

Respiratory sensitization	Not a respiratory sensitizer.
Skin sensitization	This product is not expected to cause skin sensitization.
Germ cell mutagenicity	No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.
Carcinogenicity	Not available.
Reproductive toxicity	This product is not expected to cause reproductive or developmental effects.
Specific target organ toxicity - single exposure	Not classified.
Specific target organ toxicity - repeated exposure	Not classified.
Aspiration hazard	Not an aspiration hazard.
Chronic effects	Prolonged inhalation may be harmful.

12. Ecological information

Ecotoxicity Harmful to aquatic life with long lasting effects.

Product		Species	Test Results
HYDREX 9550			
Aquatic			
Acute			
Algae	EC50	Algae	> 75 mg/l, 72 hours
Crustacea	EC50	Daphnia	>= 60 mg/l, 48 hours
Fish	LC50	Bluegill (Lepomis macrochirus)	>= 90 mg/l, 48 hours

Product	Species	Test Results
	Mosquitofish (Gambusia affinis affinis)	125 mg/l, 96 hours

* Estimates for product may be based on additional component data not shown.

Persistence and degradability No data is available on the degradability of any ingredients in the mixture.

Bioaccumulative potential No data available.

Mobility in soil No data available.

Other adverse effects No other adverse environmental effects (e.g. ozone depletion, photochemical ozone creation potential, endocrine disruption, global warming potential) are expected from this component.

13. Disposal considerations

Disposal instructions Collect and reclaim or dispose in sealed containers at licensed waste disposal site. Do not allow this material to drain into sewers/water supplies. Do not contaminate ponds, waterways or ditches with chemical or used container. Dispose of contents/container in accordance with local/regional/national/international regulations.

Local disposal regulations Dispose in accordance with all applicable regulations.

Hazardous waste code D002: Waste Corrosive material [pH <=2 or =>12.5, or corrosive to steel]
The waste code should be assigned in discussion between the user, the producer and the waste disposal company.

Waste from residues / unused products Dispose of in accordance with local regulations. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe manner (see: Disposal instructions).

Contaminated packaging Since emptied containers may retain product residue, follow label warnings even after container is emptied. Empty containers should be taken to an approved waste handling site for recycling or disposal.

14. Transport information

TDG

UN number UN1824
UN proper shipping name SODIUM HYDROXIDE SOLUTION
Transport hazard class(es)
Class 8
Subsidiary risk -
Packing group II
Environmental hazards Not available.
Special precautions for user Read safety instructions, SDS and emergency procedures before handling.

IATA

UN number UN1824
UN proper shipping name Sodium hydroxide solution
Transport hazard class(es)
Class 8
Subsidiary risk -
Packing group II
Environmental hazards No.
ERG Code 8L
Special precautions for user Read safety instructions, SDS and emergency procedures before handling.
Other information
Passenger and cargo aircraft Allowed with restrictions.
Cargo aircraft only Allowed with restrictions.

IMDG

UN number UN1824
UN proper shipping name SODIUM HYDROXIDE SOLUTION
Transport hazard class(es)
Class 8
Subsidiary risk -
Packing group II

Environmental hazards

Marine pollutant No.

EmS F-A, S-B

Special precautions for user Read safety instructions, SDS and emergency procedures before handling.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code Not established.

IATA; IMDG; TDG

15. Regulatory information

Canadian regulations This product has been classified in accordance with the hazard criteria of the HPR and the SDS contains all the information required by the HPR.

Controlled Drugs and Substances Act

Not regulated.

Export Control List (CEPA 1999, Schedule 3)

Not listed.

Greenhouse Gases

Not listed.

Precursor Control Regulations

Not regulated.

International regulations

Stockholm Convention

Not applicable.

Rotterdam Convention

Not applicable.

Kyoto protocol

Not applicable.

Montreal Protocol

Not applicable.

Basel Convention

Not applicable.

International Inventories

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	Yes
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes

Country(s) or region	Inventory name	On inventory (yes/no)*
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
Taiwan	Taiwan Toxic Chemical Substances (TCS)	No
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

*A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)
A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

16. Other information

Issue date 10-27-2018

Version # 01

Disclaimer Veolia Water Technologies is not able to anticipate all conditions under which this information and its product, or the products of other manufacturers in combination with its product, may be used. It is the user’s responsibility to ensure safe conditions for handling, storage and disposal of the product, and to assume liability for loss, injury, damage or expense due to improper use and or non respect of Veolia Water Technologies’ requirement.

Revision information
Product and Company Identification: Product Review
Composition / Information on Ingredients: Ingredients
Physical & Chemical Properties: Multiple Properties
Toxicological Information: Toxicological Data
Ecological Information: Ecotoxicity
Transport Information: Proper Shipping Name/Packing Group
Regulatory Information: Risk Phrases - Labeling
GHS: Classification

SAFETY DATA SHEET

Version 6.4
Revision Date 06.09.2022
Print Date 08.10.2022

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name	:	Sodium hexametaphosphate
Product Number	:	305553
Brand	:	Aldrich
CAS-No.	:	68915-31-1

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company : SIGMA-ALDRICH CANADA LTD.
2149 WINSTON PARK DRIVE
OAKVILLE ON L6H 6J8
CANADA

Telephone : +1 905 829-9500
Fax : +1 905 829-9292

1.4 Emergency telephone

Emergency Phone # : 800-424-9300 CHEMTREC (USA)
+1-703-527-3887 CHEMTREC (International)
24 Hours/day; 7 Days/week

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Not a hazardous substance or mixture according to the Globally Harmonized System (GHS).

2.2 GHS Label elements, including precautionary statements

Not a hazardous substance or mixture according to the Globally Harmonized System (GHS).

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS

- none

SECTION 3: Composition/information on ingredients

3.1 Substances

Synonyms : Polyphosphatesodium salt

Calgon
Sodium polyphosphate
Phosphate glass, water soluble

CAS-No.	:	68915-31-1
EC-No.	:	272-808-3

No components need to be disclosed according to the applicable regulations.

SECTION 4: First aid measures

4.1 Description of first-aid measures

If inhaled
After inhalation: fresh air.

In case of skin contact
In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower.

In case of eye contact
After eye contact: rinse out with plenty of water. Remove contact lenses.

If swallowed
After swallowing: make victim drink water (two glasses at most). Consult doctor if feeling unwell.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

Unsuitable extinguishing media
For this substance/mixture no limitations of extinguishing agents are given.

5.2 Special hazards arising from the substance or mixture
Nature of decomposition products not known.
Not combustible.
Ambient fire may liberate hazardous vapours.

5.3 Advice for firefighters
In the event of fire, wear self-contained breathing apparatus.

5.4 Further information
Prevent fire extinguishing water from contaminating surface water or the ground water system.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures
Advice for non-emergency personnel: Avoid inhalation of dusts. Evacuate the danger area, observe emergency procedures, consult an expert.
For personal protection see section 8.

6.2 Environmental precautions
Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up
Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up dry. Dispose of properly. Clean up affected area. Avoid generation of dusts.

6.4 Reference to other sections
For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Storage conditions
Tightly closed. Dry.

Storage class
Storage class (TRGS 510): 13: Non Combustible Solids

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters
Contains no substances with occupational exposure limit values.

8.2 Exposure controls

Appropriate engineering controls
Change contaminated clothing. Wash hands after working with substance.

Personal protective equipment

Eye/face protection
Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU). Safety glasses

Skin protection
This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN374 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).

Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:KCL 741 Dermatril® L

This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN374 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).
Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:KCL 741 Dermatril® L

Respiratory protection
required when dusts are generated.
Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

Control of environmental exposure
Do not let product enter drains.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: crystalline
b)	Odor	No data available
c)	Odor Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: 628 °C (1162 °F) - (External MSDS)
f)	Initial boiling point and boiling range	No data available
g)	Flash point	()Not applicable
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	The product is not flammable.
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapor pressure	No data available
l)	Vapor density	No data available
m)	Density	No data available

	Relative density	No data available
n)	Water solubility	soluble, (experimental)
o)	Partition coefficient: n-octanol/water	No data available
p)	Autoignition temperature	No data available
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	none

9.2 Other safety information
No data available

SECTION 10: Stability and reactivity

10.1 Reactivity
No data available

10.2 Chemical stability
The product is chemically stable under standard ambient conditions (room temperature) .

10.3 Possibility of hazardous reactions
no information available

10.4 Conditions to avoid
no information available

10.5 Incompatible materials
Strong oxidizing agents

10.6 Hazardous decomposition products
In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
Acute toxicity estimate Oral - > 2,000 mg/kg
(Calculation method)
LD50 Oral - Rat - 3,053 mg/kg
Remarks: Gastrointestinal:Ulceration or bleeding from stomach.
Gastrointestinal:Ulceration or bleeding from duodenum.
Gastrointestinal:Ulceration or bleeding from small intestine.
(RTECS)
Inhalation: No data available
LD50 Dermal - Rabbit - > 7,940 mg/kg
Remarks: (External MSDS)

No data available

Skin corrosion/irritation
Skin - Rabbit
Result: No skin irritation - 24 h
Remarks: (External MSDS)

Serious eye damage/eye irritation
Eyes - Rabbit
Result: Mild eye irritation
Remarks: (External MSDS)

Respiratory or skin sensitization
No data available

Germ cell mutagenicity
No data available

Carcinogenicity
No data available

Reproductive toxicity
No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

11.2 Additional Information

RTECS: TR4950250
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Hazardous properties cannot be excluded but are unlikely when the product is handled appropriately.

Handle in accordance with good industrial hygiene and safety practice.

SECTION 12: Ecological information

12.1 Toxicity
No data available

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential
No data available

12.4 Mobility in soil
No data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Endocrine disrupting properties
No data available

12.7 Other adverse effects
No data available

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product
Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself. See www.retrologistik.com for processes regarding the return of chemicals and containers, or contact us there if you have further questions.

SECTION 14: Transport information

TDG
Not regulated as a dangerous good

IMDG
Not dangerous goods

IATA
Not dangerous goods

Further information
Not classified as dangerous in the meaning of transport regulations.

SECTION 15: Regulatory information

This product has been classified in accordance with the hazard criteria of the Hazardous Products Regulations (HPR) and the SDS contains all the information required by the HPR.

SECTION 16: Other information

Further information
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See

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Version: 6.4 Revision Date: 06.09.2022 Print Date: 08.10.2022

ATTACHMENT 2

Site-Specific Toxicological Studies for Total Dissolved Solids Using Mine-Impacted Waters

This attachment summarizes the methods and results of the 2024 total dissolved solids (TDS) toxicity testing program for Meadowbank, which focused on the characterization of adverse effects of TDS in short-term and long-term aqueous exposures to aquatic organisms. These tests were conducted to support development of site-specific acute toxicity effluent quality criteria (EQC) to apply at the end-of-pipe at the point of discharge (i.e., acute benchmarks) and site-specific water quality objectives (SSWQO) to apply at the edge of the mixing zone in the receiving environment (i.e., chronic benchmarks). The memorandum presents the background and objectives for the study (Section 2-1.0), followed by the methods (Section 2-2.0) and results (Section 2-3.0). Uncertainties associated with study outcomes are discussed in Section 2-4.0. A summary of key findings is discussed in Section 2-5.0.

Table 2-1: Overview of Toxicity Testing Programs for Total Dissolved Solids

Toxicity Testing Program	Dilution Water	Laboratory Toxicity Test				
		Daphnia magna Survival Test (48-h)	Rainbow Trout Survival Test (96-h)	*Raphidocelis subcapitata* Growth (72-h)	*Ceriodaphnia dubia* Survival and Reproduction (7 to 8-d)	*Pimephales Promelas* Early Life Stage Survival, Growth, and Hatching Success (32-d)
Acute TDS	Pit E Cryo-concentrated Water	☑	☑	—	—	—
Chronic TDS	Site-collected Water	—	—	☑	☑	—
	Synthetic Laboratory Water	—	—	—	—	☑

Notes: TDS = total dissolved solids; ☑ = toxicity test performed; — = not tested or not applicable.

2-1.0 INTRODUCTION

Acute and chronic site-specific toxicity testing programs were initiated to inform development of site-specific benchmarks for the Meadowbank Mine site (Meadowbank; MBK) located in the Kivalliq Region of Nunavut. This attachment presents the acute and chronic study objectives (Section 2-1.1), methodology, (Section 2-2.0), results (Section 2-3.0), uncertainty (Section 2-4.0), and key findings (Section 2-5.0). The key findings from this study were used as lines-of-evidence in deriving site-specific acute toxicity effluent quality criteria (EQC) to apply at the end-of-pipe at the point of discharge and site-specific water quality objective (SSWQO) to apply at the edge of the mixing zone in the receiving environment. This information was considered alongside supplementary information obtained from the literature and other mining sites for comparable ionic compositions as Meadowbank Mine (Attachment 1).

2-1.1 Objectives

The objectives of the TDS study were to:

1) Acute Study—Evaluate site-specific acute TDS toxicity to regulatory test species the water flea *Daphnia magna* and the fish Rainbow Trout (*Oncorhynchus mykiss*) using waters with ionic compositions representative of future effluent discharge conditions (end-of-pipe) at Meadowbank Mine Complex.

2) Chronic Study—Evaluate site-specific chronic TDS toxicity to sensitive, surrogate aquatic test species using waters with ionic compositions representative of receiving environment conditions (i.e., conditions represented by Third Portage Lake or Wally Lake) at the edge of the regulated mixing zone under a future effluent discharge scenario.

2-2.0 METHODS

2-2.1 Acute Toxicity Program

2-2.1.1 Source Water for Testing

Site water was collected and processed for use in acute toxicity testing by Agnico as follows:

- Collection—raw water was collected from a mine-impacted settling pond at the Meadowbank Mine Complex named Pit E.
- Base Water Preparation—raw water was treated by Agnico staff to remove metals and nutrients to below a level of concern for acute toxicity.
- Cryo-concentration—prepared water was cryo-concentrated by Agnico staff and shipped to Nautilus Environmental Inc. (Nautilus, Guelph, Ontario).

Although synthesizing high TDS solutions in the laboratory to simulate major ion compositions of mine-impacted waters can be completed for some ionic compositions, it is WSP's experience that generating super-saturated synthetic waters of the nature required for this acute program (i.e., >5000 mg/L TDS with ~50% proportion sulphate as TDS) using laboratory waters is subject to solubility constraints. Therefore, Agnico staff cryo-concentrated the prepared Pit E water to a target TDS. This process was conducted by reducing the water temperature, removing the upper (partially) frozen layer that contains little-to-no solutes, and then repeating the process until target TDS concentrations were obtained.

2-2.1.2 Laboratory Methods

2-2.1.2.1 Toxicity Testing Protocols

Cryo-concentrated waters were shipped to Nautilus Environmental laboratory in Guelph, Ontario for toxicity testing (Table 2-2). Upon receipt at the laboratory, samples were stored in the dark at 4 ± 2°C prior to testing.

Table 2-2: Pit E Toxicity Test Sample Information

Measured TDS (mg/L)	Calculated TDS (mg/L)	Toxicity Test Initiation Date
4,590	4,577	12-Mar-2024
6,350	6,460	12-Mar-2024
6,920	6,886	12-Mar-2024
8,710	8,836	19-Mar-2024
10,100	10,293	27-Mar-2024

The acute toxicity testing study included two species (one invertebrate and one fish) commonly used in regulatory toxicity testing programs for effluent per the Metal and Diamond Mining Effluent Regulations (Government of Canada 2002; Appendix A):

- **48-hour *Daphnia magna* acute lethality**—Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to *D. magna*, Environment Canada, Environmental Protection Series 1/RM/13, December 2000, as amended (ECCC 2000a).
- **96-hour Rainbow Trout (*Oncorhynchus mykiss*) acute lethality**—Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout. Method and Development and Applications Unit. Environment Canada. EPS1/RM/13. Amended May 2007 and February 2016 (ECCC 2000b).

All tests were run as a pass-fail (full-strength 100% volume/volume sample) with a negative laboratory control[1] and a cryo-concentrated sample at five different TDS concentrations (4,590, 6,350, 6,920, 8,710, and 10,100 mg/L [measured]; 4,577, 6,460, 6,886, 8,836, 10,293 mg/L [calculated]). Prior to test initiation, the sample was allowed to settle overnight. The following day, the sample was carefully decanted so that no settled solids from the bottom of the sample were included in the test solutions.

2-2.1.2.2 Analytical Chemistry

Nautilus subsampled each TDS treatment at test initiation and submitted to Bureau Veritas Laboratories (BV Labs) in Guelph, ON. Samples were analyzed for standard routine parameters (i.e., pH, hardness, specific conductivity, total alkalinity), major ions (e.g., Ca^{2+}, Mg^{2+}, Na^{+}, K^{+}, SO_4^{2-}, NO_3^{-}, Cl^{-}, F^{-}, and HCO_3^{-}), total/dissolved metals, total cyanide (including Strong-Acid Digestion [SAD], Weak-Acid Digestion [WAD], free cyanide), and thiocyanate (Appendix B).

[1] The negative laboratory control contains clean dilution water prepared using a standard laboratory recipe and not amended by the Nautilus. The negative control is used as a quality assurance and quality control standard for test validity (i.e., it is used to assess organism health and test reliability).

2-2.1.3 Toxicity Data Analysis

2-2.1.3.1 Quality Assurance and Quality Control

Quality assurance information from the Nautilus Toxicity Report (Appendix A) was reviewed and summarized to establish that organism performance in the laboratory control water met acceptability criteria for the protocol as it pertains to the health histories and sensitivity of the organisms, and that no unplanned deviations from test procedures occurred that would influence the reliability of the data.

2-2.2 Chronic Toxicity Program

2-2.2.1 Source Water for Testing

For chronic toxicity testing, it is desirable to evaluate samples that have water quality (including exposure and toxicity modifying factors) representative of the edge of the regulated mixing zone. To evaluate toxicity under site-specific conditions, it is often preferable to use site water samples (surface water), but this must be balanced against the feasibility and practicality of sampling the desired conditions (issues related to sample volumes, accessibility, health and safety), along with the ability to control for concentrations of specific constituents and exposure and toxicity modifying factors during handling and transport. As this study evaluated future exposure conditions in the receiving environment during effluent discharge, it was not feasible to directly collect fully representative source waters for testing from the field. Therefore, laboratory amendment of site waters and laboratory-prepared synthetic waters were selected as the two viable options.

The source water used for chronic toxicity testing varied by test species. Amended site water was used for testing with the cladoceran *Ceriodaphnia dubia* and the algae *Raphidocelis* subcapitata, whereas synthetic laboratory-prepared dilution waters were amended and used for early-life stage Fathead Minnow testing. The latter was conducted primarily due to the very large volume requirements for fish testing relative to invertebrates and algae; the required volumes, and associated refreshes required, would be prohibitively large for fish testing.

Site water was collected from a raw drinking water intake pipe connected to Third Portage Lake (station DW-RAW-KIA) by Agnico on 27 March 2024. Water was collected from the pipe rather than directly from the lake due to site access issues (i.e., ice cover and adverse, unsafe weather conditions). As such, the historically reviewed chemistry from 2011 to 2020 (Attachment 1, Section 1-2.0, Figure 1-2) and the actual measured site water chemistry (Table 2-3) were slightly different. The differences in baseline water quality described above did not adversely affect the study implementation, because desired treatments were obtained through sample amendments as necessary. The goal of this program was to target a range of concentrations for TDS that bound and extend beyond the maximum expected TDS at the edge of the mixing zone in Third Portage Lake under future discharge conditions. The baseline site water chemistry reviewed in the historical dataset and measured in the site water collected by Agnico on 27 March 2024, was only used to a starting point for the treatments; the sample amendments applied in the laboratory resolved these differences (Section 2-2.2.2.2).

The site water was shipped to Nautilus Environmental laboratory (Nautilus) in Calgary, Alberta. Upon receipt at the laboratory, Nautilus subsampled for analytical chemistry (Section 2-2.2.2.3). Samples were then stored in the dark at 4 ± 2°C prior to use in toxicity tests. Following receipt of analytical chemistry (Section 2-2.2.2.3) for the site water, samples were brought to test temperature, amended with ion salts as described in Section 2-2.2.2.2, and a dilution series was created to evaluate range of TDS.

Due to the large volumes of water required for early life stage Fathead Minnow tests, the source water for this test was synthetic dilution water created in the laboratory. The dilution water was created to mimic the ionic composition of modelled effluent predictions Version 4.5 received on 12 June 2024 (Attachment 1, Section 1-2.0, Table 1-1 and Figure 1-1), with concentrations increased four-fold to mimic a low TDS concentration treatment (Table 2-3). The composition of the dilution water for the Fathead Minnow tests differed from the site water used for the *C. dubia* and *P. subcapitata* tests because the dilution water was designed to test the full range of TDS predictions at the edge of the mixing zone in Third Portage Lake under future discharge conditions provided by Agnico. The updated predictions were received after the first round of testing with *C. dubia* and *P. subcapitata*. Following preparation of dilution water, samples were brought to test temperature, amended with ion salts as described in Section 2-2.2.2.2, and a dilution series prepared to evaluate the target range of TDS.

Table 2-3: Site Water Control (*R. subcapitata*, *C. dubia*) and Synthetic Dilution Water (Fathead Minnow) Chemistry for Major Ions

Constituent	Site Water Control (DW-RAW-KIA)		Dilution Water Control	
	Concentration (mg/L)	Proportion of TDS (%)	Concentration (mg/L)	Proportion of TDS (%)
Sulphate	74	60	86	23
Chloride	0.94	0.77	23	6.1
Calcium	33	27	52	14
Magnesium	1.2	1.0	15	4.0
Sodium	1.3	1.1	63	17
Alkalinity (as CO_3)	11	8.9	116	31
Potassium	0.68	0.56	9.2	2.5
Fluoride	0.081	0.07	0	0
Nitrate (as NO_3)	0.020	0.07	9.4	2.5
Calculated TDS	122	100	374	100

Notes: TDS = total dissolved solids; CO_3 = carbonate; NO_3 = nitrate ion; mg/L = milligrams per litre.

2-2.2.2 Laboratory Methods

2-2.2.2.1 Toxicity Testing Protocols

The chronic TDS study presented in this report included three test species (one plant, one invertebrate, and one fish). The selected test species are commonly used in environmental effects monitoring programs, including evaluation of the chronic effects of mine discharges to receiving environments. The test protocols are highly standardized and have exhibited sensitivity to the chronic effects of major ion mixtures.

The toxicity test protocols for the chronic TDS study presented in this report were:

- ***Raphidocelis subcapitata*[2] growth inhibition**—Biological Test Method: Growth inhibition test using a freshwater alga, Environment Canada, Environmental Protection Series 1/RM/25, March 2007, as amended (ECCC 2007a).

[2] Formerly known *as Pseudokirchneriella subcapitata* and is still referred to as such in the Nautilus laboratory report (Appendix C).

- **Three-brood *Ceriodaphnia dubia* survival and reproduction**— Biological Test Method: Test of reproduction and survival using the cladoceran *Ceriodaphnia dubia*, Environment Canada, Environmental Protection Series 1/RM/21, February 2007 (ECCC 2007b).
  - The *C. dubia* test was run to a maximum of eight days, or production of three broods in all synthetic base water replicates (whichever is shorter), such that the potential effect of early termination can be evaluated further. The standard Environment Canada protocol specifies termination when 60% of negative control replicates have reached a third brood, which in some cases can lead to premature termination due to minor differences in brood timing. This change did not require a protocol deviation for standard reporting, rather it allowed for additional information on reproduction timing and output.
- **32-day Fathead Minnow survival growth and hatching success**—Ecological Effects Test Guidelines: Fish early-life stage toxicity test, United Stated Environmental Protection Agency, Office of Pollution Prevention and Toxics 850.1400, April 1996. This test is conducted with embryos that are less than 3-hrs post-fertilization.

2-2.2.2.2 Water Amendments

The toxicity tests for the chronic TDS study presented in this report were conducted with three water types, as follows:

1) **Negative Laboratory Control**—This water type was clean dilution water prepared using a standard recipe and not customized to site-specific ionic composition. The negative control was used as a quality assurance and quality control standard for test validity (i.e., it is used to assess organism health and test reliability).
2) **Site Water Control or Dilution Control**—This water type was unamended site water collected from a raw drinking water intake pipe connected to Third Portage Lake (station DW-RAW-KIA) by Agnico on 27 March 2024 (site water control for *R. subcapitata* and *C. dubia*), or simulated dilution water (synthetic dilution control for Fathead Minnow). This water type was used to evaluate baseline water responses in site water or simulated site water, as the dilution water in the test, and as the control for pairwise statistical comparisons (if test validity criteria were met; Section 2-2.1.3.1).
3) **TDS Treatments**—This water type was unamended site water (*R. subcapitata* and *C. dubia*) or unamended dilution water (Fathead Minnow) amended with major ion salts to reach a target calculated TDS concentration and ion composition.
   - ***R. subcapitata* and *C. dubia*—**The exposure treatments were first amended to the highest target nominal concentration of approximately 2,296 mg/L calculated TDS. Subsequently, successive volumetric dilutions with proportions of the TDS-amended-water and the unamended site water were prepared to target a range of concentrations for TDS that bounded the target range. The range extended beyond the maximum expected TDS at the edge of the mixing zone in Third Portage Lake under future discharge conditions. The site water control and TDS treatments were combined at a ratio of 23:77 (site water control: TDS-amended treatment water) to achieve a gradient of TDS concentrations (Table 2-4). The target ion composition was derived from a conservative modelled scenario for treated effluent (Vault Pit base waters; Attachment 1, Section 1.2.0) with a slight adjustment to the proportion of cations to balance the mixture. The target ion composition in the high treatment was approximately 43% sulphate, 15% chloride, 15% sodium, 13% calcium, 8% nitrate, 3% potassium, and negligible contributions of magnesium and fluoride.

- **Fathead Minnow—**This water was first amended to the highest target nominal concentration of approximately 2,236 mg/L calculated TDS; subsequently, volumetric dilutions with proportions of the TDS-amended-water and the unamended dilution water control were prepared to encompass the target range. The dilution water control and TDS treatments were combined at a ratio of 50:50 (dilution water control: TDS-amended treatment water) to achieve a gradient of TDS concentrations (Table 2-4). The target ion composition was derived from a conservative modelled scenario for treated effluent (Vault Pit base waters; Attachment 1, Section 1-2.0) with a slight adjustment to the proportion of cations to balance the mixture. The target ion composition in the high treatment was approximately 47% sulphate, 19% chloride, 16% sodium, 13% calcium, 4% potassium, with negligible contributions of magnesium, nitrate, and fluoride.

Table 2-4: Concentration Series for the Chronic TDS Toxicity Testing Program

Water Type	Target Calculated TDS Treatment (mg/L)	Amendment
Raphidocelis subcapitata and Ceriodaphnia dubia		
Negative laboratory control	~122	None
Site water control (station DW-RAW-KIA)	~122	None
Calculated TDS Treatments	713	Amended with $CaSO_4$, KCl, $MgSO_4$, Na_2SO_4, $NaHCO_3$, $CaCl_2$, and $NaNO_3$ salts with Ca:Mg ratio of 9.5:1 to 11:1
	889	
	1,117	
	1,414	
	1,799	
	2,296	
Fathead Minnow		
Negative laboratory control	~122	None
Dilution water control	~374	Amended with $CaSO_4$, KCl, $MgSO_4$, Na_2SO_4, $NaHCO_3$, $CaCl_2$, and $NaNO_3$ salts with Ca:Mg ratio of 9.5:1 to 11:1
Calculated TDS Treatments	490	
	606	
	839	
	1,305	
	2,236	

Notes: TDS = total dissolved solids; Ca = calcium; Mg = magnesium; NaCl = sodium chloride; $CaSO_4$ = calcium sulphate; KCl = potassium chloride; $MgSO_4$ = magnesium sulphate; Na_2SO_4 = sodium sulphate; $NaNO_3$ = sodium nitrate; $CaCO_3$ = calcium carbonate; $NaHCO_3$ = sodium bicarbonate; $CaCl_2$ = calcium chloride; mg/L = milligrams per litre; ~ = approximately.

2-2.2.2.3 Analytical Chemistry

Measurements of water quality were conducted to document changes to the partitioning of the major ion salts throughout the tests, as follows:

- **Site water control**—Upon receipt of the site water control sample, Nautilus collected as subsample and submitted to ALS Canada Ltd. (ALS) in Calgary, Alberta for analysis of standard routine parameters (i.e., pH, hardness, specific conductivity, total alkalinity), calculated TDS, total and dissolved organic carbon, major ions (e.g., Ca^{2+}, Mg^{2+}, Na^{+}, K^{+}, SO_4^{2-}, Cl^{-}, F^{-}, and HCO_3^{-}), total ammonia as nitrogen, nitrate as nitrogen, total cyanide (including Strong-Acid Digestion, Weak-Acid Digestion, free cyanide), thiocyanate, and total and dissolved metals.

- ***R. subcapitata***—Nautilus subsampled the site water control, and the low, moderate, and high TDS treatments at test initiation[3] and submitted for analysis of pH, hardness, specific conductivity, dissolved major ions (calcium, magnesium, potassium, sodium, sulphate, chloride, nitrate, fluoride), total alkalinity (as calcium carbonate [$CaCO_3$]), and calculated TDS.

- ***C. dubia***—Nautilus subsampled the site water control, and the low, moderate, and high TDS treatments at test initiation and termination, and submitted for analysis of pH, hardness, specific conductivity, dissolved major ions (calcium, magnesium, potassium, sodium, sulphate, chloride, nitrate, fluoride), total alkalinity (as $CaCO_3$), and calculated TDS.

- **Fathead Minnow**—Nautilus subsampled the dilution water control, and the low, moderate, and high TDS treatments at test initiation, mid-point, and termination, and submitted for analysis of pH, hardness, specific conductivity, dissolved major ions (calcium, magnesium, potassium, sodium, sulphate, chloride, nitrate, fluoride), total alkalinity (as $CaCO_3$), and measured TDS.

Analytical chemistry was used to confirm the nominal target test concentrations were obtained (i.e., volumetric dilutions applied effectively). Remaining water quality parameters measured in the site water or dilution water controls upon sample receipt were not remeasured in individual treatments as they were not meaningfully influenced by the introduction of the major ion salts used to amend the controls. The ratio of 23:77 site water control to TDS-amended treatment water for *C. dubia* and *P. subcapita* tests and the ratio of 50:50 dilution water control to TDS-amended treatment water for the Fathead Minnow test was applied to measured values and the to estimate TDS component concentrations for treatments not submitted for confirmatory chemistry (Appendix C).

2-2.2.3 Toxicity Data Analysis

2-2.2.3.1 Quality Assurance and Quality Control

Quality Assurance and Quality Control (QAQC) information from the laboratory report (Appendix C) was reviewed per Section 2-2.1.3.1.

[3] Insufficient volume is available at test termination to subsample chemistry for *R. subcapitata*.

2-2.2.3.2 Concentration-Response Analysis

Nautilus conducted pairwise statistical comparisons for each test species and endpoint between the laboratory control and site water control (*C. dubia* and *P. subcapitata*) or dilution water control (Fathead Minnow) and each TDS treatment. Statistical analyses were performed using CETIS™ (Tidepool Scientific Software 2013). Methods and results of statistical analyses are presented in the Nautilus Toxicity Report (Appendix C).

Response data for TDS treatments were normalized to the applicable control before performing subsequent data analyses. Normalized responses were calculated as the replicate response divided by the mean response in the applicable control multiplied by 100 to provide a response on a percentage basis. Normalization is conducted to estimate percent effect relative to the applicable control, rather than the absolute value of the biological response.

Concentration-response analysis was conducted to examine the relationship between normalized test responses of test endpoints and the corresponding TDS concentrations. Concentration-response curves were fit using the US EPA Toxicity Relationship Analysis Program (TRAP; version 1.30a) to estimate 10%, 20%, and 50% effect concentrations (±95% confidence limits [CLs]). Data were log-transformed prior to analyses because the characteristics of the exposures had multiplicative exposure intervals and were skewed to the left. Per TRAP's User Guide, "log-transformation of the exposure variable can often make the toxicity relationship more symmetric and thus make the models more accurate." Data were evaluated using a logistic model with least-squares nonlinear regression analysis. The following logistic equation was fit to concentration-response data:

$$y = \frac{y_0}{1 + e^{(4S(X - X_{50}))}}$$

Where: y_0 is the background response level at a concentration of zero
S is the slope at X_{50}, which is the concentration associated with a 50% reduction in y, the response level, relative to y_0

Model parameters, as well as the statistical significance of the regression, are reported herein for each curve estimated by TRAP. For a subset of curves fit, TRAP estimated the y_0 parameter to appreciably deviate from the expected no-effect value of 1 (deviation is defined herein as outside of 1 ± 0.02). This condition is an artifact of the spacing of the treatment levels and is more pronounced when endpoint variance is high at the lower end of the exposure series. When this occurred, the model was re-run with y_0 constrained to 1. It was important to have a reliable fit at the top of the curve because this forms the basis for effect concentration calculations. Otherwise, effects concentrations will be biased and not accurately reflect the adverse effect size implied by the x in LC_X/IC_X.[4].

[4] LC/IC_X is defined as the lethal or inhibition concentration associated with an X% reduction in the respective lethal or sublethal endpoint.

2-2.2.3.3 Relevance and Reliability of Effect Concentrations

The following information was reviewed to inform an overall interpretation of the relevance and reliability of LC/IC$_X$ estimates. The purpose of this step is to avoid undue emphasis on a predefined and somewhat arbitrary effect size (e.g., 10% effect, which may not be detectable within the statistical power constraints of the study) and appropriately consider the statistical properties of the underlying data. The rationale for this consideration is outlined in de Bruyn and Elphick (2013), who explain why the interpretation of effect concentrations must recognize the limitations of either the statistical significance approach (i.e., NOECs/LOECs) or effect size approach (i.e., IC$_X$ estimates). The respective limitations of NOECs/LOECs and IC$_X$ estimates propagate through their application to set toxicological screening values. Screening values based on compiled NOECs/LOECs represent a blend of varying effect sizes, whereas screening values based on IC$_X$ values represent a blend of high-confidence and low-confidence values with varying statistical properties (de Bruyn and Elphick 2013):

- Percent minimum significant difference (PMSD)—The PMSD represents the minimum effect size that can be distinguished with statistical confidence from natural test variability in site water control or dilution water control performance.
- No observed effect concentration (NOEC)—The NOEC represents the highest treatment concentration associated with no statistically significant effects. LC/IC$_X$ estimates below the NOEC have increased uncertainty because they represent a concentration that, in the actual toxicity test, did not result in a statistically significant departure from base water performance.
- Concentration-response model and variability in those data—Within-treatment variability was visually assessed by reviewing figures with replicate results and by reviewing standard deviation of the mean. High within-treatment variability is reflected in wide confidence intervals around model parameters.
- Width of confidence intervals around LC/IC$_X$ estimates—LC/IC$_X$ estimates with wide confidence intervals have elevated uncertainty.
- Attribution of effects to TDS—As discussed in Section 2-2.2.2.2, TDS amended waters were prepared to match target TDS concentrations and compositions; this matching was designed to evaluate the toxicity of TDS in site-relevant waters. It is prudent to consider whether observed effects were due to the balanced TDS mixture representative of site conditions or an individual ion within the mixture. To assess the potential for confoundment by an individual ion, effect concentrations estimated for TDS were compared to the expected range of effect concentrations for TDS for the species of interest. If the effect concentrations were outside the expected range, then individual ion concentrations were compared to effect concentrations for individual ions for the species of interest to determine if an individual ion is driving the unexpected response.

2-3.0 RESULTS

2-3.1 Quality Assurance and Quality Control

Laboratory QAQC information is provided in the Nautilus laboratory reports (Appendix A and Appendix C). The QAQC checks confirmed that all criteria were met for acute and chronic toxicity tests (Section 2-2.1.3.1), with the following exception:

- Site water used in tests exceeded the protocol-stipulated three-day holding time due to the nature of the study design. The study design required that water chemistry analysis be conducted prior to test initiation to characterize base water prior to amendment.

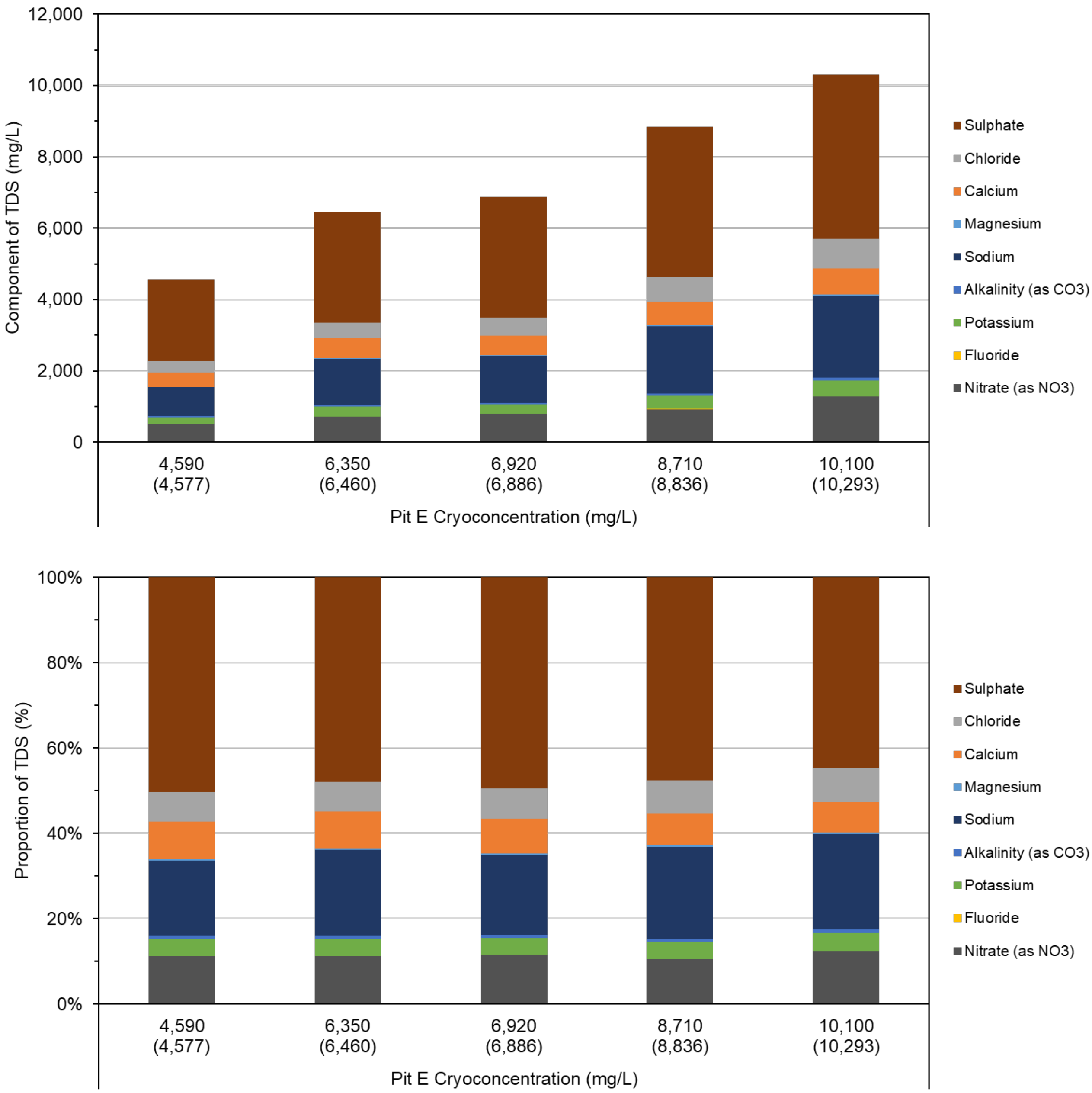
Based on experience with similar testing programs, it is anticipated that major ions would be relatively stable during storage. Any change in sample composition during storage was predicted to have negligible effects on the test results; therefore, exceedance of the hold time was not anticipated to have affected the results of the study.

2-3.2 Acute Toxicity Program

2-3.2.1 Analytical Chemistry

Measured TDS concentrations ranged from 4,590 to 10,100 mg/L (4,577 to 10,293 mg/L, calculated) (Appendix B). The cryo-concentration was successful in increasing overall TDS concentrations, while maintaining steady compositions across the five treatments. The mixtures were sodium-sulphate dominant with roughly 55% of the TDS dominated by sulphate (Figure 2-1), with similar ionic compositions to those seen in the historical mock effluent testing (Attachment 1 – Figure 1-3).

Figure 2-1: Individual Ion Concentrations (top panel) and Percentage of TDS Composition (bottom panel) in Site-Specific Acute Toxicity Tests for TDS



Notes: The measured TDS concentration corresponding with each treatment are shown on the x-axis. The calculated TDS concentration corresponding with each treatment are shown on the x-axis in brackets.

TDS (mg/L) is calculated as the sum of calcium, chloride, fluoride, magnesium, potassium, sodium, sulphate, alkalinity as carbonate (calculated 0.6 × total alkalinity as $CaCO_3$), and nitrate as NO_3 (calculated 4.427 x nitrate as N; APHA 2012).

TDS = total dissolved solids; CO_3 = carbonate ion; NO_3 = nitrate ion; mg/L = milligrams per litre.

2-3.2.2 Acute Testing Results

Ten to twenty percent immobility was seen in the *D. magna* treatments with >8,710 mg/L measured TDS (>8,836 mg/L calculated), while negligible effects to survival were observed for both test species (survival ≥97%) up to the highest tested measured TDS of 10,100 mg/L (10,293 mg/L calculated) (Table 2-5, Appendix A).

Table 2-5: Summary of Results for Acute TDS Toxicity Tests

Measured TDS (mg/L)	*D. magna* Mean Survival (%)	*D. magna* Mean Immobility (%)	Rainbow Trout Survival (%)
4,590 (4,577)	100	0	100
6,350 (6,460)	100	3	100
6,920 (6,886)	100	3	100
8,710 (8,836)	100	20	100
10,100 (10,293)	97	13	100

Notes: The calculated TDS concentration corresponding with each treatment are shown in brackets.

Total dissolved solids concentration (TDS in mg/L) was calculated as the sum of calcium, chloride, fluoride, magnesium, potassium, sodium, sulphate, alkalinity as carbonate (calculated 0.6 × total alkalinity as $CaCO_3$), and nitrate as NO_3 (calculated 4.427 x nitrate as N; APHA 2012).

TDS = Total Dissolved Solids; % = percentage.

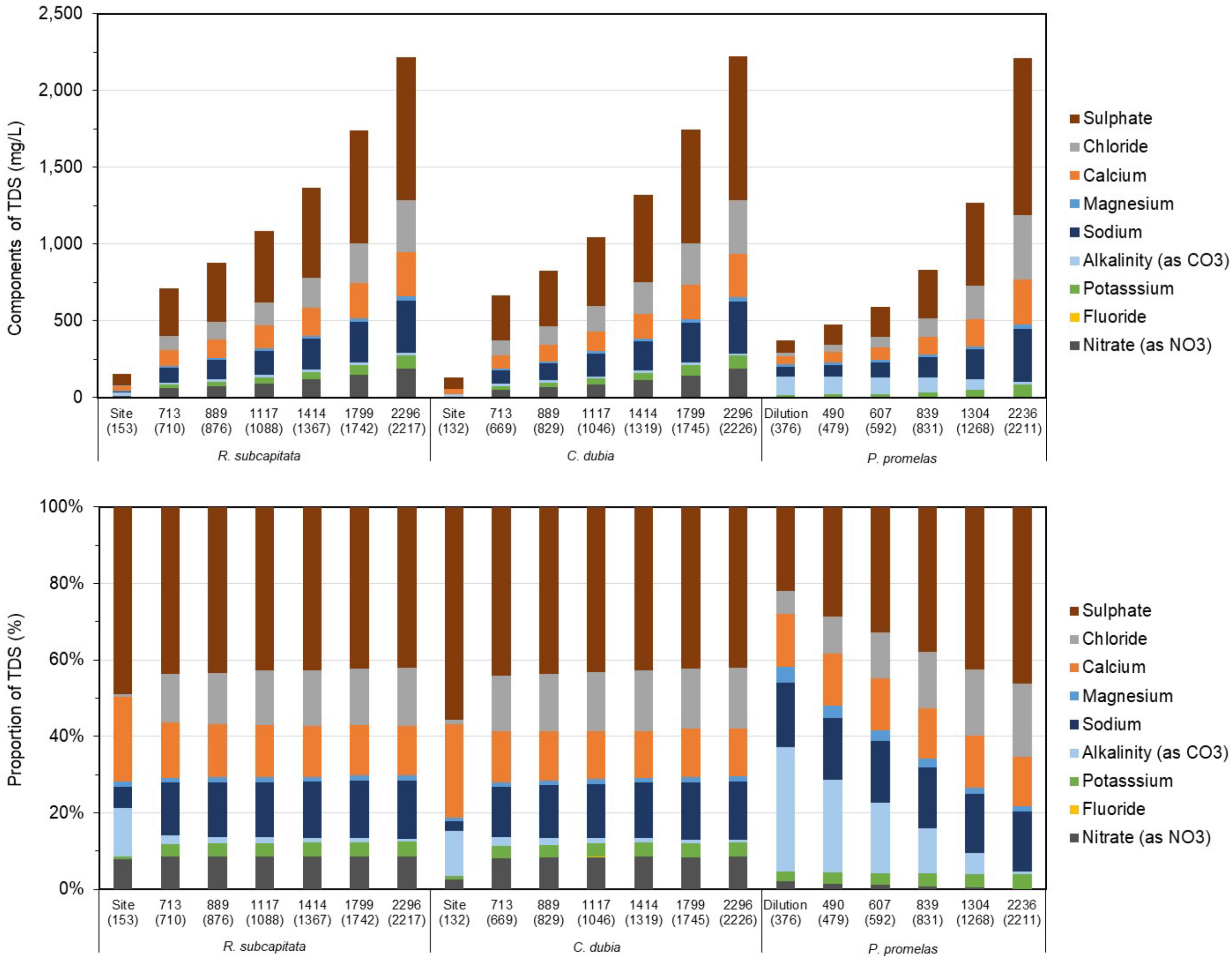
2-3.3 Chronic Toxicity Program

2-3.3.1 Analytical Chemistry

The analytical results are presented in Appendix C. On average, calculated TDS ranged was 104% (*R. subcapitata*), 96% (*C. dubia*), and 99% (Fathead Minnow) of nominal. Small discrepancies between the calculated and nominal TDS concentrations may result from additional dissolution of salts or laboratory errors in treatment preparation (i.e., incorrect measuring and/or mixing of salts in solution).

- ***R. subcapitata* and *C. dubia*—**The site water control waters were comprised of approximately 52% sulphate, 23% calcium, 12% alkalinity, 4% sodium, 5% nitrate, and negligible contributions of magnesium, potassium, and fluoride. The calculated TDS treatments were comprised of approximately 43% sulphate, 15% chloride, 14% sodium, 13% calcium, 8% nitrate, 3% potassium, and negligible contributions of magnesium and fluoride (Figure 2-2).
- **Fathead Minnow—**The dilution water control water was comprised of approximately 22% sulphate, 14% calcium, 33% alkalinity, 17% sodium, 4% magnesium, 3% potassium, 2% nitrate, and negligible contributions of fluoride. The high calculated TDS treatment comprised approximately 46% sulphate, 19% chloride, 16% sodium, 13% calcium, 4% potassium, and negligible contributions of magnesium, nitrate, and fluoride (Figure 2-2). The composition of the intermediate exposure TDS treatments shifted from the composition of the dilution water to the composition of the high calculated TDS treatment. As discussed in Section 2-2.2.1, the composition of the dilution water for the Fathead Minnow tests differed from the site water used for the *C. dubia* and *P. subcapitata* tests because the dilution water was designed to test the full range of TDS predictions at the edge of the mixing zone in Third Portage Lake under future discharge conditions provided by Agnico. The updated predictions were received after the first round of testing with *C. dubia* and *P. subcapitata*.

Figure 2-2: Individual Ion Concentrations (top panel) and Percentage of TDS Composition (bottom panel) in Site-Specific Chronic Toxicity Tests for TDS



Notes: Nominal TDS concentration corresponding with each treatment are presented on the x-axis with calculated TDS concentration corresponding with each treatment shown in brackets. “Site” is the site collected reference.

The source of tested TDS compositions for each test species are described in Section 2-2.2.1 and Section 2-2.2.2.2.

TDS (mg/L) is calculated as the sum of calcium, chloride, fluoride, magnesium, potassium, sodium, sulphate, alkalinity as carbonate (calculated 0.6 × total alkalinity as $CaCO_3$), and nitrate as NO_3 (calculated 4.427 × nitrate as N; APHA 2012).

TDS = total dissolved solids; CO_3 = carbonate ion; NO_3 = nitrate ion; mg/L = milligrams per litre.

2-3.3.2 Concentration-Response Analysis

Results for each test species and endpoint are discussed below and summarized in Table 2-6.

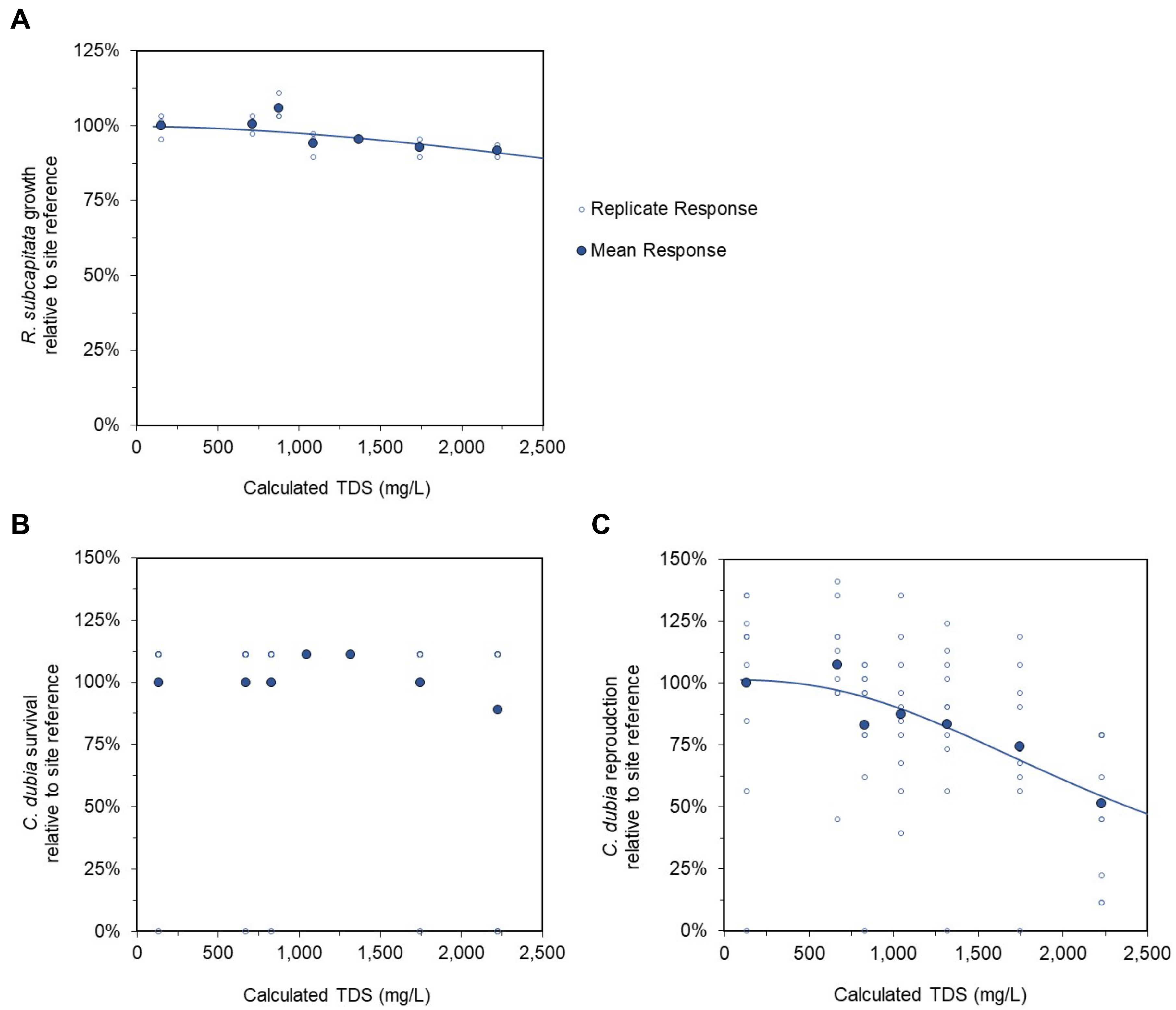
- ***R. subcapitata* growth**—There was no statistically significant reduction in *R. subcapitata* growth relative to the site water control. The NOEC was >2,217 mg/L calculated TDS (Panel A of Figure 2-3) and was considered reliable for TDS.
- ***C. dubia* survival**—There was no statistically significant reduction in *C. dubia* survival relative to the site water control. The NOEC was >2,226 mg/L calculated TDS (Panel B of Figure 2-3) and was considered reliable for TDS.
- ***C. dubia* reproduction**—*C. dubia* reproduction was significantly reduced in the 2,296 mg/L TDS treatments, with a NOEC of 1,745 mg/L TDS and LOEC of 1,745 mg/L TDS. A concentration-response curve was fit to the data with IC_{10} of 976 mg/L TDS, IC_{20} of 1,354 mg/L TDS, and IC_{50} of 1,520 mg/L calculated TDS (Panel C of Figure 2-3).
  - There is elevated uncertainty in the IC_{10} and IC_{20} effects estimates because the estimated effects are below the NOEC and because the PMSD relative to the site-collected reference (34%) was greater than the estimated effect sizes (i.e., 10% and 20%; Section 2-2.2.3.3). Therefore, IC_{10} and IC_{20} estimates have low statistical reliability and should be used and interpreted with caution.
  - The magnitude of effect on reproduction aligns with TDS thresholds for this species and endpoint from the literature; (i.e., negligible effect on reproductions at calculated TDS > 1,000 mg/L; Attachment 1, Section 1-4).
- **Fathead Minnow early life stage survival, growth, and hatching success**—There was no statistically significant reduction in Fathead Minnow overall survival, post-hatch survival, proportion normal, hatch rate, and length relative to the dilution water control. The NOEC was >2,211 mg/L calculated TDS for these endpoints (Panel A through E of Figure 2-4) and was considered reliable for TDS. Fathead Minnow dry weight was significantly reduced relative the dilution water control in the four highest calculated TDS treatments (600, 828, 1,292, and 2,211 mg/L calculated TDS), but a significant concentration response model could not be fit to the data.
  - An atypical concentration response curve was observed in which an apparent low-magnitude response (9.7% effect on dry weight) was observed in the highest exposure treatment, but the effects were flat (i.e., not concentration-dependent) for the remaining dilutions (Panel F of Figure 2-4), indicating uncertainty in the reliability and/or cause of response. The effect sizes for dry weight in the remaining significant treatments were 7.3% at 600 mg/L calculated TDS, 10% at 828 mg/L calculated TDS, and 8.3% at 1,292 mg/L calculated TDS, and there was no concentration-based pattern to the reductions. These results indicate the reduction in dry weight may be (in part) driven by a factor other than TDS.
  - The low inter-replicate variances observed for this test resulted in low magnitude responses yielding statistically significant differences relative to control water. The PMSD was 6.6%, such that both NOEC and LOEC calculations yield values below 10% magnitude of effect. Such small differences are unlikely to be biologically meaningful, especially in the absence of a clear concentration-response profile.

Table 2-6: Summary of Model Parameters and Effect Concentration Estimates for the Chronic Total Dissolved Solids Toxicity Tests

Species Endpoint	Endpoint	Statistical NOEC for Calculated TDS (mg/L)	Statistical LOEC for Calculated TDS (mg/L)	Relative to site water or dilution water control								
				PMSD (%)	Model Parameters				Estimated Effect Concentration for Calculated TDS (mg/L)			Effect Statistics Reliable for TDS?
					p-value	Y_0	Slope (95% CL)	Log X50 (95% CL)	LC/IC_{10} (95% CL)	LC/IC_{20} (95% CL)	LC/IC_{50} (95% CL)	
R. subcapitata	Growth	>2,217	>2,217	NA	<0.05	1.0	1.0 (-0.49-2.5)	3.9 (3.1-4.7)	>2,217	>2,217	>2,217	Yes
C. dubia	Survival	>2,226	>2,226	NA	No significant model fit[(a)]							Yes
	Reproduction	1,745	2,226	34	<0.05	1.0	1.4 (-0.10-3.0)	3.4 (3.2-3.5)	976 (409-2,331)	1,354 (778-2,356)	>2,226	Yes, with moderate uncertainty for IC_{10} and IC_{20} (<NOEC, <PMSD)
P. promelas	Overall Survival	>2,211	>2,211	NA	No significant model fit[(a)]							Yes
	Post-hatch Survival	>2,211	>2,211	NA								Yes
	Proportion Normal	>2,211	>2,211	NA								Yes
	Hatch Rate	>2,211	>2,211	NA								Yes
	Length	>2,211	>2,211	NA								Yes
	Dry weight	487	600	6.6								Yes, with moderate uncertainty for NOEC and LOEC (atypical concentration response)

Notes: (a) A significant effect on the test endpoint was not observed (p>0.05). Therefore, a concentration-analysis model (i.e., concentration-response curve) was not fit to the dataset using TRAP. TDS = total dissolved solids; NOEC = no observed effect concentration; LOEC = lowest observed effect concentration; PMSD = percent minimum statistical difference; LC_X = lethal concentration associated with X% lethality in the sample population; IC_X = inhibition concentration associated with X% effect for the non-lethal endpoint in the sample population; CL = confidence limit; NA = not applicable; TRAP =Toxicity Relationship Analysis Program; > = greater than; < = less than.

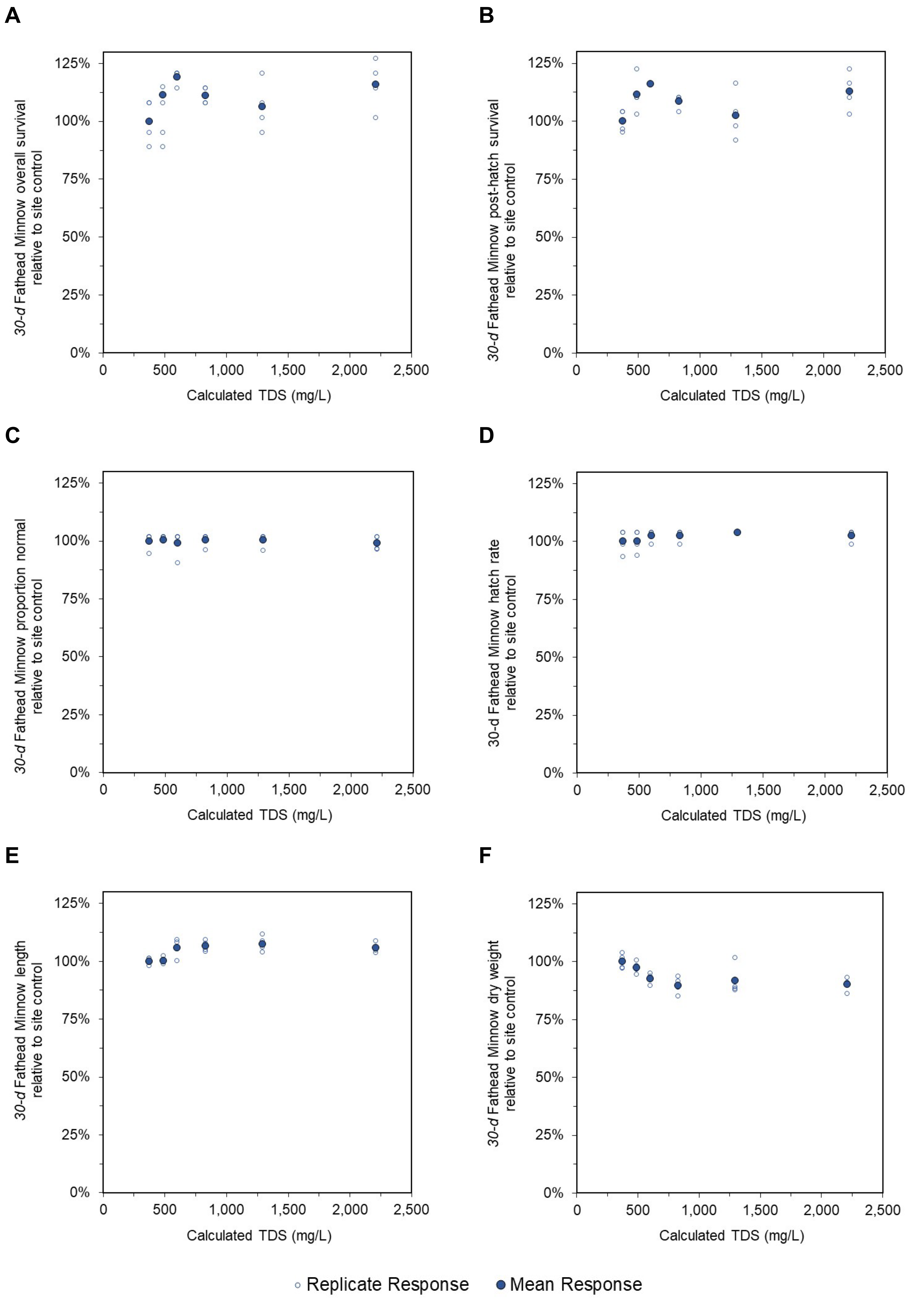
Figure 2-3: Concentration-Response Curves for *Raphidocelis subcapitata* Growth (A), and *Ceriodaphnia dubia* Survival (B) and Reproduction (C) versus Calculated Total Dissolved Solids (mg/L)



Notes: Concentration-response models were fit to the site collected reference. Solid lines are reliable concentration-response curves. Model parameters and LC/IC_X estimates are summarized in Table 2-6.

TDS = total dissolved solids; LC_X = lethal concentration associated with X% lethality in the sample population; IC_X = inhibition concentration associated with X% effect for the non-lethal endpoint in the sample population; mg/L = milligram per litre.

Figure 2-4: Concentration-Response Curves Fathead Minnow Overall Survival (A), Post-Hatch Survival (B), Proportion Normal (C), Hatch Rate (D), Length (E), and Dry Weight (F) versus Calculated Total Dissolved Solids (mg/L)



Notes: TDS = total dissolved solids; mg/L = milligram per litre.

2-4.0 UNCERTAINTY

The toxicity testing programs were conducted with standardized and sensitive representative test organisms; combined with the use of site-collected waters and synthetically prepared site waters, these test results provide an improved understanding of TDS-driven toxicity in mine-influenced waters for Meadowbank Mine Complex. These findings, when combined with the literature-based evaluation of species sensitivity, provide important evidence for the prediction of potential effects in mine-influenced waters for Meadowbank Mine Complex. As with any scientific investigation, the uncertainties associated with this study must be acknowledged.

Key areas of uncertainty in this study include the following:

- **TDS as a surrogate for ion toxicity**—The toxicity of TDS varies by ionic composition and the relative proportion of ions in the mixture. Low effect concentrations for acute endpoints (e.g., survival) have been reported in the literature for individual ions for select species, but these tests reflect exposure conditions accounting for a single ion, and not a balanced TDS mixture representative of most field conditions. The ionic compositions evaluated herein assume a sodium-sulphate-chloride dominant mixture. Should future ion mixtures shift away from the current sodium-calcium-sulphate-chloride dominant composition a revaluation of the applicability of the toxicity data presented in this report should be evaluated.

- **Use of representative test organisms**— The use of the water flea *D. magna* and fish Rainbow Trout for acute testing, and use of the green algae *R. subcapitata*, the cladoceran *C. dubia*, and the fish Fathead Minnow for chronic testing provides a standardized assessment of toxicity, conducted under the assumption that these taxa will be representative of organisms native to the Meadowbank Mine Complex. The test protocols for the chosen species were selected to provide representation of taxa and endpoints that are commonly observed to be sensitive to environmental contaminants (e.g., crustacean reproduction), and the test battery also included species demonstrated to be among the most sensitive taxa in the literature. However, there is uncertainty regarding the extrapolation of laboratory tests using site-relevant surrogate species to field conditions. This uncertainty is mitigated by using surrogate species that have been demonstrated in the literature to be sensitive to TDS exposure.

- **Biological significance of low magnitude responses**—The exposure treatments used in this study did not yield moderate to large effect sizes in any test treatment, but rather yielded a subset of test endpoints that yielded small magnitude responses relative to control water. Some of these differences were statistically significant (i.e., Fathead Minnow dry weight) whereas others were not (*C. dubia* reproduction). As a conservative approach, the statistical metrics used to define the “acceptable endpoints representing the no-effects threshold” per CCME (2007) guidance were conservatively selected (i.e., lower estimates applied even where such may indicate negligible toxicological responses reflecting influence of factors not attributable to TDS. This approach will have a tendency to bias (downward) the HC_5 estimates in species sensitivity distributions. In recognition of this bias, it is important to consider the other information from concentration-response analyses (e.g., other candidate effect sizes, statistical criteria, and degree on consistency in the modelled responses).

- **Inter-replicate variance**—As is widely observed in laboratory-based toxicity tests, there were variations in response rate among individual replicates within the same exposure treatments. These variations can influence the statistical significance tests (i.e., statistical power is influenced by variance, among other factors). Each test endpoint in this study provided different but complementary information on toxicity to aquatic organisms, including the strength (magnitude of response), reliability, and degree of association to chemical exposures. Of the tests conducted, the *C. dubia* reproduction endpoint (Figure 2-3C) yielded the most reliable indications of concentration-based response; in spite of the high variance in individual replicates, the pattern of response is clear and is consistent with information collected for similar mixtures at other sites. In contrast, the Fathead Minnow responses are unclear; the concentration-response pattern is weak and ambiguous in spite of low inter-replicate variation.

2-5.0 SUMMARY OF KEY FINDINGS

The objective of the acute and chronic TDS studies was to evaluate site-specific acute and chronic TDS toxicity to sensitive, surrogate aquatic test species using waters with ionic compositions representative of future effluent discharge conditions (end-of-pipe) at Meadowbank Mine Complex (acute study) and receiving environment conditions at the edge of the regulated mixing zone under a future effluent discharge scenario (chronic study).

A summary of key findings for the acute program is presented below:

- Negligible effects to *D. magna* and Rainbow Trout survival were observed at measured TDS concentrations up to 10,100 mg/L (10,293 mg/L calculated).
- Ten to twenty percent immobility was observed in *D. magna* with exposure to measured TDS concentrations of >8,710 mg/L (8,836 mg/L calculated).

A summary of key findings for the chronic program is presented below:

- Negligible chronic toxicity was observed to *R. subcapitata* growth, *C. dubia* survival and reproduction, and Fathead Minnow survival and hatching success at concentrations below 1,000 mg/L calculated TDS.
- No statistically significant reduction in *R. subcapitata* growth was observed with exposure to concentrations up to 2,217 mg/L calculated TDS (unbounded NOEC).
- No statistically significant reduction in *C. dubia* survival was observed with exposure to concentrations up to 2,226 mg/L calculated TDS (unbounded NOEC). *C. dubia* reproduction was significantly reduced but not until concentrations exceeding 1,000 mg/L calculated TDS (IC_{20} of 1,354 mg/L).
- No statistically significant reduction in Fathead Minnow overall and post-hatch survival, proportion normal, hatch rate, and length was observed with exposure to concentrations up to 2,211 mg/L calculated TDS (unbounded NOEC). A low-level statistically significant reduction in Fathead Minnow dry weight was observed in the 600 to 2,211 mg/L calculated TDS treatments, with a NOEC of 487 mg/L calculated TDS and LOEC of 600 mg/L calculated TDS. However, a concentration-response model could not be fit to the dry weight data and the effect sizes for dry weight in these treatments were small (equal to or less than 10%). The concentration response was considered atypical as there was no apparent trend to the reductions, indicating the reduction in dry weight may be (in part) driven by a factor other than TDS.

2-6.0 REFERENCES

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APPENDIX A

Acute Toxicity Testing Reports

B-11 Nicholas Beaver Road
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Tel. (519) 763-4412
Fax. (519) 763-4419

TOXICITY TEST REPORT

Daphnia magna
EPS 1/RM/14

Work Order : 254185
Sample Number : 81599

SAMPLE IDENTIFICATION

Company :	Agnico Eagle Mines Limited - Meadowbank Division	Sampling Date :	2024-03-07
Location :	Baker Lake NU	Sampling Time :	14:00
Substance :	Pit E (Baseline - TDS SSWQO)	Date Received :	2024-03-11
Sampling Method :	Grab	Time Received :	12:15
Sampled By :	T. Genty	Temperature at Receipt :	6 °C
Sample Description :	Clear, orange.	Date Tested :	2024-03-12

Test Method : Toxicity Investigations

48-HOUR TEST RESULTS

Substance	Effect	Value
Control	Mean Immobility	0.0 %
	Mean Mortality	0.0 %
100%	Mean Immobility	3.3 %
	Mean Mortality	0.0 %

The results reported relate only to the sample tested and as received.

TEST ORGANISM

Species :	*Daphnia magna*	Time to First Brood :	7.6 days
Organism Batch :	Dm24-04	Average Brood Size :	37.8
Culture Mortality :	2.0% (previous 7 days)		

TEST CONDITIONS

Sample Treatment :	See 'COMMENTS' section below	Number of Replicates :	3
pH Adjustment :	None	Organisms per Replicate :	10
Pre-aeration Rate :	~30 mL/min/L	Organisms per Test Level :	30
Duration of Pre-Aeration :	30 minutes	Organism Loading Rate :	15.0 mL/organism
Test Aeration :	None	Impaired Control Organisms :	0.0%
Hardness Adjustment :	None		

REFERENCE TOXICANT DATA

Toxicant :	Sodium Chloride		
Date Tested :	2024-03-11	LC50 :	6.2 g/L
Organism Batch :	Dm24-04	95% Confidence Limits :	6.2 - 6.3 g/L
Analyst(s) :	AA	Historical Mean LC50 :	6.3 g/L
Statistical Method :	Trimmed Spearman-Kärber	Warning Limits (± 2SD) :	5.8 - 6.8 g/L

COMMENTS

Prior to test initiation, the sample was allowed to settle overnight at 15^{o}C. The following day, the sample was carefully decanted so that no settled solids from the bottom of the sample were included in the test solution.

Approved By : ______________________

Project Manager

NAUTILUS ENVIRONMENTAL

TOXICITY TEST REPORT

Daphnia magna

EPS 1/RM/14

Work Order : 254185

Sample Number : 81599

TEST DATA

	pH	Dissolved O_2 (mg/L)	Conductivity (µmhos/cm)	Temperature (°C)	O_2 Saturation (%)*	Hardness (as $CaCO_3$)
Initial Chemistry (100%) :	7.2	9.2	8127	20	109	>1000 mg/L

0 HOURS

Date & Time : 2024-03-12 10:30

Analyst(s) : FM (JGR)

Concentration (%)	Replicate	Dead	Immobile	pH	Dissolved O_2	Conductivity	Temperature	O_2 Saturation*	Hardness
100	A	0	0	7.5	8.7	8073	20	103	>1000
100	B	0	0	7.5	8.7	8073	20	103	>1000
100	C	0	0	7.5	8.7	8073	20	103	>1000
Control	A	0	0	8.3	8.6	491	20	100	140
Control	B	0	0	8.3	8.6	491	20	100	140
Control	C	0	0	8.3	8.6	491	20	100	140

Notes: The 100% test solution is clear and light yellow.

24 HOURS

Date & Time : 2024-03-13 9:50

Analyst(s) : FM (JGR)

Concentration (%)	Replicate	Dead	Immobile	pH	Dissolved O_2	Conductivity	Temperature
100	A	–	0	–	–	–	21
100	B	–	0	–	–	–	21
100	C	–	0	–	–	–	21
Control	A	–	0	–	–	–	21
Control	B	–	0	–	–	–	21
Control	C	–	0	–	–	–	21

Notes: The 100% test solution is clear and light yellow. Test organisms appear normal.

48 HOURS

Date & Time : 2024-03-14 10:10

Analyst(s) : AA (PG)

Concentration (%)	Replicate	Dead	Immobile	pH	Dissolved O_2	Conductivity	Temperature
100	A	0	0	8.0	8.1	8166	20
100	B	0	0	8.0	8.1	8189	20
100	C	0	1	8.0	8.1	8117	20
Control	A	0	0	8.3	8.4	500	20
Control	B	0	0	8.3	8.5	501	20
Control	C	0	0	8.3	8.6	502	20

Notes: The 100% test solution is clear and pale yellow. Mobile test organisms appear normal.

Number immobile does not include number dead.

"–" = not measured/not required

* adjusted for temperature and barometric pressure

Test Data Reviewed By : EM

Date : 2024-03-19

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TOXICITY TEST REPORT
Rainbow Trout
EPS 1/RM/13

Work Order : 254185
Sample Number : 81599

SAMPLE IDENTIFICATION

Company :	Agnico Eagle Mines Limited - Meadowbank Division	Sampling Date :	2024-03-07
Location :	Baker Lake NU	Sampling Time :	14:00
Substance :	Pit E (Baseline - TDS SSWQO)	Date Received :	2024-03-11
Sampling Method :	Grab	Time Received :	12:15
Sampled By :	T. Genty	Temperature at Receipt :	6 °C
Sample Description :	Clear, orange.	Date Tested :	2024-03-12

Test Method(s) : Toxicity Investigation

96-HOUR TEST RESULTS

Substance	Effect	Value
Control	Mean Impairment	0.0 %
	Mean Mortality	0.0 %
100%	Mean Impairment	0.0 %
	Mean Mortality	0.0 %

The results reported relate only to the sample tested and as received.

TEST ORGANISM

Test Organism :	*Oncorhynchus mykiss*	Mean Fork Length :	47.5 mm
Organism Batch :	T24-03	Range of Fork Lengths :	46 - 50 mm
Control Sample Size :	10	Mean Wet Weight :	1.1 g
Cumulative stock tank mortality rate :	0% (previous 7 days)	Organism Loading Rate :	0.5 g/L
Control organisms showing stress :	0 (at test completion)		

TEST CONDITIONS

Sample Treatment :	See 'COMMENTS' section below	Volume Tested (L) :	20
pH Adjustment :	None	Number of Replicates :	1
Test Aeration :	Yes	Organisms Per Replicate :	10
Pre-aeration/Aeration Rate :	6.5 ± 1 mL/min/L	Organisms Per Test Level :	10
Duration of Pre-Aeration :	30 minutes		

REFERENCE TOXICANT DATA

Toxicant :	Potassium Chloride		
Organism Batch :	T24-03	LC50 :	4476 mg/L
Date Tested :	2024-03-01	95% Confidence Limits :	4070 - 4903 mg/L
Analyst(s) :	AJS, KR, PC, NWP	Historical Mean LC50 :	3967 mg/L
Statistical Method :	Linear Regression (MLE)	Warning Limits (± 2SD) :	2944 - 5345 mg/L

COMMENTS

Prior to test initiation, the sample was allowed to settle overnight at 15°C. The following day, the sample was carefully decanted so that no settled solids from the bottom of the sample were included in the 100% test solution.

Approved By : ____________________
Project Manager

NAUTILUS ENVIRONMENTAL

TOXICITY TEST REPORT

Rainbow Trout
EPS 1/RM/13

Work Order : 254185
Sample Number : 81599

TEST DATA

	pH	Dissolved O_2 (mg/L)	Conductivity (µmhos/cm)	Temperature (°C)	O_2 Saturation (%)[3]
Initial Water Chemistry (100%) :	7.4	9.3	7930	15	100
After 30 min pre-aeration :	7.4	8.8	7572	15	97

0 HOURS

Date & Time 2024-03-12 11:35
Analyst(s) : JW

Concentration	Dead	Impaired	pH	Dissolved O_2	Conductivity	Temperature	O_2 Saturation[3]
100%	0	0	7.4	8.8	7572	15	97
Control	0	0	8.3	9.8	651	14	100

Notes:

24 HOURS

Date & Time 2024-03-13 12:00
Analyst(s) : NM

Concentration	Dead	Impaired	pH	Dissolved O_2	Conductivity	Temperature
100%	0	0	7.8	8.7	7649	15
Control	0	0	8.4	9.2	665	15

Notes: The 100% test solution is clear and light brown. Test organisms appear normal.

48 HOURS

Date & Time 2024-03-14 10:20
Analyst(s) : JGR

Concentration	Dead	Impaired	pH	Dissolved O_2	Conductivity	Temperature
100%	0	0	7.8	9.2	7659	15
Control	0	0	8.4	9.3	663	15

Notes: The 100% test solution is clear and light orange. Test organisms appear normal.

72 HOURS

Date & Time 2024-03-15 10:20
Analyst(s) : NWP (NM)

Concentration	Dead	Impaired	pH	Dissolved O_2	Conductivity	Temperature
100%	0	0	7.7	9.1	7633	15
Control	0	0	8.3	9.2	651	15

Notes: The 100% test solution is clear and light orange. Test organisms appear normal.

96 HOURS

Date & Time 2024-03-16 10:45
Analyst(s) : NWP (NM)

Concentration	Dead	Impaired	pH	Dissolved O_2	Conductivity	Temperature
100%	0	0	7.8	9.2	7654	15
Control	0	0	8.3	9.0	647	15

Notes: The 100% test solution is clear and light orange. Test organisms appear normal.

"–" = not measured/not required
Number impaired does not include number dead.
[3] adjusted for temperature and barometric pressure

Test Data Reviewed By : EM
Date : 2024-03-19

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TOXICITY TEST REPORT

Daphnia magna
EPS 1/RM/14

Work Order :	254185
Sample Number :	81600

SAMPLE IDENTIFICATION

Company :	Agnico Eagle Mines Limited - Meadowbank Division	Sampling Date :	2024-03-07
Location :	Baker Lake NU	Sampling Time :	14:00
Substance :	Pit E (4000 TDS - 5100uS/cm)	Date Received :	2024-03-11
Sampling Method :	Grab	Time Received :	12:15
Sampled By :	T. Genty	Temperature at Receipt :	6 °C
Sample Description :	Clear, orange.	Date Tested :	2024-03-12

Test Method : Toxicity Investigations

48-HOUR TEST RESULTS

Substance	Effect	Value
Control	Mean Immobility	0.0 %
	Mean Mortality	0.0 %
100%	Mean Immobility	0.0 %
	Mean Mortality	0.0 %

The results reported relate only to the sample tested and as received.

TEST ORGANISM

Species :	*Daphnia magna*	Time to First Brood :	7.6 days
Organism Batch :	Dm24-04	Average Brood Size :	37.8
Culture Mortality :	2.0% (previous 7 days)		

TEST CONDITIONS

Sample Treatment :	See 'COMMENTS' section below	Number of Replicates :	3
pH Adjustment :	None	Organisms per Replicate :	10
Pre-aeration Rate :	~30 mL/min/L	Organisms per Test Level :	30
Duration of Pre-Aeration :	30 minutes	Organism Loading Rate :	15.0 mL/organism
Test Aeration :	None	Impaired Control Organisms :	0.0%
Hardness Adjustment :	None		

REFERENCE TOXICANT DATA

Toxicant :	Sodium Chloride		
Date Tested :	2024-03-11	LC50 :	6.2 g/L
Organism Batch :	Dm24-04	95% Confidence Limits :	6.2 - 6.3 g/L
Analyst(s) :	AA	Historical Mean LC50 :	6.3 g/L
Statistical Method :	Trimmed Spearman-Kärber	Warning Limits (± 2SD) :	5.8 - 6.8 g/L

COMMENTS

Prior to test initiation, the sample was allowed to settle overnight at 15°C. The following day, the sample was carefully decanted so that no settled solids from the bottom of the sample were included in the test solution. The decanted test solution was then diluted with R.O. water at a ratio of ~2 L sample: ~1 L R.O to acheive a target conductivity of ~5100 µS/cm.

Approved By : ____________________

Project Manager

NAUTILUS ENVIRONMENTAL

Work Order : 254185
Sample Number : 81600

TEST DATA

	pH	Dissolved O_2 (mg/L)	Conductivity (µmhos/cm)	Temperature (°C)	O_2 Saturation (%)*	Hardness (as $CaCO_3$)
Initial Chemistry (100%) :	7.2	8.7	5529	20	102	>1000 mg/L

0 HOURS

Date & Time : 2024-03-12 13:35
Analyst(s) : FM (JGR)

Concentration (%)	Replicate	Dead	Immobile	pH	Dissolved O_2	Conductivity	Temperature	O_2 Saturation*	Hardness
100	A	0	0	7.4	8.3	5507	20	99	>1000
100	B	0	0	7.4	8.3	5507	20	99	>1000
100	C	0	0	7.4	8.3	5507	20	99	>1000
Control	A	0	0	8.3	8.6	491	20	100	140
Control	B	0	0	8.3	8.6	491	20	100	140
Control	C	0	0	8.3	8.6	491	20	100	140

Notes: The 100% test solution is clear and light yellow.

24 HOURS

Date & Time : 2024-03-13 13:05
Analyst(s) : FM (JGR)

Concentration (%)	Replicate	Dead	Immobile	pH	Dissolved O_2	Conductivity	Temperature
100	A	–	0	–	–	–	21
100	B	–	0	–	–	–	21
100	C	–	0	–	–	–	21
Control	A	–	0	–	–	–	21
Control	B	–	0	–	–	–	21
Control	C	–	0	–	–	–	21

Notes: The 100% test solution is clear and light yellow. Test organisms appear normal.

48 HOURS

Date & Time : 2024-03-14 13:10
Analyst(s) : FM (PG)

Concentration (%)	Replicate	Dead	Immobile	pH	Dissolved O_2	Conductivity	Temperature
100	A	0	0	7.8	8.2	5525	21
100	B	0	0	7.8	8.2	5541	21
100	C	0	0	7.8	8.2	5561	21
Control	A	0	0	8.3	8.4	500	21
Control	B	0	0	8.3	8.4	498	21
Control	C	0	0	8.3	8.4	500	21

Notes: The 100% test solution is clear and light yellow. Test organisms are mobile, but very quiet and swimming slowly in the 100% test solution.

Number immobile does not include number dead.

"–" = not measured/not required
* adjusted for temperature and barometric pressure

Test Data Reviewed By : EM
Date : 2024-03-19

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TOXICITY TEST REPORT
Rainbow Trout
EPS 1/RM/13

Work Order :	254185
Sample Number :	81600

SAMPLE IDENTIFICATION

Company :	Agnico Eagle Mines Limited - Meadowbank Division	Sampling Date :	2024-03-07
Location :	Baker Lake NU	Sampling Time :	14:00
Substance :	Pit E (4000 TDS - 5100uS/cm)	Date Received :	2024-03-11
Sampling Method :	Grab	Time Received :	12:15
Sampled By :	T. Genty	Temperature at Receipt :	6 °C
Sample Description :	Clear, orange.	Date Tested :	2024-03-12

Test Method(s) : Toxicity Investigations

96-HOUR TEST RESULTS

Substance	Effect	Value
Control	Mean Impairment	0.0 %
	Mean Mortality	0.0 %
100%	Mean Impairment	0.0 %
	Mean Mortality	0.0 %

The results reported relate only to the sample tested and as received.

TEST ORGANISM

Test Organism :	*Oncorhynchus mykiss*	Mean Fork Length :	46.4 mm
Organism Batch :	T24-03	Range of Fork Lengths :	42 - 51 mm
Control Sample Size :	10	Mean Wet Weight :	1.0 g
Cumulative stock tank mortality rate :	0% (previous 7 days)	Organism Loading Rate :	0.6 g/L
Control organisms showing stress :	0 (at test completion)		

TEST CONDITIONS

Sample Treatment :	See 'COMMENTS' section below	Volume Tested (L) :	16
pH Adjustment :	None	Number of Replicates :	1
Test Aeration :	Yes	Organisms Per Replicate :	10
Pre-aeration/Aeration Rate :	6.5 ± 1 mL/min/L	Organisms Per Test Level :	10
Duration of Pre-Aeration :	30 minutes		

REFERENCE TOXICANT DATA

Toxicant :	Potassium Chloride		
Organism Batch :	T24-03	LC50 :	4476 mg/L
Date Tested :	2024-03-01	95% Confidence Limits :	4070 - 4903 mg/L
Analyst(s) :	AJS, KR, PC, NWP	Historical Mean LC50 :	3967 mg/L
Statistical Method :	Linear Regression (MLE)	Warning Limits (± 2SD) :	2944 - 5345 mg/L

COMMENTS

Prior to test initiation, the sample was allowed to settle overnight at 15^{o}C. The following day, the sample was carefully decanted so that no settled solids from the bottom of the sample were included in the test solution. The decanted test solution was then diluted with R.O. water at a ratio of ~2 L sample: ~1 L R.O to acheive a target conductivity of ~5100 µS/cm.

Approved By : ____________________

Project Manager

NAUTILUS ENVIRONMENTAL

Work Order : 254185
Sample Number : 81600

TEST DATA

	pH	Dissolved O_2 (mg/L)	Conductivity (µmhos/cm)	Temperature (°C)	O_2 Saturation (%)[3]
Initial Water Chemistry (100%) :	7.3	8.7	5182	15	95
After 30 min pre-aeration :	7.5	8.7	5211	15	95

0 HOURS

Date & Time 2024-03-12 11:35
Analyst(s) : JW

Concentration	Dead	Impaired	pH	Dissolved O_2	Conductivity	Temperature	O_2 Saturation[3]
100%	0	0	7.5	8.7	5211	15	95
Control	0	0	8.3	9.8	651	14	100

Notes: See 'COMMENTS' section on page 1.

24 HOURS

Date & Time 2024-03-13 12:00
Analyst(s) : NM

Concentration	Dead	Impaired	pH	Dissolved O_2	Conductivity	Temperature
100%	0	0	7.6	8.9	5226	15
Control	0	0	8.3	9.0	670	15

Notes: The 100% test solution is clear and light brown. Test organisms appear normal.

48 HOURS

Date & Time 2024-03-14 10:25
Analyst(s) : JGR

Concentration	Dead	Impaired	pH	Dissolved O_2	Conductivity	Temperature
100%	0	0	7.6	9.2	5221	15
Control	0	0	8.3	9.3	667	15

Notes: The 100% test solution is clear and yellow. Test organisms appear normal.

72 HOURS

Date & Time 2024-03-15 10:25
Analyst(s) : NWP (NM)

Concentration	Dead	Impaired	pH	Dissolved O_2	Conductivity	Temperature
100%	0	0	7.6	9.2	5211	15
Control	0	0	8.3	9.4	663	15

Notes: The 100% test solution is clear and light brown. Test organisms appear normal.

96 HOURS

Date & Time 2024-03-16 10:55
Analyst(s) : NWP (NM)

Concentration	Dead	Impaired	pH	Dissolved O_2	Conductivity	Temperature
100%	0	0	7.7	9.3	5222	15
Control	0	0	8.3	9.5	660	15

Notes: The 100% test solution is clear and light brown. Test organisms appear normal.

"–" = not measured/not required
Number impaired does not include number dead.
[3] adjusted for temperature and barometric pressure

Test Data Reviewed By : EM
Date : 2024-03-19

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TOXICITY TEST REPORT

Daphnia magna

EPS 1/RM/14

Work Order : 254185
Sample Number : 81601

SAMPLE IDENTIFICATION

Company :	Agnico Eagle Mines Limited - Meadowbank Division	Sampling Date :	2024-03-07
Location :	Baker Lake NU	Sampling Time :	14:00
Substance :	Pit E (5000 TDS - 6925 uS/cm)	Date Received :	2024-03-11
Sampling Method :	Grab	Time Received :	12:15
Sampled By :	T. Genty	Temperature at Receipt :	6 °C
Sample Description :	Clear, orange.	Date Tested :	2024-03-12

Test Method : Toxicity Investigations

48-HOUR TEST RESULTS

Substance	Effect	Value
Control	Mean Immobility	0.0 %
	Mean Mortality	0.0 %
100%	Mean Immobility	3.3 %
	Mean Mortality	0.0 %

The results reported relate only to the sample tested and as received.

TEST ORGANISM

Species :	*Daphnia magna*	Time to First Brood :	7.6 days
Organism Batch :	Dm24-04	Average Brood Size :	37.8
Culture Mortality :	2.0% (previous 7 days)		

TEST CONDITIONS

Sample Treatment :	See 'COMMENTS' section below	Number of Replicates :	3
pH Adjustment :	None	Organisms per Replicate :	10
Pre-aeration Rate :	~30 mL/min/L	Organisms per Test Level :	30
Duration of Pre-Aeration :	30 minutes	Organism Loading Rate :	15.0 mL/organism
Test Aeration :	None	Impaired Control Organisms :	0.0%
Hardness Adjustment :	None		

REFERENCE TOXICANT DATA

Toxicant :	Sodium Chloride		
Date Tested :	2024-03-11	LC50 :	6.2 g/L
Organism Batch :	Dm24-04	95% Confidence Limits :	6.2 - 6.3 g/L
Analyst(s) :	AA	Historical Mean LC50 :	6.3 g/L
Statistical Method :	Trimmed Spearman-Kärber	Warning Limits (± 2SD) :	5.8 - 6.8 g/L

COMMENTS

Prior to test initiation, the sample was allowed to settle overnight at 15°C. The following day, the sample was carefully decanted so that no settled solids from the bottom of the sample were included in the test solution. The decanted test solution was then diluted with R.O. water at a ratio of ~9 L sample: ~1 L R.O to acheive a target conductivity of ~6925 µS/cm.

Approved By : ____________________

Project Manager

Work Order : 254185
Sample Number : 81601

TEST DATA

	pH	Dissolved O_2 (mg/L)	Conductivity (µmhos/cm)	Temperature (°C)	O_2 Saturation (%)*	Hardness (as $CaCO_3$)
Initial Chemistry (100%) :	7.3	9.0	7482	20	105	>1000 mg/L

0 HOURS

Date & Time : 2024-03-12 13:45
Analyst(s) : FM (JGR)

Concentration (%)	Replicate	Dead	Immobile	pH	Dissolved O_2	Conductivity	Temperature	O_2 Saturation*	Hardness
100	A	0	0	7.7	8.4	7435	20	100	>1000
100	B	0	0	7.7	8.4	7435	20	100	>1000
100	C	0	0	7.7	8.4	7435	20	100	>1000
Control	A	0	0	8.3	8.6	491	20	100	140
Control	B	0	0	8.3	8.6	491	20	100	140
Control	C	0	0	8.3	8.6	491	20	100	140

Notes: The 100% test solution is clear and light yellow.

24 HOURS

Date & Time : 2024-03-13 13:15
Analyst(s) : FM (JGR)

Concentration (%)	Replicate	Dead	Immobile	pH	Dissolved O_2	Conductivity	Temperature
100	A	–	0	–	–	–	21
100	B	–	0	–	–	–	21
100	C	–	1	–	–	–	21
Control	A	–	0	–	–	–	21
Control	B	–	0	–	–	–	21
Control	C	–	0	–	–	–	21

Notes: The 100% test solution is clear and light yellow. Mobile test organisms appear normal.

48 HOURS

Date & Time : 2024-03-14 13:15
Analyst(s) : FM (PG)

Concentration (%)	Replicate	Dead	Immobile	pH	Dissolved O_2	Conductivity	Temperature
100	A	0	0	7.9	8.0	7421	21
100	B	0	1	7.8	8.0	7280	21
100	C	0	0	7.9	8.1	7434	21
Control	A	0	0	8.3	8.4	499	21
Control	B	0	0	8.3	8.4	496	21
Control	C	0	0	8.3	8.5	490	21

Notes: The 100% test solution is clear and light yellow. Test organisms are mobile, but very quiet and swimming slowly in the 100% test solution.

Number immobile does not include number dead.

"–" = not measured/not required
* adjusted for temperature and barometric pressure

Test Data Reviewed By : EM
Date : 2024-03-19

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TOXICITY TEST REPORT

Rainbow Trout
EPS 1/RM/13

Work Order :	254185
Sample Number :	81601

SAMPLE IDENTIFICATION

Company :	Agnico Eagle Mines Limited - Meadowbank Division	Sampling Date :	2024-03-07
Location :	Baker Lake NU	Sampling Time :	14:00
Substance :	Pit E (5000 TDS - 6925 uS/cm)	Date Received :	2024-03-11
Sampling Method :	Grab	Time Received :	12:15
Sampled By :	T. Genty	Temperature at Receipt :	6 °C
Sample Description :	Clear, orange.	Date Tested :	2024-03-12

Test Method(s) : Toxicity Investigations

96-HOUR TEST RESULTS

Substance	Effect	Value
Control	Mean Impairment	0.0 %
	Mean Mortality	0.0 %
100%	Mean Impairment	0.0 %
	Mean Mortality	0.0 %

The results reported relate only to the sample tested and as received.

TEST ORGANISM

Test Organism :	*Oncorhynchus mykiss*	Mean Fork Length :	47.5 mm
Organism Batch :	T24-03	Range of Fork Lengths :	43 - 52 mm
Control Sample Size :	10	Mean Wet Weight :	1.1 g
Cumulative stock tank mortality rate :	0% (previous 7 days)	Organism Loading Rate :	0.7 g/L
Control organisms showing stress :	0 (at test completion)		

TEST CONDITIONS

Sample Treatment :	See 'COMMENTS' section below	Volume Tested (L) :	16
pH Adjustment :	None	Number of Replicates :	1
Test Aeration :	Yes	Organisms Per Replicate :	10
Pre-aeration/Aeration Rate :	6.5 ± 1 mL/min/L	Organisms Per Test Level :	10
Duration of Pre-Aeration :	30 minutes		

REFERENCE TOXICANT DATA

Toxicant :	Potassium Chloride		
Organism Batch :	T24-03	LC50 :	4476 mg/L
Date Tested :	2024-03-01	95% Confidence Limits :	4070 - 4903 mg/L
Analyst(s) :	AJS, KR, PC, NWP	Historical Mean LC50 :	3967 mg/L
Statistical Method :	Linear Regression (MLE)	Warning Limits (± 2SD) :	2944 - 5345 mg/L

COMMENTS

Prior to test initiation, the sample was allowed to settle overnight at 15^{o}C. The following day, the sample was carefully decanted so that no settled solids from the bottom of the sample were included in the test solution. The decanted test solution was then diluted with R.O. water at a ratio of ~9 L sample: ~1 L R.O to acheive a target conductivity of ~6925 µS/cm.

Approved By : ____________________

Project Manager

NAUTILUS ENVIRONMENTAL

Work Order : 254185
Sample Number : 81601

TEST DATA

	pH	Dissolved O_2 (mg/L)	Conductivity (µmhos/cm)	Temperature (°C)	O_2 Saturation (%)[3]
Initial Water Chemistry (100%) :	7.4	8.7	7039	15	95
After 30 min pre-aeration :	7.4	8.8	7008	15	95

0 HOURS

Date & Time 2024-03-12 11:35
Analyst(s) : JW

Concentration	Dead	Impaired	pH	Dissolved O_2	Conductivity	Temperature	O_2 Saturation[3]
100%	0	0	7.4	8.8	7008	15	95
Control	0	0	8.3	9.8	651	14	100

Notes: See 'COMMENTS' section on page 1.

24 HOURS

Date & Time 2024-03-13 12:00
Analyst(s) : NM

Concentration	Dead	Impaired	pH	Dissolved O_2	Conductivity	Temperature
100%	0	0	7.8	8.9	7021	15
Control	0	0	8.4	9.1	669	15

Notes: The 100% test solution is clear and light brown. Test organisms appear normal.

48 HOURS

Date & Time 2024-03-14 10:30
Analyst(s) : JGR

Concentration	Dead	Impaired	pH	Dissolved O_2	Conductivity	Temperature
100%	0	0	7.8	9.3	7018	15
Control	0	0	8.4	9.5	660	15

Notes: The 100% test solution is clear and light brown. Test organisms appear normal.

72 HOURS

Date & Time 2024-03-15 10:30
Analyst(s) : NWP (NM)

Concentration	Dead	Impaired	pH	Dissolved O_2	Conductivity	Temperature
100%	0	0	7.8	9.3	7020	15
Control	0	0	8.4	9.4	654	15

Notes: The 100% test solution is clear and light brown. Test organisms appear normal.

96 HOURS

Date & Time 2024-03-16 11:00
Analyst(s) : NWP (NM)

Concentration	Dead	Impaired	pH	Dissolved O_2	Conductivity	Temperature
100%	0	0	7.8	9.3	7021	15
Control	0	0	8.4	9.5	645	15

Notes: The 100% test solution is clear and light brown. Test organisms appear normal.

"–" = not measured/not required
Number impaired does not include number dead.
[3] adjusted for temperature and barometric pressure

Test Data Reviewed By : EM
Date : 2024-03-19

CHAIN OF CUSTODY RECORD

NAUTILUS ENVIRONMENTAL

Nautilus Work Order No: 254185

Shipping Address: Nautilus Environmental Guelph.
B-11 Nicholas Beaver Road
Puslinch, Ontario Canada N0B 2J0

Voice: (519) 763-4412 **Fax:** (519) 763-4419

P.O. Number:	TBD
Field Sampler Name (print):	Thomas Genty
Signature:	
Affiliation:	Agnico Eagle
Sample Storage (prior to shipping):	Room
Custody Relinquished by:	TG
Date/Time Shipped:	7/03/24

Client:	Agnico Eagle Mines Ltd. 11600, rue Louis Bisson Mirabel, Quebec J7N 1G9
Phone:	(519) 820-9156
Fax:	
Contact:	Lisa Ramilo lisa.ramilo@agnicoeagle.com

Sample Identification					Analyses Requested									Sample Method and Volume		
Date Collected (yyyy-mm-dd)	Time Collected (e.g. 14:30, 24 hr clock)	Sample Name	Nautilus Sample Number	Temp. on arrival	Rainbow Trout Single Concentration	Rainbow Trout LC50	*Daphnia magna* Single Concentration	*Daphnia magna* LC50	Fathead Minnow Survival & Growth	*Ceriodaphnia dubia* Survival & Reproduction	*Lemna minor* Growth	*Pseudokirchneriella subcapitata* Growth	Other (please specify below)	Grab	Composite	# of Containers and Volume (eg. 2 x 1L, 3 x 10L, etc.)
2024-03-07	14:00	Pit E (Baseline - TDS SSWQO) *	81599	6	✔		✔							✔		6 x 20 L
		* : raw water - no cryoconcentration														
		Treatement done on the sample														
		1-Métal precipitation : ferric sulfate, caustic soda														
		Hydres 6909, polymer anionique Hydrex 6105														
		2-MBBR: add H3PO4, air, bacteria for SCN and														
		NH4 remporal														
		3-TSS treatment: ferric sulfate & Hydrex 6105														
		tracking numer with GLS :														
		F19 196 660 and F19 196 656														

Sample name :
ST19 treated.
conductivity ≃ 8,95 mS
TDS → 6,1 g/L.

1 pails for the 4 g/L (5,1 mS/cm) → dilution
1 pail for the 5 g/L (6,9 mS/cm) → dilution
1 pail for the 6,1 g/L (current sample)
+ 3 pails for ageing (current sample).

For Lab Use Only	
Received By:	MLP / AW
Date:	2024-03-11
Time:	12:15
Storage Location:	
Storage Temp.(°C)	

Please list any special requests or instructions:

Please collect 1 water sample for detailed analytical chemistry at the start of testing; list of parameters provided to L.Novak; please request Rush analysis - 3 Day turnaround time for results and CC results to:lisa.ramilo@agnicoeagle.com

NAUTILUS ENVIRONMENTAL
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Puslinch, ON N0B 2J0
Tel. (519) 763-4412
Fax. (519) 763-4419

TOXICITY TEST REPORT

Daphnia magna

Work Order : 254241
Sample Number : 81676

SAMPLE IDENTIFICATION

Company :	Agnico Eagle Mines Limited - Meadowbank Division		
Location :	Baker Lake NU	Sampling Date :	2024-03-12
Substance :	Pit E (TDS SSWQO) - ST19 treated cyocencentrated to 7 g/L TDS	Sampling Time :	13:00
		Date Received :	2024-03-14
Sampling Method :	Grab	Time Received :	14:50
Sampled By :	T. Genty	Temperature at Receipt :	9 °C
Sample Description :	Clear, light brown.	Date Tested :	2024-03-19

Test Method : Toxicity Investigations

48-HOUR TEST RESULTS

Substance	Effect	Value
Control	Mean Immobility	0.0 %
	Mean Mortality	0.0 %
100%	Mean Immobility	20.0 %
	Mean Mortality	0.0 %

The results reported relate only to the sample tested and as received.

TEST ORGANISM

Species :	*Daphnia magna*	Time to First Brood :	7.6 days
Organism Batch :	Dm24-04	Average Brood Size :	36.3
Culture Mortality :	2.0% (previous 7 days)		

TEST CONDITIONS

Sample Treatment :	See 'COMMENTS' section below	Number of Replicates :	3
pH Adjustment :	None	Organisms per Replicate :	10
Pre-aeration Rate :	~30 mL/min/L	Organisms per Test Level :	30
Duration of Pre-Aeration :	30 minutes	Organism Loading Rate :	15.0 mL/organism
Test Aeration :	None	Impaired Control Organisms :	0.0%
Hardness Adjustment :	None		

REFERENCE TOXICANT DATA

Toxicant :	Sodium Chloride		
Date Tested :	2024-03-11	LC50 :	6.2 g/L
Organism Batch :	Dm24-04	95% Confidence Limits :	6.2 - 6.3 g/L
Analyst(s) :	AA	Historical Mean LC50 :	6.3 g/L
Statistical Method :	Trimmed Spearman-Kärber	Warning Limits (± 2SD) :	5.8 - 6.8 g/L

COMMENTS

Prior to test initiation, the sample was allowed to settle overnight at ~15°C. The following day, the sample was carefully decanted using an appropriate siphon hose so that no settled solids from the bottom of the sample were included in the test solution. The decanted test solution was then used for testing.

Approved By : ______________________

Project Manager

Work Order : 254241
Sample Number : 81676

TEST DATA

	pH	Dissolved O_2 (mg/L)	Conductivity (µmhos/cm)	Temperature (°C)	O_2 Saturation (%)*	Hardness (as $CaCO_3$)
Initial Chemistry (100%) :	7.3	8.6	10560	21	110	>1000 mg/L

0 HOURS

Date & Time : 2024-03-19 12:10
Analyst(s) : FM (SV)/JW

Concentration (%)	Replicate	Dead	Immobile	pH	Dissolved O_2	Conductivity	Temperature	O_2 Saturation*	Hardness
100	A	0	0	7.5	8.4	10610	21	105	>1000
100	B	0	0	7.5	8.4	10610	21	105	>1000
100	C	0	0	7.5	8.4	10610	21	105	>1000
Control	A	0	0	8.2	8.6	472	21	100	130
Control	B	0	0	8.2	8.6	472	21	100	130
Control	C	0	0	8.2	8.6	472	21	100	130

Notes: See 'COMMENTS' section on page 1. Test solutions are yellow and clear.

24 HOURS

Date & Time : 2024-03-20 11:20
Analyst(s) : JW

Concentration (%)	Replicate	Dead	Immobile	pH	Dissolved O_2	Conductivity	Temperature
100	A	–	0	–	–	–	21
100	B	–	0	–	–	–	21
100	C	–	0	–	–	–	21
Control	A	–	0	–	–	–	21
Control	B	–	0	–	–	–	21
Control	C	–	0	–	–	–	21

Notes: Test solutions are yellow and clear. Organisms appear normal. In control rep A, 4 organisms are floating, in control rep C, 1 organism is floating.

48 HOURS

Date & Time : 2024-03-21 11:45
Analyst(s) : JW/FM (JGR)

Concentration (%)	Replicate	Dead	Immobile	pH	Dissolved O_2	Conductivity	Temperature
100	A	0	1	8.0	7.8	10630	20
100	B	0	1	8.0	7.9	10670	20
100	C	0	4	8.0	7.9	10700	20
Control	A	0	0	8.2	8.1	486	20
Control	B	0	0	8.2	8.1	485	20
Control	C	0	0	8.2	8.1	487	20

Notes: Test solutions are yellow and clear. Organisms appear normal.In control rep A, 3 organisms are floating. In control rep C, 1 organism is floating.

Number immobile does not include number dead.

"–" = not measured/not required
* adjusted for temperature and barometric pressure

Test Data Reviewed By : EM
Date : 2024-03-26

NAUTILUS ENVIRONMENTAL
B-11 Nicholas Beaver Road
Puslinch, ON N0B 2J0
Tel. (519) 763-4412
Fax. (519) 763-4419

TOXICITY TEST REPORT
Rainbow Trout

Work Order : 254241
Sample Number : 81676

SAMPLE IDENTIFICATION

Company :	Agnico Eagle Mines Limited - Meadowbank Division		
Location :	Baker Lake NU	Sampling Date :	2024-03-12
Substance :	Pit E (TDS SSWQO) - ST19 treated cyocencentrated to 7 g/L TDS	Sampling Time :	13:00
		Date Received :	2024-03-14
Sampling Method :	Grab	Time Received :	14:50
Sampled By :	T. Genty	Temperature at Receipt :	9 °C
Sample Description :	Clear, light brown.	Date Tested :	2024-03-19

Test Method(s) : Toxicity Investigations

96-HOUR TEST RESULTS

Substance	Effect	Value
Control	Mean Impairment	0.0 %
	Mean Mortality	0.0 %
100%	Mean Impairment	0.0 %
	Mean Mortality	0.0 %

The results reported relate only to the sample tested and as received.

TEST ORGANISM

Test Organism :	*Oncorhynchus mykiss*	Mean Fork Length :	40.9 mm
Organism Batch :	T24-03	Range of Fork Lengths :	35 - 44 mm
Control Sample Size :	10	Mean Wet Weight :	0.7 g
Cumulative stock tank mortality rate :	0% (previous 7 days)	Organism Loading Rate :	0.4 g/L
Control organisms showing stress :	0 (at test completion)		

TEST CONDITIONS

Sample Treatment :	See 'COMMENTS' section below	Volume Tested (L) :	16
pH Adjustment :	None	Number of Replicates :	1
Test Aeration :	Yes	Organisms Per Replicate :	10
Pre-aeration/Aeration Rate :	6.5 ± 1 mL/min/L	Organisms Per Test Level :	10
Duration of Pre-Aeration :	30 minutes		

REFERENCE TOXICANT DATA

Toxicant :	Potassium Chloride		
Organism Batch :	T24-03	LC50 :	4476 mg/L
Date Tested :	2024-03-01	95% Confidence Limits :	4070 - 4903 mg/L
Analyst(s) :	AJS, KR, PC, NWP	Historical Mean LC50 :	3967 mg/L
Statistical Method :	Linear Regression (MLE)	Warning Limits (± 2SD) :	2944 - 5345 mg/L

COMMENTS

Prior to test initiation, the sample was allowed to settle overnight at ~15°C. The following day, the sample was carefully decanted using an appropriate siphon hose so that no settled solids from the bottom of the sample were included in the test solution. The decanted test solution was then used for testing.

Approved By : ______________________

Project Manager

NAUTILUS ENVIRONMENTAL

TOXICITY TEST REPORT
Rainbow Trout

Work Order : 254241
Sample Number : 81676

TEST DATA

	pH	Dissolved O_2 (mg/L)	Conductivity (µmhos/cm)	Temperature (°C)	O_2 Saturation (%)[3]
Initial Water Chemistry (100%) :	7.4	8.8	9974	15	99
After 30 min pre-aeration :	7.5	8.8	9903	15	97

0 HOURS

Date & Time 2024-03-19 11:55
Analyst(s) : NWP (NM)

Concentration	Dead	Impaired	pH	Dissolved O_2	Conductivity	Temperature	O_2 Saturation[3]
100%	0	0	7.5	8.8	9903	15	97
Control	0	0	8.3	9.3	656	16	100

Notes: See 'COMMENTS' section on page 1.

24 HOURS

Date & Time 2024-03-20 10:00
Analyst(s) : NWP (PG)

Concentration	Dead	Impaired	pH	Dissolved O_2	Conductivity	Temperature
100%	0	0	7.7	8.4	9987	15
Control	0	0	8.4	9.3	653	15

Notes: 100% solution is clear and light brown. Test organisms appear normal.

48 HOURS

Date & Time 2024-03-21 10:45
Analyst(s) : NP (JGR)

Concentration	Dead	Impaired	pH	Dissolved O_2	Conductivity	Temperature
100%	0	0	7.9	8.9	9957	15
Control	0	0	8.4	9.0	639	15

Notes: 100% solution is light brown. Test organisms are swimming normally and appear healthy.

72 HOURS

Date & Time 2024-03-22 11:25
Analyst(s) : JGR

Concentration	Dead	Impaired	pH	Dissolved O_2	Conductivity	Temperature
100%	0	0	7.9	9.2	9982	
Control	0	0	8.3	9.1	628	15

Notes: 100% solution is clear and light brown. Test organisms appear normal.

96 HOURS

Date & Time 2024-03-23 11:30
Analyst(s) : JW

Concentration	Dead	Impaired	pH	Dissolved O_2	Conductivity	Temperature
100%	0	0	7.9	9.0	9960	16
Control	0	0	8.3	8.9	618	16

Notes: 100% solution is clear and light brown. Test organisms appear normal.

"–" = not measured/not required
Number impaired does not include number dead.
[3] adjusted for temperature and barometric pressure

Test Data Reviewed By : EM
Date : 2024-03-25

CHAIN OF CUSTODY RECORD

NAUTILUS ENVIRONMENTAL

Nautilus Work Order No: 254241

Shipping Address: Nautilus Environmental Guelph.
B-11 Nicholas Beaver Road
Puslinch, Ontario Canada N0B 2J0

Voice: (519) 763-4412 **Fax:** (519) 763-4419

P.O. Number:	TBD
Field Sampler Name (print):	Thomas Genty
Signature:	
Affiliation:	Agnico Eagle
Sample Storage (prior to shipping):	
Custody Relinquished by:	
Date/Time Shipped:	

Client:	Agnico Eagle Mines Ltd. 11600, rue Louis Bisson Mirabel, Quebec J7N 1G9
Phone:	(519) 820-9156
Fax:	
Contact:	Lisa Ramilo lisa.ramilo@agnicoeagle.com

Sample Identification					Analyses Requested										Sample Method and Volume		
Date Collected (yyyy-mm-dd)	Time Collected (e.g. 14:30, 24 hr clock)	Sample Name	Nautilus Sample Number	Temp. on arrival	Rainbow Trout Single Concentration	Rainbow Trout LC50	*Daphnia magna* Single Concentration	*Daphnia magna* LC50	Fathead Minnow Survival & Growth	*Ceriodaphnia dubia* Survival & Reproduction	*Lemna minor* Growth	*Pseudokirchneriella subcapitata* Growth	Other (please specify below)	Grab	Composite	# of Containers and Volume (eg. 2 x 1L, 3 x 10L, etc.)
2024-03-12	13:00	Pit E (TDS SSWQO) -	81676	9°C	✔		✔							✔		1 x 20 L
		ST19 treated cyocencentrated to 7 g/L TDS														

For Lab Use Only

Received By:	NM
Date:	2024-03-14
Time:	14:50
Storage Location:	
Storage Temp.(°C)	

Please list any special requests or instructions:

Please collect 1 water sample for detailed analytical chemistry at the start of testing; list of parameters provided to L.Novak; please request Rush analysis - 3 Day turnaround time for results and CC results to:lisa.ramilo@agnicoeagle.com

NAUTILUS ENVIRONMENTAL
B-11 Nicholas Beaver Road
Puslinch, ON N0B 2J0
Tel. (519) 763-4412
Fax. (519) 763-4419

TOXICITY TEST REPORT

Daphnia magna

Work Order :	254313
Sample Number :	81788

SAMPLE IDENTIFICATION

Company :	Agnico Eagle Mines Limited - Meadowbank Division		
Location :	Baker Lake NU	Sampling Date :	2024-03-19
Substance :	Pit E (TDS SSWQO) - ST19 treated cyocencentrated to 8 g/L TDS	Sampling Time :	13:30
		Date Received :	2024-03-26
Sampling Method :	Grab	Time Received :	15:40
Sampled By :	T. Genty	Temperature at Receipt :	9 °C
Sample Description :	Clear, orange.	Date Tested :	2024-03-27
Test Method :	Toxicity Investigations		

48-HOUR TEST RESULTS

Substance	Effect	Value
Control	Mean Immobility	0.0 %
	Mean Mortality	0.0 %
100%	Mean Immobility	13.3 %
	Mean Mortality	3.3 %

The results reported relate only to the sample tested and as received.

TEST ORGANISM

Species :	*Daphnia magna*	Time to First Brood :	7.8 days
Organism Batch :	Dm24-05	Average Brood Size :	34.9
Culture Mortality :	0.3% (previous 7 days)		

TEST CONDITIONS

Sample Treatment :	See 'COMMENTS' section below	Number of Replicates :	3
pH Adjustment :	None	Organisms per Replicate :	10
Pre-aeration Rate :	~30 mL/min/L	Organisms per Test Level :	30
Duration of Pre-Aeration :	30 minutes	Organism Loading Rate :	15.0 mL/organism
Test Aeration :	None	Impaired Control Organisms :	0.0%
Hardness Adjustment :	None		

REFERENCE TOXICANT DATA

Toxicant :	Sodium Chloride		
Date Tested :	2024-03-26	LC50 :	6.5 g/L
Organism Batch :	Dm24-05	95% Confidence Limits :	6.2 - 6.8 g/L
Analyst(s) :	AA	Historical Mean LC50 :	6.3 g/L
Statistical Method :	Spearman-Kärber	Warning Limits (± 2SD) :	5.8 - 6.8 g/L

COMMENTS

Prior to test initiation, the sample was allowed to settle overnight. The following day, the sample was carefully decanted using an appropriate siphon hose so that no settled solids from the bottom of the sample were included in the test solution. The decanted test solution was then used for testing.

Approved By : ______________________

Project Manager

Work Order :	254313
Sample Number :	81788

TEST DATA

	pH	Dissolved O_2 (mg/L)	Conductivity (µmhos/cm)	Temperature (°C)	O_2 Saturation (%)*	Hardness (as $CaCO_3$)
Initial Chemistry (100%) :	7.5	9.8	11410	20	116	>1000 mg/L

0 HOURS

Date & Time :	2024-03-27	14:45
Analyst(s) :	FM (SF)	

Concentration (%)	Replicate	Dead	Immobile	pH	Dissolved O_2	Conductivity	Temperature	O_2 Saturation*	Hardness
100	A	0	0	7.6	9.0	11410	20	108	>1000
100	B	0	0	7.6	9.0	11410	20	108	>1000
100	C	0	0	7.6	9.0	11410	20	108	>1000
Control	A	0	0	8.2	8.8	470	20	100	150
Control	B	0	0	8.2	8.8	470	20	100	150
Control	C	0	0	8.2	8.8	470	20	100	150

Notes: See 'COMMENTS' section on page 1.

24 HOURS

Date & Time :	2024-03-28	13:55
Analyst(s) :	FM (NM)	

Concentration (%)	Replicate	Dead	Immobile	pH	Dissolved O_2	Conductivity	Temperature
100	A	–	0	–	–	–	21
100	B	–	0	–	–	–	21
100	C	–	0	–	–	–	21
Control	A	–	0	–	–	–	21
Control	B	–	0	–	–	–	21
Control	C	–	0	–	–	–	21

Notes: Test solutions are clear and yellow. Organisms appear normal.

48 HOURS

Date & Time :	2024-03-29	15:25
Analyst(s) :	VC	

Concentration (%)	Replicate	Dead	Immobile	pH	Dissolved O_2	Conductivity	Temperature
100	A	1	1	8.1	7.6	11330	21
100	B	0	2	8.1	7.7	11370	21
100	C	0	1	8.1	7.8	11410	21
Control	A	0	0	8.3	8.3	482	21
Control	B	0	0	8.3	8.2	482	21
Control	C	0	0	8.3	8.2	482	21

Notes: Test organisms appear smaller in size and agitated (some erratic swimming behaviours like swimming in cirles and quick forward/backward motions). Test solutions are clear, slightly cloudy and light yellow.

Number immobile does not include number dead.

"–" = not measured/not required
* adjusted for temperature and barometric pressure

Test Data Reviewed By : EM
Date : 2024-04-02

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TOXICITY TEST REPORT

Rainbow Trout

Work Order :	254313
Sample Number :	81788

SAMPLE IDENTIFICATION

Company :	Agnico Eagle Mines Limited - Meadowbank Division		
Location :	Baker Lake NU	Sampling Date :	2024-03-19
Substance :	Pit E (TDS SSWQO) - ST19 treated cyocencentrated to 8 g/L TDS	Sampling Time :	13:30
		Date Received :	2024-03-26
Sampling Method :	Grab	Time Received :	15:40
Sampled By :	T. Genty	Temperature at Receipt :	9 °C
Sample Description :	Clear, orange.	Date Tested :	2024-03-27

Test Method(s) : Toxicity Investigations

96-HOUR TEST RESULTS

Substance	Effect	Value
Control	Mean Impairment	0.0 %
	Mean Mortality	0.0 %
100%	Mean Impairment	0.0 %
	Mean Mortality	0.0 %

The results reported relate only to the sample tested and as received.

TEST ORGANISM

Test Organism :	*Oncorhynchus mykiss*	Mean Fork Length :	38.6 mm
Organism Batch :	T24-04	Range of Fork Lengths :	33 - 45 mm
Control Sample Size :	10	Mean Wet Weight :	0.5 g
Cumulative stock tank mortality rate :	0% (previous 7 days)	Organism Loading Rate :	0.3 g/L
Control organisms showing stress :	0 (at test completion)		

TEST CONDITIONS

Sample Treatment :	See 'COMMENTS' section below	Volume Tested (L) :	16
pH Adjustment :	None	Number of Replicates :	1
Test Aeration :	Yes	Organisms Per Replicate :	10
Pre-aeration/Aeration Rate :	6.5 ± 1 mL/min/L	Organisms Per Test Level :	10
Duration of Pre-Aeration :	30 minutes		

REFERENCE TOXICANT DATA

Toxicant :	Potassium Chloride		
Organism Batch :	T24-04	LC50 :	4437 mg/L
Date Tested :	2024-03-14	95% Confidence Limits :	4204 - 4682 mg/L
Analyst(s) :	AJS, NM, NWP, PG	Historical Mean LC50 :	4024 mg/L
Statistical Method :	Spearman-Kärber	Warning Limits (± 2SD) :	3003 - 5391 mg/L

COMMENTS

Prior to test initiation, the sample was allowed to settle overnight. The following day, the sample was carefully decanted using an appropriate siphon hose so that no settled solids from the bottom of the sample were included in the test solution. The decanted test solution was then used for testing.

Approved By : ______________________

Project Manager

NAUTILUS ENVIRONMENTAL

Work Order : 254313
Sample Number : 81788

TEST DATA

	pH	Dissolved O_2 (mg/L)	Conductivity (µmhos/cm)	Temperature (°C)	O_2 Saturation (%)[3]
Initial Water Chemistry (100%) :	7.5	9.7	10860	15	103
After 30 min pre-aeration :	7.7	8.9	10720	15	97

0 HOURS

Date & Time 2024-03-27 14:00
Analyst(s) : PG

Concentration	Dead	Impaired	pH	Dissolved O_2	Conductivity	Temperature	O_2 Saturation[3]
100%	0	0	7.7	8.9	10720	15	97
Control	0	0	8.3	9.6	658	15	100

Notes: See 'COMMENTS' section on page 1.

24 HOURS

Date & Time 2024-03-28 14:00
Analyst(s) : AJS

Concentration	Dead	Impaired	pH	Dissolved O_2	Conductivity	Temperature
100%	0	0	7.9	9.7	10760	16
Control	0	0	8.3	9.6	652	16

Notes: Test organisms appear healthy and mobile. Solution is clear and orange.

48 HOURS

Date & Time 2024-03-29 13:30
Analyst(s) : AJS

Concentration	Dead	Impaired	pH	Dissolved O_2	Conductivity	Temperature
100%	0	0	8.0	9.2	10600	14
Control	0	0	8.3	9.4	648	14

Notes: Test organisms appear healthy and mobile. Solution is clear and orange.

72 HOURS

Date & Time 2024-03-30 14:30
Analyst(s) : AJS

Concentration	Dead	Impaired	pH	Dissolved O_2	Conductivity	Temperature
100%	0	0	8.0	8.6	10750	14
Control	0	0	8.3	9.3	639	14

Notes: Test organisms appear healthy and mobile. Solution is clear and orange.

96 HOURS

Date & Time 2024-03-31 14:30
Analyst(s) : AJS

Concentration	Dead	Impaired	pH	Dissolved O_2	Conductivity	Temperature
100%	0	0	8.1	8.2	10710	15
Control	0	0	8.3	9.4	638	15

Notes: Test organisms appear healthy and mobile. Solution is clear and orange.

"–" = not measured/not required

Number impaired does not include number dead.

[3] adjusted for temperature and barometric pressure

Test Data Reviewed By : JJ
Date : 2024-04-03

CHAIN OF CUSTODY RECORD

NAUTILUS ENVIRONMENTAL

Nautilus Work Order No: 254313

Shipping Address: Nautilus Environmental Guelph.
B-11 Nicholas Beaver Road
Puslinch, Ontario Canada N0B 2J0

Voice: (519) 763-4412 Fax: (519) 763-4419

P.O. Number: TBD

Field Sampler Name (print): Thomas Genty

Signature:

Affiliation: Agnico Eagle

Sample Storage (prior to shipping):

Custody Relinquished by:

Date/Time Shipped:

Client: Agnico Eagle Mines Ltd.
11600, rue Louis Bisson
Mirabel, Quebec J7N 1G9

Phone: (519) 820-9156

Fax:

Contact: Lisa Ramilo lisa.ramilo@agnicoeagle.com

Date Collected (yyyy-mm-dd)	Time Collected (e.g. 14:30, 24 hr clock)	Sample Name	Nautilus Sample Number	Temp. on arrival	Rainbow Trout Single Concentration	Rainbow Trout LC50	*Daphnia magna* Single Concentration	*Daphnia magna* LC50	Fathead Minnow Survival & Growth	*Ceriodaphnia dubia* Survival & Reproduction	*Lemna minor* Growth	*Pseudokirchneriella subcapitata* Growth	Other (please specify below)	Grab	Composite	# of Containers and Volume (eg. 2 x 1L, 3 x 10L, etc.)
2024-03-19*		Pit E (TDS SSWQO) - ST19 treated cyocencentrated to 8 g/L TDS	81788	9°C	✔		✔							✔		1 x 20 L

Please list any special requests or instructions:

Please collect 1 water sample for detailed analytical chemistry at the start of testing; list of parameters provided to L.Novak; please request Rush analysis - 3 Day turnaround time for results and CC results to:lisa.ramilo@agnicoeagle.com

*pail label says sampled at 13:30 on 2024-03-18

For Lab Use Only

Received By: JGR

Date: 2024-03-26

Time: 15:40

Storage Location:

Storage Temp.(°C)

APPENDIX B

Acute Analytical Chemistry Results

Your P.O. #: 2324-196PG
Your Project #: 162706256
Your C.O.C. #: N/A

Attention: Adam Wartman

Nautilus Environmental Company Inc.
B-11 Nicholas Beaver Rd
Puslinch, ON
CANADA N0B 2J0

Report Date: 2024/03/19
Report #: R8072798
Version: 2 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C474240
Received: 2024/03/12, 15:53

Sample Matrix: Water
Samples Received: 3

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Alkalinity	3	N/A	2024/03/13	CAM SOP-00448	SM 24 2320 B m
Carbonate, Bicarbonate and Hydroxide	3	N/A	2024/03/13	CAM SOP-00102	APHA 4500-CO2 D
Anions	3	N/A	2024/03/13	CAM SOP-00435	SM 23 4110 B m
Conductivity	3	N/A	2024/03/13	CAM SOP-00414	SM 24 2510 m
Cyanate (2)	3	N/A	2024/03/13	CAM SOP-00471	SM 24 4500-CN L
Dissolved Organic Carbon (DOC) (3)	3	N/A	2024/03/13	CAM SOP-00446	SM 24 5310 B m
Fluoride	3	2024/03/12	2024/03/13	CAM SOP-00449	SM 24 4500-F C m
Hardness (calculated as CaCO3)	3	N/A	2024/03/13	CAM SOP 00102/00408/00447	SM 2340 B
Dissolved Metals by ICPMS	1	N/A	2024/03/13	CAM SOP-00447	EPA 6020B m
Dissolved Metals by ICPMS	2	N/A	2024/03/14	CAM SOP-00447	EPA 6020B m
Total Metals Analysis by ICPMS	3	2024/03/13	2024/03/13	CAM SOP-00447	EPA 6020B m
Cyanide (Free) (1)	3	N/A	2024/03/19	CAL SOP-00266	EPA 9016d R0 m
Cyanide, Strong Acid Dissociable (SAD) (1)	3	2024/03/15	2024/03/15	CAL SOP-00270	SM 24 4500-CN m
Cyanide WAD (weak acid dissociable) (1)	3	N/A	2024/03/15	CAL SOP-00270	SM 24 4500-CN m
Total Ammonia-N	3	N/A	2024/03/13	CAM SOP-00441	USGS I-2522-90 m
Nitrate & Nitrite as Nitrogen in Water (4)	3	N/A	2024/03/13	CAM SOP-00440	SM 24 4500-NO3I/NO2B
pH (5)	3	2024/03/12	2024/03/13	CAM SOP-00413	SM 24th - 4500H+ B
Orthophosphate	1	N/A	2024/03/13	CAM SOP-00461	SM 24 4500-P E
Orthophosphate	2	N/A	2024/03/14	CAM SOP-00461	SM 24 4500-P E
Thiocyanate	3	N/A	2024/03/13	CAM SOP-00473	SM 24 4500-CN M m
Total Dissolved Solids	3	2024/03/12	2024/03/13	CAM SOP-00428	SM 24 2540C m
Low Level Total Suspended Solids	3	2024/03/12	2024/03/13	CAM SOP-00428	SM 24 2540D m

Remarks:

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, EPA, APHA or the Quebec Ministry of Environment.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement

Your P.O. #: 2324-196PG
Your Project #: 162706256
Your C.O.C. #: N/A

Attention: Adam Wartman

Nautilus Environmental Company Inc.
B-11 Nicholas Beaver Rd
Puslinch, ON
CANADA N0B 2J0

Report Date: 2024/03/19
Report #: R8072798
Version: 2 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C474240
Received: 2024/03/12, 15:53

Uncertainty has not been accounted for when stating conformity to the referenced standard.

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) This test was performed by Bureau Veritas Calgary (19th), 4000 19th Street NE , Calgary, AB, T2E 6P8
(2) Sample(s) analyzed using methodologies that have been subjected to Bureau Veritas' standard validation process for the submitted matrix however it is not an accredited method.
(3) Dissolved Organic Carbon (DOC) present in the sample should be considered as non-purgeable DOC.
(4) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.
(5) "The CCME method and Analytical Protocol (O. Reg 153/04, O. Reg. 406/19) requires pH to be analyzed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory pH analyses in this report are reported past the CCME and Analytical Protocol (O. Reg 153/04, O. Reg. 406/19) holding time. Bureau Veritas endeavors to analyze samples as soon as possible after receipt."

Encryption Key

Please direct all questions regarding this Certificate of Analysis to:
Jolanta Goralczyk, Project Manager
Email: Jolanta.Goralczyk@bureauveritas.com
Phone# (905)817-5751
==
Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by Rodney Major, General Manager responsible for Ontario Environmental laboratory operations.

Bureau Veritas Job #: C474240
Report Date: 2024/03/19

Nautilus Environmental Company Inc.
Client Project #: 162706256
Your P.O. #: 2324-196PG
Sampler Initials: AQU

ANION SCAN IN WATER (WATER)

Bureau Veritas ID		YPL701			YPL701			YPL702		
Sampling Date		2024/03/12 09:00			2024/03/12 09:00			2024/03/12 10:30		
COC Number		N/A			N/A			N/A		
	UNITS	**81599**	**RDL**	**QC Batch**	**81599 Lab-Dup**	**RDL**	**QC Batch**	**81600**	**RDL**	**QC Batch**
Inorganics										
Fluoride (F-)	mg/L	0.22	0.10	9270614				0.15	0.10	9270614
Orthophosphate (P)	mg/L	0.62	0.010	9271757				0.42	0.010	9269468
Nitrite (N)	mg/L	1.49	0.010	9270591	1.50	0.010	9270591	0.962	0.010	9270591
Dissolved Chloride (Cl-)	mg/L	500	10	9270589	500	10	9270589	320	5.0	9270589
Nitrate (N)	mg/L	181	2.0	9270591	183	2.0	9270591	117	1.0	9270591
Nitrate + Nitrite (N)	mg/L	182	2.0	9270591	185	2.0	9270591	118	1.0	9270591
Dissolved Bromide (Br-)	mg/L	<10	10	9270589	<10	10	9270589	<5.0	5.0	9270589
Dissolved Sulphate (SO4)	mg/L	3400	10	9270589	3500	10	9270589	2300	5.0	9270589

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

Bureau Veritas ID		YPL703		
Sampling Date		2024/03/12 10:45		
COC Number		N/A		
	UNITS	**8161**	**RDL**	**QC Batch**
Inorganics				
Fluoride (F-)	mg/L	0.19	0.10	9270614
Orthophosphate (P)	mg/L	0.56	0.010	9271757
Nitrite (N)	mg/L	1.34	0.010	9270591
Dissolved Chloride (Cl-)	mg/L	440	10	9270589
Nitrate (N)	mg/L	163	2.0	9270591
Nitrate + Nitrite (N)	mg/L	165	2.0	9270591
Dissolved Bromide (Br-)	mg/L	<10	10	9270589
Dissolved Sulphate (SO4)	mg/L	3100	10	9270589

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Bureau Veritas 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvna.com

Bureau Veritas Job #: C474240
Report Date: 2024/03/19

Nautilus Environmental Company Inc.
Client Project #: 162706256
Your P.O. #: 2324-196PG
Sampler Initials: AQU

RESULTS OF ANALYSES OF WATER

Bureau Veritas ID		YPL701			YPL701			YPL702		
Sampling Date		2024/03/12 09:00			2024/03/12 09:00			2024/03/12 10:30		
COC Number		N/A			N/A			N/A		
	UNITS	**81599**	**RDL**	**QC Batch**	**81599 Lab-Dup**	**RDL**	**QC Batch**	**81600**	**RDL**	**QC Batch**
Calculated Parameters										
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	81	1.0	9268847				53	1.0	9268847
Carb. Alkalinity (calc. as CaCO3)	mg/L	<1.0	1.0	9268847				<1.0	1.0	9268847
Total Cyanate (CNO-)	mg/L	0.41	0.050	9270425				0.26	0.050	9270425
Hardness (CaCO3)	mg/L	1700	1.0	9268849				1000	1.0	9268849
Inorganics										
Total Ammonia-N	mg/L	1.60	0.050	9270996	1.59	0.050	9270996	1.03	0.050	9270996
Conductivity	umho/cm	8200	1.0	9270600				5700	1.0	9270600
Free Cyanide (CN)	ug/L	6.0	2.0	9284253				5.7	2.0	9284253
Strong Acid Dissoc. Cyanide (CN)	mg/L	0.0263	0.00050	9284252	0.0262	0.00050	9284252	0.0183	0.00050	9284252
Weak Acid Dissoc. Cyanide (CN)	mg/L	0.013	0.00050	9284251	0.013	0.00050	9284251	0.011	0.00050	9284251
Total Dissolved Solids	mg/L	6920	20	9270556	6960	20	9270556	4590	10	9270556
Dissolved Organic Carbon	mg/L	12	0.40	9271013				7.3	0.40	9271013
pH	pH	7.49		9270615				7.39		9270615
Total Suspended Solids	mg/L	11	1	9268434				4	1	9268434
Thiocyanate	mg/L	0.13	0.05	9270587	0.12	0.05	9270587	0.07	0.05	9270587
Alkalinity (Total as CaCO3)	mg/L	81	1.0	9270593				53	1.0	9270593

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

Bureau Veritas Job #: C474240
Report Date: 2024/03/19

Nautilus Environmental Company Inc.
Client Project #: 162706256
Your P.O. #: 2324-196PG
Sampler Initials: AQU

RESULTS OF ANALYSES OF WATER

Bureau Veritas ID		YPL703		
Sampling Date		2024/03/12 10:45		
COC Number		N/A		
	UNITS	**8161**	**RDL**	**QC Batch**
Calculated Parameters				
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	73	1.0	9268847
Carb. Alkalinity (calc. as CaCO3)	mg/L	<1.0	1.0	9268847
Total Cyanate (CNO-)	mg/L	0.34	0.050	9270425
Hardness (CaCO3)	mg/L	1500	1.0	9268849
Inorganics				
Total Ammonia-N	mg/L	1.43	0.050	9270996
Conductivity	umho/cm	7600	1.0	9270600
Free Cyanide (CN)	ug/L	5.5	2.0	9284253
Strong Acid Dissoc. Cyanide (CN)	mg/L	0.0249	0.00050	9284252
Weak Acid Dissoc. Cyanide (CN)	mg/L	0.014	0.00050	9284251
Total Dissolved Solids	mg/L	6350	20	9270556
Dissolved Organic Carbon	mg/L	11	0.40	9271013
pH	pH	7.50		9270615
Total Suspended Solids	mg/L	7	1	9268434
Thiocyanate	mg/L	0.13	0.05	9270587
Alkalinity (Total as CaCO3)	mg/L	74	1.0	9270593

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Bureau Veritas 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvna.com

Bureau Veritas Job #: C474240
Report Date: 2024/03/19

Nautilus Environmental Company Inc.
Client Project #: 162706256
Your P.O. #: 2324-196PG
Sampler Initials: AQU

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		YPL701			YPL702			YPL703		
Sampling Date		2024/03/12 09:00			2024/03/12 10:30			2024/03/12 10:45		
COC Number		N/A			N/A			N/A		
	UNITS	**81599**	**RDL**	**QC Batch**	**81600**	**RDL**	**QC Batch**	**8161**	**RDL**	**QC Batch**
Metals										
Dissolved Aluminum (Al)	mg/L	0.014	0.0049	9273625	0.0092	0.0049	9271234	0.015	0.0049	9273625
Total Aluminum (Al)	mg/L	0.041	0.0049	9270872	0.027	0.0049	9270872	0.044	0.0049	9270872
Dissolved Antimony (Sb)	mg/L	0.0095	0.00050	9273625	0.0054	0.00050	9271234	0.0084	0.00050	9273625
Total Antimony (Sb)	mg/L	0.011	0.00050	9270872	0.0067	0.00050	9270872	0.0096	0.00050	9270872
Dissolved Arsenic (As)	mg/L	0.0017	0.0010	9273625	0.0012	0.0010	9271234	0.0016	0.0010	9273625
Total Arsenic (As)	mg/L	0.0019	0.0010	9270872	0.0014	0.0010	9270872	0.0018	0.0010	9270872
Dissolved Barium (Ba)	mg/L	0.041	0.0020	9273625	0.025	0.0020	9271234	0.037	0.0020	9273625
Total Barium (Ba)	mg/L	0.043	0.0020	9270872	0.028	0.0020	9270872	0.040	0.0020	9270872
Dissolved Beryllium (Be)	mg/L	<0.00040	0.00040	9273625	<0.00040	0.00040	9271234	<0.00040	0.00040	9273625
Total Beryllium (Be)	mg/L	<0.00040	0.00040	9270872	<0.00040	0.00040	9270872	<0.00040	0.00040	9270872
Dissolved Bismuth (Bi)	mg/L	<0.0010	0.0010	9273625	<0.0010	0.0010	9271234	<0.0010	0.0010	9273625
Total Bismuth (Bi)	mg/L	<0.0010	0.0010	9270872	<0.0010	0.0010	9270872	<0.0010	0.0010	9270872
Dissolved Boron (B)	mg/L	0.35	0.010	9273625	0.24	0.010	9271234	0.32	0.010	9273625
Total Boron (B)	mg/L	0.36	0.010	9270872	0.25	0.010	9270872	0.35	0.010	9270872
Dissolved Cadmium (Cd)	mg/L	<0.000090	0.000090	9273625	<0.000090	0.000090	9271234	<0.000090	0.000090	9273625
Total Cadmium (Cd)	mg/L	<0.000090	0.000090	9270872	<0.000090	0.000090	9270872	<0.000090	0.000090	9270872
Dissolved Calcium (Ca)	mg/L	620	1.0	9273625	380	0.20	9271234	560	1.0	9273625
Total Calcium (Ca)	mg/L	550	1.0	9270872	400	0.20	9270872	560	1.0	9270872
Dissolved Chromium (Cr)	mg/L	<0.0050	0.0050	9273625	<0.0050	0.0050	9271234	<0.0050	0.0050	9273625
Total Chromium (Cr)	mg/L	<0.0050	0.0050	9270872	<0.0050	0.0050	9270872	<0.0050	0.0050	9270872
Dissolved Cobalt (Co)	mg/L	0.68	0.00050	9273625	0.43	0.00050	9271234	0.61	0.00050	9273625
Total Cobalt (Co)	mg/L	0.69	0.00050	9270872	0.43	0.00050	9270872	0.66	0.00050	9270872
Dissolved Copper (Cu)	mg/L	0.10	0.00090	9273625	0.058	0.00090	9271234	0.095	0.00090	9273625
Total Copper (Cu)	mg/L	0.18	0.00090	9270872	0.12	0.00090	9270872	0.17	0.00090	9270872
Dissolved Iron (Fe)	mg/L	2.4	0.10	9273625	1.5	0.10	9271234	2.4	0.10	9273625
Total Iron (Fe)	mg/L	6.1	0.10	9270872	4.1	0.10	9270872	5.9	0.10	9270872
Dissolved Lead (Pb)	mg/L	<0.00050	0.00050	9273625	<0.00050	0.00050	9271234	<0.00050	0.00050	9273625
Total Lead (Pb)	mg/L	<0.00050	0.00050	9270872	<0.00050	0.00050	9270872	<0.00050	0.00050	9270872
Dissolved Lithium (Li)	mg/L	0.0062	0.0050	9273625	<0.0050	0.0050	9271234	0.0056	0.0050	9273625
Total Lithium (Li)	mg/L	0.0062	0.0050	9270872	<0.0050	0.0050	9270872	0.0061	0.0050	9270872
Dissolved Magnesium (Mg)	mg/L	28	0.050	9273625	16	0.050	9271234	24	0.050	9273625
Total Magnesium (Mg)	mg/L	26	0.050	9270872	17	0.050	9270872	24	0.050	9270872
Dissolved Manganese (Mn)	mg/L	0.098	0.0020	9273625	0.060	0.0020	9271234	0.086	0.0020	9273625
Total Manganese (Mn)	mg/L	0.097	0.0020	9270872	0.064	0.0020	9270872	0.094	0.0020	9270872

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Bureau Veritas 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvna.com

BUREAU VERITAS

Bureau Veritas Job #: C474240
Report Date: 2024/03/19

Nautilus Environmental Company Inc.
Client Project #: 162706256
Your P.O. #: 2324-196PG
Sampler Initials: AQU

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		YPL701			YPL702			YPL703		
Sampling Date		2024/03/12 09:00			2024/03/12 10:30			2024/03/12 10:45		
COC Number		N/A			N/A			N/A		
	UNITS	**81599**	**RDL**	**QC Batch**	**81600**	**RDL**	**QC Batch**	**8161**	**RDL**	**QC Batch**
Dissolved Molybdenum (Mo)	mg/L	0.094	0.00050	9273625	0.058	0.00050	9271234	0.084	0.00050	9273625
Total Molybdenum (Mo)	mg/L	0.090	0.00050	9270872	0.058	0.00050	9270872	0.087	0.00050	9270872
Dissolved Nickel (Ni)	mg/L	0.23	0.0010	9273625	0.15	0.0010	9271234	0.20	0.0010	9273625
Total Nickel (Ni)	mg/L	0.23	0.0010	9270872	0.15	0.0010	9270872	0.22	0.0010	9270872
Dissolved Phosphorus (P)	mg/L	0.37	0.10	9273625	0.23	0.10	9271234	0.36	0.10	9273625
Total Phosphorus (P)	mg/L	0.87	0.10	9270872	0.58	0.10	9270872	0.81	0.10	9270872
Dissolved Potassium (K)	mg/L	280	1.0	9273625	170	0.20	9271234	250	1.0	9273625
Total Potassium (K)	mg/L	260	1.0	9270872	180	0.20	9270872	270	1.0	9270872
Dissolved Selenium (Se)	mg/L	0.24	0.0020	9273625	0.15	0.0020	9271234	0.21	0.0020	9273625
Total Selenium (Se)	mg/L	0.23	0.0020	9270872	0.16	0.0020	9270872	0.22	0.0020	9270872
Dissolved Silicon (Si)	mg/L	2.5	0.050	9273625	1.6	0.050	9271234	2.4	0.050	9273625
Total Silicon (Si)	mg/L	2.5	0.050	9270872	1.6	0.050	9270872	2.3	0.050	9270872
Dissolved Silver (Ag)	mg/L	<0.000090	0.000090	9273625	<0.000090	0.000090	9271234	<0.000090	0.000090	9273625
Total Silver (Ag)	mg/L	0.00010	0.000090	9270872	<0.000090	0.000090	9270872	0.00013	0.000090	9270872
Dissolved Sodium (Na)	mg/L	1400	0.50	9273625	850	0.50	9271234	1300	0.50	9273625
Total Sodium (Na)	mg/L	1300	0.50	9270872	810	0.50	9270872	1300	0.50	9270872
Dissolved Strontium (Sr)	mg/L	3.0	0.0010	9273625	1.9	0.0010	9271234	2.6	0.0010	9273625
Total Strontium (Sr)	mg/L	3.2	0.0010	9270872	2.1	0.0010	9270872	3.0	0.0010	9270872
Dissolved Tellurium (Te)	mg/L	<0.0010	0.0010	9273625	<0.0010	0.0010	9271234	<0.0010	0.0010	9273625
Total Tellurium (Te)	mg/L	<0.0010	0.0010	9270872	<0.0010	0.0010	9270872	<0.0010	0.0010	9270872
Dissolved Thallium (Tl)	mg/L	0.00016	0.000050	9273625	0.00011	0.000050	9271234	0.00014	0.000050	9273625
Total Thallium (Tl)	mg/L	0.00016	0.000050	9270872	0.00011	0.000050	9270872	0.00013	0.000050	9270872
Dissolved Tin (Sn)	mg/L	<0.0010	0.0010	9273625	<0.0010	0.0010	9271234	<0.0010	0.0010	9273625
Total Tin (Sn)	mg/L	<0.0010	0.0010	9270872	<0.0010	0.0010	9270872	<0.0010	0.0010	9270872
Dissolved Titanium (Ti)	mg/L	0.0052	0.0050	9273625	<0.0050	0.0050	9271234	<0.0050	0.0050	9273625
Total Titanium (Ti)	mg/L	0.012	0.0050	9270872	0.0074	0.0050	9270872	0.011	0.0050	9270872
Dissolved Tungsten (W)	mg/L	0.0010	0.0010	9273625	<0.0010	0.0010	9271234	0.0010	0.0010	9273625
Total Tungsten (W)	mg/L	0.0014	0.0010	9270872	<0.0010	0.0010	9270872	0.0013	0.0010	9270872
Dissolved Uranium (U)	mg/L	0.0010	0.00010	9273625	0.00073	0.00010	9271234	0.00095	0.00010	9273625
Total Uranium (U)	mg/L	0.0011	0.00010	9270872	0.00071	0.00010	9270872	0.0010	0.00010	9270872
Dissolved Vanadium (V)	mg/L	<0.00050	0.00050	9273625	<0.00050	0.00050	9271234	<0.00050	0.00050	9273625
Total Vanadium (V)	mg/L	0.00069	0.00050	9270872	0.00050	0.00050	9270872	0.00069	0.00050	9270872
Dissolved Zinc (Zn)	mg/L	0.016	0.0050	9273625	0.0079	0.0050	9271234	0.014	0.0050	9273625
Total Zinc (Zn)	mg/L	0.023	0.0050	9270872	0.017	0.0050	9270872	0.022	0.0050	9270872
Dissolved Zirconium (Zr)	mg/L	<0.0010	0.0010	9273625	<0.0010	0.0010	9271234	<0.0010	0.0010	9273625

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Bureau Veritas Job #: C474240
Report Date: 2024/03/19

Nautilus Environmental Company Inc.
Client Project #: 162706256
Your P.O. #: 2324-196PG
Sampler Initials: AQU

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		YPL701			YPL702			YPL703		
Sampling Date		2024/03/12 09:00			2024/03/12 10:30			2024/03/12 10:45		
COC Number		N/A			N/A			N/A		
	UNITS	**81599**	**RDL**	**QC Batch**	**81600**	**RDL**	**QC Batch**	**8161**	**RDL**	**QC Batch**
Total Zirconium (Zr)	mg/L	<0.0010	0.0010	9270872	<0.0010	0.0010	9270872	<0.0010	0.0010	9270872

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	12.3°C

Bromide Analysis:Due to high concentrations of the target analyte (Cl), sample required dilution. Detection limits were adjusted accordingly.

Sample YPL701 [81599] : PO4>Dissolved Phosphorous. Results have been confirmed by reanalysis.

Sample YPL702 [81600] : Total Phosphorus < ortho-Phosphate: Both values fall within the method uncertainty for duplicates and are likely equivalent.

Sample YPL703 [8161] : PO4>Dissolved Phosphorous. Results have been confirmed by reanalysis.

Results relate only to the items tested.

QUALITY ASSURANCE REPORT

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9268434	Total Suspended Solids	2024/03/13			94	80 - 120	<1	mg/L	13	20
9269468	Orthophosphate (P)	2024/03/13	96	75 - 125	98	80 - 120	<0.010	mg/L	0.21	20
9270556	Total Dissolved Solids	2024/03/13			100	80 - 120	<10	mg/L	0.58	20
9270587	Thiocyanate	2024/03/13	90	80 - 120	97	80 - 120	<0.05	mg/L	5.2	20
9270589	Dissolved Bromide (Br-)	2024/03/13	97	80 - 120	98	80 - 120	<1.0	mg/L	NC	20
9270589	Dissolved Chloride (Cl-)	2024/03/13	NC	80 - 120	100	70 - 130	<1.0	mg/L	0.39	20
9270589	Dissolved Sulphate (SO4)	2024/03/13	NC	80 - 120	97	80 - 120	<1.0	mg/L	0.65	20
9270591	Nitrate (N)	2024/03/13	NC	80 - 120	97	80 - 120	<0.10	mg/L	1.5	20
9270591	Nitrite (N)	2024/03/13	NC	80 - 120	101	80 - 120	<0.010	mg/L	0.49	20
9270593	Alkalinity (Total as CaCO3)	2024/03/13			94	85 - 115	<1.0	mg/L	0.70	20
9270600	Conductivity	2024/03/13			101	85 - 115	<1.0	umho/cm	0.12	10
9270614	Fluoride (F-)	2024/03/13	95	80 - 120	99	80 - 120	<0.10	mg/L	13	20
9270615	pH	2024/03/13			102	98 - 103			1.5	N/A
9270872	Total Aluminum (Al)	2024/03/13	103	80 - 120	97	80 - 120	<0.0049	mg/L	3.3	20
9270872	Total Antimony (Sb)	2024/03/13	110	80 - 120	103	80 - 120	<0.00050	mg/L	12	20
9270872	Total Arsenic (As)	2024/03/13	102	80 - 120	100	80 - 120	<0.0010	mg/L	NC	20
9270872	Total Barium (Ba)	2024/03/13	100	80 - 120	98	80 - 120	<0.0020	mg/L		
9270872	Total Beryllium (Be)	2024/03/13	102	80 - 120	100	80 - 120	<0.00040	mg/L		
9270872	Total Bismuth (Bi)	2024/03/13	92	80 - 120	95	80 - 120	<0.0010	mg/L		
9270872	Total Boron (B)	2024/03/13	NC	80 - 120	97	80 - 120	<0.010	mg/L		
9270872	Total Cadmium (Cd)	2024/03/13	98	80 - 120	98	80 - 120	<0.000090	mg/L	15	20
9270872	Total Calcium (Ca)	2024/03/13	NC	80 - 120	97	80 - 120	<0.20	mg/L		
9270872	Total Chromium (Cr)	2024/03/13	95	80 - 120	98	80 - 120	<0.0050	mg/L	NC	20
9270872	Total Cobalt (Co)	2024/03/13	95	80 - 120	101	80 - 120	<0.00050	mg/L	4.5	20
9270872	Total Copper (Cu)	2024/03/13	NC	80 - 120	98	80 - 120	<0.00090	mg/L	8.5	20
9270872	Total Iron (Fe)	2024/03/13	97	80 - 120	102	80 - 120	<0.10	mg/L	2.3	20
9270872	Total Lead (Pb)	2024/03/13	92	80 - 120	95	80 - 120	<0.00050	mg/L	0	20
9270872	Total Lithium (Li)	2024/03/13	109	80 - 120	104	80 - 120	<0.0050	mg/L		
9270872	Total Magnesium (Mg)	2024/03/13	NC	80 - 120	106	80 - 120	<0.050	mg/L		
9270872	Total Manganese (Mn)	2024/03/13	98	80 - 120	100	80 - 120	<0.0020	mg/L	2.5	20

QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9270872	Total Molybdenum (Mo)	2024/03/13	104	80 - 120	100	80 - 120	<0.00050	mg/L	1.3	20
9270872	Total Nickel (Ni)	2024/03/13	91	80 - 120	99	80 - 120	<0.0010	mg/L	6.0	20
9270872	Total Phosphorus (P)	2024/03/13	NC	80 - 120	96	80 - 120	<0.10	mg/L		
9270872	Total Potassium (K)	2024/03/13	NC	80 - 120	106	80 - 120	<0.20	mg/L		
9270872	Total Selenium (Se)	2024/03/13	95	80 - 120	100	80 - 120	<0.0020	mg/L	NC	20
9270872	Total Silicon (Si)	2024/03/13	106	80 - 120	96	80 - 120	<0.050	mg/L		
9270872	Total Silver (Ag)	2024/03/13	87	80 - 120	91	80 - 120	<0.000090	mg/L		
9270872	Total Sodium (Na)	2024/03/13	NC	80 - 120	101	80 - 120	<0.10	mg/L		
9270872	Total Strontium (Sr)	2024/03/13	NC	80 - 120	98	80 - 120	<0.0010	mg/L		
9270872	Total Tellurium (Te)	2024/03/13	107	80 - 120	104	80 - 120	<0.0010	mg/L		
9270872	Total Thallium (Tl)	2024/03/13	97	80 - 120	100	80 - 120	<0.000050	mg/L		
9270872	Total Tin (Sn)	2024/03/13	106	80 - 120	99	80 - 120	<0.0010	mg/L		
9270872	Total Titanium (Ti)	2024/03/13	103	80 - 120	97	80 - 120	<0.0050	mg/L		
9270872	Total Tungsten (W)	2024/03/13	94	80 - 120	95	80 - 120	<0.0010	mg/L		
9270872	Total Uranium (U)	2024/03/13	97	80 - 120	98	80 - 120	<0.00010	mg/L		
9270872	Total Vanadium (V)	2024/03/13	100	80 - 120	99	80 - 120	<0.00050	mg/L		
9270872	Total Zinc (Zn)	2024/03/13	96	80 - 120	102	80 - 120	<0.0050	mg/L	1.9	20
9270872	Total Zirconium (Zr)	2024/03/13	77 (1)	80 - 120	102	80 - 120	<0.0010	mg/L		
9270996	Total Ammonia-N	2024/03/13	93	75 - 125	99	80 - 120	<0.050	mg/L	0.24	20
9271013	Dissolved Organic Carbon	2024/03/13	92	80 - 120	96	80 - 120	<0.40	mg/L	8.5	20
9271234	Dissolved Aluminum (Al)	2024/03/13	99	80 - 120	95	80 - 120	<0.0049	mg/L		
9271234	Dissolved Antimony (Sb)	2024/03/13	104	80 - 120	102	80 - 120	<0.00050	mg/L		
9271234	Dissolved Arsenic (As)	2024/03/13	101	80 - 120	97	80 - 120	<0.0010	mg/L		
9271234	Dissolved Barium (Ba)	2024/03/13	96	80 - 120	97	80 - 120	<0.0020	mg/L		
9271234	Dissolved Beryllium (Be)	2024/03/13	91	80 - 120	98	80 - 120	<0.00040	mg/L		
9271234	Dissolved Bismuth (Bi)	2024/03/13	90	80 - 120	99	80 - 120	<0.0010	mg/L		
9271234	Dissolved Boron (B)	2024/03/13	98	80 - 120	98	80 - 120	<0.010	mg/L		
9271234	Dissolved Cadmium (Cd)	2024/03/13	96	80 - 120	99	80 - 120	<0.000090	mg/L		
9271234	Dissolved Calcium (Ca)	2024/03/13	NC	80 - 120	96	80 - 120	<0.20	mg/L		
9271234	Dissolved Chromium (Cr)	2024/03/13	97	80 - 120	96	80 - 120	<0.0050	mg/L		

Bureau Veritas Job #: C474240
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QUALITY ASSURANCE REPORT(CONT'D)

Nautilus Environmental Company Inc.
Client Project #: 162706256
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Sampler Initials: AQU

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9271234	Dissolved Cobalt (Co)	2024/03/13	NC	80 - 120	95	80 - 120	<0.00050	mg/L		
9271234	Dissolved Copper (Cu)	2024/03/13	98	80 - 120	94	80 - 120	<0.00090	mg/L		
9271234	Dissolved Iron (Fe)	2024/03/13	96	80 - 120	96	80 - 120	<0.10	mg/L		
9271234	Dissolved Lead (Pb)	2024/03/13	91	80 - 120	97	80 - 120	<0.00050	mg/L		
9271234	Dissolved Lithium (Li)	2024/03/13	98	80 - 120	100	80 - 120	<0.0050	mg/L		
9271234	Dissolved Magnesium (Mg)	2024/03/13	98	80 - 120	96	80 - 120	<0.050	mg/L		
9271234	Dissolved Manganese (Mn)	2024/03/13	95	80 - 120	96	80 - 120	<0.0020	mg/L		
9271234	Dissolved Molybdenum (Mo)	2024/03/13	109	80 - 120	98	80 - 120	<0.00050	mg/L		
9271234	Dissolved Nickel (Ni)	2024/03/13	94	80 - 120	95	80 - 120	<0.0010	mg/L		
9271234	Dissolved Phosphorus (P)	2024/03/13	105	80 - 120	100	80 - 120	<0.10	mg/L		
9271234	Dissolved Potassium (K)	2024/03/13	NC	80 - 120	98	80 - 120	<0.20	mg/L		
9271234	Dissolved Selenium (Se)	2024/03/13	98	80 - 120	96	80 - 120	<0.0020	mg/L		
9271234	Dissolved Silicon (Si)	2024/03/13	98	80 - 120	95	80 - 120	<0.050	mg/L		
9271234	Dissolved Silver (Ag)	2024/03/13	93	80 - 120	97	80 - 120	<0.000090	mg/L		
9271234	Dissolved Sodium (Na)	2024/03/13	NC	80 - 120	97	80 - 120	<0.10	mg/L		
9271234	Dissolved Strontium (Sr)	2024/03/13	NC	80 - 120	100	80 - 120	<0.0010	mg/L		
9271234	Dissolved Tellurium (Te)	2024/03/13	93	80 - 120	100	80 - 120	<0.0010	mg/L		
9271234	Dissolved Thallium (Tl)	2024/03/13	91	80 - 120	97	80 - 120	<0.000050	mg/L		
9271234	Dissolved Tin (Sn)	2024/03/13	103	80 - 120	102	80 - 120	<0.0010	mg/L		
9271234	Dissolved Titanium (Ti)	2024/03/13	98	80 - 120	98	80 - 120	<0.0050	mg/L		
9271234	Dissolved Tungsten (W)	2024/03/13	104	80 - 120	99	80 - 120	<0.0010	mg/L		
9271234	Dissolved Uranium (U)	2024/03/13	104	80 - 120	105	80 - 120	<0.00010	mg/L		
9271234	Dissolved Vanadium (V)	2024/03/13	102	80 - 120	96	80 - 120	<0.00050	mg/L		
9271234	Dissolved Zinc (Zn)	2024/03/13	91	80 - 120	98	80 - 120	<0.0050	mg/L		
9271234	Dissolved Zirconium (Zr)	2024/03/13	109	80 - 120	100	80 - 120	<0.0010	mg/L		
9271757	Orthophosphate (P)	2024/03/14	96	75 - 125	92	80 - 120	<0.010	mg/L	NC	20
9273625	Dissolved Aluminum (Al)	2024/03/14	98	80 - 120	98	80 - 120	<0.0049	mg/L		
9273625	Dissolved Antimony (Sb)	2024/03/14	108	80 - 120	102	80 - 120	<0.00050	mg/L	NC	20
9273625	Dissolved Arsenic (As)	2024/03/14	102	80 - 120	99	80 - 120	<0.0010	mg/L	NC	20
9273625	Dissolved Barium (Ba)	2024/03/14	102	80 - 120	100	80 - 120	<0.0020	mg/L	3.6	20

QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9273625	Dissolved Beryllium (Be)	2024/03/14	104	80 - 120	100	80 - 120	<0.00040	mg/L	NC	20
9273625	Dissolved Bismuth (Bi)	2024/03/14	100	80 - 120	95	80 - 120	<0.0010	mg/L		
9273625	Dissolved Boron (B)	2024/03/14	100	80 - 120	97	80 - 120	<0.010	mg/L	2.1	20
9273625	Dissolved Cadmium (Cd)	2024/03/14	103	80 - 120	98	80 - 120	<0.000090	mg/L	NC	20
9273625	Dissolved Calcium (Ca)	2024/03/14	NC	80 - 120	103	80 - 120	<0.20	mg/L		
9273625	Dissolved Chromium (Cr)	2024/03/14	98	80 - 120	95	80 - 120	<0.0050	mg/L	NC	20
9273625	Dissolved Cobalt (Co)	2024/03/14	98	80 - 120	97	80 - 120	<0.00050	mg/L	NC	20
9273625	Dissolved Copper (Cu)	2024/03/14	100	80 - 120	97	80 - 120	<0.00090	mg/L	NC	20
9273625	Dissolved Iron (Fe)	2024/03/14	101	80 - 120	99	80 - 120	<0.10	mg/L	NC	20
9273625	Dissolved Lead (Pb)	2024/03/14	102	80 - 120	96	80 - 120	<0.00050	mg/L	NC	20
9273625	Dissolved Lithium (Li)	2024/03/14	111	80 - 120	111	80 - 120	<0.0050	mg/L		
9273625	Dissolved Magnesium (Mg)	2024/03/14	NC	80 - 120	96	80 - 120	<0.050	mg/L		
9273625	Dissolved Manganese (Mn)	2024/03/14	98	80 - 120	96	80 - 120	<0.0020	mg/L	3.1	20
9273625	Dissolved Molybdenum (Mo)	2024/03/14	107	80 - 120	100	80 - 120	<0.00050	mg/L	2.2	20
9273625	Dissolved Nickel (Ni)	2024/03/14	98	80 - 120	96	80 - 120	<0.0010	mg/L	14	20
9273625	Dissolved Phosphorus (P)	2024/03/14	104	80 - 120	97	80 - 120	<0.10	mg/L		
9273625	Dissolved Potassium (K)	2024/03/14	101	80 - 120	97	80 - 120	<0.20	mg/L		
9273625	Dissolved Selenium (Se)	2024/03/14	103	80 - 120	101	80 - 120	<0.0020	mg/L	NC	20
9273625	Dissolved Silicon (Si)	2024/03/14	96	80 - 120	99	80 - 120	<0.050	mg/L		
9273625	Dissolved Silver (Ag)	2024/03/14	101	80 - 120	100	80 - 120	<0.000090	mg/L	NC	20
9273625	Dissolved Sodium (Na)	2024/03/14	98	80 - 120	96	80 - 120	<0.10	mg/L		
9273625	Dissolved Strontium (Sr)	2024/03/14	NC	80 - 120	98	80 - 120	<0.0010	mg/L		
9273625	Dissolved Tellurium (Te)	2024/03/14	105	80 - 120	101	80 - 120	<0.0010	mg/L		
9273625	Dissolved Thallium (Tl)	2024/03/14	104	80 - 120	97	80 - 120	<0.000050	mg/L	NC	20
9273625	Dissolved Tin (Sn)	2024/03/14	105	80 - 120	100	80 - 120	<0.0010	mg/L		
9273625	Dissolved Titanium (Ti)	2024/03/14	97	80 - 120	97	80 - 120	<0.0050	mg/L		
9273625	Dissolved Tungsten (W)	2024/03/14	107	80 - 120	101	80 - 120	<0.0010	mg/L	NC	20
9273625	Dissolved Uranium (U)	2024/03/14	104	80 - 120	98	80 - 120	<0.00010	mg/L	2.1	20
9273625	Dissolved Vanadium (V)	2024/03/14	98	80 - 120	94	80 - 120	<0.00050	mg/L	NC	20
9273625	Dissolved Zinc (Zn)	2024/03/14	99	80 - 120	103	80 - 120	<0.0050	mg/L	9.2	20

Bureau Veritas Job #: C474240
Report Date: 2024/03/19

QUALITY ASSURANCE REPORT(CONT'D)

Nautilus Environmental Company Inc.
Client Project #: 162706256
Your P.O. #: 2324-196PG
Sampler Initials: AQU

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9273625	Dissolved Zirconium (Zr)	2024/03/14	104	80 - 120	99	80 - 120	<0.0010	mg/L		
9284251	Weak Acid Dissoc. Cyanide (CN)	2024/03/15	106	80 - 120	99	80 - 120	<0.00050	mg/L	1.2	20
9284252	Strong Acid Dissoc. Cyanide (CN)	2024/03/15	98	80 - 120	95	80 - 120	<0.00050	mg/L	0.27	20
9284253	Free Cyanide (CN)	2024/03/19	98	80 - 120	95	80 - 120	<2.0	ug/L		

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

(1) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

Bureau Veritas 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvna.com

Bureau Veritas Job #: C474240
Report Date: 2024/03/19

Nautilus Environmental Company Inc.
Client Project #: 162706256
Your P.O. #: 2324-196PG
Sampler Initials: AQU

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:

Cristina Carriere, Senior Scientific Specialist

Suwan (Sze Yeung) Fock, B.Sc., Scientific Specialist

Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by Rodney Major, General Manager responsible for Ontario Environmental laboratory operations.

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

Rush

Maxxam A Bureau Veritas Group Company

6740 Campobello Road, Mississauga, Ontario L5N 2L8
Phone: 905-817-5700 Fax: 905-817-5779 Toll Free: 800-563-6266
CAM FCD-01191/2

CHAIN OF CUSTODY RECORD

Invoice Information		Report Information (if differs from invoice)		Project Information (where applicable)		Turnaround Time (TAT) Required
Company Name:	Nautilus Environmental Company Inc.	Company Name:	Nautilus Environmental Company Inc.	Quotation #:	C41237	☐ Regular TAT (5-7 days) Most analyses
Contact Name:	Adam Wartman	Contact Name:	Adam Wartman / Lesley Novak	P.O. #/ AFE#:	2324-196PG	PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address:	11B Nicholas Beaver Rd.	Address:	B-11 Nicholas Beaver Rd	Project #:	162706256	Rush TAT (Surcharges will be applied)
	Puslinch, ON N0B 2J0		Puslinch, ON N0B2J0	Site Location:		☐ 1 Day ☐ 2 Days ☒ 3-4 Days
Email:	accounting@nautilusenvironmental.ca	Email:	awartman@aquatox.ca;pantunes@aquatox.ca; lnovak@aquatox.ca; lisa.ramilo@agnicoeagle.com; connor.pettem@wsp.com	Sampled By:	AquaTox	Date Required: 3/15/2024

MOE REGULATED DRINKING WATER OR WATER INTENDED FOR HUMAN CONSUMPTION MUST BE SUBMITTED ON THE MAXXAM DRINKING WATER CHAIN OF CUSTODY

Rush Confirmation #: JG20240311-02

Regulation 153

☐ Table 1 ☐ Res/Park ☐ Med/ Fine
☐ Table 2 ☐ Ind/Comm ☐ Coarse
☐ Table 3 ☐ Agri/ Other
☐ Table ____
FOR RSC (PLEASE CIRCLE) Y / N

Other Regulations

☐ CCME ☐ Sanitary Sewer Bylaw
☐ MISA ☐ Storm Sewer Bylaw
☐ PWQO Region ____
☐ Other (Specify) ____
☐ REG 558 (MIN. 3 DAY TAT REQUIRED)

Include Criteria on Certificate of Analysis: Y / N

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

Analysis Requested

	SAMPLE IDENTIFICATION	DATE SAMPLED (YYY/MM/DD)	TIME SAMPLED (HH:MM)	MATRIX	# OF CONTAINERS SUBMITTED	FIELD FILTERED (CIRCLE) Metals / Hg / CrVI	pH, Specific Conductivity	Total, Carbonate and Bicarbonate Alkalinity	Hardness	TSS (TSS low level)	Total ammonia	TDS	Anions Scan	Total Metals by ICP-MS/OES	Dissolved Metals by ICP-MS/OES (already filtered)	Total Cyanide (WAD, SAD and Free)	DOC	Cyanate	Thiocyanate			HOLD- DO NOT ANALYZE	COMMENTS
1	81599	2024-03-12	09:00	water	10	Y	x	x	x	x	x	x	x	x	x	x	x	x	x				Please report ammonia values to
2	81600	2024-03-12	10:30	water	10	Y	x	x	x	x	x	x	x	x	x	x	x	x	x				2 decimal places
3	81601	2024-03-12	10:45	water	10	Y	x	x	x	x	x	x	x	x	x	x	x	x	x				
4																							
5																							
6																							
7																							
8																							
9																							
10																							

LABORATORY USE ONLY

CUSTODY SEAL Y / N		COOLER TEMPERATURES
Present	Intact	
N	N	13/11/13

COOLING MEDIA PRESENT: Y / N

NONT-2024-03-854

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	MAXXAM JOB #
Adam Wartman	2024-03-12	14:30	NIRAL PATEL	2024/03/12	15:53	

Your P.O. #: 2324-196PG
Your Project #: 162706256
Your C.O.C. #: N/A

Attention: Adam Wartman

Nautilus Environmental Company Inc.
B-11 Nicholas Beaver Rd
Puslinch, ON
CANADA N0B 2J0

Report Date: 2024/03/26
Report #: R8082337
Version: 2 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C482313
Received: 2024/03/19, 15:58

Sample Matrix: Water
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Alkalinity	1	N/A	2024/03/20	CAM SOP-00448	SM 24 2320 B m
Carbonate, Bicarbonate and Hydroxide	1	N/A	2024/03/20	CAM SOP-00102	APHA 4500-CO2 D
Anions	1	N/A	2024/03/21	CAM SOP-00435	SM 23 4110 B m
Conductivity	1	N/A	2024/03/20	CAM SOP-00414	SM 24 2510 m
Cyanate (2)	1	N/A	2024/03/22	CAM SOP-00471	SM 24 4500-CN L
Dissolved Organic Carbon (DOC) (3)	1	N/A	2024/03/20	CAM SOP-00446	SM 24 5310 B m
Fluoride	1	2024/03/20	2024/03/20	CAM SOP-00449	SM 24 4500-F C m
Hardness (calculated as CaCO3)	1	N/A	2024/03/22	CAM SOP 00102/00408/00447	SM 2340 B
Dissolved Metals by ICPMS	1	N/A	2024/03/22	CAM SOP-00447	EPA 6020B m
Total Metals Analysis by ICPMS	1	2024/03/20	2024/03/21	CAM SOP-00447	EPA 6020B m
Cyanide (Free) (1)	1	N/A	2024/03/26	CAL SOP-00266	EPA 9016d R0 m
Cyanide, Strong Acid Dissociable (SAD) (1)	1	2024/03/22	2024/03/22	CAL SOP-00270	SM 24 4500-CN m
Cyanide WAD (weak acid dissociable) (1)	1	N/A	2024/03/22	CAL SOP-00270	SM 24 4500-CN m
Total Ammonia-N	1	N/A	2024/03/21	CAM SOP-00441	USGS I-2522-90 m
Nitrate & Nitrite as Nitrogen in Water (4)	1	N/A	2024/03/20	CAM SOP-00440	SM 24 4500-NO3I/NO2B
pH (5)	1	2024/03/20	2024/03/20	CAM SOP-00413	SM 24th - 4500H+ B
Orthophosphate	1	N/A	2024/03/20	CAM SOP-00461	SM 24 4500-P E
Thiocyanate	1	N/A	2024/03/22	CAM SOP-00473	SM 24 4500-CN M m
Total Dissolved Solids	1	2024/03/21	2024/03/22	CAM SOP-00428	SM 24 2540C m
Low Level Total Suspended Solids	1	2024/03/21	2024/03/22	CAM SOP-00428	SM 24 2540D m

Remarks:

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, EPA, APHA or the Quebec Ministry of Environment.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Bureau Veritas 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvna.com

Your P.O. #: 2324-196PG
Your Project #: 162706256
Your C.O.C. #: N/A

Attention: Adam Wartman

Nautilus Environmental Company Inc.
B-11 Nicholas Beaver Rd
Puslinch, ON
CANADA N0B 2J0

Report Date: 2024/03/26
Report #: R8082337
Version: 2 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C482313
Received: 2024/03/19, 15:58

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) This test was performed by Bureau Veritas Calgary (19th), 4000 19th Street NE , Calgary, AB, T2E 6P8
(2) Sample(s) analyzed using methodologies that have been subjected to Bureau Veritas' standard validation process for the submitted matrix however it is not an accredited method.
(3) Dissolved Organic Carbon (DOC) present in the sample should be considered as non-purgeable DOC.
(4) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.
(5) "The CCME method and Analytical Protocol (O. Reg 153/04, O. Reg. 406/19) requires pH to be analyzed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory pH analyses in this report are reported past the CCME and Analytical Protocol (O. Reg 153/04, O. Reg. 406/19) holding time. Bureau Veritas endeavors to analyze samples as soon as possible after receipt."

Encryption Key

Please direct all questions regarding this Certificate of Analysis to:
Jolanta Goralczyk, Project Manager
Email: Jolanta.Goralczyk@bureauveritas.com
Phone# (905)817-5751
==
Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by Rodney Major, General Manager responsible for Ontario Environmental laboratory operations.

Bureau Veritas Job #: C482313
Report Date: 2024/03/26

Nautilus Environmental Company Inc.
Client Project #: 162706256
Your P.O. #: 2324-196PG
Sampler Initials: AQU

ANION SCAN IN WATER (WATER)

Bureau Veritas ID		YRD640			YRD640		
Sampling Date		2024/03/19 11:00			2024/03/19 11:00		
COC Number		N/A			N/A		
	UNITS	**81676**	**RDL**	**QC Batch**	**81676 Lab-Dup**	**RDL**	**QC Batch**
Inorganics							
Fluoride (F-)	mg/L	0.32	0.10	9285280	0.31	0.10	9285280
Orthophosphate (P)	mg/L	0.72	0.010	9285137			
Nitrite (N)	mg/L	2.18	0.010	9285243			
Dissolved Chloride (Cl-)	mg/L	690	10	9287063	700	10	9287063
Nitrate (N)	mg/L	210	2.0	9285243			
Nitrate + Nitrite (N)	mg/L	212	2.0	9285243			
Dissolved Bromide (Br-)	mg/L	<10	10	9287063	<10	10	9287063
Dissolved Sulphate (SO4)	mg/L	4200	10	9287063	4300	10	9287063

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

Bureau Veritas Job #: C482313
Report Date: 2024/03/26

Nautilus Environmental Company Inc.
Client Project #: 162706256
Your P.O. #: 2324-196PG
Sampler Initials: AQU

RESULTS OF ANALYSES OF WATER

Bureau Veritas ID		YRD640			YRD640		
Sampling Date		2024/03/19 11:00			2024/03/19 11:00		
COC Number		N/A			N/A		
	UNITS	**81676**	**RDL**	**QC Batch**	**81676 Lab-Dup**	**RDL**	**QC Batch**
Calculated Parameters							
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	100	1.0	9282884			
Carb. Alkalinity (calc. as CaCO3)	mg/L	<1.0	1.0	9282884			
Total Cyanate (CNO-)	mg/L	0.62	0.050	9284263			
Hardness (CaCO3)	mg/L	1700	1.0	9282881			
Inorganics							
Total Ammonia-N	mg/L	2.46	0.050	9283581	2.48	0.050	9283581
Conductivity	umho/cm	11000	1.0	9285279	11000	1.0	9285279
Free Cyanide (CN)	ug/L	4.9	2.0	9298895			
Strong Acid Dissoc. Cyanide (CN)	mg/L	0.0465	0.00050	9296151			
Weak Acid Dissoc. Cyanide (CN)	mg/L	0.020	0.00050	9298894			
Total Dissolved Solids	mg/L	8710	20	9289077			
Dissolved Organic Carbon	mg/L	15	0.40	9285492			
pH	pH	7.47		9285278	7.54		9285278
Total Suspended Solids	mg/L	11	1	9288421			
Thiocyanate	mg/L	0.16	0.05	9290772	0.15	0.05	9290772
Alkalinity (Total as CaCO3)	mg/L	100	1.0	9285262	110	1.0	9285262

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

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ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		YRD640	YRD640		
Sampling Date		2024/03/19 11:00	2024/03/19 11:00		
COC Number		N/A	N/A		
	UNITS	**81676**	**81676 Lab-Dup**	**RDL**	**QC Batch**
Metals					
Dissolved Aluminum (Al)	mg/L	<0.025	<0.025	0.025	9285171
Total Aluminum (Al)	mg/L	0.050	0.048	0.0049	9286189
Dissolved Antimony (Sb)	mg/L	0.011	0.012	0.0025	9285171
Total Antimony (Sb)	mg/L	0.014	0.013	0.00050	9286189
Dissolved Arsenic (As)	mg/L	<0.0050	<0.0050	0.0050	9285171
Total Arsenic (As)	mg/L	0.0029	0.0030	0.0010	9286189
Dissolved Barium (Ba)	mg/L	0.051	0.056	0.010	9285171
Total Barium (Ba)	mg/L	0.057	0.057	0.0020	9286189
Dissolved Beryllium (Be)	mg/L	<0.0020	<0.0020	0.0020	9285171
Total Beryllium (Be)	mg/L	<0.00040	<0.00040	0.00040	9286189
Dissolved Bismuth (Bi)	mg/L	<0.0050	<0.0050	0.0050	9285171
Total Bismuth (Bi)	mg/L	<0.0010	<0.0010	0.0010	9286189
Dissolved Boron (B)	mg/L	0.48	0.49	0.050	9285171
Total Boron (B)	mg/L	0.48	0.48	0.010	9286189
Dissolved Cadmium (Cd)	mg/L	<0.00045	<0.00045	0.00045	9285171
Total Cadmium (Cd)	mg/L	0.00012	<0.000090	0.000090	9286189
Dissolved Calcium (Ca)	mg/L	610	620	1.0	9285171
Total Calcium (Ca)	mg/L	650	660	1.0	9286189
Dissolved Chromium (Cr)	mg/L	<0.025	<0.025	0.025	9285171
Total Chromium (Cr)	mg/L	<0.0050	<0.0050	0.0050	9286189
Dissolved Cobalt (Co)	mg/L	0.91	0.89	0.0025	9285171
Total Cobalt (Co)	mg/L	0.97	0.96	0.00050	9286189
Dissolved Copper (Cu)	mg/L	0.11	0.11	0.0045	9285171
Total Copper (Cu)	mg/L	0.22	0.21	0.00090	9286189
Dissolved Iron (Fe)	mg/L	2.7	2.8	0.50	9285171
Total Iron (Fe)	mg/L	7.0	7.0	0.10	9286189
Dissolved Lead (Pb)	mg/L	<0.0025	<0.0025	0.0025	9285171
Total Lead (Pb)	mg/L	0.00055	0.00054	0.00050	9286189
Dissolved Lithium (Li)	mg/L	<0.025	<0.025	0.025	9285171
Total Lithium (Li)	mg/L	0.0086	0.0090	0.0050	9286189
Dissolved Magnesium (Mg)	mg/L	33	33	0.25	9285171
Total Magnesium (Mg)	mg/L	36	36	0.050	9286189
Dissolved Manganese (Mn)	mg/L	0.13	0.12	0.010	9285171

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		YRD640	YRD640		
Sampling Date		2024/03/19 11:00	2024/03/19 11:00		
COC Number		N/A	N/A		
	UNITS	**81676**	**81676 Lab-Dup**	**RDL**	**QC Batch**
Total Manganese (Mn)	mg/L	0.13	0.14	0.0020	9286189
Dissolved Molybdenum (Mo)	mg/L	0.12	0.12	0.0025	9285171
Total Molybdenum (Mo)	mg/L	0.13	0.13	0.00050	9286189
Dissolved Nickel (Ni)	mg/L	0.30	0.30	0.0050	9285171
Total Nickel (Ni)	mg/L	0.33	0.33	0.0010	9286189
Dissolved Phosphorus (P)	mg/L	<0.50	0.50	0.50	9285171
Total Phosphorus (P)	mg/L	0.92	0.90	0.10	9286189
Dissolved Potassium (K)	mg/L	360	360	1.0	9285171
Total Potassium (K)	mg/L	370	380	1.0	9286189
Dissolved Selenium (Se)	mg/L	0.31	0.31	0.010	9285171
Total Selenium (Se)	mg/L	0.33	0.33	0.0020	9286189
Dissolved Silicon (Si)	mg/L	3.1	3.1	0.25	9285171
Total Silicon (Si)	mg/L	3.5	3.4	0.050	9286189
Dissolved Silver (Ag)	mg/L	<0.00045	<0.00045	0.00045	9285171
Total Silver (Ag)	mg/L	0.00013	0.00013	0.000090	9286189
Dissolved Sodium (Na)	mg/L	1800	1900	0.50	9285171
Total Sodium (Na)	mg/L	1900	2000	0.50	9286189
Dissolved Strontium (Sr)	mg/L	3.8	3.8	0.0050	9285171
Total Strontium (Sr)	mg/L	4.3	4.1	0.0010	9286189
Dissolved Tellurium (Te)	mg/L	<0.0050	<0.0050	0.0050	9285171
Total Tellurium (Te)	mg/L	<0.0010	<0.0010	0.0010	9286189
Dissolved Thallium (Tl)	mg/L	<0.00025	<0.00025	0.00025	9285171
Total Thallium (Tl)	mg/L	0.00023	0.00023	0.000050	9286189
Dissolved Tin (Sn)	mg/L	<0.0050	<0.0050	0.0050	9285171
Total Tin (Sn)	mg/L	<0.0010	<0.0010	0.0010	9286189
Dissolved Titanium (Ti)	mg/L	<0.025	<0.025	0.025	9285171
Total Titanium (Ti)	mg/L	0.013	0.013	0.0050	9286189
Dissolved Tungsten (W)	mg/L	<0.0050	<0.0050	0.0050	9285171
Total Tungsten (W)	mg/L	0.0018	0.0018	0.0010	9286189
Dissolved Uranium (U)	mg/L	0.0014	0.0014	0.00050	9285171
Total Uranium (U)	mg/L	0.0014	0.0014	0.00010	9286189
Dissolved Vanadium (V)	mg/L	<0.0025	<0.0025	0.0025	9285171
Total Vanadium (V)	mg/L	0.00082	0.00081	0.00050	9286189
Dissolved Zinc (Zn)	mg/L	<0.025	<0.025	0.025	9285171

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		YRD640	YRD640		
Sampling Date		2024/03/19 11:00	2024/03/19 11:00		
COC Number		N/A	N/A		
	UNITS	**81676**	**81676 Lab-Dup**	**RDL**	**QC Batch**
Total Zinc (Zn)	mg/L	0.038	0.037	0.0050	9286189
Dissolved Zirconium (Zr)	mg/L	<0.0050	<0.0050	0.0050	9285171
Total Zirconium (Zr)	mg/L	<0.0010	<0.0010	0.0010	9286189

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	12.3°C

Sample YRD640 [81676] : Metal Analysis: Due to the sample matrix, sample required dilution. Detection limits were adjusted accordingly.
Total Phosphorus < ortho-Phosphate: Both values fall within the method uncertainty for duplicates and are likely equivalent.

Results relate only to the items tested.

Bureau Veritas Job #: C482313
Report Date: 2024/03/26

QUALITY ASSURANCE REPORT

Nautilus Environmental Company Inc.
Client Project #: 162706256
Your P.O. #: 2324-196PG
Sampler Initials: AQU

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		Reagent Blank	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	Value	UNITS
9283581	Total Ammonia-N	2024/03/21	94	75 - 125	98	80 - 120	<0.050	mg/L	1.1	20		
9285137	Orthophosphate (P)	2024/03/20	103	75 - 125	100	80 - 120	<0.010	mg/L	NC	20		
9285171	Dissolved Aluminum (Al)	2024/03/22	97	80 - 120	96	80 - 120	<0.0049	mg/L	NC	20		
9285171	Dissolved Antimony (Sb)	2024/03/22	107	80 - 120	103	80 - 120	<0.00050	mg/L	4.4	20		
9285171	Dissolved Arsenic (As)	2024/03/22	100	80 - 120	99	80 - 120	<0.0010	mg/L	NC	20		
9285171	Dissolved Barium (Ba)	2024/03/22	100	80 - 120	97	80 - 120	<0.0020	mg/L	8.4	20		
9285171	Dissolved Beryllium (Be)	2024/03/22	97	80 - 120	101	80 - 120	<0.00040	mg/L	NC	20		
9285171	Dissolved Bismuth (Bi)	2024/03/22	94	80 - 120	98	80 - 120	<0.0010	mg/L	NC	20		
9285171	Dissolved Boron (B)	2024/03/22	102	80 - 120	98	80 - 120	<0.010	mg/L	1.8	20		
9285171	Dissolved Cadmium (Cd)	2024/03/22	100	80 - 120	99	80 - 120	<0.000090	mg/L	NC	20		
9285171	Dissolved Calcium (Ca)	2024/03/22	NC	80 - 120	98	80 - 120	<0.20	mg/L	0.25	20		
9285171	Dissolved Chromium (Cr)	2024/03/22	99	80 - 120	96	80 - 120	<0.0050	mg/L	NC	20		
9285171	Dissolved Cobalt (Co)	2024/03/22	NC	80 - 120	95	80 - 120	<0.00050	mg/L	1.4	20		
9285171	Dissolved Copper (Cu)	2024/03/22	99	80 - 120	96	80 - 120	<0.00090	mg/L	1.0	20		
9285171	Dissolved Iron (Fe)	2024/03/22	100	80 - 120	98	80 - 120	<0.10	mg/L	0.96	20		
9285171	Dissolved Lead (Pb)	2024/03/22	96	80 - 120	98	80 - 120	<0.00050	mg/L	NC	20		
9285171	Dissolved Lithium (Li)	2024/03/22	103	80 - 120	105	80 - 120	<0.0050	mg/L	NC	20		
9285171	Dissolved Magnesium (Mg)	2024/03/22	NC	80 - 120	96	80 - 120	<0.050	mg/L	0.30	20		
9285171	Dissolved Manganese (Mn)	2024/03/22	98	80 - 120	97	80 - 120	<0.0020	mg/L	3.9	20		
9285171	Dissolved Molybdenum (Mo)	2024/03/22	106	80 - 120	100	80 - 120	<0.00050	mg/L	1.5	20		
9285171	Dissolved Nickel (Ni)	2024/03/22	96	80 - 120	94	80 - 120	<0.0010	mg/L	0.96	20		
9285171	Dissolved Phosphorus (P)	2024/03/22	105	80 - 120	100	80 - 120	<0.10	mg/L	0.25	20		
9285171	Dissolved Potassium (K)	2024/03/22	NC	80 - 120	95	80 - 120	<0.20	mg/L	0.24	20		
9285171	Dissolved Selenium (Se)	2024/03/22	NC	80 - 120	99	80 - 120	<0.0020	mg/L	0.040	20		
9285171	Dissolved Silicon (Si)	2024/03/22	99	80 - 120	99	80 - 120	<0.050	mg/L	1.3	20		
9285171	Dissolved Silver (Ag)	2024/03/22	98	80 - 120	98	80 - 120	<0.000090	mg/L	NC	20		
9285171	Dissolved Sodium (Na)	2024/03/22	NC	80 - 120	98	80 - 120	<0.10	mg/L	1.2	20		
9285171	Dissolved Strontium (Sr)	2024/03/22	NC	80 - 120	98	80 - 120	<0.0010	mg/L	0.33	20		
9285171	Dissolved Tellurium (Te)	2024/03/22	98	80 - 120	98	80 - 120	<0.0010	mg/L	NC	20		
9285171	Dissolved Thallium (Tl)	2024/03/22	96	80 - 120	96	80 - 120	<0.000050	mg/L	NC	20		

Bureau Veritas 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvna.com

QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		Reagent Blank	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	Value	UNITS
9285171	Dissolved Tin (Sn)	2024/03/22	104	80 - 120	102	80 - 120	<0.0010	mg/L	NC	20		
9285171	Dissolved Titanium (Ti)	2024/03/22	101	80 - 120	99	80 - 120	<0.0050	mg/L	NC	20		
9285171	Dissolved Tungsten (W)	2024/03/22	101	80 - 120	98	80 - 120	<0.0010	mg/L	NC	20		
9285171	Dissolved Uranium (U)	2024/03/22	99	80 - 120	98	80 - 120	<0.00010	mg/L	1.5	20		
9285171	Dissolved Vanadium (V)	2024/03/22	102	80 - 120	97	80 - 120	<0.00050	mg/L	NC	20		
9285171	Dissolved Zinc (Zn)	2024/03/22	97	80 - 120	98	80 - 120	<0.0050	mg/L	NC	20		
9285171	Dissolved Zirconium (Zr)	2024/03/22	107	80 - 120	102	80 - 120	<0.0010	mg/L	NC	20		
9285243	Nitrate (N)	2024/03/20	96	80 - 120	97	80 - 120	<0.10	mg/L	NC	20		
9285243	Nitrite (N)	2024/03/20	105	80 - 120	105	80 - 120	<0.010	mg/L	6.9	20		
9285262	Alkalinity (Total as CaCO3)	2024/03/20			96	85 - 115	<1.0	mg/L	0.95	20		
9285278	pH	2024/03/20			102	98 - 103			0.93	N/A		
9285279	Conductivity	2024/03/20			102	85 - 115	<1.0	umho/cm	0.39	10		
9285280	Fluoride (F-)	2024/03/20	95	80 - 120	103	80 - 120	<0.10	mg/L	4.3	20		
9285492	Dissolved Organic Carbon	2024/03/20	95	80 - 120	98	80 - 120	<0.40	mg/L	0.059	20		
9286189	Total Aluminum (Al)	2024/03/21	109	80 - 120	103	80 - 120	<0.0049	mg/L	2.3	20	<0.0049	mg/L
9286189	Total Antimony (Sb)	2024/03/21	105	80 - 120	102	80 - 120	<0.00050	mg/L	5.3	20	<0.00050	mg/L
9286189	Total Arsenic (As)	2024/03/21	100	80 - 120	100	80 - 120	<0.0010	mg/L	1.5	20	<0.0010	mg/L
9286189	Total Barium (Ba)	2024/03/21	97	80 - 120	99	80 - 120	<0.0020	mg/L	0.43	20	<0.0020	mg/L
9286189	Total Beryllium (Be)	2024/03/21	97	80 - 120	97	80 - 120	<0.00040	mg/L	NC	20	<0.00040	mg/L
9286189	Total Bismuth (Bi)	2024/03/21	91	80 - 120	99	80 - 120	<0.0010	mg/L	NC	20	<0.0010	mg/L
9286189	Total Boron (B)	2024/03/21	85	80 - 120	93	80 - 120	<0.010	mg/L	1.4	20	<0.010	mg/L
9286189	Total Cadmium (Cd)	2024/03/21	98	80 - 120	98	80 - 120	<0.000090	mg/L	NC	20	<0.000090	mg/L
9286189	Total Calcium (Ca)	2024/03/21	NC	80 - 120	102	80 - 120	<0.20	mg/L	1.7	20	<0.20	mg/L
9286189	Total Chromium (Cr)	2024/03/21	96	80 - 120	96	80 - 120	<0.0050	mg/L	NC	20	<0.0050	mg/L
9286189	Total Cobalt (Co)	2024/03/21	NC	80 - 120	100	80 - 120	<0.00050	mg/L	1.2	20	<0.00050	mg/L
9286189	Total Copper (Cu)	2024/03/21	106	80 - 120	102	80 - 120	0.011, RDL=0.00090	mg/L	3.0	20	<0.00090	mg/L
9286189	Total Iron (Fe)	2024/03/21	99	80 - 120	100	80 - 120	<0.10	mg/L	0.60	20	<0.10	mg/L
9286189	Total Lead (Pb)	2024/03/21	89	80 - 120	94	80 - 120	<0.00050	mg/L	2.2	20	<0.00050	mg/L

QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		Reagent Blank	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	Value	UNITS
9286189	Total Lithium (Li)	2024/03/21	100	80 - 120	102	80 - 120	<0.0050	mg/L	4.2	20	<0.0050	mg/L
9286189	Total Magnesium (Mg)	2024/03/21	NC	80 - 120	101	80 - 120	<0.050	mg/L	1.2	20	<0.050	mg/L
9286189	Total Manganese (Mn)	2024/03/21	96	80 - 120	97	80 - 120	<0.0020	mg/L	1.2	20	<0.0020	mg/L
9286189	Total Molybdenum (Mo)	2024/03/21	117	80 - 120	101	80 - 120	<0.00050	mg/L	1.8	20	<0.00050	mg/L
9286189	Total Nickel (Ni)	2024/03/21	92	80 - 120	99	80 - 120	<0.0010	mg/L	0.70	20	<0.0010	mg/L
9286189	Total Phosphorus (P)	2024/03/21	NC	80 - 120	97	80 - 120	<0.10	mg/L	2.1	20	<0.10	mg/L
9286189	Total Potassium (K)	2024/03/21	NC	80 - 120	104	80 - 120	<0.20	mg/L	2.5	20	<0.20	mg/L
9286189	Total Selenium (Se)	2024/03/21	NC	80 - 120	102	80 - 120	<0.0020	mg/L	0.49	20	<0.0020	mg/L
9286189	Total Silicon (Si)	2024/03/21	106	80 - 120	100	80 - 120	<0.050	mg/L	2.9	20	<0.050	mg/L
9286189	Total Silver (Ag)	2024/03/21	93	80 - 120	94	80 - 120	<0.000090	mg/L	2.4	20	<0.000090	mg/L
9286189	Total Sodium (Na)	2024/03/21	NC	80 - 120	106	80 - 120	<0.10	mg/L	1.2	20	<0.10	mg/L
9286189	Total Strontium (Sr)	2024/03/21	NC	80 - 120	96	80 - 120	<0.0010	mg/L	5.5	20	<0.0010	mg/L
9286189	Total Tellurium (Te)	2024/03/21	94	80 - 120	96	80 - 120	<0.0010	mg/L	NC	20	<0.0010	mg/L
9286189	Total Thallium (Tl)	2024/03/21	96	80 - 120	101	80 - 120	<0.000050	mg/L	0.44	20	<0.000050	mg/L
9286189	Total Tin (Sn)	2024/03/21	102	80 - 120	98	80 - 120	<0.0010	mg/L	NC	20	<0.0010	mg/L
9286189	Total Titanium (Ti)	2024/03/21	103	80 - 120	101	80 - 120	<0.0050	mg/L	0.66	20	<0.0050	mg/L
9286189	Total Tungsten (W)	2024/03/21	101	80 - 120	99	80 - 120	<0.0010	mg/L	3.5	20	<0.0010	mg/L
9286189	Total Uranium (U)	2024/03/21	98	80 - 120	97	80 - 120	<0.00010	mg/L	4.1	20	<0.00010	mg/L
9286189	Total Vanadium (V)	2024/03/21	100	80 - 120	97	80 - 120	<0.00050	mg/L	1.5	20	<0.00050	mg/L
9286189	Total Zinc (Zn)	2024/03/21	91	80 - 120	100	80 - 120	<0.0050	mg/L	1.6	20	<0.0050	mg/L
9286189	Total Zirconium (Zr)	2024/03/21	114	80 - 120	102	80 - 120	<0.0010	mg/L	NC	20	<0.0010	mg/L
9287063	Dissolved Bromide (Br-)	2024/03/21	100	80 - 120	99	80 - 120	<1.0	mg/L	NC	20		
9287063	Dissolved Chloride (Cl-)	2024/03/21	NC	80 - 120	97	70 - 130	<1.0	mg/L	0.43	20		
9287063	Dissolved Sulphate (SO4)	2024/03/21	NC	80 - 120	95	80 - 120	<1.0	mg/L	0.45	20		
9288421	Total Suspended Solids	2024/03/22			95	80 - 120	<1	mg/L	13	20		
9289077	Total Dissolved Solids	2024/03/22			98	80 - 120	<10	mg/L	0.93	20		
9290772	Thiocyanate	2024/03/22	87	80 - 120	98	80 - 120	<0.05	mg/L	8.5	20		
9296151	Strong Acid Dissoc. Cyanide (CN)	2024/03/22	107	80 - 120	107	80 - 120	<0.00050	mg/L				
9298894	Weak Acid Dissoc. Cyanide (CN)	2024/03/22	107	80 - 120	106	80 - 120	<0.00050	mg/L				

QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		Reagent Blank	
QC Batch	**Parameter**	**Date**	**% Recovery**	**QC Limits**	**% Recovery**	**QC Limits**	**Value**	**UNITS**	**Value (%)**	**QC Limits**	**Value**	**UNITS**
9298895	Free Cyanide (CN)	2024/03/26	88	80 - 120	93	80 - 120	<2.0	ug/L	NC	20		

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Reagent Blank: A blank matrix containing all reagents used in the analytical procedure. Used to determine any analytical contamination.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:

Anastassia Hamanov, Scientific Specialist

Sandy Yuan, M.Sc., QP, Scientific Specialist

Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by Rodney Major, General Manager responsible for Ontario Environmental laboratory operations.

Maxxam A Bureau Veritas Group Company

6740 Campobello Road, Mississauga, Ontario L5N 2L8
Phone: 905-817-5700 Fax: 905-817-5779 Toll Free: 800-563-6266
CAM FCD-01191/2

CHAIN OF CUSTODY RECORD

Invoice Information		Report Information (if differs from invoice)		Project Information (where applicable)	
Company Name:	Nautilus Environmental Company Inc.	Company Name:	Nautilus Environmental Company Inc.	Quotation #:	C41237
Contact Name:	Adam Wartman	Contact Name:	Adam Wartman / Lesley Novak	P.O. #/ AFE#:	2324-196PG
Address:	11B Nicholas Beaver Rd.	Address:	B-11 Nicholas Beaver Rd	Project #:	162706256
	Puslinch, ON N0B 2J0		Puslinch, ON N0B2J0	Site Location:	
Email:	accounting@nautilusenvironmental.ca	Email:	awartman@aquatox.ca;pantunes@aquatox.ca; lnovak@aquatox.ca; lisa.ramilo@agnicoeagle.com; connor.pettem@wsp.com	Sampled By:	AquaTox

Turnaround Time (TAT) Required

- [ ] Regular TAT (5-7 days) Most analyses

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

Rush TAT (Surcharges will be applied)
- [ ] 1 Day
- [ ] 2 Days
- [x] 3-4 Days

Date Required: 3/22/2024

Rush Confirmation #: JG2023031805

MOE REGULATED DRINKING WATER OR WATER INTENDED FOR HUMAN CONSUMPTION MUST BE SUBMITTED ON THE MAXXAM DRINKING WATER CHAIN OF CUSTODY

Regulation 153

- [ ] Table 1 - [ ] Res/Park - [ ] Med/ Fine
- [ ] Table 2 - [ ] Ind/Comm - [ ] Coarse
- [ ] Table 3 - [ ] Agri/ Other
- [ ] Table ____

FOR RSC (PLEASE CIRCLE) Y / N

Other Regulations

- [ ] CCME - [ ] Sanitary Sewer Bylaw
- [ ] MISA - [ ] Storm Sewer Bylaw
- [ ] PWQO Region
- [ ] Other (Specify)
- [ ] REG 558 (MIN. 3 DAY TAT REQUIRED)

Include Criteria on Certificate of Analysis: Y / N

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

Analysis Requested

	SAMPLE IDENTIFICATION	DATE SAMPLED (YYY/MM/DD)	TIME SAMPLED (HH:MM)	MATRIX	# OF CONTAINERS SUBMITTED	FIELD FILTERED (CIRCLE) Metals / Hg / CrVI	pH, Specific Conductivity	Total, Carbonate and Bicarbonate Alkalinity	Hardness	TSS (TSS low level)	Total ammonia	TDS	Anions Scan	Total Metals by ICP-MS/OES	Dissolved Metals by ICP-MS/OES (already filtered)	Total Cyanide (WAD, SAD and Free)	DOC	Cyanate	Thiocyanate			HOLD- DO NOT ANALYZE
1	81676	2024-03-19	11:00	water	10	Y	x	x	x	x	x	x	x	x	x	x	x	x	x			
2																						
3																						
4																						
5																						
6																						
7																						
8																						
9																						
10																						

LABORATORY USE ONLY

CUSTODY SEAL Y / N (Present / Intact)

COOLER TEMPERATURES: 2 / 13 / 12

COOLING MEDIA PRESENT: Y / N

COMMENTS

Please report ammonia values to 2 decimal places

NONT-2024-03-1502

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	MAXXAM JOB #
Adam Wartman	2024-03-19	14:30	JACDEEP KAUR	2024/03/19	15:58	

Your P.O. #: 2324-196PG
Your Project #: 162706256
Your C.O.C. #: n/a

Attention: Adam Wartman

Nautilus Environmental Company Inc.
B-11 Nicholas Beaver Rd
Puslinch, ON
CANADA N0B 2J0

Report Date: 2024/04/02
Report #: R8090754
Version: 2 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C491986
Received: 2024/03/27, 15:50

Sample Matrix: Water
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Alkalinity	1	N/A	2024/03/28	CAM SOP-00448	SM 24 2320 B m
Carbonate, Bicarbonate and Hydroxide	1	N/A	2024/04/01	CAM SOP-00102	APHA 4500-CO2 D
Anions	1	N/A	2024/04/02	CAM SOP-00435	SM 23 4110 B m
Conductivity	1	N/A	2024/03/28	CAM SOP-00414	SM 24 2510 m
Cyanate (2)	1	N/A	2024/04/02	CAM SOP-00471	SM 24 4500-CN L
Dissolved Organic Carbon (DOC) (3)	1	N/A	2024/03/28	CAM SOP-00446	SM 24 5310 B m
Fluoride	1	2024/03/28	2024/03/28	CAM SOP-00449	SM 24 4500-F C m
Hardness (calculated as CaCO3)	1	N/A	2024/04/01	CAM SOP 00102/00408/00447	SM 2340 B
Dissolved Metals by ICPMS	1	N/A	2024/04/01	CAM SOP-00447	EPA 6020B m
Total Metals Analysis by ICPMS	1	2024/03/28	2024/03/28	CAM SOP-00447	EPA 6020B m
Cyanide (Free) (1)	1	N/A	2024/04/02	CAL SOP-00266	EPA 9016d R0 m
Cyanide, Strong Acid Dissociable (SAD) (1)	1	2024/04/02	2024/04/02	CAL SOP-00270	SM 24 4500-CN m
Cyanide WAD (weak acid dissociable) (1)	1	N/A	2024/04/02	CAL SOP-00270	SM 24 4500-CN m
Total Ammonia-N	1	N/A	2024/03/28	CAM SOP-00441	USGS I-2522-90 m
Nitrate & Nitrite as Nitrogen in Water (4)	1	N/A	2024/03/28	CAM SOP-00440	SM 24 4500-NO3I/NO2B
pH (5)	1	2024/03/28	2024/03/28	CAM SOP-00413	SM 24th - 4500H+ B
Orthophosphate	1	N/A	2024/03/31	CAM SOP-00461	SM 24 4500-P E
Thiocyanate	1	N/A	2024/03/28	CAM SOP-00473	SM 24 4500-CN M m
Total Dissolved Solids	1	2024/04/01	2024/04/02	CAM SOP-00428	SM 24 2540C m
Low Level Total Suspended Solids	1	2024/04/01	2024/04/02	CAM SOP-00428	SM 24 2540D m

Remarks:

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, EPA, APHA or the Quebec Ministry of Environment.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Bureau Veritas 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvna.com

Your P.O. #: 2324-196PG
Your Project #: 162706256
Your C.O.C. #: n/a

Attention: Adam Wartman

Nautilus Environmental Company Inc.
B-11 Nicholas Beaver Rd
Puslinch, ON
CANADA N0B 2J0

Report Date: 2024/04/02
Report #: R8090754
Version: 2 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C491986
Received: 2024/03/27, 15:50

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) This test was performed by Bureau Veritas Calgary (19th), 4000 19th Street NE , Calgary, AB, T2E 6P8
(2) Sample(s) analyzed using methodologies that have been subjected to Bureau Veritas' standard validation process for the submitted matrix however it is not an accredited method.
(3) Dissolved Organic Carbon (DOC) present in the sample should be considered as non-purgeable DOC.
(4) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.
(5) "The CCME method and Analytical Protocol (O. Reg 153/04, O. Reg. 406/19) requires pH to be analyzed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory pH analyses in this report are reported past the CCME and Analytical Protocol (O. Reg 153/04, O. Reg. 406/19) holding time. Bureau Veritas endeavors to analyze samples as soon as possible after receipt."

Encryption Key

Please direct all questions regarding this Certificate of Analysis to:
Jolanta Goralczyk, Project Manager
Email: Jolanta.Goralczyk@bureauveritas.com
Phone# (905)817-5751
==
Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by Rodney Major, General Manager responsible for Ontario Environmental laboratory operations.

Bureau Veritas Job #: C491986
Report Date: 2024/04/02

Nautilus Environmental Company Inc.
Client Project #: 162706256
Your P.O. #: 2324-196PG
Sampler Initials: AW

ANION SCAN IN WATER (WATER)

Bureau Veritas ID		YTD487			YTD487		
Sampling Date		2024/03/27 12:50			2024/03/27 12:50		
COC Number		n/a			n/a		
	UNITS	**81788**	**RDL**	**QC Batch**	**81788 Lab-Dup**	**RDL**	**QC Batch**
Inorganics							
Fluoride (F-)	mg/L	0.31	0.10	9303009	0.30	0.10	9303009
Orthophosphate (P)	mg/L	0.82	0.010	9302937			
Nitrite (N)	mg/L	2.29	0.010	9302430			
Dissolved Chloride (Cl-)	mg/L	820	10	9304800			
Nitrate (N)	mg/L	290	2.0	9302430			
Nitrate + Nitrite (N)	mg/L	292	2.0	9302430			
Dissolved Bromide (Br-)	mg/L	<10 (1)	10	9304800			
Dissolved Sulphate (SO4)	mg/L	4600	50	9304800			

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
(1) Due to high concentrations of the target analytes (Cl,SO4), sample required dilution. Detection limits were adjusted accordingly.

Bureau Veritas Job #: C491986
Report Date: 2024/04/02

Nautilus Environmental Company Inc.
Client Project #: 162706256
Your P.O. #: 2324-196PG
Sampler Initials: AW

RESULTS OF ANALYSES OF WATER

Bureau Veritas ID		YTD487			YTD487		
Sampling Date		2024/03/27 12:50			2024/03/27 12:50		
COC Number		n/a			n/a		
	UNITS	**81788**	**RDL**	**QC Batch**	**81788 Lab-Dup**	**RDL**	**QC Batch**
Calculated Parameters							
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	130	1.0	9300413			
Carb. Alkalinity (calc. as CaCO3)	mg/L	<1.0	1.0	9300413			
Total Cyanate (CNO-)	mg/L	0.83	0.050	9301525			
Hardness (CaCO3)	mg/L	1900	1.0	9300896			
Inorganics							
Total Ammonia-N	mg/L	2.87	0.050	9301137			
Conductivity	umho/cm	12000	1.0	9303013	12000	1.0	9303013
Free Cyanide (CN)	ug/L	5.8	2.0	9310353			
Strong Acid Dissoc. Cyanide (CN)	mg/L	0.0504	0.00050	9310624			
Weak Acid Dissoc. Cyanide (CN)	mg/L	0.030	0.00050	9310625			
Total Dissolved Solids	mg/L	10100	20	9306800			
Dissolved Organic Carbon	mg/L	16	0.40	9302702			
pH	pH	7.62		9303014	7.67		9303014
Total Suspended Solids	mg/L	28	1	9306590			
Thiocyanate	mg/L	0.14	0.05	9302368	0.13	0.05	9302368
Alkalinity (Total as CaCO3)	mg/L	130	1.0	9303012	140	1.0	9303012

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

Bureau Veritas Job #: C491986
Report Date: 2024/04/02

Nautilus Environmental Company Inc.
Client Project #: 162706256
Your P.O. #: 2324-196PG
Sampler Initials: AW

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		YTD487		
Sampling Date		2024/03/27 12:50		
COC Number		n/a		
	UNITS	81788	RDL	QC Batch
Metals				
Dissolved Aluminum (Al)	mg/L	0.041	0.0049	9301589
Total Aluminum (Al)	mg/L	0.063	0.025	9302202
Dissolved Antimony (Sb)	mg/L	0.014	0.00050	9301589
Total Antimony (Sb)	mg/L	0.015	0.0025	9302202
Dissolved Arsenic (As)	mg/L	0.0027	0.0010	9301589
Total Arsenic (As)	mg/L	<0.0050	0.0050	9302202
Dissolved Barium (Ba)	mg/L	0.063	0.0020	9301589
Total Barium (Ba)	mg/L	0.066	0.010	9302202
Dissolved Beryllium (Be)	mg/L	<0.00040	0.00040	9301589
Total Beryllium (Be)	mg/L	<0.0020	0.0020	9302202
Dissolved Bismuth (Bi)	mg/L	<0.0010	0.0010	9301589
Total Bismuth (Bi)	mg/L	<0.0050	0.0050	9302202
Dissolved Boron (B)	mg/L	0.55	0.010	9301589
Total Boron (B)	mg/L	0.58	0.050	9302202
Dissolved Cadmium (Cd)	mg/L	0.000097	0.000090	9301589
Total Cadmium (Cd)	mg/L	<0.00045	0.00045	9302202
Dissolved Calcium (Ca)	mg/L	680	1.0	9301589
Total Calcium (Ca)	mg/L	730	1.0	9302202
Dissolved Chromium (Cr)	mg/L	<0.0050	0.0050	9301589
Total Chromium (Cr)	mg/L	<0.025	0.025	9302202
Dissolved Cobalt (Co)	mg/L	1.0	0.00050	9301589
Total Cobalt (Co)	mg/L	1.0	0.0025	9302202
Dissolved Copper (Cu)	mg/L	0.18	0.00090	9301589
Total Copper (Cu)	mg/L	0.25	0.0045	9302202
Dissolved Iron (Fe)	mg/L	5.5	0.10	9301589
Total Iron (Fe)	mg/L	7.6	0.50	9302202
Dissolved Lead (Pb)	mg/L	<0.00050	0.00050	9301589
Total Lead (Pb)	mg/L	<0.0025	0.0025	9302202
Dissolved Lithium (Li)	mg/L	0.0095	0.0050	9301589
Total Lithium (Li)	mg/L	<0.025	0.025	9302202
Dissolved Magnesium (Mg)	mg/L	40	0.050	9301589
Total Magnesium (Mg)	mg/L	41	0.25	9302202
Dissolved Manganese (Mn)	mg/L	0.14	0.0020	9301589
Total Manganese (Mn)	mg/L	0.15	0.010	9302202

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Bureau Veritas Job #: C491986
Report Date: 2024/04/02

Nautilus Environmental Company Inc.
Client Project #: 162706256
Your P.O. #: 2324-196PG
Sampler Initials: AW

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		YTD487		
Sampling Date		2024/03/27 12:50		
COC Number		n/a		
	UNITS	**81788**	**RDL**	**QC Batch**
Dissolved Molybdenum (Mo)	mg/L	0.15	0.00050	9301589
Total Molybdenum (Mo)	mg/L	0.15	0.0025	9302202
Dissolved Nickel (Ni)	mg/L	0.34	0.0010	9301589
Total Nickel (Ni)	mg/L	0.36	0.0050	9302202
Dissolved Phosphorus (P)	mg/L	0.83	0.10	9301589
Total Phosphorus (P)	mg/L	1.1	0.50	9302202
Dissolved Potassium (K)	mg/L	420	1.0	9301589
Total Potassium (K)	mg/L	440	1.0	9302202
Dissolved Selenium (Se)	mg/L	0.36	0.0020	9301589
Total Selenium (Se)	mg/L	0.37	0.010	9302202
Dissolved Silicon (Si)	mg/L	3.8	0.050	9301589
Total Silicon (Si)	mg/L	3.9	0.25	9302202
Dissolved Silver (Ag)	mg/L	0.00011	0.000090	9301589
Total Silver (Ag)	mg/L	<0.00045	0.00045	9302202
Dissolved Sodium (Na)	mg/L	2100	0.50	9301589
Total Sodium (Na)	mg/L	2300	0.50	9302202
Dissolved Strontium (Sr)	mg/L	4.4	0.0010	9301589
Total Strontium (Sr)	mg/L	4.2	0.0050	9302202
Dissolved Tellurium (Te)	mg/L	<0.0010	0.0010	9301589
Total Tellurium (Te)	mg/L	<0.0050	0.0050	9302202
Dissolved Thallium (Tl)	mg/L	0.00024	0.000050	9301589
Total Thallium (Tl)	mg/L	<0.00025	0.00025	9302202
Dissolved Tin (Sn)	mg/L	<0.0010	0.0010	9301589
Total Tin (Sn)	mg/L	<0.0050	0.0050	9302202
Dissolved Titanium (Ti)	mg/L	0.0091	0.0050	9301589
Total Titanium (Ti)	mg/L	<0.025	0.025	9302202
Dissolved Tungsten (W)	mg/L	0.0018	0.0010	9301589
Total Tungsten (W)	mg/L	<0.0050	0.0050	9302202
Dissolved Uranium (U)	mg/L	0.0018	0.00010	9301589
Total Uranium (U)	mg/L	0.0018	0.00050	9302202
Dissolved Vanadium (V)	mg/L	0.00061	0.00050	9301589
Total Vanadium (V)	mg/L	<0.0025	0.0025	9302202
Dissolved Zinc (Zn)	mg/L	0.039	0.0050	9301589
Total Zinc (Zn)	mg/L	0.060	0.025	9302202
Dissolved Zirconium (Zr)	mg/L	<0.0010	0.0010	9301589

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		YTD487		
Sampling Date		2024/03/27 12:50		
COC Number		n/a		
	UNITS	**81788**	**RDL**	**QC Batch**
Total Zirconium (Zr)	mg/L	<0.0050	0.0050	9302202

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	10.7°C

Sample YTD487 [81788] : Metals: Due to the sample matrix, the sample required dilution. Detection limits were adjusted accordingly.

Results relate only to the items tested.

Bureau Veritas Job #: C491986
Report Date: 2024/04/02

QUALITY ASSURANCE REPORT

Nautilus Environmental Company Inc.
Client Project #: 162706256
Your P.O. #: 2324-196PG
Sampler Initials: AW

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9301137	Total Ammonia-N	2024/03/28	92	75 - 125	96	80 - 120	<0.050	mg/L	9.3	20
9301589	Dissolved Aluminum (Al)	2024/03/28	104	80 - 120	104	80 - 120	<0.0049	mg/L		
9301589	Dissolved Antimony (Sb)	2024/03/28	110	80 - 120	106	80 - 120	<0.00050	mg/L	15	20
9301589	Dissolved Arsenic (As)	2024/03/28	104	80 - 120	101	80 - 120	<0.0010	mg/L	0	20
9301589	Dissolved Barium (Ba)	2024/03/28	101	80 - 120	99	80 - 120	<0.0020	mg/L	5.2	20
9301589	Dissolved Beryllium (Be)	2024/03/28	105	80 - 120	103	80 - 120	<0.00040	mg/L	NC	20
9301589	Dissolved Bismuth (Bi)	2024/03/28	96	80 - 120	97	80 - 120	<0.0010	mg/L		
9301589	Dissolved Boron (B)	2024/03/28	103	80 - 120	98	80 - 120	<0.010	mg/L	1.7	20
9301589	Dissolved Cadmium (Cd)	2024/03/28	103	80 - 120	101	80 - 120	<0.000090	mg/L	0.96	20
9301589	Dissolved Calcium (Ca)	2024/03/28	NC	80 - 120	102	80 - 120	<0.20	mg/L		
9301589	Dissolved Chromium (Cr)	2024/03/28	99	80 - 120	97	80 - 120	<0.0050	mg/L	NC	20
9301589	Dissolved Cobalt (Co)	2024/03/28	98	80 - 120	96	80 - 120	<0.00050	mg/L	0.99	20
9301589	Dissolved Copper (Cu)	2024/03/28	100	80 - 120	99	80 - 120	<0.00090	mg/L	5.3	20
9301589	Dissolved Iron (Fe)	2024/03/28	103	80 - 120	99	80 - 120	<0.10	mg/L		
9301589	Dissolved Lead (Pb)	2024/03/28	97	80 - 120	99	80 - 120	<0.00050	mg/L	NC	20
9301589	Dissolved Lithium (Li)	2024/03/28	99	80 - 120	104	80 - 120	<0.0050	mg/L		
9301589	Dissolved Magnesium (Mg)	2024/03/28	NC	80 - 120	100	80 - 120	<0.050	mg/L		
9301589	Dissolved Manganese (Mn)	2024/03/28	101	80 - 120	100	80 - 120	<0.0020	mg/L		
9301589	Dissolved Molybdenum (Mo)	2024/03/28	108	80 - 120	102	80 - 120	<0.00050	mg/L	3.7	20
9301589	Dissolved Nickel (Ni)	2024/03/28	97	80 - 120	97	80 - 120	<0.0010	mg/L	2.0	20
9301589	Dissolved Phosphorus (P)	2024/03/28	106	80 - 120	105	80 - 120	<0.10	mg/L		
9301589	Dissolved Potassium (K)	2024/03/28	104	80 - 120	102	80 - 120	<0.20	mg/L		
9301589	Dissolved Selenium (Se)	2024/03/28	105	80 - 120	102	80 - 120	<0.0020	mg/L	0.40	20
9301589	Dissolved Silicon (Si)	2024/03/28	102	80 - 120	101	80 - 120	<0.050	mg/L		
9301589	Dissolved Silver (Ag)	2024/03/28	93	80 - 120	100	80 - 120	<0.000090	mg/L	NC	20
9301589	Dissolved Sodium (Na)	2024/03/28	NC	80 - 120	101	80 - 120	<0.10	mg/L	1.4	20
9301589	Dissolved Strontium (Sr)	2024/03/28	NC	80 - 120	101	80 - 120	<0.0010	mg/L		
9301589	Dissolved Tellurium (Te)	2024/03/28	103	80 - 120	103	80 - 120	<0.0010	mg/L		
9301589	Dissolved Thallium (Tl)	2024/03/28	99	80 - 120	99	80 - 120	<0.000050	mg/L	NC	20
9301589	Dissolved Tin (Sn)	2024/03/28	106	80 - 120	104	80 - 120	<0.0010	mg/L		

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Bureau Veritas Job #: C491986
Report Date: 2024/04/02

QUALITY ASSURANCE REPORT(CONT'D)

Nautilus Environmental Company Inc.
Client Project #: 162706256
Your P.O. #: 2324-196PG
Sampler Initials: AW

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9301589	Dissolved Titanium (Ti)	2024/03/28	104	80 - 120	102	80 - 120	<0.0050	mg/L		
9301589	Dissolved Tungsten (W)	2024/03/28	104	80 - 120	99	80 - 120	<0.0010	mg/L		
9301589	Dissolved Uranium (U)	2024/03/28	100	80 - 120	99	80 - 120	<0.00010	mg/L	2.5	20
9301589	Dissolved Vanadium (V)	2024/03/28	102	80 - 120	99	80 - 120	<0.00050	mg/L	5.3	20
9301589	Dissolved Zinc (Zn)	2024/03/28	101	80 - 120	98	80 - 120	<0.0050	mg/L	1.3	20
9301589	Dissolved Zirconium (Zr)	2024/03/28	111	80 - 120	104	80 - 120	<0.0010	mg/L		
9302202	Total Aluminum (Al)	2024/03/28	106	80 - 120	95	80 - 120	<0.0049	mg/L		
9302202	Total Antimony (Sb)	2024/03/28	109	80 - 120	106	80 - 120	<0.00050	mg/L		
9302202	Total Arsenic (As)	2024/03/28	101	80 - 120	98	80 - 120	<0.0010	mg/L		
9302202	Total Barium (Ba)	2024/03/28	97	80 - 120	94	80 - 120	<0.0020	mg/L		
9302202	Total Beryllium (Be)	2024/03/28	NC	80 - 120	108	80 - 120	<0.00040	mg/L		
9302202	Total Bismuth (Bi)	2024/03/28	93	80 - 120	96	80 - 120	<0.0010	mg/L		
9302202	Total Boron (B)	2024/03/28	95	80 - 120	99	80 - 120	<0.010	mg/L		
9302202	Total Cadmium (Cd)	2024/03/28	102	80 - 120	101	80 - 120	<0.000090	mg/L	NC	20
9302202	Total Calcium (Ca)	2024/03/28	NC	80 - 120	97	80 - 120	<0.20	mg/L		
9302202	Total Chromium (Cr)	2024/03/28	96	80 - 120	91	80 - 120	<0.0050	mg/L	NC	20
9302202	Total Cobalt (Co)	2024/03/28	96	80 - 120	95	80 - 120	<0.00050	mg/L		
9302202	Total Copper (Cu)	2024/03/28	103	80 - 120	98	80 - 120	<0.00090	mg/L	3.3	20
9302202	Total Iron (Fe)	2024/03/28	96	80 - 120	96	80 - 120	<0.10	mg/L		
9302202	Total Lead (Pb)	2024/03/28	97	80 - 120	99	80 - 120	<0.00050	mg/L	0.049	20
9302202	Total Lithium (Li)	2024/03/28	103	80 - 120	104	80 - 120	<0.0050	mg/L		
9302202	Total Magnesium (Mg)	2024/03/28	91	80 - 120	93	80 - 120	<0.050	mg/L		
9302202	Total Manganese (Mn)	2024/03/28	92	80 - 120	93	80 - 120	<0.0020	mg/L		
9302202	Total Molybdenum (Mo)	2024/03/28	108	80 - 120	103	80 - 120	<0.00050	mg/L		
9302202	Total Nickel (Ni)	2024/03/28	94	80 - 120	93	80 - 120	<0.0010	mg/L	4.6	20
9302202	Total Phosphorus (P)	2024/03/28	99	80 - 120	94	80 - 120	<0.10	mg/L	15	20
9302202	Total Potassium (K)	2024/03/28	96	80 - 120	94	80 - 120	<0.20	mg/L		
9302202	Total Selenium (Se)	2024/03/28	105	80 - 120	106	80 - 120	<0.0020	mg/L		
9302202	Total Silicon (Si)	2024/03/28	98	80 - 120	95	80 - 120	<0.050	mg/L		
9302202	Total Silver (Ag)	2024/03/28	99	80 - 120	99	80 - 120	<0.000090	mg/L		

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9302202	Total Sodium (Na)	2024/03/28	NC	80 - 120	94	80 - 120	<0.10	mg/L		
9302202	Total Strontium (Sr)	2024/03/28	NC	80 - 120	94	80 - 120	<0.0010	mg/L		
9302202	Total Tellurium (Te)	2024/03/28	100	80 - 120	103	80 - 120	<0.0010	mg/L		
9302202	Total Thallium (Tl)	2024/03/28	96	80 - 120	99	80 - 120	<0.000050	mg/L		
9302202	Total Tin (Sn)	2024/03/28	105	80 - 120	103	80 - 120	<0.0010	mg/L		
9302202	Total Titanium (Ti)	2024/03/28	97	80 - 120	95	80 - 120	<0.0050	mg/L		
9302202	Total Tungsten (W)	2024/03/28	103	80 - 120	104	80 - 120	<0.0010	mg/L		
9302202	Total Uranium (U)	2024/03/28	99	80 - 120	102	80 - 120	<0.00010	mg/L		
9302202	Total Vanadium (V)	2024/03/28	94	80 - 120	91	80 - 120	<0.00050	mg/L		
9302202	Total Zinc (Zn)	2024/03/28	99	80 - 120	100	80 - 120	<0.0050	mg/L	2.1	20
9302202	Total Zirconium (Zr)	2024/03/28	103	80 - 120	98	80 - 120	<0.0010	mg/L		
9302368	Thiocyanate	2024/03/28	81	80 - 120	99	80 - 120	<0.05	mg/L	2.2	20
9302430	Nitrate (N)	2024/03/28	96	80 - 120	97	80 - 120	<0.10	mg/L	NC	20
9302430	Nitrite (N)	2024/03/28	105	80 - 120	105	80 - 120	<0.010	mg/L	2.5	20
9302702	Dissolved Organic Carbon	2024/03/28	92	80 - 120	96	80 - 120	<0.40	mg/L	1.1	20
9302937	Orthophosphate (P)	2024/03/31	98	75 - 125	100	80 - 120	<0.010	mg/L	NC	20
9303009	Fluoride (F-)	2024/03/28	90	80 - 120	99	80 - 120	<0.10	mg/L	2.8	20
9303012	Alkalinity (Total as CaCO3)	2024/03/28			95	85 - 115	<1.0	mg/L	2.3	20
9303013	Conductivity	2024/03/28			101	85 - 115	<1.0	umho/cm	0	10
9303014	pH	2024/03/28			101	98 - 103			0.64	N/A
9304800	Dissolved Bromide (Br-)	2024/04/02	95	80 - 120	102	80 - 120	<1.0	mg/L	1.5	20
9304800	Dissolved Chloride (Cl-)	2024/04/02	NC	80 - 120	98	70 - 130	<1.0	mg/L	0.28	20
9304800	Dissolved Sulphate (SO4)	2024/04/02	NC	80 - 120	97	80 - 120	<1.0	mg/L	0.31	20
9306590	Total Suspended Solids	2024/04/02			95	80 - 120	<1	mg/L	15	20
9306800	Total Dissolved Solids	2024/04/02			100	80 - 120	<10	mg/L	19	20
9310353	Free Cyanide (CN)	2024/04/02	104	80 - 120	93	80 - 120	<2.0	ug/L		
9310624	Strong Acid Dissoc. Cyanide (CN)	2024/04/02	105	80 - 120	104	80 - 120	<0.00050	mg/L		

QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9310625	Weak Acid Dissoc. Cyanide (CN)	2024/04/02	102	80 - 120	103	80 - 120	<0.00050	mg/L		

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:

Anastassia Hamanov, Scientific Specialist

Suwan (Sze Yeung) Fock, B.Sc., Scientific Specialist

Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by Rodney Major, General Manager responsible for Ontario Environmental laboratory operations.

Bureau Veritas 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvna.com

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CAM FCD-01191/2

CHAIN OF CUSTODY RECORD

Page 1 of 1

Invoice Information		Report Information (if differs from invoice)		Project Information (where applicable)		Turnaround Time (TAT) Required
Company Name:	Nautilus Environmental Company Inc.	Company Name:	Nautilus Environmental Company Inc.	Quotation #:	C41237	☐ Regular TAT (5-7 days) Most analyses
Contact Name:	Adam Wartman	Contact Name:	Adam Wartman / Lesley Novak	P.O. #/ AFE#:	2324-196PG	PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address:	11B Nicholas Beaver Rd.	Address:	B-11 Nicholas Beaver Rd	Project #:	162706256	Rush TAT (Surcharges will be applied)
	Puslinch, ON N0B 2J0		Puslinch, ON N0B2J0	Site Location:		☐ 1 Day ☐ 2 Days ☒ 3-4 Days
Email:	accounting@nautilusenvironmental.ca	Email:	awartman@aquatox.ca;pantunes@aquatox.ca; lnovak@aquatox.ca; lisa.ramilo@agnicoeagle.com; connor.pettem@wsp.com	Sampled By:	AquaTox	Date Required: 3/30/2024

MOE REGULATED DRINKING WATER OR WATER INTENDED FOR HUMAN CONSUMPTION MUST BE SUBMITTED ON THE MAXXAM DRINKING WATER CHAIN OF CUSTODY

Rush Confirmation #: JG2023031805

Regulation 153

☐ Table 1 ☐ Res/Park ☐ Med/ Fine
☐ Table 2 ☐ Ind/Comm ☐ Coarse
☐ Table 3 ☐ Agri/ Other
☐ Table ____

FOR RSC (PLEASE CIRCLE) Y / N

Other Regulations

☐ CCME ☐ Sanitary Sewer Bylaw
☐ MISA ☐ Storm Sewer Bylaw
☐ PWQO Region ____
☐ Other (Specify) ____
☐ REG 558 (MIN. 3 DAY TAT REQUIRED)

Include Criteria on Certificate of Analysis: Y / N

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

Analysis Requested

	SAMPLE IDENTIFICATION	DATE SAMPLED (YYY/MM/DD)	TIME SAMPLED (HH:MM)	MATRIX	# OF CONTAINERS SUBMITTED	FIELD FILTERED (CIRCLE) Metals / Hg / CVI	pH, Specific Conductivity	Total, Carbonate and Bicarbonate Alkalinity	Hardness	TSS (TSS low level)	Total ammonia	TDS	Anions Scan	Total Metals by ICP-MS/OES	Dissolved Metals by ICP-MS/OES (already filtered)	Total Cyanide (WAD, SAD and Free)	DOC	Cyanate	Thiocyanate			HOLD- DO NOT ANALYZE
1	81788	2024-03-27	12:50	water	10	Y	x	x	x	x	x	x	x	x	x	x	x	x	x			
2																						
3																						
4																						
5																						
6																						
7																						
8																						
9																						
10																						

LABORATORY USE ONLY

CUSTODY SEAL Y / N		COOLER TEMPERATURES
Present	Intact	
		10 | 10 | 12

COOLING MEDIA PRESENT: Y / N

COMMENTS

Please report ammonia values to 2 decimal places

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)
Adam Wartman	2024-03-27	14:30	Raman / RAMAN	2024/03/27	15:50

27-Mar-24 15:50
Jolanta Goralczyk
C491986
AN4 ENV-1320

APPENDIX C

Chronic Toxicity Testing Report and Analytical Chemistry Results

Program 3: Total Dissolved Solids (TDS) Toxicity Test Results for *P. subcapitata* and *C. dubia*

Final Report

July 8, 2024

Submitted to: **Agnico Eagle Mines**
Rouyn-Noranda, QC

10823 27 Street SE, Calgary, AB T2Z 3V9

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List of Appendices

SIGNATURE PAGE

Kiara O'Shea

Report By:
Kiara O'Shea, BSc, BIT
Laboratory Biologist

Reviewed By:
Leila Oosterbroek, P Biol
Environmental Scientist

Melanie Gallant

Reviewed By:
Melanie Gallant, PhD, DABT
Environmental Toxicologist

This report has been prepared by Nautilus Environmental Company Inc. based on data and/or samples provided by our client and the results of this study are for their sole benefit. Any reliance on the data by a third party is at the sole and exclusive risk of that party. The results presented here relate only to the samples tested.

SUMMARY

Nautilus Environmental (Nautilus) conducted chronic toxicity tests for Agnico Eagle Mines (Agnico) to evaluate the effect of total dissolved solids (TDS) in site water amended to replicate potential mine-impacted water scenarios. Volumetric dilutions for the *Pseudokirchneriella subcapitata*[1] and *Ceriodaphnia dubia* tests were prepared to target a gradient of 713, 889, 1,117, 1,414, 1,799, and 2,296 mg/L TDS.

No statistically significant differences for cell yield in *P. subcapitata* were observed between the site water control and the TDS concentrations. However, cell yield was significantly different between the site water control and the laboratory control.

Reproduction of *C. dubia* was significantly lower in the 2,296 mg/L TDS concentration when compared to the site water control. No other statistically significant differences for survival or reproduction were observed between the site water control and the TDS concentrations or the site water control and the laboratory control.

[1] *Pseudokirchneriella subcapitata* (Korschikov) Hindák (OECD, 2011) has recently been renamed *Raphidocelis subcapitata* (Guiry and Guiry, 2018) and was formerly known as *Selenastrum capricornutum*. *P. subcapitata* is used throughout this document because it is being used in the EPS 1/RM/25 (EC, 2007) and OECD 201 (2011) test methods. *P. subcapitata* is currently regarded as a synonym of *R. subcapitata*.

1.0 INTRODUCTION

Nautilus Environmental (Nautilus) conducted toxicity tests for Agnico Eagle Mines (Agnico) to evaluate the effect of total dissolved solids (TDS) in site water amended to replicate potential mine-impacted water scenarios for both *Pseudokirchneriella subcapitata* and *Ceriodaphnia dubia*. Testing was initiated on May 2, 2024 for *C. dubia* and May 6, 2024 for *P. subcapitata.* All waters were stored in the dark at 4 ± 2°C prior to testing.

This report describes the results of these toxicity tests. Copies of raw laboratory data sheets and statistical analyses for each test species are provided in Appendices A to B. The analytical chemistry data is provided in Appendix C.

2.0 METHODS

2.1 Toxicity Testing

Each toxicity test included a laboratory control, a site water control, and six different TDS concentrations. Methods for the toxicity tests are summarized in Tables 1 and 2. Testing for *P. subcapitata* and *C. dubia* were conducted according to the procedures described by the Environment Canada protocols (2007a and 2007b, respectively).

There was a planned modification to the *C. dubia* method, as requested by Agnico. Rather than terminating the test when a minimum of 60% of the laboratory control organisms produced a third brood, test termination took place on day 8 or when 60% of organisms in all treatments and control(s) have reached three broods.

2.2 Water Preparation

2.2.1 *P. subcapitata* Water Preparation

As required by the method, an adequate volume of unamended site water was filtered through a 45 µm filter to be used as the dilution water and site control.

The top TDS concentration was prepared by dissolving predetermined quantities of reagent grade salts ($CaSO_4{\cdot}2H_2O$, KCl, $MgSO_4{\cdot}7H_2O$, Na_2SO_4, $NaHCO_3$, $CaCl_2{\cdot}2H_2O$, $NaNO_3$) in the filtered site water to target a concentration of 2,296 mg/L TDS. Once the salts were dissolved, volumetric dilutions were performed with the unamended, filtered site water and the top concentration to achieve the target TDS gradient of 713, 889, 1,117, 1,414, and 1,799mg/L TDS. Once made, mine nutrients were added to all controls and test concentrations.

2.2.2 *C. dubia* Water Preparation

The top TDS concentration was prepared by dissolving predetermined quantities of reagent grade salts ($CaSO_4{\cdot}2H_2O$, KCl, $MgSO_4{\cdot}7H_2O$, Na_2SO_4, $NaHCO_3$, $CaCl_2{\cdot}2H_2O$, $NaNO_3$) in the site water to target a concentration of 2,296 mg/L TDS. Once the salts were dissolved, volumetric dilutions were performed with the unamended site water and the top concentration to achieve the target TDS gradient of 713, 889, 1,117, 1,414, 1,799, and 2,296 mg/L TDS. Throughout testing, the site water and each treatment were monitored for the formation of precipitate.

2.3 Analytical Subsampling

Analytical subsampling for routine parameters (i.e. pH, total hardness, conductivity, total alkalinity), measured TDS, total and dissolved organic carbon, major ions, total ammonia as nitrogen, nitrate as nitrogen, total cyanide, thiocyanate, and total and dissolved metals were collected from the client-provided site water and submitted for 1-day rush analytical analysis.

At test initiation for *P. subcapitata* and *C. dubia*, analytical subsamples for routine parameters (i.e. pH, total hardness, conductivity, total alkalinity as calcium carbonate), dissolved major ions, nitrate as nitrogen, and measured TDS were collected from the unamended site water and the 889, 1,414, and 2,296 mg/L TDS concentrations. The same subset of analytical chemistries was collected at test termination for *C. dubia*. For the *P. subcapitata* test initiation analytical, samples were collected post-filtration and nutrient addition and were submitted for 3-day rush analytical analysis.

2.4 Statistical Analyses

Statistical analyses were performed using CETIS (Tidepool Scientific Software, version 2.1.5.5). For all toxicity tests, the laboratory control was used to establish test validity. Comparisons were performed between the site water and the laboratory control for the *P. subcapitata* and *C. dubia* tests. Treatments were also compared to the site water control using pairwise comparisons across each test.

Table 1. Summary of test conditions: *Pseudokirchneriella subcapitata* growth inhibition test.

Test species	*Pseudokirchneriella subcapitata*, strain UTCC# 37
Organism source	In-house axenic culture, obtained from Canadian Phycological Culture Center
Organism age	3-to 7-day old culture in logarithmic growth phase
Test type	Static
Test duration	72 hours
Test vessel	Microplate
Test volume	220 µL
Test solution depth	11 mm
Test concentrations	6 TDS concentrations, plus laboratory control and site control
Test replicates	5 per treatment, at least 3 enumerated; 8 for laboratory control
Number of organisms	10,000 +/- 1000 cells/mL
Laboratory control water	85% deionized water; 15% City of Calgary dechlorinated tap water supplemented with nutrients
Dilution water	Filtered, unamended site water provided by Agnico
Test solution renewal	None
Test temperature	24 ± 2°C
Feeding	None
Light intensity	3600 to 4400 lux
Photoperiod	24 hours light
Aeration	None
Test measurements	pH of top concentration and control at test initiation and test completion; light levels and temperature measured daily
Test protocol	Environment Canada (2007), EPS 1/RM/25
Statistical software	CETIS version 2.1.5.5
Test endpoints	Algal cell growth inhibition
Test acceptability criteria for controls	>16-fold increase in number of algal cells; CV ≤ 20%; no trend when analyzed using Mann-Kendall test
Reference toxicant	Zinc (added as $ZnSO_4$)

Table 2. Summary of test conditions: *Ceriodaphnia dubia* survival and reproduction test.

Test species	*Ceriodaphnia dubia*
Organism source	In-house culture
Organism age	<24-hour old neonates, produced within a 12-hour window
Test type	Static renewal
Test duration	8 days
Test vessel	16 x 135 mm glass test tube
Test volume	15 mL
Test solution depth	10 cm
Test concentrations	6 TDS concentrations, plus laboratory control and site control
Test replicates	10 per treatment
Number of organisms	1 per replicate
Laboratory control water	20% Perrier water and 80% deionized water supplemented with vitamin B12 (2 µg/L) and Na_2SeO_4 (5 µg Se/L)
Dilution water	Filtered, unamended site water provided by Agnico
Test solution renewal	Daily (100% renewal)
Test temperature	25 ± 1°C
Feeding	Daily with *Pseudokirchneriella subcapitata* and YCT
Light intensity	100 to 600 lux at water surface
Photoperiod	16 hours light/8 hours dark
Aeration	None
Test measurements	pH, conductivity, dissolved oxygen, and temperature measured daily; evaluated for survival and reproduction daily
Test protocol	Environment Canada (2007), EPS 1/RM/21
Statistical software	CETIS version 2.1.5.5
Test endpoints	Survival and reproduction
Test acceptability criteria for controls	≥80% survival; ≥15 young per surviving control producing three broods; ≥60% of controls producing three or more broods, no ephippia present
Reference toxicant	Sodium chloride (NaCl)

3.0 RESULTS

3.1 *P. subcapitata* Results

Results of the toxicity test conducted with *P. subcapitata*, and the accompanying analytical chemistry results are provided in Table 3. Measured TDS concentrations (mg/L) at test initiation were between 98-103% of the target values.

The site water control was significantly different from the laboratory control for cell yield. No statistically significant differences for cell yield were found between the site water control and the TDS concentrations.

3.2 *C. dubia* Results

Results of the toxicity test conducted with *C. dubia,* and the accompanying analytical chemistry results are provided in Table 4. Measured TDS concentrations (mg/L) at test initiation were between 91-92% of the target values and between 86-104% of the target values at test termination. No precipitate was observed in any of the concentrations or test vessels throughout testing.

Neither survival nor reproduction were significantly different between the site water control and laboratory control. Reproduction of *C. dubia* was significantly lower in the 2,296 mg/L TDS treatment when compared to the site water control. No other statistically significant differences for survival or reproduction were observed between the site water control and the TDS concentrations.

Table 3. Results: *Pseudokirchneriella subcapitata* growth inhibition test.

Nominal TDS Concentration (mg/L)	Measured TDS Concentration at Initiation (mg/L)	Cell Yield (x 10^3 cells/mL) (Mean ± SD)
Laboratory Control	-	235.0 ± 7.2
Site Water Control	145	309.0 ± 12.5*
713	-	311.0 ± 9.2
889	916	327.0 ± 13.9
1,117	-	291.0 ± 12.5
1,414	1,410	295.0 ± 0.0
1,799	-	287.0 ± 9.2
2,296	2,240	283.0 ± 6.0

SD = Standard Deviation
* Result is significantly different between the laboratory control and the site water control

Table 4. Results: *Ceriodaphnia dubia* survival and reproduction test.

Nominal TDS Concentration (mg/L)	Measured TDS Concentration (mg/L)		Survival (%)	Reproduction (Mean ± SD)
	Initiation	Termination		
Laboratory Control	-	-	100	22.5 ± 4.6
Site Water Control	131	180	90	17.7 ± 7.5
713	-	-	90	19.0 ± 4.7
889	816	785	90	14.7 ± 5.8
1,117	-	-	100	15.5 ± 5.1
1,414	1,290	1,210	100	14.8 ± 6.3
1,799	-	-	90	13.2 ± 5.8
2,296	2,090	2,390	80	9.1 ± 5.0*

SD = Standard Deviation
* Result is significantly lower than the site water control

4.0 QA/QC

The health histories of the test organisms used in the exposures were acceptable and met the requirements of the Environment Canada protocols. The tests met all control acceptability criteria and water quality parameters remained within ranges specified in the protocols throughout testing. There were no deviations from the test methodologies unless already noted in section 2.0 of this report. Uncertainty associated with these tests is best described by the standard deviations around the means.

Results of the reference toxicant tests conducted during the testing program are summarized in Table 5. The reference toxicant tests were performed under the same conditions as those used during testing. Results for these tests fell within the acceptable range for organism performance of two standard deviations of the mean, based on historical results obtained by the laboratory with these tests. Thus, the sensitivity of the organisms used in these tests was appropriate.

Table 5. Reference Toxicant Test Results

Test Species	Endpoint (95% CL)	Historical Mean (2 SD Range)	CV (%)	Test Date
P. subcapitata	Growth (IC25): 21.9 (19.8-24.0) µg/L Zn	32.1 (16.2-63.4)	22.7	2024-05-15
C. dubia	Survival (LC50): 2.0 (1.9-2.2) g/L NaCl	2.0 (1.7-2.3)	4.9	2024-04-25
	Reproduction (IC50): 1.8 (1.7-1.9) g/L NaCl	1.7 (1.5-2.0)	5.0	

SD = Standard Deviation, CV = Coefficient of Variation, LC = Lethal Concentration, IC = Inhibition Concentration, CL=Confidence Limit

5.0 REFERENCES

Environment Canada. 2007a. Biological test method: growth inhibition test using the freshwater alga. EPS 1/RM/25, Second Edition, March 2007.

Environment Canada. 2007b. Biological test method: test of reproduction and survival using the cladoceran *Ceriodaphnia dubia*. EPS 1/RM/21, Second Edition, February 2007.

Guiry, M.D. & Guiry, G.M. 2018. AlgaeBase. World-wide electronic publication, National University of Ireland, Galway.

OECD. 2011. Guideline 201, "Freshwater Alga and Cyanobacteria, Growth Inhibition Test". OECD Guidelines for the Testing of Chemicals.

Tidepool Scientific Software. 2022. CETIS comprehensive environmental toxicity information system, version 2.1.5.5 Tidepool Scientific Software, McKinleyville, CA. 275 pp.

APPENDIX A – *Pseudokirchneriella subcapitata* Toxicity Test Data

NAUTILUS ENVIRONMENTAL

Algae Bench Sheet

Method: AGD-Mod   Client: AGN108 (TDS)   Reference: PJ2324-004

Test log

Day	Date	Init	Time	Rotate Y/N	Rotate Time*	Threshold Size (µm)	Daily Data Review
0	2024/05/06	AI	1115			4.00	cc
1	2024/05/07	AO	0805	Y	**0800**	N/A	JC
2	2024/05/08	KN/AP/BH	0840	Y	**0800**	N/A	AI
3	2024/05/09	AI	1000	–	**0800**	4.00	–

*recommended rotation times

Sample Information

Initial pH:	
Initial EC (µS/cm):	
Initial DO (mg/L):	
Initial Temp (°C):	

AI

Inoculum - Physical Counts (must read between 981 and 1198 cells per 0.5 mL)		
	1	1075
	2	1075
	3	1103

Inoculum - Cell Yield	9956

(must be 10,000 +/- 1000 cells/mL)

Nutrients used:	normal	mine

pH Measurements:

Concentration	Initial Value	Final Value
100%	6.5	-
control (well D6)	6.5	-
control (well D7)	-	6.5

***pH range: 6.5-8.5; must be <1.5 units difference between control initial and final**

Quality Assurance - Test Initiation	
Algae Culture Name:	FRI-APR-20230926AG
Age of Algae (must be 3-7 days):	3 days
Test organisms appeared healthy before use (yes/no)	yes
Turnover Date:	2024/05/03
Start time of inoculum prep (must be <3hrs to loading):	1100
Volume filtered through the 45 µm membrane:	–
Appearance before filtration:	clear/colourless
Appearance after filtration:	clear/colourless

Light Levels (**must be 3600 - 4400 lux**)

Day 0:	4060	Day 2:	4030
Day 1:	4030	Day 3:	3980

Temperature (**must be 22-26°C**)

Day 0:	24	Day 2:	24
Day 1:	24	Day 3:	24

Average Temperature: 24

Quality Assurance - Test Termination	
Control Fold Growth (must be >16):	25
CV of standard Control Wells (must be ≤20%):	3
Mann-Kendall p value (must be >0.05) if CV is >10%:	–

Reviewed By: JD   Date Reviewed: 2024/05/09

NAUTILUS ENVIRONMENTAL

Algae Bench Sheet

Method: AGD-Mod   Client: AGN108 (TDS)   Reference: PJ2324-004

Complete Plate Physical Counts w/ Site												
		2296	1799	1414	1117	889	713	~~base~~	Site			
A	X	X	X	X	X	X	X	X	X	X	X	X
B	X	2400	2400	2600	2600	3000	2600	2600	X	X	X	X
	X	2400	2400	2500	2600	2900	2600	2500	X	X	X	X
	X								X	X	X	X
C	X	2400	2500	2600	2400	2700	2700	2800	X	X	X	X
	X	2500	2600	2500	2400	2800	2800	2700	X	X	X	X
	X								X	X	X	X
D / CTL	X	2200	2000	2000	2100	X	X	2000	2000	2000	2100	X
	X	2100	2000	2000	2100	X	X	2000	2000	2100	2000	X
	X					X	X					X
E	X	2500	2500	2500	2500	2800	2700	2700	X	X	X	X
	X	2500	2500	2600	2600	2700	2700	2700	X	X	X	X
	X								X	X	X	X
F	X								X	X	X	X
	X								X	X	X	X
	X								X	X	X	X
G	X								X	X	X	X
	X								X	X	X	X
	X								X	X	X	X
H	X	X	X	X	X	X	X	X	X	X	X	X

Only three replicates are enumerated if the CV is ≤20% within a concentration. If the CV is >20%, the additional two replicates will also be enumerated

Reviewed By: W   Date Reviewed: 2024/05/09

NAUTILUS

Standard Control Well Final Cell Densities (D Row):

Column	Final Cell Density ($x10^3$ cells/mL)	Cell Yield ($x10^3$ cells/mL)
2	257	247
3	239	229
4	239	229
5	251	241
8	239	229
9	239	229
10	251	241
11	245	235
Average	245	235
SD	7	7
CV (%)	2.9	3.0
Fold Growth (x)	25	-

Test Well Final Cell Densities:

Concen. ~~(%)~~ mg/L	Calculated Final Cell Density ($x10^3$ cells/ mL)				
	Row				
	B	C	E	F	G
~~11~~	-	-	-	-	-
~~14~~	-	-	-	-	-
~~18~~	-	-	-	-	-
site ~~23~~	305	329	323	-	-
713 ~~29~~	311	329	323	-	-
889 ~~36~~	353	329	329	-	-
1117 ~~46~~	311	287	305	-	-
1414 ~~57~~	305	305	305	-	-
1799 ~~72~~	287	305	299	-	-
2250 ~~91~~	287	293	299	-	-

Cell Yield Results:

Concentration ~~(%)~~ mg/L	Cell Yield ($x10^3$ cells/ mL)							
	Row					Mean	SD	CV (%)
	B	C	E	F	G			
~~11~~	-	-	-	-	-	-	-	-
~~14~~	-	-	-	-	-	-	-	-
~~18~~	-	-	-	-	-	-	-	-
Site ~~23~~	295	319	313	-	-	309	12	4
713 ~~29~~	301	319	313	-	-	311	9	3
889 ~~36~~	343	319	319	-	-	327	14	4
1117 ~~46~~	301	277	295	-	-	291	12	4
1414 ~~57~~	295	295	295	-	-	295	0	0
1799 ~~72~~	277	295	289	-	-	287	9	3
2250 ~~91~~	277	283	289	-	-	283	6	2

Reviewed by: VO

Date Reviewed: 2024/05/09

Written by JP on 2016/08/17
Revised by

Nautilus Environmental (Calgary)

File: AG Reftox Print Page
F060

CETIS Summary Report

Report Date: 27 May-24 13:18 (p 1 of 1)
Test Code/ID: PJ2324-004AGD / 03-1530-9899

Selenastrum Growth Test — **Nautilus Environmental Calgary**

Batch ID:	00-1899-3966	**Test Type:**	Cell Growth	**Analyst:**	Lab Tech
Start Date:	06 May-24	**Protocol:**	EC/EPS 1/RM/25	**Diluent:**	Deionized Water
Ending Date:	09 May-24	**Species:**	Pseudokirchneriella subcapitata	**Brine:**	
Test Length:	72h	**Taxon:**	Chlorophyta	**Source:**	In-House Culture **Age:** 3d

Sample ID:	02-5215-6504	**Code:**	PJ2324-004	**Project:**	Program 3 - Total Dissolved Solids
Sample Date:		**Material:**	Total dissolved Solids	**Source:**	Agnico Eagle
Receipt Date:		**CAS (PC):**		**Station:**	
Sample Age:	---	**Client:**	Agnico Eagle		

SIngle Comparison Summary

Analysis ID	Endpoint	Comparison Method	P-Value	Comparison Result
09-9564-3955	Cell Density	Equal Variance t Two-Sample Test	<1.0E-05	Site Control failed cell density

Multiple Comparison Summary

Analysis ID	Endpoint	Comparison Method	NOEL	LOEL	TOEL	PMSD
00-3251-2320	Cell Density	Nemenyi-Damico-Wolfe Test	2296	>2296	---	---

Cell Density Summary

Conc-mg/L	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	LC	8	235	229	241	229	247	2.535	7.171	3.05%	0.00%
0	XC	3	309	278	340	295	319	7.211	12.49	4.04%	-31.49%
713		3	311	288.2	333.8	301	319	5.292	9.165	2.95%	-32.34%
889		3	327	292.6	361.4	319	343	8	13.86	4.24%	-39.15%
1117		3	291	260	322	277	301	7.211	12.49	4.29%	-23.83%
1414		3	295	295	295	295	295	0	0	0.00%	-25.53%
1799		3	287	264.2	309.8	277	295	5.292	9.165	3.19%	-22.13%
2296		3	283	268.1	297.9	277	289	3.464	6	2.12%	-20.43%

Cell Density Detail — MD5: 0FCD87C4F60800C5567B1567ED914B9C

Conc-mg/L	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	LC	247	229	229	241	229	229	241	235
0	XC	295	319	313					
713		301	319	313					
889		343	319	319					
1117		301	277	295					
1414		295	295	295					
1799		277	295	289					
2296		277	283	289					

CETIS Analytical Report

Report Date:	25 May-24 13:42 (p 1 of 2)
Test Code/ID:	PJ2324-004AGD / 03-1530-9899

Selenastrum Growth Test — **Nautilus Environmental Calgary**

Analysis ID:	09-9564-3955	**Endpoint:**	Cell Density	**CETIS Version:**	CETIS v2.1.5
Analyzed:	25 May-24 13:41	**Analysis:**	Parametric-Two Sample	**Status Level:**	1
Edit Date:	16 May-24 0:00	**MD5 Hash:**	15AB8C132E5B78607233BB99EA9B907A	**Editor ID:**	009-313-022-5

Batch ID:	00-1899-3966	**Test Type:**	Cell Growth	**Analyst:**	Lab Tech
Start Date:	06 May-24	**Protocol:**	EC/EPS 1/RM/25	**Diluent:**	Deionized Water
Ending Date:	09 May-24	**Species:**	Pseudokirchneriella subcapitata	**Brine:**	
Test Length:	72h	**Taxon:**	Chlorophyta	**Source:**	In-House Culture **Age:** 3d

Sample ID:	02-5215-6504	**Code:**	PJ2324-004	**Project:**	Program 3 - Total Dissolved Solids
Sample Date:		**Material:**	Total dissolved Solids	**Source:**	Agnico Eagle
Receipt Date:		**CAS (PC):**		**Station:**	
Sample Age:	---	**Client:**	Agnico Eagle		

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C <> T	Site Control failed cell density endpoint	5.63%

Equal Variance t Two-Sample Test

Control I	vs	Control II	df	Test Stat	Critical	MSD	P-Type	P-Value	Decision(α:5%)
Lab Control		Site Control*	9	12.65	2.262	13.23	CDF	<1.0E-05	Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Outlier	Grubbs Extreme Value Test	1.708	2.355	0.7619	No Outliers Detected

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	11947.6	11947.6	1	160	<1.0E-05	Significant Effect
Error	672	74.6667	9			
Total	12619.6		10			

ANOVA Assumptions Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Variance	Variance Ratio F Test	3.033	6.542	0.2251	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9296	0.7876	0.4069	Normal Distribution

Cell Density Summary

Conc-mg/L	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	LC	8	235	229	241	232	229	247	2.535	3.05%	0.00%
0	XC	3	309	278	340	313	295	319	7.211	4.04%	-31.49%

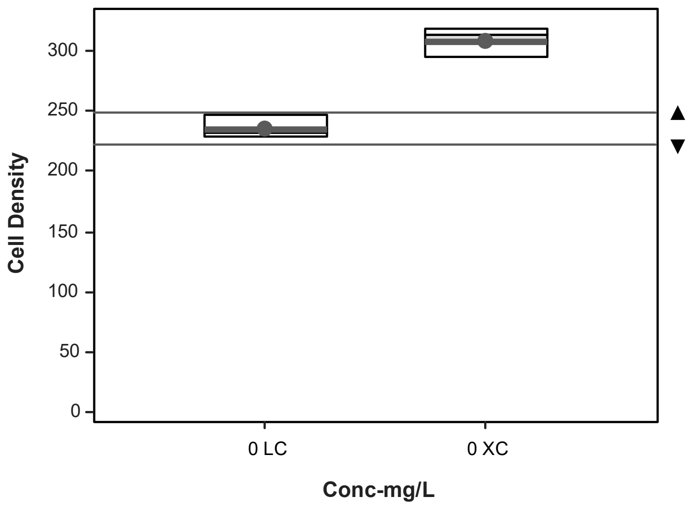
Cell Density Detail

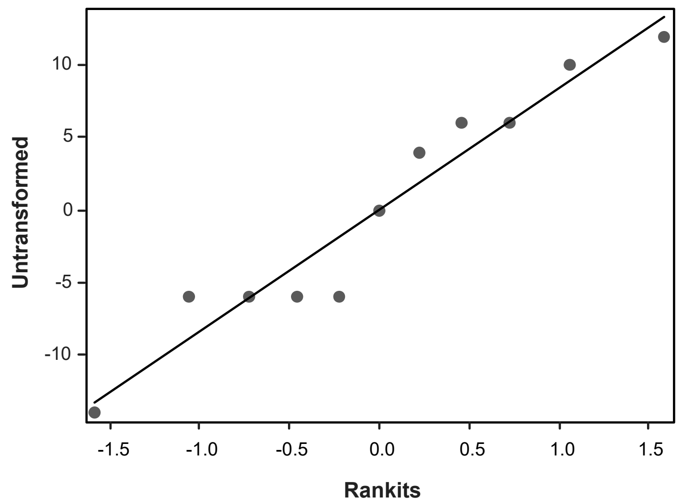
Conc-mg/L	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	LC	247	229	229	241	229	229	241	235
0	XC	295	319	313					

Selenastrum Growth Test | **Nautilus Environmental Calgary**

Analysis ID:	09-9564-3955	**Endpoint:**	Cell Density	**CETIS Version:**	CETIS v2.1.5
Analyzed:	25 May-24 13:41	**Analysis:**	Parametric-Two Sample	**Status Level:**	1
Edit Date:	16 May-24 0:00	**MD5 Hash:**	15AB8C132E5B78607233BB99EA9B907A	**Editor ID:**	009-313-022-5

Graphics





CETIS Analytical Report

Selenastrum Growth Test — **Nautilus Environmental Calgary**

Analysis ID:	00-3251-2320	**Endpoint:**	Cell Density	**CETIS Version:**	CETIS v2.1.5
Analyzed:	16 May-24 9:24	**Analysis:**	Nonparametric-Control vs Treatments	**Status Level:**	1
Edit Date:	16 May-24 0:00	**MD5 Hash:**	45340AE4263C0F82F962FD1E1B4927B9	**Editor ID:**	009-313-022-5

Batch ID:	00-1899-3966	**Test Type:**	Cell Growth	**Analyst:**	Lab Tech
Start Date:	06 May-24	**Protocol:**	EC/EPS 1/RM/25	**Diluent:**	Deionized Water
Ending Date:	09 May-24	**Species:**	Pseudokirchneriella subcapitata	**Brine:**	
Test Length:	72h	**Taxon:**	Chlorophyta	**Source:**	In-House Culture **Age:** 3d

Sample ID:	02-5215-6504	**Code:**	PJ2324-004	**Project:**	Program 3 - Total Dissolved Solids
Sample Date:		**Material:**	Total dissolved Solids	**Source:**	Agnico Eagle
Receipt Date:		**CAS (PC):**		**Station:**	
Sample Age:	---	**Client:**	Agnico Eagle		

Data Transform	Alt Hyp	NOEL	LOEL	TOEL	Tox Units
Untransformed	C <> T	2296	>2296	---	---

Nemenyi-Damico-Wolfe Test

Control	vs	Conc-mg/L	Test Stat	Critical	Ties	P-Type	P-Value	Decision(α:5%)
Site Control		713	4	39.02	6	CDF	0.9998	Non-Significant Effect
		889	14.5	39.02	6	CDF	0.8492	Non-Significant Effect
		1117	18.5	39.02	6	CDF	0.6715	Non-Significant Effect
		1414	15	39.02	6	CDF	0.8297	Non-Significant Effect
		1799	26.5	39.02	6	CDF	0.3124	Non-Significant Effect
		2296	32	39.02	6	CDF	0.1529	Non-Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Outlier	Grubbs Extreme Value Test	1.902	2.734	1.0000	No Outliers Detected
Overall Effect	Fligner-Wolfe Omnibus Test	208.5		0.3398	Non-Significant Overall Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	4481.14	746.857	6	7.384	0.0010	Significant Effect
Error	1416	101.143	14			
Total	5897.14		20			

ANOVA Assumptions Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Variance	Bartlett Equality of Variance Test				Indeterminate
Distribution	Shapiro-Wilk W Normality Test	0.958	0.9079	0.4766	Normal Distribution

Cell Density Summary

Conc-mg/L	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	XC	3	309	278	340	313	295	319	7.211	4.04%	0.00%
713		3	311	288.2	333.8	313	301	319	5.292	2.95%	-0.65%
889		3	327	292.6	361.4	319	319	343	8	4.24%	-5.83%
1117		3	291	260	322	295	277	301	7.211	4.29%	5.83%
1414		3	295	295	295	295	295	295	0	0.00%	4.53%
1799		3	287	264.2	309.8	289	277	295	5.292	3.19%	7.12%
2296		3	283	268.1	297.9	283	277	289	3.464	2.12%	8.41%

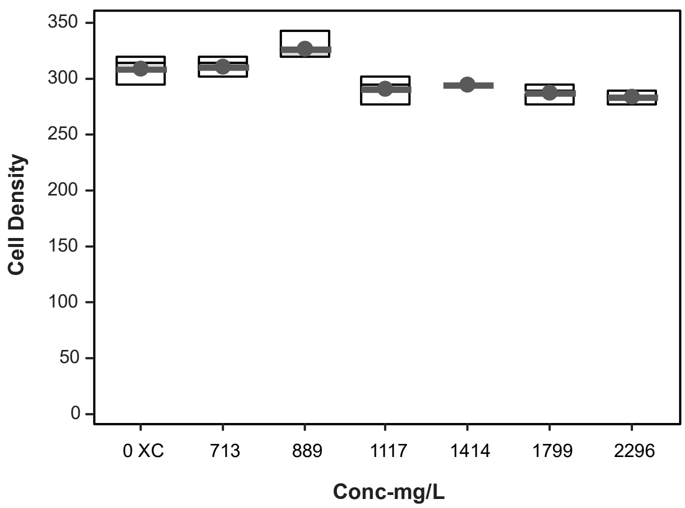
Selenastrum Growth Test **Nautilus Environmental Calgary**

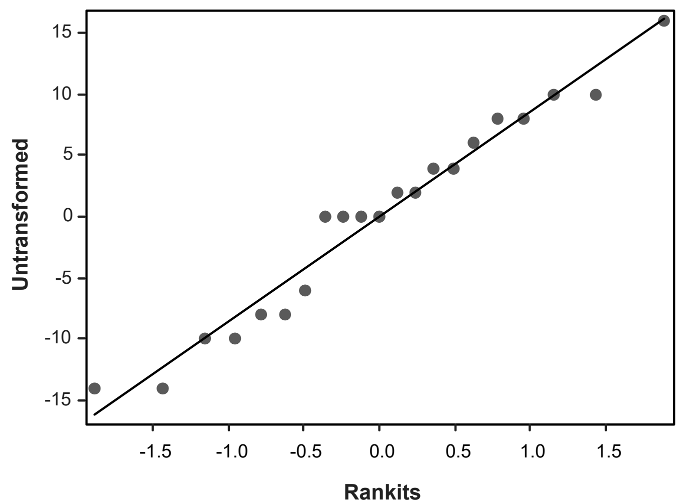
Analysis ID:	00-3251-2320	**Endpoint:**	Cell Density	**CETIS Version:**	CETIS v2.1.5
Analyzed:	16 May-24 9:24	**Analysis:**	Nonparametric-Control vs Treatments	**Status Level:**	1
Edit Date:	16 May-24 0:00	**MD5 Hash:**	45340AE4263C0F82F962FD1E1B4927B9	**Editor ID:**	009-313-022-5

Cell Density Detail

Conc-mg/L	Code	Rep 1	Rep 2	Rep 3
0	XC	295	319	313
713		301	319	313
889		343	319	319
1117		301	277	295
1414		295	295	295
1799		277	295	289
2296		277	283	289

Graphics





APPENDIX B – *Ceriodaphnia dubia* Toxicity Test Data

NAUTILUS ENVIRONMENTAL

Ceriodaphnia Bench Sheet

Method CDD-mod Client AGN 108 (TDS) Reference PJ2324-004 (2324-1704)

Test Log

Date	Day	Time	Technician	Chem. Cart Used	Subsample Fed (✓)	Daily Data Review	Subsample Used	
2024/05/02	0	1140	KO	2	✓	XC	Day 0	✓
24/05/03	1	0740	XC	2	✓	NA	Day 1	✓
24/05/04	2	0820	XC	2	✓	EP	Day 2	✓
24/05/05	3	1100	KO	2	✓	AI	Day 3	✓
24/05/06	4	0800	KO	2	✓	KM	Day 4	✓
24/05/07	5	0800	KO	2	✓	XC	Day 5	✓
24/05/08	6	1330	KO	2	✓	XC	Day 6	✓
24/05/09	7	1130	KO	2	✓	YO	Day 7	✓
24/05/10	8	0740	XC	2	–	NA	–	–

Sample Information

Initial pH: _____
Initial EC (µS/cm): _____
Initial DO (mg/L): _____
Initial Temp (°C): _____
Filtered with 60 µm nitex screen
Yes/No
Sample pre-aerated/hardness/pH adjust:
Yes/No
*if yes, describe procedure, rate and duration

Test Specifics

Food expiration: 05/18:24

Dilution water vessel and preparation date: 7:04/20 ; 1:04/20 ; 4:04/23 ; 9:04/26 ; 8:04/28 ; 1:05/03

Cup	Control Validity Day 8 Number of Young	Number of Broods
1	21	3
2	21	
3	24	
4	32	
5	15	
6	25	
7	24	
8	22	
9	24	
10	17	

Average # of Young: 23

% with ≥ 3 Broods: 100%

Control Mortality: 0%
(must be ≤20%)

Reproduction Validity Criteria: the average number of young produced in first three broods is ≥ 15, when 60% of control organsims had 3 or more broods: **Yes** / No

Reviewed By: W Date Reviewed: 2024/05/13

NAUTILUS ENVIRONMENTAL

Ceriodaphnia Bench Sheet

Method CDD-mod Client AGN 108 Reference PJ2324-004 (2324-1704)

Chemistry

pH (units) (range: **6.5-8.5**)

Day	New CTL	New SITE	New 713	New 889	New 1117	New 1414	New 1799	New 2296	Old CTL	Old SITE	Old 713	Old 889	Old 1117	Old 1414	Old 1799	Old 2296
0	7.7	7.2	7.1	7.1	7.0	7.0	7.0	7.0	—	—	—	—	—	—	—	—
1	7.8	7.3	7.2	7.2	7.1	7.1	7.1	7.1	7.8	7.3	7.1	7.2	7.1	7.1	7.1	7.1
2	7.7	7.3	7.1	7.1	7.0	7.1	7.1	7.1	7.7	7.3	7.1	7.1	7.1	7.1	7.1	7.1
3	7.8	7.3	7.1	7.1	7.1	7.1	7.1	7.1	7.8	7.3	7.0	7.0	7.1	7.1	7.1	7.1
4	7.9	7.4	7.1	7.2	7.2	7.2	7.2	7.1	7.8	7.4	7.0	7.1	7.1	7.1	7.1	7.1
5	7.8	7.2	7.0	7.0	7.0	7.0	7.0	7.0	7.6	7.1	6.9	6.9	6.9	6.9	6.9	6.9
6	7.8	7.3	7.1	7.1	7.2	7.0	7.0	7.0	7.7	7.3	6.9	6.9	6.9	6.9	6.9	7.0
7	7.9	7.3	7.1	7.1	7.1	7.1	7.1	7.1	7.6	7.2	6.9	6.9	6.9	6.9	6.9	6.9
8									7.5	7.0	6.9	6.9	6.9	6.9	6.9	6.9

Conductance (µS/cm)

Day	New CTL	New SITE	New 713	New 889	New 1117	New 1414	New 1799	New 2296	Old CTL	Old SITE	Old 713	Old 889	Old 1117	Old 1414	Old 1799	Old 2296
0	208	223	1016	1273	1559	1904	2460	3030	—	—	—	—	—	—	—	—
1	216	231	1032	1281	1565	1926	2490	3110	217	234	1028	1258	1544	1899	2440	3020
2	212	232	1036	1283	1590	1939	2510	3130	224	233	1034	1268	1558	1908	2470	3070
3	208	224	1010	1274	1563	1911	2470	3080	214	229	991	1247	1557	1898	2460	3040
4	224	229	1034	1269	1556	1907	2480	3090	220	221	969	1225	1542	1875	2410	2950
5	203	226	969	1274	1569	1931	2480	3170	218	224	977	1239	1527	1863	2390	3030
6	204	225	1006	1280	1587	1924	2470	3130	226	226	983	1237	1538	1873	2440	3030
7	200	222	989	1251	1574	1923	2480	3170	236	226	1015	1254	1552	1895	2450	3100
8									256	236	1069	1253	1563	1894	2480	3110

Dissolved Oxygen (mg/L) (**40-100% saturation**)

Day	New CTL	New SITE	New 713	New 889	New 1117	New 1414	New 1799	New 2296	Old CTL	Old SITE	Old 713	Old 889	Old 1117	Old 1414	Old 1799	Old 2296
0	7.3	7.2	7.2	7.1	7.1	7.1	7.2	7.1	—	—	—	—	—	—	—	—
1	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.2	7.2	7.2	7.2	7.2	7.2	7.2
2	7.3	7.3	7.2	7.2	7.3	7.3	7.2	7.2	6.5	6.9	6.9	7.2	6.9	7.2	7.2	7.2
3	7.3	7.3	7.3	7.3	7.3	7.3	7.2	7.2	6.7	6.9	6.5	6.5	6.5	6.4	6.5	6.5
4	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	6.3	6.6	6.5	6.3	6.4	6.4	6.4	6.5
5	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	5.9	6.4	6.3	5.8	5.8	5.8	5.9	6.0
6	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	6.1	6.3	6.2	5.9	5.8	5.8	5.8	5.9
7	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	6.1	6.3	6.0	5.6	5.5	5.4	5.6	5.6
8									5.9	5.0	4.7	4.7	4.3	4.6	4.7	4.8

Temperature **24 - 26 (˚C)**

Day	New CTL	New SITE	New 713	New 889	New 1117	New 1414	New 1799	New 2296	Old CTL	Old SITE	Old 713	Old 889	Old 1117	Old 1414	Old 1799	Old 2296
0	24	25	25	26	26	26	25	26	—	—	—	—	—	—	—	—
1	24	24	24	24	24	24	24	24	24	25	25	25	25	25	25	25
2	24	24	25	25	24	24	25	25	25	25	25	25	25	25	25	25
3	24	24	24	24	24	24	25	25	25	25	25	25	25	25	25	25
4	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
5	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
6	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
7	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
8									24	24	24	24	24	24	24	24

DO Levels (40-100% saturation)* -
2.9 to 7.3 mg/L at 24°C
2.9 to 7.2 mg/L at 25°C
2.8 to 7.1 mg/L at 26°C

*corrected for altitude

Reviewed By: LD

Date Reviewed: 2024/05/13

NAUTILUS
ENVIRONMENTAL

Ceriodaphnia Bench Sheet

Method CDD-mod   Client AGN 108   Reference PJ2324-004 (2324-1704)

Biology

(#, young produced; 0, no young; X, dead; X#, young produced-dead; —,young produced after 3rd brood)

Brood organisms produced during an organism's 4th or subsequent brood are not included in brood counts

CTL

Cup \ Day	1	2	3	4	5	6	7	8
1	0	0	0	2	7	0	12	–
2	↓	↓	↓	3	6	12	–	
3	↓	↓	↓	3	8	0	13	–
4	↓	↓	↓	4	9	0	19	–
5	↓	↓	↓	4	0	2	9	–
6	↓	↓	↓	4	6	0	15	–
7	↓	↓	↓	3	5	0	16	–
8	↓	↓	↓	2	6	0	14	–
9	↓	↓	↓	5	7	0	12	–
10	↓	↓	↓	3	5	0	9	–

1117

Cup \ Day	1	2	3	4	5	6	7	8
1	0	0	0	2	6	0	4	–
2	↓	↓	↓	2	2	0	12	–
3	↓	↓	↓	2	0	6	11	–
4	↓	↓	↓	2	0	5	8	–
5	↓	↓	↓	0	0	0	10	0
6	↓	↓	↓	4	0	9	11	–
7	↓	↓	↓	2	2	0	3	–
8	↓	↓	↓	3	0	9	9	–
9	↓	↓	↓	0	0	5	9	0
10	↓	↓	↓	2	0	6	9	–

SITE

Cup \ Day	1	2	3	4	5	6	7	8
1	0	0	0	0	2	7	12	–
2	↓	↓	↓	2	3	0	10	–
3	↓	↓	↓	0	4	0	6	0
4	↓	↓	↓	0	0	6	13	0
5	↓	↓	↓	3	0	8	13	–
6	↓	↓	↓	0	4	0	10	7
7	↓	↓	↓	0	X0			
8	↓	↓	↓	2	0	9	11	–
9	↓	↓	↓	3	0	7	11	–
10	↓	↓	↓	0	2	0	13	9

1414

Cup \ Day	1	2	3	4	5	6	7	8
1	0	0	0	0	0	7	15	0
2	↓	↓	↓	0	0	0	0	0
3	↓	↓	↓	2	0	0	11	0
4	↓	↓	↓	2	2	0	10	–
5	↓	↓	↓	2	0	7	10	–
6	↓	↓	↓	0	3	5	0	12
7	↓	↓	↓	3	4	0	3	–
8	↓	↓	↓	0	2	8	8	–
9	↓	↓	↓	2	0	3	11	–
10	↓	↓	↓	0	2	5	9	–

713

Cup \ Day	1	2	3	4	5	6	7	8
1	0	0	0	3	8	0	13	–
2	↓	↓	↓	2	6	0	9	–
3	↓	↓	↓	2	0	9	10	–
4	↓	↓	↓	3	0	10	12	–
5	↓	↓	↓	3	8	0	9	–
6	↓	↓	↓	4	0	8	7	–
7	↓	↓	↓	3	5	0	X0	
8	↓	↓	↓	3	2	0	8	–
9	↓	↓	↓	0	2	7	9	–
10	↓	↓	↓	0	2	8	11	–

1799

Cup \ Day	1	2	3	4	5	6	7	8
1	0	0	0	2	4	7	–	
2	↓	↓	↓	0	0	4	8	0
3	↓	↓	↓	0	0	7	12	0
4	↓	↓	↓	0	2	4	0	10
5	↓	↓	↓	0	4	0	8	9
6	↓	↓	↓	2	3	0	6	–
7	↓	↓	↓	0	0	2	9	2
8	↓	↓	↓	0	0	X0		
9	↓	↓	↓	0	0	3	7	0
10	↓	↓	↓	3	2	0	0	12

889

Cup \ Day	1	2	3	4	5	6	7	8
1	0	0	0	0	3	0	8	0
2	↓	↓	↓	0	0	6	8	0
3	↓	↓	↓	2	3	0	13	–
4	↓	↓	↓	2	0	6	10	–
5	↓	↓	↓	3	0	5	6	–
6	↓	↓	↓	0	4	6	9	–
7	↓	↓	↓	2	0	6	9	–
8	↓	X0						
9	↓	0	0	0	3	3	9	–
10	↓	0	0	2	0	9	8	–

2296

Cup \ Day	1	2	3	4	5	6	7	8
1	0	0	0	2	0	2	10	–
2	↓	↓	↓	2	0	3	9	–
3	↓	↓	↓	2	2	X0		
4	↓	↓	↓	2	2	0	10	–
5	↓	↓	↓	0	0	3	5	0
6	↓	↓	↓	0	0	2	12	0
7	↓	↓	↓	2	X0			
8	↓	↓	↓	0	0	4	4	0
9	↓	↓	↓	0	2	0	0	0
10	↓	↓	↓	2	2	0	7	–

Reviewed By: [illegible initials]   Date Reviewed: 2024/05/13

Written by SG on 1995/05/12
Revised by CB on 2020/10/23

Nautilus Environmental (Calgary)

File: CD Test Bench Sheet
F061

NAUTILUS ENVIRONMENTAL

Ceriodaphnia Bench Sheet

Test Organism Information

Client: AGN 108

Culture history for adults used in the test for sample reference: 2324-1704 (PJ2324-004)

Day Used: 2024/05/02

Test organisms appeared healthy before use: Yes/No

Number of young produced per brood adult within first three broods:

Brood	**row/replicate**	E4	D1	E2	A1	B1	A2	E1	D3	D5	D4	D2

Culture(s) Used for Testing: Thursday A

number of young	4	10	4	12	9	8	6	6	3	5	7
number of young	10	15	9	18	18	19	14	9	8	8	11
number of young	12	9	17	9	10	13	16	13	11	11	14
number of young	12	9	17	9	10	13	16	13	11	11	14

Number of Adults Alive in Culture	7 days prior: 25	day used: 23

Notes: all cups have 1 adult

Average No. of young in first 3 broods: 32
(must be ≥15)
Culture % mortality (7-days prior to testing): 8%
(must be ≤20%)
Number of young produced by each brood organism in last complete brood is ≥8: yes (12)
Yes (Y) or No (N)

Reviewed By: W Date Reviewed: 2024/05/13

Ceriodaphnia 7-d Survival and Reproduction Test — **Nautilus Environmental Calgary**

Batch ID:	12-0931-3203	**Test Type:**	Reproduction-Survival (7d)	**Analyst:**	Lab Tech
Start Date:	02 May-24	**Protocol:**	EC/EPS 1/RM/21	**Diluent:**	MHRW
Ending Date:	10 May-24	**Species:**	Ceriodaphnia dubia	**Brine:**	
Test Length:	8d 0h	**Taxon:**	Branchiopoda	**Source:**	In-House Culture **Age:** <24

Sample ID:	05-3270-8097	**Code:**	1FC07B01	**Project:**	
Sample Date:		**Material:**	Total dissolved Solids	**Source:**	Agnico Eagle
Receipt Date:	19 Mar-24	**CAS (PC):**		**Station:**	Program 3 TDS - CD
Sample Age:	---	**Client:**	Agnico Eagle		

SIngle Comparison Summary

Analysis ID	Endpoint	Comparison Method	P-Value	Comparison Result
19-1943-2300	7d Survival Rate	Fisher Exact Test	1.0000	Site Control passed 7d survival rate
03-9971-1135	Reproduction	Equal Variance t Two-Sample Test	0.1039	Site Control passed reproduction

Multiple Comparison Summary

Analysis ID	Endpoint	Comparison Method	NOEL	LOEL	TOEL	PMSD	TU
02-4643-4777	7d Survival Rate	Fisher Exact/Bonferroni-Holm Test	2296	>2296	---	---	0
10-1672-1431	Reproduction	Steel Many-One Rank Sum Test	1799	2296	2032	34.5%	0.1

7d Survival Rate Summary

Conc-mg/L	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	LC	10	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	0.00%
0	XC	10	0.9000	0.6738	1.1260	0.0000	1.0000	0.1000	0.3162	35.14%	10.00%
713		10	0.9000	0.6738	1.1260	0.0000	1.0000	0.1000	0.3162	35.14%	10.00%
889		10	0.9000	0.6738	1.1260	0.0000	1.0000	0.1000	0.3162	35.14%	10.00%
1117		10	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	0.00%
1414		10	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	0.00%
1799		10	0.9000	0.6738	1.1260	0.0000	1.0000	0.1000	0.3162	35.14%	10.00%
2296		10	0.8000	0.4984	1.1020	0.0000	1.0000	0.1333	0.4216	52.70%	20.00%

Reproduction Summary

Conc-mg/L	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	LC	10	22.5	19.17	25.83	15	32	1.47	4.649	20.66%	0.00%
0	XC	10	17.7	12.3	23.1	0	24	2.385	7.543	42.62%	21.33%
713		10	19	15.63	22.37	8	25	1.491	4.714	24.81%	15.56%
889		10	14.7	10.57	18.83	0	19	1.826	5.774	39.28%	34.67%
1117		10	15.5	11.85	19.15	7	24	1.614	5.104	32.93%	31.11%
1414		10	14.8	10.3	19.3	0	22	1.988	6.286	42.47%	34.22%
1799		10	13.2	9.018	17.38	0	21	1.849	5.846	44.29%	41.33%
2296		10	9.1	5.492	12.71	2	14	1.595	5.043	55.42%	59.56%

Ceriodaphnia 7-d Survival and Reproduction Test — **Nautilus Environmental Calgary**

7d Survival Rate Detail

MD5: F524A2C4BFD97542E6B026A0D992EAA2

Conc-mg/L	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	LC	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
0	XC	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000
713		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000
889		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000
1117		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1414		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1799		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000
2296		1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000

Reproduction Detail

MD5: 679303CC66F5B62872ED20125655448E

Conc-mg/L	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	LC	21	21	24	32	15	25	24	22	24	17
0	XC	21	15	10	19	24	21	0	22	21	24
713		24	17	21	25	20	19	8	17	18	21
889		11	14	18	18	14	19	17	0	17	19
1117		12	16	19	15	10	24	7	21	14	17
1414		22	0	13	14	19	20	10	18	16	16
1799		13	12	19	16	21	11	13	0	10	17
2296		14	14	4	14	8	14	2	8	2	11

7d Survival Rate Binomials

Conc-mg/L	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	LC	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
0	XC	1/1	1/1	1/1	1/1	1/1	1/1	0/1	1/1	1/1	1/1
713		1/1	1/1	1/1	1/1	1/1	1/1	0/1	1/1	1/1	1/1
889		1/1	1/1	1/1	1/1	1/1	1/1	1/1	0/1	1/1	1/1
1117		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
1414		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
1799		1/1	1/1	1/1	1/1	1/1	1/1	1/1	0/1	1/1	1/1
2296		1/1	1/1	0/1	1/1	1/1	1/1	0/1	1/1	1/1	1/1

CETIS Analytical Report

Report Date:	23 May-24 13:24 (p 1 of 1)
Test Code/ID:	PJ2324-004 CD / 15-3115-4630

Ceriodaphnia 7-d Survival and Reproduction Test — **Nautilus Environmental Calgary**

Analysis ID:	19-1943-2300	**Endpoint:**	7d Survival Rate	**CETIS Version:**	CETIS v2.1.5
Analyzed:	22 May-24 16:22	**Analysis:**	Single 2x2 Contingency Table	**Status Level:**	1
Edit Date:	22 May-24 15:47	**MD5 Hash:**	95F907219249D7FA795E1A00051C78CB	**Editor ID:**	

Batch ID:	12-0931-3203	**Test Type:**	Reproduction-Survival (7d)	**Analyst:**	Lab Tech
Start Date:	02 May-24	**Protocol:**	EC/EPS 1/RM/21	**Diluent:**	MHRW
Ending Date:	10 May-24	**Species:**	Ceriodaphnia dubia	**Brine:**	
Test Length:	8d 0h	**Taxon:**	Branchiopoda	**Source:**	In-House Culture **Age:** <24

Sample ID:	05-3270-8097	**Code:**	1FC07B01	**Project:**	
Sample Date:		**Material:**	Total dissolved Solids	**Source:**	Agnico Eagle
Receipt Date:	19 Mar-24	**CAS (PC):**		**Station:**	Program 3 TDS - CD
Sample Age:	---	**Client:**	Agnico Eagle		

Data Transform	Alt Hyp	Comparison Result
Untransformed	C <> T	Site Control passed 7d survival rate endpoint

Fisher Exact Test

Control I	vs	Control II	Test Stat	P-Type	P-Value	Decision(α:5%)
Lab Control		Site Control	1.0000	Exact	1.0000	Non-Significant Effect

7d Survival Rate Frequencies

Conc-mg/L	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
0	LC	10	0	10	1.0000	0.0000	0.00%
0	XC	9	1	10	0.9000	0.1000	10.00%

7d Survival Rate Summary

Conc-mg/L	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	LC	10	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.00%	0.00%
0	XC	10	0.9000	0.6738	1.0000	1.0000	0.0000	1.0000	0.1000	35.14%	10.00%

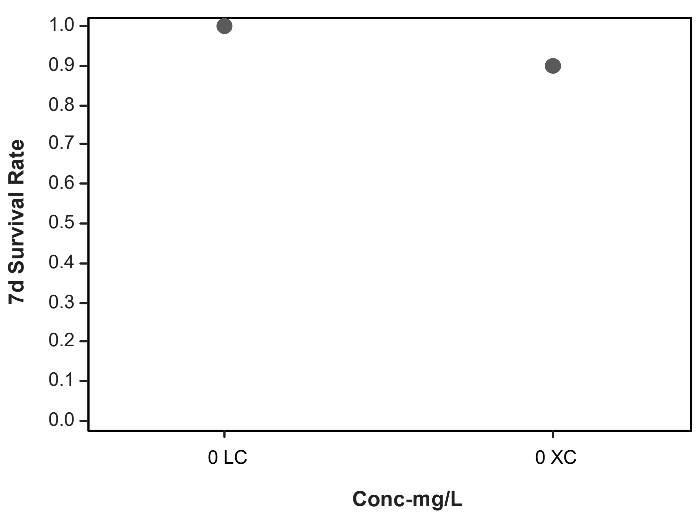
7d Survival Rate Detail

Conc-mg/L	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	LC	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
0	XC	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000

7d Survival Rate Binomials

Conc-mg/L	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	LC	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
0	XC	1/1	1/1	1/1	1/1	1/1	1/1	0/1	1/1	1/1	1/1

Graphics



CETIS Analytical Report

Ceriodaphnia 7-d Survival and Reproduction Test — **Nautilus Environmental Calgary**

Analysis ID:	02-4643-4777	**Endpoint:**	7d Survival Rate	**CETIS Version:**	CETIS v2.1.5
Analyzed:	22 May-24 16:34	**Analysis:**	STP 2xK Contingency Tables	**Status Level:**	1
Edit Date:	22 May-24 15:47	**MD5 Hash:**	3F9B0A6F00BCBBFBFA67F4D96124DF6A	**Editor ID:**	

Batch ID:	12-0931-3203	**Test Type:**	Reproduction-Survival (7d)	**Analyst:**	Lab Tech		
Start Date:	02 May-24	**Protocol:**	EC/EPS 1/RM/21	**Diluent:**	MHRW		
Ending Date:	10 May-24	**Species:**	Ceriodaphnia dubia	**Brine:**			
Test Length:	8d 0h	**Taxon:**	Branchiopoda	**Source:**	In-House Culture	**Age:**	<24

Sample ID:	05-3270-8097	**Code:**	1FC07B01	**Project:**	
Sample Date:		**Material:**	Total dissolved Soilds	**Source:**	Agnico Eagle
Receipt Date:	19 Mar-24	**CAS (PC):**		**Station:**	Program 3 TDS - CD
Sample Age:	---	**Client:**	Agnico Eagle		

Data Transform	Alt Hyp	NOEL	LOEL	TOEL	Tox Units
Untransformed	C > T	2296	>2296	---	0

Fisher Exact/Bonferroni-Holm Test

Control	vs	Conc-mg/L	Test Stat	P-Type	P-Value	Decision(α:5%)
Site Control		713	0.7632	Exact	1.0000	Non-Significant Effect
		889	0.7632	Exact	1.0000	Non-Significant Effect
		1117	1.0000	Exact	1.0000	Non-Significant Effect
		1414	1.0000	Exact	1.0000	Non-Significant Effect
		1799	0.7632	Exact	1.0000	Non-Significant Effect
		2296	0.5000	Exact	1.0000	Non-Significant Effect

7d Survival Rate Frequencies

Conc-mg/L	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
0	XC	9	1	10	0.9000	0.1000	0.00%
713		9	1	10	0.9000	0.1000	0.00%
889		9	1	10	0.9000	0.1000	0.00%
1117		10	0	10	1.0000	0.0000	-11.11%
1414		10	0	10	1.0000	0.0000	-11.11%
1799		9	1	10	0.9000	0.1000	0.00%
2296		8	2	10	0.8000	0.2000	11.11%

7d Survival Rate Summary

Conc-mg/L	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	XC	10	0.9000	0.6738	1.0000	1.0000	0.0000	1.0000	0.1000	35.14%	0.00%
713		10	0.9000	0.6738	1.0000	1.0000	0.0000	1.0000	0.1000	35.14%	0.00%
889		10	0.9000	0.6738	1.0000	1.0000	0.0000	1.0000	0.1000	35.14%	0.00%
1117		10	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.00%	-11.11%
1414		10	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.00%	-11.11%
1799		10	0.9000	0.6738	1.0000	1.0000	0.0000	1.0000	0.1000	35.14%	0.00%
2296		10	0.8000	0.4984	1.0000	1.0000	0.0000	1.0000	0.1333	52.70%	11.11%

7d Survival Rate Detail

Conc-mg/L	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	XC	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000
713		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000
889		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000
1117		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1414		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1799		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000
2296		1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000

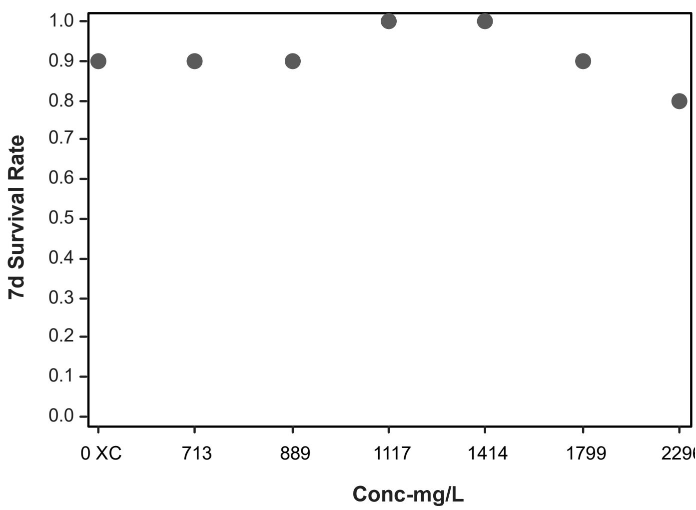
Ceriodaphnia 7-d Survival and Reproduction Test — **Nautilus Environmental Calgary**

Analysis ID:	02-4643-4777	**Endpoint:**	7d Survival Rate	**CETIS Version:**	CETIS v2.1.5
Analyzed:	22 May-24 16:34	**Analysis:**	STP 2xK Contingency Tables	**Status Level:**	1
Edit Date:	22 May-24 15:47	**MD5 Hash:**	3F9B0A6F00BCBBFBFA67F4D96124DF6A	**Editor ID:**	

7d Survival Rate Binomials

Conc-mg/L	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	XC	1/1	1/1	1/1	1/1	1/1	1/1	0/1	1/1	1/1	1/1
713		1/1	1/1	1/1	1/1	1/1	1/1	0/1	1/1	1/1	1/1
889		1/1	1/1	1/1	1/1	1/1	1/1	1/1	0/1	1/1	1/1
1117		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
1414		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
1799		1/1	1/1	1/1	1/1	1/1	1/1	1/1	0/1	1/1	1/1
2296		1/1	1/1	0/1	1/1	1/1	1/1	0/1	1/1	1/1	1/1

Graphics



Ceriodaphnia 7-d Survival and Reproduction Test — **Nautilus Environmental Calgary**

Analysis ID:	03-9971-1135	**Endpoint:**	Reproduction	**CETIS Version:**	CETIS v2.1.5
Analyzed:	22 May-24 16:27	**Analysis:**	Parametric-Two Sample	**Status Level:**	1
Edit Date:	22 May-24 15:47	**MD5 Hash:**	63CE1349575709922AF6A4C1886551DF	**Editor ID:**	

Batch ID:	12-0931-3203	**Test Type:**	Reproduction-Survival (7d)	**Analyst:**	Lab Tech
Start Date:	02 May-24	**Protocol:**	EC/EPS 1/RM/21	**Diluent:**	MHRW
Ending Date:	10 May-24	**Species:**	Ceriodaphnia dubia	**Brine:**	
Test Length:	8d 0h	**Taxon:**	Branchiopoda	**Source:**	In-House Culture **Age:** <24

Sample ID:	05-3270-8097	**Code:**	1FC07B01	**Project:**	
Sample Date:		**Material:**	Total dissolved Solids	**Source:**	Agnico Eagle
Receipt Date:	19 Mar-24	**CAS (PC):**		**Station:**	Program 3 TDS - CD
Sample Age:	---	**Client:**	Agnico Eagle		

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C <> T	Site Control passed reproduction endpoint	26.16%

Equal Variance t Two-Sample Test

Control I	vs	Control II	df	Test Stat	Critical	MSD	P-Type	P-Value	Decision(α:5%)
Lab Control		Site Control	18	1.713	2.101	5.887	CDF	0.1039	Non-Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Outlier	Grubbs Extreme Value Test	2.902	2.708	0.0180	Outlier Detected

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	115.2	115.2	1	2.935	0.1039	Non-Significant Effect
Error	706.6	39.2556	18			
Total	821.8		19			

ANOVA Assumptions Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Variance	Variance Ratio F Test	2.633	4.026	0.1654	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9067	0.9044	0.0552	Normal Distribution

Reproduction Summary

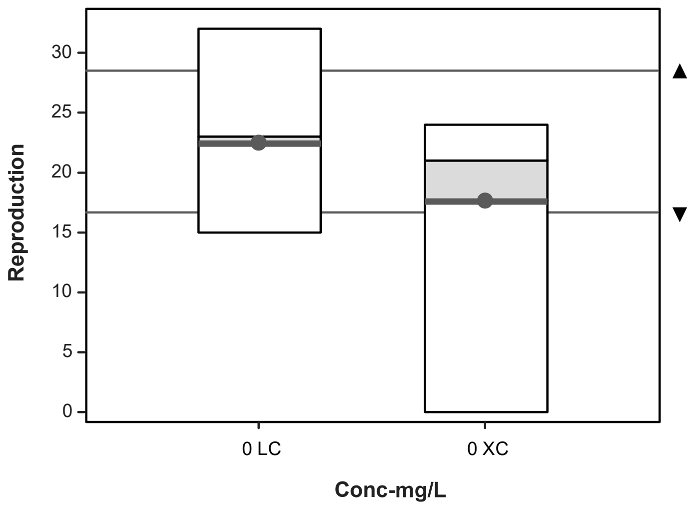
Conc-mg/L	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	LC	10	22.5	19.17	25.83	23	15	32	1.47	20.66%	0.00%
0	XC	10	17.7	12.3	23.1	21	0	24	2.385	42.62%	21.33%

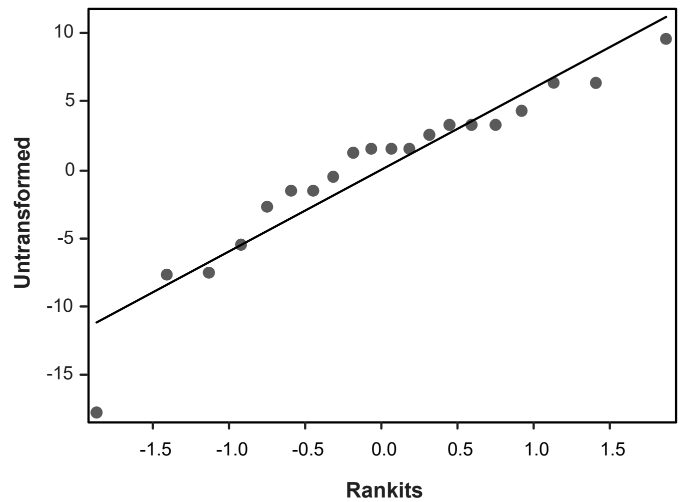
Reproduction Detail

Conc-mg/L	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	LC	21	21	24	32	15	25	24	22	24	17
0	XC	21	15	10	19	24	21	0	22	21	24

Analysis ID:	03-9971-1135	**Endpoint:**	Reproduction	**CETIS Version:**	CETIS v2.1.5
Analyzed:	22 May-24 16:27	**Analysis:**	Parametric-Two Sample	**Status Level:**	1
Edit Date:	22 May-24 15:47	**MD5 Hash:**	63CE1349575709922AF6A4C1886551DF	**Editor ID:**	

Graphics





CETIS Analytical Report

Ceriodaphnia 7-d Survival and Reproduction Test — **Nautilus Environmental Calgary**

Analysis ID:	10-1672-1431	**Endpoint:**	Reproduction	**CETIS Version:**	CETIS v2.1.5
Analyzed:	23 May-24 13:19	**Analysis:**	Nonparametric-Control vs Treatments	**Status Level:**	1
Edit Date:	22 May-24 15:47	**MD5 Hash:**	E7AA57F386BD798DB0513A902B734784	**Editor ID:**	

Batch ID:	12-0931-3203	**Test Type:**	Reproduction-Survival (7d)	**Analyst:**	Lab Tech
Start Date:	02 May-24	**Protocol:**	EC/EPS 1/RM/21	**Diluent:**	MHRW
Ending Date:	10 May-24	**Species:**	Ceriodaphnia dubia	**Brine:**	
Test Length:	8d 0h	**Taxon:**	Branchiopoda	**Source:**	In-House Culture **Age:** <24

Sample ID:	05-3270-8097	**Code:**	1FC07B01	**Project:**	
Sample Date:		**Material:**	Total dissolved Solids	**Source:**	Agnico Eagle
Receipt Date:	19 Mar-24	**CAS (PC):**		**Station:**	Program 3 TDS - CD
Sample Age:	---	**Client:**	Agnico Eagle		

Data Transform	Alt Hyp	NOEL	LOEL	TOEL	Tox Units	MSDu	PMSD
Untransformed	C > T	1799	2296	2032	0.1	6.103	34.48%

Steel Many-One Rank Sum Test

Control	vs	Conc-mg/L	df	Test Stat	Critical	Ties	P-Type	P-Value	Decision(α:5%)
Site Control		713	18	102.5	74	4	CDF	0.7993	Non-Significant Effect
		889	18	80.5	74	2	CDF	0.1282	Non-Significant Effect
		1117	18	88	74	6	CDF	0.3191	Non-Significant Effect
		1414	18	85	74	4	CDF	0.2305	Non-Significant Effect
		1799	18	80	74	4	CDF	0.1192	Non-Significant Effect
		2296*	18	70	74	0	CDF	0.0202	Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Outlier	Grubbs Extreme Value Test	3.179	3.258	0.0688	No Outliers Detected
Overall Effect	Fligner-Wolfe Omnibus Test	2.084	1.645	0.0186	Significant Overall Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	615.771	102.629	6	3.023	0.0116	Significant Effect
Error	2138.8	33.9492	63			
Total	2754.57		69			

ANOVA Assumptions Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Variance	Bartlett Equality of Variance Test	2.766	12.59	0.8376	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9077	0.9654	7.9E-05	Non-Normal Distribution

Reproduction Summary

Conc-mg/L	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	XC	10	17.7	12.3	23.1	21	0	24	2.385	42.62%	0.00%
713		10	19	15.63	22.37	19.5	8	25	1.491	24.81%	-7.34%
889		10	14.7	10.57	18.83	17	0	19	1.826	39.28%	16.95%
1117		10	15.5	11.85	19.15	15.5	7	24	1.614	32.93%	12.43%
1414		10	14.8	10.3	19.3	16	0	22	1.988	42.47%	16.38%
1799		10	13.2	9.018	17.38	13	0	21	1.849	44.29%	25.42%
2296		10	9.1	5.492	12.71	9.5	2	14	1.595	55.42%	48.59%

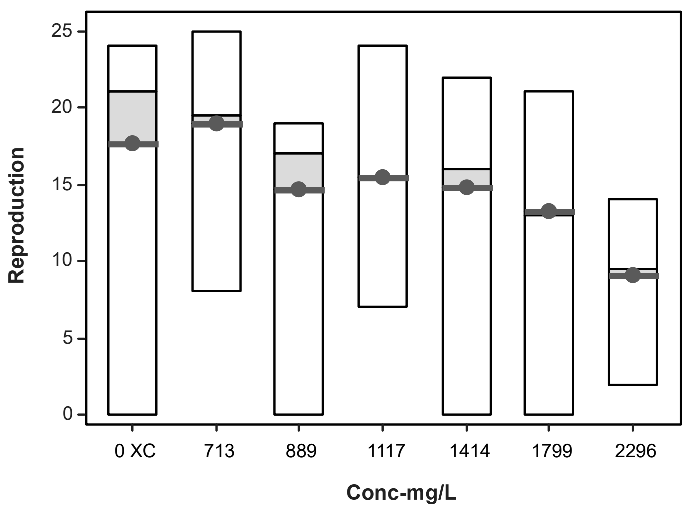
Ceriodaphnia 7-d Survival and Reproduction Test — **Nautilus Environmental Calgary**

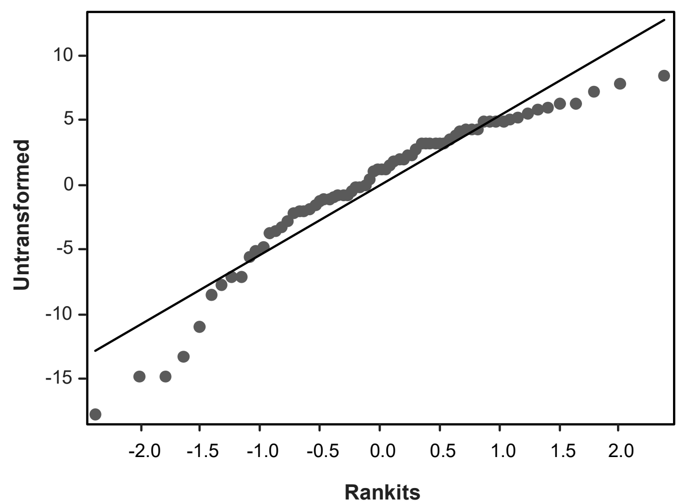
Analysis ID:	10-1672-1431	**Endpoint:**	Reproduction	**CETIS Version:**	CETIS v2.1.5
Analyzed:	23 May-24 13:19	**Analysis:**	Nonparametric-Control vs Treatments	**Status Level:**	1
Edit Date:	22 May-24 15:47	**MD5 Hash:**	E7AA57F386BD798DB0513A902B734784	**Editor ID:**	

Reproduction Detail

Conc-mg/L	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	XC	21	15	10	19	24	21	0	22	21	24
713		24	17	21	25	20	19	8	17	18	21
889		11	14	18	18	14	19	17	0	17	19
1117		12	16	19	15	10	24	7	21	14	17
1414		22	0	13	14	19	20	10	18	16	16
1799		13	12	19	16	21	11	13	0	10	17
2296		14	14	4	14	8	14	2	8	2	11

Graphics





APPENDIX C – Analytical Chemistry

CERTIFICATE OF ANALYSIS

Work Order	: **CG2403741**	Page	: 1 of 7
Client	: **Nautilus Environmental Company Inc.**	Laboratory	: ALS Environmental - Calgary
Contact	: Leila Oosterbroek	Account Manager	: Patryk Wojciak
Address	: 10823 27th Street SE Calgary AB Canada T2Z 3V9	Address	: 2559 29th Street NE Calgary AB Canada T1Y 7B5
Telephone	: 403 253 7121	Telephone	: +1 403 407 1800
Project	: ----	Date Samples Received	: 27-Mar-2024 14:05
PO	: 2324-273AB	Date Analysis Commenced	: 27-Mar-2024
C-O-C number	: ----	Issue Date	: 28-Mar-2024 16:48
Sampler	: ----		
Site	: ----		
Quote number	: CG24-NECI100-00001 Nautilus Calgary General		
No. of samples received	: 1		
No. of samples analysed	: 1		

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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*
Archana Neupane	Lab Assistant	Metals, Calgary, Alberta
George Huang	Supervisor - Inorganic	Inorganics, Calgary, Alberta
Harpreet Chawla	Team Leader - Inorganics	Inorganics, Calgary, Alberta
Harpreet Chawla	Team Leader - Inorganics	Metals, Calgary, Alberta
Jon Fisher	Production Manager, Environmental	Inorganics, Waterloo, Ontario
Katarzyna Glinka	Analyst	Inorganics, Calgary, Alberta
Kevin Baxter	Team Leader - Inorganics	Inorganics, Calgary, Alberta
Kim Jensen	Department Manager - Metals	Inorganics, Burnaby, British Columbia

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 units
%	percent
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.

Analytical Results

Sub-Matrix: **Water**

(Matrix: **Water**)

Analyte	CAS Number	Method/Lab	LOR	Unit	Baseline PJ2324-004; 2324-1704	----	----	----	----
				Client sampling date / time	27-Mar-2024 10:00	----	----	----	----
					CG2403741-001	--------	--------	--------	--------
					Result	----	----	----	----
Physical Tests									
Hardness (as CaCO3), dissolved	----	EC100/CG	0.50	mg/L	88.4	----	----	----	----
Solids, total dissolved [TDS]	----	E162/CG	10	mg/L	164	----	----	----	----
Conductivity	----	E100/CG	2.0	µS/cm	213	----	----	----	----
pH	----	E108/CG	0.10	pH units	7.32	----	----	----	----
Alkalinity, bicarbonate (as HCO3)	71-52-3	E290/CG	1.0	mg/L	22.2	----	----	----	----
Alkalinity, carbonate (as CO3)	3812-32-6	E290/CG	1.0	mg/L	<1.0	----	----	----	----
Alkalinity, hydroxide (as OH)	14280-30-9	E290/CG	1.0	mg/L	<1.0	----	----	----	----
Alkalinity, total (as CaCO3)	----	E290/CG	2.0	mg/L	18.2	----	----	----	----
Solids, total dissolved [TDS], calculated	----	EC103/CG	1.0	mg/L	125	----	----	----	----
Anions and Nutrients									
Ammonia, total (as N)	7664-41-7	E298/CG	0.0050	mg/L	0.0378	----	----	----	----
Chloride	16887-00-6	E235.Cl/CG	0.50	mg/L	0.94	----	----	----	----
Fluoride	16984-48-8	E235.F/CG	0.020	mg/L	0.081	----	----	----	----
Nitrate (as N)	14797-55-8	E235.NO3/CG	0.020	mg/L	<0.020	----	----	----	----
Nitrite (as N)	14797-65-0	E235.NO2/CG	0.010	mg/L	0.012	----	----	----	----
Sulfate (as SO4)	14808-79-8	E235.SO4/CG	0.30	mg/L	73.7	----	----	----	----
Nitrate + Nitrite (as N)	----	EC235.N+N/CG	0.0500	mg/L	<0.0500	----	----	----	----
Cyanides									
Thiocyanate	302-04-5	E344/VA	0.50	mg/L	<0.50	----	----	----	----
Cyanide, free	----	E339/WT	0.0020	mg/L	<0.0020	----	----	----	----
Cyanide, strong acid dissociable (Total)	----	E333/WT	0.0020	mg/L	<0.0020	----	----	----	----
Cyanide, weak acid dissociable	----	E336/WT	0.0020	mg/L	<0.0020	----	----	----	----
Organic / Inorganic Carbon									
Carbon, dissolved organic [DOC]	----	E358-L/CG	0.50	mg/L	1.94	----	----	----	----
Carbon, total organic [TOC]	----	E355-L/CG	0.50	mg/L	1.87	----	----	----	----
Ion Balance									
Anion sum	----	EC101/CG	0.10	meq/L	1.93	----	----	----	----
Cation sum	----	EC101/CG	0.10	meq/L	1.85	----	----	----	----

Analytical Results

Sub-Matrix: Water
(Matrix: Water)

Analyte	CAS Number	Method/Lab	LOR	Unit	Baseline PJ2324-004; 2324-1704	----	----	----	----
				Client sampling date / time	27-Mar-2024 10:00	----	----	----	----
					CG2403741-001	--------	--------	--------	--------
					Result	----	----	----	----
Ion Balance									
Ion balance (APHA)	----	EC101/CG	0.01	%	-2.12	----	----	----	----
Ion balance (cations/anions)	----	EC101/CG	0.010	%	95.8	----	----	----	----
Total Metals									
Aluminum, total	7429-90-5	E420/CG	0.0030	mg/L	0.0064	----	----	----	----
Antimony, total	7440-36-0	E420/CG	0.00010	mg/L	0.00022	----	----	----	----
Arsenic, total	7440-38-2	E420/CG	0.00010	mg/L	0.0159	----	----	----	----
Barium, total	7440-39-3	E420/CG	0.00010	mg/L	0.0156	----	----	----	----
Beryllium, total	7440-41-7	E420/CG	0.000020	mg/L	<0.000020	----	----	----	----
Bismuth, total	7440-69-9	E420/CG	0.000050	mg/L	<0.000050	----	----	----	----
Boron, total	7440-42-8	E420/CG	0.010	mg/L	<0.010	----	----	----	----
Cadmium, total	7440-43-9	E420/CG	0.0000050	mg/L	<0.0000050	----	----	----	----
Calcium, total	7440-70-2	E420/CG	0.050	mg/L	32.4	----	----	----	----
Cesium, total	7440-46-2	E420/CG	0.000010	mg/L	<0.000010	----	----	----	----
Chromium, total	7440-47-3	E420/CG	0.00050	mg/L	<0.00050	----	----	----	----
Cobalt, total	7440-48-4	E420/CG	0.00010	mg/L	0.00292	----	----	----	----
Copper, total	7440-50-8	E420/CG	0.00050	mg/L	0.00368	----	----	----	----
Iron, total	7439-89-6	E420/CG	0.010	mg/L	0.057	----	----	----	----
Lead, total	7439-92-1	E420/CG	0.000050	mg/L	<0.000050	----	----	----	----
Lithium, total	7439-93-2	E420/CG	0.0010	mg/L	<0.0010	----	----	----	----
Magnesium, total	7439-95-4	E420/CG	0.0050	mg/L	1.20	----	----	----	----
Manganese, total	7439-96-5	E420/CG	0.00010	mg/L	0.0111	----	----	----	----
Molybdenum, total	7439-98-7	E420/CG	0.000050	mg/L	0.000502	----	----	----	----
Nickel, total	7440-02-0	E420/CG	0.00050	mg/L	0.00447	----	----	----	----
Phosphorus, total	7723-14-0	E420/CG	0.050	mg/L	<0.050	----	----	----	----
Potassium, total	7440-09-7	E420/CG	0.050	mg/L	0.667	----	----	----	----
Rubidium, total	7440-17-7	E420/CG	0.00020	mg/L	0.00093	----	----	----	----
Selenium, total	7782-49-2	E420/CG	0.000050	mg/L	0.000389	----	----	----	----
Silicon, total	7440-21-3	E420/CG	0.10	mg/L	0.17	----	----	----	----
Silver, total	7440-22-4	E420/CG	0.000010	mg/L	<0.000010	----	----	----	----

Analytical Results

Sub-Matrix: **Water**

(Matrix: **Water**)

Analyte	CAS Number	Method/Lab	LOR	Unit	Baseline PJ2324-004; 2324-1704	----	----	----	----
				Client sampling date / time	27-Mar-2024 10:00	----	----	----	----
					CG2403741-001	--------	--------	--------	--------
					Result	----	----	----	----
Total Metals									
Sodium, total	7440-23-5	E420/CG	0.050	mg/L	1.30	----	----	----	----
Strontium, total	7440-24-6	E420/CG	0.00020	mg/L	0.0817	----	----	----	----
Sulfur, total	7704-34-9	E420/CG	0.50	mg/L	25.8	----	----	----	----
Tellurium, total	13494-80-9	E420/CG	0.00020	mg/L	<0.00020	----	----	----	----
Thallium, total	7440-28-0	E420/CG	0.000010	mg/L	<0.000010	----	----	----	----
Thorium, total	7440-29-1	E420/CG	0.00010	mg/L	<0.00010	----	----	----	----
Tin, total	7440-31-5	E420/CG	0.00010	mg/L	<0.00010	----	----	----	----
Titanium, total	7440-32-6	E420/CG	0.00030	mg/L	<0.00030	----	----	----	----
Tungsten, total	7440-33-7	E420/CG	0.00010	mg/L	0.00018	----	----	----	----
Uranium, total	7440-61-1	E420/CG	0.000010	mg/L	0.000270	----	----	----	----
Vanadium, total	7440-62-2	E420/CG	0.00050	mg/L	<0.00050	----	----	----	----
Zinc, total	7440-66-6	E420/CG	0.0030	mg/L	<0.0030	----	----	----	----
Zirconium, total	7440-67-7	E420/CG	0.00020	mg/L	<0.00020	----	----	----	----
Dissolved Metals									
Aluminum, dissolved	7429-90-5	E421/CG	0.0010	mg/L	0.0020	----	----	----	----
Antimony, dissolved	7440-36-0	E421/CG	0.00010	mg/L	0.00020	----	----	----	----
Arsenic, dissolved	7440-38-2	E421/CG	0.00010	mg/L	0.0156	----	----	----	----
Barium, dissolved	7440-39-3	E421/CG	0.00010	mg/L	0.0160	----	----	----	----
Beryllium, dissolved	7440-41-7	E421/CG	0.000020	mg/L	<0.000020	----	----	----	----
Bismuth, dissolved	7440-69-9	E421/CG	0.000050	mg/L	<0.000050	----	----	----	----
Boron, dissolved	7440-42-8	E421/CG	0.010	mg/L	<0.010	----	----	----	----
Cadmium, dissolved	7440-43-9	E421/CG	0.0000050	mg/L	<0.0000050	----	----	----	----
Calcium, dissolved	7440-70-2	E421/CG	0.050	mg/L	33.4	----	----	----	----
Cesium, dissolved	7440-46-2	E421/CG	0.000010	mg/L	<0.000010	----	----	----	----
Chromium, dissolved	7440-47-3	E421/CG	0.00050	mg/L	<0.00050	----	----	----	----
Cobalt, dissolved	7440-48-4	E421/CG	0.00010	mg/L	0.00278	----	----	----	----
Copper, dissolved	7440-50-8	E421/CG	0.00020	mg/L	0.00304	----	----	----	----
Iron, dissolved	7439-89-6	E421/CG	0.010	mg/L	0.016	----	----	----	----
Lead, dissolved	7439-92-1	E421/CG	0.000050	mg/L	<0.000050	----	----	----	----

Analytical Results

Sub-Matrix: Water (Matrix: Water)				Client sample ID	Baseline PJ2324-004; 2324-1704	----	----	----	----
				Client sampling date / time	27-Mar-2024 10:00	----	----	----	----
Analyte	CAS Number	Method/Lab	LOR	Unit	CG2403741-001	--------	--------	--------	--------
					Result	----	----	----	----
Dissolved Metals									
Lithium, dissolved	7439-93-2	E421/CG	0.0010	mg/L	<0.0010	----	----	----	----
Magnesium, dissolved	7439-95-4	E421/CG	0.0050	mg/L	1.22	----	----	----	----
Manganese, dissolved	7439-96-5	E421/CG	0.00010	mg/L	0.0107	----	----	----	----
Molybdenum, dissolved	7439-98-7	E421/CG	0.000050	mg/L	0.000508	----	----	----	----
Nickel, dissolved	7440-02-0	E421/CG	0.00050	mg/L	0.00434	----	----	----	----
Phosphorus, dissolved	7723-14-0	E421/CG	0.050	mg/L	<0.050	----	----	----	----
Potassium, dissolved	7440-09-7	E421/CG	0.050	mg/L	0.683	----	----	----	----
Rubidium, dissolved	7440-17-7	E421/CG	0.00020	mg/L	0.00091	----	----	----	----
Selenium, dissolved	7782-49-2	E421/CG	0.000050	mg/L	0.000411	----	----	----	----
Silicon, dissolved	7440-21-3	E421/CG	0.050	mg/L	0.126	----	----	----	----
Silver, dissolved	7440-22-4	E421/CG	0.000010	mg/L	<0.000010	----	----	----	----
Sodium, dissolved	7440-23-5	E421/CG	0.050	mg/L	1.34	----	----	----	----
Strontium, dissolved	7440-24-6	E421/CG	0.00020	mg/L	0.0831	----	----	----	----
Sulfur, dissolved	7704-34-9	E421/CG	0.50	mg/L	25.7	----	----	----	----
Tellurium, dissolved	13494-80-9	E421/CG	0.00020	mg/L	<0.00020	----	----	----	----
Thallium, dissolved	7440-28-0	E421/CG	0.000010	mg/L	<0.000010	----	----	----	----
Thorium, dissolved	7440-29-1	E421/CG	0.00010	mg/L	<0.00010	----	----	----	----
Tin, dissolved	7440-31-5	E421/CG	0.00010	mg/L	<0.00010	----	----	----	----
Titanium, dissolved	7440-32-6	E421/CG	0.00030	mg/L	<0.00030	----	----	----	----
Tungsten, dissolved	7440-33-7	E421/CG	0.00010	mg/L	0.00017	----	----	----	----
Uranium, dissolved	7440-61-1	E421/CG	0.000010	mg/L	0.000251	----	----	----	----
Vanadium, dissolved	7440-62-2	E421/CG	0.00050	mg/L	<0.00050	----	----	----	----
Zinc, dissolved	7440-66-6	E421/CG	0.0010	mg/L	0.0023	----	----	----	----
Zirconium, dissolved	7440-67-7	E421/CG	0.00030	mg/L	<0.00030	----	----	----	----
Dissolved metals filtration location	----	EP421/CG	-	-	Field	----	----	----	----

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

Please refer to the Accreditation section for an explanation of analyte accreditations.

ALS Canada Ltd.

right solutions.
right partner.

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **CG2403741**	Page	: 1 of 10
Client	: **Nautilus Environmental Company Inc.**	Laboratory	: ALS Environmental - Calgary
Contact	: Leila Oosterbroek	Account Manager	: Patryk Wojciak
Address	: 10823 27th Street SE Calgary AB Canada T2Z 3V9	Address	: 2559 29th Street NE Calgary, Alberta Canada T1Y 7B5
Telephone	: 403 253 7121	Telephone	: +1 403 407 1800
Project	: ----	Date Samples Received	: 27-Mar-2024 14:05
PO	: 2324-273AB	Issue Date	: 28-Mar-2024 16:48
C-O-C number	: ----		
Sampler	: ----		
Site	: ----		
Quote number	: CG24-NECI100-00001 Nautilus Calgary General		
No. of samples received	: 1		
No. of samples analysed	: 1		

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

- Quality Control Sample Frequency Outliers occur - please see following pages for full details.

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 : Analytical Method	Method	Sampling Date	Extraction / Preparation				Analysis			
Container / Client Sample ID(s)			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) Baseline PJ2324-004; 2324-1704	E298	27-Mar-2024	27-Mar-2024	28 days	0 days	✓	27-Mar-2024	28 days	0 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE Baseline PJ2324-004; 2324-1704	E235.Cl	27-Mar-2024	27-Mar-2024	28 days	0 days	✓	27-Mar-2024	28 days	0 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE Baseline PJ2324-004; 2324-1704	E235.F	27-Mar-2024	27-Mar-2024	28 days	0 days	✓	27-Mar-2024	28 days	0 days	✓
Anions and Nutrients : Nitrate in Water by IC										
HDPE Baseline PJ2324-004; 2324-1704	E235.NO3	27-Mar-2024	27-Mar-2024	3 days	0 days	✓	27-Mar-2024	3 days	0 days	✓
Anions and Nutrients : Nitrite in Water by IC										
HDPE Baseline PJ2324-004; 2324-1704	E235.NO2	27-Mar-2024	27-Mar-2024	3 days	0 days	✓	27-Mar-2024	3 days	0 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE Baseline PJ2324-004; 2324-1704	E235.SO4	27-Mar-2024	27-Mar-2024	28 days	0 days	✓	27-Mar-2024	28 days	0 days	✓
Cyanides : Free Cyanide										
UV-inhibited HDPE - total (sodium hydroxide) Baseline PJ2324-004; 2324-1704	E339	27-Mar-2024	28-Mar-2024	14 days	1 days	✓	28-Mar-2024	14 days	1 days	✓

Matrix: **Water**

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

Analyte Group : Analytical Method / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Cyanides : Thiocyanate by Colourimetry										
HDPE (nitric acid) Baseline PJ2324-004; 2324-1704	E344	27-Mar-2024	----	----	----		28-Mar-2024	14 days	1 days	✓
Cyanides : Total Cyanide										
UV-inhibited HDPE - total (sodium hydroxide) Baseline PJ2324-004; 2324-1704	E333	27-Mar-2024	28-Mar-2024	14 days	1 days	✓	28-Mar-2024	14 days	1 days	✓
Cyanides : WAD Cyanide										
UV-inhibited HDPE - total (sodium hydroxide) Baseline PJ2324-004; 2324-1704	E336	27-Mar-2024	28-Mar-2024	14 days	1 days	✓	28-Mar-2024	14 days	1 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE - dissolved (lab preserved) Baseline PJ2324-004; 2324-1704	E421	27-Mar-2024	27-Mar-2024	180 days	0 days	✓	28-Mar-2024	180 days	1 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) Baseline PJ2324-004; 2324-1704	E358-L	27-Mar-2024	27-Mar-2024	28 days	0 days	✓	27-Mar-2024	28 days	0 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) Baseline PJ2324-004; 2324-1704	E355-L	27-Mar-2024	27-Mar-2024	28 days	0 days	✓	27-Mar-2024	28 days	0 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE Baseline PJ2324-004; 2324-1704	E290	27-Mar-2024	27-Mar-2024	14 days	0 days	✓	27-Mar-2024	14 days	0 days	✓
Physical Tests : Conductivity in Water										
HDPE Baseline PJ2324-004; 2324-1704	E100	27-Mar-2024	27-Mar-2024	28 days	0 days	✓	27-Mar-2024	28 days	0 days	✓
Physical Tests : pH by Meter										
HDPE Baseline PJ2324-004; 2324-1704	E108	27-Mar-2024	27-Mar-2024	0.25 hrs	4 hrs	× EHTR-FM	27-Mar-2024	0.25 hrs	4 hrs	× EHTR-FM

Matrix: **Water**

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

Analyte Group : Analytical Method / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis: Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : TDS by Gravimetry										
HDPE Baseline PJ2324-004; 2324-1704	E162	27-Mar-2024	----	----	----		27-Mar-2024	7 days	0 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE - total (lab preserved) Baseline PJ2324-004; 2324-1704	E420	27-Mar-2024	28-Mar-2024	180 days	1 days	✓	28-Mar-2024	180 days	1 days	✓

Legend & Qualifier Definitions

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

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	1382518	1	7	14.2	5.0	✓
Ammonia by Fluorescence	E298	1382593	1	3	33.3	5.0	✓
Chloride in Water by IC	E235.Cl	1382636	1	1	100.0	5.0	✓
Conductivity in Water	E100	1382517	1	7	14.2	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	1382844	1	1	100.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	1382762	1	7	14.2	5.0	✓
Fluoride in Water by IC	E235.F	1382633	1	19	5.2	5.0	✓
Free Cyanide	E339	1383433	1	1	100.0	5.0	✓
Nitrate in Water by IC	E235.NO3	1382635	1	1	100.0	5.0	✓
Nitrite in Water by IC	E235.NO2	1382637	1	1	100.0	5.0	✓
pH by Meter	E108	1382516	1	7	14.2	5.0	✓
Sulfate in Water by IC	E235.SO4	1382628	1	19	5.2	5.0	✓
TDS by Gravimetry	E162	1382548	1	7	14.2	5.0	✓
Thiocyanate by Colourimetry	E344	1384283	1	5	20.0	5.0	✓
Total Cyanide	E333	1383434	1	1	100.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	1382843	1	1	100.0	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	1382763	1	7	14.2	5.0	✓
WAD Cyanide	E336	1383432	1	1	100.0	5.0	✓
Laboratory Control Samples (LCS)							
Alkalinity Species by Titration	E290	1382518	1	7	14.2	5.0	✓
Ammonia by Fluorescence	E298	1382593	1	3	33.3	5.0	✓
Chloride in Water by IC	E235.Cl	1382636	1	1	100.0	5.0	✓
Conductivity in Water	E100	1382517	1	7	14.2	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	1382844	1	1	100.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	1382762	1	7	14.2	5.0	✓
Fluoride in Water by IC	E235.F	1382633	1	19	5.2	5.0	✓
Free Cyanide	E339	1383433	1	1	100.0	5.0	✓
Nitrate in Water by IC	E235.NO3	1382635	1	1	100.0	5.0	✓
Nitrite in Water by IC	E235.NO2	1382637	1	1	100.0	5.0	✓
pH by Meter	E108	1382516	1	7	14.2	5.0	✓
Sulfate in Water by IC	E235.SO4	1382628	1	19	5.2	5.0	✓
TDS by Gravimetry	E162	1382548	1	7	14.2	5.0	✓
Thiocyanate by Colourimetry	E344	1384283	1	5	20.0	5.0	✓
Total Cyanide	E333	1383434	1	1	100.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	1382843	1	1	100.0	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	1382763	1	7	14.2	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*
Laboratory Control Samples (LCS) - Continued							
WAD Cyanide	E336	1383432	1	1	100.0	5.0	✓
Method Blanks (MB)							
Alkalinity Species by Titration	E290	1382518	1	7	14.2	5.0	✓
Ammonia by Fluorescence	E298	1382593	1	3	33.3	5.0	✓
Chloride in Water by IC	E235.Cl	1382636	1	1	100.0	5.0	✓
Conductivity in Water	E100	1382517	1	7	14.2	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	1382844	1	1	100.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	1382762	1	7	14.2	5.0	✓
Fluoride in Water by IC	E235.F	1382633	1	19	5.2	5.0	✓
Free Cyanide	E339	1383433	1	1	100.0	5.0	✓
Nitrate in Water by IC	E235.NO3	1382635	1	1	100.0	5.0	✓
Nitrite in Water by IC	E235.NO2	1382637	1	1	100.0	5.0	✓
Sulfate in Water by IC	E235.SO4	1382628	1	19	5.2	5.0	✓
TDS by Gravimetry	E162	1382548	1	7	14.2	5.0	✓
Thiocyanate by Colourimetry	E344	1384283	1	5	20.0	5.0	✓
Total Cyanide	E333	1383434	1	1	100.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	1382843	1	1	100.0	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	1382763	1	7	14.2	5.0	✓
WAD Cyanide	E336	1383432	1	1	100.0	5.0	✓
Matrix Spikes (MS)							
Ammonia by Fluorescence	E298	1382593	1	3	33.3	5.0	✓
Chloride in Water by IC	E235.Cl	1382636	0	1	0.0	5.0	✗
Dissolved Metals in Water by CRC ICPMS	E421	1382844	0	1	0.0	5.0	✗
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	1382762	1	7	14.2	5.0	✓
Fluoride in Water by IC	E235.F	1382633	1	19	5.2	5.0	✓
Free Cyanide	E339	1383433	1	1	100.0	5.0	✓
Nitrate in Water by IC	E235.NO3	1382635	0	1	0.0	5.0	✗
Nitrite in Water by IC	E235.NO2	1382637	0	1	0.0	5.0	✗
Sulfate in Water by IC	E235.SO4	1382628	1	19	5.2	5.0	✓
Thiocyanate by Colourimetry	E344	1384283	1	5	20.0	5.0	✓
Total Cyanide	E333	1383434	1	1	100.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	1382843	0	1	0.0	5.0	✗
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	1382763	1	7	14.2	5.0	✓
WAD Cyanide	E336	1383432	1	1	100.0	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 ALS Environmental - Calgary	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 ALS Environmental - Calgary	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.
TDS by Gravimetry	E162 ALS Environmental - Calgary	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 ALS Environmental - Calgary	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 ALS Environmental - Calgary	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 ALS Environmental - Calgary	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 ALS Environmental - Calgary	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 ALS Environmental - Calgary	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Alkalinity Species by Titration	E290 ALS Environmental - Calgary	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.
Ammonia by Fluorescence	E298 ALS Environmental - Calgary	Water	Method Fialab 100, 2018	Ammonia in water is determined by automated continuous flow analysis with membrane diffusion and fluorescence detection, after reaction with OPA (ortho-phthalaldehyde). This method is approved under US EPA 40 CFR Part 136 (May 2021)

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Total Cyanide	E333 ALS Environmental - Waterloo	Water	ISO 14403 (mod)	Total or Strong Acid Dissociable (SAD) Cyanide is determined by Continuous Flow Analyzer (CFA) with in-line UV digestion followed by colourmetric analysis. Method Limitation: High levels of thiocyanate (SCN) may cause positive interference (up to 0.5% of SCN concentration).
WAD Cyanide	E336 ALS Environmental - Waterloo	Water	APHA 4500-CN I (mod)	Weak Acid Dissociable (WAD) cyanide is determined by Continuous Flow Analyzer (CFA) with in-line distillation followed by colourmetric analysis.
Free Cyanide	E339 ALS Environmental - Waterloo	Water	ASTM D7237 (mod)	Free Cyanide is determined by Continuous Flow Analyzer (CFA) with in-line gas diffusion followed by colourmetric analysis.
Thiocyanate by Colourimetry	E344 ALS Environmental - Vancouver	Water	APHA 4500-CN M (mod)	Thiocyanate is determined by the ferric nitrate colourimetric method. Water samples containing high levels of hexavalent chromium, cyanide (together with sulfide), reducing agents, or hydrocarbons may cause negative or positive interferences with this method.
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L ALS Environmental - Calgary	Water	APHA 5310 B (mod)	Total Organic Carbon (Non-Purgeable), also known as NPOC (total), is a direct measurement of TOC after an acidified sample has been purged to remove inorganic carbon (IC). Analysis is by high temperature combustion with infrared detection of CO_2. NPOC does not include volatile organic species that are purged off with IC. For samples where the majority of total carbon (TC) is comprised of IC (which is common), this method is more accurate and more reliable than the TOC by subtraction method (i.e. TC minus TIC).
Dissolved Organic Carbon by Combustion (Low Level)	E358-L ALS Environmental - Calgary	Water	APHA 5310 B (mod)	Dissolved Organic Carbon (Non-Purgeable), also known as NPOC (dissolved), is a direct measurement of DOC after a filtered (0.45 micron) sample has been acidified and purged to remove inorganic carbon (IC). Analysis is by high temperature combustion with infrared detection of CO_2. NPOC does not include volatile organic species that are purged off with IC. For samples where the majority of DC (dissolved carbon) is comprised of IC (which is common), this method is more accurate and more reliable than the DOC by subtraction method (i.e. DC minus DIC).
Total Metals in Water by CRC ICPMS	E420 ALS Environmental - Calgary	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Dissolved Metals in Water by CRC ICPMS	E421 ALS Environmental - Calgary	Water	APHA 3030B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Hardness (Calculated)	EC100 ALS Environmental - Calgary	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 ALS Environmental - Calgary	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. Ion Balance cannot be calculated accurately for waters with very low electrical conductivity (EC).
TDS in Water (Calculation)	EC103 ALS Environmental - Calgary	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 ALS Environmental - Calgary	Water	EPA 300.0	Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Preparation for Ammonia	EP298 ALS Environmental - Calgary	Water		Sample preparation for Preserved Nutrients Water Quality Analysis.
Preparation for Total Organic Carbon by Combustion	EP355 ALS Environmental - Calgary	Water		Preparation for Total Organic Carbon by Combustion
Preparation for Dissolved Organic Carbon for Combustion	EP358 ALS Environmental - Calgary	Water	APHA 5310 B (mod)	Preparation for Dissolved Organic Carbon
Dissolved Metals Water Filtration	EP421 ALS Environmental - Calgary	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HNO3.

ALS Canada Ltd.

QUALITY CONTROL REPORT

Work Order	: **CG2403741**	Page	: 1 of 15
Client	: Nautilus Environmental Company Inc.	Laboratory	: ALS Environmental - Calgary
Contact	: Leila Oosterbroek	Account Manager	: Patryk Wojciak
Address	: 10823 27th Street SE Calgary AB Canada T2Z 3V9	Address	: 2559 29th Street NE Calgary, Alberta Canada T1Y 7B5
Telephone	:	Telephone	: +1 403 407 1800
Project	: ----	Date Samples Received	: 27-Mar-2024 14:05
PO	: 2324-273AB	Date Analysis Commenced	: 27-Mar-2024
C-O-C number	: ----	Issue Date	: 28-Mar-2024 16:48
Sampler	: ---- 403 253 7121		
Site	: ----		
Quote number	: CG24-NECI100-00001 Nautilus Calgary General		
No. of samples received	: 1		
No. of samples analysed	: 1		

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*
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Harpreet Chawla	Team Leader - Inorganics	Calgary Inorganics, Calgary, Alberta
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Kevin Baxter	Team Leader - Inorganics	Calgary Inorganics, Calgary, Alberta
Kim Jensen	Department Manager - Metals	Vancouver Inorganics, Burnaby, British Columbia

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: 1382516)											
CG2403733-002	Anonymous	pH	----	E108	0.10	pH units	8.30	8.31	0.120%	4%	----
Physical Tests (QC Lot: 1382517)											
CG2403733-002	Anonymous	Conductivity	----	E100	2.0	µS/cm	647	648	0.154%	10%	----
Physical Tests (QC Lot: 1382518)											
CG2403733-002	Anonymous	Alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	189	177	6.77%	20%	----
Physical Tests (QC Lot: 1382548)											
CG2403733-002	Anonymous	Solids, total dissolved [TDS]	----	E162	20	mg/L	448	466	3.83%	20%	----
Anions and Nutrients (QC Lot: 1382593)											
CG2403733-006	Anonymous	Ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	0.0135	0.0125	0.0010	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 1382628)											
CG2403412-001	Anonymous	Sulfate (as SO4)	14808-79-8	E235.SO4	1.50	mg/L	175	176	0.227%	20%	----
Anions and Nutrients (QC Lot: 1382633)											
CG2403412-001	Anonymous	Fluoride	16984-48-8	E235.F	0.100	mg/L	0.190	0.191	0.0009	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 1382635)											
CG2403741-001	Baseline PJ2324-004; 2324-1704	Nitrate (as N)	14797-55-8	E235.NO3	0.020	mg/L	<0.020	<0.020	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 1382636)											
CG2403741-001	Baseline PJ2324-004; 2324-1704	Chloride	16887-00-6	E235.Cl	0.50	mg/L	0.94	0.94	0.00010	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 1382637)											
CG2403741-001	Baseline PJ2324-004; 2324-1704	Nitrite (as N)	14797-65-0	E235.NO2	0.010	mg/L	0.012	0.012	0.0001	Diff <2x LOR	----
Cyanides (QC Lot: 1383432)											
CG2403741-001	Baseline PJ2324-004; 2324-1704	Cyanide, weak acid dissociable	----	E336	0.0020	mg/L	<0.0020	<0.0020	0	Diff <2x LOR	----
Cyanides (QC Lot: 1383433)											
CG2403741-001	Baseline PJ2324-004; 2324-1704	Cyanide, free	----	E339	0.0020	mg/L	<0.0020	<0.0020	0	Diff <2x LOR	----
Cyanides (QC Lot: 1383434)											
CG2403741-001	Baseline PJ2324-004; 2324-1704	Cyanide, strong acid dissociable (Total)	----	E333	0.0020	mg/L	<0.0020	<0.0020	0	Diff <2x LOR	----
Cyanides (QC Lot: 1384283)											
CG2403741-001	Baseline PJ2324-004; 2324-1704	Thiocyanate	302-04-5	E344	0.50	mg/L	<0.50	<0.50	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
Organic / Inorganic Carbon (QC Lot: 1382762)											
CG2403733-002	Anonymous	Carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	0.63	0.65	0.02	Diff <2x LOR	----
Organic / Inorganic Carbon (QC Lot: 1382763)											
CG2403733-002	Anonymous	Carbon, total organic [TOC]	----	E355-L	0.50	mg/L	0.73	0.65	0.08	Diff <2x LOR	----
Total Metals (QC Lot: 1382843)											
CG2403741-001	Baseline PJ2324-004; 2324-1704	Aluminum, total	7429-90-5	E420	0.0030	mg/L	0.0064	0.0063	0.0001	Diff <2x LOR	----
		Antimony, total	7440-36-0	E420	0.00010	mg/L	0.00022	0.00021	0.00001	Diff <2x LOR	----
		Arsenic, total	7440-38-2	E420	0.00010	mg/L	0.0159	0.0159	0.0434%	20%	----
		Barium, total	7440-39-3	E420	0.00010	mg/L	0.0156	0.0160	1.93%	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	<0.010	<0.010	0	Diff <2x LOR	----
		Cadmium, total	7440-43-9	E420	0.0000050	mg/L	<0.0000050	0.0000050	0.00000003	Diff <2x LOR	----
		Calcium, total	7440-70-2	E420	0.050	mg/L	32.4	32.6	0.465%	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	<0.00050	<0.00050	0	Diff <2x LOR	----
		Cobalt, total	7440-48-4	E420	0.00010	mg/L	0.00292	0.00296	1.42%	20%	----
		Copper, total	7440-50-8	E420	0.00050	mg/L	0.00368	0.00376	0.00008	Diff <2x LOR	----
		Iron, total	7439-89-6	E420	0.010	mg/L	0.057	0.058	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	<0.0010	<0.0010	0	Diff <2x LOR	----
		Magnesium, total	7439-95-4	E420	0.0050	mg/L	1.20	1.21	0.989%	20%	----
		Manganese, total	7439-96-5	E420	0.00010	mg/L	0.0111	0.0112	1.14%	20%	----
		Molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.000502	0.000517	2.96%	20%	----
		Nickel, total	7440-02-0	E420	0.00050	mg/L	0.00447	0.00454	0.00006	Diff <2x LOR	----
		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	0.667	0.666	0.129%	20%	----
		Rubidium, total	7440-17-7	E420	0.00020	mg/L	0.00093	0.00096	0.00003	Diff <2x LOR	----
		Selenium, total	7782-49-2	E420	0.000050	mg/L	0.000389	0.000389	0.0000002	Diff <2x LOR	----
		Silicon, total	7440-21-3	E420	0.10	mg/L	0.17	0.18	0.01	Diff <2x LOR	----
		Silver, total	7440-22-4	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		Sodium, total	7440-23-5	E420	0.050	mg/L	1.30	1.31	0.942%	20%	----
		Strontium, total	7440-24-6	E420	0.00020	mg/L	0.0817	0.0836	2.20%	20%	----
		Sulfur, total	7704-34-9	E420	0.50	mg/L	25.8	25.7	0.366%	20%	----
		Tellurium, total	13494-80-9	E420	0.00020	mg/L	<0.00020	<0.00020	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: 1382843) - continued											
CG2403741-001	Baseline PJ2324-004; 2324-1704	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	<0.00030	<0.00030	0	Diff <2x LOR	----
		Tungsten, total	7440-33-7	E420	0.00010	mg/L	0.00018	0.00018	0.0000005	Diff <2x LOR	----
		Uranium, total	7440-61-1	E420	0.000010	mg/L	0.000270	0.000281	3.85%	20%	----
		Vanadium, total	7440-62-2	E420	0.00050	mg/L	<0.00050	<0.00050	0	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	<0.00020	<0.00020	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 1382844)											
CG2403741-001	Baseline PJ2324-004; 2324-1704	Aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	0.0020	0.0020	0.00004	Diff <2x LOR	----
		Antimony, dissolved	7440-36-0	E421	0.00010	mg/L	0.00020	0.00019	0.000005	Diff <2x LOR	----
		Arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	0.0156	0.0155	0.534%	20%	----
		Barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.0160	0.0162	1.18%	20%	----
		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	<0.010	<0.010	0	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	33.4	32.3	3.45%	20%	----
		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	0.00278	0.00280	0.769%	20%	----
		Copper, dissolved	7440-50-8	E421	0.00020	mg/L	0.00304	0.00305	0.355%	20%	----
		Iron, dissolved	7439-89-6	E421	0.010	mg/L	0.016	0.016	0.0002	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	1.22	1.20	1.39%	20%	----
		Manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.0107	0.0110	2.57%	20%	----
		Molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.000508	0.000525	3.20%	20%	----
		Nickel, dissolved	7440-02-0	E421	0.00050	mg/L	0.00434	0.00435	0.00002	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	0.683	0.681	0.266%	20%	----
		Rubidium, dissolved	7440-17-7	E421	0.00020	mg/L	0.00091	0.00093	0.00002	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: 1382844) - continued											
CG2403741-001	Baseline PJ2324-004; 2324-1704	Selenium, dissolved	7782-49-2	E421	0.000050	mg/L	0.000411	0.000404	0.000007	Diff <2x LOR	----
		Silicon, dissolved	7440-21-3	E421	0.050	mg/L	0.126	0.123	0.004	Diff <2x LOR	----
		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	1.34	1.34	0.562%	20%	----
		Strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.0831	0.0831	0.0232%	20%	----
		Sulfur, dissolved	7704-34-9	E421	0.50	mg/L	25.7	25.4	1.25%	20%	----
		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	<0.00010	<0.00010	0	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	0.00017	0.00017	0.000002	Diff <2x LOR	----
		Uranium, dissolved	7440-61-1	E421	0.000010	mg/L	0.000251	0.000256	1.91%	20%	----
		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	0.0023	0.0022	0.00006	Diff <2x LOR	----
		Zirconium, dissolved	7440-67-7	E421	0.00030	mg/L	<0.00030	<0.00030	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: 1382517)						
Conductivity	----	E100	1	μS/cm	<1.0	----
Physical Tests (QCLot: 1382518)						
Alkalinity, total (as CaCO3)	----	E290	1	mg/L	<1.0	----
Physical Tests (QCLot: 1382548)						
Solids, total dissolved [TDS]	----	E162	10	mg/L	<10	----
Anions and Nutrients (QCLot: 1382593)						
Ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 1382628)						
Sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 1382633)						
Fluoride	16984-48-8	E235.F	0.02	mg/L	<0.020	----
Anions and Nutrients (QCLot: 1382635)						
Nitrate (as N)	14797-55-8	E235.NO3	0.02	mg/L	<0.020	----
Anions and Nutrients (QCLot: 1382636)						
Chloride	16887-00-6	E235.Cl	0.5	mg/L	<0.50	----
Anions and Nutrients (QCLot: 1382637)						
Nitrite (as N)	14797-65-0	E235.NO2	0.01	mg/L	<0.010	----
Cyanides (QCLot: 1383432)						
Cyanide, weak acid dissociable	----	E336	0.002	mg/L	<0.0020	----
Cyanides (QCLot: 1383433)						
Cyanide, free	----	E339	0.002	mg/L	<0.0020	----
Cyanides (QCLot: 1383434)						
Cyanide, strong acid dissociable (Total)	----	E333	0.002	mg/L	<0.0020	----
Cyanides (QCLot: 1384283)						
Thiocyanate	302-04-5	E344	0.5	mg/L	<0.50	----
Organic / Inorganic Carbon (QCLot: 1382762)						
Carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	<0.50	----
Organic / Inorganic Carbon (QCLot: 1382763)						
Carbon, total organic [TOC]	----	E355-L	0.5	mg/L	<0.50	----
Total Metals (QCLot: 1382843)						
Aluminum, total	7429-90-5	E420	0.003	mg/L	<0.0030	----
Antimony, total	7440-36-0	E420	0.0001	mg/L	<0.00010	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 1382843) - continued						
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	----
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	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 1382843) - continued						
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: 1382844)						
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	----
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	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 1382844) - continued						
Tin, dissolved	7440-31-5	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	----

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: 1382516)									
pH	----	E108	----	pH units	7 pH units	100	98.0	102	----
Physical Tests (QCLot: 1382517)									
Conductivity	----	E100	1	µS/cm	146.9 µS/cm	105	90.0	110	----
Physical Tests (QCLot: 1382518)									
Alkalinity, total (as CaCO3)	----	E290	1	mg/L	500 mg/L	102	85.0	115	----
Physical Tests (QCLot: 1382548)									
Solids, total dissolved [TDS]	----	E162	10	mg/L	1000 mg/L	109	85.0	115	----
Anions and Nutrients (QCLot: 1382593)									
Ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.2 mg/L	97.1	85.0	115	----
Anions and Nutrients (QCLot: 1382628)									
Sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	99.5	90.0	110	----
Anions and Nutrients (QCLot: 1382633)									
Fluoride	16984-48-8	E235.F	0.02	mg/L	1 mg/L	101	90.0	110	----
Anions and Nutrients (QCLot: 1382635)									
Nitrate (as N)	14797-55-8	E235.NO3	0.02	mg/L	2.5 mg/L	100	90.0	110	----
Anions and Nutrients (QCLot: 1382636)									
Chloride	16887-00-6	E235.Cl	0.5	mg/L	100 mg/L	99.0	90.0	110	----
Anions and Nutrients (QCLot: 1382637)									
Nitrite (as N)	14797-65-0	E235.NO2	0.01	mg/L	0.5 mg/L	101	90.0	110	----
Cyanides (QCLot: 1383432)									
Cyanide, weak acid dissociable	----	E336	0.002	mg/L	0.125 mg/L	94.8	80.0	120	----
Cyanides (QCLot: 1383433)									
Cyanide, free	----	E339	0.002	mg/L	0.125 mg/L	95.5	80.0	120	----
Cyanides (QCLot: 1383434)									
Cyanide, strong acid dissociable (Total)	----	E333	0.002	mg/L	0.25 mg/L	86.7	80.0	120	----
Cyanides (QCLot: 1384283)									
Thiocyanate	302-04-5	E344	0.5	mg/L	10 mg/L	100	85.0	115	----
Organic / Inorganic Carbon (QCLot: 1382762)									
Carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	8.57 mg/L	99.2	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
Organic / Inorganic Carbon (QCLot: 1382763)									
Carbon, total organic [TOC]	----	E355-L	0.5	mg/L	8.57 mg/L	104	80.0	120	----
Total Metals (QCLot: 1382843)									
Aluminum, total	7429-90-5	E420	0.003	mg/L	2 mg/L	98.6	80.0	120	----
Antimony, total	7440-36-0	E420	0.0001	mg/L	1 mg/L	99.3	80.0	120	----
Arsenic, total	7440-38-2	E420	0.0001	mg/L	1 mg/L	101	80.0	120	----
Barium, total	7440-39-3	E420	0.0001	mg/L	0.25 mg/L	98.1	80.0	120	----
Beryllium, total	7440-41-7	E420	0.00002	mg/L	0.1 mg/L	91.9	80.0	120	----
Bismuth, total	7440-69-9	E420	0.00005	mg/L	1 mg/L	95.2	80.0	120	----
Boron, total	7440-42-8	E420	0.01	mg/L	1 mg/L	94.6	80.0	120	----
Cadmium, total	7440-43-9	E420	0.000005	mg/L	0.1 mg/L	94.7	80.0	120	----
Calcium, total	7440-70-2	E420	0.05	mg/L	50 mg/L	94.5	80.0	120	----
Cesium, total	7440-46-2	E420	0.00001	mg/L	0.05 mg/L	94.8	80.0	120	----
Chromium, total	7440-47-3	E420	0.0005	mg/L	0.25 mg/L	97.4	80.0	120	----
Cobalt, total	7440-48-4	E420	0.0001	mg/L	0.25 mg/L	95.4	80.0	120	----
Copper, total	7440-50-8	E420	0.0005	mg/L	0.25 mg/L	93.3	80.0	120	----
Iron, total	7439-89-6	E420	0.01	mg/L	1 mg/L	100	80.0	120	----
Lead, total	7439-92-1	E420	0.00005	mg/L	0.5 mg/L	95.5	80.0	120	----
Lithium, total	7439-93-2	E420	0.001	mg/L	0.25 mg/L	94.1	80.0	120	----
Magnesium, total	7439-95-4	E420	0.005	mg/L	50 mg/L	102	80.0	120	----
Manganese, total	7439-96-5	E420	0.0001	mg/L	0.25 mg/L	97.5	80.0	120	----
Molybdenum, total	7439-98-7	E420	0.00005	mg/L	0.25 mg/L	97.2	80.0	120	----
Nickel, total	7440-02-0	E420	0.0005	mg/L	0.5 mg/L	95.4	80.0	120	----
Phosphorus, total	7723-14-0	E420	0.05	mg/L	10 mg/L	98.4	70.0	130	----
Potassium, total	7440-09-7	E420	0.05	mg/L	50 mg/L	98.5	80.0	120	----
Rubidium, total	7440-17-7	E420	0.0002	mg/L	0.1 mg/L	97.0	80.0	120	----
Selenium, total	7782-49-2	E420	0.00005	mg/L	1 mg/L	94.3	80.0	120	----
Silicon, total	7440-21-3	E420	0.1	mg/L	10 mg/L	106	60.0	140	----
Silver, total	7440-22-4	E420	0.00001	mg/L	0.1 mg/L	90.8	80.0	120	----
Sodium, total	7440-23-5	E420	0.05	mg/L	50 mg/L	98.4	80.0	120	----
Strontium, total	7440-24-6	E420	0.0002	mg/L	0.25 mg/L	97.6	80.0	120	----
Sulfur, total	7704-34-9	E420	0.5	mg/L	50 mg/L	98.6	80.0	120	----
Tellurium, total	13494-80-9	E420	0.0002	mg/L	0.1 mg/L	94.4	80.0	120	----
Thallium, total	7440-28-0	E420	0.00001	mg/L	1 mg/L	95.0	80.0	120	----
Thorium, total	7440-29-1	E420	0.0001	mg/L	0.1 mg/L	98.1	80.0	120	----
Tin, total	7440-31-5	E420	0.0001	mg/L	0.5 mg/L	98.2	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: 1382843) - continued									
Titanium, total	7440-32-6	E420	0.0003	mg/L	0.25 mg/L	97.8	80.0	120	----
Tungsten, total	7440-33-7	E420	0.0001	mg/L	0.1 mg/L	95.0	80.0	120	----
Uranium, total	7440-61-1	E420	0.00001	mg/L	0.005 mg/L	92.5	80.0	120	----
Vanadium, total	7440-62-2	E420	0.0005	mg/L	0.5 mg/L	98.7	80.0	120	----
Zinc, total	7440-66-6	E420	0.003	mg/L	0.5 mg/L	93.4	80.0	120	----
Zirconium, total	7440-67-7	E420	0.0002	mg/L	0.1 mg/L	98.4	80.0	120	----
Dissolved Metals (QCLot: 1382844)									
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	99.2	80.0	120	----
Arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	1 mg/L	103	80.0	120	----
Barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.25 mg/L	102	80.0	120	----
Beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.1 mg/L	97.1	80.0	120	----
Bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	1 mg/L	98.1	80.0	120	----
Boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	96.7	80.0	120	----
Cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.1 mg/L	96.8	80.0	120	----
Calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	98.2	80.0	120	----
Cesium, dissolved	7440-46-2	E421	0.00001	mg/L	0.05 mg/L	96.0	80.0	120	----
Chromium, dissolved	7440-47-3	E421	0.0005	mg/L	0.25 mg/L	101	80.0	120	----
Cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.25 mg/L	97.3	80.0	120	----
Copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.25 mg/L	95.2	80.0	120	----
Iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	102	80.0	120	----
Lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.5 mg/L	98.8	80.0	120	----
Lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.25 mg/L	98.9	80.0	120	----
Magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	102	80.0	120	----
Manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	99.4	80.0	120	----
Molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.25 mg/L	97.4	80.0	120	----
Nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.5 mg/L	97.6	80.0	120	----
Phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	10 mg/L	101	70.0	130	----
Potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	100	80.0	120	----
Rubidium, dissolved	7440-17-7	E421	0.0002	mg/L	0.1 mg/L	98.8	80.0	120	----
Selenium, dissolved	7782-49-2	E421	0.00005	mg/L	1 mg/L	96.4	80.0	120	----
Silicon, dissolved	7440-21-3	E421	0.05	mg/L	10 mg/L	109	60.0	140	----
Silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.1 mg/L	91.7	80.0	120	----
Sodium, dissolved	7440-23-5	E421	0.05	mg/L	50 mg/L	100	80.0	120	----
Strontium, dissolved	7440-24-6	E421	0.0002	mg/L	0.25 mg/L	99.2	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
Dissolved Metals (QCLot: 1382844) - continued									
Sulfur, dissolved	7704-34-9	E421	0.5	mg/L	50 mg/L	101	80.0	120	----
Tellurium, dissolved	13494-80-9	E421	0.0002	mg/L	0.1 mg/L	95.4	80.0	120	----
Thallium, dissolved	7440-28-0	E421	0.00001	mg/L	1 mg/L	97.1	80.0	120	----
Thorium, dissolved	7440-29-1	E421	0.0001	mg/L	0.1 mg/L	100	80.0	120	----
Tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.5 mg/L	99.2	80.0	120	----
Titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	98.5	80.0	120	----
Tungsten, dissolved	7440-33-7	E421	0.0001	mg/L	0.1 mg/L	97.4	80.0	120	----
Uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	95.9	80.0	120	----
Vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.5 mg/L	101	80.0	120	----
Zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.5 mg/L	96.6	80.0	120	----
Zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	0.1 mg/L	98.7	80.0	120	----

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: 1382593)										
CG2403735-001	Anonymous	Ammonia, total (as N)	7664-41-7	E298	0.115 mg/L	0.1 mg/L	115	75.0	125	----
Anions and Nutrients (QCLot: 1382628)										
CG2403723-004	Anonymous	Sulfate (as SO4)	14808-79-8	E235.SO4	102 mg/L	100 mg/L	102	75.0	125	----
Anions and Nutrients (QCLot: 1382633)										
CG2403723-004	Anonymous	Fluoride	16984-48-8	E235.F	1.05 mg/L	1 mg/L	105	75.0	125	----
Cyanides (QCLot: 1383432)										
CG2403741-001	Baseline PJ2324-004; 2324-1704	Cyanide, weak acid dissociable	----	E336	0.111 mg/L	0.125 mg/L	88.6	75.0	125	----
Cyanides (QCLot: 1383433)										
CG2403741-001	Baseline PJ2324-004; 2324-1704	Cyanide, free	----	E339	0.109 mg/L	0.125 mg/L	87.1	75.0	125	----
Cyanides (QCLot: 1383434)										
CG2403741-001	Baseline PJ2324-004; 2324-1704	Cyanide, strong acid dissociable (Total)	----	E333	0.199 mg/L	0.25 mg/L	79.8	75.0	125	----
Cyanides (QCLot: 1384283)										
VA24A6415-001	Anonymous	Thiocyanate	302-04-5	E344	10.2 mg/L	10 mg/L	102	75.0	125	----
Organic / Inorganic Carbon (QCLot: 1382762)										
CG2403733-002	Anonymous	Carbon, dissolved organic [DOC]	----	E358-L	4.76 mg/L	5 mg/L	95.3	70.0	130	----
Organic / Inorganic Carbon (QCLot: 1382763)										
CG2403733-002	Anonymous	Carbon, total organic [TOC]	----	E355-L	5.13 mg/L	5 mg/L	102	70.0	130	----

Chain of Custody (COC) / Analytical Request Form

COC Number: **22 -**

Canada Toll Free: 1 800 668 9878

ALS www.alsglobal.com

Report To	Contact and company name below will appear on the final report
Company:	Nautilus Environmental
Contact:	Leila Oosterbroek
Phone:	403-253-7121
	Company address below will appear on the final report
Street:	10823 27 St SE
City/Province:	Calgary, AB
Postal Code:	T2Z 3V9
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☑ YES ☐ NO
Company:	Nautilus Environmental
Contact:	Leila Oosterbroek

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	leila@nautilusenvironmental.ca; melanie@nautiluse
Email 2	lisa.ramilo@agnicoeagle.com
Email 3	breda.rahmanian@wsp.com
Invoice Recipients	
Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX	
Email 1 or Fax	accounting@nautilusenvironmental.ca
Email 2	leila@nautilusenvironmental.ca

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.

AFFIX ALS BARCODE LABEL HERE (ALS use only)

Additional fees may apply to rush requests on weekends, statutory holidays and for non-routine tests.

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 #:	
PO / AFE:	2324-273AB
LSD:	
ALS Lab Work Order # (ALS use only):	

Oil and Gas Required Fields (client use)	
AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	
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	Routine	Measured TDS	Total Metals	Dissolved Metals (F)	total ammonia as N	TOC (P)	DOC (F/P)	Total Cyanide (strong acid digestion) (P)	Total Cyanide (weak acid digestion) (P)	Free Cyanide (P)	Thiocyanate (P)	SAMPLES ON HOLD	EXTENDED STORAGE REQUIRED	SUSPECTED HAZARD (see notes)
	Baseline PJ2324-004; 2324-1704	27-Mar-24	10:00	water	7	E	E	E	E	E	E	E	E	E	E	E			

Environmental Division
Calgary
Work Order Reference
CG2403741
Telephone : +1 403 407 1800

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)

SAMPLE RECEIPT DETAILS (ALS use only)

Cooling Method: ☐ NONE ☐ ICE ☐ ICE PACKS ☐ FROZEN ☐ COOLING INITIATED

Submission Comments identified on Sample Receipt Notification: ☐ YES ☐ NO

Cooler Custody Seals Intact: ☐ YES ☐ N/A Sample Custody Seals Intact: ☐ YES ☐ N/A

INITIAL COOLER TEMPERATURES °C	FINAL COOLER TEMPERATURES °C
11	

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (ALS use only)			FINAL SHIPMENT RECEPTION (ALS use only)		
Released by: [signature]	Date: 2024/03/27	Time: 1050	Received by: YL	Date: 3/27	Time: 14:05	Received by:	Date:	Time:

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

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.

CERTIFICATE OF ANALYSIS

Work Order	: **CG2405756**	Page	: 1 of 4
Client	: **Nautilus Environmental Company Inc.**	Laboratory	: ALS Environmental - Calgary
Contact	: Leila Oosterbroek	Account Manager	: Patryk Wojciak
Address	: 10823 27th Street SE Calgary AB Canada T2Z 3V9	Address	: 2559 29th Street NE Calgary AB Canada T1Y 7B5
Telephone	: 403 253 7121	Telephone	: +1 403 407 1800
Project	: ----	Date Samples Received	: 06-May-2024 11:10
PO	: 2324-325AB	Date Analysis Commenced	: 06-May-2024
C-O-C number	: ----	Issue Date	: 09-May-2024 16:10
Sampler	: ----		
Site	: ----		
Quote number	: CG24-NECI100-00001 Nautilus Calgary General		
No. of samples received	: 4		
No. of samples analysed	: 4		

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

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*
Gurvinder Kour	Lab Assistant	Metals, Calgary, Alberta
Harpreet Chawla	Team Leader - Inorganics	Inorganics, Calgary, Alberta
Kevin Baxter	Team Leader - Inorganics	Inorganics, Calgary, Alberta
Kevin Baxter	Team Leader - Inorganics	Metals, Calgary, Alberta
Shirley Li	Team Leader - Inorganics	Inorganics, Calgary, 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 units
%	percent
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*
DLDS	*Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.*

Analytical Results

Sub-Matrix: Water
(Matrix: Water)

Analyte	CAS Number	Method/Lab	LOR	Unit	Site Reference (122mg/L TDS) PJ2324-004 Intiation AG	889 mg/L TDS PJ2324-004 Initiation AG	1,414 mg/L TDS PJ2324-004 Initiation AG	2,296 mg/L TDS PJ2324-004 Initiation AG	----
				Client sampling date / time	06-May-2024 10:00	06-May-2024 10:00	06-May-2024 10:00	06-May-2024 10:00	----
					CG2405756-001	CG2405756-002	CG2405756-003	CG2405756-004	--------
					Result	Result	Result	Result	----
Physical Tests									
Hardness (as CaCO3), dissolved	----	EC100/CG	0.50	mg/L	93.5	353	533	842	----
Solids, total dissolved [TDS]	----	E162/CG	10	mg/L	145	916	1410	2240	----
Conductivity	----	E100/CG	2.0	µS/cm	274	1320	2000	3120	----
pH	----	E108/CG	0.10	pH units	7.68	7.54	7.52	7.50	----
Alkalinity, bicarbonate (as HCO3)	71-52-3	E290/CG	1.0	mg/L	39.3	32.3	35.1	35.6	----
Alkalinity, carbonate (as CO3)	3812-32-6	E290/CG	1.0	mg/L	<1.0	<1.0	<1.0	<1.0	----
Alkalinity, hydroxide (as OH)	14280-30-9	E290/CG	1.0	mg/L	<1.0	<1.0	<1.0	<1.0	----
Alkalinity, total (as CaCO3)	----	E290/CG	2.0	mg/L	32.2	26.5	28.8	29.2	----
Solids, total dissolved [TDS], calculated	----	EC103/CG	1.0	mg/L	154	877	1370	2220	----
Anions and Nutrients									
Chloride	16887-00-6	E235.Cl/CG	0.50	mg/L	0.98	118	199	337	----
Fluoride	16984-48-8	E235.F/CG	0.020	mg/L	0.086	<0.100 DLDS	<0.100 DLDS	<0.100 DLDS	----
Nitrate (as N)	14797-55-8	E235.NO3/CG	0.020	mg/L	2.72	17.0	26.6	43.1	----
Nitrite (as N)	14797-65-0	E235.NO2/CG	0.010	mg/L	0.131	0.135	0.129	0.129	----
Sulfate (as SO4)	14808-79-8	E235.SO4/CG	0.30	mg/L	75.1	380	583	932	----
Nitrate + Nitrite (as N)	----	EC235.N+N/CG	0.0500	mg/L	2.85	17.1	26.7	43.2	----
Ion Balance									
Anion sum	----	EC101/CG	0.10	meq/L	2.44	13.0	20.2	32.6	----
Cation sum	----	EC101/CG	0.10	meq/L	2.27	13.2	20.6	33.7	----
Ion balance (APHA)	----	EC101/CG	0.01	%	-3.61	0.76	0.98	1.66	----
Ion balance (cations/anions)	----	EC101/CG	0.010	%	93.0	102	102	103	----
Dissolved Metals									
Calcium, dissolved	7440-70-2	E421/CG	0.050	mg/L	33.8	122	183	288	----
Iron, dissolved	7439-89-6	E421/CG	0.010	mg/L	0.021	0.018	<0.050 DLDS	<0.050 DLDS	----
Magnesium, dissolved	7439-95-4	E421/CG	0.0050	mg/L	2.22	11.8	18.4	29.9	----
Manganese, dissolved	7439-96-5	E421/CG	0.00010	mg/L	0.0115	0.0114	0.0125	0.0119	----
Potassium, dissolved	7440-09-7	E421/CG	0.050	mg/L	0.992	29.2	48.4	83.6	----

Analytical Results

Sub-Matrix: Water
(Matrix: Water)

				Client sample ID	Site Reference (122mg/L TDS) PJ2324-004 Intiation AG	889 mg/L TDS PJ2324-004 Initiation AG	1,414 mg/L TDS PJ2324-004 Initiation AG	2,296 mg/L TDS PJ2324-004 Initiation AG	----
				Client sampling date / time	06-May-2024 10:00	06-May-2024 10:00	06-May-2024 10:00	06-May-2024 10:00	----
Analyte	CAS Number	Method/Lab	LOR	Unit	CG2405756-001	CG2405756-002	CG2405756-003	CG2405756-004	--------
					Result	Result	Result	Result	----
Dissolved Metals									
Sodium, dissolved	7440-23-5	E421/CG	0.050	mg/L	8.60	124	200	338	----
Dissolved metals filtration location	----	EP421/CG	-	-	Field	Field	Field	Field	----

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

Please refer to the Accreditation section for an explanation of analyte accreditations.

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QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **CG2405756**	Page	: 1 of 11
Client	: **Nautilus Environmental Company Inc.**	Laboratory	: ALS Environmental - Calgary
Contact	: Leila Oosterbroek	Account Manager	: Patryk Wojciak
Address	: 10823 27th Street SE Calgary AB Canada T2Z 3V9	Address	: 2559 29th Street NE Calgary, Alberta Canada T1Y 7B5
Telephone	: 403 253 7121	Telephone	: +1 403 407 1800
Project	: ----	Date Samples Received	: 06-May-2024 11:10
PO	: 2324-325AB	Issue Date	: 09-May-2024 16:12
C-O-C number	: ----		
Sampler	: ----		
Site	: ----		
Quote number	: CG24-NECI100-00001 Nautilus Calgary General		
No. of samples received	: 4		
No. of samples analysed	: 4		

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 : Analytical Method	Method	Sampling Date	Extraction / Preparation				Analysis			
Container / Client Sample ID(s)			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 1,414 mg/L TDS PJ2324-004 Initiation AG	E235.Cl	06-May-2024	06-May-2024	28 days	0 days	✓	06-May-2024	28 days	0 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE 2,296 mg/L TDS PJ2324-004 Initiation AG	E235.Cl	06-May-2024	06-May-2024	28 days	0 days	✓	06-May-2024	28 days	0 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE 889 mg/L TDS PJ2324-004 Initiation AG	E235.Cl	06-May-2024	06-May-2024	28 days	0 days	✓	06-May-2024	28 days	0 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE Site Reference (122mg/L TDS) PJ2324-004 Intiation AG	E235.Cl	06-May-2024	06-May-2024	28 days	0 days	✓	06-May-2024	28 days	0 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE 1,414 mg/L TDS PJ2324-004 Initiation AG	E235.F	06-May-2024	06-May-2024	28 days	0 days	✓	06-May-2024	28 days	0 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE 2,296 mg/L TDS PJ2324-004 Initiation AG	E235.F	06-May-2024	06-May-2024	28 days	0 days	✓	06-May-2024	28 days	0 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE 889 mg/L TDS PJ2324-004 Initiation AG	E235.F	06-May-2024	06-May-2024	28 days	0 days	✓	06-May-2024	28 days	0 days	✓

Matrix: **Water**

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

Analyte Group : Analytical Method / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis: Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Fluoride in Water by IC										
HDPE Site Reference (122mg/L TDS) PJ2324-004 Intiation AG	E235.F	06-May-2024	06-May-2024	28 days	0 days	✓	06-May-2024	28 days	0 days	✓
Anions and Nutrients : Nitrate in Water by IC										
HDPE 1,414 mg/L TDS PJ2324-004 Initiation AG	E235.NO3	06-May-2024	06-May-2024	3 days	0 days	✓	06-May-2024	3 days	0 days	✓
Anions and Nutrients : Nitrate in Water by IC										
HDPE 2,296 mg/L TDS PJ2324-004 Initiation AG	E235.NO3	06-May-2024	06-May-2024	3 days	0 days	✓	06-May-2024	3 days	0 days	✓
Anions and Nutrients : Nitrate in Water by IC										
HDPE 889 mg/L TDS PJ2324-004 Initiation AG	E235.NO3	06-May-2024	06-May-2024	3 days	0 days	✓	06-May-2024	3 days	0 days	✓
Anions and Nutrients : Nitrate in Water by IC										
HDPE Site Reference (122mg/L TDS) PJ2324-004 Intiation AG	E235.NO3	06-May-2024	06-May-2024	3 days	0 days	✓	06-May-2024	3 days	0 days	✓
Anions and Nutrients : Nitrite in Water by IC										
HDPE 1,414 mg/L TDS PJ2324-004 Initiation AG	E235.NO2	06-May-2024	06-May-2024	3 days	0 days	✓	06-May-2024	3 days	0 days	✓
Anions and Nutrients : Nitrite in Water by IC										
HDPE 2,296 mg/L TDS PJ2324-004 Initiation AG	E235.NO2	06-May-2024	06-May-2024	3 days	0 days	✓	06-May-2024	3 days	0 days	✓
Anions and Nutrients : Nitrite in Water by IC										
HDPE 889 mg/L TDS PJ2324-004 Initiation AG	E235.NO2	06-May-2024	06-May-2024	3 days	0 days	✓	06-May-2024	3 days	0 days	✓
Anions and Nutrients : Nitrite in Water by IC										
HDPE Site Reference (122mg/L TDS) PJ2324-004 Intiation AG	E235.NO2	06-May-2024	06-May-2024	3 days	0 days	✓	06-May-2024	3 days	0 days	✓

Matrix: **Water**

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

Analyte Group : Analytical Method 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 : Sulfate in Water by IC										
HDPE 1,414 mg/L TDS PJ2324-004 Initiation AG	E235.SO4	06-May-2024	06-May-2024	28 days	0 days	✓	06-May-2024	28 days	0 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE 2,296 mg/L TDS PJ2324-004 Initiation AG	E235.SO4	06-May-2024	06-May-2024	28 days	0 days	✓	06-May-2024	28 days	0 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE 889 mg/L TDS PJ2324-004 Initiation AG	E235.SO4	06-May-2024	06-May-2024	28 days	0 days	✓	06-May-2024	28 days	0 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE Site Reference (122mg/L TDS) PJ2324-004 Intiation AG	E235.SO4	06-May-2024	06-May-2024	28 days	0 days	✓	06-May-2024	28 days	0 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE - dissolved (lab preserved) 1,414 mg/L TDS PJ2324-004 Initiation AG	E421	06-May-2024	06-May-2024	180 days	0 days	✓	07-May-2024	180 days	1 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE - dissolved (lab preserved) 2,296 mg/L TDS PJ2324-004 Initiation AG	E421	06-May-2024	06-May-2024	180 days	0 days	✓	07-May-2024	180 days	1 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE - dissolved (lab preserved) 889 mg/L TDS PJ2324-004 Initiation AG	E421	06-May-2024	06-May-2024	180 days	0 days	✓	07-May-2024	180 days	1 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE - dissolved (lab preserved) Site Reference (122mg/L TDS) PJ2324-004 Intiation AG	E421	06-May-2024	06-May-2024	180 days	0 days	✓	07-May-2024	180 days	1 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE 1,414 mg/L TDS PJ2324-004 Initiation AG	E290	06-May-2024	07-May-2024	14 days	1 days	✓	07-May-2024	14 days	1 days	✓

Matrix: **Water**

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

Analyte Group : Analytical Method / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Holding Times: Rec	Holding Times: Actual	Eval	Analysis: Analysis Date	Holding Times: Rec	Holding Times: Actual	Eval
Physical Tests : Alkalinity Species by Titration										
HDPE 2,296 mg/L TDS PJ2324-004 Initiation AG	E290	06-May-2024	07-May-2024	14 days	1 days	✔	07-May-2024	14 days	1 days	✔
Physical Tests : Alkalinity Species by Titration										
HDPE 889 mg/L TDS PJ2324-004 Initiation AG	E290	06-May-2024	07-May-2024	14 days	1 days	✔	07-May-2024	14 days	1 days	✔
Physical Tests : Alkalinity Species by Titration										
HDPE Site Reference (122mg/L TDS) PJ2324-004 Intiation AG	E290	06-May-2024	07-May-2024	14 days	1 days	✔	07-May-2024	14 days	1 days	✔
Physical Tests : Conductivity in Water										
HDPE 1,414 mg/L TDS PJ2324-004 Initiation AG	E100	06-May-2024	07-May-2024	28 days	1 days	✔	07-May-2024	28 days	1 days	✔
Physical Tests : Conductivity in Water										
HDPE 2,296 mg/L TDS PJ2324-004 Initiation AG	E100	06-May-2024	07-May-2024	28 days	1 days	✔	07-May-2024	28 days	1 days	✔
Physical Tests : Conductivity in Water										
HDPE 889 mg/L TDS PJ2324-004 Initiation AG	E100	06-May-2024	07-May-2024	28 days	1 days	✔	07-May-2024	28 days	1 days	✔
Physical Tests : Conductivity in Water										
HDPE Site Reference (122mg/L TDS) PJ2324-004 Intiation AG	E100	06-May-2024	07-May-2024	28 days	1 days	✔	07-May-2024	28 days	1 days	✔
Physical Tests : pH by Meter										
HDPE 1,414 mg/L TDS PJ2324-004 Initiation AG	E108	06-May-2024	07-May-2024	0.25 hrs	24 hrs	✖ EHTR-FM	07-May-2024	0.25 hrs	24 hrs	✖ EHTR-FM
Physical Tests : pH by Meter										
HDPE 2,296 mg/L TDS PJ2324-004 Initiation AG	E108	06-May-2024	07-May-2024	0.25 hrs	24 hrs	✖ EHTR-FM	07-May-2024	0.25 hrs	24 hrs	✖ EHTR-FM

Matrix: **Water**

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

Analyte Group : Analytical Method 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 : pH by Meter										
HDPE 889 mg/L TDS PJ2324-004 Initiation AG	E108	06-May-2024	07-May-2024	0.25 hrs	24 hrs	× EHTR-FM	07-May-2024	0.25 hrs	24 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE Site Reference (122mg/L TDS) PJ2324-004 Intiation AG	E108	06-May-2024	07-May-2024	0.25 hrs	24 hrs	× EHTR-FM	07-May-2024	0.25 hrs	24 hrs	× EHTR-FM
Physical Tests : TDS by Gravimetry										
HDPE 1,414 mg/L TDS PJ2324-004 Initiation AG	E162	06-May-2024	----	----	----		08-May-2024	7 days	2 days	✓
Physical Tests : TDS by Gravimetry										
HDPE 2,296 mg/L TDS PJ2324-004 Initiation AG	E162	06-May-2024	----	----	----		08-May-2024	7 days	2 days	✓
Physical Tests : TDS by Gravimetry										
HDPE 889 mg/L TDS PJ2324-004 Initiation AG	E162	06-May-2024	----	----	----		08-May-2024	7 days	2 days	✓
Physical Tests : TDS by Gravimetry										
HDPE Site Reference (122mg/L TDS) PJ2324-004 Intiation AG	E162	06-May-2024	----	----	----		08-May-2024	7 days	2 days	✓

Legend & Qualifier Definitions

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

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	1431243	1	20	5.0	5.0	✓
Chloride in Water by IC	E235.Cl	1430359	1	8	12.5	5.0	✓
Conductivity in Water	E100	1431242	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	1430187	1	14	7.1	5.0	✓
Fluoride in Water by IC	E235.F	1430356	1	20	5.0	5.0	✓
Nitrate in Water by IC	E235.NO3	1430357	1	8	12.5	5.0	✓
Nitrite in Water by IC	E235.NO2	1430360	1	8	12.5	5.0	✓
pH by Meter	E108	1431241	1	20	5.0	5.0	✓
Sulfate in Water by IC	E235.SO4	1430358	1	20	5.0	5.0	✓
TDS by Gravimetry	E162	1432205	1	20	5.0	5.0	✓
Laboratory Control Samples (LCS)							
Alkalinity Species by Titration	E290	1431243	1	20	5.0	5.0	✓
Chloride in Water by IC	E235.Cl	1430359	1	8	12.5	5.0	✓
Conductivity in Water	E100	1431242	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	1430187	1	14	7.1	5.0	✓
Fluoride in Water by IC	E235.F	1430356	1	20	5.0	5.0	✓
Nitrate in Water by IC	E235.NO3	1430357	1	8	12.5	5.0	✓
Nitrite in Water by IC	E235.NO2	1430360	1	8	12.5	5.0	✓
pH by Meter	E108	1431241	1	20	5.0	5.0	✓
Sulfate in Water by IC	E235.SO4	1430358	1	20	5.0	5.0	✓
TDS by Gravimetry	E162	1432205	1	20	5.0	5.0	✓
Method Blanks (MB)							
Alkalinity Species by Titration	E290	1431243	1	20	5.0	5.0	✓
Chloride in Water by IC	E235.Cl	1430359	1	8	12.5	5.0	✓
Conductivity in Water	E100	1431242	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	1430187	1	14	7.1	5.0	✓
Fluoride in Water by IC	E235.F	1430356	1	20	5.0	5.0	✓
Nitrate in Water by IC	E235.NO3	1430357	1	8	12.5	5.0	✓
Nitrite in Water by IC	E235.NO2	1430360	1	8	12.5	5.0	✓
Sulfate in Water by IC	E235.SO4	1430358	1	20	5.0	5.0	✓
TDS by Gravimetry	E162	1432205	1	20	5.0	5.0	✓
Matrix Spikes (MS)							
Chloride in Water by IC	E235.Cl	1430359	1	8	12.5	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	1430187	1	14	7.1	5.0	✓
Fluoride in Water by IC	E235.F	1430356	1	20	5.0	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*
Matrix Spikes (MS) - Continued							
Nitrate in Water by IC	E235.NO3	1430357	1	8	12.5	5.0	✓
Nitrite in Water by IC	E235.NO2	1430360	1	8	12.5	5.0	✓
Sulfate in Water by IC	E235.SO4	1430358	1	20	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 ALS Environmental - Calgary	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 ALS Environmental - Calgary	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.
TDS by Gravimetry	E162 ALS Environmental - Calgary	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 ALS Environmental - Calgary	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 ALS Environmental - Calgary	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 ALS Environmental - Calgary	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 ALS Environmental - Calgary	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 ALS Environmental - Calgary	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Alkalinity Species by Titration	E290 ALS Environmental - Calgary	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
Dissolved Metals in Water by CRC ICPMS	E421 ALS Environmental - Calgary	Water	APHA 3030B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Dissolved Hardness (Calculated)	EC100 ALS Environmental - Calgary	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 ALS Environmental - Calgary	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. Ion Balance cannot be calculated accurately for waters with very low electrical conductivity (EC).
TDS in Water (Calculation)	EC103 ALS Environmental - Calgary	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 ALS Environmental - Calgary	Water	EPA 300.0	Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Metals Water Filtration	EP421 ALS Environmental - Calgary	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HNO3.

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QUALITY CONTROL REPORT

Work Order	: **CG2405756**	Page	: 1 of 6
Client	: Nautilus Environmental Company Inc.	Laboratory	: ALS Environmental - Calgary
Contact	: Leila Oosterbroek	Account Manager	: Patryk Wojciak
Address	: 10823 27th Street SE Calgary AB Canada T2Z 3V9	Address	: 2559 29th Street NE Calgary, Alberta Canada T1Y 7B5
Telephone	: 403 253 7121	Telephone	: +1 403 407 1800
Project	: ----	Date Samples Received	: 06-May-2024 11:10
PO	: 2324-325AB	Date Analysis Commenced	: 06-May-2024
C-O-C number	: ----	Issue Date	: 09-May-2024 16:11
Sampler	: ----		
Site	: ----		
Quote number	: CG24-NECI100-00001 Nautilus Calgary General		
No. of samples received	: 4		
No. of samples analysed	: 4		

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*
Gurvinder Kour	Lab Assistant	Calgary Metals, Calgary, Alberta
Harpreet Chawla	Team Leader - Inorganics	Calgary Inorganics, Calgary, Alberta
Kevin Baxter	Team Leader - Inorganics	Calgary Inorganics, Calgary, Alberta
Kevin Baxter	Team Leader - Inorganics	Calgary Metals, Calgary, Alberta
Shirley Li	Team Leader - Inorganics	Calgary Inorganics, Calgary, 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: 1431241)											
CG2405749-001	Anonymous	pH	----	E108	0.10	pH units	7.99	7.97	0.251%	4%	----
Physical Tests (QC Lot: 1431242)											
CG2405749-001	Anonymous	Conductivity	----	E100	2.0	µS/cm	1870	1870	0.107%	10%	----
Physical Tests (QC Lot: 1431243)											
CG2405749-001	Anonymous	Alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	479	506	5.42%	20%	----
Physical Tests (QC Lot: 1432205)											
CG2405715-001	Anonymous	Solids, total dissolved [TDS]	----	E162	40	mg/L	1660	1550	6.59%	20%	----
Anions and Nutrients (QC Lot: 1430356)											
CG2405745-001	Anonymous	Fluoride	16984-48-8	E235.F	0.020	mg/L	0.056	0.052	0.003	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 1430357)											
CG2405745-001	Anonymous	Nitrate (as N)	14797-55-8	E235.NO3	0.020	mg/L	0.102	0.102	0.0004	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 1430358)											
CG2405745-001	Anonymous	Sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	2.44	2.37	0.06	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 1430359)											
CG2405745-001	Anonymous	Chloride	16887-00-6	E235.Cl	0.50	mg/L	3.17	3.15	0.02	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 1430360)											
CG2405745-001	Anonymous	Nitrite (as N)	14797-65-0	E235.NO2	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 1430187)											
CG2405595-001	Anonymous	Calcium, dissolved	7440-70-2	E421	0.100	mg/L	294	297	1.04%	20%	----
		Iron, dissolved	7439-89-6	E421	0.020	mg/L	<0.020	<0.020	0	Diff <2x LOR	----
		Magnesium, dissolved	7439-95-4	E421	0.0100	mg/L	204	201	1.46%	20%	----
		Manganese, dissolved	7439-96-5	E421	0.00020	mg/L	0.00061	0.00063	0.00001	Diff <2x LOR	----
		Potassium, dissolved	7440-09-7	E421	0.100	mg/L	7.70	7.62	1.04%	20%	----
		Sodium, dissolved	7440-23-5	E421	0.100	mg/L	43.1	41.8	2.90%	20%	----

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: 1431242)						
Conductivity	----	E100	1	µS/cm	<1.0	----
Physical Tests (QCLot: 1431243)						
Alkalinity, total (as CaCO3)	----	E290	1	mg/L	<1.0	----
Physical Tests (QCLot: 1432205)						
Solids, total dissolved [TDS]	----	E162	10	mg/L	<10	----
Anions and Nutrients (QCLot: 1430356)						
Fluoride	16984-48-8	E235.F	0.02	mg/L	<0.020	----
Anions and Nutrients (QCLot: 1430357)						
Nitrate (as N)	14797-55-8	E235.NO3	0.02	mg/L	<0.020	----
Anions and Nutrients (QCLot: 1430358)						
Sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 1430359)						
Chloride	16887-00-6	E235.Cl	0.5	mg/L	<0.50	----
Anions and Nutrients (QCLot: 1430360)						
Nitrite (as N)	14797-65-0	E235.NO2	0.01	mg/L	<0.010	----
Dissolved Metals (QCLot: 1430187)						
Calcium, dissolved	7440-70-2	E421	0.05	mg/L	<0.050	----
Iron, dissolved	7439-89-6	E421	0.01	mg/L	<0.010	----
Magnesium, dissolved	7439-95-4	E421	0.005	mg/L	<0.0050	----
Manganese, dissolved	7439-96-5	E421	0.0001	mg/L	<0.00010	----
Potassium, dissolved	7440-09-7	E421	0.05	mg/L	<0.050	----
Sodium, dissolved	7440-23-5	E421	0.05	mg/L	<0.050	----

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	Target Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 1431241)									
pH	----	E108	----	pH units	7 pH units	99.6	98.0	102	----
Physical Tests (QCLot: 1431242)									
Conductivity	----	E100	1	µS/cm	147 µS/cm	100	90.0	110	----
Physical Tests (QCLot: 1431243)									
Alkalinity, total (as CaCO3)	----	E290	1	mg/L	500 mg/L	106	85.0	115	----
Physical Tests (QCLot: 1432205)									
Solids, total dissolved [TDS]	----	E162	10	mg/L	1000 mg/L	104	85.0	115	----
Anions and Nutrients (QCLot: 1430356)									
Fluoride	16984-48-8	E235.F	0.02	mg/L	1 mg/L	104	90.0	110	----
Anions and Nutrients (QCLot: 1430357)									
Nitrate (as N)	14797-55-8	E235.NO3	0.02	mg/L	2.5 mg/L	101	90.0	110	----
Anions and Nutrients (QCLot: 1430358)									
Sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	101	90.0	110	----
Anions and Nutrients (QCLot: 1430359)									
Chloride	16887-00-6	E235.Cl	0.5	mg/L	100 mg/L	100	90.0	110	----
Anions and Nutrients (QCLot: 1430360)									
Nitrite (as N)	14797-65-0	E235.NO2	0.01	mg/L	0.5 mg/L	101	90.0	110	----
Dissolved Metals (QCLot: 1430187)									
Calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	102	80.0	120	----
Iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	103	80.0	120	----
Magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	105	80.0	120	----
Manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	99.6	80.0	120	----
Potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	105	80.0	120	----
Sodium, dissolved	7440-23-5	E421	0.05	mg/L	50 mg/L	104	80.0	120	----

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: 1430356)										
CG2405752-006	Anonymous	Fluoride	16984-48-8	E235.F	1.05 mg/L	1 mg/L	105	75.0	125	----
Anions and Nutrients (QCLot: 1430357)										
CG2405756-001	Site Reference (122mg/L TDS) PJ2324-004 Intiation AG	Nitrate (as N)	14797-55-8	E235.NO3	ND mg/L	----	ND	75.0	125	----
Anions and Nutrients (QCLot: 1430358)										
CG2405752-006	Anonymous	Sulfate (as SO4)	14808-79-8	E235.SO4	101 mg/L	100 mg/L	101	75.0	125	----
Anions and Nutrients (QCLot: 1430359)										
CG2405756-001	Site Reference (122mg/L TDS) PJ2324-004 Intiation AG	Chloride	16887-00-6	E235.Cl	101 mg/L	100 mg/L	101	75.0	125	----
Anions and Nutrients (QCLot: 1430360)										
CG2405756-001	Site Reference (122mg/L TDS) PJ2324-004 Intiation AG	Nitrite (as N)	14797-65-0	E235.NO2	0.510 mg/L	0.5 mg/L	102	75.0	125	----
Dissolved Metals (QCLot: 1430187)										
CG2405595-002	Anonymous	Calcium, dissolved	7440-70-2	E421	ND mg/L	----	ND	70.0	130	----
		Iron, dissolved	7439-89-6	E421	19.1 mg/L	20 mg/L	95.5	70.0	130	----
		Magnesium, dissolved	7439-95-4	E421	ND mg/L	----	ND	70.0	130	----
		Manganese, dissolved	7439-96-5	E421	0.195 mg/L	0.2 mg/L	97.7	70.0	130	----
		Potassium, dissolved	7440-09-7	E421	39.9 mg/L	40 mg/L	99.8	70.0	130	----
		Sodium, dissolved	7440-23-5	E421	ND mg/L	----	ND	70.0	130	----

Chain of Custody (COC) / Analytical Request Form

COC Number: 22 -

Page 1 of 1

Canada Toll Free: 1 800 668 9878

ALS www.alsglobal.com

Environmental Division
Calgary
Work Order Reference
CG2405756

Telephone : +1 403 407 1800

Report To	Contact and company name below will appear on the final report
Company:	Nautilus Environmental
Contact:	Leila Oosterbroek
Phone:	403-253-7121
	Company address below will appear on the final report
Street:	10823 27 St SE
City/Province:	Calgary, AB
Postal Code:	T2Z 3V9
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☑ YES ☐ NO
Company:	Nautilus Environmental
Contact:	Leila Oosterbroek

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 leila@nautilusenvironmental.ca; melanie@nautiluse

Email 2 lisa.ramilo@agnicoeagle.com

Email 3 breda.rahmanian@wsp.com

Invoice Recipients

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax accounting@nautilusenvironmental.ca

Email 2 leila@nautilusenvironmental.ca

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 minim
- ☑ 3 day [P3] if received by 3pm M-F - 25% rush surcharge minim
- ☐ 2 day [P2] if received by 3pm M-F - 50% rush surcharge minim
- ☐ 1 day [E] if received by 3pm M-F - 100% rush surcharge minim
- ☐ Same day [E2] if received by 10am M-S - 200% rush surcharge

Additional fees may apply to rush requests on weekend

Date and Time Required for all E&P TATs:

For all tests with rush TATs requested, please c

Project Information

ALS Account # / Quote #:	
Job #:	
PO / AFE:	2324-325AB
LSD:	
ALS Lab Work Order # (ALS use only):	

Oil and Gas Required Fields (client use)

AFE/Cost Center:		PO#	
Major/Minor Code:		Routing Code:	
Requisitioner:			
Location:			
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	E162 - measured TDS	PR01 - Routine	PR01 - Routine (dissolved metals bo (F)	SAMPLES ON HOLD	EXTENDED STORAGE REQUIRED	SUSPECTED HAZARD (see notes)
	Site Reference (122 mg/L TDS) PJ2324-004 - Initiation AG	06-May-24	1000	water	2	P3	P3	P3			
	889 mg/L TDS PJ2324-004 - Initiation AG	↓	↓	water	2	P3	P3	P3			
	1,414mg/L TDS PJ2324-004 - Initiation AG	↓	↓	water	2	P3	P3	P3			
	2,296 mg/L TDS PJ2324-004 - Initiation AG	↓	↓	water	2	P3	P3	P3			

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)

13.6

SAMPLE RECEIPT DETAILS (ALS use only)

Cooling Method: ☐ NONE ☐ ICE ☐ ICE PACKS ☐ FROZEN ☐ COOLING INITIATED

Submission Comments identified on Sample Receipt Notification: ☐ YES ☐ NO

Cooler Custody Seals Intact: ☐ YES ☐ N/A Sample Custody Seals Intact: ☐ YES ☐ N/A

INITIAL COOLER TEMPERATURES °C | FINAL COOLER TEMPERATURES °C

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (ALS use only)			FINAL SHIPMENT RECEPTION (ALS use only)		
Released by: [signature]	Date: 2024/05/06	Time: 1015	Received by: FG	Date: 06-05-24	Time: 11:10	Received by:	Date:	Time:

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

FEB 2022 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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CERTIFICATE OF ANALYSIS

Work Order	: **CG2405623**	Page	: 1 of 4
Client	: **Nautilus Environmental Company Inc.**	Laboratory	: ALS Environmental - Calgary
Contact	: Leila Oosterbroek	Account Manager	: Patryk Wojciak
Address	: 10823 27th Street SE Calgary AB Canada T2Z 3V9	Address	: 2559 29th Street NE Calgary AB Canada T1Y 7B5
Telephone	: 403 253 7121	Telephone	: +1 403 407 1800
Project	: ----	Date Samples Received	: 02-May-2024 14:45
PO	: 2324-323AB	Date Analysis Commenced	: 03-May-2024
C-O-C number	: ----	Issue Date	: 08-May-2024 12:04
Sampler	: ----		
Site	: ----		
Quote number	: CG24-NECI100-00001 Nautilus Calgary General		
No. of samples received	: 4		
No. of samples analysed	: 4		

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

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*
Gurvinder Kour	Lab Assistant	Metals, Calgary, Alberta
Harpreet Chawla	Team Leader - Inorganics	Inorganics, Calgary, Alberta
Kevin Baxter	Team Leader - Inorganics	Inorganics, Calgary, Alberta
Kevin Baxter	Team Leader - Inorganics	Metals, Calgary, Alberta
Shirley Li	Team Leader - Inorganics	Inorganics, Calgary, 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 units
%	percent
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*
DLDS	*Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.*

Analytical Results

Sub-Matrix: Water
(Matrix: Water)

Analyte	CAS Number	Method/Lab	LOR	Unit	Site Reference (122mg/L TDS) PJ2324-004 - Initiation CD	889 mg/L TDS PJ2324-004 - Initiation CD	1,414mg/L TDS PJ2324-004 - Initiation CD	2,296 mg/L TDS PJ2324-004 - Initiation CD	----
				Client sampling date / time	02-May-2024 11:30	02-May-2024 11:30	02-May-2024 11:30	02-May-2024 11:30	----
					CG2405623-001	CG2405623-002	CG2405623-003	CG2405623-004	--------
					Result	Result	Result	Result	----
Physical Tests									
Hardness (as CaCO3), dissolved	----	EC100/CG	0.50	mg/L	93.4	341	523	817	----
Solids, total dissolved [TDS]	----	E162/CG	10	mg/L	131	816	1290	2090	----
Conductivity	----	E100/CG	2.0	µS/cm	223	1280	1950	3010	----
pH	----	E108/CG	0.10	pH units	7.44	7.42	7.36	7.37	----
Alkalinity, bicarbonate (as HCO3)	71-52-3	E290/CG	1.0	mg/L	29.3	29.9	30.6	30.6	----
Alkalinity, carbonate (as CO3)	3812-32-6	E290/CG	1.0	mg/L	<1.0	<1.0	<1.0	<1.0	----
Alkalinity, hydroxide (as OH)	14280-30-9	E290/CG	1.0	mg/L	<1.0	<1.0	<1.0	<1.0	----
Alkalinity, total (as CaCO3)	----	E290/CG	2.0	mg/L	24.0	24.5	25.1	25.1	----
Solids, total dissolved [TDS], calculated	----	EC103/CG	1.0	mg/L	134	853	1370	2190	----
Anions and Nutrients									
Chloride	16887-00-6	E235.Cl/CG	0.50	mg/L	1.40	126	212	354	----
Fluoride	16984-48-8	E235.F/CG	0.020	mg/L	0.095	<0.100 DLDS	<0.100 DLDS	<0.100 DLDS	----
Nitrate (as N)	14797-55-8	E235.NO3/CG	0.020	mg/L	0.729	15.5	25.6	42.2	----
Nitrite (as N)	14797-65-0	E235.NO2/CG	0.010	mg/L	0.132	0.119	0.114	0.107	----
Sulfate (as SO4)	14808-79-8	E235.SO4/CG	0.30	mg/L	73.0	360	564	899	----
Nitrate + Nitrite (as N)	----	EC235.N+N/CG	0.0500	mg/L	0.861	15.6	25.7	42.3	----
Ion Balance									
Anion sum	----	EC101/CG	0.10	meq/L	2.10	12.6	20.0	32.2	----
Cation sum	----	EC101/CG	0.10	meq/L	2.06	12.9	20.9	33.4	----
Ion balance (APHA)	----	EC101/CG	0.01	%	-0.96	1.18	2.20	1.83	----
Ion balance (cations/anions)	----	EC101/CG	0.010	%	98.1	102	104	104	----
Dissolved Metals									
Calcium, dissolved	7440-70-2	E421/CG	0.050	mg/L	35.3	118	180	278	----
Iron, dissolved	7439-89-6	E421/CG	0.010	mg/L	0.062	0.062	0.061	0.069	----
Magnesium, dissolved	7439-95-4	E421/CG	0.0050	mg/L	1.29	11.2	17.9	29.8	----
Manganese, dissolved	7439-96-5	E421/CG	0.00010	mg/L	0.0164	0.0166	0.0171	0.0166	----
Potassium, dissolved	7440-09-7	E421/CG	0.050	mg/L	1.13	30.3	52.9	85.4	----

Analytical Results

Sub-Matrix: Water
(Matrix: Water)

				Client sample ID	Site Reference (122mg/L TDS) PJ2324-004 - Initiation CD	889 mg/L TDS PJ2324-004 - Initiation CD	1,414mg/L TDS PJ2324-004 - Initiation CD	2,296 mg/L TDS PJ2324-004 - Initiation CD	----
				Client sampling date / time	02-May-2024 11:30	02-May-2024 11:30	02-May-2024 11:30	02-May-2024 11:30	----
Analyte	CAS Number	Method/Lab	LOR	Unit	CG2405623-001	CG2405623-002	CG2405623-003	CG2405623-004	--------
					Result	Result	Result	Result	----
Dissolved Metals									
Sodium, dissolved	7440-23-5	E421/CG	0.050	mg/L	3.60	123	210	343	----
Dissolved metals filtration location	----	EP421/CG	-	-	Field	Field	Field	Field	----

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

Please refer to the Accreditation section for an explanation of analyte accreditations.

ALS Canada Ltd.

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **CG2405623**	Page	: 1 of 11
Client	: **Nautilus Environmental Company Inc.**	Laboratory	: ALS Environmental - Calgary
Contact	: Leila Oosterbroek	Account Manager	: Patryk Wojciak
Address	: 10823 27th Street SE Calgary AB Canada T2Z 3V9	Address	: 2559 29th Street NE Calgary, Alberta Canada T1Y 7B5
Telephone	: 403 253 7121	Telephone	: +1 403 407 1800
Project	: ----	Date Samples Received	: 02-May-2024 14:45
PO	: 2324-323AB	Issue Date	: 08-May-2024 12:06
C-O-C number	: ----		
Sampler	: ----		
Site	: ----		
Quote number	: CG24-NECI100-00001 Nautilus Calgary General		
No. of samples received	: 4		
No. of samples analysed	: 4		

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 : Analytical Method	Method	Sampling Date	Extraction / Preparation				Analysis			
Container / Client Sample ID(s)			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 1,414mg/L TDS PJ2324-004 - Initiation CD	E235.Cl	02-May-2024	03-May-2024	28 days	1 days	✓	03-May-2024	28 days	1 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE 2,296 mg/L TDS PJ2324-004 - Initiation CD	E235.Cl	02-May-2024	03-May-2024	28 days	1 days	✓	03-May-2024	28 days	1 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE 889 mg/L TDS PJ2324-004 - Initiation CD	E235.Cl	02-May-2024	03-May-2024	28 days	1 days	✓	03-May-2024	28 days	1 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE Site Reference (122mg/L TDS) PJ2324-004 - Initiation CD	E235.Cl	02-May-2024	03-May-2024	28 days	1 days	✓	03-May-2024	28 days	1 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE 1,414mg/L TDS PJ2324-004 - Initiation CD	E235.F	02-May-2024	03-May-2024	28 days	1 days	✓	03-May-2024	28 days	1 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE 2,296 mg/L TDS PJ2324-004 - Initiation CD	E235.F	02-May-2024	03-May-2024	28 days	1 days	✓	03-May-2024	28 days	1 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE 889 mg/L TDS PJ2324-004 - Initiation CD	E235.F	02-May-2024	03-May-2024	28 days	1 days	✓	03-May-2024	28 days	1 days	✓

Matrix: **Water**

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

Analyte Group : Analytical Method / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis: Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Fluoride in Water by IC										
HDPE Site Reference (122mg/L TDS) PJ2324-004 - Initiation CD	E235.F	02-May-2024	03-May-2024	28 days	1 days	✓	03-May-2024	28 days	1 days	✓
Anions and Nutrients : Nitrate in Water by IC										
HDPE 1,414mg/L TDS PJ2324-004 - Initiation CD	E235.NO3	02-May-2024	03-May-2024	3 days	1 days	✓	03-May-2024	3 days	1 days	✓
Anions and Nutrients : Nitrate in Water by IC										
HDPE 2,296 mg/L TDS PJ2324-004 - Initiation CD	E235.NO3	02-May-2024	03-May-2024	3 days	1 days	✓	03-May-2024	3 days	1 days	✓
Anions and Nutrients : Nitrate in Water by IC										
HDPE 889 mg/L TDS PJ2324-004 - Initiation CD	E235.NO3	02-May-2024	03-May-2024	3 days	1 days	✓	03-May-2024	3 days	1 days	✓
Anions and Nutrients : Nitrate in Water by IC										
HDPE Site Reference (122mg/L TDS) PJ2324-004 - Initiation CD	E235.NO3	02-May-2024	03-May-2024	3 days	1 days	✓	03-May-2024	3 days	1 days	✓
Anions and Nutrients : Nitrite in Water by IC										
HDPE 1,414mg/L TDS PJ2324-004 - Initiation CD	E235.NO2	02-May-2024	03-May-2024	3 days	1 days	✓	03-May-2024	3 days	1 days	✓
Anions and Nutrients : Nitrite in Water by IC										
HDPE 2,296 mg/L TDS PJ2324-004 - Initiation CD	E235.NO2	02-May-2024	03-May-2024	3 days	1 days	✓	03-May-2024	3 days	1 days	✓
Anions and Nutrients : Nitrite in Water by IC										
HDPE 889 mg/L TDS PJ2324-004 - Initiation CD	E235.NO2	02-May-2024	03-May-2024	3 days	1 days	✓	03-May-2024	3 days	1 days	✓
Anions and Nutrients : Nitrite in Water by IC										
HDPE Site Reference (122mg/L TDS) PJ2324-004 - Initiation CD	E235.NO2	02-May-2024	03-May-2024	3 days	1 days	✓	03-May-2024	3 days	1 days	✓

Matrix: **Water**

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

Analyte Group : Analytical Method / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Holding Times: Rec	Holding Times: Actual	Eval	Analysis: Analysis Date	Holding Times: Rec	Holding Times: Actual	Eval
Anions and Nutrients : Sulfate in Water by IC										
HDPE 1,414mg/L TDS PJ2324-004 - Initiation CD	E235.SO4	02-May-2024	03-May-2024	28 days	1 days	✓	03-May-2024	28 days	1 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE 2,296 mg/L TDS PJ2324-004 - Initiation CD	E235.SO4	02-May-2024	03-May-2024	28 days	1 days	✓	03-May-2024	28 days	1 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE 889 mg/L TDS PJ2324-004 - Initiation CD	E235.SO4	02-May-2024	03-May-2024	28 days	1 days	✓	03-May-2024	28 days	1 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE Site Reference (122mg/L TDS) PJ2324-004 - Initiation CD	E235.SO4	02-May-2024	03-May-2024	28 days	1 days	✓	03-May-2024	28 days	1 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE - dissolved (lab preserved) 1,414mg/L TDS PJ2324-004 - Initiation CD	E421	02-May-2024	06-May-2024	180 days	4 days	✓	07-May-2024	180 days	5 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE - dissolved (lab preserved) 2,296 mg/L TDS PJ2324-004 - Initiation CD	E421	02-May-2024	06-May-2024	180 days	4 days	✓	07-May-2024	180 days	5 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE - dissolved (lab preserved) 889 mg/L TDS PJ2324-004 - Initiation CD	E421	02-May-2024	06-May-2024	180 days	4 days	✓	07-May-2024	180 days	5 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE - dissolved (lab preserved) Site Reference (122mg/L TDS) PJ2324-004 - Initiation CD	E421	02-May-2024	06-May-2024	180 days	4 days	✓	07-May-2024	180 days	5 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE 1,414mg/L TDS PJ2324-004 - Initiation CD	E290	02-May-2024	03-May-2024	14 days	1 days	✓	03-May-2024	14 days	1 days	✓

Matrix: **Water**

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

Analyte Group : Analytical Method / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis: Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Alkalinity Species by Titration										
HDPE 2,296 mg/L TDS PJ2324-004 - Initiation CD	E290	02-May-2024	03-May-2024	14 days	1 days	✓	03-May-2024	14 days	1 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE 889 mg/L TDS PJ2324-004 - Initiation CD	E290	02-May-2024	03-May-2024	14 days	1 days	✓	03-May-2024	14 days	1 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE Site Reference (122mg/L TDS) PJ2324-004 - Initiation CD	E290	02-May-2024	03-May-2024	14 days	1 days	✓	03-May-2024	14 days	1 days	✓
Physical Tests : Conductivity in Water										
HDPE 1,414mg/L TDS PJ2324-004 - Initiation CD	E100	02-May-2024	03-May-2024	28 days	1 days	✓	03-May-2024	28 days	1 days	✓
Physical Tests : Conductivity in Water										
HDPE 2,296 mg/L TDS PJ2324-004 - Initiation CD	E100	02-May-2024	03-May-2024	28 days	1 days	✓	03-May-2024	28 days	1 days	✓
Physical Tests : Conductivity in Water										
HDPE 889 mg/L TDS PJ2324-004 - Initiation CD	E100	02-May-2024	03-May-2024	28 days	1 days	✓	03-May-2024	28 days	1 days	✓
Physical Tests : Conductivity in Water										
HDPE Site Reference (122mg/L TDS) PJ2324-004 - Initiation CD	E100	02-May-2024	03-May-2024	28 days	1 days	✓	03-May-2024	28 days	1 days	✓
Physical Tests : pH by Meter										
HDPE 1,414mg/L TDS PJ2324-004 - Initiation CD	E108	02-May-2024	03-May-2024	0.25 hrs	27 hrs	× EHTR-FM	03-May-2024	0.25 hrs	27 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE 2,296 mg/L TDS PJ2324-004 - Initiation CD	E108	02-May-2024	03-May-2024	0.25 hrs	27 hrs	× EHTR-FM	03-May-2024	0.25 hrs	27 hrs	× EHTR-FM

Matrix: **Water**

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

Analyte Group : Analytical Method 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 : pH by Meter										
HDPE 889 mg/L TDS PJ2324-004 - Initiation CD	E108	02-May-2024	03-May-2024	0.25 hrs	27 hrs	× EHTR-FM	03-May-2024	0.25 hrs	27 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE Site Reference (122mg/L TDS) PJ2324-004 - Initiation CD	E108	02-May-2024	03-May-2024	0.25 hrs	27 hrs	× EHTR-FM	03-May-2024	0.25 hrs	27 hrs	× EHTR-FM
Physical Tests : TDS by Gravimetry										
HDPE 1,414mg/L TDS PJ2324-004 - Initiation CD	E162	02-May-2024	----	----	----		07-May-2024	7 days	5 days	✓
Physical Tests : TDS by Gravimetry										
HDPE 2,296 mg/L TDS PJ2324-004 - Initiation CD	E162	02-May-2024	----	----	----		07-May-2024	7 days	5 days	✓
Physical Tests : TDS by Gravimetry										
HDPE 889 mg/L TDS PJ2324-004 - Initiation CD	E162	02-May-2024	----	----	----		07-May-2024	7 days	5 days	✓
Physical Tests : TDS by Gravimetry										
HDPE Site Reference (122mg/L TDS) PJ2324-004 - Initiation CD	E162	02-May-2024	----	----	----		07-May-2024	7 days	5 days	✓

Legend & Qualifier Definitions

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

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	1427866	1	20	5.0	5.0	✓
Chloride in Water by IC	E235.Cl	1427998	1	15	6.6	5.0	✓
Conductivity in Water	E100	1427868	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	1430187	1	14	7.1	5.0	✓
Fluoride in Water by IC	E235.F	1427995	1	8	12.5	5.0	✓
Nitrate in Water by IC	E235.NO3	1427996	1	15	6.6	5.0	✓
Nitrite in Water by IC	E235.NO2	1427999	1	14	7.1	5.0	✓
pH by Meter	E108	1427867	1	20	5.0	5.0	✓
Sulfate in Water by IC	E235.SO4	1427997	1	8	12.5	5.0	✓
TDS by Gravimetry	E162	1429472	1	20	5.0	5.0	✓
Laboratory Control Samples (LCS)							
Alkalinity Species by Titration	E290	1427866	1	20	5.0	5.0	✓
Chloride in Water by IC	E235.Cl	1427998	1	15	6.6	5.0	✓
Conductivity in Water	E100	1427868	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	1430187	1	14	7.1	5.0	✓
Fluoride in Water by IC	E235.F	1427995	1	8	12.5	5.0	✓
Nitrate in Water by IC	E235.NO3	1427996	1	15	6.6	5.0	✓
Nitrite in Water by IC	E235.NO2	1427999	1	14	7.1	5.0	✓
pH by Meter	E108	1427867	1	20	5.0	5.0	✓
Sulfate in Water by IC	E235.SO4	1427997	1	8	12.5	5.0	✓
TDS by Gravimetry	E162	1429472	1	20	5.0	5.0	✓
Method Blanks (MB)							
Alkalinity Species by Titration	E290	1427866	1	20	5.0	5.0	✓
Chloride in Water by IC	E235.Cl	1427998	1	15	6.6	5.0	✓
Conductivity in Water	E100	1427868	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	1430187	1	14	7.1	5.0	✓
Fluoride in Water by IC	E235.F	1427995	1	8	12.5	5.0	✓
Nitrate in Water by IC	E235.NO3	1427996	1	15	6.6	5.0	✓
Nitrite in Water by IC	E235.NO2	1427999	1	14	7.1	5.0	✓
Sulfate in Water by IC	E235.SO4	1427997	1	8	12.5	5.0	✓
TDS by Gravimetry	E162	1429472	1	20	5.0	5.0	✓
Matrix Spikes (MS)							
Chloride in Water by IC	E235.Cl	1427998	1	15	6.6	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	1430187	1	14	7.1	5.0	✓
Fluoride in Water by IC	E235.F	1427995	1	8	12.5	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*
Matrix Spikes (MS) - Continued							
Nitrate in Water by IC	E235.NO3	1427996	1	15	6.6	5.0	✓
Nitrite in Water by IC	E235.NO2	1427999	1	14	7.1	5.0	✓
Sulfate in Water by IC	E235.SO4	1427997	1	8	12.5	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 ALS Environmental - Calgary	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 ALS Environmental - Calgary	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.
TDS by Gravimetry	E162 ALS Environmental - Calgary	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 ALS Environmental - Calgary	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 ALS Environmental - Calgary	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 ALS Environmental - Calgary	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 ALS Environmental - Calgary	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 ALS Environmental - Calgary	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Alkalinity Species by Titration	E290 ALS Environmental - Calgary	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
Dissolved Metals in Water by CRC ICPMS	E421 ALS Environmental - Calgary	Water	APHA 3030B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Dissolved Hardness (Calculated)	EC100 ALS Environmental - Calgary	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 ALS Environmental - Calgary	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. Ion Balance cannot be calculated accurately for waters with very low electrical conductivity (EC).
TDS in Water (Calculation)	EC103 ALS Environmental - Calgary	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 ALS Environmental - Calgary	Water	EPA 300.0	Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Metals Water Filtration	EP421 ALS Environmental - Calgary	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HNO3.

ALS Canada Ltd.

right solutions. right partner.

QUALITY CONTROL REPORT

Work Order	: **CG2405623**	Page	: 1 of 6
Client	: Nautilus Environmental Company Inc.	Laboratory	: ALS Environmental - Calgary
Contact	: Leila Oosterbroek	Account Manager	: Patryk Wojciak
Address	: 10823 27th Street SE Calgary AB Canada T2Z 3V9	Address	: 2559 29th Street NE Calgary, Alberta Canada T1Y 7B5
Telephone	: 403 253 7121	Telephone	: +1 403 407 1800
Project	: ----	Date Samples Received	: 02-May-2024 14:45
PO	: 2324-323AB	Date Analysis Commenced	: 03-May-2024
C-O-C number	: ----	Issue Date	: 08-May-2024 12:05
Sampler	: ----		
Site	: ----		
Quote number	: CG24-NECI100-00001 Nautilus Calgary General		
No. of samples received	: 4		
No. of samples analysed	: 4		

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*
Gurvinder Kour	Lab Assistant	Calgary Metals, Calgary, Alberta
Harpreet Chawla	Team Leader - Inorganics	Calgary Inorganics, Calgary, Alberta
Kevin Baxter	Team Leader - Inorganics	Calgary Inorganics, Calgary, Alberta
Kevin Baxter	Team Leader - Inorganics	Calgary Metals, Calgary, Alberta
Shirley Li	Team Leader - Inorganics	Calgary Inorganics, Calgary, 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: 1427866)											
CG2405622-002	Anonymous	Alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	1260	1170	7.50%	20%	----
Physical Tests (QC Lot: 1427867)											
CG2405622-002	Anonymous	pH	----	E108	0.10	pH units	7.16	7.14	0.280%	4%	----
Physical Tests (QC Lot: 1427868)											
CG2405622-002	Anonymous	Conductivity	----	E100	1.0	µS/cm	2350	2340	0.426%	10%	----
Physical Tests (QC Lot: 1429472)											
CG2405601-012	Anonymous	Solids, total dissolved [TDS]	----	E162	40	mg/L	1390	1360	2.55%	20%	----
Anions and Nutrients (QC Lot: 1427995)											
CG2405623-001	Site Reference (122mg/L TDS) PJ2324-004 - Initiation CD	Fluoride	16984-48-8	E235.F	0.020	mg/L	0.095	0.095	0.0005	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 1427996)											
CG2405623-001	Site Reference (122mg/L TDS) PJ2324-004 - Initiation CD	Nitrate (as N)	14797-55-8	E235.NO3	0.020	mg/L	0.729	0.728	0.0824%	20%	----
Anions and Nutrients (QC Lot: 1427997)											
CG2405623-001	Site Reference (122mg/L TDS) PJ2324-004 - Initiation CD	Sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	73.0	72.7	0.424%	20%	----
Anions and Nutrients (QC Lot: 1427998)											
CG2405623-001	Site Reference (122mg/L TDS) PJ2324-004 - Initiation CD	Chloride	16887-00-6	E235.Cl	0.50	mg/L	1.40	1.41	0.002	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 1427999)											
CG2405623-001	Site Reference (122mg/L TDS) PJ2324-004 - Initiation CD	Nitrite (as N)	14797-65-0	E235.NO2	0.010	mg/L	0.132	0.132	0.152%	20%	----
Dissolved Metals (QC Lot: 1430187)											
CG2405595-001	Anonymous	Calcium, dissolved	7440-70-2	E421	0.100	mg/L	294	297	1.04%	20%	----
		Iron, dissolved	7439-89-6	E421	0.020	mg/L	<0.020	<0.020	0	Diff <2x LOR	----
		Magnesium, dissolved	7439-95-4	E421	0.0100	mg/L	204	201	1.46%	20%	----
		Manganese, dissolved	7439-96-5	E421	0.00020	mg/L	0.00061	0.00063	0.00001	Diff <2x LOR	----
		Potassium, dissolved	7440-09-7	E421	0.100	mg/L	7.70	7.62	1.04%	20%	----
		Sodium, dissolved	7440-23-5	E421	0.100	mg/L	43.1	41.8	2.90%	20%	----

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: 1427866)						
Alkalinity, total (as $CaCO_3$)	----	E290	1	mg/L	<1.0	----
Physical Tests (QCLot: 1427868)						
Conductivity	----	E100	1	µS/cm	<1.0	----
Physical Tests (QCLot: 1429472)						
Solids, total dissolved [TDS]	----	E162	10	mg/L	<10	----
Anions and Nutrients (QCLot: 1427995)						
Fluoride	16984-48-8	E235.F	0.02	mg/L	<0.020	----
Anions and Nutrients (QCLot: 1427996)						
Nitrate (as N)	14797-55-8	E235.NO3	0.02	mg/L	<0.020	----
Anions and Nutrients (QCLot: 1427997)						
Sulfate (as SO_4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 1427998)						
Chloride	16887-00-6	E235.Cl	0.5	mg/L	<0.50	----
Anions and Nutrients (QCLot: 1427999)						
Nitrite (as N)	14797-65-0	E235.NO2	0.01	mg/L	<0.010	----
Dissolved Metals (QCLot: 1430187)						
Calcium, dissolved	7440-70-2	E421	0.05	mg/L	<0.050	----
Iron, dissolved	7439-89-6	E421	0.01	mg/L	<0.010	----
Magnesium, dissolved	7439-95-4	E421	0.005	mg/L	<0.0050	----
Manganese, dissolved	7439-96-5	E421	0.0001	mg/L	<0.00010	----
Potassium, dissolved	7440-09-7	E421	0.05	mg/L	<0.050	----
Sodium, dissolved	7440-23-5	E421	0.05	mg/L	<0.050	----

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	Target Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 1427866)									
Alkalinity, total (as CaCO3)	----	E290	1	mg/L	500 mg/L	100	85.0	115	----
Physical Tests (QCLot: 1427867)									
pH	----	E108	----	pH units	7 pH units	100	98.0	102	----
Physical Tests (QCLot: 1427868)									
Conductivity	----	E100	1	µS/cm	147 µS/cm	101	90.0	110	----
Physical Tests (QCLot: 1429472)									
Solids, total dissolved [TDS]	----	E162	10	mg/L	1000 mg/L	95.5	85.0	115	----
Anions and Nutrients (QCLot: 1427995)									
Fluoride	16984-48-8	E235.F	0.02	mg/L	1 mg/L	101	90.0	110	----
Anions and Nutrients (QCLot: 1427996)									
Nitrate (as N)	14797-55-8	E235.NO3	0.02	mg/L	2.5 mg/L	99.2	90.0	110	----
Anions and Nutrients (QCLot: 1427997)									
Sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	100	90.0	110	----
Anions and Nutrients (QCLot: 1427998)									
Chloride	16887-00-6	E235.Cl	0.5	mg/L	100 mg/L	101	90.0	110	----
Anions and Nutrients (QCLot: 1427999)									
Nitrite (as N)	14797-65-0	E235.NO2	0.01	mg/L	0.5 mg/L	99.4	90.0	110	----
Dissolved Metals (QCLot: 1430187)									
Calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	102	80.0	120	----
Iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	103	80.0	120	----
Magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	105	80.0	120	----
Manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	99.6	80.0	120	----
Potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	105	80.0	120	----
Sodium, dissolved	7440-23-5	E421	0.05	mg/L	50 mg/L	104	80.0	120	----

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: 1427995)										
CG2405623-002	889 mg/L TDS PJ2324-004 - Initiation CD	Fluoride	16984-48-8	E235.F	1.06 mg/L	1 mg/L	106	75.0	125	----
Anions and Nutrients (QCLot: 1427996)										
CG2405623-002	889 mg/L TDS PJ2324-004 - Initiation CD	Nitrate (as N)	14797-55-8	E235.NO3	ND mg/L	----	ND	75.0	125	----
Anions and Nutrients (QCLot: 1427997)										
CG2405623-002	889 mg/L TDS PJ2324-004 - Initiation CD	Sulfate (as SO4)	14808-79-8	E235.SO4	ND mg/L	----	ND	75.0	125	----
Anions and Nutrients (QCLot: 1427998)										
CG2405623-002	889 mg/L TDS PJ2324-004 - Initiation CD	Chloride	16887-00-6	E235.Cl	ND mg/L	----	ND	75.0	125	----
Anions and Nutrients (QCLot: 1427999)										
CG2405623-002	889 mg/L TDS PJ2324-004 - Initiation CD	Nitrite (as N)	14797-65-0	E235.NO2	0.518 mg/L	0.5 mg/L	104	75.0	125	----
Dissolved Metals (QCLot: 1430187)										
CG2405595-002	Anonymous	Calcium, dissolved	7440-70-2	E421	ND mg/L	----	ND	70.0	130	----
		Iron, dissolved	7439-89-6	E421	19.1 mg/L	20 mg/L	95.5	70.0	130	----
		Magnesium, dissolved	7439-95-4	E421	ND mg/L	----	ND	70.0	130	----
		Manganese, dissolved	7439-96-5	E421	0.195 mg/L	0.2 mg/L	97.7	70.0	130	----
		Potassium, dissolved	7440-09-7	E421	39.9 mg/L	40 mg/L	99.8	70.0	130	----
		Sodium, dissolved	7440-23-5	E421	ND mg/L	----	ND	70.0	130	----

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Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

COC Number: 22 -

Page 1 of 1

Report To	Contact and company name below will appear on the final report	Reports / Recipients		Turnaround Time (TAT) Requested
Company:	Nautilus Environmental	Select Report Format: ☑ PDF ☑ EXCEL ☐ EDD (DIGITAL)		☑ Routine [R] if received by 3pm M-F - no surcharges apply
Contact:	Leila Oosterbroek	Merge QC/QCI Reports with COA ☑ YES ☐ NO ☐ N/A		☐ 4 day [P4] if received by 3pm M-F - 20% rush surcharge minimum
Phone:	403-253-7121	☐ Compare Results to Criteria on Report - provide details below if box checked		☐ 3 day [P3] if received by 3pm M-F - 25% rush surcharge minimum
	Company address below will appear on the final report	Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX		☐ 2 day [P2] if received by 3pm M-F - 50% rush surcharge minimum
Street:	10823 27 St SE	Email 1 or Fax	leila@nautilusenvironmental.ca; melanie@nautiluse	☐ 1 day [E] if received by 3pm M-F - 100% rush surcharge minimum
City/Province:	Calgary, AB	Email 2	lisa.ramilo@agnicoeagle.com	☐ Same day [E2] if received by 10am M-S - 200% rush surcharge.
Postal Code:	T2Z 3V9	Email 3	breda.rahmanian@wsp.com	Additional fees may apply to rush requests on weekends, statutory holidays and for non-routine tests.
Invoice To	Same as Report To ☑ YES ☐ NO	Invoice Recipients		Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm am/pm
	Copy of Invoice with Report ☑ YES ☐ NO	Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX		For all tests with rush TATs requested, please contact your AM to confirm availability.
Company:	Nautilus Environmental	Email 1 or Fax	accounting@nautilusenvironmental.ca	
Contact:	Leila Oosterbroek	Email 2	leila@nautilusenvironmental.ca	

AFFIX ALS BARCODE LABEL HERE (ALS use only)

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:		AFE/Cost Center:	PO#
Job #:		Major/Minor Code:	Routing Code:
PO / AFE:	2324-323AB	Requisitioner:	
LSD:		Location:	
ALS Lab Work Order # (ALS use only):		ALS Contact:	Sampler:

Environmental Division
Calgary
Work Order Reference
CG2405623

Telephone : +1 403 407 1800

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	E162 - measured TDS	PR01 - Routine	PR01 - Routine (dissolved metals bo (F)	SAMPLES ON HOLD	EXTENDED STORAGE REQUIRED	SUSPECTED HAZARD (see notes)
	Site Reference (122 mg/L TDS) PJ2324-004 - Initiation CD	02-May-24	1130	water	2	R	R	R			
	889 mg/L TDS PJ2324-004 - Initiation CD	↓	↓	water	2	R	R	R			
	1,414mg/L TDS PJ2324-004 - Initiation CD	↓	↓	water	2	R	R	R			
	2,296 mg/L TDS PJ2324-004 - Initiation CD	↓	↓	water	2	R	R	R			

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)

SAMPLE RECEIPT DETAILS (ALS use only)

Cooling Method: ☐ NONE ☐ ICE ☐ ICE PACKS ☐ FROZEN ☐ COOLING INITIATED

Submission Comments identified on Sample Receipt Notification: ☐ YES ☐ NO

Cooler Custody Seals Intact: ☐ YES ☐ N/A Sample Custody Seals Intact: ☐ YES ☐ N/A

INITIAL COOLER TEMPERATURES °C | FINAL COOLER TEMPERATURES °C: 12

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (ALS use only)			FINAL SHIPMENT RECEPTION (ALS use only)		
Released by: [signature]	Date: 2024/05/02	Time: 1200	Received by:	Date:	Time:	Received by: [signature]	Date: 5/2	Time: 1415

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

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.

FEB 2022 FRONT

CERTIFICATE OF ANALYSIS

Work Order	: **CG2406209**	Page	: 1 of 4
Client	: **Nautilus Environmental Company Inc.**	Laboratory	: ALS Environmental - Calgary
Contact	: Leila Oosterbroek	Account Manager	: Patryk Wojciak
Address	: 10823 27th Street SE Calgary AB Canada T2Z 3V9	Address	: 2559 29th Street NE Calgary AB Canada T1Y 7B5
Telephone	: 403 253 7121	Telephone	: +1 403 407 1800
Project	: ----	Date Samples Received	: 13-May-2024 15:10
PO	: 2324-324AB	Date Analysis Commenced	: 13-May-2024
C-O-C number	: ----	Issue Date	: 20-May-2024 19:20
Sampler	: ----		
Site	: ----		
Quote number	: CG24-NECI100-00001 Nautilus Calgary General		
No. of samples received	: 4		
No. of samples analysed	: 4		

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

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*
Anthony Calero	Supervisor - Inorganic	Inorganics, Calgary, Alberta
Gurvinder Kour	Lab Assistant	Metals, Calgary, Alberta
Katarzyna Glinka	Analyst	Inorganics, Calgary, Alberta
Kevin Baxter	Team Leader - Inorganics	Inorganics, Calgary, Alberta
Kevin Baxter	Team Leader - Inorganics	Metals, Calgary, 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 units
%	percent
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*
DLDS	*Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.*
IB:INT	*Ion Balance Reviewed: Imbalance is due to interference or non-measured component.*

Analytical Results

Sub-Matrix: Water
(Matrix: Water)

Analyte	CAS Number	Method/Lab	LOR	Unit	Site Reference (122 mg/L TDS) PJ2324-004 - Termination CD	889 mg/L TDS PJ2324-004 - Termination CD	1,414 mg/L TDS PJ2324-004 - Termination CD	2,296 mg/L TDS PJ2324-004 - Termination CD	----
Client sampling date / time					09-May-2024 08:00	09-May-2024 08:05	09-May-2024 08:10	09-May-2024 08:15	----
					CG2406209-001	CG2406209-002	CG2406209-003	CG2406209-004	--------
					Result	Result	Result	Result	----
Physical Tests									
Hardness (as CaCO3), dissolved	----	EC100/CG	0.50	mg/L	77.8	280	420	812	----
Solids, total dissolved [TDS]	----	E162/CG	10	mg/L	180	785	1210	2390	----
Conductivity	----	EC100/CG	2.0	µS/cm	229	1280	1920	3110	----
pH	----	E108/CG	0.10	pH units	7.50	7.40	7.46	7.46	----
Alkalinity, bicarbonate (as HCO3)	71-52-3	E290/CG	1.0	mg/L	33.4	33.3	32.7	34.5	----
Alkalinity, carbonate (as CO3)	3812-32-6	E290/CG	1.0	mg/L	<1.0	<1.0	<1.0	<1.0	----
Alkalinity, hydroxide (as OH)	14280-30-9	E290/CG	1.0	mg/L	<1.0	<1.0	<1.0	<1.0	----
Alkalinity, total (as CaCO3)	----	E290/CG	2.0	mg/L	27.4	27.3	26.8	28.3	----
Solids, total dissolved [TDS], calculated	----	EC103/CG	1.0	mg/L	131	810	1280	2260	----
Anions and Nutrients									
Chloride	16887-00-6	E235.Cl/CG	0.50	mg/L	1.71	123	208	353	----
Fluoride	16984-48-8	E235.F/CG	0.020	mg/L	0.095	<0.100 DLDS	<0.100 DLDS	<0.100 DLDS	----
Nitrate (as N)	14797-55-8	E235.NO3/CG	0.020	mg/L	0.796	15.6	25.7	42.9	----
Nitrite (as N)	14797-65-0	E235.NO2/CG	0.010	mg/L	0.134	0.135	0.146	0.139	----
Sulfate (as SO4)	14808-79-8	E235.SO4/CG	0.30	mg/L	73.4	365	564	979	----
Nitrate + Nitrite (as N)	----	EC235.N+N/CG	0.0500	mg/L	0.930	15.7	25.8	43.0	----
Ion Balance									
Anion sum	----	EC101/CG	0.10	meq/L	2.20	12.7	20.0	34.0	----
Cation sum	----	EC101/CG	0.10	meq/L	1.73	10.8	17.1	32.9	----
Ion balance (APHA)	----	EC101/CG	0.01	%	-12.0 IB:INT	-8.08	-7.82	-1.64	----
Ion balance (cations/anions)	----	EC101/CG	0.010	%	78.6 IB:INT	85.0	85.5	96.8	----
Dissolved Metals									
Calcium, dissolved	7440-70-2	E421/CG	0.050	mg/L	29.3	96.1	143	278	----
Iron, dissolved	7439-89-6	E421/CG	0.010	mg/L	0.063	0.060	0.062	0.057	----
Magnesium, dissolved	7439-95-4	E421/CG	0.0050	mg/L	1.13	9.72	15.4	28.6	----
Manganese, dissolved	7439-96-5	E421/CG	0.00010	mg/L	0.00205	0.00680	0.0108	0.0159	----
Potassium, dissolved	7440-09-7	E421/CG	0.050	mg/L	1.01	24.8	41.2	83.7	----

Analytical Results

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

				Client sample ID	Site Reference (122 mg/L TDS) PJ2324-004 - Termination CD	889 mg/L TDS PJ2324-004 - Termination CD	1,414 mg/L TDS PJ2324-004 - Termination CD	2,296 mg/L TDS PJ2324-004 - Termination CD	----
				Client sampling date / time	09-May-2024 08:00	09-May-2024 08:05	09-May-2024 08:10	09-May-2024 08:15	----
Analyte	CAS Number	Method/Lab	LOR	Unit	CG2406209-001	CG2406209-002	CG2406209-003	CG2406209-004	--------
					Result	Result	Result	Result	----
Dissolved Metals									
Sodium, dissolved	7440-23-5	E421/CG	0.050	mg/L	3.41	105	175	334	----
Dissolved metals filtration location	----	EP421/CG	-	-	Field	Field	Field	Field	----

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

Please refer to the Accreditation section for an explanation of analyte accreditations.

ALS Canada Ltd.

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **CG2406209**	Page	: 1 of 11
Client	: **Nautilus Environmental Company Inc.**	Laboratory	: ALS Environmental - Calgary
Contact	: Leila Oosterbroek	Account Manager	: Patryk Wojciak
Address	: 10823 27th Street SE Calgary AB Canada T2Z 3V9	Address	: 2559 29th Street NE Calgary, Alberta Canada T1Y 7B5
Telephone	: 403 253 7121	Telephone	: +1 403 407 1800
Project	: ----	Date Samples Received	: 13-May-2024 15:10
PO	: 2324-324AB	Issue Date	: 20-May-2024 19:20
C-O-C number	: ----		
Sampler	: ----		
Site	: ----		
Quote number	: CG24-NECI100-00001 Nautilus Calgary General		
No. of samples received	: 4		
No. of samples analysed	: 4		

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 : Analytical Method 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 1,414 mg/L TDS PJ2324-004 - Termination CD	E235.Cl	09-May-2024	13-May-2024	28 days	4 days	✓	13-May-2024	28 days	4 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE 2,296 mg/L TDS PJ2324-004 - Termination CD	E235.Cl	09-May-2024	13-May-2024	28 days	4 days	✓	13-May-2024	28 days	4 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE 889 mg/L TDS PJ2324-004 - Termination CD	E235.Cl	09-May-2024	13-May-2024	28 days	4 days	✓	13-May-2024	28 days	4 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE Site Reference (122 mg/L TDS) PJ2324-004 - Termination CD	E235.Cl	09-May-2024	13-May-2024	28 days	4 days	✓	13-May-2024	28 days	4 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE 1,414 mg/L TDS PJ2324-004 - Termination CD	E235.F	09-May-2024	13-May-2024	28 days	4 days	✓	13-May-2024	28 days	4 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE 2,296 mg/L TDS PJ2324-004 - Termination CD	E235.F	09-May-2024	13-May-2024	28 days	4 days	✓	13-May-2024	28 days	4 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE 889 mg/L TDS PJ2324-004 - Termination CD	E235.F	09-May-2024	13-May-2024	28 days	4 days	✓	13-May-2024	28 days	4 days	✓

Matrix: **Water**

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

Analyte Group : Analytical Method / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis: Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Fluoride in Water by IC										
HDPE Site Reference (122 mg/L TDS) PJ2324-004 - Termination CD	E235.F	09-May-2024	13-May-2024	28 days	4 days	✓	13-May-2024	28 days	4 days	✓
Anions and Nutrients : Nitrate in Water by IC										
HDPE 1,414 mg/L TDS PJ2324-004 - Termination CD	E235.NO3	09-May-2024	13-May-2024	3 days	4 days	× EHTR	13-May-2024	3 days	4 days	× EHTR
Anions and Nutrients : Nitrate in Water by IC										
HDPE 2,296 mg/L TDS PJ2324-004 - Termination CD	E235.NO3	09-May-2024	13-May-2024	3 days	4 days	× EHTR	13-May-2024	3 days	4 days	× EHTR
Anions and Nutrients : Nitrate in Water by IC										
HDPE 889 mg/L TDS PJ2324-004 - Termination CD	E235.NO3	09-May-2024	13-May-2024	3 days	4 days	× EHTR	13-May-2024	3 days	4 days	× EHTR
Anions and Nutrients : Nitrate in Water by IC										
HDPE Site Reference (122 mg/L TDS) PJ2324-004 - Termination CD	E235.NO3	09-May-2024	13-May-2024	3 days	4 days	× EHTR	13-May-2024	3 days	4 days	× EHTR
Anions and Nutrients : Nitrite in Water by IC										
HDPE 1,414 mg/L TDS PJ2324-004 - Termination CD	E235.NO2	09-May-2024	13-May-2024	3 days	4 days	× EHTR	13-May-2024	3 days	4 days	× EHTR
Anions and Nutrients : Nitrite in Water by IC										
HDPE 2,296 mg/L TDS PJ2324-004 - Termination CD	E235.NO2	09-May-2024	13-May-2024	3 days	4 days	× EHTR	13-May-2024	3 days	4 days	× EHTR
Anions and Nutrients : Nitrite in Water by IC										
HDPE 889 mg/L TDS PJ2324-004 - Termination CD	E235.NO2	09-May-2024	13-May-2024	3 days	4 days	× EHTR	13-May-2024	3 days	4 days	× EHTR
Anions and Nutrients : Nitrite in Water by IC										
HDPE Site Reference (122 mg/L TDS) PJ2324-004 - Termination CD	E235.NO2	09-May-2024	13-May-2024	3 days	4 days	× EHTR	13-May-2024	3 days	4 days	× EHTR

Matrix: **Water**

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

Analyte Group : Analytical Method Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis: Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Sulfate in Water by IC										
HDPE 1,414 mg/L TDS PJ2324-004 - Termination CD	E235.SO4	09-May-2024	13-May-2024	28 days	4 days	✓	13-May-2024	28 days	4 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE 2,296 mg/L TDS PJ2324-004 - Termination CD	E235.SO4	09-May-2024	13-May-2024	28 days	4 days	✓	13-May-2024	28 days	4 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE 889 mg/L TDS PJ2324-004 - Termination CD	E235.SO4	09-May-2024	13-May-2024	28 days	4 days	✓	13-May-2024	28 days	4 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE Site Reference (122 mg/L TDS) PJ2324-004 - Termination CD	E235.SO4	09-May-2024	13-May-2024	28 days	4 days	✓	13-May-2024	28 days	4 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE - dissolved (lab preserved) 1,414 mg/L TDS PJ2324-004 - Termination CD	E421	09-May-2024	14-May-2024	180 days	5 days	✓	16-May-2024	180 days	7 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE - dissolved (lab preserved) 2,296 mg/L TDS PJ2324-004 - Termination CD	E421	09-May-2024	14-May-2024	180 days	5 days	✓	16-May-2024	180 days	7 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE - dissolved (lab preserved) 889 mg/L TDS PJ2324-004 - Termination CD	E421	09-May-2024	14-May-2024	180 days	5 days	✓	16-May-2024	180 days	7 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE - dissolved (lab preserved) Site Reference (122 mg/L TDS) PJ2324-004 - Termination CD	E421	09-May-2024	14-May-2024	180 days	5 days	✓	16-May-2024	180 days	7 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE 1,414 mg/L TDS PJ2324-004 - Termination CD	E290	09-May-2024	14-May-2024	14 days	5 days	✓	14-May-2024	14 days	5 days	✓

Matrix: **Water**

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

Analyte Group : Analytical Method / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis: Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Alkalinity Species by Titration										
HDPE 2,296 mg/L TDS PJ2324-004 - Termination CD	E290	09-May-2024	14-May-2024	14 days	5 days	✔	14-May-2024	14 days	5 days	✔
Physical Tests : Alkalinity Species by Titration										
HDPE 889 mg/L TDS PJ2324-004 - Termination CD	E290	09-May-2024	14-May-2024	14 days	5 days	✔	14-May-2024	14 days	5 days	✔
Physical Tests : Alkalinity Species by Titration										
HDPE Site Reference (122 mg/L TDS) PJ2324-004 - Termination CD	E290	09-May-2024	14-May-2024	14 days	5 days	✔	14-May-2024	14 days	5 days	✔
Physical Tests : Conductivity in Water										
HDPE 1,414 mg/L TDS PJ2324-004 - Termination CD	E100	09-May-2024	14-May-2024	28 days	5 days	✔	14-May-2024	28 days	5 days	✔
Physical Tests : Conductivity in Water										
HDPE 2,296 mg/L TDS PJ2324-004 - Termination CD	E100	09-May-2024	14-May-2024	28 days	5 days	✔	14-May-2024	28 days	5 days	✔
Physical Tests : Conductivity in Water										
HDPE 889 mg/L TDS PJ2324-004 - Termination CD	E100	09-May-2024	14-May-2024	28 days	5 days	✔	14-May-2024	28 days	5 days	✔
Physical Tests : Conductivity in Water										
HDPE Site Reference (122 mg/L TDS) PJ2324-004 - Termination CD	E100	09-May-2024	14-May-2024	28 days	5 days	✔	14-May-2024	28 days	5 days	✔
Physical Tests : pH by Meter										
HDPE 1,414 mg/L TDS PJ2324-004 - Termination CD	E108	09-May-2024	14-May-2024	0.25 hrs	123 hrs	✖ EHTR-FM	14-May-2024	0.25 hrs	123 hrs	✖ EHTR-FM
Physical Tests : pH by Meter										
HDPE 2,296 mg/L TDS PJ2324-004 - Termination CD	E108	09-May-2024	14-May-2024	0.25 hrs	123 hrs	✖ EHTR-FM	14-May-2024	0.25 hrs	123 hrs	✖ EHTR-FM

Matrix: **Water**

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

Analyte Group : Analytical Method / 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 : pH by Meter										
HDPE 889 mg/L TDS PJ2324-004 - Termination CD	E108	09-May-2024	14-May-2024	0.25 hrs	123 hrs	✖ EHTR-FM	14-May-2024	0.25 hrs	123 hrs	✖ EHTR-FM
Physical Tests : pH by Meter										
HDPE Site Reference (122 mg/L TDS) PJ2324-004 - Termination CD	E108	09-May-2024	14-May-2024	0.25 hrs	123 hrs	✖ EHTR-FM	14-May-2024	0.25 hrs	123 hrs	✖ EHTR-FM
Physical Tests : TDS by Gravimetry										
HDPE 1,414 mg/L TDS PJ2324-004 - Termination CD	E162	09-May-2024	----	----	----		16-May-2024	7 days	7 days	✓
Physical Tests : TDS by Gravimetry										
HDPE 2,296 mg/L TDS PJ2324-004 - Termination CD	E162	09-May-2024	----	----	----		16-May-2024	7 days	7 days	✓
Physical Tests : TDS by Gravimetry										
HDPE 889 mg/L TDS PJ2324-004 - Termination CD	E162	09-May-2024	----	----	----		16-May-2024	7 days	7 days	✓
Physical Tests : TDS by Gravimetry										
HDPE Site Reference (122 mg/L TDS) PJ2324-004 - Termination CD	E162	09-May-2024	----	----	----		16-May-2024	7 days	7 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.

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	1441751	1	19	5.2	5.0	✓
Chloride in Water by IC	E235.Cl	1440445	1	7	14.2	5.0	✓
Conductivity in Water	E100	1441749	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	1442711	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	1440437	1	17	5.8	5.0	✓
Nitrate in Water by IC	E235.NO3	1440443	1	5	20.0	5.0	✓
Nitrite in Water by IC	E235.NO2	1440444	1	5	20.0	5.0	✓
pH by Meter	E108	1441750	1	20	5.0	5.0	✓
Sulfate in Water by IC	E235.SO4	1440442	1	17	5.8	5.0	✓
TDS by Gravimetry	E162	1444190	1	20	5.0	5.0	✓
Laboratory Control Samples (LCS)							
Alkalinity Species by Titration	E290	1441751	1	19	5.2	5.0	✓
Chloride in Water by IC	E235.Cl	1440445	1	7	14.2	5.0	✓
Conductivity in Water	E100	1441749	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	1442711	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	1440437	1	17	5.8	5.0	✓
Nitrate in Water by IC	E235.NO3	1440443	1	5	20.0	5.0	✓
Nitrite in Water by IC	E235.NO2	1440444	1	5	20.0	5.0	✓
pH by Meter	E108	1441750	1	20	5.0	5.0	✓
Sulfate in Water by IC	E235.SO4	1440442	1	17	5.8	5.0	✓
TDS by Gravimetry	E162	1444190	1	20	5.0	5.0	✓
Method Blanks (MB)							
Alkalinity Species by Titration	E290	1441751	1	19	5.2	5.0	✓
Chloride in Water by IC	E235.Cl	1440445	1	7	14.2	5.0	✓
Conductivity in Water	E100	1441749	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	1442711	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	1440437	1	17	5.8	5.0	✓
Nitrate in Water by IC	E235.NO3	1440443	1	5	20.0	5.0	✓
Nitrite in Water by IC	E235.NO2	1440444	1	5	20.0	5.0	✓
Sulfate in Water by IC	E235.SO4	1440442	1	17	5.8	5.0	✓
TDS by Gravimetry	E162	1444190	1	20	5.0	5.0	✓
Matrix Spikes (MS)							
Chloride in Water by IC	E235.Cl	1440445	1	7	14.2	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	1442711	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	1440437	1	17	5.8	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*
Matrix Spikes (MS) - Continued							
Nitrate in Water by IC	E235.NO3	1440443	1	5	20.0	5.0	✓
Nitrite in Water by IC	E235.NO2	1440444	1	5	20.0	5.0	✓
Sulfate in Water by IC	E235.SO4	1440442	1	17	5.8	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 ALS Environmental - Calgary	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 ALS Environmental - Calgary	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.
TDS by Gravimetry	E162 ALS Environmental - Calgary	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 ALS Environmental - Calgary	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 ALS Environmental - Calgary	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 ALS Environmental - Calgary	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 ALS Environmental - Calgary	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 ALS Environmental - Calgary	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Alkalinity Species by Titration	E290 ALS Environmental - Calgary	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
Dissolved Metals in Water by CRC ICPMS	E421 ALS Environmental - Calgary	Water	APHA 3030B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Dissolved Hardness (Calculated)	EC100 ALS Environmental - Calgary	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 ALS Environmental - Calgary	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. Ion Balance cannot be calculated accurately for waters with very low electrical conductivity (EC).
TDS in Water (Calculation)	EC103 ALS Environmental - Calgary	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 ALS Environmental - Calgary	Water	EPA 300.0	Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Metals Water Filtration	EP421 ALS Environmental - Calgary	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HNO3.

ALS Canada Ltd.

QUALITY CONTROL REPORT

Work Order	: **CG2406209**	Page	: 1 of 6
Client	: Nautilus Environmental Company Inc.	Laboratory	: ALS Environmental - Calgary
Contact	: Leila Oosterbroek	Account Manager	: Patryk Wojciak
Address	: 10823 27th Street SE Calgary AB Canada T2Z 3V9	Address	: 2559 29th Street NE Calgary, Alberta Canada T1Y 7B5
Telephone	: 403 253 7121	Telephone	: +1 403 407 1800
Project	: ----	Date Samples Received	: 13-May-2024 15:10
PO	: 2324-324AB	Date Analysis Commenced	: 13-May-2024
C-O-C number	: ----	Issue Date	: 20-May-2024 19:20
Sampler	: ----		
Site	: ----		
Quote number	: CG24-NECI100-00001 Nautilus Calgary General		
No. of samples received	: 4		
No. of samples analysed	: 4		

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*
Anthony Calero	Supervisor - Inorganic	Calgary Inorganics, Calgary, Alberta
Gurvinder Kour	Lab Assistant	Calgary Metals, Calgary, Alberta
Katarzyna Glinka	Analyst	Calgary Inorganics, Calgary, Alberta
Kevin Baxter	Team Leader - Inorganics	Calgary Inorganics, Calgary, Alberta
Kevin Baxter	Team Leader - Inorganics	Calgary Metals, Calgary, 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: 1441749)											
CG2406185-019	Anonymous	Conductivity	----	E100	2.0	µS/cm	1850	1850	0.108%	10%	----
Physical Tests (QC Lot: 1441750)											
CG2406185-019	Anonymous	pH	----	E108	0.10	pH units	7.75	7.73	0.258%	4%	----
Physical Tests (QC Lot: 1441751)											
CG2406185-019	Anonymous	Alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	505	506	0.198%	20%	----
Physical Tests (QC Lot: 1444190)											
CG2406156-010	Anonymous	Solids, total dissolved [TDS]	----	E162	40	mg/L	1690	1750	3.66%	20%	----
Anions and Nutrients (QC Lot: 1440437)											
CG2406192-001	Anonymous	Fluoride	16984-48-8	E235.F	0.100	mg/L	0.252	0.252	0.0001	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 1440442)											
CG2406192-001	Anonymous	Sulfate (as SO4)	14808-79-8	E235.SO4	1.50	mg/L	916	916	0.0209%	20%	----
Anions and Nutrients (QC Lot: 1440443)											
CG2406209-001	Site Reference (122 mg/L TDS) PJ2324-004 - Termination CD	Nitrate (as N)	14797-55-8	E235.NO3	0.020	mg/L	0.796	0.797	0.0879%	20%	----
Anions and Nutrients (QC Lot: 1440444)											
CG2406209-001	Site Reference (122 mg/L TDS) PJ2324-004 - Termination CD	Nitrite (as N)	14797-65-0	E235.NO2	0.010	mg/L	0.134	0.134	0.298%	20%	----
Anions and Nutrients (QC Lot: 1440445)											
CG2406209-001	Site Reference (122 mg/L TDS) PJ2324-004 - Termination CD	Chloride	16887-00-6	E235.Cl	0.50	mg/L	1.71	1.73	0.02	Diff <2x LOR	----
Dissolved Metals (QC Lot: 1442711)											
CG2406152-001	Anonymous	Calcium, dissolved	7440-70-2	E421	0.100	mg/L	106	102	3.87%	20%	----
		Iron, dissolved	7439-89-6	E421	0.020	mg/L	<0.020	<0.020	0	Diff <2x LOR	----
		Magnesium, dissolved	7439-95-4	E421	0.0100	mg/L	150	144	4.30%	20%	----
		Manganese, dissolved	7439-96-5	E421	0.00020	mg/L	1.00	0.956	4.94%	20%	----
		Potassium, dissolved	7440-09-7	E421	0.100	mg/L	4.58	4.42	3.72%	20%	----
		Sodium, dissolved	7440-23-5	E421	0.100	mg/L	171	164	4.04%	20%	----

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: 1441749)						
Conductivity	----	E100	1	µS/cm	<1.0	----
Physical Tests (QCLot: 1441751)						
Alkalinity, total (as CaCO3)	----	E290	1	mg/L	<1.0	----
Physical Tests (QCLot: 1444190)						
Solids, total dissolved [TDS]	----	E162	10	mg/L	<10	----
Anions and Nutrients (QCLot: 1440437)						
Fluoride	16984-48-8	E235.F	0.02	mg/L	<0.020	----
Anions and Nutrients (QCLot: 1440442)						
Sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 1440443)						
Nitrate (as N)	14797-55-8	E235.NO3	0.02	mg/L	<0.020	----
Anions and Nutrients (QCLot: 1440444)						
Nitrite (as N)	14797-65-0	E235.NO2	0.01	mg/L	<0.010	----
Anions and Nutrients (QCLot: 1440445)						
Chloride	16887-00-6	E235.Cl	0.5	mg/L	<0.50	----
Dissolved Metals (QCLot: 1442711)						
Calcium, dissolved	7440-70-2	E421	0.05	mg/L	<0.050	----
Iron, dissolved	7439-89-6	E421	0.01	mg/L	<0.010	----
Magnesium, dissolved	7439-95-4	E421	0.005	mg/L	<0.0050	----
Manganese, dissolved	7439-96-5	E421	0.0001	mg/L	<0.00010	----
Potassium, dissolved	7440-09-7	E421	0.05	mg/L	<0.050	----
Sodium, dissolved	7440-23-5	E421	0.05	mg/L	<0.050	----

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	Target Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 1441749)									
Conductivity	----	E100	1	µS/cm	147 µS/cm	91.8	90.0	110	----
Physical Tests (QCLot: 1441750)									
pH	----	E108	----	pH units	7 pH units	101	98.0	102	----
Physical Tests (QCLot: 1441751)									
Alkalinity, total (as CaCO3)	----	E290	1	mg/L	500 mg/L	97.3	85.0	115	----
Physical Tests (QCLot: 1444190)									
Solids, total dissolved [TDS]	----	E162	10	mg/L	1000 mg/L	94.5	85.0	115	----
Anions and Nutrients (QCLot: 1440437)									
Fluoride	16984-48-8	E235.F	0.02	mg/L	1 mg/L	104	90.0	110	----
Anions and Nutrients (QCLot: 1440442)									
Sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	102	90.0	110	----
Anions and Nutrients (QCLot: 1440443)									
Nitrate (as N)	14797-55-8	E235.NO3	0.02	mg/L	2.5 mg/L	102	90.0	110	----
Anions and Nutrients (QCLot: 1440444)									
Nitrite (as N)	14797-65-0	E235.NO2	0.01	mg/L	0.5 mg/L	104	90.0	110	----
Anions and Nutrients (QCLot: 1440445)									
Chloride	16887-00-6	E235.Cl	0.5	mg/L	100 mg/L	101	90.0	110	----
Dissolved Metals (QCLot: 1442711)									
Calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	95.2	80.0	120	----
Iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	113	80.0	120	----
Magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	98.8	80.0	120	----
Manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	92.8	80.0	120	----
Potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	97.9	80.0	120	----
Sodium, dissolved	7440-23-5	E421	0.05	mg/L	50 mg/L	96.2	80.0	120	----

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: 1440437)										
CG2406194-006	Anonymous	Fluoride	16984-48-8	E235.F	1.05 mg/L	1 mg/L	105	75.0	125	----
Anions and Nutrients (QCLot: 1440442)										
CG2406194-006	Anonymous	Sulfate (as SO4)	14808-79-8	E235.SO4	102 mg/L	100 mg/L	102	75.0	125	----
Anions and Nutrients (QCLot: 1440443)										
CG2406209-002	889 mg/L TDS PJ2324-004 - Termination CD	Nitrate (as N)	14797-55-8	E235.NO3	ND mg/L	----	ND	75.0	125	----
Anions and Nutrients (QCLot: 1440444)										
CG2406209-002	889 mg/L TDS PJ2324-004 - Termination CD	Nitrite (as N)	14797-65-0	E235.NO2	0.528 mg/L	0.5 mg/L	106	75.0	125	----
Anions and Nutrients (QCLot: 1440445)										
CG2406209-002	889 mg/L TDS PJ2324-004 - Termination CD	Chloride	16887-00-6	E235.Cl	ND mg/L	----	ND	75.0	125	----
Dissolved Metals (QCLot: 1442711)										
CG2406163-001	Anonymous	Calcium, dissolved	7440-70-2	E421	ND mg/L	----	ND	70.0	130	----
		Iron, dissolved	7439-89-6	E421	19.1 mg/L	20 mg/L	95.6	70.0	130	----
		Magnesium, dissolved	7439-95-4	E421	ND mg/L	----	ND	70.0	130	----
		Manganese, dissolved	7439-96-5	E421	0.183 mg/L	0.2 mg/L	91.7	70.0	130	----
		Potassium, dissolved	7440-09-7	E421	38.9 mg/L	40 mg/L	97.2	70.0	130	----
		Sodium, dissolved	7440-23-5	E421	ND mg/L	----	ND	70.0	130	----

Chain of Custody (COC) / Analytical Request Form

COC Number: **22 -**

Page 1 of 1

Canada Toll Free: 1 800 668 9878

ALS www.alsglobal.com

Environmental Division
Calgary
Work Order Reference
CG2406209

Telephone : + 1 403 407 1800

Report To	Contact and company name below will appear on the final report
Company:	Nautilus Environmental
Contact:	Leila Oosterbroek
Phone:	403-253-7121
	Company address below will appear on the final report
Street:	10823 27 St SE
City/Province:	Calgary, AB
Postal Code:	T2Z 3V9
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☑ YES ☐ NO
Company:	Nautilus Environmental
Contact:	Leila Oosterbroek

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 leila@nautilusenvironmental.ca; melanie@nautiluse

Email 2 lisa.ramilo@agnicoeagle.com

Email 3 breda.rahmanian@wsp.com

Invoice Recipients

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax accounting@nautilusenvironmental.ca

Email 2 leila@nautilusenvironmental.ca

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 mini
☐ 3 day [P3] if received by 3pm M-F - 25% rush surcharge min
☐ 2 day [P2] if received by 3pm M-F - 50% rush surcharge min
☐ 1 day [E] if received by 3pm M-F - 100% rush surcharge min
☐ Same day [E2] if received by 10am M-S - 200% rush surchai

Additional fees may apply to rush requests on weeke

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

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

Project Information

ALS Account # / Quote #:

Job #:

PO / AFE: 2324-324AB

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): 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	E162 - measured TDS	PR01 - Routine	PR01 - Routine (dissolved metals bot (F)	SAMPLES ON HOLD	EXTENDED STORAGE REQUIRED	SUSPECTED HAZARD (see notes)
	Site Reference (122 mg/L TDS) PJ2324-004 - Termination CD	9-May-24	0800	water	2	R	R	R			
	889 mg/L TDS PJ2324-004 - Termination CD	9-May-24	0805	water	2	R	R	R			
	1,414mg/L TDS PJ2324-004 - Termination CD	9-May-24	0810	water	2	R	R	R			
	2,296 mg/L TDS PJ2324-004 - Termination CD	9-May-24	0815	water	2	R	R	R			

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)

SAMPLE RECEIPT DETAILS (ALS use only)

Cooling Method: ☐ NONE ☐ ICE ☐ ICE PACKS ☐ FROZEN ☐ COOLING INITIATED

Submission Comments identified on Sample Receipt Notification: ☐ YES ☐ NO

Cooler Custody Seals Intact: ☐ YES ☐ N/A Sample Custody Seals Intact: ☐ YES ☐ N/A

INITIAL COOLER TEMPERATURES °C: 13.8

FINAL COOLER TEMPERATURES °C:

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (ALS use only)			FINAL SHIPMENT RECEPTION (ALS use only)		
Released by: [signature]	Date: 24/05/10	Time: 0830	Received by: [signature]	Date: 5/13/24	Time: 15:10	Received by:	Date:	Time:

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

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.

FEB 2022 FRONT

END OF REPORT

Total Dissolved Solids (TDS) Toxicity Test Results for *P. promelas*

Final Report

December 11, 2024

Submitted to: **Agnico Eagle Mines**
Rouyn-Noranda, QC

10823 27 Street SE, Calgary, AB T2Z 3V9

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SIGNATURE PAGE

Report By:	Reviewed By:
Alyssa Minifie, BSc	Leila Oosterbroek, P Biol
Laboratory Biologist	Environmental Scientist

This report has been prepared by Nautilus Environmental Company Inc. based on data and/or samples provided by our client and the results of this study are for their sole benefit. Any reliance on the data by a third party is at the sole and exclusive risk of that party. The results presented here relate only to the samples tested.

SUMMARY

Nautilus Environmental (Nautilus) conducted a 32-day *Pimephales promelas* chronic toxicity test for Agnico Eagle Mines (Agnico) to evaluate the effect of total dissolved solids (TDS) in laboratory prepared water (synthetic site water) amended to replicate potential mine-impacted water scenarios. Volumetric dilutions for the test were prepared to target a gradient of 373, 490, 607, 839, 1,304, and 2,236 mg/L TDS.

In the *P. promelas* test, the hatch rate, overall survival, post-hatch survival, proportion normal, and length were not significantly lower in any of the TDS concentrations when compared to the synthetic site water control. The dry weight was significantly lower in the 607, 839, 1,304, and 2,236 mg/L TDS concentrations when compared to the synthetic site water control. No statistically significant differences for hatch rate, overall survival, post hatch survival, proportion normal, length, and dry weight were observed between the synthetic site water control and the laboratory control.

1.0 INTRODUCTION

Nautilus Environmental (Nautilus) conducted a 32-day *P. promelas* toxicity test for Agnico Eagle Mines (Agnico) to evaluate the effect of total dissolved solids (TDS) in laboratory prepared water (synthetic site water) amended to replicate potential mine-impacted water scenarios. Testing was initiated on October 8, 2024, for *P. promelas*. All waters were stored in the dark at 4 ± 2°C prior to testing.

This report describes the results of this toxicity test. Copies of raw laboratory data sheets and statistical analyses for each test species are provided in Appendix A. The analytical chemistry data is provided in Appendix B.

2.0 METHODS

2.1 Toxicity Testing

The toxicity test included a laboratory control and six different TDS concentrations. Methods for the toxicity test are summarized in Table 1. Testing for *P. promelas* was conducted according to the procedures described by US EPA (2016) and ASTM (2013).

2.2 Water Preparation

The synthetic dilution water control was prepared by dissolving predetermined quantities of reagent grade salts (NaCl, $CaSO_4{\cdot}2H_2O$, KCl, $MgSO_4{\cdot}7H_2O$, Na_2SO_4, $NaHCO_3$, $NaNO_3$) in Perrier® and deionized reverse osmosis (DRO) water to a target concentration of 373 mg/L TDS. The top TDS concentration was prepared by dissolving predetermined quantities and types of reagent grade salts (NaCl, $CaSO_4{\cdot}2H_2O$, KCl, $MgSO_4{\cdot}7H_2O$, Na_2SO_4, $NaHCO_3$, $CaCl_2{\cdot}2H_2O$, $NaNO_3$) in DRO water to a target concentration of 2,236 mg/L TDS. To aid in dissolving the $CaSO_4{\cdot}2H_2O$, a portion of the Perrier® and DRO water in the synthetic site water and top concentration, respectively, was removed and the $CaSO_4{\cdot}2H_2O$ was dissolved separately in this water. The remaining salts for both the synthetic site water and top concentration were dissolved in another portion of Perrier® or DRO water, respectively, before addition to the overall volume of water. Volumetric dilutions were performed with the synthetic site water and top concentration to achieve the target gradient of 373, 490, 607, 839, 1,304, and 2,236 mg/L TDS. The synthetic site water, top concentration and all other test concentrations were prepared twice during testing.

2.3 Analytical Subsampling

Analytical subsamples for TDS were collected from the 373, 839, and 2,236 mg/L TDS at initiation, mid-point, and termination. At the mid-point of the test, analytical subsamples were collected for both the old test solutions (solutions removed during the replenishment) and the new test solutions (solutions added during the replenishment).

2.4 Statistical Analyses

Statistical analyses were performed using CETIS (Tidepool Scientific Software, version 2.1.5.5). For this toxicity test, the laboratory control was used to establish test validity. Comparisons were performed between the synthetic dilution water control and the laboratory control. Treatments were also compared to the synthetic dilution water control using pairwise comparisons across the test.

Table 1. Summary of test conditions: 32-day fathead minnow *(Pimephales promelas)* survival and growth test.

Test species	*Pimephales promelas*
Organism source	Aquatox Inc., Hotsprings, Arkansas
Organism age	<24 hour fertilized eggs
Test type	Static-renewal
Test duration	From egg stage until 28 days post hatch; ~32 days
Test vessel	2-L glass jar
Test volume	1.4 L
Test concentrations	Five concentrations, plus laboratory control and synthetic dilution water control
Test replicates	4 per treatment
Number of organisms	20 per replicate
Laboratory control water	Dechlorinated City of Calgary municipal tap water amended with 4 mg/L KCl
Control/dilution water	Site Control
Test solution renewal	Daily (~80% renewal)
Test temperature	25 ± 1°C
Feeding	Three time per day after hatch, with newly hatched brine shrimp (*Artemia* nauplii)
Light intensity	100 to 500 lux
Photoperiod	16 hours light / 8 hours dark
Aeration	60 minutes daily, prior to water renewal
Test measurements	Temperature, dissolved oxygen, pH, and conductivity measured daily; evaluated for survival daily
Test protocol	US EPA (2016) and ASTM (2013)
Statistical software	CETIS Version 2.1.5.5
Test endpoints	Hatch, survival, post hatch survival, length, dry weight, normal development (which assesses incidence of deformities)
Test acceptability criteria for controls	>66% hatch, ≥70% post-hatch survival
Reference toxicant	Sodium chloride (NaCl)

3.0 RESULTS

Results of the toxicity test conducted with *P. promelas*, and the accompanying analytical chemistry results are provided in Table 2. Measured TDS concentrations (mg/L) at test initiation were between 97-99% of the target values, between 98-100% at the mid-point, and between 101-107% of the target values at test termination. Precipitate was observed slowly accumulating over the last few weeks of testing in the 607, 839, 1,304, and 2,236 mg/L TDS concentrations.

The synthetic dilution water control was not significantly different from the laboratory control for hatch rate, overall survival, post hatch survival, proportion normal, length, or dry weight. The TDS concentrations were not significantly lower than the synthetic dilution water control for hatch rate, overall survival, post-hatch survival, proportion normal, and length. However, dry weight was significantly lower in the 607, 839, 1,304, and 2,236 mg/L TDS concentrations when compared to the synthetic dilution water control.

Table 2. Results: *P. promelas* survival and growth.

Nominal TDS Concentration (mg/L)	Measured TDS Concentration (mg/L)				Hatch Rate (%) (Mean ± SD)	Survival (%) (Mean ± SD)	Post Hatch Survival (%) (Mean ± SD)	Proportion Normal (%) (Mean ± SD)	Dry Weight (mg) (Mean ± SD)	Length (mm) (Mean ± SD)
	Initial	Old Mid-Point	New Mid-Point	Final						
Laboratory Control	-	-	-	-	98.8 ± 2.5	88.8 ± 8.5	89.9 ± 8.2	96.1 ± 4.8	1.9 ± 0.1	10.9 ± 0.1
Synthetic Dilution Water Control (373)	370	372	370	398	96.3 ± 4.8	78.8 ± 7.5	81.7 ± 3.9	98.2 ± 3.6	2.0 ± 0.1	10.9 ± 0.2
490	-	-	-	-	96.4 ± 4.6	87.6 ± 5.1	91.1 ± 6.6	100.0 ± 0.0	2.0 ± 0.1	11.0 ± 0.2
607	-	-	-	-	98.8 ± 2.5	93.8 ± 2.5	94.9 ± 0.1	97.2 ± 5.6	1.9 ± 0.0*	11.6 ± 0.5
839	821	837	821	844	98.8 ± 2.5	87.5 ± 2.9	88.6 ± 2.4	98.6 ± 2.8	1.8 ± 0.0*	11.6 ± 0.3
1,304	-	-	-	-	100.0 ± 0.0	83.8 ± 8.5	83.8 ± 8.5	98.5 ± 2.9	1.8 ± 0.1*	11.8 ± 0.4
2,236	2,170	2,210	2,210	2,260	98.8 ± 2.5	91.3 ± 8.5	92.3 ± 6.8	97.4 ± 3.0	1.8 ± 0.1*	11.6 ± 0.2

SD = Standard Deviation

* Result is significantly lower than the synthetic dilution water control

4.0 QA/QC

The health histories of the test organisms used in the exposures were acceptable and met the requirements of the Environment Canada protocols. The tests met all control acceptability criteria and water quality parameters remained within ranges specified in the protocols throughout testing. Twenty-one organisms were found in replicate A of the 490 mg/L TDS concentration at the 3-day observation period. Additionally, one fish was lost during take down in replicate C of the 490 mg/L TDS concentration. Both instances were taken into account when performing the statistical analyses for endpoints that were affected. There were no further deviations from the test methodologies. Uncertainty associated with these tests is best described by the standard deviations around the means.

Results of the reference toxicant tests conducted during the testing program are summarized in Table 3. The reference toxicant tests were performed under the same conditions as those used during testing. Results for these tests fell within the acceptable range for organism performance of two standard deviations of the mean, based on historical results obtained by the laboratory with these tests. Thus, the sensitivity of the organisms used in these tests was appropriate.

Table 3. Reference Toxicant Test Results

Test Species	Endpoint (95% CL)	Historical Mean (2 SD Range)	CV (%)	Test Date
P. promelas	Survival (LC50): 5.0 (4.3-5.8) g/L NaCl	6.6 (4.5-9.7)	12.7	2024-10-12
	Biomass (IC25): 2.7 (2.2-4.5) g/L NaCl	3.9 (2.3-6.4)	16.8	

SD = Standard Deviation, CV = Coefficient of Variation, LC = Lethal Concentration, IC = Inhibition Concentration, CL=Confidence Limit

5.0 REFERENCES

ASTM. 2013. Standard guide for conducting early life-stage toxicity tests with fishes. E1241-05, 29 pp.

US EPA. 2016. Ecological Effects Test Guidelines. OCSPP 850.1400 Fish Early-Life Stage Toxicity Test. EPA-712-C-16-008.

Tidepool Scientific Software. 2022. CETIS comprehensive environmental toxicity information system, version 2.1.5.5 Tidepool Scientific Software, McKinleyville, CA. 275 pp.

APPENDIX A – *Pimephales promelas* Toxicity Test Data

NAUTILUS ENVIRONMENTAL

Fathead Minnow Bench Sheet

Method: FMD 32 Day ELS Client: AGN108 Sample: PJ2425-002

Organism Information

Source: Aquatox Batch: 20241008FM Egg Stage: 16 - Somites Organisms Received in Good Condition: Yes or No

Test Log

Date	Day	Time	Technicians	Chem Cart Used	Sample Pre-Aeration Time	Bench Sheet Review
2024-10-08	0	1130	AM/KO/CD	5	1 hour	AM
2024-10-09	1	1100	KO	5	1 hour	AM
2024-10-10	2	1200	AM/KO	5	1 hour	XC
2024-10-11	3	1010	XC	5	1 hour	CC
2024-10-12	4	~~09~~0950	XC	5	1 hour	KO
2024-10-13	5	1030	KO	5	1 hour	AM
2024-10-14	6	1020	KO	5	1 hour	AM
2024-10-15	7	1030	KO/AM	5	1 hour	AM
2024-10-16	8	1040	KO	5	1 hour	AM
2024-10-17	9	1100	XC	5	1 hour	JK
2024-10-18	10	1110	CC	5	1 hour	JK
2024-10-19	11	1115	BS	5	1 hour	JK
2024-10-20	12	1100	AM	5	1 hour	AM
2024-10-21	13	1120	KO	5	1 hour	AM
2024-10-22	14	1140	KO	5	1 hour	AM
2024-10-23	15	1030	KO	5	1 hour	AM
2024-10-24	16	1200	AM	5	1 hour	KO
2024-10-25	17	1000	XC	5	1 hour	XC
2024-10-26	18	1010	XC	5	1 hour	EP
2024-10-27	19	1015	AM	5	1 hour	KO
2024-10-28	20	1130	KO	5	1 hour	AM
2024-10-29	21	1110	AM	5	1 hour	AM
2024-10-30	22	1310	AM	5	1 hour	KO
2024-10-31	23	1120	AM	5	1 hour	CC
2024-11-01	24	1140	DM	5	1 hour	CC
2024-11-02	25	1030	XC	5	1 hour	EP
2024-11-03	26	1120	CC	5	1 hour	CC
2024-11-04	27	1050	XC	5	1 hour	DM
2024-11-05	28	1045	AM	5	1 hour	KO
2024-11-06	29	1115	AM	5	1 hour	KO
2024-11-07	30	1100	AM	5	1 hour.	KO
2024-11-08	31	1200	KO	5	1 hour	AM
2024-11-09	32	0800	KO/AM	5	—	KO/AM

Reviewed By: WD Date Reviewed: 2024/11/14

NAUTILUS ENVIRONMENTAL

Fathead Minnow Bench Sheet

Method FMD 32 Day ELS Client AGN108 Sample: PJ2425-002

Control hatching success must be >66% (≥10 per replicate). Post hatch survival must be >70%.

Number of Alive Embryos and Hatched Organisms

replicate	LAB CTL Day 1 Alive Embryos	LAB CTL Day 1 Dead Embryos	T1 Day 1 Alive Embryos	T1 Day 1 Dead Embryos	T2 Day 1 Alive Embryos	T2 Day 1 Dead Embryos	T3 Day 1 Alive Embryos	T3 Day 1 Dead Embryos	T4 Day 1 Alive Embryos	T4 Day 1 Dead Embryos	T5 Day 1 Alive Embryos	T5 Day 1 Dead Embryos	T6 Day 1 Alive Embryos	T6 Day 1 Dead Embryos
a	18	2	20	0	20	0	19	1	20	0	19	1	20	0
b	20	0	19	1	18	2	19	1	18	2	20	0	20	0
c	16	4	20	0	19	1	20	0	18	2	18	2	20	0
d	20	0	17	3	20	0	16	4	19	1	20	0	20	0
e	18	2	19	1	19	1	19	1	20	0	19	1	20	0

Comments/Observations:

Number of Alive Embryos and Hatched Organisms

replicate	CTL Day 2 Alive Embryos	CTL Day 2 Dead Embryos	CTL Cull to 20	T1 Day 2 Alive Embryos	T1 Day 2 Dead Embryos	T1 Cull to 20	T2 Day 2 Alive Embryos	T2 Day 2 Dead Embryos	T2 Cull to 20	T3 Day 2 Alive Embryos	T3 Day 2 Dead Embryos	T3 Cull to 20
a	16	2	✓	17	3	✓	20	0	✓	17	2	✓
b	20	0	✓	15	4	✓	* 14	4FM	✓	19	0	✓
c	15	1	✓	* 16	4	✓	14	5	✓	17	3	✓
d	19	1	✓	15	2	✓	18	2	✓	14	2	✓
e	18	0		16	3		17	2		18	1	

replicate	T4 Day 2 Alive Embryos	T4 Day 2 Dead Embryos	T4 Cull to 20	T5 Day 2 Alive Embryos	T5 Day 2 Dead Embryos	T5 Cull to 20	T6 Day 2 Alive Embryos	T6 Day 2 Dead Embryos	T6 Cull to 20
a	20	0	✓	16	3	✓	19	1	✓
b	17	1	✓	18	2	✓	19	1	✓
c	17	1	✓	15	3	✓	18	2	✓
d	17	2	✓	19	1	✓	18	2	✓
e	17	3		17	2		16	4	

Day 2 - Poor looking and dead embryos in replicates a, b, c and d are replaced with healthy embryos from replicates e and f. Replicates e and f are discarded after day 2

Comments/Observations:
*microbial growth.

Reviewed By: W Date Reviewed: 24/11/14

NAUTILUS ENVIRONMENTAL

Fathead Minnow Bench Sheet

Species: 32-d Fathead Minnow

Early-life stage test

Date Initiated : 2024/10/08

Number of embryos and hatched

Treatment ID	Rep.	Day 3 AE	Day 3 DE	Day 3 AH	Day 3 DH	Day 3 TS	Day 4 AE	Day 4 DE	Day 4 AH	Day 4 DH	Day 4 TS
LAB CTL	A	15	0	5	0	20	4	0	16	0	20
	B	19	0	1	0	20	6	0	14	0	20
	C	14	0	6	0	20	4	0	16	0	20
	D	16	0	4	0	20	1	0	19	0	20
T1	A	18	0	2	0	20	6	0	14	0	20
	B	19	0	1	0	20	3	0	17	0	20
	C	19	0	1	0	20	15	0	5	0	20
	D	20	0	0	0	20	5	0	15	0	20
T2	A	18 ~~17~~	0	3	0	20 ~~21~~	~~4~~ 5	0	16	0	20 ~~21~~
	B	20 ~~21~~	0	0	0	20	10	0	10	0	20
	C	20	0	0	0	20	2	0	18	0	20
	D	17	0	3	0	20	6	0	14	0	20
T3	A	16	0	4	0	20	0	0	20	0	20
	B	16	0	4	0	20	0	0	20	0	20
	C	16	0	4	0	20	1	0	19	0	20
	D	16	0	4	0	20	0	0	20	0	20
T4	A	19	0	1	0	20	1	0	19	0	20
	B	17	0	3	0	20	1	0	19	0	20
	C	16	0	4	0	20	2	0	18	0	20
	D	16	1	3	0	19	1	0	18	0	19
T5	A	18	0	2	0	20	1	0	19	0	20
	B	11	0	9	0	20	8	0	12	0	20
	C	19	0	1	0	20	1	0	19	0	20
	D	20	0	0	0	20	8	0	12	0	20
T6	A	9	0	11	0	20	1	0	19	0	20
	B	17	0	3	0	20	2	0	18	0	20
	C	14	0	6	0	20	2	0	18	0	20
	D	16	0	4	0	20	5	0	15	0	20

Treatment ID	Rep.	Day 5 AE	Day 5 DE	Day 5 AH	Day 5 DH	Day 5 TS	Day 6 AE	Day 6 DE	Day 6 AH	Day 6 DH	Day 6 TS	Day 7 AE	Day 7 DE	Day 7 AH	Day 7 DH	Day 7 TS
LAB CTL	A	1	0	19	0	20	0	0	20	0	20	0	0	20	0	20
	B	0	0	19	1	19	0	0	19	0	19	0	0	19	0	19
	C	1	0	19	0	20	0	1	19	0	19	0	0	19	0	19
	D	0	0	20	0	20	0	0	20	0	20	0	0	20	0	20
T1	A	2	0	18	0	20	0	0	20	0	20	0	0	20	0	20
	B	2	0	18	0	20	0	0	20	0	20	0	0	20	0	20
	C	9	0	11	0	20	2	2	16	0	18	0	0	18	0	18
	D	3	0	17	0	20	0	1	19	0	19	0	0	19	0	19
T2	A	~~1~~ 2	0	19	0	20 ~~21~~	0	1	20 ~~19~~	0	20 ~~19~~	0	0	20 ~~19~~	0	20 ~~19~~
	B	1	0	19	0	20	0	0	20	0	20	0	0	20	0	20
	C	0	0	20	0	20	0	0	19	1	19	0	0	19	0	19
	D	1	1	17	1	18	0	0	18	0	18	0	0	18	0	18
T3	A	0	0	20	0	20	0	0	20	0	20	0	0	20	0	20
	B	0	0	20	0	20	0	0	20	0	20	0	0	20	0	20
	C	0	1 ~~0~~	19	0	19	0	0	19	0	19	0	0	19	0	19
	D	0	0	20	0	20	0	0	20	0	20	0	0	20	0	20
T4	A	0	0	20	0	20	0	0	20	0	20	0	0	20	0	20
	B	0	0	20	0	20	0	0	20	0	20	0	0	20	0	20
	C	0	0	20	0	20	0	0	20	0	20	0	0	20	0	20
	D	0	0	19	0	19	0	0	19	0	19	0	0	19	0	19
T5	A	1	0	18	1	19	0	0	18	~~0~~ 1	18	0	0	18	0	18
	B	1	0	19	0	20	0	0	20	0	20	0	0	20	0	20
	C	0	0	20	0	20	0	0	19	1	19	0	0	19	0	19
	D	0	0	18	2	18	0	0	18	0	18	0	0	18	0	18
T6	A	0	0	20	0	20	0	0	20	0	20	0	0	20	0	20
	B	0	1	17	2	17	0	0	17	0	17	0	0	17	0	17
	C	0	0	20	0	20	0	0	20	0	20	0	0	20	0	20
	D	0	0	20	0	20	0	0	20	0	20	0	0	20	0	20

Comments: AE = alive embryo, DE = dead embryo, AH = alive hatched, DH = dead hatched, TS = total survival
AS = abnormal spine, E = edema, C = cranofacial, DD = delayed development

2024/11/14 [illegible]

NAUTILUS ENVIRONMENTAL

Fathead Minnow Bench Sheet

Method FMD 32 Day ELS Client AGN108 Sample: PJ2425-002

Number of Alive Embryos and Hatched Organisms

replicate	LAB CTL Day 8 Alive Hatched	T1 Day 8 Alive Hatched	T2 Day 8 Alive Hatched	T3 Day 8 Alive Hatched	T4 Day 8 Alive Hatched	T5 Day 8 Alive Hatched	T6 Day 8 Alive Hatched
a	19	20	~~19~~ 20	20	20	18	20
b	19	20	20	19	20	20	17
c	18	18	19	19	20	19	20
d	20	19	18	20	19	18	20

Comments/Observations:

replicate	LAB CTL Day 9 Alive Hatched	T1 Day 9 Alive Hatched	T2 Day 9 Alive Hatched 20	T3 Day 9 Alive Hatched	T4 Day 9 Alive Hatched	T5 Day 9 Alive Hatched	T6 Day 9 Alive Hatched
a	19 (1)	20 (1)	19 ~~20~~ LC	20	20	18 (1)	20 (1)
b	19	20 (1)	20 (1)	19	20	20	16
c	18	17 (1)	19	19	20	19	19
d	20	19 (3)	18	20	19	17	20

Comments/Observations:

replicate	LAB CTL Day 10 Alive Hatched	T1 Day 10 Alive Hatched	T2 Day 10 *Alive Hatched	T3 Day 10 Alive Hatched	T4 Day 10 Alive Hatched	T5 Day 10 Alive Hatched	T6 Day 10 Alive Hatched
a	19(1)	20(1)	** 20	20	20	18(1)	20(1)
b	19	20(2)	20(1)	19	20(1)	20	16
c	18	17(3)	19	19(1)	19	19	19
d	20	* 17(2)	17	20(1)	19	15	20

Comments/Observations: * Death due to microbial growth ** counted 20

replicate	LAB CTL Day 11 Alive Hatched	T1 Day 11 Alive Hatched	T2 Day 11 Alive Hatched	T3 Day 11 Alive Hatched	T4 Day 11 Alive Hatched	T5 Day 11 Alive Hatched	T6 Day 11 Alive Hatched
a	18(1)	19(1)	20	20	~~19~~ 20(1)*	17(1)	20(2)
b	19	20(2)	19	19	20(2)	20	16
c	18(1)	17(3)	19	19(1)	19	19	19
d	20	16(1)	17(2)	20(1)	19(1)	15	20

BS

Comments/Observations: ~~* counted 19~~ BS

Reviewed By: JD Date Reviewed: 2024/11/14

NAUTILUS ENVIRONMENTAL

Fathead Minnow Bench Sheet

Method: FMD 32 Day ELS   Client: AGN108   Sample: PJ2425-002

Number of Alive Embryos and Hatched Organisms

replicate	LAB CTL Day 12 Alive Hatched	T1 Day 12 Alive Hatched	T2 Day 12 Alive Hatched	T3 Day 12 Alive Hatched	T4 Day 12 Alive Hatched	T5 Day 12 Alive Hatched	T6 Day 12 Alive Hatched
a	18(1)	18 *	20 *	20	20(1)	17	20
b	19	20(2) *	19 *	19	20(2)	20	16
c	18	16(1) *	19 *	19(1)	19	19	19
d	20	16(1) *	17 *	20(1)	19	15 *	20

Comments/Observations: * microbial growth in jar.

replicate	LAB CTL Day 13 Alive Hatched	T1 Day 13 Alive Hatched	T2 Day 13 Alive Hatched	T3 Day 13 Alive Hatched	T4 Day 13 Alive Hatched	T5 Day 13 Alive Hatched	T6 Day 13 Alive Hatched
a	18(1)	18	20	20	20(1)	17	20
b	19	20(2)	19	19	20(2)	~~20~~ 19	16
c	18(1)	16(1)	19(1)	19(1)	19	19(1)	19
d	20	16(1)	17(1)	20(1)	19	15	20

Comments/Observations:

replicate	LAB CTL Day 14 Alive Hatched	T1 Day 14 Alive Hatched	T2 Day 14 Alive Hatched	T3 Day 14 Alive Hatched	T4 Day 14 Alive Hatched	T5 Day 14 Alive Hatched	T6 Day 14 Alive Hatched
a	17	18	20	19	20(1)	17	20(2)
b	19	19(2)	19(1)	19	20(2)	19	16
c	18(1)	16(2)	18	19(1)	19	19(1)	19
d	20	16(2)	17(1)	19(1)	19(1)	15	20

Comments/Observations:

replicate	LAB CTL Day 15 Alive Hatched	T1 Day 15 Alive Hatched	T2 Day 15 Alive Hatched	T3 Day 15 Alive Hatched	T4 Day 15 Alive Hatched	T5 Day 15 Alive Hatched	T6 Day 15 Alive Hatched
a	17	18	20(1)	19	20(1)	17(1)	19(1)
b	19	19(2)	19	19	20(2)	19	16
c	18(1)	16(2)	18	19(1)	19	19	19
d	20	16(2)	17(1)	19(1)	19(1)	15	20

Comments/Observations:

Reviewed By: W   Date Reviewed: 2024/11/14

NAUTILUS ENVIRONMENTAL

Fathead Minnow Bench Sheet

Method FMD 32 Day ELS Client AGN108 Sample: PJ2425-002

Number of Alive Embryos and Hatched Organisms

	LAB CTL	T1	T2	T3	T4	T5	T6
	Day 16	Day 16	Day 16	Day 16	Day 16	Day 16	Day 16
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	17	18(1)	20	19	20(1)	17(1)	19(1)
b	19	19(2)	19	19	19(1)	19	16
c	18(1)	16(2)	18	19(1)	18	19	19
d	20	16(2)	17(1)	19(1)	19	15	20

Comments/Observations:

	LAB CTL	T1	T2	T3	T4	T5	T6
	Day 17	Day 17	Day 17	Day 17	Day 17	Day 17	Day 17
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	17(1)	18(1)	20	19	19(2)	17(1)	18
b	18	17	19	19	18	19(1)	16
c	17	16(3)	18	19(1)	18	19	19
d	20	16(2)	17(1)	19(1)	18	15	20

Comments/Observations:

	LAB CTL	T1	T2	T3	T4	T5	T6
	Day 18	Day 18	Day 18	Day 18	Day 18	Day 18	Day 18
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	17(1)	18(1)	20	19	18(1)	17(1)	18
b	18	17	19(1)	19	18(1)	19(1)	16
c	17	16(3)	18	18(1)	18	19	19(2)
d	20	16(2)	* ~~17(1)~~	19(1)	18(1)	15	20

Comments/Observations: *16(1)

	LAB CTL	T1	T2	T3	T4	T5	T6
	Day 19	Day 19	Day 19	Day 19	Day 19	Day 19	Day 19
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	17(1)	18(1)	20	19	18(1)	17(1)	18
b	18	17	19	19	18	19(1)	16
c	17	16(3)	18	18(1)	18	19	19(2)
d	20	15(1)	16	19	18(1)	15	20

Comments/Observations:

Reviewed By: W Date Reviewed: 2024/11/14

NAUTILUS ENVIRONMENTAL

Fathead Minnow Bench Sheet

Method: FMD 32 Day ELS Client: AGN108 Sample: PJ2425-002

Number of Alive Embryos and Hatched Organisms

	LAB CTL	T1	T2	T3	T4	T5	T6
	Day 20	Day 20	Day 20	Day 20	Day 20	Day 20	Day 20
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	17(1)	18(1)	20	19	17	17(1)	18
b	18	17	19	19	18	18	16
c	17	14(1)	18	18(1)	18	19	19(2)
d	20	15(1)	16	19(1)	17	15(1)	20

Comments/Observations:

	LAB CTL	T1	T2	T3	T4	T5	T6
	Day 21	Day 21	Day 21	Day 21	Day 21	Day 21	Day 21
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	17(1)	18(1)	20	19	17	16	18
b	18	17	19	19	18	18	16
c	17	14(1)	18	18(1)	18	19	19(2)
d	20	15(1)	16	19(1)	17	15(1)	20

Comments/Observations:

	LAB CTL	T1	T2	T3	T4	T5	T6
	Day 22	Day 22	Day 22	Day 22	Day 22	Day 22	Day 22
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	17(1)	18(1)	20	19	17	16	18
b	18	17	19	19	18	18	16
c	17	14(1)	18	18(1)	18	19	19(1)
d	20	15(1)	16	19(1)	17	15(1)	20

Comments/Observations:

	LAB CTL	T1	T2	T3	T4	T5	T6
	Day 23	Day 23	Day 23	Day 23	Day 23	Day 23	Day 23
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	17(1)	18(1)	20	19	17	16	18
b	18	17	19	19	18	18	16
c	17	14(1)	18	18(1)	18	19	19(1)
d	20	15(1)	16	19(1)	17	15(1)	20

Comments/Observations:

Reviewed By: JD Date Reviewed: 2024/11/14

NAUTILUS
ENVIRONMENTAL

Fathead Minnow Bench Sheet

Method: FMD 32 Day ELS Client: AGN108 Sample: PJ2425-002

Number of Alive Embryos and Hatched Organisms

replicate	LAB CTL Day 24 Alive Hatched	T1 Day 24 Alive Hatched	T2 Day 24 Alive Hatched	T3 Day 24 Alive Hatched	T4 Day 24 Alive Hatched	T5 Day 24 Alive Hatched	T6 Day 24 Alive Hatched
a	17(1)	18(1)	20	19	17	16*	18
b	18	17	19	19	18(1)	18	16
c	17	14(1)	18	18(1)	18	19	19(2)
d	20	15(1)	16	19(1)	17	15(1)	20

Comments/Observations: *Only counted 16

replicate	LAB CTL Day 25 Alive Hatched	T1 Day 25 Alive Hatched	T2 Day 25 Alive Hatched	T3 Day 25 Alive Hatched	T4 Day 25 Alive Hatched	T5 Day 25 Alive Hatched	T6 Day 25 Alive Hatched
a	17(1)	18(1)	20	19	17	16	18
b	18	17	19	19	18(1)	18	16
c	17	14(1)	18	18(1)	18	19	19(1)
d	20	15(1)	16	19	17	15(1)	20

Comments/Observations:

replicate	LAB CTL Day 26 Alive Hatched	T1 Day 26 Alive Hatched	T2 Day 26 Alive Hatched	T3 Day 26 Alive Hatched	T4 Day 26 Alive Hatched	T5 Day 26 Alive Hatched	T6 Day 26 Alive Hatched
a	17(1)	~~16~~ 17	20	19	17	16	18
b	18	17	19	19	18(1)	18	16
c	17	14(1)	18	18(1)	18	19	19(1)
d	20	15(1)	16	19	17	15(1)	20

Comments/Observations:

replicate	LAB CTL Day 27 Alive Hatched	T1 Day 27 Alive Hatched	T2 Day 27 Alive Hatched	T3 Day 27 Alive Hatched	T4 Day 27 Alive Hatched	T5 Day 27 Alive Hatched	T6 Day 27 Alive Hatched
a	17(1)	17	20	19	17	16	18
b	18	17(1)	19(1)	19	18(1)	17(1)	16
c	17	14(1)	18	18(1)	18	19	19(2)
d	20	15(2)	16	19	17	15(1)	20

Comments/Observations:

Reviewed By: W Date Reviewed: 2024/11/14

NAUTILUS ENVIRONMENTAL

Fathead Minnow Bench Sheet

Method: FMD 32 Day ELS Client: AGN108 Sample: PJ2425-002

Number of Alive Embryos and Hatched Organisms

replicate	LAB CTL Day 28 Alive Hatched	T1 Day 28 Alive Hatched	T2 Day 28 Alive Hatched	T3 Day 28 Alive Hatched	T4 Day 28 Alive Hatched	T5 Day 28 Alive Hatched	T6 Day 28 Alive Hatched
a	17(1)	17	19	19	17	16	18
b	18(1)	17	18	19	18(1)	17	16
c	17	14(1)	18	18(2)	18	19	19(2)
d	20	15(1)	16	19	17	15(1)	20

Comments/Observations:

replicate	LAB CTL Day 29 Alive Hatched	T1 Day 29 Alive Hatched	T2 Day 29 Alive Hatched	T3 Day 29 Alive Hatched	T4 Day 29 Alive Hatched	T5 Day 29 Alive Hatched	T6 Day 29 Alive Hatched
a	17(1)	17	19	19	17	16	18
b	18(1)	17	18	19	18(1)	17	16
c	17	14(1)	18	18(2)	18	19	19(2)
d	20	15(1)	16	19	17	15(1)	20

Comments/Observations:

replicate	LAB CTL Day 30 Alive Hatched	T1 Day 30 Alive Hatched	T2 Day 30 Alive Hatched	T3 Day 30 Alive Hatched	T4 Day 30 Alive Hatched	T5 Day 30 Alive Hatched	T6 Day 30 Alive Hatched
a	17(1)	17	19	19	17	16	18
b	18(1)	17	18	19	18(1)	17	16
c	17	14(1)	18	18(2)	18	19	19(2)
d	20	15(1)	16	19	17	15(1)	20

Comments/Observations:

replicate	LAB CTL Day 31 Alive Hatched	T1 Day 31 Alive Hatched	T2 Day 31 Alive Hatched	T3 Day 31 Alive Hatched	T4 Day 31 Alive Hatched	T5 Day 31 Alive Hatched	T6 Day 31 Alive Hatched
a	16	17	19	19	17	16	18
b	18(1)	17	18	19	18(1)	17(1)	16
c	17	14(1)	18	18(2)	18	19	19(2)
d	20	15(1)	16	19(1)	17	15(1)	20

Comments/Observations:

Reviewed By: W Date Reviewed: 2024/11/14

NAUTILUS ENVIRONMENTAL

Fathead Minnow Bench Sheet

Method FMD 32 Day ELS Client AGN108 Sample: PJ2425-002

Number of Alive Embryos and Hatched Organisms

	LAB CTL	T1	T2	T3	T4	T5	T6
	Day 32	Day 32	Day 32	Day 32	Day 32	Day 32	Day 32
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched
a	16	17	19	19	17	16	18
b	18(1)	17	18	19	18(1)	17(1)	16
c	17	14(1)	18	18(2)	18	19	19(2)
d	20	15(1)	16	19(1)	17	15(1)	20

Comments/Observations:

Reviewed By: VO Date Reviewed: 2024/11/14

NAUTILUS ENVIRONMENTAL

Fathead Minnow Bench Sheet

Method FMD 32 Day ELS Client AGN108 Sample: PJ2425-002

Test Termination

For normal/abnormal column, use the following notation:

N=Normal, A= Abnormal And note location: H=head, O=oral, E=eyes, G=gills, F=fins, S=spine

Conc

LAB CTL

	Replicate # A		Replicate # B		Replicate # C		Replicate # D	
Fish	Length (mm)	Normal/ Abnormal	Length (mm)	Normal/ Abnormal	Length (mm)	Normal/ Abnormal	Length (mm)	Normal/ Abnormal
1	11	N	7	AS	10	N	7	N
2	10		12	N	13		8	AS
3	13		13		9		11	AS
4	14		9		12		11	N
5	14		10		13		8	
6	7		12		10		13	
7	12		13		11		14	
8	11		13		12		14	
9	11		11		11		8	
10	10		9		11		10	
11	9		12		10		10	
12	11		8		9		9	
13	9		12		10		10	
14	10		13		10		14	
15	10		14		11		10	
16	10		9		11		14	
17			11		11		12	
18			11				14	
19							10	
20							13	
	Mean Length (mm) : 10.8	**# Normal:** 16	**Mean Length (mm) :** 11.1	**# Normal:** 17	**Mean Length (mm) :** 10.8	**# Normal:** 17	**Mean Length (mm) :** 11.0	**# Normal:** 18

Comments

Reviewed By: JD Date Reviewed: 2024/11/14

NAUTILUS ENVIRONMENTAL

Fathead Minnow Bench Sheet

Method FMD 32 Day ELS Client AGN108 Sample: PJ2425-002

Test Termination

For normal/abnormal column, use the following notation:

N=Normal, A= Abnormal And note location: H=head, O=oral, E=eyes, G=gills, F=fins, S=spine

Conc. T1

Fish	Replicate # A Length (mm)	Replicate # A Normal/ Abnormal	Replicate # B Length (mm)	Replicate # B Normal/ Abnormal	Replicate # C Length (mm)	Replicate # C Normal/ Abnormal	Replicate # D Length (mm)	Replicate # D Normal/ Abnormal
1	10	N	7	N	8	N	13	N
2	11		12		8		8	
3	9		11		14		14	
4	10		12		15		12	
5	12		7		10		14	
6	12		8		12		11	
7	14		10		14		13	
8	10		12		8		13	
9	12		10		12		7	
10	9		13		12		10	
11	9		11		10		13	
12	8		10		8	AS	14	
13	9		8		12	N	9	
14	13		13		12	N	6	
15	12		13				6	
16	14		14					
17	14		11					
18								
19								
20								

A	B	C	D
Mean Length (mm) : 11.1	**Mean Length (mm) :** 10.7	**Mean Length (mm) :** 11.1	**Mean Length (mm) :** 10.9
# Normal: 17	**# Normal:** 17	**# Normal:** 13	**# Normal:** 15

Comments

Reviewed By: ID Date Reviewed: 2024/11/14

NAUTILUS ENVIRONMENTAL

Fathead Minnow Bench Sheet

Method FMD 32 Day ELS Client #REF! Sample: #REF!

Test Termination

For normal/abnormal column, use the following notation:

N=Normal, A= Abnormal And note location: H=head, O=oral, E=eyes, G=gills, F=fins, S=spine

Conc.

T2

	Replicate # A			Replicate # B			Replicate # C			Replicate # D	
Fish	Length (mm)	Normal/ Abnormal	Fish	Length (mm)	Normal/ Abnormal	Fish	Length (mm)	Normal/ Abnormal	Fish	Length (mm)	Normal/ Abnormal
1	13	N	1	14	N	1	11	N	1	9	N
2	11		2	11		2	13		2	8	
3	11		3	11		3	11		3	11	
4	10		4	11		4	11		4	12	
5	12		5	11		5	11		5	9	
6	11		6	15		6	9		6	15	
7	9		7	14		7	12		7	12	
8	12		8	7		8	11		8	9	
9	9		9	10		9	14		9	12	
10	7		10	8		10	13		10	9	
11	10		11	9		11	13		11	14	
12	9		12	10		12	10		12	9	
13	15		13	13		13	11		13	11	
14	10		14	8		14	12		14	13	
15	11		15	13		15	11		15	12	
16	8		16	14		16	9		16	11	
17	11		17	10		17	9		17		
18	13		18	7		18	*	*	18		
19	13		19			19			19		
20			20			20			20		

Mean Length (mm) : 10.8	**Mean Length (mm) :** 10.9	**Mean Length (mm) :** 11.2	**Mean Length (mm) :** 11
# Normal: 19	**# Normal:** 18	**# Normal:** 17	**# Normal:** 16

Comments
* lost by tech

Reviewed By: JD Date Reviewed: 2024/11/14

Test Termination

For normal/abnormal column, use the following notation:

N=Normal, A= Abnormal And note location: H=head, O=oral, E=eyes, G=gills, F=fins, S=spine

Conc. T3

Replicate #	A		B		C		D	
Fish	Length (mm)	Normal/ Abnormal	Length (mm)	Normal/ Abnormal	Length (mm)	Normal/ Abnormal	Length (mm)	Normal/ Abnormal
1	12	N	9	N	12	N	11	N
2	9		11		13		8	
3	12		13		12		13	
4	15		10		11		11	
5	13		11		10		12	
6	14		12		12		11	
7	13		13		14		9	
8	9		11		12		11	
9	13		13		13		6	
10	12		12		12		11	
11	10		14		14		11	
12	13		13		12		12	
13	11		14		10		10	
14	12		11		13		15	
15	12		15		12		13	
16	14		9		10		13	
17	12		12		8	AS	10	
18	13		10		7	AS	11	
19	8		12				11	
20								

Replicate	Mean Length (mm)	# Normal
A	11.9	19
B	11.8	19
C	11.5	16
D	10.9	19

Comments

Reviewed By: VO Date Reviewed: 2024/11/14

NAUTILUS ENVIRONMENTAL

Fathead Minnow Bench Sheet

Test Termination

For normal/abnormal column, use the following notation:

N=Normal, A= Abnormal And note location: H=head, O=oral, E=eyes, G=gills, F=fins, S=spine

Conc.

T4

Replicate # A

Fish	Length (mm)	Normal/ Abnormal
1	12	N
2	8	
3	12	
4	11	
5	10	
6	15	
7	11	
8	15	
9	14	
10	13	
11	10	
12	13	
13	12	
14	11	
15	11	
16	12	
17	13	
18		
19		
20		

Mean Length (mm) : 11.9
 # Normal: 17

Replicate # B

Fish	Length (mm)	Normal/ Abnormal
1	11	N
2	13	
3	12	
4	8	
5	16	
6	10	
7	11	
8	11	
9	12	
10	11	
11	11	
12	11	
13	12	
14	12	
15	8	
16	12	
17	14	
18	10	AS
19		
20		

Mean Length (mm) : 11.4
 # Normal: 17

Replicate # C

Fish	Length (mm)	Normal/ Abnormal
1	9	N
2	12	
3	12	
4	12	
5	14	
6	13	
7	14	
8	14	
9	12	
10	8	
11	12	
12	14	
13	11	
14	14	
15	11	
16	11	
17	9	
18	10	
19		
20		

Mean Length (mm) : 11.8
 # Normal: 18

Replicate # D

Fish	Length (mm)	Normal/ Abnormal
1	13	N
2	10	
3	13	
4	12	
5	8	
6	12	
7	11	
8	12	
9	9	
10	11	
11	9	
12	11	
13	13	
14	13	
15	11	
16	14	
17	13	
18		
19		
20		

Mean Length (mm) : 11.5
 # Normal: 17

Comments

Reviewed By: lo

Date Reviewed: 2024/11/14

NAUTILUS ENVIRONMENTAL

Fathead Minnow Bench Sheet

Test Termination

For normal/abnormal column, use the following notation:

N=Normal, A= Abnormal And note location: H=head, O=oral, E=eyes, G=gills, F=fins, S=spine

Conc.

T5

Replicate # A			Replicate # B			Replicate # C			Replicate # D		
Fish	Length (mm)	Normal/ Abnormal	Fish	Length (mm)	Normal/ Abnormal	Fish	Length (mm)	Normal/ Abnormal	Fish	Length (mm)	Normal/ Abnormal
1	11	N	1	15	N	1	12	N	1	13	N
2	8		2	12		2	14		2	13	
3	11		3	12		3	10		3	12	
4	12		4	12		4	13		4	12	
5	12		5	12		5	11		5	11	
6	14		6	13		6	9		6	12	
7	11		7	11		7	11		7	14	
8	14		8	12		8	12		8	13	
9	11		9	11		9	12		9	14	
10	11		10	9		10	12		10	12	
11	12		11	13		11	13		11	12	
12	13		12	11		12	10		12	12	
13	10		13	11		13	14		13	8	
14	14		14	11		14	10		14	13	
15	13		15	10		15	11		15	12	
16	13		16	11		16	10		16		
17			17	7	AS	17	12		17		
18			18			18	12		18		
19			19			19	12		19		
20			20			20			20		

Mean Length (mm) : 11.9 **# Normal:** 16	**Mean Length (mm) :** 11.4 **# Normal:** 16	**Mean Length (mm) :** 11.6 **# Normal:** 19	**Mean Length (mm) :** 12.2 **# Normal:** 15

Comments

Reviewed By: LD

Date Reviewed: 2024/11/14

NAUTILUS ENVIRONMENTAL

Fathead Minnow Bench Sheet

Test Termination

For normal/abnormal column, use the following notation:

N=Normal, A= Abnormal And note location: H=head, O=oral, E=eyes, G=gills, F=fins, S=spine

Conc. **T6**

Fish	Replicate # A Length (mm)	Replicate # A Normal/ Abnormal	Replicate # B Length (mm)	Replicate # B Normal/ Abnormal	Replicate # C Length (mm)	Replicate # C Normal/ Abnormal	Replicate # D Length (mm)	Replicate # D Normal/ Abnormal
1	10	N	11	N	11	N	10	N
2	14		10		9		13	
3	10		14		12		16	
4	14		13		10		12	
5	9		11		10		15	
6	13		13		12		10	
7	11		13		13		10	
8	14		13		13		12	
9	13		12		15		13	
10	10		10		7		12	
11	14		11		13		10	
12	10		12		14		13	
13	9		15		12		10	
14	13		11		9		11	
15	9		13		13		10	
16	11		8		12		13	
17	11				9		11	
18	11				11		12	
19					10	AS	10	
20							9	AS

Replicate	Mean Length (mm)	# Normal
A	11.4	18
B	11.9	16
C	11.3	18
D	11.6	19

Comments

Reviewed By: Vb Date Reviewed: 2024/11/14

NAUTILUS ENVIRONMENTAL

Organism Weights Bench Sheet

Client Agn108 Sample RJ 2425-002 Organism ~~[illegible]~~ FM Batch 20241008FM ELS

	Item Weighed	Date	Initials	Balance*
Initial Weight (mg):	dried pan	2024/10/26	SY	# 3
Final Weight (mg):	dried pan + organisms	2024/11/11	DMC	#3

* same balance should be used for initial and final weights
* for FM/HA/CT, must use scale with 0.01 mg accuracy

Concentration

Replicate	CTL		T1		T2		T3		T4		T5	
	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final
a	779.50	~~[illegible]~~	771.70	804.87	774.12	810.89	772.92	809.06	767.05	797.36	767.67	796.23
b	787.52	820.89	771.64	804.70	784.52	818.61	766.09	801.52	804.66	838.41	776.14	806.08
c	765.77	795.07	762.56	791.12	794.44	828.70	800.46	832.81	763.13	796.13	790.01	823.62
d	780.16	818.21	773.63	804.84	779.49	810.98	781.25	816.92	747.94	776.93	774.44	805.00
e		811.30										

Concentration

Replicate	T6											
	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final
a	780.65	811.72										
b	792.59	821.68										
c	772.53	807.53										
d	771.99	809.28										
e												

Balance Calibration Check:

	Initial	Final
first pan weighed:	CTL 1A	CTL A
weight of first pan:	779.50	811.30
first pan after all other pans weighed:	779.49	811.49
% difference <5%:	Yes/No	Yes/No

$$\% \text{ difference} = \frac{(\text{initial weight - reweight})}{(\text{initial weight + reweight}) / 2} \times 100\%$$

Test Validity Met: Yes/No/NA

Results are Logical:** Yes/No

** no negative numbers, consistent values across replicates

If "no" is circled for any parameter, notify Lab Supervisor/ QA Group to determine appropriate action

Reviewed By: LA Date Reviewed: 2024/11/14

Written by BU on 2002/11/29
Revised by DM on 2023/12/05

Nautilus Environmental (Calgary)

File: Organism Wts-Bench
F138

NAUTILUS ENVIRONMENTAL

Fathead Minnow Bench Sheet

Method: FMD 32 Day ELS   Client: AGN108   Sample: PJ2425-002

New Solutions

Conc. (%) / Day: LAB CTL, T1, T2, T3, T4, T5, T6

pH (units)

Day	LAB CTL	T1	T2	T3	T4	T5	T6
0	7.9	6.0	6.0	6.8	7.0	7.0	7.0
1	7.6	6.0	6.1	6.6	6.8	6.7	6.9
2	7.7	6.6	7.0	7.7	7.7	7.7	7.3
3	7.8	6.2	6.4	7.3	7.6	7.6	7.2
4	7.7	6.2	6.4	7.2	7.5	7.3	7.1
5	8.0	6.5	6.7	7.4	7.6	7.4	7.3
6	8.1	6.4	6.7	7.5	7.7	7.5	7.4
7	8.1	6.6	6.8	7.6	7.8	7.7	7.5
8	8.2	7.2	7.5	7.8	7.9	7.7	7.2

Conductance (µS/cm)

Day	LAB CTL	T1	T2	T3	T4	T5	T6
0	441	660	842	993	1339	1994	3220
1	449	666	849	1002	1296	1939	3210
2	437	663	861	1016	1346	2000	3310
3	434	668	854	1006	1355	1971	3300
4	449	667	852	1004	1350	1960	3300
5	432	638	848	1008	1335	2010	3220
6	439	650	848	998	1341	1946	3230
7	426	659	843	996	1337	1984	3190
8	433	636	852	1002	1323	1923	3210

Dissolved Oxygen (mg/L) (60-100% saturation)

Day	LAB CTL	T1	T2	T3	T4	T5	T6
0	7.3	7.3	7.3	7.3	7.3	7.3	7.3
1	7.3	7.3	7.3	7.3	7.3	7.3	7.3
2	7.3	7.3	7.3	7.3	7.3	7.3	7.3
3	7.3	7.3	7.3	7.3	7.3	7.3	7.3
4	7.3	7.3	7.3	7.3	7.3	7.3	7.3
5	7.3	7.3	7.3	7.3	7.3	7.3	7.3
6	7.3	7.3	7.3	7.3	7.3	7.3	7.3
7	7.3	7.3	7.3	7.3	7.3	7.3	7.3
8	7.3	7.3	7.3	7.3	7.3	7.3	7.3

Temperature (°C)

Day	LAB CTL	T1	T2	T3	T4	T5	T6
0	24	24	24	24	24	24	24
1	24	24	24	24	24	24	24
2	24	24	24	24	24	24	24
3	24	24	24	24	24	24	24
4	24	24	24	24	24	24	24
5	24	24	24	24	24	24	24
6	24	24	24	24	24	24	24
7	24	24	24	24	24	24	24
8	24	24	24	24	24	24	24

Old Solutions

pH (units)

Day	LAB CTL	T1	T2	T3	T4	T5	T6
0							
1	7.9	6.7	6.6	7.4	7.6	7.4	7.1
2	8.0	7.0	7.1	7.6	7.7	7.6	7.3
3	8.2	7.6	7.7	8.1	8.1	7.9	7.3
4	7.8	7.1	7.2	7.7	7.8	7.7	7.2
5	8.0	7.1	7.4	7.9	8.0	7.8	7.3
6	8.1	7.4	7.5	8.0	8.0	7.9	7.4
7	8.3	7.4	7.7	8.1	8.2	8.1	7.5
8	8.0	7.4	7.6	8.0	8.1	8.0	7.4

Conductance (µS/cm)

Day	LAB CTL	T1	T2	T3	T4	T5	T6
0							
1	433	657	843	1000	1335	1998	3300
2	439	662	850	998	1326	1898	3190
3	451	679	867	1021	1365	1981	3330
4	444	673	858	1010	1356	1971	3320
5	458	650	841	1005	1350	1959	3080
6	432	671	851	1000	1338	2020	3300
7	457	663	851	1003	1344	2010	3240
8	444	649	845	1005	1353	1930	3270

Dissolved Oxygen (mg/L) (60-100% saturation)

Day	LAB CTL	T1	T2	T3	T4	T5	T6
0							
1	7.3	7.3	7.3	7.3	7.3	7.3	7.3
2	7.3	7.3	7.3	7.3	7.3	7.3	7.3
3	7.3	7.3	7.3	7.3	7.3	7.3	7.3
4	7.3	7.3	7.3	7.3	7.3	7.3	7.3
5	7.3	7.3	7.3	7.3	7.3	7.3	7.3
6	7.3	7.3	7.3	7.3	7.3	7.3	7.3
7	7.3	7.3	7.3	7.3	7.3	7.3	7.3
8	7.3	7.3	7.3	7.3	7.3	7.3	7.3

Temperature (°C)

Day	LAB CTL	T1	T2	T3	T4	T5	T6
0							
1	24	24	24	24	24	24	24
2	24	24	24	24	24	24	24
3	24	24	24	24	24	24	24
4	24	24	24	24	24	24	24
5	24	24	24	24	24	24	24
6	24	24	24	24	24	24	24
7	24	24	24	24	24	24	24
8	24	24	24	24	24	24	24

DO Levels (60-100% saturation) -
4.4 to 7.3 mg/L at 24°C
4.3 to 7.2 mg/L at 25°C
4.2 to 7.0 mg/L at 26°C

Comments:

Reviewed By: VP   Date Reviewed: 2024/11/14

NAUTILUS ENVIRONMENTAL

Fathead Minnow Bench Sheet

Method: FMD 32 Day ELS   Client: AGN108   Sample: PJ2425-002

New Solutions

Conc. (%) / Day	LAB CTL	T1	T2	T3	T4	T5	T6
pH (units)							
9	8.0	6.7	7.0	7.7	7.3	7.5	7.2
10	8.2	7.1	7.7	7.7	7.8	7.6	7.5
11	8.1	7.3	7.8	7.9	8.1	7.8	7.4
12	8.1	7.2	7.5	7.8	7.9	7.7	7.6
13	8.1	7.3	7.7	7.7	7.9	7.8	7.4
14	7.9	7.2	7.4	7.7	7.9	7.8	7.3
15	7.8	7.3	7.4	7.7	7.8	7.7	7.4
16	7.8	7.1	7.3	7.6	7.8	7.8	7.5
17	7.8	7.0	7.3	7.6	7.7	7.6	7.2
Conductance (µS/cm)							
9	444	668	852	1005	1353	1962	3310
10	440	658	835	999	1327	2000	3240
11	447	671	857	992	1345	1954	3220
12	440	661	853	1008	1349	2010	3260
13	431	654	856	1016	1344	1978	3280
14	436	652	854	1006	1345	2010	3250
15	439	660	857	1005	1340	1942	3280
16	429	650	850	1003	1344	2020	3270
17	439	671	859	1011	1353	1976	3340
Dissolved Oxygen (mg/L) (60-100% saturation)							
9	7.3	7.3	7.3	7.3	7.3	7.3	7.3
10	7.3	7.3	7.3	7.3	7.3	7.3	7.3
11	7.3	7.3	7.3	7.3	7.3	7.3	7.3
12	7.3	7.3	7.3	7.3	7.3	7.3	7.3
13	7.3	7.3	7.3	7.3	7.3	7.3	7.3
14	7.3	7.3	7.3	7.3	7.3	7.3	7.3
15	7.3	7.3	7.3	7.3	7.3	7.3	7.3
16	7.3	7.3	7.3	7.3	7.3	7.3	7.3
17	7.3	7.3	7.3	7.3	7.3	7.3	7.3
Temperature (°C)							
9	24	24	24	24	24	24	24
10	24	24	24	24	24	24	24
11	24	24	24	24	24	24	24
12	24	24	24	24	24	24	24
13	24	24	24	24	24	24	24
14	24	24	24	24	24	24	24
15	24	24	24	24	24	24	24
16	24	24	24	24	24	24	24
17	24	24	24	24	24	24	24

Old Solutions

Day	LAB CTL	T1	T2	T3	T4	T5	T6
pH (units)							
9	8.0	7.8	7.9	8.0	8.0	7.8	7.2
10	8.1	7.8	7.8	8.0	7.9	7.9	7.5
11	8.0	7.9	7.9	8.1	8.1	7.9	7.4
12	8.2	8.1	8.1	8.1	8.1	7.9	7.6
13	8.1	8.0	8.1	8.1	8.1	7.9	7.3
14	7.9	7.9	8.0	8.0	8.0	7.9	7.3
15	7.9	7.9	8.0	8.0	8.0	7.9	7.3
16	8.0	8.0	8.0	8.0	8.0	7.9	7.6
17	7.8	7.7	7.7	7.8	7.8	7.7	7.0
Conductance (µS/cm)							
9	455	681	868	1021	1369	1989	3360
10	510	676	853	996	1344	1993	3230
11	453	672	858	1010	1349	2020	3270
12	495	674	863	1020	1365	2060	3310
13	447	649	855	1024	1357	1960	3380
14	451	662	858	1005	1357	2040	3320
15	450	671	858	1017	1353	1946	3290
16	478	678	865	1024	1356	1962	3300
17	455	681	870	1026	1377	2000	3380
Dissolved Oxygen (mg/L) (60-100% saturation)							
9	7.3	7.3	7.3	7.3	7.3	7.3	7.3
10	7.3	7.3	7.3	7.3	7.3	7.3	7.3
11	7.3	7.3	7.3	7.3	7.3	7.3	7.3
12	7.3	7.3	7.3	7.3	7.3	7.3	7.3
13	7.3	7.3	7.3	7.3	7.3	7.3	7.3
14	7.3	7.3	7.3	7.3	7.3	7.3	7.3
15	7.3	7.3	7.3	7.3	7.3	7.3	7.3
16	7.3	7.3	7.3	7.3	7.3	7.3	7.3
17	7.3	7.3	7.3	7.3	7.3	7.3	7.3
Temperature (°C)							
9	24	24	24	24	24	24	24
10	24	24	24	24	24	24	24
11	24	24	24	24	24	24	24
12	24	24	24	24	24	24	24
13	24	24	24	24	24	24	24
14	24	24	24	24	24	24	24
15	24	24	24	24	24	24	24
16	24	24	24	24	24	24	24
17	24	24	24	24	24	24	24

DO Levels (60-100% saturation) -
4.4 to 7.3 mg/L at 24°C
4.3 to 7.2 mg/L at 25°C
4.2 to 7.0 mg/L at 26°C

Comments:

Reviewed By: LO   Date Reviewed: 2024/11/14

NAUTILUS ENVIRONMENTAL

Fathead Minnow Bench Sheet

Method: FMD 32 Day ELS   Client: AGN108   Sample: PJ2425-002

VP

New Solutions

Conc. (%) / Day	LAB CTL	T1	T2	T3	T4	T5	T6
pH (units)							
18	8.1	7.4	7.7	7.8	7.8	7.8	7.3
19	7.8	7.0	7.0	7.5	7.4	7.4	7.4
20	7.9	7.4	7.6	7.7	7.8	7.7	7.3
21	7.8	7.0	7.2	7.7	7.8	7.7	7.5
22	7.7	7.2	7.7	7.8	7.9	7.8	7.4
23	7.8	7.5	7.7	7.9	7.9	7.9	7.5
24	7.8	7.4	7.6	7.8	7.8	7.8	7.4
25	7.7	7.4	7.5	7.8	7.8	7.8	7.4
26	7.7	7.3	7.2	7.8	7.8	7.7	7.4
Conductance (µS/cm)							
18	432	683	867	1018	1358	1985	3330
19	425	661	850	999	1349	2020	3240
20	420	650	861	1016	1347	2020	3350
21	416	648	865	1013	1342	2030	3300
22	415	666	863	1026	1345	2040	3280
23	452	662	857	1009	1344	2030	3290
24	490	678	859	1014	1357	1995	3300
25	470	681	872	1027	1365	2000	3360
26	471	674	853	1012	1355	2040	3260
Dissolved Oxygen (mg/L) (60-100% saturation)							
18	7.3	7.3	7.3	7.3	7.3	7.3	7.3
19	7.3	7.3	7.3	7.3	7.3	7.3	7.3
20	7.3	7.3	7.3	7.3	7.3	7.3	7.3
21	7.3	7.3	7.3	7.3	7.3	7.3	7.3
22	7.3	7.3	7.3	7.3	7.3	7.3	7.3
23	7.3	7.3	7.3	7.3	7.3	7.3	7.3
24	7.3	7.3	7.3	7.3	7.3	7.3	7.3
25	7.3	7.3	7.3	7.3	7.3	7.3	7.3
26	7.3	7.3	7.3	7.3	7.3	7.3	7.3
Temperature (°C)							
18	24	24	24	24	24	24	24
19	24	24	24	24	24	24	24
20	24	24	24	24	24	24	24
21	24	24	24	24	24	24	24
22	24	24	24	24	24	24	24
23	24	24	24	24	24	24	24
24	24	24	24	24	24	24	24
25	24	24	24	24	24	24	24
26	24	24	24	24	24	24	24

Old Solutions

Day	LAB CTL	T1	T2	T3	T4	T5	T6
pH (units)							
18	8.0	7.9	8.0	8.0	8.0	7.9	7.2
19	7.8	7.7	7.8	7.8	7.9	7.7	7.4
20	7.9	7.7	7.8	7.9	7.8	7.7	7.2
21	7.8	7.8	7.9	7.9	7.9	7.8	7.4
22	7.9	7.9	7.9	7.9	7.9	7.8	7.4
23	7.9	7.9	8.0	8.0	8.0	7.8	7.4
24	7.8	7.8	7.9	7.8	7.8	7.7	7.2
25	7.8	7.8	7.8	7.8	7.8	7.7	7.2
26	7.9	7.9	7.9	7.9	7.9	7.8	7.3
Conductance (µS/cm)							
18	450	678	868	1024	1372	2080	3370
19	471	674	861	1012	1346	2040	3240
20	446	651	851	1013	1361	2070	3320
21	455	667	860	1024	1359	2040	3290
22	457	661	859	1024	1363	2030	3310
23	437	672	864	1027	1360	1960	3220
24	468	681	875	1033	1357	1962	3300
25	472	688	881	1034	1382	2020	3390
26	505	677	866	1028	1359	1952	3320
Dissolved Oxygen (mg/L) (60-100% saturation)							
18	7.3	7.0	7.0	7.0	6.9	7.0	6.9
19	7.3	7.1	7.1	6.9	7.0	7.0	7.0
20	7.3	6.9	6.9	6.9	6.9	6.9	6.9
21	7.0	7.0	7.0	7.0	6.9	7.0	7.0
22	7.0	7.0	7.0	7.0	7.0	7.0	7.0
23	7.3	7.0	7.0	7.0	7.0	7.0	7.0
24	7.0	6.8	6.7	6.7	6.7	6.7	6.6
25	6.9	6.8	6.7	6.6	6.6	6.6	6.6
26	6.7	6.8	6.8	6.9	6.9	6.9	7.0
Temperature (°C)							
18	24	24	24	24	24	24	24
19	24	24	24	24	24	24	24
20	24	24	24	24	24	24	24
21	24	24	24	24	24	24	24
22	24	24	24	24	24	24	24
23	24	24	24	24	24	24	24
24	24	24	24	24	24	24	24
25	24	24	24	24	24	24	24
26	24	24	24	24	24	24	24

DO Levels (60-100% saturation) -
4.4 to 7.3 mg/L at 24°C
4.3 to 7.2 mg/L at 25°C
4.2 to 7.0 mg/L at 26°C

Comments:

Reviewed By: LO   Date Reviewed: 2024/11/14

NAUTILUS ENVIRONMENTAL

Fathead Minnow Bench Sheet

Method FMD 32 Day ELS Client AGN108 Sample PJ2425-002

New Solutions

Conc. (✓) / Day	LAB CTL	T1	T2	T3	T4	T5	T6
pH (units)							
27	8.0	7.6	7.8	7.9	7.8	7.8	7.3
28	8.0	6.9	6.8	7.4	7.6	7.7	7.5
29	7.6	6.7	7.0	7.0	7.6	7.5	7.3
30	7.7	7.3	7.4	7.7	7.8	7.7	7.7
31	7.7	6.9	6.9	7.1	7.5	7.6	7.2
32							
Conductance (µS/cm)							
27	446	678	864	1019	1358	2000	3340
28	447	688	846	1017	1363	2030	3200
29	466	674	861	1044	1369	2040	3230
30	442	676	862	1034	1364	2050	3250
31	427	667	861	1035	1347	2020	3210
32							
Dissolved Oxygen (mg/L) (60-100% saturation)							
27	7.3	7.3	7.3	7.3	7.3	7.3	7.3
28 m	7.3	7.3	7.3	7.3	7.3	7.3	7.3
29 7.3	~~4.6~~	7.3	7.3	7.3	7.3	7.3	7.3
30	7.3	7.3	7.3	7.3	7.3	7.3	7.3
31	7.3	7.3	7.3	7.3	7.3	7.3	7.3
32							
Temperature (°C)							
27	24	24	24	24	24	24	24
28	24	24	24	24	24	24	24
29	24	24	24	24	24	24	24
30	24	24	24	24	24	24	24
31	24	24	24	24	24	24	24
32							

Old Solutions

Day	LAB CTL	T1	T2	T3	T4	T5	T6
pH (units)							
27	7.9	8.0	8.0	8.0	8.0	7.8	7.2
28	7.9	7.9	7.9	7.9	7.9	7.8	7.7
29	7.7	7.6	7.6	7.7	7.8	7.7	7.3
30	7.7	7.6	7.7	7.8	7.7	7.6	7.2
31	7.6	7.8	7.8	7.8	7.8	7.6	6.9
32	7.5	7.6	7.6	7.7	7.7	7.7	7.0
Conductance (µS/cm)							
27	472	687	874	1031	1377	2020	3400
28	476	674	863	1022	1367	2070	3290
29	499	685	863	1046	1373	2060	3240
30	486	682	866	1043	1365	1992	3390
31	458	682	859	1077	1318	1957	3270
32	456	683	865	1068	1345	1960	3250
Dissolved Oxygen (mg/L) (60-100% saturation)							
27	7.0	7.0	6.9	6.8	6.9	6.9	6.8
28	6.8	6.8	6.8	6.7	6.7	6.7	6.8
29	7.0	7.0	7.0	7.0	6.9	7.0	7.0
30	7.0	6.9	6.9	6.8	6.7	6.8	6.7
31	6.7	6.7	6.6	6.6	6.5	6.5	6.5
32	6.5	6.5	6.5	6.4	6.4	6.5	6.6
Temperature (°C)							
27	24	24	24	24	24	24	24
28	24	24	24	24	24	24	24
29	24	24	24	24	24	24	24
30	24	24	24	24	24	24	24
31	24	24	24	24	24	24	24
32	24	24	24	24	24	24	24

DO Levels (60-100% saturation) -
4.4 to 7.3 mg/L at 24°C
4.3 to 7.2 mg/L at 25°C
4.2 to 7.0 mg/L at 26°C

Comments:

Reviewed By: W Date Reviewed: 2024/11/14

Fathead minnow (Pimephales promelas) 32-d survival and growth test — **Nautilus Environmental Calgary**

Batch ID:	05-0291-7218	**Test Type:**	Survival-Development-Growth	**Analyst:**	Alyssa Minifie		
Start Date:	08 Oct-24	**Protocol:**	ASTM E1241-05 (2013)	**Diluent:**	Site water		
Ending Date:	09 Nov-24	**Species:**	Pimephales promelas	**Brine:**			
Test Length:	32d 0h	**Taxon:**	Actinopterygii	**Source:**	Aquatox, AR	**Age:**	

Sample ID:	11-6169-7917	**Code:**	453E1A7D	**Project:**	
Sample Date:		**Material:**	Total dissolved Solids	**Source:**	Agnico Eagle
Receipt Date:		**CAS (PC):**		**Station:**	TDS - ELS
Sample Age:	---	**Client:**	Agnico Eagle		

SIngle Comparison Summary

Analysis ID	Endpoint	Comparison Method	P-Value	Comparison Result
12-1447-8891	Hatch Rate	Fisher Exact Test	0.6202	Site Control passed hatch rate
02-2637-7606	Length	Equal Variance t Two-Sample Test	0.8758	Site Control passed length
02-9816-6381	Mean Dry Weight-mg	Equal Variance t Two-Sample Test	0.0776	Site Control passed mean dry weight-mg
19-0090-2613	Post Hatch Survival	Fisher Exact Test	0.1722	Site Control passed post hatch survival
12-9986-8654	Proportion Normal	Fisher Exact Test	0.6220	Site Control passed proportion normal
06-0793-7078	Survival Rate	Fisher Exact Test	0.1325	Site Control passed survival rate

Multiple Comparison Summary

Analysis ID	Endpoint	Comparison Method	NOEL	LOEL	TOEL	PMSD
18-4179-5060	Hatch Rate	Fisher Exact/Bonferroni Adj Test	2236	>2236	---	---
12-6877-7559	Length	Dunnett Multiple Comparison Test	2236	>2236	---	4.59%
01-2118-6378	Mean Dry Weight-mg	Dunnett Multiple Comparison Test	490	607	545.4	6.55%
14-7905-9621	Post Hatch Survival	Fisher Exact/Bonferroni Adj Test	2236	>2236	---	---
13-3730-0518	Survival Rate	Fisher Exact/Bonferroni Adj Test	2236	>2236	---	---

Fathead minnow (Pimephales promelas) 32-d survival and growth test | **Nautilus Environmental Calgary**

Hatch Rate Summary

Conc-mg/L	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	LC	4	0.9875	0.9477	1.0270	0.9500	1.0000	0.0125	0.0250	2.53%	0.00%
373	XC	4	0.9625	0.8863	1.0390	0.9000	1.0000	0.0239	0.0479	4.97%	2.53%
490		4	0.9637	0.8908	1.0370	0.9048	1.0000	0.0229	0.0458	4.75%	2.41%
607		4	0.9875	0.9477	1.0270	0.9500	1.0000	0.0125	0.0250	2.53%	0.00%
839		4	0.9875	0.9477	1.0270	0.9500	1.0000	0.0125	0.0250	2.53%	0.00%
1304		4	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	-1.27%
2236		4	0.9875	0.9477	1.0270	0.9500	1.0000	0.0125	0.0250	2.53%	0.00%

Length Summary

Conc-mg/L	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	LC	4	10.91	10.68	11.14	10.75	11.06	0.07207	0.1441	1.32%	0.00%
373	XC	4	10.93	10.65	11.2	10.71	11.07	0.08697	0.1739	1.59%	-0.17%
490		4	10.96	10.7	11.23	10.79	11.18	0.08294	0.1659	1.51%	-0.52%
607		4	11.56	10.84	12.28	10.95	11.95	0.2252	0.4504	3.90%	-5.98%
839		4	11.64	11.23	12.06	11.39	11.94	0.1295	0.2591	2.22%	-6.76%
1304		4	11.75	11.17	12.34	11.35	12.2	0.1837	0.3674	3.13%	-7.74%
2236		4	11.56	11.18	11.94	11.32	11.88	0.1204	0.2407	2.08%	-5.97%

Mean Dry Weight-mg Summary

Conc-mg/L	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	LC	4	1.867	1.691	2.042	1.724	1.987	0.05518	0.1104	5.91%	0.00%
373	XC	4	2.004	1.897	2.111	1.945	2.081	0.03352	0.06703	3.34%	-7.35%
490		4	1.953	1.871	2.035	1.894	2.015	0.02569	0.05138	2.63%	-4.62%
607		4	1.858	1.786	1.929	1.797	1.902	0.02241	0.04483	2.41%	0.49%
839		4	1.799	1.683	1.915	1.705	1.875	0.03651	0.07301	4.06%	3.63%
1304		4	1.838	1.626	2.05	1.761	2.037	0.06659	0.1332	7.25%	1.54%
2236		4	1.809	1.715	1.902	1.726	1.865	0.02935	0.05869	3.24%	3.11%

Post Hatch Survival Summary

Conc-mg/L	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	LC	4	0.8987	0.7687	1.0290	0.8000	1.0000	0.0409	0.0817	9.09%	0.00%
373	XC	4	0.8168	0.7554	0.8783	0.7778	0.8500	0.0193	0.0386	4.73%	9.11%
490		4	0.9105	0.8061	1.0150	0.8421	1.0000	0.0328	0.0656	7.20%	-1.32%
607		4	0.9493	0.9472	0.9514	0.9474	0.9500	0.0007	0.0013	0.14%	-5.64%
839		4	0.8862	0.8476	0.9248	0.8500	0.9000	0.0121	0.0243	2.74%	1.39%
1304		4	0.8375	0.7016	0.9734	0.7500	0.9500	0.0427	0.0854	10.20%	6.81%
2236		4	0.9230	0.8154	1.0310	0.8421	1.0000	0.0338	0.0677	7.33%	-2.71%

Proportion Normal Summary

Conc-mg/L	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	LC	4	0.9611	0.8840	1.0380	0.9000	1.0000	0.0242	0.0484	5.04%	0.00%
373	XC	4	0.9821	0.9253	1.0390	0.9286	1.0000	0.0179	0.0357	3.64%	-2.19%
490		4	0.9861	0.9419	1.0300	0.9444	1.0000	0.0139	0.0278	2.82%	-2.60%
607		4	0.9722	0.8838	1.0610	0.8889	1.0000	0.0278	0.0556	5.71%	-1.16%
839		4	0.9861	0.9419	1.0300	0.9444	1.0000	0.0139	0.0278	2.82%	-2.60%
1304		4	0.9853	0.9385	1.0320	0.9412	1.0000	0.0147	0.0294	2.99%	-2.52%
2236		4	0.9743	0.9272	1.0220	0.9474	1.0000	0.0148	0.0297	3.04%	-1.38%

Survival Rate Summary

Conc-mg/L	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	LC	4	0.8875	0.7516	1.0230	0.8000	1.0000	0.0427	0.0854	9.62%	0.00%
373	XC	4	0.7875	0.6682	0.9068	0.7000	0.8500	0.0375	0.0750	9.52%	11.27%
490		4	0.8762	0.7953	0.9571	0.8000	0.9048	0.0254	0.0508	5.80%	1.27%
607		4	0.9375	0.8977	0.9773	0.9000	0.9500	0.0125	0.0250	2.67%	-5.63%
839		4	0.8750	0.8291	0.9209	0.8500	0.9000	0.0144	0.0289	3.30%	1.41%
1304		4	0.8375	0.7016	0.9734	0.7500	0.9500	0.0427	0.0854	10.20%	5.63%
2236		4	0.9125	0.7766	1.0480	0.8000	1.0000	0.0427	0.0854	9.36%	-2.82%

Fathead minnow (Pimephales promelas) 32-d survival and growth test **Nautilus Environmental Calgary**

Hatch Rate Detail MD5: C36657912CE78FB9B3EBC603D952505D

Conc-mg/L	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	LC	1.0000	1.0000	0.9500	1.0000
373	XC	1.0000	1.0000	0.9000	0.9500
490		0.9048	1.0000	1.0000	0.9500
607		1.0000	1.0000	0.9500	1.0000
839		1.0000	1.0000	1.0000	0.9500
1304		1.0000	1.0000	1.0000	1.0000
2236		1.0000	0.9500	1.0000	1.0000

Length Detail MD5: 0C2BCD1EB85A577BE6C88B8238C1B258

Conc-mg/L	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	LC	10.75	11.06	10.82	11
373	XC	11.06	10.71	11.07	10.87
490		10.79	10.89	11.18	11
607		11.95	11.84	11.5	10.95
839		11.94	11.39	11.78	11.47
1304		11.88	11.35	11.58	12.2
2236		11.44	11.88	11.32	11.6

Mean Dry Weight-mg Detail MD5: C758DE9337EFB380BCAD68401BECE0C5

Conc-mg/L	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	LC	1.987	1.854	1.724	1.903
373	XC	1.951	1.945	2.04	2.081
490		1.935	1.894	2.015	1.968
607		1.902	1.854	1.797	1.877
839		1.783	1.875	1.833	1.705
1304		1.785	1.761	1.769	2.037
2236		1.726	1.818	1.826	1.865

Post Hatch Survival Detail MD5: 2A95191961B701F9282836AD39E5458A

Conc-mg/L	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	LC	0.8000	0.9000	0.8947	1.0000
373	XC	0.8500	0.8500	0.7778	0.7895
490		1.0000	0.9000	0.9000	0.8421
607		0.9500	0.9500	0.9474	0.9500
839		0.8500	0.9000	0.9000	0.8947
1304		0.8000	0.8500	0.9500	0.7500
2236		0.9000	0.8421	0.9500	1.0000

Proportion Normal Detail MD5: 88F98950C58062942B757FD903195536

Conc-mg/L	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	LC	1.0000	0.9444	1.0000	0.9000
373	XC	1.0000	1.0000	0.9286	1.0000
490		1.0000	1.0000	0.9444	1.0000
607		1.0000	1.0000	0.8889	1.0000
839		1.0000	0.9444	1.0000	1.0000
1304		1.0000	0.9412	1.0000	1.0000
2236		1.0000	1.0000	0.9474	0.9500

Fathead minnow (Pimephales promelas) 32-d survival and growth test **Nautilus Environmental Calgary**

Survival Rate Detail MD5: DED3DE38E3F640DF51A6AE27E649EFB7

Conc-mg/L	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	LC	0.8000	0.9000	0.8500	1.0000
373	XC	0.8500	0.8500	0.7000	0.7500
490		0.9048	0.9000	0.9000	0.8000
607		0.9500	0.9500	0.9000	0.9500
839		0.8500	0.9000	0.9000	0.8500
1304		0.8000	0.8500	0.9500	0.7500
2236		0.9000	0.8000	0.9500	1.0000

Hatch Rate Binomials

Conc-mg/L	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	LC	20/20	20/20	19/20	20/20
373	XC	20/20	20/20	18/20	19/20
490		19/21	20/20	20/20	19/20
607		20/20	20/20	19/20	20/20
839		20/20	20/20	20/20	19/20
1304		20/20	20/20	20/20	20/20
2236		20/20	19/20	20/20	20/20

Post Hatch Survival Binomials

Conc-mg/L	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	LC	16/20	18/20	17/19	20/20
373	XC	17/20	17/20	14/18	15/19
490		19/19	18/20	18/20	16/19
607		19/20	19/20	18/19	19/20
839		17/20	18/20	18/20	17/19
1304		16/20	17/20	19/20	15/20
2236		18/20	16/19	19/20	20/20

Proportion Normal Binomials

Conc-mg/L	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	LC	16/16	17/18	17/17	18/20
373	XC	17/17	17/17	13/14	15/15
490		19/19	18/18	17/18	16/16
607		19/19	19/19	16/18	19/19
839		17/17	17/18	18/18	17/17
1304		16/16	16/17	19/19	15/15
2236		18/18	16/16	18/19	19/20

Survival Rate Binomials

Conc-mg/L	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	LC	16/20	18/20	17/20	20/20
373	XC	17/20	17/20	14/20	15/20
490		19/21	18/20	18/20	16/20
607		19/20	19/20	18/20	19/20
839		17/20	18/20	18/20	17/20
1304		16/20	17/20	19/20	15/20
2236		18/20	16/20	19/20	20/20

Fathead minnow (Pimephales promelas) 32-d survival and growth test — **Nautilus Environmental Calgary**

Batch ID:	05-0291-7218	**Test Type:**	Survival-Development-Growth	**Analyst:**	Alyssa Minifie
Start Date:	08 Oct-24	**Protocol:**	ASTM E1241-05 (2013)	**Diluent:**	Site water
Ending Date:	09 Nov-24	**Species:**	Pimephales promelas	**Brine:**	
Test Length:	32d 0h	**Taxon:**	Actinopterygii	**Source:**	Aquatox, AR

Age:

Sample ID:	11-6169-7917	**Code:**	453E1A7D	**Project:**	
Sample Date:		**Material:**	Total dissolved Solids	**Source:**	Agnico Eagle
Receipt Date:		**CAS (PC):**		**Station:**	TDS - ELS
Sample Age:	---	**Client:**	Agnico Eagle		

Multiple Comparison Summary

Analysis ID	Endpoint	Comparison Method	NOEL	LOEL	TOEL	PMSD
03-1093-1105	Proportion Normal	Fisher Exact/Bonferroni Adj Test	2236	>2236	---	---

Proportion Normal Summary

Conc-mg/L	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	LC	4	0.9611	0.8840	1.0380	0.9000	1.0000	0.0242	0.0484	5.04%	0.00%
373	XC	4	0.9821	0.9253	1.0390	0.9286	1.0000	0.0179	0.0357	3.64%	-2.19%
490		4	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	-4.05%
607		4	0.9722	0.8838	1.0610	0.8889	1.0000	0.0278	0.0556	5.71%	-1.16%
839		4	0.9861	0.9419	1.0300	0.9444	1.0000	0.0139	0.0278	2.82%	-2.60%
1304		4	0.9853	0.9385	1.0320	0.9412	1.0000	0.0147	0.0294	2.99%	-2.52%
2236		4	0.9743	0.9272	1.0220	0.9474	1.0000	0.0148	0.0297	3.04%	-1.38%

Proportion Normal Detail

MD5: 7795FF5110775E22FDB57E86C1F6FB4E

Conc-mg/L	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	LC	1.0000	0.9444	1.0000	0.9000
373	XC	1.0000	1.0000	0.9286	1.0000
490		1.0000	1.0000	1.0000	1.0000
607		1.0000	1.0000	0.8889	1.0000
839		1.0000	0.9444	1.0000	1.0000
1304		1.0000	0.9412	1.0000	1.0000
2236		1.0000	1.0000	0.9474	0.9500

Proportion Normal Binomials

Conc-mg/L	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	LC	16/16	17/18	17/17	18/20
373	XC	17/17	17/17	13/14	15/15
490		19/19	18/18	17/17	16/16
607		19/19	19/19	16/18	19/19
839		17/17	17/18	18/18	17/17
1304		16/16	16/17	19/19	15/15
2236		18/18	16/16	18/19	19/20

CETIS Analytical Report

Fathead minnow (Pimephales promelas) 32-d survival and growth test — **Nautilus Environmental Calgary**

Analysis ID:	12-1447-8891	**Endpoint:**	Hatch Rate	**CETIS Version:**	CETIS v2.1.5
Analyzed:	15 Nov-24 13:26	**Analysis:**	Single 2x2 Contingency Table	**Status Level:**	1
Edit Date:	15 Nov-24 13:15	**MD5 Hash:**	672F670F524572A26FA45A58D3E4FBBE	**Editor ID:**	

Batch ID:	05-0291-7218	**Test Type:**	Survival-Development-Growth	**Analyst:**	Alyssa Minifie		
Start Date:	08 Oct-24	**Protocol:**	ASTM E1241-05 (2013)	**Diluent:**			
Ending Date:	09 Nov-24	**Species:**	Pimephales promelas	**Brine:**			
Test Length:	32d 0h	**Taxon:**	Actinopterygii	**Source:**	Aquatox, AR	**Age:**	

Sample ID:	11-6169-7917	**Code:**	453E1A7D	**Project:**	
Sample Date:		**Material:**	Total dissolved Solids	**Source:**	Agnico Eagle
Receipt Date:		**CAS (PC):**		**Station:**	TDS - ELS
Sample Age:	---	**Client:**	Agnico Eagle		

Data Transform	Alt Hyp	Comparison Result
Untransformed	C <> T	Site Control passed hatch rate endpoint

Fisher Exact Test

Control I	vs	Control II	Test Stat	P-Type	P-Value	Decision(α:5%)
Lab Control		Site Control	0.6202	Exact	0.6202	Non-Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Outlier	Grubbs Extreme Value Test	1.697	2.127	0.4840	No Outliers Detected

Hatch Rate Frequencies

Conc-mg/L	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
0	LC	79	1	80	0.9875	0.0125	0.00%
373	XC	77	3	80	0.9625	0.0375	2.53%

Hatch Rate Summary

Conc-mg/L	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	LC	4	0.9875	0.9477	1.0000	1.0000	0.9500	1.0000	0.0125	2.53%	0.00%
373	XC	4	0.9625	0.8863	1.0000	0.9750	0.9000	1.0000	0.0239	4.97%	2.53%

Hatch Rate Detail

Conc-mg/L	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	LC	1.0000	1.0000	0.9500	1.0000
373	XC	1.0000	1.0000	0.9000	0.9500

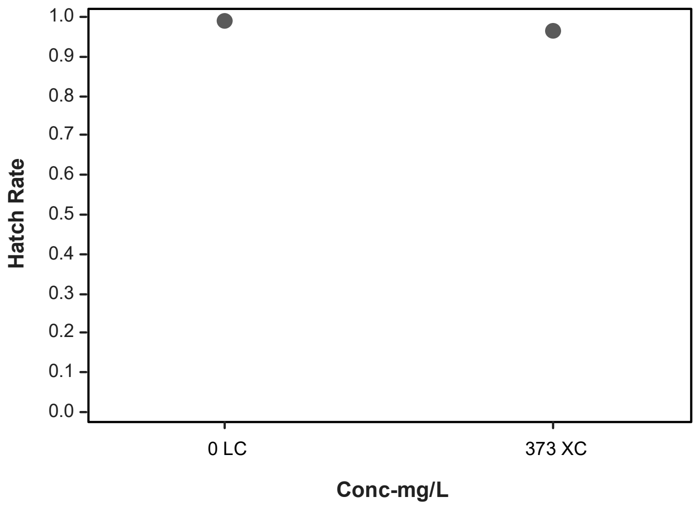
Hatch Rate Binomials

Conc-mg/L	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	LC	20/20	20/20	19/20	20/20
373	XC	20/20	20/20	18/20	19/20

Fathead minnow (Pimephales promelas) 32-d survival and growth test — **Nautilus Environmental Calgary**

Analysis ID:	12-1447-8891	**Endpoint:**	Hatch Rate	**CETIS Version:**	CETIS v2.1.5
Analyzed:	15 Nov-24 13:26	**Analysis:**	Single 2x2 Contingency Table	**Status Level:**	1
Edit Date:	15 Nov-24 13:15	**MD5 Hash:**	672F670F524572A26FA45A58D3E4FBBE	**Editor ID:**	

Graphics



CETIS Analytical Report

Fathead minnow (Pimephales promelas) 32-d survival and growth test — **Nautilus Environmental Calgary**

Analysis ID:	18-4179-5060	**Endpoint:**	Hatch Rate	**CETIS Version:**	CETIS v2.1.5
Analyzed:	15 Nov-24 13:35	**Analysis:**	STP 2xK Contingency Tables	**Status Level:**	1
Edit Date:	15 Nov-24 13:15	**MD5 Hash:**	DFD611B755A3E71C51CAE4CC6ED7E2C	**Editor ID:**	

Batch ID:	05-0291-7218	**Test Type:**	Survival-Development-Growth	**Analyst:**	Alyssa Minifie	
Start Date:	08 Oct-24	**Protocol:**	ASTM E1241-05 (2013)	**Diluent:**		
Ending Date:	09 Nov-24	**Species:**	Pimephales promelas	**Brine:**		
Test Length:	32d 0h	**Taxon:**	Actinopterygii	**Source:**	Aquatox, AR	**Age:**

Sample ID:	11-6169-7917	**Code:**	453E1A7D	**Project:**	
Sample Date:		**Material:**	Total dissolved Solids	**Source:**	Agnico Eagle
Receipt Date:		**CAS (PC):**		**Station:**	TDS - ELS
Sample Age:	---	**Client:**	Agnico Eagle		

Data Transform	Alt Hyp	NOEL	LOEL	TOEL	Tox Units
Untransformed	C > T	2236	>2236	---	---

Fisher Exact/Bonferroni Adj Test

Control	vs	Conc-mg/L	Test Stat	P-Type	P-Value	Decision(α:5%)
Site Control		490	0.6651	Exact	1.0000	Non-Significant Effect
		607	0.9399	Exact	1.0000	Non-Significant Effect
		839	0.9399	Exact	1.0000	Non-Significant Effect
		1304	1.0000	Exact	1.0000	Non-Significant Effect
		2236	0.9399	Exact	1.0000	Non-Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Outlier	Grubbs Extreme Value Test	2.079	2.802	0.7256	No Outliers Detected

Hatch Rate Frequencies

Conc-mg/L	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
373	XC	77	3	80	0.9625	0.0375	0.00%
490		78	3	81	0.9630	0.0370	-0.05%
607		79	1	80	0.9875	0.0125	-2.60%
839		79	1	80	0.9875	0.0125	-2.60%
1304		80	0	80	1.0000	0.0000	-3.90%
2236		79	1	80	0.9875	0.0125	-2.60%

Hatch Rate Summary

Conc-mg/L	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
373	XC	4	0.9625	0.8863	1.0000	0.9750	0.9000	1.0000	0.0239	4.97%	0.00%
490		4	0.9637	0.8908	1.0000	0.9750	0.9048	1.0000	0.0229	4.75%	-0.12%
607		4	0.9875	0.9477	1.0000	1.0000	0.9500	1.0000	0.0125	2.53%	-2.60%
839		4	0.9875	0.9477	1.0000	1.0000	0.9500	1.0000	0.0125	2.53%	-2.60%
1304		4	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.00%	-3.90%
2236		4	0.9875	0.9477	1.0000	1.0000	0.9500	1.0000	0.0125	2.53%	-2.60%

Hatch Rate Detail

Conc-mg/L	Code	Rep 1	Rep 2	Rep 3	Rep 4
373	XC	1.0000	1.0000	0.9000	0.9500
490		0.9048	1.0000	1.0000	0.9500
607		1.0000	1.0000	0.9500	1.0000
839		1.0000	1.0000	1.0000	0.9500
1304		1.0000	1.0000	1.0000	1.0000
2236		1.0000	0.9500	1.0000	1.0000

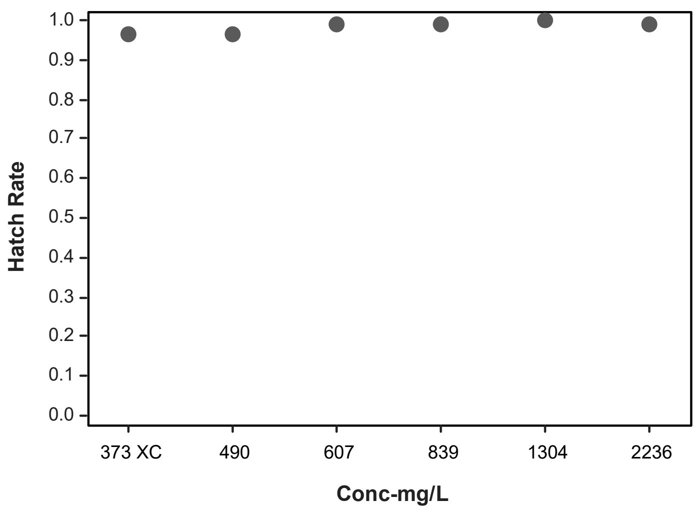
Fathead minnow (Pimephales promelas) 32-d survival and growth test — **Nautilus Environmental Calgary**

Analysis ID:	18-4179-5060	**Endpoint:**	Hatch Rate	**CETIS Version:**	CETIS v2.1.5
Analyzed:	15 Nov-24 13:35	**Analysis:**	STP 2xK Contingency Tables	**Status Level:**	1
Edit Date:	15 Nov-24 13:15	**MD5 Hash:**	DFD611B755A3E71C51CAE4CC6ED7E2C	**Editor ID:**	

Hatch Rate Binomials

Conc-mg/L	Code	Rep 1	Rep 2	Rep 3	Rep 4
373	XC	20/20	20/20	18/20	19/20
490		19/21	20/20	20/20	19/20
607		20/20	20/20	19/20	20/20
839		20/20	20/20	20/20	19/20
1304		20/20	20/20	20/20	20/20
2236		20/20	19/20	20/20	20/20

Graphics



Fathead minnow (Pimephales promelas) 32-d survival and growth test — **Nautilus Environmental Calgary**

Analysis ID:	19-0090-2613	**Endpoint:**	Post Hatch Survival	**CETIS Version:**	CETIS v2.1.5
Analyzed:	15 Nov-24 13:23	**Analysis:**	Single 2x2 Contingency Table	**Status Level:**	1
Edit Date:	15 Nov-24 13:15	**MD5 Hash:**	1A8C9FE7651BCF52CB842455CE2C30C3	**Editor ID:**	

Batch ID:	05-0291-7218	**Test Type:**	Survival-Development-Growth	**Analyst:**	Alyssa Minifie	
Start Date:	08 Oct-24	**Protocol:**	ASTM E1241-05 (2013)	**Diluent:**		
Ending Date:	09 Nov-24	**Species:**	Pimephales promelas	**Brine:**		
Test Length:	32d 0h	**Taxon:**	Actinopterygii	**Source:**	Aquatox, AR	**Age:**

Sample ID:	11-6169-7917	**Code:**	453E1A7D	**Project:**	
Sample Date:		**Material:**	Total dissolved Solids	**Source:**	Agnico Eagle
Receipt Date:		**CAS (PC):**		**Station:**	TDS - ELS
Sample Age:	---	**Client:**	Agnico Eagle		

Data Transform	Alt Hyp	Comparison Result
Untransformed	C <> T	Site Control passed post hatch survival endpoint

Fisher Exact Test

Control I	vs	Control II	Test Stat	P-Type	P-Value	Decision(α:5%)
Lab Control		Site Control	0.1722	Exact	0.1722	Non-Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Outlier	Grubbs Extreme Value Test	1.938	2.127	0.1725	No Outliers Detected

Post Hatch Survival Frequencies

Conc-mg/L	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
0	LC	71	8	79	0.8987	0.1013	0.00%
373	XC	63	14	77	0.8182	0.1818	8.96%

Post Hatch Survival Summary

Conc-mg/L	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	LC	4	0.8987	0.7687	1.0000	0.8974	0.8000	1.0000	0.0409	9.09%	0.00%
373	XC	4	0.8168	0.7554	0.8783	0.8197	0.7778	0.8500	0.0193	4.73%	9.11%

Post Hatch Survival Detail

Conc-mg/L	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	LC	0.8000	0.9000	0.8947	1.0000
373	XC	0.8500	0.8500	0.7778	0.7895

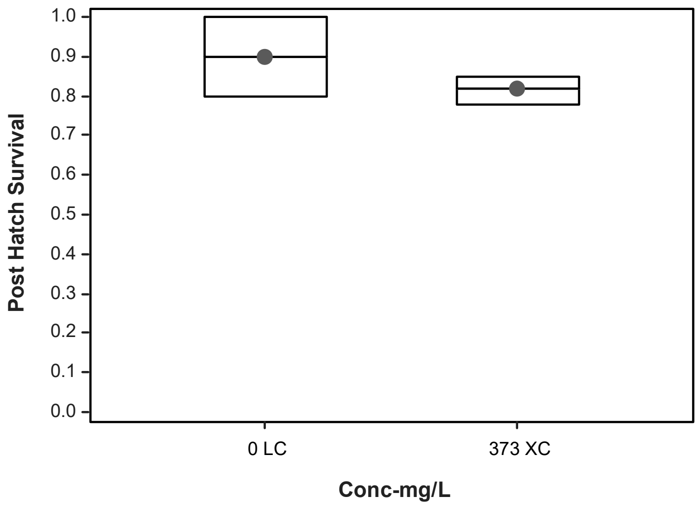
Post Hatch Survival Binomials

Conc-mg/L	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	LC	16/20	18/20	17/19	20/20
373	XC	17/20	17/20	14/18	15/19

Fathead minnow (Pimephales promelas) 32-d survival and growth test | **Nautilus Environmental Calgary**

Analysis ID:	19-0090-2613	**Endpoint:**	Post Hatch Survival	**CETIS Version:**	CETIS v2.1.5
Analyzed:	15 Nov-24 13:23	**Analysis:**	Single 2x2 Contingency Table	**Status Level:**	1
Edit Date:	15 Nov-24 13:15	**MD5 Hash:**	1A8C9FE7651BCF52CB842455CE2C30C3	**Editor ID:**	

Graphics



Fathead minnow (Pimephales promelas) 32-d survival and growth test — **Nautilus Environmental Calgary**

Analysis ID:	14-7905-9621	**Endpoint:**	Post Hatch Survival	**CETIS Version:**	CETIS v2.1.5
Analyzed:	15 Nov-24 13:33	**Analysis:**	STP 2xK Contingency Tables	**Status Level:**	1
Edit Date:	15 Nov-24 13:15	**MD5 Hash:**	2B83C6EABA74177CE1C2EC6E39FADE7	**Editor ID:**	

Batch ID:	05-0291-7218	**Test Type:**	Survival-Development-Growth	**Analyst:**	Alyssa Minifie		
Start Date:	08 Oct-24	**Protocol:**	ASTM E1241-05 (2013)	**Diluent:**			
Ending Date:	09 Nov-24	**Species:**	Pimephales promelas	**Brine:**			
Test Length:	32d 0h	**Taxon:**	Actinopterygii	**Source:**	Aquatox, AR	**Age:**	

Sample ID:	11-6169-7917	**Code:**	453E1A7D	**Project:**	
Sample Date:		**Material:**	Total dissolved Solids	**Source:**	Agnico Eagle
Receipt Date:		**CAS (PC):**		**Station:**	TDS - ELS
Sample Age:	---	**Client:**	Agnico Eagle		

Data Transform	Alt Hyp	NOEL	LOEL	TOEL	Tox Units
Untransformed	C > T	2236	>2236	---	---

Fisher Exact/Bonferroni Adj Test

Control	vs	Conc-mg/L	Test Stat	P-Type	P-Value	Decision(α:5%)
Site Control		490	0.9728	Exact	1.0000	Non-Significant Effect
		607	0.9981	Exact	1.0000	Non-Significant Effect
		839	0.9229	Exact	1.0000	Non-Significant Effect
		1304	0.7026	Exact	1.0000	Non-Significant Effect
		2236	0.9876	Exact	1.0000	Non-Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Outlier	Grubbs Extreme Value Test	2.145	2.802	0.5961	No Outliers Detected

Post Hatch Survival Frequencies

Conc-mg/L	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
373	XC	63	14	77	0.8182	0.1818	0.00%
490		71	7	78	0.9103	0.0897	-11.25%
607		75	4	79	0.9494	0.0506	-16.03%
839		70	9	79	0.8861	0.1139	-8.30%
1304		67	13	80	0.8375	0.1625	-2.36%
2236		73	6	79	0.9241	0.0760	-12.94%

Post Hatch Survival Summary

Conc-mg/L	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
373	XC	4	0.8168	0.7554	0.8783	0.8197	0.7778	0.8500	0.0193	4.73%	0.00%
490		4	0.9105	0.8061	1.0000	0.9000	0.8421	1.0000	0.0328	7.20%	-11.47%
607		4	0.9493	0.9472	0.9514	0.9500	0.9474	0.9500	0.0007	0.14%	-16.23%
839		4	0.8862	0.8476	0.9248	0.8974	0.8500	0.9000	0.0121	2.74%	-8.49%
1304		4	0.8375	0.7016	0.9734	0.8250	0.7500	0.9500	0.0427	10.20%	-2.53%
2236		4	0.9230	0.8154	1.0000	0.9250	0.8421	1.0000	0.0338	7.33%	-13.00%

Post Hatch Survival Detail

Conc-mg/L	Code	Rep 1	Rep 2	Rep 3	Rep 4
373	XC	0.8500	0.8500	0.7778	0.7895
490		1.0000	0.9000	0.9000	0.8421
607		0.9500	0.9500	0.9474	0.9500
839		0.8500	0.9000	0.9000	0.8947
1304		0.8000	0.8500	0.9500	0.7500
2236		0.9000	0.8421	0.9500	1.0000

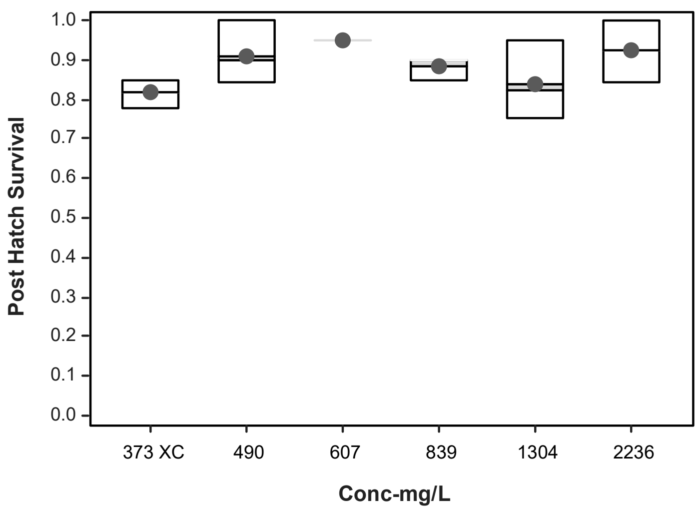
Fathead minnow (Pimephales promelas) 32-d survival and growth test **Nautilus Environmental Calgary**

Analysis ID:	14-7905-9621	**Endpoint:**	Post Hatch Survival	**CETIS Version:**	CETIS v2.1.5
Analyzed:	15 Nov-24 13:33	**Analysis:**	STP 2xK Contingency Tables	**Status Level:**	1
Edit Date:	15 Nov-24 13:15	**MD5 Hash:**	2B83C6EABA74177CE1C2EC6E39FADE7	**Editor ID:**	

Post Hatch Survival Binomials

Conc-mg/L	Code	Rep 1	Rep 2	Rep 3	Rep 4
373	XC	17/20	17/20	14/18	15/19
490		19/19	18/20	18/20	16/19
607		19/20	19/20	18/19	19/20
839		17/20	18/20	18/20	17/19
1304		16/20	17/20	19/20	15/20
2236		18/20	16/19	19/20	20/20

Graphics



CETIS Analytical Report

Fathead minnow (Pimephales promelas) 32-d survival and growth test — **Nautilus Environmental Calgary**

Analysis ID:	06-0793-7078	**Endpoint:**	Survival Rate	**CETIS Version:**	CETIS v2.1.5
Analyzed:	15 Nov-24 13:25	**Analysis:**	Single 2x2 Contingency Table	**Status Level:**	1
Edit Date:	15 Nov-24 13:15	**MD5 Hash:**	D35D08379C1682589345D3615B016963	**Editor ID:**	

Batch ID:	05-0291-7218	**Test Type:**	Survival-Development-Growth	**Analyst:**	Alyssa Minifie		
Start Date:	08 Oct-24	**Protocol:**	ASTM E1241-05 (2013)	**Diluent:**			
Ending Date:	09 Nov-24	**Species:**	Pimephales promelas	**Brine:**			
Test Length:	32d 0h	**Taxon:**	Actinopterygii	**Source:**	Aquatox, AR	**Age:**	

Sample ID:	11-6169-7917	**Code:**	453E1A7D	**Project:**	
Sample Date:		**Material:**	Total dissolved Solids	**Source:**	Agnico Eagle
Receipt Date:		**CAS (PC):**		**Station:**	TDS - ELS
Sample Age:	---	**Client:**	Agnico Eagle		

Data Transform	Alt Hyp	Comparison Result
Untransformed	C <> T	Site Control passed survival rate endpoint

Fisher Exact Test

Control I vs	Control II	Test Stat	P-Type	P-Value	Decision(α:5%)
Lab Control	Site Control	0.1325	Exact	0.1325	Non-Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Outlier	Grubbs Extreme Value Test	1.816	2.127	0.3055	No Outliers Detected

Survival Rate Frequencies

Conc-mg/L	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
0	LC	71	9	80	0.8875	0.1125	0.00%
373	XC	63	17	80	0.7875	0.2125	11.27%

Survival Rate Summary

Conc-mg/L	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	LC	4	0.8875	0.7516	1.0000	0.8750	0.8000	1.0000	0.0427	9.62%	0.00%
373	XC	4	0.7875	0.6682	0.9068	0.8000	0.7000	0.8500	0.0375	9.52%	11.27%

Survival Rate Detail

Conc-mg/L	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	LC	0.8000	0.9000	0.8500	1.0000
373	XC	0.8500	0.8500	0.7000	0.7500

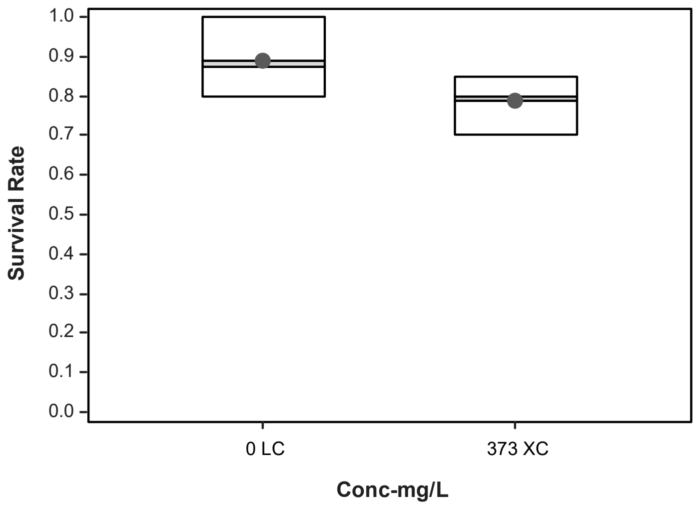
Survival Rate Binomials

Conc-mg/L	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	LC	16/20	18/20	17/20	20/20
373	XC	17/20	17/20	14/20	15/20

Fathead minnow (Pimephales promelas) 32-d survival and growth test | **Nautilus Environmental Calgary**

Analysis ID:	06-0793-7078	**Endpoint:**	Survival Rate	**CETIS Version:**	CETIS v2.1.5
Analyzed:	15 Nov-24 13:25	**Analysis:**	Single 2x2 Contingency Table	**Status Level:**	1
Edit Date:	15 Nov-24 13:15	**MD5 Hash:**	D35D08379C1682589345D3615B016963	**Editor ID:**	

Graphics



CETIS Analytical Report

Fathead minnow (Pimephales promelas) 32-d survival and growth test — **Nautilus Environmental Calgary**

Analysis ID:	13-3730-0518	**Endpoint:**	Survival Rate	**CETIS Version:**	CETIS v2.1.5
Analyzed:	15 Nov-24 13:34	**Analysis:**	STP 2xK Contingency Tables	**Status Level:**	1
Edit Date:	15 Nov-24 13:15	**MD5 Hash:**	066169109F2BC2E660F4DC0C92A44531	**Editor ID:**	

Batch ID:	05-0291-7218	**Test Type:**	Survival-Development-Growth	**Analyst:**	Alyssa Minifie		
Start Date:	08 Oct-24	**Protocol:**	ASTM E1241-05 (2013)	**Diluent:**			
Ending Date:	09 Nov-24	**Species:**	Pimephales promelas	**Brine:**			
Test Length:	32d 0h	**Taxon:**	Actinopterygii	**Source:**	Aquatox, AR	**Age:**	

Sample ID:	11-6169-7917	**Code:**	453E1A7D	**Project:**	
Sample Date:		**Material:**	Total dissolved Solids	**Source:**	Agnico Eagle
Receipt Date:		**CAS (PC):**		**Station:**	TDS - ELS
Sample Age:	---	**Client:**	Agnico Eagle		

Data Transform	Alt Hyp	NOEL	LOEL	TOEL	Tox Units
Untransformed	C > T	2236	>2236	---	---

Fisher Exact/Bonferroni Adj Test

Control	vs	Conc-mg/L	Test Stat	P-Type	P-Value	Decision(α:5%)
Site Control		490	0.9582	Exact	1.0000	Non-Significant Effect
		607	0.9989	Exact	1.0000	Non-Significant Effect
		839	0.9550	Exact	1.0000	Non-Significant Effect
		1304	0.8444	Exact	1.0000	Non-Significant Effect
		2236	0.9932	Exact	1.0000	Non-Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Outlier	Grubbs Extreme Value Test	2.127	2.802	0.6289	No Outliers Detected

Survival Rate Frequencies

Conc-mg/L	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
373	XC	63	17	80	0.7875	0.2125	0.00%
490		71	10	81	0.8765	0.1235	-11.31%
607		75	5	80	0.9375	0.0625	-19.05%
839		70	10	80	0.8750	0.1250	-11.11%
1304		67	13	80	0.8375	0.1625	-6.35%
2236		73	7	80	0.9125	0.0875	-15.87%

Survival Rate Summary

Conc-mg/L	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
373	XC	4	0.7875	0.6682	0.9068	0.8000	0.7000	0.8500	0.0375	9.52%	0.00%
490		4	0.8762	0.7953	0.9571	0.9000	0.8000	0.9048	0.0254	5.80%	-11.26%
607		4	0.9375	0.8977	0.9773	0.9500	0.9000	0.9500	0.0125	2.67%	-19.05%
839		4	0.8750	0.8291	0.9209	0.8750	0.8500	0.9000	0.0144	3.30%	-11.11%
1304		4	0.8375	0.7016	0.9734	0.8250	0.7500	0.9500	0.0427	10.20%	-6.35%
2236		4	0.9125	0.7766	1.0000	0.9250	0.8000	1.0000	0.0427	9.36%	-15.87%

Survival Rate Detail

Conc-mg/L	Code	Rep 1	Rep 2	Rep 3	Rep 4
373	XC	0.8500	0.8500	0.7000	0.7500
490		0.9048	0.9000	0.9000	0.8000
607		0.9500	0.9500	0.9000	0.9500
839		0.8500	0.9000	0.9000	0.8500
1304		0.8000	0.8500	0.9500	0.7500
2236		0.9000	0.8000	0.9500	1.0000

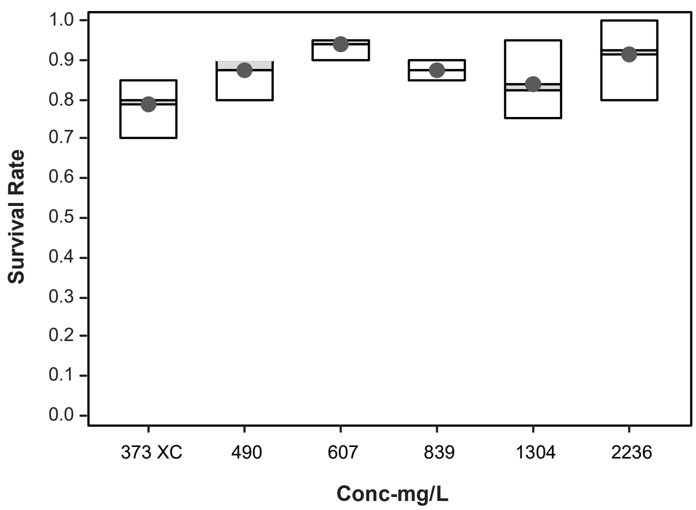
Fathead minnow (Pimephales promelas) 32-d survival and growth test **Nautilus Environmental Calgary**

Analysis ID:	13-3730-0518	**Endpoint:**	Survival Rate	**CETIS Version:**	CETIS v2.1.5
Analyzed:	15 Nov-24 13:34	**Analysis:**	STP 2xK Contingency Tables	**Status Level:**	1
Edit Date:	15 Nov-24 13:15	**MD5 Hash:**	066169109F2BC2E660F4DC0C92A44531	**Editor ID:**	

Survival Rate Binomials

Conc-mg/L	Code	Rep 1	Rep 2	Rep 3	Rep 4
373	XC	17/20	17/20	14/20	15/20
490		19/21	18/20	18/20	16/20
607		19/20	19/20	18/20	19/20
839		17/20	18/20	18/20	17/20
1304		16/20	17/20	19/20	15/20
2236		18/20	16/20	19/20	20/20

Graphics



Fathead minnow (Pimephales promelas) 32-d survival and growth test | **Nautilus Environmental Calgary**

Analysis ID:	12-9986-8654	**Endpoint:**	Proportion Normal	**CETIS Version:**	CETIS v2.1.5
Analyzed:	15 Nov-24 13:28	**Analysis:**	Single 2x2 Contingency Table	**Status Level:**	1
Edit Date:	15 Nov-24 13:15	**MD5 Hash:**	E287A4E3082E4BB62A0E0291AF9B8672	**Editor ID:**	

Batch ID:	05-0291-7218	**Test Type:**	Survival-Development-Growth	**Analyst:**	Alyssa Minifie	
Start Date:	08 Oct-24	**Protocol:**	ASTM E1241-05 (2013)	**Diluent:**		
Ending Date:	09 Nov-24	**Species:**	Pimephales promelas	**Brine:**		
Test Length:	32d 0h	**Taxon:**	Actinopterygii	**Source:**	Aquatox, AR	**Age:**

Sample ID:	11-6169-7917	**Code:**	453E1A7D	**Project:**	
Sample Date:		**Material:**	Total dissolved Solids	**Source:**	Agnico Eagle
Receipt Date:		**CAS (PC):**		**Station:**	TDS - ELS
Sample Age:	---	**Client:**	Agnico Eagle		

Data Transform	Alt Hyp	Comparison Result
Untransformed	C <> T	Site Control passed proportion normal endpoint

Fisher Exact Test

Control I	vs	Control II	Test Stat	P-Type	P-Value	Decision(α:5%)
Lab Control		Site Control	0.6220	Exact	0.6220	Non-Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Outlier	Grubbs Extreme Value Test	1.513	2.127	0.8575	No Outliers Detected

Proportion Normal Frequencies

Conc-mg/L	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
0	LC	68	3	71	0.9577	0.0423	0.00%
373	XC	62	1	63	0.9841	0.0159	-2.75%

Proportion Normal Summary

Conc-mg/L	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	LC	4	0.9611	0.8840	1.0000	0.9722	0.9000	1.0000	0.0242	5.04%	0.00%
373	XC	4	0.9821	0.9253	1.0000	1.0000	0.9286	1.0000	0.0179	3.64%	-2.19%

Proportion Normal Detail

Conc-mg/L	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	LC	1.0000	0.9444	1.0000	0.9000
373	XC	1.0000	1.0000	0.9286	1.0000

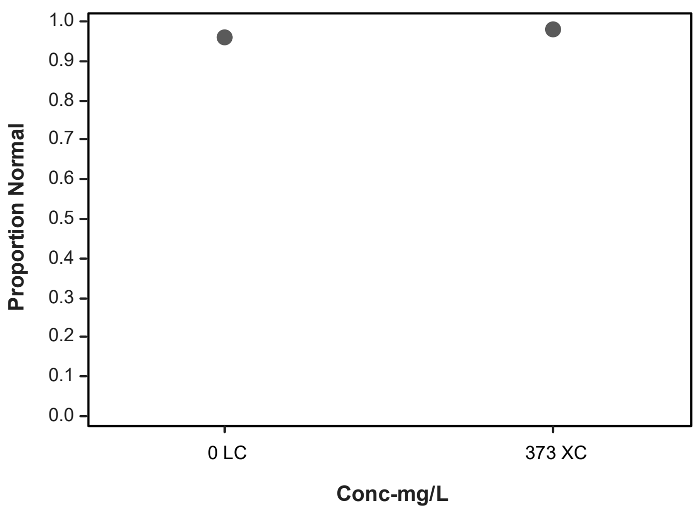
Proportion Normal Binomials

Conc-mg/L	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	LC	16/16	17/18	17/17	18/20
373	XC	17/17	17/17	13/14	15/15

Fathead minnow (Pimephales promelas) 32-d survival and growth test **Nautilus Environmental Calgary**

Analysis ID:	12-9986-8654	**Endpoint:**	Proportion Normal	**CETIS Version:**	CETIS v2.1.5
Analyzed:	15 Nov-24 13:28	**Analysis:**	Single 2x2 Contingency Table	**Status Level:**	1
Edit Date:	15 Nov-24 13:15	**MD5 Hash:**	E287A4E3082E4BB62A0E0291AF9B8672	**Editor ID:**	

Graphics



Fathead minnow (Pimephales promelas) 32-d survival and growth test | **Nautilus Environmental Calgary**

Analysis ID:	03-1093-1105	**Endpoint:**	Proportion Normal	**CETIS Version:**	CETIS v2.1.5
Analyzed:	26 Nov-24 16:40	**Analysis:**	STP 2xK Contingency Tables	**Status Level:**	1
Edit Date:	26 Nov-24 0:00	**MD5 Hash:**	C1D2CBDF76679F18E49937B7CF257447	**Editor ID:**	002-704-782-4

Batch ID:	05-0291-7218	**Test Type:**	Survival-Development-Growth	**Analyst:**	Alyssa Minifie		
Start Date:	08 Oct-24	**Protocol:**	ASTM E1241-05 (2013)	**Diluent:**			
Ending Date:	09 Nov-24	**Species:**	Pimephales promelas	**Brine:**			
Test Length:	32d 0h	**Taxon:**	Actinopterygii	**Source:**	Aquatox, AR	**Age:**	

Sample ID:	11-6169-7917	**Code:**	453E1A7D	**Project:**	
Sample Date:		**Material:**	Total dissolved Solids	**Source:**	Agnico Eagle
Receipt Date:		**CAS (PC):**		**Station:**	TDS - ELS
Sample Age:	---	**Client:**	Agnico Eagle		

Data Transform	Alt Hyp	NOEL	LOEL	TOEL	Tox Units
Untransformed	C > T	2236	>2236	---	---

Fisher Exact/Bonferroni Adj Test

Control	vs	Conc-mg/L	Test Stat	P-Type	P-Value	Decision(α:5%)
Site Control		490	1.0000	Exact	1.0000	Non-Significant Effect
		607	0.5655	Exact	1.0000	Non-Significant Effect
		839	0.7775	Exact	1.0000	Non-Significant Effect
		1304	0.7671	Exact	1.0000	Non-Significant Effect
		2236	0.5555	Exact	1.0000	Non-Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Outlier	Grubbs Extreme Value Test	2.74	2.802	0.0660	No Outliers Detected

Proportion Normal Frequencies

Conc-mg/L	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
373	XC	62	1	63	0.9841	0.0159	0.00%
490		70	0	70	1.0000	0.0000	-1.61%
607		73	2	75	0.9733	0.0267	1.10%
839		69	1	70	0.9857	0.0143	-0.16%
1304		66	1	67	0.9851	0.0149	-0.10%
2236		71	2	73	0.9726	0.0274	1.17%

Proportion Normal Summary

Conc-mg/L	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
373	XC	4	0.9821	0.9253	1.0000	1.0000	0.9286	1.0000	0.0179	3.64%	0.00%
490		4	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.00%	-1.82%
607		4	0.9722	0.8838	1.0000	1.0000	0.8889	1.0000	0.0278	5.71%	1.01%
839		4	0.9861	0.9419	1.0000	1.0000	0.9444	1.0000	0.0139	2.82%	-0.40%
1304		4	0.9853	0.9385	1.0000	1.0000	0.9412	1.0000	0.0147	2.99%	-0.32%
2236		4	0.9743	0.9272	1.0000	0.9750	0.9474	1.0000	0.0148	3.04%	0.79%

Proportion Normal Detail

Conc-mg/L	Code	Rep 1	Rep 2	Rep 3	Rep 4
373	XC	1.0000	1.0000	0.9286	1.0000
490		1.0000	1.0000	1.0000	1.0000
607		1.0000	1.0000	0.8889	1.0000
839		1.0000	0.9444	1.0000	1.0000
1304		1.0000	0.9412	1.0000	1.0000
2236		1.0000	1.0000	0.9474	0.9500

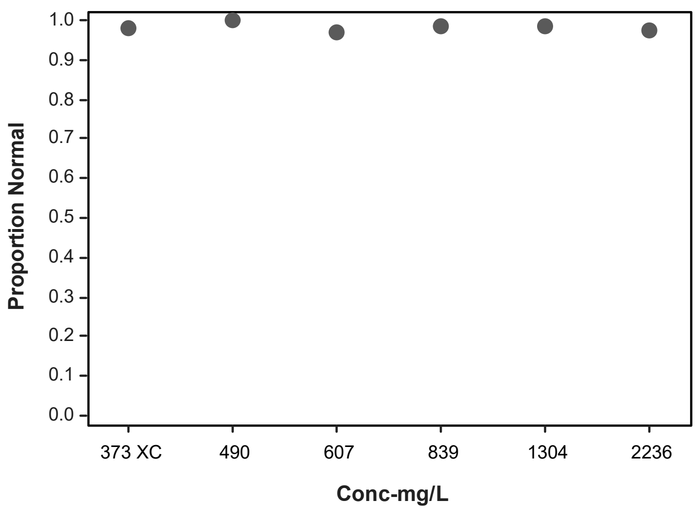
Fathead minnow (Pimephales promelas) 32-d survival and growth test **Nautilus Environmental Calgary**

Analysis ID:	03-1093-1105	**Endpoint:**	Proportion Normal	**CETIS Version:**	CETIS v2.1.5
Analyzed:	26 Nov-24 16:40	**Analysis:**	STP 2xK Contingency Tables	**Status Level:**	1
Edit Date:	26 Nov-24 0:00	**MD5 Hash:**	C1D2CBDF76679F18E49937B7CF257447	**Editor ID:**	002-704-782-4

Proportion Normal Binomials

Conc-mg/L	Code	Rep 1	Rep 2	Rep 3	Rep 4
373	XC	17/17	17/17	13/14	15/15
490		19/19	18/18	17/17	16/16
607		19/19	19/19	16/18	19/19
839		17/17	17/18	18/18	17/17
1304		16/16	16/17	19/19	15/15
2236		18/18	16/16	18/19	19/20

Graphics



Fathead minnow (Pimephales promelas) 32-d survival and growth test — **Nautilus Environmental Calgary**

Analysis ID:	02-2637-7606	**Endpoint:**	Length	**CETIS Version:**	CETIS v2.1.5
Analyzed:	15 Nov-24 13:29	**Analysis:**	Parametric-Two Sample	**Status Level:**	1
Edit Date:	15 Nov-24 13:15	**MD5 Hash:**	1AF53C3BB556AF86A6229ECA23A14EA8	**Editor ID:**	

Batch ID:	05-0291-7218	**Test Type:**	Survival-Development-Growth	**Analyst:**	Alyssa Minifie		
Start Date:	08 Oct-24	**Protocol:**	ASTM E1241-05 (2013)	**Diluent:**			
Ending Date:	09 Nov-24	**Species:**	Pimephales promelas	**Brine:**			
Test Length:	32d 0h	**Taxon:**	Actinopterygii	**Source:**	Aquatox, AR	**Age:**	

Sample ID:	11-6169-7917	**Code:**	453E1A7D	**Project:**	
Sample Date:		**Material:**	Total dissolved Solids	**Source:**	Agnico Eagle
Receipt Date:		**CAS (PC):**		**Station:**	TDS - ELS
Sample Age:	---	**Client:**	Agnico Eagle		

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C <> T	Site Control passed length endpoint	2.53%

Equal Variance t Two-Sample Test

Control I	vs	Control II	df	Test Stat	Critical	MSD	P-Type	P-Value	Decision(α:5%)
Lab Control		Site Control	6	0.1632	2.447	0.2764	CDF	0.8758	Non-Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Outlier	Grubbs Extreme Value Test	1.486	2.127	0.9231	No Outliers Detected

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.0006793	0.0006793	1	0.02662	0.8758	Non-Significant Effect
Error	0.153097	0.0255162	6			
Total	0.153776		7			

ANOVA Assumptions Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Variance	Variance Ratio F Test	1.456	15.44	0.7649	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.8707	0.6805	0.1532	Normal Distribution

Length Summary

Conc-mg/L	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	LC	4	10.91	10.68	11.14	10.91	10.75	11.06	0.07207	1.32%	0.00%
373	XC	4	10.93	10.65	11.2	10.96	10.71	11.07	0.08697	1.59%	-0.17%

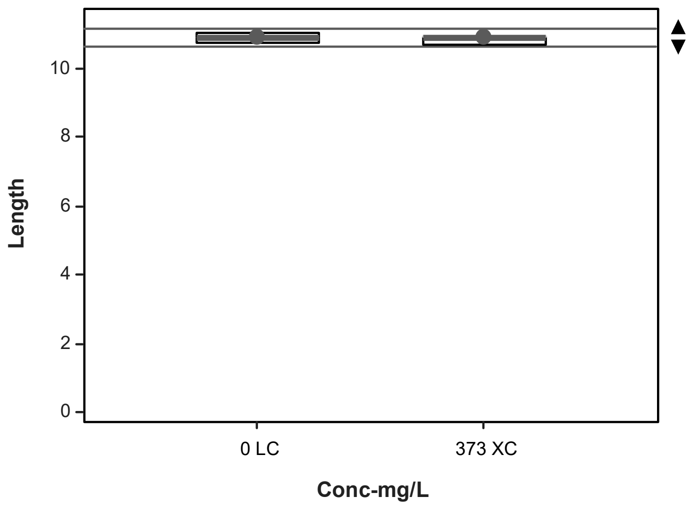
Length Detail

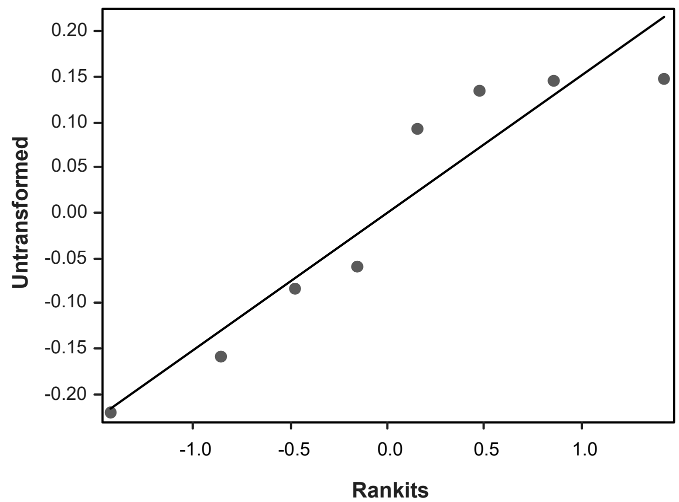
Conc-mg/L	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	LC	10.75	11.06	10.82	11
373	XC	11.06	10.71	11.07	10.87

Fathead minnow (Pimephales promelas) 32-d survival and growth test **Nautilus Environmental Calgary**

Analysis ID:	02-2637-7606	**Endpoint:**	Length	**CETIS Version:**	CETIS v2.1.5
Analyzed:	15 Nov-24 13:29	**Analysis:**	Parametric-Two Sample	**Status Level:**	1
Edit Date:	15 Nov-24 13:15	**MD5 Hash:**	1AF53C3BB556AF86A6229ECA23A14EA8	**Editor ID:**	

Graphics





CETIS Analytical Report

Fathead minnow (Pimephales promelas) 32-d survival and growth test — **Nautilus Environmental Calgary**

Analysis ID:	12-6877-7559	**Endpoint:**	Length	**CETIS Version:**	CETIS v2.1.5
Analyzed:	15 Nov-24 13:36	**Analysis:**	Parametric-Control vs Treatments	**Status Level:**	1
Edit Date:	15 Nov-24 13:15	**MD5 Hash:**	CF4CA336BD5D2842F1CD57B13A87D5A	**Editor ID:**	

Batch ID:	05-0291-7218	**Test Type:**	Survival-Development-Growth	**Analyst:**	Alyssa Minifie	
Start Date:	08 Oct-24	**Protocol:**	ASTM E1241-05 (2013)	**Diluent:**		
Ending Date:	09 Nov-24	**Species:**	Pimephales promelas	**Brine:**		
Test Length:	32d 0h	**Taxon:**	Actinopterygii	**Source:**	Aquatox, AR	**Age:**

Sample ID:	11-6169-7917	**Code:**	453E1A7D	**Project:**	
Sample Date:		**Material:**	Total dissolved Solids	**Source:**	Agnico Eagle
Receipt Date:		**CAS (PC):**		**Station:**	TDS - ELS
Sample Age:	---	**Client:**	Agnico Eagle		

Data Transform	Alt Hyp	NOEL	LOEL	TOEL	Tox Units	MSDu	PMSD
Untransformed	C > T	2236	>2236	---	---	0.5014	4.59%

Dunnett Multiple Comparison Test

Control	vs	Conc-mg/L	df	Test Stat	Critical	MSD	P-Type	P-Value	Decision(α:5%)
Site Control		490	6	-0.1825	2.407	0.5014	CDF	0.8814	Non-Significant Effect
		607	6	-3.041	2.407	0.5014	CDF	1.0000	Non-Significant Effect
		839	6	-3.451	2.407	0.5014	CDF	1.0000	Non-Significant Effect
		1304	6	-3.965	2.407	0.5014	CDF	1.0000	Non-Significant Effect
		2236	6	-3.039	2.407	0.5014	CDF	1.0000	Non-Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Outlier	Grubbs Extreme Value Test	2.348	2.802	0.3079	No Outliers Detected

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	2.59767	0.519534	5	5.987	0.0020	Significant Effect
Error	1.56206	0.0867809	18			
Total	4.15973		23			

ANOVA Assumptions Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Variance	Bartlett Equality of Variance Test	4.176	11.07	0.5244	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9775	0.9169	0.8447	Normal Distribution

Length Summary

Conc-mg/L	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
373	XC	4	10.93	10.65	11.2	10.96	10.71	11.07	0.08697	1.59%	0.00%
490		4	10.96	10.7	11.23	10.94	10.79	11.18	0.08294	1.51%	-0.35%
607		4	11.56	10.84	12.28	11.67	10.95	11.95	0.2252	3.90%	-5.80%
839		4	11.64	11.23	12.06	11.62	11.39	11.94	0.1295	2.22%	-6.58%
1304		4	11.75	11.17	12.34	11.73	11.35	12.2	0.1837	3.13%	-7.56%
2236		4	11.56	11.18	11.94	11.52	11.32	11.88	0.1204	2.08%	-5.79%

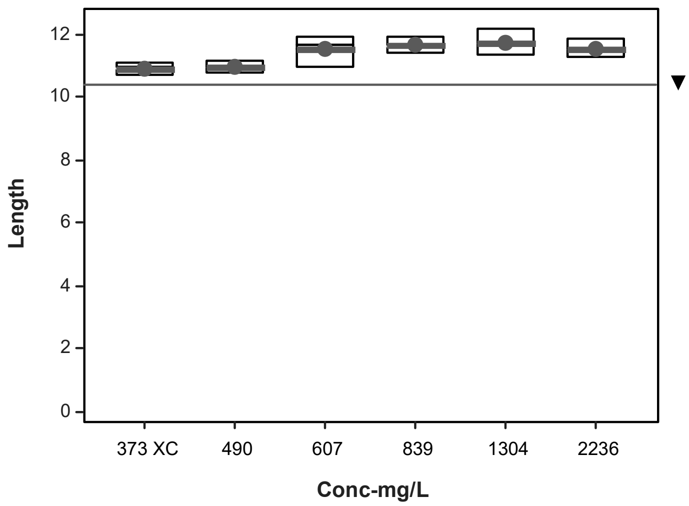
Length Detail

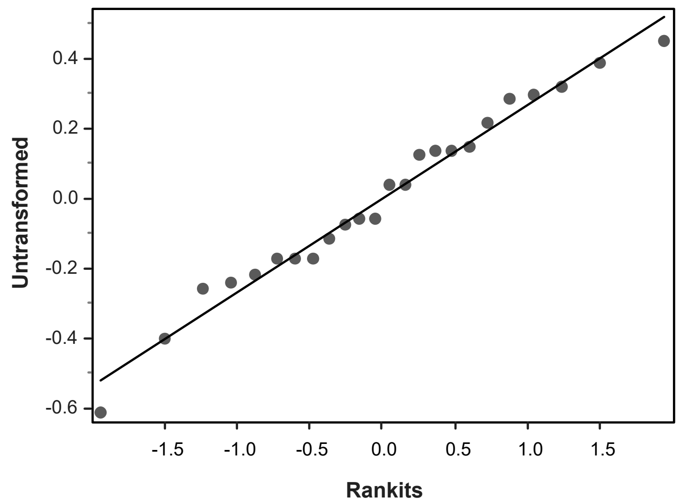
Conc-mg/L	Code	Rep 1	Rep 2	Rep 3	Rep 4
373	XC	11.06	10.71	11.07	10.87
490		10.79	10.89	11.18	11
607		11.95	11.84	11.5	10.95
839		11.94	11.39	11.78	11.47
1304		11.88	11.35	11.58	12.2
2236		11.44	11.88	11.32	11.6

Fathead minnow (Pimephales promelas) 32-d survival and growth test | **Nautilus Environmental Calgary**

Analysis ID:	12-6877-7559	**Endpoint:**	Length	**CETIS Version:**	CETIS v2.1.5
Analyzed:	15 Nov-24 13:36	**Analysis:**	Parametric-Control vs Treatments	**Status Level:**	1
Edit Date:	15 Nov-24 13:15	**MD5 Hash:**	CF4CA336BD5D2842F1CD57B13A87D5A	**Editor ID:**	

Graphics





Fathead minnow (Pimephales promelas) 32-d survival and growth test — **Nautilus Environmental Calgary**

Analysis ID:	02-9816-6381	**Endpoint:**	Mean Dry Weight-mg	**CETIS Version:**	CETIS v2.1.5
Analyzed:	15 Nov-24 13:31	**Analysis:**	Parametric-Two Sample	**Status Level:**	1
Edit Date:	15 Nov-24 13:15	**MD5 Hash:**	ED75F51198AC30299436802B3354F7E7	**Editor ID:**	

Batch ID:	05-0291-7218	**Test Type:**	Survival-Development-Growth	**Analyst:**	Alyssa Minifie		
Start Date:	08 Oct-24	**Protocol:**	ASTM E1241-05 (2013)	**Diluent:**			
Ending Date:	09 Nov-24	**Species:**	Pimephales promelas	**Brine:**			
Test Length:	32d 0h	**Taxon:**	Actinopterygii	**Source:**	Aquatox, AR	**Age:**	

Sample ID:	11-6169-7917	**Code:**	453E1A7D	**Project:**	
Sample Date:		**Material:**	Total dissolved Solids	**Source:**	Agnico Eagle
Receipt Date:		**CAS (PC):**		**Station:**	TDS - ELS
Sample Age:	---	**Client:**	Agnico Eagle		

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C <> T	Site Control passed mean dry weight-mg endpoint	8.46%

Equal Variance t Two-Sample Test

Control I	vs	Control II	df	Test Stat	Critical	MSD	P-Type	P-Value	Decision(α:5%)
Lab Control		Site Control	6	2.126	2.447	0.158	CDF	0.0776	Non-Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Outlier	Grubbs Extreme Value Test	1.696	2.127	0.4862	No Outliers Detected

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.037693	0.037693	1	4.522	0.0776	Non-Significant Effect
Error	0.0500165	0.0083361	6			
Total	0.0877095		7			

ANOVA Assumptions Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Variance	Variance Ratio F Test	2.71	15.44	0.4346	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9767	0.6805	0.9448	Normal Distribution

Mean Dry Weight-mg Summary

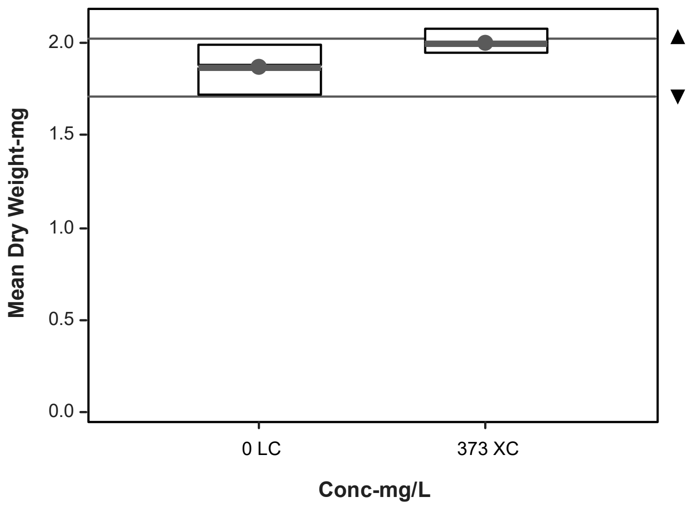
Conc-mg/L	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	LC	4	1.867	1.691	2.042	1.878	1.724	1.987	0.05518	5.91%	0.00%
373	XC	4	2.004	1.897	2.111	1.996	1.945	2.081	0.03352	3.34%	-7.35%

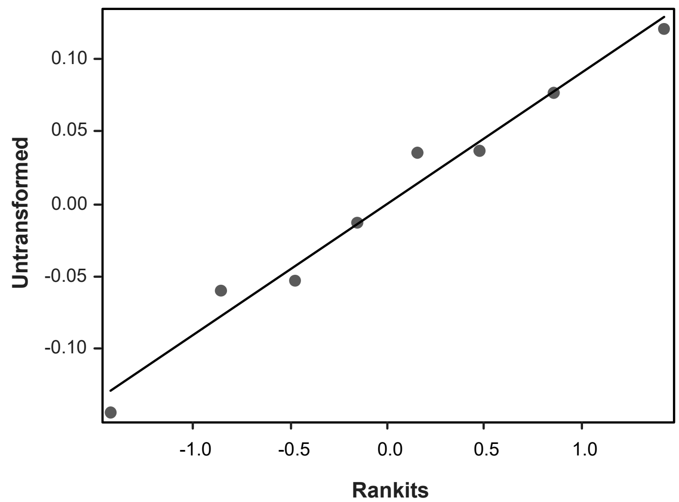
Mean Dry Weight-mg Detail

Conc-mg/L	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	LC	1.987	1.854	1.724	1.903
373	XC	1.951	1.945	2.04	2.081

Analysis ID:	02-9816-6381	**Endpoint:**	Mean Dry Weight-mg	**CETIS Version:**	CETIS v2.1.5
Analyzed:	15 Nov-24 13:31	**Analysis:**	Parametric-Two Sample	**Status Level:**	1
Edit Date:	15 Nov-24 13:15	**MD5 Hash:**	ED75F51198AC30299436802B3354F7E7	**Editor ID:**	

Graphics





CETIS Analytical Report

Fathead minnow (Pimephales promelas) 32-d survival and growth test — **Nautilus Environmental Calgary**

Analysis ID:	01-2118-6378	**Endpoint:**	Mean Dry Weight-mg	**CETIS Version:**	CETIS v2.1.5
Analyzed:	15 Nov-24 13:38	**Analysis:**	Parametric-Control vs Treatments	**Status Level:**	1
Edit Date:	15 Nov-24 13:15	**MD5 Hash:**	FA5C10E8F6B681C7AFE86F6C938FE7A8	**Editor ID:**	

Batch ID:	05-0291-7218	**Test Type:**	Survival-Development-Growth	**Analyst:**	Alyssa Minifie	
Start Date:	08 Oct-24	**Protocol:**	ASTM E1241-05 (2013)	**Diluent:**		
Ending Date:	09 Nov-24	**Species:**	Pimephales promelas	**Brine:**		
Test Length:	32d 0h	**Taxon:**	Actinopterygii	**Source:**	Aquatox, AR	**Age:**

Sample ID:	11-6169-7917	**Code:**	453E1A7D	**Project:**	
Sample Date:		**Material:**	Total dissolved Solids	**Source:**	Agnico Eagle
Receipt Date:		**CAS (PC):**		**Station:**	TDS - ELS
Sample Age:	---	**Client:**	Agnico Eagle		

Data Transform	Alt Hyp	NOEL	LOEL	TOEL	Tox Units	MSDu	PMSD
Untransformed	C > T	490	607	545.4	---	0.1312	6.55%

Dunnett Multiple Comparison Test

Control	vs	Conc-mg/L	df	Test Stat	Critical	MSD	P-Type	P-Value	Decision(α:5%)
Site Control		490	6	0.9355	2.407	0.1312	CDF	0.4506	Non-Significant Effect
		607*	6	2.686	2.407	0.1312	CDF	0.0291	Significant Effect
		839*	6	3.761	2.407	0.1312	CDF	0.0031	Significant Effect
		1304*	6	3.046	2.407	0.1312	CDF	0.0140	Significant Effect
		2236*	6	3.584	2.407	0.1312	CDF	0.0045	Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Outlier	Grubbs Extreme Value Test	2.921	2.802	0.0280	Outlier Detected

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.138253	0.0276506	5	4.653	0.0067	Significant Effect
Error	0.106968	0.0059427	18			
Total	0.245221		23			

ANOVA Assumptions Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Variance	Bartlett Equality of Variance Test	4.61	11.07	0.4653	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9212	0.9169	0.0622	Normal Distribution

Mean Dry Weight-mg Summary

Conc-mg/L	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
373	XC	4	2.004	1.897	2.111	1.996	1.945	2.081	0.03352	3.34%	0.00%
490		4	1.953	1.871	2.035	1.952	1.894	2.015	0.02569	2.63%	2.54%
607		4	1.858	1.786	1.929	1.866	1.797	1.902	0.02241	2.41%	7.31%
839		4	1.799	1.683	1.915	1.808	1.705	1.875	0.03651	4.06%	10.23%
1304		4	1.838	1.626	2.05	1.777	1.761	2.037	0.06659	7.25%	8.28%
2236		4	1.809	1.715	1.902	1.822	1.726	1.865	0.02935	3.24%	9.75%

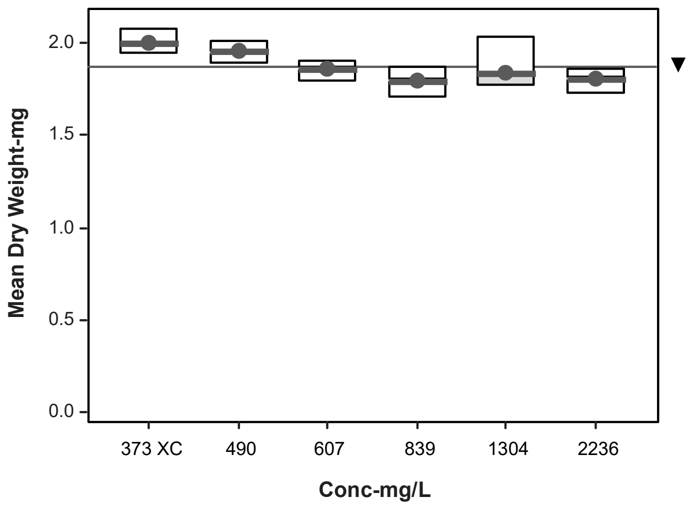
Mean Dry Weight-mg Detail

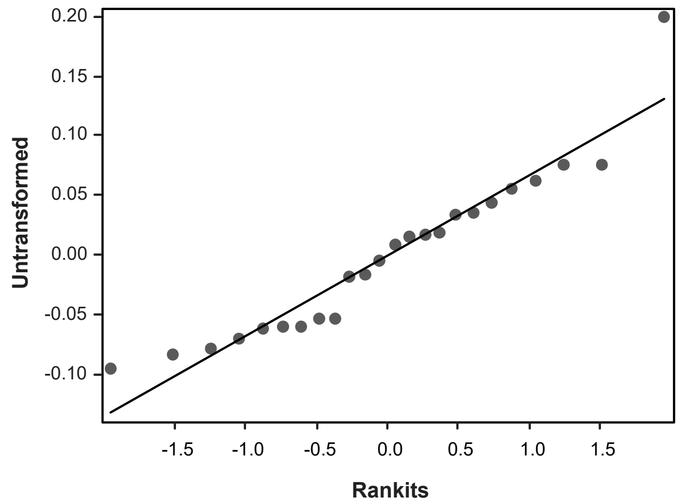
Conc-mg/L	Code	Rep 1	Rep 2	Rep 3	Rep 4
373	XC	1.951	1.945	2.04	2.081
490		1.935	1.894	2.015	1.968
607		1.902	1.854	1.797	1.877
839		1.783	1.875	1.833	1.705
1304		1.785	1.761	1.769	2.037
2236		1.726	1.818	1.826	1.865

Fathead minnow (Pimephales promelas) 32-d survival and growth test **Nautilus Environmental Calgary**

Analysis ID:	01-2118-6378	**Endpoint:**	Mean Dry Weight-mg	**CETIS Version:**	CETIS v2.1.5
Analyzed:	15 Nov-24 13:38	**Analysis:**	Parametric-Control vs Treatments	**Status Level:**	1
Edit Date:	15 Nov-24 13:15	**MD5 Hash:**	FA5C10E8F6B681C7AFE86F6C938FE7A8	**Editor ID:**	

Graphics





APPENDIX B – Analytical Chemistry

ALS Canada Ltd.

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CERTIFICATE OF ANALYSIS

Work Order	:	**CG2414740**			
Client	:	**Nautilus Environmental Company Inc.**	Laboratory	:	ALS Environmental - Calgary
Contact	:	Leila Oosterbroek	Account Manager	:	Patryk Wojciak
Address	:	10823 27th Street SE Calgary Alberta Canada T2Z 3V9	Address	:	2559 29th Street NE Calgary AB Canada T1Y 7B5
Telephone	:	403 253 7121	Telephone	:	+1 403 407 1800
Project	:	----	Date Samples Received	:	08-Oct-2024 11:50
PO	:	2425-030AB	Date Analysis Commenced	:	09-Oct-2024
C-O-C number	:	----	Issue Date	:	15-Oct-2024 09:39
Sampler	:	----			
Site	:	----			
Quote number	:	CG24-NECI100-00001 Nautilus Calgary General			
No. of samples received	:	3			
No. of samples analysed	:	3			

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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*
Gurvinder Kour	Lab Assistant	Metals, Calgary, Alberta
Katarzyna Glinka	Analyst	Inorganics, Calgary, Alberta
Kevin Baxter	Team Leader - Inorganics	Inorganics, Calgary, Alberta
Shirley Li	Team Leader - Inorganics	Inorganics, Calgary, Alberta
Shirley Li	Team Leader - Inorganics	Metals, Calgary, 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*
mg/L	milligrams per litre
pH units	pH units
µS/cm	microsiemens per centimetre
-	no units
%	percent
meq/L	milliequivalents per litre

<: 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
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.

Analytical Results

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

Analyte	CAS Number	Method/Lab/Accreditation	LOR	Unit	Synthetic Site (373 mg/L TDS) PJ2425-0024 - Initiation 32-d FM	839 mg/L TDS PJ2425-002 - Initiation 32-d FM	2,236 mg/L TDS PJ2425-002 - Initiation 32-d FM	----	----
				Client sampling date / time	08-Oct-2024 10:20	08-Oct-2024 10:20	08-Oct-2024 10:20	----	----
					CG2414740-001	CG2414740-002	CG2414740-003	----	----
					Result	Result	Result	----	----
Physical Tests									
Hardness (as CaCO3), dissolved	----	EC100/CG	0.50	mg/L	185	346	844	----	----
Conductivity	----	E100/CG	2.0	µS/cm	617	1270	2970	----	----
pH	----	E108/CG	0.10	pH units	7.21	7.97	7.26	----	----
Alkalinity, bicarbonate (as HCO3)	71-52-3	E290/CG	1.0	mg/L	252	195	31.1	----	----
Alkalinity, carbonate (as CO3)	3812-32-6	E290/CG	1.0	mg/L	<1.0	<1.0	<1.0	----	----
Alkalinity, hydroxide (as OH)	14280-30-9	E290/CG	1.0	mg/L	<1.0	<1.0	<1.0	----	----
Alkalinity, total (as CaCO3)	----	E290/CG	2.0	mg/L	206	160	25.5	----	----
Solids, total dissolved [TDS], calculated	----	EC103/CG	1.0	mg/L	370	821	2170	----	----
Anions and Nutrients									
Chloride	16887-00-6	E235.Cl/CG	0.50	mg/L	21.9	120	416	----	----
Fluoride	16984-48-8	E235.F/CG	0.020	mg/L	0.029	<0.100 DLDS	<0.100 DLDS	----	----
Nitrate (as N)	14797-55-8	E235.NO3/CG	0.020	mg/L	1.65	1.43	0.608	----	----
Nitrite (as N)	14797-65-0	E235.NO2/CG	0.010	mg/L	<0.010	<0.050 DLDS	<0.050 DLDS	----	----
Sulfate (as SO4)	14808-79-8	E235.SO4/CG	0.30	mg/L	79.7	310	1000	----	----
Nitrate + Nitrite (as N)	----	EC235.N+N/CG	0.0500	mg/L	1.65	1.43	0.608	----	----
Ion Balance									
Anion sum	----	EC101/CG	0.10	meq/L	6.51	13.1	33.1	----	----
Cation sum	----	EC101/CG	0.10	meq/L	6.54	13.3	33.4	----	----
Ion balance (APHA)	----	EC101/CG	0.01	%	0.23	0.76	0.45	----	----
Ion balance (cations/anions)	----	EC101/CG	0.010	%	100	102	101	----	----

Analytical Results

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

Analyte	CAS Number	Method/Lab/Accreditation	LOR	Unit	Synthetic Site (373 mg/L TDS) PJ2425-0024 - Initiation 32-d FM	839 mg/L TDS PJ2425-002 - Initiation 32-d FM	2,236 mg/L TDS PJ2425-002 - Initiation 32-d FM	----	----
				Client sampling date / time	08-Oct-2024 10:20	08-Oct-2024 10:20	08-Oct-2024 10:20	----	----
					CG2414740-001	CG2414740-002	CG2414740-003	----	----
					Result	Result	Result	----	----
Dissolved Metals									
Calcium, dissolved	7440-70-2	E421/CG	0.050	mg/L	51.0	110	295	----	----
Magnesium, dissolved	7439-95-4	E421/CG	0.0050	mg/L	14.0	17.3	26.2	----	----
Potassium, dissolved	7440-09-7	E421/CG	0.050	mg/L	9.17	26.3	79.4	----	----
Sodium, dissolved	7440-23-5	E421/CG	0.050	mg/L	59.9	132	334	----	----
Dissolved metals filtration location	----	EP421/CG	-	-	Laboratory	Laboratory	Laboratory	----	----

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

Please refer to the Accreditation section for an explanation of analyte accreditations.

ALS Canada Ltd.

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **CG2414740**	Page	: 1 of 9
Client	: **Nautilus Environmental Company Inc.**	Laboratory	: ALS Environmental - Calgary
Contact	: Leila Oosterbroek	Account Manager	: Patryk Wojciak
Address	: 10823 27th Street SE Calgary AB Canada T2Z 3V9	Address	: 2559 29th Street NE Calgary, Alberta Canada T1Y 7B5
Telephone	: 403 253 7121	Telephone	: +1 403 407 1800
Project	: ----	Date Samples Received	: 08-Oct-2024 11:50
PO	: 2425-030AB	Issue Date	: 15-Oct-2024 09:39
C-O-C number	: ----		
Sampler	: ----		
Site	: ----		
Quote number	: CG24-NECI100-00001 Nautilus Calgary General		
No. of samples received	: 3		
No. of samples analysed	: 3		

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 : Analytical Method 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 2,236 mg/L TDS PJ2425-002 - Initiation 32-d FM	E235.Cl	08-Oct-2024	09-Oct-2024	28 days	1 days	✓	09-Oct-2024	28 days	1 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE 839 mg/L TDS PJ2425-002 - Initiation 32-d FM	E235.Cl	08-Oct-2024	09-Oct-2024	28 days	1 days	✓	09-Oct-2024	28 days	1 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE Synthetic Site (373 mg/L TDS) PJ2425-0024 - Initiation 32-d FM	E235.Cl	08-Oct-2024	09-Oct-2024	28 days	1 days	✓	09-Oct-2024	28 days	1 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE 2,236 mg/L TDS PJ2425-002 - Initiation 32-d FM	E235.F	08-Oct-2024	09-Oct-2024	28 days	1 days	✓	09-Oct-2024	28 days	1 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE 839 mg/L TDS PJ2425-002 - Initiation 32-d FM	E235.F	08-Oct-2024	09-Oct-2024	28 days	1 days	✓	09-Oct-2024	28 days	1 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE Synthetic Site (373 mg/L TDS) PJ2425-0024 - Initiation 32-d FM	E235.F	08-Oct-2024	09-Oct-2024	28 days	1 days	✓	09-Oct-2024	28 days	1 days	✓
Anions and Nutrients : Nitrate in Water by IC										
HDPE 2,236 mg/L TDS PJ2425-002 - Initiation 32-d FM	E235.NO3	08-Oct-2024	09-Oct-2024	3 days	1 days	✓	09-Oct-2024	3 days	1 days	✓

Matrix: **Water**

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

Analyte Group : Analytical Method / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Anions and Nutrients : Nitrate in Water by IC										
HDPE 839 mg/L TDS PJ2425-002 - Initiation 32-d FM	E235.NO3	08-Oct-2024	09-Oct-2024	3 days	1 days	✓	09-Oct-2024	3 days	1 days	✓
Anions and Nutrients : Nitrate in Water by IC										
HDPE Synthetic Site (373 mg/L TDS) PJ2425-0024 - Initiation 32-d FM	E235.NO3	08-Oct-2024	09-Oct-2024	3 days	1 days	✓	09-Oct-2024	3 days	1 days	✓
Anions and Nutrients : Nitrite in Water by IC										
HDPE 2,236 mg/L TDS PJ2425-002 - Initiation 32-d FM	E235.NO2	08-Oct-2024	09-Oct-2024	3 days	1 days	✓	09-Oct-2024	3 days	1 days	✓
Anions and Nutrients : Nitrite in Water by IC										
HDPE 839 mg/L TDS PJ2425-002 - Initiation 32-d FM	E235.NO2	08-Oct-2024	09-Oct-2024	3 days	1 days	✓	09-Oct-2024	3 days	1 days	✓
Anions and Nutrients : Nitrite in Water by IC										
HDPE Synthetic Site (373 mg/L TDS) PJ2425-0024 - Initiation 32-d FM	E235.NO2	08-Oct-2024	09-Oct-2024	3 days	1 days	✓	09-Oct-2024	3 days	1 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE 2,236 mg/L TDS PJ2425-002 - Initiation 32-d FM	E235.SO4	08-Oct-2024	09-Oct-2024	28 days	1 days	✓	09-Oct-2024	28 days	1 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE 839 mg/L TDS PJ2425-002 - Initiation 32-d FM	E235.SO4	08-Oct-2024	09-Oct-2024	28 days	1 days	✓	09-Oct-2024	28 days	1 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE Synthetic Site (373 mg/L TDS) PJ2425-0024 - Initiation 32-d FM	E235.SO4	08-Oct-2024	09-Oct-2024	28 days	1 days	✓	09-Oct-2024	28 days	1 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE - dissolved (lab preserved) 2,236 mg/L TDS PJ2425-002 - Initiation 32-d FM	E421	08-Oct-2024	11-Oct-2024	180 days	3 days	✓	12-Oct-2024	180 days	4 days	✓

Matrix: **Water**

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

Analyte Group : Analytical Method / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis: Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE - dissolved (lab preserved) 839 mg/L TDS PJ2425-002 - Initiation 32-d FM	E421	08-Oct-2024	11-Oct-2024	180 days	3 days	✓	12-Oct-2024	180 days	4 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE - dissolved (lab preserved) Synthetic Site (373 mg/L TDS) PJ2425-0024 - Initiation 32-d FM	E421	08-Oct-2024	11-Oct-2024	180 days	3 days	✓	12-Oct-2024	180 days	4 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE 2,236 mg/L TDS PJ2425-002 - Initiation 32-d FM	E290	08-Oct-2024	09-Oct-2024	14 days	1 days	✓	09-Oct-2024	14 days	1 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE 839 mg/L TDS PJ2425-002 - Initiation 32-d FM	E290	08-Oct-2024	09-Oct-2024	14 days	1 days	✓	09-Oct-2024	14 days	1 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE Synthetic Site (373 mg/L TDS) PJ2425-0024 - Initiation 32-d FM	E290	08-Oct-2024	09-Oct-2024	14 days	1 days	✓	09-Oct-2024	14 days	1 days	✓
Physical Tests : Conductivity in Water										
HDPE 2,236 mg/L TDS PJ2425-002 - Initiation 32-d FM	E100	08-Oct-2024	09-Oct-2024	28 days	1 days	✓	09-Oct-2024	28 days	1 days	✓
Physical Tests : Conductivity in Water										
HDPE 839 mg/L TDS PJ2425-002 - Initiation 32-d FM	E100	08-Oct-2024	09-Oct-2024	28 days	1 days	✓	09-Oct-2024	28 days	1 days	✓
Physical Tests : Conductivity in Water										
HDPE Synthetic Site (373 mg/L TDS) PJ2425-0024 - Initiation 32-d FM	E100	08-Oct-2024	09-Oct-2024	28 days	1 days	✓	09-Oct-2024	28 days	1 days	✓
Physical Tests : pH by Meter										
HDPE 2,236 mg/L TDS PJ2425-002 - Initiation 32-d FM	E108	08-Oct-2024	09-Oct-2024	0.25 hrs	29 hrs	× EHTR-FM	09-Oct-2024	0.25 hrs	29 hrs	× EHTR-FM

Matrix: **Water**

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

Analyte Group : Analytical Method Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
Physical Tests : pH by Meter										
HDPE 839 mg/L TDS PJ2425-002 - Initiation 32-d FM	E108	08-Oct-2024	09-Oct-2024	0.25 hrs	29 hrs	✘ EHTR-FM	09-Oct-2024	0.25 hrs	29 hrs	✘ EHTR-FM
Physical Tests : pH by Meter										
HDPE Synthetic Site (373 mg/L TDS) PJ2425-0024 - Initiation 32-d FM	E108	08-Oct-2024	09-Oct-2024	0.25 hrs	29 hrs	✘ EHTR-FM	09-Oct-2024	0.25 hrs	29 hrs	✘ EHTR-FM

Legend & Qualifier Definitions

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

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	1700245	1	4	25.0	5.0	✓
Chloride in Water by IC	E235.Cl	1699457	1	10	10.0	5.0	✓
Conductivity in Water	E100	1700243	1	17	5.8	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	1704231	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	1699461	1	4	25.0	5.0	✓
Nitrate in Water by IC	E235.NO3	1699459	1	10	10.0	5.0	✓
Nitrite in Water by IC	E235.NO2	1699460	1	8	12.5	5.0	✓
pH by Meter	E108	1700244	1	20	5.0	5.0	✓
Sulfate in Water by IC	E235.SO4	1699458	1	10	10.0	5.0	✓
Laboratory Control Samples (LCS)							
Alkalinity Species by Titration	E290	1700245	1	4	25.0	5.0	✓
Chloride in Water by IC	E235.Cl	1699457	1	10	10.0	5.0	✓
Conductivity in Water	E100	1700243	1	17	5.8	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	1704231	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	1699461	1	4	25.0	5.0	✓
Nitrate in Water by IC	E235.NO3	1699459	1	10	10.0	5.0	✓
Nitrite in Water by IC	E235.NO2	1699460	1	8	12.5	5.0	✓
pH by Meter	E108	1700244	1	20	5.0	5.0	✓
Sulfate in Water by IC	E235.SO4	1699458	1	10	10.0	5.0	✓
Method Blanks (MB)							
Alkalinity Species by Titration	E290	1700245	1	4	25.0	5.0	✓
Chloride in Water by IC	E235.Cl	1699457	1	10	10.0	5.0	✓
Conductivity in Water	E100	1700243	1	17	5.8	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	1704231	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	1699461	1	4	25.0	5.0	✓
Nitrate in Water by IC	E235.NO3	1699459	1	10	10.0	5.0	✓
Nitrite in Water by IC	E235.NO2	1699460	1	8	12.5	5.0	✓
Sulfate in Water by IC	E235.SO4	1699458	1	10	10.0	5.0	✓
Matrix Spikes (MS)							
Chloride in Water by IC	E235.Cl	1699457	1	10	10.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	1704231	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	1699461	1	4	25.0	5.0	✓
Nitrate in Water by IC	E235.NO3	1699459	1	10	10.0	5.0	✓
Nitrite in Water by IC	E235.NO2	1699460	1	8	12.5	5.0	✓
Sulfate in Water by IC	E235.SO4	1699458	1	10	10.0	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 ALS Environmental - Calgary	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 ALS Environmental - Calgary	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.
Chloride in Water by IC	E235.Cl ALS Environmental - Calgary	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 ALS Environmental - Calgary	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 ALS Environmental - Calgary	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 ALS Environmental - Calgary	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 ALS Environmental - Calgary	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Alkalinity Species by Titration	E290 ALS Environmental - Calgary	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.
Dissolved Metals in Water by CRC ICPMS	E421 ALS Environmental - Calgary	Water	APHA 3030B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Hardness (Calculated)	EC100 ALS Environmental - Calgary	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 ALS Environmental - Calgary	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. Ion Balance cannot be calculated accurately for waters with very low electrical conductivity (EC).
TDS in Water (Calculation)	EC103 ALS Environmental - Calgary	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 ALS Environmental - Calgary	Water	EPA 300.0	Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Metals Water Filtration	EP421 ALS Environmental - Calgary	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HNO3.

ALS Canada Ltd.

QUALITY CONTROL REPORT

Work Order	: **CG2414740**	Page	: 1 of 6
Client	: Nautilus Environmental Company Inc.	Laboratory	: ALS Environmental - Calgary
Contact	: Leila Oosterbroek	Account Manager	: Patryk Wojciak
Address	: 10823 27th Street SE Calgary AB Canada T2Z 3V9	Address	: 2559 29th Street NE Calgary, Alberta Canada T1Y 7B5
Telephone	: 403 253 7121	Telephone	: +1 403 407 1800
Project	: ----	Date Samples Received	: 08-Oct-2024 11:50
PO	: 2425-030AB	Date Analysis Commenced	: 09-Oct-2024
C-O-C number	: ----	Issue Date	: 15-Oct-2024 09:39
Sampler	: ----		
Site	: ----		
Quote number	: CG24-NECI100-00001 Nautilus Calgary General		
No. of samples received	: 3		
No. of samples analysed	: 3		

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*
Gurvinder Kour	Lab Assistant	Calgary Metals, Calgary, Alberta
Katarzyna Glinka	Analyst	Calgary Inorganics, Calgary, Alberta
Kevin Baxter	Team Leader - Inorganics	Calgary Inorganics, Calgary, Alberta
Shirley Li	Team Leader - Inorganics	Calgary Inorganics, Calgary, Alberta
Shirley Li	Team Leader - Inorganics	Calgary Metals, Calgary, 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: 1700243)											
CG2414739-006	Anonymous	Conductivity	----	E100	2.0	µS/cm	<2.0	<2.0	0	Diff <2x LOR	----
Physical Tests (QC Lot: 1700244)											
CG2414739-006	Anonymous	pH	----	E108	0.10	pH units	5.17	5.15	0.388%	4%	----
Physical Tests (QC Lot: 1700245)											
CG2414739-006	Anonymous	Alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 1699457)											
CG2414740-001	Synthetic Site (373 mg/L TDS) PJ2425-0024 - Initiation 32-d FM	Chloride	16887-00-6	E235.Cl	0.50	mg/L	21.9	21.9	0.0507%	20%	----
Anions and Nutrients (QC Lot: 1699458)											
CG2414740-001	Synthetic Site (373 mg/L TDS) PJ2425-0024 - Initiation 32-d FM	Sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	79.7	79.8	0.0960%	20%	----
Anions and Nutrients (QC Lot: 1699459)											
CG2414740-001	Synthetic Site (373 mg/L TDS) PJ2425-0024 - Initiation 32-d FM	Nitrate (as N)	14797-55-8	E235.NO3	0.020	mg/L	1.65	1.64	0.559%	20%	----
Anions and Nutrients (QC Lot: 1699460)											
CG2414740-001	Synthetic Site (373 mg/L TDS) PJ2425-0024 - Initiation 32-d FM	Nitrite (as N)	14797-65-0	E235.NO2	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 1699461)											
CG2414740-001	Synthetic Site (373 mg/L TDS) PJ2425-0024 - Initiation 32-d FM	Fluoride	16984-48-8	E235.F	0.020	mg/L	0.029	0.029	0.0004	Diff <2x LOR	----
Dissolved Metals (QC Lot: 1704231)											
CG2414704-001	Anonymous	Calcium, dissolved	7440-70-2	E421	0.050	mg/L	257	261	1.57%	20%	----
		Magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	61.4	58.6	4.54%	20%	----
		Potassium, dissolved	7440-09-7	E421	0.050	mg/L	2.08	2.02	2.52%	20%	----
		Sodium, dissolved	7440-23-5	E421	0.050	mg/L	4.96	4.94	0.516%	20%	----

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: 1700243)						
Conductivity	----	E100	1	μS/cm	<1.0	----
Physical Tests (QCLot: 1700245)						
Alkalinity, total (as CaCO3)	----	E290	1	mg/L	<1.0	----
Anions and Nutrients (QCLot: 1699457)						
Chloride	16887-00-6	E235.Cl	0.5	mg/L	<0.50	----
Anions and Nutrients (QCLot: 1699458)						
Sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 1699459)						
Nitrate (as N)	14797-55-8	E235.NO3	0.02	mg/L	<0.020	----
Anions and Nutrients (QCLot: 1699460)						
Nitrite (as N)	14797-65-0	E235.NO2	0.01	mg/L	<0.010	----
Anions and Nutrients (QCLot: 1699461)						
Fluoride	16984-48-8	E235.F	0.02	mg/L	<0.020	----
Dissolved Metals (QCLot: 1704231)						
Calcium, dissolved	7440-70-2	E421	0.05	mg/L	<0.050	----
Magnesium, dissolved	7439-95-4	E421	0.005	mg/L	<0.0050	----
Potassium, dissolved	7440-09-7	E421	0.05	mg/L	<0.050	----
Sodium, dissolved	7440-23-5	E421	0.05	mg/L	<0.050	----

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	Target Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 1700243)									
Conductivity	----	E100	1	µS/cm	147 µS/cm	104	90.0	110	----
Physical Tests (QCLot: 1700244)									
pH	----	E108	----	pH units	7 pH units	102	98.0	102	----
Physical Tests (QCLot: 1700245)									
Alkalinity, total (as CaCO3)	----	E290	1	mg/L	500 mg/L	101	85.0	115	----
Anions and Nutrients (QCLot: 1699457)									
Chloride	16887-00-6	E235.Cl	0.5	mg/L	100 mg/L	98.3	90.0	110	----
Anions and Nutrients (QCLot: 1699458)									
Sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	99.2	90.0	110	----
Anions and Nutrients (QCLot: 1699459)									
Nitrate (as N)	14797-55-8	E235.NO3	0.02	mg/L	2.5 mg/L	98.6	90.0	110	----
Anions and Nutrients (QCLot: 1699460)									
Nitrite (as N)	14797-65-0	E235.NO2	0.01	mg/L	0.5 mg/L	97.6	90.0	110	----
Anions and Nutrients (QCLot: 1699461)									
Fluoride	16984-48-8	E235.F	0.02	mg/L	1 mg/L	102	90.0	110	----
Dissolved Metals (QCLot: 1704231)									
Calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	104	80.0	120	----
Magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	94.9	80.0	120	----
Potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	97.6	80.0	120	----
Sodium, dissolved	7440-23-5	E421	0.05	mg/L	50 mg/L	93.6	80.0	120	----

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: 1699457)										
FJ2403049-001	Anonymous	Chloride	16887-00-6	E235.Cl	ND mg/L	----	ND	75.0	125	----
Anions and Nutrients (QCLot: 1699458)										
FJ2403049-001	Anonymous	Sulfate (as SO4)	14808-79-8	E235.SO4	ND mg/L	----	ND	75.0	125	----
Anions and Nutrients (QCLot: 1699459)										
FJ2403049-001	Anonymous	Nitrate (as N)	14797-55-8	E235.NO3	2.39 mg/L	2.5 mg/L	95.8	75.0	125	----
Anions and Nutrients (QCLot: 1699460)										
FJ2403049-001	Anonymous	Nitrite (as N)	14797-65-0	E235.NO2	0.478 mg/L	0.5 mg/L	95.5	75.0	125	----
Anions and Nutrients (QCLot: 1699461)										
FJ2403049-001	Anonymous	Fluoride	16984-48-8	E235.F	0.937 mg/L	1 mg/L	93.7	75.0	125	----
Dissolved Metals (QCLot: 1704231)										
CG2414704-002	Anonymous	Calcium, dissolved	7440-70-2	E421	ND mg/L	----	ND	70.0	130	----
		Magnesium, dissolved	7439-95-4	E421	ND mg/L	----	ND	70.0	130	----
		Potassium, dissolved	7440-09-7	E421	35.3 mg/L	40 mg/L	88.2	70.0	130	----
		Sodium, dissolved	7440-23-5	E421	18.4 mg/L	20 mg/L	91.9	70.0	130	----

Chain of Custody (COC) / Analytical Request Form

ALS www.alsglobal.com

Canada Toll Free: 1 800 668 9878

COC Number: 22 -

Page 1 of 1

Environmental Division
Calgary
Work Order Reference
CG2414740

Telephone : +1 403 407 1800

Report To	Contact and company name below will appear on the final report
Company:	Nautilus Environmental
Contact:	Leila Oosterbroek
Phone:	403-253-7121
	Company address below will appear on the final report
Street:	10823 27 St SE
City/Province:	Calgary, AB
Postal Code:	T2Z 3V9
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☑ YES ☐ NO
Company:	Nautilus Environmental
Contact:	Leila Oosterbroek

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: leila@nautilusenvironmental.ca; stephanie@nautilu

Email 2: lisa.ramilo@agnicoeagle.com

Email 3: chelsea.grimard@wsp.com

Invoice Recipients

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax: accounting@nautilusenvironmental.ca

Email 2: leila@nautilusenvironmental.ca

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, statu

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 #:	
PO / AFE:	2425-030AB
LSD:	
ALS Lab Work Order # (ALS use only):	

Oil and Gas Required Fields (client use)

AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	
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	PR01 - Routine	SAMPLES ON HOLD	EXTENDED STORAGE REQUIRED	SUSPECTED HAZARD (see notes)
	Synthetic Site (373 mg/L TDS) PJ2425-0024 - Initiation 32-d FM	8-Oct-24	10:20	water	1	R			
	839 mg/L TDS PJ2425-002 - Initiation 32-d FM	8-Oct-24	10:20	water	1	R			
	2,236 mg/L TDS PJ2425-002 - Initiation 32-d FM	8-Oct-24	10:20	water	1	R			

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)

SAMPLE RECEIPT DETAILS (ALS use only)

Cooling Method: ☐ NONE ☐ ICE ☐ ICE PACKS ☐ FROZEN ☐ COOLING INITIATED

Submission Comments identified on Sample Receipt Notification: ☐ YES ☐ NO

Cooler Custody Seals Intact: ☐ YES ☐ N/A Sample Custody Seals Intact: ☐ YES ☐ N/A

INITIAL COOLER TEMPERATURES °C: 16.1

FINAL COOLER TEMPERATURES °C:

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (ALS use only)			FINAL SHIPMENT RECEPTION (ALS use only)		
Released by: AM	Date: 2024/10/08	Time: 1035	Received by: JH	Date: 10/9	Time: 1157	Received by:	Date:	Time:

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION WHITE - LABORATORY COPY YELLOW - CLIENT COPY FEB 2022 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.

ALS Canada Ltd.

CERTIFICATE OF ANALYSIS

Work Order	: **CG2415687**		
Client	: **Nautilus Environmental Company Inc.**	Laboratory	: ALS Environmental - Calgary
Contact	: Leila Oosterbroek	Account Manager	: Patryk Wojciak
Address	: 10823 27th Street SE Calgary Alberta Canada T2Z 3V9	Address	: 2559 29th Street NE Calgary AB Canada T1Y 7B5
Telephone	: 403 253 7121	Telephone	: +1 403 407 1800
Project	: ----	Date Samples Received	: 23-Oct-2024 14:50
PO	: 2324-061AB	Date Analysis Commenced	: 24-Oct-2024
C-O-C number	: ----	Issue Date	: 30-Oct-2024 10:19
Sampler	: ----		
Site	: ----		
Quote number	: CG24-NECI100-00001 Nautilus Calgary General		
No. of samples received	: 6		
No. of samples analysed	: 6		

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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*
Archana Neupane	Lab Assistant	Metals, Calgary, Alberta
Harpreet Chawla	Team Leader - Inorganics	Metals, Calgary, Alberta
Harpreet Chawla	Team Leader - Inorganics	Inorganics, Calgary, Alberta
Katarzyna Glinka	Analyst	Inorganics, Calgary, Alberta
Kevin Baxter	Team Leader - Inorganics	Inorganics, Calgary, 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
mg/L	milligrams per litre
pH units	pH units
µS/cm	microsiemens per centimetre
-	no units
meq/L	milliequivalents per litre
%	percent

<: 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
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.

Analytical Results

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

Analyte	CAS Number	Method/Lab/Accreditation	LOR	Unit	Synthetic Site (373 mg/L TDS) PJ2425-0024 - Mid -point NEW 32-d FM	839 mg/L TDS PJ2425-002 - Mid-point NEW 32-d FM	2,236 mg/L TDS PJ2425-002 - Mid-point NEW 32-d FM	Synthetic Site (373 mg/L TDS) PJ2425-0024 - Mid-point OLD 32-d FM	839 mg/L TDS PJ2425-002 - Mid-point OLD 32-d FM
				Client sampling date / time	23-Oct-2024 10:30	23-Oct-2024 10:30	23-Oct-2024 10:30	23-Oct-2024 12:00	23-Oct-2024 12:00
					CG2415687-001	CG2415687-002	CG2415687-003	CG2415687-004	CG2415687-005
					Result	Result	Result	Result	Result
Physical Tests									
Hardness (as CaCO3), dissolved	----	EC100/CG	0.50	mg/L	186	343	868	191	355
Conductivity	----	E100/CG	2.0	µS/cm	606	1240	2900	615	1260
pH	----	E108/CG	0.10	pH units	8.14	8.28	7.48	8.42	8.33
Alkalinity, bicarbonate (as HCO3)	71-52-3	E290/CG	1.0	mg/L	239	189	30.7	225	189
Alkalinity, carbonate (as CO3)	3812-32-6	E290/CG	1.0	mg/L	<1.0	1.3	<1.0	5.9	4.6
Alkalinity, hydroxide (as OH)	14280-30-9	E290/CG	1.0	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Alkalinity, total (as CaCO3)	----	E290/CG	2.0	mg/L	196	157	25.2	194	163
Solids, total dissolved [TDS], calculated	----	EC103/CG	1.0	mg/L	370	821	2210	372	837
Anions and Nutrients									
Chloride	16887-00-6	E235.Cl/CG	0.50	mg/L	22.4	120	415	22.5	122
Fluoride	16984-48-8	E235.F/CG	0.020	mg/L	0.027	<0.100 DLDS	<0.100 DLDS	0.028	<0.100 DLDS
Nitrate (as N)	14797-55-8	E235.NO3/CG	0.020	mg/L	1.66	1.42	0.607	1.67	1.42
Nitrite (as N)	14797-65-0	E235.NO2/CG	0.010	mg/L	0.032	<0.050 DLDS	<0.050 DLDS	0.035	<0.050 DLDS
Sulfate (as SO4)	14808-79-8	E235.SO4/CG	0.30	mg/L	82.0	313	1000	82.2	318
Nitrate + Nitrite (as N)	----	EC235.N+N/CG	0.0500	mg/L	1.69	1.42	0.607	1.70	1.42
Ion Balance									
Anion sum	----	EC101/CG	0.10	meq/L	6.38	13.1	33.1	6.35	13.4
Cation sum	----	EC101/CG	0.10	meq/L	6.65	13.3	35.3	6.78	13.5
Ion balance (APHA)	----	EC101/CG	0.01	%	2.07	0.76	3.22	3.27	0.37
Ion balance (cations/anions)	----	EC101/CG	0.010	%	104	102	107	107	101

Analytical Results

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

Analyte	CAS Number	Method/Lab/Accreditation	LOR	Unit	Synthetic Site (373 mg/L TDS) PJ2425-0024 - Mid -point NEW 32-d FM	839 mg/L TDS PJ2425-002 - Mid-point NEW 32-d FM	2,236 mg/L TDS PJ2425-002 - Mid-point NEW 32-d FM	Synthetic Site (373 mg/L TDS) PJ2425-0024 - Mid-point OLD 32-d FM	839 mg/L TDS PJ2425-002 - Mid-point OLD 32-d FM
Client sampling date / time					23-Oct-2024 10:30	23-Oct-2024 10:30	23-Oct-2024 10:30	23-Oct-2024 12:00	23-Oct-2024 12:00
					CG2415687-001	CG2415687-002	CG2415687-003	CG2415687-004	CG2415687-005
					Result	Result	Result	Result	Result
Dissolved Metals									
Calcium, dissolved	7440-70-2	E421/CG	0.050	mg/L	50.1	108	299	51.8	112
Magnesium, dissolved	7439-95-4	E421/CG	0.0050	mg/L	14.7	17.8	29.6	15.0	18.2
Potassium, dissolved	7440-09-7	E421/CG	0.050	mg/L	9.59	28.0	88.4	10.1	28.2
Sodium, dissolved	7440-23-5	E421/CG	0.050	mg/L	61.9	131	360	62.1	132
Dissolved metals filtration location	----	EP421/CG	-	-	Laboratory	Laboratory	Laboratory	Laboratory	Laboratory

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

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results

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

Analyte	CAS Number	Method/Lab/Accreditation	LOR	Unit	2,236 mg/L TDS PJ2425-002 - Mid-point OLD 32-d FM	----	----	----	----
Client sampling date / time					23-Oct-2024 12:00	----	----	----	----
					CG2415687-006	----	----	----	----
					Result	----	----	----	----
Physical Tests									
Hardness (as CaCO3), dissolved	----	EC100/CG	0.50	mg/L	860	----	----	----	----
Conductivity	----	E100/CG	2.0	µS/cm	2990	----	----	----	----
pH	----	E108/CG	0.10	pH units	7.45	----	----	----	----
Alkalinity, bicarbonate (as HCO3)	71-52-3	E290/CG	1.0	mg/L	33.4	----	----	----	----
Alkalinity, carbonate (as CO3)	3812-32-6	E290/CG	1.0	mg/L	<1.0	----	----	----	----
Alkalinity, hydroxide (as OH)	14280-30-9	E290/CG	1.0	mg/L	<1.0	----	----	----	----
Alkalinity, total (as CaCO3)	----	E290/CG	2.0	mg/L	27.4	----	----	----	----

Analytical Results

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

				Client sample ID	2,236 mg/L TDS PJ2425-002 - Mid-point OLD 32-d FM	----	----	----	----
				Client sampling date / time	23-Oct-2024 12:00	----	----	----	----
Analyte	CAS Number	Method/Lab/Accreditation	LOR	Unit	CG2415687-006	----	----	----	----
					Result	----	----	----	----
Physical Tests									
Solids, total dissolved [TDS], calculated	----	EC103/CG	1.0	mg/L	2210	----	----	----	----
Anions and Nutrients									
Chloride	16887-00-6	E235.Cl/CG	0.50	mg/L	418	----	----	----	----
Fluoride	16984-48-8	E235.F/CG	0.020	mg/L	<0.100 DLDS	----	----	----	----
Nitrate (as N)	14797-55-8	E235.NO3/CG	0.020	mg/L	0.613	----	----	----	----
Nitrite (as N)	14797-65-0	E235.NO2/CG	0.010	mg/L	<0.050 DLDS	----	----	----	----
Sulfate (as SO4)	14808-79-8	E235.SO4/CG	0.30	mg/L	1010	----	----	----	----
Nitrate + Nitrite (as N)	----	EC235.N+N/CG	0.0500	mg/L	0.613	----	----	----	----
Ion Balance									
Anion sum	----	EC101/CG	0.10	meq/L	33.4	----	----	----	----
Cation sum	----	EC101/CG	0.10	meq/L	34.6	----	----	----	----
Ion balance (APHA)	----	EC101/CG	0.01	%	1.76	----	----	----	----
Ion balance (cations/anions)	----	EC101/CG	0.010	%	104	----	----	----	----
Dissolved Metals									
Calcium, dissolved	7440-70-2	E421/CG	0.050	mg/L	297	----	----	----	----
Magnesium, dissolved	7439-95-4	E421/CG	0.0050	mg/L	28.8	----	----	----	----
Potassium, dissolved	7440-09-7	E421/CG	0.050	mg/L	87.4	----	----	----	----
Sodium, dissolved	7440-23-5	E421/CG	0.050	mg/L	349	----	----	----	----
Dissolved metals filtration location	----	EP421/CG	-	-	Laboratory	----	----	----	----

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

Please refer to the Accreditation section for an explanation of analyte accreditations.

ALS Canada Ltd.

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **CG2415687**	Page	: 1 of 12
Client	: **Nautilus Environmental Company Inc.**	Laboratory	: ALS Environmental - Calgary
Contact	: Leila Oosterbroek	Account Manager	: Patryk Wojciak
Address	: 10823 27th Street SE Calgary AB Canada T2Z 3V9	Address	: 2559 29th Street NE Calgary, Alberta Canada T1Y 7B5
Telephone	: 403 253 7121	Telephone	: +1 403 407 1800
Project	: ----	Date Samples Received	: 23-Oct-2024 14:50
PO	: 2324-061AB	Issue Date	: 30-Oct-2024 10:19
C-O-C number	: ----		
Sampler	: ----		
Site	: ----		
Quote number	: CG24-NECI100-00001 Nautilus Calgary General		
No. of samples received	: 6		
No. of samples analysed	: 6		

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 : Analytical Method / 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 2,236 mg/L TDS PJ2425-002 - Mid-point NEW 32-d FM	E235.Cl	23-Oct-2024	23-Oct-2024	28 days	0 days	✓	23-Oct-2024	28 days	0 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE 2,236 mg/L TDS PJ2425-002 - Mid-point OLD 32-d FM	E235.Cl	23-Oct-2024	23-Oct-2024	28 days	0 days	✓	23-Oct-2024	28 days	0 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE 839 mg/L TDS PJ2425-002 - Mid-point NEW 32-d FM	E235.Cl	23-Oct-2024	23-Oct-2024	28 days	0 days	✓	23-Oct-2024	28 days	0 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE 839 mg/L TDS PJ2425-002 - Mid-point OLD 32-d FM	E235.Cl	23-Oct-2024	23-Oct-2024	28 days	0 days	✓	23-Oct-2024	28 days	0 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE Synthetic Site (373 mg/L TDS) PJ2425-0024 - Mid-point NEW 32-d FM	E235.Cl	23-Oct-2024	23-Oct-2024	28 days	0 days	✓	23-Oct-2024	28 days	0 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE Synthetic Site (373 mg/L TDS) PJ2425-0024 - Mid-point OLD 32-d FM	E235.Cl	23-Oct-2024	23-Oct-2024	28 days	0 days	✓	23-Oct-2024	28 days	0 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE 2,236 mg/L TDS PJ2425-002 - Mid-point NEW 32-d FM	E235.F	23-Oct-2024	23-Oct-2024	28 days	0 days	✓	23-Oct-2024	28 days	0 days	✓

Matrix: **Water**

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

Analyte Group : Analytical Method / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis: Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Fluoride in Water by IC										
HDPE 2,236 mg/L TDS PJ2425-002 - Mid-point OLD 32-d FM	E235.F	23-Oct-2024	23-Oct-2024	28 days	0 days	✓	23-Oct-2024	28 days	0 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE 839 mg/L TDS PJ2425-002 - Mid-point NEW 32-d FM	E235.F	23-Oct-2024	23-Oct-2024	28 days	0 days	✓	23-Oct-2024	28 days	0 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE 839 mg/L TDS PJ2425-002 - Mid-point OLD 32-d FM	E235.F	23-Oct-2024	23-Oct-2024	28 days	0 days	✓	23-Oct-2024	28 days	0 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE Synthetic Site (373 mg/L TDS) PJ2425-0024 - Mid-point NEW 32-d FM	E235.F	23-Oct-2024	23-Oct-2024	28 days	0 days	✓	23-Oct-2024	28 days	0 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE Synthetic Site (373 mg/L TDS) PJ2425-0024 - Mid-point OLD 32-d FM	E235.F	23-Oct-2024	23-Oct-2024	28 days	0 days	✓	23-Oct-2024	28 days	0 days	✓
Anions and Nutrients : Nitrate in Water by IC										
HDPE 2,236 mg/L TDS PJ2425-002 - Mid-point NEW 32-d FM	E235.NO3	23-Oct-2024	23-Oct-2024	3 days	0 days	✓	23-Oct-2024	3 days	0 days	✓
Anions and Nutrients : Nitrate in Water by IC										
HDPE 2,236 mg/L TDS PJ2425-002 - Mid-point OLD 32-d FM	E235.NO3	23-Oct-2024	23-Oct-2024	3 days	0 days	✓	23-Oct-2024	3 days	0 days	✓
Anions and Nutrients : Nitrate in Water by IC										
HDPE 839 mg/L TDS PJ2425-002 - Mid-point NEW 32-d FM	E235.NO3	23-Oct-2024	23-Oct-2024	3 days	0 days	✓	23-Oct-2024	3 days	0 days	✓
Anions and Nutrients : Nitrate in Water by IC										
HDPE 839 mg/L TDS PJ2425-002 - Mid-point OLD 32-d FM	E235.NO3	23-Oct-2024	23-Oct-2024	3 days	0 days	✓	23-Oct-2024	3 days	0 days	✓

Matrix: **Water**

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

Analyte Group : Analytical Method 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 : Nitrate in Water by IC										
HDPE Synthetic Site (373 mg/L TDS) PJ2425-0024 - Mid-point NEW 32-d FM	E235.NO3	23-Oct-2024	23-Oct-2024	3 days	0 days	✓	23-Oct-2024	3 days	0 days	✓
Anions and Nutrients : Nitrate in Water by IC										
HDPE Synthetic Site (373 mg/L TDS) PJ2425-0024 - Mid-point OLD 32-d FM	E235.NO3	23-Oct-2024	23-Oct-2024	3 days	0 days	✓	23-Oct-2024	3 days	0 days	✓
Anions and Nutrients : Nitrite in Water by IC										
HDPE 2,236 mg/L TDS PJ2425-002 - Mid-point NEW 32-d FM	E235.NO2	23-Oct-2024	23-Oct-2024	3 days	0 days	✓	23-Oct-2024	3 days	0 days	✓
Anions and Nutrients : Nitrite in Water by IC										
HDPE 2,236 mg/L TDS PJ2425-002 - Mid-point OLD 32-d FM	E235.NO2	23-Oct-2024	23-Oct-2024	3 days	0 days	✓	23-Oct-2024	3 days	0 days	✓
Anions and Nutrients : Nitrite in Water by IC										
HDPE 839 mg/L TDS PJ2425-002 - Mid-point NEW 32-d FM	E235.NO2	23-Oct-2024	23-Oct-2024	3 days	0 days	✓	23-Oct-2024	3 days	0 days	✓
Anions and Nutrients : Nitrite in Water by IC										
HDPE 839 mg/L TDS PJ2425-002 - Mid-point OLD 32-d FM	E235.NO2	23-Oct-2024	23-Oct-2024	3 days	0 days	✓	23-Oct-2024	3 days	0 days	✓
Anions and Nutrients : Nitrite in Water by IC										
HDPE Synthetic Site (373 mg/L TDS) PJ2425-0024 - Mid-point NEW 32-d FM	E235.NO2	23-Oct-2024	23-Oct-2024	3 days	0 days	✓	23-Oct-2024	3 days	0 days	✓
Anions and Nutrients : Nitrite in Water by IC										
HDPE Synthetic Site (373 mg/L TDS) PJ2425-0024 - Mid-point OLD 32-d FM	E235.NO2	23-Oct-2024	23-Oct-2024	3 days	0 days	✓	23-Oct-2024	3 days	0 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE 2,236 mg/L TDS PJ2425-002 - Mid-point NEW 32-d FM	E235.SO4	23-Oct-2024	23-Oct-2024	28 days	0 days	✓	23-Oct-2024	28 days	0 days	✓

Matrix: **Water** Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group : Analytical Method / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis: Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Sulfate in Water by IC										
HDPE 2,236 mg/L TDS PJ2425-002 - Mid-point OLD 32-d FM	E235.SO4	23-Oct-2024	23-Oct-2024	28 days	0 days	✓	23-Oct-2024	28 days	0 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE 839 mg/L TDS PJ2425-002 - Mid-point NEW 32-d FM	E235.SO4	23-Oct-2024	23-Oct-2024	28 days	0 days	✓	23-Oct-2024	28 days	0 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE 839 mg/L TDS PJ2425-002 - Mid-point OLD 32-d FM	E235.SO4	23-Oct-2024	23-Oct-2024	28 days	0 days	✓	23-Oct-2024	28 days	0 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE Synthetic Site (373 mg/L TDS) PJ2425-0024 - Mid-point NEW 32-d FM	E235.SO4	23-Oct-2024	23-Oct-2024	28 days	0 days	✓	23-Oct-2024	28 days	0 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE Synthetic Site (373 mg/L TDS) PJ2425-0024 - Mid-point OLD 32-d FM	E235.SO4	23-Oct-2024	23-Oct-2024	28 days	0 days	✓	23-Oct-2024	28 days	0 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE - dissolved (lab preserved) 2,236 mg/L TDS PJ2425-002 - Mid-point NEW 32-d FM	E421	23-Oct-2024	28-Oct-2024	180 days	5 days	✓	28-Oct-2024	180 days	5 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE - dissolved (lab preserved) 2,236 mg/L TDS PJ2425-002 - Mid-point OLD 32-d FM	E421	23-Oct-2024	28-Oct-2024	180 days	5 days	✓	28-Oct-2024	180 days	5 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE - dissolved (lab preserved) 839 mg/L TDS PJ2425-002 - Mid-point NEW 32-d FM	E421	23-Oct-2024	28-Oct-2024	180 days	5 days	✓	28-Oct-2024	180 days	5 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE - dissolved (lab preserved) 839 mg/L TDS PJ2425-002 - Mid-point OLD 32-d FM	E421	23-Oct-2024	28-Oct-2024	180 days	5 days	✓	28-Oct-2024	180 days	5 days	✓

Matrix: **Water**

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

Analyte Group : Analytical Method / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis: Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE - dissolved (lab preserved) Synthetic Site (373 mg/L TDS) PJ2425-0024 - Mid-point NEW 32-d FM	E421	23-Oct-2024	28-Oct-2024	180 days	5 days	✓	28-Oct-2024	180 days	5 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE - dissolved (lab preserved) Synthetic Site (373 mg/L TDS) PJ2425-0024 - Mid-point OLD 32-d FM	E421	23-Oct-2024	28-Oct-2024	180 days	5 days	✓	28-Oct-2024	180 days	5 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE 2,236 mg/L TDS PJ2425-002 - Mid-point NEW 32-d FM	E290	23-Oct-2024	24-Oct-2024	14 days	1 days	✓	24-Oct-2024	14 days	1 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE 2,236 mg/L TDS PJ2425-002 - Mid-point OLD 32-d FM	E290	23-Oct-2024	24-Oct-2024	14 days	1 days	✓	24-Oct-2024	14 days	1 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE 839 mg/L TDS PJ2425-002 - Mid-point NEW 32-d FM	E290	23-Oct-2024	24-Oct-2024	14 days	1 days	✓	24-Oct-2024	14 days	1 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE 839 mg/L TDS PJ2425-002 - Mid-point OLD 32-d FM	E290	23-Oct-2024	24-Oct-2024	14 days	1 days	✓	24-Oct-2024	14 days	1 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE Synthetic Site (373 mg/L TDS) PJ2425-0024 - Mid-point NEW 32-d FM	E290	23-Oct-2024	24-Oct-2024	14 days	1 days	✓	24-Oct-2024	14 days	1 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE Synthetic Site (373 mg/L TDS) PJ2425-0024 - Mid-point OLD 32-d FM	E290	23-Oct-2024	24-Oct-2024	14 days	1 days	✓	24-Oct-2024	14 days	1 days	✓
Physical Tests : Conductivity in Water										
HDPE 2,236 mg/L TDS PJ2425-002 - Mid-point NEW 32-d FM	E100	23-Oct-2024	24-Oct-2024	28 days	1 days	✓	24-Oct-2024	28 days	1 days	✓

Matrix: **Water**

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

Analyte Group : Analytical Method / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis: Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Conductivity in Water										
HDPE 2,236 mg/L TDS PJ2425-002 - Mid-point OLD 32-d FM	E100	23-Oct-2024	24-Oct-2024	28 days	1 days	✓	24-Oct-2024	28 days	1 days	✓
Physical Tests : Conductivity in Water										
HDPE 839 mg/L TDS PJ2425-002 - Mid-point NEW 32-d FM	E100	23-Oct-2024	24-Oct-2024	28 days	1 days	✓	24-Oct-2024	28 days	1 days	✓
Physical Tests : Conductivity in Water										
HDPE 839 mg/L TDS PJ2425-002 - Mid-point OLD 32-d FM	E100	23-Oct-2024	24-Oct-2024	28 days	1 days	✓	24-Oct-2024	28 days	1 days	✓
Physical Tests : Conductivity in Water										
HDPE Synthetic Site (373 mg/L TDS) PJ2425-0024 - Mid-point NEW 32-d FM	E100	23-Oct-2024	24-Oct-2024	28 days	1 days	✓	24-Oct-2024	28 days	1 days	✓
Physical Tests : Conductivity in Water										
HDPE Synthetic Site (373 mg/L TDS) PJ2425-0024 - Mid-point OLD 32-d FM	E100	23-Oct-2024	24-Oct-2024	28 days	1 days	✓	24-Oct-2024	28 days	1 days	✓
Physical Tests : pH by Meter										
HDPE 2,236 mg/L TDS PJ2425-002 - Mid-point OLD 32-d FM	E108	23-Oct-2024	24-Oct-2024	0.25 hrs	25 hrs	× EHTR-FM	24-Oct-2024	0.25 hrs	25 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE 839 mg/L TDS PJ2425-002 - Mid-point OLD 32-d FM	E108	23-Oct-2024	24-Oct-2024	0.25 hrs	25 hrs	× EHTR-FM	24-Oct-2024	0.25 hrs	25 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE Synthetic Site (373 mg/L TDS) PJ2425-0024 - Mid-point OLD 32-d FM	E108	23-Oct-2024	24-Oct-2024	0.25 hrs	25 hrs	× EHTR-FM	24-Oct-2024	0.25 hrs	25 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE 2,236 mg/L TDS PJ2425-002 - Mid-point NEW 32-d FM	E108	23-Oct-2024	24-Oct-2024	0.25 hrs	26 hrs	× EHTR-FM	24-Oct-2024	0.25 hrs	26 hrs	× EHTR-FM

Matrix: **Water**

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

Analyte Group : Analytical Method Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
Physical Tests : pH by Meter										
HDPE 839 mg/L TDS PJ2425-002 - Mid-point NEW 32-d FM	E108	23-Oct-2024	24-Oct-2024	0.25 hrs	26 hrs	× EHTR-FM	24-Oct-2024	0.25 hrs	26 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE Synthetic Site (373 mg/L TDS) PJ2425-0024 - Mid-point NEW 32-d FM	E108	23-Oct-2024	24-Oct-2024	0.25 hrs	26 hrs	× EHTR-FM	24-Oct-2024	0.25 hrs	26 hrs	× EHTR-FM

Legend & Qualifier Definitions

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

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	1729167	1	20	5.0	5.0	✓
Chloride in Water by IC	E235.Cl	1727349	1	17	5.8	5.0	✓
Conductivity in Water	E100	1729165	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	1735685	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	1727346	1	17	5.8	5.0	✓
Nitrate in Water by IC	E235.NO3	1727347	1	18	5.5	5.0	✓
Nitrite in Water by IC	E235.NO2	1727350	1	17	5.8	5.0	✓
pH by Meter	E108	1729166	1	20	5.0	5.0	✓
Sulfate in Water by IC	E235.SO4	1727348	1	17	5.8	5.0	✓
Laboratory Control Samples (LCS)							
Alkalinity Species by Titration	E290	1729167	1	20	5.0	5.0	✓
Chloride in Water by IC	E235.Cl	1727349	1	17	5.8	5.0	✓
Conductivity in Water	E100	1729165	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	1735685	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	1727346	1	17	5.8	5.0	✓
Nitrate in Water by IC	E235.NO3	1727347	1	18	5.5	5.0	✓
Nitrite in Water by IC	E235.NO2	1727350	1	17	5.8	5.0	✓
pH by Meter	E108	1729166	1	20	5.0	5.0	✓
Sulfate in Water by IC	E235.SO4	1727348	1	17	5.8	5.0	✓
Method Blanks (MB)							
Alkalinity Species by Titration	E290	1729167	1	20	5.0	5.0	✓
Chloride in Water by IC	E235.Cl	1727349	1	17	5.8	5.0	✓
Conductivity in Water	E100	1729165	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	1735685	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	1727346	1	17	5.8	5.0	✓
Nitrate in Water by IC	E235.NO3	1727347	1	18	5.5	5.0	✓
Nitrite in Water by IC	E235.NO2	1727350	1	17	5.8	5.0	✓
Sulfate in Water by IC	E235.SO4	1727348	1	17	5.8	5.0	✓
Matrix Spikes (MS)							
Chloride in Water by IC	E235.Cl	1727349	1	17	5.8	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	1735685	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	1727346	1	17	5.8	5.0	✓
Nitrate in Water by IC	E235.NO3	1727347	1	18	5.5	5.0	✓
Nitrite in Water by IC	E235.NO2	1727350	1	17	5.8	5.0	✓
Sulfate in Water by IC	E235.SO4	1727348	1	17	5.8	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 ALS Environmental - Calgary	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 ALS Environmental - Calgary	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.
Chloride in Water by IC	E235.Cl ALS Environmental - Calgary	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 ALS Environmental - Calgary	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 ALS Environmental - Calgary	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 ALS Environmental - Calgary	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 ALS Environmental - Calgary	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Alkalinity Species by Titration	E290 ALS Environmental - Calgary	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.
Dissolved Metals in Water by CRC ICPMS	E421 ALS Environmental - Calgary	Water	APHA 3030B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Hardness (Calculated)	EC100 ALS Environmental - Calgary	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 ALS Environmental - Calgary	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. Ion Balance cannot be calculated accurately for waters with very low electrical conductivity (EC).
TDS in Water (Calculation)	EC103 ALS Environmental - Calgary	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 ALS Environmental - Calgary	Water	EPA 300.0	Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Metals Water Filtration	EP421 ALS Environmental - Calgary	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HNO3.

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QUALITY CONTROL REPORT

Work Order	: **CG2415687**	Page	: 1 of 6
Client	: Nautilus Environmental Company Inc.	Laboratory	: ALS Environmental - Calgary
Contact	: Leila Oosterbroek	Account Manager	: Patryk Wojciak
Address	: 10823 27th Street SE Calgary AB Canada T2Z 3V9	Address	: 2559 29th Street NE Calgary, Alberta Canada T1Y 7B5
Telephone	: 403 253 7121	Telephone	: +1 403 407 1800
Project	: ----	Date Samples Received	: 23-Oct-2024 14:50
PO	: 2324-061AB	Date Analysis Commenced	: 23-Oct-2024
C-O-C number	: ----	Issue Date	: 30-Oct-2024 10:19
Sampler	: ----		
Site	: ----		
Quote number	: CG24-NECI100-00001 Nautilus Calgary General		
No. of samples received	: 6		
No. of samples analysed	: 6		

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*
Archana Neupane	Lab Assistant	Calgary Metals, Calgary, Alberta
Harpreet Chawla	Team Leader - Inorganics	Calgary Inorganics, Calgary, Alberta
Harpreet Chawla	Team Leader - Inorganics	Calgary Metals, Calgary, Alberta
Katarzyna Glinka	Analyst	Calgary Inorganics, Calgary, Alberta
Kevin Baxter	Team Leader - Inorganics	Calgary Inorganics, Calgary, 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: 1729165)											
CG2415652-024	Anonymous	Conductivity	----	E100	2.0	µS/cm	1800	1770	1.40%	10%	----
Physical Tests (QC Lot: 1729166)											
CG2415652-024	Anonymous	pH	----	E108	0.10	pH units	8.15	8.19	0.490%	4%	----
Physical Tests (QC Lot: 1729167)											
CG2415652-024	Anonymous	Alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	246	242	1.72%	20%	----
Anions and Nutrients (QC Lot: 1727346)											
CG2415630-001	Anonymous	Fluoride	16984-48-8	E235.F	0.020	mg/L	0.097	0.094	0.002	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 1727347)											
CG2415630-001	Anonymous	Nitrate (as N)	14797-55-8	E235.NO3	0.020	mg/L	0.036	0.034	0.002	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 1727348)											
CG2415630-001	Anonymous	Sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	27.0	27.1	0.210%	20%	----
Anions and Nutrients (QC Lot: 1727349)											
CG2415630-001	Anonymous	Chloride	16887-00-6	E235.Cl	0.50	mg/L	12.3	12.3	0.0870%	20%	----
Anions and Nutrients (QC Lot: 1727350)											
CG2415630-001	Anonymous	Nitrite (as N)	14797-65-0	E235.NO2	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 1735685)											
CG2415628-001	Anonymous	Calcium, dissolved	7440-70-2	E421	0.050	mg/L	5.20	5.30	1.97%	20%	----
		Magnesium, dissolved	7439-95-4	E421	0.100	mg/L	42.1	42.8	1.74%	20%	----
		Potassium, dissolved	7440-09-7	E421	0.100	mg/L	3.38	3.40	0.476%	20%	----
		Sodium, dissolved	7440-23-5	E421	0.050	mg/L	30.7	31.0	1.17%	20%	----

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: 1729165)						
Conductivity	----	E100	1	µS/cm	<1.0	----
Physical Tests (QCLot: 1729167)						
Alkalinity, total (as CaCO3)	----	E290	1	mg/L	<1.0	----
Anions and Nutrients (QCLot: 1727346)						
Fluoride	16984-48-8	E235.F	0.02	mg/L	<0.020	----
Anions and Nutrients (QCLot: 1727347)						
Nitrate (as N)	14797-55-8	E235.NO3	0.02	mg/L	<0.020	----
Anions and Nutrients (QCLot: 1727348)						
Sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 1727349)						
Chloride	16887-00-6	E235.Cl	0.5	mg/L	<0.50	----
Anions and Nutrients (QCLot: 1727350)						
Nitrite (as N)	14797-65-0	E235.NO2	0.01	mg/L	<0.010	----
Dissolved Metals (QCLot: 1735685)						
Calcium, dissolved	7440-70-2	E421	0.05	mg/L	<0.050	----
Magnesium, dissolved	7439-95-4	E421	0.005	mg/L	<0.0050	----
Potassium, dissolved	7440-09-7	E421	0.05	mg/L	<0.050	----
Sodium, dissolved	7440-23-5	E421	0.05	mg/L	<0.050	----

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	Target Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 1729165)									
Conductivity	----	E100	1	µS/cm	147 µS/cm	107	90.0	110	----
Physical Tests (QCLot: 1729166)									
pH	----	E108	----	pH units	7 pH units	100	98.0	102	----
Physical Tests (QCLot: 1729167)									
Alkalinity, total (as CaCO3)	----	E290	1	mg/L	500 mg/L	98.8	85.0	115	----
Anions and Nutrients (QCLot: 1727346)									
Fluoride	16984-48-8	E235.F	0.02	mg/L	1 mg/L	103	90.0	110	----
Anions and Nutrients (QCLot: 1727347)									
Nitrate (as N)	14797-55-8	E235.NO3	0.02	mg/L	2.5 mg/L	100	90.0	110	----
Anions and Nutrients (QCLot: 1727348)									
Sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	99.4	90.0	110	----
Anions and Nutrients (QCLot: 1727349)									
Chloride	16887-00-6	E235.Cl	0.5	mg/L	100 mg/L	99.9	90.0	110	----
Anions and Nutrients (QCLot: 1727350)									
Nitrite (as N)	14797-65-0	E235.NO2	0.01	mg/L	0.5 mg/L	96.2	90.0	110	----
Dissolved Metals (QCLot: 1735685)									
Calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	99.3	80.0	120	----
Magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	96.7	80.0	120	----
Potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	100	80.0	120	----
Sodium, dissolved	7440-23-5	E421	0.05	mg/L	50 mg/L	98.8	80.0	120	----

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: 1727346)										
CG2415630-002	Anonymous	Fluoride	16984-48-8	E235.F	0.963 mg/L	1 mg/L	96.3	75.0	125	----
Anions and Nutrients (QCLot: 1727347)										
CG2415630-002	Anonymous	Nitrate (as N)	14797-55-8	E235.NO3	2.51 mg/L	2.5 mg/L	100	75.0	125	----
Anions and Nutrients (QCLot: 1727348)										
CG2415630-002	Anonymous	Sulfate (as SO4)	14808-79-8	E235.SO4	99.0 mg/L	100 mg/L	99.0	75.0	125	----
Anions and Nutrients (QCLot: 1727349)										
CG2415630-002	Anonymous	Chloride	16887-00-6	E235.Cl	100 mg/L	100 mg/L	100	75.0	125	----
Anions and Nutrients (QCLot: 1727350)										
CG2415630-002	Anonymous	Nitrite (as N)	14797-65-0	E235.NO2	0.497 mg/L	0.5 mg/L	99.4	75.0	125	----
Dissolved Metals (QCLot: 1735685)										
CG2415628-002	Anonymous	Calcium, dissolved	7440-70-2	E421	41.1 mg/L	40 mg/L	103	70.0	130	----
		Magnesium, dissolved	7439-95-4	E421	9.25 mg/L	10 mg/L	92.5	70.0	130	----
		Potassium, dissolved	7440-09-7	E421	40.4 mg/L	40 mg/L	101	70.0	130	----
		Sodium, dissolved	7440-23-5	E421	ND mg/L	----	ND	70.0	130	----

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Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

COC Number: 22 -

Page 1 of 1

Environmental Division
Calgary
Work Order Reference
CG2415687

Telephone : +1 403 407 1800

Report To	Contact and company name below will appear on the final report
Company:	Nautilus Environmental
Contact:	Leila Oosterbroek
Phone:	403-253-7121
	Company address below will appear on the final report
Street:	10823 27 St SE
City/Province:	Calgary, AB
Postal Code:	T2Z 3V9
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☑ YES ☐ NO
Company:	Nautilus Environmental
Contact:	Leila Oosterbroek

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 leila@nautilusenvironmental.ca; stephanie@nautilu

Email 2 lisa.ramilo@agnicoeagle.com

Email 3 chelsea.grimard@wsp.com

Invoice Recipients

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax accounting@nautilusenvironmental.ca

Email 2 leila@nautilusenvironmental.ca

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

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

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

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

☐ Same day [E2] if received by 10am M-S - 200% rush su

Additional fees may apply to rush requests on we

Date and Time Required for all E&P TATs:

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

Project Information

ALS Account # / Quote #:

Job #:

PO / AFE: 2324-061AB

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): | 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	PR01 - Routine	SAMPLES ON HOLD	EXTENDED STORAGE REQUIRED	SUSPECTED HAZARD (see notes)
	Synthetic Site (373 mg/L TDS) PJ2425-0024 - Mid-point NEW 32-d FM	23-Oct-24	10:30	water	1	R			
	839 mg/L TDS PJ2425-002 - Mid-point NEW 32-d FM	23-Oct-24	10:30	water	1	R			
	2,236 mg/L TDS PJ2425-002 - Mid-point NEW 32-d FM	23-Oct-24	10:30	water	1	R			
	Synthetic Site (373 mg/L TDS) PJ2425-0024 - Mid-point OLD 32-d FM	23-Oct-24	12:00	water	1	R			
	839 mg/L TDS PJ2425-002 - Mid-point OLD 32-d FM	23-Oct-24	12:00	water	1	R			
	2,236 mg/L TDS PJ2425-002 - Mid-point OLD 32-d FM	23-Oct-24	12:00	water	1	R			

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

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

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

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

SAMPLE RECEIPT DETAILS (ALS use only)

Cooling Method: ☐ NONE ☐ ICE ☐ ICE PACKS ☐ FROZEN ☐ COOLING INITIATED

Submission Comments identified on Sample Receipt Notification: ☐ YES ☐ NO

Cooler Custody Seals Intact: ☐ YES ☐ N/A Sample Custody Seals Intact: ☐ YES ☐ N/A

INITIAL COOLER TEMPERATURES °C: 7 | FINAL COOLER TEMPERATURES °C

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (ALS use only)			FINAL SHIPMENT RECEPTION (ALS use only)		
Released by: [signature]	Date: 2024/10/23	Time: 1300	Received by:	Date:	Time:	Received by: [signature]	Date: 10/23	Time: 19:0

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

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.

ALS Canada Ltd.

CERTIFICATE OF ANALYSIS

Work Order	:	**CG2416747**			
Client	:	**Nautilus Environmental Company Inc.**	Laboratory	:	ALS Environmental - Calgary
Contact	:	Leila Oosterbroek	Account Manager	:	Patryk Wojciak
Address	:	10823 27th Street SE Calgary Alberta Canada T2Z 3V9	Address	:	2559 29th Street NE Calgary AB Canada T1Y 7B5
Telephone	:	403 253 7121	Telephone	:	+1 403 407 1800
Project	:	----	Date Samples Received	:	09-Nov-2024 11:10
PO	:	----	Date Analysis Commenced	:	09-Nov-2024
C-O-C number	:	----	Issue Date	:	19-Nov-2024 12:49
Sampler	:	----			
Site	:	----			
Quote number	:	CG24-NECI100-00001 Nautilus Calgary General			
No. of samples received	:	3			
No. of samples analysed	:	3			

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

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*
Gurvinder Kour	Lab Assistant	Metals, Calgary, Alberta
Harpreet Chawla	Team Leader - Inorganics	Metals, Calgary, Alberta
Harpreet Chawla	Team Leader - Inorganics	Inorganics, Calgary, Alberta
Kevin Baxter	Team Leader - Inorganics	Metals, Calgary, Alberta
Kevin Baxter	Team Leader - Inorganics	Inorganics, Calgary, Alberta
Shirley Li	Team Leader - Inorganics	Inorganics, Calgary, 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*
mg/L	milligrams per litre
pH units	pH units
µS/cm	microsiemens per centimetre
-	no units
%	percent
meq/L	milliequivalents per litre

<: 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
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.

Analytical Results

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

Analyte	CAS Number	Method/Lab	LOR	Unit	SYNTHETIC SITE (373 mg/L TDS) PJ2425-024 - TERMINATION 32-d FM	839 mg/L TDS PJ2425-002 - TERMINATION 32-d FM	2,236 mg/L TDS PJ2425-002 - TERMINATION 32-d FM	----	----
				Client sampling date / time	09-Nov-2024 07:45	09-Nov-2024 07:45	09-Nov-2024 07:45	----	----
					CG2416747-001	CG2416747-002	CG2416747-003	----	----
					Result	Result	Result	----	----
Physical Tests									
Hardness (as CaCO3), dissolved	----	EC100/CG	0.50	mg/L	199	354	817	----	----
Conductivity	----	E100/CG	2.0	µS/cm	619	1230	3010	----	----
pH	----	E108/CG	0.10	pH units	8.09	8.15	7.27	----	----
Alkalinity, bicarbonate (as HCO3)	71-52-3	E290/CG	1.0	mg/L	260	208	34.5	----	----
Alkalinity, carbonate (as CO3)	3812-32-6	E290/CG	1.0	mg/L	<1.0	<1.0	<1.0	----	----
Alkalinity, hydroxide (as OH)	14280-30-9	E290/CG	1.0	mg/L	<1.0	<1.0	<1.0	----	----
Alkalinity, total (as CaCO3)	----	E290/CG	2.0	mg/L	213	170	28.3	----	----
Solids, total dissolved [TDS], calculated	----	EC103/CG	1.0	mg/L	398	844	2260	----	----
Anions and Nutrients									
Chloride	16887-00-6	E235.Cl/CG	0.50	mg/L	23.9	124	438	----	----
Fluoride	16984-48-8	E235.F/CG	0.020	mg/L	0.032	<0.100 DLDS	<0.100 DLDS	----	----
Nitrate (as N)	14797-55-8	E235.NO3/CG	0.020	mg/L	1.88	1.54	0.714	----	----
Nitrite (as N)	14797-65-0	E235.NO2/CG	0.010	mg/L	0.127	0.073	<0.050 DLDS	----	----
Sulfate (as SO4)	14808-79-8	E235.SO4/CG	0.30	mg/L	86.4	317	1050	----	----
Nitrate + Nitrite (as N)	----	EC235.N+N/CG	0.0500	mg/L	2.01	1.61	0.714	----	----
Ion Balance									
Anion sum	----	EC101/CG	0.10	meq/L	6.87	13.6	34.8	----	----
Cation sum	----	EC101/CG	0.10	meq/L	7.18	13.6	34.1	----	----
Ion balance (APHA)	----	EC101/CG	0.01	%	2.21	0.0	-1.02	----	----
Ion balance (cations/anions)	----	EC101/CG	0.010	%	104	100	98.0	----	----

Analytical Results

Sub-Matrix: Water
(Matrix: Water)

Analyte	CAS Number	Method/Lab	LOR	Unit	SYNTHETIC SITE (373 mg/L TDS) PJ2425-024 - TERMINATION 32-d FM	839 mg/L TDS PJ2425-002 - TERMINATION 32-d FM	2,236 mg/L TDS PJ2425-002 - TERMINATION 32-d FM	----	----
Client sampling date / time					09-Nov-2024 07:45	09-Nov-2024 07:45	09-Nov-2024 07:45	----	----
					CG2416747-001	CG2416747-002	CG2416747-003	----	----
					Result	Result	Result	----	----
Dissolved Metals									
Calcium, dissolved	7440-70-2	E421/CG	0.050	mg/L	52.6	110	277	----	----
Magnesium, dissolved	7439-95-4	E421/CG	0.0050	mg/L	16.5	19.2	30.5	----	----
Potassium, dissolved	7440-09-7	E421/CG	0.050	mg/L	10.2	27.2	83.4	----	----
Sodium, dissolved	7440-23-5	E421/CG	0.050	mg/L	67.6	134	359	----	----
Dissolved metals filtration location	----	EP421/CG	-	-	Laboratory	Laboratory	Laboratory	----	----

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

ALS Canada Ltd.

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **CG2416747**	Page	: 1 of 9
Client	: **Nautilus Environmental Company Inc.**	Laboratory	: ALS Environmental - Calgary
Contact	: Leila Oosterbroek	Account Manager	: Patryk Wojciak
Address	: 10823 27th Street SE Calgary AB Canada T2Z 3V9	Address	: 2559 29th Street NE Calgary, Alberta Canada T1Y 7B5
Telephone	: 403 253 7121	Telephone	: +1 403 407 1800
Project	: ----	Date Samples Received	: 09-Nov-2024 11:10
PO	: ----	Issue Date	: 19-Nov-2024 12:52
C-O-C number	: ----		
Sampler	: ----		
Site	: ----		
Quote number	: CG24-NECI100-00001 Nautilus Calgary General		
No. of samples received	: 3		
No. of samples analysed	: 3		

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 : Analytical Method	Method	Sampling Date	Extraction / Preparation				Analysis			
Container / Client Sample ID(s)			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 2,236 mg/L TDS PJ2425-002 - TERMINATION 32- d FM	E235.Cl	09-Nov-2024	10-Nov-2024	28 days	1 days	✓	10-Nov-2024	28 days	1 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE 839 mg/L TDS PJ2425-002 - TERMINATION 32- d FM	E235.Cl	09-Nov-2024	10-Nov-2024	28 days	1 days	✓	10-Nov-2024	28 days	1 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE SYNTHETIC SITE (373 mg/L TDS) PJ2425-024 -TERMINATION 32- d FM	E235.Cl	09-Nov-2024	10-Nov-2024	28 days	1 days	✓	10-Nov-2024	28 days	1 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE 2,236 mg/L TDS PJ2425-002 - TERMINATION 32- d FM	E235.F	09-Nov-2024	10-Nov-2024	28 days	1 days	✓	10-Nov-2024	28 days	1 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE 839 mg/L TDS PJ2425-002 - TERMINATION 32- d FM	E235.F	09-Nov-2024	10-Nov-2024	28 days	1 days	✓	10-Nov-2024	28 days	1 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE SYNTHETIC SITE (373 mg/L TDS) PJ2425-024 -TERMINATION 32- d FM	E235.F	09-Nov-2024	10-Nov-2024	28 days	1 days	✓	10-Nov-2024	28 days	1 days	✓
Anions and Nutrients : Nitrate in Water by IC										
HDPE 2,236 mg/L TDS PJ2425-002 - TERMINATION 32- d FM	E235.NO3	09-Nov-2024	10-Nov-2024	3 days	1 days	✓	10-Nov-2024	3 days	1 days	✓

Matrix: **Water**

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

Analyte Group : Analytical Method Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Anions and Nutrients : Nitrate in Water by IC										
HDPE 839 mg/L TDS PJ2425-002 - TERMINATION 32- d FM	E235.NO3	09-Nov-2024	10-Nov-2024	3 days	1 days	✓	10-Nov-2024	3 days	1 days	✓
Anions and Nutrients : Nitrate in Water by IC										
HDPE SYNTHETIC SITE (373 mg/L TDS) PJ2425-024 -TERMINATION 32- d FM	E235.NO3	09-Nov-2024	10-Nov-2024	3 days	1 days	✓	10-Nov-2024	3 days	1 days	✓
Anions and Nutrients : Nitrite in Water by IC										
HDPE 2,236 mg/L TDS PJ2425-002 - TERMINATION 32- d FM	E235.NO2	09-Nov-2024	10-Nov-2024	3 days	1 days	✓	10-Nov-2024	3 days	1 days	✓
Anions and Nutrients : Nitrite in Water by IC										
HDPE 839 mg/L TDS PJ2425-002 - TERMINATION 32- d FM	E235.NO2	09-Nov-2024	10-Nov-2024	3 days	1 days	✓	10-Nov-2024	3 days	1 days	✓
Anions and Nutrients : Nitrite in Water by IC										
HDPE SYNTHETIC SITE (373 mg/L TDS) PJ2425-024 -TERMINATION 32- d FM	E235.NO2	09-Nov-2024	10-Nov-2024	3 days	1 days	✓	10-Nov-2024	3 days	1 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE 2,236 mg/L TDS PJ2425-002 - TERMINATION 32- d FM	E235.SO4	09-Nov-2024	10-Nov-2024	28 days	1 days	✓	10-Nov-2024	28 days	1 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE 839 mg/L TDS PJ2425-002 - TERMINATION 32- d FM	E235.SO4	09-Nov-2024	10-Nov-2024	28 days	1 days	✓	10-Nov-2024	28 days	1 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE SYNTHETIC SITE (373 mg/L TDS) PJ2425-024 -TERMINATION 32- d FM	E235.SO4	09-Nov-2024	10-Nov-2024	28 days	1 days	✓	10-Nov-2024	28 days	1 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE - dissolved (lab preserved) 2,236 mg/L TDS PJ2425-002 - TERMINATION 32- d FM	E421	09-Nov-2024	18-Nov-2024	180 days	9 days	✓	18-Nov-2024	180 days	9 days	✓

Matrix: **Water**

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

Analyte Group : Analytical Method / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis: Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE - dissolved (lab preserved) 839 mg/L TDS PJ2425-002 - TERMINATION 32- d FM	E421	09-Nov-2024	18-Nov-2024	180 days	9 days	✓	18-Nov-2024	180 days	9 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE - dissolved (lab preserved) SYNTHETIC SITE (373 mg/L TDS) PJ2425-024 -TERMINATION 32- d FM	E421	09-Nov-2024	18-Nov-2024	180 days	9 days	✓	18-Nov-2024	180 days	9 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE 2,236 mg/L TDS PJ2425-002 - TERMINATION 32- d FM	E290	09-Nov-2024	09-Nov-2024	14 days	0 days	✓	09-Nov-2024	14 days	0 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE 839 mg/L TDS PJ2425-002 - TERMINATION 32- d FM	E290	09-Nov-2024	09-Nov-2024	14 days	0 days	✓	09-Nov-2024	14 days	0 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE SYNTHETIC SITE (373 mg/L TDS) PJ2425-024 -TERMINATION 32- d FM	E290	09-Nov-2024	09-Nov-2024	14 days	0 days	✓	09-Nov-2024	14 days	0 days	✓
Physical Tests : Conductivity in Water										
HDPE 2,236 mg/L TDS PJ2425-002 - TERMINATION 32- d FM	E100	09-Nov-2024	09-Nov-2024	28 days	0 days	✓	09-Nov-2024	28 days	0 days	✓
Physical Tests : Conductivity in Water										
HDPE 839 mg/L TDS PJ2425-002 - TERMINATION 32- d FM	E100	09-Nov-2024	09-Nov-2024	28 days	0 days	✓	09-Nov-2024	28 days	0 days	✓
Physical Tests : Conductivity in Water										
HDPE SYNTHETIC SITE (373 mg/L TDS) PJ2425-024 -TERMINATION 32- d FM	E100	09-Nov-2024	09-Nov-2024	28 days	0 days	✓	09-Nov-2024	28 days	0 days	✓
Physical Tests : pH by Meter										
HDPE 2,236 mg/L TDS PJ2425-002 - TERMINATION 32- d FM	E108	09-Nov-2024	09-Nov-2024	0.25 hrs	8 hrs	× EHTR-FM	09-Nov-2024	0.25 hrs	9 hrs	× EHTR-FM

Matrix: **Water**

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

Analyte Group : Analytical Method 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 : pH by Meter										
HDPE 839 mg/L TDS PJ2425-002 - TERMINATION 32- d FM	E108	09-Nov-2024	09-Nov-2024	0.25 hrs	8 hrs	× EHTR-FM	09-Nov-2024	0.25 hrs	9 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE SYNTHETIC SITE (373 mg/L TDS) PJ2425-024 -TERMINATION 32- d FM	E108	09-Nov-2024	09-Nov-2024	0.25 hrs	8 hrs	× EHTR-FM	09-Nov-2024	0.25 hrs	9 hrs	× EHTR-FM

Legend & Qualifier Definitions

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

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	1759789	1	19	5.2	5.0	✓
Chloride in Water by IC	E235.Cl	1760264	1	3	33.3	5.0	✓
Conductivity in Water	E100	1759788	1	17	5.8	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	1768120	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	1760261	1	9	11.1	5.0	✓
Nitrate in Water by IC	E235.NO3	1760262	1	3	33.3	5.0	✓
Nitrite in Water by IC	E235.NO2	1760265	1	3	33.3	5.0	✓
pH by Meter	E108	1759787	1	19	5.2	5.0	✓
Sulfate in Water by IC	E235.SO4	1760263	1	9	11.1	5.0	✓
Laboratory Control Samples (LCS)							
Alkalinity Species by Titration	E290	1759789	1	19	5.2	5.0	✓
Chloride in Water by IC	E235.Cl	1760264	1	3	33.3	5.0	✓
Conductivity in Water	E100	1759788	1	17	5.8	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	1768120	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	1760261	1	9	11.1	5.0	✓
Nitrate in Water by IC	E235.NO3	1760262	1	3	33.3	5.0	✓
Nitrite in Water by IC	E235.NO2	1760265	1	3	33.3	5.0	✓
pH by Meter	E108	1759787	1	19	5.2	5.0	✓
Sulfate in Water by IC	E235.SO4	1760263	1	9	11.1	5.0	✓
Method Blanks (MB)							
Alkalinity Species by Titration	E290	1759789	1	19	5.2	5.0	✓
Chloride in Water by IC	E235.Cl	1760264	1	3	33.3	5.0	✓
Conductivity in Water	E100	1759788	1	17	5.8	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	1768120	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	1760261	1	9	11.1	5.0	✓
Nitrate in Water by IC	E235.NO3	1760262	1	3	33.3	5.0	✓
Nitrite in Water by IC	E235.NO2	1760265	1	3	33.3	5.0	✓
Sulfate in Water by IC	E235.SO4	1760263	1	9	11.1	5.0	✓
Matrix Spikes (MS)							
Chloride in Water by IC	E235.Cl	1760264	1	3	33.3	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	1768120	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	1760261	1	9	11.1	5.0	✓
Nitrate in Water by IC	E235.NO3	1760262	1	3	33.3	5.0	✓
Nitrite in Water by IC	E235.NO2	1760265	1	3	33.3	5.0	✓
Sulfate in Water by IC	E235.SO4	1760263	1	9	11.1	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 ALS Environmental - Calgary	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 ALS Environmental - Calgary	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.
Chloride in Water by IC	E235.Cl ALS Environmental - Calgary	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 ALS Environmental - Calgary	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 ALS Environmental - Calgary	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 ALS Environmental - Calgary	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 ALS Environmental - Calgary	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Alkalinity Species by Titration	E290 ALS Environmental - Calgary	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.
Dissolved Metals in Water by CRC ICPMS	E421 ALS Environmental - Calgary	Water	APHA 3030B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Hardness (Calculated)	EC100 ALS Environmental - Calgary	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 ALS Environmental - Calgary	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. Ion Balance cannot be calculated accurately for waters with very low electrical conductivity (EC).
TDS in Water (Calculation)	EC103 ALS Environmental - Calgary	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 ALS Environmental - Calgary	Water	EPA 300.0	Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Metals Water Filtration	EP421 ALS Environmental - Calgary	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HNO3.

ALS Canada Ltd.

QUALITY CONTROL REPORT

Work Order	: **CG2416747**	Page	: 1 of 6
Client	: Nautilus Environmental Company Inc.	Laboratory	: ALS Environmental - Calgary
Contact	: Leila Oosterbroek	Account Manager	: Patryk Wojciak
Address	: 10823 27th Street SE Calgary AB Canada T2Z 3V9	Address	: 2559 29th Street NE Calgary, Alberta Canada T1Y 7B5
Telephone	: 403 253 7121	Telephone	: +1 403 407 1800
Project	: ----	Date Samples Received	: 09-Nov-2024 11:10
PO	: ----	Date Analysis Commenced	: 09-Nov-2024
C-O-C number	: ----	Issue Date	: 19-Nov-2024 12:49
Sampler	: ----		
Site	: ----		
Quote number	: CG24-NECI100-00001 Nautilus Calgary General		
No. of samples received	: 3		
No. of samples analysed	: 3		

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*
Gurvinder Kour	Lab Assistant	Calgary Metals, Calgary, Alberta
Harpreet Chawla	Team Leader - Inorganics	Calgary Inorganics, Calgary, Alberta
Harpreet Chawla	Team Leader - Inorganics	Calgary Metals, Calgary, Alberta
Kevin Baxter	Team Leader - Inorganics	Calgary Inorganics, Calgary, Alberta
Kevin Baxter	Team Leader - Inorganics	Calgary Metals, Calgary, Alberta
Shirley Li	Team Leader - Inorganics	Calgary Inorganics, Calgary, 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: 1759787)											
CG2416741-001	Anonymous	pH	----	E108	0.10	pH units	7.80	7.83	0.384%	4%	----
Physical Tests (QC Lot: 1759788)											
CG2416741-001	Anonymous	Conductivity	----	E100	2.0	µS/cm	1170	1160	0.516%	10%	----
Physical Tests (QC Lot: 1759789)											
CG2416741-001	Anonymous	Alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	333	322	3.14%	20%	----
Anions and Nutrients (QC Lot: 1760261)											
CG2416747-001	SYNTHETIC SITE (373 mg/L TDS) PJ2425-024 -TERMINATION 32- d FM	Fluoride	16984-48-8	E235.F	0.020	mg/L	0.032	0.032	0.0002	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 1760262)											
CG2416747-001	SYNTHETIC SITE (373 mg/L TDS) PJ2425-024 -TERMINATION 32- d FM	Nitrate (as N)	14797-55-8	E235.NO3	0.020	mg/L	1.88	1.88	0.208%	20%	----
Anions and Nutrients (QC Lot: 1760263)											
CG2416747-001	SYNTHETIC SITE (373 mg/L TDS) PJ2425-024 -TERMINATION 32- d FM	Sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	86.4	86.3	0.125%	20%	----
Anions and Nutrients (QC Lot: 1760264)											
CG2416747-001	SYNTHETIC SITE (373 mg/L TDS) PJ2425-024 -TERMINATION 32- d FM	Chloride	16887-00-6	E235.Cl	0.50	mg/L	23.9	23.9	0.0420%	20%	----
Anions and Nutrients (QC Lot: 1760265)											
CG2416747-001	SYNTHETIC SITE (373 mg/L TDS) PJ2425-024 -TERMINATION 32- d FM	Nitrite (as N)	14797-65-0	E235.NO2	0.010	mg/L	0.127	0.127	0.157%	20%	----
Dissolved Metals (QC Lot: 1768120)											
CG2416546-018	Anonymous	Calcium, dissolved	7440-70-2	E421	0.050	mg/L	49.9	49.2	1.22%	20%	----
		Magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	18.4	18.2	1.14%	20%	----
		Potassium, dissolved	7440-09-7	E421	0.050	mg/L	3.99	3.96	0.521%	20%	----
		Sodium, dissolved	7440-23-5	E421	0.050	mg/L	22.1	22.4	1.35%	20%	----

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: 1759788)						
Conductivity	----	E100	1	µS/cm	<1.0	----
Physical Tests (QCLot: 1759789)						
Alkalinity, total (as CaCO3)	----	E290	1	mg/L	<1.0	----
Anions and Nutrients (QCLot: 1760261)						
Fluoride	16984-48-8	E235.F	0.02	mg/L	<0.020	----
Anions and Nutrients (QCLot: 1760262)						
Nitrate (as N)	14797-55-8	E235.NO3	0.02	mg/L	<0.020	----
Anions and Nutrients (QCLot: 1760263)						
Sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 1760264)						
Chloride	16887-00-6	E235.Cl	0.5	mg/L	<0.50	----
Anions and Nutrients (QCLot: 1760265)						
Nitrite (as N)	14797-65-0	E235.NO2	0.01	mg/L	<0.010	----
Dissolved Metals (QCLot: 1768120)						
Calcium, dissolved	7440-70-2	E421	0.05	mg/L	<0.050	----
Magnesium, dissolved	7439-95-4	E421	0.005	mg/L	<0.0050	----
Potassium, dissolved	7440-09-7	E421	0.05	mg/L	<0.050	----
Sodium, dissolved	7440-23-5	E421	0.05	mg/L	<0.050	----

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	Target Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 1759787)									
pH	----	E108	----	pH units	7 pH units	100	98.0	102	----
Physical Tests (QCLot: 1759788)									
Conductivity	----	E100	1	µS/cm	147 µS/cm	104	90.0	110	----
Physical Tests (QCLot: 1759789)									
Alkalinity, total (as CaCO3)	----	E290	1	mg/L	500 mg/L	106	85.0	115	----
Anions and Nutrients (QCLot: 1760261)									
Fluoride	16984-48-8	E235.F	0.02	mg/L	1 mg/L	100	90.0	110	----
Anions and Nutrients (QCLot: 1760262)									
Nitrate (as N)	14797-55-8	E235.NO3	0.02	mg/L	2.5 mg/L	100.0	90.0	110	----
Anions and Nutrients (QCLot: 1760263)									
Sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	99.9	90.0	110	----
Anions and Nutrients (QCLot: 1760264)									
Chloride	16887-00-6	E235.Cl	0.5	mg/L	100 mg/L	98.9	90.0	110	----
Anions and Nutrients (QCLot: 1760265)									
Nitrite (as N)	14797-65-0	E235.NO2	0.01	mg/L	0.5 mg/L	97.2	90.0	110	----
Dissolved Metals (QCLot: 1768120)									
Calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	93.8	80.0	120	----
Magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	99.0	80.0	120	----
Potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	94.1	80.0	120	----
Sodium, dissolved	7440-23-5	E421	0.05	mg/L	50 mg/L	94.3	80.0	120	----

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: 1760261)										
CG2416747-002	839 mg/L TDS PJ2425-002 - TERMINATION 32- d FM	Fluoride	16984-48-8	E235.F	1.02 mg/L	1 mg/L	102	75.0	125	----
Anions and Nutrients (QCLot: 1760262)										
CG2416747-002	839 mg/L TDS PJ2425-002 - TERMINATION 32- d FM	Nitrate (as N)	14797-55-8	E235.NO3	2.50 mg/L	2.5 mg/L	100	75.0	125	----
Anions and Nutrients (QCLot: 1760263)										
CG2416747-002	839 mg/L TDS PJ2425-002 - TERMINATION 32- d FM	Sulfate (as SO4)	14808-79-8	E235.SO4	ND mg/L	----	ND	75.0	125	----
Anions and Nutrients (QCLot: 1760264)										
CG2416747-002	839 mg/L TDS PJ2425-002 - TERMINATION 32- d FM	Chloride	16887-00-6	E235.Cl	ND mg/L	----	ND	75.0	125	----
Anions and Nutrients (QCLot: 1760265)										
CG2416747-002	839 mg/L TDS PJ2425-002 - TERMINATION 32- d FM	Nitrite (as N)	14797-65-0	E235.NO2	0.500 mg/L	0.5 mg/L	99.9	75.0	125	----
Dissolved Metals (QCLot: 1768120)										
CG2416546-019	Anonymous	Calcium, dissolved	7440-70-2	E421	ND mg/L	----	ND	70.0	130	----
		Magnesium, dissolved	7439-95-4	E421	ND mg/L	----	ND	70.0	130	----
		Potassium, dissolved	7440-09-7	E421	38.0 mg/L	40 mg/L	95.1	70.0	130	----
		Sodium, dissolved	7440-23-5	E421	ND mg/L	----	ND	70.0	130	----

Chain of Custody (COC) / Analytical Request Form

COC Number: 22 -

Canada Toll Free: 1 800 668 9878

www.alsglobal.com

Report To	Contact and company name below will appear on the final report	Reports / Recipients	
Company:	Nautilus Environmental	Select Report Format:	☑ PDF ☑ EXCEL ☐ EDD (DIGITAL)
Contact:	Leila Oosterbroek	Merge QC/QCI Reports with COA	☑ YES ☐ NO ☐ N/A
Phone:	403-253-7121	☐ Compare Results to Criteria on Report - provide details below if box checked	
	Company address below will appear on the final report	Select Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Street:	10823 27 St SE	Email 1 or Fax	leila@nautilusenvironmental.ca; stephanie@nautilu
City/Province:	Calgary, AB	Email 2	lisa.ramilo@agnicoeagle.com
Postal Code:	T2Z 3V9	Email 3	chelsea.grimard@wsp.com
Invoice To	Same as Report To ☑ YES ☐ NO	Invoice Recipients	
	Copy of Invoice with Report ☑ YES ☐ NO	Select Invoice Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Company:	Nautilus Environmental	Email 1 or Fax	accounting@nautilusenvironmental.ca
Contact:	Leila Oosterbroek	Email 2	leila@nautilusenvironmental.ca

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:		AFE/Cost Center:	PO#
Job #:		Major/Minor Code:	Routing Code:
PO / AFE:	2425-062AB	Requisitioner:	
LSD:		Location:	
ALS Lab Work Order # (ALS use only):		ALS Contact:	Sampler:

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.

AFFIX ALS BARCODE LABEL HERE (ALS use only)

Additional fees may apply to rush requests on weekends, statutory holidays and for non-routine tests.

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.

Analysis Request

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

Environmental Division
Calgary
Work Order Reference
CG2416747

Telephone : +1 403 407 1800

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	PR01 - Routine	SAMPLES ON HOLD	EXTENDED STORAGE REQUIRED	SUSPECTED HAZARD (see notes)
	Synthetic Site (373 mg/L TDS) PJ2425-0024 - Termination 32-d FM	9-Nov-24	7:45	water	1	R			
	839 mg/L TDS PJ2425-002 - Termination 32-d FM	9-Nov-24	7:45	water	1	R			
	2,236 mg/L TDS PJ2425-002 - Termination 32-d FM	9-Nov-24	7:45	water	1	R			

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)

SAMPLE RECEIPT DETAILS (ALS use only)

Cooling Method: ☐ NONE ☐ ICE ☐ ICE PACKS ☐ FROZEN ☐ COOLING INITIATED

Submission Comments identified on Sample Receipt Notification: ☐ YES ☐ NO

Cooler Custody Seals Intact: ☐ YES ☐ N/A Sample Custody Seals Intact: ☐ YES ☐ N/A

INITIAL COOLER TEMPERATURES °C: 10

FINAL COOLER TEMPERATURES °C:

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (ALS use only)			FINAL SHIPMENT RECEPTION (ALS use only)		
Released by: Am	Date: 2024/11/09	Time: 7:50	Received by: [illegible]	Date: 11/9	Time: 11:17	Received by:	Date:	Time:

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

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.

END OF REPORT