AGNICO EAGLE

January 29, 2025 NWB File: 2AM-MEA1530

Richard Dwyer
Nunavut Water Board
PO Box 119
Gjoa Haven, NU
X0B 1J0

Re: Second Response to Comments on the Operational Notice of the Development of Site-Specific Water Quality Objectives for Total Dissolved Solids under Water Licence 2AM-MEA1530

Dear Mr. Dwyer,

Agnico Eagle thanks the Nunavut Water Board (NWB) for the opportunity to respond to the second round of comments received from Crown-Indigenous Relations and Northern Affairs Canada, and Environment and Climate Change Canada regarding the Operational Notice of the Development of Site-Specific Water Quality Objectives (SSWQO) for Total Dissolved Solids under Water Licence 2AM-MEA1530.

Agnico Eagle has worked with WSP Canada Inc. (WSP) on the SSWQO. WSP has developed numerous SSWQO's in Nunavut and Northwest Territories. The WSP approach follows the CCME and ECCC standard for SSWQO that is recognized by multiple regulatory bodies and should be considered as an industry standard by NWB.

In addition, our interpretation of the Licence is that Agnico Eagle is following the process as set out under Part E, Item 7 of the Water Licence in situations where predicted pit flood water quality post-closure indicates treatment may be necessary. As per Part E, Item 7 of Water Licence 2AM-MEA1530 (emphasis added):

> "*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****.*"

Accordingly, we have submitted the operational notice and are in compliance with the conditions for the Licence. These are explained (along with the supporting evidence) in greater detail in the enclosed comments.

Should you have any questions or require further information, please contact the undersigned at your convenience.

Regards,

Jamie Quesnel
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Director, Permitting & Regulatory Affairs

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CROWN-INDIGENOUS RELATIONS AND NORTHERN AFFAIRS CANADA (CIRNAC)

Interested Party:	**CIRNAC**	**Rec No.:**	**CIRNAC-R-1**
Re:	**In-Pit Tailing Deposition**		

Request Made by Interested Party:
CIRNAC recommends that the NWB not allow site-specific water quality objectives for pit lakes used for in-pit tailing deposition. Instead, Agnico Eagle should be required to implement appropriate mitigation measures to achieve the post-closure pit lake water quality objectives.

Agnico Eagle's Response to Request:
Agnico Eagle is following the process as set out under Part E, Item 7 of the Water Licence in situations where predicted pit flood water quality post-closure indicates treatment may be necessary.

As per Part E, Item 7 of Water Licence 2AM-MEA1530 (emphasis added):

> *"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****."*

Mitigation measures have already been implemented to minimize increasing TDS during Operations, but as a precautionary step, Agnico Eagle has proactively prepared an action plan to address the potential future risk of TDS to the aquatic receiving environment at closure. Since there are no available CCME guidelines for TDS and the model predictions indicate baseline conditions for TDS would not be achievable in the pit lakes, there was a need to assess the true risk to the aquatic receiving environment by completing the following risk assessments:

- Acute toxicity of TDS at the point of discharge (Appendix A of SSWQO memo provided as part of the notification to NWB)
- Chronic toxicity of TDS at the edge of the mixing zone (Appendix B SSWQO memo provided as part of the notification to NWB)
- Evaluation of the assimilative capacity of TDS in the receiving environment

Part E, Item 7 of the Water Licence allows for the development of an appropriate site-specific guideline, subject to NWB approval. An increase in a particular parameter of concern does not necessarily equate to catastrophic environmental impacts, particularly when the parameter of concern is TDS in which the ionic composition and toxic response to aquatic organisms can differ greatly among sites.

As such, Agnico Eagle has undertaken a site-specific risk assessment to develop appropriate site-specific water quality objectives (EQC and SSWQO) for TDS.

The site-specific water quality objectives proposed contain sufficient conservatism that it would be protective of all aquatic life. The site-specific TDS EQC and SSWQO that Agnico Eagle is proposing were developed following the preferred CCME methodologies using species sensitivity distribution approaches where there are adequate primary and secondary toxicity data available to develop an appropriate guideline. The methods used for developing the EQC and SSWQO were adopted and recommended by the CCME that they themselves apply in the derivation of water quality guidelines for the protection of aquatic life (CCME 2007).

References:

Canadian Council of Ministers of the Environment (CCME). 2007. A protocol for the derivation of water quality guidelines for the protection of aquatic life 2007. In: Canadian environmental quality guidelines, Canadian Council of Ministers of the Environment. Winnipeg MB. https://ccme.ca/en/res/protocol-for-the-derivation-ofwater-quality-guidelines-for-the-protection-of-aquatic-life-2007-en.pdf.

Request Made by Interested Party (December 24, 2024):

CIRNAC acknowledges Agnico Eagle's reference to Part E, Item 7 of Water Licence 2AMMEA1530, which allows for developing site-specific water quality objectives (SSWQO). However, in CIRNAC's view, the primary intent of this provision is to ensure that re-flooded pit water quality meets baseline concentrations or CCME guidelines. CIRNAC is concerned that Agnico Eagle has not provided sufficient justification for why achieving baseline concentrations through mitigation measures and/or water treatment is not feasible. During the in-pit tailings deposition amendment process, Agnico Eagle assured the NWB that the changes would not impact water quality, quantity, or flow. The current proposal to establish an SSWQO due to elevated TDS concentrations contradicts these earlier assurances. It raises concerns about the robustness of past water quality predictions and the effectiveness of mitigation measures.

Although CIRNAC agrees with Agnico Eagle's clarification that this proposal does not involve immediate effluent discharge, adopting an SSWQO would set a precedent for allowing discharge with significantly elevated TDS concentrations. This risks the receiving environment and undermines closure objectives, particularly when baseline concentrations remain the standard in the Water Licence.

Until these issues are addressed, CIRNAC cannot support the development of site-specific TDS water quality objectives. Achieving baseline concentrations or CCME guidelines must remain the primary focus to ensure long-term environmental protection and regulatory compliance.

Agnico Eagle's Response to Request:

Agnico Eagle respectfully disagrees with CIRNAC's interpretation of the NWB Licence requirements; Agnico Eagle's interpretation is that we are in compliance of the licence, and in particular to Part E, Item 7. The development of an SSWQO does not create a precedent, as Agnico Eagle has developed five SSWQO's over the last decade in Nunavut (Appendix A of this submission). In addition, this is a normal practice for mining companies and has been recommended to Agnico Eagle by ECCC and also referenced in our Licence. The Water Licence does not specifically require Agnico Eagle to achieve background water quality conditions in a pit for which water did not previously exist. As there are no CCME guidelines for TDS, the only other option is to develop a site-specific objective that is protective of aquatic life based on science, which is in compliance with our interpretation of the Water Licence. This was recommended by ECCC during the Whale Tail Pit Expansion and associated Meadowbank and Whale Tail Water Licence Amendment (NWB 2020). See response to **CIRNAC-3** (in this response package) for more details related to development of the SSWQO.

Agnico Eagle has continued to investigate mitigation and treatment options for the pits in preparation for closure. Preliminary mitigation measures began in 2024 using aeration in Goose Pit. Additional future mitigation measures during active closure are detailed within the CRP (issued November 2024 for comment to CIRNAC and KivIA).

Reference:

NWB (Nunavut Water Board). 2020. Water Licence Nos: 2AM-WTP1830 and 2AM-MEA1530 Reasons for Decision Including Record of Proceedings. March 27, 2020.

Interested Party:	**CIRNAC**	**Rec No.:**	**CIRNAC-R-2**
Re:	**Uncertainty and Potential Risks**		

Request Made by Interested Party:
CIRNAC recommends that the NWB reject the proposed site-specific EQC and SSWQO for TDS due to significant uncertainty, data gaps, and risks of long-term environmental harm. Following CCME guidelines would offer a more precautionary and scientifically sound approach to ecosystem protection.

Agnico Eagle's Response to Request:
Agnico Eagle respectfully disagrees with CIRNAC's comments as Agnico Eagle is following existing conditions Water Licence that has been developed in rigor and approved by multiple parties. In addition, through this submission Agnico Eagle has presented data that provides certainty and demonstrated no long-term environmental harm. Agnico Eagle requires certainty that the Water Licence can be relied upon as a regulatory road map to meet operational needs.

There is no better precautionary and scientifically sound approach for long-term ecosystem protection available in Canada than the process that Agnico Eagle has already undertaken for TDS by following CCME protocols (2007) for the derivation of a site-specific water quality guidelines for the protection of aquatic life, particularly for a parameter such as TDS for which CCME guidelines do not exist.

As mentioned in the SSWQO technical memorandum prepared by WSP (provided as part of the notification to NWB), a very rigorous screening process was undertaken, including extensive literature review in addition to site specific toxicity testing to derive the interim benchmarks. The EQC of 4,000 mg/L was very conservative given that no acute toxicity was observed to fish or invertebrates exposed to Pit E and Goose Pit water at TDS concentrations above 10,000 mg/L. Likewise the SSWQO of 1,000 mg/L was also conservative given that we observed no chronic toxicity to invertebrates and algae (most sensitive species) at TDS below 2,200 mg/L.

References:
Canadian Council of Ministers of the Environment (CCME). 2007. A protocol for the derivation of water quality guidelines for the protection of aquatic life 2007. In: Canadian environmental quality guidelines, Canadian Council of Ministers of the Environment. Winnipeg MB. https://ccme.ca/en/res/protocol-for-the-derivation-ofwater-quality-guidelines-for-the-protection-of-aquatic-life-2007-en.pdf

Request Made by Interested Party (December 24, 2024):
CIRNAC acknowledges Agnico Eagle's response to the concerns regarding uncertainty and potential risks associated with the proposed Site-Specific Water Quality Objective (SSWQO) for Total Dissolved Solids (TDS). However, significant gaps remain in the information provided, particularly in addressing uncertainty, long-term harm, assimilative capacity, chronic toxicity, and geographic applicability.

Agnico Eagle claims its proposed SSWQO is based on conservative assumptions and adequate toxicity data. However, the datasets used to derive the SSWQO appear limited in scope, with no evidence of long-term site-specific toxicity testing for all relevant species. Additionally, Agnico Eagle relies heavily on predictive models. Yet, historical discrepancies between modelled and observed TDS concentrations suggest that the models may not accurately reflect real-world conditions, particularly for post-closure scenarios. Without robust empirical data or validated models, uncertainty remains high regarding the SSWQO's ability to protect aquatic ecosystems in the long term.

Agnico Eagle's assertion that there is no risk of long-term harm is unsubstantiated, given the absence of long-term monitoring data and a cumulative effects assessment. This raises questions about the reliability of the proposed benchmarks and the adequacy of the risk assessments conducted. While Agnico Eagle mentions adaptive management strategies, the specifics of these plans are unclear. For example, what mitigation measures will be implemented if post-closure water quality fails to meet objectives?

CIRNAC highlighted the need for a comprehensive assessment of the receiving environment's assimilative capacity to ensure the SSWQO protects local ecosystems. While Agnico Eagle referenced an assimilative capacity study, it did not provide sufficient details to demonstrate how it accounts for seasonal variations, cumulative impacts, and long-term changes in the receiving environment. Furthermore, the study has not been validated against monitoring data or peer-reviewed findings, leaving significant gaps in understanding the ecosystem's ability to absorb TDS without harm.

CIRNAC raised concerns about the lack of emphasis on chronic toxicity in the development of the SSWQO. While Agnico Eagle referenced its adherence to the CCME species sensitivity distribution (SSD) methodology, it provided no details on the duration of its toxicity studies, the endpoints evaluated, or whether chronic toxicity thresholds were adequately considered. This omission is critical, as chronic exposure to elevated TDS levels could lead to sub-lethal effects on sensitive aquatic species' growth, reproduction, and survival. Without long-term, site-specific toxicity data, it is impossible to confirm that the SSWQO will prevent chronic toxicity.

CIRNAC also expressed concerns about whether the toxicity data used to derive the SSWQO adequately reflects the unique environmental conditions at Meadowbank. Agnico Eagle asserted that the SSD approach aligns with CCME guidelines. Still, it did not provide evidence demonstrating the applicability of the datasets to Meadowbank's site-specific water chemistry, hydrology, and aquatic species. Geographic variability in factors such as water chemistry and ecosystem sensitivity can significantly influence the toxicity of TDS. The lack of validation for the benchmarks in the context of downstream ecosystems and their cumulative impacts remains a significant gap.

Agnico Eagle's Response to Request:
The specific concern or recommendation to be addressed is unclear. As stated previously, Agnico Eagle has retained WSP Canada Inc. (WSP) to develop this SSWQO. WSP is well known in developing SSWQO's having developed over 56 SSWQO's in Nunavut and Northwest Territories (Appendix A of this response package), and this approach has been approved by the NWB and ECCC previously.

Agnico Eagle respectfully disagrees with the suggestion by CIRNAC that "*Following CCME guidelines would offer a more precautionary and scientifically sound approach to ecosystem protection."* With respect to a precautionary approach, development of SSWQOs is protective of the environment as the objective is specific to the conditions in the receiving environment. Agnico Eagle's proposal to develop an SSWQO aims to provide a more well-rounded protective approach to investigating thresholds of site-specific TDS toxicity, using science-based derivation methods and SSWQOs to fill gaps in the environmental criteria for ionic mixtures.

The approach used by Agnico Eagle, which is an industry approved approach, to develop an SSWQO relies on site-specific information that is applied in conjunction with a wealth of other testing of ionic mixtures, including those tested using synthetic mixtures and those tested using field-collected samples. The site-specific information can be evaluated in two ways:

- Results of testing using field-collected samples, adjusted where necessary based on predicted future compositional changes, can be used to validate the SSWQO.
- Results of testing of mixtures observed at other sites, for which the ionic composition is similar to that of expected TDS composition at Meadowbank, can be used to validate the SSWQO.

Both of these complementary approaches have been applied in the SSWQO derivation. The chronic toxicity tests have been selected to provide information on species known in the literature to be sensitive to effects of ionic strength and TDS components, and also use of standardized test protocols commonly used in Canada to evaluate aquatic toxicity.

With respect to CIRNAC's comment: "*While Agnico Eagle referenced its adherence to the CCME species sensitivity distribution (SSD) methodology, it provided no details on the duration of its toxicity studies, the endpoints evaluated, or whether chronic toxicity thresholds were adequately considered. This omission is critical, as chronic exposure to elevated TDS levels could lead to sub-lethal effects on sensitive aquatic species' growth, reproduction, and survival. Without long-term, site-specific toxicity data, it is impossible to confirm that the SSWQO will prevent chronic toxicity."*

- The statement that no details were provided on toxicity tests is incorrect. Attachment 1 – Section 1-4 of the SSWQO memo, (submitted as part of the notification package to NWB) outlines the methods and results undertaken for the chronic toxicity review. This review was drawn from the literature and other sites 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. The test species, life stages, test durations, endpoints, and results were all provided in Attachment 1 – Table 1-3 of the SSWQO memo, submitted as part of the notification to NWB.

- The selected test endpoints used in the SSWQO derivation include species, durations, and endpoints defined as long-term (chronic) following the CCME definitions provided in CCME (2007). The degree to which a toxicity test must be "long-term" depends on the species and life stage, as some tests targeted to specific developmental stages yield greater sensitivity than other tests over longer durations.
- The current version of the TDS SSWQO report (Appendix B of this response package) provides a long-term chronic test with fathead minnow incorporated in an SSD.

With respect to CIRNAC's comment: "*Geographic variability in factors such as water chemistry and ecosystem sensitivity can significantly influence the toxicity of TDS. The lack of validation for the benchmarks in the context of downstream ecosystems and their cumulative impacts remains a significant gap"*.

- The assimilative capacity model for validation of the benchmark in the context of the downstream ecosystem impacts is provided in Appendix C of this response package. The assimilative capacity study was used to evaluate a discharge scenario (a total load) that could be achieved and still protective of the environment.
- We agree that water quality factors can influence toxicity of TDS, and both our approach and that of CCME (2007) recognize the importance of environmental and toxicity modifying factors (ETMFs). Our studies, including both literature reviews and the design of site-specific toxicity test programs, customize the exposure conditions to be relevant to the Meadowbank environment. Future conditions can be estimated by models with sufficient reliability that SSWQOs can be derived. Our experience at other northern sites indicates that SSWQOs can be approved under conditions of reasonable assumptions concerning future ionic composition. If monitoring indicates changes to those underlying conditions, additional validation testing can be triggered to confirm that chronic toxicity potential remains low.
- Regarding geographic variability in factors, we acknowledge the importance of ETMFs, which account for factors that may vary among sites. For ecosystem sensitivity, there are procedures that can be applied to account for local sensitivities, but these should be applied based on specific known biological considerations, rather than application of arbitrary safety factors. For example, the CCME (2007) protocol explicitly considered the ecosystem protectiveness consideration in using the SSD approach in the derivation of long-term exposure guidelines (i.e., suitability of an SSWQO for fulfilling the guiding principles of CCME with respect to the intended level of protection). For example, the protection clause is outlined in CCME (2007), which applies only to the long-term exposure guideline, "should only be invoked if there is a strong reason to question

that the Type A long-term exposure guideline based on the 5th percentile intercept to the fitted curve is achieving the intended level of protection."

- In terms of selecting toxicity tests and endpoints to develop a chronic SSWQO, CIRNAC has requested "long-term site-specific toxicity testing for all relevant species" and "need for a comprehensive assessment" without identifying the standard of care or inventory for attaining these goals. As standardized toxicity testing programs require use of a subset of organisms to evaluate toxicity, as opposed to testing all resident organisms, the issue is whether the selected organisms and protocols provide a representative and reliable basis for evaluating toxicity. Similarly, with respect to environmental site characterization and modelling, no can be defined as "comprehensive" unless the required elements are all clearly defined. The candidate tests, models, and exposure design in the SSWQO program meets the technical criteria for adequacy and rigor commonly applied for permitting projects of this type.

Agnico Eagle respectfully disagrees with the comment that "*the datasets used to derive the SSWQO appear limited in scope, with no evidence of long-term site-specific toxicity testing for all relevant species".* As discussed above:

- The datasets being used are most representative of the geographic region using species most likely to be present at the Meadowbank Complex.
- The methodologies used for developing the SSWQO comply with the CCME protocols and ECCC preferred standards (Type A SSD) which is provided in the final SSWQO report (Appendix B of this response package).
- Agnico Eagle has now conducted several rounds of site-specific Acute Toxicity testing using site water, and several rounds of Chronic toxicity using both site water and simulated water with the highest predicted TDS concentrations at closure (Appendix B of this response package).
- The toxicity tests were conducted following industry standard methods.

As mentioned in the initial notification submission (August 22, 2024) and again within the first round of responses submitted to the NWB on November 12, 2024, Agnico Eagle explicitly verbalized that the development of an assimilative capacity model and updates to the SSWQO were ongoing and further indicated that the supporting studies would be provided once available to address any outstanding information gaps identified by the reviewers. Agnico Eagle would like to direct the reviewers to Appendix B of this response package where they will find the updated TDS SSWQO report and Appendix C of this response package where they will find the Assimilative Capacity Report for Wally Lake.

A detailed discussion of mitigation measures were provided within the CRP submission (issued November 2024 for comment to CIRNAC and KivIA). Agnico Eagle has another decade or more of data to collect to be able to inform decisions regarding pit water quality to make sure that it meets licence requirements prior to reconnection to the receiving environment (as per 2AM-MEA1530 Part E, Item 7).

Interested Party:	**CIRNAC**	**Rec No.:**	**CIRNAC-R-3**
Re:	**Water Quality Parameter Exceedances**		

Request Made by Interested Party:
CIRNAC recommends that Agnico Eagle investigate the causes of exceedances for all water quality parameters, not just TDS, and develop appropriate mitigation measures to ensure compliance with post-closure pit water quality objectives. This approach will help address the broader environmental risks and ensure long-term ecosystem protection.

Agnico Eagle's Response to Request:
For clarity, there is no exceedance of TDS because it is not being discharged to the environment. As per the Water Licence conditions noted in the previous responses, which defines the approach, the focus of this particular notice was specifically targeting TDS. Other parameters of concern may be assessed for risk in the same manner in the future.

Request Made by Interested Party (December 24, 2024):
Agnico Eagle did not explain the cause of TDS concentration being, on average, 275% higher than predicted values. Agnico Eagle's response primarily focuses on TDS but, as the licence requires, did not discuss the implication of other water quality parameters that have exceeded model predictions by more than 20%. For instance, dissolved arsenic concentrations in Goose Pit exceeded predicted values by over 21,000%, as reported in Appendix 16 of the 2023 Annual Report. These extreme deviations raise serious questions about the adequacy of predictive models and the robustness of monitoring and reporting mechanisms.

Agnico Eagle stated, "Other parameters of concern may be assessed for risk in the same manner in the future." This implies that Agnico Eagle may seek site-specific criteria for other water quality parameters, such as arsenic, that exceeded predicted values by over 21,000%. This supports CIRNAC's concern that allowing an SSWQO for TDS will set a precedent for developing site-specific criteria for other contaminants predicted to fail to meet the closure objective. Such an approach undermines the intent of the Water Licence, which prioritizes mitigation and treatment measures to achieve closure water quality objectives. By normalizing exceedances through site-specific criteria, the long-term integrity of the receiving environment will be at risk. CIRNAC emphasizes prioritizing baseline concentrations and CCME guidelines alongside robust mitigation measures and treatment options to uphold regulatory compliance and protect the Meadowbank ecosystem.

Agnico Eagle's Response to Request:

Our interpretation of the Licence clearly states that Agnico Eagle can develop SSWQO's. Part E, Item 7 states "*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***." Accordingly, based on our interpretation of the Licence and previous applications, we are in compliance with the conditions of the Licence and are not reinventing the Licence. In addition, Agnico Eagle has already developed SSWQO for the receiving environment in Nunavut for the Meliadine Mine under NWB approval. These include:

- Fluoride = 2.8 mg/L
- Arsenic = 25 µg/L
- Iron = 1.5 mg/L
- TDS Receiving Environment = 1,000 mg/L
- TDS End of Pipe = 4,500 mg/L

These five SSWQO, plus others developed by our subject matter experts are summarized in Appendix A of this response package.

The source of the TDS is due to mining activities at the Meadowbank Mine including the processing and milling the ore, and placing the tailings into a pit. This has been described in the annual report (2023 Annual Report, Appendix 13); for example:

- Chloride, Sulphate, and TDS are present in the Mill Effluent due to the following processes in the mill:
    - Chloride is present due to the continued use of calcium chloride as a dust suppressant in the mill and crusher;
    - Sulphates are present due to the oxidation of sulphide produced in the ore; and
    - The overall TDS of the Mill Effluent will continue to increase due to the increase in chloride, and sulphate.

This Operational Notice was submitted to the NWB as an Action Plan in response to TDS concentrations exceeding forecasted model predictions by more than 20% (the trigger Part E, Items 7 and 9). The first part of the action plan is to move water from the Portage and Goose Pits to the Vault Pit to provide time to develop appropriate treatment. The second part of the action plan is to develop appropriate discharge

criteria (EQC) and receiving environment criteria (SSWQO) should it be necessary to discharge water from the Vault Pit to the receiving environment.

In addition, TDS is the only parameter of concern considered within this current notice. Due to the concerns raised by ECCC during the permitting process for the Whale Tail Pit Expansion and associated Meadowbank and Whale Tail Water Licence Amendment (NWB 2020), the NWB approved the recommendation to remove TDS as a regulated parameter for effluent discharge from the Vault Attenuation Pond at ST-10 to Wally Lake. Since ECCC had continued to express concerns about the discharge of high TDS at post-closure, and if TDS was predicted to exceed the licence limits, Agnico Eagle had agreed to undertake site-specific and scientifically based process to develop an applicable site-specific TDS value which included:

1. No acute toxicity at the point of discharge
2. No unacceptable chronic toxicity at the edge of the mixing zone
3. Evaluation of assimilation capacity in the receiving environment

In the Operational Notice submission (August 22, 2024), results of acute toxicity using a fish and an invertebrate, and results of chronic toxicity testing of invertebrate species, were provided. Chronic fish toxicity testing and an evaluation of the assimilative capacity have continued since the initial submission, and Agnico Eagle would like to direct the reviewers to Appendix B of this response package where they will find the updated TDS SSWQO report and Appendix C of this response package where they will find the Assimilative Capacity Report for Wally Lake.

Furthermore, ECCC provided the following clarification (NWB 2020) regarding TDS discharge from ST-10:

> "*Our concern with the removal of TDS limit pertained to potential discharges with the higher sulphate limits and the higher TDS that are predicted to exceed the licence limits as they stand now. That had never been assessed in the previous water licence or in the environmental assessment before.*
>
> *When the proposal was made to switch to a site-specific approach, ECCC said they would support the use of the acute and chronic toxicity and, equally importantly, the evaluation of effects in the receiving environment..."*

A precedent has already been set within the Water Licence (2AM-MEA1530) for higher TDS limit of 1,400 mg/L at ST-9. The TDS limit Agnico Eagle is proposing for ST-10 is based on prior concerns raised by ECCC and guidance from Part E, Items 7 & 9 and Part F, Item 6 of the Water Licence to follow a site-specific approach.

An updated water balance and water quality model, that includes a longer list of parameters, was prepared for and included in the CRP (issued November 2024 for comment to CIRNAC and KivIA). Agnico Eagle will be monitoring closely the mitigation and treatment measures that will be put in place during

the latter stages of Operations and into Closure and if warranted assess SSWQO's for other parameters of concern.

Reference:

NWB (Nunavut Water Board). 2020. Water Licence Nos: 2AM-WTP1830 and 2AM-MEA1530 Reasons for Decision Including Record of Proceedings. March 27, 2020.

Interested Party:	**CIRNAC**	**Rec No.:**	**CIRNAC-R-4**
Re:	**Closure Planning**		

Request Made by Interested Party:

CIRNAC recommends that Agnico Eagle convene an annual workshop with regulators and interested parties to discuss closure planning and mitigation measures to meet post-closure pit lake water quality objectives for the Meadowbank and Whale Tail Mines.

The overall goal of the workshop is to a) ensure that all organizations (including Agnico Eagle) are fully informed of closure requirements, b) To assess the adequacy of any progressive reclamation activities undertaken by Agnico Eagle, and 3) to proactively identify critical issues such as the post-closure pit lake water quality objectives that need to be resolved on a priority basis.

Agnico Eagle's Response to Request:

Agnico Eagle acknowledges that active dialogue on closure planning is justified between the involved organizations and regulators. Agnico Eagle intends to continue providing updates on progressive closure work, closure planning and closure engineering concepts, for both Meadowbank and Whale Tail sites, through the Annual Report and the next version of the Closure and Reclamation Plan.

The next version of the Closure and Reclamation Plan is planned to be submitted in 2025 and will include details on the closure activities, progressive closure completed and planned for the remaining part of operations, as well as monitoring plan framework for closure and post-closure.

Agnico Eagle intends to present to CIRNAC and the KivIA a preliminary version of this Closure and Reclamation Plan before the end of 2024.

As per the Water Licenses (2AM-MEA1530 and 2AM-WTP1830), the Licensee shall submit the Final Closure and Reclamation Plan to the Board for approval at least twelve (12) months prior to the expected end of planned mining.

Request Made by Interested Party (December 24, 2024):

CIRNAC has no further comments at this time. However, it reiterates the importance of developing a comprehensive and transparent closure plan that aligns with regulatory requirements and ensures the long-term protection of the Meadowbank ecosystem.

Agnico Eagle's Response to Request:

Thank you for your comment, these concerns are addressed within the CRP submission (issued November 2024 for comment to CIRNAC and KivIA).

Interested Party:	**CIRNAC**	**Rec No.:**	**CIRNAC-R-5**
Re:	**Water Quality Prediction Methods**		

Request Made by Interested Party:
CIRNAC recommends that Agnico Eagle revisit its water quality modelling assumptions and approaches used for the Meadowbank project to ensure all future project decisions (particularly closure) are informed by sufficiently accurate predictions.

Agnico Eagle's Response to Request:
Agnico Eagle has produced an updated water balance and water quality model in 2024 which will be included as part of the CRP.

Request Made by Interested Party (December 24, 2024):
CIRNAC emphasizes the need for Agnico Eagle to clearly explain its prediction methods, address past discrepancies, and integrate site-specific data into future forecasts to ensure accurate and reliable water quality predictions. CIRNAC looks forward to reviewing the updated water balance and water quality model.

Agnico Eagle's Response to Request:
Agnico Eagle disagrees that our model forecasts are not accurate. As per the annual reporting process, Agnico Eagle verifies and calibrates models based on site-specific data to ensure accurate and reliable water quality predictions. This notice provides a reason to address a past discrepancy in the model for TDS. To address this discrepancy, Agnico Eagle analysed site-specific TDS data and calibrated the model accordingly. Furthermore, establishment of a TDS SSWQO, an objective for the receiving environment (i.e., Wally Lake), provides an appropriate water quality benchmark to inform whether additional mitigation measures are required or not. Note that there is currently no discharge from Meadowbank to the environment; the SSWQO developed as part of this submission is for the receiving environment and will be used when discharge resumes in the future see Appendix C of this response package (the Assimilative Capacity Report for Wally Lake) with the predictions for a future discharge scenario.

ENVIRONMENT AND CLIMATE CHANGE CANADA (ECCC)

Interested Party:	ECCC	Rec No.:	ECCC-R-1
Re:	Consideration of Mitigation and Management Options		

Request Made by Interested Party:
ECCC recommends the Proponent provide a discussion of potential mitigation or management options that could be implemented to improve water quality during operations, closure, and post-closure.

Agnico Eagle's Response to Request:
As per Part E, Item 7, the request is for the development of a SSWQO for TDS that was initiated when Agnico Eagle notified the NWB that measured TDS concentrations in Portage Pit E and Goose Pit exceeded forecasted model predictions by over 20%. While measured concentrations were higher than what was modeled, the request was not due to poor water quality. Further mitigation other than what is currently outlined in management plans is not necessary, and instead calibration of the water quality model is being completed to better predict concentrations. Mitigation measures currently in place are expected to keep TDS concentrations at acceptable levels including closure and post-closure.

Request Made by Interested Party (December 20, 2024):
ECCC recommended the Proponent provide a discussion of potential mitigation or management options that could be implemented to improve water quality during operations, closure, and post-closure.

The Proponent states "Further mitigation other than what is currently outlined in management plans is not necessary" without justifying why. They Proponent does not describe which of the mitigation or management options in the plans will be or has been implemented. The Proponent concludes with "Mitigation measures currently in place are expected to keep TDS [total dissolved solids] concentrations at acceptable levels including closure and post-closure." Acceptable TDS concentration levels are the subject of discussion so it is premature to determine if current measures will be sufficient to meet them, once they are determined. ECCC's recommendation remains unchanged.

Agnico Eagle's Response to Request:
The first step in the mitigation is to develop an SSWQO (as per Water Licence conditions) that is protective of the environment. This has been provided as part of this application. The follow-up management and mitigation steps are to develop water management solutions for effluent discharge to ultimately meet the SSWQO or better.

The water balance and water quality model shows future predictions of TDS in the discharge and in the receiving environment once discharge from the mine site resumes. The assimilative capacity predictions take into account the proposed TDS SSWQO of 1,000 mg/L detailed in Appendix B of this response package, which are protective of the receiving environment (Wally Lake) as detailed within the

Assimilative Capacity report (Appendix C of this response package). These models predict acceptable concentrations in the discharge and that mitigation measures are sufficient to meet closure objectives.

The final step would be to update the water balance and water quality forecast with the TDS SSWQO of 1,000 mg/L once there is agreement. This will be provided to the NWB and ECCC in the CRP to be issued in Q2 2025.

Interested Party:	ECCC	Rec No.:	ECCC-R-2
Re:	Comparison to Existing Conditions and Predicted Future Effluent and Water Quality to Effluent Quality Criteria and Site-Specific Water Quality Objectives		

Request Made by Interested Party:
ECCC recommends the Proponent provide a comparison of how both measured and predicted concentrations in the pits and receiving environment compare to the proposed EQC and SSWQO, respectively.

Agnico Eagle's Response to Request:
The reason for this notice was that measured TDS concentrations in Portage Pit E and Goose Pit exceeded forecasted model predictions by over 20%. This TDS levels measured in Pit A, Pit E and Goose Pit were provided in Table 4.1, Section 4 of the updated Meadowbank Water Management Plan V13 (2024) submitted as part of the initial TDS notification package. Predictions of the receiving environment were not provided because we are not discharging to the receiving environment. Once Agnico Eagle is ready to discharge, we will meet the EQC and SSWQO.

Request Made by Interested Party (December 20, 2024):
ECCC recommended the Proponent provide a comparison of how both measured and predicted concentrations in the pits and receiving environment compare to the proposed effluent quality criteria (EQC) and site-specific water quality objectives (SSWQO), respectively.

The Proponent's reference to Table 4.1 of the Water Management Plan V.13 allows us to compare measured and predicted concentration in the pits for 2020-2023 with the proposed EQC. Forecasted concentrations in the pit for the remainder of operations and closure should also be provided for comparison with the proposed EQC.

The Proponent has not provided current or predicted conditions in the receiving environment because they "are not discharging to the receiving environment." If the Proponent is not discharging to the receiving environment and doesn't plan to do so for operations, it is not clear why it is necessary to develop EQC and SSWQO through a water licence modification request.

If TDS criteria are developed, it will be necessary to understand conditions in the receiving environment in order to evaluate the appropriateness of proposed EQC and SSWQO.

ECCC recommends the Proponent provide:

1) a comparison of forecasted parameter concentrations in the pits with the proposed EQC; and

2) a comparison of measured and predicted concentrations in the receiving environment with the proposed SSWQO.

Agnico Eagle's Response to Request:

The predicted EQC provided in the tables below are based on the water balance and water quality model provided in the August 2024 submission and Appendix C of this response package. This water balance and water quality model is highly conservative and if a water balance and water quality model is less conservative the EQCs would be adjusted accordingly; however, the SSWQO of 1,000 mg/L will not change and will be protective of the environment.

As shown in Table 7 provided below and found within the Assimilative Capacity Report (Appendix C of this response package), the estimated 95th Percentile concentration of TDS at the edge of the mixing zone in Wally Lake of 1,285 mg/L is slightly higher than the proposed SSWQO of 1,000 mg/L when the discharge maximum average is 2,075 mg/L. The alternative discharge criterion of reducing the TDS maximum average by a factor of 22% to 1,608 mg/L would ensure that TDS concentrations remain well below the TDS SSWQO during periods of discharge.

Table 7: Predicted In-Lake 95th Percentile Concentrations in Wally Lake

Constituent	MAC EQC[c]	Chronic - SSWQO 2024	Chronic - FEQG	Reduction Factor (%)	Wally Lake	
					Edge of Mixing Zone	Lake-wide
					95th%ile[a,b]	
Physical Tests (mg/L)						
TDS (Scenario 1)	2,075	1,000	-	-	**1,285**	523
TDS (Scenario 2)	1,608	1,000	-	22	1,000	412

Note:
a) Cells shaded in grey are those for which the predicted 95th percentile concentration exceeds the TDS SSWQO (WSP 2024)
b) The 95th percentile concentrations presented are calculated over the entire active discharge period (i.e., 2037 to 2060)
c) MAC EQC is maximum average concentration effluent quality criterion (Appendix B)

The proposed EQC for TDS for the mine effluent to be discharged to Wally Lake and meet the SSWQO of 1,000 mg/L are 1,608 mg/L (MAC EQC) and 3,217 mg/L (MGC EQC), provided in Table 1 below and within the EQC Report (Appendix C of this response package).

Table 1: Maximum Average and Maximum Grab Effluent Quality Criteria for Annual Effluent Discharge from Meadowbank Mine to Wally Lake (2037 to 2060)

SSWQO [a]	Dilution Factor	Edge RMZ (95th percentile)	Edge RMZ (Max)	MAC EQC[b]	MGC EQC[c]
mg/L		mg/L	mg/L	mg/L	mg/L
1,000	2	**1,285**	**1,406**	2,075	4,150
		1,000[d]	**1,093**	1,608	3,217

A **bold** TDS concentration indicates the concentration exceeds the SSWQO / supplemental threshold.
a) SSWQO = site-specific water quality objective.
b) MAC EQC is maximum average concentration effluent quality criterion.
c) MGC EQC is maximum grab concentration effluent quality criterion, which has been derived using a simple 2 x MAC.
d) With the SSWQO of 1,000 mg/L, the effluent TDS concentration was decreased by a factor of 0.78 so that the 95th percentile TDS concentration at the edge of the mixing zone met the 1,000 mg/L SSWQO.

These are initial discharge numbers based on the water balance and water quality model provided with the initial submission (August 22, 2024). Additional summary tables comparing the forecasted concentrations of TDS at the end of pipe and any additional pieces of information will be available for review by Q2 of 2025 with the submission of the CRP to the NWB.

Interested Party:	**ECCC**	**Rec No.:**	**ECCC-R-3**
Re:	**Effluent and Water Quality Model Update**		

Request Made by Interested Party:
ECCC recommends the Proponent clarify whether an update to the effluent and water quality model has been undertaken as a result of measured concentrations exceeding predictions. If not, ECCC recommends that a model update be completed to refine source terms and predictions to address measured concentrations exceeding predictions.

Agnico Eagle's Response to Request:
Yes, Agnico Eagle has an updated effluent and water quality model that will be submitted in 2025 with the CRP. An earlier model prediction provided the basis for the toxicity work and the assimilative capacity study that applies to this notification for the development of a TDS EQC/SSWQO.

Request Made by Interested Party (December 20, 2024):
ECCC recommended the Proponent clarify whether an update to the effluent and water quality model has been undertaken as a result of measured concentrations exceeding predictions. If not, ECCC recommended that a model update be completed to refine source terms and predictions to address measured concentrations exceeding predictions.

The Proponent acknowledged that an updated effluent and water quality model will be submitted in 2025.

ECCC requests opportunity to review the updated model once it is submitted.

Agnico Eagle's Response to Request:
ECCC will have the opportunity to review the updated water quality model within the CRP once submitted to the NWB Q2 2025.

Interested Party:	ECCC	Rec No.:	ECCC-R-4
Re:	Data Inconsistencies		

Request Made by Interested Party:
ECCC recommends that the Proponent:

1. *Provide clarification on why the observations of reduced survival referred to in Section 1-3.0 are not included in Table 1-2;*
2. *Complete a review of Table 1-2 and Figure 1-3 for accuracy, and provided updated tables/figures, as required.*

Agnico Eagle's Response to Request:
Response to bullet 1)
The intent of this table was to show the lethal concentration to 50% of the test organisms (LC50) at 100% concentration of TDS (%vol/vol) and that is why reduced survival was not presented in this summary table.

Response to bullet 2)
Table 1-2 does not require an update as it accurately summarizes the LC50 results of the acute toxicity testing of *D.magna* and Rainbow Trout. Figure 1-3 accurately represents the ionic composition of TDS in the various samples assessed for Acute toxicity and does not require updating.

Request Made by Interested Party (December 20, 2024):
The Proponent's response to part 1) is that the table was intended to show "the lethal concentration to 50% of the test organisms (LC50) at 100% concentration of TDS (%vol/vol) and that is why reduced survival was not presented in this summary table." It is still not clear why the 7 December 2022 test referred to in the paragraph above Table 1-2 is not included in the table. The answer generates a follow-up question regarding reduced survival for the other tests listed in Table 1-2.

The Proponent's response to part 2) is that neither Table 1-2 nor Figure 1-3 require updating, even though inconsistencies have not been explained. Both the table and figure report on eight tests, however they are not the same 8 tests based on the dates, so it appears that data is missing.

ECCC recommends the Proponent:

1) Provide survival rate data for the following toxicity tests: 17 May 2022, 27 May 2022, 3 October 2022, 24 October 2022, 2 December 2022, 7 December 2022 (for Daphnia magna), 2 January 2023, 1 February 2023, and 13 April 2023.

2) Provide the measured total dissolved solid compositions for toxicity tests performed on 2 December 2022 and 2 January 2023?

3) Provide the toxicity test results for TDS compositions reported for 7 December 2022 (for D. magna) and 1 February 2023 (for both D. magna and rainbow trout)?

Agnico Eagle's Response to Request:
Attachment 1 - Table 1-2 and Figure 1-3 both report the same eight tests. The inconsistencies noted by ECCC were due to a typographic error (i.e., mislabeling the test dates), rather than exclusion of data. The test conducted on 7 December 2022 (as outlined in Figure 1-3) was mistakenly labelled as 2 December 2022 in Table 1-2. This has been rectified in the revised TDS SSWQO report (Appendix B of this response package).

Response to bullet 1)
Attachment 1 - Table 1-2 has been revised to include the 48-hour (*Daphnia magna*) and 96-hour (RBT) full strength sample (100%) survival percentages. These revisions have been included in the revised TDS SSWQO report (Appendix B of this response package). Additionally, the typographic error in the dates from the previous version have been corrected in Table 1-2 and are consistent with Figure 1-3.

Response to bullet 2)
Attachment 1 – Table 1-2 has been revised to include the measured and calculated TDS concentrations. These revisions have been included in the revised TSD SSWQO report (Appendix B of this response package).

Response to bullet 3)
Attachment 1 - Table 1-2 has been revised to include the 48-hour (*Daphnia magna*) and 96-hour (RBT) full strength sample (100%) survival percentages. These revisions have been included in the revised TDS SSWQO report (Appendix B of this response package).

Interested Party:	ECCC	Rec No.:	ECCC-R-5
Re:	Justification for Effluent Quality Criteria		

Request Made by Interested Party:
ECCC recommends that the Proponent provide an interpretation of the results of acute toxicity testing resulting in <100% survival.

Agnico Eagle's Response to Request:
The testing in Attachment 1 – Section 1-3.0 refers to testing conducted by Agnico Eagle in 2022 using Mock Effluent. This information was used for background information purposes (i.e., range finding) prior to the site-specific and more definitive 2024 testing. Care must be exercised in interpreting the magnitude of response in these samples given that no response was 50% or greater:

- For rainbow trout, all samples yielded survival of 80% or greater in the maximum strength sample.
- For *Daphnia magna*, all samples but one yielded 100% survival, with the remaining sample yielding 60% survival in the maximum strength sample

The low frequency and effect sizes for these mortalities do not allow for a quantitative concentration-response analysis. The reduced survival in the 7 November 2022 sample and 7 December 2022 sample corresponded to TDS concentrations of 2,834 and 2,382 mg/L, respectively. These findings could be indicative of low-level responses due to sample chemistry but could also be influenced by other sources of variance in the Mock Effluent testing. These results were considered along with the more recent 2024 testing; the latter exhibited no acute toxicity to *Daphnia magna* or Rainbow Trout at calculated TDS concentrations of <10,233 mg/L (Attachment 2 of the SSWQO memo, submitted as part of the notification to NWB). Therefore, the cause of toxicity in the previous 2022 testing is likely not due to TDS itself, but rather another constituent in the Mock Effluent. No investigations into the cause of toxicity in those tests were conducted, as they were used as a preliminary rangefinder for additional testing, and because the low to moderate effect sizes in those two tests are not conducive to reliable toxicity identification evaluation.

Request Made by Interested Party (December 20, 2024):
ECCC recommended that the Proponent provide an interpretation of the results of acute toxicity testing resulting in <100% survival.

The Proponent responded, "the cause of toxicity in the previous 2022 testing is likely not due to TDS itself, but rather another constituent in the Mock Effluent" because the 2024 testing "exhibited no acute toxicity to Daphnia magna or Rainbow Trout at calculated TDS concentrations of <10,233 mg/L". It is not clear what other constituents are being considered.

ECCC notes one of the areas of uncertainty identified in the 2024 report (Attachment 2) is TDS as a surrogate for ion toxicity. There are differences in the mix ions contributing to TDS between the 2024 samples and the 27 May 2022 sample, including lower proportional sulphate concentrations and the presence of nitrate. The total dissolved solids composition was not provided for the 7 December 2022 sample (see comment #4), so it is not yet possible to compare its composition to that of the 2024 samples. Understanding the effects of variable ion mixture proportions is important when evaluating potential impacts of proposed EQC and SSWQO.

ECCC recommends the Proponent discuss possible influence of different ion mixtures contributing to TDS on the results of acute toxicity testing resulting in <100% survival.

Agnico Eagle's Response to Request:

The testing in Attachment 1 – Section 1-3.0 of the SSWQO memo, submitted as part of the August 2024 notification to NWB, refers to testing conducted by Agnico Eagle in 2022 using Mock Effluent. This information was used for background information purposes (i.e., range finding) prior to the site-specific and more definitive 2024 testing.

The reduced survival in the 7 November 2022 sample and 7 December 2022 sample corresponded to measured TDS concentrations of 2,900 and 3,500 mg/L, respectively (calculated TDS concentrations of 2,834 and 2,382 mg/L). These findings could be indicative of low-level responses due to sample chemistry but could also be influenced by other sources of variance in the Mock Effluent testing. These results were considered along with the more recent 2024 testing; the latter exhibited no acute toxicity to *Daphnia magna* or Rainbow Trout at measured TDS concentrations of <10,100 mg/L (Attachment 2 of the SSWQO memo, submitted as part of the August notification to NWB).

TDS compositions between the Mock Effluent testing and the 2024 site-specific testing have been provided in the figure below. ECCC notes "*There are differences in the mix ions contributing to TDS between the 2024 samples and the 27 May 2022 sample, including lower proportional sulphate concentrations and the presence of nitrate".* Although Agnico Eagle agrees that there are some differences in the ionic mixtures between the Mock Effluent testing and the 2024 site-specific testing, the figure below shows that these differences are relatively minor, do not explain variance in test outcomes, and do not change the results of the SSWQO derivation (i.e., this historical testing was only used for background information purposes prior to the 2024 site-specific testing).

As shown in the figure provided below, the TDS composition in the 27 May 2022 Mock Effluent tests was similar to the profile observed in site-specific testing completed in 2024. Ionic compositions were dominated by sulphate (60% in Mock Effluent; 45–50% in 2024 Site-Specific) and sodium (16% in Mock Effluent; 18–22% in 2024 Site-Specific). An increased presence of nitrate was seen in the 2024 site-specific testing, but did not result in increased toxicity.

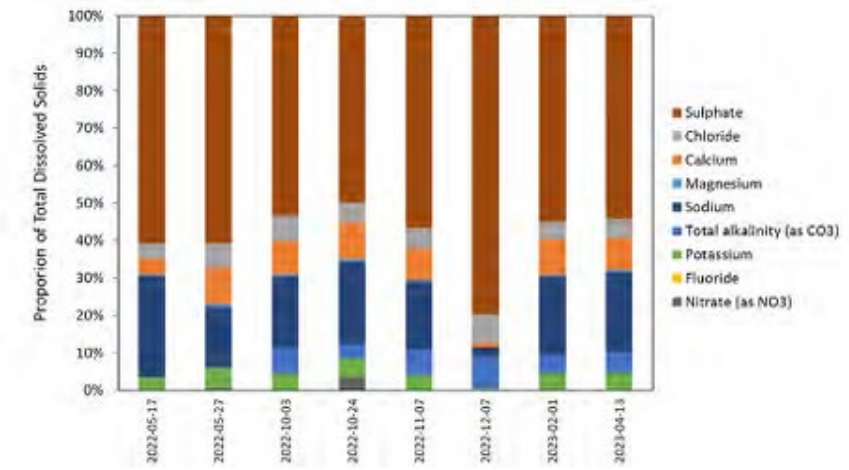
While differences in TDS composition were observed, they do not align with the outcomes of the toxicity testing:

- Similar compositions to the general TDS profile described above were also observed in the 7 November 2022 Mock Effluent tests, wherein minor toxicity to *D. magna* and rainbow trout was observed. This 7 November 2022 sample did not have evidence of a water quality composition (elevated individual concentrations or proportions of ions) that would explain the reduced survival results.
- Greater profile differences were observed when comparing the 7 December 2022 Mock Effluent tests to other samples: sulphate represented roughly 80% of the TDS composition (45–50% in 2024 Site-Specific), and sodium and calcium concentrations were below <5% (18–22% and 7–9% in 2024 Site-Specific, respectively). However, there was no correspondence between the concentrations or ionic components and the magnitude of effect; for example, other samples with higher concentrations of sulphate yielded no toxicity.

In conclusion, the cause of toxicity seen in the 7 November 2022 and 7 December 2022 tests is likely not due to TDS itself, but rather another constituent in the Mock Effluent. No investigations into the cause of toxicity in those tests is necessary because:

- they were only used as a preliminary range finder target for the additional site-specific 2024 testing
- the low to moderate effect sizes in those two tests are not conducive to reliable toxicity identification evaluation
- those ionic compositions tested do not strongly represent the modelled future discharge conditions (see Attachment 1-Figure 1-3 in Appendix B of this response package).

Figure 1-3: Measured total dissolved solid composition in Mock Treated Effluent Blends of Pit E water, 2022 to 2023



Interested Party:	**ECCC**	**Rec No.:**	**ECCC-R-6**
Re:	**Chronic Toxicity and Existing Guidelines**		

Request Made by Interested Party:
ECCC recommends the Proponent:

1. Provide additional justification for proceeding with a TDS EQC and SSWQO, rather than sulphate, given existing precedence for similar projects within Canada.

2. Consider a combined approach of including EQC and SSWQO for both sulphate and TDS.

Agnico Eagle's Response to Request:
Response to bullet 1)

The preference for either TDS or sulphate as the primary basis for SSWQO development should be made on a case-by-case basis. The reliability of one or the other depends on factors such as the dominance of sulphate in the mixture, the proportions of other ions, and the degree to which the mixture is expected to remain stable over the long term.

The TDS mixture used in the 2024 testing was formulated to investigate site-specific ionic compositions. Although these mixtures were sulphate dominant, use of a TDS SSWQO accounts for other mixture components that could modify the toxicity of sulphate. The role of hardness, in particular, can influence the toxicity of sulphate, both in terms of ameliorating hardness at low to moderate levels and enhancing toxicity at higher concentrations (i.e., where either cation-specific toxicity or a more generalized osmotic stress is introduced).

Recent research suggests that individual ions, such as the sulphate ion alone, are not the sole causal factor of toxicity; rather, the toxicity can be based on dominant cations or the cumulative osmotic pressure caused by the full ionic composition of the water (Mount et al. 2016, 2018; Erickson et al. 2016a,b). For these reasons, there was value in evaluating the full effects of major ion concentrations and ratios of major ions (such as calcium-to-magnesium ratios) in a site-specific manner. Effluent projections for Meadowbank were simulated in a laboratory setting to investigate how the balance of ions may or may not cause toxicity. This allowed for the consideration of multiple major ions in a chemical solution (calcium, magnesium, potassium, sodium, chloride, sulphate, nitrate, fluoride, and total alkalinity [as $CaCO_3$]), and evaluated how the chemical interactions among these ions can influence toxicity in a site-specific manner.

We believe it would be redundant to generate both a TDS SSWQO and a sulphate SSWQO for this site. Sulphate measurements can be a useful surrogate measure (in some cases), however, investigating TDS as whole is a more holistic approach as it considers both individual ions and mixture effects. The interim benchmark provided for TDS is also similar to, if not lower, than what has previously been generated for similar sulphate-dominant mixtures at other sites.

Response to bullet 2)

As indicated in the response to bullet 1, we believe it would be redundant to generate both a TDS SSWQO and a sulphate SSWQO; these values are highly autocorrelated.

References:

Erickson RJ, Mount DR, Highland TL, Hockett JR, Hoff DJ, Jenson CT, Norberg-King TJ, Peterson KN, Polaske ZM, Wisniewski S. 2016a. The Acute Toxicity of Major Ion Salts to *Ceriodaphnia dubia*: I. Influence of Background Water Chemistry. Environmental Toxicology and Chemistry 35(12):3039-3057.

Erickson RJ, Mount DR, Highland TL, Hockett JR, Hoff DJ, Jenson CT, Norberg-King TJ, Peterson KN. 2016b. The Acute Toxicity of Major Ion Salts to *Ceriodaphnia dubia*. II. Empirical Relationships in Binary Salt Mixtures. Environmental Toxicology and Chemistry 36(6):1525–1537.

Mount D, Erickson R, Forsman B, Highland T, Hockett J, Hoff D, Jenson C, Norberg-King T. (2018). Chronic toxicity of major ion salts and their mixtures to *Ceriodaphnia dubia*: Chronic toxicity of major ions to *Ceriodaphnia*. Environmental Toxicology and Chemistry 38. 10.1002/etc.4346.

Mount D, Erickson R, Forsman B, Highland T, Hockett J, Hoff D, Jenson C, Norberg-King T, Soucek D. 2016. Thoughts on applying existing toxicological understanding to risk assessment for major ions in fresh waters. Prairie Research Institute. Conference Publication: 7th Society of Environmental Toxicology and Chemistry World Congress/Society of Environmental Toxicology and Chemistry North America 37th Annual Meeting, 6-10 November 2016, Orlando, Florida. 73 pp.

Request Made by Interested Party (December 20, 2024):

The Proponent responded, "it would be redundant to generate both a TDS SSWQO and a sulphate SSWQO for this site." They propose "evaluating the full effects of major ion concentrations and ratios of major ions (such as calcium-to-magnesium ratios) in a site-specific manner" because research by Mount et al. (2016, 2018) and Erickson et al. (2106a, b) reports on two mechanisms for major ion toxicity.

The research referenced does highlight the complexity of mechanisms and interactions for major ion toxicity. It does not conclude that TDS is a good surrogate for determining sample toxicity, but instead proposes a mathematical model for predicting the median lethal concentration for any ion mixture, excepting those dominated by potassium-specific toxicity (Erickson et al., 2017).

The specific ion mixture can have a critical role in determining toxicity, which the proponent accounted for: "The TDS mixture used in the 2024 testing was formulated to investigate site-specific ionic compositions." Using only a criterion for TDS assumes that the ion mixture will remain constant. As noted in Section 2-4.0 of the Site-Specific Toxicological Study for Total Dissolved Solids Using Mine-Impacted Waters report (August 15, 2024), "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." Accounting for potential changes to ionic mixture composition is necessary when setting criteria and is not addressed by a single criterion for TDS.

ECCC recommends the Proponent suggest how their proposed TDS EQC and SSWQO could be modified or augmented to account for varying ionic mixture composition.

Agnico Eagle's Response to Request:

The source of TDS, sulphate, and chloride to the pits has been described in the Annual Reports (see response to CIRNAC-R-3 in this response package). The mixture, and dominant ions, of TDS is not expected to change over time. TDS concentration is expected to decrease once the site moves from operations to closure. If however, TDS concentrations do not decrease, or if the ionic mixture change, a repeat of the TDS evaluation process (as summarized in response to CIRNAC-R-3 in this response package) would be conducted.

As indicated above in responses to other comments, Agnico Eagle agrees that site-specific composition of TDS is an important factor in SSWQO, and explicitly considered ETMFs in the development of SSWQOs. The remaining question is how varying ionic mixture composition should be incorporated in SSWQO validation. Agnico Eagle recommends three approaches in this regard, two of which have already been applied, with a third approach for future needs should the ionic mixture change:

1. Use of customized ionic composition for site-specific testing— The results presented in the SSWQO derivation report are based on modelled future discharge conditions, and not generalized to all TDS compositions.
2. Use of conservative modelling scenarios— Site water was amended to target a range of concentrations for TDS and component ions that bound and **extend beyond** the maximum expected concentrations at the edge of the mixing zone under future discharge conditions. This provides a buffer against false negatives resulting from compositional changes relative to the main testing scenario.
3. If future effluent quality with respect to TDS constituents is markedly different, then re-evaluation of the dataset underlying the proposed TDS benchmark would be considered.

   The discharge would be managed such that the SSWQO is met at all times.

Interested Party:	**ECCC**	**Rec No.:**	**ECCC-R-7**
Re:	**Receiving Environment Predictions**		

Request Made by Interested Party:
ECCC recommends the Proponent provide additional details on the source of the dilution factor used to generate the predictions provided in Table 1-1 and additional clarity on what this table is intended to demonstrate.

Agnico Eagle's Response to Request:
The intention of the Table 1-1 entries was to show both the full-strength effluent predictions, and the edge of the mixing zone predictions. The dilution factor of 0.75 (1.33:1) was chosen to be a "worse-case scenario" given that the predicted minimum dilution factor for Wally Lake is estimated to be closer to 0.5 (2:1), and 0.077 (13:1) for Third Portage Lake.

Request Made by Interested Party (December 20, 2024):
ECCC recommended the Proponent provide additional details on the source of the dilution factor used to generate the predictions provided in Table 1-1 and additional clarity on what this table is intended to demonstrate.

The Proponent responded Table 1-1 "was to show both the full-strength effluent predictions, and the edge of the mixing zone predictions" and specified the dilution factor of 0.75 was chosen to represent a worst-case scenario.

The information provided answers ECCC's questions. As noted in our initial comment, the ongoing studies to generate edge of mixing zone predictions based on assimilative capacity modelling results will provide a vital piece in understanding overall water quality and the potential for effects in Wally Lake and Third Portage Lake. Presently there is insufficient information to evaluate the SSWQO.

ECCC requests the opportunity to review the mixing zone model and predictions after they are submitted.

Agnico Eagle's Response to Request:
Agreed, please refer to response to **ECCC-R-2** for a summary of the edge of mixing zone predictions. Additional details can be found within the Assimilative Capacity report provided in Appendix C of this response package.

Interested Party:	ECCC	Rec No.:	ECCC-R-8
Re:	Measured vs. Calculated TDS		

Request Made by Interested Party:
ECCC recommends the Proponent provide a discussion on the large differences in measured and calculated TDS that were observed on October 3 and December 2.

Agnico Eagle's Response to Request:
Total dissolved solids concentrations can be measured (TDSmeas) directly by evaporating a known volume of filtered water and measuring the mass of the residue left after evaporation, known as the gravimetric method. Alternatively, TDS concentrations can be calculated (TDScalc) from the summation of major ions in the sample (APHA 2012).

The TDS differences between TDSmeas and TDScalc seen in Attachment 1 Table 1-1 (SSWQO memo provided as part of the notification to NWB), are partly due to the differences in how analytical laboratories report TDS versus how toxicologists calculate TDS (i.e., for concentration-response assessment, and standardization in publications). For consistency across all projects, as well as to interpret literature data consistently, WSP uses the APHA (2012) method, whereby:

- 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).
- The October 3rd and December 7th (incorrectly labelled as December 2nd) samples were analyzed by Bureau Veritas Inc. in St-Laurent, Quebec. TDSmeas was reported using the MA. 115-S.D 1.0 R4 m gravimetric method (Governement de Québec 2023).

This difference in using the gravimetric method and measuring the mass of residue left after evaporation for TDSmeas, compared to the TDScalc method of summing major ion constituents, would result in two different numbers being reported. As outlined in Attachment 1, Section 1-1.1 (SSWQO memo provided as part of the notification to NWB), TDScalc is preferred rather than measured 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.

Using the APHA 2012 method (for consistency) and preferred use of TDScalc is likely more accurate given the practical limitations in handling and measuring TDS.

References:

APHA (American Public Health Association). 2005. Standard Methods for the Examination of Water and Wastewater, 21st Edition. Washington, DC, USA.

APHA. 2012. Standard Methods for the Examination of Water and Wastewater, 22nd Edition, with updates to 2015. Washington, DC, USA.

Evaristo-Cordero, C. 2011. Senior Account Manager, ALS Laboratory Group, Edmonton, AB, Canada. Email to Tasha Hall (Golder Associates Ltd), September 2011.

Evaristo-Cordero C. 2013. Senior Account Manager. ALS Laboratory Group, Edmonton, AB, Canada. Email to Tasha Hall (Golder Associates Ltd.), February 2013.

Governement de Québec. 2023. Méthode d'analyse MA. 115 – S.D. 1.0. Détermination des solides dissous totaux et volatils : méthode gravimétrique. February 2023, Version 6.

Request Made by Interested Party (December 20, 2024):

The Proponent responded that "This difference in using the gravimetric method and measuring the mass of residue left after evaporation for TDSmeas, compared to the TDScalc method of summing major ion constituents, would result in two different numbers being reported." It is understood that measuring and calculating TDS will give different results, however the ratio of the values is expected to remain relatively constant. The ratio of measured to calculated TDS in Table 1-2 vary from 0.81 to 1.47 which highlights that in the case of these toxicity studies, the TDS values are not reliably equivalent. The Standard Methods for the Examination of Water and Wastewater 24th Edition (American Public Health Association (APHA), 2023) explain "the measured TDS concentration is expected to be larger than the calculated one because the calculation may not include a significant contributor" and specify an acceptable measured to calculated TDS ratio is between 1.0 and 1.2.

The Proponent also re-iterates their preference for setting criteria for calculated TDS rather than measured TDS, referring to the sum of ions calculations described in the Standard Methods for the Examination of Water and Wastewater 22nd Edition (APHA, 2012). In the 24th Edition, the sum of ion calculation is described in APHA 1030E as a tool for checking analyses' correctness, not as a test method for determining total dissolved solids (ALS Limited, 2022). A method for measuring total dissolved solids is included as APHA 2540C.

ECCC notes that the TDS measurement method MA. 115-S.D 1.0 gravimetric method (Governement de Québec 2023) used by the Proponent measures both TDS and volatiles. This would not be equivalent to a method measuring only TDS such as APHA 2540C or BC Environmental Laboratory Manual (2023)

method for total dissolved solids/filterable residue 1.0 µm. It will be important to consistently use the same test method for TDS.

ECCC recommends that any criteria for TDS be for measured TDS.

Agnico Eagle's Response to Request:

The TDS differences between TDSmeas and TDScalc seen in Attachment 1 Table 1-1 (SSWQO memo provided as part of the notification to NWB), are partly due to the differences in how analytical laboratories report TDS versus how toxicologists calculate TDS (i.e., for concentration-response assessment, and standardization in publications).

Ionic compositions and individual TDS components are important when investigating the role of TDS. In response to ECCC's comment, all references to TDS acute and chronic testing results will include both measured and calculated in the revised report. This would therefore allow for standardization in publications, as well as to partially fulfill ECCC's request. However, to provide a single representative SSWQO number for TDS, we require matching of units/methods between exposure and effect concentrations, and require concentrations of individual TDS components that can be mathematically aggregated to a TDS total. This allows for a standardized number regardless of laboratory methods of reporting TDS. For these reasons, Agnico Eagle believes that it is appropriate to report and apply the TDS SSWQO number on the basis of calculated TDS, whereas individual toxicity testing results will be reported using both measured and calculated values.

Interested Party:	**ECCC**	**Rec No.:**	**ECCC-R-9**
Re:	**Chronic Toxicity Dataset**		

Request Made by Interested Party:
ECCC recommends that the Proponent consider the development of a species sensitivity distribution to provide statistically robust justification for a proposed site-specific water quality objective.

Agnico Eagle's Response to Request:
A species sensitivity distribution (SSD) will be generated to aid in the justification for the proposed SSWQO. At the time of writing this response, Agnico is currently running a long-term fish toxicity test, which should be available by mid- to late-November 2024. These data will be included in the revised TDS report, which will also include the SSD. As stated in the Section 3.2.3 of the main report, the proposed (interim) SSWQO of 1,000 mg/L is dependent on "Confirmation of negligible chronic toxicity to Rainbow Trout [revised to Fathead Minnow] survival and development at TDS concentrations ≤1,000 mg/L."

In developing the SSD, consideration will be given to the treatment of literature-based results versus site-specific toxicity results; preference will be given to site-specific testing because it accounts for the ionic composition expected to be relevant to future conditions. However, literature data will also be included because site-specific tests alone will not provide sufficient species representation to provide the species requirements for a CCME Type A derivation.

Request Made by Interested Party (December 20, 2024):
ECCC recommended that the Proponent consider the development of a species sensitivity distribution to provide statistically robust justification for a proposed site-specific water quality objective.

The Proponent responded "A species sensitivity distribution (SSD) will be generated to aid in the justification for the proposed SSWQO." Presently there is insufficient information to evaluate the SSWQO and the SSD will contribute to filling some of the gaps.

ECCC requests the opportunity to review the species sensitivity distribution once it is submitted.

Agnico Eagle's Response to Request:
The updated report can be reviewed within the updated SSWQO in Appendix B of this response package, which includes a species sensitivity distribution in Section 1-5.2, Figure 1-4 of Attachment 1.

Interested Party:	ECCC	Rec No.:	ECCC-R-10
Re:	Site Reference Chemistry		

Request Made by Interested Party:
ECCC recommends the Proponent clarify the source of the site reference chemistry for major ions that is provided in Table 2-3. This should include a discussion/clarification on the discrepancies between this table and other sections of the report.

Agnico Eagle's Response to Request:
We do not believe there are any discrepancies between Table 2-3 and the other sections of the report. However, additional details have been added to explicitly state the source of the site reference throughout. These revisions will reduce the potential for confusion or misinterpretation of findings and will be reflected in the revised report.

The source of the site reference is stated in Attachment 2, Section 2-2.2.1 (SSWQO memo provided as part of the notification to NWB) with the heading "*Source Water for 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.

It is possible that confusion arose due to the following sentence (Attachment 2, Section 2-2.2.1, SSWQO memo provided as part of the notification to NWB):

> "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 with the cladoceran *Ceriodaphnia dubia* and the algae *Raphidocelis subcapitata* was amended site-collected water."

This sentence (emphasis added) was carried over from a previous version of the TDS report, which included Rainbow Trout test waters. Due to the Rainbow Trout test not being included in the report version reviewed by ECCC (due to non-availability of test organisms), the reference to laboratory-prepared synthetic waters is not relevant here. The base waters for testing should have been described as site waters only (not laboratory-prepared waters) for the *C. dubia* and *R. subcapitata* tests. This sentence may have been a source of confusion due to deferral of trout testing and will be addressed in the revised TDS report.

Attachment 2, Section 2-2.2.1 (SSWQO memo provided as part of the notification to NWB) provides rationale for why a site reference water is needed, and why it was used in the *C. dubia* and *R. subcapitata* tests as both the dilution water and a field reference. 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; for this purpose, and to evaluate toxicity under site-specific conditions, it is often preferable to use site water samples (surface water). As this study evaluated future exposure

conditions in the receiving environment during effluent discharge, rather than current conditions, it was not possible to directly collect fully-representative source waters for testing from the field. Instead, current field conditions are assumed to be broadly representative of future receiving environment water composition.

Request Made by Interested Party (December 20, 2024):
ECCC recommended the Proponent clarify the source of the site reference chemistry for major ions that is provided in Table 2-3. This should include a discussion/clarification on the discrepancies between this table and other sections of the report.

The Proponent clarified that the site reference chemistry for major ions provided in Table 2-3 is for "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." Additionally, they "do not believe there are any discrepancies between Table 2-3 and the other sections of the report."

The discrepancies noted by ECCC are between the water chemistry provided in Table 2-3 of Attachment 2 of the TDS site-specific water quality program technical memorandum and Section 1-2.0 and Figure 1-2 bottom of Attachment 1 of the same memo. In Attachment 1, water from Third Portage Lake is described as having calculated TDS <40 mg/L. In Attachment 2, water from Third Portage Lake is characterized as having a calculated TDS of 122 mg/L, and the ion proportions have changed. As well as the change in the sulphate ion noted in our initial comment, ECCC notes the proportion of calcium ions has approximately doubled and that of alkalinity is reduced to approximately a third. It is not clear why the water chemistry in Third Portage Lake has changed in the 2023 to 2024 time period between which the attachments reports were produced. Understanding the variability of site conditions is important when evaluating potential impacts of proposed EQC and SSWQO.

ECCC recommends the Proponent discuss why water chemistry of the reference site, Third Portage Lake, has changed between the work in Attachments 1 and 2. Attachments 1 and 2 should address both the difference in TDS and difference in ionic mixture proportion.

Agnico Eagle's Response to Request:
The differences referred to in this comment are related to the text in Attachment 1 – Section 1-2.0 and Figure 1-2, in which WSP reviewed and presented historical receiving environment chemistry from 2011 to 2021 in Third Portage Lake. These samples, results, and context (used for developing sampling design) differ from information presented in Attachment 2 (actual measurements from field-collected samples).

Attachment 1 – Section 1-2.0 stated: *"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".

Attachment 2 – Table 2-3 outlines the measured Site water chemistry collected by Agnico on 27 March 2024 from a raw drinking water intake pipe connected to Third Portage Lake (station DW-RAW-KIA). 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).

In response to the ECCC request, we have divided the query into the following:

1. Differences in chemistry between text in Attachment 1 – Section 1-2.0, the graph depicted in Figure 1-2, and Attachment 2 – Table 2-3.
2. Differences in ion proportions in the tested treatment scenarios when compared to the historical (2011-2021) Third Portage Lake receiving environment chemistry.

Question 1 - Differences in chemistry between text in Attachment 1 – Section 1-2.0, the graph depicted in Figure 1-2, and Attachment 2 – Table 2-3:

Historical measurements from TPL were used to estimate baseline chemistry conditions; the intent of the sampling design was that baseline water quality be amended to target a range of predicted concentrations for TDS. To accomplish this goal, the TDS ranges were designed to bound and extend beyond the maximum expected TDS at the edge of the mixing zone under future discharge conditions.

The original design proposed to collect site water directly from Third Portage Lake (as is shown in Attachment 1-Figure 1-2), however this was not possible due to site access issues (i.e., ice cover and adverse, unsafe weather conditions). Therefore, 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. As such, the historically reviewed chemistry from 2011 to 2020 (Attachment 1 – Section 1-2.0 and the graph depicted in Figure 1-2) and the actual measured site water chemistry (Attachment 2, Table 2-3) were slightly different.

The differences in baseline water quality described above were not considered to adversely affect the study implementation, as 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 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 during final recipe generation.

In conclusion, although the sample preparation process required adaptation to prepare the test treatments, the test results remain valid for their intended purpose. 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 collected waters to represent future exposure conditions was selected. The testing could have used laboratory water, amended with salts to reach these target TDS ranges, however, to increase the direct site-specific applicability of the testing, site collected waters were used.

Question 2: Differences in ion proportions in the tested treatment scenarios when compared to the historical (2011-2021) Third Portage Lake receiving environment chemistry.

Similar to the previous question, historical measurements from TPL were used to estimate baseline chemistry conditions. This water was then amended to target a range of concentrations for TDS that bound and extend beyond the maximum expected TDS at the edge of the mixing zone under future discharge conditions.

The chemistry presented in Attachment 1 – Figure 1-2 was used to show historical baseline receiving environment conditions, whereas the goal of the study was to target a range of concentrations for TDS under future discharge conditions. The proportions and concentrations tested were based on modelled future discharge conditions. In comparing average historical (2011–2021) TDS compositions to the measured baseline site water (see table below), ECCC is correct that there are ion composition differences, however, this was not unexpected nor a flaw in study design. The original design proposed to collect site water directly from Third Portage Lake; however due to ice cover and unsafe weather conditions, site water was instead collected from a raw drinking water intake pipe connected to Third Portage Lake (station DW-RAW-KIA). Because-site collected water was already planned to be amended with salts in the laboratory, these differences did not fundamentally affect the exposure treatments. In fact, having a site water with greater baseline concentrations (i.e., higher concentrations in DW-RAW-KIA) was advantageous in terms of minimizing the amount of laboratory amendments required.

The explanation provided above has been include in the final report. See Appendix B of this response package.

Constituent	Historical Third Portage Lake (2011-2021)			Measured Site water control (DW-RAW-KIA)
	Average Concentration (±SD) (mg/L)	Average Proportion of TDS (%)	Concentration (mg/L)	Proportion of TDS (%)
Sulphate	4.6 ± 1.0	32 ± 4	74	60
Chloride	0.8 ± 0.1	5 ± 0.4	0.94	0.77
Calcium	2.2 ± 0.4	15 ± 1	33	27
Magnesium	0.9 ± 0.2	6 ± 0.5	1.2	1
Sodium	1.1 ± 0.2	8 ± 1	1.3	1.1
Alkalinity (as CO_3)	4.2 ± 1.0	29 ± 5	11	8.9
Potassium	0.5 ± 0.1	3 ± 0.4	0.68	0.56
Fluoride	0.1 ± 0.0	0 ± 0.1	0.08	0.07
Nitrate (as NO_3)	0.1 ± 0.1	1 ± 1	0.02	0.07
Calculated TDS	14.4 ± 2.4	100	122	100

TDS = total dissolved solids; CO_3 = carbonate; NO_3 = nitrate ion; mg/L = milligrams per litre.

Interested Party:	**ECCC**	**Rec No.:**	**ECCC-R-11**
Re:	**Report Inconsistencies**		

Request Made by Interested Party:
ECCC recommends that the above noted sections are reviewed for accuracy, and clarifications provided as needed.

Agnico Eagle's Response to Request:
The revised TDS report (expected December 2024) will include applicable revisions from ECCC, including incorporation of information from these responses. Revisions and additional information from on-going testing will be reviewed for accuracy, with clarifications provided as needed.

Request Made by Interested Party (December 20, 2024):
ECCC recommended that sections noted in the original comment be reviewed for accuracy, and clarifications provided as needed.

The Proponent proposes to include applicable revisions in a revised TDS Report.

ECCC requests the opportunity to review the revised TDS Report when it is submitted.

Agnico Eagle's Response to Request:
Thank you for your comment, the updated report has been provided in Appendix B of this response package, which includes revisions to Attachment 1 noted in the original comment.

Appendix A – Summary of SSWQO's Developed by WSP in Nunavut and Northwest Territories

Mine/Development	Proponent	Parameter	SSWQO Value (ug/L)	Year	Citation
Sabina	Sabina Gold and Silver Corp.	Arsenic	25	2017	Golder. 2017. Sabina Gold and Silver Corp - Back River Project - Development of a Site-Specific Water Quality Objective for Arsenic. Revised (1776921_008_TM_Rev1). Issued 31 July 2017
		Arsenic	10 [c]	2021	Golder. 2021. Sabina Gold and Silver Corp - Back River Project - Effluent Quality Criteria Report for Effluent Discharged from Tailings Dacilities, Tailings Storage Facilities, or Reservoirs - Version 1. Reference number 20412211-081-R-Rev0-2400. Issued 27 May 2021
		Copper	4.2 [d]	2021	
		Nitrate (mg-N/L)	2.93-10 (mg-N/L) [a][b]	2021	
		Aluminum	44-122 [e]	2021	
Diavik	Rio Tinto	Total Aluminum	87	2012	Golder. 2012. Diavik Diamond Mines Inc. Aquatic Effects Monitoring Program Design Plan Version 4.1. Reference number 1648005-R-1527-Rev1-6000. Issued 1 June 2017
		Antimony	33	2012	
		Silicon	2,100	2012	
		Sodium (mg/L)	52	2012	
		Tin	73	2012	
		Turbidity (NTU)	2.2	2012	
		Calcium (mg/L)	60	2019	
Meliadine Gold	Agnico Eagle Mines	Fluoride (mg/L)	2.8	2013	Golder 2013. Site-Specific Water Quality Objective (SSWQO) Assessment – Meliadine Gold Project, Nunavut. Project Number 371-1013730076/1960 Ver.0. Issued 22 February 2013
		Arsenic	25	2013	
		Iron (mg/L)	1.5	2013	
		TDS (mg/L) - Receiving Environment	1,000	2021	Golder. 2021. Water Quality Management and Optimization Plan Progress Update Rev4b - Phase 3: Mealidine Mine Effluent Discharge Benchmarks for Total Dissolved Solids. Reference No. 21480734-751-RPT-Rev4b. Issued 10 August 2021
		TDS (mg/L) - End of Pipe	4,500	2021	
Snap Lake	De Beers Canada Inc.	TDS (mg/L)	1,000	2015	Baker JA, Elphick JR, McPherson CA, Chapman PM. 2015. Effect of Total Dissolved Solids on Fertilization and Decelopment of two Salmonid Species. Bull. Environ. Contam. Toxicol. 95:488-493
		Strontium (mg/L)	10.7	2014	McPherson CA, Lawrence GS, Elphick JR, Chapman PM. 2014. Development of a strontium chronic effects benchmark for aquatic life in freshwater. Environ Toxicol Chem. 33(11): 2472-2478
		Chloride (mg/L)	450		
		Sulphate (mg/L)	90	2019	Golder 2019. Snap Lake Mine, Effluent Quality Criteria Report for Closure and Post-Closure. Debeers Canada Inc. Reference number 18105918/DCN-002. Issued March 2019
		Hexavalent Chromium (mg/L)	0.0021 [f]		
		Cadmium (mg/L)	0.00036	2019	
		Nitrate (mg-N/L)	3.2-10 (mg-N/L) [g]	2017	Rescan. 2012. EKATI Diamond Mine: Site-Specific Water Quality Objective for Nitrate. Prepared for BHP Billiton Canada Inc. by Rescan Environmental Services Ltd. Yellowknife, Northwest Territories.
Giant Mine	Royal Oak Resources Ltd.	Aluminum	236	2019	Crown-Indigenous Relations and Northern Affairs Canada. 2019. Giant Mine Remediation Project - Effluent Quality Criteria Report - Appendix F. Issued January 2019
		Antimony	33	2019	
		Arsenic	31	2019	
		Cobalt	1.41	2019	
		Copper	6.3 [h]	2019	
Faro Mine	Previously Curragh Resources; Currently The Federal and Territorial Governments	Aluminum	149	2019	Faro Mine Remediation Project. 2019. Appendix 7H Site Specific Water Quality Objectives - Department of Indian Affairs and Northern Development. Document Number 135_1669811 Version 2. Issued 25 January 2019
		Arsenic	31	2019	
		Beryllium	0.13-6.6 (hardness of 10-100 mg/L)	2019	
		Cadmium	0.0176-0.457 (hardness of 3.4-285 mg/L)	2019	
		Chromium	5	2019	
		Cobalt	1.41-3.27 (hardness 52-396 mg/L)	2019	
		Copper	Variable	2019	
		Fluoride (mg/L)	1.94	2019	
		Iron	577	2019	
		Lead	Variable	2019	
		Manganese	Variable	2019	
		Silver	0.25	2019	
		Sulphate	- 128 mg/L sulphate for hardness between 0 and 30 mg/L as $CaCO_3$ - 218 mg/L sulphate for hardness between 31 and 75 mg/L as $CaCO_3$ - 309 mg/L sulphate for hardness between 76 and 180 mg/L as $CaCO_3$ - 429 mg/L sulphate for hardness between 181 and 250 mg/L as $CaCO_3$ - 429 mg/L sulphate for very high hardness levels (i.e., greater than 250 mg/L as CaCO3)	2019	
		Zinc	Variable	2019	
GFL Environmental	Green For Life Environmental Inc.	Ammonia (mg-N/L)	Acute: 60.0 mg-N/L [i]	2021	Golder. 2021. Derivation of Proposed Acute and Chronic Site-Speicifc Water Quality Objectives - Eastern Ontario Waste Handling Facility near Moose Creek, Ontario. Reference number 20144558. Issued September 2021
			Chronic: 5.2 mg-N/L [i]	2021	
		Boron (mg/L)	Acute: 68 mg/L Chronic: 4.0 mg/L	2021	
		Chloride (mg/L)	Acute: 870-1379mg/L (hardness 100-800 mg/L) Chronic: 120-234 mg/L (hardness <57->200 mg/L)	2021 2021	
		Nitrate (mg-N/L)	Acute: 124-216 mg-N/L (hardness of <82->162 mg/L) Chronic 3.0-32.4 mg-N/L (hardness <31->350 mg/L)	2021 2021	
		Phenols (mg/L)	Acute: 7.4 mg/L Chronic: 0.028 mg/L	2021 2021	
		Sulphate (mg/L)	Acute: 1,121-1,996 mg/L (hardness 100-400 mg/L) Chronic: 128-429 mg/L (hardness 0-250 mg/L)	2021 2021	
CNRL	Canadian Natural Resources	Antimony	33	2018	Golder. 2018. Canadian Natural Horizon North Pit Extension - Volume 3: Environmental Impact Assessment - Section 8.0: Chronic Effects Benchmark - Appendix 8A Chronic Effects Benchmarks. Issued April 2018
		Arsenic	30.7	2018	
Gahcho Kue	De Beers Canada Inc.	Chloride	120 to 223	2020	Elphick JR, Davies M, Gilron G, Canaria EC, Lo B, Bailey HC. 2011. An aquatic toxicological evaluation of sulfate: the case for considering hardness as a modifying factor in setting water quality guidelines. Environ Toxicol Chem. 30(1):247-53.
		Potassium	41	2020	Rescan. 2012. EKATI Diamond Mine: Site-Specific Water Quality Objective for Potassium. Prepared for BHP Billiton Canada Inc. by Rescan Environmental Services Ltd. Yellowknife, Northwest Territories.
		Sulphate	45.2 to 566	2020	Rescan. 2012. EKATI Diamond Mine: Site-specific Water Quality Objective for Sulphate. Prepared for BHP Billiton Canada Inc. by Rescan Environmental Services Ltd. Yellowknife, Northwest Territories.
		Nitrate (mg-N/L)	3 to 16.4 mg N/L	2021	Rescan. 2012. EKATI Diamond Mine: Site-Specific Water Quality Objective for Nitrate. Prepared for BHP Billiton Canada Inc. by Rescan Environmental Services Ltd. Yellowknife, Northwest Territories.
		Aluminum	0.14 to 0.41	2022	De Beers Group. 2020. Water Licence and Land Use Permit Amendment Responses to Undertakings - Gahcho Kue Mine - 2020 WL/LUP Amendment – Undertaking Responses. Issued 16 October 2020

Notes:

(a) The WQG is hardness dependent. The acute WQG is based on a predicted discharge hardness concentration from Primary Pond of 1,034 mg/L as $CaCO_3$. The chronic WQG is based on predicted hardness concentrations that ranged from 13 to 104 mg/L as $CaCO_3$ in the Goose Lake model. Hardness concentrations are calculated from predicted calcium and magnesium concentrations in the model.

(b) The chronic SSWQO for nitrate is based on the generic WQG for the protection of aquatic life (CCME 1999) when hardness concentrations are less than 26 mg/L as CaCO3, the hardness-dependent SSWQO (Rescan 2012) when hardness concentrations are between 26.4 and 94 mg/L as CaCO3, and the maximum acceptable concentration in drinking water (Health Canada 2019) when hardness concentrations are greater than 94 mg/L as CaCO3.

(c) The SSWQO for total arsenic is from Appendix E1 of Sabina (2017).

(d) The SSWQO for total copper is from Golder (2016)

(e) The SSWQO for total aluminum is pH, DOC, and hardness dependent. The SSWQO is based on a pH of 6, DOC of 3.5 mg/L, and predicted hardness concentrations that ranged from 13 to 104 mg/L as CaCO3 in the Goose Lake model.

(g) The current AEMP benchmark for hexavalent chromium is the SSWQO of 0.0021 mg/L developed for the Environmental Assessment Report (EAR; De Beers 2002). The Federal Environmental Quality Guideline (FEQG) for hexavalent chromium of 0.005 mg/L (ECCC 2018) is recommended to replace the SSWQO
The hardness-dependent SSWQO equation from Rescan (2012). Rescan (2012) developed a nitrate SSWQO for the Ekati Diamond Mine that is hardness-dependent over a range of hardness concentrations from 10 to 160 mg/L as $CaCO_3$. This SSWQO

(f) was adopted for the Ekati Diamond Mine in May 2013 (WLWB 2013). The hardness-dependent SSWQO for nitrate was also determined to be protective of aquatic life in Snap Lake (MVEIRB 2014). Hardness concentrations in Snap Lake in Post-closure are not predicted to exceed 160 mg/L as $CaCO_3$.

(h) CCME (1999)

(i) pH normalized to 7, temperature normalized to 20 degrees

Appendix B – Revised TDS SSWQO Report

TECHNICAL MEMORANDUM

DATE January 24, 2025 **Reference No.** CA0031499.3639-MBK2024_020-TM-Rev1

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).

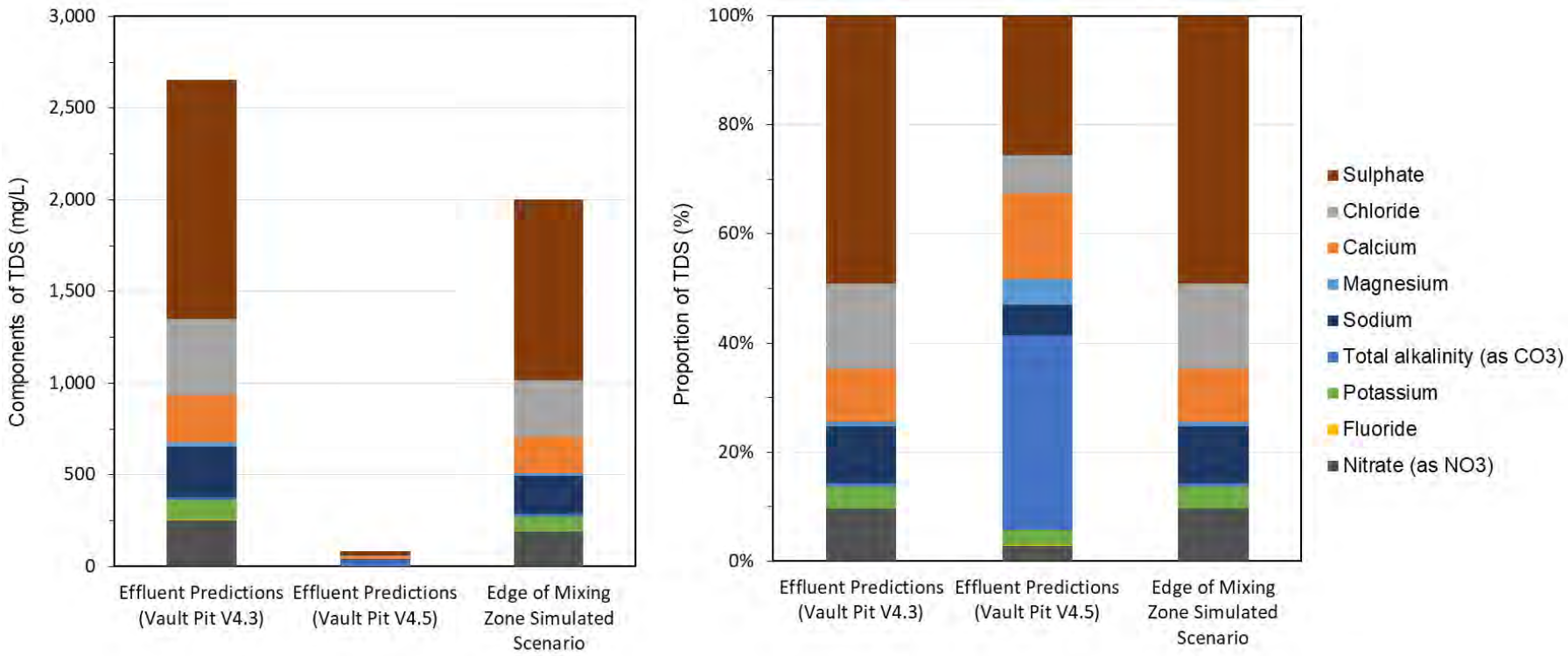
TDS = total dissolved solids; mg/L = milligrams per litre; N = nitrogen; $CaCO_3$ = calcium carbonate.

(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

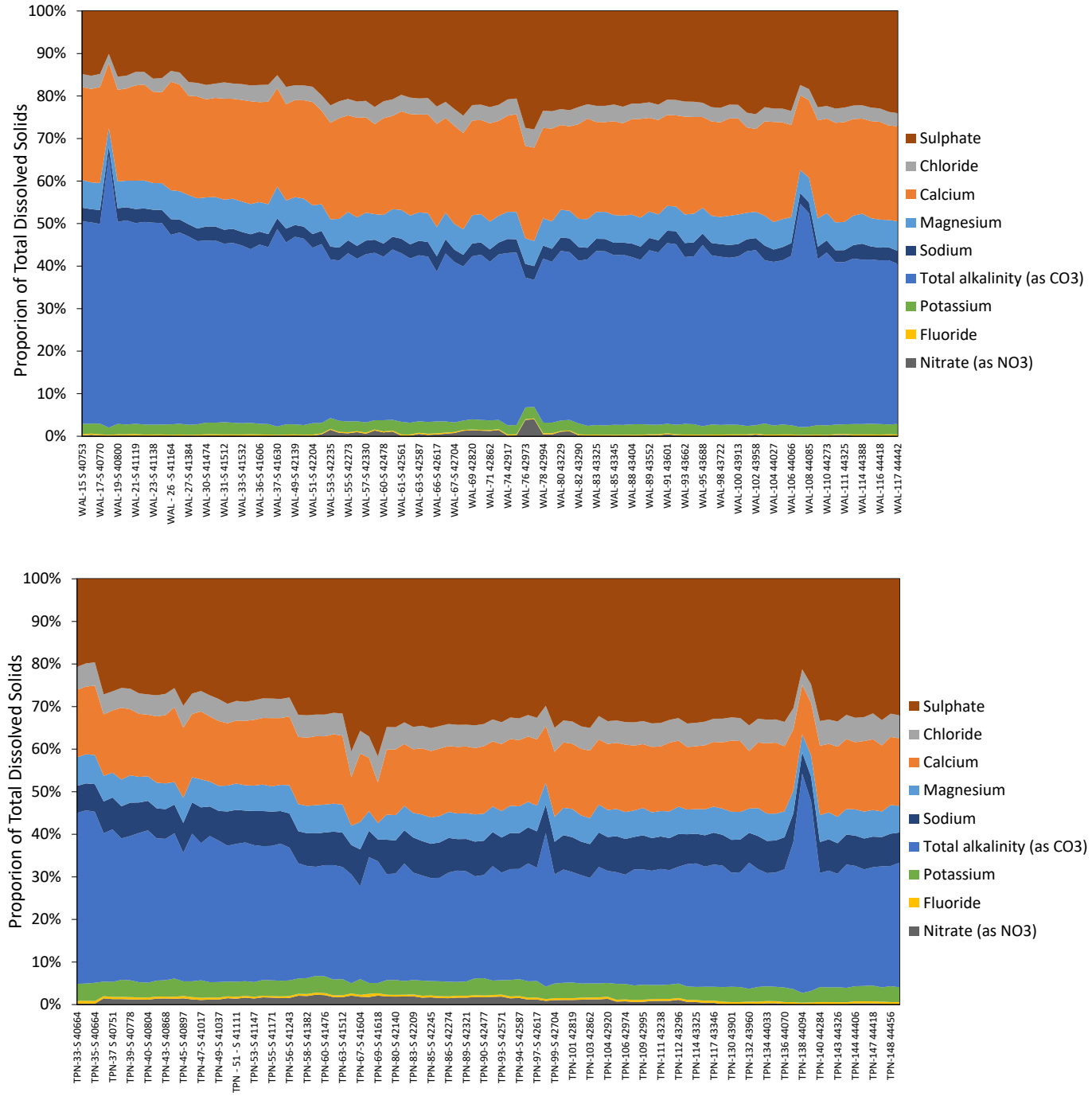


Notes: The simulated edge of mixing zone scenario was generated by applying a dilution factor of 0.75 to the V.3 effluent predictions to reach TDS of 2,000 mg/L.

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

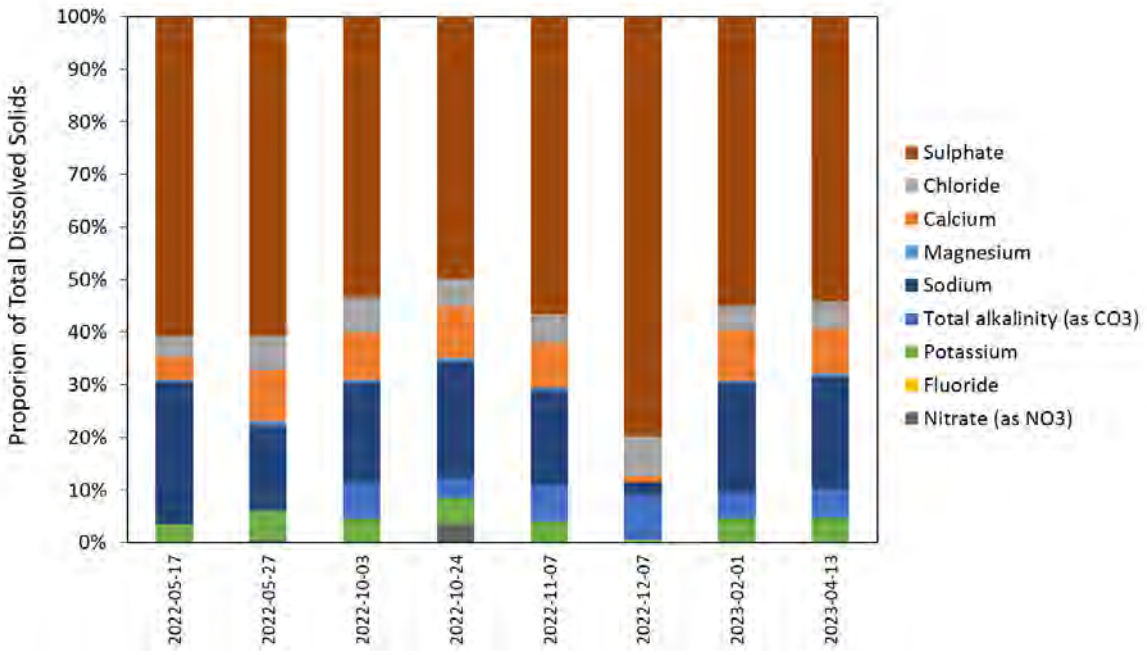
Sample Date	Acute Toxicity				Water Chemistry (mg/L)			
	Daphnia magna		Rainbow Trout *Oncorhynchus mykiss*					
	48-hour Survival in Full-Strength Sample (%)	48-hour Survival LC_{50} (% vol/vol)	96-hour Survival in Full-Strength Sample (%)	96-hour Survival LC_{50} (% vol/vol)	Measured TDS	Calculated 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	>100	80	2,900	2,834	1,600	672
December 7 2022	100	>100	>100	80	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}		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}	1,511	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.
- $EC_{26\text{-}40}/IC_{26\text{-}49}$—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

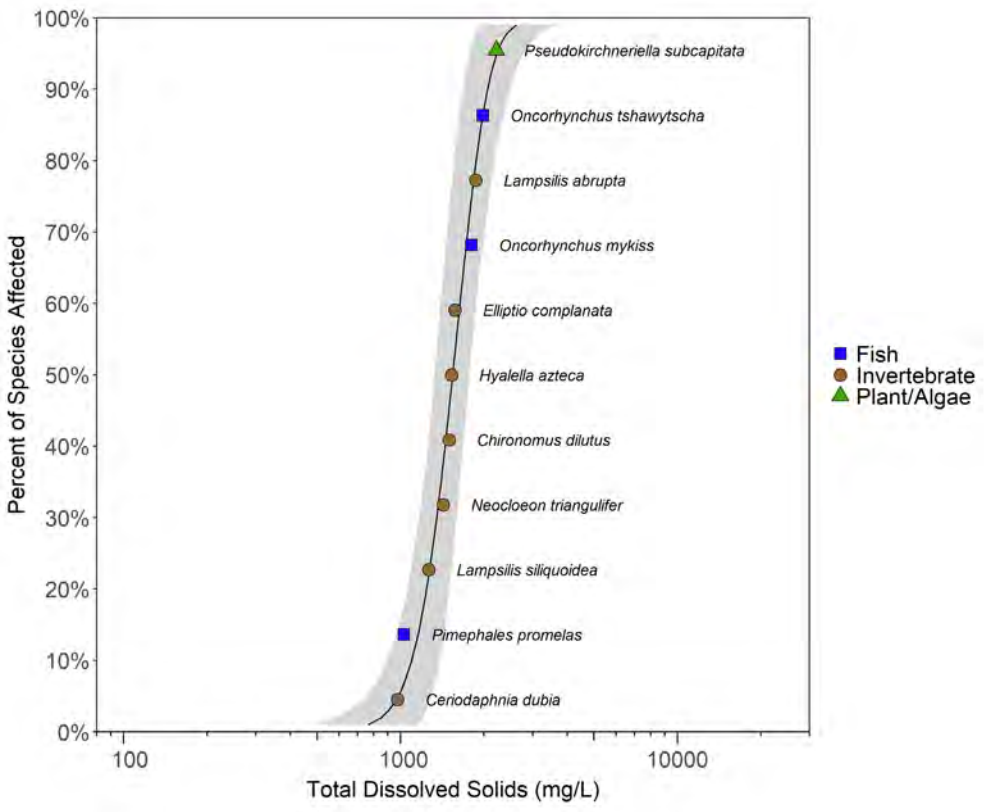
Distribution	Delta	Predicted HC_5 (mg/L)	95% LCL (mg/L)	95% UCL (mg/L)	Weight	Weighted HC_5 (mg/L)
Gamma	0.076	999	787	1,298	0.28	280
Log-logistic	0.94	1,005	758	1,288	0.18	183
Log-normal	0.33	1,012	822	1,300	0.25	249
Weibull	0	916	654	1,298	0.29	267
					Final HC_5[(a)] =	**979 (752–1,297)**

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)**

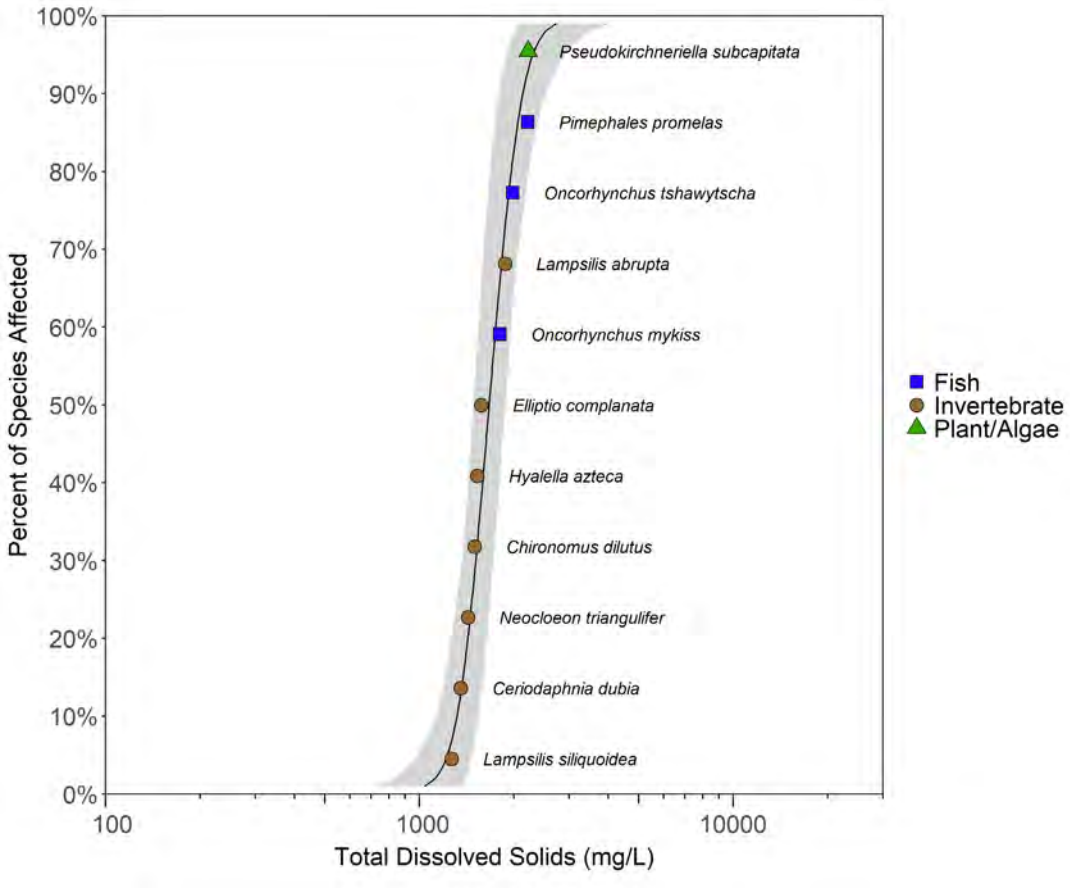
Notes:

(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

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Environmental Engineer – Agnico Eagle

FINAL REPORT

TOTAL AMMONIA REMOVAL EMPLOYING MBBR TECHNOLOGY

DECEMBER 09, 2022, REVISION 1

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PROPRIETARY NOTICE
This proposal is confidential and contains proprietary information.
It is not to be disclosed to a third party without the written consent of Veolia Water Technologies Canada.

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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.

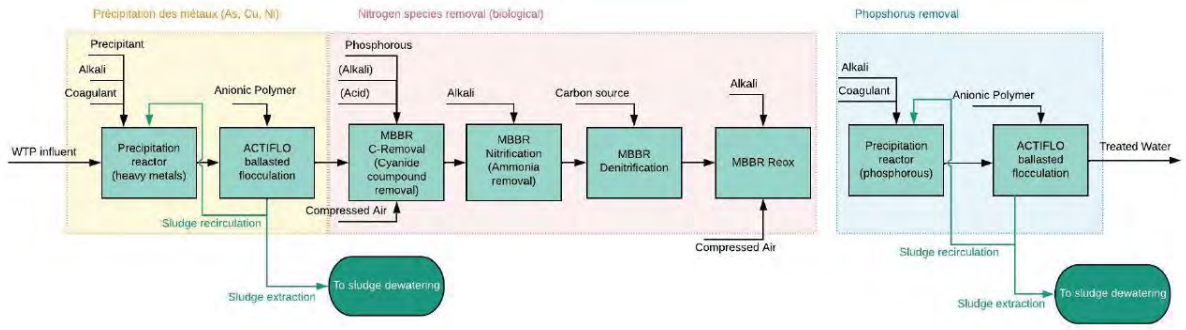


Figure 1 *Proposed treatment*

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.

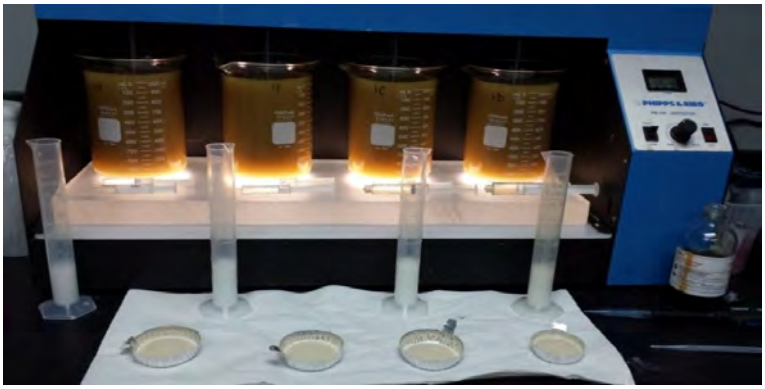


Figure 3: Bench scale jar tester

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.

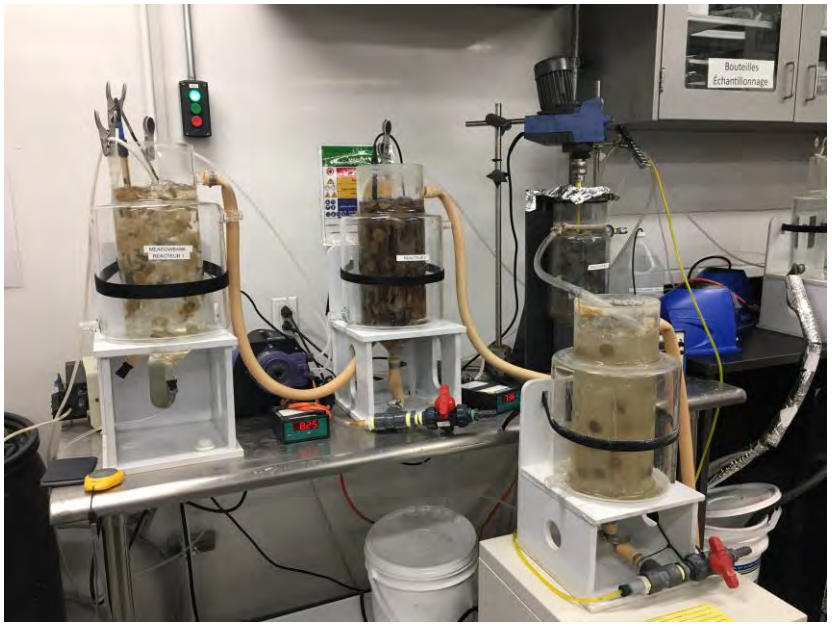


Figure 4 **: Laboratory MBBR set-up**

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.

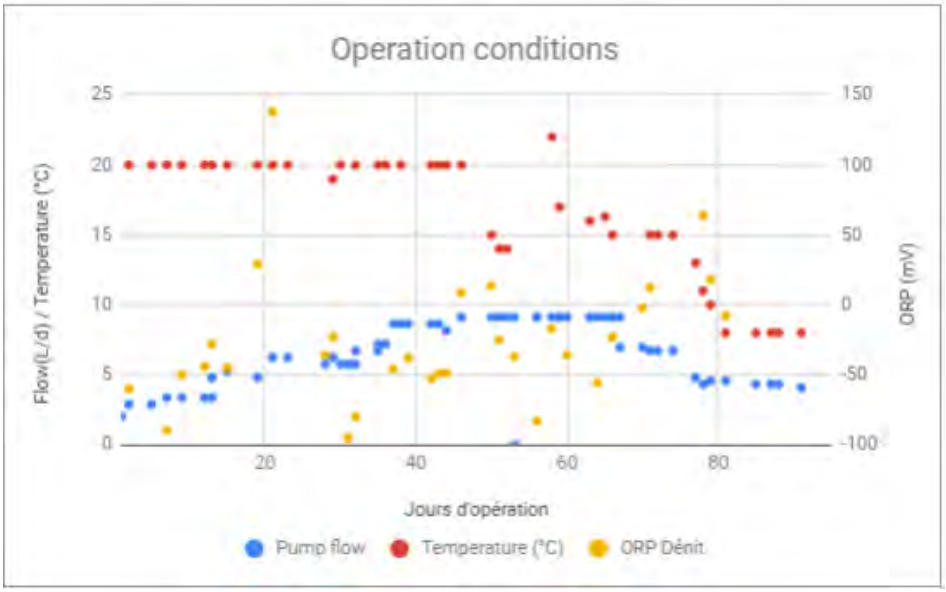


Figure 5 **: Flowrate and operation temperature for the MBBR set-up**

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.

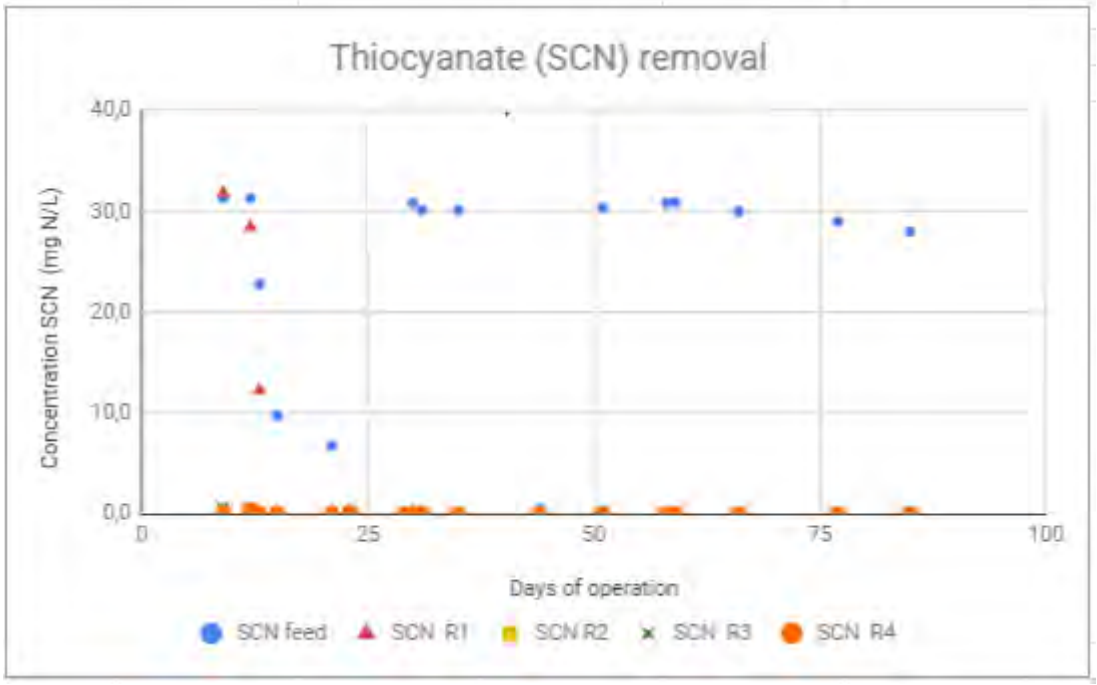


Figure 6 **: Thiocyanate removal by the MBBR process**

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.

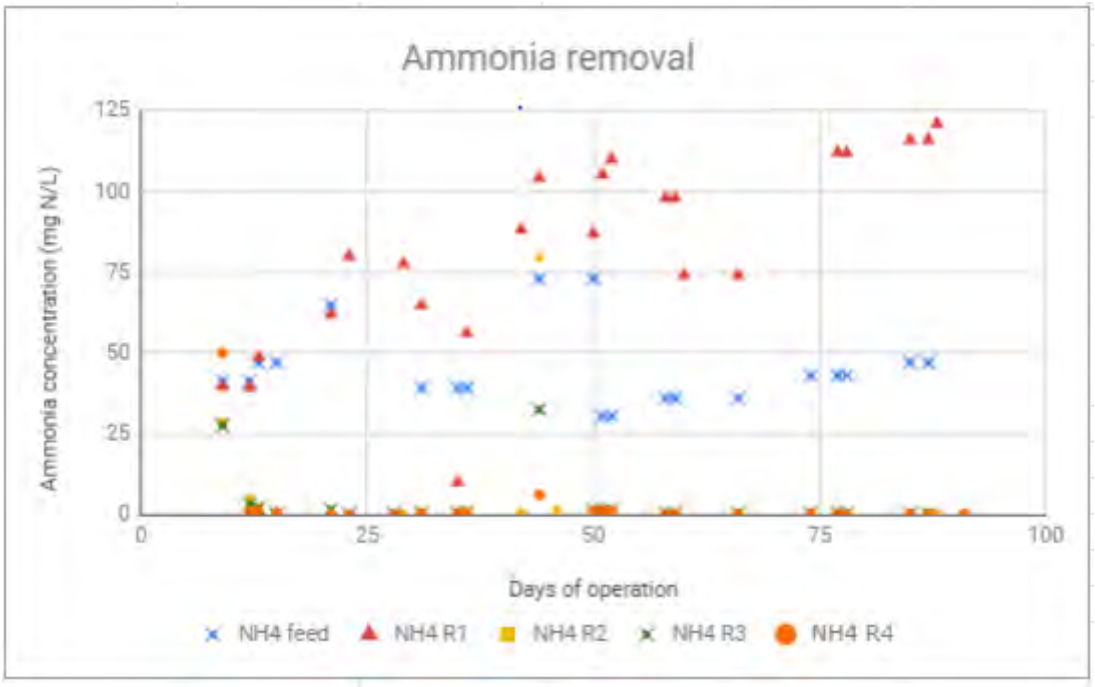


Figure 7: Total Ammonia profile across the MBBR system

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.

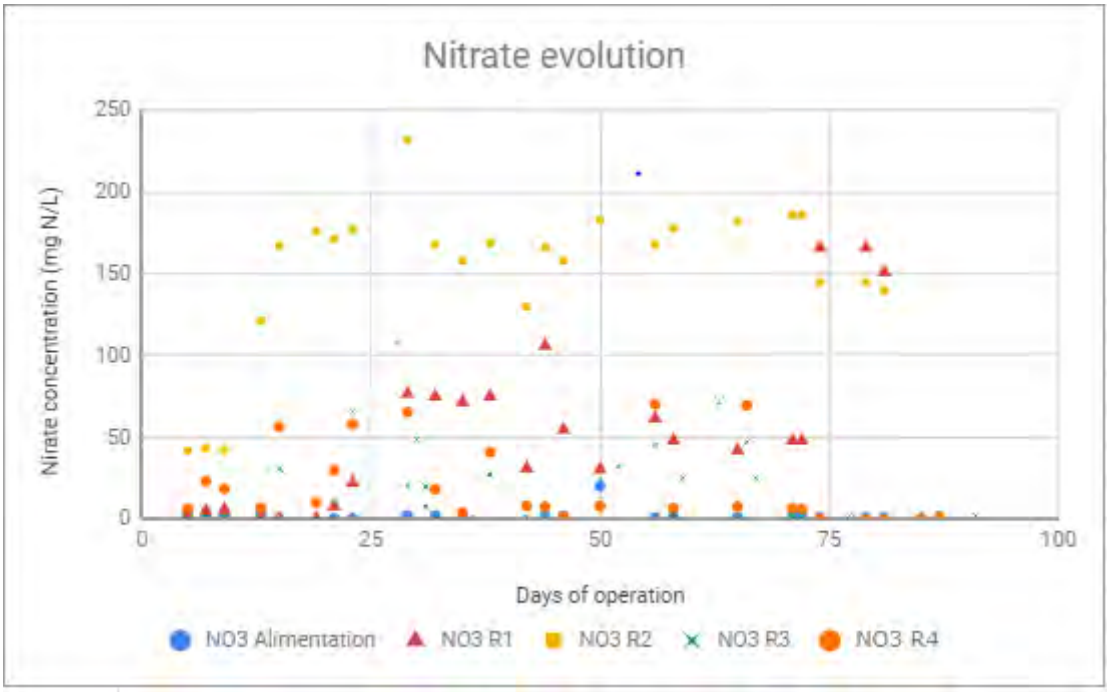


Figure 8 Nitrate evolution across the MBBR system

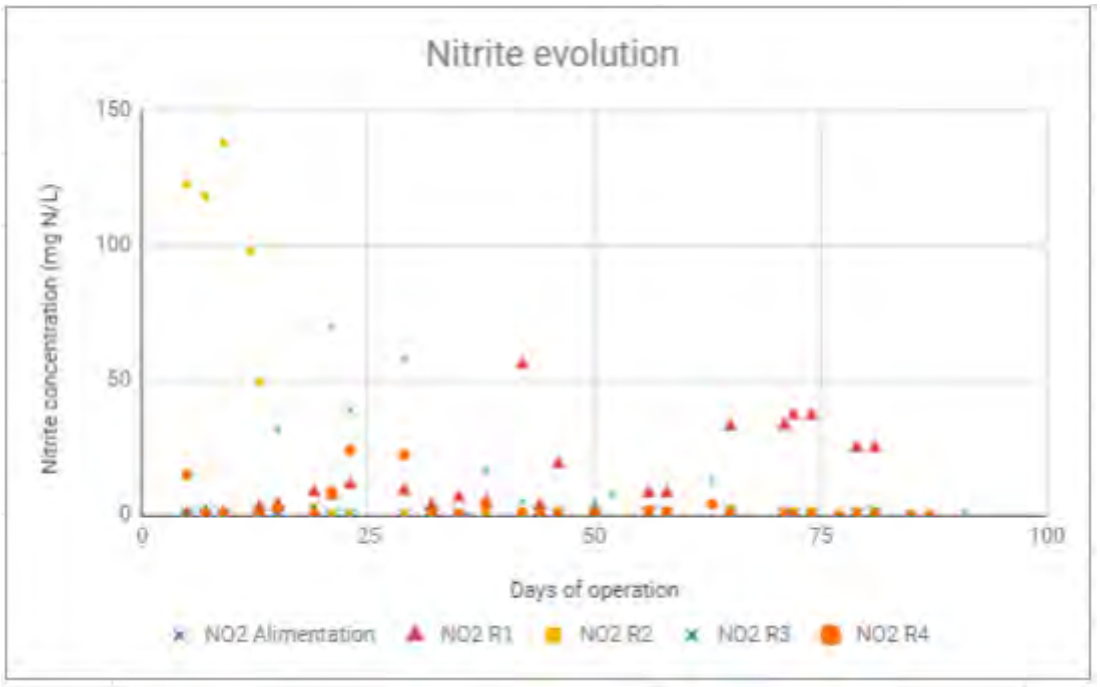


Figure 9 Nitrite evolution throughout the MBBR trial

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.

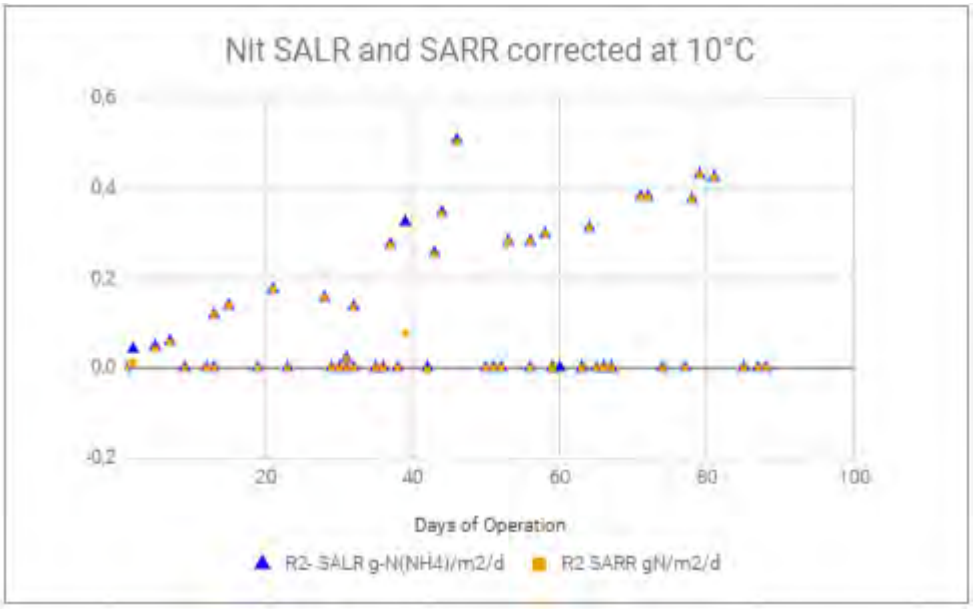


Figure 11 Nitrification SALR and SARR

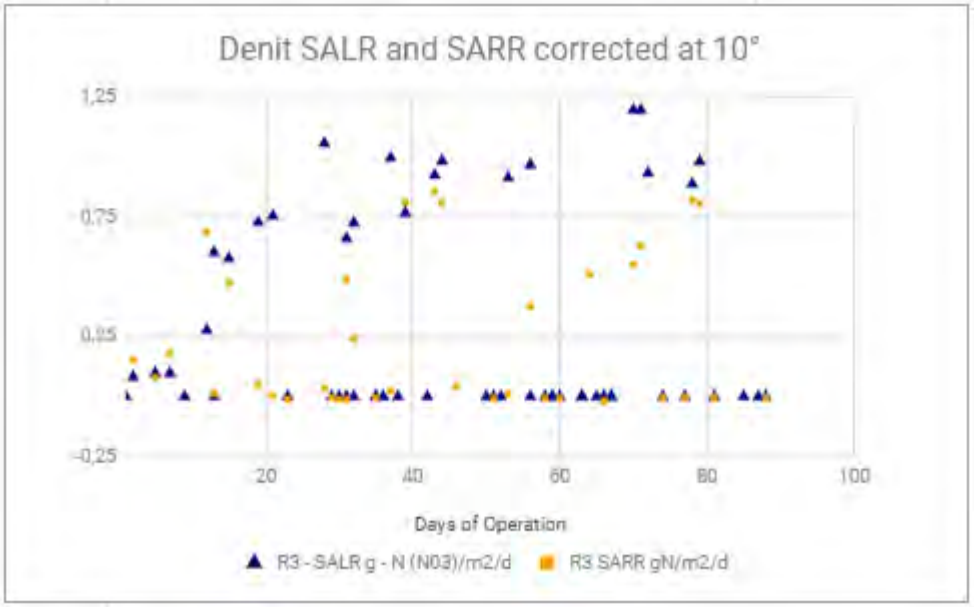


Figure 12 Denitrification SALR and SARR

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	2110	2600
Total Suspended Solids	mg/L	15	6.3	346	<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	64.4	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)					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
			L/h	L/d	Feed	R1	R2	R3	R4	R1	R2	R3	R4	R1	R2	R3	R4	ORP Daniil	Feed	R1	R2	R3	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 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	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	8,03	20	20	20	20	8,51	6,42	0,45	7,56	-60	0,4	7,1	6,1	2,1	3,1	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	9,6	1,8	41,9	0,4	6,3	30,0					31,3	31,8	0,6	0,5	0,0
2022-03-09	9h00	7	0,14	3,36	8,30	8,14	6,93	7,88	8,29	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						376	241	183	42	43	47,0	48,6	2,2	2,0	1,1	0,10	0,91	138	0,13	0,37	3,6	5,5	42,3	0,4	18,3					22,8	12,3	0,0	0,0	0,0
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									98																											
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									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	121,8	0,3	7,1					9,7	0,2	0,1	0,0	0,0
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						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	19	0,20	4,80		7,99	7,28	7,29	8,36	20	20	20	20	8,67	6,67	0,37	8,34	-43												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	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						181	189	55	197	58			0,1	0,1	0,0	0,03	7,45	0,55	70,0	8,7	0,4	7,7	173	10,8	29,7														
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				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	28	0,24	5,76												0,56											761																						108,0					30,9	0,2	0,0	0,0	0,0
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	0,73	8,16	-36									148	94	39,2	64,8	0,3	0,4	0,4	0,43	9,1	0,6	58,0	22,3	2,3	76,6	232	20,4	65,4					30,1	0,2	0,1	0,0	0,0
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					236																						48,7									
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					93																						19,8									
2022-03-31	15h30	31	0,24	5,76																		1,0																										7,4									
2022-04-01	9h00	32	0,24	5,76	8,10	7,07	7,58	7,15		20	20	20	20	6,48	6,70	0,38	7,51	-95						275	55	21	75	58	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	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					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	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										200																						0,07					1,1				
2022-04-06	16h00	37	0,36	8,64																							132																											
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	8,03	-46				0,02					163	37		88,2	0,7				5	1,12	16,5	3,4		75	169	27	40,8									
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				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	43	0,36	8,64		6,91	7,12	7,14	8,32	20	20	20	20	5,80	5,74	0,36	7,31	-53									53				1,4																						
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									90	58	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	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									180	98	30,4	105,3	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	50	0,38	9,12		7,39	7,49	7,02	8,24	19	19	19	19	6,36	7,17	0,38	8,38	8,5		0,42	0,66	0,04	0,02				681	107	30,4	110,0	1,1	1,2	1,1	0,18	2,02	3	3,8	0,12	20	30,4	183,0	24,1	8,0									
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									421																											
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									532																						7,69					32,1				
2022-04-23	8h00	53	0,38	9,12																							53																											
2022-04-22	12h05	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									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	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											36,0	98,0	0,06	0,1	0,1	0,34	8,15	1,40	0,69	1,58	1,0	48	178	1,9	6,7					30,9	0,0	0,0	0,0	0,0
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									1000	248		74																		24,9									
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	7,36	6,58	0,69	8,42	-36				0,02					70	29		ND							12,4	4,05				71,4										
2022-05-02	13h00	63	0,38	9,12																																															
2022-05-03	9h00	64	0,38	9,12												0,43											64																											
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					66	53	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	66	0,38	9,12						15	15	15	15									2,77					39																						>70	69,6				
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					60																						25									
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									130	48	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	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	8,36	12,4				0,80					184	46	43,0	112,2	0,30	0,16	0,16	0,18	37,2	1,62	0,00	0,03	2,3	48,0	186	1,4	6,1					29,0	0,0	0,0	0,0	0,0
2022-05-13	9h00	74	0,28	6,72						15	15	15	15														110	40	43	112	0,3	0,2	0,1	0,20	37,0	1,6	0,05	0,06	1,0	166	145	0,5	0,3									
2022-05-16	9h00	77	0,20	4,80						13	13	13	13														276	47																						0,0	0,0								
2022-05-17	9h00	78	0,18	4,32						11	11	11	11														431																						0,8									
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	9,16	64				0,9					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	81	0,19	4,56		7,84	8,07	7,03	7,74	8	8	8	8	9,80	9,44	0,36	9,31	18									449	67	47,0	116	0,1	0,2	0,3	0,3	25,0	1,4	1,90	0,07	1,0	151	140	0,9	0									
2022-05-24	9h00	85	0,18	4,32		7,31	7,88	7,01	7,84	8	8	8	8	10,21	10,24	0,45	10,10	-8				0,0					577	160		121	0,28								0,67	0,17									3,40	0,46					

APPENDIX B. CERTIFICATE OF ANALYSIS

ALS Environmental

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**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	196035-RW-8.C	----	----	----	----
					Client sampling date / time	27-May-2022	----	----	----	----
						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	Client sample ID	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 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 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 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).
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 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: 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 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: 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**

					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									
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**

					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: 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

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: 5000196035.606300.2103000 3
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	Cyanides	Cyanides	thiocyanate	Anion scan	NO2+NO3	O-PO4	SAMPLES ON HOLD	SUSPECTED HAZARD (see Special Instructions)
	196035-RW-B.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 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			
				18.9			

SHIPMENT RELEASE (client use)

Released by: EHT Date: 2022-05-27 Time:

INITIAL SHIPMENT RECEPTION (lab use only)

Received by: Date: Time:

FINAL SHIPMENT RECEPTION (lab use only)

Received by: Date: 05/30/22 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**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	196035_MD_R4_8C	196035_MD_CW_8C	----	----	----
					Client sampling date / time	26-May-2022	26-May-2022	----	----	----
						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)					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	----	----	----
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 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: 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 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: 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 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: 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	----

Chain of Custody (COC) / Analytical Request Form

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here (lab use only)

COC Number: 17 - -

Page of

Report To	Contact and company name below will appear on the final report
Company:	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:

Project Information

ALS Account # / Quote #:
Job #: 196035_MD
PO / AFE: 5000196035.606300.21030001
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:

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.

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 Limit)	CN, SCN	Anions scan	ortho-phosphates	RT	TOC, DOC	COA solube	TSS, TA	NO2	NO3	NH4	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 (e

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)

Released by: EHT Date: 2022.05.26 Time:

INITIAL SHIPMENT RECEPTION (lab use only)

Received by: Date: Time:

FINAL SHIPMENT RECEPTION (lab use only)

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 OC H2S 2B3

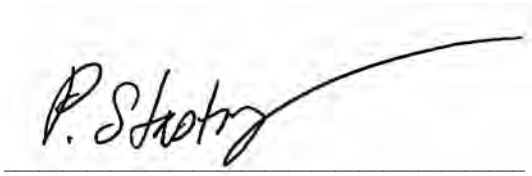
Date Received: 17-MAY-22
Report Date: 27-MAY-22 14:57 (MT)
Version: FINAL

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:



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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.

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			<0.000005C		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			<0.000005C		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

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

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	Report Format / Distribution	
Company:	Veolia Water Technologies (26895)	Select Report Format: ☑ PDF ☐ EXCEL ☐ EDD (DIGITAL)	
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 Sartelon	Email 1 or Fax josee.lalonde@veolia.com	
City/Province:	Ville St-Laurent	Email 2	
Postal Code:	H2S 2B3	Email 3	
Invoice To	Same as Report To ☑ YES ☐ NO	Invoice Distribution	
	Copy of Invoice with Report ☐ YES ☐ NO	Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX	
Company:		Email 1 or Fax vwtcanada_payables@veolia.com	
Contact:		Email 2	

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:	5000196035-606300.2103000	Requisitioner:	
LSD:		Location:	
ALS Lab Work Order # (lab use only):	L2706977	ALS Contact:	Sampler:

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.

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	TP	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		
	196035-MD-R1	↓		↓	4		X		X	X	X							
	196035-MD-R2				4		X		X	X	X							
	196035-MD-R3				4		X		X	X	X							
	196035-MD-CW15°C				8	X	X	X	X	X	X	X	X	X	X	X		

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			
				11.6			

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: 11:40

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.

Veolia Water Technologies Canada (Saint-Laurent)
ATTN: Josee Lalonde
4105 Sartelon
Ville St-Laurent OC H2S 2B3

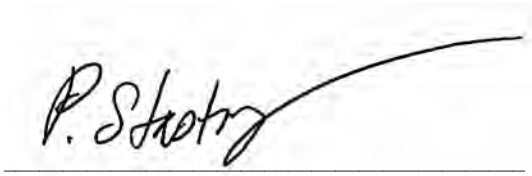
Date Received: 17-MAY-22
Report Date: 27-MAY-22 14:57 (MT)
Version: FINAL

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:



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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.

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			<0.000005C		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			<0.000005C		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

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

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2706977-COFC

COC Number: 17 - -

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Report To	Contact and company name below will appear on the final report	Report Format / Distribution	
Company:	Veolia Water Technologies (26895)	Select Report Format: ☑ PDF ☐ EXCEL ☐ EDD (DIGITAL)	
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 Sartelon	Email 1 or Fax josee.lalonde@veolia.com	
City/Province:	Ville St-Laurent	Email 2	
Postal Code:	H2S 2B3	Email 3	
Invoice To	Same as Report To ☑ YES ☐ NO	Invoice Distribution	
	Copy of Invoice with Report ☐ YES ☐ NO	Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX	
Company:		Email 1 or Fax vwtcanada_payables@veolia.com	
Contact:		Email 2	

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:	5000196035-606300.2103000	Requisitioner:	
LSD:		Location:	
ALS Lab Work Order # (lab use only):	L2706977	ALS Contact:	Sampler:

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.

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	TP	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		
	196035-MD-R1	↓		↓	4		X		X	X	X							
	196035-MD-R2				4		X		X	X	X							
	196035-MD-R3				4		X		X	X	X							
	196035-MD-CW15°C				8	X	X	X	X	X	X	X	X	X	X	X		

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			
				11.6			

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: 11:40

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

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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

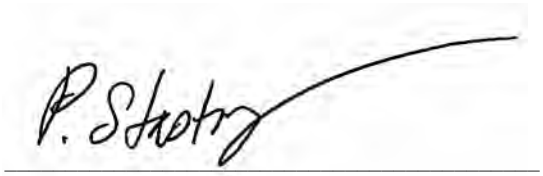
Date Received: 17-FEB-22
Report Date: 17-FEB-22 14:59 (MT)
Version: FINAL

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:



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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

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:

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.

Chain of Custody (COC) / Analytical Request Form

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Canada Toll Free: 1 800 668 9878

L2686613-COFC

COC Number: 17 - -

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Report To	Contact and company name below will appear on the final report	Report Format / Distribution	Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)
Company:	Veolia Water Technologies (26895)	Select Report Format: ☑ PDF ☐ EXCEL ☐ EDD (DIGITAL)	Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply
Contact:	Josee Lalonde	Quality Control (QC) Report with Report ☐ YES ☐ NO	PRIORITY (Business Days): 4 day [P4-20%] ☐ / 3 day [P3-25%] ☐ / 2 day [P2-50%] ☐
Phone:		☐ Compare Results to Criteria on Report - provide details below if box checked	EMERGENCY: 1 Business day [E - 100%] ☒ / Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] ☐
	Company address below will appear on the final report	Select Distribution: ☐ EMAIL ☐ MAIL ☐ FAX	
Street:	4105 Sartelon	Email 1 or Fax josee.lalonde@veolia.com	Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm
City/Province:	Ville St-Laurent	Email 2	For tests that can not be performed according to the service level selected, you will be contacted.
Postal Code:	H2S 2B3	Email 3	

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):	L2686613	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	Ni	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+4C									

Drinking Water (DW) Samples (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			
				13.5			

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: EHT	Date: 2022-FEB-16	Time:	Received by:	Date:	Time:	Received by:	Date: 17 Feb 22	Time: 10:30

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

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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

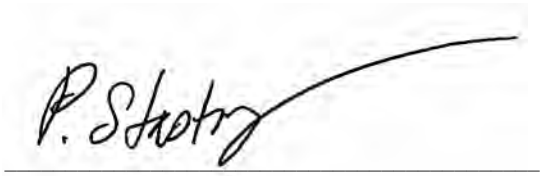
Date Received: 14-FEB-22
Report Date: 24-FEB-22 08:15 (MT)
Version: FINAL

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:



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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			<0.000005(		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			<0.000005C		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	Select Below - Contact your AM to confirm all E&P TATs (surcharges may apply)
Company:	Veolia Water Technologies (26895)	Select Report Format: [illegible]	☑ Standard TAT if received by 3 pm - business days - no surcharges apply
Contact:	Josee Lalonde	Quality Control (QC) Report with Report ☐ YES ☐ NO	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)] ☐
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	Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm
City/Province:	Ville St-Laurent	Email 2	For tests that can not be performed according to the service level selected, you will be contacted.
Postal Code:	H2S 2B3	Email 3	
Invoice To	Same as Report To ☑ YES ☐ NO	**Invoice Distribution**	**Analysis Request**
	Copy of Invoice with Report ☐ YES ☐ NO	Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX	
Company:		Email 1 or Fax vwtcanada_payables@veolia.com	
Contact:		Email 2	

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:

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	Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below: metals total *	metals dissolved	CUO	CU	SCN	Anions scan	Phenol 4AAP	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 only for total metals

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)	SAMPLE CONDITION AS RECEIVED (lab use only)
Are samples taken from a Regulated DW System? ☐ YES ☐ NO		Frozen ☑ SIF Observations Yes ☐ No ☐
Are samples for human consumption/ use? ☐ 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: 945

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

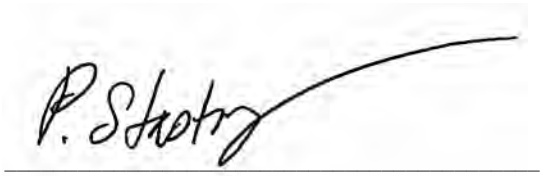
Date Received: 23-FEB-22
Report Date: 24-FEB-22 08:17 (MT)
Version: FINAL

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:



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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

Workorder: L2687682 Report Date: 24-FEB-22

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			<0.000005(		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

Quality Control Report

Workorder: L2687682 Report Date: 24-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.

Chain of Custody (COC) / Analytical Request Form

www.alsglobal.com

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	Report Format	✓ - Contact your AM to confirm all E&P TATs (surcharges may apply)
Company:	Veolia Water Technologies (26895)	Select Report Format: ☑ PDF ☐ EXCEL ☐ EDD (DIGITAL)	Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply
Contact:	Josee Lalonde	Quality Control (QC) Report with Report ☐ YES ☐ NO	PRIORITY (Business Days): 4 day [P4-20%] ☐ / 3 day [P3-25%] ☐ / 2 day [P2-50%] ☐
Phone:		☐ Compare Results to Criteria on Report - provide details below if box checked	EMERGENCY: 1 Business day [E - 100%] ☑ / Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] ☐
	Company address below will appear on the final report	Select Distribution: ☐ EMAIL ☐ MAIL ☐ FAX	
Street:	4105 Sartelon	Email 1 or Fax josee.lalonde@veolia.com	Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm
City/Province:	Ville St-Laurent	Email 2	For tests that can not be performed according to the service level selected, you will be contacted.
Postal Code:	H2S 2B3	Email 3	

Invoice To	Same as Report To ☑ YES ☐ NO	Invoice Distribution	
	Copy of Invoice with Report ☐ YES ☑ NO	Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX	
Company:		Email 1 or Fax vwtcanada_payables@veolia.com	
Contact:		Email 2	

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:	5000196035.606300.24030003	...itioner:	
LSD:		...tion:	

Analysis Request

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

NUMBER OF CONTAINERS: Lead (F) | Nickel (F) | Metal Scan Low Limit (F/P)

SAMPLES ON HOLD

SUSPECTED HAZARD (see Special Instructions)

ALS Lab Work Order # (lab use only): L2687682 JD

ALS Contact: | Sampler:

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	Metal Scan Low Limit (F/P)
	CW - TOTE	22/2/22		WW	X

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			
				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:	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

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: 5000196035.606300.21030003
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
Phone: Tel. 514-334-7230
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°	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.
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Puslinch, ON N0B 2J0
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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

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.)
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 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 (CO2).
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

The life science business of Merck KGaA, Darmstadt, Germany
operates as MilliporeSigma in the US and Canada

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	:	Na2S
Molecular weight	:	78.04 g/mol
CAS-No.	:	1313-82-2
EC-No.	:	215-211-5

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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

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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.

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operates as MilliporeSigma in the US and Canada

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.

The life science business of Merck KGaA, Darmstadt, Germany
operates as MilliporeSigma in the US and Canada

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

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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

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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.

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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

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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

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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.

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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).

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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

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	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)

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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

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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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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.

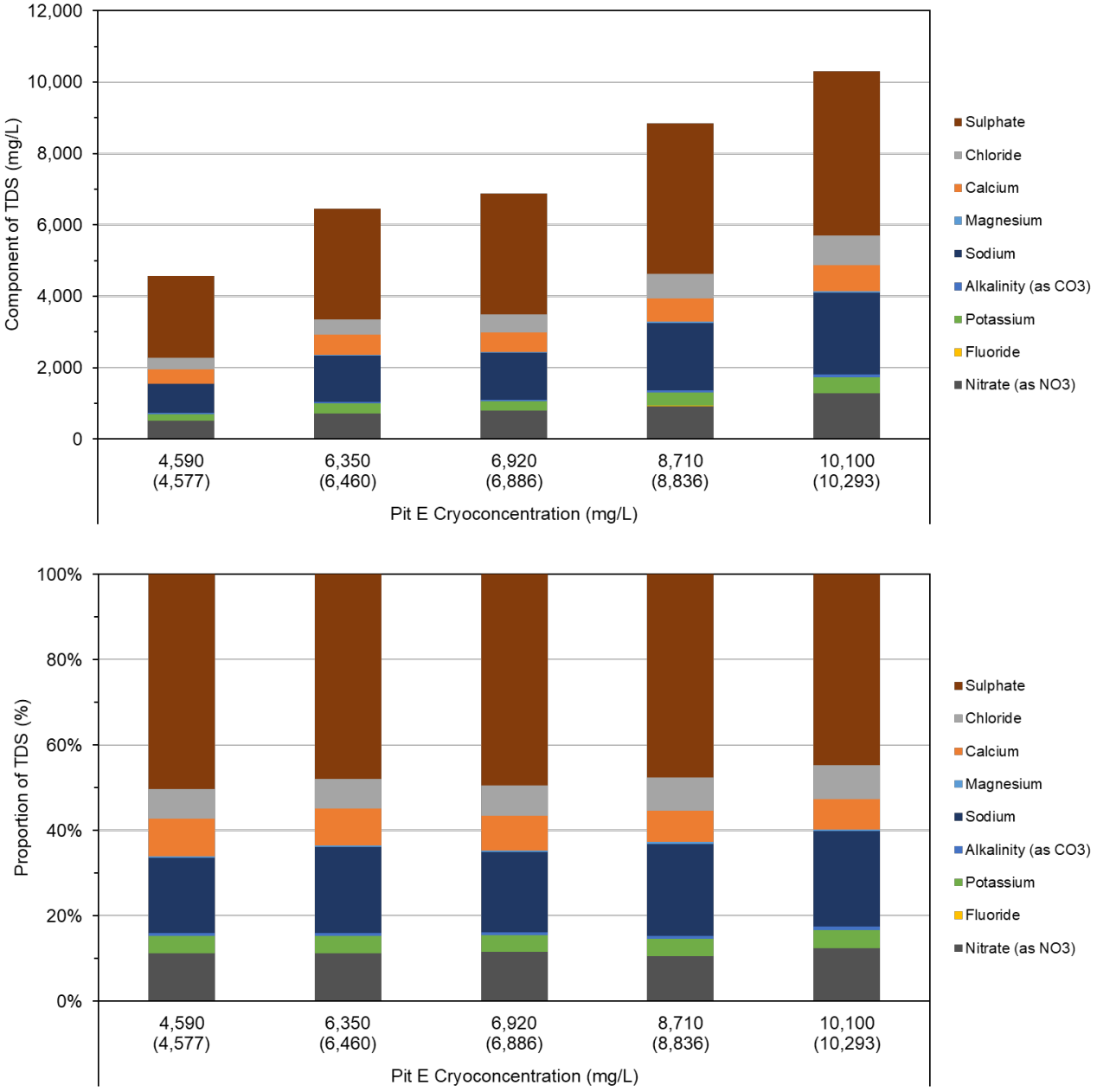
Based on experience with similar testing programs, it is anticipated that major ions would be relatively stable during storage. Any change in sample composition during storage was predicted to have negligible effects on the test results; therefore, exceedance of the hold time was not anticipated to have 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.

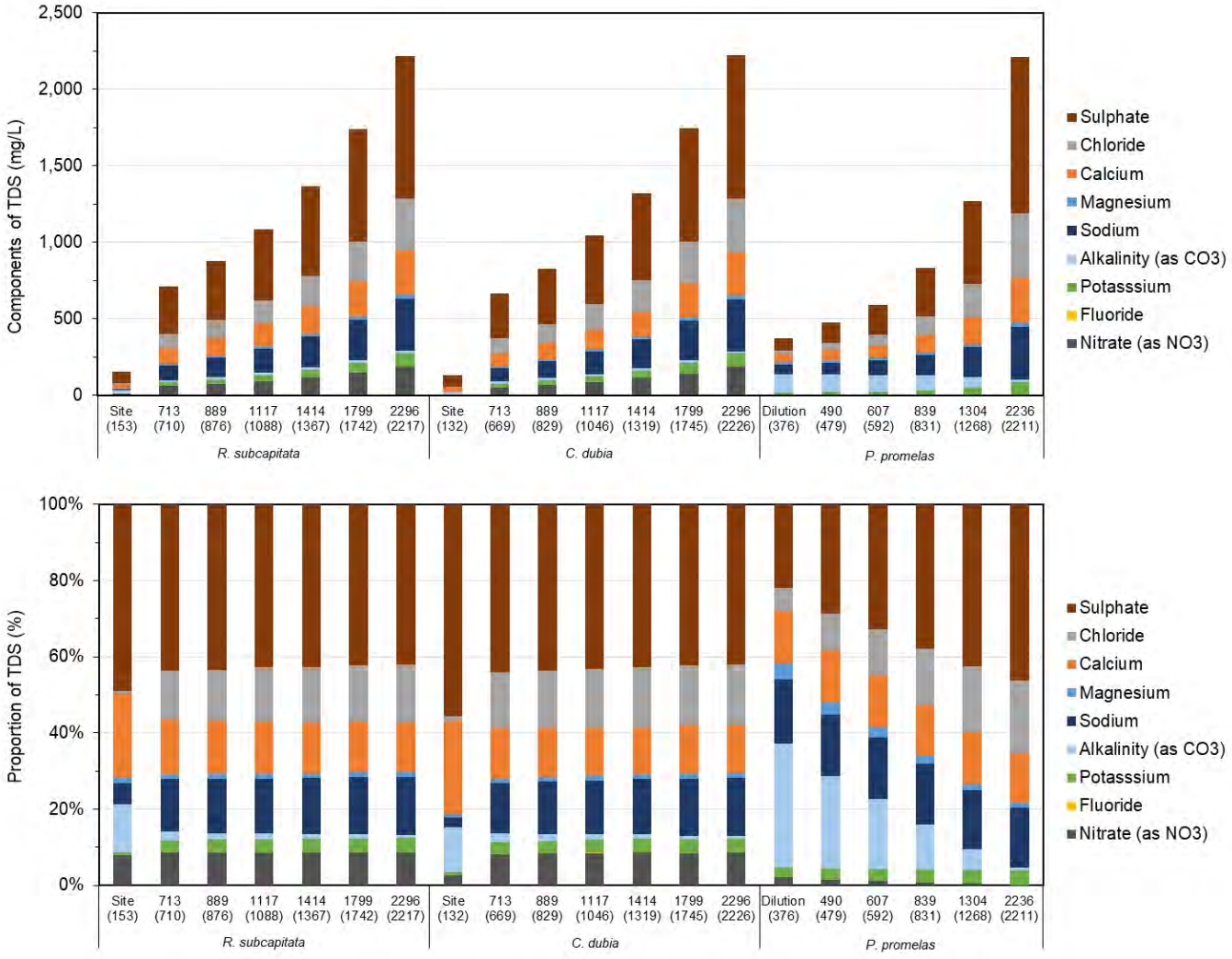
2-3.3 Chronic Toxicity Program

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.

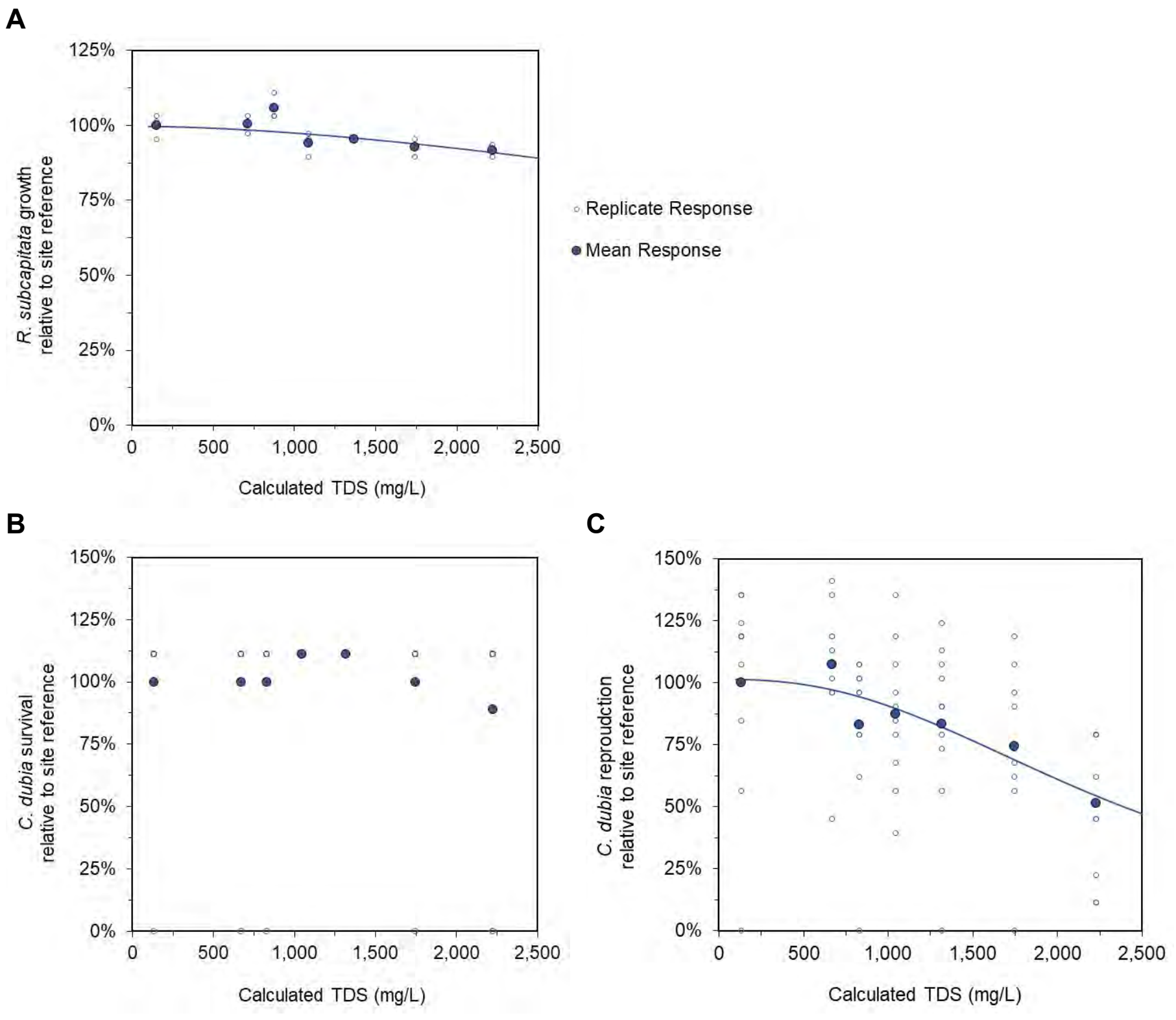
- ***R. subcapitata* growth**—There was no statistically significant reduction in *R. subcapitata* growth relative to the site water control. The NOEC was >2,217 mg/L calculated TDS (Panel A of Figure 2-3) and was considered reliable for TDS.
- ***C. dubia* survival**—There was no statistically significant 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.

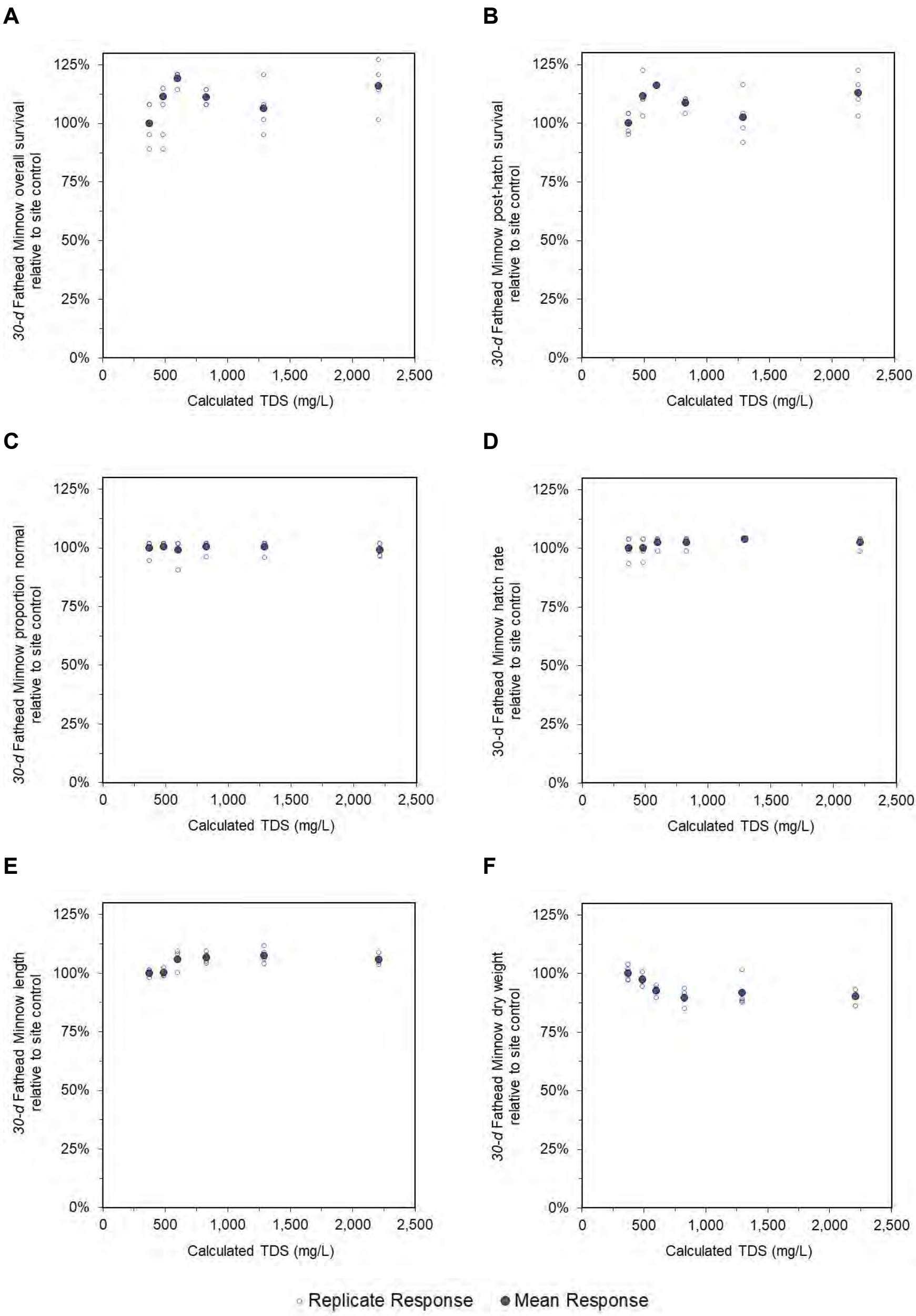
Figure 2-3: Concentration-Response Curves for *Raphidocelis subcapitata* Growth (A), and *Ceriodaphnia dubia* Survival (B) and Reproduction (C) versus Calculated Total Dissolved Solids (mg/L)



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

APHA. 2012. Standard Methods for the Examination of Water and Wastewater, 22nd Edition, with updates to 2015. Washington, DC, USA.

ECCC (Environment and Climate Change Canada). 2000a. Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to *Daphnia magna*. Method and Development and Applications Unit. Environment Canada. EPS1/RM/14. Amended February 2016.

ECCC. 2000b. 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. 2007a. Biological test method: growth inhibition test using the freshwater alga. EPS 1/RM/25, Second Edition, March 2007.

ECCC. 2007b. Biological test method: test of reproduction and survival using the cladoceran *Ceriodaphnia dubia*. EPS 1/RM/21, Second Edition, February 2007.

APPENDIX A

Acute Toxicity Testing Reports

NAUTILUS ENVIRONMENTAL
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 : 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°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

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

NAUTILUS ENVIRONMENTAL
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 : 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

NAUTILUS ENVIRONMENTAL
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 : 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

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°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

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°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 (%)[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					Sample name is									
		1-Métal precipitation : ferric sulfate, caustic soda					ST19 treated.									
		Hydres 6909, polymer anionique Hydrex 6105					conductivity ≈ 8,95 mS									
		2-MBBR: add H3PO4, air, bacteria for SCN and					TDS → 6,1 g/L.									
		NH4 rempoval														
		3-TSS treatment: ferric sulfate & Hydrex 6105					1 pair for the 4g/L (5,1 mS/cm) → dilution									
		tracking numer with GLS :					1 pair for the 5g/L (6,9 mS/cm) → dilution									
		F19 196 660 and F19 196 656					1 pair for the 6,1g/L (current sample)									
							† 3 pairs for a 5g/L (current sample).									

For Lab Use Only

Received By: MP / 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

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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

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 behavours 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

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 : 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

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

Shipping Address: Nautilus Environmental Guelph.
B-11 Nicholas Beaver Road
Puslinch, Ontario Canada N0B 2J0

Voice: (519) 763-4412 **Fax:** (519) 763-4419

NAUTILUS ENVIRONMENTAL

Nautilus Work Order No: 254313

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.)
2024-03-19 *		Pit E (TDS SSWQO) - ST19 treated cyocencentrated to 8 g/L TDS	81788	9°C	✔		✔							✔		1 x 20 L

For Lab Use Only
Received By: JGR
Date: 2024-03-26
Time: 15:40
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
* pail label says Sampled at 13:30 on 2024-03-18

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

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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

Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

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
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Lab-Dup = Laboratory Initiated Duplicate

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

Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

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

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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

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

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

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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

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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.

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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

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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		

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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
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

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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

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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 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.

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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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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. Puslinch, ON N0B 2J0	Address: B-11 Nicholas Beaver Rd Puslinch, ON N0B2J0	Project #: 162706256	Rush TAT (Surcharges will be applied)
	awartman@aquatox.ca;pantunes@aquatox.ca; lnovak@aquatox.ca; lisa.ramilo@agnicoeagle.com;	Site Location:	☐ 1 Day ☐ 2 Days ☒ 3-4 Days
Email: accounting@nautilusenvironmental.ca	Email: 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

LABORATORY USE ONLY

CUSTODY SEAL Y / N: Present / Intact

COOLER TEMPERATURES: N / N / 13/11/13

COOLING MEDIA PRESENT: Y / (N)

	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	81599	2024-03-12	09:00	water	10	Y	x	x	x	x	x	x	x	x	x	x	x	x	x			
2	81600	2024-03-12	10:30	water	10	Y	x	x	x	x	x	x	x	x	x	x	x	x	x			
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																						

Please report ammonia values to 2 decimal places

NONT-2024-03-854

COMMENTS

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.

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

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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.

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 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvna.com

Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

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

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Nautilus Environmental Company Inc.
Client Project #: 162706256
Your P.O. #: 2324-196PG
Sampler Initials: AQU

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

Nautilus Environmental Company Inc.
Client Project #: 162706256
Your P.O. #: 2324-196PG
Sampler Initials: AQU

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

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

Nautilus Environmental Company Inc.
Client Project #: 162706256
Your P.O. #: 2324-196PG
Sampler Initials: AQU

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

Bureau Veritas Job #: C482313
Report Date: 2024/03/26

Nautilus Environmental Company Inc.
Client Project #: 162706256
Your P.O. #: 2324-196PG
Sampler Initials: AQU

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.

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

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		

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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		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

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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		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				

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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)

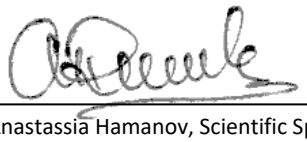
NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

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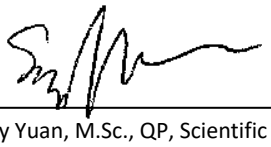
Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

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.

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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: 3/22/2024

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 / 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		COOLER TEMPERATURES
Present	Intact	
		12/13/12

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	[illegible]	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.

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 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvna.com

Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

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

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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
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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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

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**
Total Zirconium (Zr)	mg/L	<0.0050	0.0050	9302202

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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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.

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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
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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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
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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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		

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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)

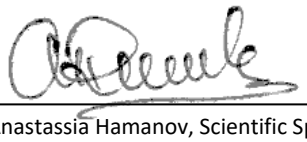
NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

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

Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

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.

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

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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. Puslinch, ON N0B 2J0	Address: B-11 Nicholas Beaver Rd Puslinch, ON N0B2J0	Project #: 162706256	Rush TAT (Surcharges will be applied)
	awartman@aquatox.ca;pantunes@aquatox.ca; lnovak@aquatox.ca; lisa.ramilo@agnicoeagle.com;	Site Location:	☐ 1 Day ☐ 2 Days ☒ 3-4 Days
Email: accounting@nautilusenvironmental.ca	Email: 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 / 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	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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APPENDIX B – *Ceriodaphnia dubia* Toxicity Test Data
APPENDIX C – Analytical Chemistry

SIGNATURE PAGE

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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	Y/N	Time*	4.00	LC
1	2024/05/07	AO	0805	Y	0800	N/A	LC
2	2024/05/08	KNIAPIBH	0840	Y	0800	N/A	AI
3	2024/05/09	AI	1000	-	0800	4.00	-

Sample Information

Initial pH: AI
Initial EC (µS/cm):
Initial DO (mg/L):
Initial Temp (°C):

*recommended rotation times

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: LD Date Reviewed: 2024/05/09

NAUTILUS ENVIRONMENTAL

Algae Bench Sheet

Method: AGD-Mod Client: AGN108 (TDS) Reference: PJ2324-004

Complete Plate Physical Counts

		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: [signature] 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	-	-
2256 91	287	293	299	-	-

Cell Yield Results:

Concentration (%) mg/L	Cell Yield ($x10^3$ cells/ mL) Row B	C	E	F	G	Mean	SD	CV (%)
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
2256 91	277	283	289	-	-	283	6	2

Reviewed by: LO

Date Reviewed: 2016/05/09

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					

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%

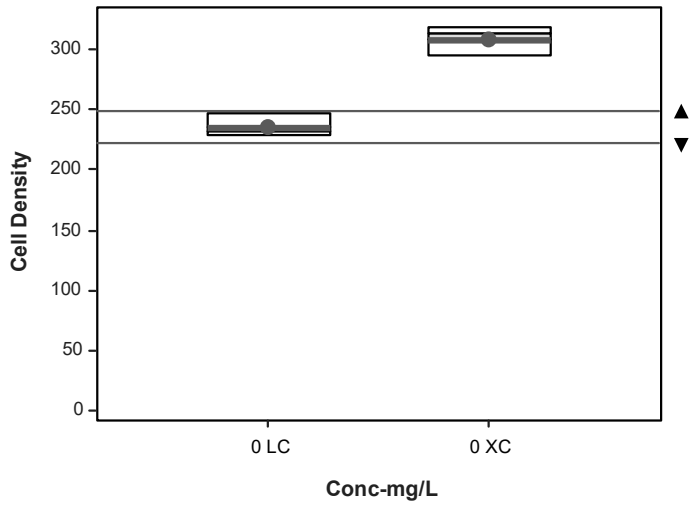
Cell Density Detail

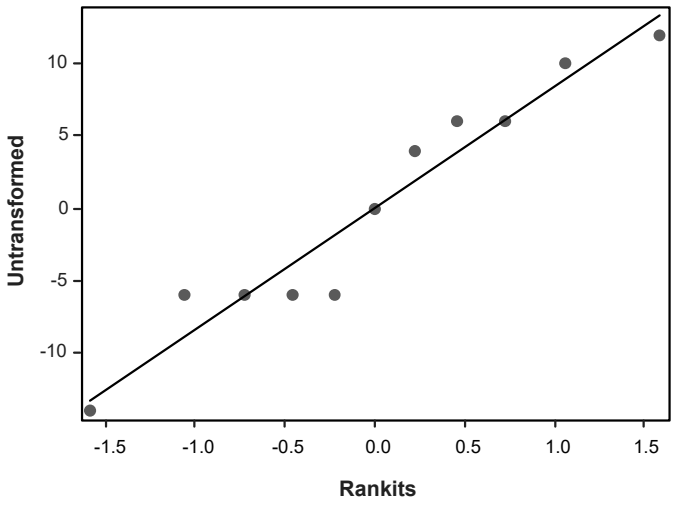
Conc-mg/L	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	LC	247	229	229	241	229	229	241	235
0	XC	295	319	313					

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





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%

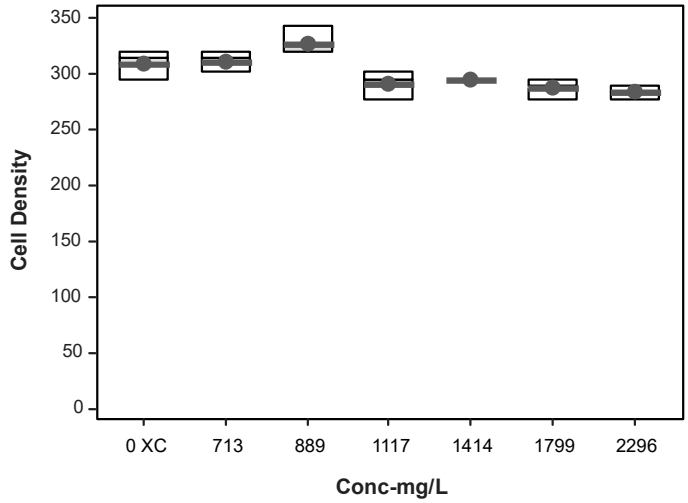
Selenastrum Growth Test **Nautilus Environmental Calgary**

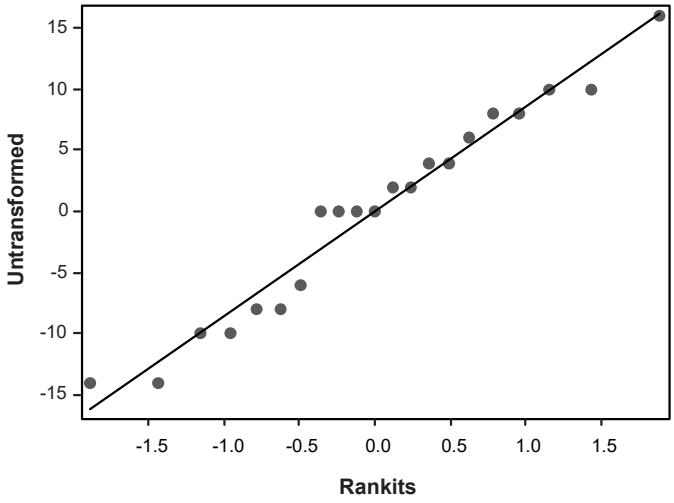
Analysis ID:	00-3251-2320	**Endpoint:**	Cell Density	**CETIS Version:**	CETIS v2.1.5
Analyzed:	16 May-24 9:24	**Analysis:**	Nonparametric-Control vs Treatments	**Status Level:**	1
Edit Date:	16 May-24 0:00	**MD5 Hash:**	45340AE4263C0F82F962FD1E1B4927B9	**Editor ID:**	009-313-022-5

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	✓	YC	Day 0	✓
24/05/03	1	0740	YC	2	✓	NA	Day 1	✓
24/05/04	2	0820	YC	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	✓	YC	Day 5	✓
24/05/08	6	1330	KO	2	✓	YC	Day 6	✓
24/05/09	7	1130	KO	2	✓	YC	Day 7	✓
24/05/10	8	0740	YC	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 — 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

Control Validity Day 8

Cup	Number of Young	Number of Broods
1	21	3
2	21	↓
3	24	
4	32	
5	15	
6	25	
7	24	
8	32	
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: May/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)

Conc. TDS (mg/L)	New Solutions								Old Solutions							
Day	CTL	SITE	713	889	1117	1414	1799	2296	CTL	SITE	713	889	1117	1414	1799	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)

0	208	223	1016	1273	1558	1904	2460	3030								
1	216	231	1032	1281	1565	1936	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	1235	1542	1875	2410	2950
5	203	226	969	1274	1564	1931	2480	3170	218	224	977	1239	1527	1863	2390	3030
6	204	225	1006	1280	1587	1924	2470	3130	226	226	983	1237	1539	1873	2440	3030
7	200	222	999	1251	1574	1923	2480	3170	236	226	1015	1264	1552	1895	2450	3100
8									256	236	1069	1253	1563	1894	2480	3110

Dissolved Oxygen (mg/L) (40-100% saturation)

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	5.9	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)

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

Day	1	2	3	4	5	6	7	8
Cup	CTL							
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	0	9	—
6				4	6	0	15	—
7				3	5	0	16	—
8				2	6	0	14	—
9				3	7	0	12	—
10				3	5	0	9	—

Day	1	2	3	4	5	6	7	8
Cup	1117							
1	0	0	0	2	6	0	14	—
2				2	6	0	12	—
3				2	6	0	11	—
4				2	0	0	8	—
5				2	0	0	10	0
6				4	0	0	11	—
7				3	0	0	13	—
8				3	0	0	9	—
9				2	0	0	5	9
10				2	0	0	6	9

Day	1	2	3	4	5	6	7	8
Cup	SITE							
1	0	0	0	0	2	7	12	—
2				0	3	0	10	—
3				0	4	0	6	0
4				0	0	0	13	0
5				0	4	0	13	—
6				0	4	0	10	—
7				0	X0			
8				0	0	9	11	—
9				0	0	7	11	—
10				0	2	0	13	9

Day	1	2	3	4	5	6	7	8
Cup	1414							
1	0	0	0	0	0	7	15	0
2				0	0	0	0	0
3				0	0	0	11	0
4				0	0	0	10	—
5				0	0	0	10	—
6				0	0	5	0	12
7				0	4	0	3	—
8				0	3	0	8	—
9				0	2	0	11	—
10				0	2	0	9	—

Day	1	2	3	4	5	6	7	8
Cup	713							
1	0	0	0	3	8	0	13	—
2				2	6	0	9	—
3				3	0	0	10	—
4				3	0	0	12	—
5				3	0	0	9	—
6				4	0	0	7	—
7				3	5	0	X0	—
8				3	0	0	8	—
9				2	0	0	9	—
10				0	2	0	11	—

Day	1	2	3	4	5	6	7	8
Cup	1799							
1	0	0	0	2	4	7	—	
2				0	0	4	8	0
3				0	0	7	12	0
4				0	2	0	4	10
5				0	4	0	8	9
6				0	3	0	9	—
7				0	2	0	X0	2
8				0	0	0		
9				0	0	0	7	0
10				3	2	0	0	12

Day	1	2	3	4	5	6	7	8
Cup	889							
1	0	0	0	0	3	0	8	0
2				0	3	0	8	0
3				0	0	0	13	—
4				2	0	0	10	—
5				2	0	0	6	—
6				2	4	0	9	—
7				2	0	0	9	—
8		X0						
9		0	0	0	3	0	9	—
10		0	0	2	0	0	8	—

Day	1	2	3	4	5	6	7	8
Cup	2296							
1	0	0	0	2	0	2	10	—
2				2	0	3	9	—
3				2	0	X0		
4				2	0	0	10	—
5				2	0	0	5	0
6				2	0	2	12	0
7				2	0	X0		
8				2	0	0	4	0
9				2	0	2	4	0
10				2	2	0	0	0

Reviewed By: [illegible] Date Reviewed: 2024/05/13

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: [illegible] 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

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%

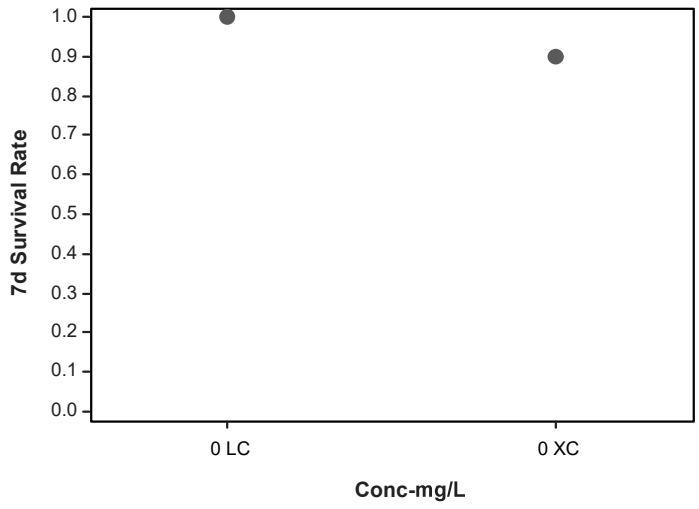
7d Survival Rate Detail

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



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

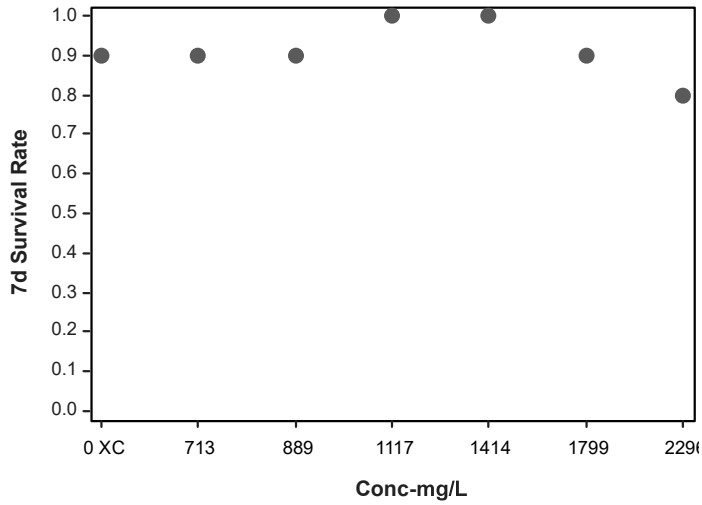
Ceriodaphnia 7-d Survival and Reproduction Test **Nautilus Environmental Calgary**

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%

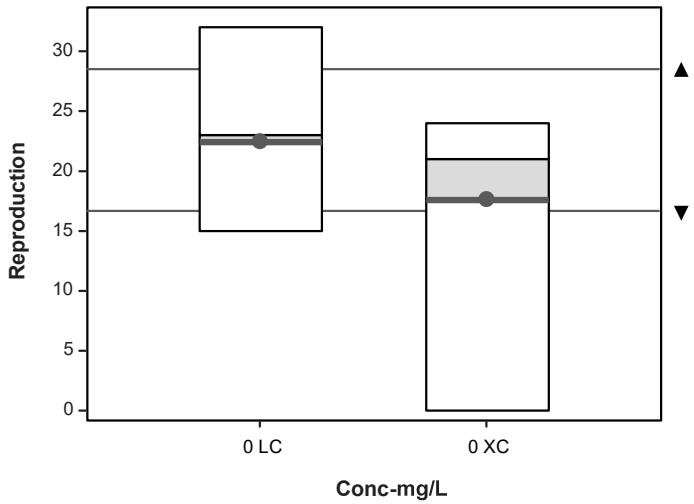
Reproduction Detail

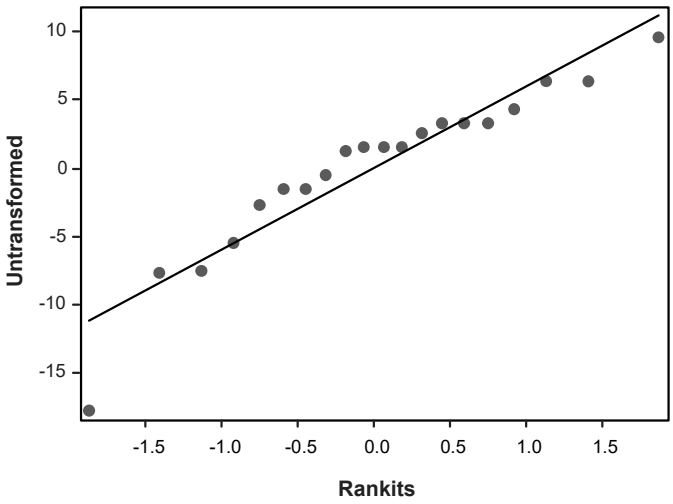
Conc-mg/L	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	LC	21	21	24	32	15	25	24	22	24	17
0	XC	21	15	10	19	24	21	0	22	21	24

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:**	

Graphics





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%

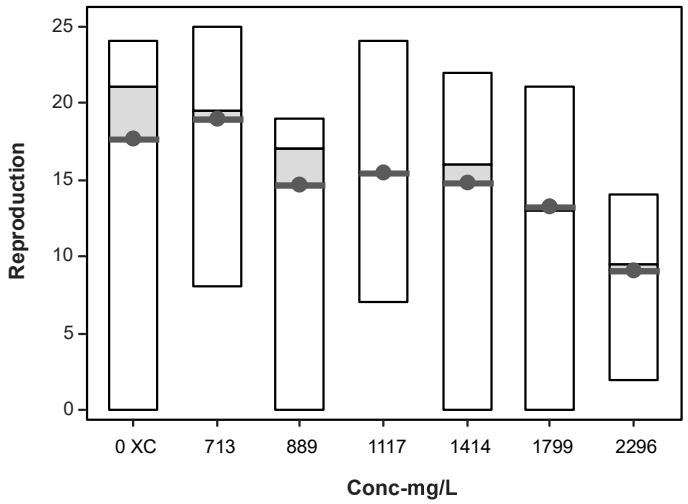
Ceriodaphnia 7-d Survival and Reproduction Test **Nautilus Environmental Calgary**

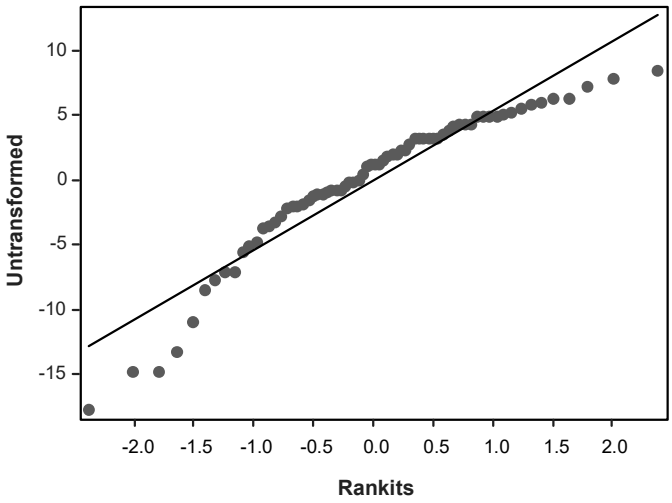
Analysis ID:	10-1672-1431	**Endpoint:**	Reproduction	**CETIS Version:**	CETIS v2.1.5
Analyzed:	23 May-24 13:19	**Analysis:**	Nonparametric-Control vs Treatments	**Status Level:**	1
Edit Date:	22 May-24 15:47	**MD5 Hash:**	E7AA57F386BD798DB0513A902B734784	**Editor ID:**	

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

ALS Canada Ltd.

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 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*
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)				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	----	----	----	----
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	Client sample ID: 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	Client sample ID: **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**)

Analyte	CAS Number	Method/Lab	LOR	Unit	Client sample ID: **Baseline PJ2324-004; 2324-1704**	----	----	----	----
					Client sampling date / time: 27-Mar-2024 10:00	----	----	----	----
					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.

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 / **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*	
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				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	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				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	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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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**

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: 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 -

Page 1 of 1

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	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@nautilusenvironmental.ca	☑ 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: brede.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:	2324-273AB	Requisitioner:	
LSD:		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	Routine	Measured TDS	Total Metals	Dissolved Metals (F)	Total Ammonia as N (P)	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	R	R	R	F	P	P	F/P	P	P	P	P			

Environmental Division
Calgary
Work Order Reference
CG2403741

Telephone : +1 403 407 1800

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				FINAL COOLER TEMPERATURES °C			
11							

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (ALS use only)			FINAL SHIPMENT RECEPTION (ALS use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by:	Date:	Time:
	2024/03/27	1090		3/27	14:05			

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	: **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	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	----
					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.

ALS Canada Ltd.

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 / 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 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				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	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				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Alkalinity Species by Titration										
HDPE										
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 $CaCO_3$ 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	: **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

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

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	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 minim
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 minim
	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 minim
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 minim
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 weekend
Invoice To	Same as Report To ☑ YES ☐ NO	Invoice Recipients	Date and Time Required for all E&P TATs:
	Copy of Invoice with Report ☑ YES ☐ NO	Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX	For all tests with rush TATs requested, please a
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:	2324-325AB	Requisitioner:	
LSD:		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 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)	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	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: Maria Ohman	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

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	: **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	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	----
					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**)

Analyte	CAS Number	Method/Lab	LOR	Unit	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	----
						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 / 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 1,414mg/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				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	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				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										
1,414mg/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				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Alkalinity Species by Titration										
HDPE										
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 $CaCO_3$ 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	: **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 CaCO3)	----	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 SO4)	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	----

Chain of Custody (COC) / Analytical Request Form

COC Number: 22 -

Page 1 of 1

Canada Toll Free: 1 800 668 9878

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@nautilusen
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

Oil and Gas Required Fields (client use)

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

Project Information

ALS Account # / Quote #:
Job #:
PO / AFE: 2324-323AB
LSD:

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

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.

AFFIX ALS BARCODE LABEL HERE (ALS use only)

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	E16z - measured TDS	PR01 - Routine	PR01 - Routine (dissolved metals fld)	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			

Environmental Division
Calgary
Work Order Reference
CG2405623

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
	12

SHIPMENT RELEASE (client use)

Released by: Mira Olsen | Date: 2024/05/02 | Time: 1300

INITIAL SHIPMENT RECEPTION (ALS use only)

Received by: | Date: | Time:

FINAL SHIPMENT RECEPTION (ALS use only)

Received by: | Date: 5/2 | Time: 1445

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	: **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	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	----
					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	----	E100/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*		*Eval*	*Analysis Date*	*Holding Times*		*Eval*
				Rec	*Actual*			*Rec*	*Actual*	
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				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	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				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 - 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				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Alkalinity Species by Titration										
HDPE										
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 $CaCO_3$ 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

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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	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 mini
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 mini
	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 mini
Street:	10823 27 St SE	Email 1 or Fax: leila@nautilusenvironmental.ca; melanie@nautilus	☐ 1 day [E] if received by 3pm M-F - 100% rush surcharge mini
City/Province:	Calgary, AB	Email 2: lisa.ramlo@agnicoeagle.com	☐ Same day [E2] if received by 10am M-S - 200% rush surchar
Postal Code:	T2Z 3V9	Email 3: breda.rahmanian@wsp.com	Additional fees may apply to rush requests on weeke
Invoice To	Same as Report To ☑ YES ☐ NO	Invoice Recipients	Date and Time Required for all E&P TATs:
	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	

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:		AFE/Cost Center:	PO#:
Job #:		Major/Minor Code:	Routing Code:
PO / AFE:	2324-324AB	Requisitioner:	
LSD:		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)	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)	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				FINAL COOLER TEMPERATURES °C			
13.8							

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (ALS use only)			FINAL SHIPMENT RECEPTION (ALS use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by:	Date:	Time:
[signature]	24105110	0830	[signature]	5/13/24	15:10			

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

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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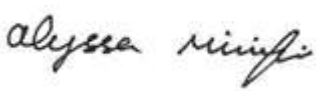
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SIGNATURE PAGE



Report By:
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Laboratory Biologist



Reviewed By:
Leila Oosterbroek, P Biol
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	YC
2024-10-11	3	1010	YC	5	1 hour	CC
2024-10-12	4	0950	YC	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	YC	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	YC	5	1 hour	YC
2024-10-26	18	1010	YC	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	YC	5	1 hour	EP
2024-11-03	26	1120	CC	5	1 hour	CC
2024-11-04	27	1050	YC	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: [illegible] Date Reviewed: 2024/11/11

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

	LAB CTL		T1		T2		T3		T4		T5		T6	
	Day 1		Day 1		Day 1		Day 1		Day 1		Day 1		Day 1	
replicate	Alive Embryos	Dead Embryos	Alive Embryos	Dead Embryos	Alive Embryos	Dead Embryos	Alive Embryos	Dead Embryos	Alive Embryos	Dead Embryos	Alive Embryos	Dead Embryos	Alive Embryos	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

	CTL			T1			T2			T3		
	Day 2			Day 2			Day 2			Day 2		
replicate	Alive Embryos	Dead Embryos	Cull to 20	Alive Embryos	Dead Embryos	Cull to 20	Alive Embryos	Dead Embryos	Cull to 20	Alive Embryos	Dead Embryos	Cull to 20
a	16	2	✓	17	3	✓	20	0	✓	17	2	✓
b	20	0	✓	15	4	✓	* 14	4	✓	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	

	T4			T5			T6		
	Day 2			Day 2			Day 2		
replicate	Alive Embryos	Dead Embryos	Cull to 20	Alive Embryos	Dead Embryos	Cull to 20	Alive Embryos	Dead Embryos	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: [illegible] Date Reviewed: [illegible]

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.	Days 3 AE	3 DE	3 AH	3 DH	3 TS	4 AE	4 DE	4 AH	4 DH	4 TS	5 AE	5 DE	5 AH	5 DH	5 TS	6 AE	6 DE	6 AH	6 DH	6 TS	7 AE	7 DE	7 AH	7 DH	7 TS
LAB CTL	A	15	0	5	0	20	4	0	16	0	20	1	0	19	0	20	0	0	20	0	20	0	0	20	0	20
	B	19	0	1	0	20	6	0	14	0	20	0	0	19	1	19	0	0	19	0	19	0	0	19	0	19
	C	14	0	6	0	20	4	0	16	0	20	1	0	19	0	20	0	1	19	0	19	0	0	19	0	19
	D	16	0	4	0	20	1	0	19	0	20	0	0	20	0	20	0	0	20	0	20	0	0	20	0	20
T1	A	18	0	2	0	20	6	0	14	0	20	2	0	18	0	20	0	0	20	0	20	0	0	20	0	20
	B	19	0	1	0	20	3	0	17	0	20	2	0	18	0	20	0	0	20	0	20	0	0	20	0	20
	C	19	0	1	0	20	15	0	5	0	20	4	0	16	0	20	0	2	16	0	18	0	0	18	0	18
	D	20	0	0	0	20	5	0	15	0	20	3	0	17	0	20	0	1	19	0	19	0	0	19	0	19
T2	A	17	0	3	0	20	16	0	16	0	20	12	0	19	0	20	0	1	19	0	19	0	0	19	0	19
	B	20	0	0	0	20	10	0	10	0	20	1	0	19	0	20	0	0	20	0	20	0	0	20	0	20
	C	20	0	0	0	20	2	0	18	0	20	0	0	20	0	20	0	0	19	1	19	0	0	19	0	19
	D	17	0	3	0	20	6	0	14	0	20	1	1	17	1	18	0	0	18	0	18	0	0	18	0	18
T3	A	16	0	4	0	20	0	0	20	0	20	0	0	20	0	20	0	0	20	0	20	0	0	20	0	20
	B	16	0	4	0	20	0	0	20	0	20	0	0	20	0	20	0	0	20	0	20	0	0	20	0	20
	C	16	0	4	0	20	1	0	19	0	20	0	0	19	0	19	0	0	19	0	19	0	0	19	0	19
	D	16	0	4	0	20	0	0	20	0	20	0	0	20	0	20	0	0	20	0	20	0	0	20	0	20
T4	A	19	0	1	0	20	1	0	19	0	20	0	0	20	0	20	0	0	20	0	20	0	0	20	0	20
	B	17	0	3	0	20	1	0	19	0	20	0	0	20	0	20	0	0	20	0	20	0	0	20	0	20
	C	16	0	4	0	20	2	0	18	0	20	0	0	20	0	20	0	0	20	0	20	0	0	20	0	20
	D	16	1	3	0	19	1	0	18	0	19	0	0	19	0	19	0	0	19	0	19	0	0	19	0	19
T5	A	18	0	2	0	20	1	0	19	0	20	1	0	18	1	19	0	0	18	1	18	0	0	18	0	18
	B	11	0	9	0	20	8	0	12	0	20	1	0	19	0	20	0	0	20	0	20	0	0	20	0	20
	C	19	0	1	0	20	1	0	19	0	20	0	0	20	0	20	0	0	19	0	19	0	0	19	0	19
	D	20	0	0	0	20	8	0	12	0	20	0	0	18	2	18	0	0	18	0	18	0	0	18	0	18
T6	A	9	0	11	0	20	1	0	19	0	20	0	0	20	0	20	0	0	20	0	20	0	0	20	0	20
	B	17	0	3	0	20	2	0	18	0	20	0	1	17	2	17	0	0	17	0	17	0	0	17	0	17
	C	14	0	6	0	20	2	0	18	0	20	0	0	20	0	20	0	0	20	0	20	0	0	20	0	20
	D	16	0	4	0	20	5	0	15	0	20	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 = craniofacial, DD = delayed development

2024/11/14 10:

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	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)	20 ~~19~~ 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	20 ~~19~~ (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

(T4 Day 11: 20 ~~19~~ 20 ~~19~~ 20)

Comments/Observations: * counted ~~19~~ 20

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 major.

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: [illegible] 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 16 Alive Hatched	T1 Day 16 Alive Hatched	T2 Day 16 Alive Hatched	T3 Day 16 Alive Hatched	T4 Day 16 Alive Hatched	T5 Day 16 Alive Hatched	T6 Day 16 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:

replicate	LAB CTL Day 17 Alive Hatched	T1 Day 17 Alive Hatched	T2 Day 17 Alive Hatched	T3 Day 17 Alive Hatched	T4 Day 17 Alive Hatched	T5 Day 17 Alive Hatched	T6 Day 17 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:

replicate	LAB CTL Day 18 Alive Hatched	T1 Day 18 Alive Hatched	T2 Day 18 Alive Hatched	T3 Day 18 Alive Hatched	T4 Day 18 Alive Hatched	T5 Day 18 Alive Hatched	T6 Day 18 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)

replicate	LAB CTL Day 19 Alive Hatched	T1 Day 19 Alive Hatched	T2 Day 19 Alive Hatched	T3 Day 19 Alive Hatched	T4 Day 19 Alive Hatched	T5 Day 19 Alive Hatched	T6 Day 19 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

replicate	LAB CTL Day 20 Alive Hatched	T1 Day 20 Alive Hatched	T2 Day 20 Alive Hatched	T3 Day 20 Alive Hatched	T4 Day 20 Alive Hatched	T5 Day 20 Alive Hatched	T6 Day 20 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:

replicate	LAB CTL Day 21 Alive Hatched	T1 Day 21 Alive Hatched	T2 Day 21 Alive Hatched	T3 Day 21 Alive Hatched	T4 Day 21 Alive Hatched	T5 Day 21 Alive Hatched	T6 Day 21 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:

replicate	LAB CTL Day 22 Alive Hatched	T1 Day 22 Alive Hatched	T2 Day 22 Alive Hatched	T3 Day 22 Alive Hatched	T4 Day 22 Alive Hatched	T5 Day 22 Alive Hatched	T6 Day 22 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:

replicate	LAB CTL Day 23 Alive Hatched	T1 Day 23 Alive Hatched	T2 Day 23 Alive Hatched	T3 Day 23 Alive Hatched	T4 Day 23 Alive Hatched	T5 Day 23 Alive Hatched	T6 Day 23 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: [illegible] Date Reviewed: [illegible]

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 24	Day 24	Day 24	Day 24	Day 24	Day 24	Day 24
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(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~~ 1m

	LAB CTL	T1	T2	T3	T4	T5	T6
	Day 25	Day 25	Day 25	Day 25	Day 25	Day 25	Day 25
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(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:

	LAB CTL	T1	T2	T3	T4	T5	T6
	Day 26	Day 26	Day 26	Day 26	Day 26	Day 26	Day 26
replicate	Alive Hatched	Alive Hatched cc	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	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:

	LAB CTL	T1	T2	T3	T4	T5	T6
	Day 27	Day 27	Day 27	Day 27	Day 27	Day 27	Day 27
replicate	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	Alive Hatched	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: 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 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: [illegible] 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: 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: LAB CTL

Replicate # A		
Fish	Length (mm)	Normal/ Abnormal
1	11	N
2	10	
3	13	
4	14	
5	14	
6	7	
7	12	
8	11	
9	11	
10	10	
11	9	
12	11	
13	9	
14	10	
15	10	
16	10	
17		
18		
19		
20		

Mean Length (mm): 10.8
Normal: 16

Replicate # B		
Fish	Length (mm)	Normal/ Abnormal
1	7	AS
2	12	N
3	13	
4	9	
5	10	
6	11	
7	13	
8	13	
9	11	
10	9	
11	12	
12	8	
13	12	
14	13	
15	14	
16	9	
17	11	
18	11	
19		
20		

Mean Length (mm): 11.1
Normal: 17

Replicate # C		
Fish	Length (mm)	Normal/ Abnormal
1	10	N
2	13	
3	9	
4	13	
5	13	
6	10	
7	11	
8	12	
9	11	
10	11	
11	10	
12	9	
13	10	
14	10	
15	11	
16	11	
17	11	
18		
19		
20		

Mean Length (mm): 10.8
Normal: 17

Replicate # D		
Fish	Length (mm)	Normal/ Abnormal
1	7	N
2	8	AS
3	11	AS
4	11	N
5	8	
6	13	
7	14	
8	14	
9	8	
10	10	
11	10	
12	9	
13	10	
14	14	
15	10	
16	14	
17	12	
18	14	
19	10	
20	13	

Mean Length (mm): 11.0
Normal: 18

Comments

Reviewed By: [illegible] 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

Replicate # A		
Fish	Length (mm)	Normal/ Abnormal
1	10	N
2	11	
3	9	
4	10	
5	10	
6	10	
7	14	
8	10	
9	10	
10	9	
11	9	
12	9	
13	9	
14	13	
15	13	
16	14	
17	14	
18		
19		
20		

Replicate # B		
Fish	Length (mm)	Normal/ Abnormal
1	7	N
2	10	
3	11	
4	12	
5	7	
6	8	
7	10	
8	12	
9	10	
10	13	
11	11	
12	10	
13	9	
14	13	
15	13	
16	14	
17	11	
18		
19		
20		

Replicate # C		
Fish	Length (mm)	Normal/ Abnormal
1	8	N
2	8	
3	14	
4	15	
5	10	
6	12	
7	14	
8	8	
9	13	
10	12	
11	10	
12	8	AS
13	12	N
14	12	N
15		
16		
17		
18		
19		
20		

Replicate # D		
Fish	Length (mm)	Normal/ Abnormal
1	13	N
2	8	
3	15	
4	12	
5	14	
6	11	
7	13	
8	13	
9	7	
10	10	
11	13	
12	14	
13	9	
14	9	
15	6	
16		
17		
18		
19		
20		

Mean Length (mm): 11.1	Mean Length (mm): 10.7	Mean Length (mm): 11.1	Mean Length (mm): 10.9
# Normal: 17	# Normal: 19	# Normal: 13	# Normal: 15

Comments

Reviewed By: ID Date Reviewed: 2024/11/14

NAUTILUS

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		
Fish	Length (mm)	Normal/ Abnormal
1	13	N
2	11	
3	11	
4	10	
5	12	
6	11	
7	9	
8	12	
9	9	
10	7	
11	10	
12	9	
13	15	
14	10	
15	11	
16	8	
17	11	
18	13	
19	13	
20		

Replicate # B		
Fish	Length (mm)	Normal/ Abnormal
1	14	N
2	11	
3	11	
4	11	
5	11	
6	15	
7	14	
8	7	
9	10	
10	8	
11	9	
12	10	
13	13	
14	8	
15	13	
16	14	
17	10	
18	7	
19		
20		

Replicate # C		
Fish	Length (mm)	Normal/ Abnormal
1	11	N
2	13	
3	11	
4	11	
5	11	
6	9	
7	12	
8	11	
9	14	
10	13	
11	11	
12	10	
13	10	
14	12	
15	11	
16	9	
17	9	
18	*	*
19		
20		

Replicate # D		
Fish	Length (mm)	Normal/ Abnormal
1	9	N
2	8	
3	11	
4	12	
5	9	
6	15	
7	12	
8	9	
9	12	
10	9	
11	14	
12	9	
13	11	
14	13	
15	12	
16	11	
17		
18		
19		
20		

Mean Length (mm): 10.8 # Normal: 19	Mean Length (mm): 10.9 # Normal: 18	Mean Length (mm): 11.2 # Normal: 17	Mean Length (mm): 11 # 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		
Fish	Length (mm)	Normal/ Abnormal
1	12	N
2	9	
3	12	
4	15	
5	13	
6	14	
7	13	
8	9	
9	13	
10	12	
11	10	
12	13	
13	11	
14	12	
15	12	
16	14	
17	12	
18	13	
19	8	
20		

Replicate # B		
Fish	Length (mm)	Normal/ Abnormal
1	9	N
2	11	
3	13	
4	10	
5	11	
6	12	
7	13	
8	11	
9	13	
10	12	
11	14	
12	13	
13	14	
14	11	
15	15	
16	9	
17	12	
18	10	
19	12	
20		

Replicate # C		
Fish	Length (mm)	Normal/ Abnormal
1	12	N
2	13	
3	12	
4	11	
5	10	
6	12	
7	14	
8	12	
9	13	
10	12	
11	14	
12	12	
13	10	
14	13	
15	12	
16	10	
17	8	AS
18	7	AS
19		
20		

Replicate # D		
Fish	Length (mm)	Normal/ Abnormal
1	11	N
2	8	
3	13	
4	11	
5	12	
6	11	
7	9	
8	11	
9	6	
10	11	
11	11	
12	12	
13	10	
14	15	
15	13	
16	13	
17	10	
18	11	
19	11	
20		

Mean Length (mm): 11.9	Mean Length (mm): 11.8	Mean Length (mm): 11.5	Mean Length (mm): 10.9
# Normal: 19	# Normal: 19	# Normal: 16	# Normal: 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		

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		

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		

Replicate # D		
Fish	Length (mm)	Normal/ Abnormal
1	13	N
2	14	↓
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): 11.9 # Normal: 17	Mean Length (mm): 11.4 # Normal: 17	Mean Length (mm): 11.8 # Normal: 18	Mean Length (mm): 11.5 # Normal: 17

Comments

Reviewed By: LO 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

T5

Replicate # A		
Fish	Length (mm)	Normal/ Abnormal
1	11	N
2	8	
3	11	
4	12	
5	12	
6	14	
7	11	
8	14	
9	11	
10	11	
11	12	
12	13	
13	10	
14	14	
15	13	
16	13	
17		
18		
19		
20		

Replicate # B		
Fish	Length (mm)	Normal/ Abnormal
1	15	N
2	12	
3	12	
4	12	
5	12	
6	13	
7	11	
8	12	
9	11	
10	9	
11	13	
12	11	
13	11	
14	11	
15	10	
16	11	
17	7	AS
18		
19		
20		

Replicate # C		
Fish	Length (mm)	Normal/ Abnormal
1	12	N
2	14	
3	10	
4	13	
5	11	
6	9	
7	11	
8	12	
9	12	
10	12	
11	13	
12	10	
13	14	
14	10	
15	11	
16	10	
17	12	
18	12	
19	12	
20		

Replicate # D		
Fish	Length (mm)	Normal/ Abnormal
1	13	N
2	13	
3	12	
4	12	
5	11	
6	12	
7	14	
8	13	
9	14	
10	12	
11	12	
12	12	
13	~~8~~	
14	13	
15	12	
16		
17		
18		
19		
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

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

Replicate # A		
Fish	Length (mm)	Normal/ Abnormal
1	10	N
2	14	
3	10	
4	14	
5	9	
6	13	
7	11	
8	14	
9	13	
10	10	
11	14	
12	10	
13	9	
14	13	
15	9	
16	11	
17	11	
18	11	
19		
20		

Mean Length (mm) : 11.4
 # Normal: 18

Replicate # B		
Fish	Length (mm)	Normal/ Abnormal
1	11	N
2	10	
3	14	
4	13	
5	11	
6	13	
7	13	
8	13	
9	12	
10	10	
11	11	
12	12	
13	15	
14	11	
15	13	
16	8	
17		
18		
19		
20		

Mean Length (mm) : 11.9
 # Normal: 16

Replicate # C		
Fish	Length (mm)	Normal/ Abnormal
1	11	N
2	9	
3	12	
4	10	
5	10	
6	12	
7	13	
8	13	
9	15	
10	7	
11	13	
12	14	
13	12	
14	9	
15	13	
16	12	
17	9	
18	11	
19	10	AS
20		

Mean Length (mm) : 11.3
 # Normal: 18

Replicate # D		
Fish	Length (mm)	Normal/ Abnormal
1	10	N
2	13	
3	16	
4	12	
5	15	
6	10	
7	10	
8	12	
9	13	
10	12	
11	10	
12	13	
13	10	
14	11	
15	10	
16	13	
17	11	
18	12	
19	10	
20	9	AS

Mean Length (mm) : 11.6
 # Normal: 19

Comments

Reviewed By: VL Date Reviewed: 2024/11/14

NAUTILUS ENVIRONMENTAL

Organism Weights Bench Sheet

Client Agg108 Sample RJ 2425-002 Organism ~~#3~~ FM Batch 20241008FMELS

	Item Weighed	Date	Initials	Balance*
Initial Weight (mg):	dried pan	2024/10/08	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 Initial	CTL Final	T1 Initial	T1 Final	T2 Initial	T2 Final	T3 Initial	T3 Final	T4 Initial	T4 Final	T5 Initial	T5 Final
a	779.50	~~811.30~~ DNC	771.70	804.87	774.12	810.89	772.92	809.06	762.05	797.36	767.67	796.23
b	787.52	820.89	771.64	804.70	781.52	818.61	766.09	801.32	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	T6 Final										
a	780.65	811.72										
b	792.59	821.68										
c	772.53	807.53										
d	771.49	809.38										
e												

Balance Calibration Check:

	Initial	Final
first pan weighed:	CTL A	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**

Test Validity Met: **Yes/No/NA**

Results are Logical:** **Yes/No**

** no negative numbers, consistent values across replicates

$$\% \text{ difference} = \frac{\text{(initial weight - reweight)}}{\text{(initial weight + reweight) / 2)}} \times 100\%$$

If "no" is circled for any parameter, notify Lab Supervisor/ QA Group to determine appropriate action

Reviewed By: [illegible] Date Reviewed: 2024/11/14

NAUTILUS ENVIRONMENTAL

Fathead Minnow Bench Sheet

Method FMD 32 Day ELS Client AGN108 Sample PJ2425-002

New Solutions

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	1346	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	1934	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	1998	3190
3	451	679	867	1021	1365	1981	3330
4	444	673	858	1010	1356	1971	3320
5	458	650	841	1005	1350	1959	3280
6	432	671	851	1000	1338	2020	3300
7	457	663	851	1003	1346	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	7.5	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: JP Date Reviewed: 2024/11/14

NAUTILUS ENVIRONMENTAL

Fathead Minnow Bench Sheet

Method FMD 32 Day ELS Client AGN108 Sample PJ2425-002

JP

New Solutions

pH (units)

Day	LAB CTL	T1	T2	T3	T4	T5	T6
9	8.0	6.7	7.0	7.7	7.3	7.5	7.2
10	8.2	7.1	7.2	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)

Day	LAB CTL	T1	T2	T3	T4	T5	T6
9	444	668	852	1005	1353	1962	3310
10	440	658	835	999	1327	2000	3240
11	447	671	857	997	1345	1954	3220
12	440	661	853	1008	1345	2010	3260
13	431	654	856	1016	1944	1978	3280
14	436	652	854	1006	1945	2010	3250
15	439	660	857	1005	1340	1942	3280
16	429	650	851	1003	1344	2020	3270
17	439	671	859	1011	1358	1976	3340

Dissolved Oxygen (mg/L) (60-100% saturation)

Day	LAB CTL	T1	T2	T3	T4	T5	T6
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)

Day	LAB CTL	T1	T2	T3	T4	T5	T6
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

pH (units)

Day	LAB CTL	T1	T2	T3	T4	T5	T6
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)

Day	LAB CTL	T1	T2	T3	T4	T5	T6
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	642	855	1024	1357	1960	3280
14	451	662	858	1005	1357	2040	3300
15	450	671	858	1017	1353	1946	3280
16	478	678	865	1024	1356	1962	3300
17	455	681	870	1026	1377	2000	3380

Dissolved Oxygen (mg/L) (60-100% saturation)

Day	LAB CTL	T1	T2	T3	T4	T5	T6
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)

Day	LAB CTL	T1	T2	T3	T4	T5	T6
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: JP

Date Reviewed: 2024/11/14

NAUTILUS ENVIRONMENTAL

Fathead Minnow Bench Sheet

Method FMD 32 Day ELS Client AGN108 Sample PJ2425-002

JP

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	950	999	1349	2020	3240
20	420	650	861	1016	1347	2020	3350
21	416	648	865	1013	1342	2030	3300
22	415	660	823	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	1358	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	7.9
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

LAB CTL	T1	T2	T3	T4	T5	T6
pH (units)						
8.0	7.9	8.0	8.0	8.0	7.9	7.2
7.8	7.7	7.8	7.8	7.9	7.7	7.4
7.9	7.7	7.8	7.9	7.9	7.7	7.2
7.8	7.8	7.9	7.9	7.9	7.8	7.4
7.9	7.9	7.9	7.9	7.9	7.8	7.4
7.9	7.9	8.0	8.0	8.0	7.8	7.4
7.8	7.8	7.9	7.8	7.8	7.7	7.2
7.8	7.8	7.8	7.8	7.8	7.7	7.2
7.9	7.9	7.9	7.9	7.9	7.8	7.3
Conductance (µS/cm)						
450	678	868	1024	1372	2080	3370
471	674	861	1012	1346	2040	3240
446	651	851	1013	1361	2070	3320
455	667	860	1024	1359	2040	3290
451	661	859	1024	1363	2030	3300
437	672	864	1027	1360	1960	3220
468	681	875	1033	1357	1962	3300
472	688	881	1034	1383	2020	3390
505	677	866	1028	1359	1956	3320
Dissolved Oxygen (mg/L) (60-100% saturation)						
7.3	7.0	7.0	7.0	6.9	7.0	6.9
7.3	7.1	7.1	6.9	7.0	7.0	7.0
7.3	6.9	6.9	6.9	6.9	6.9	6.9
7.0	7.0	7.0	7.0	6.9	7.0	7.0
7.0	7.0	7.0	7.0	7.0	7.0	7.0
7.3	7.0	7.0	7.0	7.0	7.0	7.0
7.0	6.8	6.7	6.7	6.7	6.7	6.6
6.9	6.8	6.7	6.6	6.6	6.6	6.6
6.7	6.8	6.8	6.9	6.9	6.9	7.0
Temperature (°C)						
24	24	24	24	24	24	24
24	24	24	24	24	24	24
24	24	24	24	24	24	24
24	24	24	24	24	24	24
24	24	24	24	24	24	24
24	24	24	24	24	24	24
24	24	24	24	24	24	24
24	24	24	24	24	24	24
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. (%) ✓	LAB CTL	T1	T2	T3	T4	T5	T6
Day							
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	696	862	1034	1364	2050	3251
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	7.3	7.3	7.3	7.3	7.3	7.3	7.3
29	7.3	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

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	3290
31	458	682	859	1077	1318	1957	3270
32	456	689	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: [illegible] 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

CETIS Summary Report

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

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

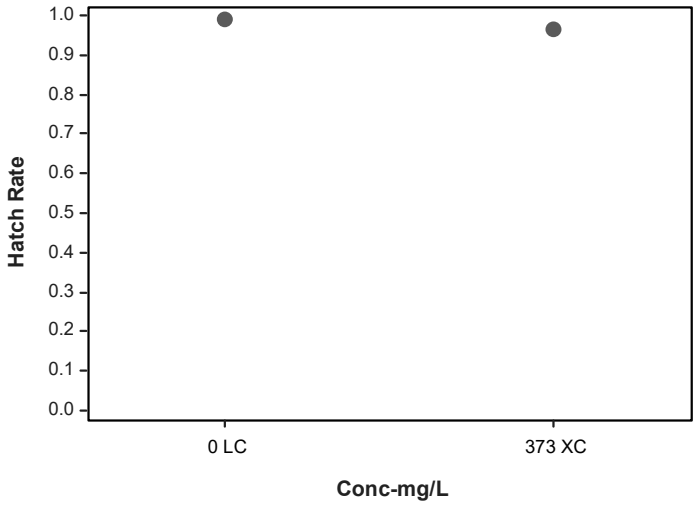
Hatch Rate Binomials

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



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

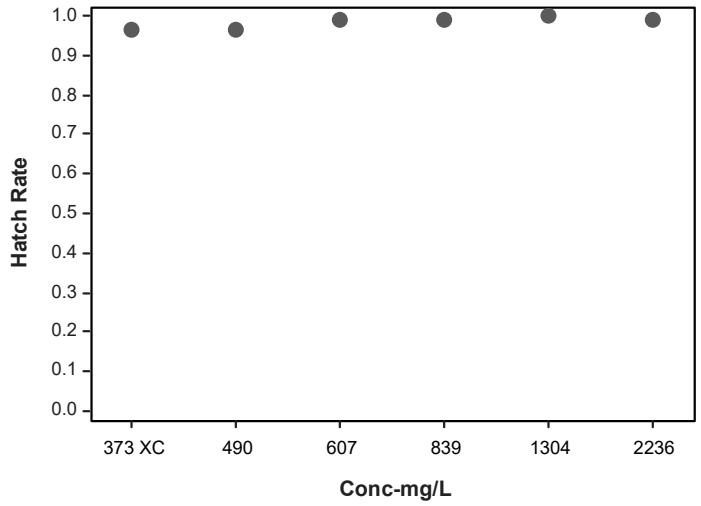
Fathead minnow (Pimephales promelas) 32-d survival and growth test **Nautilus Environmental Calgary**

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

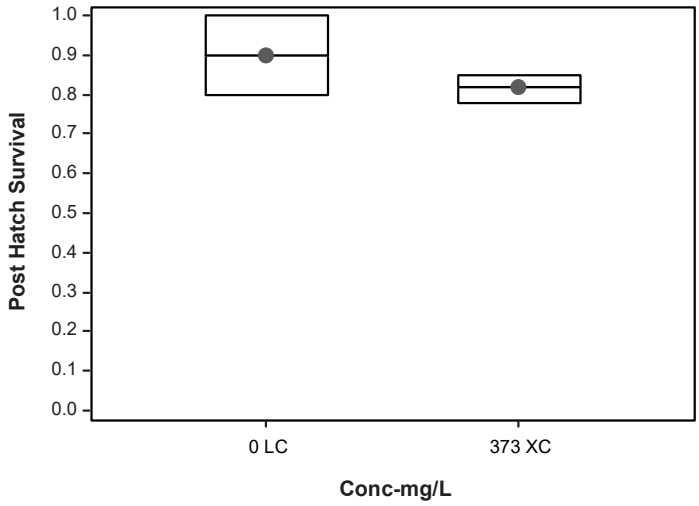
Post Hatch Survival Binomials

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

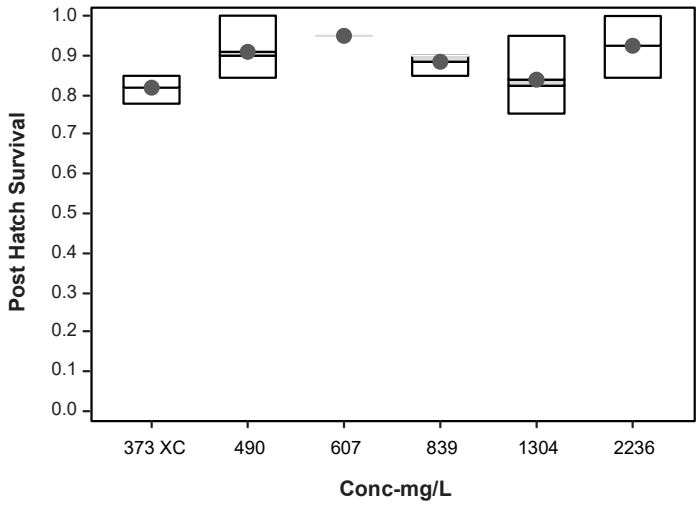
Fathead minnow (Pimephales promelas) 32-d survival and growth test **Nautilus Environmental Calgary**

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



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

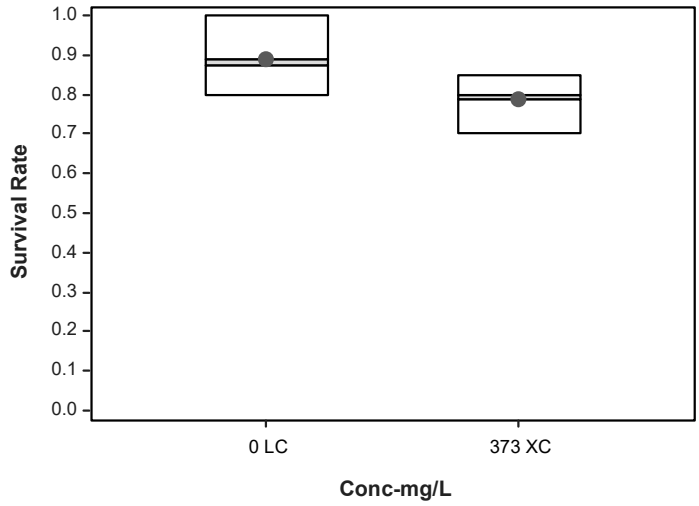
Survival Rate Binomials

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



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

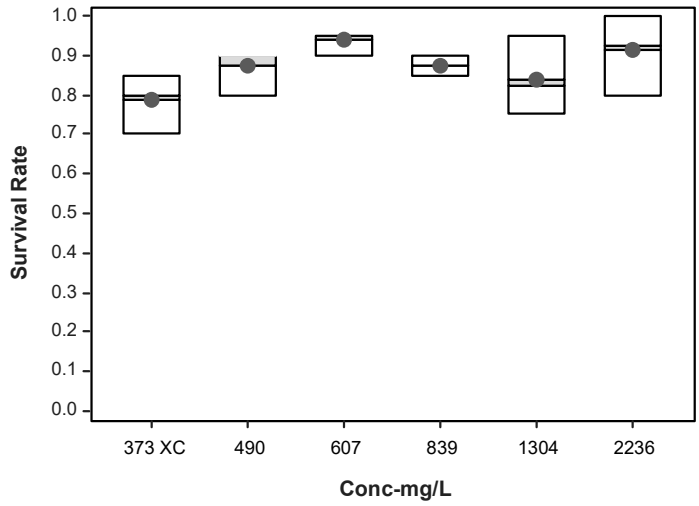
Fathead minnow (Pimephales promelas) 32-d survival and growth test **Nautilus Environmental Calgary**

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

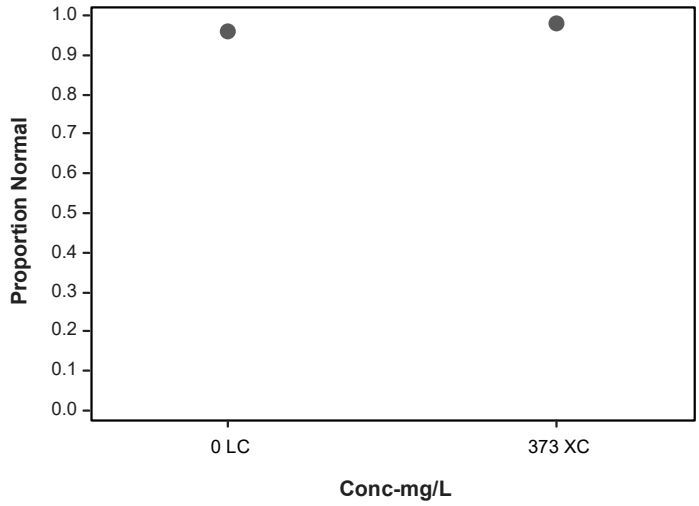
Proportion Normal Binomials

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

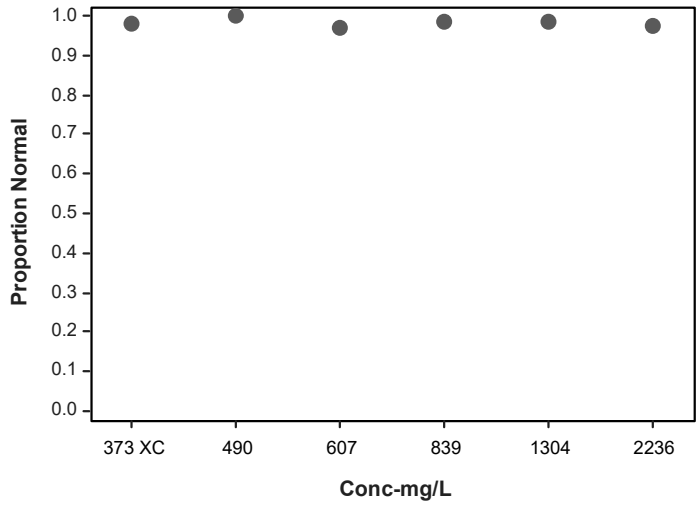
Fathead minnow (Pimephales promelas) 32-d survival and growth test **Nautilus Environmental Calgary**

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%

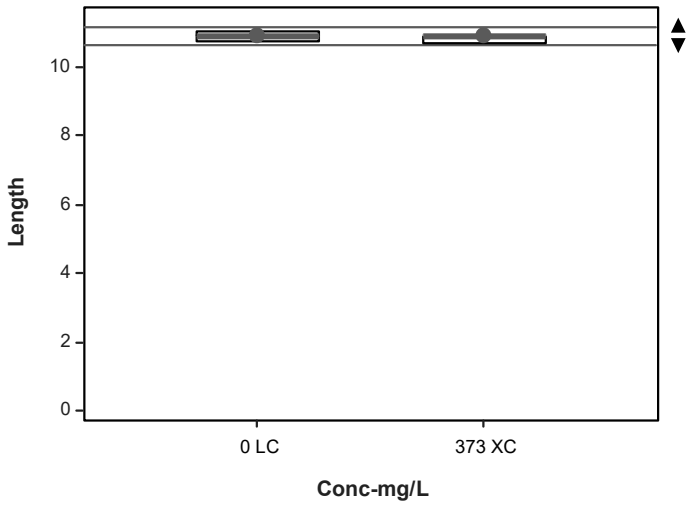
Length Detail

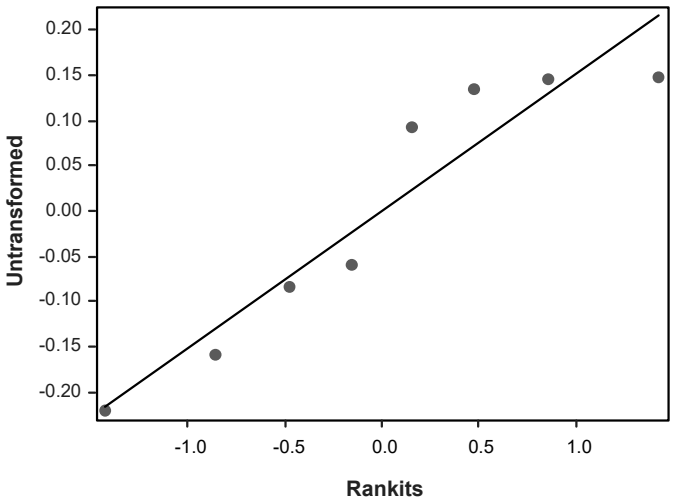
Conc-mg/L	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	LC	10.75	11.06	10.82	11
373	XC	11.06	10.71	11.07	10.87

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





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%

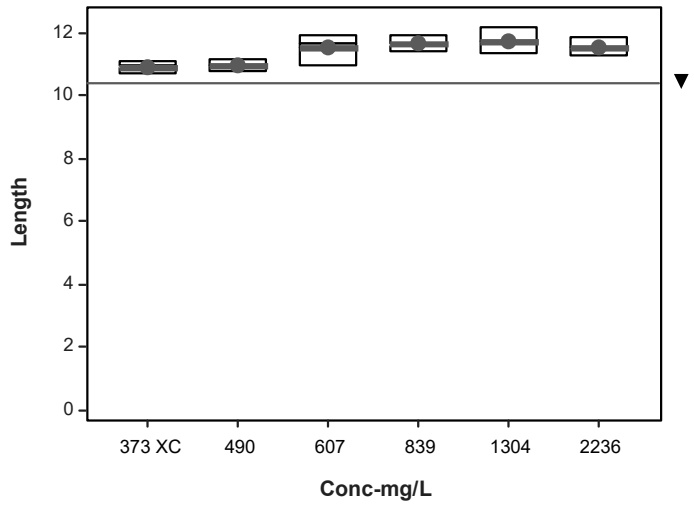
Length Detail

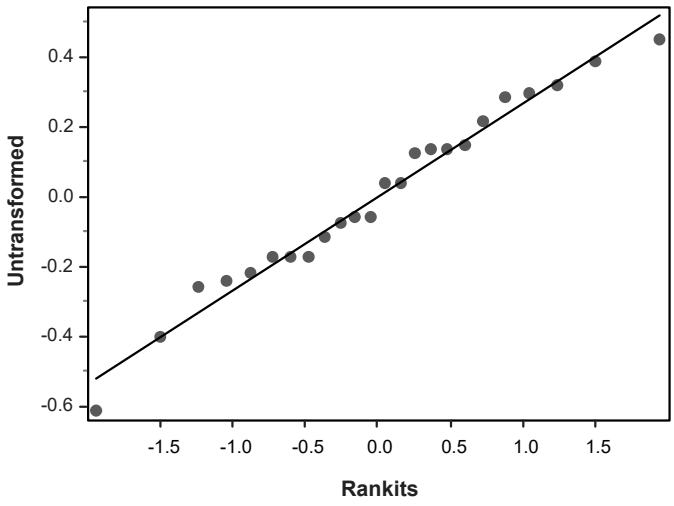
Conc-mg/L	Code	Rep 1	Rep 2	Rep 3	Rep 4
373	XC	11.06	10.71	11.07	10.87
490		10.79	10.89	11.18	11
607		11.95	11.84	11.5	10.95
839		11.94	11.39	11.78	11.47
1304		11.88	11.35	11.58	12.2
2236		11.44	11.88	11.32	11.6

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%

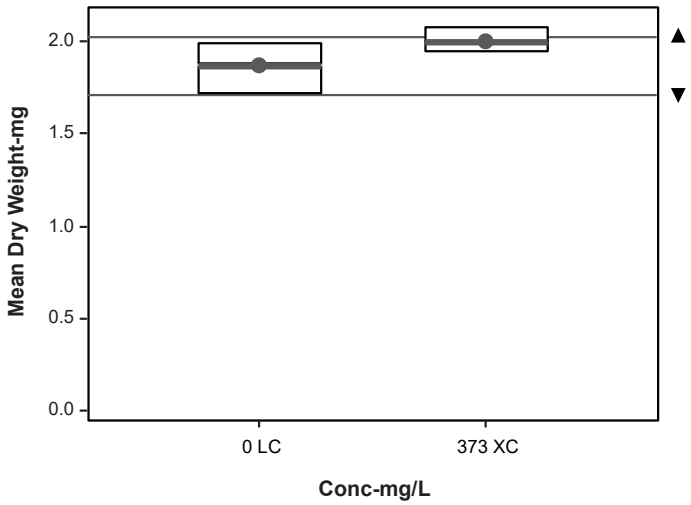
Mean Dry Weight-mg Detail

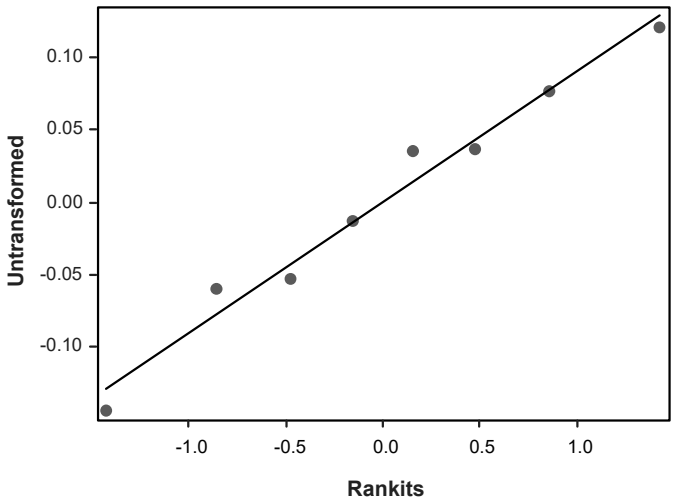
Conc-mg/L	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	LC	1.987	1.854	1.724	1.903
373	XC	1.951	1.945	2.04	2.081

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:**	

Graphics





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%

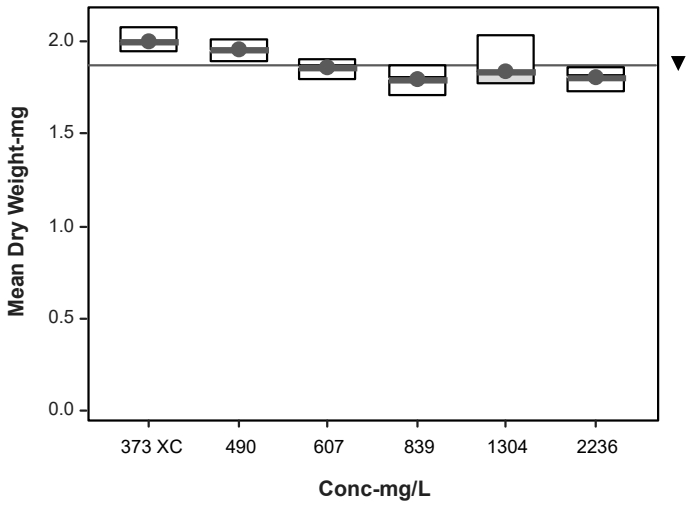
Mean Dry Weight-mg Detail

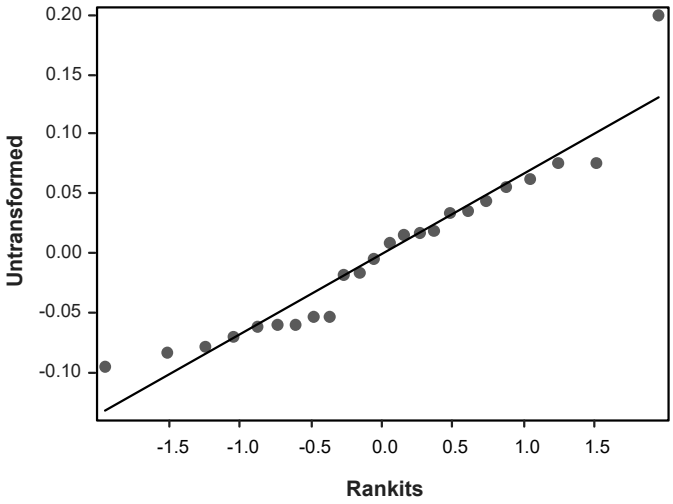
Conc-mg/L	Code	Rep 1	Rep 2	Rep 3	Rep 4
373	XC	1.951	1.945	2.04	2.081
490		1.935	1.894	2.015	1.968
607		1.902	1.854	1.797	1.877
839		1.783	1.875	1.833	1.705
1304		1.785	1.761	1.769	2.037
2236		1.726	1.818	1.826	1.865

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.

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 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
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	Client sample ID: 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*		*Eval*	*Analysis Date*	*Holding Times*		*Eval*
				Rec	*Actual*			*Rec*	*Actual*	
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				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										
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				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	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 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 - 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

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	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; stephanie@nautilu	☐ 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 chelsea.grimard@wsp.com	Additional fees may apply to rush requests on weekends, statu
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	

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:		AFE/Cost Center:	PO#
Job #:		Major/Minor Code:	Routing Code:
PO / AFE:	2425-030AB	Requisitioner:	
LSD:		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 - 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)	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				FINAL COOLER TEMPERATURES °C			
16.1							

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (ALS use only)			FINAL SHIPMENT RECEPTION (ALS use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by:	Date:	Time:
AM	2024/10/08	1555	AH	10/9	1157			

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	:	**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 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*
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	Client sample ID: 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	Client sample ID	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	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	----	----	----	----
						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*		*Eval*	*Analysis Date*	*Holding Times*		*Eval*
				Rec	*Actual*			*Rec*	*Actual*	
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*				*Analysis*			
			Preparation Date	*Holding Times* Rec	*Holding Times* Actual	*Eval*	*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				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										
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				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	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				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	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 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 - 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.

ALS Canada Ltd.

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 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*
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	----

Chain of Custody (COC) / Analytical Request Form

COC Number: 22 -

Page 1 of 1

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

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	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
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
	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
Street:	10823 27 St SE	Email 1 or Fax: leila@nautilusenvironmental.ca; stephanie@nautilu	☐ 1 day [E] if received by 3pm M-F - 100% rush surcharge
City/Province:	Calgary, AB	Email 2: lisa.ramilo@agnicoeagle.com	☐ Same day [E2] if received by 10am M-S - 200% rush su
Postal Code:	T2Z 3V9	Email 3: chelsea.gnmard@wsp.com	Additional fees may apply to rush requests on we
Invoice To	Same as Report To ☑ YES ☐ NO	Invoice Recipients	Date and Time Required for all E&P TATs:
	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	

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:		AFE/Cost Center:	PO#:
Job #:		Major/Minor Code:	Routing Code:
PO / AFE:	2324-061AB	Requisitioner:	
LSD:		Location:	
ALS Lab Work Order # (ALS use only):		ALS Contact:	Sampler:

Analysis Request

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	PRCI - Routine	Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below	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				FINAL COOLER TEMPERATURES °C			
			9				

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (ALS use only)			FINAL SHIPMENT RECEPTION (ALS use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by:	Date:	Time:
	2024/10/23	1900					10/23	1452

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	Client sample ID: 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)

					Client sample ID	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	----	----
Analyte	CAS Number	Method/Lab	LOR	Unit		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 / 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 - 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				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										
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				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	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 -

Page 1 of 1

Canada Toll Free: 1 800 668 9878

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; 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

Project Information	
ALS Account # / Quote #:	
Job #:	
PO / AFE:	2425-062AB
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:

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	
	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

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.

SAMPLES ON HOLD | EXTENDED STORAGE REQUIRED | SUSPECTED HAZARD (see notes)

Environmental Division
Calgary
Work Order Reference
CG2416747

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			
12							

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (ALS use only)			FINAL SHIPMENT RECEPTION (ALS use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by:	Date:	Time:
AM	2024/11/09	7:50		11/9	1112			

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

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FEB 2024 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.

END OF REPORT

Appendix C – Assimilative Capacity Report – Wally Lake

REPORT

Assimilative Capacity Assessment of Wally Lake Meadowbank Mine

Submitted to:

Agnico Eagle Mines Limited

Submitted by:

WSP Canada Inc.
Suite 3300, 237 - 4 Avenue SW, Calgary, AB
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+1 (403) 243-8380

CA0020740.2497-MBK2024_035-R-Rev1-CA-NuqsanaGolder_MBK2024 Water Projects

January 27, 2025

Distribution List

1 e-copy - Agnico Eagle Mines Limited

1 e-copy - WSP Canada Inc.

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APPENDIX A
Estimated Drainage Area Maps
Lake Ambient Concentration Data
Non-Contact Overland Drainage Sampling Data

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Effluent Quality Criteria

1 INTRODUCTION

WSP was retained by Agnico Eagle Mines Limited (Agnico) to complete a high-level assimilative capacity study for Wally Lake in the receiving environment of the Meadowbank Mine (Mine). The purpose of the study was to:

- compare the predicted total dissolved solids (TDS) in Wally Lake as a result of effluent discharge to water quality thresholds, and
- identify an alternative discharge criterion for TDS if the threshold was exceeded

The study includes cases that consider both the lake-wide water quality and the water quality at the edge of the mixing zone. The effluent is planned to be stored in the Vault Pit and then discharged to Wally Lake seasonally. This report presents the approach, inputs, and assumptions used to develop Wally Lake assimilative capacity model.

2 ASSESSMENT APPROACH

A mass balance model was developed in Microsoft Excel to assess the assimilative capacity of Wally Lake (i.e., the Wally Lake Model). The model assumes the lake is fully mixed and has a constant water level. The model predicted the resulting in-lake TDS concentrations (lake-wide and at the edge of the mixing zone) based on the effluent chemistry provided by Agnico (Agnico 2024a). A CREMP threshold has never been developed for TDS for Wally Lake because of the high site specificity of this parameter related to the specific composition of the ions, its major ionic speciation and composition, and other dissolved solids present in water. This challenge is reflected in the absence of any federal water quality guideline, except for an aesthetic objective of less than or equal to 500 mg/L for TDS (Health Canada 1991). A Site-Specific Water Quality Objective (SSWQO) of 1,000 mg/L has been developed (WSP 2024) to protect site-specific aquatic life assemblages in Wally Lake. The SSWQO of 1,000 mg/L at the edge of the mixing zone was used to develop maximum effluent quality criteria that applies at the end of pipe (Appendix B). Model predictions therefore were compared against the proposed SSWQO submitted to the Nunavut Water Board (NWB) as an Operational Notice (August 22, 2024), which sets a threshold for TDS at 1,000 mg/L in the receiving environment for the protection of aquatic life. As part of this assessment, if predicted TDS concentrations exceeded the SSWQO (WSP 2024) at the edge of the mixing zone, then TDS would be identified as a Constituent of Potential Concern (COPC). If TDS concentrations are predicted to exceed the SSWQO, an alternative discharge criterion was estimated to allow the SSWQO to be met at the edge of mixing zone.

The model inputs, assumptions, and results are described in the following sections.

2.1 Modelled Period and Scenarios

The Wally Lake Model simulation period was 47 years, from 2022 to 2069. This period covered the discharge period modeled for closure (i.e., 2037 to 2060) with the following periods of no discharge: 2022 to 2036, and 2061 to 2069. The period after the cessation of effluent discharge (i.e., 2061 to 2069) was included to assess the lake's recovery trajectory towards conditions similar to background water quality conditions.

The following two scenarios were simulated using the Wally Lake Model:

- Scenario 1 (Original Discharge Scenario) – This scenario represents the model run with the effluent chemistry provided by Agnico (Agnico 2024a).

- Scenario 2 (Alternative Discharge Scenario) – This scenario represents the model run with a reduction factor applied to the effluent TDS used in Scenario 1, to estimate an alternative discharge criterion. Based on the results of Scenario 1, a reduction factor was applied to TDS concentrations that were predicted to exceed the SSWQO at the edge of the mixing zone (95th percentile) such that the predicted TDS concentrations no longer exceed the threshold at the edge of the mixing zone.

2.2 Model Inputs

Inputs to the Wally Lake Model and their sources are described in this section.

Model inputs are categorized into the following groups:

- Geometric Data:
  - Lake bathymetry
  - Lake surface area and volumes
  - Lake surface water elevation
  - Lake stage-storage curves
- Hydrologic Data:
  - Natural surface runoff rate
  - Effluent discharge rate
  - Ice formation and melting rates
- Water Quality:
  - Ambient lake TDS chemistry
  - Natural surface runoff TDS chemistry
  - Effluent TDS chemistry

2.2.1 Geometric Data Inputs and Assumptions

Below is the summary of inputs and assumptions used to represent the Wally Lake in the model:

- The lake was represented using its stage-storage curve, which was derived from the lake bathymetric map provided by Agnico (Agnico 2022).
- The model domain included the entire lake. It was assumed the surface water elevation of the lake was constant at 139.4 m above sea level (masl) (Agnico 2020).
- The surface area and volume of Wally Lake are approximately 5,870,000 m^2 and 24,374,000 m^3, respectively. Figure 1 presents the stage-storage curve of the lake.

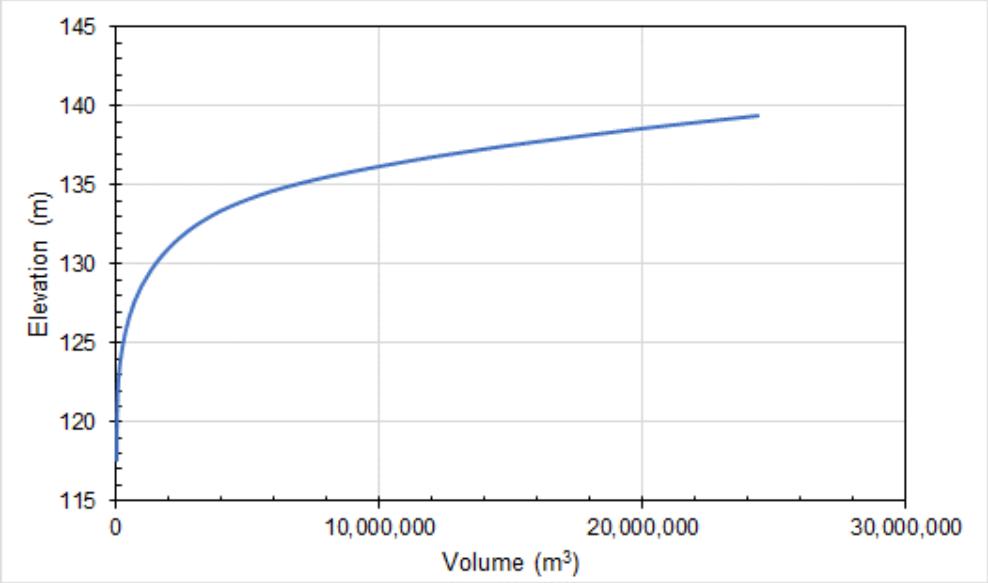


Figure 1: Wally Lake Stage-storage Curve.

2.2.2 Hydrologic Data Inputs and Assumptions

Hydrological inputs to the model included natural surface runoff, effluent discharge, and ice formation and melting. During the discharge period, Wally Lake received natural surface runoff and effluent discharge. When there was no effluent discharge to the lake, natural runoff was the only inflow to the lake.

The hydrologic data and related assumptions are described below:

1) Outflows from the lake were assumed to be same as the daily inflows to the lake due to unavailable data for water levels and outflow rates.

2) Direct precipitation to the lake and evaporation from the lake surface were not included in the model. On average, the annual precipitation in Central Nunavut (~200 to 400 mm) is higher than the annual evaporation (~100 to 300 mm) at the Mine site (Minister of Supply and Services Canada 1978). Thus, the results presented in this model are considered conservative.

3) Natural surface runoff:

   - The surface runoff to the lake was estimated by prorating the total runoff to Third Portage Lake (TPL) (Cumberland 2005) based on the surface drainage area of Wally Lake and total surface drainage area of TPL. These calculations were done under average climate conditions.
   - To estimate the drainage area of Wally Lake, geospatial data from the National Hydrograph Network was used, which provided catchment boundaries and flow paths that are associated with the lake. Using the Google Earth imagery, the basin size was estimated and compared against the total TPL surface drainage area (88.9 km^2; Cumberland 2005) to ensure the estimate was appropriate. Table 1 summarizes the estimated drainage basin area used in the model. A map of the estimated drainage area used in the model is presented in Appendix A, Figure A-1.

- Under average climate conditions, assuming a two-year return period, the total runoff to TPL was approximated as 110 mm (Cumberland 2005). The runoff behaviour of the Mine area indicated that the open water season is from June to October (Cumberland 2005). This distribution of runoff was applied to the total drainage area of TPL (88.9 km^2; Cumberland 2005) to estimate the monthly inflows into TPL (Table 2). The approximate monthly natural runoff inflow to the Wally Lake basin was then estimated (Table 3).
- Lake retention time (estimated based on the annual flows into the lake) is presented in Table 4.

Table 1: Estimated Drainage Basin Surface Areas, Third Portage Lake and Wally Lake

Lake	Estimated Drainage Area (km^2)	Proportion of Third Portage Lake (%)
Third Portage Lake - Total	88.9	100
Wally Lake	64.5	73

Note: km^2 = square kilometre; % = percent

Table 2: Monthly Runoff Characteristics to Third Portage Lake

Month	Proportion of Annual Runoff (%)	Runoff Depth (mm)	Runoff Rate (m^3/month)
June	30	33	2,933,700
July	40	44	3,911,600
August	20	22	1,955,800
September	9	10	880,110
October	1	1.1	97,790
Total	**100**	**110**	**9,779,000**

Note: m^3 = cubic metre; mm = millimetre

Table 3: Estimated Monthly Runoff to Wally Lake

Month	Wally Lake (m^3/month)
Jan	0
Feb	0
Mar	0
Apr	0
May	0
Jun	2,128,203
Jul	2,837,604
Aug	1,418,802
Sep	638,461
Oct	70,940
Nov	0
Dec	0
Annual	**7,094,010**

Note: m^3/month = cubic metres per month

Table 4: Estimated Lake Retention Times

Lake	Lake Volume (m^3)	Estimated Total Annual Outflow (m^3/year)	Estimated Annual Effluent Rate[a] (m^3/year)	Estimated Average Retention Time (no Discharge Period (years)	Estimated Average Retention Time During Discharge Period (years)
Wally Lake	24,374,000	7,094,010	1,590,000	3.4	2.8

Note: m^3 = cubic metres; m^3/year = cubic metres per year

a) average annual discharge rate from 2037 to 2060

Effluent Discharge

Effluent discharged period (open water only) and rates are presented in Table 5, and Figure 2 (Agnico 2024a).

Table 5: Effluent Discharge Rates and Periods For Scenario 1

Discharge Year	Months of Discharge	Annual Discharge Rate (m^3/year)
2037	July, August	2,380,000
2038	August, September	1,400,000
2039	June to September	4,680,000
2040		2,910,000
2041		1,200,000
2042		1,760,000
2043	June, August, September	1,210,000
2044		1,160,000
2045	June	560,000
2046	June, August, September	1,340,000
2047	June, September	1,040,000
2048	June, July, September	1,720,000
2049	July to September	1,830,000
2050		1,070,000
2051	June, August, September	1,620,000
2052	June, September	790,000
2053	June	1,140,000
2054	June to September	2,190,000
2055		1,500,000
2056	June, September	1,320,000
2057	June, July, September	1,100,000
2058	June, September	1,390,000
2059		1,060,000
2060	June to September	1,770,000

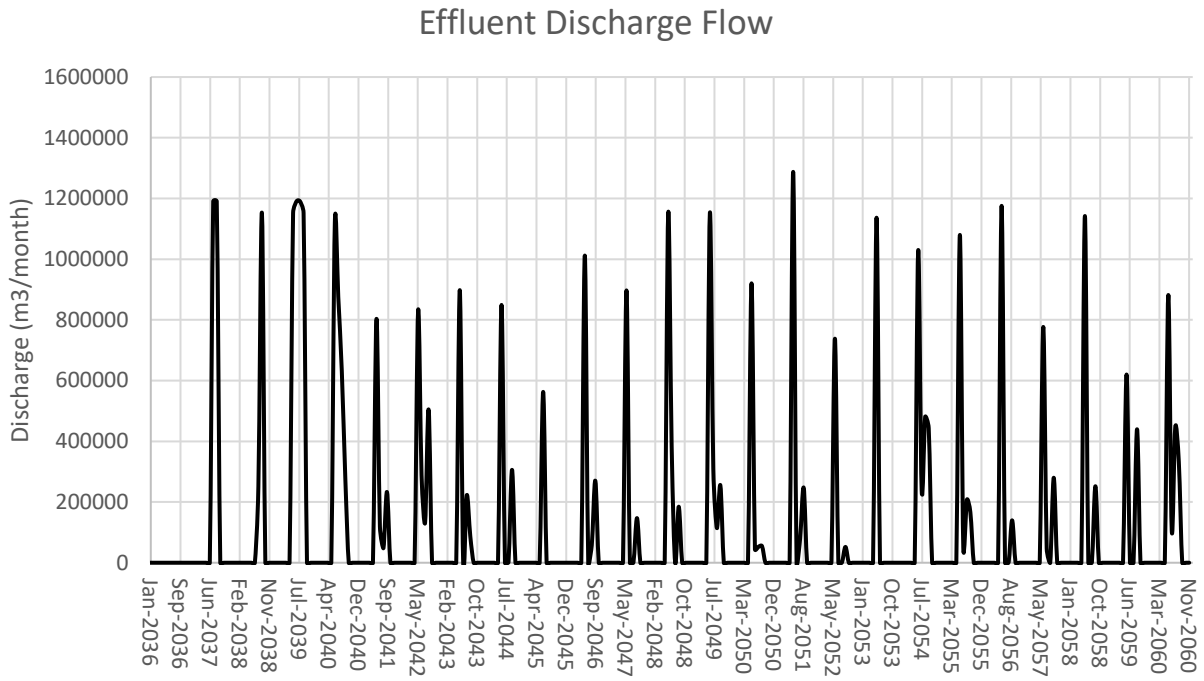


Figure 2: Effluent Discharge Flow (Agnico 2024a)

Ice Formation and Melting:

- Ice formation occurred evenly over a 30-day period from October 1 to 31 each year.
- Ice thawing occurred evenly over a 30-day period from May 1 to 31 each year.
- A maximum ice thickness of 2 m was assumed based on monitored data for the Mine area (Cumberland 2005).
- Water was gradually drawn from the lake to compensate for the rate of ice formation and to consider the reduction in the lake volume. The water was gradually returned from ice to the lake during the melt period to simulate ice-melt.
- The ice formation and melting process was applied in each year in the simulation period.
- It is assumed that salts are rejected from the water during ice formation (i.e., the total mass of dissolved solids remained the same, but the lake's water volume decreased proportionally with that represented by ice formation), and pure water was added back as the ice melted.
- The volume of water removed to form ice and returned during melting was adjusted by a factor of 0.92 to account for the density difference between ice and freshwater.

2.2.3 Water Quality Inputs and Assumptions

Water quality inputs applied in the Wally Lake Model are described below:

1) Ambient lake chemistry:

   - The 75th percentile concentration of data collected in Wally Lake from 2020 to 2023 (Agnico 2024c) were used in the model to define the ambient TDS concentrations in the Wally Lake (i.e., the initial conditions) (Table 6).
   - The raw data used to develop the ambient concentrations in Wally Lake are presented in Appendix A, Table A-1.

2) Natural surface runoff chemistry:

   - The average concentration of non-contact overland drainage data collected at 6 sampling locations (SV-1, SV-2, PST-1, SP-1, SP-2, and SP-3) at the Meadowbank site (Table 5-12, Cumberland 2005) was used to estimate TDS concentrations of natural surface runoff to Wally Lake.
   - The raw data used to develop the natural runoff concentrations Wally Lake are presented in Appendix A, Table A-2.

3) Effluent discharge chemistry:

   - Effluent TDS concentrations (Agnico 2024a) are presented on Figure 3. The reported effluent concentration of TDS without a reduction factor was considered as the effluent water quality input to the Wally Lake Model for Scenario 1.

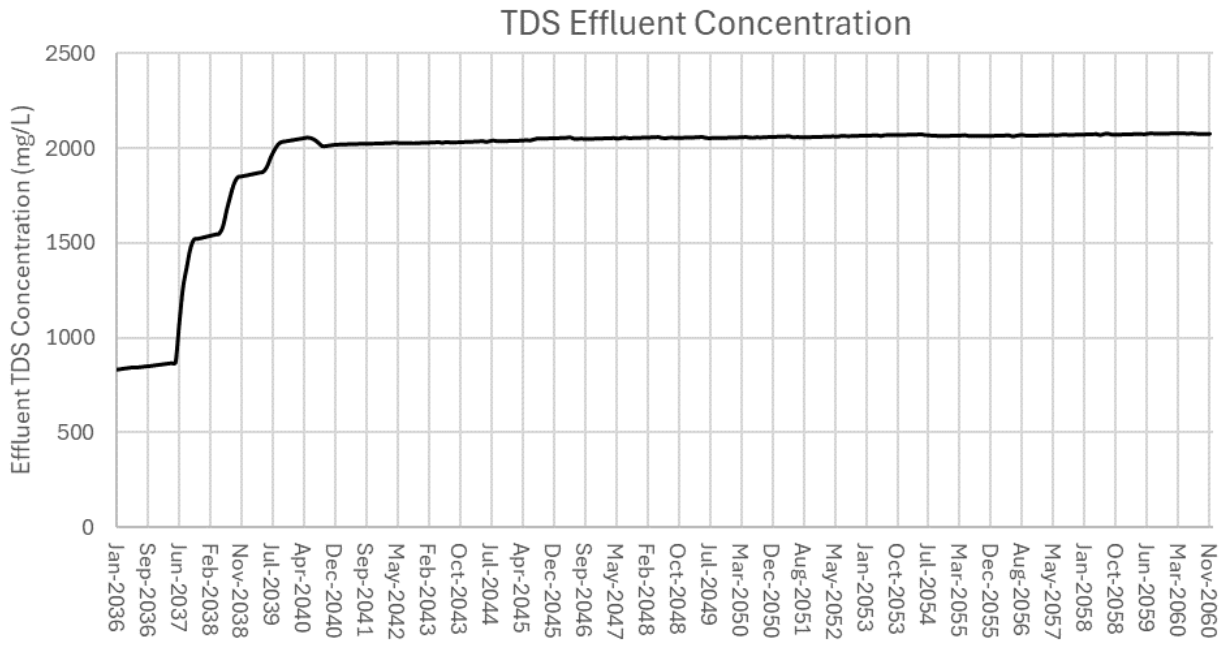


Figure 3: Total Dissolved Solids (TDS) Effluent Concentrations (Agnico 2024a).

Table 6: Model Input Chemistry – Ambient, Natural Runoff, and Effluent Inflow Chemistry

Constituent	Wally Lake Ambient Concentrations		Natural Runoff Concentrations		Effluent		
					Discharge Criteria	Discharge Concentrations[a]	
	(75th %ile)	Min - Max	Average	Min - Max	Acute	Average	Min - Max
Conventional Constituents (mg/L)							
TDS	36	19 - 51	24	13 - 28	-	2015	1,254 – 2,075

Note:

a) Average, minimum and maximum effluent concentrations are determined based on when effluent flow is active

2.3 Model Assumptions and Limitations

Below is the list of overall assumptions and limitations applied in this study:

- This study considered a mixing zone for discharge to the lake. Based on the data provided by Agnico (Agnico 2024b; Tetra Tech 2024), the edge of the mixing zone was set where a minimum dilution factor of 2:1 was achieved. As the model does not predict spatial variations for concentrations within the mixing zone or the lake itself, the size or extent of the mixing zone was not needed.
- Water chemistry data used as inputs to the model were representative of their respective sources. This is an inherent assumption in all modelling: *that data obtained as part of sampling programs used in the modelling adequately represent the input sources*.
- Water quality constituents were modelled conservatively in the water column, which means that they would not undergo chemical, biological, or physical processes that may transform, enhance, or reduce their presence.

3 MODEL RESULTS

Predicted 95th percentile in-lake concentrations for TDS at the edge of the mixing zone and on a lake-wide average basis for Scenarios 1 and 2 are presented in Table 7. Note, the predicted 95th percentile concentrations were determined only for the period of effluent discharge (June 2037 to Dec 2060). Figures 4 and 5 illustrate the predicted in-lake TDS concentrations (i.e., at the edge of the mixing zone and on a lake-wide average basis) as a timeseries over the 47-year simulation period for Scenarios 1 and 2 (January 2022 to Dec 2069).

In Scenario 1 (Original Discharge Scenario):

- The lake-wide average 95th percentile TDS concentration is predicted to be lower than the TDS SSWQO (Figure 4a).
- At the edge of the mixing zone, the 95th percentile TDS concentration is predicted to exceed the respective TDS SSWQO (1,000 mg/L) (Figure 4b).

Once effluent discharge ceases to Wally Lake, the TDS concentrations decline and return to baseline conditions over a nine-year period.

In Scenario 2 (Alternative Discharge Scenario), an alternative discharge criterion was considered, by reducing the original effluent TDS concentration applied in scenario 1, by a factor of 22%. As a result, daily timeseries of TDS concentrations for Scenario 2 show that the lake-wide and at the edge of mixing zone TDS concentrations are predicted to remain well below the TDS SWQO during the discharge period (Figure 5a and b).

The results indicate that to meet the current Project threshold at the edge of the mixing zone, an alternative effluent discharge criterion for TDS in the effluent is required.

Table 7: Predicted In-Lake 95th Percentile Concentrations in Wally Lake

Constituent	MAC EQC[c]	Chronic - SSWQO 2024	Chronic - FEQG	Reduction Factor (%)	Wally Lake	
					Edge of Mixing Zone	Lake-wide
					95th%ile[a,b]	
Physical Tests (mg/L)						
TDS (Scenario 1)	2,075	1,000	-	-	**1,285**	523
TDS (Scenario 2)	1,608	1,000	-	22	1,000	412

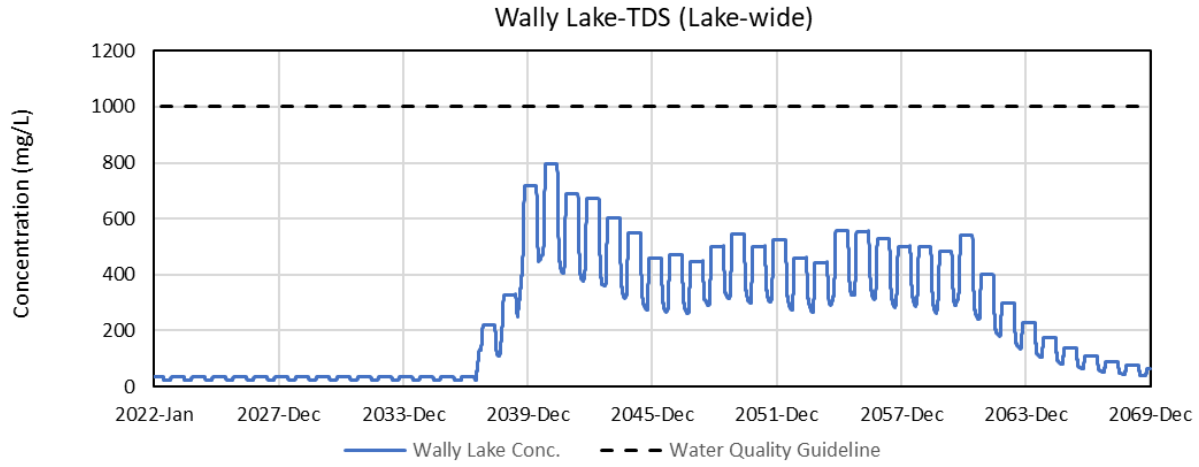
Note:

a) Cells shaded in grey are those for which the predicted 95th percentile concentration exceeds the TDS SSWQO (WSP 2024)

b) The 95th percentile concentrations presented are calculated over the entire active discharge period (i.e., 2037 to 2060)

c) MAC EQC is maximum average concentration effluent quality criterion (Appendix B)

a) Lake-wide TDS Concentrations:



b) At the Edge of Mixing Zone TDS Concentrations:

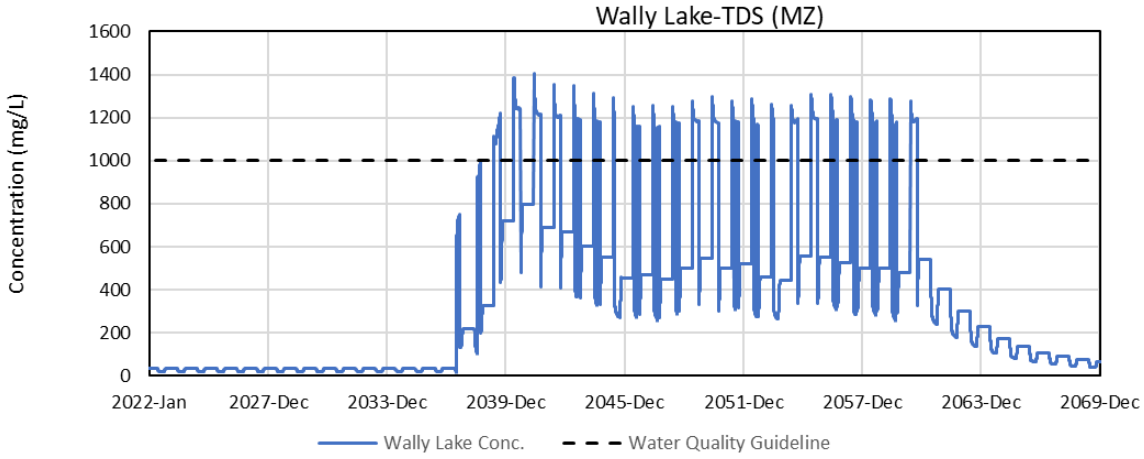
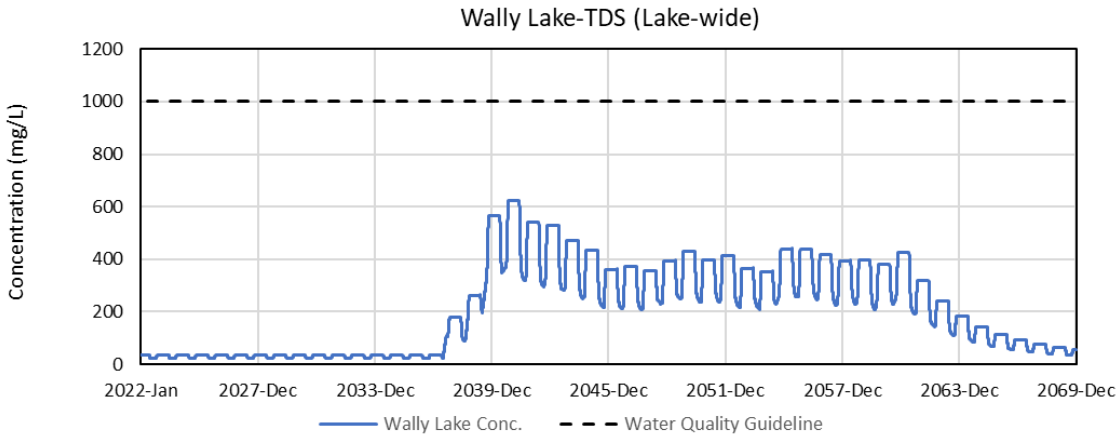


Figure 4: Timeseries of Predicted In-Lake Concentrations for Wally Lake (Scenario 1). a, b

a) Lake-wide TDS Concentrations:



b) At the Edge of Mixing Zone TDS Concentrations:

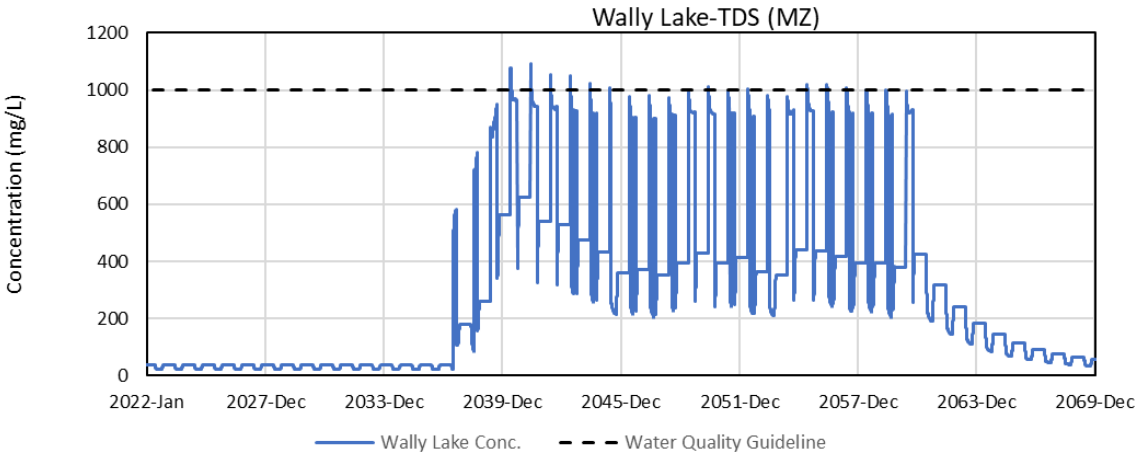


Figure 5: Timeseries of Predicted In-Lake Concentrations for Wally Lake (Scenario 2). a, b

4 SUMMARY AND CONCLUSIONS

A mass balance model was developed to assess assimilative capacity of the receiving environment in Wally Lake for effluent discharge at Agnico Eagle's Meadowbank Mine operations. The model predicted the in-lake TDS concentration for a period of 47 years (2022 to 2069), which included varying periods of discharge and no discharge, varying TDS concentrations in the effluent to be discharged, and screened the predicted concentrations against the SSWQO at the edge of mixing zone and lake-wide condition.

TDS was identified as a constituent of potential concern as modelled concentrations at the edge of the mixing were predicted to occasionally exceed the SSWQO. In response, a TDS reduction factor was estimated (i.e., 22%) and applied to effluent concentrations, which resulted in TDS concentrations meeting the SSWQO at the edge of mixing zone.

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APPENDIX A

Estimated Drainage Area Maps
Lake Ambient Concentration Data
Non-Contact Overland Drainage Sampling Data

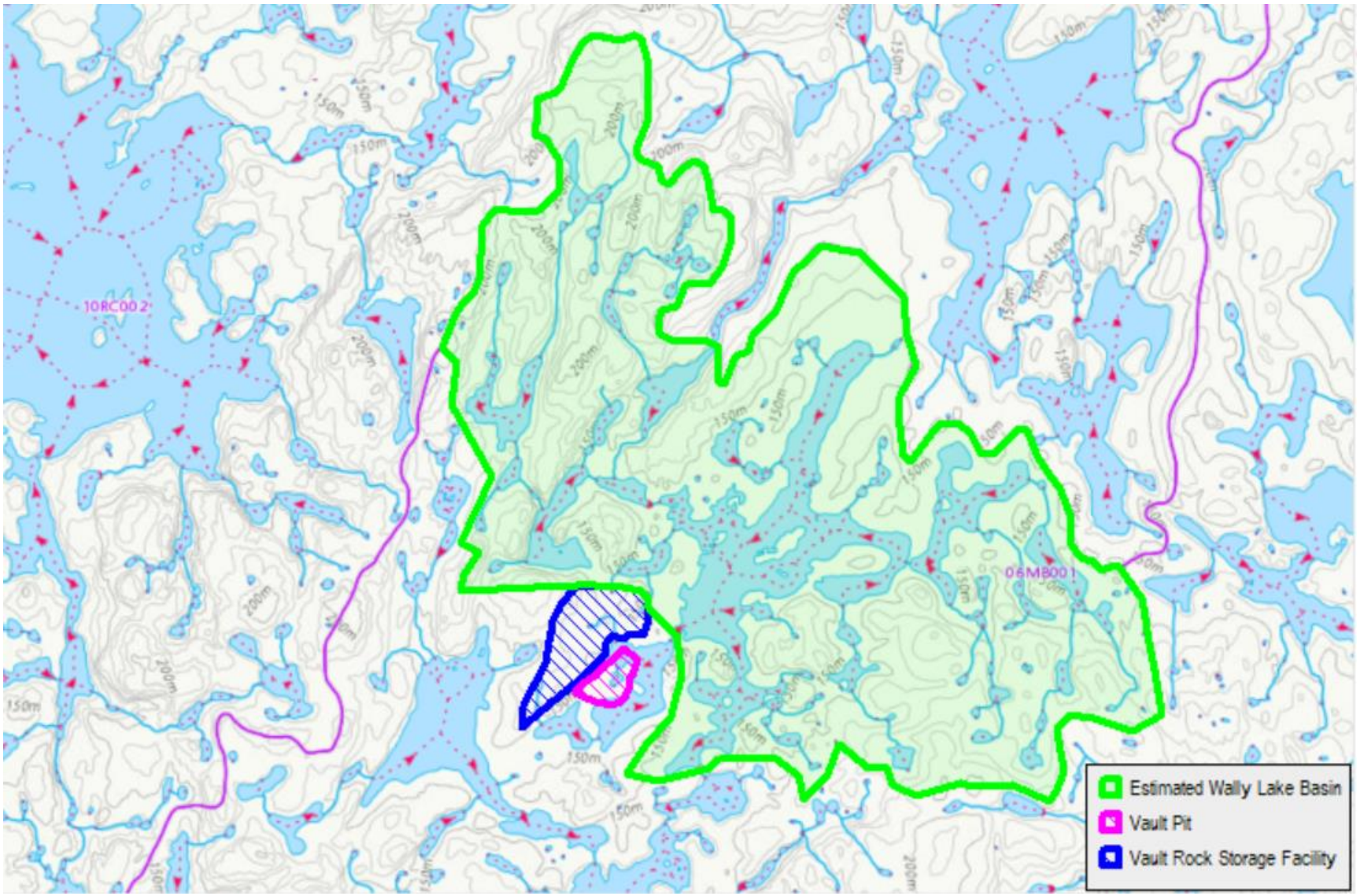


Figure A-1: Estimated Wally Lake Drainage Area

Table A-1: Wally Lake Ambient Water Quality Constituent Concentrations (2020-2023) (Agnico 2024c)

Location Name	Date	Season (Month)	Year	Total Dissolved Solids
				mg/L
Wally Lake	2020-05-09	May	2020	34
Wally Lake	2020-03-23	March	2020	47
Wally Lake	2020-03-23	March	2020	42
Wally Lake	2020-05-07	May	2020	40
Wally Lake	2020-05-07	May	2020	33
Wally Lake	2020-08-23	August	2020	26
Wally Lake	2020-08-23	August	2020	26
Wally Lake	2020-09-20	September	2020	28
Wally Lake	2020-09-11	September	2020	27
Wally Lake	2021-03-18	March	2021	29
Wally Lake	2021-03-18	March	2021	36
Wally Lake	2021-05-09	May	2021	51
Wally Lake	2021-05-09	May	2021	46
Wally Lake	2021-05-09	May	2021	51
Wally Lake	2021-07-11	July	2021	20
Wally Lake	2021-07-11	July	2021	22
Wally Lake	2021-08-10	August	2021	26
Wally Lake	2021-08-10	August	2021	25
Wally Lake	2021-08-10	August	2021	25
Wally Lake	2021-09-03	September	2021	22
Wally Lake	2021-09-03	September	2021	21
Wally Lake	2022-03-06	March	2022	24
Wally Lake	2022-03-06	March	2022	27
Wally Lake	2022-05-07	May	2022	38
Wally Lake	2022-05-07	May	2022	42
Wally Lake	2022-07-05	July	2022	25
Wally Lake	2022-07-05	July	2022	24
Wally Lake	2022-08-19	August	2022	28
Wally Lake	2022-08-19	August	2022	29
Wally Lake	2022-09-03	September	2022	26
Wally Lake	2022-09-03	September	2022	26
Wally Lake	2023-07-06	July	2023	27
Wally Lake	2023-07-06	July	2023	27
Wally Lake	2023-08-21	August	2023	19
Wally Lake	2023-08-21	August	2023	19
Wally Lake	2023-09-09	September	2023	29
Wally Lake	2023-09-09	September	2023	29

Table A-2: Non-Contact Overland Drainage Sampling Data (Cumberland 2005)

	Vault Pit Drainage Basin		Exploration Camp	Second Portage Arm Drainage Basin		
	SV-1	SV-2	PST-1	SP-1	SP-2	SP-3
TDS	24	13	28	23	27	27

APPENDIX B

Effluent Quality Criteria

MEMO

Proposed TDS Effluent Quality Criteria for Wally Lake

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1 INTRODUCTION

This technical memorandum (memo) presents proposed Effluent Quality Criteria (EQC) for total dissolved solids (TDS) for Agnico Eagle Mines Limited's (Agnico Eagle) Meadowbank Mine (Mine) for mine effluent discharge to Wally Lake. TDS is identified as a constituent of potential concern (COPC) in the Mine effluent because of the relatively low concentrations of TDS in the background receiving environment.

The proposed EQC are required to support the Site-Specific Water Quality Objective (SSWQO) studies (WSP 2024b) for Wally Lake under future discharge conditions. For derivation of EQC, a SSWQO for TDS of 1,000 mg/L has been proposed for Wally Lake (WSP 2024b).

For the task requested by Agnico Eagle, TDS EQC were calculated using a high-level assimilative capacity study (ACS) model (WSP 2024a) specifically developed by WSP for Wally Lake based on the projected chemistry of the effluent to be discharged by Agnico Eagle (Agnico Eagle 2024), the chemistry of the receiving environment from the ACS model, and the annual discharge volumes for the period of planned future discharges. As necessary, alternate discharge conditions were considered to make sure that the SSWQO could be met at the edge of the mixing zone.

The EQC development process included estimation of maximum average concentration (MAC) and maximum grab concentration (MGC) of TDS in the effluent so that the 95th percentile TDS concentration at the edge of the mixing zone in Wally Lake does not exceed the SSWQO.

2 BACKGROUND

Effluent Quality Criteria apply at the point of discharge (end of pipe) of effluent discharge to the receiving environment. The EQC for a particular water quality constituent (i.e., TDS) represent the maximum concentration or load of that constituent in the effluent that when discharged under planned discharge rates over time will result in the constituent consistently meeting site-specific water quality objectives (SSWQOs) at the edge of the mixing zone and within the broader reeving environment.

To calculate EQC, the following information is required:

- The chemical constituency characteristics of the effluent.
- The ambient water quality characteristics of the receiving environment (mixing zone and whole lake).
- The mixing and assimilation potential during discharge for the duration of discharge and dilution within the edge of mixing zone.
- The accumulation of the discharge constituents in the receiving environment over time.

Two types of EQC are typically used in Type A water licences in the north, which account for inherent variability in the effluent for regulated constituents in the discharge (Mackenzie Vally 2023):

- Maximum average concentration (MAC) – an average constituent concentration in effluent, determined by averaging a series of successive samples collected in a given period (typically this is four weekly samples over a four-week period).
- Maximum grab concentration (MGC) – the maximum allowable discharge concentration measured in a single grab sample of effluent at any time.

The development of the TDS EQC for the Mine's effluent discharge to Wally Lake accounts for the proposed SSWQO (1,000 mg/L) presented in WSP (2024b).The rationale for this proposed SSWQO in Wally Lake is supported by toxicity assessment considerations that indicated a favourable ionic balance, comparability to validated benchmarks at other sites and the literature, site-specific toxicity study resulting in negligible chronic toxicity, conservatism of test endpoints, and application of the species sensitivity distribution method.

The SSWQO for TDS would apply at the edge of the mixing zone in Wally Lake and assumes that effluent discharges will not exceed this concentration following initial mixing of the effluent in the mixing zone and thus result in unacceptable chronic toxicity at the edge of the mixing zone. This SSWQO has been proposed to protect the receiving environment against chronic toxicity to representative aquatic species that may occur at TDS concentrations greater than 1,000 mg/L (WSP 2024b).

3 PROPOSED EFFLUENT QUALITY CRITERIA USING THE ASSIMILATIVE CAPACITY STUDY MODEL FOR WALLY LAKE

The ACS model developed by WSP for Wally Lake (i.e., the Wally Lake Model), and revised over the past few years, was used to develop the TDS EQC for effluent discharge from the Mine to Wally Lake. The ACS model uses a mass balance approach and was developed in Microsoft Excel with the purpose of assessing the assimilative capacity of Wally Lake for effluent discharge from Vault Pit to Wally Lake for the period 2037 to 2060. The ACS model assumes Wally Lake is fully mixed and has a constant water level over the period of effluent discharge.

The current version of the ACS model (WSP 2024a) projected the resulting in-lake concentrations of TDS (both lake-wide and at the edge of the mixing zone) based on:

- the chemistry of the effluent to be discharged (i.e., effluent TDS concentrations) provided by Agnico Eagle (Agnico 2024)
- a dilution factor of 2:1 (Tetra Tech 2024) for the effluent discharge, and
- accounting for accumulation of TDS in the lake over time through retention and outflow based on the lake's water balance over the period of effluent discharge

Although Tetra Tech identified the potential for a range of dilution factors to apply to the effluent discharge in the immediate receiving environment (i.e., 2:1 to 15:1; Tetra Tech 2024), the MAC EQC was conservatively developed using a minimum dilution factor of 2:1 over the entire multi-year discharge scenario at the edge of the mixing zone. Conditions where the dilution factor is increased (e.g., through modified discharge conditions) would have a notable effect upon the assimilation of the effluent discharge in Wally Lake (i.e., in the mixing zone) and thus affect the EQC (e.g., increase the EQC).

Using the developed ACS model and starting with an initial TDS concentration in the lake and for the effluent per Agnico Eagle (2024), the resulting TDS concentrations at the edge of the mixing zone in Wally Lake were estimated over the period of discharge. Both the maximum and 95th percentile TDS concentrations were evaluated. It was determined based on the conservatism of the dilution factor that the 95th percentile TDS concentration at the edge of the mixing zone would be a defensible approach used to derive the MAC EQC. The effluent TDS concentration for effluent chemistry at the annual discharge volumes per Agnico Eagle (2024) resulted in discharge not meeting the SSWQO at the edge of the mixing zone (95th percentile). The MAC EQC for TDS was derived using an alternative discharge criterion reducing the effluent TDS concentration by a factor of 22% to achieve the SSWQO of 1,000 mg/L at the edge of the mixing zone and on a lake-wide in Wally Lake.

The MGC EQC was determined from the MAC EQC using an equation referenced in USEPA (1991); that is the MGC = 2 times the MAC. This two times the MAC factor is based on an assigned variability factor for the effluent TDS concentration (i.e., a coefficient of variation = 0.6) that would be appropriate from four effluent samples per month (per typical regulatory licence sampling requirements in Nunavut and the Northwest Territories).

4 PROPOSED EQC RESULTS

The ACS model using the effluent quality TDS concentrations provided by Agnico Eagle (2024a) resulted in exceeding the SSWQO (1,000 mg/L) at the edge of mixing zone. The 95th percentile TDS concentration at the edge of mixing zone with a dilution factor of 2:1 was 1,285 mg/L. As a result, the effluent TDS required an alternative discharge criterion by reducing TDS in the effluent by a factor of 0.78 to meet the SSWQO at the edge of the mixing zone. Under this effluent condition, the MAC EQC and MGC EQC are 1,608 and 3,217 mg/L, respectively (Table 1).

Each of the proposed MGC EQC concentrations are considered to remain protective of aquatic life at the end of pipe and in the mixing zone because acute toxicity data from the site-specific toxicological study in WSP (2024a) indicated no acute lethality to *Daphnia magna* and Rainbow Trout exposed to cryo-concentrated Pit E waters (sodium-sulphate dominant) with calculated TDS concentrations ranging from 4,577 to 10,233 mg/L.

Table 1: Maximum Average and Maximum Grab Effluent Quality Criteria for Annual Effluent Discharge from Meadowbank Mine to Wally Lake (2037 to 2060)

SSWQO [a]	Dilution Factor	Edge RMZ (95th percentile)	Edge RMZ (Max)	MAC EQC[b]	MGC EQC[c]
mg/L		mg/L	mg/L	mg/L	mg/L
1,000	2	**1,285**	**1,406**	2,075	4,150
		1,000[d]	**1,093**	1,608	3,217

A **bold** TDS concentration indicates the concentration exceeds the SSWQO / supplemental threshold.

a) SSWQO = site-specific water quality objective.

b) MAC EQC is maximum average concentration effluent quality criterion.

c) MGC EQC is maximum grab concentration effluent quality criterion, which has been derived using a simple 2 x MAC.

d) With the SSWQO of 1,000 mg/L, the effluent TDS concentration was decreased by a factor of 0.78 so that the 95th percentile TDS concentration at the edge of the mixing zone met the 1,000 mg/L SSWQO.

5 CONCLUSIONS

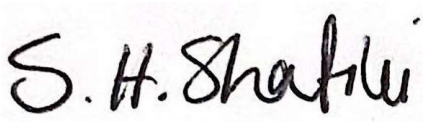
This work to propose EQC for TDS in the mine effluent to be released from Vault Pit to Wally Lake between 2037 and 2060 was conducted to support the Site-Specific Water Quality Objective (SSWQO) study (WSP 2024b) for application to future discharge conditions appointed by Agnico Eagle Mines Limited for Wally Lake in the receiving environment of the Meadowbank Mine (Mine). The development of EQC (MAC and MGC) used the high-level assimilative capacity study (WSP 2024a) for Wally Lake based on the effluent chemistry and annual discharge volumes provided by Agnico Eagle (2024).

The proposed EQC for TDS for the mine effluent to be discharged to Wally Lake are 1,608 mg/L (MAC EQC) and 3,217 mg/L (MGC EQC). However, to meet the SSWQO at the edge of the mixing zone, the TDS concentration in the mine effluent would require an alternative discharge criterion to reduce TDS in the effluent by a factor of 0.78. To avoid the potential for an alternative discharge criterion to reduce the TDS concentration in the effluent, modifications to the assumptions regarding mixing of the effluent discharge in the receiving environment (i.e., rate of assimilation or dilution factor) should be considered.

The approach to derive the EQC so that the SSWQO is met at the edge of the mixing zone has utilized a conservative approach (assuming the minimum dilution factor in the mixing zone for the period of discharge), which provides confidence that discharge would not be expected have potential for chronic toxicity effects in the receiving environment adjacent to the mixing zone in Wally Lake. Further, the EQC represent concentrations that would not be expected to result in adverse effects (i.e., acute toxicity effects) in the receiving environment. Monitoring during discharge of TDS concentrations in the effluent and at the edge of the mixing zone, including a plume delineation study to confirm the rate of assimilation within the mixing zone, would be recommended to confirm the quality of discharges from Vault Pit to Wally Lake, and their assimilation in the receiving environment.

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