FINAL REPORT

Chapter 1.0 Program Overview

2021 Marine Environmental Effects Monitoring Program (MEEMP) and Non-Indigenous Species/Aquatic Invasive Species (NIS/AIS) Monitoring Program

Submitted to:

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Executive Summary

MARINE WATER QUALITY (CHAPTER 2.0)

The marine water quality component of the MEEMP ensures that site discharges are in compliance with requirements outlined in the Type A Water License and satisfies PC Conditions No. 76, 87, 89 and 99(a). Water quality samples are collected at four sampling stations in Milne Inlet downstream from the primary discharge point (MP-05), as well as four sampling stations downstream from a second discharge point (MP-06) at Milne Port. These receiving environment stations were distributed in a radial design up to 250 m from each discharge point to monitor for potential changes in water quality due to site drainage and operational discharges, including iron ore stockpile run-off.

In 2021, reported analytical results for water quality parameters (i.e., major ions, nutrients, metals, hydrocarbons, and polycyclic aromatic hydrocarbons [PAHs]) were generally within ranges observed during previous MEEMP sampling programs (2015 to 2020), with no exceedances of CCME WQGs. Consistent with previous programs, hydrocarbons and PAHs were not detected in the 2021 water samples. In fact, a substantial proportion of parameters analyzed in the water samples from Milne Inlet were not detected at all in downstream sampling stations.

Collectively, measured concentrations of parameters of potential concern (e.g., metals, nutrients, hydrocarbons) were either not detected or were present at low concentrations, such that adverse impacts to the biota in the Milne Inlet receiving environment are unlikely to occur. Increased iron deposition in the marine environment as a result of Project activities is a primary interest for local Inuit. Given that CCME marine WQGs for iron have not been developed, iron levels measured in water during 2021 were compared to measurements made during previous MEEMP programs (2015 to 2020) to evaluate whether increases in production at Milne Port have led to associated increases in iron concentrations. Analysis shows that iron concentrations have not increased over time, despite production increases, and concentrations measured in 2021 water samples remain well within the range of what has been detected previously.

Overall, results indicate that, to date, water discharged from the Milne Port operational site into the marine receiving environment meets discharge requirements of the Water License and that parameters of potential concern remain well below thresholds associated with potential harm of marine biota. Moving forward, continued compliance monitoring for water quality is recommended.

MARINE SEDIMENT QUALITY (CHAPTER 3.0)

Sediment sampling in Milne Inlet is conducted to satisfy PC Conditions No. 83(a) and 99(a). After three consecutive years of implementation, the joint radial benthic and sediment sampling program was not conducted in 2021 commensurate with the lack of directional trends observed to date in sediment quality indicators. Baffinland is committed to continued implementation of the full sampling program with an adjusted monitoring frequency of every three years, which is consistent with routine environmental effects monitoring (EEM) programs for other mining projects in Canada.

In 2021, sediment sampling effort focussed on station SW-2, a station west of the existing Ore Dock for which anomalous patterns in sediment and benthic infaunal indicators were observed in 2020, specifically increased sand content, decreased percent fines content and decreased species richness and species density values compared to other sampling stations along the West transect. The Marine Environmental Working Group (MEWG) requested that Baffinland revisit this site in 2021 and investigate whether changes at this station could be Project-related. This chapter therefore presents the results of targeted sampling completed in 2021 in comparison to historical data collected at station SW-2.

In general, measured sediment quality parameters at SW-2 in 2021 were consistent with previous years' results with no exceedances of CCME sediment quality guidelines observed. However, sediment grain size results at SW-2 indicate that the substrate in this area was subject to some level of physical disturbance during the 2020 shipping season. Propellor wash generated by tug-assisted ore carrier movements on the west side of the Ore Dock during the 2020 shipping season is considered the most likely cause for this disturbance (i.e., scour effects) given SW2's proximity to the Ore Dock. The observed change in sediment grain size distribution is likely attributed to small-scale shifts in the position of bedforms formed under the propellor-generated currents, which act to mobilize finer sediments resulting in coarsening of substrates. This area of disturbance due to propellor wash is within the limits predicted in the original FEIS.

Overall, monitoring results remain within original FEIS predictions, which forecasted the potential for minor and localized sediment disturbance associated with propellor wash, which is expected to stabilize over time. We recommend continued targeted sampling in 2022 to further evaluate sediment grain size variability in this area and potential changes in local sediment distribution due to ongoing shipping and berthing activities at Milne Port.

BENTHIC INFAUNA (CHAPTER 4.0)

Benthic infaunal sampling in Milne Inlet is conducted to satisfy PC Condition 99(a) and 99(c). After three consecutive years of implementation, the joint radial benthic and sediment sampling program was not conducted in 2021 commensurate with the lack of directional trends observed to date in benthic infaunal community indicators. Baffinland is committed to continued implementation of the full sampling program with an adjusted monitoring frequency of every three years, which is more consistent with routine biological sampling for other mining effects monitoring programs (e.g., the federal Environmental Effects Monitoring Program [EEM]).

In 2022, benthic infaunal sampling effort focussed on station SW-2, a station west of the existing Ore Dock for which anomalous patterns in sediment and benthic infaunal indicators were observed in 2020, specifically increased sand content, decreased percent fines content and decreased diversity, taxonomic richness, and density values compared to other sampling stations along the West transect. The MEWG requested that Baffinland revisit this site in 2021 to investigate whether changes at this station could be Project-related.

Benthic infaunal sampling results in in 2021 indicated an increase in animal density, species richness, and species diversity relative to values observed in 2020. Specifically, this included an order of magnitude increase in animal density and species richness, while species diversity returned to similar levels recorded at SW-2 in 2019. While natural variability may have partially contributed to the changes documented at SW-2 in 2020 (benthic infaunal communities can demonstrate pronounced changes in population metrics at restricted spatial scales), an external stressor was likely responsible for this change given similar changes were not observed at any of the other 59 stations sampled in 2020. Given the site's proximity to the Ore Dock, it is considered likely that tug-assisted berthing activities in 2020 resulted in localized propellor wash effects (lateral mobilization of finer grained sediments) resulting in a coarsening and/or scouring of the existing substrate at SW-2, and possibly, a shift in the position of bedforms at this station. This, in turn, resulted in alterations to the local benthic community, given the close relationship between sediment grain size and the distribution and abundance of infauna (with higher abundance and diversity typically associated with smaller, finer grain sizes). However, benthic communities are known to be naturally dynamic and able to rapidly recover from non-chronic disturbance effects, as evidenced by the increases in benthic community indicators observed in 2021 commensurate with changes implemented by Baffinland in 2021 with respect to tug-assisted berthing operations on the west side of the Ore Dock.

Overall, marine sediment and benthic infaunal analytical results indicate that the seabed area surrounding station SW-2 shows evidence of physical disturbance that is assumed to be the result of propellor wash generated during tug-assisted ore carrier movements on the west side of the Ore Dock during the 2020 shipping season. Targeted sampling undertaken in 2021 indicates that the benthic infaunal community in this area is showing signs of recovery given observed increases in animal density, species richness, and species diversity. The observed results are consistent with FEIS predictions, which predicted localized resuspension of fine-grained sediments from propellor-generated currents and associated alteration to benthic community composition. We recommend continued targeted sampling in 2022 to further monitor for potential Project effects on the local benthic community at Milne Port.

SUBSTRATE, MACROFLORA AND BENTHIC EPIFAUNA (CHAPTER 5.0)

Sampling of substrate, macroflora, and benthic epifauna fulfills PC Condition No. 99(a), (c) and is relevant to PC Conditions 76, 83(a), 84 and 87. To evaluate potential project-related effects on substrate, macroflora, and benthic epifauna, standardized underwater visual census methods were employed by SCUBA-based scientific divers to survey marine vegetation, invertebrate, and fish species and to record habitat type within a series of survey quadrats permanently installed on the seafloor in both an exposure area and a reference area. Quadrats were analyzed to record percent cover (%) of substrate type, benthic macroflora, and sessile benthic epifauna, density (counts) for motile epifauna, as well as taxonomic identification to the lowest practical taxonomic level. Specimens were opportunistically collected and sent to an accredited taxonomy laboratory (Biologica Environmental Services Ltd.) for taxonomic identification. Taxa richness and diversity (Simpson's Diversity Index) were calculated for macroflora and epifauna.

Quadrat sampling results in 2021 indicated a primarily soft substrate environment, composed primarily of silt and sand. Similar macroflora and epifaunal taxa were observed in 2021 as in previous years (2018-2020). Community indicators (i.e., percent cover, density, species richness, and diversity) were shown to be variable within and among quadrats and between the reference and exposure areas; with no statistically significant differences observed between the exposure and reference areas for any of the indicators. Overall, survey results suggest that macrofloral and epibenthic community assemblages are comparable between the Project exposure and reference areas with no obvious evidence of Project-related influence or impairment.

Power analysis results in combination with a taxa accumulation curve generated for this dataset indicate that the current sampling design is insufficient to reliably detect a Project-induced change in community structure or fully characterize the epibenthic community with the existing dataset. As such, the current results should be interpreted with caution. The predicted sampling effort that would be required to achieve reasonable detection power (as determined by the power analysis) for this program was determined to be unattainable within the limited open-water sampling window (August/September). Therefore, three options for moving forward were presented to the MEWG in the draft 2021 MEEMP Report: (i) remove this study component entirely from the 2022 MEEMP design and focus on other components that offer adequate statistical detection power (e.g., benthic infauna, sediment quality); (ii) retain quadrat sampling using the same sampling effort while accepting the associated statistical limitations (i.e., ability to detect large-scale trends only); or, (iii) adding several additional quadrats in each of the reference and exposure areas in order to moderately increase detection power for the majority of the selected indicators. Through subsequent engagement with the MEWG in June 2022, Baffinland has agreed to proceeding with Option #3, which will see three additional quadrats installed in both the study and reference area in 2022, resulting in a total of 13 survey quadrats per area.

Overall, the 2021 survey results indicate that Project activities to date have not resulted in adverse effects on macrofloral and epifaunal communities in Milne Port, however, results of the power analysis suggest that detection power is low for this study component.

MARINE FISH COMMUNITY AND CATCH DATA (CHAPTER 6.0)

To satisfy PC Condition No. 99(b)(ii), (c), 113, and 114, sampling was conducted to assess the relative abundance of Arctic Char (*Salvelinus alpinus*) and other fish species in the Milne Port area. Multiple sampling methodologies were employed to target different species and habitat types, including gill net, angling (jigging and trolling), Fukui trap, hoop net, otter trawl and longline sampling. Collected fish were identified to the lowest practicable taxonomic level (typically to species-level) before being released. Fish not identified to species-level in the field were retained for subsequent identification by an accredited taxonomic and/or genetic laboratory.

Fish captures in 2021 (n = 603 fish) and 2020 (n = 852 fish) were higher compared to 2014-2019, likely due to increased sampling effort in 2020 and 2021. Community composition was similar to previous sampling years, with the local fish community during summer consisting primarily of Arctic Char, Fourhorn Sculpin (*Myoxocephalus quadricornis)* and Shorthorn Sculpin (*Myoxocephalus scorpius)*. In previous survey years, these three species comprised approximately 90% of the total catch, whereas in 2020 and 2021, the three species comprised approximately 74% of the total catch, with Arctic Sculpin, Greenland Cod, and Ribbed Sculpin combining to represent approximately 23% of the total catch.

Eight other fish species were recorded in the Project area in 2021, including Greenland Cod (*Gadus ogac*), Arctic Sculpin (*Myoxocephalus scorpioides*), Ribbed Sculpin (*Triglops pingelii*), Shorthorn Sculpin (*Myoxocephalus Scorpius)*, Arctic Staghorn Sculpin (*Gymnocanthus tricuspis*), Arctic Alligatorfish (*Aspidophoroides olrikii*), Atlantic Poacher (*Leptagonus decagonus*) and Saddled Eelpout (*Lycodes mucosus*). Captures of Ribbed Sculpin, Atlantic Poacher, and Arctic Alligatorfish represent the first recorded occurrences of these species in the 2014-2021 MEEMP, likely due to the increased sampling effort and additional sampling methods integrated into the program in 2021.

Of the six fish sampling methods used in 2021, angling contributed the most to overall catch, capturing five taxa and accounting for 43% of the total catch, followed by gill net sampling which captured five taxa and accounted for 40% of the total catch. The remaining 17% of the total catch were collected via trawling (12% of catch, nine species detected), Fukui traps (3% of catch, two species detected) and hoop net sampling (2% of catch, one species detected). Hoop nets were added to the MEEMP study design in 2021 (following a trial in 2019) based on recommendations from the MEWG for a replacement sampling method for Fukui traps, which have historically yielded low catch rates. Longline sampling was added in 2021 as Commitment No. 37 to the MEWG (Appendix 1A in Golder 2021) in order to target large-bodied demersal fish; however, catch efforts were unsuccessful (zero catch rates).

Two distinct Fishing Areas (FAs) were delineated in Milne Port based on habitat features and their location relative to existing port infrastructure and operational activities. This included a Direct Project Footprint (DPF) area and an Indirect Project Footprint (IPF) area. The FAs are intended to help standardize sampling efforts and address variability in the catch data across Milne Port. Using 2020 and 2021 datasets, Catch per Unit Effort

(CPUE) was compared across FAs and across years using an Analysis of Variance (ANOVA). While no statistically significant differences in fish abundance were noted between the FAs, fish abundance was generally highest within the DPF FA. Angling CPUE was significantly different between years; however, the analysis was constrained by a small sample size, and some inconsistencies in sampling effort between years with respect to gear type and sampling locations.

Overall, fishing methods were deemed effective in characterizing the marine fish community in terms of species presence and relative abundance. Fish sampling in 2020 and 2021 yielded similar numbers and proportional representation of the dominant fish species in Milne Port (Arctic Char, Fourhorn Sculpin and Shorthorn Sculpin) relative to previous years. The delineation of FAs and the standardization of fishing methods in 2021 will allow for future assessments of interannual change in relative fish abundance and distribution at Milne Port.

FISH HEALTH AND TISSUE CHEMISTRY (CHAPTER 7.0)

Fish health and tissue chemistry data are relevant to Relevant to PC Conditions No. 76, 83 (a), 87, 99 (a), 99 (b) (ii), 99 (c), 113, and 114. Fish health data were collected for Fourhorn Sculpin (*Myoxocephalus quadricornis*) and *Hiatella arctica* (*H. arctica*, wrinkled rock-borer) in 2021 using methods aligned with monitoring requirements under the Metal and Diamond Mine Effluent Regulations (MDMER; Government of Canada 2002).

Based on internal and external examinations, Fourhorn Sculpin from the Milne Port area in 2021 appear to be healthy. Sample timing was appropriate for evaluating reproduction in Fourhorn Sculpin and *H. arctica*, meaning adequate gonad development had occurred to assess gonad endpoints (e.g., gonadosomatic index [GSI]). *H. arctica* collected in 2021 also appear to be healthy. Gonad endpoints exhibited relatively low variability for both species. Health data from 2021 were compared against 2020; while significant differences were found for condition, the magnitude of difference was relatively small (<10%). The gonad weights for *H. arctica* could not be compared with previous years as gonad tissues had not previously been collected.

Fish tissue chemistry results for Arctic Char sampled in 2021 were similar to historical data collected for the Milne Port area since 2010. Results for Fourhorn Sculpin and *H. arctica* were also similar to data collected in recent years for most metals. Statistically significant increases were observed since 2018 for some contaminants of potential concern in Arctic Char and *H. arctica* (e.g., aluminum and magnesium); however, differences were small (<100%) and often inconsistent, likely indicating natural variability in both the bioavailability and subsequent uptake of metals, reflected in the tissue concentrations.

All tissue samples for Arctic Char, Fourhorn Sculpin and *H. arctica* collected from 2018 to 2021 were below Health Canada's Maximum Levels for Chemical Contaminants in Foods mercury consumption guideline (Health Canada 2015) and below the British Columbia Ministry of Environment fish tissue guidelines for selenium (BC MOE 2014). Impact predictions in the original FEIS (Baffinland 2012) forecasted the potential for low magnitude changes in some ecological parameters, such as water quality and Arctic Char tissue chemistry, but characterized these changes as not significant.

Overall, monitoring data from 2021 align with FEIS predictions, as any observed changes have generally been minor – either within established guidelines or consistent with baseline conditions. At present, monitoring indicates that mitigation measures are functioning as intended and that Project activities are being managed in a way that has not resulted in adverse effects on the marine ecosystem. To date, construction and operational activities at Milne Port do not appear to have negatively affected fish health

or tissue chemistry in the Milne Port area. Moving forward, continued monitoring is recommended to maintain continuity in established time series data for Arctic Char and to provide a benchmark for Fourhorn Sculpin and *H. arctica* health and tissue chemistry on which to base future comparisons.

NIS/AIS MONITORING (CHAPTER 8.0)

Comprehensive sampling has been conducted in the Milne Inlet marine environment to monitor for the presence of non-indigenous species (NIS) and aquatic invasive species (AIS), fulfilling PC Conditions No. 87, 89, and 91. The program includes both targeted (e.g., benthic grabs, settlement plates) and general (e.g., screening all species identified through MEEMP components, such as fish and macroflora surveys) sampling efforts. All species are compared to a taxonomic inventory for Milne Inlet, which has been developed over time (starting with pre-Project baseline) and is updated annually. Literature reviews are performed on any taxa that are not part of the inventory to determine if their range on record includes north Atlantic, Arctic and/or Canadian Arctic waters; in addition, these taxa are cross-referenced against both global and domestic databases of known invasive taxa (e.g., Molnar et al. 2008) or "Trigger List". The Watchlist is comprised of taxa considered to be low-risk (i.e., not listed on AIS databases but accepted range on record does not include Canadian Arctic) or high-risk (i.e., listed on AIS databases and accepted range on record does not include Canadian Arctic). Species placed on the Watchlist include low to high-risk species that have a confirmed presence in the Project area that is not directly attributable to the Project, in addition to those species that require more supportive data. The Trigger List is comprised of high-risk taxa that are considered potentially introduced via Project shipping activities.

A total of 432 taxa were identified in 2021 surveys, of which 54 were new additions to the taxonomic inventory for Milne Inlet (i.e., had not been observed in previous surveys). Of the new taxa, all but one (*Tricellaria* sp.) had records of occurrence in the Canadian Arctic with no record in the AIS databases. Several species of *Tricellaria* are found in the Canadian Arctic, however, one species (*T. inopinata*) is listed on the National Risk Assessment as a potential invader to Canadian waters, including the Arctic region. The specimen of *Tricellaria* sp. was sent to the Benthic Ecology Lab at Université Laval (Laval) for independent verification as a precaution. Due to similarities between *Tricellaria* and the genus *Scrupocellaria,* Laval recommended the identification be brought to family level (Candidae indet.). Based on the presence of multiple Candidae species in the eastern Canadian arctic (including previous observations in Milne Port during baseline sampling) and poor range descriptions for bryozoans in general, it is considered highly probable the Candidae indet. specimen is a Canadian Arctic species rather than a new species introduction to the Project area. Therefore, Candidae indet. is designated No Risk and is not considered to be of concern for Milne Inlet.

Additionally, AIS/NIS sampling in 2021 recorded five taxa that were flagged in previous years due to uncertainties in their natural range or because they were listed in an existing AIS database. This included *Pseudofabricia aberrans*, *Marenzelleria* sp., *Ampharete petersenae, Paramphitrite birulai* and *Crassicorophium* sp. These specimens were sent to taxonomic experts for independent verification and/or molecular analysis. Results are summarized below.

Molecular (DNA) results confirmed the 2021 *Marenzelleria* sp. specimens as *Marenzelleria wireni* – an Arctic Basin species. This taxon has a probable range that includes the Project area and was designated "No Risk". That said, as a precaution, *Marenzelleria* specimens (aside from *M. arctia* and *M. wireni*) will continue to be subject to heightened monitoring, including genetic analysis, until there is more certainty that *M. viridis* is not present at Milne Port.

Molecular results for *Crassicorophium* sp. were largely inconclusive, with no match to the taxa of concern. The closest molecular match was to an unidentified amphipod specimen (presumed to be *Crassicorophium clarencense*) collected near Victoria Island in Nunavut, indicating that these are likely representative of an indigenous taxon, supported by the identification of similar specimens during the Program baseline. Independent morphological assessments agreed with the identification of *C. clarencense*.

Inconclusive results were also received for the *Pseudofabricia* sp. nr. *aberrans.* The specimens were confirmed to not match *Fabricia stellaris* (a previously suggested alternative identification for the specimens), but also did not match existing records for any other species. Taxonomic experts suggested it is probable that these specimens are from a currently undescribed species that is indigenous to the Project area. The status of *P.* sp. nr. *aberrans* has been revised to “No Risk” and has been removed from the Program Watchlist.

Following a literature review of collection information, *A. petersenae* has been reclassified as “No Risk” and has been removed from the Project Watchlist. The majority of identified taxa in benthic infauna samples collected in Milne Inlet were not considered NIS or AIS.

The Baffinland NIS/AIS program represents the most comprehensive monitoring program for NIS/AIS conducted by a marine port in Canada. Approximately 870 taxa have been identified in Milne Inlet through monitoring to date, and include macroflora, zooplankton, benthic invertebrates and fish. The identification and flagging of individual taxa out of the hundreds identified in Milne Inlet indicate this surveillance program is effective and functioning as intended. The vast majority of these taxa have been designated as “No Risk” and are not considered to be of concern.

TIDE GAUGE (CHAPTER 9.0)

The tide gauge program at Milne Port demonstrated a distinct seasonal pattern for near-surface water in Milne Inlet. The processes observed have occurred in every year since tide gauge monitoring began in 2017 and can be delineated into the following two general time periods.

From early July through early September 2021, temperature fluctuated between approximately 0 and 8 degrees C and salinity fluctuated between approximately 4 and 32 PSU. This range is most likely the result of freshwater runoff from Phillips Creek during the spring freshet and the melting of sea ice in Milne Inlet near Milne Port. These processes cause the surface layer to be warmer and less saline than the water column beneath the pycnocline.

The second time period extends from early September to the tide gauge’s retrieval on 31 October 2021. Overall, temperature was generally lower and salinity was generally higher in the second time period than in the first time period. In the second time period, temperature ranged from -1 to 3 degrees C, with a mean of 1 degree C; and salinity ranged from 20 to 32 PSU, with a mean of 29 PSU. This likely occurs in response to decreasing air temperature in Milne Port and autumn storms with high winds which cause the surface layer of the water column to become well mixed with the layers below. This results in generally colder and more saline surface waters, as observed in the temperature and salinity measurements from early September to the end of the deployment.

The water level data shows that tides in Milne Port follow a mixed semidiurnal tidal cycle. 8 neap tides and 8 spring tides occurred during the tide gauge deployment. The mean water level observed was -0.04 m CGVD. The maximum water level observed was 1.16 m CGVD and the minimum water level observed was -1.14 m CGVD. This 2021 tide gauge results are consistent with tide data from the previous four years of monitoring (2017-2020)

MEWG COMMENTS OF DRAFT REPORT

Comments on the draft 2021 MEEMP and NIS/AIS Monitoring Program Report were received from the Marine Environmental Working Group (MEWG) in June of 2022. Baffinland's responses to MEWG comments and recommendations on the draft report are included as Appendix A.

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ᑕᕆᐅᑉ ᐃᒪᖓᑕ ᖃᓄᐃᓐᓂᖓ (ᐅᖃᓕᒫᒐᑦ ᐊᕕᒃᑐᖅᓯᒪᓂᖏᑦ 2.0)

ᑕᕆᐅᑉ ᐃᒪᖓᑕ ᖃᓄᐃᓐᓂᖓᓄᑦ ᐃᓗᓕᕆᔭᐅᔪᑦ ᑕᕆᐅᑉ ᐊᕙᑎᖓᓄᑦ ᐊᒃᑐᐃᓂᕐᓄᑦ ᖃᐅᔨᓴᐃᓇᕐᓂᕐᒧᑦ ᐸᓕᕆᐊᖅ (MEEMP) ᓇᓗᓇᐃᖅᓯᖓᒪᑦ ᐃᓂᐅᔪᒥᑦ ᑯᕕᔭᐅᔪᑦ ᒪᓕᒃᑲᓗᐊᕐᒪᖔᑦ ᐱᔭᕆᐊᖃᖅᑐᓂᑦ ᓇᓗᓇᐃᖅᓯᒪᔪᖅ ᖃᓄᐃᑦᑑᓂᖓ A ᐃᒪᕐᒧᑦ ᓚᐃᓴᓐᓯᒥᑦ ᐊᒻᒪᓗ ᓈᒻᒪᒋᔭᐅᓗᓂ ᐅᔾᕋᓐᓂᐊᕈᓐᓇᐅᑎᒧᑦ ᒪᓕᒃᑕᐅᔭᕆᐊᓖᑦ ᓈᓴᐅᑎᖏᑦ 76, 87, 89 ᐊᒻᒪᓗ 99(ᐃ). ᐃᒪᐅᑉ ᖃᓄᐃᓐᓂᖓᓄᑦ ᖃᐅᔨᓴᖅᑳᓕᐊᖑᔪᑦ ᑲᑎᑕᐅᖃᑦᑕᖅᑐᑦ ᑎᓴᒪᓂ ᖃᐅᔨᓴᖅᑳᓕᐅᕐᕕᖕᓂ ᕿᓚᒧᐊᓂ ᑰᕕᐅᔪᒥ ᑯᕕᓯᕙᓪᓗᐊᑕᕐᒥ (MP-05), ᐊᒻᒪᓗ ᑎᓴᒪᓂ ᖃᐅᔨᓴᖅᑳᓕᐅᕐᕕᖕᓂ ᑰᒃᑐᓂ ᐱᖃᑖᓂᑦ ᑯᕙᕕᐅᖃᑦᑕᖅᑐᒥ (MP-06) ᑕᐃᑲᓂ ᕿᓚᒧᐊᓂ ᑐᓇᒃᑕᕐᕕᖕᒥᑦ. ᑖᒃᑯᐊ ᐊᕙᑎᓕᕆᕚᑦ ᐋᖅᑭᒃᓯᖅᑕᐅᓯᒪᔪᑦ ᖃᓂᒋᔭᖓᓂ 250 ᒦᑕᓂᒃ ᐅᖓᓯᒃᑎᒋᔪᒥᒃ ᐊᑐᓂ ᑯᕕᓯᕙᐅᕙᒃᓂᑦ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᕐᕆᓇᖁᓪᓗᒋᑦ ᐊᓯᔾᔨᑐᐃᓐᓇᐅᓇᐊᓕᖕᓂᒃ ᐃᒪᐅᑉ ᖃᓄᐃᓐᓂᖓᓄᑦ ᐅᔾᕋᓐᓂᐊᕐᕕᐅᑉ ᑯᕕᓯᕙᕆᕙᒃᑕᖓᓂ ᐊᒻᒪ ᐊᐅᓚᓂᖓᓄᑦ ᑯᕕᑎᑕᐅᔪᓂᑦ, ᐱᖃᓯᐅᑎᓪᓗᒋᑦ ᓴᕕᒃᓴᐃᑦ ᑲᑎᖅᓱᖅᑕᐅᔪᓂᖔᖅᑐᑦ ᑰᒃᑐᑦ.

2021−ᒥ, ᐅᓂᒃᑳᓯᐅᔪᑦ ᖃᐅᔨᓭᑕᐅᓚᐅᖅᑐᑦ ᐃᒪᐅᑉ ᖃᓄᐃᓐᓂᖓᓄᑦ ᑭᓪᓕᒋᔭᐅᔪᓄᑦ (ᓱᕐᓗ, ᐱᕐᔪᐊᑦ ᑭᓱᓂᒐᓚᑯᓗᐃᑦ, ᐱᕈᖅᑐᑦ, ᓴᕕᕋᔭᑦ, ᐅᖅᓱᐊᓗᒃᓴᑦ, ᐊᒻᒪ ᐃᓚᐅᕈᑎᒃᓴᕐᓂᒃ (ᐅᕕᓂᖓᒧᑦ ᐋᓇᖅᑑᓕᑦ ᐅᖅᓱᐊᓗᒃᓴᐃᑦ [PAHs]) ᐊᔾᔨᒌᙱᑦᑐᓂᔭᖅᑐᓂᒃ ᖃᐅᔨᔭᐅᖃᑦᑕᓚᐅᖅᑐᑦ ᑭᖓᓂᖔᑦᑎᓐᓂ ᑕᕆᐅᑉ ᐊᕙᑎᖓᓄᑦ ᐊᒃᑐᐃᓂᕐᓄᑦ ᖃᐅᔨᓴᐃᓇᕐᓂᕐᒧᑦ ᐸᓕᕆᐊᕐᒥ (MEEMP) ᖃᐅᔨᓴᖅᑳᓕᐅᖅᑎᓪᓗᒋᑦ ᐃᓕᕆᓂᕐᓂ (2015-ᒥ 2020-ᒧᑦ), ᖄᖏᐅᑎᓯᒪᙱᓐᓗᑎᒃ ᑲᓇᑕᒥ ᐊᕙᑎᓕᕆᓂᕐᒧᑦ ᖃᓄᐃᓐᓂᖓᓄᑦ ᖃᐅᔾᒪᔾᔪᑏᑦ (CCME) ᐃᒥᕐᒧᑦ ᖃᐅᔾᒪᔾᔪᑏᑦ (WGs). ᐊᓪᓛᑦ, ᐊᖏᔫᒃᑲᓪᓚᖏᑦ ᑭᓪᓕᐅᔪᓂᑦ ᖃᐅᔨᓴᖅᑕᐅᓚᐅᖅᑐᑦ ᐃᒪᖏᑦ ᖃᐅᔨᓴᖅᑳᓴᓂ ᕿᓚᒧᐊᓂ ᖃᐅᔨᓴᐅᓚᐅᙱᑦᑎᐊᖅᑐᑦ ᑰᒡᑯᐅᔪᓂ ᖃᐅᔨᓴᕐᕕᖕᓂᑦ.

ᑲᑎᕝᕕᒋᑦ, ᐆᒃᑐᕋᖅᑕᐅᔪᑦ ᑲᑎᓯᒪᔪᑦ ᑭᓪᓕᐅᔪᓂᑦ ᐃᓱᒫᓘᑕᐅᑐᐃᓐᓇᓇᐊᓖᑦ (ᓱᕐᓗ ᓴᕕᕋᔭᐃᑦ, ᐆᒪᑦᑎᐊᕆᓐᓇᖅᑐᑦ, ᐅᖅᓱᐊᓗᒃᓴᑦ) ᖃᐅᔨᔭᐅᓚᐅᙱᑦᑐᓘᓐᓃᑦ ᐱᑕᖃᓚᐅᙱᑦᑐᓘᓐᓃᑦ ᐅᕙᓘᓐᓃᑦ ᐊᒃᐸᓯᒃᑐᒥ ᐱᑕᖃᓚᐅᖅᑐᑦ ᑲᑎᑎᓯᒪᔪᓂᑦ, ᑕᒪᒃᑯᐊ ᐊᒃᑐᐃᓂᕐᓗᓐᓃᑦ ᐆᒪᔪᑦ ᓇᔪᒐᖏᓐᓂᑦ ᕿᓚᒧᐊᓂᑦ ᓴᖅᑭᕕᐅᕙᒃᑐᑦ ᐊᕙᑎᖏᓐᓂᑦ ᑕᐃᒪᐃᔾᔭᙱᑦᑐᒃᓴᐅᔪᑦ. ᐱᑕᖃᕐᓂᖅᓴᐅᓂᖏᑦ ᓴᕕᒃᓴᑦ ᐃᒪᐅᑉ ᐊᕙᑎᖓᓂ ᐱᔾᔪᑕᐅᓗᓂ ᐱᓕᕆᐊᖑᔪᖅ ᐃᓱᒪᒋᔭᐅᓗᐊᑕᖅᐳᖅ ᓄᓇᖃᖅᑐᑦ ᐃᓄᖏᑦ. ᑖᒃᑯᐊ ᑲᓇᑕᒥ ᐊᕙᑎᓕᕆᓂᕐᒧᑦ ᖃᓄᐃᓐᓂᖓᓄᑦ ᖃᐅᔾᒪᔾᔪᑏᑦ (CCME) ᐃᒪᕐᒥᐅᑕᐃᑦ ᐃᒪᐅᑉ ᖃᓄᐃᓐᓂᖓᓄᑦ ᖃᐅᔾᒪᔾᔪᑏᑦ (WGs) ᓴᕕᒃᓴᒧᑦ ᐋᖅᑭᒃᑕᐅᓚᐅᙱᑦᑐᑦ, ᓴᕕᒃᓴᑦ ᐆᒃᑐᕋᖅᑕᐅᓚᐅᖅᑐᑦ ᐃᒫᓂᑦ 2021−ᒥᑦ ᖃᓄᐃᓐᓂᖅᓴᐅᖕᒪᖔᑕ ᖃᐅᔨᓴᖅᑕᐅᓚᐅᖅᑐᑦ ᑭᖑᓂᖔᑦᑎᓐᓂ ᑕᕆᐅᑉ ᐊᕙᑎᖓᓄᑦ ᐊᒃᑐᐃᓂᕐᓄᑦ ᖃᐅᔨᓴᐃᓇᕐᓂᕐᒧᑦ ᐸᓕᕆᐊᕐᒥ (MEEMP) (2015−ᒥᑦ 2020−ᒧᑦ) ᖃᐅᔨᓴᕋᓱᒃᓗᑎᒃ ᐅᔾᕋᓐᓂᐊᕆᐊᓪᓚᖕᓂᖅ ᕿᓚᒧᐊᓂ ᑐᓚᒃᑕᕐᕕᖕᒥᑦ ᐃᓚᒋᐊᕈᑕᐅᓯᒪᖕᒪᖔᑦ ᓴᕕᒃᓴᓂᑦ ᑲᑎᓯᒪᔪᓄᑦ. ᖃᐅᔨᓴᖅᑕᐅᔪᑦ ᑕᑯᒃᓴᐅᑎᑦᑎᕗᑦ ᓴᕕᒃᓴᒧᑦ ᑲᑎᓯᒪᔪᑦ ᐅᓄᖅᓯᕚᓕᖅᓯᒪᙱᓐᓂᖏᓐᓂᒃ ᖃᑯᙳᖅᐸᓪᓕᐊᑎᓗᒍ, ᐅᔾᕋᓐᓂᐊᕆᐊᓪᓚᒃᑲᓗᐊᖅᑎᓗᒋᑦ, ᐊᒻᒪ ᑲᑎᑎᓯᒪᔪᑦ ᖃᐅᔨᓴᖅᑕᐅᓚᐅᖅᑐᑦ 2021−ᒥ ᐃᒫᓂᒃ ᖃᐅᔨᓴᖅᑳᓕᐊᑦ ᓱᓕ ᓈᒻᒪᒃᑑᕗᑦ ᖃᐅᔨᔭᐅᓛᓚᐅᖅᑐᓂᒃ ᑭᖑᓂᖔᑦᑎᓐᓂ.

ᑕᒪᐃᑎᒍᑦ, ᖃᐅᔨᔭᐅᔪᑦ ᓇᓗᓇᐃᖅᓯᔪᑦ ᑕᐃᒪᒃᑯᐊ, ᐅᑉᓗᒥᒧᑦ ᑎᑭᕝᕙᒍ, ᐃᒪᖅ ᑯᕕᐳᔪᖅ ᕿᓚᒧᐊᓂ ᑐᓇᒃᑕᕐᕕᖕᒥᑦ ᐊᐅᓚᓂᖏᓐᓂᑦ ᐅᔾᕋᓐᓂᐊᕐᕕᐅᔪᒥᑦ ᑕᕆᐅᕐᒧᑦ ᑎᑭᐅᑎᔪᖅ ᑯᕕᓂᕐᒧᑦ ᐱᔭᕆᐊᖃᕐᓂᐅᔪᓂᒃ ᐃᒪᕐᒧᑦ ᓚᐃᓴᓐᓯᒥᑦ ᐊᒻᒪᓗ ᑭᓪᓕᐅᔪᑦ ᐃᓱᒫᓘᑕᐅᑐᐃᓐᓇᓇᐊᓕᖓᓄᑦ ᑐᖓᐅᑦᑎᓯᒪᓗᑎᒃ ᖃᓄᐃᓕᔪᖅᑲᖅᑎᓇᒍ ᑭᓪᓕᐅᔪᒃ ᓱᕋᐃᑐᐃᓐᓇᓇᐊᖃᕐᓂᕐᒧᑦ ᐃᒫᓂᑦ ᐆᒪᓂᖃᖅᑐᓂᒃ. ᓯᕗᓪᓕᐊᒃᑎᓗᑕ, ᒪᓕᑦᑎᐊᖏᓐᓇᕐᓂᕐᒧᑦ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖏᓐᓇᕐᓂᖅ ᐃᒪᐅᑉ ᖃᓄᐃᓐᓂᖓᓂᒃ ᐊᑐᓕᖅᑎᑕᐅᕈᓯᐅᔪᖅ.

ᐃᒪᐅᑉ ᐃᓱᕐᓂᖓᑕ ᖃᓄᐃᓐᓂᖓ (ᐅᖃᓕᒫᒐᑦ ᐊᕕᒃᑐᖅᓯᒪᓂᖏᑦ 3.0)

ᐃᓱᕐᓂᕐᒥᒃ ᖃᐅᔨᓴᖅᑳᓕᐅᕐᓂᖅ ᕿᓚᒧᐊᓂᑦ ᐱᓕᕆᐊᖑᓚᐅᖅᑐᖅ ᓈᒻᒪᒃᓯᕐᑯᓗᒍ ᐅᔾᕋᓐᓂᐊᕈᓐᓇᐅᑎᒧᑦ ᒪᓕᒃᑕᐅᔭᕆᐊᓕᒃ ᓈᓴᐅᑎᖓ 83(ᐃ) ᐊᒻᒪ 99(ᐃ). ᐊᕐᕌᒎᑦ ᐱᖓᓱᑦ ᑭᖑᓕᕇᑦ ᐊᑐᓕᖅᑎᑕᐅᓚᐅᖅᑎᓗᒍ, ᑲᑐᔾᔭᐅᓗᓂ ᖃᓂᒌᓂ ᐃᖅᑲᖓᓂᑦ ᐊᒻᒪᓗ ᐃᓱᕐᓂᕐᒧᑦ ᖃᐅᔨᓴᖅᑳᓕᐅᕐᓃᑦ ᐱᓕᕆᐊᖑᓚᐅᖏᑦᑐᖅ 2021−ᒥ ᒪᓕᑐᐃᓇᖅᑐᖅ ᑐᑭᒧᐊᒃᓯᒪᑦᑎᐊᖏᓐᓂᖏᓐᓄᑦ ᖃᓄᐃᓕᕙᓪᓕᐊᓂᕆᔭᐅᔪᑦ ᖃᐅᔨᔭᐅᓯᒪᔪᑦ ᐅᓪᓗᒥᒧᑦ ᐃᓱᕐᓂᕐᐅᑉ ᖃᓄᐃᓐᓂᖓᓄᑦ ᓇᓗᓇᐃᖅᓯᔾᔪᑏᑦ. ᐸᕙᓛᓐᑯᑦ ᐊᖏᖅᓯᒪᔪᑦ ᐊᑐᓕᖅᑎᑦᑎᕙᓪᓕᐊᖏᓐᓇᓂᕐᒥᑦ ᐊᑕᖏᕐᓗᒍ ᖃᐅᔨᓴᖅᑳᓕᐅᕐᓂᕐᒧᑦ ᐱᓕᕆᐊᒥ ᐋᖅᑭᒋᐊᖅᑕᐅᓯᒪᔪᒥᑦ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖏᓐᓇᕐᓂᕐᒧᑦ ᕿᓚᒥᐅᑦᑕᕐᓂᖏᑦ ᐊᕐᕆᒍᐃᑦ ᐱᖓᓱᑦ

ᐊᓂᒍᕌᖓᑕ, ᑕᒪᓐᓇᓗ ᒪᓕᒃᓱᓂ ᐊᕙᑎᐅᑉ ᐋᒃᑐᖅᑕᐅᓂᖓᓄᑦ ᖃᐅᔨᓴᓂᕐᒥᑦ (EEM) ᐱᓕᕆᐊᓂᑦ ᐊᓯᖏᓐᓄᑦ ᐅᔾᕋᓐᓂᐊᓂᕐᒧᑦ ᐱᓕᕆᐊᓄᑦ ᑲᓇᑕᒥ.

2021−ᒥ, ᐃᓱᓂᕐᒥᒃ ᖃᐅᔨᓴᒐᒃᓴᓕᐅᕋᓱᖕᓃᑦ ᑐᕌᒐᖃᓚᐅᖅᐳᑦ ᐱᓕᕆᕝᕙᐅᔪᒥ SW-2-ᒥ, ᖃᐅᔨᓴᕝᕙᐅᔪᖅ ᐱᖓᓐᓇᖕᒋᖓᓂ ᒫᓐᓇ ᑐᓚᒃᑕᕝᕙᐅᑉ ᑕᒪᒃᑯᓄᖓ ᖃᓄᐃᓕᖓᓂᐅᔪᓄᑦ ᐊᒻᒪ ᐃᖅᑲᕐᒥᐅᑕᑦ ᐱᖁᑦᑐᖏᑕ ᓇᓗᓇᐃᒃᑯᑕᖏᑦ ᑕᑯᔭᐅᓚᐅᖅᑐᑦ 2020-ᒥ, ᑖᒃᑯᓄᖓᓛᓚᑦᑖᖅ ᐅᓄᖅᓯᒋᐊᖅᓯᒪᔪᑦ ᓯᐅᕋᖃᕐᓂᖓ, ᐅᓄᕈᓐᓃᖅᑻᓕᖅᓗ ᐳᓴᖏᑦ ᒥᑭᒃᑑᑎᕋᓛᑦ ᐱᑕᖃᖅᑐᑦ ᐊᒻᒪᓗ ᐅᓄᕈᓐᓃᖅᓱᑎᒃ ᐊᔾᔨᒌᙱᑦᑐᑦ ᐆᒪᔪᑦ ᐱᑕᖃᑦᑎᐊᕐᓂᖏᓐᓄᑦ ᐊᒻᒪ ᐊᔾᔨᒌᙱᑦᑎᑐᑦ ᐆᒪᔪᑦ ᐅᓄᕐᓂᖏᓐᓄᑦ ᐱᒻᒪᕆᐅᔪᑦ ᖃᓄᐃᓐᓂᖅᓴᐅᓂᖏᑦ ᑕᖁᓗᑎᑦ ᐊᓯᖏᓐᓄᑦ ᖃᐅᔨᓴᒐᒃᓴᓕᐅᕐᕙᖕᓂ ᑕᐅᕗᓇ ᐱᓇᖕᓇᖕᒋᖓᓂ ᑐᑭᓕᐊᖓᔪᑦ. ᑖᒃᑯᐊ ᑕᕆᐅᑉ ᐊᕙᑎᖓᓄᑦ ᐱᓕᕆᖃᑎᒌᖑᔪᑦ (MEWG) ᑐᒃᓯᕋᓚᐅᖅᐳᑦ ᐹᕙᓐᓛᓐᑯᑦ ᑲᒪᓕᖅᑭᓪᓗᑎᒃ ᐃᓂᐅᔪᓂᒃ 2021−ᒥᑦ ᖃᐅᔨᓴᕐᓗᑎᓪᓗ ᐊᓯᔾᔨᖕᓂᐅᔪᑦ ᑕᕝᕙᓂ ᖃᐅᔨᓴᕝᕙᐊᓂᑦ ᐱᓕᕆᐊᒧᑦ–ᐋᒃᑐᐊᖕᒪᖕᒋᑕ. ᑖᓐᓇ ᐅᖃᓕᒫᒐᑦ ᐊᕕᒃᑐᖅᓯᒪᓂᖓ ᑕᐃᒪᐃᓐᓂᖓᓄᑦ ᓴᖅᑭᑎᑦᑎᕗᖅ ᖃᐅᔨᔭᐅᔪᓂᒃ ᑐᕌᕆᔭᐅᔪᓄᑦ ᖃᐅᔨᓴᒐᒃᓴᓄᑦ ᐱᔭᕇᖅᑕᐅᔪᓄᑦ 2021−ᒥ ᖃᓄᐃᓐᓂᖅᓴᐅᖕᒪᖕᒋᑕ ᑕᑯᓪᓗᒋᑦ ᐊᑐᖅᑕᐅᕙᒃᑐᑐᖃᕕᓂᕐᓄᑦ ᑎᑎᕋᖅᑕᐅᓯᒪᔪᓄᑦ ᑲᑎᑕᐅᓯᒪᔪᓄᑦ ᑕᐃᑲᓂ SW-2−ᒥ.

ᑕᒪᐃᑎᒎᑦ, ᐆᒃᑐᕋᖅᑕᐅᔪᑦ ᐃᓱᕐᓃᑦ ᖃᓄᐃᓕᖓᓂᖕᓄᑦ ᑭᒡᓕᐅᔪᑦ SW-2-ᒥ 2021-ᒥ ᒪᓕᑐᐃᓐᓇᓚᐅᖅᑐᑦ ᐊᕐᕋᒎᓚᐅᖅᑐᓂᑦ ᖃᓄᐃᖓᓂᐅᔪᓂᒃ ᐅᖓᑕᐅᔾᔨᓂᖅᖗᕐᓱᑎᒃ ᑲᓇᑕᒥ ᐊᕙᑎᓕᕆᓂᕐᒧᑦ ᖃᓄᐃᓐᓂᖓᓄᑦ ᖃᐅᔨᒪᔾᔪᑎᓂᒃ (CCME) ᐃᓱᕐᓂᕐᒧᑦ ᖃᓄᐃᓕᖓᓂᐅᔪᓄᑦ ᒪᓕᒃᑕᐅᔪᒃᓴᓂᑦ ᑕᑯᔭᐅᔪᓂᑦ. ᑭᓯᐊᓂ, ᐃᓱᕐᓃᑦ ᐊᖏᓂᖕᒋᑦ ᖃᐅᔨᔭᐅᔪᑦ SW-2−ᒥ ᓇᓗᓇᐃᖅᓯᔪᑦ ᐱᑕᖃᕐᓂᖓ ᑕᐅᕙᓂ ᐱᔾᔪᑎᖃᓚᐅᖅᐳᖅ ᐃᓚᖓᒍᑦ ᑕᑯᒃᓴᐅᔪᑦ ᐸᕝᕕᓭᕝᕙᐅᓂᕐᒥᒃ 2020−ᒥ ᐅᒥᐊᕐᔪᐊᖃᕐᓇᒥ. ᐊᖑᑎᖕᒋᓐᓂ ᐊᐅᓚᔾᔭᒃᑎᑕᐅᔪᑦ ᓯᑲᐅᓂᒃ ᐃᑲᔪᖅᑕᐅᑎᓪᓗᒋᑦ ᓴᕝᓴᓂᒃ ᐅᓯᔪᒃᓴ ᐅᒥᐊᕐᔪᐊᑦ ᐊᐅᓚᔾᔭᒃᑎᑕᐅᓇᓱᒃᑎᓪᓗᒋᑦ ᐱᓇᖕᓇᖕᒋᓂ ᑐᓚᒃᑐᕐᕝᕙᖕᒥ 2020−ᒥ ᐅᒥᐊᕐᔪᐊᖅᑲᐅᑎᓪᓗᒍ ᐃᓱᒪᒋᔭᐅᔫᖅ ᐸᕝᕕᓴᐃᓂᖅᐸᖕᒍᓚᐅᕋᓱᒋᔭᐅᓪᓗᑎᒃ (ᓱᕐᓗ ᐋᔭᐃᕙᓪᓕᐊᓪᒥᑦ ᐋᒃᑐᐃᓐᓂᑦ) ᐱᔾᔪᑎᒋᓪᓗᒋᑦ SW2 ᖃᓐᓂᖕᒋᓄᑦ ᑐᓚᒃᑕᕝᕙᖕᒧᑦ. ᖃᐅᔨᔭᐅᓯᒪᔪᖅ ᐊᓯᔾᔨᖅᑐᖅ ᐃᓱᕐᓂᕐᒧᑦ ᐊᖏᓂᖕᒋᓐᓄᑦ ᓯᐊᒻᒪᑦᑎᕆᓂᖅ ᐱᔾᔪᑎᖃᑐᐃᓐᓇᕆᐊᓕᒃ ᒥᑭᔪᓂᑦ-ᐊᓯᔾᔨᖅᑐᓂᑦ ᐃᖅᑲᖓᓂ ᐋᖅᑭᑦᑕᐅᔪᑦ ᐊᖑᑎᖕᒋᓐᓂᖕᒌᖅᑐᑦ ᐃᖕᒋᕐᕋᓂᕐᓂ, ᐃᖕᒋᕐᕋᑎᑦᑎᓲᑦ ᒥᑭᓐᓂᖅᓴᓂᒃ ᐃᓱᕐᓂᕐᓂᒃ ᓴᖅᑮᓪᓗᑎᒃ ᐊᖏᓂᖅᓵᕐᔪᖕᓂᒃ ᑕᖏᓕᖕᓂᒃ. ᑕᒪᓐᓇ ᐃᓂᐅᔪᖅ ᐸᕝᕕᓭᒃᑕᐅᓯᒪᔪᖅ ᐱᔾᔪᑎᒋᓪᓗᒋᑦ ᐊᖑᑏᑦ ᐃᖕᒋᕐᕋᓂᖕᒋᑦ ᑭᒡᓕᐅᔪᓂ ᒥᒃᓵᓴᒃᑕᐅᓯᒪᔪᑦ ᑕᐃᑲᓂ ᑎᑎᕋᖅᑕᐅᕐᖓᖅᓯᒪᔪᒥ ᑭᖑᓪᓕᖅᐹᖅᓯᐅᑏᑦ ᐊᕙᑎᒧᑦ ᐋᒃᑐᐃᓂᕐᒧᑦ ᐅᓂᒃᑳᓂ (FEIS).

ᑕᒪᒃᑭᕐᓱᒋᑦ, ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖕᒋᓐᓇᓂᕐᒥᑦ ᖃᐅᔨᔭᐅᔪᑦ ᒪᓖᓐᓇᖅᑐᑦ ᑎᑎᕋᕆᐊᙳᖅᑕᐅᓯᒪᔪᓂ ᑭᖑᓪᓕᖅᐹᒥᒃ ᐊᕙᑎᒧᑦ ᐋᒃᑐᐃᓂᕐᓄᑦ ᐅᓂᒃᑳᒥ (FEIS) ᒥᒃᓵᓴᒃᑕᐅᓯᒪᔪᓂ, ᓇᓚᐅᑦᑖᕐᓗᑎᒃ ᒥᑭᑦᑑᑐᐃᓐᓇᕆᐊᖃᕐᓂᖓᓂᒃ ᐊᒻᒪᓗ ᖃᓂᒋᔮᓂᑐᐊᖅ ᐃᓱᖅᑐᑦ ᐸᕝᕕᓴᒃᑕᐅᓗᑎᒃ ᐋᒃᑐᐊᔪᑦ ᐊᖑᑎᖕᒋᑕ ᐃᖕᒋᕐᕋᖕᒋᓐᓄᑦ, ᓂᕆᐅᒋᔭᐅᔪᖅ ᓱᕐᕋᕙᓪᓕᐊᔪᓐᓂᕐᓂᐊᕋᓱᒋᔭᐅᓗᓂ ᑕᐃᒪᐃᓕᐅᖕᒋᓐᓇᖅᑲᑦᑕᓕᕈᑎᒃ. ᐊᑐᓕᖅᑯᔨᔪᒎᑦ ᑐᕌᒐᖃᐃᓐᓇᕐᓗᑎᒃ ᖃᐅᔨᓴᒐᒃᓴᓂᒃ 2022-ᒥ ᖃᐅᔨᓴᖅᑕᐅᒃᑲᓐᓂᐅᔭᕐᓗᑎᒃ ᐃᓱᕐᓃᑦ ᐊᖏᓂᖕᒋᑦ ᐊᔾᔨᒌᙱᑦᑐᑦ ᑕᐅᕙᓂ ᐊᒻᒪᓗ ᐊᓯᔾᔨᐅᑕᐅᑐᐃᓐᓇᕆᐊᓖᑦ ᓄᓇᖓᓂ ᐃᓱᖅᑐᑦ ᓇᓃᖃᑦᑕᕐᓂᖕᒋᓐᓄᑦ ᐱᔪᑕᐅᓪᓗᑎᒃ ᐅᓯᑲᖅᑕᐃᓐᓇᕐᓂᖕᒋᓐᓄᑦ ᐊᒻᒪᓗ ᑐᓚᖃᑦᑕᐃᓐᓇᕐᓂᖕᒋᓐᓄᑦ ᕿᙳᐊᓂ ᑐᓚᒃᑕᕝᕙᖕᒥ.

ᐃᖅᑲᖓᓂ ᐱᕈᖅᑐᑦ (ᐅᖃᓕᒫᒐᑦ ᐊᕕᒃᑐᖅᓯᒪᓂᖕᒋᑦ 4.0)

ᐃᓱᕐᓂᕐᒥᒃ ᖃᐅᔨᓴᒐᒃᓴᓕᐅᕐᓂᖅ ᕿᙳᐊᓂᑦ ᐱᓕᕆᐊᖑᓚᐅᖅᑐᖅ ᓈᒻᒪᒃᓯᕐᑯᓪᓗᒍ ᐅᔾᕋᖕᓂᐊᕈᓐᓇᐅᑎᒧᑦ ᒪᓕᒃᑕᐅᔭᕆᐊᓕᒃ ᓈᓴᐅᑎᖓ 99(ᐃ) ᐊᒻᒪ 99(ᑎ). ᐊᕐᕌᒍᑦ ᐱᖓᓱᑦ ᑭᖑᓕᖓᑦ ᐊᑐᓕᖅᑎᑕᐅᓚᐅᖅᑎᓗᒍ, ᑲᑐᔾᔭᐅᓗᓂ ᖃᓂᒋᔮᓂ ᐃᖅᑲᖓᓂᑦ ᐊᒻᒪᓗ ᐃᓱᕐᓂᕐᒧᑦ ᖃᐅᔨᓴᒐᒃᓴᓕᐅᕐᓃᑦ ᐱᓕᕆᐊᖑᓚᐅᖅᓯᑦᑐᖅ 2021−ᒥ ᒪᓕᑐᐃᓐᓇᖅᑐᖅ ᑐᑭᒧᐊᒃᓯᒪᑦᑎᐊᖕᒋᓐᓂᖕᒋᓐᓄᑦ ᖃᓄᐃᓕᕚᓕᓕᐊᓂᕆᔭᐅᔪᑦ ᖃᐅᔨᔭᐅᓯᒪᔪᑦ ᐅᓪᓗᒥᒧᑦ ᐃᓱᕐᓂᕐᐅᑉ ᖃᓄᐃᓐᓂᖓᓄᑦ ᓇᓗᓇᐃᖅᓯᔾᔪᑏᑦ. ᐹᕙᓐᓛᓐᑯᑦ ᐊᖏᖅᓯᒪᔪᑦ ᐊᑐᓕᖅᑎᑦᑎᕙᓪᓕᐊᖕᒋᓐᓇᓂᕐᒥᑦ ᐊᑕᖏᕐᓗᒍ ᖃᐅᔨᓴᒐᒃᓴᓕᐅᕐᓂᕐᒧᑦ ᐱᓕᕆᐊᒥ ᐋᖅᑭᐊᖅᑕᐅᓯᒪᔪᒥᑦ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖕᒋᓐᓇᕐᓂᕐᒧᑦ ᕿᓚᒻᒥᐅᑦᑕᕐᓂᖕᒋᑦ ᐊᕐᕌᒍᐃᑦ ᐱᖓᓱᑦ ᐊᓂᒍᕌᖓᑕ, ᑕᒪᓐᓇᓗ ᒪᓕᒃᓱᓂ ᐊᑯᓚᐃᓕᕇᓂᒃ ᑎᒥᒥᖕᒌᖅᑐᓂᒃ ᖃᐅᔨᓴᒐᒃᓴᓕᐅᕐᓂᕐᓂᒃ ᐊᓯᖏᓐᓄᑦ ᐅᔾᕋᓐᓂᐊᓂᕐᒧᑦ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖕᒋᓐᓇᕐᓂᕐᒧᑦ ᐱᓕᕆᐊᓄᑦ (ᓱᕐᓗ, ᐅᕙᒪᑐᖃᒃᑯᑦ ᐊᕙᑎᐅᑉ ᐋᒃᑐᖅᑕᐅᓂᖓᓄᑦ ᖃᐅᔨᓴᓂᕐᒥᑦ [EEM]).

2022−ᒥ, ᐃᖅᑲᖓᓂ ᐱᕈᖅᑐᓂᒃ ᖃᐅᔨᓴᒐᒃᓴᓕᐅᕋᓱᖕᓃᑦ ᑐᕌᒐᖃᓚᐅᖅᑐᑦ SW-2−ᒥ, ᖃᐅᔨᓴᒐᒃᓴᓕᐅᕝᕕᒃ ᐱᖓᓐᓇᖕᒋᖓᓂ ᑐᓚᒃᑕᕝᕙᐅᑉ ᐊᔾᔨᒌᙱᑦᑐᑎᒍᑦ ᖃᓄᐃᓕᖓᓂᐅᓕᖅᐸᒃᑐᑦ ᐃᓱᕐᓂᕐᒥ ᐊᒻᒪ ᐃᖅᑲᖓᓂ ᐱᕈᖅᑐᑦ ᓇᓗᓇᐃᖅᓯᔾᔨᑎᖕᒋᑦ ᖃᐅᔨᔭᐅᓚᐅᖅᑐᑦ 2020−ᒥ, ᐱᓗᐊᖅᑐᒥᒃ ᐅᓄᖅᓯᕚᓕᖅᓯᒪᔪᑦ ᓯᐅᕋᐃᑦ ᖃᓄᐃᓕᖓᓂᖕᒋᑦ, ᒥᒃᓯᒋᐊᖅᓯᒪᔪᑦ ᐳᓴᓐᑎᑦ ᒥᑭᑦᑑᑎᐅᓂᖅᓴᑦ ᐊᒻᒪ ᐊᔾᔨᒌᙱᑦᑑᑕᐅᓗᐊᕆᓪᓗᑎᒃ, ᐆᒪᔪᕋᓛᑦ ᐊᕕᒃᑐᖅᓯᒪᔪᑦ ᐱᑕᖃᑦᑎᐊᕐᓂᖕᒋᑦ, ᐊᒻᒪ ᐅᓄᕐᓂᖕᒋᑦ ᒥᒃᓴᐅᑦᑎᓯᒪᔪᑦ ᐊᓯᖏᑦ ᑕᖁᓗᑎᑦ

ᖃᓄᐃᓐᓂᖅᓴᐅᖖᒪᖓᓚ ᖃᐅᔨᓴᕐᕕᖕᒥ ᐱᖓᓐᓇᖕᒑᖓᓂ. ᑕᕆᐅᑉ ᐊᕙᑎᖓᓄᑦ ᐱᓕᕆᖃᑎᒌᑦᑐᑦ (MEWG) ᑐᔅᓯᕋᓚᐅᖅᐳᑦ ᐹᕙᓖᓐᑯᓐᓄᑦ ᐅᐸᒃᑲᓐᓂᕐᑯᔨᓪᓗᑎᒃ ᑖᔅᓯᒥᖓ ᐃᓂᒥᒃ 2021−ᒥ ᖃᐅᔨᓴᕈᕐᑯᓪᓗᒋᑦ ᐊᓯᔾᔨᖅᑐᑦ ᑕᕝᕙᓂ ᖃᐅᔨᓴᕐᕕᖕᒥ ᐱᓕᕆᐊᖑᔪᒧᑦ−ᐊᒃᑐᐊᓂᖃᖏᒃᑲᓗᐊᕐᒪᖓᓚ.

ᐃᖅᑲᖓᓂ ᐱᕈᖅᑐᑦ ᖃᐅᔨᓴᒐᒃᓴᓕᐅᕐᓂᕐᒥ ᖃᐅᔨᔭᐅᔪᑦ 2021−ᒥ ᓇᓗᓇᐃᖅᑕᐅᓚᐅᖅᐳᑦ ᓂᕐᔪᑎᑦ ᐅᓄᕐᓂᖏᑦ, ᐆᒪᔪᑦ ᐱᑕᖃᑦᑎᐊᕐᓂᖏᑦ, ᐊᒻᒪ ᐆᒪᔪᑦ ᐊᔾᔨᒌᖏᒋᑲᓘᔭᖅᑐᑦ ᐊᒃᑐᐊᔪᑦ ᓇᐃᓴᐅᑎᖏᓐᓄᑦ ᖃᐅᔨᔭᐅᓚᐅᖅᑐᑦ 2020−ᒥ. ᐱᓗᐊᖅᑐᒥᒃ, ᑕᒪᓐᓇ ᐃᓚᖃᓚᐅᖅᐳᖅ ᐅᓄᖅᓯᕐᔪᐊᖅᑐᓂᒃ ᓂᕐᔪᑏᑦ ᐅᓄᕐᓂᖏᓐᓄᑦ ᐊᒻᒪ ᐆᒪᔪᐃᑦ ᐊᔾᔨᒌᖏᒋᐊᕐᔫᓐᓂᖏᑦ ᐱᑕᖃᑦᑎᐊᕐᓂᖏᑦ, ᐆᒪᔪᐃᑦ ᐊᔾᔨᒌᖏᒋᑲᓘᔭᕐᓂᖏᑦ ᐅᑎᖅᓯᒪᓕᖅᑐᑦ ᐊᔾᔨᐸᓗᖏᓐᓄᑦ ᑎᑎᕋᖅᑕᐅᓯᒪᔪᑦ SW-2−ᒥ 2019−ᒥ. ᓄᓇᒥᙵᖅᑐᑦ ᐊᔾᔨᒌᖏᓐᓂᖏᑦ ᐃᓚᖓᒍᑦ ᐃᑲᔫᑎᓯᒪᑐᐃᓐᓇᕆᐊᖃᓚᐅᕋᓗᐊᖅᑎᓪᓗᒋᑦ ᐊᓯᔾᔨᖅᑐᓄᑦ ᑎᑎᕋᖅᑕᐅᓯᒪᔪᓂᑦ SW-2−ᒥ 2020−ᒥ (ᐃᖅᑲᖓᓂ ᐱᕈᖅᑐᑦ ᓄᓇᖓ ᓴᖅᑮᔭᖅᑎᑦᑎᔪᓐᓇᖅᑐᖅ ᐊᓯᔾᔨᖅᓯᒪᔪᓂᒃ ᐅᓄᕐᓂᖏᓐᓄᑦ ᖃᐅᔨᓴᐅᑎᖏᓐᓄᑦ ᑭᒡᓕᖃᖅᑎᑕᐅᔪᓂᒃ ᐃᓂᖏᓐᓄᑦ), ᓯᓚᑖᓂᙵᖅᑐᑦ ᐊᒡᓱᕈᕐᓇᖅᑐᖅᓯᐅᕈᑕᐅᔪᑦ ᐱᔾᔪᑕᐅᓚᐅᖅᐳᑦ ᑖᒃᑯᓄᖓ ᐊᓯᔾᔨᐅᑎᓄᑦ ᐱᔾᔪᑎᒋᓪᓗᒋᑦ ᐊᔾᔨᐸᓗᖏᑦ ᐊᓯᔾᔨᖅᓯᒪᔪᑦ ᖃᐅᔨᔭᐅᓚᐅᙱᓪᒪᑕ ᓇᓕᐊᖕᓂᑐᐃᓐᓇᕐᓂ 59−ᓂᒃ ᖃᐅᔨᓴᕐᕕᖕᓂ 2020−ᒥ. ᐱᔾᔪᑕᐅᓪᓗᑎᒃ ᐃᓂᐅᔫᑉ ᖃᓂᒃᓴᓂᕐᓂᖓᓄᑦ ᑐᓚᒃᑕᕐᕕᖑᒧᑦ, ᐃᐱᒪᕆᔭᐅᕚᖅ 2020-ᒥ ᓯᓪᔭᒥ ᓯᑲᐅᒧᑦ−ᐃᑲᔪᖅᑕᐅᔪᑦ ᑐᓚᒃᓯᒪᓂᐅᖃᑦᑕᓚᐅᖅᑐᖅ 2020-ᒥ ᓴᖅᑮᓯᒪᔪᑦ ᓄᓇᖓᓂ ᐊᖑᑎᓄᑦ ᐊᐅᓚᔾᔭᒃᑕᐅᓯᒪᓪᓗᑎᒃ ᐊᒃᑐᖅᑕᐅᔪᑦ (ᐊᐅᓚᔾᔭᒃᑎᑕᐅᓂᖏᑦ ᒥᑭᓐᓂᖅᓴᐃᑦ ᐃᓱᖅᑐᑦ) ᓴᖅᑭᓪᓗᑎᒃ ᐊᖏᕌᑕᐅᓂᖅᓴᓂᒃ ᐊᒻᒪᓗ/ᐅᕝᕙᓘᓐᓃᑦ ᐋᔭᐃᕝᕕᐅᓪᓗᑎᒃ ᒫᓐᓇ ᐃᖅᑲᖓ SW-2-ᒥ, ᐃᒪᐃᑐᐃᓐᓇᕆᐊᖃᕋᓪᓗᓂᓗ, ᐊᐅᓚᔾᔭᖕᓂᖏᑦ ᖃᐃᖅᓱᐃᑦ ᐃᖅᑲᖓᓂ ᑕᐃᑲᓂ ᖃᐅᔨᓴᕐᕕᐅᔪᒥ. ᑕᒪᓐᓇ, ᑕᐃᒪᐃᓐᓂᖓᓄᑦ, ᓴᖅᑭᑎᑦᑎᓚᐅᖅᐳᖅ ᐊᓯᔾᔨᖅᓯᓂᕐᒥᒃ ᓄᓇᖓᓂ ᐃᖅᑲᖓᓚ ᖃᓄᐃᓕᖓᓂᖓᓄᑦ, ᐱᔾᔪᒍ ᐊᒃᑐᐊᓂᖃᓪᓚᑦᑖᕐᓂᖓᓄᑦ ᑖᒃᑯᓇᓂ ᐃᓱᖅᑐᑦ ᐊᖏᓕᕇᖕᓂᖏᓐᓄᑦ ᐊᒻᒪ ᓇᓃᖃᑦᑕᕐᓂᖏᑦ ᐱᑕᖃᑦᑎᐊᕐᓂᖏᓪᓗ ᐱᕈᖅᑐᑦ (ᐱᑕᖃᑦᑎᐊᕐᓂᖅᓴᐅᓪᓗᑎᒃ ᐊᔾᔨᒌᙱᑦᑑᑕᐅᓪᓗᑎᒡᓗ ᐊᒃᑐᐊᓂᖃᕋᔅᐸᐳᑦ ᒥᑭᓐᓂᖅᓴᓄᑦ, ᒥᑭᓐᓂᖅᓴᐃᑦ ᒥᑭᓐᓂᖏᓐᓄᑦ). ᑭᓯᐊᓂ, ᐃᖅᑲᖓᓂ ᓄᓇᖓ ᖃᐅᔨᒪᔭᐅᕚᖅ ᐆᒻᒪᕆᖕᓂᖓᓂᒃ ᐊᒻᒪ ᐅᑎᖅᓵᓕᔪᓇᕐᓂᖓᓄᑦ ᑕᐃᒪᐃᖏᓐᓇᒐᔪᙱᑦᑐᓂᒃ ᐸᒡᕕᓵᕆᓂᒃᑯᑦ ᐊᒃᑐᐃᔾᔪᑕᐅᓲᓂᒃ, ᖃᐅᔨᔭᐅᓯᒪᖓᓚ ᐅᓄᖅᓯᕚᓕᖅᓯᒪᓂᖏᓐᓂᒃ ᐃᖅᑲᖓᓂ ᓄᓇᖓᓂ ᓇᓗᓇᐃᒃᑯᑕᑦ ᖃᐅᔨᔭᐅᓚᐅᖅᑐᑦ 2021−ᒥ ᒪᓕᒃᓗᑎᒃ ᐊᓯᔾᔨᖅᑐᓄᑦ ᐊᑐᓕᖅᑎᑕᐅᔪᑦ ᐹᕙᓖᓐᑯᓐᓂ 2021−ᒥ ᐱᔪᑎᒋᓪᓗᒋᑦ ᓯᑲᐅᒧᑦ-ᐃᑲᔪᖅᑕᐅᓪᓗᑎᒃ ᑐᓚᒃᓯᒪᓂᕐᒧᑦ ᐊᐅᓚᓂᕆᔭᐅᔪᑦ ᐱᖓᓐᓇᖕᒑᖓᓂ ᑐᓚᒃᑕᕐᕕᖕᒥ.

ᑕᒪᐃᓐᓂᒡᓕ, ᐃᒫᓂ ᐃᓱᖅᑐᖅ ᐊᒻᒪ ᖄᖓᓃᑦᑐᑦ ᐱᕈᖅᑐᑦ ᖃᐅᔨᓴᖅᑕᐅᓚᐅᖅᑐᑦ ᓇᓗᓇᐃᖅᓯᖕᒪᑕ ᑕᕆᐅᑉ ᐃᖅᑲᖓᓂ ᖃᓂᒌᔭᓂ ᖃᐅᔨᓴᕐᕕᐅᑉ SW-2-ᒥ ᑕᑯᒃᓴᐅᑎᑦᑎᔪᑦ ᐊᒃᑐᕐᓇᖅᑕᑦᑕ ᐸᒡᕕᓴᒃᑕᐅᓂᖏᓐᓂᒃ ᐃᓱᒪᒋᔭᐅᔪᑦ ᐊᖑᑎᖏᓐᓂᒃ ᐊᐅᓚᔾᔭᒃᑎᑕᐅᓯᒪᔪᑦ ᓯᑲᐅᒥᒃ-ᐃᑲᔪᖅᑕᐅᓪᓗᑎᒃ ᓴᕝᕐᓴᓂᒃ ᐅᓯᔪᑦ ᐃᖏᕐᕋᑎᑕᐅᖃᑦᑕᕐᓂᖏᓐᓂᑦ ᐱᓇᖕᓇᖓᓂ ᑐᓚᒃᑕᕐᕕᐅᑉ 2020-ᒥ ᐅᒥᐊᕐᔪᐊᖃᕐᓇᐅᑎᓪᓗᒍ. ᑐᕌᒐᒋᔭᐅᓚᐅᖅᑐᑦ ᖃᐅᔨᓴᒐᒃᓴᓕᐅᕐᓃᑦ ᐱᓕᕆᐊᖑᓚᐅᖅᑐᑦ 2021-ᒥ ᓇᓗᓇᐃᖅᓯᔪᑦ ᑕᒪᒃᑯᐊ ᐃᖅᑲᖓᓂ ᐱᕈᖅᑐᑦ ᓄᓇᖓ ᑕᐅᕙᓂ ᓴᖅᑮᖅᑎᑦᑎᖕᒪᑦ ᐅᑎᖅᐸᓪᓕᐊᓂᐅᔪᓄᑦ ᓇᓗᓇᐃᒃᑯᑕᓂᒃ ᐱᔾᔪᑕᐅᓪᓗᑎᒃ ᑕᑯᔭᐅᓯᒪᔪᑦ ᐅᓄᖅᓯᒋᐊᕐᓯᒪᔪᑦ ᓂᕐᔪᑎᑦ ᐅᓄᕐᓂᖏᑦ, ᐆᒪᔪᑦ ᐱᑕᖃᑦᑎᐊᕐᓂᖏᑦ ᐊᒻᒪᓗ ᐆᒪᔪᑦ ᐊᔾᔨᒌᖏᒋᑦᑐᑦ. ᑕᑯᔭᐅᔪᑦ ᖃᐅᔨᔭᐅᓯᒪᔪᑦ ᒪᓕᑐᐃᓐᓇᖅᑐᑦ ᑭᖑᓪᓕᖅᐹᒥᒃ ᐊᕙᑎᒧᑦ ᐊᒃᑐᐃᓂᕐᓄᑦ ᐅᓂᒃᑳᓂᑦ (FEIS) ᒥᒃᓴᐅᓴᒃᑕᐅᓯᒪᔪᑦ, ᓇᓚᐅᖅᑖᖅᓯᒪᔪᑦ ᓄᓇᖓᓂ ᓴᖅᑭᒃᑲᓐᓂᕋᔭᕐᓂᖏᑦ ᒥᑭᑦᑑᑕᐅᓂᖅᓴᑦ-ᐃᓱᕐᓃᑦ ᐊᖑᑎᓂᖕᒑᕐᑐᑦ ᐃᖏᕐᕋᓂᖓᓄᑦ ᐊᒻᒪᓗ ᐊᒃᑐᐊᔪᑦ ᐊᓯᔾᔨᖅᑕᐅᔭᖅᑐᑦ ᐃᖅᑲᖓᑕ ᓄᓇᖓᓂ ᖃᓄᐃᓕᖓᓂᐅᔪᓄᑦ. ᐊᑐᓕᕐᑯᔨᓚᓗᐊᖅᑐᖑᑦ ᑕᕌᓚᖃᐃᓐᓇᕐᓗᑎᒃ ᖃᐅᔨᓴᒐᒃᓴᓕᐅᕐᓂᕐᒥᒃ 2020-ᒥ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖏᓐᓇᕐᑯᓪᓗᒋᑦ ᐱᓕᕆᐊᒥᖕᒑᑐᐃᓐᓇᕆᐊᓖᑦ ᐊᒃᑐᐃᓃᑦ ᓄᓇᖓᓂ ᐃᖅᑲᓇᑕ ᓄᓇᕐᑯᑖᓂ ᕿᙳᐊᓂ.

ᓄᓇᖓ, ᐱᕈᖅᑐᑦ ᐊᒻᒪ ᐃᖅᑲᖓᓂᕐᒥᐅᑕᑦ (ᐅᖃᓕᒫᓚᑦ ᐊᕕᒃᑐᖅᓯᒪᓂᖏᑦ 5.0)

ᖃᐅᔨᓴᒐᒃᓴᓕᐊᖑᓯᒪᔪᑦ ᓄᓇᖓᓂ, ᐱᕈᖅᑐᓂ, ᐊᒻᒪᓗ ᐃᖅᑲᖓᓂᕐᒥᐅᑕᑦ ᓈᒻᒪᒃᓯᕐᑯᓪᓗᒍ ᐅᔭᕋᖕᓂᐊᕈᓐᓇᐅᑎᒧᑦ ᒪᓕᒃᑕᐅᔭᕆᐊᓕᒃ ᓈᓴᐅᑎᖓ 99(ᐃ), (ᑎ) ᐊᒻᒪᓗ ᐊᒃᑐᐊᔪᑦ ᐅᔭᕋᖕᓂᐊᕈᓐᓇᐅᑎᒧᑦ ᒪᓕᒃᑕᐅᔭᕆᐊᓖᑦ 76, 83(ᐃ), 84 ᐊᒻᒪᓗ 87. ᖃᐅᔨᓴᖅᑕᐅᕐᑯᓪᓗᒋᑦ ᐱᓕᕆᐊᒥᖕᒑᑐᐃᓐᓇᕆᐊᓖᑦ−ᐊᒃᑐᐊᔪᑦ ᐊᒃᑐᐃᓃᑦ ᓄᓇᒧᑦ, ᐱᕈᖅᑐᓄᑦ, ᐊᒻᒪᓗ ᐃᖅᑲᖓᓂᕐᒥᐅᑕᑦ, ᐊᔾᔨᓕᖅᑎᑕᐅᓯᒪᔪᑦ ᐃᒫᓂ ᑕᑯᔭᐅᔪᓐᓇᖅᑐᑦ ᓇᐃᓴᖅᓯᔾᔪᓯᖏᑦ ᐊᑐᖅᑕᐅᓚᐅᖅᑐᑦ SCUBA−ᒥᒃ ᑐᙵᕕᖃᖅᓗᑎᒃ ᑭᒡᓕᓯᓂᐊᕐᓃᑦ ᐳᐃᔾᔪᕐᖅᑏᑦ ᖃᐅᔨᓴᕐᑯᓪᓗᒋᑦ ᑕᕆᐅᑉ ᐱᕈᖅᑐᖏᓐᓂᒃ, ᕿᒥᕐᕈᖃᙱᑦᑐᓂᒃ ᐊᒻᒪᓗ ᐃᖃᓄᓐᓂᒃ ᐊᔾᔨᒌᙱᑦᑐᓂᒃ ᑎᑎᕋᖅᑕᐅᕐᑯᓪᓗᒋᑦ ᓇᔪᖏᑦ ᖃᓄᐃᑦᑑᓂᖏ ᑖᒃᑯᓇᓂ ᑭᐸᑲᓐᓂᕐᑯᓪᓗᒍ ᐊᖏᓕᕐᑕᐅᓚᐅᖅᑎᑕᐅᓯᒪᓕᖅᑐᑦ ᐃᖅᑲᖓᓂ ᑕᒪᕐᒦᖕᓂᒃ ᓴᖅᑮᕈᐅᔭᕐᓇᖅᑐᒥ ᐃᓂᒥ ᐊᒻᒪᓗ ᓇᓗᓇᐃᖅᑕᐅᓯᒪᔪᒥ ᐃᓂᒥ. ᑭᐸᑲᓐᓂᕐᑑᑎᓚᖁᑦ ᖃᐅᔨᓴᖅᑕᐅᓚᐳᖅᑐᑎ ᑎᑎᕋᖅᑕᐅᕐᑯᓪᓗᒋᑦ ᐳᓴᖓᑦ ᐱᑕᖃᕐᕕᐅᔪᑦ (%) ᓄᓇᖓ ᖃᓄᐃᑦᑑᓂᖓᓄᑦ, ᐃᖅᑲᖓᕐᒥᐅᑕᑦ ᐱᕈᖅᑐᑦ, ᐊᒻᒪᓗ ᑖᒃᑯᐊᓇᙱᑦᑐᑦ ᐃᖅᑲᖓᓂᕐᒥᐅᑕᑦ ᐱᕈᖅᑐᑦ, ᐅᓄᕐᓂᖏᑦ (ᓇᐃᓴᖅᑕᐅᓗᑎᒃ) ᓅᑦᑐᓇᖅᑐᑦ ᐱᕈᖅᑐᑦ, ᐊᒻᒪᓗᑦᑕᐅᖅ ᐊᕕᒃᑐᖅᓯᒪᓂᖏᑦ ᓇᓗᓇᐃᔭᖅᑕᐅᓗᑎᒃ ᐅᓄᙱᓛᓄᑦ ᐊᑐᕈᓐᓇᖅᑐᓄᑦ ᐊᕕᒃᑐᖅᓯᒪᔪᓄᑦ

ᖁᕝᕙᓯᓕᕖᓄᑦ. ᖃᐅᔨᓴᕐᕕᓴᑦ ᐱᔭᐅᔪᓇᕌᖓᑕ ᑲᑎᑕᐅᖃᑦᑕᓚᐅᖅᑐᑦ ᓇᒡᓯᐅᔾᔭᐅᓪᓗᑎᒡᓗ ᐃᓕᓴᕆᔭᐅᓯᒪᔪᓄᑦ ᐆᒪᔪᑦ ᐊᕕᒃᑐᖅᓯᒪᓂᖏᓐᓄᑦ ᖃᐅᔨᓵᕕᖕᓄᑦ (Biologica Environmental Services Ltd.) ᐊᕕᒃᑐᖅᓯᒪᓂᖏᑦ ᓇᓗᓇᐃᖅᔭᖅᑕᐅᖁᔨᓗᒋᑦ. ᐊᕕᒃᑐᖅᓯᒪᓂᖏᑦ ᐱᑕᖃᑎᐊᕐᓂᖏᓐᓄᑦ ᐊᔾᔨᒋᙱᒋᕈᓘᔭᕐᓂᖏᓐᓄᔨᓗ (Simpson's Diversity Index) ᖃᐅᔨᓴᖅᑕᐅᓚᕗᖅᑐᑦ ᐱᕈᖅᑐᖏᓐᓄᑦ ᐃᖅᑲᖓᓂᕐᒥᐅᑕᔨᓗ.

ᑭᐸᕇᓐᓂᒃᓯᓯᒪᔪᑦ ᖃᐅᔨᓴᕆᓪᓴᓕᐅᕐᕕᖕᓂ ᖃᐅᔨᔭᐅᓚᐅᖅᑐᑦ 2021−ᒥ ᓇᓗᓇᐃᖅᓯᓚᐅᖅᐳᑦ ᐊᕿᑦᑐᒥ ᓄᓇᖓ ᐊᕙᑎᖃᕐᓂᖓᓂᒃ, ᐅᑯᐊᖑᔨᓗᑎᒃ ᒪᕋ ᐊᒻᒪ ᓯᐅᕋᖅ. ᐊᔾᔨᐸᓗᖏᑦ ᐱᕈᖅᑐᑦ ᐊᒻᒪ ᐃᖅᑲᕐᒥᐅᑕᑦ ᐊᕕᒃᑐᖅᑕᐅᓯᒪᔪᑦ ᖃᐅᔨᔭᐅᓚᐅᖅᑐᑦ 2021−ᒥ ᐊᕐᕌᒍᓂ ᐊᓂᒍᖅᑐᓂᒃ (2018-2020). ᓄᓇᖓᓄᑦ ᓇᓗᓇᐃᖅᓯᔾᔪᑎᑦ (ᓲᕐᓗ, ᐳᓴᓐᑎ ᐱᑕᖃᕐᓂᖓᓄᑦ, ᐅᓄᕐᓂᖏᑦ, ᐆᒪᔪᑦ ᐱᑕᖃᑎᐊᕐᓂᖏᑦ, ᐊᒻᒪ ᐊᔾᔨᒌᙱᓐᓂᖏᑦ) ᐊᔾᔨᒌᙱᒋᕈᓘᔭᓚᐅᖅᐳᑦ ᐃᓗᐊᓂ ᐊᒻᒪ ᑖᒃᑯᓇᓂ ᑭᐸᕇᓐᓂᒃᑑᑎᓂ ᑖᒃᑯᓇᓂᓗ ᓇᓗᓇᐃᖅᑕᐅᓯᒪᔪᓂ ᓴᖅᑮᔭᕕᐅᔪᓂ; ᓇᐃᓴᐃᑎᑎᒍᑦ ᐊᓯᔾᔨᒌᙱᕐᔪᐊᓗᐊᕐᓇᑎᒃ ᑕᑯᔭᐅᔪᑎᒍᑦ ᑖᒃᑯᓇᓂ ᓴᖅᑮᔭᕕᐅᔪᓂ ᐊᒻᒪᓗ ᓇᓗᓇᐃᖅᑕᐅᓯᒪᔪᓂ ᐃᓂᓂ ᓇᓕᐊᖕᓄᑐᐃᓐᓴᖅ ᓇᓗᓇᐃᕈᑎᒃᓴᕐᓄᑦ. ᑕᒪᐃᓐᓂᓪᓕ, ᖃᐅᔨᓴᕈᑎᕕᓃᑦ ᓇᓗᓇᐃᖅᓯᕗᑦ ᐃᒪᐃᓐᓇᓱᒋᓐᓈᓪᓗᑎᒃ ᑖᒃᑯᐊ ᐱᕈᖅᑐᑦ ᐊᒻᒪ ᐃᖅᑲᓇᓂᕐᒥᐅᑦ ᓄᓇᖓᑕ ᐋᖅᑭᒃᓯᒪᓂᖓ ᖃᓄᐃᓐᓂᖅᓴᐅᖕᒪᖓᑕ ᑖᒃᑯᓇᓂ ᐱᓕᕆᕝᕕᐅᔪᒥ ᐊᒻᒪ ᖃᐅᔨᒋᐊᕐᕕᐅᔪᓐᓇᖅᑐᑦ ᐃᓅᑦ ᓇᓗᓇᒃᑯᑕᖅᑰᔫᒥᑦᑐᑦ ᐱᓕᕆᐊᓄᑦ−ᐊᒃᑐᐊᓂᓖᑦ ᐊᒃᑐᐃᔾᔪᑕᐅᓛᑦ ᐅᕝᕙᓘᓐᓃᑦ ᐊᔾᔨᒋᔫᓐᓂᕈᑎᖏᑦ.

ᒥᒃᓴᐅᓴᒃᑕᐅᔪᑦ ᖃᐅᔨᓴᕈᑎᕕᓂᕐᓂ ᖃᐅᔨᔭᐅᔪᑦ ᐃᓚᖅᖢᑎᒃ ᐆᒪᔪᕋᑏᑦ ᐊᕕᒃᑐᖅᓯᒪᓂᖏᓐᓄᑦ ᑲᑎᑉᐸᓕᐊᔪᑦ ᓴᖑᕙᓕᐊᓂᖓ ᑎᑎᖅᑲᕐᑯᑎᓄᑦ ᓇᓗᓇᐃᖅᓯᖓᒪᑦ ᒫᓇ ᖃᐅᔨᓴᕐᕕᓴᓕᐅᕐᓂᕐᒧᑦ ᐋᖅᑭᒃᑕᐅᓯᒪᔪᑦ ᓈᒻᒪᓂᙱᒻᒪᑕ ᑕᑎᒋᓗᒋᑦ ᖃᐅᔾᔪᑎᒋᓇᓱᒋᑦ ᐱᓕᕆᐊᒥᑦ−ᓴᖅᑭᑕᐅᔪᑦ ᐊᓯᔾᔨᐅᑏᑦ ᓄᓇᖓᑕ ᖃᓄᐃᓕᖓᓂᖓᓄᑦ ᐅᕝᕙᓘᓐᓃᑦ ᓇᓗᓇᐃᔭᕐᓚᑦᑖᕐᓗᒍ ᐃᖅᑲᖓᓂ ᓄᓇᖓ ᒫᓇ ᑎᑎᖅᑲᕐᑎᑎᒍᑦ. ᑕᐃᒪᓐᓂᖓᓄᑦ, ᒫᓇ ᖃᐅᔨᔭᐅᓯᒪᔪᑦ ᑐᑭᓕᐅᖅᑕᕐᓗᐊᖅᑐᑦ ᐅᔾᔨᖅᓱᖅᑕᐅᑦᑎᐊᕐᓗᑎᒃ. ᒥᒃᓴᐅᓴᐃᓃᑦ ᖃᐅᔨᓴᕐᕕᓴᓕᐅᕐᓂᕐᒧᑦ ᐱᑕᖃᙳᑎᑦᑎᔭᓇᐊᓖᑦ ᑎᑭᑕᐅᑎᐊᕈᓇᕐᓗᓂ ᖃᐅᔨᔪᓇᐅᑎᓄᑦ ᒥᒃᓴᐅᓴᒃᑕᐅᔪᓄᑦ (ᓲᕐᓗ ᓇᓗᓇᐃᖅᑕᐅᓗᓂ ᒥᒃᓴᐅᓴᒃᑕᐅᔪᑦ ᖃᐅᔨᓴᕈᑏᑦ) ᑕᒪᑐᒧᖓ ᐱᓕᕆᐊᒧᑦ ᓇᓗᓇᐃᖅᑕᐅᓚᐅᖅᑐᑦ ᑎᑭᑕᐅᔪᓇᙱᓐᓂᖏᓐᓂᒃ ᐃᓗᐊᓂ ᑭᒡᓕᖅᑐᑦ ᓯᑯᖃᙱᑎᓪᓗᒍ ᖃᐅᔨᓴᕐᕕᓴᓕᐅᕐᕕᐅᕙᒃᑐᒥ (ᐋᒡᒌᓯ/ᓯᑎᐱᕆ). ᑕᐃᒪᐃᒻᒪᑦ, ᒫᓇ ᖃᐅᔨᔭᐅᓯᒪᔪᑦ ᑐᑭᓕᐅᖅᑕᐅᓗᐊᖅᑐᑦ ᐅᔾᔨᖅᓱᖅᑕᐅᓗᑎᒃ. ᑕᐃᒪᐃᒻᒪ, ᐱᖓᓱᑦ ᐊᑐᖅᑕᐅᖖᒋᕈᓇᖅᑐᑦ ᓯᕗᓪᓗᐊᕆᓱᒃᑎᓗᑕ ᓴᖅᑕᐅᓚᐅᖅᑐᑦ 2021 ᑕᕆᐅᑉ ᐊᕙᑎᖓᓄᑦ ᐊᒃᑐᐃᓂᕐᓄᑦ ᖃᐅᔨᓴᐃᓇᕐᓂᕐᒧᑦ ᐱᓕᕆᐊᖅ (MEEMP) ᐅᓂᒃᑳᖓᓂ: (i) ᐋᖅᓯᓚᐅᖅᐳᑦ ᑖᓯᒥᖓ ᖃᐅᔨᓴᕈᑎᑦ ᐃᓗᓕᖏᓐᓂᒃ 2022−ᒥ ᑕᕆᐅᑉ ᐊᕙᑎᖓᓄᑦ ᐊᒃᑐᐃᓂᕐᓄᑦ ᖃᐅᔨᓴᐃᓇᕐᓂᕐᒧᑦ ᐱᓕᕆᐊᒥ (MEEMP) ᐋᖅᑭᒃᓯᒪᓂᖓᓂ ᐊᒻᒪᓗ ᑐᕌᖓᒋᓐᓂ ᐊᓯᖏᓐᓄᑦ ᐃᓗᓕᖏᓐᓄᑦ ᐊᑐᐃᓐᓇᕈᐃᔪᑦ ᓈᒪᓈᖅᓯᒪᔪᓂᒃ ᓇᐃᓴᐅᑎᑎᒍᑦ ᖃᐅᔨᔭᐅᓂᕐᒧᑦ ᒥᒃᓴᐅᓴᒃᑕᐅᔪᓄᑦ (ᓲᕐᓗ, ᐃᖅᑲᖓᓂ ᐱᕈᖅᑐᑦ, ᐃᓱᕐᓂᐅᑉ ᖃᓄᐃᓕᖓᓂᖓ); (ii) ᐱᓕᕆᐊᖑᔾᔪᓇᕐᓗᑎᒃ ᑭᐸᕇᓐᓂᒃᓯᑎᓯᒪᔪᑦ ᖃᐅᔨᓴᕐᕕᓴᓕᐅᕐᑰᑦ ᐊᑐᕐᓗᑎᒃ ᐊᔾᔨᖓᓂᒃ ᖃᐅᔨᓴᕐᕕᓴᓕᐅᕆᔪᖏᓐᓂᕐᒧᑦ ᓈᒻᒪᒋᓗᒋᑦ ᐊᒃᑐᐊᔪᑦ ᓇᐃᓴᐃᓯᓐᓂᕐᒧᑦ ᑭᒡᓕᐅᕙᒃᑐᑦ (ᓲᕐᓗ, ᖃᐅᔨᔪᓇᕐᓂᖅ ᐊᓯᔪᒥᒃ-ᐊᑐᕐᓗᒃ ᖃᓄᐃᓂᖓᓕᕐᓂᐅᕙᒃᑐᓂᑐᐊᖅ); ᐅᕝᕙᓘᓐᓃᑦ (iii) ᐃᓚᓯᓗᓂ ᐊᒥᓱᒐᓚᖕᓂᒃ ᑭᐸᕕᓐᓂᒃᑐᓂ ᐊᑐᓂ ᖃᐅᔨᒋᐊᕐᕕᐅᔪᓇᖅᑐᓂ ᐊᒻᒪᓗ ᓴᖅᑮᔭᕕᐅᔪᓂ ᐃᓂᐅᔪᓂᑦ ᐊᖏᓪᓕᒋᐊᖅᑎᐊᕐᔪᒡᓗᒋᑦ ᖃᐅᔨᔭᐅᔪᓇᖅᑐᑦ ᒥᒃᓴᐅᓴᒃᑕᐅᓯᒪᔪᑦ ᐅᓄᕐᓂᖅᓴᓄᑦ ᓂᕈᐊᖅᑕᐅᓯᒪᔪᓄᑦ ᓇᓗᓇᐃᖅᓯᔾᔪᑎᓄᑦ. ᑭᖑᓂᐊᒍᑦ ᐱᓕᕆᖃᑎᖃᖅᑕᐅᖅᑎᒡᓗᒋᑦ ᑕᕆᐅᑉ ᐊᕙᑎᖓᓄᑦ ᐱᓕᕆᖃᑎᒌᑰᓐᓂ (MEWG) ᔫᓂ 2022−ᒥ, ᐸᕙᕐᖠᒃᑯᑦ ᐊᖏᕐᓚᐅᖅᐳᑦ ᑲᔪᓯᔪᒪᓪᓗᑎᒃ ᐱᓕᕆᐊᖑᔾᔪᖓᐅᓇᖅᑐᒥᒃ #3−ᒥ, ᐱᖓᓱᓂᒃ ᑭᐸᕇᓐᓂᒃᓯᑎᓯᒪᔪᓂᒃ ᐃᓕᐅᖅᑲᑲᓐᓂᕐᓂᐊᖅᖢᑎᒃ ᑕᒪᐃᓐᓂᒃ ᖃᐅᔨᓵᕕᐅᔪᓂᒃ ᐊᒻᒪ ᖃᐅᔨᒋᐊᕐᕕᐅᔪᓇᖅᑐᓂᒃ 2022−ᒥ, ᐃᒪᐃᓕᖓᓕᕈᑕᐅᓗᓂ ᑲᑎᖅᖢᒋᑦ 13-ᖑᓕᕐᓗᑎᒃ ᑭᐸᕇᓐᓂᒃᑐᑦ ᐊᑐᓂ ᐃᓂᒥ.

ᑕᒪᐃᓐᓂᓪᓕ, 2021-ᒥ ᖃᐅᔨᓴᕐᓂᕐᓂ ᖃᐅᔨᔭᐅᔪᑦ ᓇᓗᓇᐃᖅᓯᔪᑦ ᐱᓕᕆᐊᒥ ᐱᓕᕆᓃᑦ ᐅᓗᒥᒧᑦ ᓴᖅᑮᓯᒪᙳᒋᓪᓚᑦ ᐊᒃᑐᐃᓂᕐᓗᙳᕐᓂᕐᓂᒃ ᐱᕈᖅᑐᓄᑦ ᐊᒻᒪᓗ ᐃᖅᑲᕐᒥᐅᑦ ᓄᓇᖏᓐᓄᑦ ᕿᙵᐊᓂ ᑐᓇᒃᑕᕐᕕᖏᑦ, ᑭᓯᐊᓂᓕ, ᒥᒃᓴᐅᓴᒃᑕᐅᔪᑦ ᖃᐅᔨᓴᕈᑎᕕᓃᑦ ᖃᐅᔨᓂᕐᒧᑦ ᒥᒃᓴᐅᓴᐃᔾᔪᑕᐅᔪᖅ ᐊᑦᑎᒃᑑᓂᖒᐃᕚᑦ ᖃᐅᔨᓴᙱᓂᐅᑉ ᐃᓗᓕᖏᓐᓂᑦ.

ᑕᕆᐅᒥ ᐃᖃᓗᐃᑦ ᓄᓇᖃᕐᕕᖏᑦ ᐊᖑᓂᒃᑕᐅᔪᓪᓗ ᑎᑎᕋᖅᓯᒪᔪᑦ (ᐅᖃᓕᒫᕈᑦ ᐊᕕᒃᑐᖅᓯᒪᓂᖏᑦ 6.0)

ᓈᒪᒃᓯᖁᓪᓗᒍ ᐅᔭᕋᖕᓂᐊᕈᓇᐅᑎᒍᑦ ᒪᓕᒃᑕᐅᔭᓐᓂᐊᓕᒃ ᓈᓴᐅᑎᖓ 99(ᐱ)(ii), (ᑎ), 113, ᐊᒻᒪᓗ 114, ᖃᐅᔨᓴᕐᕕᓴᓕᐅᖅᑐᖃᓚᐅᖅᑐᑦ ᖃᐅᔨᓴᖅᑕᐅᖁᔨᓗᒋᑦ ᐊᒃᑐᐊᒍᑦ ᐅᓄᕐᓂᖏᓐᓄᑦ ᑕᕆᐅᕐᒥᐅᑕᑦ ᐃᖃᓗᐃᑦ (*Salvelinus alpinus*) ᐊᒻᒪ ᐊᓯᖏᑦ ᐃᖃᓗᐃᑦ ᐃᒪᕐᒥᐅᑕᐃᑦ ᕿᙵᖃᓂ ᑐᓇᒃᑕᕐᕕᖏᕈᔪᒃ. ᐊᒥᓱᑦ ᖃᐅᔨᓴᕐᕕᓴᓕᐅᕐᓂᕐᒧᑦ ᐱᓕᕆᔾᔪᔩᑦ ᐊᑐᖅᑕᐅᓚᐅᖅᑐᑦ ᑐᕌᒐᖃᖅᑎᑕᐅᓗᑎ ᐊᔾᔨᙱᑦᑐᓂᑦ ᐆᒪᔪᓂᒃ ᓇᔪᖅᐸᒃᑕᖏᓐᓂᓪᓗ, ᐊᑐᖃᓯᐅᑎᓪᓗᑦ ᒪᑎᑦᑕᐅᑏᑦ, ᐊᐅᓚᓴᕐᓂᑦ (ᐊᐅᓚᓴᖅ ᐊᒻᒪ ᑲᓕᓐᓂᑦ) ᐃᓱᕕᐅᔪᓇᖅᑐᑦ, ᒪᑎᑦᑕᐅᑎᑦᓚᐅᔭᑦ ᐃᓱᕕᐅᔪᓇᖅᑐᑦ, ᑲᓕᒐᕐᓂᒃ ᐊᒻᒪ ᓂᖏᑦᑎᓂᖅ ᖃᕐᔪᒃᓴᖃᖅᑐᓂᒃ. ᑲᑎᑕᐅᔪᑦ ᐃᖃᓗᐃᑦ ᓇᓗᓇᐃᖅᑕᐅᓚᐅᖅᑐᑦ ᐊᒃᐸᓯᕇᒥᒃ ᐊᑐᖅᑕᐅᔪᓇᖅᑐᒥ ᐆᒪᔪᑦ ᐊᕕᒃᑐᖅᓯᒪᓂᖏᓐᓄᑦ ᖁᕝᕙᓯᓕᕖᓄᑦ (ᐃᒪᐃᑦᑑᓕᔫᒃᑎᒃ ᓂᕐᔪᑏᑦ ᐊᔾᔨᒌᙱᑦᑐᓄᑦ−ᖁᕝᕙᓯᓕᕖᑦ)

ᐅᑎᖅᑎᑕᐅᓚᐅᖅᑳᖅᑎᓐᓇᒋᑦ. ᐃᖃᓗᐃᑦ ᓇᓗᓇᐃᖅᑕᐅᓚᐅᙱᑦᑐᑦ ᓂᕐᔪᑏᑦ ᐊᔾᔨᒌᙱᑦᑐᓄᑦ–ᖁᕝᕙᓯᓕᓂᓄᑦ ᑕᐅᕙᓂ ᐱᔭᐅᓚᐅᖅᑐᑦ ᑭᖑᓂᖓᒍᑦ ᓇᓗᓇᐃᖅᑕᐅᔪᓐᓇᖁᓪᓗᒋᑦ ᐃᓕᓴᕆᔭᐅᓯᒪᔪᓄᑦ ᓂᕐᔪᑏᑦ ᐊᕙᒃᑐᖅᓯᒪᓂᖕᒋᓐᓄᑦ ᐊᒻᒪᓗ/ᐅᕝᕙᓘᓐᓃᑦ ᑭᓲᓂᕐᒧᑦ ᖃᐅᔨᓴᕐᕕᖕᒥ.

ᐃᖃᓗᒃᑕᑦ ᐱᔭᐅᔪᑦ 2021–ᒥ (n = 603 ᐃᖃᓗᐃᑦ) ᐊᒻᒪ 2020 (n = 852 ᐃᖃᓗᐃᑦ) ᐅᓄᕐᓂᖅᓴᐅᓚᐅᖅᐳᑦ 2014-2019–ᒥᓂ, ᐱᔾᔪᑕᐅᑐᐃᓐᓇᕆᐊᖃᖅᑐᖅ ᖃᐅᔨᓴᖅᑲᖅᓯᓚᐅᕋᓱᖕᓂᖅᓴᐅᓂᖕᒋᓐᓄᑦ ᑖᒃᑯᓇᓂ ᐊᕐᕌᒍᓂ. ᓄᓇᖕᒐᑕ ᖃᓄᐃᓕᖕᒐᓂᖕᒋᑦ ᐊᔾᐸᓗᒋᔭᐅᓚᐅᖅᑐᑦ ᑭᖑᓂᖕᒎᑦᑎᓐᓂ ᖃᐅᔨᓴᖅᑲᖅᓯᐅᕐᓂᕐᒧᑦ ᐊᕐᕋᒎᔪᓂ, ᓄᓇᓕᖕᓂ ᐃᖃᓗᓕᕆᔩᑦ ᐊᐅᔭᒃᑯᑦ ᐃᖃᓗᒃᑕᓪᓗᐊᑕᒃᖓᖅᑎᒃ ᑕᕆᐅᕐᒥᐅᑕᓂᒃ, ᐅᑭᐅᖅᑕᖅᑐᕐᒥᐅᑕᑦ ᑲᓇᔦᐃᑦ (*Myoxocephalus quadricornis*) ᐊᒻᒪ ᑲᓇᔪᕐᓂᒃ (*Myoxocephalus scorpius*). ᑭᖑᓂᖕᒑᑦᑎᓐᓂ ᖃᐅᔨᓴᕐᓂᐅᓚᐅᖅᑐᑦ ᐊᕐᕌᒍᓂ, ᑖᒃᑯᐊ ᐱᖓᓱᑦ ᐊᔾᔨᒌᙱᑦᑐᑦ ᐆᒪᔪᑦ 90%–ᖏᓐᓃᓚᐅᖅᐳᑦ ᑲᑎᖓᓗᒋᑦ ᐊᖑᔭᐅᔪᑦ, ᐃᒪᐃᒃᑲᓗᐊᖅᑎᖓᓗᒍ 2020–ᒥ ᐊᒻᒪ 2021–ᒥ, ᐱᖓᓱᑦ ᐊᔾᔨᒌᙱᑦᑐᑦ ᐆᒪᔪᑦ 74%–ᖏᓐᓃᓚᐅᖅᐳᑦ ᑲᑎᖓᓗᒋᑦ ᐊᖑᔭᐅᔪᑦ, ᐅᑭᐅᖅᑕᖅᑐᒥ ᑲᓇᔪᑦ, ᐊᑯᑭᑦᑐᒥᐅᑦ ᐆᒐᖏᑦ, ᐊᒻᒪ ᑲᓇᔪᑦ ᑲᑎᖓᓗᒋᑦ ᓴᖅᑭᔮᖅᑎᑦᑎᔪᑦ 23%–ᖏᓐᓂᐸᓗᒃ ᑲᑎᖓᓗᒋᑦ ᐊᖑᔭᐅᔪᑦ.

8-ᖑᔪᑦ ᐊᓯᖏᑦ ᐆᒪᔪᑦ ᐱᔭᐅᓚᐅᖅᑐᑦ ᐃᖃᓗᓚᓱᑎᓪᓗᒋᑦ, ᐃᓚᐅᓪᓗᑎᒃ ᐊᑯᑭᑦᑐᒥᐅᑦ ᐆᒐᖏᑦ (*Gadus ogac*), ᐅᑭᐅᖅᑕᖅᑐᕐᒥᐅᑕᑦ ᑲᓇᔦᐃᑦ (*Myoxocephalus scorpioides*), ᓂᐱᓴᑦ (*Triglops pingelii*), ᑲᓇᔪᑦ (*Myoxochalus Scorpius)*, ᓇᒡᔪᖃᐅᖅᑐᑦ ᑲᓇᔪᑦ (*Gymnocanthus tricuspis*), ᓱᓗᒃᐸᐅᒐᑦ (*Aspidobiides) olrikii*), ᐃᖃᓗᑯᑖᑯᓗᐃᑦ (*Leptagonus decagonus*) ᐊᒻᒪ ᓂᒥᕆᐊᑦ (*Lycodes mucosus*). ᐱᔭᐅᔪᑦ ᑲᓇᔪᕋᓛᑦ, ᑐᕐᑯᖕᒐᔪᓂᒃ ᓂᕆᕝᒃᑐᑦ ᐃᖃᓗᑯᓗᐃᑦ, ᐊᒻᒪ ᓱᓗᖅᐸᐅᒐᑦ ᑭᒡᒐᖅᑐᐃᕚᑦ ᓯᕚᓕᖅᐹᒥ ᑎᑎᕋᖅᑕᐅᓚᐅᖅᑐᓂᒃ ᑖᒃᑯᓇᓂ ᐊᔾᔨᒌᙱᑦᑐᓂ ᐆᒪᔪᕐᓂᒃ 2014-2021 ᑕᕆᐅᑉ ᐊᕙᑎᖓᓄᑦ ᐊᒃᑐᐃᓂᕐᓄᑦ ᖃᐅᔨᓴᐃᓐᓇᕐᓂᕐᒧᑦ ᐱᓕᕆᐊᕐᒥ (MEEMP), ᐱᔾᔪᑕᐅᑐᐃᓐᓇᕆᐊᖃᖅᑐᖅ ᐅᓄᖅᓯᕚᓕᖅᓯᒪᓂᖏᓐᓄᑦ ᖃᐅᔨᓴᕐᕕᖕᓕᐊᖑᔪᑦ ᐊᒻᒪ ᖃᐅᔨᓴᕐᕕᖕᓕᐅᒃᑲᓂᕐᓃᑦ ᐱᓕᕆᔾᔪ]ᑦ ᐃᓚᓕᐅᖅᔭᐅᓯᒪᔪᑦ ᐱᓕᕆᐊᒧᑦ ᐊᕐᕌᒍᓂ ᐊᓂᒎᖅᑐᓂᒃ.

ᑖᒃᑯᓇᓂ 6–ᖑᔪᑦ ᐃᖃᓗᖕᓄᑦ ᖃᐅᔨᓴᕐᕕᖕᓕᐅᕐᓂᕐᒧᑦ ᐱᓕᕆᔾᔪᓰᑦ ᐊᑐᖅᑕᐅᓚᐅᖅᑐᑦ 2021–ᒥᑦ, ᐃᖅᑲᑦᑕᖅᓱᑎᒃ ᐃᖃᓗᖕᓂᖅᐹᖑᓚᐅᖅᑐᑦ ᑲᑎᓗᒃᑖᖅᓱᒋᑦ ᐃᖃᓗᒃᑕᐅᔪᓂ, ᑕᓪᓕᒪᓂᑦ ᐆᒪᔪᓂᒃ ᐊᕕᒃᑐᖅᓯᒪᔪᓂᑦ ᐱᓗᑎᒃ 43% ᑲᑎᖓᓗᒋᑦ ᐊᖑᓂᒃᑕᐅᔪᓖᒥᓂ, ᑭᖑᓂᐊᓗᑎᒃ ᒪᑎᑦᑕᐅᑎᓂᒃ ᐊᑐᖅᓗᑎᒃ ᖃᐅᔨᓴᕐᕕᖕᓴᖅᑖᕐᓃᑦ ᐱᓚᐅᖅᑐᑦ ᑕᓪᓕᒪᓂᑦ ᐆᒪᔪᓂᒃ ᐊᕕᒃᑐᖅᓯᒪᔪᓂᑦ 40% ᑲᑎᖓᓗᒋᑦ ᐊᖑᓂᒃᑕᐅᔪᑦ. ᐊᒥᐊᒃᑯᖏᑦ 17% ᑲᑎᖓᓗᒋᑦ ᐊᖑᓂᒃᑕᐅᔪᑦ ᑲᑎᖅᓱᖅᑕᐅᓚᐅᖅᐳᑦ ᑲᓕᒐᕐᓄᑦ (12% ᐊᖑᓂᒃᑕᐅᔪᑦ, 9 ᐆᒪᔪᑦ ᐊᕕᒃᑐᖅᓯᒪᔪᑦ ᐊᔾᔨᒌᙱᓐᓂᖏᓐᓄᑦ ᖃᐅᔨᔭᐅᔪᑦ), ᐃᓱᕐᕕᐅᔦᓐᓇᖅᑐᑦ (3% ᐱᔭᐅᔪᑦ, ᒪᕐᕉᒃ ᐆᒪᔪᑦ ᐊᕕᒃᑐᖅᓯᒪᔪᑦ ᐊᔾᔨᒌᙱᓐᓂᖏᓐᓄᑦ ᖃᐅᔨᔭᐅᓪᓗᑎᒃ), ᐊᒻᒪ ᐃᓱᕐᕕᐅᔦᓐᓇᖅᑐᑦ ᒪᑎᑦᑕᐅᑎᓕᖅᓯᒪᔪᓂ ᖃᐅᔨᓴᒃᓴᑦ (12% ᐊᖑᓂᒃᑕᐅᔪᑦ, ᐊᑕᐅᓯᖅ ᐊᕕᒃᑐᖅᓯᒪᔪᑦ ᐊᔾᔨᒌᙱᓐᓂᖏᓐᓄᑦ ᖃᐅᔨᔭᐅᔪᑦ). ᐃᓱᕐᕕᐅᔦᓐᓇᖅᑐᑦ ᒪᑎᑦᑕᐅᑎᓛᑦ ᐊᑐᖅᑕᐅᖃᓯᐅᔾᔭᐅᓕᓚᐅᖅᑐᑦ ᑕᐃᑯᖓ ᐃᓚᓕᐅᔾᔭᐅᓚᐅᖅᐳᑦ ᑕᕆᐅᑉ ᐊᕙᑎᖓᓄᑦ ᐊᒃᑐᐃᓂᕐᓄᑦ ᖃᐅᔨᓴᐃᓐᓇᕐᓂᕐᒧᑦ ᐱᓕᕆᐊᕐᒧᑦ (MEEMP) ᖃᐅᔨᓴᕈᑏᑦ ᐋᖅᑭᒃᓯᒪᓂᒃᓴᖓᓄᑦ 2021–ᒥ (ᒪᓕᒃᖢᒍ ᖃᐅᔨᓴᕈᑎᒋᔭᐅᓚᐅᖅᑐᖅ 2019–ᒥ) ᑐᙵᕕᒋᔭᐅᓪᓗᑎᒃ ᐊᑐᓕᖁᔭᐅᔪᑦ ᑕᕆᐅᑉ ᐊᕙᑎᖓᓄᑦ ᐱᓕᕆᖃᑎᒌᒃᑯᓐᓂ (MEWG) ᑭᖑᕝᕕᖅᑕᐅᖁᓪᓗᒋᑦ ᖃᐅᔨᓴᕈᑎᒃᓴᑦ ᐱᓕᕆᔾᔪᓯᖏᑦ ᐃᓱᕐᕕᐅᔦᓐᓇᖅᑐᑦ, ᐅᓄᙱᓗᐊᖅᑐᓂᒃ ᐱᔭᖃᑦᑕᖅᓯᒪᔪᑐᖃᐅᓕᕐᓂᖏᓐᓄᑦ. ᓂᖏᑦᑎᓂᖅ ᖃᕐᔪᒃᓴᖃᖅᑐᓂᒃ ᐃᓚᓕᐅᔾᔭᐅᓚᐅᖅᑐᑦ 2021–ᒥᑦ ᐊᖏᖅᓯᔭᐅᔪᑦ ᓇᐃᓴᐅᑖ 37–ᒥᑦ ᑕᕆᐅᑉ ᐊᕙᑎᖓᓄᑦ ᐱᓕᕆᖃᑎᒌᖕᓄᑦ (MEWG) (ᐅᐃᒍᖅ 1A–ᒥᑦ ᒨᑐᒃᑯ 2021–ᒥᑦ) ᑐᕌᒐᖃᕈᓐᓇᖁᓪᓗᒋᑦ ᐊᖏᔪᓂᑦ ᐃᖃᓗᖕᓂᑦ; ᑭᓯᐊᓂᓕ, ᐱᓕᕆᓇᓱᖕᓂᖏᑦ ᑲᔪᓯᑎᐊᓚᐅᙱᑦᑐᑦ (ᐊᖑᓂᙱᑦᑎᐊᒻᒪᕆᒃᖢᑎᒃ).

ᒪᕐᕉᒃ ᐊᔾᔨᒌᙱᑦᑑᒃ ᐃᖃᓗᓕᓐᕕᐅᔫᒃ (FAs) ᓇᓗᓇᐃᖅᑕᐅᓚᐅᖅᐳᑦ ᕿᙵᐊᓂ ᑐᓚᒃᑕᕐᕕᖕᒥ ᑐᙵᕕᒋᔭᐅᓪᓗᑎᒃ ᓇᔪᒐᖏᑦ ᓇᓃᓐᓂᖏᓪᓗ ᐊᒃᑐᐊᔪᑦ ᒫᓇ ᑐᓚᒃᑕᕐᕕᖕᒥ ᐱᖁᑎᕐᔪᐊᓄᑦ ᐊᒻᒪ ᐊᐅᓚᓂᕐᒧᑦ ᐱᓕᕆᐊᓄᑦ. ᑕᒪᓇ ᐱᖃᓯᐅᔾᔨᓚᐅᖅᑐᑦ ᐱᓕᕆᐊᒥᓪᓚᑦᑖᖅ ᐃᓂᐅᔪᑦ (DPF) ᐃᓂᖏᓐᓂᒃ ᐊᒻᒪᓗ ᐊᒃᑐᐊᓪᓚᕙᙱᑦᑐᑦ ᐱᓕᕆᐊᒥ ᐃᓂᐅᔪᓂᒃ (IPF) ᐃᓂᖏᓐᓂᒃ. ᐃᖃᓗᓕᓐᕕᐅᔪᑦ (FAs) ᐊᑐᖅᑕᐅᓇᓱᒃᑐᑦ ᐃᑲᔪᖁᓪᓗᒋᑦ ᐊᔾᔨᓕᖅᑎᑦᑎᓂᖅ ᖃᐅᔨᓴᕋᒃᓴᓂᕋᓱᒃᑐᓂᒃ ᐊᒻᒪᓗ ᑲᒪᒋᔭᐅᓗᑎᒃ ᐊᔾᔨᒃᑲᑦᑕᙱᓐᓂᖏᓐᓄᑦ ᐊᖑᓂᒃᑕᐅᔪᑦ ᑎᑎᖅᑲᖁᑎᖏᑦ ᕿᙵᐊᓂᓗᒃᑖᖅ. ᐊᑐᖅᖢᒋᑦ 2020 ᐊᒻᒪᓗ 2021 ᑎᑎᖅᑲᖁᑏᑦ, ᐊᖑᓂᒃᑕᐅᔪᑦ ᐊᑐᓂ ᐊᖑᓇᓱᒃᑕᐅᔪᓂ (CPUE) ᖃᓄᐃᓐᓂᖅᓴᐅᖔᓖᑕ ᖃᐅᔨᕆᐊᖅᑕᐅᓯᒪᔪᑦ ᐃᖃᓗᓕᓐᕕᐅᔪᓂ (FAs) ᐊᒻᒪᓗ ᐊᕐᕌᒍᓂ ᐊᑐᖅᖢᒋᑦ ᖃᐅᔨᓴᕈᓯᕐᒥᒃ ᐊᔾᔨᒌᖃᑦᑕᙱᑦᑐᑦ (ANOVA). ᓇᐃᓴᐅᑎᑎᖑᑦ ᐊᔾᔨᒌᙱᕐᔪᐊᖅᑐᖃᙱᒃᑲᓗᐊᖅᑎᓪᓗᒍ ᐃᖃᓗᐃᑦ ᐱᑕᖃᕐᓂᖏᓐᓄᑦ ᓇᓗᓇᐃᖅᑕᐅᔪᓂ ᑕᐃᒃᑯᓇᓂ ᐃᖃᓗᓕᓐᕕᐅᔪᓂ (FAs), ᐃᖃᓗᐃᑦ ᐱᑕᖃᕐᓂᖏᑦ ᐅᓄᕐᓂᖑᓚᐅᖅᑐᑦ ᐃᓗᐊᓂ ᐱᓕᕆᐊᒥᓪᓚᑦᑖᖅ ᐃᓂᐅᔪᒥ (DPF) ᐃᖃᓗᓕᓐᕕᐅᔪᓂ (FA). ᐃᖅᑲᑦᑕᕐᓂᒃᑯᑦ ᐊᖑᓂᒃᑕᐅᔪᑦ ᐊᑐᓂ ᐊᖑᓇᓱᒃᑕᐅᔪᓂ (CPUE) ᐊᔾᔨᒋᖏᕐᔪᐊᓛᖑᖃᑦᑕᓚᐅᖅᑐᑦ ᐊᕐᕌᒍᓂ; ᑭᓯᐊᓂᓕ, ᖃᐅᔨᓴᕈᑏᑦ ᑭᒡᓕᓕᖅᑕᐅᓯᒪᓚᐅᖅᑐᑦ ᐅᓄᙱᓐᓂᖏᓐᓄᑦ ᖃᐅᔨᓴᕐᕕᖕᓕᐊᖑᔪᑦ, ᐃᓚᖏᑦ ᒪᓕᙱᖢᑎᒃ ᖃᐅᔨᓴᕐᕕᖕᓕᐅᕐᓂᕐᒧᑦ ᐋᕐᕌᒍᓂ ᐱᔪᑎᖃᖅᖢᑎᒃ ᐱᖁᑏᑦ ᖃᓄᐃᑦᑑᓂᖏᑦ ᐊᒻᒪᓗ ᖃᐅᔨᓴᕐᕕᖕᓕᐅᕐᕕᐅᔪᖅ ᐃᓂᒥᒃ.

ᑕᒪᐃᓐᓂᓪᓕ, ᐃᖃᓗᓕᓱᒍᓰᑦ ᐊᑑᑎᖃᕆᔭᐅᓚᐅᖅᑐᑦ ᓇᓗᓇᐃᕋᓱᐊᕐᓗᒋᑦ ᑕᕆᐅᒥ ᐃᖃᓗᐃᑦ ᓄᓇᖏᓐᓂ ᐆᒪᔦᑦ ᐊᔾᔨᒋᓐᓂᖏᓐᓂᑦ ᐱᑕᖃᖕᓂᖏᓐᓄᑦ ᖃᓄᕐᓗ ᐊᒥᒨᓂᖏᓐᓄᑦ. ᐃᖃᓗᖕᓂᒃ ᖃᐅᔨᓴᕐᕕᖕᓕᐅᕐᓃᑦ 2020-ᒥ ᐊᒻᒪ 2021-ᒥ ᓴᖅᑭᑎᑦᑎᓚᐅᖅᐳᑦ ᐊᔾᔨᐸᓗᖏᓐᓂᒃ ᓇᐃᓴᐅᑎᓂᒃ ᐊᒻᒪ ᐃᓚᖏᓐᓂᒃ ᑭᒡᒐᖅᑐᐃᔭᓂᒃ ᐃᖃᓗᖃᕐᓂᖅᐹᖏᓐᓂ ᕿᙵᐊᓂ ᑐᓇᒃᑕᕐᕕᖕᒥ (ᑕᕆᐅᕐᒥᐅᑕᑦ ᐃᖃᓗᐃᑦ, ᑲᓇᔪᑦ ᐊᒻᒪ ᑲᓇᔪᕋᓛᑦ) ᐊᕐᕌᒍᓂ ᐊᓂᒍᖅᑐᓂᒃ. ᓇᓗᓇᐃᔭᖅᑕᐅᓂᖏᑦ ᐃᖃᓗᓕᓐᕕᐅᔪᑦ (FAs) ᐊᒻᒪᓗ ᐊᔾᔨᓕᖅᑎᑦᑎᓂᖅ ᐃᖃᓗᓕᓱᒍᓯᕐᓂᒃ

ᐊᑐᐃᓐᓇᕈᐃᓚᐅᖅᑐᑦ ᖃᐅᔨᓴᕐᓂᓪᓚᑦᑖᒥᒃ ᐋᖅᑭᒃᓯᒪᔪᒥᒃ ᐊᖑᓂᒃᑕᐅᕚᒃᑐᑦ ᓇᐃᓴᐅᑎᖕᒋᓐᓂᒃ ᖃᓄᐃᓐᓂᖅᓴᐅᖕᒪᖕᒑᑕ ᖃᐅᔨᓴᖅᑕᐅᔪᓐᓇᖅᑐᓂᒃ ᖃᐅᔨᓴᖅᑎᓪᓗᒋᑦ ᖃᓄᐃᓕᖕᒪᓕᖅᐸᖕᓂᖕᒋᑦ ᐅᓄᕐᓂᖕᒋᓐᓄᑦ ᐱᑕᖃᕐᓂᖕᒋᓐᓄᓪᓗ ᐃᖃᓗᐃᑦ ᕿᙶᕙᓂ ᓯᕗᓂᒃᓴᒧᓯᖕᒪᖅ.

ᐃᖃᓗᐃ ᖃᓄᐃᙱᑦᑎᐊᕐᓂᖕᒋᑦ ᓄᕿᖕᒪᑕᓗ ᖃᓄᐃᓕᖕᒪᓂᖕᒋ (ᐅᖃᓕᒫᒐᑦ ᐊᕕᒃᑐᖅᓯᒪᓂᖕᒋᑦ 7.0)

ᐃᖃᓗᐃᑦ ᖃᓄᐃᙱᑦᑎᐊᕐᓂᖕᒋᑦ ᓂᕿᖕᒪᑕᓗ ᖃᓄᐃᓕᖕᒪᓂᖕᒋᑦ ᐊᒃᑐᐊᔪᑦ ᐅᔾᔨᕆᓂᐊᕈᓐᓇᐅᑎᒧᑦ ᒪᓕᒃᑕᐅᔾᔭᕆᐊᓖᑦ ᓇᐃᓴᐃᑎᖕᒐ 76, 83 (ᐃ), 87, 99 (ᐃ), 99 (b) (ii), 99 (ᑎ), 113, ᐊᒻᒪᓗ 114. ᐃᖃᓗᐃᑦ ᖃᓄᐃᙱᑦᑎᐊᕐᓂᖕᒋᓐᓄᑦ ᑎᑎᖅᑲᖁᑏᑦ ᑲᑎᑕᐅᔪᑦ ᖃᓇᔾᔪᓄᑦ (*Myoxocephalus quadricornis*) and *ᐋᒻᒦᔭᑦ* (*H. arctica*, wrinkled rock-borer) 2021-ᒥ ᐊᑐᖅᖢᑎᒃ ᐱᔨᓐᓇᐅᔾᔨᓂᒃ ᒪᓕᒃᑐᓂᒃ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᕐᒋᓇᕐᓂᕐᒧᑦ ᐱᑕᖃᕆᐊᓖᑦ ᒪᓕᒃᑕᐅᓪᓗᑎᒃ ᓴᕝᕌᔭᐃᑦ ᐊᒻᒪᓗ ᐅᔾᔨᑦ ᑎᓯᔪᑦ ᓴᓗᒻᒪᖅᓴᖅᓯᒪᔪᑦ ᐃᒦᑦ ᒪᓕᒐᖕᒋᑦ (MDMER; ᑲᓇᑕᒥ ᒐᕙᒪᒃᑯᑦ 2002).

ᑐᖖᒐᕕᒋᓪᓗᒋᑦ ᐃᓗᐊᓂ ᓯᓚᑖᓂᓗ ᖃᐅᔨᓴᖅᑕᐅᓂᑦ, ᑲᓇᔪᐃᑦ ᕿᙶᕙᓂᕈᔪᒃ 2021–ᒥ ᖃᓄᐃᙱᑦᑎᐊᖅᑯᔨᓚᐅᖅᑐᑦ. ᖃᐅᔨᓴᕋᒃᓴᑦ ᐱᕕᒃᓴᖕᒋᑦ ᓈᒻᒪᓚᐅᖅᐳᑦ ᖃᐅᔨᓴᖅᑕᐅᓂᐊᖅᑎᓪᓗᒋᑦ ᐃᕐᓂᐅᖅᑐᑦ ᑲᓇᔪᑦ ᐋᒻᒦᔭᐃᓪᓗ (*H. arctica*) ᑐᑭᑖᖅᓱᓂ ᓈᒻᒪᓈᖅᓯᒪᔪᖅ ᕿᑐᕐᖏᐅᕈᑎᖕᒋᑦ ᐱᕙᓪᓕᐊᓂᖕᒋᑦ ᑕᐃᒪᐃᓯᒪᔪᑦ ᖃᐅᔨᓴᖅᑕᐅᖁᓪᓗᒋᑦ ᕿᑐᕐᖏᐅᕈᑎᖕᒋ ᑐᑭᑖᕈᑎᖕᒋᑦ (ᓲᕐᓗ ᕿᑐᕐᖏᐅᕐᓂᕐᒧᑦ ᓇᓗᓇᐃᔭᖅᓯᒪᔪᑦ [GSI]). ᐋᒻᒦᔪᑦ ᐱᔭᐅᔪᑦ 2021-ᒥ ᖃᓄᐃᙱᑦᑎᐊᖅᑯᔨᓚᐅᕐᒥᔪᑦ. ᕿᑐᕐᖏᐅᕐᓂᕐᒧᑦ ᑐᑭᑖᕈᑎᖕᒋᑦ ᓴᖅᑮᔭᖅᑎᑦᑎᓚᐅᖅᑐᑦ ᐊᒃᑐᐊᔪᑦ ᐊᔾᔨᒌᙱᑦᑐᐊᕐᔪᖃᑦᑕᕐᓂᖕᒋᓐᓄᑦ ᑕᒪᕐᒥᖕᓄᑦ ᐊᔾᔨᒌᙱᑦᑐᓄᑦ ᐆᒪᔪᓄᑦ. ᐋᓐᓂᐊᖃᑦᑕᐃᓕᒪᓂᕐᒧᑦ ᑎᑎᖅᑲᖁᑏᑦ 2021-ᒥ ᖃᓄᐃᓐᓂᖅᓴᐅᖕᒪᖕᒑᑕ ᕿᒥᕐᕈᔭᐅᓚᐅᖅᑐᑦ ᑖᒃᑯᓄᖓ 2020-ᒧ; ᑕᒪᒃᑯᐊ ᐊᔾᔨᒌᙱᑦᑐᕐᔪᐊᕈᑏᑦ ᖃᐅᐃᔾᔪᐅᓚᐅᖅᑐᑦ ᖃᓄᐃᙴᓂᖕᒐᓄᑦ, ᐊᖕᒋᓂᖕᒐᓄᑦ ᐊᔾᔨᒌᙱᑦᑐᕐᔪᐊᕈᑏᑦ ᒥᑭᑦᑑᓚᐅᖅᑐᑦ (<10%). ᕿᑐᕐᓂᐅᕐᓂᕐᒧᑦ ᐊᑐᖅᑕᐅᔪᑦ ᐋᒻᒦᔪᓄᑦ ᖃᓄᐃᓐᓂᖅᓴᐅᖕᒪᖕᒑᑕ ᖃᒪᑦᓯᐅᔪᓐᓇᓚᐅᙱᑦᑐᑦ ᑭᖑᓂᖕᒑᑦᑎᓐᓂ ᐊᕐᕌᒍᓂ ᕿᑐᕐᖏᐅᕈᓇᐅᑎᖕᒋᑦ ᐱᔭᐅᖃᑦᑕᓚᐅᙱᓐᓂᖕᒋᓐᓄᑦ.

ᐃᖃᓗᐃᑦ ᓂᕿᖕᒋᓐᓂᒫᖅᑐᖅ ᖃᐅᔨᓴᔪᑦ ᑕᓇᐅᕐᒥᐊᑕᓄᑦ ᐃᖃᓗᖕᓂ ᖃᐅᔨᓴᒐᒃᓴᓕᐊᖑᔪᓂ 2021–ᒥ ᐊᔾᔨᐸᓗᒋᕙᖕᒋᑦ ᐊᑐᖅᑕᐅᕚᒃᑐᑐᖃᕕᓂᕐᓄᑦ ᑲᑎᖅᑕᐅᓯᒪᔪᓄᑦ ᑎᑎᖅᑲᖁᑎᓄᑦ ᕿᙶᕙᓂ ᑐᓚᒃᑕᕐᕕᐅᑉ ᖃᓂᒋᔮᓄᑦ ᑕᐃᒪᙵᑦ 2010–ᒥ. ᖃᐅᔨᓴᐅᔪᑦ ᑲᓇᔪᕐᓂᑦ ᐊᒻᒪ *ᐋᒻᒦᔭᓂᑦ* (*H. arctica*) ᐊᔾᔨᐸᓗᒋᓚᐅᕐᒥᔭᖕᒋᑦ ᑎᑎᕋᖅᓯᒪᔪᑦ ᖃᐅᔨᓴᖅᑕᐅᓂᑯᐃᑦ ᓄᐊᑕᐅᓯᒪᔪᑦ ᒫᓐᓇᓕᓴᑦ ᓴᕝᕌᔭᓄᑦ. ᓇᐃᓴᐃᑎᖕᒋᑦ ᐅᔾᔨᕐᓇᖅᑐᒥᒃ ᐅᓄᖅᓯᕚᓕᖅᓯᒪᔪᑦ ᖃᐅᔨᓴᐅᓚᐅᖅᑐᑦ ᑕᐃᒪᙵᑦ 2018–ᖑᓚᐅᖅᑎᓪᓗᒍ ᐃᓚᖕᒋᓐᓄᑦ ᓱᕈᕐᓇᖅᑐᓄᑦ ᐃᓱᒫᓘᑕᐅᑐᐃᓐᓇᓇᐊᓕᖕᓄᑦ ᑕᕆᐅᕐᒥᐅᑕᓄᑦ ᐃᖃᓗᖕᓄᑦ *ᐋᒻᒦᔭᓄᑦ* (*H. arctica*) (ᓲᕐᓗ, ᓴᕕᕋᔭᒃ ᐊᒻᒪ ᐋᖅᑭᒃᓴᖅ); ᑭᓯᐊᓂ, ᐊᔾᔨᒌᙱᓐᓂᖕᒋᑦ ᒥᑭᑦᑐᒃᑑᓚᐅᖅᑐᑦ (<100%) ᐊᔾᔨᒌᙱᒐᔪᒃᖢᑎᒃ, ᓇᓗᓇᐃᖅᓯᑐᐃᓐᓇᓇᐊᖅᖢᑎᒃ ᐊᔾᔨᒌᙱᓐᓂᖕᒋᓐᓂᒃ ᑕᒪᐃᓐᓂᒃ ᐆᒪᔪᑦ ᐊᔾᔨᒌᙱᑦᑐᑦ ᐊᒻᒪ ᑭᖑᓂᐊᒍᑦ ᓴᕕᕋᔭᑖᖅᑕᕐᓂᖕᒋᑦ, ᑕᑯᒃᓴᐅᑎᑕᐅᔪᑦ ᕿᓂᖕᒋᓐᓂᒃ.

ᓂᖕᒋᓕᒫᖕᒋᓐᓄᑦ ᖃᐅᔨᓴᒃᓴᑦ ᑕᓇᐅᕐᒥᐊᑕᓄᑦ ᐃᖃᓗᖕᓄᑦ, ᑲᓇᔪᕐᓄᑦ ᐊᒻᒪ *ᐋᒻᒦᔭᓄᑦ* (*H. arctica*) ᑲᑎᑕᐅᔪᑦ 2018–ᒥᑦ 2021–ᒧᑦ ᑐᖖᒑᓂᓚᐅᖅᑐᑦ ᐋᓐᓂᐊᖃᕐᓇᖏᓐᑐᓕᕆᔨᒃᑯᑦ ᑲᓇᑕᒥ ᐊᖏᓛᕆᔭᖕᒐᓂ ᐃᓚᐅᕈᑎᒃᓴᓄᑦ ᓱᕈᕐᓇᖅᑐᓄᑦ ᓂᕿᓂ ᐊᕿᕐᑏᔭᖃᕐᓂᕐᒧᑦ ᖃᐅᔨᒪᔾᔪᑎᓂᑦ (ᐋᓐᓂᐊᖃᕐᓇᖏᓐᑐᓕᕆᔨᒃᑯᑦ ᑲᓇᑕᒥ 2015) ᑐᖖᒑᕙᐅᑎᒃᑯ ᐳᓚᐅᒃ ᑲᓪᓚᐱᐊᒥ ᒥᓂᔅᑕᖅᑲᒃ ᐊᕙᑎᓕᕆᓂᕐᒧᑦ ᐃᖃᓗᐃᑦ ᓂᕿᖏᓐᓄᑦ ᒪᓕᒐᒃᓴᖏᓐᓂ ᒪᕐᒃᓴᒧᑦ (selenium) (ᐳᓚᐅᒃ ᑲᓪᓚᐱᐊᒥ ᒥᓂᔅᑕᖅᑲᒃ ᐊᕙᑎᓕᕆᓂᕐᒧᑦ (MOE) 2014). ᐊᒃᑐᐃᓂᐊᕋᔨᕆᔭᐅᔪᑦ ᑎᑎᕋᖅᑕᐅᕆᐊᖕᒐᖅᑎᓪᓗᒍ ᑭᖑᓪᓕᖅᐸᖕᔪᐅᑏᑦ ᐊᕙᑎᒧᑦ ᐊᒃᑐᐃᓂᕐᒧᑦ ᐅᓂᒃᑳᓂ (FEIS). (ᐸᕙᓵ 2012) ᓇᓚᐅᑦᑖᓚᐅᖅᐳᑦ ᑐᖖᒑᓐᓂᐊᕋᔨᕆᔭᐅᓪᓗᑎᒃ ᐃᓚᖕᒋᓐᓄᑦ ᐆᒪᔪᖃᕝᕕᐅᔪᑦ ᑭᓪᓕᖕᒋᓐᓂ, ᓱᕐᓗ ᐃᒪᐅᑉ ᖃᓄᐃᓐᓂᖓ ᐊᒻᒪ ᑕᕆᐅᕐᒥᑦ ᐃᖃᓗᐃᑦ ᓂᕿᖓᓄᑦ ᐃᓚᐅᕈᑎᒃᓴᑦ, ᑭᓯᐊᓂ ᓇᓗᓇᐃᖅᑕᐅᓪᓗᑎᒃ ᑖᒃᑯᐊ ᐊᔾᔨᖅᑐᑦ ᐅᔾᔨᕐᓇᓗᐊᕐᒋᓐᓂᕐᒋᓐᓂᒃ.

ᐊᑕᖕᒋᖅᖢᒋᑦ, ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖕᒋᓐᓇᕈᑎᑦ ᑎᑎᖅᑲᖁᑏᑦ 2021-ᒥ ᒪᓕᒃᑐᑦ ᑭᖑᓪᓕᖅᐸᖕᔪᐅᑏᑦ ᐊᕙᑎᒧᑦ ᐊᒃᑐᐃᓂᕐᒧᑦ ᐅᓂᒃᑳᓂ (FEIS) ᓇᓚᐅᑦᑖᖅᑕᐅᔪᓄᑦ, ᓇᓕᐊᑐᐃᓐᓇᖅ ᐅᔾᔨᕆᔭᐅᔪᑦ ᐊᓯᔾᔨᕐᓂᑦ ᒥᑭᑦᑑᓕᔪᕐᒪᑕ - ᐋᖅᑭᒃᑕᐅᓯᒪᔪᓂ ᖃᐅᔨᒪᔾᔪᑕᐅᔪᓂᖅᑕᐅᓂᖅᑕᐅᓂᖅᑕᐅᓪᓗᓂᖅ ᒪᓕᒃᑲᓗᐊᖅᑎᓪᓗᒋᓪᓗ ᐱᒋᐊᕈᑕᐅᔪᓄᑦ ᖃᐅᔨᓴᕈᑎᓄᑦ ᖃᓄᐃᓕᖕᒪᓂᖕᒋᓄᑦ. ᒫᓐᓇᐅᔪᖅ, ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖕᒋᓐᓇᕐᓂᖅ ᓇᓗᓇᐃᖅᓯᔪᖅ ᐊᒃᑐᐃᓗᐊᖅᑕᐃᓕᒋᑦᑎᓂᖅ ᐊᐅᓚᖕᒪᑕ ᐊᑑᑎᒃᓴᖕᒋᓄᑦ ᐊᒻᒪᓗ ᐱᓕᕆᐊᒧᑦ ᖃᓄᐃᓕᐅᕐᓂᐅᔪᑦ ᐊᐅᓚᑕᐅᓪᓗᑎᒃ ᓴᖅᑭᑎᑦᑎᓯᒪᖕᒋᑦᑐᒥᒃ ᐊᒃᑐᐃᓂᕐᒧᖕᓂᐅᔪᒥᒃ ᐃᒪᕐᒥᐅᑕᐃᑦ ᐊᕙᑎᖕᒋᓂᑦ. ᐅᓪᓗᒥᒧᑦ, ᓴᓇᔭᐅᔪᑦ ᐊᒻᒪ ᐊᐅᓚᓂᕐᓂᑦ ᐱᓕᕆᐊᑦ ᕿᙶᕙᓂ ᑐᓚᒃᑕᕝᕕᖕᒥ ᐱᐅᙴᖕᒋᑦᑐᒥᒃ ᐊᑐᐃᔭᕈᑕᐅᖕᒋᑦᑐᑦ ᐃᖃᓗᐃᑦ ᖃᓄᐃᙱᑦᑎᐊᕐᓂᖕᒋᓐᓄᑦ ᐅᕙᓗᓈᓂᑦ ᓂᕿᖕᒋᓐᓄᑦ ᐃᓚᐅᕈᑎᒃᓴᓄᑦ ᕿᙶᕙᓂ ᑐᓚᒃᑕᕝᕕᖕᒥ. ᓯᕗᓂᒧᐊᖅᑎᓪᓗᑕ, ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖕᒋᓐᓇᕐᓂᑦ ᑲᔪᓯᐊᖅᑐᑦ ᑲᓪᓕᕆᔭᐅᕐᒋᓐᓇᖅᓱᓂᖕᒋᑦ ᐱᕕᒃᓴᓇᑎᑕᐅᔪᓂᒃ ᑎᑎᕋᖅᓯᒪᔪᓂᒃ ᑕᓇᐅᕐᒥᐅᑕᓄᑦ ᐃᖃᓗᖕᓄᑦ ᐱᑕᖃᕐᓂᕐᒧᑦ ᐱᒋᐊᕈᑎᒃᓴᑦ ᑲᓇᔪᕐᓄᑦ ᐊᒻᒪ ᐋᒻᒦᔭᕐᓄᑦ *(H.*

***arctica).* ᖃᓄᐃᖅᑎᑦᑎᐊᕐᓂᖏᓐᓄᑦ ᓂᕿᖏᓐᓄᓪᓗ ᐃᓚᐅᕈᑎᒃᓴᓕᕆᓂᕐᒧᑦ ᑐᖅᑲᕕᐅᓕᕐᓂᐊᖅᑐᑦ ᓯᕗᓂᒃᓴᒥ ᖃᓄᐃᓐᓂᖅᓴᐅᓕᕐᒪᖔᑕ ᖃᐅᔨᒋᐊᕈᑎᒃᓴᓄᑦ.**

ᑕᒫᓂᕐᒥᐅᑕᐅᖏᑦᑐᑦ ᐆᒪᔪᕋᓛᑦ (NIS)/ᐃᒫᓂ ᑎᑭᐸᒃᑐᑦ ᐆᒪᔪᕋᓛᓂᒃ (AIS) ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖏᓐᓇᕐᓂᖅ (ᐅᖃᓕᒫᒐᑦ ᐊᕕᒃᑐᖅᓯᒪᓂᖏᑦ 8.0)

ᐊᑕᖏᑦᑎᐊᖅᓯᒪᔪᒥᒃ ᖃᐅᔨᓴᕋᒃᓴᓕᐅᕐᓂᖅ ᕿᓂᖑᐊᓂ ᑕᓇᐅᑉ ᐊᕙᑎᖏᓐᓂᑦ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖏᓐᓇᕐᓗᑎᒃ ᐱᑕᖃᓕᕐᒪᖔᑕ ᑕᒫᓂᕐᒥᐅᑕᐅᖏᑦᑐᑦ ᐆᒪᔪᐃᑦ (NIS) ᐊᒻᒪ ᐃᒫᓂ ᑎᑭᐸᒃᑐᑦ ᐆᒪᔪᕋᓛᑦ (AIS), ᓈᒻᒪᒃᓯᕐᑯᓪᓗᒍ ᐅᔭᕋᖕᓂᐊᕈᓐᓇᐅᑎᒧᑦ ᒪᓕᒃᑕᐅᔭᕆᐊᓕᒃ ᓇᐃᓴᐅᑏᑦ 87, 89, ᐊᒻᒪ 91. ᑖᓐᓇ ᐱᓕᕆᐊᖑᔪᖅ ᐱᖃᓯᐅᔾᔭᔪᖅ ᑕᒪᕐᒦᖕᓂᒃ ᑐᕋᖓᓇᔭᐅᔪᓂᒃ (ᓲᕐᓗ ᐃᖅᑲᖓᓂ ᐱᔭᐅᔪᑦ, ᓄᓇᖓᑕ ᓇᑎᖓᓂ) ᐊᑕᖏᕐᓗᒋᓪᓗ (ᓲᕐᓗ, ᖃᐅᔨᓴᖅᓯᓂᖅ ᑕᒪᐃᓐᓂᑦᑎᐊᖅ ᐆᒪᔪᓂᒃ ᓇᓗᓇᐃᖅᑕᐅᓯᒪᔪᓂᒃ ᑕᓇᐅᑉ ᐊᕙᑎᖓᓄᑦ ᐊᒃᑐᐃᓂᒃᑯᑦ ᖃᐅᔨᓴᐃᓐᓇᕐᓂᒃᑯᑦ ᐱᓕᕆᐊᒥᑦ (MEEMP) ᐃᓗᓕᖏᓐᓂᒃ, ᓲᕐᓗ ᐃᖃᓗᖕᓂᒃ ᐱᕈᖅᑐᕋᓛᓂᓪᓗ ᖃᐅᔨᓴᕐᓃᑦ) ᖃᐅᔨᓴᕋᒃᓴᓕᐅᕋᓱᖕᓃᑦ. ᐆᒪᔪᓕᒫᑦ ᐊᔾᔨᒌᙱᕈᓱᔾᔪᖅᑐᑦ ᖃᓄᐃᓐᓂᖅᓴᐅᖕᒪᖔᑕ ᐊᕕᒃᑐᖅᓯᒪᓂᖏᓐᓄᑦ ᐃᓕᐅᖅᑲᖅᑕᐅᓯᒪᔪᑦ ᖃᐅᔨᓴᖅᑕᐅᕙᑦᑐᑦ ᕿᓂᖑᐊᓂᑦ, ᐱᕙᓪᓕᐊᑎᑕᐅᓯᒪᔪᑦ ᐱᓕᕆᕙᓪᓕᐊᑎᓪᓗᒋᑦ (ᐱᒋᐊᖅᐸᒃ ᓯᕗᓂᐊᒍᑦ–ᐱᓕᕆᐊᑉ ᐱᒋᐊᕈᑕᐅᔪᑦ ᖃᐅᔨᓴᕈᑏᑦ) ᓄᑖᖑᕆᐊᖅᑕᐅᕙᒃᑲᑎᓪᓗ ᐊᕐᕌᒍᑕᒫᑦ. ᑎᑎᖅᑲᐃᑦ ᕿᒥᕐᕈᔭᐅᓲᑦ ᓇᓕᐊᖕᓄᑐᐃᓐᓇᖅ ᐊᕕᒃᑐᖅᓯᒪᔪᓄᑦ ᐃᓚᒋᔭᐅᖏᑦᑐᑦ ᓇᐃᓴᐃᓂᖕᒧᑦ ᓇᓗᓇᐃᖅᑕᐅᕐᑯᓪᓗᒋᑦ ᑕᒪᐃᓪᓗᐊᕐᒪᖔᑕ ᑎᑎᕋᖅᑕᐅᓯᒪᓂᖏᑦ ᐃᓚᖃᖕᒪᖔᖏᑦ ᐅᐊᖕᓇᖓᓂᑦ ᐊᑦᓛᓐᑎᒃ, ᐅᑭᐅᖅᑕᖅᑐᒥᑦ ᐊᒻᒪᓗ/ᐅᕝᕙᓘᓐᓃᑦ ᑲᓇᑕᐅᑉ ᐅᑭᐅᖅᑕᖅᑐᖓᑕ ᐃᒪᖏᓐᓂ; ᐊᒻᒪ ᓱᓕ, ᑖᒃᑯᐊ ᐊᕕᒃᖅᓯᖅᓯᒪᔪᑦ ᓇᑭᙶᕈᓱᔾᔪᖅᑐᑦ ᑕᒪᐃᓐᓄᑦ ᓄᓇᕐᔪᐊᕐᒥ ᐊᒻᒪ ᓄᓇᖓᓂ ᖃᓇᓴᐅᔭᒥ ᑎᑎᕋᖅᓯᒪᔪᑦ ᖃᐅᔨᒪᔭᐅᔪᑦ ᑎᑭᐸᒃᑐᑦ ᐊᕕᒃᑐᖅᓯᒪᔪᓃᑦᑐᑦ (ᓲᕐᓗ, ᒨᓇᐅ ᐊᑕᖏᖅᔫᑎᒃ 2008) ᐅᕝᕙᓘᓐᓃᑦ "ᐱᒋᐊᕈᑏᑦ ᑎᑎᕋᖅᓯᒪᔪᑦ". ᐅᔾᔨᕆᔭᐅᓇᓱᒃᐸᒃᑐᑦ ᐃᓗᓕᖅᖃᖅᑐᑦ ᐊᕕᒃᑐᖅᓯᒪᔪᓂ ᐃᓱᒪᒋᔭᐅᖃᓯᐅᑎᓪᓗᒋᑦ ᐊᑦᑕᕐᓇᓗᐊᕋᓱᒋᔭᐅᖅᑎᑦᑐᑦ (ᓲᕐᓗ, ᑎᑎᕋᖅᑕᐅᓯᒪᖅᑎᑦᑐᑦ ᐃᒫᓂ ᑎᑭᐸᒃᑐᑦ ᐆᒪᔪᕋᓛᑦ (AIS) ᖃᓇᓴᐅᔭᒃᑯᑦ ᑐᖅᑯᖅᑐᐃᕕᖓᓂ ᑭᓯᐊᓂ ᑲᓇᑕᐅᑉ ᐅᑭᐅᖅᑕᖅᑐᖓᓂ ᐃᓚᒋᔭᐅᖏᑦᑐᑦ ᓈᒻᒪᒋᔭᐅᔪᓄᑦ ᑎᑎᕋᖅᑕᐅᓯᒪᔪᓄᑦ) ᐅᕝᕙᓘᓐᓃᑦ ᐊᑦᑕᕐᓇᖅᑐᒦᕐᔪᐊᖅᑐᓄᑦ (ᓲᕐᓗ, ᑎᑎᕋᖅᓯᒪᔪᑦ ᐃᒫᓂ ᑎᑭᐸᒃᑐᑦ ᐆᒪᔪᕋᓛᑦ (AIS) ᖃᓇᓴᐅᔭᒃᑯᑦ ᑎᑎᕋᖅᓯᒪᔪᑦ ᐊᒻᒪ/ᐅᕝᕙᓘᓐᓃᑦ ᑲᓇᑕᐅᑉ ᐅᑭᐅᖅᑕᖅᑐᖓᓂ ᐃᓚᒋᔭᐅᖏᑦᑐᑦ ᑎᑎᕋᖅᑕᐅᓯᒪᔪᓄᑦ) ᑭᓯᐊᓂ ᐱᔾᔪᑕᐅᖏᓐᓇᓂ ᐱᓕᕆᐊᒧᑦ, ᑖᒃᑯᐊ ᐱᒋᐊᕈᑏᑦ ᑎᑎᕋᖅᓯᒪᔪᑦ ᐃᓗᓕᖅᖃᖅᑐᑦ ᐊᑦᑕᕐᓇᖅᑐᒦᕐᔪᐊᖅᑐᓂᒃ ᐊᕕᒃᑐᖅᓯᒪᔪᓂ ᓴᖅᑭᑦᑐᑦ ᐊᑐᖅᑕᐅᓪᓗᑎᒃ ᐱᓕᕆᐊᒥ ᐅᒥᐊᕐᔪᐊᒃᑯᑦ ᐱᓕᕆᓃᑦ.

ᑲᑎᖦᖢᒋᑦ 432 ᐊᕕᒃᑐᖅᓯᒪᔪᑦ ᓇᓗᓇᐃᖅᑕᐅᓚᐅᖅᐳᑦ 2021–ᒥ ᖃᐅᔨᓴᕐᓂᕐᓂ, 54–ᖑᓪᓗᑎᒃ ᓴᖅᑭᔮᖅᑎᑦᑐᑦ ᑎᑎᕋᖅᑕᐅᓯᒪᖏᖢᑎᒃ ᕿᓂᖑᐊᓂ (ᓲᕐᓗ, ᐅᔾᔨᕆᔭᐅᓚᐅᖏᑦᑐᑦ ᖃᐅᔨᓴᕐᓂᐅᓚᐅᖅᓯᒪᔪᓂ). ᓄᑖᓂ ᐊᕕᒃᑐᖅᓯᒪᔪᓂ, ᑕᒪᕐᒥᓪᓗᒃᑖᖅ ᑭᓯᐊᓂ ᐊᑕᐅᓯᖅ (*Tricellaria* sp.) ᑎᑎᖅᑲᖁᑎᖃᓚᐅᖅᐳᑦ ᑲᓇᑕᐅᑉ ᐅᑭᐅᖅᑕᖅᑐᖓᓂ ᑎᑎᖅᑲᖁᑎᖃᙱᖢᑎᒃ ᐃᒫᓂ ᑎᑭᐸᒃᑐᑦ ᐆᒪᔪᕋᓛᑦ (AIS) ᖃᓇᓴᐅᔭᒃᑯᑦ ᑎᑎᕋᖅᓯᒪᔪᓂᒃ. ᐊᒥᓱᓚᑦ ᐆᒪᔪᑦ ᐊᔾᔨᒌᙱᑦᑐᑦ *ᖁᐱᕿᐊᖅᔭᐃᑦ* (*Tricellaria*) ᑕᑯᔭᐅᔪᓐᓇᖅᑐᑦ ᑲᓇᑕᐅᑉ ᐅᑭᐅᖅᑕᖅᑐᖓᓂ, ᑭᓯᐊᓂᓕ, ᐊᑕᐅᓯᖅ ᐆᒪᔪᖅ (*T. Inopinata*) ᑎᑎᕋᖅᑕᐅᓯᒪᕗᖅ ᑲᓇᑕᓕᒫᒥ ᖁᐊᖅᓵᕐᓇᖅᑐᓂᒃ ᖃᐅᔨᓴᖅᓯᓂᕐᒥᒃ ᑎᑭᑐᐃᓐᓇᕆᐊᖃᕐᓂᖓᓂᒃ ᑲᓇᑕᐅᑉ ᐃᒪᖏᓐᓄᑦ, ᐃᓚᒋᔭᐅᓪᓗᓂ ᐅᑭᐅᖅᑕᖅᑐᑉ ᓄᓇᖁᑎᖏᓐᓄ. *ᖁᐱᕿᐊᖅᔭᐃᑦ* (*Tricellaria* sp.) ᓇᒃᓯᐅᑦᔭᐅᓚᐅᖅᑐᖅ ᐃᓛᒃᑰᖅᖢᓂ ᓇᓗᓇᐃᖅᑕᐅᓪᓚᑦᑖᕆᐊᖃᙱᓐᓂᒃ ᐅᔾᔨᖅᓱᕐᓂᕐᒧᑦ, ᖃᓄᐃᓕᖓ ᐅᑕᖅᑭᔭᐅᔪᖅ ᓱᓕ. ᒪᓕᒃᖢᒋᑦ ᐱᑕᖃᕐᓂᖏᑦ ᑎᓴᒪᓗᐊᑕᐃᑦ *ᖁᐱᕿᐊᖅᔭᐃᑦ* (*Tricellaria*) ᐆᒪᔪᑦ ᑲᓇᖕᓇᖓᓂ ᑲᓇᑕᐅᑉ ᐅᑭᐅᖅᑕᖅᑐᖓᓂ ᐊᒻᒪ ᖃᓄᐃᓕᖓᓪᓚᑦᑖᕐᒪᖔᑕ ᓇᓗᓇᐃᖅᑕᐅᓪᓚᑦᑖᖅᓯᒪᖏᑦᑐᑦ ᑕᒃᑯᓄᖓ ᐊᑦᑕᑕᓲᑦ ᐱᕈᖅᑐᑦ (bryozoans), ᐃᓱᒪᒋᔭᐅᕗᖅ *ᖁᐱᕿᐊᖅᔮᓇᓱᒋᔭᐅᓪᓗᓂ* (*Tricellaria* sp.) ᑲᓇᑕᒥ ᐅᑭᐅᖅᑕᖅᑐᒥᐅᑕᐅᓪᓗᓂ ᐆᒪᔪᖅ ᐊᔾᔨᒌᙱᓚᖓᒃᑐᓂ ᑭᖑᖅᑐᐃᖅᑎᖑᕐᓗᓂ ᓄᑖᒥᒃ ᐆᒪᔪᐃᑦ ᐊᔾᔨᒋᙱᑦᑐᐊᕐᔪᖓᓂᖏᓐᓄᑦ ᓴᖅᑭᑦᑐᑦ ᐱᓕᕆᕝᕕᐅᔪᒥ. ᑕᐃᒪᐃᒻᒪᑦ, ᑭᓯᐊᓂ ᓇᓗᓇᐃᖅᑕᐅᒃᐸᑦ ᐆᒪᔪᖅ (*T. Inopinata*) ᓇᓗᓇᐃᖅᑕᐅᔪᖅ, *ᖁᐱᕿᐊᖅᔭᐃᑦ* (*Tricellaria* sp.) ᓇᓗᓇᐃᖅᑕᐅᓯᒪᔪᖅ ᐊᑦᑕᕐᓇᕐᓂᖅᒋᓪᓕᖓᓂᒃ ᒦᓇᓗ ᐃᓱᒪᒋᔭᐅᖏᑦᑐᖅ ᐃᓱᒫᓗᑕᐅᒋᐊᖓᓂᑦ ᕿᓂᖑᐊᓂ ᑐᓚᒃᑕᖅᕕᖕᒥᑦ.

ᖃᒃᑲᓂᐊᒍᑦ, ᐃᒫᓂ ᑎᑭᐸᒃᑐᑦ ᐆᒪᔪᕋᓛᓂᒃ (AIS) / ᑕᒫᓂᕐᒥᐅᑕᐅᖏᑦᑐᑦ ᐆᒪᔪᓂᒃ (NIS) ᖃᐅᔨᓴᕐᕕᒃ 2021–ᒥ ᑎᑎᕋᓚᐅᖅᐳᑦ ᑕᓪᓕᒪᓂᒃ ᐊᕕᒃᑐᖅᓯᒪᔪᓂ ᓇᓗᓇᐃᖅᑕᐅᓚᐅᖅᑐᓂᒃ ᐊᕐᕌᒍᓂ ᐊᓂᒍᖅᑐᓂᒃ ᓇᓗᓇᕐᓂᖏᓐᓄᑦ ᓇᔪᒐᖏᓐᓂ ᐅᕝᕙᓘᓐᓃᑦ ᑎᑎᕋᖅᑕᐅᓯᒪᓂᖏᓐᓄᑦ ᐃᒫᓂ ᑎᑭᐸᒃᑐᑦ ᐆᒪᔪᕋᓛᑦ (AIS) ᖃᓇᓴᐅᔭᒃᑯᑦ ᑎᑎᕋᖅᓯᒪᔪᓂᒃ (*Pseudofabricia aberrans*, *Marenzelleria* sp., *Ampharete Petersenae, Paramphitrite birulai* ᐊᒻᒪ *Crassicophium* sp.). ᑖᒃᑯᐊ ᖃᐅᔨᓴᕐᕕᐅᑉ ᓇᒃᓯᐅᑦᔭᐅᓚᐅᖅᑐᑦ ᐊᕕᒃᑐᖅᓯᒪᔪᓄᑦ ᖃᐅᔨᒪᔨᑕᓪᓚᓇᖕᓄᑦ ᐊᒻᒪᓗ/ᐅᕝᕙᓘᓐᓃᑦ ᕿᓂᖑᓪᒥᒐᖅᑕᐅᓪᓗᑎᒃ ᖃᐅᔨᓴᖅᑕᐅᓂᕐᒧᑦ ᐊᒻᒪ, ᖁᐄᓂᑦᑐᑎᑐᑦ, ᖃᓄᐃᓕᖓᓕᕐᓂᖏᑦ ᐅᑕᖅᑭᑎᑕᐅᔪᑦ.

ᕿᖅᑰᒥᒐᖅᑕᐅᔪᕙᓂᕐᓂ (DNA) ᖃᐅᔨᔭᐅᔪᑦ ᓇᓗᓇᐃᖅᑕᐅᓚᐅᖅᐳᑦ 2021 –ᒥ *ᖁᐱᕿᑯᑖᑦ (Marenzelleria* sp) ᖃᐅᔨᓴᒐᒃᓴᑦ *ᖁᐱᕿᑯᑖᖑᓂᖏᓐᓂᒃ (Marenzelleria wireni)* – ᐅᑭᐅᖅᑕᖅᑐᒥ ᑲᖏᖅᓘᓐᓂ ᓂᕐᔪᑎᐅᔪᑦ. ᑖᓐᓇ ᐊᕕᒃᑐᖅᓯᒪᔪᖅ ᐃᓂᖃᑐᐃᓐᓇᕆᐊᓕᒃ ᐱᖃᓯᐅᑎᓪᓗᒍ ᐱᓕᕆᐊᑉ ᐃᓂᖓᓂᒃ ᑎᒃᑯᐊᖅᑕᐅᓪᓗᓂᓗ "ᐊᑦᑕᕐᓇᖅᑑᖏᓐᓂᖓᓂᒃ". ᑕᐃᒪᓐᓇ ᐅᖃᖅᓯᒪᖓᒪᑦ, ᐅᔾᔨᖅᓱᑕᐅᓪᓗᓂᑦ, *ᖁᐱᕿᑯᑖᑦ (Marenzelleria)* ᖃᐅᔨᓴᖅᐸᓪᓕᐊᔭᐅᓂᖅᓴᐅᓂᐊᖅᑐᑦ ᐱᖃᓯᐅᑎᓪᓗᒋᑦ ᑭᓲᓂᖏᓐᓄ ᖃᐅᔨᓴᖅᑕᐅᓗᑎᒃ, ᑭᓯᐊᓂ ᓇᓗᓇᐃᖅᑕᐅᒃᑳᓂᖅᐸᑦ ᖁᐱᕿᑯᑖᒃ (*M. Viridis)* ᐱᑕᖃᙱᓐᓂᖏᓐᓂᒃ ᕿᙵᐊᓂ ᑐᓇᒃᑕᕐᕕᖏᑦ.

ᕿᖅᑰᒥᒐᖅᑕᐅᔪᕙᓂᕐᓂ ᖃᐅᔨᔭᐅᔪᑦ ᑭᖑᐃᑦ (*Crassicorophium* sp.) ᓇᓗᓇᐸᔫᔭᓚᐳᖅᑐᑦ, ᓇᓕᒧᑦᑐᕐᑲᙱᕙᓗᓂ ᑖᒃᑯᓄᐊ ᐊᕕᒃᑐᖅᓯᒪᔪᓄᑦ ᐃᓱᒫᓘᑕᐅᔪᓄᑦ. ᑲᓂᓛᖑᔪᖅ ᕿᖅᑰᒥᒐᖅᑕᐅᔪᕙᓂᕐᓂ ᓇᓕᒧᐸᓘᓛᖓ ᓇᓗᓴᐃᖅᑕᐅᓯᒪᙱᑦᑐᑦ ᑭᖑᖕᓄᑦ ᖃᐅᔨᓴᒐᒃᓴᒧᑦ (ᐃᓱᒪᒋᔭᐅᔪᖅ ᑭᖑᑉ (*Crassicorophium clarencense)*) ᑲᑎᑕᐅᔪᑦ ᑮᓕᓂᕐᒥ ᓄᓇᕗᒻᒥ, ᓇᓗᓇᐃᖅᓯᓪᓗᓂ ᑖᒃᑯᐊ ᑭᒡᒐᖅᑐᐃᔫᒃᓴᐅᔪᑦ ᑕᒫᓂᕐᒥᐅᑕᓂᒃ ᐊᕕᒃᑐᖅᓯᒪᔪᓂᒃ, ᐃᑲᔪᖅᓯᖅᑕᐅᓯᒪᓪᓗᓂᓗ ᓇᓗᓇᐃᔭᖅᑕᐅᓯᒪᔪᑦ ᐊᔾᔨᐸᓗᖏᑦ ᖃᐅᔨᓴᖕᒐᒃᓴᑦ ᐱᓕᕆᐊᖑᑎᓪᓗᒋ ᐱᒋᐊᕈᑕᐅᔪᑦ ᖃᐅᔨᓴᕈᑏᑦ. ᓇᓗᓇᖅᑐᑦ ᖃᐅᔨᔭᐅᔪᑦ ᑐᓂᔭᐅᓚᐅᖅᑐᑦ ᖁᐱᕿᑯᑖᑦ (*Pseudofabricia* sp. nr. *Aberrans).* ᑖᒃᑯᐊ ᖃᐅᔨᓴᒐᒃᓴᑦ ᓇᓗᓇᐃᖅᑕᐅᓚᐅᖅᑐᑦ ᓇᓕᒧᙱᓐᓂᖏᓐᓄᑦ ᖁᐱᕿᑯᑖᑦ ᓴᖅᐱᐅᔻᖃᖅᑰᔨᔪᑦ *(Fabricia stellaris)* (ᑭᖑᓂᖖᑦᑎᓐᓂ ᑕᐃᒪᐃᑑᓇᓱᑦᓯᔭᐅᓚᐅᖅᑐᑦ ᑖᒃᑯᓄᖓᖖᖅ ᓇᓗᓇᐃᖅᑕᐅᓗᑎᒃ ᖃᐅᔨᓴᒐᒃᓴᐃᑦ), ᑭᓯᐊᓂᓕ ᓇᓕᒧᓚᐅᙱᑦᑐᑦ ᒫᓐᓇ ᑎᑎᖅᑲᖁᑎᓄᑦ ᐊᓯᖏᓐᓄᑦ ᐆᒪᔪᓄᑦ. ᐊᕕᒃᑐᖅᓯᒪᔪᓕᕆᓂᕐᒧᑦ ᖃᐅᔨᒪᔨᑕᑦ ᐃᒪᐃᑑᓇᓯᒋᓈᓚᐅᖅᑐᑦ ᑕᒪᓐᓇ ᑕᐃᒪᐃᑐᐃᓐᓇᕆᐊᖃᕐᓂᖓᓂᒃ ᑕᒪᒃᑯᐊ ᖃᐅᔨᓴᒐᒃᓴᑦ ᒫᓐᓇ ᓇᓗᓇᐃᖅᑕᐅᓯᒪᙱᑦᑐᑦ ᐆᒪᔪᑦ ᑕᒫᓂᕐᒥᐅᑕᐅᔪᑦ ᐱᓕᕆᕚᐅᑉ ᐃᓂᐊᓂ. ᖃᓄᐃᓕᖓᓂᖓ ᖁᐱᕿᑦ (*P.* sp. nr. *Aberrans)* ᐋᖅᑭᑎᐊᖅᑕᐅᓯᒪᓕᖅᑐᑦ “ᖁᐊᖅᕵᕐᓇᙱᑦᑐᒧᑦ” ᐊᒻᒪᓗ ᐲᖅᑕᐅᓯᒪᓕᖅᓗᓂ ᐱᓕᕆᐊᖑᔪᓄᑦ ᓇᑦᑎᖅᓱᖅᑕᐅᔪᓂᑦ.

ᑎᑎᕋᖅᓯᒪᔪᓂᒃ ᕿᒥᕈᓚᐅᖅᑎᓪᓗᒋᑦ ᑲᑎᑕᐅᓯᒪᔪᑦ ᑐᓴᐅᒪᔾᔪᑏᑦ, ᖁᐱᕿᑯᑖᑦ (*A. Petersenae)* ᓇᓗᓇᐃᖅᑕᐅᒃᑲᓐᓂᓚᐅᖅᑐᖅ "ᐊᑦᑕᕐᓇᙱᑦᑐᑦ" ᐲᖅᑕᐅᓪᓗᓂᓗ ᐱᓕᕆᐊᒃᓴᒥᑦ ᐊᒻᒪᓗ ᐲᖅᑕᐅᓯᒪᓕᖅᓗᓂ ᐱᓕᕆᐊᖑᔪᓄᑦ ᓇᑦᑎᖅᓱᖅᑕᐅᔪᓂᑦ. ᐅᓄᕐᓂᖅᓴᑦ ᓇᓗᓇᐃᖅᑕᐅᓯᒪᔪᑦ ᐊᕕᒃᑐᖅᓯᒪᔪᑦ ᐃᖅᑲᖓᓂ ᐱᕈᖅᑐᑦ ᖃᐅᔨᓴᒐᒃᓴᓕᐊᖑᔪᑦ ᕿᙵᐊᓂ ᐃᓱᒪᒋᔭᐅᙱᑦᑐᑦ ᑕᐃᓐᓂᕐᒥᐅᑕᐅᙱᑦᑐᑦ ᐆᒪᔪᓂᖏᓐᓂᒃ (NIS) ᐅᕝᕙᓘᓐᓃᑦ ᐃᒫᓂ ᑎᑭᐸᒃᑐᑦ ᐆᒪᔪᕋᕌᖑᓇᑎᒃ (AIS).

ᐹᕙᓛᓐᑯᑦ ᑕᐃᓐᓂᕐᒥᐅᑕᐅᙱᑦᑐᑦ ᐆᒪᔪᓂᖏᓐᓂᒃ (NIS) / ᐃᒫᓂ ᑎᑭᐸᒃᑐᑦ ᐆᒪᔪᕋᕌᓂᒃ (AIS) ᐱᓕᕆᐊᑦ ᓴᖅᑮᔭᖅᑎᑦᑎᔪᑦ ᐱᓕᕆᔭᐅᕐᔪᐊᕐᓂᖅᐹᖑᓪᓗᓂ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᓂᖅ ᐱᓕᕆᐊᖅ ᑕᒪᒃᑯᓄᖓ ᑕᐃᓐᓂᕐᒥᐅᑕᐅᙱᑦᑐᑦ ᐆᒪᔪᓂᖏᓐᓂᒃ (NIS) / ᐃᒫᓂ ᑎᑭᐸᒃᑐᑦ ᐆᒪᔪᕋᕌᓂᒃ (AIS) ᐱᓕᕆᐊᖑᓯᒪᔪᖅ ᑕᖑᐅᒥ ᑐᓚᒃᑕᕐᕕᐅᔪᓂ ᑲᓇᑕᒥ. ᒥᒃᓴᐅᓴᒃᑕᐅᓯᒪᔪᑦ 870 ᐊᕕᒃᑐᖅᓯᒪᔪᑦ ᓇᓗᓇᐃᖅᑕᐅᓯᒪᔪᑦ ᕿᙵᐊᓂ ᐊᑐᖅᑕᐅᓪᓗᑎᒃ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᓃᑦ ᐅᓪᓗᒥᒧᑦ, ᐊᒻᒪᓗ ᐱᖃᓯᐅᔾᔨᔪᑦ ᐃᖅᑲᐅᑉ ᐃᑭᐊᖓᓂ ᐆᒪᔪᕋᓛᑦ, ᖁᐱᕿᐊᕐᔪᐃᑦ ᐃᒪᕐᒥᐅᑕᑦ, ᐃᖅᑲᖓᓂ ᕿᒥᕐᓗᖃᙱᑦᑐᑦ ᐃᖃᓗᐃᓪᓗ. ᓇᓗᓇᐃᔭᐃᓂᖅ ᐊᒻᒪᓗ ᑎᑎᕋᖅᓯᓂᖅ ᐊᑐᓂ ᐊᕕᒃᑐᖅᓯᒪᔪᓂ Hᐋᓐᓇᓚᖏᓐᓃᑦᑐᑦ ᓇᓗᓇᐃᖅᑕᐅᓯᒪᔫᒃ ᕿᙵᐊᓂ ᓇᓗᓇᐃᖅᓯᓪᓗᑎᒃ ᑕᒪᓐᓇ ᓇᐅᑦᑎᖅᓱᕐᓂᕐᒧᑦ ᐱᓕᕆᐊᖅ ᐊᑑᑎᓂᖓᓂᒃ ᐊᒻᒪᓗ ᐊᐅᓚᓂᖅᖢᓂ ᐊᑑᑎᒃᓴᖏᓐᓄᑦ. ᐊᒥᓲᕐᔪᐊᖑᓂᖅᓴᐃᑦ ᑖᒃᑯᓇᓂ ᐊᕕᒃᑐᖅᓯᒪᔪᓂ ᑕᐃᔭᐅᓯᒪᔪᑦ “ᖁᐊᖅᕵᕐᓇᙱᑦᑐᑦ” ᐊᒻᒪᓗ ᐃᓱᒪᒋᔭᐅᖃᓯᐅᔾᔭᐅᙱᑦᑐ ᐃᓱᒫᓘᑎᓄᑦ.

Study Limitations

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APPENDICES

APPENDIX A
Responses to MEWG Comments on 2021 Draft Report

ACRONYMS AND ABBREVIATIONS

Acronym or Abbreviation	Definition
AIS	Aquatic Invasive Species
ARCH	Arctic Char
BACI	Before/After Control/Impact
Baffinland	Baffinland Iron Mines Corporation
BC	British Columbia
BC MOE	BC Ministry of Environment and Climate Change Strategy
BOD	Biological Oxygen Demand
CCME	Canadian Council of Ministers of the Environment
CPUE	Catch Per Unit Effort
DFO	Fisheries and Oceans Canada
EEM	Environmental Effects Monitoring
ERP	Early Revenue Phase
FEIS	Final Environmental Impact Statement
FHSC	Fourhorn Sculpin
GPS	Global Positioning System
HIAT	Arctic Hiatella
Indet.	Indeterminate
ISQGs	Interim Sediment Quality Guidelines
ISSG	Invasive Species Specialist Group
Laval	The Benthic Ecology Lab at Université Laval
LSA	Local Study Area
LSI	Liver Somatic Index
m	Metres
MDMER	Metal and Diamond Mining Effluent Regulations
MEEMP	Marine Environmental Effects Monitoring Program
MEWG	Marine Environmental Working Group
mg/kg	Milligrams per Kilogram
mm	Millimetre
mtpa	million tonnes per annum
n	Sample Size
N/A	Not Applicable

Acronym or Abbreviation	Definition
NIRB	Nunavut Impact Review Board
NIS	Non-Indigenous Species
NIS/AIS	Non-Indigenous Species / Aquatic Invasive Species
No.	Number
PAHs	Polycyclic Aromatic Hydrocarbons
PC	Project Certificate
ROV	Remotely Operated Vehicle
SEM	Sikumiut Environmental Management Ltd.
SHSC	Shorthorn Sculpin
sp.	Species
sp. nr.	Species Near To
spp.	Species (plural)
TSS	Total Suspended Solids
VEC	Valued Ecosystem Components

1.0 INTRODUCTION

Baffinland Iron Mines Corporation (Baffinland) completed its seventh consecutive year of the marine ecological effects monitoring program (MEEMP) and non-indigenous/aquatic invasive species (NIS/AIS) monitoring program for the Mary River Project (the Project). This report presents the results for the 2021 field programs conducted in Milne Inlet during the open-water season. Both the MEEMP and NIS/AIS programs were originally developed in 2015 following completion of marine baseline studies in Milne Port during 2013 and 2014 and are intended to provide a primary means to identify and quantify potential Project-related changes in the marine environment. Where such changes occur, the programs assist in identifying appropriate modifications to, or mitigation of, Project operational activities to avoid and/or minimize potential adverse effects on the marine environment. Results from the MEEMP and NIS/AIS monitoring programs also provide information to the Nunavut Impact Review Board (NIRB) to support its annual review of the Mary River Project.

1.1 Project Context

The Mary River Project is an operating iron ore mine located in the Qikiqtani Region of North Baffin Island, Nunavut (Figure 1-1). Baffinland Iron Mines Corporation (Baffinland, the Company) is the owner and operator of the Project. The operating Mine Site is connected to a port at Milne Inlet (Milne Port) via the 100-km long Milne Inlet Tote Road. Undeveloped components of the Project include a South Railway connecting the Mine Station to a future port at Steensby Inlet (Steensby Port).

Baffinland is currently operating in the Early Revenue Phase (ERP) of the Project. Project Certificate No. 005, amended by the Nunavut Impact Review Board on 18 June 2020 (Amendment No. 03), authorizes the Company to mine up to 22.2 million tonnes per annum (mtpa) of iron ore from Deposit No. 1. Of the 22.2 mtpa, Baffinland is authorized to transport 6.0 mtpa of ore by truck to Milne Port for open water shipping through the Northern Shipping Route using chartered ore carrier vessels until December 31, 2021 (Condition 179(a)). The Company is also currently authorized to transport 18 mtpa by rail to Steensby Port for year-round shipping through the Southern Shipping Route (via Foxe Basin and Hudson Strait), as part of the currently undeveloped Project component.

Shipping of ore from Milne Inlet during the early revenue phase began in 2015 and is expected to continue for the life of the Project (20+ years). During the first year of ERP Operations in 2015, Baffinland shipped approximately 900,000 tonnes via 13 ore carrier voyages. In 2021, a total of 5.6 Mtpa of iron ore was shipped via 73 return voyages with the first inbound transit of the season occurring on 27 July and the last outbound transit of the season occurring on 31 October 2021. One additional vessel was called to Milne Port in 2021, but not loaded due to timing constraints at the end of the shipping season.

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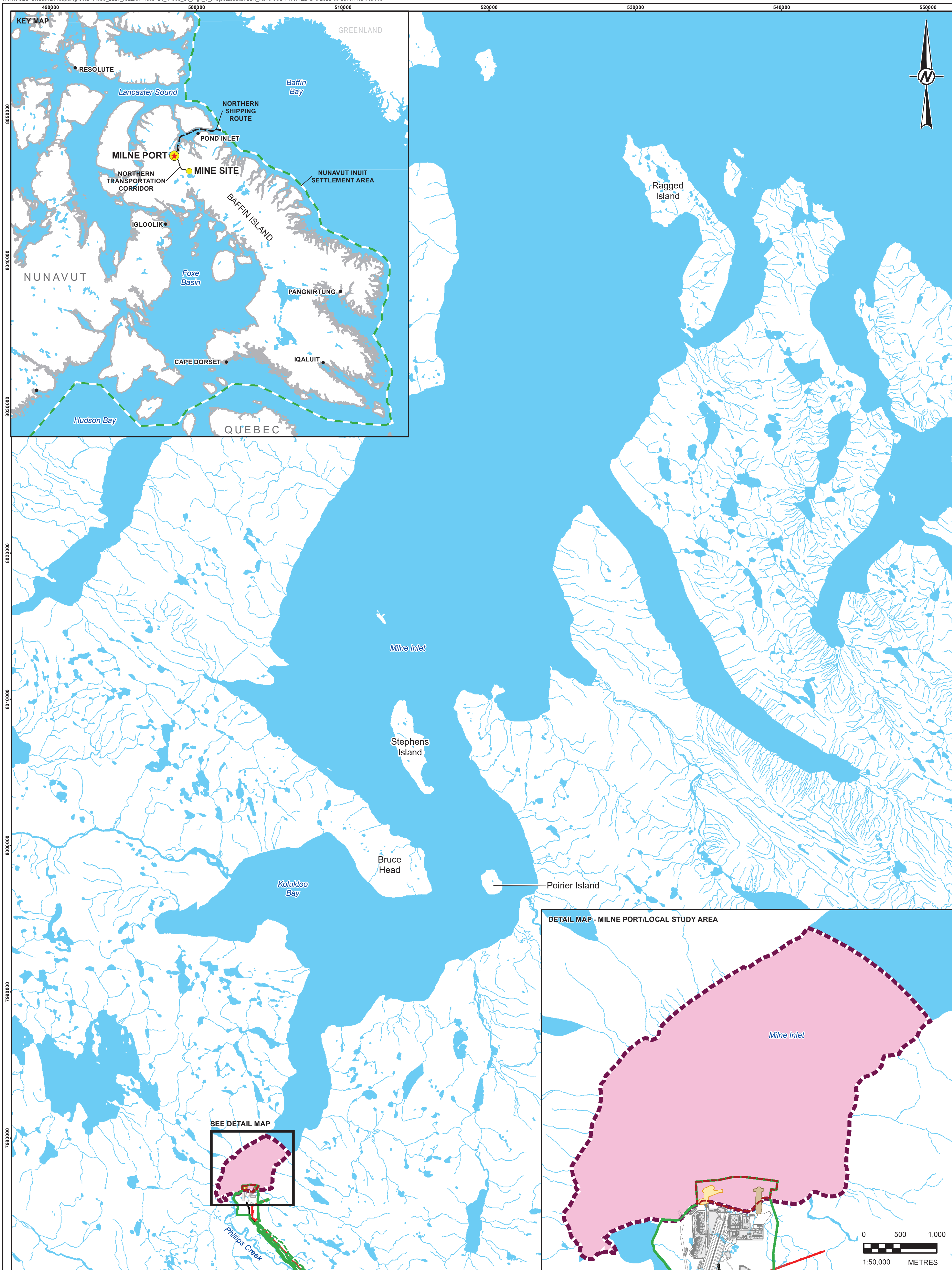

LEGEND

- MINE SITE
- PROJECT LOCATION
- MILNE INLET TOTE ROAD
- PROPOSED NORTH RAILWAY
- SHIPPING ROUTE
- WATERCOURSE
- EXISTING INFRASTRUCTURE
- EXISTING ORE DOCK
- PROPOSED FREIGHT DOCK AND CAUSEWAY
- INAC FORESHORE LEASE
- LOCAL STUDY AREA
- NUNAVUT SETTLEMENT AREA
- PDA / QIA COMMERCIAL LEASE
- REVISED PDA FOR PHASE 2 PROPOSAL
- WATERBODY

0 5 10
1:250,000 KILOMETRES

REFERENCE(S)
LOCAL STUDY AREA BOUNDARY DIGITIZED FROM THE MARY RIVER PROJECT FINAL ENVIRONMENTAL IMPACT STATEMENT (FEBRUARY 2012). FREIGHT DOCK DATA PROVIDED BY CLIENT, MAY 21, 2020. ADDITIONAL MILNE PORT INFRASTRUCTURE PROVIDED BY CLIENT, MAY 28, 2018 AND PROVIDED BY HATCH, JANUARY 25, 2017, RETRIEVED FROM KNIGHT PIESOLD LTD. FULCRUM DATA MANAGEMENT SITE MAY 19, 2017. HYDROGRAPHY AND TOPOGRAPHY DATA BY EAGLE MAPPING (2005), RETRIEVED FROM KNIGHT PIESOLD LTD. FULCRUM DATA MANAGEMENT SITE, MAY 2017. HYDROGRAPHY, POPULATED PLACE, AND PROVINCIAL BOUNDARY DATA OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
PROJECTION: UTM ZONE 17 DATUM: NAD 83

CLIENT
BAFFINLAND IRON MINES CORPORATION

PROJECT
MARY RIVER PROJECT

TITLE
PROJECT LOCATION

CONSULTANT
GOLDER MEMBER OF WSP

YYYY-MM-DD	2022-06-30
DESIGNED	CB
PREPARED	AJA
REVIEWED	PR
APPROVED	PR

PROJECT NO.	CONTROL	REV.	FIGURE
1663724	44000-04	0	1-1

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25mm

1.2 Background

As a part of regulatory commitments, Baffinland has developed and implemented a multi-disciplinary Marine Environmental Effects Monitoring Program (MEEMP). The MEEMP is designed to evaluate potential Project-related effects on the marine environment as predicted in the Final Environmental Impact Statement (FEIS; Baffinland 2013) and subsequent addendums; original FEIS predictions, associated mitigation measures, and current status are presented in Table 1-1 below.

The MEEMP includes monitoring of marine water and sediment quality, marine invertebrates, marine vegetation, and fish and fish habitat. The MEEMP sampling design is generally based on the Metal Mining Environmental Effects Monitoring guidelines (Environment Canada 2012) and includes statistical approaches for detecting potential Project-induced impacts on the marine environment. NIS/AIS monitoring is an integral component of the MEEMP and is designed to address the potential risks of species introductions to the marine environment from ship ballast water and hull biofouling.

Sikumiut Environmental Management Ltd. (SEM) was originally retained by Baffinland to design and implement the MEEMP. The MEEMP program was first implemented in 2015, at which time monitoring efforts focused primarily on further characterization of baseline conditions in Milne Port prior to commencement of Project operations in 2015 (SEM 2015). Environmental effects monitoring was completed by SEM in 2015 and 2016. Golder completed environmental effects monitoring from 2017 through 2021, which included modifications to the 2014-2016 MEEMP and NIS/AIS sampling design to better address the objectives of the programs.

1.3 Objectives

This report presents the results of the MEEMP and NIS/AIS monitoring programs conducted in Milne Inlet during the 2021 open-water season. The GPS/tidal gauge component for the monitoring of sea levels and storm surges is presented in a separate report, included as Appendix 1A.

In accordance with existing Terms and Conditions of Project Certificate (PC) No. 005, Baffinland is responsible for the establishment and implementation of the MEEMP, which comprises monitoring studies that are conducted over a defined time period with the following objectives:

- Assess the accuracy of effects predictions in the FEIS (Baffinland 2012) and subsequent addendums.
- Assess the effectiveness of Project mitigation measures.
- Verify compliance of the Project with regulatory requirements, Project permits, standards and policies.
- Identify unforeseen adverse effects and provide early warnings of undesirable changes in the environment.
- Improve understanding of local environmental processes and potential Project-related cause-and-effect relationships.
- Provide feedback to the applicable regulators (e.g., NIRB) and advisory bodies (e.g., Marine Environmental Working Group [MEWG]) with respect to:
  - Potential adjustments to existing monitoring protocols or monitoring framework to allow for the most scientifically defensible synthesis, analysis, and interpretation of data.
  - Considerations for the modification of operational practices where and when necessary.

Table 1-1: Summary of FEIS/ERP Predictions for Milne Port, Associated Mitigation Measures, and Current Status

FEIS/ERP Predictions				Relevant MEEMP Sections	Current Status
VEC	Activity	Impact/Significance	Associated Mitigation Measures		
Water and Sediment Quality	Barge and ship traffic to/from Milne Inlet	Negligible effects to total suspended solids (TSS), nutrient, or metal concentrations in the water or sediment due to resuspension of substrates from propeller currents; expected that the new equilibrium state will be reached early within the operation phase of the Project.	• Environmental Monitoring and Mitigation Plan outlines measures such as use of silt curtains and drainage ditches, as well as treatment and testing of effluent/run-off prior to discharge, to mitigate potential effects to water and sediment quality. • Emergency Response and Spill Contingency Plan outlines measures to mitigate potential fuel spills. • Shipping Management Plan outlines measures to mitigate potential effects associated with vessel traffic such as a mandatory mid-ocean ballast water exchange and compliance with Anti-Fouling Systems Convention.	Chapter 2.0 Chapter 3.0, Chapter 5.0	No indications of impacted marine water or sediment quality. Measured metals concentrations are low, typically below applicable guidelines, and generally consistent with previous years. No observance of ore dust deposition in substrate. One station, SW-2, showed signs of propwash effects in 2020 (i.e., lower percent fines and higher sand content); effects are localized.
		No anticipated increases in hydrocarbon concentrations in water or sediments through normal vessel operations.			
	Discharge of ballast water	Open-water season: no anticipated effects to water or sediment quality.			
		Ice-cover season: increases in temperature and nitrate concentrations in the water; increases in nitrogen concentrations in the sediment; no anticipated changes in the concentrations of metals or other nutrients in water or sediment.			
	Dispersion and deposition of dust from the ore stockpile	Increases in concentrations of TSS and metals (primarily iron) in the water.			
		Increases in concentrations of metals (primarily iron) in the sediment.			
	Discharge of wastewater and site run-off	Increases in biological oxygen demand (BOD) and concentrations of TSS, nutrients, metals, and hydrocarbons in the water.			
		Increases in concentrations of nutrients, metals, and hydrocarbons in the sediment.			

FEIS/ERP Predictions				Relevant MEEMP Sections	Current Status
VEC	**Activity**	**Impact/Significance**	**Associated Mitigation Measures**		
Marine Fish Habitat	Habitat Alteration (Sediment introduction and resuspension)	Wastewater discharge and site runoff may introduce TSS into the water column, increasing the amount of fine-grained sediments in the immediate vicinity of the discharge point.	• Environmental Monitoring and Mitigation Plan outlines measures such as use of silt curtains and drainage ditches, as well as treatment and testing of effluent/run-off prior to discharge, to mitigate potential effects to water and sediment quality. • Emergency Response and Spill Contingency Plan outlines measures to mitigate potential fuel spills • Shipping Management Plan outlines measures to mitigate potential effects associated with vessel traffic such as a mandatory mid-ocean ballast water exchange and compliance with Anti-Fouling Systems Convention. • Minimize vessel operations to the extent possible. • Mitigation by design and through compliance of Fisheries and Oceans Canada's (DFO) no net loss habitat policy.	Chapter 2.0 Chapter 3.0 Chapter 4.0 Chapter 5.0, Chapter 8.0	No indications of impacted marine sediment quality. Measured metals concentrations are low, typically below applicable guidelines, and/or generally consistent with previous years. No observance of ore dust deposition in substrate Generally no evidence of altered benthic infauna, epifauna, or macroflora community composition or productivity. One station, SW-2, showed signs of propwash effects (i.e., lower density and diversity metrics) in 2020, but rebounded substantially in 2021; effects are temporary and localized.
		Potential increases in concentrations of TSS in the water column and accumulation of fines in the sediments could alter the nearshore habitat, although tidal fluxes are expected to disperse the effluents and minimize effects on habitat.			
	Habitat Alteration (Substrate alteration)	Sediment resuspension due to occasional (<1 per year) vessels and propeller-generated currents expected to lessen as fine-grained sediments on seabed are removed and seabed sediment composition stabilizes.			
		Removal of fine-grained sediments may alter benthic community composition.			
	Habitat Alteration (Noise disturbance)	Intermittent noise disturbance due to occasional vessel operations and loading activities.			
	Habitat Alteration (Fugitive ore dust deposition)	Fugitive ore dust deposition to marine environment.			
		Possible change to water and sediment chemistry and seabed grain size composition.			
		Possible change to benthic productivity.			

FEIS/ERP Predictions				Relevant MEEMP Sections	Current Status
VEC	**Activity**	**Impact/Significance**	**Associated Mitigation Measures**		
Arctic Char (*Salvelinus alpinus*) Health	Sediment Resuspension	Increases in concentrations of TSS, nutrients, and metals in the water column as a result of sediment disturbance from propeller currents are expected infrequently during operation. Short-term exposure of arctic char to these conditions has minimum potential to affect fish health.	• Environmental Monitoring and Mitigation Plan outlines measures such as use of silt curtains and drainage ditches, as well as treatment and testing of effluent/run-off prior to discharge, to mitigate potential effects to water and sediment quality. • Emergency Response and Spill Contingency Plan outlines measures to mitigate potential fuel spills. • Shipping Management Plan outlines measures to mitigate potential effects associated with vessel traffic such as a mandatory mid-ocean ballast water exchange and compliance with Anti-Fouling Systems Convention.	Chapter 6.0 Chapter 7.0	No indications of changes in relative abundances of Arctic Char and other fish species. No notable trends observed in tissue concentrations of contaminants of concern (e.g., aluminum, iron, magnesium, mercury, and selenium) over time.
		The redistribution of sediments near the docks is not expected to directly affect fish health or condition.			
	Discharge of ballast water	Slight reductions in nutrient concentrations and short-term, localized increases water temperature in Milne Inlet are expected to have negligible effects on fish health and condition.			
		Metal concentrations in water and fish tissues are not expected to change.			
	Discharge of wastewater, contact water, and site drainage	Potential increases in metal and hydrocarbon concentrations in fish tissues and reductions in fish health and condition are possible as a result of release of site drainage (with elevated BOD and concentrations of TSS, nutrients, metals, and hydrocarbons) to the marine environment.			
		Combined effluents will be tested to ensure that they are not acutely toxic.			

VEC = Valued Ecosystem Component

The MEEMP was developed in consideration of the anticipated and potential Project-related impacts to the marine environment as identified in the 2012 FEIS and subsequent ERP Addendum, as well as monitoring requirements outlined in several PC Terms and Conditions; relevant PC conditions are listed in Table 1-2, along with a description of how the conditions are addressed through the MEEMP/NIS/AIS program.

Table 1-2: PC Conditions Relevant to MEEMP Surveys

Condition #	Condition	Relevant MEEMP Chapter(s)
76	The Proponent shall develop a comprehensive Environmental Effects Monitoring Program to address concerns and identify potential impacts of the Project on the marine environment.	Chapter 2.0 Chapter 3.0 Chapter 4.0 Chapter 5.0 Chapter 6.0 Chapter 7.0 Chapter 8.0
1 and 83	GPS/tidal gauge monitoring of sea levels and storm surges. Install tidal gauges at Steensby and Milne Port to monitor seas levels and storm surges.	Appendix 1A
83(a)	The Proponent shall conduct hydrodynamic modelling in the Milne Inlet Port area to determine the potential impacts arising from disturbance to sediments including re-suspension and subsequent transport and deposition of sediment. The modelling results shall be used to update the marine water and sediment quality monitoring and mitigation program to include activities associated with the construction and operation of the Milne Inlet Port. The monitoring program shall include an ongoing assessment of the potential introduction of metals that bio-accumulate in the marine food chain.	Chapter 3.0 Chapter 5.0 Chapter 7.0
84	The Proponent shall update its sediment redistribution modeling once ship design has been completed and sampling should be undertaken to validate the model and to inform sampling sites and the monitoring plan.	Chapter 3.0 Chapter 5.0
85	The Proponent shall develop a monitoring plan to verify its impact predictions associated with sediment redistribution resulting from propeller wash in shallow water locations along the shipping route. If monitoring detects negative impacts from sediment redistribution, additional mitigation measures will need to be developed and implemented.	Chapter 3.0
86	Prior to commercial shipping or iron ore, use more detailed bathymetry collected from Steensby and Milne Inlets to model anticipated ballast water discharges from ore carriers. This information should be used to update ballast water discharge impact predictions and sampling should be conducted to validate the model.	N/A
87	The Proponent shall develop a detailed monitoring program at a number of sites over the long term to evaluate changes to marine habitat and organisms and to monitor for non-native introductions resulting from Project-related shipping. This program needs to be able to detect changes that may have biological consequences and should be initiated several years prior to any ballast water discharge into Steensby Inlet and Milne Inlet to collect sufficient baseline data and should continue over the life of the Project.	Chapter 2.0 Chapter 3.0 Chapter 4.0 Chapter 5.0 Chapter 6.0 Chapter 7.0 Chapter 8.0

Condition #	Condition	Relevant MEEMP Chapter(s)
89	The Proponent shall develop and implement an effective ballast water management program that may include the treatment and monitoring of ballast water discharges in a manner consistent with applicable regulations and/or exceed those regulations if they are determined to be ineffective for providing the desired and predicted results. The ballast water management program shall include, without limitation, a provision that requires ship owners to test their ballast water to confirm that it meets the salinity requirements of the applicable regulations prior to discharge at the Milne Port, and a requirement noting that the Proponent, in choosing shipping contractors will, whenever feasible, give preference to contractors that use ballast water treatment in addition to ballast water exchange.	Chapter 2.0 Chapter 8.0
91	The Proponent shall develop a detailed monitoring plan for Steensby Inlet and Milne Inlet for fouling that complies with all applicable regulatory requirements and guidelines as issued by Transport Canada, and includes sampling areas on ships where antifouling treatment is not applied such as the areas where non-native species are most likely to occur.	Chapter 8.0
99(a)	Establish shipping season, inter-annual baseline in Steensby Inlet and Milne Inlet that enables effective monitoring of physical and chemical effects of ballast water releases, sewage outfall, and bottom scour by ship props, particularly downslope and downstream from the docks. This shall include the selection and identification of physical, chemical, and biological community/indicator components. The biological indicators shall include both pelagic and benthic species but with emphasis on relatively sedentary benthic species (e.g., sculpins).	Chapter 2.0 Chapter 3.0 Chapter 4.0 Chapter 5.0 Chapter 6.0 Chapter 7.0 Chapter 8.0
99(b)(ii)	The collection of additional baseline data in Milne Inlet on narwhal (*Monodon monoceros*), bowhead whale (*Balaena mysticetus*) and anadromous Arctic char abundance, distribution ecology and habitat use.	Chapter 6.0 Chapter 7.0
99(c)	Enhance baseline data on marine wildlife (fish, invertebrates, birds, mammals, etc.) and to provide more details on species abundance and distribution found in the Project area.	Chapter 3.0 Chapter 4.0 Chapter 5.0 Chapter 6.0 Chapter 7.0 Chapter 8.0
113	The Proponent shall conduct monitoring of marine fish and fish habitat, which includes but is not limited to, monitoring for Arctic char stock size and health condition in Steensby Inlet and Milne Inlet, as recommended by the Marine Environment Working Group.	Chapter 6.0 Chapter 7.0
114	In the event of the development of a commercial fishery in the Steensby Inlet area or Milne Inlet-Eclipse Sound areas, the Proponent, in conjunction with the Marine Environment Working Group, shall update its monitoring program for marine fish and fish habitat to ensure that the ability to identify Arctic char stock(s) potentially affected by Project activities and monitor for changes in stock size and structure of affected stocks and fish health (condition, taste) is maintained to address any additional monitoring issues identified by the MEWG relating to the commercial fishery.	Chapter 6.0 Chapter 7.0
126	The Proponent shall design monitoring programs to ensure that local users of the marine area in communities along the shipping route have opportunity to be engaged throughout the life of the Project in assisting with monitoring and evaluating potential Project-induced impacts and changes in marine mammal distributions.	Chapter 4.0 Chapter 6.0

1.4 VECs and Indicators

1.4.1 VECs and Criteria for Magnitude Determination (FEIS)

The original MEEMP design was based on indicators and thresholds as presented in the FEIS, centred around three Valued Ecosystem Components (VECs): Marine Water and Sediment Quality, Marine Fish Habitat and Arctic Char Health.

Indicators used to determine the magnitude thresholds were based on guidelines, where available (Table 1-1). A reduction in productive capacity (measured as a proportion of lost or altered habitat to the total area of the Local Study Area, or LSA) was used as an indicator for the Marine Fish Habitat VEC (Baffinland 2012 and 2013). Thresholds were established based on degree of exceedance relative to guidelines. For certain parameters where no guidelines or quality criteria exist, the MEEMP used a significance criterion of two standard deviations of the baseline year as a threshold (Baffinland 2016).

The assessment predicted that Project activities may result in localized changes above threshold values for VECs, confined within the LSA. It was predicted that changes would not exceed thresholds for the Marine Fish Habitat VEC. All predicted residual environmental effects were rated as “Not Significant” since they were localized within the LSA (Table 1-1, Baffinland 2012 and 2013).

1.4.2 Indicators and Thresholds Currently Used for the MEEMP

Since 2016, the MEEMP and NIS/AIS program study design has evolved through consultation with regulatory agencies and Inuit organizations, as well as in response to recommendations made in previous survey years. Modifications to study designs are discussed in Sections 1.5.3.1 and 1.5.4.1. Changes to the program have also included updates or additions to the indicators and thresholds used to determine Project-related impacts to the environment in Milne Port. Sampling parameters and indicators used in 2021 are summarized in Table 1-3.

Table 1-3: Sampling Parameters and Indicators for the 2021 MEEMP and NIS/AIS Monitoring Program

MEEMP Component	Indicator	Context
Marine Water Quality	Metals Total Suspended Solids Nutrients Hydrocarbons	Temporal
Marine Sediment Quality	Percent Fines Nutrients Metals Hydrocarbons	Spatial Temporal
Benthic Invertebrates	Total Density Taxa Richness Simpson's Diversity Index Simpson's Evenness Index	Spatial Temporal
Substrate, Macroflora, and Epifauna	Taxa Richness Relative Abundance Simpson's Diversity Index Abundance/Percent Cover	Spatial Temporal
Fish Population	Taxa Richness Relative Abundance Arctic Char Abundance Catch Per Unit Effort (CPUE)	Qualitative Temporal
Fish Health	Survival Growth Condition Reproduction	Temporal
Fish Tissue Chemistry	Total Metals Total Polycyclic Aromatic Hydrocarbons (PAHs)	Temporal
NIS/AIS	Presence of NIS or AIS	No Context

1.5 Study Design

1.5.1 Study Area

Consistent with previous years, the 2021 MEEMP and NIS/AIS field surveys were conducted primarily within the Local Study Area[1] (LSA) for the Marine Environment as defined in the FEIS and Addendum 1 (Baffinland 2012; 2013). The LSA includes all of Milne Port (Assomption Harbour) and extends north up to 4 km from the existing terminal (spanning the full width of Milne Inlet at the northern boundary; Figure 1-2). The southeast boundary of the LSA ends at the mouth of Phillips Creek.

In 2019, following feedback provided from MEWG members and the community during 2016 community workshops, additional NIS/AIS and physical oceanographic monitoring was conducted north of the LSA boundary extending to Ragged Island and Eclipse Sound (Figure 1-1). No sampling was conducted at Ragged Island in 2021, though new settlement substrates were deployed for collection in 2022.

1.5.2 Inuit Participation

Inuit personnel have been integral to the overall success and safe execution of Baffinland's monitoring programs to date. The success of the MEEMP is greatly reliant on local expertise/knowledge and the continued participation of Pond Inlet community members with respect to study design, program implementation, and field logistics. For the 2021 MEEMP program, Inuit participation included field technicians supporting sampling and processing for the various components.

1.5.3 MEEMP

The MEEMP was initially designed in 2014 to evaluate potential Project-related impacts on the marine environment as predicted in the FEIS and subsequent FEIS Addendum (Baffinland 2013). The original sampling design for the MEEMP (Baffinland 2016; SEM 2015) was based on a radial gradient transect design extending out from the ore dock (Figure 1-2), which represents a potential point source for contaminants (e.g., ore dust, hydrocarbon release, wastewater, and site runoff) and physical perturbations (e.g., sediment re-suspension and transportation). The radial pattern was designed to detect potential Project-related effects based on a gradient of key components with numerical indicators (e.g., metal concentrations in sediment) along a series of transects with increasing distance from the point source.

The initial MEEMP design (excluding NIS/AIS monitoring) comprised the following study components:

- Marine sediment quality
- Benthic epifauna and epiflora dive surveys
- Fish

While the original radial gradient design has remained since 2014, the program has been updated to include more components and changes have been made to sampling methodologies and frequencies. Modifications to the MEEMP are summarized below in Section 1.5.3.1. Sampling efforts for the MEEMP in 2021 are summarized in Table 1-4.

[1] The LSA includes all marine waters where there exists a reasonable potential for direct measurable effects from Project activities on the marine environment.

Table 1-4: Summary of Sampling Efforts Performed in Milne Port as Part of MEEMP Surveys, 2021

MEEMP Component	Relevant PC Conditions	Collection Method	Sampling Effort	Sampling Frequency	Years of Data
Marine Water Quality	89 and 99 (a)	Vessel-based using 5.0L Niskin sampling bottles	8 stations	Annual; 5 sampling events/year	6
Marine Sediment Quality	76, 83 (a), 87, 99 (a), and 99 (c).	Vessel-based using Van Veen grab	1 station	Every three years	8
Benthic Infauna	99 (a), and 99 (c)	Vessel-based using Van Veen grab	26 stations (17 taxonomic; 9 genetic)	Every three years	3
Substrate, Macroflora, & Epifauna	76, 83a, 84, 87, 99 (a) and (c)	Quadrat surveys by SCUBA divers (formerly ROV video)	17 quadrats	Annual	2
Fish Population	99 (b)(ii), 99 (c), 113, and 114	Angling	48 hours	32 stations	5
		Fukui Trap	3,853 hours	14 stations	9
		Gill Net	66 hours	25 stations	10
		Hoop Net	616 hours	7 stations	3
		Longline	61 hours	3 stations	1
		Trawling	2 hours	4 stations	2
Fish Health & Tissue Chemistry	76, 83 (a), 87, 99 (a), 99 (b) (ii), 99 (c), 113, and 114.	See above for fish collection methods. Chemistry analyses completed by specialized laboratories.	Incidental ARCH 40 FHSC 40 HIAT	Annual	11 (ARCH) 3 (FHSC) 4 (HIAT)

ROV = Remotely Operated Video; ARCH = Arctic char; FHSC = Fourhorn sculpin (*Myoxocephalus quadricornis)*; HIAT = Arctic hiatella (*Hiatella arctica*)

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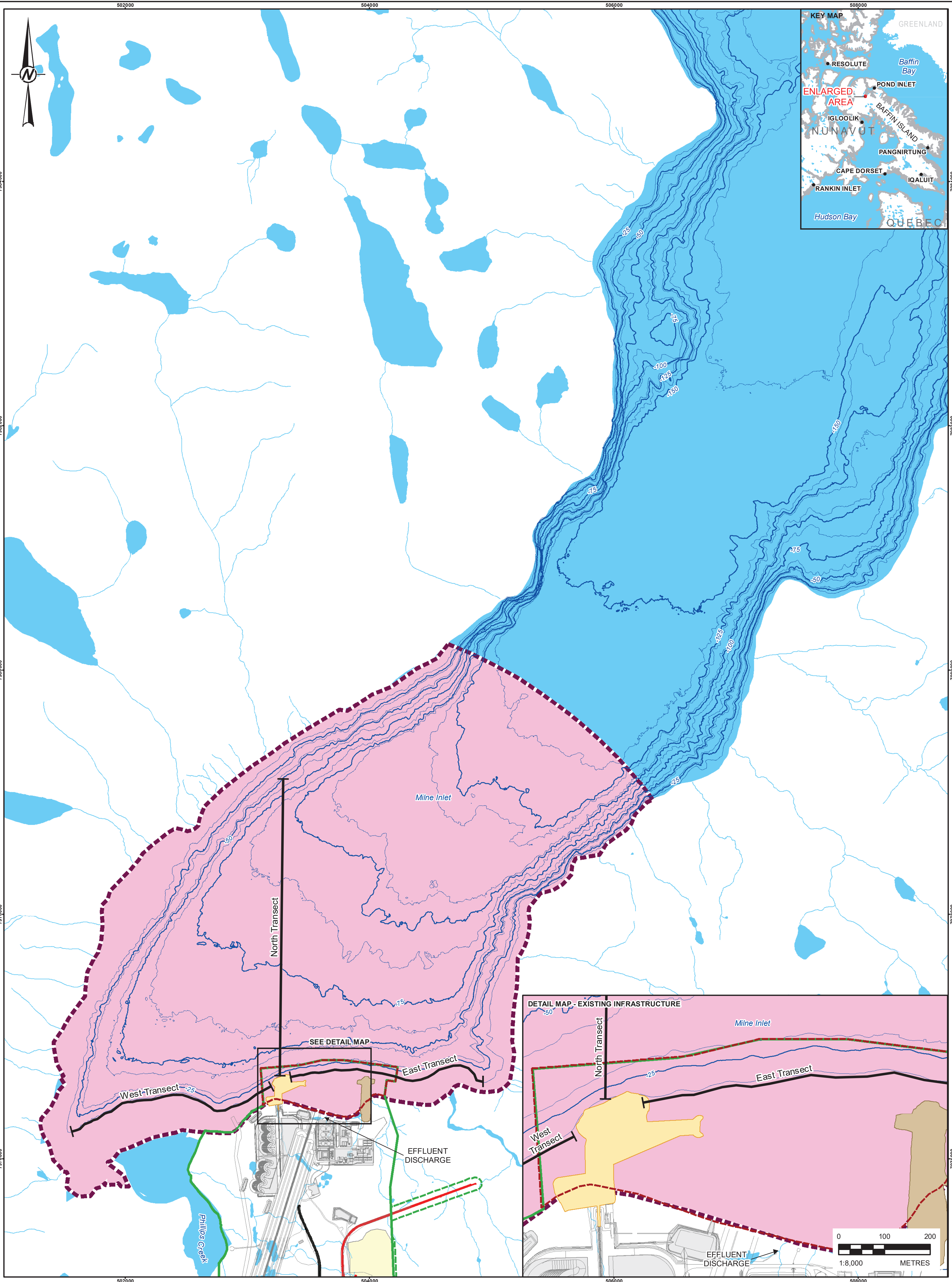

LEGEND

- BATHYMETRIC CONTOUR (15 m INTERVAL)
- BATHYMETRIC CONTOUR (25 m INTERVAL)
- MILNE INLET TOTE ROAD
- PROPOSED NORTH RAILWAY
- TRANSECT
- WATERCOURSE
- AGGREGATE SOURCE (BORROW PIT OR QUARRY)
- EXISTING INFRASTRUCTURE
- EXISTING ORE DOCK
- PROPOSED FREIGHT DOCK AND CAUSEWAY
- LOCAL STUDY AREA
- PDA / QIA COMMERCIAL LEASE
- REVISED PDA FOR PHASE 2 PROPOSAL
- WATERBODY

0 500 1,000
1:30,000 METRES

REFERENCE(S)

BATHYMETRY CREATED BY GOLDER FROM MULTIPLE DATA SOURCES. FREIGHT DOCK DATA PROVIDED BY HATCH, MAY 21, 2020. ADDITIONAL MILNE PORT INFRASTRUCTURE PROVIDED BY CLIENT, MAY 28, 2018 AND PROVIDED BY HATCH, JANUARY 25, 2017, RETRIEVED FROM KNIGHT PIESOLD LTD. FULCRUM DATA MANAGEMENT SITE MAY 19, 2017. HYDROGRAPHY AND TOPOGRAPHY DATA BY EAGLE MAPPING (2005), RETRIEVED FROM KNIGHT PIESOLD LTD. FULCRUM DATA MANAGEMENT SITE, MAY 2017. HYDROGRAPHY, POPULATED PLACE, AND PROVINCIAL BOUNDARY DATA OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
PROJECTION: UTM ZONE 17 DATUM: NAD 83

CLIENT
BAFFINLAND IRON MINES CORPORATION

PROJECT
MARY RIVER PROJECT

TITLE
STUDY AREA FOR THE MARINE ENVIRONMENTAL EFFECTS MONITORING PROGRAM (MEEMP), 2021

CONSULTANT

GOLDER MEMBER OF WSP

YYYY-MM-DD	2022-06-30
DESIGNED	CB
PREPARED	AJA
REVIEWED	PR
APPROVED	PR

PROJECT NO.	CONTROL	REV.	FIGURE
1663724	44000-04	0	1-2

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

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1.5.3.1 Modifications to the Program

Since program inception, survey design has continually evolved based on refinements identified through consultation with regulatory agencies and Inuit organizations and recommendations made in previous survey years. Table 1-5 summarizes key changes to the program since 2014.

Table 1-5: Summary of Modifications to the MEEMP Study Design from 2014 to 2021.

Year	MEEMP Component	Description of Modification
2015	Marine Water Quality	Addition of water quality component to monitor for potential changes associated with site drainage and treated effluent discharges to the marine environment (including iron ore stockpile run-off). Four water quality stations were established near the site discharge point for compliance monitoring; one station next to the site discharge point, and three stations located slightly offshore to the northeast, north and northwest of the source.
2017	Physical Oceanography	Addition of sea level monitoring (using a tidal gauge) and vertical physical profiles of physical oceanographic parameters at Milne Port.
2017/18	Fish Population	In 2017, fish sampling was limited to a two-week period in August, which was not necessarily representative of the entire open-water shipping season (late July to mid-October). In 2018, fish sampling was conducted throughout the duration of the MEEMP program (over four weeks, from the end of July to the end of August) for better representation of the shipping season. Fishing methods included gill netting and Fukui traps, with angling added in 2017, and beach seines added in 2018.
2018	Physical Oceanography	Sea level monitoring was expanded to include physical oceanographic monitoring throughout Milne Inlet including two sites at Milne Port and one at Bruce Head, and additional vertical physical profiles at select times and locations throughout Milne Inlet.
2018	Marine Sediment Quality	The number of sediment samples analyzed for hydrocarbon concentrations was reduced from three samples to one sample at each station, as hydrocarbon concentrations had been below detection limits (DL) in all samples to date. Additionally, two new sediment sampling stations were included along the East Transect to account for anticipated construction associated with the proposed Phase 2 ore dock and freight dock.
2018	Benthic Infauna	Addition of benthic infaunal sampling program, with input from MEWG. Previous years did not include infaunal sampling but, rather, evaluated changes to the benthic community using epifauna[2] and epiflora[3] as indicators using towed underwater video transect surveys – an approach that did not yield consistent nor reliable data primarily due to issues associated with video resolution.
2018	Epifauna and Epiflora	Study design was changed from one long video transect to a Before - After Control - Impact (BACI) approach with five belt transects (1 m x 5 m plots) permanently installed on the seabed in each of the exposure and reference areas; monitoring was conducted using a remotely operated vehicle underwater video system.

[2] benthic invertebrates living on the substrate

[3] marine vegetation attached to the substrate (e.g. kelp)

Year	MEEMP Component	Description of Modification
2018	Fish Health & Tissue Chemistry	Addition of local shellfish species, wrinkled rock borer (*Hiatella arctica)*, as an additional effects indicator in the event finfish species (Arctic char or sculpins) were sampled in insufficient numbers to adequately support statistical analyses. Measurement endpoints included body weight to length ratio and tissue (body burden) analysis. Prior to 2018, fish tissue sampling was limited to incidental Arctic char mortalities, which fluctuated from year to year and did not always yield enough samples for a meaningful statistical analysis.
2019	Physical Oceanography	Vertical physical profiles of water quality parameters including temperature, salinity, conductivity, turbidity, pH, chlorophyll-a, and dissolved oxygen were taken north of Ragged Island in Eclipse Sound in August and September 2019.
2019	Benthic Infauna/ Marine Sediment Quality	Following the results of a power analysis, sampling intensity for benthic infauna and marine sediment was increased from four transects with 5 stations, to five transects with 15 stations each to improve statistical power and the ability to detect Project-related effects. Unlike in previous years, separate NIS/AIS stations were not sampled due to the expansion of the benthic sampling program.
2019	Benthic Infauna	In previous years, 3 subsamples were taken at each benthic infauna sampling station. In 2019, the three subsamples were composited into a single sample for each station.
2019	Fish Health & Tissue Chemistry	Inclusion of sculpin (*Myoxocephalus sp*.) as a sentinel species and effects indicator due to the number of incidental mortalities being sufficient to support analyses.
2019	Fish Health & Tissue Chemistry	Instead of collecting length and weight measurements of *Hiatella arctica* samples in the field, *H. arctica* specimens were submitted for age analysis in addition to the tissue (body burden) analysis.
2019	Fish Population	Hoop nets were introduced to the fish sampling program to determine the capture efficiency of the method in Milne Port and to assess its potential as a replacement for Fukui trapping. Fukui traps will continue to be used in addition to hoop nets to meet commitments of continuing to sample at old locations for a minimum of three years to facilitate comparison of old and new methods/results.
2020	Marine Water Quality	Addition of a second water quality monitoring station at the discharge location of MP-06, consistent with the study design for the existing water quality monitoring station at the discharge location for MP-05.
2020	Marine Water Quality	The collection of water samples was scheduled to coincide with at least one active discharge event at each discharge. One collection event also coincided with a de-ballasting event along the Ore Dock.
2020	Marine Sediment Quality/Benthic Infauna	Following time constraints in 2019, the sampling effort was increased from 8 to 10 sampling stations per transect to 15 sampling stations per transect.
2020	Marine Sediment Quality/Benthic Infauna	Benthic infauna and sediment sampling methodology and equipment was standardized across all stations to ensure consistency and comparability of results.
2020	Marine Sediment Quality/Benthic Infauna	The Coastal Transect was removed from the sampling plan after being determined as not contributing to the radial gradient design of the sediment and benthic sampling components.
2020	Substrate, Macroflora, and Benthic Epifauna	Due to the previously deployed belt transects being moved, twisted, and obscured following a short deployment period, the belt transects were replaced with 10 steel quadrats that should be more robust under the local conditions.

Year	MEEMP Component	Description of Modification
2020	Substrate, Macroflora, and Benthic Epifauna	Following limitations in species identification in ROV footage on the belt transects, a dive team trained in the identification of marine biota were used in addition to ROV for survey of the quadrats.
2020	Fish Population	Based on input and recommendations by Inuit field personnel, fishing locations were selected, and modifications were made to the methodologies for Fukui traps and hoop nets. Modifications included setting the traps in deeper locations to target demersal species and improve capture efficiency.
2020	Fish Health and Tissue Chemistry	Fourhorn Sculpin were added as a targeted species for fish health and tissue chemistry/body burden analysis to monitor for impacts to resident fish species in Milne Port.
2020	Fish Health and Tissue Chemistry	Additional indicators were added to the fish health program to align with a Metal and Diamond Mining Effluent Regulations (MDMER) Environmental Effects Monitoring (EEM) program design. This included the addition of targeted lethal fish sampling to meet a minimum sample size.
2021	Marine Sediment Quality/Benthic Infauna	Monitoring frequency for the joint radial sediment and benthic sampling program has been adjusted to every three years, consistent with routine biological sampling for other mining effects monitoring programs and reflective of federal guidance (e.g., the federal Environmental Effects Monitoring Program [EEM]).
2021	Substrate, Macroflora, and Benthic Epifauna	Ten additional quadrats were fabricated and deployed: 5 in each the reference and impact areas. ROV methods were replaced by exclusive use of divers to improve taxonomic resolution of the data. 2021 was the first year that opportunistic samples of macroflora and epifauna were collected for taxonomic/genetic identification.
2021	Fish Population	Longlines were added as a fishing method to the 2021 program. In addition, two Fishing Areas (FAs) were delineated based on habitat features and their location relative to Milne Port to help standardize sampling efforts and address variability in the catch data across Milne Port.

1.5.4 NIS/AIS Monitoring

The NIS/AIS monitoring program was designed to detect for the potential introduction of non-native species from ballast water discharges and/or hull biofouling and focuses in areas with the highest likelihood of marine invasion. Due to ballast water releases occurring in Milne Port, NIS/AIS sampling largely focuses on southern Milne Inlet. The NIS/AIS Monitoring Program is conducted at a surveillance level, where detection of a single Project-related invasive species is the threshold for triggering of adaptive management measures (e.g., species rapid response plans) and/or potential corrective actions (e.g., measures to eradicate the NIS/AIS), if deemed feasible. The NIS/AIS monitoring program consists of data collected across multiple trophic levels (marine vegetation, benthic invertebrates and fish) to establish a comprehensive inventory of existing marine biota in the Project area that is intended to serve as a point of reference for any new species identified over time, and to evaluate potential changes in community structure that may be linked to NIS/AIS introductions. Sampling efforts that contribute to the NIS/AIS monitoring program are summarized in Table 1-6. NIS/AIS monitoring is recommended to be conducted annually until results of ballast water sampling are deemed satisfactory to recommend reducing the frequency of monitoring in the receiving environment.

Table 1-6: Summary of Sampling Efforts Performed in Milne Port as Part of NIS/AIS Monitoring Program Surveys, 2021

Relevant PC Conditions	Collection Method	Sampling Effort	Sampling Frequency	Years of Data
76, 87, 89, 91, 99 (a), and 99 (c)	Permanent Quadrats	17 Quadrats	Annual	4
	Active Fish Sampling	85 Stations	Repetitive, Annually	10
	Fish Stomach Contents	33 Incidental Mortalities	Repetitive, Opportunistic, Annually	9
	Benthic Infauna	26 Stations	Annual	10
	Settlement Substrates	18 Plates 9 Baskets	Annual	1
	Incidental Specimen Collection	N/A	Opportunistic, Annually	3

1.5.4.1 Modifications to the Program

The initial NIS/AIS surveys were conducted in 2014 to enhance marine flora and fauna inventories collected during baseline sampling in 2008 and 2013. In subsequent years, NIS/AIS monitoring focused on identification of organisms not previously detected during the baseline program (as primary indicators of invasion). Equivalent NIS/AIS monitoring was continued in Milne Port area, although the program was expanded and modified based on refinements identified through consultation with regulatory agencies and Inuit organizations and recommendations made in previous survey years. Table 1-7 summarizes key changes to the program.

Table 1-7: Summary of Modifications to the NIS/AIS Monitoring Program Study Design from 2015 to 2021.

Year	Program Component	Description of Modification
2015	Overall Program	Baskets were redeployed instead of being collected for annual analysis due to insufficient colonization on the substrate.
2015	Settlement Baskets	Baskets were redeployed instead of being collected for annual analysis due to insufficient colonization on the substrate.
2016	Settlement Baskets	New settlement baskets were deployed in Milne Port to replace sets previously lost.
2017	Benthic Infauna and Zooplankton	Four new sampling locations were added at Ragged Island to sample specifically for the NIS/AIS monitoring program in response to public concern over ships potentially discharging ballast water while occupying anchorage sites in this area.
2017	Zooplankton	Four new sampling locations were established in Milne Port for vertical zooplankton hauls, and two new locations for oblique zooplankton tows.
2017	Zooplankton	Modifications to the methodology for oblique zooplankton tows were made to target faster moving species and increase the total number of species identified.
2018	ROV Surveys	ROV based surveys were made along the hulls of several ore carriers to assess for potential biofouling on vessels originating from outside of Canadian waters.
2019	Benthic Infauna	In 2019, no benthic infauna sampling occurred at the original NIS/AIS specific stations, due to the significant expansion of the benthic sampling program. A greater number of stations were sampled for identification of benthic infauna. NIS/AIS status was determined for all infauna identified in benthic sampling.

Year	Program Component	Description of Modification
2019	Macroflora and Epifauna	A new NIS/AIS towed video survey transect was added east of the new freight dock at Milne Port to account for potential changes in shipping rates in Port.
2019	Zooplankton	Two oblique zooplankton tow sampling locations were added to the Ragged Island component.
2020	Overall Program	The program name was changed from AIS Monitoring to NIS/AIS monitoring to emphasize efforts to monitor for all potential species introductions to Milne Port, regardless of invasive status.
2020	ROV Surveys	Survey methodology was reviewed with the operator to ensure the methodology was aligned with the stratified survey design used in Sylvester and MacIsaac (2010).
2020	Ship Hull Monitoring	Performed ship hull monitoring on two ships at anchorage to avoid limitations with hull visibility and accessibility when ships are moored at the Ore Dock, increasing the total area and survey time for each ship.
2020	Settlement Baskets	Deployment of nine new sets of settlement baskets and plates along the Freight Dock, as well as 10 sets of settlement plates in other locations around Milne Port to increase monitoring of recruitment of encrusting biota.
2020	DNA Sampling	To improve taxonomic resolution, a DNA sampling component was added. Targeted sampling occurred at locations where potential NIS/AIS taxa had been observed previously, samples were preserved for DNA analysis at the Canadian Centre for DNA Barcoding at the University of Guelph. Incidentally-collected specimens were also selectively preserved for barcoding and taxonomic confirmation.
2021	Zooplankton	Zooplankton tows were removed from the sampling program due to the high variability in the data and limited sampling not capturing the seasonal presence of many taxa.
2021	Ship Hull Monitoring	Monitoring of ship hulls was not conducted in 2021 as Baffinland works with DFO to design a methodology that will improve the taxonomic resolution of the data collected to better inform assessment of NIS/AIS risk

1.6 Conclusion and Recommendations

The MEEMP has been designed to meet the objectives of the various conditions associated with Project Certificate 005, as well as to evaluate whether Project activities have impacted the marine environment over time. Original FEIS predictions indicated the potential for low magnitude changes in some ecological parameters, such as water quality and Arctic char tissue chemistry, but characterized these as “not significant”. Overall, monitoring data align with these predictions, as observed changes are typically minor and either within established guidelines or consistent with baseline levels. Thus, monitoring to date suggests that mitigation measures are functioning as intended and that Project activities are being managed in a way that has not adversely affected the marine ecosystem.

The main conclusions and recommendations based on the results of the 2021 MEEMP studies are as follows:

- **Marine Water Quality**
  - Relevant to PC No. 76, 87, 89, 99(a).

- Site discharges from MP-05 and MP-06 are in compliance with the requirements outlined in the Water License
- Measured concentrations of metals were generally consistent with previous years and remain below CCME water quality guidelines for the protection of aquatic life while hydrocarbons and PAHs were not detected at all.
- Laboratory analyses have not revealed an observed trend of increased levels of iron in water samples collected between 2017 and 2021; iron is well within the 2015-2020 range of detected concentrations.
- Monitoring results remain within original FEIS predictions, which forecasted no significant residual effects on water quality, but indicated the potential for minor localized increases in TSS, nutrient, metal, and hydrocarbon concentrations.
- **It is recommended that the water quality sampling program continue in 2022 to ensure compliance with Project permits and that parameters of potential concern remain well below thresholds of harm for marine biota.**

- **Marine Sediment Quality**
  - Relevant to PC No. 76, 83 (a), 84, 85, 87, 99 (a), and 99 (c).
  - To date, construction and operation of Milne Port does not appear to have negatively affected sediment quality, as measured concentrations were low and generally consistent with previous years.
  - Laboratory analysis of sediment from SW-2 shows that indicators (i.e., nutrients, metals, PAHs, hydrocarbons) are within the range measured in previous years and either not detectable or are below CCME sediment quality guideline thresholds.
    - Iron concentration in 2021 was comparable to concentrations measured in previous years at this station.
    - Sediment grain size measurements indicate a coarsening of substrate at this site in recent years, reflected in higher sand, and lower fines, content. This is attributed to propellor wash from berthing ore carriers mobilizing fine sediments and is considered to be a localized physical disturbance.
  - Monitoring results largely remain within original FEIS predictions, which forecasted no significant residual effects on sediment quality, but indicated the potential for minor localized increases in nutrient, metal, or hydrocarbon concentrations that would not exceed Canadian Council of Ministers of the Environment (CCME) sediment quality guidelines for the protection of aquatic life as well as potential for localized fine sediment resuspension as a result of propellor-generated currents.
  - **It is recommended to continue targeted sampling in 2022 to increase understanding of sediment grain size variability and monitor for potential effects of Project activities on grain size distribution.**

- **Benthic Infauna**
  - Relevant to PC No. 76, 99(a) and 99(c).
  - To date, construction and operation of Milne Port does not appear to have negatively affected benthic infaunal communities, which continue to be diverse and well established in both nearshore and offshore habitats.

- Evaluation of benthic community effect indicators show an increase in total density, richness, and diversity relative to the 2020 sampling program. suggesting the benthic infaunal community is rebounding, or has rebounded, from a physical disturbance linked to propellor wash from berthing ore carriers that caused localized and temporary changes in community indices.
- Monitoring results largely remain within original FEIS predictions, which forecast the potential for localized alterations to benthic community composition from fine sediment resuspension as a result of propellor-generated currents.
- **It is recommended to continue targeted sampling in 2022 to increase understanding of variability in benthic community indicators as well as to monitor for signs of continued recovery in the benthic community.**

- **Substrate, Macroflora and Benthic Epifauna**
  - Relevant to PC No. 76, 83 (a), 87, 99 (a), and 99 (c).
  - Substrates documented within the quadrats are predominantly soft, dominated by silt and sand, consistent with what has been observed previously at Milne Port.
  - Similar macroflora and benthic epifaunal taxa were observed in 2021 as in previous years (2018-2020) and no statistically significant differences were noted between the exposure and reference areas for any of the indicators evaluated (i.e., percent cover, density, species richness, and diversity).
  - Results reveal no evidence of Project-related influence or impairment, consistent with FEIS predictions.
  - Results of both a power analysis and taxa accumulation curve indicate that the current sampling design is insufficient to detect change and fully characterize the epibenthic community, respectively, such that these results should be interpreted with some caution.
  - **Given that sampling effort has not been adequate to detect community change with acceptable statistical power, following discussion with the MEWG the decision was made to add three additional quadrats in both the study and reference areas during field sampling in 2022 to increase statistical detection power over previous years.**

- **Marine Fish Community and Catch Data**
  - Relevant to PC No. 99 (b)(ii), (c), 113, and 114.
  - Construction and operation of Milne Port does not appear to have triggered detectable changes in local fish communities to date.
  - Overall, fishing methods were deemed effective in characterizing the marine fish community in terms of species presence and relative abundance.
  - The delineation of FAs and standardization of fishing methods provides a rigorous study design for generating catch statistics that can be compared for assessing trends in the abundance and distribution of fish at Milne Port into the future.
  - Monitoring results align with original FEIS predictions, which forecasted that the Project would have no significant effects on marine fish habitat, nor would it affect the size of Arctic char populations.

- **It is recommended that standardized fish sampling continue in 2022.**

- **Fish Health and Tissue Chemistry**
  - Relevant to PC No. 76, 83 (a), 87, 99 (a), 99 (b) (ii), 99 (c), 113, and 114.
  - Monitoring results remain well within original FEIS predictions, which indicated the potential for non-significant, low magnitude effects on Arctic Char health and body condition that are expected to be reversible. Observed changes have generally been small and either within established guidelines, or consistent with baseline conditions, and are thus considered to reflect natural variability rather than effects resulting from the Project.
  - Differences were observed among years in fish size; however, these differences were small and inconsistent among years and likely reflect natural variability in these fish populations over time.
  - Statistically significant elevations in tissue concentrations of some metals were noted for the clam *H. arctica* and Arctic char in 2021 relative to concentrations in 2020, however, these differences were small and often inconsistent, likely reflecting natural variability in both the bioavailability and subsequent uptake of metals, reflected in the reported tissue concentrations.
  - **Continued monitoring is recommended to maintain continuity in established time series data for Arctic Char and the collection of additional fish health and tissue chemistry for Fourhorn Sculpin and *H. arctica,* to provide a benchmark for comparisons in the future.**

- **NIS/AIS Program**
  - Relevant to PC No. 76, 87, 89, 91, 99 (a), and 99 (c).
  - Hundreds of taxa (800+) have been documented to date, the vast majority of which are not NIS/AIS.
  - Taxa identified in 2021 surveys included 53 benthic infauna taxa not previously reported in Milne Port; of these, only one was flagged based on literature review and sent for independent verification as a precaution. Results are pending.
  - 2021 samples included five taxa currently listed on the Watch List. These specimens were sent to taxonomic experts for independent verification and/or molecular analysis.
  - Targeted sampling occurred at nine locations in Milne Port to capture taxa designated as “High Risk” for DNA verification.
  - Genetic results indicate:
    - The 2021 *Marenzelleria* sp. specimens were confirmed to be *Marenzelleria wireni* – an Arctic basin species.
    - *Crassicorophium* sp. were largely inconclusive, with no match to the taxa of concern. The closest molecular match was to unidentified amphipod specimens (presumed to be *Crassicorophium clarencense*) collected from Victoria Island in Nunavut, indicating that these are likely representative of an indigenous taxon, supported by the identification of similar specimens during the Program baseline.

  - Inconclusive results were also received for the *Pseudofabricia* sp. nr. *aberrans.* The specimens were confirmed to not match *Fabricia stellaris* (a previously suggested alternative identification for the specimens), but also did not match existing records for any other species. Taxonomic experts suggested it is probable that these specimens are from a currently undescribed species that is indigenous to the Project area.
- There are currently no taxa on the Trigger List and no taxa were added in 2021.
- No taxa were added to the Watchlist in 2021, though one species was removed (*Ampharete petersenae*)
- **It is recommended to continue:**
  - **sampling across multiple trophic levels continue in 2022 and building the Milne Inlet Taxonomic Inventory**
  - **using external accredited laboratories and/or global specialists to confirm identifications of flagged specimens**
  - **collecting targeted samples for DNA analysis at locations where high-risk taxa have previously been observed.**

Further details on each component of the MEEMP are provided in topic specific chapters: Marine Water Quality (Chapter 2.0); Marine Sediment Quality (Chapter 3.0); Benthic Infauna (Chapter 4.0); Substrate, Macroflora, and Epifauna (Chapter 5.0); Marine Fish Community (Chapter 6.0); Fish Health and Tissue Chemistry (Chapter 7.0); and, NIS/AIS Monitoring (Chapter 8.0).

Comments on the draft 2021 MEEMP and NIS/AIS Monitoring Report were received from the MEWG in June of 2022. Baffinland's responses to MEWG comments and recommendations on the draft report are included as Appendix A.

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APPENDIX A

Responses to MEWG Comments on 2021 Draft Report

Baffinland

Baffinland Mary River Project Report Working Group Comment Form

Reviewer Agency/Organization:	*Parks Canada Agency*
Reviewers:	*Allison Stoddart, Jordan Hoffman, Chantal Vis*
Document(s) Reviewed:	*2021 Bruce Head Shore Based Monitoring Program, 2021 MEEMP and AIS Monitoring Program, 2021 Marine Mammal Aerial Survey, 2021 Ringed Seal Aerial Survey, 2021 Underwater Acoustic Monitoring Program (Open-water Season), Year 2 Freight Dock Offset Habitat Monitoring Program*
Date Review Completed	*2022-05-17*

Comment No.:	PCA-06
Section Reference:	2021 Marine Environmental Effects Monitoring Program (MEEMP) and Aquatic Invasive Species (AIS) Monitoring Program, Section 2.0 Water quality, pages 1-12
Comment:	

The stated objectives are to “Assess potential changes in marine water quality parameters” (p.1), however, the report does not provide any statistically-based inter-annual comparisons of water quality parameters through time at all sites. Figures 2.2- and 2-3 summarize trends through time for iron concentrations, however for only select sites. In general, results presented are descriptive and selective, and it is hard to discern if any significant changes in any of the parameters monitored have occurred through time. We suggest a statistical analysis of change through time of the key water quality parameters (e.g., iron, etc.) of all sites combined would be required to assess the significance of changes in water quality parameters through time.

Baffinland Response:

The objective of the marine water quality component is stated in Section 2.1.1 as: *Assess potential changes in marine water quality parameters in the receiving environment related to site drainage and the treated effluent discharges MP-05 and MP-06.* The water quality program is a discharge monitoring program primarily designed to ensure site discharges from MP-05 and MP-06 are compliant with federal water quality guidelines (WQGs), such as the Canadian Council of Ministers of the Environment (CCME)

Protection of Aquatic Life (PAL) guidelines and requirements outlined in the Type A Water License No. 2AM-MRY1325; it is not designed to assess changes in water quality parameters through time.

As outlined in the original study design for the MEEMP (BIMC 2016), marine water quality is not a suitable monitoring parameter for an Environmental Effects Monitoring (EEM) program because of the natural variability created by freshwater inputs and tidal exchanges. Therefore, this parameter is only monitored at a surveillance level as part of an 'end-of-pipe' compliance monitoring program rather than integrated into the overall EEM sampling design (see Section 3.2.3 and Table 3.1 in BIMC 2016). Other monitoring parameters such as marine sediment quality or benthic infauna are more appropriate parameters for detection of environmental change(s) attributable to Project activities (e.g., ore dust emissions/dispersion) because contaminants are less likely to be flushed through tidal exchanges and thus have the potential to accumulate over longer time scales. As such, a statistical analysis of temporal and/ or spatial changes in water quality indicators (e.g., iron concentration, etc.) is not justified.

In 2021, measured metal concentrations downstream of both discharges were lower than applicable Canadian Council of Ministers of the Environment (CCME) Water Quality Guidelines (WQGs) over the five sampling events. In response to recommendations from the MEWG on the 2020 MEEMP report, Baffinland made a commitment to present marine water quality data collected over time in graphical form to facilitate data interpretation. To support the evaluation of iron (metal of primary interest) and provide a more visual presentation of the data, Figures 2-2 and 2-3 were included in the 2021 MEEMP report for Total Iron. The data show there has been no trend of increasing iron concentrations in water samples from Milne Inlet to date, which is as expected given that iron ore stockpiled at Milne Port is in a mineral/particulate form and would therefore likely settle and accumulate in marine sediment rather than dissolve in the water column if it were to enter the marine environment via run-off, discharge and/or airborne transport. This is why the marine sediment and benthic program is considered to represent a more appropriate medium than surface water to monitor for temporal changes in iron concentrations within the marine environment. Results from sediment monitoring demonstrate that iron has not been accumulating in Milne Inlet sediments, while tissue chemistry results for various ecological receptors including fish (Arctic char, fourhorn sculpin) and shellfish (Hiatella arctica) demonstrate that iron is neither entering the food chain nor accumulating in fish tissues.

References:

Baffinland Iron Mines Corporation (BIMC). 2016. Marine Environmental Effects Monitoring Plan. Rev 1.1. Prepared by LGL Limited - Environmental Research Associates and Sikumiut Environmental Management (SEM) Ltd.

Comment No.:	PCA-07
Section Reference:	2021 Marine Environmental Effects Monitoring Program (MEEMP) and Aquatic Invasive Species (AIS) Monitoring Program, Section 8.0 Non-Indigenous and Aquatic Invasive Species monitoring, page 4
Comment:	

The NIS/AIS program is designed as a surveillance survey, and does not have traditional indicators or thresholds, and as a result – it is unclear what adaptive management actions or responses would be implemented should a species on the Trigger list be detected. The report presents an overview of the response protocol aimed at assessing the risk and determining the appropriate course of action, however, the course of action leads to many steps (validation of identification, heightened monitoring, etc.) which could take months or years to complete, prior to initiating an actual response plan. Does Baffinland have an early response/action plan ready for species on the trigger list? Or would this only be developed once the species is found and confirmed related to project. We suggest that an Early Response Plan (containment, eradication) and an Incident Command approach to responding to the species on the Trigger list could be prepared as part of the surveillance program to help reduce probability of species establishment.

Baffinland Response:

While it is true that the NIS/AIS program is designed as a surveillance program, Baffinland would like to clarify that it is concurrently working on the prevention of species introductions through its ongoing commitments related to ballast water exchange and treatment practices, which exceed current federal regulations.

Development of a response plan would occur should a species be placed on the trigger list (i.e., following confirmation of a Project-introduced invasive species in the RSA; see Figure 8-3). There are currently no species on the trigger list and, therefore, no species-specific response or action plans have been developed to date. Should a species be added to the trigger list, a species-specific response plan would be developed in consultation with DFO.

Baffinland disagrees that an Early Response Plan should detail containment and eradication efforts. Rather, as outlined in current literature, early response plans should focus on determining the best course of action to respond to the specific non-indigenous/invasive species in question in the context of the local environment, including observations of the behaviour and competitive interactions in relation to the local community. Green and Grosholz (2020) provide a valuable discussion on the limitations and information requirements for choosing to begin eradication and control programs. Notably, the best course of action may not necessarily be an active response. Monitoring may indicate that the local environment is resilient or competitive to pressures from the non-indigenous species, resulting in a natural biocontrol program, which could be disrupted by an intervention; in other words, detection of an AIS/NIS does not necessarily mean that it has established and requires intervention.

Additionally, eradication and control methods should neither be rushed nor undertaken lightly. These methods can be highly indiscriminate and destructive, resulting in the complete eradication or destruction of entire benthic communities and/or habitats, not just the target species. These actions may have unintended long-term consequences such as extirpation of more sensitive native species, creation of conditions more suitable to recruitment of additional AIS due to lack of competition or loss of functional diversity, or cascading effects to the broader ecosystem due to eradication of primary producers and lower trophic level species (Veitch and Clout 2002). Eradication should be considered only when absolutely necessary such as when observations indicate the AIS is showing signs of aggressive establishment with threat of overtaking the communities in the broader region, is having a significant negative impact on native populations with flow on effects to higher trophic levels, other control or suppression methods have failed in comparable environments, or when the loss of natural fauna is considered inconsequential (Bax et al. 2002). Successful eradication programs are generally reliant on the ability to fully isolate the ecosystem, such as in closed harbors or island habitats, where containment is already occurring (see examples in Veitch and Clout 2002).

References

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Reviewer Agency/Organization:	*DFO*
Reviewers:	Marianne *Marcoux, Kimberly Howland, Joclyn Paulic, Daniel Coombs, Edyta Ratajczyk*
Document(s) Reviewed:	2021 Marine Environment Effects Monitoring Program (MEEMP) and Aquatic Invasive Species (AIS) Monitoring Program
Date Review Completed	

Comment No.:	*DFO-12*
Section Reference:	8.2.1 Modifications to the Program (2021)
Comment:	

Issue:
The recommendation for the removal of Zooplankton sampling from the program in 2021 was not developed in consultation with DFO or the MEWG.

Recommendation:
Consult with DFO and the MEWG on modifications to monitoring programs.

Baffinland Response:

Zooplankton sampling has been reinstated as a component of the 2022 Aquatic Invasive Species / Non-indigenous Species (AIS/NIS) Monitoring Program at Milne Port. Zooplankton samples will be collected using vertical and horizontal oblique zooplankton tows (same methods as 2020).

Comment No.:	*DFO-13*
Section Reference:	8.4.3 Independent Verification
Comment:	

Issue:
“Seven taxa were flagged for review in 2021, due to concerns regarding possible NIS/AIS status, presence on the program Watchlist, limited descriptions of geographic range, to gain clarity or confirmation of uncertain identifications, or as part of QAQC procedures (Table 8-8). Results of independent review will be summarized in table 8-9, once the information becomes available.

Recommendation:
Provide DFO with Table 8-9 information once available.

Baffinland Response:

Results have been received for three of the independent verifications. Table 8-9 has been revised with the updated laboratory results in the final MEEMP report.

Comment No.:	*DFO-14*
Section Reference:	8.5.3.3. Bryozoans
Comment:	

Issue:
“Due to the presence of Eastern Canadian Arctic species within the genus, and poor range descriptions for bryozoans in general, *Tricellaria* sp. Is designated No Risk and is not considered to be of concern for Milne Inlet.

Clarification:
DFO does not agree with the conclusion. Independent verification of samples sent have not been received as of date. The genus as stated has been included on species listed on databases as alien (Rius et al. 2022, Fofonoff et al. 2022, Molnar et al. 2008).

Recommendation:
Without proper verification of samples collected, it cannot be ruled out that the sample contains *T. inopinata*, which is listed on the National Risk Assessment as a potential invasive species in Canadian waters.

Baffinland Response:

When a taxa is not identifiable to species level, procedure is to confirm if there are any species within the broader taxonomic group that have a range that would include the Project area. If there is at least one species with a natural range that includes the Project area, it is assumed that the unidentified species has a reasonable probability of being indigenous. This is an assumption that is applicable to all taxa not identifiable to species level.

A review of the genus indicated that *Tricellaria* contains four species native to the Project area, and one species (*T. inopinata*) flagged as a potential invader. It is thus considered probable that the unidentified *Tricellaria* would be one of the four species with a documented Canadian Arctic range rather than an unconfirmed NIS; therefore, this identification was designated "No Risk". However, due to the presence of *T. inopinata* on AIS databases, the specimen was treated with extra caution and sent for independent verification; results remain pending.

Baffinland will revise the text to frame "No Risk" as a statement of probability, rather than a conclusion (i.e., most likely, this specimen is among the indigenous species of the genus) and indicate the extra steps being undertaken to resolve the identification. Should the identification be resolved to *T. inopinata*, the risk determination would be revised, the taxa would be placed on the watchlist and flagged for further review. Should more specimens of *Tricellaria* sp. be found in future studies, they would be treated with the same caution and sent for independent verification (i.e., treated as non-indigenous until confirmed otherwise).

Comment No.:	*DFO-15*
Section Reference:	8.3.2 Sample Collection for Genetic Analysis
Comment:	

Issue:
"These samples were collected and processed in a similar manner to the other benthic infauna samples, however, the samples were preserved in 90% ethanol, rather than formalin, to allow for DNA analysis should the flagged taxa be identified again in 2021. "

Recommendation:
Could BIM provide rational as to the reasoning for using 90% ethanol? DFO generally uses 95% ethanol or higher based on recommendations from experts within the DNA field.

Baffinland Response:

Baffinland would like to clarify that the reference to 90% ethanol was a typographic error: samples were preserved in either 95% ethanol or 80% ethanol.

It was not possible to source enough 95% ethanol product to meet the 2021 program needs without major shipping restrictions. Therefore, in consultation with Biologica Environmental Services Ltd. and the Canadian Centre for DNA Barcoding, it was confirmed that 80% molecular biology grade ethanol was appropriate for the preservation of samples scheduled for DNA analysis given the relatively short time the samples would be in the preservative prior to being analyzed. Samples slated for taxonomic analysis were preserved in 95% ethanol (Tara Macdonald, Biologica Environmental Services Ltd., pers. comm.).

Baffinland

Baffinland Mary River Project Report Working Group Comment Form

Reviewer Agency/Organization:	Qikiqtani Inuit Association
Reviewers:	D. Bruce Stewart, Jeff W. Higdon
Document(s) Reviewed:	Mary River 2021 Marine Environmental Effects Monitoring Program (MEEMP) and Aquatic Invasive Species (AIS) Monitoring Program 2021 Annual Monitoring Report Draft (2021 MEEMP AIS Report Draft for MEWG.pdf)
Date Review Completed	2022-06-06

Comment No.:	QIA-01
Section Reference:	Entire Document
Comment:	

Yet again Golder has provided a document for review that is protected to prevent copying of text for inclusion in comments. This practice, intentionally or unintentionally, wastes reviewer's time. QIA's comment to that effect on the 2020 draft was "Noted" by Baffinland but not acted upon.

- QIA requests that in future Baffinland provide these documents in a format that allows highlighting, addition of comments, and copying of text. None of these should affect the security of the original documents.

Baffinland Response:

Noted. In future, Baffinland will provide unsecured PDF versions of its draft annual monitoring reports to the MEWG. Final reports will be provided as secured PDF files.

Comment No.:	QIA-02
Section Reference:	Executive Summary, p. 4 of 1047; see also 3.2.1 Modifications to the Program (2021), p. 513 of 1047
Comment:	

QIA was surprised and dismayed at the 29 June 2021 MEWG meeting to learn that Baffinland would not be conducting the radial sampling programs for sediment and benthic biota in 2021.

- The rationale provided for making this change was that the radial sampling design had been implemented for three consecutive years without directional trends having been observed (p.

513). This rationale misses the fact that power analyses found the 2018 design (20 stations) unable to detect change at an acceptable level; that the 2019 sampling program was not completed due to time constraints (32 stns.). This leaves 2020 as the only year of full implementation of the recommended design (60 stns) and only year to use exclusively Van Veen grab samplers, with the next sampling now in 2023. This change weakens understanding of current conditions and natural variability at a time when construction of a second ore dock and doubling of shipping has been proposed. The approach to this monitoring program going forward requires fulsome discussion by the MEWG.

Baffinland Response:

While Baffinland acknowledges QIA's concerns regarding ongoing continuity in the full-scale radial monitoring program, we are confident that a monitoring frequency of every three years is appropriate (although scaled-back sampling still occurs in off-years), aligned with regulatory guidance, and capable of detecting changes/trends in indicators.

Baffinland would like to address the power analyses and the perception of data collected under the MEEMP being "unable to detect change at an acceptable level". The original power analysis appended to the 2019 MEEMP report was based on data simulation using residual bootstrapping – the target sample size of 60 stations was set based on results of these analyses. However, follow-up analyses were completed for both 2019 and 2020 using sediment and benthic data collected in the field, which confirmed there was sufficient statistical power (i.e., >80%) for both sediment variables (percent fines and iron content) and all four benthic community variables (density, richness, Simpson's Diversity Index (SDI), and Simpson's Evenness Index (SEI) *even in 2019 where only 32 of the planned 60 stations were sampled*. This demonstrates Baffinland's understanding of current conditions and natural variability in terms of sediment quality and composition and benthic communities is robust and that the monitoring programs are functioning as intended (i.e., able to detect change). The 2020 power analyses were not appended to the final 2020 MEEMP report – an oversight on Golder's part for which we apologize. The final 2021 MEEMP Report has now been revised to include the results of the 2020 power analyses (see Appendix E of Chapter 2 – Sediment Quality).

Comment No.:	QIA-03
Section Reference:	Executive Summary, p. 4 of 1047.
Comment:	

Sampling that focused on sediment station SW-02 was in response to a request from QIA and discussion by the MEWG.

- QIA welcomes this investigation and Baffinland's intention to continue this monitoring but is concerned that without a robust baseline and ongoing radial monitoring such anomalies will not be detected in the Milne Port area in the future. How does Baffinland plan to identify and address such anomalies in a timely manner while monitoring at 3-year intervals?

Baffinland Response:

While Baffinland acknowledges QIA's concerns regarding ongoing continuity in the full-scale radial monitoring program, we are confident that a monitoring frequency of every three years is appropriate (although scaled-back sampling is occurring on off-years), aligned with regulatory guidance (e.g., Environment and Climate Change Canada's Environmental Effects Monitoring (EEM) program), and capable of detecting changes/trends in indicators. Baffinland would also like to note that the "anomalies" detected at station SW-02 are well within the predictions made in the FEIS, which indicated the potential for localized fines mobilization and subsequent coarsening of sediment in areas exposed to propellor wash from vessels.

In an innately variable ecosystem such as Milne Inlet, an anomaly noted within a single year would not necessarily trigger a management response given the degree to which environmental parameters fluctuate naturally. What we are monitoring for is year over year directional change beyond the natural variability of the system. The intensive sampling that has occurred over the last three years, coupled with previous (albeit less intensive) sampling dating back to pre-shipping, has given us a solid understanding of sediment composition and quality from which to base comparisons. As outlined in the response to QIA-02 above, sampling 32 stations (out of a planned 60) yielded sufficient statistical power to detect changes in sediment and benthic indicators.

Moving forward, Baffinland will continue to conduct targeted sediment and benthic infaunal sampling in the proximity of SW-02 in summer 2022 to further enhance our understanding of natural variability as well as to monitor for any potential effects of Project activities.

Comment No.:	QIA-04
Section Reference:	Executive Summary, p. 4 – 9 of 1047.
Comment:	

QIA supports the following recommendations in the report:

- Marine water quality, p. 3 of 1047. "Marine water quality monitoring for Site drainage and treated effluent discharges is recommended to continue, to keep monitoring for potential changes in downstream water chemistry from Site operations and provide continuity in the established time series for the MEEMP." (see also 2.6 Conclusions and recommendations, p. 77 of 1047)
- Marine sediment quality, p. 4 of 1047. "It is recommended to continue targeted sampling in 2022 to increase understanding of sediment grain size variability and to continue monitoring for potential effects of Project activities on grain size distribution." (see also 3.6, p. 519 of 1047)
- Benthic infauna, p. 5 of 1047. "…it is recommended to continue targeted sampling in 2022 to increase understanding of natural variability as well as to monitor for additional changes in benthic community indicators." (see also 4.6, p. 574)
- Benthic epifauna, p. 609 of 1047. "It is recommended that a diver-based methodology permanently replace the combined use of ROVs and underwater video."; "Future dive surveys should analyze the quadrats as a whole (not by subquadrat) to reduce dive time."; "…a new quadrat should be deployed to replace the missing quadrat (Q2) and the location of Q12 should be moved to a deeper site…"; and, "Future field surveys should incorporate enough field days to buffer for inclement weather."
- Fish health and tissue chemistry, p. 8 of 1047. "…continued monitoring is recommended to maintain continuity in established time series data for Arctic Char and to provide a benchmark for Fourhorn Sculpin and *H. arctica* health and tissue chemistry on which to base future

comparisons."

- 2.6 Conclusions and recommendations, p. 77 of 1047. "…annual marine water quality monitoring is recommended to continue to evaluate whether Site operations are affecting downstream water chemistry and to provide continuity in the established time series for the MEEMP."
- NIS/AIS, p. 967 of 1047: "It is recommended that sampling across multiple trophic levels continues in 2022, that taxonomic inventory for Milne Inlet continue to be expanded upon, and that all flagged specimens continue to be screened for known geographic ranges and AIS/NIS status. It is further recommended that efforts are continued to collect and review genetic evidence for *Marenzelleria* sp. and *Monocorophium* sp. (both flagged as High Risk but not Project-related), including targeted sampling to obtain specimens for DNA barcoding."

Baffinland Response:

Acknowledged.

Comment No.:	QIA-05
Section Reference:	Executive Summary, p. 5 of 1047, and 5.6 Conclusions and recommendations, p. 609 of 1047

Comment:

Power analysis and the taxa accumulation curve indicate that the current sampling design is insufficient to detect change and fully characterize the epibenthic community, and that the sampling effort required to detect change with statistical power is not feasible within the open water season. The power analyses were considering statistical power values of 0.8 and 0.9 (p. 681). Baffinland has proposed the MEWG discuss: 1) removing this component and focusing on other components that have the ability to detect change with statistical power (e.g., benthic infauna, sediment quality) or 2) to continue current sampling and accept its statistical limitations.

1. A third approach to discuss is increasing the sample size incrementally to increase the number of indices capable of detecting changes of ±40%. For example, increasing the number of quadrats in both the reference and exposure areas to 12, would increase the number of summary indices with the power to detect changes of ±40% from ca. 2 at present to ca. 6. (pp. 682 and 683)
2. Appendices 5E and 5F are mislabeled in the Bookmarks as 5F and FG, respectively.

Baffinland Response:

Baffinland is in agreement with QIA's proposed "third" approach, which was also raised during the June 2022 MEWG meetings, and will increase the number of quadrats in each the exposure and reference areas to 13.

Baffinland will revise the report to correct the Appendix labelling in the Bookmarks.

Comment No.:	QIA-06
Section Reference:	Executive summary, p. 7 and 8 of 1047.
Comment:	

Significant differences between 2020 and 2021 samples were found in the condition of both Fourhorn Sculpin and *Hiatella arctica*.

- This finding of significance was qualified as being "relatively small (<10%)". However, this magnitude of change can be biologically significant and should not be downplayed. Further monitoring is needed in 2022 to assess whether a trend exists.

Baffinland Response:

A magnitude of change in condition of <10% is consistent with Metal and Diamond Mining Effluent Regulations (MDMER) effect sizes. Additional monitoring is planned for 2022 and trends in condition over time will be evaluated in the 2022 annual report.

References

MDMER regulations: https://laws-lois.justice.gc.ca/eng/regulations/sor-2002-222/FullText.html

Comment No.:	QIA-07
Section Reference:	1.4.2 Indicators and thresholds currently used for the MEEMP, p. 22 of 1047
Comment:	

"Section 1.4.2 Indicators and thresholds currently used for the MEEMP" mentions that "Changes to the program also included updates or additions to the indicators and thresholds used to determine Project-related impacts to the environment in Milne Port"

- Sampling parameters and indicators used in 2021 were summarized in Table 1-3 but not thresholds. Were changes made to the thresholds in 2021 and, if so, what were they?

Baffinland Response:

No changes to thresholds were made in 2021. The sentence was referencing modifications made to the MEEMP since 2016, not modifications made exclusively in 2021. The sentence has been edited to clarify.

Comment No.:	QIA-08
Section Reference:	2.1.1 Objectives, p. 67 of 1047.
Comment:	

The objective of this program is to "Assess potential changes in marine water quality parameters in the receiving environment related to site drainage and treated effluent discharges MP-05 and MP-06."

- What water quality monitoring is conducted at Milne Port during the open water season for changes in water quality related to shipping?

Baffinland Response:

No monitoring is conducted to assess changes in water quality related to shipping at Milne Port during the open water season. This is because shipping is not anticipated to measurably affect water quality in Milne Inlet: as noted in the FEIS, vessels will be operated and maintained in accordance with all applicable pollution prevention laws (e.g., Arctic Waters Pollution Prevention Act; Canada Shipping Act), discharges of bilge or sewage at Port or any associated anchorages is prohibited, and ballast water modelling indicates that any increases in temperature or salinity would be highly localized and dissipate within a few meters of the discharge point. Further, in the unlikely event of a refuelling spill, effects to water quality would be monitored and managed through the Emergency Response and Spill Contingency Plans (FEIS Appendix 10C).

In contrast, land-based operations via site drainage and effluent discharge do have the potential to adversely and measurably affect water quality in Milne Port, hence the focus of monitoring efforts on these potential pathways of effects. In addition to monitoring discharge points in the marine environment, Baffinland's environment team also conducts stream sampling at outfalls which feed directly into Milne Inlet; Baffinland can provide the relevant annual reports upon request. Further, dispersion and deposition of ore dust from stockpiles was also identified in the FEIS as a potential effect pathway. Because the iron occurs in a mineralized, particulate form, it is most likely to settle to the bottom and integrate into the sediments rather than dissolve in the water column, such that this potential pathway is best assessed through monitoring of sediments and associated benthic communities in Milne Inlet that act as integrators of exposure conditions over the longer term, rather than water quality monitoring. See also response to PCA-06.

Comment No.:	QIA-09
Section Reference:	2.2 Study Design, p. 67 of 1047; and 2.3.1 Field methodology, p. 69
Comment:	

RE: "...effort was made to collect water quality samples during active effluent discharge periods..." (p. 67) and "Water quality samples were collected during five sampling events scheduled between 2 August and 19 August..." (p. 69)

- Were these collection efforts successful at obtaining samples during all active effluent discharge periods in 2021?

Baffinland Response:

In 2021, active discharges to the marine environment were monitored during 2 of the 5 water quality sampling events (2 and 19 August). While effort is made to overlap sampling with active discharge periods, this is not always possible given that MP-05 and MP-06 are intermittent discharges, meaning that sometimes there isn't enough water in the containment ponds on site for a discharge to occur when sampling is scheduled within the scheduled 3-week sampling period.

Baffinland would like to clarify that regulations are closely followed and, prior to any discharge into the marine environment, specific water quality requirements are to be met as per the Type "A" Water Licence No. 2AM-MRY1325; this is reported on annually in the NWB/QIA report.

Comment No.:	QIA-10
Section Reference:	2.3.1 Field methodology, p. 69 of 1047
Comment:	

Water samples were collected mid-water at deeper stations.

- The freshwater effluent should be lighter than the receiving waters and tend to spread across the surface. What are the rationale for collecting samples at deepwater stations from mid-water depths rather than at the surface?

Baffinland Response:

Multiple stations are sampled for each of the site discharges and these include both surface and mid-depth samples. Mid-depth samples were taken at the deeper stations because they are representative of the water column at those depths.

Comment No.:	QIA-11
Section Reference:	2.3.1 Field methodology, p. 70 of 1047
Comment:	

RE: "...dissolved metals and mercury samples were field filtered and preserved."

- How does this change in methodology from 2020, when samples were not filtered or preserved in the field (Baffinland 2021 MEEMP AISNIS Final Report, p. 137 of 1581), affect sample comparability?

Baffinland Response:

Field filtering and preservation does not influence or change the total metal concentrations measured, and it is these data that are screened against CCME water quality guidelines and upon which conclusions are drawn. Going forward, field filtration and preservation will be implemented in the water quality sampling program because it limits the influence of any delays in shipping the samples to the laboratory.

Comment No.:	QIA-12
Section Reference:	2.3.1 Field methodology, p. 70 of 1047
Comment:	

Monitoring of bacteria in receiving water around each discharge was discontinued in 2021, as fecal coliforms were not detected by sampling of the receiving waters in 2017 through 2020.

- The objective of monitoring is to detect problems with effluent discharge quality. Absence of fecal coliforms in past years' monitoring confirms that the systems were working but is not a good reason for discontinuing monitoring, since without monitoring there is no check on whether these systems are still working or for unexpected sources of bacterial contamination. QIA recommends that bacterial monitoring continue.

Baffinland Response:

Baffinland notes that there is no potential pathway of effect related to the introduction of fecal coliform at discharge locations MP-05 and MP-06 because these are discharges for the settling ponds that collect water specifically from the ore pad. Accordingly, monitoring of fecal bacteria or other bacterial parameters in the site discharges MP-05 and MP-06 is not a required sampling parameter under the current Type A Water License; nevertheless, Baffinland included it within the monitoring scope for the past four years with results confirming that MP-05 and MP-06 are not sources of fecal coliforms. For these reasons, monitoring of bacteria was discontinued in 2021.

However, there is a separate water containment facility (MP-01A), which acts as a sewage pond for when the water treatment facilities are at capacity. This pond is sampled monthly for fecal coliforms as part of Type A Water Licence 2AM-MRY-1325 and cannot be discharged until a compliant pre-discharge sample is collected and analyzed. For further details, refer to Baffinland's 2021 Qikiqtani Inuit Association and Nunavut Water Board Annual Report for Operations.

Comment No.:	QIA-13
Section Reference:	2.4.1 QA/QC results, p. 72 of 1047
Comment:	

RE: water quality monitoring, "There was a low frequency and magnitude of notable detected concentrations in blanks and low variability and high precision between duplicates."

- How are" low" and "high" defined in these contexts? Appendix 2C could also be referred to here.

Baffinland Response:

"Low" and "high" were not defined per se. The intent was to communicate that the parent samples and their respective duplicates were not substantially different using low and high as qualitative descriptors (low variability and thus high precision in sampling) and, therefore, the water chemistry data collected during the 2021 MEEMP were of acceptable quality. However, it is acknowledged that clearer language could have been used to make that point with a more direct reference to Appendix 2C.

Baffinland

Comment No.:	QIA-14
Section Reference:	2.4.3.2 Metals, p. 73 of 1047

Comment:

The 2021 iron concentrations did not exceed iron concentrations measured in September 2017 that were elevated by a storm event.

- If a comparable storm event was not mobilizing iron in 2021, that data should be compared instead with sampling events that were not affected by a storm (i.e., compare apples to apples).

Baffinland Response:

Baffinland wishes to clarify that iron data collected in 2021 were compared to all data collected from 2017 through 2020, and not just a single storm event in 2017 as implied by the text in the report. Results across sampling events and years indicate that Total Iron water concentrations in the marine receiving environment are stable (i.e., no increasing trend observed) despite increases in production over the same time period.

Comment No.:	QIA-15
Section Reference:	Appendix 2B. Analysis of hold time compliance, p. 105ff of 1047

Comment:

Hold times were exceeded for some water samples, for example nitrates and nitrites (10 d held cf. 3 d recommended; p. 109ff and p. 182ff), pH meter (115 h cf 0.25 h; p. 122ff and p. 192ff), and total dissolved solids (TDS) (19 d cf. 7 d; p. 198).

1. How do these exceedances alter precision and accuracy of the results and what will be done to avoid hold exceedances in 2022?
2. The Baffinland 2021 Annual Report to QIA and NWB on Operations (Section 7.8, p. 70) states "An on-site accredited field laboratory, located at the Mine Site and also operated by ALS, performed select analyses in 2021 (i.e. pH, TSS, Total Dissolved Solids [TDS], turbidity), reducing logistical costs while providing timely results." Why were the marine pH and TDS samples not sent there for timely analysis?

Baffinland Response:

1. In short, these exceedances are not anticipated to affect the precision and/or accuracy of results. A discussion of exceedances for some parameters with short hold times, within the context of northern environments, is provided in Section 2.4.1. Overall, the discussion concluded that, despite the hold time exceedances, the data are considered valid and are comparable to other years. Baffinland has already made attempts to avoid hold exceedances; for example, by changing couriers to Purolator to have a direct contact to facilitate shipments and arranging direct couriers with "NextFlight" for sample shipments with short hold times.
2. The marine pH and TDS samples were not sent to the onsite ALS lab because these particular measurements (i.e., for pH, conductivity, and turbidity (among other water quality parameters))

are collected in situ (at the time of sampling) and thus provide real-time measurements. Further, the onsite ALS laboratory is responsible for processing all of the general chemistry samples for site environment, including tote road monitoring, freshet, SNP etc., such that it would not be feasible to complete MEEMP analysis in addition to current analysis load.

Comment No.:	QIA-16
Section Reference:	Matrix spike (MS) report, p. 154ff and p. 230ff of 1047
Comment:	

Some matrix spikes were exceeded by the background level, resulting in loss of analyte recovery data.

- What will be done in 2022 to improve information regarding analyte recovery?

Baffinland Response:

Previously, Baffinland staff and consultants would manually add preservatives to sample bottles, which leaves room for error. To improve on this, sample bottles now come pre-charged to eliminate risk of analyte recovery data loss.

Comment No.:	QIA-17
Section Reference:	3.3.1 Field methodology, p. 514 of 1047
Comment:	

At each station depending on grab volume and penetration depth, multiple grab samples were collected to obtain sufficient volume of surficial sediments for the selected analyses.

- How does gathering shallow surface sediment from multiple locations affect the sediment comparisons relative to gathering a greater volume from fewer samples that have greater depth?

Baffinland Response:

As described in Section 3.3.1 of the 2021 MEEMP report and as per standard practice, only the upper 5 cm layer is sampled for sediment chemistry, so sampling depth is standardized. The number of grabs taken (area sampled) is determined by the volume of sediment needed for the analysis required at that station and does not affect sediment comparisons. Sampling depth (upper 5 cm) is different from the grab penetration depth (variable). To obtain an undisturbed 5 cm layer, the grab penetration depth should be deeper than 5 cm and is noted to assess whether the grab should be accepted or not; however, grab penetration depth does not affect the volume of sample submitted to the laboratory for analysis because the sampling depth is standardized. The final 2021 MEEMP report has been edited for clarity.

Comment No.:	QIA-18
Section Reference:	3.3.4 Sediment quality QA/QC results, p. 517 of 1047 Appendix C. Sediment quality laboratory data, p. 530ff Appendix D. Sediment screening table and QA/QC results, p. 561ff

Comment:

RE: "There was low variability and high precision between duplicate samples, with the exception of a number of metals."

1. Greater detail is needed to put the quoted text in proper perspective. Twenty-five of the 35 metals measured were at least 50% different between the two sediment subsamples (p. 523).

RE: "The data are considered to be reliable because accounting for variability does not substantially change the data screening results at the metal concentrations reported."

2. In 2021 at site SW-02, 18 of the 35 metals measured were present in the highest concentrations measured during sediment sampling at the site over the period 2018-2021 (p. 562). Twenty - three of the 35 metals analyzed had a relative percent difference (RPD) of greater than 50% between SW-02 and Dup A (p. 563). These differences are much greater than those of the laboratory sample and duplicate (p. 542). Duplicate outliers and surrogate recovery outliers were identified in the quality control samples (p. 534). QIA recommends that Golder review the sediment sampling methodology to see if measures can be taken to reduce variability, and more samples be taken at this site to provide a better assessment of how sediment composition at the site varies and may be changing.

Baffinland Response:

Noted. The observed differences between the duplicates and the original sediment samples could be a result of heterogeneity in concentrations inherent within the sediment matrix, or 'incomplete' homogenization of the sediment sample such that subsampling for laboratory analysis could have introduced some variability. Golder will review the sediment sampling methodology with the aim of identifying measures that can be taken to reduce variability between duplicate samples and make modifications as necessary. It should also be noted that variability in sediment composition and chemistry at this site might be naturally higher relative to some other areas given the dynamic influences of tides, ice scour, storm events, and freshwater input.

Comment No.:	QIA-19
Section Reference:	4.2.1 Modifications to the program (2021) p. 569 of 1047
Comment:	

The radial monitoring program was suspended in 2021 for both sediment and benthic infauna on the basis that 3 years of monitoring had not found evidence of Project impacts. However, directed sampling at site SW-02 for both parameters in 2021 confirmed that the anomalies at this site appear to be Project-related.

- Will Baffinland be restoring its radial sampling programs for sediment and benthic infauna in 2022?

Baffinland Response:

Baffinland will be conducting the full radial sampling programs for sediment and benthic infauna every 3 years. The next full-scale sampling program for these parameters is scheduled for 2023.

The effects observed at SW-02 are well within the predictions made in the FEIS, which indicated the potential for fine sediment mobilization as a result of propeller wash from ships. Additional targeted sampling in the SW-02 area is planned for the 2022 sampling program with effort similar to that completed in 2021.

Comment No.:	QIA-20
Section Reference:	5.2.3 Indicators, p. 585 of 1047.
Comment:	

RE: "The 2021 quadrat survey results are to serve as a baseline for quantitative comparisons to future survey years so long as field methodologies remain consistent."

- This is a benchmark, not a baseline which would imply pre-development and given the variability, needs more than a single year of comparable data to be useful for future comparisons. Will Baffinland replicate this study in 2022 and 2023?

Baffinland Response:

The final 2021 MEEMP report has been updated to change the term "baseline" to "benchmark". The quadrat survey will be replicated in 2022 and in future monitoring years, with three additional quadrats added to each of the reference and exposure areas.

Comment No.:	QIA-21
Section Reference:	5.4.1 Substrate, Figure 5-4, p. 593 of 1047
Comment:	

Panels of the figure need to be identified using A to E labels to link them to the caption, or the caption needs editing (e.g., "...Milne Port (clockwise from upper left panel), a) silt/sand, ...".

Baffinland Response:

Labels (A to E) will be added to Figure 5-4 to reference with the Figure caption.

Comment No.:	QIA-22
Section Reference:	5.4.3.2 Motile epifauna, Table 5-8, p. 603 of 1047
Comment:	

The caption does not appear to fit the table, which does not include information on "Total Percent Cover". The SDI means and SEs were identical for the Exposure and Reference areas.

- Are these correct?

Baffinland Response:

Caption for Table 5-8 has been updated to include "Density", instead of "Total Percent Cover." The Simpson's Diversity Index (SDI) means and standard errors were corrected in Table 5-8. These corrections do not affect the content of the results section.

Comment No.:	QIA-23
Section Reference:	5.4.3.2 Motile epifauna, Figure 5-8 p. 604 of 1047.
Comment:	

Panel A) describes "Density" but the caption describes it as "Total Percent Cover".

- Correct the caption or replace the panel?

Baffinland Response:

The caption has been revised to accurately reflect the graph with "Density".

Comment No.:	QIA-24
Section Reference:	5.5 Discussion, p. 608 of 1047
Comment:	

RE: quadrat surveys, “Taxonomic resolution was improved in 2021 due to the exclusive use of divers…”

- QIA recognizes that identification of 16 of the 44 taxa found in the quadrat surveys to species (Appendix F, p. 686) is an improvement and encourages further improvement.

Baffinland Response:

Baffinland continues to work on improving taxonomic resolution of diver-based quadrat surveys via opportunistic collection of samples that can be sent for laboratory taxonomy analysis. If QIA has further recommendations on how to further improve taxonomic resolution, Baffinland would appreciate receiving those in writing so they can be considered for future implementation.

Comment No.:	QIA-25
Section Reference:	6.2.1 2021 modifications to the program, p. 694
Comment:	

RE: “Previously, CPUE was calculated by using the following general equation: no. of fish/hour(h) fishing.” The change in 2021 to reporting catch per unit of sampling effort (CPUE) in terms of the gear employed (e.g., /rod, /100 m of gillnet, /trap) is important as it facilitates comparisons with other studies.

- Because the gillnets use panels of different mesh sizes and the vulnerability of fish to capture varies with mesh size, reporting the mesh size each fish was caught in provides useful information for future comparisons. Is this information recorded and, if not, will it be in 2022 and future monitoring?

Baffinland Response:

Although useful for fish population estimates, this information is beyond the scope of the MEEMP Fish Community objective ‘Characterize the marine fish community at Milne Port in terms of species presence and relative abundance’. This information has been collected in previous programs but was discontinued when it was determined to increase handling time of the fish during recovery of the nets and did not provide added value to the fish community monitoring objectives.

Comment No.:	QIA-26
Section Reference:	6.3.1.3 Gill nets, p. 702
Comment:	

RE: "Gillnets were either suspended just below the water surface or weighted to run along the seabed."

- Gill net placement in the water column (surface, midwater, bottom) and water depth affect the vulnerability of fish species and fish of different sizes to capture and provide information on their habitat use. Do the CUPE (etc.) data differentiate between the floating and sinking nets and were depths at each end of the net recorded? If not, these data should be recorded in future sampling.

Baffinland Response:

While data from the floating and sinking nets were recorded separately, they were combined to increase the strength of the bin size for comparative statistics rather than separated into smaller bins. Baffinland does not intend to analyze the data separately, as doing so would not advance the overall objective of this component of the MEEMP which is to 'characterize the marine fish community at Milne Port in terms of species presence and relative abundance'.

Comment No.:	QIA-27
Section Reference:	6.3.1.5 Fukui traps, p. 706 of 1047 and 6.3.1.6 Hoop nets, p. 707 of 1047
Comment:	

Fukui traps were not deployed in the East Shore area due to limited suitable habitat and time constraints (p. 706), and hoop nets were not deployed at the Phillips Creek or East Shore areas (p. 707).

- How does this data gap affect future comparisons and how will it be avoided in the future?

Baffinland Response:

While every effort will be made to ensure all Fishing Areas (FAs) are sampled, and with similar fishing pressure, this is not always possible. A tremendous amount of sampling, across multiple disciplines, occurs within a limited open-water season and inclement weather can ground the field crews for multiple days.

Data are compared over time in these regions specifically (Phillips Creek and East Shore), and for only those specific types of effort (Fukui Traps and Hoop Nets). The 2021 data will be absent in future comparisons for these efforts but will not influence the year-to-year comparison of other FAs and efforts. Over time, and with the increase of interannual data sets for established suitable sampling locations these data gaps are expected to be observed as outliers.

Comment No.:	QIA-28
Section Reference:	6.3.1.6 Hoop nets, p. 707 of 1047
Comment:	

RE: Shore-based "Hoopnets were checked every 1 to 5 days after deployment."

- Please explain why there were intervals of up to 5 days between checks and how this may affect CPUE comparisons?

Baffinland Response:

Time and weather constraints dictated the frequency with which hoop nets could be checked. Field crews have a limited time to complete an ambitious sampling scope, across disciplines, with often inclement weather – they do their best in often challenging conditions. The intervals ranging from 1 to 5 days would not affect CPUE comparisons (as the nets were never saturated with fish upon collection), as the calculations are based on total soak time per effort.

Comment No.:	QIA-29
Section Reference:	6.4.1.1 2021 Summary, p. 711 of 1047 6.4.2 CPUE comparisons, p. 724
Comment:	

RE: use of the term "abundance" as in "…Fourhorn Sculpin (44.56%) were the most abundant fish species caught." (p. 711) and "…fish abundance was higher in Ore Dock West relative to other FAs."

- As noted in past comments, these sampling methods do not necessarily reflect abundance in the environment. The sculpins may have been caught more frequently but this may be related to their vulnerability to capture in the various fishing gear, which varies with factors such as gear type, set location/habitat/depth, species, and fish size. A better way to describe the results would be: Fourhorn sculpin comprised 44.56% of the catch.

Baffinland Response:

Fish abundance in section 6.4.2 is calculated as catch per unit effort, which corrects catch for gear type and effort. Sentences were edited to indicate relative abundance.

Section 6.4.1.1 was revised to clarify that Fourhorn sculpin were the most numerous fish species collected.

Comment No.:	QIA-30
Section Reference:	6.4.1.3. Fishing areas, p. 716 of 1047
Comment:	

RE: "the ore Dock was the most productive fishing area."

- The sampling was more productive at this site but the site was not necessarily more biologically productive. This is an important distinction that should be made in text. Further information is needed to assess whether the fish (e.g., sculpins) were simply more vulnerable to the gear, or the area was really more productive.

Baffinland Response:

Noted. The statement in the report was edited to reflect this distinction (the statement no longer alludes to relative *productivity)* and clarify the area had the highest captures, not corrected for fishing effort. Comparative CPUE for different methodologies across the different fishing areas (direct project footprint and indirect project footprint) were assessed statistically and the result was no significant spatial differences (Table 6.14). CPUE values for each method across each area in 2020 and 2021 are presented in Table 6.15.

Comment No.:	QIA-31
Section Reference:	6.4.1.5 Gill nets, p. 719 of 1047
Comment:	

RE: "…gillnet CPUE was second highest after trawling…"

- Comparisons of CPUE from different gear types should be avoided unless the CPUE metrics have been standardized in some way, otherwise it is comparing apples to oranges. CPUE comparisons are best used for comparisons between stations or years for a particular gear within a sampling program that is itself standardized.

Baffinland Response:

Sentence was edited to remove comparison to other methods.

Comment No.:	QIA-32
Section Reference:	6.4.1 Catch Data, Figures 6-12 - 6-15 (p. 720 – 723)
Comment:	

RE: Figures 6-11 to 6-15 depicting total catch by different gear types

- These numbers graphed do not provide a useful metric for comparing how well or poorly a particular species is, or fish in general are, faring post development. What should be compared here is CPUE for each species over time between fishing areas. To do this most effectively other variables such as habitat type/location/depth, set/check time, survey timing, mesh size, etc. need to be controlled (i.e., follow a consistent monitoring plan design over time). QIA recommends these figures be repeated but replacing the species totals in each bar with their CPUE. Comparison of the total catch and CPUE figures might provide insights into how changes in the monitoring programs have altered the total catches cf. catch effort.

Baffinland Response:

Due to inconsistent methodologies and the lack of standardization between sampling locations, it is not possible to make these comparisons between survey years. Standardization of methodology started in 2021 and will continue in 2022, which may allow for this level of comparison in future reports; however, a detailed analysis on the level of relative abundance by species is not possible at this time.

Comment No.:	QIA-33
Section Reference:	6.4.1.9 Trawling, p. 723
Comment:	

The fish species composition of trawl catches in 2020 and 2021 were quite different. In 2020, trawling began when the net reached the bottom and was conducted at sample depths ranging from 23 to 27 m over sand bottom at a speed of 1 knot (2020 MEEP AISNIS Report, p. 1259 of 1581). In 2021, trawling began after the trawl contacted bottom and had been raised 2 to 3 m, and was conducted at sample depths of 30 to 50 m; tow speed and bottom type were not stated in the Methods (p. 708 of 1047).

- The composition of the catches is very different and likely reflects differences in methodology rather than interannual changes. Is the objective of these trawls primarily to characterize fish presence at various depths and habitats or is it to facilitate interannual comparisons, in which case how will the 2022 trawling be conducted?

Baffinland Response:

Trawling is a new method being trialed for the program. Trawling efforts in 2020 and 2021 were intended to test different methodologies to determine the effectiveness of the method for the program. Methods in 2021 were refined to improve on limitations found during 2020 trials and the efforts are not comparable. Methods in 2022 will follow 2021 efforts, with potential changes based on limitations identified in 2021.

Comment No.:	QIA-34
Section Reference:	6.4.2 CPUE comparisons, p. 725
Comment:	

RE: "Table 6-16 Statistical comparisons of CPUE among areas and years and for gear types" (p. 725).

- QIA recommends that similar comparisons for key species and gear (e.g., Arctic Char and gillnets) be assessed to see whether they might provide insights into trends within and among FAs over time that are not otherwise apparent.

Baffinland Response:

Baffinland acknowledges QIA's recommendation and will consider the option of adding similar comparisons into future monitoring reports. This level of data analyses is possible for Arctic Char in Fishing Areas by gear type where there is sufficient catch for statistical analysis. We agree that this is valuable data, and it can be incorporated into future reports.

Comment No.:	QIA-35
Section Reference:	6.5 Discussion, p. 728 of 1047 6.6 Conclusions and recommendations, p. 729

The 2021 results "…when combined with the 2020 dataset, provides a reliable characterization of the status of the marine fish community."

- Lumping together all the species caught by a particular gear, or all gears' catches of a species, will obscure trends in relative abundance of key species that are useful for identifying Project impacts, so characterizing the treatment of the results as yielding a "reliable characterization of the current status of the marine fish community" is not supported.

Baffinland Response:

QIA's comment is noted. Text has been updated to clarify that the fish community has been characterized, and not its status. We further note that the objective of this particular exercise was to provide a characterization of the marine fish community, not identify trends in relative abundance of key species. Nonetheless, "reliable" was replaced with the word "general" to more accurately indicate the level of comparison.

Comment No.:	QIA-36
Section Reference:	6.5 Discussion, p. 728 of 1047
Comment:	

RE: "Recommendations for future monitoring includes a minimum three fishing efforts per gear type in the focal FAs."

- Please clarify what "three fishing efforts" translates to for each gear type, and which fishing areas are considered "focal FAs".

Baffinland Response:

Focal was removed from this sentence. The recommendation was to conduct a minimum of three deployments per fishing methodology per fishing area (FA) in order to support statistical comparisons between each FA for each fishing method. Please note that this specific analysis approach for fish community has since been revised (as outlined in revisions made to Chapter 6) such that there are now only two distinct FAs (Indirect Project Footprint, Direct Project Footprint) in Milne Port, as opposed to five FAs as originally identified in the draft report. This change was made because there was not enough biophysical variation between the 5 FAs to warrant their independent classification. The two FAs offer a more reasonable segregation of the sampling stations based on their relative proximity to port activities (i.e., marine infrastructure, discharge activities, and berthing operations) and will provide for a more robust statistical comparison given the larger sample sizes that will available per FA.

Comment No.:	QIA-37
Section Reference:	7.4.1.1 Fourhorn Sculpin, p. 781 of 1047
Comment:	

RE: The y-axis of Figure 7-1 Length frequency distributions of Fourhorn Sculpin sampled from the Milne Port area, 2021, p. 781.

- In % Frequency figures the total of the columns would normally add up to 100%. These don't and some clarification would be helpful. Do the columns represent the percentage of the total Fourhorn Sculpin catch that was sampled for males and females of a particular length class? To provide context, the sample sizes should be included in the figure or caption for both the number of sculpins of each sex sampled and the total number of each sex caught.

Baffinland Response:

There was an error in the depiction of relative frequency in this figure that has been corrected. Columns represent the relative frequency of a particular size class, compared with the total Fourhorn Sculpin catch. The relative frequency of each size class sums to 100% across sexes (i.e., females and males together). Sample sizes for each sex have been added to improve figure clarity.

A similar error was also found in Figure 7-9, where relative frequency was not depicted correctly. This figure has also been revised, similarly to Figure 7-1. The relative frequency for each size class of *Hiatella arctica* sums to 100% across sampling years (i.e., 2020 and 2021 together). Sample sizes for each year have been added to improve figure clarity.

Comment No.:	QIA-38
Section Reference:	7.4.1.1 Fourhorn Sculpin, p. 785 of 1047
Comment:	

Figures 7-2 though 7-5 provide nice clear illustrations of the data.

- Figures 7-6 and 7-7, p. 785 and 786 could be improved by using the same x and y-scale axes to facilitate direct comparisons, or by noting in the captions that the left and right panels of each figure have different x- and y-scales.

Baffinland Response:

The same x and y axis scaling have been applied for female and male fish in figures 7-6 and 7-7.

Comment No.:	QIA-39
Section Reference:	7.4.2.1 Arctic char, p. 792 of 1047.

Comment:

RE: "One Arctic Char sampled had tissue concentrations of several metals which were notably different than other Arctic Char sampled the same year." (p. 792) Golder suggests that, based on its small size, this fish may have been a smolt on its first migration to sea and "[t]he elevated concentrations of metals, including some COPCs [i.e., contaminants of potential concern], may be attributable to differences in water chemistry between its originating lake and Milne Inlet." (p. 793)

- These elevated tissue metals argue the need to sample char of this size from rivers draining into Milne Port to learn where these fish are being exposed to higher metal concentrations (i.e., which river system).

Baffinland Response:

Concentrations of several metals naturally occur in greater concentrations in freshwater when compared to the marine environment. Therefore, it is not unusual for fish originating from freshwater to have greater tissue concentrations of these metals when compared to individuals of the same species collected from the marine environment; one explanation is that prolonged periods of reduced feeding, such as those that occur for overwintering Arctic char, can have significant consequences for tissue contaminant levels (Martyniuk et al. 2020). Over time, the tissue concentrations of these metals would be expected to decrease as the fish reaches equilibrium within the marine environment.

As described in Section 7.4.2.1: "Characteristic differences in water chemistry, including metals concentrations, between freshwater and marine environments may explain the abnormal metals concentrations in this individual Arctic Char. A recent study of tissue metals burdens in Arctic Char from the Nunavik region of northern Quebec found that concentrations of chromium, lead, and nickel were significantly higher in muscle tissue samples from Arctic Char in the post-winter period before they returned to the ocean when compared with Arctic Char caught in the ocean during summer (Martyniuk et al. 2020). Given this individual Arctic Char had elevated concentrations of chromium, lead, and nickel, and its stomach contents were comprised entirely of freshwater insects, it is likely that this individual was a first-year smolt that had migrated from a lake upstream of Milne Port. The elevated concentrations of metals, including some COPCs, may be attributable to differences in water chemistry between its originating lake and Milne Inlet."

References:

Martyniuk, M.A.C., Couture, P., Tran, L., Beaupre, L. and M. Power. 2020. Seasonal variation of total mercury and condition indices of Arctic charr (*Salvelinus alpinus*) in Northern Quebec, Canada. Science of the Total Environment. 738: 139450.

Comment No.:	QIA-40
Section Reference:	7.4.2.1 Arctic char, pp. 781 to 798 of 1047.
Comment:	

RE: Figures 7-2, 7-4, 7-5, 7-6, 7-7, 7-11, 7-12, and 7-13.

- What are the R-squared values for the linear relationships shown in these figures?

Baffinland Response:

The linear relationships shown in these figures are visual representations of several ANCOVA models. Given the nature of ANCOVA and the assumptions of this test, specifically parallel slopes among factor groups, individual R^2 values cannot be derived for each linear relationship depicted. Instead, R^2 values for each ANCOVA model depicted in the indicated figures are provided in the table below.

Figure	Species	ANCOVA Model			Sex	R^2 Value
		Dependent	Factor	Covariate		
7-2	FHSC	$\log_{10}$ Total Weight	Sex	$\log_{10}$ Total Length	n/a	0.942
7-4	FHSC	Total Length	Year	Age	Female	0.777
					Male	0.579
7-5	FHSC	$\log_{10}$ Total Weight	Year	$\log_{10}$ Total Length	Female	0.959
					Male	0.911
7-6	FHSC	Liver Weight	Year	Total Weight	Female	0.829
					Male	0.608
7-7	FHSC	$\log_{10}$ Gonad Weight	Year	$\log_{10}$ Total Weight	Female	0.812
					Male	0.596
7-11	HTAR	$\log_{10}$ Total Weight	Year	$\log_{10}$ Total Length	n/a	0.514
7-12	ARCH	$\log_{10}$ Mercury	Year	$\log_{10}$ Total Length	n/a	0.060[a]
		$\log_{10}$ Selenium	Year	$\log_{10}$ Total Length	n/a	0.267
7-13	FHSC	$\log_{10}$ Mercury	Year	$\log_{10}$ Total Length	n/a	0.631
		$\log_{10}$ Selenium	Year	$\log_{10}$ Total Length	n/a	0.426

[a] Mercury concentrations in ARCH did not differ significantly among sampling years (*P*-value = 0.199). See Section 7.4.2.1 in MEEMP 2021 Report.

ANCOVA = Analysis of Covariance; FHSC = Fourhorn Sculpin (*Myoxocephalus quadricornis*); HTAR = Wrinkled Rock-Borer (*Hiatella arctica*); ARCH = Arctic Char (*Salvelinus alpinus*); $\log_{10}$ = $\log_{10}$-transformed; n/a = not applicable.

Comment No.:	QIA-41
Section Reference:	Appendix 7A, pp. 813 and 816
Comment:	

RE: "Due to equipment malfunction in the field, no weights were recorded from fish collected from the Tugaat River Estuary." (p. 816)

1. How will this problem be avoided in the future reconnaissance surveys?

RE: “The Tugaat River area is not recommended for use as a fish health reference area based on data collected during the 2021 reconnaissance survey." (p. 816)

2. What other alternatives are being considered?

Baffinland Response:

1) To avoid potential issues related to malfunctioning equipment, additional scales will be provided to the field crew during future sampling events to provide redundancy.

2) In 2022, additional sampling will be conducted north of Tugaat estuary (further north of the previously sampled reference site in 2020) and in Koluktoo Bay to identify a suitable reference site that offers similar habitat conditions as Milne Port and supports similar species assemblages including both indicator species for the fish health program (i.e., Fourhorn sculpin, *Hiatella arctia*).

Comment No.:	QIA-42
Section Reference:	8.1.1 Objectives, p. 923 of 1047
Comment:	

The AIS/NIS objectives listed are reactive rather than proactive, in that they do not address prevention of NIS/AIS introductions, rather identify whether introductions have occurred. Once NIS/AIS have been introduced they are typically very difficult to eradicate and can have significant ecological and economic consequences. This is an ongoing concern with Project shipping.

- Discussions have been held with DFO regarding a risk-based assessment of biota carried to Milne Port in the ballast water and on the hulls of Project shipping. When will these studies be implemented?

Baffinland Response:

The program referenced by QIA is being led by DFO (as per the relevant commitment for Phase 2), thus timing and implementation of the program will be determined by DFO. Again, Baffinland would like to emphasize that its current approach to managing ballast water introductions – mandating both exchange AND treatment for vessels that are currently fitted with onboard treatment systems – exceeds Transport Canada regulations.

Comment No.:	QIA-43
Section Reference:	8.2.1 Modifications to the program in 2021, p. 926 of 1047
Comment:	

RE: "Zooplankton sampling was removed from the program in 2021 and replaced with monitoring for recruitment." Monitoring of settlement plates and baskets for NIS/AIS focuses on fouling species and may miss other species that arrive as plankton.

1. Are there sufficient settlement plates and baskets to detect NIS/AIS in a timely manner?
2. Why were there no settlement plates and baskets deployed at the existing ore dock?

3. Will biological sampling of the ballast water be used in 2022 to identify which live taxa in the ballast water may pose a risk if released, including zooplankton and phytoplankton?

Baffinland Response:

1. Settlement substrates have been deployed in 23 locations in Milne Port and Ragged Island, with an additional 9 deployments near the Freight Dock. Locations were selected to provide an even distribution throughout the Milne Port area. Deployments have been set up to monitor for short term (annual) and medium term (3 years) recruitment. This is considered adequate to detect NIS/AIS in a timely manner.

2. Settlement substrates were deployed at the ore dock in 2016-2018. However, when attempts were made to recover them the next season, the deployed settlement substrates were determined to be lost or damaged, presumably due to interactions with ships during seasonal berthing activities. It was determined there was no safe location along the ore dock where substrates could be deployed where they could be reliably retrieved on an annual basis.

3. Ballast water sampling for plankton is a DFO-led project; hence details regarding the implementation of this program in 2022 would be determined by DFO.

Comment No.:	QIA-44
Section Reference:	8.3.3.1 Taxonomic identification and literature review, p. Figure 8-5, p. 934 of 1047
Comment:	

Golder has highlighted the fact that ArcOD has few datasets on marine species from the Canadian Arctic relative to other areas of the circumpolar Arctic (Figure 8-5, p. 934).

- Golder and Baffinland have a remarkable dataset of Arctic marine species from Milne Inlet. Will the dataset be made available on ArcOD and, if so, when?

Baffinland Response:

Baffinland will explore the option of making the Milne Inlet taxonomic inventory available on ArcOD and report back to the MEWG during future MEWG meeting(s).

Comment No.:	QIA-45
Section Reference:	8.4.1.1 Benthic infauna, p. 935 of 1047, and 8.5.3.2.1 *Diastyloides biplicatus*, p. 965
Comment:	

Diastyloides biplicatus was flagged for review as part of the QA/QC procedures following a transcription error in the lab data.

- QIA acknowledges this precautionary response to the data error.

Baffinland

Baffinland Response:

N/A

Comment No.:	QIA-46
Section Reference:	8.4.1.2 Macroflora and Benthic epifauna, p. 938 of 1047
Comment:	

RE: "A literature review was performed for all new taxa identified in quadrat surveys..."

- These references were not cited but might be useful for future discussions of benthic macroflora:
    - Mathieson, A.C., Pederson, J.R., Neefus, C.D., Dawes, C.J., and Bray, T.L. 2008. Multiple assessments of introduced seaweeds in the Northwest Atlantic. – ICES Journal of Marine Science, 65: 730–741.
    - Mathieson, A.C., Moore, G.E., and Short, F.T. 2010. A floristic comparison of seaweeds from James Bay and three contiguous northeastern Canadian Arctic sites. Rhodora 112(952): 396-434. DOI: http://dx.doi.org/10.3119/09-12.1
    - Goldsmit, J., Schlegel, R.W., Filbee-Dexter, K., MacGregor, K.A., Johnson, L.E., Mundy, C.J., Savoie, A.M., McKindsey, C.W., Howland, K.L., and Archambault, P. 2021. Kelp in the Eastern Canadian Arctic: Current and Future Predictions of Habitat Suitability and Cover. Front. Mar. Sci. 18:742209. doi: 10.3389/fmars.2021.742209

Baffinland Response:

We thank QIA for providing these additional references. These have been added to our database of relevant literature.

Comment No.:	QIA-47
Section Reference:	8.4.1.3 Settlement substrates, p. 940 of 1047
Comment:	

Casas-Monroy et al. (2014) provided a summary of species in ballast water, not biofouling which may be the more likely source of species fouling the rocks and plates. This recent paper discusses some fouling species of concern:

- Goldsmit J, McKindsey CW, Stewart DB and Howland KL (2021) Screening for High-Risk Marine Invaders in the Hudson Bay Region, Canadian Arctic. Front. Ecol. Evol. 9:627497. doi: 10.3389/fevo.2021.627497

Baffinland Response:

We thank QIA for providing this additional reference. This has been added to our database of relevant literature.

Comment No.:	QIA-48
Section Reference:	8.4.1.3 Settlement substrates, p. 940 of 1047

Comment:

The three watchlist species found on settlement substrates in close proximity to the ore dock raise questions regarding their origins.

- Biological sampling of the ballast water and hull fouling is needed to assess whether these species are present in the vessels' ballast water or as biofouling on their hulls.

Baffinland Response:

Baffinland will continue to work with DFO to implement the ballast water sampling program and to discuss options for hull biofouling monitoring.

Comment No.:	QIA-49
Section Reference:	8.5.2.3 Settlement substrates, p. 953 of 1047.

Comment:

RE: "in 2021, settlement substrates were deployed in nineteen locations..."

- Weren't these settlement substrates deployed in 2020 and recovered in 2021? Were new settlement plates deployed to replace those recovered in 2021? If not, QIA recommends this be considered given the high loss rates and value of longer soak times for species identification.

Baffinland Response:

Settlement substrates were deployed at ten locations in 2020; however due to limited supplies of settlement baskets, full sets were not placed at each location. In 2021, additional substrates were added to the existing deployments where they were required, and an additional thirteen deployments were added at new locations (for a total of 23 monitoring locations, plus nine along the Freight Dock). All substrates recovered in 2021 were replaced.

The program design allows for short- and medium-term soak times. Each sample year, two sets of substrates will be collected from each location. One set will be an annual set (representing annual recruitment, or short term) and one set that has soaked for three years (representing medium term recruitment). Based on the original deployment times, substrates collected in 2022 will have soaked for one or two years, with the first three-year substrates anticipated to be collected in 2023.

FINAL REPORT

Chapter 2.0 Marine Water Quality

2021 Marine Environmental Effects Monitoring Program (MEEMP) and Non-Indigenous Species / Aquatic Invasive Species (NIS/AIS) Monitoring Program

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1663724-349b-R-Rev0-44000

21 October 2022

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TABLES

FIGURES

APPENDICES

ACRONYMS AND ABBREVIATIONS

Acronym or Abbreviation	Definition
ALS	ALS Canada Ltd.
BC	British Columbia
BTEX	Benzene, Toluene, Ethylbenzene and Xylenes
CALA	Canadian Association for Laboratory Accreditation Inc.
CCME	Canadian Council of Ministers of the Environment
DL	Detection limit
DQOs	Data Quality Objectives
ERP	Early Revenue Phase
FEIS	Final Environmental Impact Statement
HEPH	Heavy Extractable Petroleum Hydrocarbons
LEPH	Light Extractable Petroleum Hydrocarbons
MEEMP	Marine Environmental Effects Monitoring Program
MDL	Method Detection Limit
PAHs	Polycyclic aromatic hydrocarbons
PC	Project Certificate
PSU	Practical Salinity Unit
QA/QC	Quality Assurance / Quality Control
QC	Quality Control
RPD	Relative Percent Difference
TSS	Total Suspended Solids
UTM	Universal Transverse Mercator
WQGs	Water Quality Guidelines

2.0 WATER QUALITY

2.1 Introduction

This chapter presents the results of the marine water quality monitoring program, a component of the larger Marine Environmental Effects Monitoring Program (MEEMP) conducted at Milne Port and in Milne Inlet during the 2021 open-water season. This component was developed in consideration of the potential Project-related impacts to the marine environment as identified in the 2012 Final Environmental Impact Statement (FEIS) and subsequent addendums, as well as monitoring requirements outlined in the Project Certificate (PC) Conditions described in Chapter 1.0, Table 1-2 (i.e., PC Conditions No. 76, 87, 89 and 99(a)).

2.1.1 Objectives

The MEEMP objectives are outlined in Section 1.3 of Chapter 1.0 (Program Overview). The objectives specific to the 2021 marine water quality program were as follows:

- Ensure that water entering the marine receiving environment from site discharges MP-05 and MP-06 meets the requirements of the Water License.
- Compare water quality parameters of samples collected at discharge locations against water quality guidelines or measurements from previous years to assess potential for effects to marine biota.

2.2 Study Design

The marine water quality study is designed to ensure that water discharged from site is compliant with requirements outlined in BIM's Type "A", Water Licence No. 2AM-MRY1325. Discharge occurs from two locations, MP-05 and MP-06, which store run-off from the iron ore stockpiles. The MP-05 discharge is permitted from the Milne Port Ore Stockpile Sedimentation Pond (East) and the MP-06 discharge is permitted from the Milne Port Ore Stockpile Sedimentation Pond (West). The marine receiving environment for the MP-05 primary discharge has been monitored annually since 2015, with monitoring at a second discharge point (MP-06) added in 2020. It should be noted that monitoring of effluent quality is not within the scope of the MEEMP; rather, treated effluent is monitored monthly during each intermittent discharge period by the Mine, and reported elsewhere.

Water quality samples were collected at four sampling stations that have been monitored annually from 2015 to 2020[1] near the primary site discharge (MP-05). One station was situated downstream from the marine discharge point for treated effluent and collected site drainage (i.e., Source-1), while the remaining three stations were located approximately 250 m offshore from the outfall location to the northwest (WNE-1), north (North-1), and northeast (ENE-1), respectively (Figure 2-1, Table 2-1). The same sampling plan was applied to MP-06 in 2020 and so four water quality stations were monitored in 2020 and again in 2021 downstream from the discharge (Source-2) and 250 m offshore in different directions (WNE-2, North-2, ENE-2) (Figure 2-1, Table 2-1). Similar to previous years, effort was made to collect water quality samples during active effluent discharge periods, given that the site effluent discharges were intermittent during the 2021 open-water season.

The present sampling design has been applied to identify and characterize adverse effects on marine water quality in Milne Port from the two treated site discharges, to evaluate the current effectiveness of existing mitigation measures, and to inform the need for further mitigation and/or alterations to Project activities.

[1] SEM 2016; SEM 2017; Golder 2018, Golder 2019, Golder 2020, Golder 2021

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LEGEND

DISCRETE WATER QUALITY SAMPLES

- MP-05
- MP-06

0 250 500

1:10,000 METRES

REFERENCE(S)

BATHYMETRY CREATED BY GOLDER FROM MULTIPLE DATA SOURCES. FREIGHT DOCK DATA PROVIDED BY HATCH, MARCH 4, 2020. ADDITIONAL MILNE PORT INFRASTRUCTURE DATA OBTAINED FROM CLIENT, MAY 2, 2020 AND MAY 28, 2018. HYDROGRAPHY DATA OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED. MILNE PORT IMAGERY CAPTURED AUGUST 2020 © 2020 DIGITAL GLOBE, INC. ADDITIONAL IMAGERY COPYRIGHT © 20190802 ESRI AND ITS LICENSORS. SOURCE: MAXAR VIVID. USED UNDER LICENSE, ALL RIGHTS RESERVED.
PROJECTION: UTM ZONE 17 DATUM: NAD 83

CLIENT
BAFFINLAND IRON MINES CORPORATION

PROJECT
MARY RIVER PROJECT

TITLE
WATER QUALITY SAMPLING STATIONS FOR THE MP-05 AND MP-06 MILNE PORT SITE DISCHARGES, MEEMP 2021

CONSULTANT

GOLDER

YYYY-MM-DD	2022-06-30
DESIGNED	EI
PREPARED	AJA
REVIEWED	EI
APPROVED	PR

PROJECT NO.	CONTROL	REV.	FIGURE
1663724	44000-04	0	2-1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B
25mm
0

Table 2-1: 2021 Marine Water Quality Sampling Locations at MP-05 and MP-06.

Site Discharge Location	Station Name	UTM Zone	Easting (m)	Northing (m)
MP-05 (Milne Port Ore Stockpile Sedimentation Pond [East])	ENE-1	17W	503874	7976517
	North-1	17W	503725	7976612
	WNW-1	17W	503540	7976599
	Source-1	17W	503662	7976403
MP-06 (Milne Port Ore Stockpile Sedimentation Pond [West])	ENE-2	17W	503114	7976665
	North-2	17W	502943	7976619
	WNW-2	17W	502828	7976474
	Source-2	17W	503038	7976416

Notes: UTM = Universal Transverse Mercator; m = meter.

2.2.1 Indicators and Thresholds

Indicators and thresholds selected for the MEEMP program are described in Section 1.4.2. For marine water quality, a number of parameters are measured, including physical parameters, nutrients, metals, and hydrocarbons. A sub-set of these parameters (i.e., metals, total suspended solids [TSS], nutrients, and hydrocarbons) were identified as water quality indicators to assess for potential effluent discharge effects on the receiving environment. To provide early warning of environmental effects from the Project, applicable water quality guidelines (WQGs) are used as a threshold where these exist (i.e., Canadian Council of Ministers of the Environment [CCME] WQGs for the protection of aquatic life in marine environments [CCME 2021]). For indicators with no associated WQG, such as iron, concentrations were compared to the data range from previous years (2015-2020). If either of these thresholds were exceeded, then the treated effluent data from the discharge were reviewed to determine if the observed increase in these parameters was related to effluent discharges from MP-05 and MP-06.

2.3 Materials and Methods

2.3.1 Field Methodology

Water quality samples were collected during five sampling events scheduled between 2 August and 19 August 2021. Samples were typically collected weekly over this period; however, some flexibility was built into the sampling program to facilitate the collection of samples from the same discharge period to allow for direct comparisons.

Water samples were collected from just below the surface (1 to 2 m) or mid-water column depth from the deeper sample MP-06 locations (MP-06-WNW, MP-06-North, and MP-06-ENE) from a zodiac vessel using a 2.0 L vertically oriented Kemmerer bottle sampler. The sampler was washed with laboratory-grade detergent and then rinsed with site-water prior to sample collection at each station. Samples were preserved in the field according to laboratory instructions and kept refrigerated until they were shipped (within 48 h of sample collection) on ice in coolers to ALS Canada Ltd. (ALS), a Canadian Association for Laboratory Accreditation Inc. (CALA) accredited analytical laboratory. To further limit the time between sample collection and preservation, dissolved metals and mercury samples were field filtered and preserved, rather than being filtered by the analytical laboratory upon sample receipt. Samples were analyzed for routine parameters, TSS, nutrients, major ions, total and dissolved metals (including mercury), benzene, toluene, ethylbenzene, xylenes, hydrocarbons and PAHs. A full list of field water quality parameters is provided in Appendix 2A in the field data sheets, while a full chemistry parameter list is provided in the analytical reports in Appendix 2B. A total of three field duplicates and three field blank quality control (QC) samples were collected during the field program for Quality Assurance / Quality Control (QA/QC) purposes as discussed in Section 2.3.3.

The sampling effort for hydrocarbons (Petroleum hydrocarbons [BTEX/F1]; Hydrocarbons [LEPH/HEPH], F2-F4, Polycyclic Aromatic Hydrocarbons [PAHs]) was lowered in 2021 because these organic constituents have not been detected in water samples collected since 2015. As such, for each of the five sampling events, hydrocarbons were sampled at two of the four stations at each discharge, for a total of ten samples or five samples per discharge. Fecal coliform bacteria were not detected in the 2020 samples collected downstream of both discharges, which was consistent with either low or non-detectable bacteria counts measured in water samples collected from Milne Inlet since 2017. These multi-year data confirmed that MP-05 and MP-06 are not sources of fecal coliforms to Milne Inlet and monitoring of bacteria in receiving waters around each discharge was therefore discontinued.

2.3.2 Data Analysis

Descriptive summary statistics (i.e., mean, minimum, maximum) were calculated for each sampling station over the five sampling events. For statistical calculations, the value of the reported detection limit (DL)[2] was conservatively used for measurements reported to be below the DL. The 2021 summary statistics were screened against the CCME WQGs for the protection of aquatic life in marine environments (CCME 2021). For parameters of interest without an applicable CCME WQG (e.g., iron), concentrations were qualitatively compared to the range of water concentrations reported in previous years (i.e., annually from 2015 to 2020). Baffinland was responsible for summarizing the 2021 effluent data from MP-05 and MP-06 as per their Type A Water Licence requirements and are reported elsewhere.

The application of CCME WQGs to total concentrations measured in the environment can be conservative, especially when those metals are part of the mineral matrix that makes up the particle. This is because total metal concentrations reflect both the proportion of metals associated with particles and that are dissolved in the water column. Dissolved concentrations tend to provide a more realistic indication of the bioavailable concentration for direct uptake from the water, particularly in turbid receiving environments (Chapman and Wang 2000). However, the measure of “dissolved” metals is an operational definition based on whether the metal passes through a small (0.45 micrometre [µm]) filter (BC MWLAP 2003). Water quality guidelines for the protection of aquatic life are generally applied to total concentrations but are derived from laboratory-based toxicity tests. In these tests, exposure concentrations are based on metals in solution from metal salts and the laboratory test water has a low level of suspended matter (typically clear water). Typically, these toxicity tests involve exposure of test species to more bioavailable dissolved metal concentrations, and not the total concentrations usually reported as the exposure concentrations, thus contributing to conservatism in the derivation of water quality guidelines.

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[2] The lowest concentration at which individual measurement results for a specific analyte are statistically different from a blank (that may be zero) with a specified confidence level for a given method and representative matrix.

2.3.3 Quality Management

The overall goal of the water quality sampling program was to collect quality data, which was achieved through the consistent application of QA/QC measures. These quality management procedures were applied to the field collection, data analysis, and reporting tasks for the water quality program to verify that the data presented were valid and of acceptable quality to address MEEMP objectives.

2.3.3.1 Field QA/QC

Field staff were trained to be proficient in standardized sampling procedures, data recording using standard forms, and equipment operations applicable to the monitoring program. Field work was conducted according to specified instructions and established technical procedures for standard sample collection, preservation, handling, storage, and shipping procedures.

General QA/QC tasks applicable to the water quality program included, but were not limited to, the following:

- Preparing geo-referenced field maps for use during the surveys to accurately document sampling locations and project-specific data collection forms to standardize the field data collection process.
- Regular communications between the Project Manager and field staff.
- Collection of Quality Control samples in the field (i.e., field duplicates and blanks).
- Accredited laboratories were selected for sample analysis. Performance quality of selected laboratories were verified through Golder's internal vendor approval and assessment procedures.
- Field data sheets were reviewed by the field supervisor at the end of each day for completeness and accuracy.
- Chain-of-custody documentation was used to track sample shipments to the individual subcontractor laboratories.
- Samples were packaged and shipped to the laboratory in accordance with required holding times and storage conditions.

Field blanks were collected to identify potential sources of contamination during field sampling. Field blank sample containers were filled with de-ionized water in the laboratory and then processed in the field in the same manner as water samples from each station (i.e., uncapped, treated with preservative, re-capped). Three field duplicates and three field blanks were collected over the five sampling events.

2.3.3.2 Laboratory and Data Analysis QA/QC

Laboratory QA/QC reports were reviewed upon receipt to confirm adherence to sample hold times and laboratory data quality objectives (DQOs), and that the appropriate QA/QC information had been reported. Laboratory QA/QC included verification of recommended sample holding times and the analysis of laboratory control samples, laboratory duplicates, and spiked samples to assess precision and accuracy of analytical methods.

The analysis of field QC samples involved a review of field blank results. Notable results were defined as those greater than five times the respective DL detected in the field blanks, in accordance with the BC Field Sampling Manual (BC MWLAP 2003). To assess variability between field duplicates, the Relative Percent Difference (RPD) was calculated as follows:

$$RPD = \left(\frac{sample - duplicate}{(sample + duplicate)/2}\right) \times 100$$

In accordance with the BC Field Sampling Manual (BC MWLAP 2003), an RPD value of >20% was used to identify differences between original and duplicate samples. Values less than five times the Method Detection Limit (MDL) were not included in the RPD calculations because analytical variability near the MDL is higher and does not provide a good measure of variability associated with the collection of field samples.

2.4 Results

2.4.1 QA/QC Results

The 2021 marine water quality data were considered valid based on the results of the QA/QC assessment provided in Appendix 2C for the following reasons:

- Most chemical analyses on surface water samples were completed within the sample hold time requirements. Although exceedances of sample hold time requirements have been documented, the hold times for the parameters in question are relatively short. Given the remote location of the site, such exceedances were unavoidable. The data should still be comparable to previous yearly measurements as similar issues with hold time exceedances of a similar length of time have been encountered.
- Sample temperature was within laboratory thresholds (< 10ºC), with the exception of a single exceedance observed for VA21B6250 with measured sample temperatures of between 19 and 20ºC, which did not affect interpretation of the data.
- Data reported by the laboratory were considered reliable according to the accredited laboratory QA/QC assessment.
- Measured concentrations in the field blanks were all less than the analytical detection limit.
- Parent samples and their respective duplicates were not substantially different (low variability and thus high precision in sampling).

Overall, the QA/QC results in Appendix 2D indicate that the water chemistry data collected during the 2021 MEEMP are of acceptable quality to address the objectives stated in Section 2.1.1.

2.4.2 Marine Water Quality Results

Field water quality measurements are documented in Appendix 2A and water quality laboratory reports are provided in Appendix 2B. The field measurements and laboratory raw data for each station sampled in 2021 are summarized in Appendix 2C. Summary statistics (mean, maximum, and minimum) for the 2021 water quality program calculated from these data are presented in Table 2-2. Summary statistics for parameters of interest for the six monitoring years between 2015 and 2021 are provided in Appendix 2E – Table 1.

2.4.2.1 Conventional Parameters

The pH in water samples collected in 2021 downstream of both discharge points ranged from 7.9 to 8.1 (Table 2-2) and were within the CCME WQGs range for marine waters (7.0 to 8.7) and within pH ranges (7.0 – 8.1) reported in previous years (Appendix 2E – Table 1). Total suspended solids were low, with most samples <2 mg/L (30 of 40 collected samples) and a maximum concentration of 7.9 mg/L in a sample collected from the MP-06 ENE location on 14 August 2021. Turbidity levels were similarly low (<0.1 NTU to 1.7 NTU) and both TSS and turbidity levels in 2021 were below CCME WQGs and within previously observed annual ranges (Appendix 2E – Table 1). Salinity ranged from 1,700 mg/L to 31,000 mg/L in 2021, reflective of an estuarine environment (i.e., one that fluctuates between brackish and fully saline) and dissolved oxygen levels at all stations were indicative of well-oxygenated conditions (Table 2-2).

2.4.2.2 Nutrients

Nutrients were mostly not detectable over the five 2021 sampling events and where detected, concentrations were low and below applicable CCME WQGs. Nitrate concentrations downstream of both discharges in 2021 were below CCME guidelines and were mostly below the detection limit (<0.01 mg-N/L) except for samples collected from the MP-05 discharge, MP-05 ENE, MP-05 WNW, MP-06 discharge and MP-06 North station locations. Overall, nitrate concentrations are consistent with those reported in 2020 for the MP-05 and MP-06 discharge (Table 2-2; Appendix 2E – Table 1). Ammonia (<0.005 mg-N/L) and nitrite (<0.01 mg-N/L) concentrations were below detection in 2021 (Table 2-2; Appendix 2C). No CCME marine WQGs are available for ammonia and nitrite.

2.4.2.3 Metals

Measured metal concentrations downstream of both discharges were lower than applicable CCME WQGs over the five 2021 sampling events (Table 2-2). A number of total metals were measured below detection limits[3] in each of the 2021 samples (Appendix 2C). Several total concentrations of metals were detected, and of those, some were mostly present in particulate form because most dissolved concentrations were below detection (i.e., aluminum, iron, nickel, and zinc).

Iron is the metal of primary interest for the MEEMP. A CCME marine WQG for iron is not available and, as such, the 2021 iron data were compared to the detected concentration range measured between 2015 and 2020 downstream from the MP-05 and MP-06[4] discharges (Table 2-2, Appendix 2E – Table 1). Analytical improvements in the ability to detect iron were made in 2017, which reduced the detection limit to <10 µg/L from the DL of 500 µg/L reported in the 2015 and 2016 MEEMP programs. Differences in the sensitivity of DL precludes comparison of the 2021 data to pre-2017 data.

[3] Total antimony, beryllium, bismuth, caesium, chromium, cobalt, gallium, iron, lead, mercury, rhenium, selenium, silicon, silver, tellurium, thallium, thorium-232, tin, titanium, tungsten, yttrium, and zirconium.

[4] Receiving water quality data for the MP-06 discharge are only available from 2020.

Concentrations detected downstream of both discharges in 2021 are well within the range measured from 2017 to 2020, which ranged from <10 to 286[5] mg/L (Appendix 2E – Table 1). The temporal trend in iron concentrations for the MP-05 and MP-06 sampling locations from 2017 onwards is shown in Figure 2-2 and Figure 2-3. These plots demonstrate that total iron water concentrations have not been increasing in the receiving environment, despite increases in production since 2017, and have remained fairly stable. Furthermore, dissolved iron concentrations were <10 µg/L in each of the samples collected in 2021 (Table 2-2), indicating that for most samples, a substantial portion of the reported total concentration was present in particulate form, and therefore likely less bioavailable for uptake by aquatic biota.

In addition to iron, several other metals of interest do not have CCME marine WQGs. In these cases, comparisons of 2021 concentrations were made to the 2015 to 2020 MEEMP water quality dataset (Appendix 2E – Table 1). These comparisons indicate that all measurements downstream from the primary site discharges MP-05 and MP-06 in 2021 were within the detected concentration range at MP-05 from previous years. There was some variability in the concentrations of some of these metals between 2021 and 2020 at MP-06, but all concentrations were with the range previously measured at MP-05.

The maximum concentration of 83.7 µg/L total zinc measured at the MP-05 Source Station (Appendix 2D – Table 1) was 3.3 times higher than the previous maximum of 25.0 µg/L measured in 2016 at the MP-05 North Station (SEM 2017). This measurement was the only detected concentration measured at any of the water quality stations sampled in 2021, and less than 3% of the total concentration was present in the dissolved phase (2.2 µg/L). These data therefore suggest that more than 97% of the reported total concentration was present in particulate form, meaning it is not as bioavailable for uptake by aquatic biota, and therefore is not expected to adversely affect aquatic life. Moreover, the MP-05 effluent would not have been expected to be a source of zinc at the time of water quality sampling because zinc was not detected in the effluent sampled at approximately the same time as the 83.7 µg/L measurement at MP-05.

2.4.2.4 Hydrocarbons

Hydrocarbons and polycyclic aromatic hydrocarbons (PAHs) were below the analytical DLs in each of the samples collected during the 2021 MEEMP. Hydrocarbons have consistently been less than DLs since sampling was initiated in 2015 (SEM 2016; SEM 2017; Golder 2018; Golder 2019; Golder 2020).

[5] Note that the highest concentration of total iron recorded (286 µg/L) was measured during a September 2017 storm event when TSS was elevated.

Table 2-2: Marine Water Quality – Receiving Environment Summary Statistics for the MP-05 and MP-06 Milne Port Site Discharges over the Five Sampling Events in 2021.

Parameter	CCME Marine WQG for Protection of Aquatic Life[(a)]		MP-05			MP-06			MP-05			MP-06			MP-05			MP-06			MP-05			MP-06		
			Source 1			Source 2			WNW 1			WNW 2			North 1			North 2			ENE 1			ENE 2		
	Short Term	Long Term	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max
Physical																										
pH	—	7.0-8.7	8.0	8.0	8.0	8.0	8.0	8.1	8.0	8.0	8.0	8.0	7.9	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	7.9	8.0	8.0	7.9	8.0
Salinity (mg/L)[b]	—	—	10220	5200	24400	11660	1700	24400	14400	6200	23800	21120	7700	27600	13280	6200	24100	22900	7900	30800	14740	5400	25500	23100	13200	30200
TSS (mg/L)	<25 mg/L above background	<5 mg/L above background	2.1	< 2.0	2.7	2.6	< 2.0	4.7	2.5	< 2.0	4.7	2.1	< 2.0	2.7	2.5	< 2.0	4.6	2.3	< 2.0	3.5	2.4	< 2.0	4.0	3.2	< 2.0	7.9
Turbidity (NTU)	<8 NTU above background	<2 NTU above background	0.75	0.13	1.7	0.57	< 0.10	1.1	0.41	0.16	0.87	0.48	0.15	1.0	0.46	0.31	0.69	0.3	0.13	0.52	0.54	< 0.10	0.99	0.47	0.14	1.3
Nutrients (µg/L)																										
Nitrate (as N)	339,000	45,000	62	< 10	210	10	< 10	11	<10	< 10	12	< 10	< 10	< 10	< 10	< 10	< 10	13	< 10	26	24	< 10	43	< 10	< 10	< 10
Total Metals (µg/L)																										
Aluminum	—	—	20.2	7.6	37.4	19.7	7.6	34.8	14.9	6.4	29.3	14.8	5.0	33.4	16.2	7.0	23.6	10.8	5.0	25	15.1	5.6	24.7	14.8	5.0	38.3
Arsenic	—	12.5	0.61	< 0.40	1.31	0.75	< 0.40	1.41	0.77	< 0.40	1.28	1.07	0.43	1.55	0.74	< 0.40	1.38	1.13	0.43	1.62	0.83	< 0.40	1.45	1.16	0.69	1.67
Cadmium	—	0.12	0.015	< 0.010	0.031	0.018	< 0.010	0.037	0.017	< 0.010	0.026	0.030	0.014	0.045	0.019	< 0.010	0.035	0.031	0.013	0.044	0.020	< 0.010	0.031	0.030	0.020	0.041
Chromium	—	1.5 (Cr(VI))	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Copper	—	—	0.80	< 0.50	2.0	0.87	< 0.50	2.1	0.62	< 0.50	1.1	0.53	< 0.50	0.66	0.81	< 0.50	1.9	0.52	< 0.50	0.58	0.81	< 0.50	1.9	0.61	< 0.50	1.0
Iron	—	—	23.6	< 10	49	25.0	10	60	16.4	10.0	32.0	20.8	< 10	57	18.6	< 10	28	15.6	< 10	37	19.2	< 10	32	22.4	< 10	71
Mercury	—	0.016	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Silver	7.5	—	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
PAHs (µg/L)																										
Naphthalene	—	1.4	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050

Notes: (a) = Guidelines taken from CMME Marine WQG for the protection of Aquatic Life (http://ceqg-rcqe.ccme.ca/download/en/221); (b) Salinity reported as PSU by ALS and converted to mg/L for the purpose of this table. Bold Font = max exceeding a short term guideline or mean exceeding a long term guideline; CCME = Canadian Council of Ministers of the Environment; WQG = water quality guidelines; Min = minimum; Max = maximum; — = no guideline available; NR = not recorded; PSU = practical salinity unit; TSS = total suspended solid; mg/L = milligrams per liter; < = less than; N = Nitrogen; CFU = colony forming unit; Cr(VI) = hexavalent chromium; PAH = polycyclic aromatic hydrocarbon; µg/L = micrograms per liter; mL = milliliter.

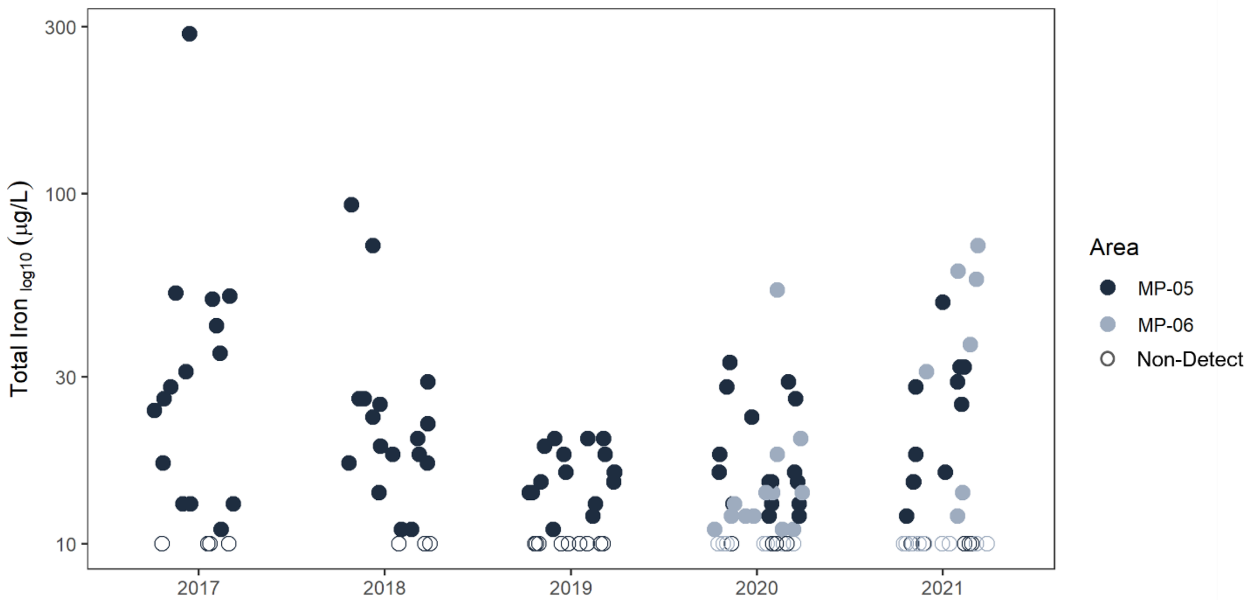

Figure 2-2: Receiving Environment Total Iron Concentrations in Milne Inlet for the MP-05 and MP-06 Milne Port Site Discharges, (2017-2021)

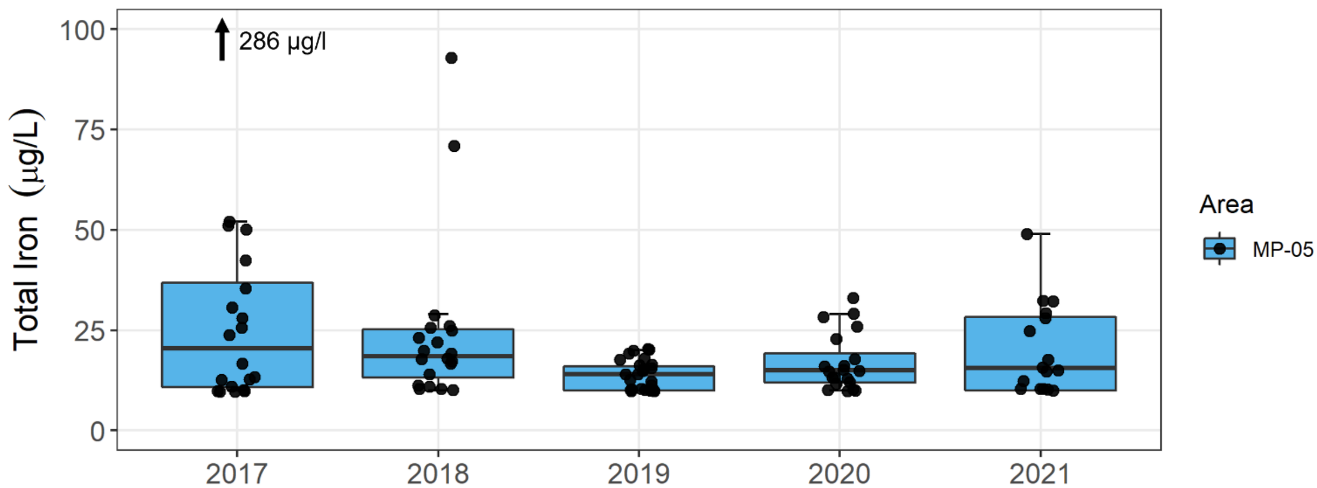

Figure 2-3: Receiving Environment Total Iron Concentrations in Milne Inlet for the MP-05 Milne Port Site Discharges, (2017-2021)

2.5 Discussion

The collection of marine water samples was added to the MEEMP in 2015 to monitor compliance of site discharges with permit requirements. Since 2015, samples have been collected close to the primary site discharge (MP-05) location and at three downstream locations 250 m offshore from MP-05. Sampling has typically involved five separate sampling events at each of the four stations between August and October, depending on the year and discharge schedule. In 2020, a second discharge location (MP-06) was added and marine water quality was monitored under a similar design as that for MP-05.

Concentrations of conventional water quality parameters, major ions, nutrients, metals were often not detected in the water samples and applicable CCME WQGs were not exceeded downstream from either discharge. Where guidelines are not available, comparisons are made the 2015 to 2020 MEEMP water quality dataset; 2021 concentrations were all within the range of what has been recorded previously. For both discharges, hydrocarbons and PAHs were not detected in downstream water samples, consistent with results from previous sampling years.

Monitoring results remain within original FEIS predictions (see Table 1-1), which forecasted no significant residual effects on water quality but indicated the potential for minor localized increases in TSS, nutrient, metal, and hydrocarbon concentrations. Water quality monitoring in 2021 shows that iron concentrations in marine water samples collected in 2021 remained within the range measured in previous years and have not increased despite increases in production over the same time period. These results show no evidence of compromised water quality because of iron ore deposition. Further, it should be noted that for iron to be biologically available to phytoplankton and other marine biota, it generally needs to be in a dissolved form so that it can effectively cross biological membranes. Because iron ore particulates stored at the Site are in mineral form, they would be expected to predominantly settle in marine sediments where they would be biologically inert. Environmental conditions in the receiving environment, such as pH, dissolved oxygen concentrations and redox potential, can influence the proportion of biologically available iron that can be released from particulates into surrounding waters. According to Millero (1998) and Lis et al. (2015), in circumneutral pH and well oxygenated environments, similar to those observed in Milne Inlet, iron tends to be poorly soluble. As a result, many open ocean waters and some freshwater systems are characterized by low dissolved iron concentrations (Johnson et al 1997; McKay et al 2004). Accordingly, iron deposition from the Project, at both present levels and in its current form, are not expected to adversely effect aquatic life.

2.6 Conclusions and Recommendations

Site discharge from the ore pad settling ponds into the marine environment does not appear to have resulted in adverse effects on marine water quality. Water quality measurements demonstrated compliance with Water License requirements and measured concentrations in downstream waters were low and/or undetectable, below applicable guidelines, and/or consistent with previous years' measurements. With respect to iron, which is of primary concern for the Project, no increasing trend has been detected in sampling conducted between 2015 and 2021. For water quality in general, monitoring results remain within original FEIS predictions, which forecasted no significant residual effects on water quality but indicated the potential for minor localized increases in TSS, nutrient, metal, and hydrocarbon concentrations.

These results confirm that mitigation measures are functioning as intended and that Project activities are being managed in a way that ensures site discharges are compliant with Water License requirements. Moving forward, continued monitoring of site discharge is recommended to maintain compliance with project permits and to ensure concentrations of potential contaminants of concern remain below thresholds that could harm marine biota.

2.7 Closure

We trust the information contained in this report is sufficient for your present needs. Should you have any additional questions regarding the Project, please do not hesitate to contact the undersigned.

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https://golderassociates.sharepoint.com/sites/11206g/deliverables (do not use)/issued to client_for wp/300-399/1663724-349b-r-rev0/1663724-349b-r-rev0-44000 2021 meemp_2.0 water quality_21oct_22.docx

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APPENDIX 2A

Marine Water Quality - Field Data Sheets

Water Quality Field Log	**Project #:** 1663724-44000	**Project title: Baffinlands MEEMP**

Date: 2 AUG 2021 Sampled By: NOB, JC, ACK

Discharge: Start @ MP-05 @ 13:30
start @ MP-06 @ 15:10

Weather: Partly sunny, 10°C Wind Spd/Dir: ______ Tide: 0.7 m

Station	Sample Name	Depth	# of Jars	Time	pH	DO (mg/L)	Cond. (µS/cm)	Temp (°C)	Turb (NTU)	Comments
MP05	MP05 Source	1m	10	15:50	7.6	11.2	16,500	7.1	2.4	Salinity: 9.61 PSU
MP05	MP05 ENE	1m	~~10~~ 6	16:37	7.8	11.6	29,250	5.9	2.2	Salinity: 17.5 PSU
	MP05 ~~North~~ WNW	1m	10	16:46	7.9	11.4	25,446	6.3	6.74	Salinity 14.90 PSU
	MP05 ~~WNW~~	1m	~~10~~ 6	17:01	7.9	10.9	22,747	6.91	0.54	" 12.86 "
	MP06 Source	1m	10	17:17	8.0	11.73	23,1[illegible]	5.51	0.33	" 13.86 "
	MP06 ENE	1m	10	17:40		11.88	24,952	6.07		18.68
	MP06 North	1m	~~10~~ 6	17:22	8.04	11.58	[illegible]26866	6.32	0.55	Salinity 16.61 PSU
	MP06 WNW	1m	~~10~~ 6	17:30	8.02	11.79	28050	5.4	0.45	18.20
	DUPA	1m	10							MP-05 Source
	~~MP-05-WNW-FBLANK~~	~~1m~~	~~10~~							

MP-05-WNW-FBLANK | 1m | 10

Date: ______ Sampled By: ______

Weather: ______ Wind Spd/Dir: ______ Tide: ______

Station	Sample Name	Depth	# of Jars	Time	pH	DO	Cond.	Temp	Turb	Comments

* switch labels on WNW & North.

Water Quality Field Log	Project #: 1663724-44000-03	Project title: Baffinlands MEEMP

Date: 08 Aug 2021 Sampled By: TT, JC, AR

Weather: Overcast, 5-7°C Wind Spd/Dir: 9 (20kts) SW Tide: 15:00 (1.3m), 16:00 (1.1m)

Station	Sample Name	Total Depth	Sample depth # of Jars	Time	pH	DO mg/L	Cond µS/cm	Temp	Turb	Comments
MP-06	MP06-Source-2	1.6m	1m	15:10	8.1	11.98	40,803	3.7	1.1	Surface sample / DUP B
	MP06-WNW-2	26.4m	13m	15:35	8.3	13.2	45,939	2.2	0.7	13m sample colln / Salinity 29.26 PSU
	MP06-North-2	41.4m	20m	15:55	8.3	13.9	52,055	0.38	0.9	Salinity 31.15 PSU
	MP06-ENE-2	35.2	17m	16:10	8.3	13.9	51,438	0.71	0.7	Sal - 31.40 PSU
										~~Took profile recording of WNW-2~~ *Upload took too long

Date: 08 Aug 2021 Sampled By: TT, JC, AR

Weather: Overcast, 5-7°C Wind Spd/Dir: 9 (20kts) SW Tide: 17:00 (0.8m)

Station	Sample Name	Depth	# of Jars	Time	pH	DO mg/L	Cond. µS/cm	Temp	Turb	Comments
MP-05	MP05-ENE-1	1m		17:10	8.3	11.99	41,881	4.3	0.74	Salinity - 25.77 PSU
	MP05-Source-1	1m		17:16	8.3	11.56	40,939	4.5	2.3	Sal - 25.16 PSU
	MP05-North-1	1m		17:23	8.3	11.21	41,711	4.3	0.9	Sal - 25.69 PSU
	MP05-WNW-1	1m		17:32	8.3	11.77	40,874	4.3	0.8	

Water Quality Field Log **Project #:** 1663724-44000 **Project title: Baffinlands MEEMP**

Date: 14-Aug-2021 Sampled By: DV, BC

Weather: Overcast, rain, 3°C Wind Spd/Dir: Mod out of N Tide: ______

Station	Sample Name	Depth	# of Jars	Time	pH	DO	Cond.	Temp	Turb	Comments
MP-06-WNW	MP-06-WNW	8	8 6	10:55		12.03	33,764	5.95	6.03	
MP06-North	MP-06-North	8	8 6	11:10		12.14	32,536	5.94	3.66	
MP-06-Source	MP-06-Source	10	10	11:25		12.05	33,998	6.04	5.60	
MP-06-ENE	MP-06-ENE	10	10	11:40		12.02	33,688	6.08	6.09	
MP-05-Source	MP-05-Source	1	10	09:55		12.63	21,214	6.39	7.08	Waves crashing on shore.
MP-05-WNW	MP-05-WNW	13	10	09:40		12.45	46,048	4.40	~~0.02~~	0.06
MP-05-North	MP-05-North	20	8 6	0841		12.48	46,237	4.25	0.03	pH Sensor not working
MP-05-ENE	MP-05-ENE	17	8 6	0930		12.64	46,061	4.33	0.02	

Date: ______ Sampled By: ______

Weather: ______ Wind Spd/Dir: ______ Tide: ______

Station	Sample Name	Depth	# of Jars	Time	pH	DO	Cond.	Temp	Turb	Comments

Tugaat River

Water Quality Field Log **Project #:** 1663724-44000 **Project title: Baffinlands MEEMP**

Date: 15 Aug 2021 Sampled By: TT, NOB

Weather: Low lying fog, 3°C, 3-4kts NW Wind Spd/Dir: ____ Tide: 17:09 (1.63m)

Station	Sample Name	Depth	# of Jars	Time	pH	DO mg/L	Specific Cond. µS/cm	Temp	Turb	Comments
Tugaat River	TR-Ref2-21	15.3	6	17:00						
		1m		16:53	8.1	12.7	35,389	4.7	0.15	Sal - 21.9 PSU
		7m		16:55	8.1	12.6	37,840	4.5	<0.00	Sal - 23.1 PSU
		13m		16:57	8.1	12.6	40,925	3.9	<0.00	Sal - 25.0 PSU

Date: 15 Aug 2021 Sampled By: TT, NOB

Weather: Low lying fog 3°C Wind Spd/Dir: 3-4kts NW Tide: 17:09 (1.63m)

Total - 14.7m

Station	Sample Name	Depth	# of Jars	Time	pH	DO mg/L	Specific Cond. µS/cm	Temp	Turb	Comments
Tugaat Ref	TR-Ref3-21	1m	—	17:26	8.4	12.5	37157	4.7	0.2	Sal
		7m	—	17:28	8.3	12.6	37640	4.6	<0.0	Sal - 23.02 PSU
		13m	—	17:30	8.3	12.5	38990	4.4	[illegible]	Sal 23.9 PSU

Tugaat River

Water Quality Field Log | **Project #:** 1663724-44000 | **Project title: Baffinlands MEEMP**

Date: 15 Aug 2021 Sampled By: TT/NOB

Weather: Low lying fog, 3°C, ~~3-5kts~~ Wind Spd/Dir: 3-5kts, NW Tide: Rising (0.58m)

Station	Sample Name	Depth	# of Jars	Time	pH	DO mg/L	Specific Cond uS/cm	Temp	Turb	Comments
Tugaat River	TR-Ref4-2021	15.2	in-situ	13:45						HS - 2 captured
		1.01m	~~"~~	13:50	8.1	12.6	36,674	4.7	0.3	Salinity 22.2 PSU
		8.0m	"	13:55	8.1	12.6	37,019	4.6	0.03	Salinity 26.6 PSU
		13.0m	"	13:57	8.1	12.5	40,677	3.9	40.0	Sal - 24.97 PSU

Date: 15 Aug 2021 Sampled By: TT, NOB

Weather: Low lying fog, 3°C Wind Spd/Dir: 3-5 Kts NW Tide: Rising (0.77m)

Total 14.4m

Station	Sample Name	Depth	# of Jars	Time	pH	DO mg/L	Specific Cond µS/cm	Temp	Turb	Comments
Tugaat	TR-Ref1-2021	7	6	14:30	8.0	12.6	36,862	4.7	0.5	Sal - 22.6 PSU
	DUP-D	7	6	"	"	"	"	"	"	"
	TR-Ref1-2021	1	—	14:27	8.03	12.6	36,747	4.7	1.1	Sal - 22.4 PSU
	TR-Ref1-2021	13.0	—	14:30	"	12.6	40,811	3.9	40.0	Sal 24.6 PSU

Water Quality Field Log **Project #:** 1663724-44000 **Project title: Baffinlands MEEMP**

P - preserved in field/on water

Date: 16 AUG 2021 Sampled By: AR, NOB, RK

Weather: Cloudy, 3°C Wind Spd/Dir: ______ Tide: ______

Station	Sample Name	Depth	# of Jars	Time	~~pH~~ DO %	DO (mg/L)	Cond. (μS/cm)	Temp °C	Turb NTU	Salinity (PSU)	Comments
	MP06 - SOURCE	1m	10	10:25	114	13.25	12061	6.8	2.94	7.90	(P) 26 m N of station → station on shore
	MP06 - WNW	13m	6	10:45	116	13.10	41200	3.5	0.7	28.2	
	MP06 - North	20m	6	10:55	121	14.50	46810	1.1	0.6	28.4	
	MP06 - ENE	17m	10	11:05	124	14.06	45030	1.9	0.7	27.4	49 m E of Station ↳ under Vitus Bering
	MP05										

Date: same as above Sampled By: same as above

Weather: ______ Wind Spd/Dir: ______ Tide: ______

Station	Sample Name	Depth	# of Jars	Time	~~pH~~ DO %	DO (mg/L)	Cond (μS/cm)	Temp °C	Turb NTU	Salinity (PSU)	Comments
	MP05 - North	1m	10	1325	113.62	13.07	12,590	7.06	1.94		
	MP05 - WNW	1m	6	1335	113.25	13.13	6,172	7.34	1.96		
	MP05 - Source	1m	10	13:40	113.23	13.10	6,273	7.36	3.97		
	MP05 - ENE	1m	6	13:50	113.25	13.06	8,563	7.13	2.84		
	DUP-C	1m	6	13:55	"	"	"	"			

09:17 Start.
11:08 End

Water Quality Field Log **Project #:** 1663724-4000 **Project title: Baffinlands MEEMP**

Date: 19 Aug 2021 Sampled By: JC, KW, RK

Weather: Overcast Wind Spd/Dir: NE 15653 Tide: Flood (1.1m)

Station	Sample Name	Depth	# of Jars	Time	pH	DO	Cond.	Temp	Turb	Comments
MP-05	Source	1m	10	917	—	15.0	~~9,970~~ (15653)	7.42	0.21	Salinity 9.12
MP-05	ENE	1m	6	937	—	13.16	15,529	6.37	0.0	Salinity 9.98
MP-05	North	1m	10	954	—	13.23	13,372	4.15	0.0	Salinity 7.33
MP-05	WNW	1m	6	1015	—	13.24	12,024	6.44	0.0	Salinity 6.59

Date: 19 Aug 2021 Sampled By: JC, KW, RK

Weather: Overcast Wind Spd/Dir: NE Tide: Flood (1.2m)

Station	Sample Name	Depth	# of Jars	Time	pH	DO	Cond.	Temp	Turb	Comments
MP-06	Source	1m	10	10:31	—	13.29	13,957	6.46	0.0	Salinity 8.10
MP-06	ENE	17 m	10	10:46	—	14.93	49,798	0.65	0.0	Salinity 30.49
MP-06	North	20 m	6	10:58	—	15.21	51,005	0.22	0.0	Salinity 30.92
MP-06	WNW	13 m	6	11:08	—	14.00	47,005	1.91	0.0	Salinity 28.63

* No discharge immediatly prior to sampling for either stations.
* Filter MP-05 North Dissolved Mercury in office

APPENDIX 2B

Marine Water Quality - 2021 Analytical Reports

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **YL2101029**	Page	: 1 of 14
Client	: **Golder Associates Ltd.**	Laboratory	: Yellowknife - Environmental
Contact	: Elaine Irving	Account Manager	: Amber Springer
Address	: 200-2920 Virtual Way Vancouver BC Canada V5M 0C4	Address	: 314 Old Airport Road, Unit 116 Yellowknife NT Canada X1A 3T3
Telephone	: ----	Telephone	: +1 867 873 5593
Project	: 1663724-44000-03	Date Samples Received	: 16-Aug-2021 08:45
PO	: ----	Date Analysis Commenced	: 18-Aug-2021
C-O-C number	: 20-920781	Issue Date	: 26-Aug-2021 15:01
Sampler	: ----		
Site	: ----		
Quote number	: Q84262		
No. of samples received	: 9		
No. of samples analysed	: 9		

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

Signatories	*Position*	*Laboratory Department*
Angela Ren	Team Leader - Metals	Metals, Burnaby, British Columbia
Dee Lee	Analyst	Metals, Burnaby, British Columbia
Janice Leung	Supervisor - Organics Instrumentation	Organics, Burnaby, British Columbia
Kevin Duarte	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia
Saron Kim	Analyst	Metals, Burnaby, British Columbia
Sristika Chand	Lab Analyst	Metals, Burnaby, British Columbia
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*
-	No Unit
µg/L	micrograms per litre
µS/cm	Microsiemens per centimetre
mg/L	milligrams per litre
NTU	nephelometric turbidity units
pH units	pH units
psu	practical salinity 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: **Seawater**

(Matrix: **Water**)

				Client sample ID	MP-06-North FBlank-2	MP-06-North	MP-06-WNW	MP-06-Source	MP-06-ENE
				Client sampling date / time	14-Aug-2021 11:15	14-Aug-2021 11:10	14-Aug-2021 10:55	14-Aug-2021 11:25	14-Aug-2021 11:40
Analyte	CAS Number	Method	LOR	Unit	YL2101029-001	YL2101029-002	YL2101029-003	YL2101029-004	YL2101029-005
					Result	Result	Result	Result	Result
Physical Tests									
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	<1.0	94.0	92.9	92.6	91.2
conductivity	----	E100S	2.0	µS/cm	<2.0	27000	28000	28200	28000
hardness (as CaCO3), dissolved	----	EC100	0.50	mg/L	<1.00	2870	3210	3040	3050
pH	----	E108	0.10	pH units	6.37	7.96	7.96	7.96	7.96
salinity	----	EC100S	1.0	psu	<1.0	16.5	17.2	17.3	17.2
solids, total dissolved [TDS]	----	E162S	10	mg/L	<10	16100	17000	16900	17200
solids, total suspended [TSS]	----	E160S	2.0	mg/L	<2.0	<2.0	2.7	4.7	7.9
turbidity	----	E121	0.10	NTU	<0.10	0.52	1.02	0.86	1.26
Anions and Nutrients									
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
bromide	24959-67-9	E235S.Br	5.0	mg/L	<5.0	32.8	34.2	35.1	33.6
chloride	16887-00-6	E235S.Cl	50	mg/L	<50	9960	10400	10600	10200
fluoride	16984-48-8	E235S.F-L	0.20	mg/L	<0.20	0.50	0.53	0.54	0.53
Kjeldahl nitrogen, total [TKN]	----	E318S	0.050	mg/L	<0.050	0.085	<0.050	<0.050	<0.050
nitrate (as N)	14797-55-8	E235S.NO3-T	0.010	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010
nitrite (as N)	14797-65-0	E235S.NO2-L	0.010	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010
phosphorus, total	7723-14-0	E372S	0.0020	mg/L	<0.0040	0.0183	0.0164	0.0146	0.0156
sulfate (as SO4)	14808-79-8	E235S.SO4-L	3.0	mg/L	<3.0	1330	1400	1400	1380
Organic / Inorganic Carbon									
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	<0.50	1.11	1.21	1.05	1.09
carbon, total organic [TOC]	----	E355-L	0.50	mg/L	<0.50	0.99	1.02	1.00	1.05
Total Metals									
aluminum, total	7429-90-5	E468S	0.0050	mg/L	<0.0050	0.0250	0.0334	0.0348	0.0383
antimony, total	7440-36-0	E468S	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
arsenic, total	7440-38-2	E468S	0.00040	mg/L	<0.00040	0.00083	0.00082	0.00087	0.00082
barium, total	7440-39-3	E468S	0.0010	mg/L	<0.0010	0.0062	0.0063	0.0064	0.0062
beryllium, total	7440-41-7	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
bismuth, total	7440-69-9	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
boron, total	7440-42-8	E468S	0.30	mg/L	<0.30	1.98	2.04	2.05	2.06
cadmium, total	7440-43-9	E468S	0.000010	mg/L	<0.000010	0.000015	0.000026	0.000018	0.000022

Analytical Results

Sub-Matrix: **Seawater**

(Matrix: **Water**)

Client sample ID					MP-06-North FBlank-2	MP-06-North	MP-06-WNW	MP-06-Source	MP-06-ENE
Client sampling date / time					14-Aug-2021 11:15	14-Aug-2021 11:10	14-Aug-2021 10:55	14-Aug-2021 11:25	14-Aug-2021 11:40
Analyte	CAS Number	Method	LOR	Unit	YL2101029-001	YL2101029-002	YL2101029-003	YL2101029-004	YL2101029-005
					Result	Result	Result	Result	Result
Total Metals									
calcium, total	7440-70-2	E468S	1.0	mg/L	<1.0	207	212	213	213
cesium, total	7440-46-2	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
chromium, total	7440-47-3	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
cobalt, total	7440-48-4	E468S	0.000050	mg/L	<0.000050	<0.000050	0.000050	<0.000050	0.000059
copper, total	7440-50-8	E468S	0.00050	mg/L	<0.00050	0.00058	0.00066	0.00070	0.00054
gallium, total	7440-55-3	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
iron, total	7439-89-6	E468S	0.010	mg/L	<0.010	0.037	0.057	0.060	0.071
lead, total	7439-92-1	E468S	0.000050	mg/L	<0.000050	0.000050	0.000078	0.000075	0.000106
lithium, total	7439-93-2	E468S	0.020	mg/L	<0.020	0.084	0.088	0.089	0.086
magnesium, total	7439-95-4	E468S	1.0	mg/L	<1.0	607	628	627	620
manganese, total	7439-96-5	E468S	0.00020	mg/L	<0.00020	0.00148	0.00188	0.00199	0.00264
mercury, total	7439-97-6	E508S	0.0000050	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, total	7439-98-7	E468S	0.00010	mg/L	<0.00010	0.00536	0.00564	0.00540	0.00559
nickel, total	7440-02-0	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
phosphorus, total	7723-14-0	E468S	0.050	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050
potassium, total	7440-09-7	E468S	1.0	mg/L	<1.0	208	219	210	214
rhenium, total	7440-15-5	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
rubidium, total	7440-17-7	E468S	0.0050	mg/L	<0.0050	0.0569	0.0595	0.0575	0.0576
selenium, total	7782-49-2	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
silicon, total	7440-21-3	E468S.NaSi	1.0	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0
silver, total	7440-22-4	E468S	0.00010	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
sodium, total	17341-25-2	E468S.NaSi	2.5	mg/L	<2.5	5120	5230	5500	5210
strontium, total	7440-24-6	E468S	0.010	mg/L	<0.010	3.81	3.88	3.93	4.03
sulfur, total	7704-34-9	E468S	5.0	mg/L	<5.0	496	523	549	517
tellurium, total	13494-80-9	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
thallium, total	7440-28-0	E468S	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
thorium, total	7440-29-1	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
tin, total	7440-31-5	E468S	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
titanium, total	7440-32-6	E468S	0.0050	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
tungsten, total	7440-33-7	E468S	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
uranium, total	7440-61-1	E468S	0.000050	mg/L	<0.000050	0.00212	0.00204	0.00206	0.00246

Analytical Results

Sub-Matrix: **Seawater**

(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	MP-06-North FBlank-2	MP-06-North	MP-06-WNW	MP-06-Source	MP-06-ENE
Client sampling date / time					14-Aug-2021 11:15	14-Aug-2021 11:10	14-Aug-2021 10:55	14-Aug-2021 11:25	14-Aug-2021 11:40
					YL2101029-001	YL2101029-002	YL2101029-003	YL2101029-004	YL2101029-005
					Result	Result	Result	Result	Result
Total Metals									
vanadium, total	7440-62-2	E468S	0.00050	mg/L	<0.00050	0.00084	0.00087	0.00088	0.00093
yttrium, total	7440-65-5	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
zinc, total	7440-66-6	E468S	0.0030	mg/L	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
zirconium, total	7440-67-7	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Dissolved Metals									
aluminum, dissolved	7429-90-5	E469S	0.0050	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
antimony, dissolved	7440-36-0	E469S	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
arsenic, dissolved	7440-38-2	E469S	0.00040	mg/L	<0.00040	0.00081	0.00091	0.00087	0.00084
barium, dissolved	7440-39-3	E469S	0.0010	mg/L	<0.0010	0.0062	0.0066	0.0064	0.0065
beryllium, dissolved	7440-41-7	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
bismuth, dissolved	7440-69-9	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
boron, dissolved	7440-42-8	E469S	0.30	mg/L	<0.30	2.10	2.20	2.12	2.13
cadmium, dissolved	7440-43-9	E469S	0.000010	mg/L	<0.000010	0.000018	0.000022	0.000024	0.000024
calcium, dissolved	7440-70-2	E469S	1.0	mg/L	<1.0	206	217	207	214
cesium, dissolved	7440-46-2	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
chromium, dissolved	7440-47-3	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
cobalt, dissolved	7440-48-4	E469S	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
copper, dissolved	7440-50-8	E469S	0.00020	mg/L	<0.00020	0.00052	0.00039	0.00035	0.00039
gallium, dissolved	7440-55-3	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
iron, dissolved	7439-89-6	E469S	0.010	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010
lead, dissolved	7439-92-1	E469S	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
lithium, dissolved	7439-93-2	E469S	0.020	mg/L	<0.020	0.088	0.090	0.089	0.088
magnesium, dissolved	7439-95-4	E469S	1.0	mg/L	<1.0	572	647	614	610
manganese, dissolved	7439-96-5	E469S	0.00010	mg/L	<0.00010	0.00075	0.00077	0.00077	0.00084
mercury, dissolved	7439-97-6	E509S	0.0000050	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, dissolved	7439-98-7	E469S	0.00010	mg/L	<0.00010	0.00537	0.00573	0.00550	0.00548
nickel, dissolved	7440-02-0	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
phosphorus, dissolved	7723-14-0	E469S	0.050	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050
potassium, dissolved	7440-09-7	E469S	1.0	mg/L	<1.0	192	214	210	211
rhenium, dissolved	7440-15-5	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
rubidium, dissolved	7440-17-7	E469S	0.0050	mg/L	<0.0050	0.0574	0.0619	0.0617	0.0605

Analytical Results

Sub-Matrix: **Seawater**

(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	MP-06-North FBlank-2	MP-06-North	MP-06-WNW	MP-06-Source	MP-06-ENE
				Client sampling date / time	14-Aug-2021 11:15	14-Aug-2021 11:10	14-Aug-2021 10:55	14-Aug-2021 11:25	14-Aug-2021 11:40
					YL2101029-001	YL2101029-002	YL2101029-003	YL2101029-004	YL2101029-005
					Result	Result	Result	Result	Result
Dissolved Metals									
selenium, dissolved	7782-49-2	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
silicon, dissolved	7440-21-3	E469S.NaSi	1.0	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0
silver, dissolved	7440-22-4	E469S	0.00010	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
sodium, dissolved	17341-25-2	E469S.NaSi	2.5	mg/L	<2.5	4830	5230	5150	5210
strontium, dissolved	7440-24-6	E469S	0.010	mg/L	<0.010	3.55	3.83	3.72	3.75
sulfur, dissolved	7704-34-9	E469S	5.0	mg/L	<5.0	460	521	526	500
tellurium, dissolved	13494-80-9	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
thallium, dissolved	7440-28-0	E469S	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
thorium, dissolved	7440-29-1	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
tin, dissolved	7440-31-5	E469S	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
titanium, dissolved	7440-32-6	E469S	0.0050	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
tungsten, dissolved	7440-33-7	E469S	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
uranium, dissolved	7440-61-1	E469S	0.000050	mg/L	<0.000050	0.00214	0.00188	0.00188	0.00231
vanadium, dissolved	7440-62-2	E469S	0.00050	mg/L	<0.00050	0.00071	0.00079	0.00073	0.00070
yttrium, dissolved	7440-65-5	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
zinc, dissolved	7440-66-6	E469S	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
zirconium, dissolved	7440-67-7	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
dissolved mercury filtration location	----	EP509	-	-	Field	Field	Field	Field	Field
dissolved metals filtration location	----	EP421	-	-	Field	Field	Field	Field	Field
Volatile Organic Compounds [Fuels]									
benzene	71-43-2	E611A	0.50	µg/L	----	----	----	<0.50	<0.50
ethylbenzene	100-41-4	E611A	0.50	µg/L	----	----	----	<0.50	<0.50
methyl-tert-butyl ether [MTBE]	1634-04-4	E611A	0.50	µg/L	----	----	----	<0.50	<0.50
styrene	100-42-5	E611A	0.50	µg/L	----	----	----	<0.50	<0.50
toluene	108-88-3	E611A	0.50	µg/L	----	----	----	<0.50	<0.50
xylene, m+p-	179601-23-1	E611A	0.40	µg/L	----	----	----	<0.40	<0.40
xylene, o-	95-47-6	E611A	0.30	µg/L	----	----	----	<0.30	<0.30
xylenes, total	1330-20-7	E611A	0.50	µg/L	----	----	----	<0.50	<0.50
Volatile Organic Compounds Surrogates									
bromofluorobenzene, 4-	460-00-4	E611A	1.0	%	----	----	----	90.0	94.9
difluorobenzene, 1,4-	540-36-3	E611A	1.0	%	----	----	----	118	120

Analytical Results

Sub-Matrix: **Seawater**

(Matrix: **Water**)

				Client sample ID	MP-06-North FBlank-2	MP-06-North	MP-06-WNW	MP-06-Source	MP-06-ENE
				Client sampling date / time	14-Aug-2021 11:15	14-Aug-2021 11:10	14-Aug-2021 10:55	14-Aug-2021 11:25	14-Aug-2021 11:40
Analyte	CAS Number	Method	LOR	Unit	YL2101029-001	YL2101029-002	YL2101029-003	YL2101029-004	YL2101029-005
					Result	Result	Result	Result	Result
Hydrocarbons									
F2 (C10-C16)	----	E601	100	µg/L	----	----	----	<100	<100
F3 (C16-C34)	----	E601	250	µg/L	----	----	----	<250	<250
F4 (C34-C50)	----	E601	250	µg/L	----	----	----	<250	<250
VHw (C6-C10)	----	E581.VH+F1	100	µg/L	----	----	----	<100	<100
F1-BTEX	----	EC580	100	µg/L	----	----	----	<100	<100
VPHw	----	EC580A	100	µg/L	----	----	----	<100	<100
F1 (C6-C10)	----	E581.VH+F1	100	µg/L	----	----	----	<100	<100
Hydrocarbons Surrogates									
bromobenzotrifluoride, 2- (F2-F4 surr)	392-83-6	E601	1.0	%	----	----	----	76.0	76.3
dichlorotoluene, 3,4-	97-75-0	E581.VH+F1	1.0	%	----	----	----	88.9	114
Polycyclic Aromatic Hydrocarbons									
acenaphthene	83-32-9	E641A	0.010	µg/L	----	----	----	<0.010	<0.010
acenaphthylene	208-96-8	E641A	0.010	µg/L	----	----	----	<0.010	<0.010
acridine	260-94-6	E641A	0.010	µg/L	----	----	----	<0.010	<0.010
anthracene	120-12-7	E641A	0.010	µg/L	----	----	----	<0.010	<0.010
benz(a)anthracene	56-55-3	E641A	0.010	µg/L	----	----	----	<0.010	<0.010
benzo(a)pyrene	50-32-8	E641A	0.0050	µg/L	----	----	----	<0.0050	<0.0050
benzo(b+j)fluoranthene	----	E641A	0.010	µg/L	----	----	----	<0.010	<0.010
benzo(b+j+k)fluoranthene	----	E641A	0.015	µg/L	----	----	----	<0.015	<0.015
benzo(g,h,i)perylene	191-24-2	E641A	0.010	µg/L	----	----	----	<0.010	<0.010
benzo(k)fluoranthene	207-08-9	E641A	0.010	µg/L	----	----	----	<0.010	<0.010
chrysene	218-01-9	E641A	0.010	µg/L	----	----	----	<0.010	<0.010
dibenz(a,h)anthracene	53-70-3	E641A	0.0050	µg/L	----	----	----	<0.0050	<0.0050
fluoranthene	206-44-0	E641A	0.010	µg/L	----	----	----	<0.010	<0.010
fluorene	86-73-7	E641A	0.010	µg/L	----	----	----	<0.010	<0.010
indeno(1,2,3-c,d)pyrene	193-39-5	E641A	0.010	µg/L	----	----	----	<0.010	<0.010
methylnaphthalene, 1-	90-12-0	E641A	0.010	µg/L	----	----	----	<0.010	<0.010
methylnaphthalene, 1+2-	----	E641A	0.015	µg/L	----	----	----	<0.015	<0.015
methylnaphthalene, 2-	91-57-6	E641A	0.010	µg/L	----	----	----	<0.010	<0.010
naphthalene	91-20-3	E641A	0.050	µg/L	----	----	----	<0.050	<0.050
phenanthrene	85-01-8	E641A	0.020	µg/L	----	----	----	<0.020	<0.020

Analytical Results

Sub-Matrix: **Seawater**

(Matrix: **Water**)

				Client sample ID	MP-06-North FBlank-2	MP-06-North	MP-06-WNW	MP-06-Source	MP-06-ENE
				Client sampling date / time	14-Aug-2021 11:15	14-Aug-2021 11:10	14-Aug-2021 10:55	14-Aug-2021 11:25	14-Aug-2021 11:40
Analyte	CAS Number	Method	LOR	Unit	YL2101029-001	YL2101029-002	YL2101029-003	YL2101029-004	YL2101029-005
					Result	Result	Result	Result	Result
Polycyclic Aromatic Hydrocarbons									
pyrene	129-00-0	E641A	0.010	µg/L	----	----	----	<0.010	<0.010
quinoline	6027-02-7	E641A	0.050	µg/L	----	----	----	<0.050	<0.050
B(a)P total potency equivalents [B(a)P TPE]	----	E641A	0.010	µg/L	----	----	----	<0.010	<0.010
PAHs, high molecular weight (BC AWQ)	----	E641A	0.030	µg/L	----	----	----	<0.030	<0.030
PAHs, low molecular weight (BC AWQ)	----	E641A	0.060	µg/L	----	----	----	<0.060	<0.060
PAHs, total (EPA 16)	----	E641A	0.065	µg/L	----	----	----	<0.065	<0.065
Polycyclic Aromatic Hydrocarbons Surrogates									
chrysene-d12	1719-03-5	E641A	0.1	%	----	----	----	76.6	69.1
naphthalene-d8	1146-65-2	E641A	0.1	%	----	----	----	87.2	79.5
phenanthrene-d10	1517-22-2	E641A	0.1	%	----	----	----	101	92.4

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

Analytical Results

Sub-Matrix: **Seawater**

(Matrix: **Water**)

				Client sample ID	MP-05-Source	MP-05-WNW	MP-05-North	MP-05-ENE	----
				Client sampling date / time	14-Aug-2021 09:55	14-Aug-2021 09:40	14-Aug-2021 08:41	14-Aug-2021 09:30	----
Analyte	CAS Number	Method	LOR	Unit	YL2101029-006	YL2101029-007	YL2101029-008	YL2101029-009	--------
					Result	Result	Result	Result	----
Physical Tests									
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	88.1	95.9	93.1	102	----
conductivity	----	E100S	2.0	µS/cm	12100	37100	31500	40100	----
hardness (as CaCO3), dissolved	----	EC100	0.50	mg/L	1140	4220	3240	4640	----
pH	----	E108	0.10	pH units	8.02	7.95	7.96	7.96	----
salinity	----	EC100S	1.0	psu	6.9	23.4	19.5	25.5	----
solids, total dissolved [TDS]	----	E162S	10	mg/L	7000	23000	21400	26000	----
solids, total suspended [TSS]	----	E160S	2.0	mg/L	2.7	4.7	<2.0	<2.0	----
turbidity	----	E121	0.10	NTU	1.68	0.16	0.44	0.10	----
Anions and Nutrients									
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	----
bromide	24959-67-9	E235S.Br	5.0	mg/L	13.2	48.4	<5.0	39.9	----
chloride	16887-00-6	E235S.Cl	50	mg/L	4090	14300	<50	12000	----
fluoride	16984-48-8	E235S.F-L	0.20	mg/L	0.25	0.70	0.62	0.76	----
Kjeldahl nitrogen, total [TKN]	----	E318S	0.050	mg/L	<0.050	<0.050	<0.050	<0.050	----
nitrate (as N)	14797-55-8	E235S.NO3-T	0.010	mg/L	<0.010	<0.010	<0.010	<0.010	----
nitrite (as N)	14797-65-0	E235S.NO2-L	0.010	mg/L	<0.010	<0.010	<0.010	<0.010	----
phosphorus, total	7723-14-0	E372S	0.0020	mg/L	0.0095	0.0163	0.0133	0.0178	----
sulfate (as SO4)	14808-79-8	E235S.SO4-L	3.0	mg/L	570	1900	1600	2080	----
Organic / Inorganic Carbon									
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	1.04	0.99	0.97	1.03	----
carbon, total organic [TOC]	----	E355-L	0.50	mg/L	0.98	0.97	0.94	0.96	----
Total Metals									
aluminum, total	7429-90-5	E468S	0.0050	mg/L	0.0374	0.0107	0.0171	0.0088	----
antimony, total	7440-36-0	E468S	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	----
arsenic, total	7440-38-2	E468S	0.00040	mg/L	0.00042	0.00111	0.00092	0.00111	----
barium, total	7440-39-3	E468S	0.0010	mg/L	0.0046	0.0071	0.0064	0.0070	----
beryllium, total	7440-41-7	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
bismuth, total	7440-69-9	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
boron, total	7440-42-8	E468S	0.30	mg/L	0.97	2.75	2.29	2.80	----
cadmium, total	7440-43-9	E468S	0.000010	mg/L	<0.000010	0.000025	0.000024	0.000031	----
calcium, total	7440-70-2	E468S	1.0	mg/L	102	281	233	303	----

Analytical Results

Sub-Matrix: **Seawater**

(Matrix: **Water**)

				Client sample ID	MP-05-Source	MP-05-WNW	MP-05-North	MP-05-ENE	----
				Client sampling date / time	14-Aug-2021 09:55	14-Aug-2021 09:40	14-Aug-2021 08:41	14-Aug-2021 09:30	----
Analyte	CAS Number	Method	LOR	Unit	YL2101029-006	YL2101029-007	YL2101029-008	YL2101029-009	--------
					Result	Result	Result	Result	----
Total Metals									
cesium, total	7440-46-2	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
chromium, total	7440-47-3	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
cobalt, total	7440-48-4	E468S	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	----
copper, total	7440-50-8	E468S	0.00050	mg/L	<0.00050	0.00112	<0.00050	0.00068	----
gallium, total	7440-55-3	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
iron, total	7439-89-6	E468S	0.010	mg/L	0.049	0.012	0.025	<0.010	----
lead, total	7439-92-1	E468S	0.000050	mg/L	0.000066	<0.000050	<0.000050	<0.000050	----
lithium, total	7439-93-2	E468S	0.020	mg/L	0.038	0.121	0.099	0.122	----
magnesium, total	7439-95-4	E468S	1.0	mg/L	268	860	713	907	----
manganese, total	7439-96-5	E468S	0.00020	mg/L	0.00179	0.00107	0.00132	0.00093	----
mercury, total	7439-97-6	E508S	0.0000050	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	----
molybdenum, total	7439-98-7	E468S	0.00010	mg/L	0.00239	0.00750	0.00647	0.00828	----
nickel, total	7440-02-0	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
phosphorus, total	7723-14-0	E468S	0.050	mg/L	<0.050	<0.050	<0.050	<0.050	----
potassium, total	7440-09-7	E468S	1.0	mg/L	85.7	296	243	321	----
rhenium, total	7440-15-5	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
rubidium, total	7440-17-7	E468S	0.0050	mg/L	0.0236	0.0808	0.0661	0.0863	----
selenium, total	7782-49-2	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
silicon, total	7440-21-3	E468S.NaSi	1.0	mg/L	<1.0	<1.0	<1.0	<1.0	----
silver, total	7440-22-4	E468S	0.00010	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	----
sodium, total	17341-25-2	E468S.NaSi	2.5	mg/L	2210	7140	5940	7890	----
strontium, total	7440-24-6	E468S	0.010	mg/L	1.64	5.31	4.42	5.84	----
sulfur, total	7704-34-9	E468S	5.0	mg/L	209	743	621	837	----
tellurium, total	13494-80-9	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
thallium, total	7440-28-0	E468S	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	----
thorium, total	7440-29-1	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
tin, total	7440-31-5	E468S	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	----
titanium, total	7440-32-6	E468S	0.0050	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	----
tungsten, total	7440-33-7	E468S	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	----
uranium, total	7440-61-1	E468S	0.000050	mg/L	0.00155	0.00219	0.00201	0.00223	----
vanadium, total	7440-62-2	E468S	0.00050	mg/L	<0.00050	0.00105	0.00092	0.00113	----

Analytical Results

Sub-Matrix: **Seawater**

(Matrix: **Water**)

				Client sample ID	MP-05-Source	MP-05-WNW	MP-05-North	MP-05-ENE	----
				Client sampling date / time	14-Aug-2021 09:55	14-Aug-2021 09:40	14-Aug-2021 08:41	14-Aug-2021 09:30	----
Analyte	CAS Number	Method	LOR	Unit	YL2101029-006	YL2101029-007	YL2101029-008	YL2101029-009	--------
					Result	Result	Result	Result	----
Total Metals									
yttrium, total	7440-65-5	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
zinc, total	7440-66-6	E468S	0.0030	mg/L	<0.0030	<0.0030	<0.0030	<0.0030	----
zirconium, total	7440-67-7	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
Dissolved Metals									
aluminum, dissolved	7429-90-5	E469S	0.0050	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	----
antimony, dissolved	7440-36-0	E469S	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	----
arsenic, dissolved	7440-38-2	E469S	0.00040	mg/L	<0.00040	0.00120	0.00096	0.00137	----
barium, dissolved	7440-39-3	E469S	0.0010	mg/L	0.0045	0.0076	0.0065	0.0076	----
beryllium, dissolved	7440-41-7	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
bismuth, dissolved	7440-69-9	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
boron, dissolved	7440-42-8	E469S	0.30	mg/L	0.84	2.84	2.22	3.10	----
cadmium, dissolved	7440-43-9	E469S	0.000010	mg/L	0.000012	0.000025	0.000019	0.000026	----
calcium, dissolved	7440-70-2	E469S	1.0	mg/L	93.6	284	224	306	----
cesium, dissolved	7440-46-2	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
chromium, dissolved	7440-47-3	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
cobalt, dissolved	7440-48-4	E469S	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	----
copper, dissolved	7440-50-8	E469S	0.00020	mg/L	0.00027	0.00051	0.00028	0.00072	----
gallium, dissolved	7440-55-3	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
iron, dissolved	7439-89-6	E469S	0.010	mg/L	<0.010	<0.010	<0.010	<0.010	----
lead, dissolved	7439-92-1	E469S	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	----
lithium, dissolved	7439-93-2	E469S	0.020	mg/L	0.032	0.118	0.089	0.124	----
magnesium, dissolved	7439-95-4	E469S	1.0	mg/L	220	853	650	940	----
manganese, dissolved	7439-96-5	E469S	0.00010	mg/L	0.00049	0.00074	0.00072	0.00070	----
mercury, dissolved	7439-97-6	E509S	0.0000050	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	----
molybdenum, dissolved	7439-98-7	E469S	0.00010	mg/L	0.00221	0.00760	0.00591	0.00792	----
nickel, dissolved	7440-02-0	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
phosphorus, dissolved	7723-14-0	E469S	0.050	mg/L	<0.050	<0.050	<0.050	<0.050	----
potassium, dissolved	7440-09-7	E469S	1.0	mg/L	74.9	298	220	332	----
rhenium, dissolved	7440-15-5	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
rubidium, dissolved	7440-17-7	E469S	0.0050	mg/L	0.0216	0.0833	0.0640	0.0904	----
selenium, dissolved	7782-49-2	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----

Analytical Results

Sub-Matrix: Seawater
(Matrix: Water)

Analyte	CAS Number	Method	LOR	Unit	MP-05-Source	MP-05-WNW	MP-05-North	MP-05-ENE	----
				Client sampling date / time	14-Aug-2021 09:55	14-Aug-2021 09:40	14-Aug-2021 08:41	14-Aug-2021 09:30	----
					YL2101029-006	YL2101029-007	YL2101029-008	YL2101029-009	--------
					Result	Result	Result	Result	----
Dissolved Metals									
silicon, dissolved	7440-21-3	E469S.NaSi	1.0	mg/L	<1.0	<1.0	<1.0	<1.0	----
silver, dissolved	7440-22-4	E469S	0.00010	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	----
sodium, dissolved	17341-25-2	E469S.NaSi	2.5	mg/L	2010	6930	5410	7300	----
strontium, dissolved	7440-24-6	E469S	0.010	mg/L	1.46	5.22	4.07	5.46	----
sulfur, dissolved	7704-34-9	E469S	5.0	mg/L	194	725	540	790	----
tellurium, dissolved	13494-80-9	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
thallium, dissolved	7440-28-0	E469S	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	----
thorium, dissolved	7440-29-1	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
tin, dissolved	7440-31-5	E469S	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	----
titanium, dissolved	7440-32-6	E469S	0.0050	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	----
tungsten, dissolved	7440-33-7	E469S	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	----
uranium, dissolved	7440-61-1	E469S	0.000050	mg/L	0.00130	0.00205	0.00183	0.00218	----
vanadium, dissolved	7440-62-2	E469S	0.00050	mg/L	<0.00050	0.00098	0.00076	0.00114	----
yttrium, dissolved	7440-65-5	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
zinc, dissolved	7440-66-6	E469S	0.0010	mg/L	<0.0010	<0.0010	0.0011	<0.0010	----
zirconium, dissolved	7440-67-7	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
dissolved mercury filtration location	----	EP509	-	-	Field	Field	Field	Field	----
dissolved metals filtration location	----	EP421	-	-	Field	Field	Field	Field	----
Volatile Organic Compounds [Fuels]									
benzene	71-43-2	E611A	0.50	µg/L	<0.50	----	<0.50	----	----
ethylbenzene	100-41-4	E611A	0.50	µg/L	<0.50	----	<0.50	----	----
methyl-tert-butyl ether [MTBE]	1634-04-4	E611A	0.50	µg/L	<0.50	----	<0.50	----	----
styrene	100-42-5	E611A	0.50	µg/L	<0.50	----	<0.50	----	----
toluene	108-88-3	E611A	0.50	µg/L	<0.50	----	<0.50	----	----
xylene, m+p-	179601-23-1	E611A	0.40	µg/L	<0.40	----	<0.40	----	----
xylene, o-	95-47-6	E611A	0.30	µg/L	<0.30	----	<0.30	----	----
xylenes, total	1330-20-7	E611A	0.50	µg/L	<0.50	----	<0.50	----	----
Volatile Organic Compounds Surrogates									
bromofluorobenzene, 4-	460-00-4	E611A	1.0	%	95.7	----	91.4	----	----
difluorobenzene, 1,4-	540-36-3	E611A	1.0	%	123	----	83.2	----	----
Hydrocarbons									

Analytical Results

Sub-Matrix: **Seawater**

(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	MP-05-Source	MP-05-WNW	MP-05-North	MP-05-ENE	----
				Client sampling date / time	14-Aug-2021 09:55	14-Aug-2021 09:40	14-Aug-2021 08:41	14-Aug-2021 09:30	----
					YL2101029-006	YL2101029-007	YL2101029-008	YL2101029-009	--------
					Result	Result	Result	Result	----
Hydrocarbons									
F2 (C10-C16)	----	E601	100	µg/L	<100	----	<100	----	----
F3 (C16-C34)	----	E601	250	µg/L	<250	----	<250	----	----
F4 (C34-C50)	----	E601	250	µg/L	<250	----	<250	----	----
VHw (C6-C10)	----	E581.VH+F1	100	µg/L	<100	----	<100	----	----
F1-BTEX	----	EC580	100	µg/L	<100	----	<100	----	----
VPHw	----	EC580A	100	µg/L	<100	----	<100	----	----
F1 (C6-C10)	----	E581.VH+F1	100	µg/L	<100	----	<100	----	----
Hydrocarbons Surrogates									
bromobenzotrifluoride, 2- (F2-F4 surr)	392-83-6	E601	1.0	%	71.2	----	72.0	----	----
dichlorotoluene, 3,4-	97-75-0	E581.VH+F1	1.0	%	116	----	101	----	----
Polycyclic Aromatic Hydrocarbons									
acenaphthene	83-32-9	E641A	0.010	µg/L	<0.010	----	<0.010	----	----
acenaphthylene	208-96-8	E641A	0.010	µg/L	<0.010	----	<0.010	----	----
acridine	260-94-6	E641A	0.010	µg/L	<0.010	----	<0.010	----	----
anthracene	120-12-7	E641A	0.010	µg/L	<0.010	----	<0.010	----	----
benz(a)anthracene	56-55-3	E641A	0.010	µg/L	<0.010	----	<0.010	----	----
benzo(a)pyrene	50-32-8	E641A	0.0050	µg/L	<0.0050	----	<0.0050	----	----
benzo(b+j)fluoranthene	----	E641A	0.010	µg/L	<0.010	----	<0.010	----	----
benzo(b+j+k)fluoranthene	----	E641A	0.015	µg/L	<0.015	----	<0.015	----	----
benzo(g,h,i)perylene	191-24-2	E641A	0.010	µg/L	<0.010	----	<0.010	----	----
benzo(k)fluoranthene	207-08-9	E641A	0.010	µg/L	<0.010	----	<0.010	----	----
chrysene	218-01-9	E641A	0.010	µg/L	<0.010	----	<0.010	----	----
dibenz(a,h)anthracene	53-70-3	E641A	0.0050	µg/L	<0.0050	----	<0.0050	----	----
fluoranthene	206-44-0	E641A	0.010	µg/L	<0.010	----	<0.010	----	----
fluorene	86-73-7	E641A	0.010	µg/L	<0.010	----	<0.010	----	----
indeno(1,2,3-c,d)pyrene	193-39-5	E641A	0.010	µg/L	<0.010	----	<0.010	----	----
methylnaphthalene, 1-	90-12-0	E641A	0.010	µg/L	<0.010	----	<0.010	----	----
methylnaphthalene, 1+2-	----	E641A	0.015	µg/L	<0.015	----	<0.015	----	----
methylnaphthalene, 2-	91-57-6	E641A	0.010	µg/L	0.013	----	<0.010	----	----
naphthalene	91-20-3	E641A	0.050	µg/L	<0.050	----	<0.050	----	----
phenanthrene	85-01-8	E641A	0.020	µg/L	<0.020	----	<0.020	----	----

Analytical Results

Sub-Matrix: **Seawater**

(Matrix: **Water)**

				Client sample ID	**MP-05-Source**	**MP-05-WNW**	**MP-05-North**	**MP-05-ENE**	**----**
				Client sampling date / time	14-Aug-2021 09:55	14-Aug-2021 09:40	14-Aug-2021 08:41	14-Aug-2021 09:30	----
Analyte	*CAS Number*	*Method*	*LOR*	*Unit*	**YL2101029-006**	**YL2101029-007**	**YL2101029-008**	**YL2101029-009**	**--------**
					Result	Result	Result	Result	----
Polycyclic Aromatic Hydrocarbons									
pyrene	129-00-0	E641A	0.010	µg/L	<0.010	----	<0.010	----	----
quinoline	6027-02-7	E641A	0.050	µg/L	<0.050	----	<0.050	----	----
B(a)P total potency equivalents [B(a)P TPE]	----	E641A	0.010	µg/L	<0.010	----	<0.010	----	----
PAHs, high molecular weight (BC AWQ)	----	E641A	0.030	µg/L	<0.030	----	<0.030	----	----
PAHs, low molecular weight (BC AWQ)	----	E641A	0.060	µg/L	<0.060	----	<0.060	----	----
PAHs, total (EPA 16)	----	E641A	0.065	µg/L	<0.065	----	<0.065	----	----
Polycyclic Aromatic Hydrocarbons Surrogates									
chrysene-d12	1719-03-5	E641A	0.1	%	71.3	----	72.0	----	----
naphthalene-d8	1146-65-2	E641A	0.1	%	82.4	----	84.2	----	----
phenanthrene-d10	1517-22-2	E641A	0.1	%	96.8	----	98.1	----	----

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

ALS Environmental

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **YL2101029**	Page	: 1 of 34
Client	: **Golder Associates Ltd.**	Laboratory	: Yellowknife - Environmental
Contact	: Elaine Irving	Account Manager	: Amber Springer
Address	: 200-2920 Virtual Way Vancouver BC Canada V5M 0C4	Address	: 314 Old Airport Road, Unit 116 Yellowknife, Northwest Territories Canada X1A 3T3
Telephone	: ----	Telephone	: +1 867 873 5593
Project	: 1663724-44000-03	Date Samples Received	: 16-Aug-2021 08:45
PO	: ----	Issue Date	: 26-Aug-2021 15:01
C-O-C number	: 20-920781		
Sampler	: ----		
Site	: ----		
Quote number	: Q84262		
No. of samples received	: 9		
No. of samples analysed	: 9		

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 Services number is a unique identifier assigned to discrete substances.

DQO: Data Quality Objective.

LOR: Limit of Reporting (detection limit).

RPD: Relative Percent Difference.

Summary of Outliers

Outliers : Quality Control Samples

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

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

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

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Analysis Holding Time Compliance

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

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

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

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

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) MP-05-ENE	E298	14-Aug-2021	23-Aug-2021	----	----		23-Aug-2021	28 days	9 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) MP-05-North	E298	14-Aug-2021	23-Aug-2021	----	----		23-Aug-2021	28 days	9 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) MP-05-Source	E298	14-Aug-2021	23-Aug-2021	----	----		23-Aug-2021	28 days	9 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) MP-05-WNW	E298	14-Aug-2021	23-Aug-2021	----	----		23-Aug-2021	28 days	9 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) MP-06-ENE	E298	14-Aug-2021	23-Aug-2021	----	----		23-Aug-2021	28 days	9 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) MP-06-North	E298	14-Aug-2021	23-Aug-2021	----	----		23-Aug-2021	28 days	9 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) MP-06-North FBlank-2	E298	14-Aug-2021	23-Aug-2021	----	----		23-Aug-2021	28 days	9 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) MP-06-Source	E298	14-Aug-2021	23-Aug-2021	----	----		23-Aug-2021	28 days	9 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) MP-06-WNW	E298	14-Aug-2021	23-Aug-2021	----	----		23-Aug-2021	28 days	9 days	✓
Anions and Nutrients : Bromide in Seawater by IC										
HDPE MP-05-ENE	E235S.Br	14-Aug-2021	----	----	----		24-Aug-2021	28 days	10 days	✓
Anions and Nutrients : Bromide in Seawater by IC										
HDPE MP-05-North	E235S.Br	14-Aug-2021	----	----	----		24-Aug-2021	28 days	10 days	✓
Anions and Nutrients : Bromide in Seawater by IC										
HDPE MP-05-Source	E235S.Br	14-Aug-2021	----	----	----		24-Aug-2021	28 days	10 days	✓
Anions and Nutrients : Bromide in Seawater by IC										
HDPE MP-05-WNW	E235S.Br	14-Aug-2021	----	----	----		24-Aug-2021	28 days	10 days	✓
Anions and Nutrients : Bromide in Seawater by IC										
HDPE MP-06-ENE	E235S.Br	14-Aug-2021	----	----	----		24-Aug-2021	28 days	10 days	✓
Anions and Nutrients : Bromide in Seawater by IC										
HDPE MP-06-North	E235S.Br	14-Aug-2021	----	----	----		24-Aug-2021	28 days	10 days	✓
Anions and Nutrients : Bromide in Seawater by IC										
HDPE MP-06-North FBlank-2	E235S.Br	14-Aug-2021	----	----	----		24-Aug-2021	28 days	10 days	✓

Matrix: **Water**

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

Analyte Group	Method	Sampling Date	Extraction / Preparation				Analysis			
Container / Client Sample ID(s)			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Bromide in Seawater by IC										
HDPE MP-06-Source	E235S.Br	14-Aug-2021	----	----	----		24-Aug-2021	28 days	10 days	✓
Anions and Nutrients : Bromide in Seawater by IC										
HDPE MP-06-WNW	E235S.Br	14-Aug-2021	----	----	----		24-Aug-2021	28 days	10 days	✓
Anions and Nutrients : Chloride in Seawater by IC										
HDPE MP-05-ENE	E235S.Cl	14-Aug-2021	----	----	----		24-Aug-2021	28 days	10 days	✓
Anions and Nutrients : Chloride in Seawater by IC										
HDPE MP-05-North	E235S.Cl	14-Aug-2021	----	----	----		24-Aug-2021	28 days	10 days	✓
Anions and Nutrients : Chloride in Seawater by IC										
HDPE MP-05-Source	E235S.Cl	14-Aug-2021	----	----	----		24-Aug-2021	28 days	10 days	✓
Anions and Nutrients : Chloride in Seawater by IC										
HDPE MP-05-WNW	E235S.Cl	14-Aug-2021	----	----	----		24-Aug-2021	28 days	10 days	✓
Anions and Nutrients : Chloride in Seawater by IC										
HDPE MP-06-ENE	E235S.Cl	14-Aug-2021	----	----	----		24-Aug-2021	28 days	10 days	✓
Anions and Nutrients : Chloride in Seawater by IC										
HDPE MP-06-North	E235S.Cl	14-Aug-2021	----	----	----		24-Aug-2021	28 days	10 days	✓
Anions and Nutrients : Chloride in Seawater by IC										
HDPE MP-06-North FBlank-2	E235S.Cl	14-Aug-2021	----	----	----		24-Aug-2021	28 days	10 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Anions and Nutrients : Chloride in Seawater by IC										
HDPE MP-06-Source	E235S.Cl	14-Aug-2021	----	----	----		24-Aug-2021	28 days	10 days	✓
Anions and Nutrients : Chloride in Seawater by IC										
HDPE MP-06-WNW	E235S.Cl	14-Aug-2021	----	----	----		24-Aug-2021	28 days	10 days	✓
Anions and Nutrients : Fluoride in Seawater by IC (Low Level)										
HDPE MP-05-ENE	E235S.F-L	14-Aug-2021	----	----	----		24-Aug-2021	28 days	10 days	✓
Anions and Nutrients : Fluoride in Seawater by IC (Low Level)										
HDPE MP-05-North	E235S.F-L	14-Aug-2021	----	----	----		24-Aug-2021	28 days	10 days	✓
Anions and Nutrients : Fluoride in Seawater by IC (Low Level)										
HDPE MP-05-Source	E235S.F-L	14-Aug-2021	----	----	----		24-Aug-2021	28 days	10 days	✓
Anions and Nutrients : Fluoride in Seawater by IC (Low Level)										
HDPE MP-05-WNW	E235S.F-L	14-Aug-2021	----	----	----		24-Aug-2021	28 days	10 days	✓
Anions and Nutrients : Fluoride in Seawater by IC (Low Level)										
HDPE MP-06-ENE	E235S.F-L	14-Aug-2021	----	----	----		24-Aug-2021	28 days	10 days	✓
Anions and Nutrients : Fluoride in Seawater by IC (Low Level)										
HDPE MP-06-North	E235S.F-L	14-Aug-2021	----	----	----		24-Aug-2021	28 days	10 days	✓
Anions and Nutrients : Fluoride in Seawater by IC (Low Level)										
HDPE MP-06-North FBlank-2	E235S.F-L	14-Aug-2021	----	----	----		24-Aug-2021	28 days	10 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Anions and Nutrients : Fluoride in Seawater by IC (Low Level)										
HDPE MP-06-Source	E235S.F-L	14-Aug-2021	----	----	----		24-Aug-2021	28 days	10 days	✓
Anions and Nutrients : Fluoride in Seawater by IC (Low Level)										
HDPE MP-06-WNW	E235S.F-L	14-Aug-2021	----	----	----		24-Aug-2021	28 days	10 days	✓
Anions and Nutrients : Nitrate in Seawater by IC (Trace Level)										
HDPE MP-05-ENE	E235S.NO3-T	14-Aug-2021	----	----	----		24-Aug-2021	3 days	10 days	✗ EHT
Anions and Nutrients : Nitrate in Seawater by IC (Trace Level)										
HDPE MP-05-North	E235S.NO3-T	14-Aug-2021	----	----	----		24-Aug-2021	3 days	10 days	✗ EHT
Anions and Nutrients : Nitrate in Seawater by IC (Trace Level)										
HDPE MP-05-Source	E235S.NO3-T	14-Aug-2021	----	----	----		24-Aug-2021	3 days	10 days	✗ EHT
Anions and Nutrients : Nitrate in Seawater by IC (Trace Level)										
HDPE MP-05-WNW	E235S.NO3-T	14-Aug-2021	----	----	----		24-Aug-2021	3 days	10 days	✗ EHT
Anions and Nutrients : Nitrate in Seawater by IC (Trace Level)										
HDPE MP-06-ENE	E235S.NO3-T	14-Aug-2021	----	----	----		24-Aug-2021	3 days	10 days	✗ EHT
Anions and Nutrients : Nitrate in Seawater by IC (Trace Level)										
HDPE MP-06-North	E235S.NO3-T	14-Aug-2021	----	----	----		24-Aug-2021	3 days	10 days	✗ EHT
Anions and Nutrients : Nitrate in Seawater by IC (Trace Level)										
HDPE MP-06-North FBlank-2	E235S.NO3-T	14-Aug-2021	----	----	----		24-Aug-2021	3 days	10 days	✗ EHT

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 : Nitrate in Seawater by IC (Trace Level)										
HDPE MP-06-Source	E235S.NO3-T	14-Aug-2021	----	----	----		24-Aug-2021	3 days	10 days	✘ EHT
Anions and Nutrients : Nitrate in Seawater by IC (Trace Level)										
HDPE MP-06-WNW	E235S.NO3-T	14-Aug-2021	----	----	----		24-Aug-2021	3 days	10 days	✘ EHT
Anions and Nutrients : Nitrite in Seawater by IC (Low Level)										
HDPE MP-05-ENE	E235S.NO2-L	14-Aug-2021	----	----	----		24-Aug-2021	3 days	10 days	✘ EHT
Anions and Nutrients : Nitrite in Seawater by IC (Low Level)										
HDPE MP-05-North	E235S.NO2-L	14-Aug-2021	----	----	----		24-Aug-2021	3 days	10 days	✘ EHT
Anions and Nutrients : Nitrite in Seawater by IC (Low Level)										
HDPE MP-05-Source	E235S.NO2-L	14-Aug-2021	----	----	----		24-Aug-2021	3 days	10 days	✘ EHT
Anions and Nutrients : Nitrite in Seawater by IC (Low Level)										
HDPE MP-05-WNW	E235S.NO2-L	14-Aug-2021	----	----	----		24-Aug-2021	3 days	10 days	✘ EHT
Anions and Nutrients : Nitrite in Seawater by IC (Low Level)										
HDPE MP-06-ENE	E235S.NO2-L	14-Aug-2021	----	----	----		24-Aug-2021	3 days	10 days	✘ EHT
Anions and Nutrients : Nitrite in Seawater by IC (Low Level)										
HDPE MP-06-North	E235S.NO2-L	14-Aug-2021	----	----	----		24-Aug-2021	3 days	10 days	✘ EHT
Anions and Nutrients : Nitrite in Seawater by IC (Low Level)										
HDPE MP-06-North FBlank-2	E235S.NO2-L	14-Aug-2021	----	----	----		24-Aug-2021	3 days	10 days	✘ EHT

Matrix: **Water**

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

Analyte Group	*Method*	*Sampling Date*	*Extraction / Preparation*				*Analysis*			
Container / Client Sample ID(s)			*Preparation Date*	*Holding Times Rec*	*Holding Times Actual*	*Eval*	*Analysis Date*	*Holding Times Rec*	*Holding Times Actual*	*Eval*
Anions and Nutrients : Nitrite in Seawater by IC (Low Level)										
HDPE MP-06-Source	E235S.NO2-L	14-Aug-2021	----	----	----		24-Aug-2021	3 days	10 days	× EHT
Anions and Nutrients : Nitrite in Seawater by IC (Low Level)										
HDPE MP-06-WNW	E235S.NO2-L	14-Aug-2021	----	----	----		24-Aug-2021	3 days	10 days	× EHT
Anions and Nutrients : Sulfate in Seawater by IC (Low Level)										
HDPE MP-05-ENE	E235S.SO4-L	14-Aug-2021	----	----	----		24-Aug-2021	----	10 days	
Anions and Nutrients : Sulfate in Seawater by IC (Low Level)										
HDPE MP-05-North	E235S.SO4-L	14-Aug-2021	----	----	----		24-Aug-2021	----	10 days	
Anions and Nutrients : Sulfate in Seawater by IC (Low Level)										
HDPE MP-05-Source	E235S.SO4-L	14-Aug-2021	----	----	----		24-Aug-2021	----	10 days	
Anions and Nutrients : Sulfate in Seawater by IC (Low Level)										
HDPE MP-05-WNW	E235S.SO4-L	14-Aug-2021	----	----	----		24-Aug-2021	----	10 days	
Anions and Nutrients : Sulfate in Seawater by IC (Low Level)										
HDPE MP-06-ENE	E235S.SO4-L	14-Aug-2021	----	----	----		24-Aug-2021	----	10 days	
Anions and Nutrients : Sulfate in Seawater by IC (Low Level)										
HDPE MP-06-North	E235S.SO4-L	14-Aug-2021	----	----	----		24-Aug-2021	----	10 days	
Anions and Nutrients : Sulfate in Seawater by IC (Low Level)										
HDPE MP-06-North FBlank-2	E235S.SO4-L	14-Aug-2021	----	----	----		24-Aug-2021	----	10 days	

Matrix: **Water**

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

Analyte Group	Method	Sampling Date	Extraction / Preparation				Analysis			
Container / Client Sample ID(s)			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
Anions and Nutrients : Sulfate in Seawater by IC (Low Level)										
HDPE MP-06-Source	E235S.SO4-L	14-Aug-2021	----	----	----		24-Aug-2021	----	10 days	
Anions and Nutrients : Sulfate in Seawater by IC (Low Level)										
HDPE MP-06-WNW	E235S.SO4-L	14-Aug-2021	----	----	----		24-Aug-2021	----	10 days	
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence										
Amber glass total (sulfuric acid) MP-05-ENE	E318S	14-Aug-2021	19-Aug-2021	----	----		20-Aug-2021	28 days	6 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence										
Amber glass total (sulfuric acid) MP-05-Source	E318S	14-Aug-2021	19-Aug-2021	----	----		20-Aug-2021	28 days	6 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence										
Amber glass total (sulfuric acid) MP-05-WNW	E318S	14-Aug-2021	19-Aug-2021	----	----		20-Aug-2021	28 days	6 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence										
Amber glass total (sulfuric acid) MP-06-ENE	E318S	14-Aug-2021	19-Aug-2021	----	----		20-Aug-2021	28 days	6 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence										
Amber glass total (sulfuric acid) MP-06-North	E318S	14-Aug-2021	19-Aug-2021	----	----		20-Aug-2021	28 days	6 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence										
Amber glass total (sulfuric acid) MP-06-North FBlank-2	E318S	14-Aug-2021	19-Aug-2021	----	----		20-Aug-2021	28 days	6 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence										
Amber glass total (sulfuric acid) MP-06-Source	E318S	14-Aug-2021	19-Aug-2021	----	----		20-Aug-2021	28 days	6 days	✓

Matrix: **Water**

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

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence										
Amber glass total (sulfuric acid) MP-06-WNW	E318S	14-Aug-2021	19-Aug-2021	----	----		20-Aug-2021	28 days	6 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence										
Amber glass total (sulfuric acid) MP-05-North	E318S	14-Aug-2021	19-Aug-2021	----	----		20-Aug-2021	28 days	7 days	✓
Anions and Nutrients : Total Phosphorus in Seawater by Colourimetry										
Amber glass total (sulfuric acid) MP-05-ENE	E372S	14-Aug-2021	23-Aug-2021	----	----		23-Aug-2021	28 days	9 days	✓
Anions and Nutrients : Total Phosphorus in Seawater by Colourimetry										
Amber glass total (sulfuric acid) MP-05-North	E372S	14-Aug-2021	23-Aug-2021	----	----		23-Aug-2021	28 days	9 days	✓
Anions and Nutrients : Total Phosphorus in Seawater by Colourimetry										
Amber glass total (sulfuric acid) MP-05-Source	E372S	14-Aug-2021	23-Aug-2021	----	----		23-Aug-2021	28 days	9 days	✓
Anions and Nutrients : Total Phosphorus in Seawater by Colourimetry										
Amber glass total (sulfuric acid) MP-05-WNW	E372S	14-Aug-2021	23-Aug-2021	----	----		23-Aug-2021	28 days	9 days	✓
Anions and Nutrients : Total Phosphorus in Seawater by Colourimetry										
Amber glass total (sulfuric acid) MP-06-ENE	E372S	14-Aug-2021	23-Aug-2021	----	----		23-Aug-2021	28 days	9 days	✓
Anions and Nutrients : Total Phosphorus in Seawater by Colourimetry										
Amber glass total (sulfuric acid) MP-06-North	E372S	14-Aug-2021	23-Aug-2021	----	----		23-Aug-2021	28 days	9 days	✓
Anions and Nutrients : Total Phosphorus in Seawater by Colourimetry										
Amber glass total (sulfuric acid) MP-06-North FBlank-2	E372S	14-Aug-2021	23-Aug-2021	----	----		23-Aug-2021	28 days	9 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 : Total Phosphorus in Seawater by Colourimetry										
Amber glass total (sulfuric acid) MP-06-Source	E372S	14-Aug-2021	23-Aug-2021	----	----		23-Aug-2021	28 days	9 days	✓
Anions and Nutrients : Total Phosphorus in Seawater by Colourimetry										
Amber glass total (sulfuric acid) MP-06-WNW	E372S	14-Aug-2021	23-Aug-2021	----	----		23-Aug-2021	28 days	9 days	✓
Dissolved Metals : Dissolved Mercury in Seawater by CVAAS										
Glass vial dissolved (hydrochloric acid) MP-05-ENE	E509S	14-Aug-2021	20-Aug-2021	----	----		20-Aug-2021	28 days	6 days	✓
Dissolved Metals : Dissolved Mercury in Seawater by CVAAS										
Glass vial dissolved (hydrochloric acid) MP-05-North	E509S	14-Aug-2021	20-Aug-2021	----	----		20-Aug-2021	28 days	6 days	✓
Dissolved Metals : Dissolved Mercury in Seawater by CVAAS										
Glass vial dissolved (hydrochloric acid) MP-05-Source	E509S	14-Aug-2021	20-Aug-2021	----	----		20-Aug-2021	28 days	6 days	✓
Dissolved Metals : Dissolved Mercury in Seawater by CVAAS										
Glass vial dissolved (hydrochloric acid) MP-05-WNW	E509S	14-Aug-2021	20-Aug-2021	----	----		20-Aug-2021	28 days	6 days	✓
Dissolved Metals : Dissolved Mercury in Seawater by CVAAS										
Glass vial dissolved (hydrochloric acid) MP-06-ENE	E509S	14-Aug-2021	20-Aug-2021	----	----		20-Aug-2021	28 days	6 days	✓
Dissolved Metals : Dissolved Mercury in Seawater by CVAAS										
Glass vial dissolved (hydrochloric acid) MP-06-North	E509S	14-Aug-2021	20-Aug-2021	----	----		20-Aug-2021	28 days	6 days	✓
Dissolved Metals : Dissolved Mercury in Seawater by CVAAS										
Glass vial dissolved (hydrochloric acid) MP-06-North FBlank-2	E509S	14-Aug-2021	20-Aug-2021	----	----		20-Aug-2021	28 days	6 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
Dissolved Metals : Dissolved Mercury in Seawater by CVAAS										
Glass vial dissolved (hydrochloric acid) MP-06-Source	E509S	14-Aug-2021	20-Aug-2021	----	----		20-Aug-2021	28 days	6 days	✓
Dissolved Metals : Dissolved Mercury in Seawater by CVAAS										
Glass vial dissolved (hydrochloric acid) MP-06-WNW	E509S	14-Aug-2021	20-Aug-2021	----	----		20-Aug-2021	28 days	6 days	✓
Dissolved Metals : Dissolved Metals in Seawater by CRC ICPMS (HMI)										
HDPE - dissolved (lab preserved) MP-05-ENE	E469S	14-Aug-2021	18-Aug-2021	----	----		18-Aug-2021	180 days	4 days	✓
Dissolved Metals : Dissolved Metals in Seawater by CRC ICPMS (HMI)										
HDPE - dissolved (lab preserved) MP-05-North	E469S	14-Aug-2021	18-Aug-2021	----	----		18-Aug-2021	180 days	4 days	✓
Dissolved Metals : Dissolved Metals in Seawater by CRC ICPMS (HMI)										
HDPE - dissolved (lab preserved) MP-05-Source	E469S	14-Aug-2021	18-Aug-2021	----	----		18-Aug-2021	180 days	4 days	✓
Dissolved Metals : Dissolved Metals in Seawater by CRC ICPMS (HMI)										
HDPE - dissolved (lab preserved) MP-05-WNW	E469S	14-Aug-2021	18-Aug-2021	----	----		18-Aug-2021	180 days	4 days	✓
Dissolved Metals : Dissolved Metals in Seawater by CRC ICPMS (HMI)										
HDPE - dissolved (lab preserved) MP-06-ENE	E469S	14-Aug-2021	18-Aug-2021	----	----		18-Aug-2021	180 days	4 days	✓
Dissolved Metals : Dissolved Metals in Seawater by CRC ICPMS (HMI)										
HDPE - dissolved (lab preserved) MP-06-North	E469S	14-Aug-2021	18-Aug-2021	----	----		18-Aug-2021	180 days	4 days	✓
Dissolved Metals : Dissolved Metals in Seawater by CRC ICPMS (HMI)										
HDPE - dissolved (lab preserved) MP-06-North FBlank-2	E469S	14-Aug-2021	18-Aug-2021	----	----		18-Aug-2021	180 days	4 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
Dissolved Metals : Dissolved Metals in Seawater by CRC ICPMS (HMI)										
HDPE - dissolved (lab preserved) MP-06-Source	E469S	14-Aug-2021	18-Aug-2021	----	----		18-Aug-2021	180 days	4 days	✓
Dissolved Metals : Dissolved Metals in Seawater by CRC ICPMS (HMI)										
HDPE - dissolved (lab preserved) MP-06-WNW	E469S	14-Aug-2021	18-Aug-2021	----	----		18-Aug-2021	180 days	4 days	✓
Dissolved Metals : Dissolved Sodium and Silicon in Seawater by CRC ICPMS										
HDPE - dissolved (lab preserved) MP-05-ENE	E469S.NaSi	14-Aug-2021	25-Aug-2021	----	----		25-Aug-2021	180 days	11 days	✓
Dissolved Metals : Dissolved Sodium and Silicon in Seawater by CRC ICPMS										
HDPE - dissolved (lab preserved) MP-05-Source	E469S.NaSi	14-Aug-2021	25-Aug-2021	----	----		25-Aug-2021	180 days	11 days	✓
Dissolved Metals : Dissolved Sodium and Silicon in Seawater by CRC ICPMS										
HDPE - dissolved (lab preserved) MP-05-WNW	E469S.NaSi	14-Aug-2021	25-Aug-2021	----	----		25-Aug-2021	180 days	11 days	✓
Dissolved Metals : Dissolved Sodium and Silicon in Seawater by CRC ICPMS										
HDPE - dissolved (lab preserved) MP-06-ENE	E469S.NaSi	14-Aug-2021	25-Aug-2021	----	----		25-Aug-2021	180 days	11 days	✓
Dissolved Metals : Dissolved Sodium and Silicon in Seawater by CRC ICPMS										
HDPE - dissolved (lab preserved) MP-06-North	E469S.NaSi	14-Aug-2021	25-Aug-2021	----	----		25-Aug-2021	180 days	11 days	✓
Dissolved Metals : Dissolved Sodium and Silicon in Seawater by CRC ICPMS										
HDPE - dissolved (lab preserved) MP-06-North FBlank-2	E469S.NaSi	14-Aug-2021	25-Aug-2021	----	----		25-Aug-2021	180 days	11 days	✓
Dissolved Metals : Dissolved Sodium and Silicon in Seawater by CRC ICPMS										
HDPE - dissolved (lab preserved) MP-06-Source	E469S.NaSi	14-Aug-2021	25-Aug-2021	----	----		25-Aug-2021	180 days	11 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Dissolved Metals : Dissolved Sodium and Silicon in Seawater by CRC ICPMS										
HDPE - dissolved (lab preserved) MP-06-WNW	E469S.NaSi	14-Aug-2021	25-Aug-2021	----	----		25-Aug-2021	180 days	11 days	✓
Dissolved Metals : Dissolved Sodium and Silicon in Seawater by CRC ICPMS										
HDPE - dissolved (lab preserved) MP-05-North	E469S.NaSi	14-Aug-2021	25-Aug-2021	----	----		25-Aug-2021	180 days	12 days	✓
Hydrocarbons : CCME PHC - F2-F4 by GC-FID										
Amber glass/Teflon lined cap (sodium bisulfate) MP-05-North	E601	14-Aug-2021	18-Aug-2021	14 days	4 days	✓	19-Aug-2021	40 days	1 days	✓
Hydrocarbons : CCME PHC - F2-F4 by GC-FID										
Amber glass/Teflon lined cap (sodium bisulfate) MP-05-Source	E601	14-Aug-2021	18-Aug-2021	14 days	4 days	✓	19-Aug-2021	40 days	1 days	✓
Hydrocarbons : CCME PHC - F2-F4 by GC-FID										
Amber glass/Teflon lined cap (sodium bisulfate) MP-06-ENE	E601	14-Aug-2021	18-Aug-2021	14 days	4 days	✓	19-Aug-2021	40 days	1 days	✓
Hydrocarbons : CCME PHC - F2-F4 by GC-FID										
Amber glass/Teflon lined cap (sodium bisulfate) MP-06-Source	E601	14-Aug-2021	18-Aug-2021	14 days	4 days	✓	19-Aug-2021	40 days	1 days	✓
Hydrocarbons : VH and F1 by Headspace GC-FID										
Glass vial (sodium bisulfate) MP-05-North	E581.VH+F1	14-Aug-2021	20-Aug-2021	----	----		20-Aug-2021	14 days	7 days	✓
Hydrocarbons : VH and F1 by Headspace GC-FID										
Glass vial (sodium bisulfate) MP-05-Source	E581.VH+F1	14-Aug-2021	20-Aug-2021	----	----		20-Aug-2021	14 days	7 days	✓
Hydrocarbons : VH and F1 by Headspace GC-FID										
Glass vial (sodium bisulfate) MP-06-ENE	E581.VH+F1	14-Aug-2021	20-Aug-2021	----	----		20-Aug-2021	14 days	7 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Hydrocarbons : VH and F1 by Headspace GC-FID										
Glass vial (sodium bisulfate) MP-06-Source	E581.VH+F1	14-Aug-2021	20-Aug-2021	----	----		20-Aug-2021	14 days	7 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
HDPE MP-05-ENE	E358-L	14-Aug-2021	24-Aug-2021	3 days	10 days	× EHT	24-Aug-2021	28 days	0 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
HDPE MP-05-North	E358-L	14-Aug-2021	24-Aug-2021	3 days	10 days	× EHT	24-Aug-2021	28 days	0 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
HDPE MP-05-Source	E358-L	14-Aug-2021	24-Aug-2021	3 days	10 days	× EHT	24-Aug-2021	28 days	0 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
HDPE MP-05-WNW	E358-L	14-Aug-2021	24-Aug-2021	3 days	10 days	× EHT	24-Aug-2021	28 days	0 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
HDPE MP-06-ENE	E358-L	14-Aug-2021	24-Aug-2021	3 days	10 days	× EHT	24-Aug-2021	28 days	0 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
HDPE MP-06-North	E358-L	14-Aug-2021	24-Aug-2021	3 days	10 days	× EHT	24-Aug-2021	28 days	0 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
HDPE MP-06-North FBlank-2	E358-L	14-Aug-2021	24-Aug-2021	3 days	10 days	× EHT	24-Aug-2021	28 days	0 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
HDPE MP-06-Source	E358-L	14-Aug-2021	24-Aug-2021	3 days	10 days	× EHT	24-Aug-2021	28 days	0 days	✓

Matrix: **Water**

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

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
HDPE MP-06-WNW	E358-L	14-Aug-2021	24-Aug-2021	3 days	10 days	✘ EHT	24-Aug-2021	28 days	0 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) MP-05-ENE	E355-L	14-Aug-2021	20-Aug-2021	----	----		20-Aug-2021	28 days	6 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) MP-05-North	E355-L	14-Aug-2021	20-Aug-2021	----	----		20-Aug-2021	28 days	6 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) MP-05-Source	E355-L	14-Aug-2021	20-Aug-2021	----	----		20-Aug-2021	28 days	6 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) MP-05-WNW	E355-L	14-Aug-2021	20-Aug-2021	----	----		20-Aug-2021	28 days	6 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) MP-06-ENE	E355-L	14-Aug-2021	20-Aug-2021	----	----		20-Aug-2021	28 days	6 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) MP-06-North	E355-L	14-Aug-2021	20-Aug-2021	----	----		20-Aug-2021	28 days	6 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) MP-06-North FBlank-2	E355-L	14-Aug-2021	20-Aug-2021	----	----		20-Aug-2021	28 days	6 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) MP-06-Source	E355-L	14-Aug-2021	20-Aug-2021	----	----		20-Aug-2021	28 days	6 days	✓

Matrix: **Water**

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

Analyte Group	Method	Sampling Date	Extraction / Preparation				Analysis			
Container / Client Sample ID(s)			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid)										
MP-06-WNW	E355-L	14-Aug-2021	20-Aug-2021	----	----		20-Aug-2021	28 days	6 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE										
MP-05-ENE	E290	14-Aug-2021	----	----	----		19-Aug-2021	14 days	5 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE										
MP-05-North	E290	14-Aug-2021	----	----	----		19-Aug-2021	14 days	5 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE										
MP-05-Source	E290	14-Aug-2021	----	----	----		19-Aug-2021	14 days	5 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE										
MP-05-WNW	E290	14-Aug-2021	----	----	----		19-Aug-2021	14 days	5 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE										
MP-06-ENE	E290	14-Aug-2021	----	----	----		19-Aug-2021	14 days	5 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE										
MP-06-North	E290	14-Aug-2021	----	----	----		19-Aug-2021	14 days	5 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE										
MP-06-North FBlank-2	E290	14-Aug-2021	----	----	----		19-Aug-2021	14 days	5 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE										
MP-06-Source	E290	14-Aug-2021	----	----	----		19-Aug-2021	14 days	5 days	✓

Matrix: **Water**

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

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Alkalinity Species by Titration										
HDPE MP-06-WNW	E290	14-Aug-2021	----	----	----		19-Aug-2021	14 days	5 days	✓
Physical Tests : Conductivity in Seawater										
HDPE MP-05-ENE	E100S	14-Aug-2021	----	----	----		19-Aug-2021	28 days	5 days	✓
Physical Tests : Conductivity in Seawater										
HDPE MP-05-North	E100S	14-Aug-2021	----	----	----		19-Aug-2021	28 days	5 days	✓
Physical Tests : Conductivity in Seawater										
HDPE MP-05-Source	E100S	14-Aug-2021	----	----	----		19-Aug-2021	28 days	5 days	✓
Physical Tests : Conductivity in Seawater										
HDPE MP-05-WNW	E100S	14-Aug-2021	----	----	----		19-Aug-2021	28 days	5 days	✓
Physical Tests : Conductivity in Seawater										
HDPE MP-06-ENE	E100S	14-Aug-2021	----	----	----		19-Aug-2021	28 days	5 days	✓
Physical Tests : Conductivity in Seawater										
HDPE MP-06-North	E100S	14-Aug-2021	----	----	----		19-Aug-2021	28 days	5 days	✓
Physical Tests : Conductivity in Seawater										
HDPE MP-06-North FBlank-2	E100S	14-Aug-2021	----	----	----		19-Aug-2021	28 days	5 days	✓
Physical Tests : Conductivity in Seawater										
HDPE MP-06-Source	E100S	14-Aug-2021	----	----	----		19-Aug-2021	28 days	5 days	✓

Matrix: **Water**

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

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Physical Tests : Conductivity in Seawater										
HDPE MP-06-WNW	E100S	14-Aug-2021	----	----	----		19-Aug-2021	28 days	5 days	✓
Physical Tests : pH by Meter										
HDPE MP-06-ENE	E108	14-Aug-2021	----	----	----		19-Aug-2021	0.25 hrs	115 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MP-06-Source	E108	14-Aug-2021	----	----	----		19-Aug-2021	0.25 hrs	115 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MP-06-North	E108	14-Aug-2021	----	----	----		19-Aug-2021	0.25 hrs	116 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MP-06-North FBlank-2	E108	14-Aug-2021	----	----	----		19-Aug-2021	0.25 hrs	116 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MP-06-WNW	E108	14-Aug-2021	----	----	----		19-Aug-2021	0.25 hrs	116 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MP-05-ENE	E108	14-Aug-2021	----	----	----		19-Aug-2021	0.25 hrs	117 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MP-05-Source	E108	14-Aug-2021	----	----	----		19-Aug-2021	0.25 hrs	117 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MP-05-WNW	E108	14-Aug-2021	----	----	----		19-Aug-2021	0.25 hrs	117 hrs	× EHTR-FM

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Physical Tests : pH by Meter										
HDPE MP-05-North	E108	14-Aug-2021	----	----	----		19-Aug-2021	0.25 hrs	118 hrs	× EHTR-FM
Physical Tests : TDS by Gravimetry (Seawater)										
HDPE MP-05-ENE	E162S	14-Aug-2021	----	----	----		23-Aug-2021	7 days	9 days	× EHT
Physical Tests : TDS by Gravimetry (Seawater)										
HDPE MP-05-North	E162S	14-Aug-2021	----	----	----		23-Aug-2021	7 days	9 days	× EHT
Physical Tests : TDS by Gravimetry (Seawater)										
HDPE MP-05-Source	E162S	14-Aug-2021	----	----	----		23-Aug-2021	7 days	9 days	× EHT
Physical Tests : TDS by Gravimetry (Seawater)										
HDPE MP-05-WNW	E162S	14-Aug-2021	----	----	----		23-Aug-2021	7 days	9 days	× EHT
Physical Tests : TDS by Gravimetry (Seawater)										
HDPE MP-06-ENE	E162S	14-Aug-2021	----	----	----		23-Aug-2021	7 days	9 days	× EHT
Physical Tests : TDS by Gravimetry (Seawater)										
HDPE MP-06-North	E162S	14-Aug-2021	----	----	----		23-Aug-2021	7 days	9 days	× EHT
Physical Tests : TDS by Gravimetry (Seawater)										
HDPE MP-06-North FBlank-2	E162S	14-Aug-2021	----	----	----		23-Aug-2021	7 days	9 days	× EHT
Physical Tests : TDS by Gravimetry (Seawater)										
HDPE MP-06-Source	E162S	14-Aug-2021	----	----	----		23-Aug-2021	7 days	9 days	× EHT

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Physical Tests : TDS by Gravimetry (Seawater)										
HDPE MP-06-WNW	E162S	14-Aug-2021	----	----	----		23-Aug-2021	7 days	9 days	× EHT
Physical Tests : TSS by Gravimetry (Seawater)										
HDPE MP-05-ENE	E160S	14-Aug-2021	----	----	----		20-Aug-2021	7 days	6 days	✓
Physical Tests : TSS by Gravimetry (Seawater)										
HDPE MP-05-North	E160S	14-Aug-2021	----	----	----		20-Aug-2021	7 days	6 days	✓
Physical Tests : TSS by Gravimetry (Seawater)										
HDPE MP-05-Source	E160S	14-Aug-2021	----	----	----		20-Aug-2021	7 days	6 days	✓
Physical Tests : TSS by Gravimetry (Seawater)										
HDPE MP-05-WNW	E160S	14-Aug-2021	----	----	----		20-Aug-2021	7 days	6 days	✓
Physical Tests : TSS by Gravimetry (Seawater)										
HDPE MP-06-ENE	E160S	14-Aug-2021	----	----	----		20-Aug-2021	7 days	6 days	✓
Physical Tests : TSS by Gravimetry (Seawater)										
HDPE MP-06-North	E160S	14-Aug-2021	----	----	----		20-Aug-2021	7 days	6 days	✓
Physical Tests : TSS by Gravimetry (Seawater)										
HDPE MP-06-North FBlank-2	E160S	14-Aug-2021	----	----	----		20-Aug-2021	7 days	6 days	✓
Physical Tests : TSS by Gravimetry (Seawater)										
HDPE MP-06-Source	E160S	14-Aug-2021	----	----	----		20-Aug-2021	7 days	6 days	✓

Matrix: **Water**

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

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : TSS by Gravimetry (Seawater)										
HDPE MP-06-WNW	E160S	14-Aug-2021	----	----	----		20-Aug-2021	7 days	6 days	✓
Physical Tests : Turbidity by Nephelometry										
HDPE MP-05-ENE	E121	14-Aug-2021	----	----	----		18-Aug-2021	3 days	4 days	×
Physical Tests : Turbidity by Nephelometry										
HDPE MP-05-North	E121	14-Aug-2021	----	----	----		18-Aug-2021	3 days	4 days	×
Physical Tests : Turbidity by Nephelometry										
HDPE MP-05-Source	E121	14-Aug-2021	----	----	----		18-Aug-2021	3 days	4 days	×
Physical Tests : Turbidity by Nephelometry										
HDPE MP-05-WNW	E121	14-Aug-2021	----	----	----		18-Aug-2021	3 days	4 days	×
Physical Tests : Turbidity by Nephelometry										
HDPE MP-06-ENE	E121	14-Aug-2021	----	----	----		18-Aug-2021	3 days	4 days	×
Physical Tests : Turbidity by Nephelometry										
HDPE MP-06-North	E121	14-Aug-2021	----	----	----		18-Aug-2021	3 days	4 days	×
Physical Tests : Turbidity by Nephelometry										
HDPE MP-06-North FBlank-2	E121	14-Aug-2021	----	----	----		18-Aug-2021	3 days	4 days	×
Physical Tests : Turbidity by Nephelometry										
HDPE MP-06-Source	E121	14-Aug-2021	----	----	----		18-Aug-2021	3 days	4 days	×

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Holding Times: Rec	Holding Times: Actual	Eval	Analysis: Analysis Date	Holding Times: Rec	Holding Times: Actual	Eval
Physical Tests : Turbidity by Nephelometry										
HDPE MP-06-WNW	E121	14-Aug-2021	----	----	----		18-Aug-2021	3 days	4 days	×
Polycyclic Aromatic Hydrocarbons : PAHs by Hexane LVI GC-MS										
Amber glass/Teflon lined cap (sodium bisulfate) MP-05-North	E641A	14-Aug-2021	18-Aug-2021	14 days	4 days	✓	18-Aug-2021	40 days	0 days	✓
Polycyclic Aromatic Hydrocarbons : PAHs by Hexane LVI GC-MS										
Amber glass/Teflon lined cap (sodium bisulfate) MP-05-Source	E641A	14-Aug-2021	18-Aug-2021	14 days	4 days	✓	18-Aug-2021	40 days	0 days	✓
Polycyclic Aromatic Hydrocarbons : PAHs by Hexane LVI GC-MS										
Amber glass/Teflon lined cap (sodium bisulfate) MP-06-ENE	E641A	14-Aug-2021	18-Aug-2021	14 days	4 days	✓	18-Aug-2021	40 days	0 days	✓
Polycyclic Aromatic Hydrocarbons : PAHs by Hexane LVI GC-MS										
Amber glass/Teflon lined cap (sodium bisulfate) MP-06-Source	E641A	14-Aug-2021	18-Aug-2021	14 days	4 days	✓	18-Aug-2021	40 days	0 days	✓
Total Metals : Total Mercury in Seawater by CVAAS										
Glass vial total (hydrochloric acid) MP-05-ENE	E508S	14-Aug-2021	----	----	----		21-Aug-2021	28 days	7 days	✓
Total Metals : Total Mercury in Seawater by CVAAS										
Glass vial total (hydrochloric acid) MP-05-North	E508S	14-Aug-2021	----	----	----		21-Aug-2021	28 days	7 days	✓
Total Metals : Total Mercury in Seawater by CVAAS										
Glass vial total (hydrochloric acid) MP-05-Source	E508S	14-Aug-2021	----	----	----		21-Aug-2021	28 days	7 days	✓
Total Metals : Total Mercury in Seawater by CVAAS										
Glass vial total (hydrochloric acid) MP-05-WNW	E508S	14-Aug-2021	----	----	----		21-Aug-2021	28 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
Total Metals : Total Mercury in Seawater by CVAAS										
Glass vial total (hydrochloric acid) MP-06-ENE	E508S	14-Aug-2021	----	----	----		21-Aug-2021	28 days	7 days	✓
Total Metals : Total Mercury in Seawater by CVAAS										
Glass vial total (hydrochloric acid) MP-06-North	E508S	14-Aug-2021	----	----	----		21-Aug-2021	28 days	7 days	✓
Total Metals : Total Mercury in Seawater by CVAAS										
Glass vial total (hydrochloric acid) MP-06-North FBlank-2	E508S	14-Aug-2021	----	----	----		21-Aug-2021	28 days	7 days	✓
Total Metals : Total Mercury in Seawater by CVAAS										
Glass vial total (hydrochloric acid) MP-06-Source	E508S	14-Aug-2021	----	----	----		21-Aug-2021	28 days	7 days	✓
Total Metals : Total Mercury in Seawater by CVAAS										
Glass vial total (hydrochloric acid) MP-06-WNW	E508S	14-Aug-2021	----	----	----		21-Aug-2021	28 days	7 days	✓
Total Metals : Total Metals in Seawater by CRC ICPMS (HMI)										
HDPE - total (lab preserved) MP-05-ENE	E468S	14-Aug-2021	----	----	----		25-Aug-2021	180 days	11 days	✓
Total Metals : Total Metals in Seawater by CRC ICPMS (HMI)										
HDPE - total (lab preserved) MP-05-North	E468S	14-Aug-2021	----	----	----		25-Aug-2021	180 days	11 days	✓
Total Metals : Total Metals in Seawater by CRC ICPMS (HMI)										
HDPE - total (lab preserved) MP-05-Source	E468S	14-Aug-2021	----	----	----		25-Aug-2021	180 days	11 days	✓
Total Metals : Total Metals in Seawater by CRC ICPMS (HMI)										
HDPE - total (lab preserved) MP-05-WNW	E468S	14-Aug-2021	----	----	----		25-Aug-2021	180 days	11 days	✓

Matrix: **Water**

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

Analyte Group	Method	Sampling Date	Extraction / Preparation				Analysis			
Container / Client Sample ID(s)			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Total Metals : Total Metals in Seawater by CRC ICPMS (HMI)										
HDPE - total (lab preserved) MP-06-ENE	E468S	14-Aug-2021	----	----	----		25-Aug-2021	180 days	11 days	✓
Total Metals : Total Metals in Seawater by CRC ICPMS (HMI)										
HDPE - total (lab preserved) MP-06-North	E468S	14-Aug-2021	----	----	----		25-Aug-2021	180 days	11 days	✓
Total Metals : Total Metals in Seawater by CRC ICPMS (HMI)										
HDPE - total (lab preserved) MP-06-North FBlank-2	E468S	14-Aug-2021	----	----	----		25-Aug-2021	180 days	11 days	✓
Total Metals : Total Metals in Seawater by CRC ICPMS (HMI)										
HDPE - total (lab preserved) MP-06-Source	E468S	14-Aug-2021	----	----	----		25-Aug-2021	180 days	11 days	✓
Total Metals : Total Metals in Seawater by CRC ICPMS (HMI)										
HDPE - total (lab preserved) MP-06-WNW	E468S	14-Aug-2021	----	----	----		25-Aug-2021	180 days	11 days	✓
Total Metals : Total Sodium and Silicon in Seawater by CRC ICPMS										
HDPE - total (lab preserved) MP-05-ENE	E468S.NaSi	14-Aug-2021	----	----	----		26-Aug-2021	180 days	12 days	✓
Total Metals : Total Sodium and Silicon in Seawater by CRC ICPMS										
HDPE - total (lab preserved) MP-05-North	E468S.NaSi	14-Aug-2021	----	----	----		26-Aug-2021	180 days	12 days	✓
Total Metals : Total Sodium and Silicon in Seawater by CRC ICPMS										
HDPE - total (lab preserved) MP-05-Source	E468S.NaSi	14-Aug-2021	----	----	----		26-Aug-2021	180 days	12 days	✓
Total Metals : Total Sodium and Silicon in Seawater by CRC ICPMS										
HDPE - total (lab preserved) MP-05-WNW	E468S.NaSi	14-Aug-2021	----	----	----		26-Aug-2021	180 days	12 days	✓

Matrix: **Water**

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

Analyte Group	Method	Sampling Date	Extraction / Preparation				Analysis			
Container / Client Sample ID(s)			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Total Metals : Total Sodium and Silicon in Seawater by CRC ICPMS										
HDPE - total (lab preserved) MP-06-ENE	E468S.NaSi	14-Aug-2021	----	----	----		26-Aug-2021	180 days	12 days	✓
Total Metals : Total Sodium and Silicon in Seawater by CRC ICPMS										
HDPE - total (lab preserved) MP-06-North	E468S.NaSi	14-Aug-2021	----	----	----		26-Aug-2021	180 days	12 days	✓
Total Metals : Total Sodium and Silicon in Seawater by CRC ICPMS										
HDPE - total (lab preserved) MP-06-North FBlank-2	E468S.NaSi	14-Aug-2021	----	----	----		26-Aug-2021	180 days	12 days	✓
Total Metals : Total Sodium and Silicon in Seawater by CRC ICPMS										
HDPE - total (lab preserved) MP-06-Source	E468S.NaSi	14-Aug-2021	----	----	----		26-Aug-2021	180 days	12 days	✓
Total Metals : Total Sodium and Silicon in Seawater by CRC ICPMS										
HDPE - total (lab preserved) MP-06-WNW	E468S.NaSi	14-Aug-2021	----	----	----		26-Aug-2021	180 days	12 days	✓
Volatile Organic Compounds [Fuels] : BTEX by Headspace GC-MS										
Glass vial (sodium bisulfate) MP-05-North	E611A	14-Aug-2021	20-Aug-2021	----	----		20-Aug-2021	14 days	7 days	✓
Volatile Organic Compounds [Fuels] : BTEX by Headspace GC-MS										
Glass vial (sodium bisulfate) MP-05-Source	E611A	14-Aug-2021	20-Aug-2021	----	----		20-Aug-2021	14 days	7 days	✓
Volatile Organic Compounds [Fuels] : BTEX by Headspace GC-MS										
Glass vial (sodium bisulfate) MP-06-ENE	E611A	14-Aug-2021	20-Aug-2021	----	----		20-Aug-2021	14 days	7 days	✓
Volatile Organic Compounds [Fuels] : BTEX by Headspace GC-MS										
Glass vial (sodium bisulfate) MP-06-Source	E611A	14-Aug-2021	20-Aug-2021	----	----		20-Aug-2021	14 days	7 days	✓

Legend & Qualifier Definitions

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

EHT: Exceeded ALS recommended hold time prior to analysis.

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

Quality Control Parameter Frequency Compliance

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

Matrix: **Water**

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

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Alkalinity Species by Titration	E290	270497	1	19	5.2	5.0	✓
Ammonia by Fluorescence	E298	273986	1	9	11.1	5.0	✓
Bromide in Seawater by IC	E235S.Br	274514	1	18	5.5	5.0	✓
BTEX by Headspace GC-MS	E611A	271810	1	20	5.0	5.0	✓
Chloride in Seawater by IC	E235S.Cl	274515	1	18	5.5	5.0	✓
Conductivity in Seawater	E100S	270498	1	9	11.1	5.0	✓
Dissolved Mercury in Seawater by CVAAS	E509S	272423	1	9	11.1	5.0	✓
Dissolved Metals in Seawater by CRC ICPMS (HMI)	E469S	269840	1	9	11.1	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	274733	1	9	11.1	5.0	✓
Dissolved Sodium and Silicon in Seawater by CRC ICPMS	E469S.NaSi	276152	1	9	11.1	5.0	✓
Fluoride in Seawater by IC (Low Level)	E235S.F-L	274516	1	18	5.5	5.0	✓
Nitrate in Seawater by IC (Trace Level)	E235S.NO3-T	274517	1	18	5.5	5.0	✓
Nitrite in Seawater by IC (Low Level)	E235S.NO2-L	274518	1	18	5.5	5.0	✓
pH by Meter	E108	270495	1	19	5.2	5.0	✓
Sulfate in Seawater by IC (Low Level)	E235S.SO4-L	274519	1	18	5.5	5.0	✓
TDS by Gravimetry (Seawater)	E162S	273892	1	18	5.5	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence	E318S	271604	1	9	11.1	5.0	✓
Total Mercury in Seawater by CVAAS	E508S	272764	1	10	10.0	5.0	✓
Total Metals in Seawater by CRC ICPMS (HMI)	E468S	269825	1	20	5.0	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	271969	1	16	6.2	5.0	✓
Total Phosphorus in Seawater by Colourimetry	E372S	273987	1	9	11.1	5.0	✓
Total Sodium and Silicon in Seawater by CRC ICPMS	E468S.NaSi	276162	1	9	11.1	5.0	✓
Turbidity by Nephelometry	E121	269478	2	26	7.6	5.0	✓
VH and F1 by Headspace GC-FID	E581.VH+F1	271809	1	16	6.2	5.0	✓
Laboratory Control Samples (LCS)							
Alkalinity Species by Titration	E290	270497	1	19	5.2	5.0	✓
Ammonia by Fluorescence	E298	273986	1	9	11.1	5.0	✓
Bromide in Seawater by IC	E235S.Br	274514	1	18	5.5	5.0	✓
BTEX by Headspace GC-MS	E611A	271810	1	20	5.0	5.0	✓
CCME PHC - F2-F4 by GC-FID	E601	269387	1	4	25.0	5.0	✓
Chloride in Seawater by IC	E235S.Cl	274515	1	18	5.5	5.0	✓
Conductivity in Seawater	E100S	270498	1	9	11.1	5.0	✓
Dissolved Mercury in Seawater by CVAAS	E509S	272423	1	9	11.1	5.0	✓
Dissolved Metals in Seawater by CRC ICPMS (HMI)	E469S	269840	1	9	11.1	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	274733	1	9	11.1	5.0	✓
Dissolved Sodium and Silicon in Seawater by CRC ICPMS	E469S.NaSi	276152	1	9	11.1	5.0	✓
Fluoride in Seawater by IC (Low Level)	E235S.F-L	274516	1	18	5.5	5.0	✓

Matrix: **Water**

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

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Control Samples (LCS) - Continued							
Nitrate in Seawater by IC (Trace Level)	E235S.NO3-T	274517	1	18	5.5	5.0	✓
Nitrite in Seawater by IC (Low Level)	E235S.NO2-L	274518	1	18	5.5	5.0	✓
PAHs by Hexane LVI GC-MS	E641A	269384	1	11	9.0	5.0	✓
pH by Meter	E108	270495	1	19	5.2	5.0	✓
Sulfate in Seawater by IC (Low Level)	E235S.SO4-L	274519	1	18	5.5	5.0	✓
TDS by Gravimetry (Seawater)	E162S	273892	1	18	5.5	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence	E318S	271604	1	9	11.1	5.0	✓
Total Mercury in Seawater by CVAAS	E508S	272764	1	10	10.0	5.0	✓
Total Metals in Seawater by CRC ICPMS (HMI)	E468S	269825	1	20	5.0	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	271969	1	16	6.2	5.0	✓
Total Phosphorus in Seawater by Colourimetry	E372S	273987	1	9	11.1	5.0	✓
Total Sodium and Silicon in Seawater by CRC ICPMS	E468S.NaSi	276162	1	9	11.1	5.0	✓
TSS by Gravimetry (Seawater)	E160S	272077	1	14	7.1	5.0	✓
Turbidity by Nephelometry	E121	269478	2	26	7.6	5.0	✓
VH and F1 by Headspace GC-FID	E581.VH+F1	271809	1	16	6.2	5.0	✓
Method Blanks (MB)							
Alkalinity Species by Titration	E290	270497	1	19	5.2	5.0	✓
Ammonia by Fluorescence	E298	273986	1	9	11.1	5.0	✓
Bromide in Seawater by IC	E235S.Br	274514	1	18	5.5	5.0	✓
BTEX by Headspace GC-MS	E611A	271810	1	20	5.0	5.0	✓
CCME PHC - F2-F4 by GC-FID	E601	269387	1	4	25.0	5.0	✓
Chloride in Seawater by IC	E235S.Cl	274515	1	18	5.5	5.0	✓
Conductivity in Seawater	E100S	270498	1	9	11.1	5.0	✓
Dissolved Mercury in Seawater by CVAAS	E509S	272423	1	9	11.1	5.0	✓
Dissolved Metals in Seawater by CRC ICPMS (HMI)	E469S	269840	1	9	11.1	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	274733	1	9	11.1	5.0	✓
Dissolved Sodium and Silicon in Seawater by CRC ICPMS	E469S.NaSi	276152	1	9	11.1	5.0	✓
Fluoride in Seawater by IC (Low Level)	E235S.F-L	274516	1	18	5.5	5.0	✓
Nitrate in Seawater by IC (Trace Level)	E235S.NO3-T	274517	1	18	5.5	5.0	✓
Nitrite in Seawater by IC (Low Level)	E235S.NO2-L	274518	1	18	5.5	5.0	✓
PAHs by Hexane LVI GC-MS	E641A	269384	1	11	9.0	5.0	✓
Sulfate in Seawater by IC (Low Level)	E235S.SO4-L	274519	1	18	5.5	5.0	✓
TDS by Gravimetry (Seawater)	E162S	273892	1	18	5.5	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence	E318S	271604	1	9	11.1	5.0	✓
Total Mercury in Seawater by CVAAS	E508S	272764	1	10	10.0	5.0	✓
Total Metals in Seawater by CRC ICPMS (HMI)	E468S	269825	1	20	5.0	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	271969	1	16	6.2	5.0	✓
Total Phosphorus in Seawater by Colourimetry	E372S	273987	1	9	11.1	5.0	✓
Total Sodium and Silicon in Seawater by CRC ICPMS	E468S.NaSi	276162	1	9	11.1	5.0	✓
TSS by Gravimetry (Seawater)	E160S	272077	1	14	7.1	5.0	✓
Turbidity by Nephelometry	E121	269478	2	26	7.6	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							
VH and F1 by Headspace GC-FID	E581.VH+F1	271809	1	16	6.2	5.0	✓
Matrix Spikes (MS)							
Ammonia by Fluorescence	E298	273986	1	9	11.1	5.0	✓
Bromide in Seawater by IC	E235S.Br	274514	1	18	5.5	5.0	✓
BTEX by Headspace GC-MS	E611A	271810	1	20	5.0	5.0	✓
Chloride in Seawater by IC	E235S.Cl	274515	1	18	5.5	5.0	✓
Dissolved Mercury in Seawater by CVAAS	E509S	272423	1	9	11.1	5.0	✓
Dissolved Metals in Seawater by CRC ICPMS (HMI)	E469S	269840	1	9	11.1	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	274733	1	9	11.1	5.0	✓
Dissolved Sodium and Silicon in Seawater by CRC ICPMS	E469S.NaSi	276152	1	9	11.1	5.0	✓
Fluoride in Seawater by IC (Low Level)	E235S.F-L	274516	1	18	5.5	5.0	✓
Nitrate in Seawater by IC (Trace Level)	E235S.NO3-T	274517	1	18	5.5	5.0	✓
Nitrite in Seawater by IC (Low Level)	E235S.NO2-L	274518	1	18	5.5	5.0	✓
Sulfate in Seawater by IC (Low Level)	E235S.SO4-L	274519	1	18	5.5	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence	E318S	271604	1	9	11.1	5.0	✓
Total Mercury in Seawater by CVAAS	E508S	272764	1	10	10.0	5.0	✓
Total Metals in Seawater by CRC ICPMS (HMI)	E468S	269825	1	20	5.0	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	271969	1	16	6.2	5.0	✓
Total Phosphorus in Seawater by Colourimetry	E372S	273987	1	9	11.1	5.0	✓
Total Sodium and Silicon in Seawater by CRC ICPMS	E468S.NaSi	276162	1	9	11.1	5.0	✓
VH and F1 by Headspace GC-FID	E581.VH+F1	271809	1	16	6.2	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 Seawater	E100S Vancouver - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a seawater sample. Conductivity measurements are temperature-compensated to 25°C. Salinity in Practical Salinity Units is calculated.
pH by Meter	E108 Vancouver - Environmental	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
Turbidity by Nephelometry	E121 Vancouver - Environmental	Water	APHA 2130 B (mod)	Turbidity is measured by the nephelometric method, by measuring the intensity of light scatter under defined conditions.
TSS by Gravimetry (Seawater)	E160S Vancouver - 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 (Seawater)	E162S Vancouver - 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 Seawater by IC	E235S.Br Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Chloride in Seawater by IC	E235S.Cl Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Fluoride in Seawater by IC (Low Level)	E235S.F-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrite in Seawater by IC (Low Level)	E235S.NO2-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrate in Seawater by IC (Trace Level)	E235S.NO3-T Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Sulfate in Seawater by IC (Low Level)	E235S.SO4-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Alkalinity Species by Titration	E290 Vancouver - Environmental	Water	APHA 2320 B (mod)	Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.
Ammonia by Fluorescence	E298 Vancouver - 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).
Total Kjeldahl Nitrogen by Fluorescence	E318S Vancouver - Environmental	Water	APHA 4500-Norg D (mod)	Total Kjeldahl Nitrogen is determined using block digestion followed by flow-injection analysis with fluorescence detection.
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L Vancouver - 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 Vancouver - Environmental	Water	APHA 5310 B (mod)	Dissolved Organic Carbon (Non-Purgeable), also known as NPOC (dissolved), is a direct measurement of DOC after a filtered (0.45 micron) sample has been acidified and purged to remove inorganic carbon (IC). Analysis is by high temperature combustion with infrared detection of CO2. NPOC does not include volatile organic species that are purged off with IC. For samples where the majority of DC (dissolved carbon) is comprised of IC (which is common), this method is more accurate and more reliable than the DOC by subtraction method (i.e. DC minus DIC).
Total Phosphorus in Seawater by Colourimetry	E372S Vancouver - Environmental	Water	APHA 4500-P E (mod).	Total Phosphorus is determined colourimetrically using a discrete analyzer after heated persulfate digestion of the sample.
Total Metals in Seawater by CRC ICPMS (HMI)	E468S Vancouver - Environmental	Water	EPA 200.2/6020B (mod)	Seawater samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS (HMI Mode). This method is compliant with digestion requirements of the British Columbia Environmental Laboratory Manual.
Total Sodium and Silicon in Seawater by CRC ICPMS	E468S.NaSi Vancouver - Environmental	Water	EPA 200.2/6020B (mod)	Seawater samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS. This method is compliant with digestion requirements of the British Columbia Environmental Laboratory Manual.
Dissolved Metals in Seawater by CRC ICPMS (HMI)	E469S Vancouver - Environmental	Water	APHA 3030B/EPA 6020B (mod)	Seawater samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS (HMI Mode).

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Sodium and Silicon in Seawater by CRC ICPMS	E469S.NaSi Vancouver - Environmental	Water	APHA 3030B/EPA 6020B (mod)	Seawater samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS.
Total Mercury in Seawater by CVAAS	E508S Vancouver - Environmental	Water	EPA 1631E (mod)	Seawater samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.
Dissolved Mercury in Seawater by CVAAS	E509S Vancouver - Environmental	Water	APHA 3030B/EPA 1631E (mod)	Seawater samples are filtered (0.45 um), preserved with HCl, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.
VH and F1 by Headspace GC-FID	E581.VH+F1 Vancouver - Environmental	Water	BC MOE Lab Manual / CCME PHC in Soil - Tier 1 (mod)	Volatile Hydrocarbons (VH and F1) is analyzed by static headspace GC-FID. Samples are prepared in headspace vials and are heated and agitated on the headspace autosampler, causing VOCs to partition between the aqueous phase and the headspace in accordance with Henry's law.
CCME PHC - F2-F4 by GC-FID	E601 Vancouver - Environmental	Water	CCME PHC in Soil - Tier 1	CCME Fractions 2-4 (F2-F4) are analyzed by GC-FID.
BTEX by Headspace GC-MS	E611A Vancouver - Environmental	Water	EPA 8260D (mod)	Volatile Organic Compounds (VOCs) are analyzed by static headspace GC-MS. Samples are prepared in headspace vials and are heated and agitated on the headspace autosampler, causing VOCs to partition between the aqueous phase and the headspace in accordance with Henry's law.
PAHs by Hexane LVI GC-MS	E641A Vancouver - Environmental	Water	EPA 8270E (mod)	Polycyclic Aromatic Hydrocarbons (PAHs) are analyzed by large volume injection (LVI) GC-MS.
Dissolved Hardness (Calculated)	EC100 Vancouver - Environmental	Water	APHA 2340B	"Hardness (as CaCO3), dissolved" is calculated from the sum of dissolved Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. "Total Hardness" refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations.
Salinity in Seawater (calculation)	EC100S Vancouver - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a seawater sample. Conductivity measurements are temperature-compensated to 25°C. Salinity in Practical Salinity Units is calculated.
F1-BTEX	EC580 Vancouver - Environmental	Water	CCME PHC in Soil - Tier 1	F1-BTEX is calculated as follows: F1-BTEX = F1 (C6-C10) minus benzene, toluene, ethylbenzene and xylenes (BTEX).
VPH: VH-BTEX-Styrene	EC580A Vancouver - Environmental	Water	BC MOE Lab Manual (VPH in Water and Solids) (mod)	Volatile Petroleum Hydrocarbons (VPH) is calculated as follows: VPHw = Volatile Hydrocarbons (VH6-10) minus benzene, toluene, ethylbenzene, xylenes (BTEX) and styrene.

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Preparation for Ammonia	EP298 Vancouver - Environmental	Water		Sample preparation for Preserved Nutrients Water Quality Analysis.
Digestion for TKN in Seawater	EP318S Vancouver - Environmental	Water	APHA 4500-Norg D (mod)	Samples are digested using block digestion with Copper Sulfate Digestion Reagent and H2SO4.
Preparation for Total Organic Carbon by Combustion	EP355 Vancouver - Environmental	Water		Preparation for Total Organic Carbon by Combustion
Preparation for Dissolved Organic Carbon for Combustion	EP358 Vancouver - Environmental	Water	APHA 5310 B (mod)	Preparation for Dissolved Organic Carbon
Digestion for Total Phosphorus in water	EP372 Vancouver - Environmental	Water	APHA 4500-P E (mod).	Samples are heated with a persulfate digestion reagent.
Dissolved Metals Water Filtration	EP421 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HNO3.
Dissolved Mercury Water Filtration	EP509 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HCl.
VOCs Preparation for Headspace Analysis	EP581 Vancouver - Environmental	Water	EPA 5021A (mod)	Samples are prepared in headspace vials and are heated and agitated on the headspace autosampler. An aliquot of the headspace is then injected into the GC/MS-FID system.
PHCs and PAHs Hexane Extraction	EP601 Vancouver - Environmental	Water	EPA 3511 (mod)	Petroleum Hydrocarbons (PHCs) and Polycyclic Aromatic Hydrocarbons (PAHs) are extracted using a hexane liquid-liquid extraction.

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **YL2101029**	Page	: 1 of 20
Client	: Golder Associates Ltd.	Laboratory	: Yellowknife - Environmental
Contact	: Elaine Irving	Account Manager	: Amber Springer
Address	: 200-2920 Virtual Way Vancouver BC Canada V5M 0C4	Address	: 314 Old Airport Road, Unit 116 Yellowknife, Northwest Territories Canada X1A 3T3
Telephone	: ----	Telephone	: +1 867 873 5593
Project	: 1663724-44000-03	Date Samples Received	: 16-Aug-2021 08:45
PO	: ----	Date Analysis Commenced	: 18-Aug-2021
C-O-C number	: 20-920781	Issue Date	: 26-Aug-2021 15:01
Sampler	: ----		
Site	: ----		
Quote number	: Q84262		
No. of samples received	: 9		
No. of samples analysed	: 9		

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 Percentage Difference (RPD) and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits
- Reference Material (RM) Report; Recovery and Acceptance Limits
- Method Blank (MB) Report; Recovery and Acceptance Limits
- Laboratory Control Sample (LCS) Report; Recovery and Acceptance Limits

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*
Angela Ren	Team Leader - Metals	Metals, Burnaby, British Columbia
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Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia
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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 Services number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percentage Difference
# = Indicates a QC result that did not meet the ALS DQO.

Laboratory Duplicate (DUP) Report

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

Sub-Matrix: **Water**

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Physical Tests (QC Lot: 269478)											
FJ2100721-016	Anonymous	turbidity	----	E121	0.10	NTU	0.29	0.32	0.04	Diff <2x LOR	----
Physical Tests (QC Lot: 269479)											
YL2101029-004	MP-06-Source	turbidity	----	E121	0.10	NTU	0.86	0.92	0.07	Diff <2x LOR	----
Physical Tests (QC Lot: 270495)											
KS2102583-001	Anonymous	pH	----	E108	0.10	pH units	8.27	8.25	0.242%	4%	----
Physical Tests (QC Lot: 270497)											
KS2102583-001	Anonymous	alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	190	191	0.158%	20%	----
Physical Tests (QC Lot: 270498)											
YL2101029-001	MP-06-North FBlank-2	conductivity	----	E100S	2.0	µS/cm	<2.0	<2.0	0	Diff <2x LOR	----
Physical Tests (QC Lot: 273892)											
VA21B7539-001	Anonymous	solids, total dissolved [TDS]	----	E162S	40	mg/L	3450	3220	6.93%	20%	----
Anions and Nutrients (QC Lot: 271604)											
YL2101029-001	MP-06-North FBlank-2	Kjeldahl nitrogen, total [TKN]	----	E318S	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 273986)											
YL2101029-001	MP-06-North FBlank-2	ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 273987)											
YL2101029-001	MP-06-North FBlank-2	phosphorus, total	7723-14-0	E372S	0.0040	mg/L	<0.0040	<0.0040	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 274514)											
VA21B7539-001	Anonymous	bromide	24959-67-9	E235S.Br	5.0	mg/L	5.1	5.0	0.04	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 274515)											
VA21B7539-001	Anonymous	chloride	16887-00-6	E235S.Cl	50	mg/L	1660	1660	0.254%	20%	----
Anions and Nutrients (QC Lot: 274516)											
VA21B7539-001	Anonymous	fluoride	16984-48-8	E235S.F-L	0.20	mg/L	<0.20	<0.20	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 274517)											
VA21B7539-001	Anonymous	nitrate (as N)	14797-55-8	E235S.NO3-T	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 274518)											
VA21B7539-001	Anonymous	nitrite (as N)	14797-65-0	E235S.NO2-L	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 274519)											
VA21B7539-001	Anonymous	sulfate (as SO4)	14808-79-8	E235S.SO4-L	3.0	mg/L	233	234	0.429%	20%	----
Organic / Inorganic Carbon (QC Lot: 271969)											
YL2101029-001	MP-06-North FBlank-2	carbon, total organic [TOC]	----	E355-L	0.50	mg/L	<0.50	<0.50	0	Diff <2x LOR	----

Sub-Matrix: **Water**

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Laboratory Duplicate (DUP) Report						
					LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Organic / Inorganic Carbon (QC Lot: 274733)											
YL2101029-001	MP-06-North FBlank-2	carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	<0.50	<0.50	0	Diff <2x LOR	----
Total Metals (QC Lot: 269825)											
VA21B7069-061	Anonymous	aluminum, total	7429-90-5	E468S	0.0050	mg/L	0.0535	0.0532	0.657%	20%	----
		antimony, total	7440-36-0	E468S	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		arsenic, total	7440-38-2	E468S	0.00040	mg/L	0.00161	0.00161	0.000003	Diff <2x LOR	----
		barium, total	7440-39-3	E468S	0.0010	mg/L	0.0089	0.0088	0.0001	Diff <2x LOR	----
		beryllium, total	7440-41-7	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		bismuth, total	7440-69-9	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		boron, total	7440-42-8	E468S	0.30	mg/L	3.70	3.54	4.58%	20%	----
		cadmium, total	7440-43-9	E468S	0.000010	mg/L	0.000077	0.000078	0.0000003	Diff <2x LOR	----
		calcium, total	7440-70-2	E468S	1.0	mg/L	370	362	1.93%	20%	----
		cesium, total	7440-46-2	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		chromium, total	7440-47-3	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		cobalt, total	7440-48-4	E468S	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		copper, total	7440-50-8	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		gallium, total	7440-55-3	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		iron, total	7439-89-6	E468S	0.010	mg/L	0.076	0.076	0.0006	Diff <2x LOR	----
		lead, total	7439-92-1	E468S	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		lithium, total	7439-93-2	E468S	0.020	mg/L	0.162	0.148	0.014	Diff <2x LOR	----
		magnesium, total	7439-95-4	E468S	1.0	mg/L	1150	1120	2.67%	20%	----
		manganese, total	7439-96-5	E468S	0.00020	mg/L	0.00599	0.00590	1.49%	20%	----
		molybdenum, total	7439-98-7	E468S	0.00010	mg/L	0.00998	0.00981	1.67%	20%	----
		nickel, total	7440-02-0	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		phosphorus, total	7723-14-0	E468S	0.050	mg/L	0.096	0.102	0.005	Diff <2x LOR	----
		potassium, total	7440-09-7	E468S	1.0	mg/L	395	395	0.127%	20%	----
		rhenium, total	7440-15-5	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		rubidium, total	7440-17-7	E468S	0.0050	mg/L	0.106	0.107	0.830%	20%	----
		selenium, total	7782-49-2	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		silver, total	7440-22-4	E468S	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		strontium, total	7440-24-6	E468S	0.010	mg/L	6.94	6.93	0.146%	20%	----
		sulfur, total	7704-34-9	E468S	5.0	mg/L	991	974	1.74%	20%	----
		tellurium, total	13494-80-9	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		thallium, total	7440-28-0	E468S	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		thorium, total	7440-29-1	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		tin, total	7440-31-5	E468S	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----

Sub-Matrix: **Water**

Laboratory Duplicate (DUP) Report

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Total Metals (QC Lot: 269825) - continued											
VA21B7069-061	Anonymous	titanium, total	7440-32-6	E468S	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
		tungsten, total	7440-33-7	E468S	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		uranium, total	7440-61-1	E468S	0.000050	mg/L	0.00276	0.00260	5.74%	20%	----
		vanadium, total	7440-62-2	E468S	0.00050	mg/L	0.00190	0.00192	0.00002	Diff <2x LOR	----
		yttrium, total	7440-65-5	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, total	7440-66-6	E468S	0.0030	mg/L	<0.0030	<0.0030	0	Diff <2x LOR	----
		zirconium, total	7440-67-7	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
Total Metals (QC Lot: 272764)											
VA21B7655-001	Anonymous	mercury, total	7439-97-6	E508S	0.0000050	mg/L	0.0000165	0.0000161	0.0000004	Diff <2x LOR	----
Total Metals (QC Lot: 276162)											
YL2101029-001	MP-06-North FBlank-2	silicon, total	7440-21-3	E468S.NaSi	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		sodium, total	17341-25-2	E468S.NaSi	2.5	mg/L	<2.5	<2.5	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 269840)											
YL2101029-001	MP-06-North FBlank-2	aluminum, dissolved	7429-90-5	E469S	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
		antimony, dissolved	7440-36-0	E469S	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		arsenic, dissolved	7440-38-2	E469S	0.00040	mg/L	<0.00040	<0.00040	0	Diff <2x LOR	----
		barium, dissolved	7440-39-3	E469S	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		beryllium, dissolved	7440-41-7	E469S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		bismuth, dissolved	7440-69-9	E469S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		boron, dissolved	7440-42-8	E469S	0.30	mg/L	<0.30	<0.30	0	Diff <2x LOR	----
		cadmium, dissolved	7440-43-9	E469S	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		calcium, dissolved	7440-70-2	E469S	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		cesium, dissolved	7440-46-2	E469S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		chromium, dissolved	7440-47-3	E469S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		cobalt, dissolved	7440-48-4	E469S	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		copper, dissolved	7440-50-8	E469S	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		gallium, dissolved	7440-55-3	E469S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		iron, dissolved	7439-89-6	E469S	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		lead, dissolved	7439-92-1	E469S	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		lithium, dissolved	7439-93-2	E469S	0.020	mg/L	<0.020	<0.020	0	Diff <2x LOR	----
		magnesium, dissolved	7439-95-4	E469S	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		manganese, dissolved	7439-96-5	E469S	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		molybdenum, dissolved	7439-98-7	E469S	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		nickel, dissolved	7440-02-0	E469S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		phosphorus, dissolved	7723-14-0	E469S	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----

Sub-Matrix: **Water**

Laboratory Duplicate (DUP) Report

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Dissolved Metals (QC Lot: 269840) - continued											
YL2101029-001	MP-06-North FBlank-2	potassium, dissolved	7440-09-7	E469S	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		rhenium, dissolved	7440-15-5	E469S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		rubidium, dissolved	7440-17-7	E469S	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
		selenium, dissolved	7782-49-2	E469S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		silver, dissolved	7440-22-4	E469S	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		strontium, dissolved	7440-24-6	E469S	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		sulfur, dissolved	7704-34-9	E469S	5.0	mg/L	<5.0	<5.0	0	Diff <2x LOR	----
		tellurium, dissolved	13494-80-9	E469S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		thallium, dissolved	7440-28-0	E469S	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		thorium, dissolved	7440-29-1	E469S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		tin, dissolved	7440-31-5	E469S	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		titanium, dissolved	7440-32-6	E469S	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
		tungsten, dissolved	7440-33-7	E469S	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		uranium, dissolved	7440-61-1	E469S	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		vanadium, dissolved	7440-62-2	E469S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		yttrium, dissolved	7440-65-5	E469S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, dissolved	7440-66-6	E469S	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		zirconium, dissolved	7440-67-7	E469S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 272423)											
YL2101029-001	MP-06-North FBlank-2	mercury, dissolved	7439-97-6	E509S	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 276152)											
YL2101029-001	MP-06-North FBlank-2	silicon, dissolved	7440-21-3	E469S.NaSi	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		sodium, dissolved	17341-25-2	E469S.NaSi	2.5	mg/L	<2.5	<2.5	0	Diff <2x LOR	----
Volatile Organic Compounds (QC Lot: 271810)											
VA21B7110-002	Anonymous	benzene	71-43-2	E611A	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		ethylbenzene	100-41-4	E611A	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		methyl-tert-butyl ether [MTBE]	1634-04-4	E611A	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		styrene	100-42-5	E611A	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		toluene	108-88-3	E611A	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		xylene, m+p-	179601-23-1	E611A	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		xylene, o-	95-47-6	E611A	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
Hydrocarbons (QC Lot: 271809)											
VA21B7110-002	Anonymous	F1 (C6-C10)	----	E581.VH+F1	100	µg/L	<100	<100	0.0%	30%	----
		VHw (C6-C10)	----	E581.VH+F1	100	µg/L	<100	<100	0.0%	30%	----

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: 269478)						
turbidity	----	E121	0.1	NTU	<0.10	----
Physical Tests (QCLot: 269479)						
turbidity	----	E121	0.1	NTU	<0.10	----
Physical Tests (QCLot: 270497)						
alkalinity, total (as CaCO3)	----	E290	1	mg/L	1.4	----
Physical Tests (QCLot: 270498)						
conductivity	----	E100S	2	µS/cm	<2.0	----
Physical Tests (QCLot: 272077)						
solids, total suspended [TSS]	----	E160S	2	mg/L	<2.0	----
Physical Tests (QCLot: 273892)						
solids, total dissolved [TDS]	----	E162S	10	mg/L	<10	----
Anions and Nutrients (QCLot: 271604)						
Kjeldahl nitrogen, total [TKN]	----	E318S	0.05	mg/L	<0.050	----
Anions and Nutrients (QCLot: 273986)						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 273987)						
phosphorus, total	7723-14-0	E372S	0.002	mg/L	<0.0040	----
Anions and Nutrients (QCLot: 274514)						
bromide	24959-67-9	E235S.Br	5	mg/L	<5.0	----
Anions and Nutrients (QCLot: 274515)						
chloride	16887-00-6	E235S.Cl	50	mg/L	<50	----
Anions and Nutrients (QCLot: 274516)						
fluoride	16984-48-8	E235S.F-L	0.2	mg/L	<0.20	----
Anions and Nutrients (QCLot: 274517)						
nitrate (as N)	14797-55-8	E235S.NO3-T	0.01	mg/L	<0.010	----
Anions and Nutrients (QCLot: 274518)						
nitrite (as N)	14797-65-0	E235S.NO2-L	0.01	mg/L	<0.010	----
Anions and Nutrients (QCLot: 274519)						
sulfate (as SO4)	14808-79-8	E235S.SO4-L	3	mg/L	<3.0	----
Organic / Inorganic Carbon (QCLot: 271969)						
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	<0.50	----
Organic / Inorganic Carbon (QCLot: 274733)						
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	<0.50	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 269825)						
aluminum, total	7429-90-5	E468S	0.005	mg/L	<0.0050	----
antimony, total	7440-36-0	E468S	0.001	mg/L	<0.0010	----
arsenic, total	7440-38-2	E468S	0.0004	mg/L	<0.00040	----
barium, total	7440-39-3	E468S	0.001	mg/L	<0.0010	----
beryllium, total	7440-41-7	E468S	0.0005	mg/L	<0.00050	----
bismuth, total	7440-69-9	E468S	0.0005	mg/L	<0.00050	----
boron, total	7440-42-8	E468S	0.3	mg/L	<0.30	----
cadmium, total	7440-43-9	E468S	0.00001	mg/L	<0.000010	----
calcium, total	7440-70-2	E468S	1	mg/L	<1.0	----
cesium, total	7440-46-2	E468S	0.0005	mg/L	<0.00050	----
chromium, total	7440-47-3	E468S	0.0005	mg/L	<0.00050	----
cobalt, total	7440-48-4	E468S	0.00005	mg/L	<0.000050	----
copper, total	7440-50-8	E468S	0.0005	mg/L	<0.00050	----
gallium, total	7440-55-3	E468S	0.0005	mg/L	<0.00050	----
iron, total	7439-89-6	E468S	0.01	mg/L	<0.010	----
lead, total	7439-92-1	E468S	0.00005	mg/L	<0.000050	----
lithium, total	7439-93-2	E468S	0.02	mg/L	<0.020	----
magnesium, total	7439-95-4	E468S	1	mg/L	<1.0	----
manganese, total	7439-96-5	E468S	0.0002	mg/L	<0.00020	----
molybdenum, total	7439-98-7	E468S	0.0001	mg/L	<0.00010	----
nickel, total	7440-02-0	E468S	0.0005	mg/L	<0.00050	----
phosphorus, total	7723-14-0	E468S	0.05	mg/L	<0.050	----
potassium, total	7440-09-7	E468S	1	mg/L	<1.0	----
rhenium, total	7440-15-5	E468S	0.0005	mg/L	<0.00050	----
rubidium, total	7440-17-7	E468S	0.005	mg/L	<0.0050	----
selenium, total	7782-49-2	E468S	0.0005	mg/L	<0.00050	----
silver, total	7440-22-4	E468S	0.0001	mg/L	<0.00010	----
strontium, total	7440-24-6	E468S	0.01	mg/L	<0.010	----
sulfur, total	7704-34-9	E468S	5	mg/L	<5.0	----
tellurium, total	13494-80-9	E468S	0.0005	mg/L	<0.00050	----
thallium, total	7440-28-0	E468S	0.00005	mg/L	<0.000050	----
thorium, total	7440-29-1	E468S	0.0005	mg/L	<0.00050	----
tin, total	7440-31-5	E468S	0.001	mg/L	<0.0010	----
titanium, total	7440-32-6	E468S	0.005	mg/L	<0.0050	----
tungsten, total	7440-33-7	E468S	0.001	mg/L	<0.0010	----
uranium, total	7440-61-1	E468S	0.00005	mg/L	<0.000050	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 269825) - continued						
vanadium, total	7440-62-2	E468S	0.0005	mg/L	<0.00050	----
yttrium, total	7440-65-5	E468S	0.0005	mg/L	<0.00050	----
zinc, total	7440-66-6	E468S	0.003	mg/L	<0.0030	----
zirconium, total	7440-67-7	E468S	0.0005	mg/L	<0.00050	----
Total Metals (QCLot: 272764)						
mercury, total	7439-97-6	E508S	0.000005	mg/L	<0.0000050	----
Total Metals (QCLot: 276162)						
silicon, total	7440-21-3	E468S.NaSi	1	mg/L	<1.0	----
sodium, total	17341-25-2	E468S.NaSi	2.5	mg/L	<2.5	----
Dissolved Metals (QCLot: 269840)						
aluminum, dissolved	7429-90-5	E469S	0.005	mg/L	<0.0050	----
antimony, dissolved	7440-36-0	E469S	0.001	mg/L	<0.0010	----
arsenic, dissolved	7440-38-2	E469S	0.0004	mg/L	<0.00040	----
barium, dissolved	7440-39-3	E469S	0.001	mg/L	<0.0010	----
beryllium, dissolved	7440-41-7	E469S	0.0005	mg/L	<0.00050	----
bismuth, dissolved	7440-69-9	E469S	0.0005	mg/L	<0.00050	----
boron, dissolved	7440-42-8	E469S	0.3	mg/L	<0.30	----
cadmium, dissolved	7440-43-9	E469S	0.00001	mg/L	<0.000010	----
calcium, dissolved	7440-70-2	E469S	1	mg/L	<1.0	----
cesium, dissolved	7440-46-2	E469S	0.0005	mg/L	<0.00050	----
chromium, dissolved	7440-47-3	E469S	0.0005	mg/L	<0.00050	----
cobalt, dissolved	7440-48-4	E469S	0.00005	mg/L	<0.000050	----
copper, dissolved	7440-50-8	E469S	0.0002	mg/L	<0.00020	----
gallium, dissolved	7440-55-3	E469S	0.0005	mg/L	<0.00050	----
iron, dissolved	7439-89-6	E469S	0.01	mg/L	<0.010	----
lead, dissolved	7439-92-1	E469S	0.00005	mg/L	<0.000050	----
lithium, dissolved	7439-93-2	E469S	0.02	mg/L	<0.020	----
magnesium, dissolved	7439-95-4	E469S	1	mg/L	<1.0	----
manganese, dissolved	7439-96-5	E469S	0.0001	mg/L	<0.00010	----
molybdenum, dissolved	7439-98-7	E469S	0.0001	mg/L	<0.00010	----
nickel, dissolved	7440-02-0	E469S	0.0005	mg/L	<0.00050	----
phosphorus, dissolved	7723-14-0	E469S	0.05	mg/L	<0.050	----
potassium, dissolved	7440-09-7	E469S	1	mg/L	<1.0	----
rhenium, dissolved	7440-15-5	E469S	0.0005	mg/L	<0.00050	----
rubidium, dissolved	7440-17-7	E469S	0.005	mg/L	<0.0050	----
selenium, dissolved	7782-49-2	E469S	0.0005	mg/L	<0.00050	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 269840) - continued						
silver, dissolved	7440-22-4	E469S	0.0001	mg/L	<0.00010	----
strontium, dissolved	7440-24-6	E469S	0.01	mg/L	<0.010	----
sulfur, dissolved	7704-34-9	E469S	5	mg/L	<5.0	----
tellurium, dissolved	13494-80-9	E469S	0.0005	mg/L	<0.00050	----
thallium, dissolved	7440-28-0	E469S	0.00005	mg/L	<0.000050	----
thorium, dissolved	7440-29-1	E469S	0.0005	mg/L	<0.00050	----
tin, dissolved	7440-31-5	E469S	0.001	mg/L	<0.0010	----
titanium, dissolved	7440-32-6	E469S	0.005	mg/L	<0.0050	----
tungsten, dissolved	7440-33-7	E469S	0.001	mg/L	<0.0010	----
uranium, dissolved	7440-61-1	E469S	0.00005	mg/L	<0.000050	----
vanadium, dissolved	7440-62-2	E469S	0.0005	mg/L	<0.00050	----
yttrium, dissolved	7440-65-5	E469S	0.0005	mg/L	<0.00050	----
zinc, dissolved	7440-66-6	E469S	0.001	mg/L	<0.0010	----
zirconium, dissolved	7440-67-7	E469S	0.0005	mg/L	<0.00050	----
Dissolved Metals (QCLot: 272423)						
mercury, dissolved	7439-97-6	E509S	0.000005	mg/L	<0.0000050	----
Dissolved Metals (QCLot: 276152)						
silicon, dissolved	7440-21-3	E469S.NaSi	1	mg/L	<1.0	----
sodium, dissolved	17341-25-2	E469S.NaSi	2.5	mg/L	<2.5	----
Volatile Organic Compounds (QCLot: 271810)						
benzene	71-43-2	E611A	0.5	µg/L	<0.50	----
ethylbenzene	100-41-4	E611A	0.5	µg/L	<0.50	----
methyl-tert-butyl ether [MTBE]	1634-04-4	E611A	0.5	µg/L	<0.50	----
styrene	100-42-5	E611A	0.5	µg/L	<0.50	----
toluene	108-88-3	E611A	0.5	µg/L	<0.50	----
xylene, m+p-	179601-23-1	E611A	0.4	µg/L	<0.40	----
xylene, o-	95-47-6	E611A	0.3	µg/L	<0.30	----
Hydrocarbons (QCLot: 269387)						
F2 (C10-C16)	----	E601	100	µg/L	<100	----
F3 (C16-C34)	----	E601	250	µg/L	<250	----
F4 (C34-C50)	----	E601	250	µg/L	<250	----
Hydrocarbons (QCLot: 271809)						
F1 (C6-C10)	----	E581.VH+F1	100	µg/L	<100	----
VHw (C6-C10)	----	E581.VH+F1	100	µg/L	<100	----
Polycyclic Aromatic Hydrocarbons (QCLot: 269384)						
acenaphthene	83-32-9	E641A	0.01	µg/L	<0.010	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Polycyclic Aromatic Hydrocarbons (QCLot: 269384) - continued						
acenaphthylene	208-96-8	E641A	0.01	µg/L	<0.010	----
acridine	260-94-6	E641A	0.01	µg/L	<0.010	----
anthracene	120-12-7	E641A	0.01	µg/L	<0.010	----
benz(a)anthracene	56-55-3	E641A	0.01	µg/L	<0.010	----
benzo(a)pyrene	50-32-8	E641A	0.005	µg/L	<0.0050	----
benzo(b+j)fluoranthene	----	E641A	0.01	µg/L	<0.010	----
benzo(g,h,i)perylene	191-24-2	E641A	0.01	µg/L	<0.010	----
benzo(k)fluoranthene	207-08-9	E641A	0.01	µg/L	<0.010	----
chrysene	218-01-9	E641A	0.01	µg/L	<0.010	----
dibenz(a,h)anthracene	53-70-3	E641A	0.005	µg/L	<0.0050	----
fluoranthene	206-44-0	E641A	0.01	µg/L	<0.010	----
fluorene	86-73-7	E641A	0.01	µg/L	<0.010	----
indeno(1,2,3-c,d)pyrene	193-39-5	E641A	0.01	µg/L	<0.010	----
methylnaphthalene, 1-	90-12-0	E641A	0.01	µg/L	<0.010	----
methylnaphthalene, 2-	91-57-6	E641A	0.01	µg/L	<0.010	----
naphthalene	91-20-3	E641A	0.05	µg/L	<0.050	----
phenanthrene	85-01-8	E641A	0.02	µg/L	<0.020	----
pyrene	129-00-0	E641A	0.01	µg/L	<0.010	----
quinoline	6027-02-7	E641A	0.05	µg/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	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 269478)									
turbidity	----	E121	0.1	NTU	200 NTU	98.5	85.0	115	----
Physical Tests (QCLot: 269479)									
turbidity	----	E121	0.1	NTU	200 NTU	98.5	85.0	115	----
Physical Tests (QCLot: 270495)									
pH	----	E108	----	pH units	7 pH units	99.8	98.0	102	----
Physical Tests (QCLot: 270497)									
alkalinity, total (as CaCO3)	----	E290	1	mg/L	500 mg/L	98.6	85.0	115	----
Physical Tests (QCLot: 270498)									
conductivity	----	E100S	2	µS/cm	146.9 µS/cm	98.6	80.0	120	----
Physical Tests (QCLot: 272077)									
solids, total suspended [TSS]	----	E160S	2	mg/L	150 mg/L	104	85.0	115	----
Physical Tests (QCLot: 273892)									
solids, total dissolved [TDS]	----	E162S	10	mg/L	1000 mg/L	97.0	85.0	115	----
Anions and Nutrients (QCLot: 271604)									
Kjeldahl nitrogen, total [TKN]	----	E318S	0.05	mg/L	4 mg/L	93.7	75.0	125	----
Anions and Nutrients (QCLot: 273986)									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.2 mg/L	95.2	85.0	115	----
Anions and Nutrients (QCLot: 273987)									
phosphorus, total	7723-14-0	E372S	0.002	mg/L	0.05 mg/L	101	80.0	120	----
Anions and Nutrients (QCLot: 274514)									
bromide	24959-67-9	E235S.Br	5	mg/L	0.5 mg/L	97.9	85.0	115	----
Anions and Nutrients (QCLot: 274515)									
chloride	16887-00-6	E235S.Cl	50	mg/L	100 mg/L	101	90.0	110	----
Anions and Nutrients (QCLot: 274516)									
fluoride	16984-48-8	E235S.F-L	0.2	mg/L	1 mg/L	95.8	90.0	110	----
Anions and Nutrients (QCLot: 274517)									
nitrate (as N)	14797-55-8	E235S.NO3-T	0.01	mg/L	2.5 mg/L	101	90.0	110	----
Anions and Nutrients (QCLot: 274518)									
nitrite (as N)	14797-65-0	E235S.NO2-L	0.01	mg/L	0.5 mg/L	96.0	90.0	110	----
Anions and Nutrients (QCLot: 274519)									
sulfate (as SO4)	14808-79-8	E235S.SO4-L	3	mg/L	100 mg/L	101	90.0	110	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Spike Concentration	Recovery (%) LCS	Recovery Limits (%) Low	Recovery Limits (%) High	Qualifier
Organic / Inorganic Carbon (QCLot: 271969)									
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	8.57 mg/L	98.2	80.0	120	----
Organic / Inorganic Carbon (QCLot: 274733)									
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	8.57 mg/L	96.6	80.0	120	----
Total Metals (QCLot: 269825)									
aluminum, total	7429-90-5	E468S	0.005	mg/L	2 mg/L	103	80.0	120	----
antimony, total	7440-36-0	E468S	0.001	mg/L	1 mg/L	105	80.0	120	----
arsenic, total	7440-38-2	E468S	0.0004	mg/L	1 mg/L	101	80.0	120	----
barium, total	7440-39-3	E468S	0.001	mg/L	0.25 mg/L	102	80.0	120	----
beryllium, total	7440-41-7	E468S	0.0005	mg/L	0.1 mg/L	100	80.0	120	----
bismuth, total	7440-69-9	E468S	0.0005	mg/L	1 mg/L	107	80.0	120	----
boron, total	7440-42-8	E468S	0.3	mg/L	10 mg/L	96.5	80.0	120	----
cadmium, total	7440-43-9	E468S	0.00001	mg/L	0.1 mg/L	107	80.0	120	----
calcium, total	7440-70-2	E468S	1	mg/L	50 mg/L	101	80.0	120	----
cesium, total	7440-46-2	E468S	0.0005	mg/L	0.05 mg/L	103	80.0	120	----
chromium, total	7440-47-3	E468S	0.0005	mg/L	0.25 mg/L	99.7	80.0	120	----
cobalt, total	7440-48-4	E468S	0.00005	mg/L	0.25 mg/L	108	80.0	120	----
copper, total	7440-50-8	E468S	0.0005	mg/L	0.25 mg/L	105	80.0	120	----
gallium, total	7440-55-3	E468S	0.0005	mg/L	0.25 mg/L	103	80.0	120	----
iron, total	7439-89-6	E468S	0.01	mg/L	1 mg/L	108	80.0	120	----
lead, total	7439-92-1	E468S	0.00005	mg/L	0.5 mg/L	107	80.0	120	----
lithium, total	7439-93-2	E468S	0.02	mg/L	0.25 mg/L	100	80.0	120	----
magnesium, total	7439-95-4	E468S	1	mg/L	50 mg/L	102	80.0	120	----
manganese, total	7439-96-5	E468S	0.0002	mg/L	0.25 mg/L	104	80.0	120	----
molybdenum, total	7439-98-7	E468S	0.0001	mg/L	0.25 mg/L	98.1	80.0	120	----
nickel, total	7440-02-0	E468S	0.0005	mg/L	0.5 mg/L	104	80.0	120	----
phosphorus, total	7723-14-0	E468S	0.05	mg/L	10 mg/L	106	80.0	120	----
potassium, total	7440-09-7	E468S	1	mg/L	50 mg/L	101	80.0	120	----
rhenium, total	7440-15-5	E468S	0.0005	mg/L	0.1 mg/L	103	80.0	120	----
rubidium, total	7440-17-7	E468S	0.005	mg/L	0.1 mg/L	106	80.0	120	----
selenium, total	7782-49-2	E468S	0.0005	mg/L	1 mg/L	110	80.0	120	----
silver, total	7440-22-4	E468S	0.0001	mg/L	0.1 mg/L	104	80.0	120	----
strontium, total	7440-24-6	E468S	0.01	mg/L	0.25 mg/L	106	80.0	120	----
sulfur, total	7704-34-9	E468S	5	mg/L	50 mg/L	93.4	80.0	120	----
tellurium, total	13494-80-9	E468S	0.0005	mg/L	0.1 mg/L	111	80.0	120	----
thallium, total	7440-28-0	E468S	0.00005	mg/L	1 mg/L	108	80.0	120	----
thorium, total	7440-29-1	E468S	0.0005	mg/L	0.1 mg/L	93.6	80.0	120	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Spike Concentration	Recovery (%) LCS	Recovery Limits (%) Low	Recovery Limits (%) High	Qualifier
Total Metals (QCLot: 269825) - continued									
tin, total	7440-31-5	E468S	0.001	mg/L	0.5 mg/L	102	80.0	120	----
titanium, total	7440-32-6	E468S	0.005	mg/L	0.25 mg/L	95.6	80.0	120	----
tungsten, total	7440-33-7	E468S	0.001	mg/L	0.1 mg/L	100.0	80.0	120	----
uranium, total	7440-61-1	E468S	0.00005	mg/L	0.005 mg/L	96.2	80.0	120	----
vanadium, total	7440-62-2	E468S	0.0005	mg/L	0.5 mg/L	98.0	80.0	120	----
yttrium, total	7440-65-5	E468S	0.0005	mg/L	0.1 mg/L	102	80.0	120	----
zinc, total	7440-66-6	E468S	0.003	mg/L	0.5 mg/L	107	80.0	120	----
zirconium, total	7440-67-7	E468S	0.0005	mg/L	0.1 mg/L	96.1	80.0	120	----
Total Metals (QCLot: 272764)									
mercury, total	7439-97-6	E508S	0.000005	mg/L	0.0001 mg/L	96.7	80.0	120	----
Total Metals (QCLot: 276162)									
silicon, total	7440-21-3	E468S.NaSi	1	mg/L	10 mg/L	100	80.0	120	----
sodium, total	17341-25-2	E468S.NaSi	2.5	mg/L	50 mg/L	104	80.0	120	----
Dissolved Metals (QCLot: 269840)									
aluminum, dissolved	7429-90-5	E469S	0.005	mg/L	2 mg/L	108	80.0	120	----
antimony, dissolved	7440-36-0	E469S	0.001	mg/L	1 mg/L	100	80.0	120	----
arsenic, dissolved	7440-38-2	E469S	0.0004	mg/L	1 mg/L	100	80.0	120	----
barium, dissolved	7440-39-3	E469S	0.001	mg/L	0.25 mg/L	108	80.0	120	----
beryllium, dissolved	7440-41-7	E469S	0.0005	mg/L	0.1 mg/L	97.5	80.0	120	----
bismuth, dissolved	7440-69-9	E469S	0.0005	mg/L	1 mg/L	109	80.0	120	----
boron, dissolved	7440-42-8	E469S	0.3	mg/L	10 mg/L	94.6	80.0	120	----
cadmium, dissolved	7440-43-9	E469S	0.00001	mg/L	0.1 mg/L	102	80.0	120	----
calcium, dissolved	7440-70-2	E469S	1	mg/L	50 mg/L	99.8	80.0	120	----
cesium, dissolved	7440-46-2	E469S	0.0005	mg/L	0.05 mg/L	98.6	80.0	120	----
chromium, dissolved	7440-47-3	E469S	0.0005	mg/L	0.25 mg/L	105	80.0	120	----
cobalt, dissolved	7440-48-4	E469S	0.00005	mg/L	0.25 mg/L	111	80.0	120	----
copper, dissolved	7440-50-8	E469S	0.0002	mg/L	0.25 mg/L	106	80.0	120	----
gallium, dissolved	7440-55-3	E469S	0.0005	mg/L	0.25 mg/L	101	80.0	120	----
iron, dissolved	7439-89-6	E469S	0.01	mg/L	1 mg/L	103	80.0	120	----
lead, dissolved	7439-92-1	E469S	0.00005	mg/L	0.5 mg/L	106	80.0	120	----
lithium, dissolved	7439-93-2	E469S	0.02	mg/L	0.25 mg/L	98.3	80.0	120	----
magnesium, dissolved	7439-95-4	E469S	1	mg/L	50 mg/L	101	80.0	120	----
manganese, dissolved	7439-96-5	E469S	0.0001	mg/L	0.25 mg/L	104	80.0	120	----
molybdenum, dissolved	7439-98-7	E469S	0.0001	mg/L	0.25 mg/L	98.5	80.0	120	----
nickel, dissolved	7440-02-0	E469S	0.0005	mg/L	0.5 mg/L	107	80.0	120	----
phosphorus, dissolved	7723-14-0	E469S	0.05	mg/L	10 mg/L	105	80.0	120	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
					Concentration	LCS	Low	High	Qualifier
Dissolved Metals (QCLot: 269840) - continued									
potassium, dissolved	7440-09-7	E469S	1	mg/L	50 mg/L	107	80.0	120	----
rhenium, dissolved	7440-15-5	E469S	0.0005	mg/L	0.1 mg/L	103	80.0	120	----
rubidium, dissolved	7440-17-7	E469S	0.005	mg/L	0.1 mg/L	112	80.0	120	----
selenium, dissolved	7782-49-2	E469S	0.0005	mg/L	1 mg/L	107	80.0	120	----
silver, dissolved	7440-22-4	E469S	0.0001	mg/L	0.1 mg/L	105	80.0	120	----
strontium, dissolved	7440-24-6	E469S	0.01	mg/L	0.25 mg/L	96.0	80.0	120	----
sulfur, dissolved	7704-34-9	E469S	5	mg/L	50 mg/L	85.9	80.0	120	----
tellurium, dissolved	13494-80-9	E469S	0.0005	mg/L	0.1 mg/L	112	80.0	120	----
thallium, dissolved	7440-28-0	E469S	0.00005	mg/L	1 mg/L	108	80.0	120	----
thorium, dissolved	7440-29-1	E469S	0.0005	mg/L	0.1 mg/L	88.8	80.0	120	----
tin, dissolved	7440-31-5	E469S	0.001	mg/L	0.5 mg/L	101	80.0	120	----
titanium, dissolved	7440-32-6	E469S	0.005	mg/L	0.25 mg/L	100	80.0	120	----
tungsten, dissolved	7440-33-7	E469S	0.001	mg/L	0.1 mg/L	98.7	80.0	120	----
uranium, dissolved	7440-61-1	E469S	0.00005	mg/L	0.005 mg/L	96.2	80.0	120	----
vanadium, dissolved	7440-62-2	E469S	0.0005	mg/L	0.5 mg/L	103	80.0	120	----
yttrium, dissolved	7440-65-5	E469S	0.0005	mg/L	0.1 mg/L	97.1	80.0	120	----
zinc, dissolved	7440-66-6	E469S	0.001	mg/L	0.5 mg/L	115	80.0	120	----
zirconium, dissolved	7440-67-7	E469S	0.0005	mg/L	0.1 mg/L	91.8	80.0	120	----
mercury, dissolved	7439-97-6	E509S	0.000005	mg/L	0.0001 mg/L	101	80.0	120	----
silicon, dissolved	7440-21-3	E469S.NaSi	1	mg/L	10 mg/L	95.5	80.0	120	----
sodium, dissolved	17341-25-2	E469S.NaSi	2.5	mg/L	50 mg/L	97.5	80.0	120	----
Volatile Organic Compounds (QCLot: 271810)									
benzene	71-43-2	E611A	0.5	µg/L	100 µg/L	116	70.0	130	----
ethylbenzene	100-41-4	E611A	0.5	µg/L	100 µg/L	120	70.0	130	----
methyl-tert-butyl ether [MTBE]	1634-04-4	E611A	0.5	µg/L	100 µg/L	112	70.0	130	----
styrene	100-42-5	E611A	0.5	µg/L	100 µg/L	106	70.0	130	----
toluene	108-88-3	E611A	0.5	µg/L	100 µg/L	108	70.0	130	----
xylene, m+p-	179601-23-1	E611A	0.4	µg/L	200 µg/L	110	70.0	130	----
xylene, o-	95-47-6	E611A	0.3	µg/L	100 µg/L	116	70.0	130	----
Hydrocarbons (QCLot: 269387)									
F2 (C10-C16)	----	E601	100	µg/L	3538 µg/L	102	70.0	130	----
F3 (C16-C34)	----	E601	250	µg/L	7053 µg/L	94.8	70.0	130	----
F4 (C34-C50)	----	E601	250	µg/L	5051 µg/L	95.0	70.0	130	----
Hydrocarbons (QCLot: 271809)									
F1 (C6-C10)	----	E581.VH+F1	100	µg/L	6310 µg/L	82.6	70.0	130	----
VHw (C6-C10)	----	E581.VH+F1	100	µg/L	6310 µg/L	72.9	70.0	130	----

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
Polycyclic Aromatic Hydrocarbons (QCLot: 269384)									
acenaphthene	83-32-9	E641A	0.01	µg/L	0.5 µg/L	112	60.0	130	----
acenaphthylene	208-96-8	E641A	0.01	µg/L	0.5 µg/L	117	60.0	130	----
acridine	260-94-6	E641A	0.01	µg/L	0.5 µg/L	118	60.0	130	----
anthracene	120-12-7	E641A	0.01	µg/L	0.701 µg/L	92.8	60.0	130	----
benz(a)anthracene	56-55-3	E641A	0.01	µg/L	0.743 µg/L	92.6	60.0	130	----
benzo(a)pyrene	50-32-8	E641A	0.005	µg/L	0.5 µg/L	121	60.0	130	----
benzo(b+j)fluoranthene	----	E641A	0.01	µg/L	0.5 µg/L	91.6	60.0	130	----
benzo(g,h,i)perylene	191-24-2	E641A	0.01	µg/L	0.5 µg/L	114	60.0	130	----
benzo(k)fluoranthene	207-08-9	E641A	0.01	µg/L	0.5 µg/L	102	60.0	130	----
chrysene	218-01-9	E641A	0.01	µg/L	0.705 µg/L	88.6	60.0	130	----
dibenz(a,h)anthracene	53-70-3	E641A	0.005	µg/L	0.685 µg/L	92.5	60.0	130	----
fluoranthene	206-44-0	E641A	0.01	µg/L	0.681 µg/L	90.7	60.0	130	----
fluorene	86-73-7	E641A	0.01	µg/L	0.5 µg/L	122	60.0	130	----
indeno(1,2,3-c,d)pyrene	193-39-5	E641A	0.01	µg/L	0.749 µg/L	100	60.0	130	----
methylnaphthalene, 1-	90-12-0	E641A	0.01	µg/L	0.5 µg/L	109	60.0	130	----
methylnaphthalene, 2-	91-57-6	E641A	0.01	µg/L	0.5 µg/L	106	60.0	130	----
naphthalene	91-20-3	E641A	0.05	µg/L	0.5 µg/L	100	50.0	130	----
phenanthrene	85-01-8	E641A	0.02	µg/L	0.5 µg/L	122	60.0	130	----
pyrene	129-00-0	E641A	0.01	µg/L	0.705 µg/L	90.0	60.0	130	----
quinoline	6027-02-7	E641A	0.05	µg/L	0.5 µg/L	111	60.0	130	----

Matrix Spike (MS) Report

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

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Anions and Nutrients (QCLot: 271604)										
YL2101029-002	MP-06-North	Kjeldahl nitrogen, total [TKN]	----	E318S	2.75 mg/L	2.5 mg/L	110	70.0	130	----
Anions and Nutrients (QCLot: 273986)										
YL2101029-002	MP-06-North	ammonia, total (as N)	7664-41-7	E298	0.106 mg/L	0.1 mg/L	106	75.0	125	----
Anions and Nutrients (QCLot: 273987)										
YL2101029-002	MP-06-North	phosphorus, total	7723-14-0	E372S	0.0863 mg/L	0.1 mg/L	86.3	70.0	130	----
Anions and Nutrients (QCLot: 274514)										
VA21B7539-002	Anonymous	bromide	24959-67-9	E235S.Br	ND mg/L	50 mg/L	ND	75.0	125	----
Anions and Nutrients (QCLot: 274515)										
VA21B7539-002	Anonymous	chloride	16887-00-6	E235S.Cl	ND mg/L	10000 mg/L	ND	75.0	125	----
Anions and Nutrients (QCLot: 274516)										
VA21B7539-002	Anonymous	fluoride	16984-48-8	E235S.F-L	8.20 mg/L	10 mg/L	82.0	75.0	125	----
Anions and Nutrients (QCLot: 274517)										
VA21B7539-002	Anonymous	nitrate (as N)	14797-55-8	E235S.NO3-T	7.50 mg/L	7.5 mg/L	100	75.0	125	----
Anions and Nutrients (QCLot: 274518)										
VA21B7539-002	Anonymous	nitrite (as N)	14797-65-0	E235S.NO2-L	1.43 mg/L	1.5 mg/L	95.1	75.0	125	----
Anions and Nutrients (QCLot: 274519)										
VA21B7539-002	Anonymous	sulfate (as SO4)	14808-79-8	E235S.SO4-L	ND mg/L	1000 mg/L	ND	75.0	125	----
Organic / Inorganic Carbon (QCLot: 271969)										
YL2101029-002	MP-06-North	carbon, total organic [TOC]	----	E355-L	5.09 mg/L	5 mg/L	102	70.0	130	----
Organic / Inorganic Carbon (QCLot: 274733)										
YL2101029-002	MP-06-North	carbon, dissolved organic [DOC]	----	E358-L	5.34 mg/L	5 mg/L	107	70.0	130	----
Total Metals (QCLot: 269825)										
VA21B7069-062	Anonymous	aluminum, total	7429-90-5	E468S	0.430 mg/L	0.4 mg/L	108	70.0	130	----
		antimony, total	7440-36-0	E468S	0.0382 mg/L	0.04 mg/L	95.6	70.0	130	----
		arsenic, total	7440-38-2	E468S	0.0359 mg/L	0.04 mg/L	89.7	70.0	130	----
		barium, total	7440-39-3	E468S	0.0369 mg/L	0.04 mg/L	92.2	70.0	130	----
		beryllium, total	7440-41-7	E468S	0.0776 mg/L	0.08 mg/L	97.1	70.0	130	----
		bismuth, total	7440-69-9	E468S	0.0164 mg/L	0.02 mg/L	81.8	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: 269825) - continued										
VA21B7069-062	Anonymous	boron, total	7440-42-8	E468S	ND mg/L	0.2 mg/L	ND	70.0	130	----
		cadmium, total	7440-43-9	E468S	0.00707 mg/L	0.008 mg/L	88.4	70.0	130	----
		calcium, total	7440-70-2	E468S	ND mg/L	8 mg/L	ND	70.0	130	----
		cesium, total	7440-46-2	E468S	0.0200 mg/L	0.02 mg/L	99.8	70.0	130	----
		chromium, total	7440-47-3	E468S	0.0775 mg/L	0.08 mg/L	96.9	70.0	130	----
		cobalt, total	7440-48-4	E468S	0.0375 mg/L	0.04 mg/L	93.9	70.0	130	----
		copper, total	7440-50-8	E468S	0.0331 mg/L	0.04 mg/L	82.7	70.0	130	----
		gallium, total	7440-55-3	E468S	0.00507 mg/L	0.005 mg/L	101	70.0	130	----
		iron, total	7439-89-6	E468S	3.91 mg/L	4 mg/L	97.8	70.0	130	----
		lead, total	7439-92-1	E468S	0.0339 mg/L	0.04 mg/L	84.7	70.0	130	----
		lithium, total	7439-93-2	E468S	0.180 mg/L	0.2 mg/L	89.9	70.0	130	----
		magnesium, total	7439-95-4	E468S	ND mg/L	2 mg/L	ND	70.0	130	----
		manganese, total	7439-96-5	E468S	0.0407 mg/L	0.04 mg/L	102	70.0	130	----
		molybdenum, total	7439-98-7	E468S	0.0384 mg/L	0.04 mg/L	96.1	70.0	130	----
		nickel, total	7440-02-0	E468S	0.0686 mg/L	0.08 mg/L	85.8	70.0	130	----
		phosphorus, total	7723-14-0	E468S	21.8 mg/L	20 mg/L	109	70.0	130	----
		potassium, total	7440-09-7	E468S	ND mg/L	8 mg/L	ND	70.0	130	----
		rhenium, total	7440-15-5	E468S	0.00440 mg/L	0.005 mg/L	88.0	70.0	130	----
		rubidium, total	7440-17-7	E468S	ND mg/L	0.04 mg/L	ND	70.0	130	----
		selenium, total	7782-49-2	E468S	0.0739 mg/L	0.08 mg/L	92.4	70.0	130	----
		silver, total	7440-22-4	E468S	0.00695 mg/L	0.008 mg/L	86.9	70.0	130	----
		strontium, total	7440-24-6	E468S	ND mg/L	0.04 mg/L	ND	70.0	130	----
		sulfur, total	7704-34-9	E468S	ND mg/L	40 mg/L	ND	70.0	130	----
		tellurium, total	13494-80-9	E468S	0.0685 mg/L	0.08 mg/L	85.6	70.0	130	----
		thallium, total	7440-28-0	E468S	0.00719 mg/L	0.008 mg/L	89.8	70.0	130	----
		thorium, total	7440-29-1	E468S	0.0392 mg/L	0.04 mg/L	98.0	70.0	130	----
		tin, total	7440-31-5	E468S	0.0372 mg/L	0.04 mg/L	92.9	70.0	130	----
		titanium, total	7440-32-6	E468S	0.0847 mg/L	0.08 mg/L	106	70.0	130	----
		tungsten, total	7440-33-7	E468S	0.0372 mg/L	0.04 mg/L	93.0	70.0	130	----
		uranium, total	7440-61-1	E468S	0.00689 mg/L	0.008 mg/L	86.1	70.0	130	----
		vanadium, total	7440-62-2	E468S	0.203 mg/L	0.2 mg/L	102	70.0	130	----
		yttrium, total	7440-65-5	E468S	0.00558 mg/L	0.005 mg/L	112	70.0	130	----
		zinc, total	7440-66-6	E468S	0.668 mg/L	0.8 mg/L	83.5	70.0	130	----
		zirconium, total	7440-67-7	E468S	0.0810 mg/L	0.08 mg/L	101	70.0	130	----
Total Metals (QCLot: 272764)										
YL2101029-001	MP-06-North FBlank-2	mercury, total	7439-97-6	E508S	0.0000988 mg/L	0.0001 mg/L	98.8	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: 276162)										
YL2101029-002	MP-06-North	silicon, total	7440-21-3	E468S.NaSi	464 mg/L	500 mg/L	92.8	70.0	130	----
		sodium, total	17341-25-2	E468S.NaSi	ND mg/L	100 mg/L	ND	70.0	130	----
Dissolved Metals (QCLot: 269840)										
YL2101029-002	MP-06-North	aluminum, dissolved	7429-90-5	E469S	0.432 mg/L	0.4 mg/L	108	70.0	130	----
		antimony, dissolved	7440-36-0	E469S	0.0363 mg/L	0.04 mg/L	90.8	70.0	130	----
		arsenic, dissolved	7440-38-2	E469S	0.0383 mg/L	0.04 mg/L	95.7	70.0	130	----
		barium, dissolved	7440-39-3	E469S	0.0412 mg/L	0.04 mg/L	103	70.0	130	----
		beryllium, dissolved	7440-41-7	E469S	0.0769 mg/L	0.08 mg/L	96.1	70.0	130	----
		bismuth, dissolved	7440-69-9	E469S	0.0166 mg/L	0.02 mg/L	83.3	70.0	130	----
		boron, dissolved	7440-42-8	E469S	ND mg/L	0.2 mg/L	ND	70.0	130	----
		cadmium, dissolved	7440-43-9	E469S	0.00761 mg/L	0.008 mg/L	95.2	70.0	130	----
		calcium, dissolved	7440-70-2	E469S	ND mg/L	8 mg/L	ND	70.0	130	----
		cesium, dissolved	7440-46-2	E469S	0.0186 mg/L	0.02 mg/L	92.9	70.0	130	----
		chromium, dissolved	7440-47-3	E469S	0.0837 mg/L	0.08 mg/L	104	70.0	130	----
		cobalt, dissolved	7440-48-4	E469S	0.0394 mg/L	0.04 mg/L	98.4	70.0	130	----
		copper, dissolved	7440-50-8	E469S	0.0367 mg/L	0.04 mg/L	91.8	70.0	130	----
		gallium, dissolved	7440-55-3	E469S	0.00510 mg/L	0.005 mg/L	102	70.0	130	----
		iron, dissolved	7439-89-6	E469S	4.15 mg/L	4 mg/L	104	70.0	130	----
		lead, dissolved	7439-92-1	E469S	0.0342 mg/L	0.04 mg/L	85.5	70.0	130	----
		lithium, dissolved	7439-93-2	E469S	0.180 mg/L	0.2 mg/L	89.8	70.0	130	----
		magnesium, dissolved	7439-95-4	E469S	ND mg/L	2 mg/L	ND	70.0	130	----
		manganese, dissolved	7439-96-5	E469S	0.0402 mg/L	0.04 mg/L	100	70.0	130	----
		molybdenum, dissolved	7439-98-7	E469S	0.0385 mg/L	0.04 mg/L	96.3	70.0	130	----
		nickel, dissolved	7440-02-0	E469S	0.0752 mg/L	0.08 mg/L	94.0	70.0	130	----
		phosphorus, dissolved	7723-14-0	E469S	22.0 mg/L	20 mg/L	110	70.0	130	----
		potassium, dissolved	7440-09-7	E469S	ND mg/L	8 mg/L	ND	70.0	130	----
		rhenium, dissolved	7440-15-5	E469S	0.00503 mg/L	0.005 mg/L	101	70.0	130	----
		rubidium, dissolved	7440-17-7	E469S	ND mg/L	0.04 mg/L	ND	70.0	130	----
		selenium, dissolved	7782-49-2	E469S	0.0807 mg/L	0.08 mg/L	101	70.0	130	----
		silver, dissolved	7440-22-4	E469S	0.00709 mg/L	0.008 mg/L	88.6	70.0	130	----
		strontium, dissolved	7440-24-6	E469S	ND mg/L	0.04 mg/L	ND	70.0	130	----
		sulfur, dissolved	7704-34-9	E469S	ND mg/L	40 mg/L	ND	70.0	130	----
		tellurium, dissolved	13494-80-9	E469S	0.0736 mg/L	0.08 mg/L	92.1	70.0	130	----
		thallium, dissolved	7440-28-0	E469S	0.00702 mg/L	0.008 mg/L	87.7	70.0	130	----
		thorium, dissolved	7440-29-1	E469S	0.0359 mg/L	0.04 mg/L	89.9	70.0	130	----
		tin, dissolved	7440-31-5	E469S	0.0367 mg/L	0.04 mg/L	91.8	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Dissolved Metals (QCLot: 269840) - continued										
YL2101029-002	MP-06-North	titanium, dissolved	7440-32-6	E469S	0.0857 mg/L	0.08 mg/L	107	70.0	130	----
		tungsten, dissolved	7440-33-7	E469S	0.0363 mg/L	0.04 mg/L	90.7	70.0	130	----
		uranium, dissolved	7440-61-1	E469S	0.00662 mg/L	0.008 mg/L	82.8	70.0	130	----
		vanadium, dissolved	7440-62-2	E469S	0.212 mg/L	0.2 mg/L	106	70.0	130	----
		yttrium, dissolved	7440-65-5	E469S	0.00606 mg/L	0.005 mg/L	121	70.0	130	----
		zinc, dissolved	7440-66-6	E469S	0.775 mg/L	0.8 mg/L	96.9	70.0	130	----
		zirconium, dissolved	7440-67-7	E469S	0.0794 mg/L	0.08 mg/L	99.3	70.0	130	----
Dissolved Metals (QCLot: 272423)										
YL2101029-002	MP-06-North	mercury, dissolved	7439-97-6	E509S	0.0000986 mg/L	0.0001 mg/L	98.6	70.0	130	----
Dissolved Metals (QCLot: 276152)										
YL2101029-002	MP-06-North	silicon, dissolved	7440-21-3	E469S.NaSi	468 mg/L	500 mg/L	93.5	70.0	130	----
		sodium, dissolved	17341-25-2	E469S.NaSi	ND mg/L	100 mg/L	ND	70.0	130	----
Volatile Organic Compounds (QCLot: 271810)										
VA21B7173-002	Anonymous	benzene	71-43-2	E611A	114 µg/L	100 µg/L	114	60.0	140	----
		ethylbenzene	100-41-4	E611A	122 µg/L	100 µg/L	122	60.0	140	----
		methyl-tert-butyl ether [MTBE]	1634-04-4	E611A	114 µg/L	100 µg/L	114	60.0	140	----
		styrene	100-42-5	E611A	108 µg/L	100 µg/L	108	60.0	140	----
		toluene	108-88-3	E611A	108 µg/L	100 µg/L	108	60.0	140	----
		xylene, m+p-	179601-23-1	E611A	224 µg/L	200 µg/L	112	60.0	140	----
		xylene, o-	95-47-6	E611A	118 µg/L	100 µg/L	118	60.0	140	----
Hydrocarbons (QCLot: 271809)										
VA21B7173-001	Anonymous	F1 (C6-C10)	----	E581.VH+F1	6240 µg/L	6310 µg/L	98.9	60.0	140	----
		VHw (C6-C10)	----	E581.VH+F1	5500 µg/L	6310 µg/L	87.2	60.0	140	----

Chain of Custody (COC) / Analytical Request Form

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COC Number: 20 - 920781

Report To	Contact and company name below will appear on the final report
Company:	Golder Associates Ltd.
Contact:	Trish Tomliens / Elaine Irving
Phone:	250-881-7372
	Company address below will appear on the final report
Street:	200-2920 Virtual Way
City/Province:	Vancouver, BC
Postal Code:	V5M 0C4
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	
Contact:	

Reports / Recipients	
Select Report Format:	☑ PDF ☑ EXCEL ☐ EDD (DIGITAL)
Merge QC/QCI Reports with COA	☑ YES ☐ NO ☐ N/A
☐ Compare Results to Criteria on Report - provide details below if box checked	
Select Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	Patricia-Tomliens@golder.com
Email 2	Elaine-IRVING@golder.com
Email 3	
Invoice Recipients	
Select Invoice Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	
Email 2	

Turnaround Time (TAT) Requested

- ☑ Routine [R] if received by 3pm M-F - no surcharges apply
- ☐ 4 day [P4] if received by 3pm M-F - 20% rush surcharge minimum
- ☐ 3 day [P3] if received by 3pm M-F - 25% rush surcharge minimum
- ☐ 2 day [P2] if received by 3pm M-F - 50% rush surcharge minimum
- ☐ 1 day [E] if received by 3pm M-F - 100% rush surcharge minimum
- ☐ Same day [E2] if received by 10am M-S - 200% rush surcharge. Additional fees may apply to rush requests on weekends, statutory holidays and non-routine tests

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

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

AFFIX ALS BARCODE LABEL HERE (ALS use only)

Environmental Division
Yellowknife
Work Order Reference
YL2101029

Telephone : +1 867 873 5593

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:	Q84262	AFE/Cost Center:	PO#
Job #:	1663724-44000-03	Major/Minor Code:	Routing Code:
PO / AFE:		Requisitioner:	
LSD:		Location:	
ALS Lab Work Order # (ALS use only):	YL2101029	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	General (pH, Alkalinity, TSS, turbidity, Conductivity)	Dissolved metals	Total metals	Dissolved mercury	Total mercury	Total nutrients	TOC, TKN	BTEX/F1	F2-F4, PAH	SAMPLES ON HOLD	EXTENDED STORAGE REQUIRED	SUSPECTED HAZARD (see notes)
							F/P	P	F/P	P	P	P	P	P			
	MP-06-North-FBlank-2	14-Aug-21	11:15	Seawater	6	X	X	X	X	X	X	X					
	MP-06-North	14-Aug-21	11:10	Seawater	6	X	X	X	X	X	X	X					
	MP-06-WNW	14-Aug-21	10:55	Seawater	6	X	X	X	X	X	X	X					
	MP-06-Source	14-Aug-21	11:25	Seawater	10	X	X	X	X	X	X	X	X	X			
	MP-06-ENE	14-Aug-21	11:40	Seawater	10	X	X	X	X	X	X	X	X	X			
	MP-05-Source	14-Aug-21	09:55	Seawater	10	X	X	X	X	X	X	X	X	X			
	MP-05-WNW	14-Aug-21	09:40	Seawater	6	X	X	X	X	X	X	X					
	MP-05-North	14-Aug-21	08:41	Seawater	10	X	X	X	X	X	X	X	X	X			
	MP-05-ENE	14-Aug-21	09:30	Seawater	6	X	X	X	X	X	X	X					

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

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

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

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: 4.7

FINAL COOLER TEMPERATURES °C:

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (ALS use only)			FINAL SHIPMENT RECEPTION (ALS use only)		
Released by:	Date:	Time:	Received by: [signature]	Date: 16 Aug 21	Time: 8:45	Received by:	Date:	Time:

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

AUG 2020 FRONT

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

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

GENERAL TERMS AND CONDITIONS:

These terms and conditions are incorporated in and form part of the Agreement between ALS Group's Environmental Division and the party named in the Offer (the "Client").

1. Definitions. Capitalized Terms not defined in these Terms and Conditions have the definitions set out in the other Agreement documents.
2. The Services. ALS will provide the Services to the Client as described in the Offer and in any chain of custody form provided with any sample. Unless otherwise agreed, ALS may elect to re-allocate testing, without prior notice, to other ALS Canada laboratories with equivalent services and applicable accreditations and licenses, if required to prevent hold time or due date exceedance due to unanticipated over-capacity situations.
3. Prices. ALS may review and change all prices, fees, surcharges or other charges set out in the Agreement if there are changes to ALS's cost beyond ALS's control, including changes in legislative requirements, Client variations of sample numbers and Client requests for changes to standard reporting requirements. Notwithstanding Condition 3, all quotations expire after three years.
4. Payment Terms. The Client shall pay ALS within 30 days of the invoice date OAC. ALS may, for reasonable business reasons, require the Client to arrange for payment in advance.
5. Quotation Numbers. The Client shall provide the quotation number to ALS (where applicable) to ensure correct pricing.
6. Taxes. Applicable taxes are not included in prices. Applicable surcharges and additional fees will be added at the time of invoicing.
7. Quality Control. ALS has an extensive QA/QC program. Clients' samples are analyzed using approved, referenced procedures followed by thorough data validation prior to reporting of the analytical results.
8. Test Results. Results are obtained from analytical measurements that are subject to inherent variability. Measurement results reflect characteristics of submitted test samples at time of analysis. The Client is responsible for informing itself on the limitation of test results and acknowledges that test results are not guaranteed. When statements of conformity are requested on test reports (e.g. within Criteria Reports), measurement uncertainty is not applied to test results prior to the evaluation.
9. Standard of Care. ALS will use reasonable care and diligence as required by the laws of the province or territory where the sample is tested.
10. Storage. Where possible, ALS will store; soil and water samples for 45 days from date of receipt, tissue/biota samples for 6 months from date of receipt, air samples or re-usable media for 14 days from date of receipt, and microbiological samples for 3 days from date of receipt.
11. Holds. If the Client requests a sample to be placed on hold, ALS will store the samples according to paragraph 10, after which ALS will invoice the Client and discard the sample. Each sample is subject to a minimum $5.00 hold fee. Longer hold periods are available upon request. See paragraph 12.
12. Archives. If the Client requests for a sample to be archived, ALS will invoice in advance and will store the sample for the period requested, after which ALS may discard the sample.
13. Legal Sample Handling Protocol. Legal sample handling protocol must be arranged before samples are collected. ALS charges a surcharge on the list price plus the hourly technologist or chemist rates for legal sample protocol. Additional charges will apply for samples that require storage by ALS.
14. Samples. The quality, condition, content, and source of samples stored and tested are not known to ALS except as declared and described on the chain of custody form completed and submitted by the Client and accompanying the sample.
15. Risk of Loss. ALS will use reasonable care to protect samples during storage, however all samples are stored at the Client's risk and the Client is responsible for obtaining appropriate insurance, if desired. The Client acknowledges that during the performance of the Services samples may be altered, lost, damaged, or destroyed and the Client releases ALS from any claim the Client may have for any loss or damage to the sample.
16. Environmental. The Client must comply with all applicable environment legislation, including labeling all hazardous samples to comply with GHS and TDG regulations, and must provide appropriate Safety Data that include the nature of the hazard and a contact name and phone number to call for information. The Client will indemnify ALS for all loss or damages, including any fine or cost of complying with an order of any government authority, resulting from the Client's breach of this paragraph.
17. Hazardous Materials Disposal. ALS may return, at the Client's cost, hazardous material to the Client for disposal.
18. Hazardous Materials Surcharge. ALS may apply an additional surcharge for handling of hazardous samples or samples with Naturally Occurring Radioactive Materials (NORM), H2S, cyanide, etc.
19. Sample Containers. ALS may ship sample containers to the Client's location by the most cost effective means using ALS preferred courier suppliers, within the specified project timeline.
20. Additional Charges. ALS may charge the Client (a) its cost for emergency bottle shipments and shipments to and from a remote site, and (b) where pickup and delivery services are provided, subject in each instance to a minimum charge of $25.00.
21. Holding Times. Samples and chain of custody forms should be submitted to ALS as soon as possible after sampling, with a minimum of half the analytical hold time remaining, unless prior arrangements are made.
22. Re-Tests. ALS reserves the right to re-test any samples that remain in its possession. Re-tests requested by the Client may be subject to charges.
23. Waiver. The Client is responsible for making any assessment regarding the suitability of the Services and the intended results for the Client's purposes and waives any claims against ALS it may have as a result of the interpretation of the results. The Client shall indemnify ALS for all claims made by any third party against ALS in respect of all losses however arising from the performance of the Services or the use of any report provided in the performance of the Services.
24. Limitation of Liability. In no event shall ALS be liable for any consequential, indirect, incidental, special, exemplary, or punitive damages, whether foreseeable or unforeseeable (including claims for loss of profits or revenue or losses caused by stoppage of other work or impairment of other assets), incurred by the Client arising out of breach or failure of express or implied warranty, breach of contract, breach of warranty, misrepresentation, negligence, strict liability in tort or otherwise. In any event, the liability of ALS to the Client shall be limited to the cost of testing the sample as requested in the chain of custody form under which the sample was originally deposited. For the purposes of this paragraph and paragraphs 8, 15, 16, 23 and 25, as applicable, "ALS" includes without limitations its directors, officers, employees and affiliates and the "Client" includes without limitation any third party that may have a claim against ALS through the Client.
25. Notice of Liability. Notwithstanding paragraph 24, ALS shall not be liable to the Client unless the Client provides notice in writing to ALS of such loss or damage, together with full particulars thereof, within 30 days of the Client's receipt of the report of the analysis of the sample giving rise to such liability. The provisions of this paragraph allocate the risk under the Agreement between the Client and ALS, and the fees to be paid by the Client to ALS reflect this allocation of risks and the limitations of liability in this Agreement.
26. Third Party Service Provider Indemnity. For testing not performed at ALS, and where the Client requires ALS to forward samples to a third party service provider, the Client indemnifies ALS against any breach of this Agreement, all liabilities or losses incurred in connection with the third party service provider, including but not limited to courier services, testing turn-around time, and any additional costs associated with such third party.
27. Third Party Service Provider Indemnity. If ALS is required to engage a third party service provider for whatever reason, the Client indemnifies ALS against any breach of this Agreement, liabilities, or losses incurred in connection with the third party service provider, including but not limited to courier services, testing turn-around time, and any additional costs associated with such third party.
28. Entire Agreement. The Agreement is the entire agreement between the parties and supersedes and takes precedence over any terms and conditions contained in any documentation provided by the Client. ALS's execution of any subsequent documentation from the Client only acknowledges receipt and not acceptance of any terms or conditions therein. If there is a conflict between these terms and conditions and any other Agreement document, these terms and conditions prevail.
29. Term. Providing the first batch of samples to which this tender refers is submitted within three months of the starting date of this quotation, the following prices, terms and conditions will remain firm until the closing date. This offer, and its terms and conditions will automatically lapse if the offer has not been accepted and samples not delivered to ALS by the Closing Date.
30. Termination. (a) Either party may terminate this Agreement for any reason by giving the other party thirty (30) days written notice (Notice Period). (b) If the Agreement is terminated pursuant to clause (a), then the Client must pay ALS for all Services performed up to the expiry of the Notice Period.

Chain of Custody (COC) / Analytical Request Form

ALS www.alsglobal.com

Canada Toll Free: 1 800 668 9878

COC Number: 20 - 920781

Page 1 of 1

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

Company: Golder Associates Ltd.
Contact: Trish Tomliens / Elaine Irving
Phone: 250-881-7372

Company address below will appear on the final report

Street: 200-2920 Virtual Way
City/Province: Vancouver, BC
Postal Code: V5M 0C4

Invoice To
Same as Report To ☑ YES ☐ NO
Copy of Invoice with Report ☐ YES ☑ NO
Company:
Contact:

Project Information
ALS Account # / Quote #: Q84262
Job #: 1663724-44000-03
PO / AFE:
LSD:
ALS Lab Work Order # (ALS use only): YL2101029

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: Patricia_Tomliens@golder.com
Email 2: Elaine_IRVING@golder.com
Email 3:

Invoice Recipients
Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax:
Email 2:

Oil and Gas Required Fields (client use)
AFE/Cost Center: | PO#:
Major/Minor Code: | Routing Code:
Requisitioner:
Location:
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 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	General (pH, Alkalinity, TSS, turbidity, conductivity)	Dissolved metals (F/P)	Total metals (P)	Dissolved mercury (F/P)	Total mercury (P)	Total nutrients (P)	TOC, TKN (P)	BTEX/F1 (P)	F2-F4, PAH (P)	SAMPLES ON HOLD	EXTENDED STORAGE REQUIRED	SUSPECTED HAZARD (see notes)
	MP-06-North-FBlank-2	14-Aug-21	11:15	Seawater	6	X	X	X	X	X	X	X					
	MP-06-North	14-Aug-21	11:10	Seawater	6	X	X	X	X	X	X	X					
	MP-06-WNW	14-Aug-21	10:55	Seawater	6	X	X	X	X	X	X	X					
	MP-06-Source	14-Aug-21	11:25	Seawater	10	X	X	X	X	X	X	X	X	X			
	MP-06-ENE	14-Aug-21	11:40	Seawater	10	X	X	X	X	X	X	X	X	X			
	MP-05-Source	14-Aug-21	09:55	Seawater	10	X	X	X	X	X	X	X	X	X			
	MP-05-WNW	14-Aug-21	09:40	Seawater	6	X	X	X	X	X	X	X	[illegible]				
	MP-05-North	14-Aug-21	08:41	Seawater	10	X	X	X	X	X	X	X	X	X			
	MP-05-ENE	14-Aug-21	09:30	Seawater	6	X	X	X	X	X	X	X					

Environmental Division
Yellowknife
Work Order Reference
YL2101029
Telephone : +1 867 873 5593

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: 4.7
FINAL COOLER TEMPERATURES °C: 8 | 8 | 7

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (ALS use only)			FINAL SHIPMENT RECEPTION (ALS use only)		
Released by:	Date:	Time:	Received by: [signature]	Date: 16-A-121	Time: 8:45	Received by: JC ice packs	Date: AUG 17 2021	Time: 12:45 pm

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.

AUG 2020 FRONT

CERTIFICATE OF ANALYSIS

Work Order	: **VA21B6250**	Page	: 1 of 15
Amendment	: **1**		
Client	: **Golder Associates Ltd.**	Laboratory	: Vancouver - Environmental
Contact	: Elaine Irving	Account Manager	: Amber Springer
Address	: 200-2920 Virtual Way Vancouver BC Canada V5M 0C4	Address	: 8081 Lougheed Highway Burnaby BC Canada V5A 1W9
Telephone	: ----	Telephone	: +1 604 253 4188
Project	: ----	Date Samples Received	: 05-Aug-2021 10:30
PO	: ----	Date Analysis Commenced	: 06-Aug-2021
C-O-C number	: 20-920773	Issue Date	: 02-Sep-2021 16:25
Sampler	: ----		
Site	: ----		
Quote number	: Q84262		
No. of samples received	: 10		
No. of samples analysed	: 10		

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

Signatories	*Position*	*Laboratory Department*
Aaron Yu	Laboratory Analyst	Inorganics, Burnaby, British Columbia
Angela Ren	Team Leader - Metals	Metals, Burnaby, British Columbia
Courtney Cox	Analsyt	Inorganics, Burnaby, British Columbia
Dee Lee	Analyst	Metals, Burnaby, British Columbia
Kevin Duarte	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Miles Gropen	Department Manager - Inorganics	Inorganics, Burnaby, British Columbia
Monica Ko	Lab Assistant	Metals, Burnaby, British Columbia
Ophelia Chiu	Department Manager - Organics	Organics, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia
Ruby Pham	Lab Assistant	Metals, Burnaby, British Columbia
Sristika Chand	Lab Analyst	Metals, 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 Unit
µg/L	micrograms per litre
µS/cm	Microsiemens per centimetre
mg/L	milligrams per litre
NTU	nephelometric turbidity units
pH units	pH units
psu	practical salinity 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*
HTD	*Hold time exceeded for re-analysis or dilution, but initial testing was conducted within hold time.*
RRV	*Reported result verified by repeat analysis.*

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	MP-05-WNW-FBLANK-1	MP-05 ENE	MP-05 North	MP-05 WNW	MP-05 Source
				Client sampling date / time	02-Aug-2021 17:00	02-Aug-2021 16:35	02-Aug-2021 16:45	02-Aug-2021 17:00	02-Aug-2021 15:55
					VA21B6250-001	VA21B6250-002	VA21B6250-003	VA21B6250-004	VA21B6250-005
					Result	Result	Result	Result	Result
Physical Tests									
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	<1.0	91.8	85.7	88.8	86.8
conductivity	----	E100S	2.0	µS/cm	<2.0	21900	16800	19600	15900
hardness (as CaCO3), dissolved	----	EC100	0.50	mg/L	<1.00	2640	1990	2300	1830
pH	----	E108	0.10	pH units	5.35	7.96	7.96	7.98	7.98
salinity	----	EC100S	1.0	psu	<1.0	13.2	9.9	11.7	9.3
solids, total dissolved [TDS]	----	E162S	10	mg/L	<10	14100	10700	12400	10500
solids, total suspended [TSS]	----	E160S	2.0	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0
turbidity	----	E121	0.10	NTU	<0.10	0.49	0.31	0.26	0.37
hardness (as CaCO3), from total Ca/Mg	----	EC100A	0.60	mg/L	<1.00	2770	2020	2410	1930
Anions and Nutrients									
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
bromide	24959-67-9	E235S.Br	5.0	mg/L	<5.0	25.5	18.8	20.9	18.2
chloride	16887-00-6	E235S.Cl	50	mg/L	<50	7700	5470	6050	5320
fluoride	16984-48-8	E235S.F-L	0.20	mg/L	<0.20	0.32	0.26	0.29	0.24
Kjeldahl nitrogen, total [TKN]	----	E318S	0.050	mg/L	<0.050	0.096	0.080	0.085	0.085
nitrate (as N)	14797-55-8	E235S.NO3-T	0.010	mg/L	<0.010	<0.010	<0.010	0.012	0.053
nitrite (as N)	14797-65-0	E235S.NO2-L	0.010	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010
phosphorus, total	7723-14-0	E372S	0.0020	mg/L	<0.0040	0.0107	0.0166	0.0109	0.0133
sulfate (as SO4)	14808-79-8	E235S.SO4-L	3.0	mg/L	<3.0	1060	779	912	738
Organic / Inorganic Carbon									
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	<0.50	1.38 HTD	<0.50 HTD	1.15 HTD	1.15 HTD
carbon, total organic [TOC]	----	E355-L	0.50	mg/L	<0.50	0.97	0.93	0.89	1.04
Total Metals									
aluminum, total	7429-90-5	E468S	0.0050	mg/L	<0.0050	0.0201	0.0115	0.0100	0.0153
antimony, total	7440-36-0	E468S	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
arsenic, total	7440-38-2	E468S	0.00040	mg/L	<0.00040	0.00072	0.00059	0.00064	0.00051
barium, total	7440-39-3	E468S	0.0010	mg/L	<0.0010	0.0055	0.0050	0.0053	0.0050
beryllium, total	7440-41-7	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
bismuth, total	7440-69-9	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050

Analytical Results

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

				Client sample ID	MP-05-WNW-FBLANK-1	MP-05 ENE	MP-05 North	MP-05 WNW	MP-05 Source
				Client sampling date / time	02-Aug-2021 17:00	02-Aug-2021 16:35	02-Aug-2021 16:45	02-Aug-2021 17:00	02-Aug-2021 15:55
Analyte	*CAS Number*	*Method*	*LOR*	*Unit*	VA21B6250-001	VA21B6250-002	VA21B6250-003	VA21B6250-004	VA21B6250-005
					Result	Result	Result	Result	Result
Total Metals									
boron, total	7440-42-8	E468S	0.30	mg/L	<0.30	1.86	1.38	1.65	1.37
cadmium, total	7440-43-9	E468S	0.000010	mg/L	<0.000010	0.000019	0.000016	0.000013	0.000016
calcium, total	7440-70-2	E468S	1.0	mg/L	<1.0	187	141	165	137
cesium, total	7440-46-2	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
chromium, total	7440-47-3	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
cobalt, total	7440-48-4	E468S	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
copper, total	7440-50-8	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	0.00202
gallium, total	7440-55-3	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
iron, total	7439-89-6	E468S	0.010	mg/L	<0.010	0.029	0.012	0.012	0.015
lead, total	7439-92-1	E468S	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	0.000080
lithium, total	7439-93-2	E468S	0.020	mg/L	<0.020	0.084	0.061	0.073	0.057
magnesium, total	7439-95-4	E468S	1.0	mg/L	<1.0	560	404	486	386
manganese, total	7439-96-5	E468S	0.00020	mg/L	<0.00020	0.00107	0.00079	0.00083	0.00088
mercury, total	7439-97-6	E508S	0.0000050	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, total	7439-98-7	E468S	0.00010	mg/L	<0.00010	0.00455	0.00333	0.00386	0.00307
nickel, total	7440-02-0	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	0.00147
phosphorus, total	7723-14-0	E468S	0.050	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050
potassium, total	7440-09-7	E468S	1.0	mg/L	<1.0	175	125	150	119
rhenium, total	7440-15-5	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
rubidium, total	7440-17-7	E468S	0.0050	mg/L	<0.0050	0.0490	0.0351	0.0422	0.0345
selenium, total	7782-49-2	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
silicon, total	7440-21-3	E468S.NaSi	1.0	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0
silver, total	7440-22-4	E468S	0.00010	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
sodium, total	17341-25-2	E468S.NaSi	2.5	mg/L	<2.5	4140	3080	3650	2910
strontium, total	7440-24-6	E468S	0.010	mg/L	<0.010	3.07	2.26	2.68	2.15
sulfur, total	7704-34-9	E468S	5.0	mg/L	<5.0	409	288	354	278
tellurium, total	13494-80-9	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
thallium, total	7440-28-0	E468S	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
thorium, total	7440-29-1	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
tin, total	7440-31-5	E468S	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010

Analytical Results

Sub-Matrix: Seawater
(Matrix: Water)

Analyte	CAS Number	Method	LOR	Unit	MP-05-WNW-FBLANK-1	MP-05 ENE	MP-05 North	MP-05 WNW	MP-05 Source
				Client sampling date / time	02-Aug-2021 17:00	02-Aug-2021 16:35	02-Aug-2021 16:45	02-Aug-2021 17:00	02-Aug-2021 15:55
					VA21B6250-001	VA21B6250-002	VA21B6250-003	VA21B6250-004	VA21B6250-005
					Result	Result	Result	Result	Result
Total Metals									
titanium, total	7440-32-6	E468S	0.0050	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
tungsten, total	7440-33-7	E468S	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
uranium, total	7440-61-1	E468S	0.000050	mg/L	<0.000050	0.00178	0.00161	0.00166	0.00162
vanadium, total	7440-62-2	E468S	0.00050	mg/L	<0.00050	0.00074	0.00052	0.00061	0.00050
yttrium, total	7440-65-5	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
zinc, total	7440-66-6	E468S	0.0030	mg/L	<0.0030	<0.0030	<0.0030	<0.0030	0.0837
zirconium, total	7440-67-7	E468S	0.00050	mg/L	0.00065 RRV	<0.00050	<0.00050	<0.00050	<0.00050
Dissolved Metals									
aluminum, dissolved	7429-90-5	E469S	0.0050	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
antimony, dissolved	7440-36-0	E469S	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
arsenic, dissolved	7440-38-2	E469S	0.00040	mg/L	<0.00040	0.00067	0.00045	0.00054	0.00048
barium, dissolved	7440-39-3	E469S	0.0010	mg/L	<0.0010	0.0054	0.0048	0.0050	0.0047
beryllium, dissolved	7440-41-7	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
bismuth, dissolved	7440-69-9	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
boron, dissolved	7440-42-8	E469S	0.30	mg/L	<0.30	1.75	1.29	1.52	1.21
cadmium, dissolved	7440-43-9	E469S	0.000010	mg/L	<0.000010	0.000019	0.000015	0.000014	0.000016
calcium, dissolved	7440-70-2	E469S	1.0	mg/L	<1.0	183	139	159	131
cesium, dissolved	7440-46-2	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
chromium, dissolved	7440-47-3	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
cobalt, dissolved	7440-48-4	E469S	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
copper, dissolved	7440-50-8	E469S	0.00020	mg/L	<0.00020	0.00031	0.00038	0.00035	0.00057
gallium, dissolved	7440-55-3	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
iron, dissolved	7439-89-6	E469S	0.010	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010
lead, dissolved	7439-92-1	E469S	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
lithium, dissolved	7439-93-2	E469S	0.020	mg/L	<0.020	0.074	0.052	0.063	0.048
magnesium, dissolved	7439-95-4	E469S	1.0	mg/L	<1.0	530	398	463	366
manganese, dissolved	7439-96-5	E469S	0.00010	mg/L	<0.00010	0.00060	0.00057	0.00057	0.00058
mercury, dissolved	7439-97-6	E509S	0.0000050	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, dissolved	7439-98-7	E469S	0.00010	mg/L	<0.00010	0.00440	0.00319	0.00371	0.00300
nickel, dissolved	7440-02-0	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050

Analytical Results

Sub-Matrix: **Seawater**

(Matrix: **Water**)

				Client sample ID	MP-05-WNW-FBLANK-1	MP-05 ENE	MP-05 North	MP-05 WNW	MP-05 Source
				Client sampling date / time	02-Aug-2021 17:00	02-Aug-2021 16:35	02-Aug-2021 16:45	02-Aug-2021 17:00	02-Aug-2021 15:55
Analyte	CAS Number	Method	LOR	Unit	VA21B6250-001	VA21B6250-002	VA21B6250-003	VA21B6250-004	VA21B6250-005
					Result	Result	Result	Result	Result
Dissolved Metals									
phosphorus, dissolved	7723-14-0	E469S	0.050	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050
potassium, dissolved	7440-09-7	E469S	1.0	mg/L	<1.0	165	121	144	113
rhenium, dissolved	7440-15-5	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
rubidium, dissolved	7440-17-7	E469S	0.0050	mg/L	<0.0050	0.0430	0.0321	0.0376	0.0301
selenium, dissolved	7782-49-2	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
silicon, dissolved	7440-21-3	E469S.NaSi	1.0	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0
silver, dissolved	7440-22-4	E469S	0.00010	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
sodium, dissolved	17341-25-2	E469S.NaSi	2.5	mg/L	<2.5	4440	3060	3760	3240
strontium, dissolved	7440-24-6	E469S	0.010	mg/L	<0.010	2.95	2.19	2.57	2.09
sulfur, dissolved	7704-34-9	E469S	5.0	mg/L	<5.0	398	282	337	262
tellurium, dissolved	13494-80-9	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
thallium, dissolved	7440-28-0	E469S	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
thorium, dissolved	7440-29-1	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
tin, dissolved	7440-31-5	E469S	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
titanium, dissolved	7440-32-6	E469S	0.0050	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
tungsten, dissolved	7440-33-7	E469S	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
uranium, dissolved	7440-61-1	E469S	0.000050	mg/L	<0.000050	0.00149	0.00137	0.00145	0.00137
vanadium, dissolved	7440-62-2	E469S	0.00050	mg/L	<0.00050	0.00057	<0.00050	0.00051	<0.00050
yttrium, dissolved	7440-65-5	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
zinc, dissolved	7440-66-6	E469S	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	0.0022
zirconium, dissolved	7440-67-7	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
dissolved mercury filtration location	----	EP509	-	-	Field	Field	Field	Field	Field
dissolved metals filtration location	----	EP421	-	-	Field	Field	Field	Field	Field
Volatile Organic Compounds [Fuels]									
benzene	71-43-2	E611A	0.50	µg/L	<0.50	----	<0.50	----	<0.50
ethylbenzene	100-41-4	E611A	0.50	µg/L	<0.50	----	<0.50	----	<0.50
methyl-tert-butyl ether [MTBE]	1634-04-4	E611A	0.50	µg/L	<0.50	----	<0.50	----	<0.50
styrene	100-42-5	E611A	0.50	µg/L	<0.50	----	<0.50	----	<0.50
toluene	108-88-3	E611A	0.50	µg/L	<0.50	----	<0.50	----	<0.50
xylene, m+p-	179601-23-1	E611A	0.40	µg/L	<0.40	----	<0.40	----	<0.40

Analytical Results

Sub-Matrix: **Seawater**

(Matrix: **Water**)

				Client sample ID	MP-05-WNW-FBLANK-1	MP-05 ENE	MP-05 North	MP-05 WNW	MP-05 Source
				Client sampling date / time	02-Aug-2021 17:00	02-Aug-2021 16:35	02-Aug-2021 16:45	02-Aug-2021 17:00	02-Aug-2021 15:55
Analyte	CAS Number	Method	LOR	Unit	VA21B6250-001	VA21B6250-002	VA21B6250-003	VA21B6250-004	VA21B6250-005
					Result	Result	Result	Result	Result
Volatile Organic Compounds [Fuels]									
xylene, o-	95-47-6	E611A	0.30	µg/L	<0.30	----	<0.30	----	<0.30
xylenes, total	1330-20-7	E611A	0.50	µg/L	<0.50	----	<0.50	----	<0.50
BTEX, total	----	E611A	1.0	µg/L	<1.0	----	<1.0	----	<1.0
Volatile Organic Compounds Surrogates									
bromofluorobenzene, 4-	460-00-4	E611A	1.0	%	93.8	----	93.6	----	95.6
difluorobenzene, 1,4-	540-36-3	E611A	1.0	%	122	----	87.2	----	111
Hydrocarbons									
F2 (C10-C16)	----	E601	100	µg/L	<100	----	<100	----	<100
F3 (C16-C34)	----	E601	250	µg/L	<250	----	<250	----	<250
F4 (C34-C50)	----	E601	250	µg/L	<250	----	<250	----	<250
F1 (C6-C10)	----	E581.VH+F1	100	µg/L	<100	----	<100	----	<100
Hydrocarbons Surrogates									
bromobenzotrifluoride, 2- (F2-F4 surr)	392-83-6	E601	1.0	%	70.4	----	69.6	----	76.9
dichlorotoluene, 3,4-	97-75-0	E581.VH+F1	1.0	%	72.9	----	98.4	----	83.2
Polycyclic Aromatic Hydrocarbons									
acenaphthene	83-32-9	E641A	0.010	µg/L	<0.010	----	<0.010	----	<0.010
acenaphthylene	208-96-8	E641A	0.010	µg/L	<0.010	----	<0.010	----	<0.010
acridine	260-94-6	E641A	0.010	µg/L	<0.010	----	<0.010	----	<0.010
anthracene	120-12-7	E641A	0.010	µg/L	<0.010	----	<0.010	----	<0.010
benz(a)anthracene	56-55-3	E641A	0.010	µg/L	<0.010	----	<0.010	----	<0.010
benzo(a)pyrene	50-32-8	E641A	0.0050	µg/L	<0.0050	----	<0.0050	----	<0.0050
benzo(b+j)fluoranthene	----	E641A	0.010	µg/L	<0.010	----	<0.010	----	<0.010
benzo(b+j+k)fluoranthene	----	E641A	0.015	µg/L	<0.015	----	<0.015	----	<0.015
benzo(g,h,i)perylene	191-24-2	E641A	0.010	µg/L	<0.010	----	<0.010	----	<0.010
benzo(k)fluoranthene	207-08-9	E641A	0.010	µg/L	<0.010	----	<0.010	----	<0.010
chrysene	218-01-9	E641A	0.010	µg/L	<0.010	----	<0.010	----	<0.010
dibenz(a,h)anthracene	53-70-3	E641A	0.0050	µg/L	<0.0050	----	<0.0050	----	<0.0050
fluoranthene	206-44-0	E641A	0.010	µg/L	<0.010	----	<0.010	----	<0.010
fluorene	86-73-7	E641A	0.010	µg/L	<0.010	----	<0.010	----	<0.010
indeno(1,2,3-c,d)pyrene	193-39-5	E641A	0.010	µg/L	<0.010	----	<0.010	----	<0.010

Analytical Results

Sub-Matrix: **Seawater**

(Matrix: **Water**)

				Client sample ID	MP-05-WNW-FBLANK-1	MP-05 ENE	MP-05 North	MP-05 WNW	MP-05 Source
				Client sampling date / time	02-Aug-2021 17:00	02-Aug-2021 16:35	02-Aug-2021 16:45	02-Aug-2021 17:00	02-Aug-2021 15:55
Analyte	*CAS Number*	*Method*	*LOR*	*Unit*	**VA21B6250-001**	**VA21B6250-002**	**VA21B6250-003**	**VA21B6250-004**	**VA21B6250-005**
					Result	Result	Result	Result	Result
Polycyclic Aromatic Hydrocarbons									
methylnaphthalene, 1-	90-12-0	E641A	0.010	µg/L	<0.010	----	<0.010	----	<0.010
methylnaphthalene, 2-	91-57-6	E641A	0.010	µg/L	<0.010	----	<0.010	----	<0.010
naphthalene	91-20-3	E641A	0.050	µg/L	<0.050	----	<0.050	----	<0.050
phenanthrene	85-01-8	E641A	0.020	µg/L	<0.020	----	<0.020	----	<0.020
pyrene	129-00-0	E641A	0.010	µg/L	<0.010	----	<0.010	----	<0.010
quinoline	6027-02-7	E641A	0.050	µg/L	<0.050	----	<0.050	----	<0.050
Polycyclic Aromatic Hydrocarbons Surrogates									
chrysene-d12	1719-03-5	E641A	0.1	%	73.2	----	83.5	----	81.7
naphthalene-d8	1146-65-2	E641A	0.1	%	77.2	----	86.3	----	91.8
phenanthrene-d10	1517-22-2	E641A	0.1	%	97.8	----	111	----	112

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

Analytical Results

Sub-Matrix: **Seawater**

(Matrix: **Water**)

				Client sample ID	**DUP-A**	**MP-06 ENE**	**MP-06 North**	**MP-06 WNW**	**MP-06 Source**
				Client sampling date / time	02-Aug-2021	02-Aug-2021 17:45	02-Aug-2021 17:25	02-Aug-2021 17:35	02-Aug-2021 17:15
Analyte	*CAS Number*	*Method*	*LOR*	*Unit*	**VA21B6250-006**	**VA21B6250-007**	**VA21B6250-008**	**VA21B6250-009**	**VA21B6250-010**
					Result	Result	Result	Result	Result
Physical Tests									
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	88.0	89.7	84.5	84.8	89.0
conductivity	----	E100S	2.0	µS/cm	16000	21900	13700	13300	20100
hardness (as CaCO3), dissolved	----	EC100	0.50	mg/L	1860	2630	1560	1530	2250
pH	----	E108	0.10	pH units	7.98	7.96	7.99	8.00	7.98
salinity	----	EC100S	1.0	psu	9.4	13.2	7.9	7.7	12.0
solids, total dissolved [TDS]	----	E162S	10	mg/L	9250	13800	8450	7740	12200
solids, total suspended [TSS]	----	E160S	2.0	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0
turbidity	----	E121	0.10	NTU	0.38	0.20	0.22	0.19	0.20
hardness (as CaCO3), from total Ca/Mg	----	EC100A	0.60	mg/L	1980	2740	1590	1600	2420
Anions and Nutrients									
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
bromide	24959-67-9	E235S.Br	5.0	mg/L	18.5	26.4	15.4	14.7	24.0
chloride	16887-00-6	E235S.Cl	50	mg/L	5440	7730	4520	4300	6980
fluoride	16984-48-8	E235S.F-L	0.20	mg/L	0.25	0.34	0.22	0.20	0.30
Kjeldahl nitrogen, total [TKN]	----	E318S	0.050	mg/L	0.092	0.090	0.084	0.084	0.084
nitrate (as N)	14797-55-8	E235S.NO3-T	0.010	mg/L	0.053	<0.010	<0.010	<0.010	0.010
nitrite (as N)	14797-65-0	E235S.NO2-L	0.010	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010
phosphorus, total	7723-14-0	E372S	0.0020	mg/L	0.0136	0.0098	0.0088	0.0060	0.0069
sulfate (as SO4)	14808-79-8	E235S.SO4-L	3.0	mg/L	739	1060	630	618	943
Organic / Inorganic Carbon									
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	1.01 [HTD]	1.12 [HTD]	0.95 [HTD]	1.19 [HTD]	1.02 [HTD]
carbon, total organic [TOC]	----	E355-L	0.50	mg/L	0.96	0.95	0.94	0.86	0.97
Total Metals									
aluminum, total	7429-90-5	E468S	0.0050	mg/L	0.0082	0.0104	0.0087	0.0096	0.0092
antimony, total	7440-36-0	E468S	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
arsenic, total	7440-38-2	E468S	0.00040	mg/L	0.00053	0.00069	0.00043	0.00043	0.00065
barium, total	7440-39-3	E468S	0.0010	mg/L	0.0050	0.0056	0.0045	0.0045	0.0053
beryllium, total	7440-41-7	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
bismuth, total	7440-69-9	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
boron, total	7440-42-8	E468S	0.30	mg/L	1.41	1.91	1.09	1.13	1.67
cadmium, total	7440-43-9	E468S	0.000010	mg/L	0.000019	0.000020	0.000013	0.000014	0.000014

Analytical Results

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

				Client sample ID	DUP-A	MP-06 ENE	MP-06 North	MP-06 WNW	MP-06 Source
				Client sampling date / time	02-Aug-2021	02-Aug-2021 17:45	02-Aug-2021 17:25	02-Aug-2021 17:35	02-Aug-2021 17:15
Analyte	CAS Number	Method	LOR	Unit	VA21B6250-006	VA21B6250-007	VA21B6250-008	VA21B6250-009	VA21B6250-010
					Result	Result	Result	Result	Result
Total Metals									
calcium, total	7440-70-2	E468S	1.0	mg/L	140	190	118	118	169
cesium, total	7440-46-2	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
chromium, total	7440-47-3	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
cobalt, total	7440-48-4	E468S	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
copper, total	7440-50-8	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
gallium, total	7440-55-3	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
iron, total	7439-89-6	E468S	0.010	mg/L	<0.010	0.011	0.011	0.013	0.012
lead, total	7439-92-1	E468S	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
lithium, total	7439-93-2	E468S	0.020	mg/L	0.060	0.084	0.045	0.046	0.072
magnesium, total	7439-95-4	E468S	1.0	mg/L	395	550	314	316	486
manganese, total	7439-96-5	E468S	0.00020	mg/L	0.00064	0.00080	0.00074	0.00075	0.00091
mercury, total	7439-97-6	E508S	0.0000050	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, total	7439-98-7	E468S	0.00010	mg/L	0.00339	0.00467	0.00254	0.00267	0.00412
nickel, total	7440-02-0	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
phosphorus, total	7723-14-0	E468S	0.050	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050
potassium, total	7440-09-7	E468S	1.0	mg/L	122	174	97.1	97.5	149
rhenium, total	7440-15-5	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
rubidium, total	7440-17-7	E468S	0.0050	mg/L	0.0348	0.0485	0.0286	0.0282	0.0424
selenium, total	7782-49-2	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
silicon, total	7440-21-3	E468S.NaSi	1.0	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0
silver, total	7440-22-4	E468S	0.00010	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
sodium, total	17341-25-2	E468S.NaSi	2.5	mg/L	3000	4250	2430	2480	3630
strontium, total	7440-24-6	E468S	0.010	mg/L	2.24	3.19	1.76	1.82	2.74
sulfur, total	7704-34-9	E468S	5.0	mg/L	283	433	230	230	350
tellurium, total	13494-80-9	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
thallium, total	7440-28-0	E468S	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
thorium, total	7440-29-1	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
tin, total	7440-31-5	E468S	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
titanium, total	7440-32-6	E468S	0.0050	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
tungsten, total	7440-33-7	E468S	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
uranium, total	7440-61-1	E468S	0.000050	mg/L	0.00163	0.00172	0.00136	0.00136	0.00388

Analytical Results

Sub-Matrix: **Seawater**

(Matrix: **Water**)

				Client sample ID	DUP-A	MP-06 ENE	MP-06 North	MP-06 WNW	MP-06 Source
				Client sampling date / time	02-Aug-2021	02-Aug-2021 17:45	02-Aug-2021 17:25	02-Aug-2021 17:35	02-Aug-2021 17:15
Analyte	CAS Number	Method	LOR	Unit	VA21B6250-006	VA21B6250-007	VA21B6250-008	VA21B6250-009	VA21B6250-010
					Result	Result	Result	Result	Result
Total Metals									
vanadium, total	7440-62-2	E468S	0.00050	mg/L	<0.00050	0.00068	<0.00050	<0.00050	0.00059
yttrium, total	7440-65-5	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
zinc, total	7440-66-6	E468S	0.0030	mg/L	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
zirconium, total	7440-67-7	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Dissolved Metals									
aluminum, dissolved	7429-90-5	E469S	0.0050	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
antimony, dissolved	7440-36-0	E469S	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
arsenic, dissolved	7440-38-2	E469S	0.00040	mg/L	0.00047	0.00058	<0.00040	<0.00040	0.00058
barium, dissolved	7440-39-3	E469S	0.0010	mg/L	0.0048	0.0052	0.0045	0.0044	0.0051
beryllium, dissolved	7440-41-7	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
bismuth, dissolved	7440-69-9	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
boron, dissolved	7440-42-8	E469S	0.30	mg/L	1.30	1.72	1.06	1.02	1.50
cadmium, dissolved	7440-43-9	E469S	0.000010	mg/L	0.000017	0.000017	<0.000010	0.000012	0.000012
calcium, dissolved	7440-70-2	E469S	1.0	mg/L	137	183	117	112	158
cesium, dissolved	7440-46-2	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
chromium, dissolved	7440-47-3	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
cobalt, dissolved	7440-48-4	E469S	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
copper, dissolved	7440-50-8	E469S	0.00020	mg/L	0.00056	0.00033	0.00036	0.00033	0.00042
gallium, dissolved	7440-55-3	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
iron, dissolved	7439-89-6	E469S	0.010	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010
lead, dissolved	7439-92-1	E469S	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
lithium, dissolved	7439-93-2	E469S	0.020	mg/L	0.053	0.076	0.042	0.041	0.063
magnesium, dissolved	7439-95-4	E469S	1.0	mg/L	369	528	309	304	451
manganese, dissolved	7439-96-5	E469S	0.00010	mg/L	0.00058	0.00057	0.00049	0.00050	0.00063
mercury, dissolved	7439-97-6	E509S	0.0000050	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, dissolved	7439-98-7	E469S	0.00010	mg/L	0.00329	0.00425	0.00251	0.00249	0.00378
nickel, dissolved	7440-02-0	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
phosphorus, dissolved	7723-14-0	E469S	0.050	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050
potassium, dissolved	7440-09-7	E469S	1.0	mg/L	116	164	94.0	94.2	142
rhenium, dissolved	7440-15-5	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
rubidium, dissolved	7440-17-7	E469S	0.0050	mg/L	0.0306	0.0432	0.0252	0.0258	0.0378

Analytical Results

Sub-Matrix: **Seawater**

(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	DUP-A	MP-06 ENE	MP-06 North	MP-06 WNW	MP-06 Source
				Client sampling date / time	02-Aug-2021	02-Aug-2021 17:45	02-Aug-2021 17:25	02-Aug-2021 17:35	02-Aug-2021 17:15
					VA21B6250-006	VA21B6250-007	VA21B6250-008	VA21B6250-009	VA21B6250-010
					Result	Result	Result	Result	Result
Dissolved Metals									
selenium, dissolved	7782-49-2	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
silicon, dissolved	7440-21-3	E469S.NaSi	1.0	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0
silver, dissolved	7440-22-4	E469S	0.00010	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
sodium, dissolved	17341-25-2	E469S.NaSi	2.5	mg/L	3110	4560	2650	2700	3860
strontium, dissolved	7440-24-6	E469S	0.010	mg/L	2.21	2.96	1.72	1.76	2.57
sulfur, dissolved	7704-34-9	E469S	5.0	mg/L	273	394	217	223	324
tellurium, dissolved	13494-80-9	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
thallium, dissolved	7440-28-0	E469S	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
thorium, dissolved	7440-29-1	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
tin, dissolved	7440-31-5	E469S	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
titanium, dissolved	7440-32-6	E469S	0.0050	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
tungsten, dissolved	7440-33-7	E469S	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
uranium, dissolved	7440-61-1	E469S	0.000050	mg/L	0.00147	0.00148	0.00118	0.00117	0.00341
vanadium, dissolved	7440-62-2	E469S	0.00050	mg/L	<0.00050	0.00058	<0.00050	<0.00050	<0.00050
yttrium, dissolved	7440-65-5	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
zinc, dissolved	7440-66-6	E469S	0.0010	mg/L	0.0027	<0.0010	<0.0010	<0.0010	0.0016
zirconium, dissolved	7440-67-7	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
dissolved mercury filtration location	----	EP509	-	-	Field	Field	Field	Field	Field
dissolved metals filtration location	----	EP421	-	-	Field	Field	Field	Field	Field
Volatile Organic Compounds [Fuels]									
benzene	71-43-2	E611A	0.50	µg/L	<0.50	<0.50	----	----	<0.50
ethylbenzene	100-41-4	E611A	0.50	µg/L	<0.50	<0.50	----	----	<0.50
methyl-tert-butyl ether [MTBE]	1634-04-4	E611A	0.50	µg/L	<0.50	<0.50	----	----	<0.50
styrene	100-42-5	E611A	0.50	µg/L	<0.50	<0.50	----	----	<0.50
toluene	108-88-3	E611A	0.50	µg/L	<0.50	<0.50	----	----	<0.50
xylene, m+p-	179601-23-1	E611A	0.40	µg/L	<0.40	<0.40	----	----	<0.40
xylene, o-	95-47-6	E611A	0.30	µg/L	<0.30	<0.30	----	----	<0.30
xylenes, total	1330-20-7	E611A	0.50	µg/L	<0.50	<0.50	----	----	<0.50
BTEX, total	----	E611A	1.0	µg/L	<1.0	<1.0	----	----	<1.0
Volatile Organic Compounds Surrogates									
bromofluorobenzene, 4-	460-00-4	E611A	1.0	%	95.8	98.6	----	----	97.9

Analytical Results

Sub-Matrix: **Seawater**

(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	DUP-A	MP-06 ENE	MP-06 North	MP-06 WNW	MP-06 Source
				Client sampling date / time	02-Aug-2021	02-Aug-2021 17:45	02-Aug-2021 17:25	02-Aug-2021 17:35	02-Aug-2021 17:15
					VA21B6250-006	VA21B6250-007	VA21B6250-008	VA21B6250-009	VA21B6250-010
					Result	Result	Result	Result	Result
Volatile Organic Compounds Surrogates									
difluorobenzene, 1,4-	540-36-3	E611A	1.0	%	88.0	126	----	----	123
Hydrocarbons									
F2 (C10-C16)	----	E601	100	µg/L	<100	<100	----	----	<100
F3 (C16-C34)	----	E601	250	µg/L	<250	<250	----	----	<250
F4 (C34-C50)	----	E601	250	µg/L	<250	<250	----	----	<250
F1 (C6-C10)	----	E581.VH+F1	100	µg/L	<100	<100	----	----	<100
Hydrocarbons Surrogates									
bromobenzotrifluoride, 2- (F2-F4 surr)	392-83-6	E601	1.0	%	77.7	62.4	----	----	77.7
dichlorotoluene, 3,4-	97-75-0	E581.VH+F1	1.0	%	100	93.2	----	----	80.8
Polycyclic Aromatic Hydrocarbons									
acenaphthene	83-32-9	E641A	0.010	µg/L	<0.010	<0.010	----	----	<0.010
acenaphthylene	208-96-8	E641A	0.010	µg/L	<0.010	<0.010	----	----	<0.010
acridine	260-94-6	E641A	0.010	µg/L	<0.010	<0.010	----	----	<0.010
anthracene	120-12-7	E641A	0.010	µg/L	<0.010	<0.010	----	----	<0.010
benz(a)anthracene	56-55-3	E641A	0.010	µg/L	<0.010	<0.010	----	----	<0.010
benzo(a)pyrene	50-32-8	E641A	0.0050	µg/L	<0.0050	<0.0050	----	----	<0.0050
benzo(b+j)fluoranthene	----	E641A	0.010	µg/L	<0.010	<0.010	----	----	<0.010
benzo(b+j+k)fluoranthene	----	E641A	0.015	µg/L	<0.015	<0.015	----	----	<0.015
benzo(g,h,i)perylene	191-24-2	E641A	0.010	µg/L	<0.010	<0.010	----	----	<0.010
benzo(k)fluoranthene	207-08-9	E641A	0.010	µg/L	<0.010	<0.010	----	----	<0.010
chrysene	218-01-9	E641A	0.010	µg/L	<0.010	<0.010	----	----	<0.010
dibenz(a,h)anthracene	53-70-3	E641A	0.0050	µg/L	<0.0050	<0.0050	----	----	<0.0050
fluoranthene	206-44-0	E641A	0.010	µg/L	<0.010	<0.010	----	----	<0.010
fluorene	86-73-7	E641A	0.010	µg/L	<0.010	<0.010	----	----	<0.010
indeno(1,2,3-c,d)pyrene	193-39-5	E641A	0.010	µg/L	<0.010	<0.010	----	----	<0.010
methylnaphthalene, 1-	90-12-0	E641A	0.010	µg/L	<0.010	<0.010	----	----	<0.010
methylnaphthalene, 2-	91-57-6	E641A	0.010	µg/L	<0.010	<0.010	----	----	<0.010
naphthalene	91-20-3	E641A	0.050	µg/L	<0.050	<0.050	----	----	<0.050
phenanthrene	85-01-8	E641A	0.020	µg/L	<0.020	<0.020	----	----	<0.020
pyrene	129-00-0	E641A	0.010	µg/L	<0.010	<0.010	----	----	<0.010
quinoline	6027-02-7	E641A	0.050	µg/L	<0.050	<0.050	----	----	<0.050

Analytical Results

Sub-Matrix: **Seawater**

(Matrix: **Water**)

				Client sample ID	DUP-A	MP-06 ENE	MP-06 North	MP-06 WNW	MP-06 Source
				Client sampling date / time	02-Aug-2021	02-Aug-2021 17:45	02-Aug-2021 17:25	02-Aug-2021 17:35	02-Aug-2021 17:15
Analyte	*CAS Number*	*Method*	*LOR*	*Unit*	**VA21B6250-006**	**VA21B6250-007**	**VA21B6250-008**	**VA21B6250-009**	**VA21B6250-010**
					Result	Result	Result	Result	Result
Polycyclic Aromatic Hydrocarbons Surrogates									
chrysene-d12	1719-03-5	E641A	0.1	%	78.3	79.7	----	----	79.2
naphthalene-d8	1146-65-2	E641A	0.1	%	86.8	84.5	----	----	88.5
phenanthrene-d10	1517-22-2	E641A	0.1	%	104	110	----	----	108

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

ALS Environmental

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **VA21B6250**	Page	: 1 of 38
Amendment	: **1**		
Client	: **Golder Associates Ltd.**	Laboratory	: Vancouver - Environmental
Contact	: Elaine Irving	Account Manager	: Amber Springer
Address	: 200-2920 Virtual Way Vancouver BC Canada V5M 0C4	Address	: 8081 Lougheed Highway Burnaby, British Columbia Canada V5A 1W9
Telephone	: ----	Telephone	: +1 604 253 4188
Project	: ----	Date Samples Received	: 05-Aug-2021 10:30
PO	: ----	Issue Date	: 02-Sep-2021 16:25
C-O-C number	: 20-920773		
Sampler	: ----		
Site	: ----		
Quote number	: Q84262		
No. of samples received	: 10		
No. of samples analysed	: 10		

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 Services number is a unique identifier assigned to discrete substances.

DQO: Data Quality Objective.

LOR: Limit of Reporting (detection limit).

RPD: Relative Percent Difference.

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Matrix Spike outliers occur.
- Laboratory Control Sample (LCS) outliers occur - please see following pages for full details.
- 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.

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **Water**

Analyte Group	Laboratory sample ID	Client/Ref Sample ID	Analyte	CAS Number	Method	Result	Limits	Comment
Laboratory Control Sample (LCS) Recoveries								
Total Metals	QC-MRG2-260245002	----	tellurium, total	13494-80-9	E468S	124 % MES	80.0-120%	Recovery greater than upper control limit

Result Qualifiers

Qualifier	Description
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).

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	*Method*	*Sampling Date*	*Extraction / Preparation*				*Analysis*			
Container / Client Sample ID(s)			*Preparation Date*	*Holding Times Rec*	*Holding Times Actual*	*Eval*	*Analysis Date*	*Holding Times Rec*	*Holding Times Actual*	*Eval*
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) DUP-A	E298	02-Aug-2021	21-Aug-2021	----	----		22-Aug-2021	28 days	20 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) MP-05 ENE	E298	02-Aug-2021	21-Aug-2021	----	----		22-Aug-2021	28 days	20 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) MP-05 North	E298	02-Aug-2021	21-Aug-2021	----	----		22-Aug-2021	28 days	20 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) MP-05 Source	E298	02-Aug-2021	21-Aug-2021	----	----		22-Aug-2021	28 days	20 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) MP-05 WNW	E298	02-Aug-2021	21-Aug-2021	----	----		22-Aug-2021	28 days	20 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) MP-05- WNW-FBLANK-1	E298	02-Aug-2021	21-Aug-2021	----	----		22-Aug-2021	28 days	20 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) MP-06 ENE	E298	02-Aug-2021	21-Aug-2021	----	----		22-Aug-2021	28 days	20 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis: Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
MP-06 North	E298	02-Aug-2021	21-Aug-2021	----	----		22-Aug-2021	28 days	20 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
MP-06 Source	E298	02-Aug-2021	21-Aug-2021	----	----		22-Aug-2021	28 days	20 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
MP-06 WNW	E298	02-Aug-2021	21-Aug-2021	----	----		22-Aug-2021	28 days	20 days	✓
Anions and Nutrients : Bromide in Seawater by IC										
HDPE										
DUP-A	E235S.Br	02-Aug-2021	----	----	----		23-Aug-2021	28 days	21 days	✓
Anions and Nutrients : Bromide in Seawater by IC										
HDPE										
MP-05 ENE	E235S.Br	02-Aug-2021	----	----	----		23-Aug-2021	28 days	21 days	✓
Anions and Nutrients : Bromide in Seawater by IC										
HDPE										
MP-05 North	E235S.Br	02-Aug-2021	----	----	----		23-Aug-2021	28 days	21 days	✓
Anions and Nutrients : Bromide in Seawater by IC										
HDPE										
MP-05 Source	E235S.Br	02-Aug-2021	----	----	----		23-Aug-2021	28 days	21 days	✓
Anions and Nutrients : Bromide in Seawater by IC										
HDPE										
MP-05 WNW	E235S.Br	02-Aug-2021	----	----	----		23-Aug-2021	28 days	21 days	✓
Anions and Nutrients : Bromide in Seawater by IC										
HDPE										
MP-05- WNW-FBLANK-1	E235S.Br	02-Aug-2021	----	----	----		23-Aug-2021	28 days	21 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Anions and Nutrients : Bromide in Seawater by IC										
HDPE MP-06 ENE	E235S.Br	02-Aug-2021	----	----	----		23-Aug-2021	28 days	21 days	✓
Anions and Nutrients : Bromide in Seawater by IC										
HDPE MP-06 North	E235S.Br	02-Aug-2021	----	----	----		23-Aug-2021	28 days	21 days	✓
Anions and Nutrients : Bromide in Seawater by IC										
HDPE MP-06 Source	E235S.Br	02-Aug-2021	----	----	----		23-Aug-2021	28 days	21 days	✓
Anions and Nutrients : Bromide in Seawater by IC										
HDPE MP-06 WNW	E235S.Br	02-Aug-2021	----	----	----		23-Aug-2021	28 days	21 days	✓
Anions and Nutrients : Chloride in Seawater by IC										
HDPE DUP-A	E235S.Cl	02-Aug-2021	----	----	----		23-Aug-2021	28 days	21 days	✓
Anions and Nutrients : Chloride in Seawater by IC										
HDPE MP-05 ENE	E235S.Cl	02-Aug-2021	----	----	----		23-Aug-2021	28 days	21 days	✓
Anions and Nutrients : Chloride in Seawater by IC										
HDPE MP-05 North	E235S.Cl	02-Aug-2021	----	----	----		23-Aug-2021	28 days	21 days	✓
Anions and Nutrients : Chloride in Seawater by IC										
HDPE MP-05 Source	E235S.Cl	02-Aug-2021	----	----	----		23-Aug-2021	28 days	21 days	✓
Anions and Nutrients : Chloride in Seawater by IC										
HDPE MP-05 WNW	E235S.Cl	02-Aug-2021	----	----	----		23-Aug-2021	28 days	21 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis: Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Chloride in Seawater by IC										
HDPE MP-05- WNW-FBLANK-1	E235S.Cl	02-Aug-2021	----	----	----		23-Aug-2021	28 days	21 days	✓
Anions and Nutrients : Chloride in Seawater by IC										
HDPE MP-06 ENE	E235S.Cl	02-Aug-2021	----	----	----		23-Aug-2021	28 days	21 days	✓
Anions and Nutrients : Chloride in Seawater by IC										
HDPE MP-06 North	E235S.Cl	02-Aug-2021	----	----	----		23-Aug-2021	28 days	21 days	✓
Anions and Nutrients : Chloride in Seawater by IC										
HDPE MP-06 Source	E235S.Cl	02-Aug-2021	----	----	----		23-Aug-2021	28 days	21 days	✓
Anions and Nutrients : Chloride in Seawater by IC										
HDPE MP-06 WNW	E235S.Cl	02-Aug-2021	----	----	----		23-Aug-2021	28 days	21 days	✓
Anions and Nutrients : Fluoride in Seawater by IC (Low Level)										
HDPE DUP-A	E235S.F-L	02-Aug-2021	----	----	----		23-Aug-2021	28 days	21 days	✓
Anions and Nutrients : Fluoride in Seawater by IC (Low Level)										
HDPE MP-05 ENE	E235S.F-L	02-Aug-2021	----	----	----		23-Aug-2021	28 days	21 days	✓
Anions and Nutrients : Fluoride in Seawater by IC (Low Level)										
HDPE MP-05 North	E235S.F-L	02-Aug-2021	----	----	----		23-Aug-2021	28 days	21 days	✓
Anions and Nutrients : Fluoride in Seawater by IC (Low Level)										
HDPE MP-05 Source	E235S.F-L	02-Aug-2021	----	----	----		23-Aug-2021	28 days	21 days	✓

Matrix: **Water**

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

Analyte Group	Method	Sampling Date	Extraction / Preparation				Analysis			
Container / Client Sample ID(s)			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Fluoride in Seawater by IC (Low Level)										
HDPE MP-05 WNW	E235S.F-L	02-Aug-2021	----	----	----		23-Aug-2021	28 days	21 days	✓
Anions and Nutrients : Fluoride in Seawater by IC (Low Level)										
HDPE MP-05- WNW-FBLANK-1	E235S.F-L	02-Aug-2021	----	----	----		23-Aug-2021	28 days	21 days	✓
Anions and Nutrients : Fluoride in Seawater by IC (Low Level)										
HDPE MP-06 ENE	E235S.F-L	02-Aug-2021	----	----	----		23-Aug-2021	28 days	21 days	✓
Anions and Nutrients : Fluoride in Seawater by IC (Low Level)										
HDPE MP-06 North	E235S.F-L	02-Aug-2021	----	----	----		23-Aug-2021	28 days	21 days	✓
Anions and Nutrients : Fluoride in Seawater by IC (Low Level)										
HDPE MP-06 Source	E235S.F-L	02-Aug-2021	----	----	----		23-Aug-2021	28 days	21 days	✓
Anions and Nutrients : Fluoride in Seawater by IC (Low Level)										
HDPE MP-06 WNW	E235S.F-L	02-Aug-2021	----	----	----		23-Aug-2021	28 days	21 days	✓
Anions and Nutrients : Nitrate in Seawater by IC (Trace Level)										
HDPE DUP-A	E235S.NO3-T	02-Aug-2021	----	----	----		23-Aug-2021	3 days	21 days	× EHTL
Anions and Nutrients : Nitrate in Seawater by IC (Trace Level)										
HDPE MP-05 ENE	E235S.NO3-T	02-Aug-2021	----	----	----		23-Aug-2021	3 days	21 days	× EHTL
Anions and Nutrients : Nitrate in Seawater by IC (Trace Level)										
HDPE MP-05 North	E235S.NO3-T	02-Aug-2021	----	----	----		23-Aug-2021	3 days	21 days	× EHTL

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 : Nitrate in Seawater by IC (Trace Level)										
HDPE MP-05 Source	E235S.NO3-T	02-Aug-2021	----	----	----		23-Aug-2021	3 days	21 days	× EHTL
Anions and Nutrients : Nitrate in Seawater by IC (Trace Level)										
HDPE MP-05 WNW	E235S.NO3-T	02-Aug-2021	----	----	----		23-Aug-2021	3 days	21 days	× EHT
Anions and Nutrients : Nitrate in Seawater by IC (Trace Level)										
HDPE MP-05- WNW-FBLANK-1	E235S.NO3-T	02-Aug-2021	----	----	----		23-Aug-2021	3 days	21 days	× EHT
Anions and Nutrients : Nitrate in Seawater by IC (Trace Level)										
HDPE MP-06 ENE	E235S.NO3-T	02-Aug-2021	----	----	----		23-Aug-2021	3 days	21 days	× EHT
Anions and Nutrients : Nitrate in Seawater by IC (Trace Level)										
HDPE MP-06 North	E235S.NO3-T	02-Aug-2021	----	----	----		23-Aug-2021	3 days	21 days	× EHT
Anions and Nutrients : Nitrate in Seawater by IC (Trace Level)										
HDPE MP-06 Source	E235S.NO3-T	02-Aug-2021	----	----	----		23-Aug-2021	3 days	21 days	× EHT
Anions and Nutrients : Nitrate in Seawater by IC (Trace Level)										
HDPE MP-06 WNW	E235S.NO3-T	02-Aug-2021	----	----	----		23-Aug-2021	3 days	21 days	× EHT
Anions and Nutrients : Nitrite in Seawater by IC (Low Level)										
HDPE DUP-A	E235S.NO2-L	02-Aug-2021	----	----	----		23-Aug-2021	3 days	21 days	× EHTL
Anions and Nutrients : Nitrite in Seawater by IC (Low Level)										
HDPE MP-05 ENE	E235S.NO2-L	02-Aug-2021	----	----	----		23-Aug-2021	3 days	21 days	× EHTL

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Holding Times: Rec	Holding Times: Actual	Eval	Analysis: Analysis Date	Holding Times: Rec	Holding Times: Actual	Eval
Anions and Nutrients : Nitrite in Seawater by IC (Low Level)										
HDPE MP-05 North	E235S.NO2-L	02-Aug-2021	----	----	----		23-Aug-2021	3 days	21 days	✖ EHTL
Anions and Nutrients : Nitrite in Seawater by IC (Low Level)										
HDPE MP-05 Source	E235S.NO2-L	02-Aug-2021	----	----	----		23-Aug-2021	3 days	21 days	✖ EHTL
Anions and Nutrients : Nitrite in Seawater by IC (Low Level)										
HDPE MP-05 WNW	E235S.NO2-L	02-Aug-2021	----	----	----		23-Aug-2021	3 days	21 days	✖ EHT
Anions and Nutrients : Nitrite in Seawater by IC (Low Level)										
HDPE MP-05- WNW-FBLANK-1	E235S.NO2-L	02-Aug-2021	----	----	----		23-Aug-2021	3 days	21 days	✖ EHT
Anions and Nutrients : Nitrite in Seawater by IC (Low Level)										
HDPE MP-06 ENE	E235S.NO2-L	02-Aug-2021	----	----	----		23-Aug-2021	3 days	21 days	✖ EHT
Anions and Nutrients : Nitrite in Seawater by IC (Low Level)										
HDPE MP-06 North	E235S.NO2-L	02-Aug-2021	----	----	----		23-Aug-2021	3 days	21 days	✖ EHT
Anions and Nutrients : Nitrite in Seawater by IC (Low Level)										
HDPE MP-06 Source	E235S.NO2-L	02-Aug-2021	----	----	----		23-Aug-2021	3 days	21 days	✖ EHT
Anions and Nutrients : Nitrite in Seawater by IC (Low Level)										
HDPE MP-06 WNW	E235S.NO2-L	02-Aug-2021	----	----	----		23-Aug-2021	3 days	21 days	✖ EHT
Anions and Nutrients : Sulfate in Seawater by IC (Low Level)										
HDPE DUP-A	E235S.SO4-L	02-Aug-2021	----	----	----		23-Aug-2021	----	21 days	

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Anions and Nutrients : Sulfate in Seawater by IC (Low Level)										
HDPE MP-05 ENE	E235S.SO4-L	02-Aug-2021	----	----	----		23-Aug-2021	----	21 days	
Anions and Nutrients : Sulfate in Seawater by IC (Low Level)										
HDPE MP-05 North	E235S.SO4-L	02-Aug-2021	----	----	----		23-Aug-2021	----	21 days	
Anions and Nutrients : Sulfate in Seawater by IC (Low Level)										
HDPE MP-05 Source	E235S.SO4-L	02-Aug-2021	----	----	----		23-Aug-2021	----	21 days	
Anions and Nutrients : Sulfate in Seawater by IC (Low Level)										
HDPE MP-05 WNW	E235S.SO4-L	02-Aug-2021	----	----	----		23-Aug-2021	----	21 days	
Anions and Nutrients : Sulfate in Seawater by IC (Low Level)										
HDPE MP-05- WNW-FBLANK-1	E235S.SO4-L	02-Aug-2021	----	----	----		23-Aug-2021	----	21 days	
Anions and Nutrients : Sulfate in Seawater by IC (Low Level)										
HDPE MP-06 ENE	E235S.SO4-L	02-Aug-2021	----	----	----		23-Aug-2021	----	21 days	
Anions and Nutrients : Sulfate in Seawater by IC (Low Level)										
HDPE MP-06 North	E235S.SO4-L	02-Aug-2021	----	----	----		23-Aug-2021	----	21 days	
Anions and Nutrients : Sulfate in Seawater by IC (Low Level)										
HDPE MP-06 Source	E235S.SO4-L	02-Aug-2021	----	----	----		23-Aug-2021	----	21 days	
Anions and Nutrients : Sulfate in Seawater by IC (Low Level)										
HDPE MP-06 WNW	E235S.SO4-L	02-Aug-2021	----	----	----		23-Aug-2021	----	21 days	

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Holding Times: Rec	Holding Times: Actual	Eval	Analysis: Analysis Date	Holding Times: Rec	Holding Times: Actual	Eval
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence										
Amber glass total (sulfuric acid) DUP-A	E318S	02-Aug-2021	10-Aug-2021	----	----		12-Aug-2021	28 days	10 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence										
Amber glass total (sulfuric acid) MP-05 ENE	E318S	02-Aug-2021	10-Aug-2021	----	----		12-Aug-2021	28 days	10 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence										
Amber glass total (sulfuric acid) MP-05 North	E318S	02-Aug-2021	10-Aug-2021	----	----		12-Aug-2021	28 days	10 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence										
Amber glass total (sulfuric acid) MP-05 Source	E318S	02-Aug-2021	10-Aug-2021	----	----		12-Aug-2021	28 days	10 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence										
Amber glass total (sulfuric acid) MP-05 WNW	E318S	02-Aug-2021	10-Aug-2021	----	----		12-Aug-2021	28 days	10 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence										
Amber glass total (sulfuric acid) MP-05- WNW-FBLANK-1	E318S	02-Aug-2021	10-Aug-2021	----	----		12-Aug-2021	28 days	10 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence										
Amber glass total (sulfuric acid) MP-06 ENE	E318S	02-Aug-2021	10-Aug-2021	----	----		12-Aug-2021	28 days	10 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence										
Amber glass total (sulfuric acid) MP-06 North	E318S	02-Aug-2021	10-Aug-2021	----	----		12-Aug-2021	28 days	10 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence										
Amber glass total (sulfuric acid) MP-06 Source	E318S	02-Aug-2021	10-Aug-2021	----	----		12-Aug-2021	28 days	10 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence										
Amber glass total (sulfuric acid) MP-06 WNW	E318S	02-Aug-2021	10-Aug-2021	----	----		12-Aug-2021	28 days	10 days	✓
Anions and Nutrients : Total Phosphorus in Seawater by Colourimetry										
Amber glass total (sulfuric acid) DUP-A	E372S	02-Aug-2021	21-Aug-2021	----	----		22-Aug-2021	28 days	20 days	✓
Anions and Nutrients : Total Phosphorus in Seawater by Colourimetry										
Amber glass total (sulfuric acid) MP-05 ENE	E372S	02-Aug-2021	21-Aug-2021	----	----		22-Aug-2021	28 days	20 days	✓
Anions and Nutrients : Total Phosphorus in Seawater by Colourimetry										
Amber glass total (sulfuric acid) MP-05 North	E372S	02-Aug-2021	21-Aug-2021	----	----		22-Aug-2021	28 days	20 days	✓
Anions and Nutrients : Total Phosphorus in Seawater by Colourimetry										
Amber glass total (sulfuric acid) MP-05 Source	E372S	02-Aug-2021	21-Aug-2021	----	----		22-Aug-2021	28 days	20 days	✓
Anions and Nutrients : Total Phosphorus in Seawater by Colourimetry										
Amber glass total (sulfuric acid) MP-05 WNW	E372S	02-Aug-2021	21-Aug-2021	----	----		22-Aug-2021	28 days	20 days	✓
Anions and Nutrients : Total Phosphorus in Seawater by Colourimetry										
Amber glass total (sulfuric acid) MP-05- WNW-FBLANK-1	E372S	02-Aug-2021	21-Aug-2021	----	----		22-Aug-2021	28 days	20 days	✓
Anions and Nutrients : Total Phosphorus in Seawater by Colourimetry										
Amber glass total (sulfuric acid) MP-06 ENE	E372S	02-Aug-2021	21-Aug-2021	----	----		22-Aug-2021	28 days	20 days	✓
Anions and Nutrients : Total Phosphorus in Seawater by Colourimetry										
Amber glass total (sulfuric acid) MP-06 North	E372S	02-Aug-2021	21-Aug-2021	----	----		22-Aug-2021	28 days	20 days	✓

Matrix: **Water**

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

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis: Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Total Phosphorus in Seawater by Colourimetry										
Amber glass total (sulfuric acid) MP-06 Source	E372S	02-Aug-2021	21-Aug-2021	----	----		22-Aug-2021	28 days	20 days	✓
Anions and Nutrients : Total Phosphorus in Seawater by Colourimetry										
Amber glass total (sulfuric acid) MP-06 WNW	E372S	02-Aug-2021	21-Aug-2021	----	----		22-Aug-2021	28 days	20 days	✓
Dissolved Metals : Dissolved Mercury in Seawater by CVAAS										
Glass vial dissolved (hydrochloric acid) DUP-A	E509S	02-Aug-2021	11-Aug-2021	----	----		11-Aug-2021	28 days	9 days	✓
Dissolved Metals : Dissolved Mercury in Seawater by CVAAS										
Glass vial dissolved (hydrochloric acid) MP-05 ENE	E509S	02-Aug-2021	11-Aug-2021	----	----		11-Aug-2021	28 days	9 days	✓
Dissolved Metals : Dissolved Mercury in Seawater by CVAAS										
Glass vial dissolved (hydrochloric acid) MP-05 North	E509S	02-Aug-2021	11-Aug-2021	----	----		11-Aug-2021	28 days	9 days	✓
Dissolved Metals : Dissolved Mercury in Seawater by CVAAS										
Glass vial dissolved (hydrochloric acid) MP-05 Source	E509S	02-Aug-2021	11-Aug-2021	----	----		11-Aug-2021	28 days	9 days	✓
Dissolved Metals : Dissolved Mercury in Seawater by CVAAS										
Glass vial dissolved (hydrochloric acid) MP-05 WNW	E509S	02-Aug-2021	11-Aug-2021	----	----		11-Aug-2021	28 days	9 days	✓
Dissolved Metals : Dissolved Mercury in Seawater by CVAAS										
Glass vial dissolved (hydrochloric acid) MP-05- WNW-FBLANK-1	E509S	02-Aug-2021	11-Aug-2021	----	----		11-Aug-2021	28 days	9 days	✓
Dissolved Metals : Dissolved Mercury in Seawater by CVAAS										
Glass vial dissolved (hydrochloric acid) MP-06 ENE	E509S	02-Aug-2021	11-Aug-2021	----	----		11-Aug-2021	28 days	9 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Dissolved Metals : Dissolved Mercury in Seawater by CVAAS										
Glass vial dissolved (hydrochloric acid)										
MP-06 North	E509S	02-Aug-2021	11-Aug-2021	----	----		11-Aug-2021	28 days	9 days	✓
Dissolved Metals : Dissolved Mercury in Seawater by CVAAS										
Glass vial dissolved (hydrochloric acid)										
MP-06 Source	E509S	02-Aug-2021	11-Aug-2021	----	----		11-Aug-2021	28 days	9 days	✓
Dissolved Metals : Dissolved Mercury in Seawater by CVAAS										
Glass vial dissolved (hydrochloric acid)										
MP-06 WNW	E509S	02-Aug-2021	11-Aug-2021	----	----		11-Aug-2021	28 days	9 days	✓
Dissolved Metals : Dissolved Metals in Seawater by CRC ICPMS (HMI)										
HDPE dissolved (nitric acid)										
DUP-A	E469S	02-Aug-2021	06-Aug-2021	----	----		09-Aug-2021	180 days	7 days	✓
Dissolved Metals : Dissolved Metals in Seawater by CRC ICPMS (HMI)										
HDPE dissolved (nitric acid)										
MP-05 ENE	E469S	02-Aug-2021	06-Aug-2021	----	----		09-Aug-2021	180 days	7 days	✓
Dissolved Metals : Dissolved Metals in Seawater by CRC ICPMS (HMI)										
HDPE dissolved (nitric acid)										
MP-05 North	E469S	02-Aug-2021	06-Aug-2021	----	----		09-Aug-2021	180 days	7 days	✓
Dissolved Metals : Dissolved Metals in Seawater by CRC ICPMS (HMI)										
HDPE dissolved (nitric acid)										
MP-05 Source	E469S	02-Aug-2021	06-Aug-2021	----	----		09-Aug-2021	180 days	7 days	✓
Dissolved Metals : Dissolved Metals in Seawater by CRC ICPMS (HMI)										
HDPE dissolved (nitric acid)										
MP-05 WNW	E469S	02-Aug-2021	06-Aug-2021	----	----		09-Aug-2021	180 days	7 days	✓
Dissolved Metals : Dissolved Metals in Seawater by CRC ICPMS (HMI)										
HDPE dissolved (nitric acid)										
MP-05- WNW-FBLANK-1	E469S	02-Aug-2021	06-Aug-2021	----	----		09-Aug-2021	180 days	7 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis: Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Metals in Seawater by CRC ICPMS (HMI)										
HDPE dissolved (nitric acid) MP-06 ENE	E469S	02-Aug-2021	06-Aug-2021	----	----		09-Aug-2021	180 days	7 days	✓
Dissolved Metals : Dissolved Metals in Seawater by CRC ICPMS (HMI)										
HDPE dissolved (nitric acid) MP-06 North	E469S	02-Aug-2021	06-Aug-2021	----	----		09-Aug-2021	180 days	7 days	✓
Dissolved Metals : Dissolved Metals in Seawater by CRC ICPMS (HMI)										
HDPE dissolved (nitric acid) MP-06 Source	E469S	02-Aug-2021	06-Aug-2021	----	----		09-Aug-2021	180 days	7 days	✓
Dissolved Metals : Dissolved Metals in Seawater by CRC ICPMS (HMI)										
HDPE dissolved (nitric acid) MP-06 WNW	E469S	02-Aug-2021	06-Aug-2021	----	----		09-Aug-2021	180 days	7 days	✓
Dissolved Metals : Dissolved Sodium and Silicon in Seawater by CRC ICPMS										
HDPE dissolved (nitric acid) DUP-A	E469S.NaSi	02-Aug-2021	06-Aug-2021	----	----		09-Aug-2021	180 days	7 days	✓
Dissolved Metals : Dissolved Sodium and Silicon in Seawater by CRC ICPMS										
HDPE dissolved (nitric acid) MP-05 ENE	E469S.NaSi	02-Aug-2021	06-Aug-2021	----	----		09-Aug-2021	180 days	7 days	✓
Dissolved Metals : Dissolved Sodium and Silicon in Seawater by CRC ICPMS										
HDPE dissolved (nitric acid) MP-05 North	E469S.NaSi	02-Aug-2021	06-Aug-2021	----	----		09-Aug-2021	180 days	7 days	✓
Dissolved Metals : Dissolved Sodium and Silicon in Seawater by CRC ICPMS										
HDPE dissolved (nitric acid) MP-05 Source	E469S.NaSi	02-Aug-2021	06-Aug-2021	----	----		09-Aug-2021	180 days	7 days	✓
Dissolved Metals : Dissolved Sodium and Silicon in Seawater by CRC ICPMS										
HDPE dissolved (nitric acid) MP-05 WNW	E469S.NaSi	02-Aug-2021	06-Aug-2021	----	----		09-Aug-2021	180 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
Dissolved Metals : Dissolved Sodium and Silicon in Seawater by CRC ICPMS										
HDPE dissolved (nitric acid) MP-05- WNW-FBLANK-1	E469S.NaSi	02-Aug-2021	06-Aug-2021	----	----		09-Aug-2021	180 days	7 days	✓
Dissolved Metals : Dissolved Sodium and Silicon in Seawater by CRC ICPMS										
HDPE dissolved (nitric acid) MP-06 ENE	E469S.NaSi	02-Aug-2021	06-Aug-2021	----	----		09-Aug-2021	180 days	7 days	✓
Dissolved Metals : Dissolved Sodium and Silicon in Seawater by CRC ICPMS										
HDPE dissolved (nitric acid) MP-06 North	E469S.NaSi	02-Aug-2021	06-Aug-2021	----	----		09-Aug-2021	180 days	7 days	✓
Dissolved Metals : Dissolved Sodium and Silicon in Seawater by CRC ICPMS										
HDPE dissolved (nitric acid) MP-06 Source	E469S.NaSi	02-Aug-2021	06-Aug-2021	----	----		09-Aug-2021	180 days	7 days	✓
Dissolved Metals : Dissolved Sodium and Silicon in Seawater by CRC ICPMS										
HDPE dissolved (nitric acid) MP-06 WNW	E469S.NaSi	02-Aug-2021	06-Aug-2021	----	----		09-Aug-2021	180 days	7 days	✓
Hydrocarbons : CCME PHC - F2-F4 by GC-FID										
Amber glass/Teflon lined cap (sodium bisulfate) DUP-A	E601	02-Aug-2021	10-Aug-2021	14 days	8 days	✓	11-Aug-2021	40 days	1 days	✓
Hydrocarbons : CCME PHC - F2-F4 by GC-FID										
Amber glass/Teflon lined cap (sodium bisulfate) MP-05 North	E601	02-Aug-2021	10-Aug-2021	14 days	8 days	✓	11-Aug-2021	40 days	1 days	✓
Hydrocarbons : CCME PHC - F2-F4 by GC-FID										
Amber glass/Teflon lined cap (sodium bisulfate) MP-05 Source	E601	02-Aug-2021	10-Aug-2021	14 days	8 days	✓	11-Aug-2021	40 days	1 days	✓
Hydrocarbons : CCME PHC - F2-F4 by GC-FID										
Amber glass/Teflon lined cap (sodium bisulfate) MP-05- WNW-FBLANK-1	E601	02-Aug-2021	10-Aug-2021	14 days	8 days	✓	11-Aug-2021	40 days	1 days	✓

Matrix: **Water**

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

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Hydrocarbons : CCME PHC - F2-F4 by GC-FID										
Amber glass/Teflon lined cap (sodium bisulfate) MP-06 ENE	E601	02-Aug-2021	10-Aug-2021	14 days	8 days	✓	11-Aug-2021	40 days	1 days	✓
Hydrocarbons : CCME PHC - F2-F4 by GC-FID										
Amber glass/Teflon lined cap (sodium bisulfate) MP-06 Source	E601	02-Aug-2021	10-Aug-2021	14 days	8 days	✓	11-Aug-2021	40 days	1 days	✓
Hydrocarbons : VH and F1 by Headspace GC-FID										
Glass vial (sodium bisulfate) DUP-A	E581.VH+F1	02-Aug-2021	11-Aug-2021	----	----		12-Aug-2021	14 days	10 days	✓
Hydrocarbons : VH and F1 by Headspace GC-FID										
Glass vial (sodium bisulfate) MP-05 North	E581.VH+F1	02-Aug-2021	11-Aug-2021	----	----		12-Aug-2021	14 days	10 days	✓
Hydrocarbons : VH and F1 by Headspace GC-FID										
Glass vial (sodium bisulfate) MP-05 Source	E581.VH+F1	02-Aug-2021	11-Aug-2021	----	----		12-Aug-2021	14 days	10 days	✓
Hydrocarbons : VH and F1 by Headspace GC-FID										
Glass vial (sodium bisulfate) MP-05- WNW-FBLANK-1	E581.VH+F1	02-Aug-2021	11-Aug-2021	----	----		12-Aug-2021	14 days	10 days	✓
Hydrocarbons : VH and F1 by Headspace GC-FID										
Glass vial (sodium bisulfate) MP-06 ENE	E581.VH+F1	02-Aug-2021	11-Aug-2021	----	----		12-Aug-2021	14 days	10 days	✓
Hydrocarbons : VH and F1 by Headspace GC-FID										
Glass vial (sodium bisulfate) MP-06 Source	E581.VH+F1	02-Aug-2021	11-Aug-2021	----	----		12-Aug-2021	14 days	10 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (lab preserved) DUP-A	E358-L	02-Aug-2021	21-Aug-2021	3 days	19 days	✗ EHTL	22-Aug-2021	28 days	1 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (lab preserved) MP-05 ENE	E358-L	02-Aug-2021	21-Aug-2021	3 days	19 days	× EHTL	22-Aug-2021	28 days	1 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (lab preserved) MP-05 North	E358-L	02-Aug-2021	21-Aug-2021	3 days	19 days	× EHTL	22-Aug-2021	28 days	1 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (lab preserved) MP-05 Source	E358-L	02-Aug-2021	21-Aug-2021	3 days	19 days	× EHTL	22-Aug-2021	28 days	1 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (lab preserved) MP-05 WNW	E358-L	02-Aug-2021	21-Aug-2021	3 days	19 days	× EHT	22-Aug-2021	28 days	1 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (lab preserved) MP-05- WNW-FBLANK-1	E358-L	02-Aug-2021	21-Aug-2021	3 days	19 days	× EHT	22-Aug-2021	28 days	1 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (lab preserved) MP-06 ENE	E358-L	02-Aug-2021	21-Aug-2021	3 days	19 days	× EHT	22-Aug-2021	28 days	1 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (lab preserved) MP-06 North	E358-L	02-Aug-2021	21-Aug-2021	3 days	19 days	× EHT	22-Aug-2021	28 days	1 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (lab preserved) MP-06 Source	E358-L	02-Aug-2021	21-Aug-2021	3 days	19 days	× EHT	22-Aug-2021	28 days	1 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (lab preserved) MP-06 WNW	E358-L	02-Aug-2021	21-Aug-2021	3 days	19 days	× EHT	22-Aug-2021	28 days	1 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) DUP-A	E355-L	02-Aug-2021	10-Aug-2021	----	----		10-Aug-2021	28 days	7 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) MP-05 ENE	E355-L	02-Aug-2021	10-Aug-2021	----	----		10-Aug-2021	28 days	7 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) MP-05 North	E355-L	02-Aug-2021	10-Aug-2021	----	----		10-Aug-2021	28 days	7 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) MP-05 Source	E355-L	02-Aug-2021	10-Aug-2021	----	----		10-Aug-2021	28 days	7 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) MP-05 WNW	E355-L	02-Aug-2021	10-Aug-2021	----	----		10-Aug-2021	28 days	7 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) MP-05- WNW-FBLANK-1	E355-L	02-Aug-2021	10-Aug-2021	----	----		10-Aug-2021	28 days	7 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) MP-06 ENE	E355-L	02-Aug-2021	10-Aug-2021	----	----		10-Aug-2021	28 days	7 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) MP-06 North	E355-L	02-Aug-2021	10-Aug-2021	----	----		10-Aug-2021	28 days	7 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) MP-06 Source	E355-L	02-Aug-2021	10-Aug-2021	----	----		10-Aug-2021	28 days	7 days	✓

Matrix: **Water** Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Holding Times: Rec	Holding Times: Actual	Eval	Analysis: Analysis Date	Holding Times: Rec	Holding Times: Actual	Eval
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) MP-06 WNW	E355-L	02-Aug-2021	10-Aug-2021	----	----		10-Aug-2021	28 days	7 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE DUP-A	E290	02-Aug-2021	----	----	----		07-Aug-2021	14 days	5 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MP-05 ENE	E290	02-Aug-2021	----	----	----		07-Aug-2021	14 days	5 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MP-05 North	E290	02-Aug-2021	----	----	----		07-Aug-2021	14 days	5 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MP-05 Source	E290	02-Aug-2021	----	----	----		07-Aug-2021	14 days	5 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MP-05 WNW	E290	02-Aug-2021	----	----	----		07-Aug-2021	14 days	5 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MP-05- WNW-FBLANK-1	E290	02-Aug-2021	----	----	----		07-Aug-2021	14 days	5 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MP-06 ENE	E290	02-Aug-2021	----	----	----		07-Aug-2021	14 days	5 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MP-06 North	E290	02-Aug-2021	----	----	----		07-Aug-2021	14 days	5 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Physical Tests : Alkalinity Species by Titration										
HDPE										
MP-06 Source	E290	02-Aug-2021	----	----	----		07-Aug-2021	14 days	5 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE										
MP-06 WNW	E290	02-Aug-2021	----	----	----		07-Aug-2021	14 days	5 days	✓
Physical Tests : Conductivity in Seawater										
HDPE										
DUP-A	E100S	02-Aug-2021	----	----	----		07-Aug-2021	28 days	5 days	✓
Physical Tests : Conductivity in Seawater										
HDPE										
MP-05 ENE	E100S	02-Aug-2021	----	----	----		07-Aug-2021	28 days	5 days	✓
Physical Tests : Conductivity in Seawater										
HDPE										
MP-05 North	E100S	02-Aug-2021	----	----	----		07-Aug-2021	28 days	5 days	✓
Physical Tests : Conductivity in Seawater										
HDPE										
MP-05 Source	E100S	02-Aug-2021	----	----	----		07-Aug-2021	28 days	5 days	✓
Physical Tests : Conductivity in Seawater										
HDPE										
MP-05 WNW	E100S	02-Aug-2021	----	----	----		07-Aug-2021	28 days	5 days	✓
Physical Tests : Conductivity in Seawater										
HDPE										
MP-05- WNW-FBLANK-1	E100S	02-Aug-2021	----	----	----		07-Aug-2021	28 days	5 days	✓
Physical Tests : Conductivity in Seawater										
HDPE										
MP-06 ENE	E100S	02-Aug-2021	----	----	----		07-Aug-2021	28 days	5 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Physical Tests : Conductivity in Seawater										
HDPE MP-06 North	E100S	02-Aug-2021	----	----	----		07-Aug-2021	28 days	5 days	✓
Physical Tests : Conductivity in Seawater										
HDPE MP-06 Source	E100S	02-Aug-2021	----	----	----		07-Aug-2021	28 days	5 days	✓
Physical Tests : Conductivity in Seawater										
HDPE MP-06 WNW	E100S	02-Aug-2021	----	----	----		07-Aug-2021	28 days	5 days	✓
Physical Tests : pH by Meter										
HDPE MP-06 ENE	E108	02-Aug-2021	----	----	----		07-Aug-2021	0.25 hrs	117 hrs	✗ EHTR-FM
Physical Tests : pH by Meter										
HDPE MP-06 North	E108	02-Aug-2021	----	----	----		07-Aug-2021	0.25 hrs	117 hrs	✗ EHTR-FM
Physical Tests : pH by Meter										
HDPE MP-06 WNW	E108	02-Aug-2021	----	----	----		07-Aug-2021	0.25 hrs	117 hrs	✗ EHTR-FM
Physical Tests : pH by Meter										
HDPE MP-05 ENE	E108	02-Aug-2021	----	----	----		07-Aug-2021	0.25 hrs	118 hrs	✗ EHTR-FM
Physical Tests : pH by Meter										
HDPE MP-05 North	E108	02-Aug-2021	----	----	----		07-Aug-2021	0.25 hrs	118 hrs	✗ EHTR-FM
Physical Tests : pH by Meter										
HDPE MP-05 WNW	E108	02-Aug-2021	----	----	----		07-Aug-2021	0.25 hrs	118 hrs	✗ EHTR-FM

Matrix: **Water** Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group	Method	Sampling Date	Extraction / Preparation				Analysis			
Container / Client Sample ID(s)			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : pH by Meter										
HDPE MP-05- WNW-FBLANK-1	E108	02-Aug-2021	----	----	----		07-Aug-2021	0.25 hrs	118 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MP-06 Source	E108	02-Aug-2021	----	----	----		07-Aug-2021	0.25 hrs	118 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MP-05 Source	E108	02-Aug-2021	----	----	----		07-Aug-2021	0.25 hrs	119 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE DUP-A	E108	02-Aug-2021	----	----	----		07-Aug-2021	0.25 hrs	120 hrs	× EHTR-FM
Physical Tests : TDS by Gravimetry (Seawater)										
HDPE DUP-A	E162S	02-Aug-2021	----	----	----		21-Aug-2021	7 days	19 days	× EHT
Physical Tests : TDS by Gravimetry (Seawater)										
HDPE MP-05 ENE	E162S	02-Aug-2021	----	----	----		21-Aug-2021	7 days	19 days	× EHT
Physical Tests : TDS by Gravimetry (Seawater)										
HDPE MP-05 North	E162S	02-Aug-2021	----	----	----		21-Aug-2021	7 days	19 days	× EHT
Physical Tests : TDS by Gravimetry (Seawater)										
HDPE MP-05 Source	E162S	02-Aug-2021	----	----	----		21-Aug-2021	7 days	19 days	× EHT
Physical Tests : TDS by Gravimetry (Seawater)										
HDPE MP-05 WNW	E162S	02-Aug-2021	----	----	----		21-Aug-2021	7 days	19 days	× EHT

Matrix: **Water**

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

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : TDS by Gravimetry (Seawater)										
HDPE MP-05- WNW-FBLANK-1	E162S	02-Aug-2021	----	----	----		21-Aug-2021	7 days	19 days	× EHT
Physical Tests : TDS by Gravimetry (Seawater)										
HDPE MP-06 ENE	E162S	02-Aug-2021	----	----	----		21-Aug-2021	7 days	19 days	× EHT
Physical Tests : TDS by Gravimetry (Seawater)										
HDPE MP-06 North	E162S	02-Aug-2021	----	----	----		21-Aug-2021	7 days	19 days	× EHT
Physical Tests : TDS by Gravimetry (Seawater)										
HDPE MP-06 Source	E162S	02-Aug-2021	----	----	----		21-Aug-2021	7 days	19 days	× EHT
Physical Tests : TDS by Gravimetry (Seawater)										
HDPE MP-06 WNW	E162S	02-Aug-2021	----	----	----		21-Aug-2021	7 days	19 days	× EHT
Physical Tests : TSS by Gravimetry (Seawater)										
HDPE DUP-A	E160S	02-Aug-2021	----	----	----		08-Aug-2021	7 days	6 days	✓
Physical Tests : TSS by Gravimetry (Seawater)										
HDPE MP-05 ENE	E160S	02-Aug-2021	----	----	----		08-Aug-2021	7 days	6 days	✓
Physical Tests : TSS by Gravimetry (Seawater)										
HDPE MP-05 North	E160S	02-Aug-2021	----	----	----		08-Aug-2021	7 days	6 days	✓
Physical Tests : TSS by Gravimetry (Seawater)										
HDPE MP-05 Source	E160S	02-Aug-2021	----	----	----		08-Aug-2021	7 days	6 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Physical Tests : TSS by Gravimetry (Seawater)										
HDPE										
MP-05 WNW	E160S	02-Aug-2021	----	----	----		08-Aug-2021	7 days	6 days	✓
Physical Tests : TSS by Gravimetry (Seawater)										
HDPE										
MP-05- WNW-FBLANK-1	E160S	02-Aug-2021	----	----	----		08-Aug-2021	7 days	6 days	✓
Physical Tests : TSS by Gravimetry (Seawater)										
HDPE										
MP-06 ENE	E160S	02-Aug-2021	----	----	----		08-Aug-2021	7 days	6 days	✓
Physical Tests : TSS by Gravimetry (Seawater)										
HDPE										
MP-06 North	E160S	02-Aug-2021	----	----	----		08-Aug-2021	7 days	6 days	✓
Physical Tests : TSS by Gravimetry (Seawater)										
HDPE										
MP-06 Source	E160S	02-Aug-2021	----	----	----		08-Aug-2021	7 days	6 days	✓
Physical Tests : TSS by Gravimetry (Seawater)										
HDPE										
MP-06 WNW	E160S	02-Aug-2021	----	----	----		08-Aug-2021	7 days	6 days	✓
Physical Tests : Turbidity by Nephelometry										
HDPE										
DUP-A	E121	02-Aug-2021	----	----	----		06-Aug-2021	3 days	4 days	×
Physical Tests : Turbidity by Nephelometry										
HDPE										
MP-05 ENE	E121	02-Aug-2021	----	----	----		06-Aug-2021	3 days	4 days	×
Physical Tests : Turbidity by Nephelometry										
HDPE										
MP-05 North	E121	02-Aug-2021	----	----	----		06-Aug-2021	3 days	4 days	×

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis: Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Turbidity by Nephelometry										
HDPE MP-05 Source	E121	02-Aug-2021	----	----	----		06-Aug-2021	3 days	4 days	×
Physical Tests : Turbidity by Nephelometry										
HDPE MP-05 WNW	E121	02-Aug-2021	----	----	----		06-Aug-2021	3 days	4 days	×
Physical Tests : Turbidity by Nephelometry										
HDPE MP-05- WNW-FBLANK-1	E121	02-Aug-2021	----	----	----		06-Aug-2021	3 days	4 days	×
Physical Tests : Turbidity by Nephelometry										
HDPE MP-06 ENE	E121	02-Aug-2021	----	----	----		06-Aug-2021	3 days	4 days	×
Physical Tests : Turbidity by Nephelometry										
HDPE MP-06 North	E121	02-Aug-2021	----	----	----		06-Aug-2021	3 days	4 days	×
Physical Tests : Turbidity by Nephelometry										
HDPE MP-06 Source	E121	02-Aug-2021	----	----	----		06-Aug-2021	3 days	4 days	×
Physical Tests : Turbidity by Nephelometry										
HDPE MP-06 WNW	E121	02-Aug-2021	----	----	----		06-Aug-2021	3 days	4 days	×
Polycyclic Aromatic Hydrocarbons : PAHs by Hexane LVI GC-MS										
Amber glass/Teflon lined cap (sodium bisulfate) DUP-A	E641A	02-Aug-2021	10-Aug-2021	14 days	8 days	✓	11-Aug-2021	40 days	1 days	✓
Polycyclic Aromatic Hydrocarbons : PAHs by Hexane LVI GC-MS										
Amber glass/Teflon lined cap (sodium bisulfate) MP-05 North	E641A	02-Aug-2021	10-Aug-2021	14 days	8 days	✓	11-Aug-2021	40 days	1 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Polycyclic Aromatic Hydrocarbons : PAHs by Hexane LVI GC-MS										
Amber glass/Teflon lined cap (sodium bisulfate) MP-05 Source	E641A	02-Aug-2021	10-Aug-2021	14 days	8 days	✓	11-Aug-2021	40 days	1 days	✓
Polycyclic Aromatic Hydrocarbons : PAHs by Hexane LVI GC-MS										
Amber glass/Teflon lined cap (sodium bisulfate) MP-05- WNW-FBLANK-1	E641A	02-Aug-2021	10-Aug-2021	14 days	8 days	✓	11-Aug-2021	40 days	1 days	✓
Polycyclic Aromatic Hydrocarbons : PAHs by Hexane LVI GC-MS										
Amber glass/Teflon lined cap (sodium bisulfate) MP-06 ENE	E641A	02-Aug-2021	10-Aug-2021	14 days	8 days	✓	11-Aug-2021	40 days	1 days	✓
Polycyclic Aromatic Hydrocarbons : PAHs by Hexane LVI GC-MS										
Amber glass/Teflon lined cap (sodium bisulfate) MP-06 Source	E641A	02-Aug-2021	10-Aug-2021	14 days	8 days	✓	11-Aug-2021	40 days	1 days	✓
Total Metals : Total Mercury in Seawater by CVAAS										
Glass vial total (hydrochloric acid) DUP-A	E508S	02-Aug-2021	----	----	----		12-Aug-2021	28 days	10 days	✓
Total Metals : Total Mercury in Seawater by CVAAS										
Glass vial total (hydrochloric acid) MP-05 Source	E508S	02-Aug-2021	----	----	----		12-Aug-2021	28 days	10 days	✓
Total Metals : Total Mercury in Seawater by CVAAS										
Glass vial total (hydrochloric acid) MP-05 ENE	E508S	02-Aug-2021	----	----	----		12-Aug-2021	28 days	9 days	✓
Total Metals : Total Mercury in Seawater by CVAAS										
Glass vial total (hydrochloric acid) MP-05 North	E508S	02-Aug-2021	----	----	----		12-Aug-2021	28 days	9 days	✓
Total Metals : Total Mercury in Seawater by CVAAS										
Glass vial total (hydrochloric acid) MP-05 WNW	E508S	02-Aug-2021	----	----	----		12-Aug-2021	28 days	9 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Total Metals : Total Mercury in Seawater by CVAAS										
Glass vial total (hydrochloric acid) MP-05- WNW-FBLANK-1	E508S	02-Aug-2021	----	----	----		12-Aug-2021	28 days	9 days	✓
Total Metals : Total Mercury in Seawater by CVAAS										
Glass vial total (hydrochloric acid) MP-06 ENE	E508S	02-Aug-2021	----	----	----		12-Aug-2021	28 days	9 days	✓
Total Metals : Total Mercury in Seawater by CVAAS										
Glass vial total (hydrochloric acid) MP-06 North	E508S	02-Aug-2021	----	----	----		12-Aug-2021	28 days	9 days	✓
Total Metals : Total Mercury in Seawater by CVAAS										
Glass vial total (hydrochloric acid) MP-06 Source	E508S	02-Aug-2021	----	----	----		12-Aug-2021	28 days	9 days	✓
Total Metals : Total Mercury in Seawater by CVAAS										
Glass vial total (hydrochloric acid) MP-06 WNW	E508S	02-Aug-2021	----	----	----		12-Aug-2021	28 days	9 days	✓
Total Metals : Total Metals in Seawater by CRC ICPMS (HMI)										
HDPE total (nitric acid) DUP-A	E468S	02-Aug-2021	----	----	----		15-Aug-2021	180 days	13 days	✓
Total Metals : Total Metals in Seawater by CRC ICPMS (HMI)										
HDPE total (nitric acid) MP-05 ENE	E468S	02-Aug-2021	----	----	----		15-Aug-2021	180 days	13 days	✓
Total Metals : Total Metals in Seawater by CRC ICPMS (HMI)										
HDPE total (nitric acid) MP-05 North	E468S	02-Aug-2021	----	----	----		15-Aug-2021	180 days	13 days	✓
Total Metals : Total Metals in Seawater by CRC ICPMS (HMI)										
HDPE total (nitric acid) MP-05 Source	E468S	02-Aug-2021	----	----	----		15-Aug-2021	180 days	13 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Total Metals : Total Metals in Seawater by CRC ICPMS (HMI)										
HDPE total (nitric acid) MP-05 WNW	E468S	02-Aug-2021	----	----	----		15-Aug-2021	180 days	13 days	✓
Total Metals : Total Metals in Seawater by CRC ICPMS (HMI)										
HDPE total (nitric acid) MP-05- WNW-FBLANK-1	E468S	02-Aug-2021	----	----	----		15-Aug-2021	180 days	13 days	✓
Total Metals : Total Metals in Seawater by CRC ICPMS (HMI)										
HDPE total (nitric acid) MP-06 ENE	E468S	02-Aug-2021	----	----	----		15-Aug-2021	180 days	13 days	✓
Total Metals : Total Metals in Seawater by CRC ICPMS (HMI)										
HDPE total (nitric acid) MP-06 North	E468S	02-Aug-2021	----	----	----		15-Aug-2021	180 days	13 days	✓
Total Metals : Total Metals in Seawater by CRC ICPMS (HMI)										
HDPE total (nitric acid) MP-06 Source	E468S	02-Aug-2021	----	----	----		15-Aug-2021	180 days	13 days	✓
Total Metals : Total Metals in Seawater by CRC ICPMS (HMI)										
HDPE total (nitric acid) MP-06 WNW	E468S	02-Aug-2021	----	----	----		15-Aug-2021	180 days	13 days	✓
Total Metals : Total Sodium and Silicon in Seawater by CRC ICPMS										
HDPE total (nitric acid) DUP-A	E468S.NaSi	02-Aug-2021	----	----	----		16-Aug-2021	180 days	14 days	✓
Total Metals : Total Sodium and Silicon in Seawater by CRC ICPMS										
HDPE total (nitric acid) MP-05 ENE	E468S.NaSi	02-Aug-2021	----	----	----		16-Aug-2021	180 days	14 days	✓
Total Metals : Total Sodium and Silicon in Seawater by CRC ICPMS										
HDPE total (nitric acid) MP-05 North	E468S.NaSi	02-Aug-2021	----	----	----		16-Aug-2021	180 days	14 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis: Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Total Metals : Total Sodium and Silicon in Seawater by CRC ICPMS										
HDPE total (nitric acid) MP-05 Source	E468S.NaSi	02-Aug-2021	----	----	----		16-Aug-2021	180 days	14 days	✓
Total Metals : Total Sodium and Silicon in Seawater by CRC ICPMS										
HDPE total (nitric acid) MP-05 WNW	E468S.NaSi	02-Aug-2021	----	----	----		16-Aug-2021	180 days	14 days	✓
Total Metals : Total Sodium and Silicon in Seawater by CRC ICPMS										
HDPE total (nitric acid) MP-05- WNW-FBLANK-1	E468S.NaSi	02-Aug-2021	----	----	----		16-Aug-2021	180 days	14 days	✓
Total Metals : Total Sodium and Silicon in Seawater by CRC ICPMS										
HDPE total (nitric acid) MP-06 ENE	E468S.NaSi	02-Aug-2021	----	----	----		16-Aug-2021	180 days	14 days	✓
Total Metals : Total Sodium and Silicon in Seawater by CRC ICPMS										
HDPE total (nitric acid) MP-06 North	E468S.NaSi	02-Aug-2021	----	----	----		16-Aug-2021	180 days	14 days	✓
Total Metals : Total Sodium and Silicon in Seawater by CRC ICPMS										
HDPE total (nitric acid) MP-06 Source	E468S.NaSi	02-Aug-2021	----	----	----		16-Aug-2021	180 days	14 days	✓
Total Metals : Total Sodium and Silicon in Seawater by CRC ICPMS										
HDPE total (nitric acid) MP-06 WNW	E468S.NaSi	02-Aug-2021	----	----	----		16-Aug-2021	180 days	14 days	✓
Volatile Organic Compounds [Fuels] : BTEX by Headspace GC-MS										
Glass vial (sodium bisulfate) DUP-A	E611A	02-Aug-2021	11-Aug-2021	----	----		12-Aug-2021	14 days	10 days	✓
Volatile Organic Compounds [Fuels] : BTEX by Headspace GC-MS										
Glass vial (sodium bisulfate) MP-05 North	E611A	02-Aug-2021	11-Aug-2021	----	----		12-Aug-2021	14 days	10 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Volatile Organic Compounds [Fuels] : BTEX by Headspace GC-MS										
Glass vial (sodium bisulfate) MP-05 Source	E611A	02-Aug-2021	11-Aug-2021	----	----		12-Aug-2021	14 days	10 days	✓
Volatile Organic Compounds [Fuels] : BTEX by Headspace GC-MS										
Glass vial (sodium bisulfate) MP-05- WNW-FBLANK-1	E611A	02-Aug-2021	11-Aug-2021	----	----		12-Aug-2021	14 days	10 days	✓
Volatile Organic Compounds [Fuels] : BTEX by Headspace GC-MS										
Glass vial (sodium bisulfate) MP-06 ENE	E611A	02-Aug-2021	11-Aug-2021	----	----		12-Aug-2021	14 days	10 days	✓
Volatile Organic Compounds [Fuels] : BTEX by Headspace GC-MS										
Glass vial (sodium bisulfate) MP-06 Source	E611A	02-Aug-2021	11-Aug-2021	----	----		12-Aug-2021	14 days	10 days	✓

Legend & Qualifier Definitions

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

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).

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	261255	1	10	10.0	5.0	✓
Ammonia by Fluorescence	E298	273052	1	20	5.0	5.0	✓
Bromide in Seawater by IC	E235S.Br	272957	1	19	5.2	5.0	✓
BTEX by Headspace GC-MS	E611A	263791	1	20	5.0	5.0	✓
Chloride in Seawater by IC	E235S.Cl	272958	1	19	5.2	5.0	✓
Conductivity in Seawater	E100S	261254	1	10	10.0	5.0	✓
Dissolved Mercury in Seawater by CVAAS	E509S	263871	1	10	10.0	5.0	✓
Dissolved Metals in Seawater by CRC ICPMS (HMI)	E469S	260359	1	19	5.2	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	272964	1	19	5.2	5.0	✓
Dissolved Sodium and Silicon in Seawater by CRC ICPMS	E469S.NaSi	260358	1	19	5.2	5.0	✓
Fluoride in Seawater by IC (Low Level)	E235S.F-L	272959	1	19	5.2	5.0	✓
Nitrate in Seawater by IC (Trace Level)	E235S.NO3-T	272960	1	19	5.2	5.0	✓
Nitrite in Seawater by IC (Low Level)	E235S.NO2-L	272961	1	19	5.2	5.0	✓
pH by Meter	E108	261256	1	18	5.5	5.0	✓
Sulfate in Seawater by IC (Low Level)	E235S.SO4-L	272962	1	19	5.2	5.0	✓
TDS by Gravimetry (Seawater)	E162S	273148	1	20	5.0	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence	E318S	262405	1	10	10.0	5.0	✓
Total Mercury in Seawater by CVAAS	E508S	264851	1	10	10.0	5.0	✓
Total Metals in Seawater by CRC ICPMS (HMI)	E468S	260246	2	16	12.5	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	262404	1	16	6.2	5.0	✓
Total Phosphorus in Seawater by Colourimetry	E372S	273053	1	19	5.2	5.0	✓
Total Sodium and Silicon in Seawater by CRC ICPMS	E468S.NaSi	260245	1	16	6.2	5.0	✓
Turbidity by Nephelometry	E121	260384	1	10	10.0	5.0	✓
VH and F1 by Headspace GC-FID	E581.VH+F1	263792	1	18	5.5	5.0	✓
Laboratory Control Samples (LCS)							
Alkalinity Species by Titration	E290	261255	1	10	10.0	5.0	✓
Ammonia by Fluorescence	E298	273052	1	20	5.0	5.0	✓
Bromide in Seawater by IC	E235S.Br	272957	1	19	5.2	5.0	✓
BTEX by Headspace GC-MS	E611A	263791	1	20	5.0	5.0	✓
CCME PHC - F2-F4 by GC-FID	E601	263155	1	14	7.1	5.0	✓
Chloride in Seawater by IC	E235S.Cl	272958	1	19	5.2	5.0	✓
Conductivity in Seawater	E100S	261254	1	10	10.0	5.0	✓
Dissolved Mercury in Seawater by CVAAS	E509S	263871	1	10	10.0	5.0	✓
Dissolved Metals in Seawater by CRC ICPMS (HMI)	E469S	260359	1	19	5.2	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	272964	1	19	5.2	5.0	✓
Dissolved Sodium and Silicon in Seawater by CRC ICPMS	E469S.NaSi	260358	1	19	5.2	5.0	✓
Fluoride in Seawater by IC (Low Level)	E235S.F-L	272959	1	19	5.2	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							
Nitrate in Seawater by IC (Trace Level)	E235S.NO3-T	272960	1	19	5.2	5.0	✓
Nitrite in Seawater by IC (Low Level)	E235S.NO2-L	272961	1	19	5.2	5.0	✓
PAHs by Hexane LVI GC-MS	E641A	263156	1	9	11.1	5.0	✓
pH by Meter	E108	261256	1	18	5.5	5.0	✓
Sulfate in Seawater by IC (Low Level)	E235S.SO4-L	272962	1	19	5.2	5.0	✓
TDS by Gravimetry (Seawater)	E162S	273148	1	20	5.0	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence	E318S	262405	1	10	10.0	5.0	✓
Total Mercury in Seawater by CVAAS	E508S	264851	1	10	10.0	5.0	✓
Total Metals in Seawater by CRC ICPMS (HMI)	E468S	260246	1	16	6.2	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	262404	1	16	6.2	5.0	✓
Total Phosphorus in Seawater by Colourimetry	E372S	273053	1	19	5.2	5.0	✓
Total Sodium and Silicon in Seawater by CRC ICPMS	E468S.NaSi	260245	1	16	6.2	5.0	✓
TSS by Gravimetry (Seawater)	E160S	261380	1	14	7.1	5.0	✓
Turbidity by Nephelometry	E121	260384	1	10	10.0	5.0	✓
VH and F1 by Headspace GC-FID	E581.VH+F1	263792	1	18	5.5	5.0	✓
Method Blanks (MB)							
Alkalinity Species by Titration	E290	261255	1	10	10.0	5.0	✓
Ammonia by Fluorescence	E298	273052	1	20	5.0	5.0	✓
Bromide in Seawater by IC	E235S.Br	272957	1	19	5.2	5.0	✓
BTEX by Headspace GC-MS	E611A	263791	1	20	5.0	5.0	✓
CCME PHC - F2-F4 by GC-FID	E601	263155	1	14	7.1	5.0	✓
Chloride in Seawater by IC	E235S.Cl	272958	1	19	5.2	5.0	✓
Conductivity in Seawater	E100S	261254	1	10	10.0	5.0	✓
Dissolved Mercury in Seawater by CVAAS	E509S	263871	1	10	10.0	5.0	✓
Dissolved Metals in Seawater by CRC ICPMS (HMI)	E469S	260359	1	19	5.2	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	272964	1	19	5.2	5.0	✓
Dissolved Sodium and Silicon in Seawater by CRC ICPMS	E469S.NaSi	260358	1	19	5.2	5.0	✓
Fluoride in Seawater by IC (Low Level)	E235S.F-L	272959	1	19	5.2	5.0	✓
Nitrate in Seawater by IC (Trace Level)	E235S.NO3-T	272960	1	19	5.2	5.0	✓
Nitrite in Seawater by IC (Low Level)	E235S.NO2-L	272961	1	19	5.2	5.0	✓
PAHs by Hexane LVI GC-MS	E641A	263156	1	9	11.1	5.0	✓
Sulfate in Seawater by IC (Low Level)	E235S.SO4-L	272962	1	19	5.2	5.0	✓
TDS by Gravimetry (Seawater)	E162S	273148	1	20	5.0	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence	E318S	262405	1	10	10.0	5.0	✓
Total Mercury in Seawater by CVAAS	E508S	264851	1	10	10.0	5.0	✓
Total Metals in Seawater by CRC ICPMS (HMI)	E468S	260246	1	16	6.2	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	262404	1	16	6.2	5.0	✓
Total Phosphorus in Seawater by Colourimetry	E372S	273053	1	19	5.2	5.0	✓
Total Sodium and Silicon in Seawater by CRC ICPMS	E468S.NaSi	260245	1	16	6.2	5.0	✓
TSS by Gravimetry (Seawater)	E160S	261380	1	14	7.1	5.0	✓
Turbidity by Nephelometry	E121	260384	1	10	10.0	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*
Method Blanks (MB) - Continued							
VH and F1 by Headspace GC-FID	E581.VH+F1	263792	1	18	5.5	5.0	✓
Matrix Spikes (MS)							
Ammonia by Fluorescence	E298	273052	1	20	5.0	5.0	✓
Bromide in Seawater by IC	E235S.Br	272957	1	19	5.2	5.0	✓
BTEX by Headspace GC-MS	E611A	263791	1	20	5.0	5.0	✓
Chloride in Seawater by IC	E235S.Cl	272958	1	19	5.2	5.0	✓
Dissolved Mercury in Seawater by CVAAS	E509S	263871	1	10	10.0	5.0	✓
Dissolved Metals in Seawater by CRC ICPMS (HMI)	E469S	260359	1	19	5.2	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	272964	1	19	5.2	5.0	✓
Dissolved Sodium and Silicon in Seawater by CRC ICPMS	E469S.NaSi	260358	2	19	10.5	5.0	✓
Fluoride in Seawater by IC (Low Level)	E235S.F-L	272959	1	19	5.2	5.0	✓
Nitrate in Seawater by IC (Trace Level)	E235S.NO3-T	272960	1	19	5.2	5.0	✓
Nitrite in Seawater by IC (Low Level)	E235S.NO2-L	272961	1	19	5.2	5.0	✓
Sulfate in Seawater by IC (Low Level)	E235S.SO4-L	272962	1	19	5.2	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence	E318S	262405	1	10	10.0	5.0	✓
Total Mercury in Seawater by CVAAS	E508S	264851	1	10	10.0	5.0	✓
Total Metals in Seawater by CRC ICPMS (HMI)	E468S	260246	1	16	6.2	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	262404	1	16	6.2	5.0	✓
Total Phosphorus in Seawater by Colourimetry	E372S	273053	1	19	5.2	5.0	✓
Total Sodium and Silicon in Seawater by CRC ICPMS	E468S.NaSi	260245	1	16	6.2	5.0	✓
VH and F1 by Headspace GC-FID	E581.VH+F1	263792	1	18	5.5	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 Seawater	E100S Vancouver - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a seawater sample. Conductivity measurements are temperature-compensated to 25°C. Salinity in Practical Salinity Units is calculated.
pH by Meter	E108 Vancouver - Environmental	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
Turbidity by Nephelometry	E121 Vancouver - Environmental	Water	APHA 2130 B (mod)	Turbidity is measured by the nephelometric method, by measuring the intensity of light scatter under defined conditions.
TSS by Gravimetry (Seawater)	E160S Vancouver - 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 (Seawater)	E162S Vancouver - 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 Seawater by IC	E235S.Br Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Chloride in Seawater by IC	E235S.Cl Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Fluoride in Seawater by IC (Low Level)	E235S.F-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrite in Seawater by IC (Low Level)	E235S.NO2-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrate in Seawater by IC (Trace Level)	E235S.NO3-T Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Sulfate in Seawater by IC (Low Level)	E235S.SO4-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Alkalinity Species by Titration	E290 Vancouver - Environmental	Water	APHA 2320 B (mod)	Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.
Ammonia by Fluorescence	E298 Vancouver - 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).
Total Kjeldahl Nitrogen by Fluorescence	E318S Vancouver - Environmental	Water	APHA 4500-Norg D (mod)	Total Kjeldahl Nitrogen is determined using block digestion followed by flow-injection analysis with fluorescence detection.
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L Vancouver - 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 Vancouver - Environmental	Water	APHA 5310 B (mod)	Dissolved Organic Carbon (Non-Purgeable), also known as NPOC (dissolved), is a direct measurement of DOC after a filtered (0.45 micron) sample has been acidified and purged to remove inorganic carbon (IC). Analysis is by high temperature combustion with infrared detection of CO2. NPOC does not include volatile organic species that are purged off with IC. For samples where the majority of DC (dissolved carbon) is comprised of IC (which is common), this method is more accurate and more reliable than the DOC by subtraction method (i.e. DC minus DIC).
Total Phosphorus in Seawater by Colourimetry	E372S Vancouver - Environmental	Water	APHA 4500-P E (mod).	Total Phosphorus is determined colourimetrically using a discrete analyzer after heated persulfate digestion of the sample.
Total Metals in Seawater by CRC ICPMS (HMI)	E468S Vancouver - Environmental	Water	EPA 200.2/6020B (mod)	Seawater samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS (HMI Mode). This method is compliant with digestion requirements of the British Columbia Environmental Laboratory Manual.
Total Sodium and Silicon in Seawater by CRC ICPMS	E468S.NaSi Vancouver - Environmental	Water	EPA 200.2/6020B (mod)	Seawater samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS. This method is compliant with digestion requirements of the British Columbia Environmental Laboratory Manual.
Dissolved Metals in Seawater by CRC ICPMS (HMI)	E469S Vancouver - Environmental	Water	APHA 3030B/EPA 6020B (mod)	Seawater samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS (HMI Mode).

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Sodium and Silicon in Seawater by CRC ICPMS	E469S.NaSi Vancouver - Environmental	Water	APHA 3030B/EPA 6020B (mod)	Seawater samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS.
Total Mercury in Seawater by CVAAS	E508S Vancouver - Environmental	Water	EPA 1631E (mod)	Seawater samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.
Dissolved Mercury in Seawater by CVAAS	E509S Vancouver - Environmental	Water	APHA 3030B/EPA 1631E (mod)	Seawater samples are filtered (0.45 um), preserved with HCl, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.
VH and F1 by Headspace GC-FID	E581.VH+F1 Vancouver - Environmental	Water	BC MOE Lab Manual / CCME PHC in Soil - Tier 1 (mod)	Volatile Hydrocarbons (VH and F1) is analyzed by static headspace GC-FID. Samples are prepared in headspace vials and are heated and agitated on the headspace autosampler, causing VOCs to partition between the aqueous phase and the headspace in accordance with Henry's law.
CCME PHC - F2-F4 by GC-FID	E601 Vancouver - Environmental	Water	CCME PHC in Soil - Tier 1	CCME Fractions 2-4 (F2-F4) are analyzed by GC-FID.
BTEX by Headspace GC-MS	E611A Vancouver - Environmental	Water	EPA 8260D (mod)	Volatile Organic Compounds (VOCs) are analyzed by static headspace GC-MS. Samples are prepared in headspace vials and are heated and agitated on the headspace autosampler, causing VOCs to partition between the aqueous phase and the headspace in accordance with Henry's law.
PAHs by Hexane LVI GC-MS	E641A Vancouver - Environmental	Water	EPA 8270E (mod)	Polycyclic Aromatic Hydrocarbons (PAHs) are analyzed by large volume injection (LVI) GC-MS.
Dissolved Hardness (Calculated)	EC100 Vancouver - Environmental	Water	APHA 2340B	"Hardness (as CaCO3), dissolved" is calculated from the sum of dissolved Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. "Total Hardness" refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations.
Hardness (Calculated) from Total Ca/Mg	EC100A Vancouver - Environmental	Water	APHA 2340B	"Hardness (as CaCO3), from total Ca/Mg" is calculated from the sum of total 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. Hardness from total Ca/Mg is normally comparable to Dissolved Hardness in non-turbid waters.
Salinity in Seawater (calculation)	EC100S Vancouver - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a seawater sample. Conductivity measurements are temperature-compensated to 25°C. Salinity in Practical Salinity Units is calculated.

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Preparation for Ammonia	EP298 Vancouver - Environmental	Water		Sample preparation for Preserved Nutrients Water Quality Analysis.
Digestion for TKN in Seawater	EP318S Vancouver - Environmental	Water	APHA 4500-Norg D (mod)	Samples are digested using block digestion with Copper Sulfate Digestion Reagent and H2SO4.
Preparation for Total Organic Carbon by Combustion	EP355 Vancouver - Environmental	Water		Preparation for Total Organic Carbon by Combustion
Preparation for Dissolved Organic Carbon for Combustion	EP358 Vancouver - Environmental	Water	APHA 5310 B (mod)	Preparation for Dissolved Organic Carbon
Digestion for Total Phosphorus in water	EP372 Vancouver - Environmental	Water	APHA 4500-P E (mod).	Samples are heated with a persulfate digestion reagent.
Dissolved Metals Water Filtration	EP421 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HNO3.
Dissolved Mercury Water Filtration	EP509 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HCl.
VOCs Preparation for Headspace Analysis	EP581 Vancouver - Environmental	Water	EPA 5021A (mod)	Samples are prepared in headspace vials and are heated and agitated on the headspace autosampler. An aliquot of the headspace is then injected into the GC/MS-FID system.
PHCs and PAHs Hexane Extraction	EP601 Vancouver - Environmental	Water	EPA 3511 (mod)	Petroleum Hydrocarbons (PHCs) and Polycyclic Aromatic Hydrocarbons (PAHs) are extracted using a hexane liquid-liquid extraction.

QUALITY CONTROL REPORT

Work Order	: **VA21B6250**	Page	: 1 of 20
Amendment	: **1**		
Client	: Golder Associates Ltd.	Laboratory	: Vancouver - Environmental
Contact	: Elaine Irving	Account Manager	: Amber Springer
Address	: 200-2920 Virtual Way Vancouver BC Canada V5M 0C4	Address	: 8081 Lougheed Highway Burnaby, British Columbia Canada V5A 1W9
Telephone	: ----	Telephone	: +1 604 253 4188
Project	: ----	Date Samples Received	: 05-Aug-2021 10:30
PO	: ----	Date Analysis Commenced	: 06-Aug-2021
C-O-C number	: 20-920773	Issue Date	: 02-Sep-2021 16:25
Sampler	: ----		
Site	: ----		
Quote number	: Q84262		
No. of samples received	: 10		
No. of samples analysed	: 10		

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 Percentage Difference (RPD) and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits
- Reference Material (RM) Report; Recovery and Acceptance Limits
- Method Blank (MB) Report; Recovery and Acceptance Limits
- Laboratory Control Sample (LCS) Report; Recovery and Acceptance Limits

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*
Aaron Yu	Laboratory Analyst	Inorganics, Burnaby, British Columbia
Angela Ren	Team Leader - Metals	Metals, Burnaby, British Columbia
Courtney Cox	Analsyt	Inorganics, Burnaby, British Columbia
Dee Lee	Analyst	Metals, Burnaby, British Columbia
Kevin Duarte	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Miles Gropen	Department Manager - Inorganics	Inorganics, Burnaby, British Columbia
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Ophelia Chiu	Department Manager - Organics	Organics, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia
Ruby Pham	Lab Assistant	Metals, Burnaby, British Columbia
Sristika Chand	Lab Analyst	Metals, 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 Services number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percentage Difference
# = Indicates a QC result that did not meet the ALS DQO.

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: 260384)											
VA21B6250-001	MP-05- WNW-FBLANK-1	turbidity	----	E121	0.10	NTU	<0.10	<0.10	0	Diff <2x LOR	----
Physical Tests (QC Lot: 261254)											
VA21B6250-001	MP-05- WNW-FBLANK-1	conductivity	----	E100S	2.0	µS/cm	<2.0	<2.0	0	Diff <2x LOR	----
Physical Tests (QC Lot: 261255)											
VA21B6250-003	MP-05 North	alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	85.7	86.0	0.349%	20%	----
Physical Tests (QC Lot: 261256)											
VA21B6250-001	MP-05- WNW-FBLANK-1	pH	----	E108	0.10	pH units	5.35	5.29	1.13%	4%	----
Physical Tests (QC Lot: 273148)											
VA21B6250-001	MP-05- WNW-FBLANK-1	solids, total dissolved [TDS]	----	E162S	10	mg/L	<10	<10	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 262405)											
VA21B6250-001	MP-05- WNW-FBLANK-1	Kjeldahl nitrogen, total [TKN]	----	E318S	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 272957)											
VA21B6250-001	MP-05- WNW-FBLANK-1	bromide	24959-67-9	E235S.Br	5.0	mg/L	<5.0	<5.0	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 272958)											
VA21B6250-001	MP-05- WNW-FBLANK-1	chloride	16887-00-6	E235S.Cl	50	mg/L	<50	<50	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 272959)											
VA21B6250-001	MP-05- WNW-FBLANK-1	fluoride	16984-48-8	E235S.F-L	0.20	mg/L	<0.20	<0.20	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 272960)											
VA21B6250-001	MP-05- WNW-FBLANK-1	nitrate (as N)	14797-55-8	E235S.NO3-T	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 272961)											
VA21B6250-001	MP-05- WNW-FBLANK-1	nitrite (as N)	14797-65-0	E235S.NO2-L	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 272962)											
VA21B6250-001	MP-05- WNW-FBLANK-1	sulfate (as SO4)	14808-79-8	E235S.SO4-L	3.0	mg/L	<3.0	<3.0	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 273052)											
VA21B6250-001	MP-05- WNW-FBLANK-1	ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 273053)											
VA21B6250-001	MP-05- WNW-FBLANK-1	phosphorus, total	7723-14-0	E372S	0.0040	mg/L	<0.0040	<0.0040	0	Diff <2x LOR	----
Organic / Inorganic Carbon (QC Lot: 262404)											
VA21B6095-001	Anonymous	carbon, total organic [TOC]	----	E355-L	0.50	mg/L	0.84	0.94	0.10	Diff <2x LOR	----
Organic / Inorganic Carbon (QC Lot: 272964)											
VA21B6250-001	MP-05- WNW-FBLANK-1	carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	<0.50	<0.50	0	Diff <2x LOR	----

Sub-Matrix: **Water**

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
					Laboratory Duplicate (DUP) Report						
Total Metals (QC Lot: 260245)											
VA21B6250-001	MP-05- WNW-FBLANK-1	silicon, total	7440-21-3	E468S.NaSi	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		sodium, total	17341-25-2	E468S.NaSi	2.5	mg/L	<2.5	<2.5	0	Diff <2x LOR	----
Total Metals (QC Lot: 260246)											
VA21B6250-001	MP-05- WNW-FBLANK-1	aluminum, total	7429-90-5	E468S	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
		zirconium, total	7440-67-7	E468S	0.00050	mg/L	0.00065	0.00065	0.0000007	Diff <2x LOR	----
VA21B6250-001	MP-05- WNW-FBLANK-1	antimony, total	7440-36-0	E468S	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		arsenic, total	7440-38-2	E468S	0.00040	mg/L	<0.00040	<0.00040	0	Diff <2x LOR	----
		barium, total	7440-39-3	E468S	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		beryllium, total	7440-41-7	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		bismuth, total	7440-69-9	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		boron, total	7440-42-8	E468S	0.30	mg/L	<0.30	<0.30	0	Diff <2x LOR	----
		cadmium, total	7440-43-9	E468S	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		calcium, total	7440-70-2	E468S	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		cesium, total	7440-46-2	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		chromium, total	7440-47-3	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		cobalt, total	7440-48-4	E468S	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		copper, total	7440-50-8	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		gallium, total	7440-55-3	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		iron, total	7439-89-6	E468S	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		lead, total	7439-92-1	E468S	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		lithium, total	7439-93-2	E468S	0.020	mg/L	<0.020	<0.020	0	Diff <2x LOR	----
		magnesium, total	7439-95-4	E468S	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		manganese, total	7439-96-5	E468S	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		molybdenum, total	7439-98-7	E468S	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		nickel, total	7440-02-0	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		phosphorus, total	7723-14-0	E468S	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		potassium, total	7440-09-7	E468S	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		rhenium, total	7440-15-5	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		rubidium, total	7440-17-7	E468S	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
		selenium, total	7782-49-2	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		silver, total	7440-22-4	E468S	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		strontium, total	7440-24-6	E468S	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		sulfur, total	7704-34-9	E468S	5.0	mg/L	<5.0	<5.0	0	Diff <2x LOR	----
		tellurium, total	13494-80-9	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		thallium, total	7440-28-0	E468S	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----

Sub-Matrix: **Water**

Laboratory Duplicate (DUP) Report

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Total Metals (QC Lot: 260246) - continued											
VA21B6250-001	MP-05- WNW-FBLANK-1	thorium, total	7440-29-1	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		tin, total	7440-31-5	E468S	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		titanium, total	7440-32-6	E468S	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
		tungsten, total	7440-33-7	E468S	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		uranium, total	7440-61-1	E468S	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		vanadium, total	7440-62-2	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		yttrium, total	7440-65-5	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, total	7440-66-6	E468S	0.0030	mg/L	<0.0030	<0.0030	0	Diff <2x LOR	----
Total Metals (QC Lot: 264851)											
VA21B6250-001	MP-05- WNW-FBLANK-1	mercury, total	7439-97-6	E508S	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 260358)											
VA21B6112-002	Anonymous	silicon, dissolved	7440-21-3	E469S.NaSi	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		sodium, dissolved	17341-25-2	E469S.NaSi	2.5	mg/L	<2.5	2.5	0.004	Diff <2x LOR	----
Dissolved Metals (QC Lot: 260359)											
VA21B6112-002	Anonymous	aluminum, dissolved	7429-90-5	E469S	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
		antimony, dissolved	7440-36-0	E469S	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		arsenic, dissolved	7440-38-2	E469S	0.00040	mg/L	<0.00040	<0.00040	0	Diff <2x LOR	----
		barium, dissolved	7440-39-3	E469S	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		beryllium, dissolved	7440-41-7	E469S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		bismuth, dissolved	7440-69-9	E469S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		boron, dissolved	7440-42-8	E469S	0.30	mg/L	<0.30	<0.30	0	Diff <2x LOR	----
		cadmium, dissolved	7440-43-9	E469S	0.000010	mg/L	0.000043	0.000038	0.000005	Diff <2x LOR	----
		calcium, dissolved	7440-70-2	E469S	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		cesium, dissolved	7440-46-2	E469S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		chromium, dissolved	7440-47-3	E469S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		cobalt, dissolved	7440-48-4	E469S	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		copper, dissolved	7440-50-8	E469S	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		gallium, dissolved	7440-55-3	E469S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		iron, dissolved	7439-89-6	E469S	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		lead, dissolved	7439-92-1	E469S	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		lithium, dissolved	7439-93-2	E469S	0.020	mg/L	<0.020	<0.020	0	Diff <2x LOR	----
		magnesium, dissolved	7439-95-4	E469S	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		manganese, dissolved	7439-96-5	E469S	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		molybdenum, dissolved	7439-98-7	E469S	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		nickel, dissolved	7440-02-0	E469S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----

Sub-Matrix: **Water**

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Laboratory Duplicate (DUP) Report						
					LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Dissolved Metals (QC Lot: 260359) - continued											
VA21B6112-002	Anonymous	phosphorus, dissolved	7723-14-0	E469S	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		potassium, dissolved	7440-09-7	E469S	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		rhenium, dissolved	7440-15-5	E469S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		rubidium, dissolved	7440-17-7	E469S	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
		selenium, dissolved	7782-49-2	E469S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		silver, dissolved	7440-22-4	E469S	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		strontium, dissolved	7440-24-6	E469S	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		sulfur, dissolved	7704-34-9	E469S	5.0	mg/L	<5.0	<5.0	0	Diff <2x LOR	----
		tellurium, dissolved	13494-80-9	E469S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		thallium, dissolved	7440-28-0	E469S	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		thorium, dissolved	7440-29-1	E469S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		tin, dissolved	7440-31-5	E469S	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		titanium, dissolved	7440-32-6	E469S	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
		tungsten, dissolved	7440-33-7	E469S	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		uranium, dissolved	7440-61-1	E469S	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		vanadium, dissolved	7440-62-2	E469S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		yttrium, dissolved	7440-65-5	E469S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, dissolved	7440-66-6	E469S	0.0010	mg/L	0.0014	0.0013	0.00002	Diff <2x LOR	----
		zirconium, dissolved	7440-67-7	E469S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 263871)											
VA21B6250-001	MP-05- WNW-FBLANK-1	mercury, dissolved	7439-97-6	E509S	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
Volatile Organic Compounds (QC Lot: 263791)											
VA21B6224-001	Anonymous	benzene	71-43-2	E611A	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		ethylbenzene	100-41-4	E611A	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		methyl-tert-butyl ether [MTBE]	1634-04-4	E611A	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		styrene	100-42-5	E611A	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		toluene	108-88-3	E611A	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		xylene, m+p-	179601-23-1	E611A	0.40	µg/L	<0.40	<0.40	0	Diff <2x LOR	----
		xylene, o-	95-47-6	E611A	0.30	µg/L	<0.30	<0.30	0	Diff <2x LOR	----
Hydrocarbons (QC Lot: 263792)											
VA21B6250-001	MP-05- WNW-FBLANK-1	F1 (C6-C10)	----	E581.VH+F1	100	µg/L	<100	<100	0.0%	30%	----

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: 260384)						
turbidity	----	E121	0.1	NTU	<0.10	----
Physical Tests (QCLot: 261254)						
conductivity	----	E100S	2	µS/cm	<2.0	----
Physical Tests (QCLot: 261255)						
alkalinity, total (as CaCO3)	----	E290	1	mg/L	<1.0	----
Physical Tests (QCLot: 261380)						
solids, total suspended [TSS]	----	E160S	2	mg/L	<2.0	----
Physical Tests (QCLot: 273148)						
solids, total dissolved [TDS]	----	E162S	10	mg/L	<10	----
Anions and Nutrients (QCLot: 262405)						
Kjeldahl nitrogen, total [TKN]	----	E318S	0.05	mg/L	<0.050	----
Anions and Nutrients (QCLot: 272957)						
bromide	24959-67-9	E235S.Br	5	mg/L	<5.0	----
Anions and Nutrients (QCLot: 272958)						
chloride	16887-00-6	E235S.Cl	50	mg/L	<50	----
Anions and Nutrients (QCLot: 272959)						
fluoride	16984-48-8	E235S.F-L	0.2	mg/L	<0.20	----
Anions and Nutrients (QCLot: 272960)						
nitrate (as N)	14797-55-8	E235S.NO3-T	0.01	mg/L	<0.010	----
Anions and Nutrients (QCLot: 272961)						
nitrite (as N)	14797-65-0	E235S.NO2-L	0.01	mg/L	<0.010	----
Anions and Nutrients (QCLot: 272962)						
sulfate (as SO4)	14808-79-8	E235S.SO4-L	3	mg/L	<3.0	----
Anions and Nutrients (QCLot: 273052)						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 273053)						
phosphorus, total	7723-14-0	E372S	0.002	mg/L	<0.0040	----
Organic / Inorganic Carbon (QCLot: 262404)						
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	<0.50	----
Organic / Inorganic Carbon (QCLot: 272964)						
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	<0.50	----
Total Metals (QCLot: 260245)						
silicon, total	7440-21-3	E468S.NaSi	1	mg/L	<1.0	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 260245) - continued						
sodium, total	17341-25-2	E468S.NaSi	2.5	mg/L	<2.5	----
Total Metals (QCLot: 260246)						
aluminum, total	7429-90-5	E468S	0.005	mg/L	<0.0050	----
antimony, total	7440-36-0	E468S	0.001	mg/L	<0.0010	----
arsenic, total	7440-38-2	E468S	0.0004	mg/L	<0.00040	----
barium, total	7440-39-3	E468S	0.001	mg/L	<0.0010	----
beryllium, total	7440-41-7	E468S	0.0005	mg/L	<0.00050	----
bismuth, total	7440-69-9	E468S	0.0005	mg/L	<0.00050	----
boron, total	7440-42-8	E468S	0.3	mg/L	<0.30	----
cadmium, total	7440-43-9	E468S	0.00001	mg/L	<0.000010	----
calcium, total	7440-70-2	E468S	1	mg/L	<1.0	----
cesium, total	7440-46-2	E468S	0.0005	mg/L	<0.00050	----
chromium, total	7440-47-3	E468S	0.0005	mg/L	<0.00050	----
cobalt, total	7440-48-4	E468S	0.00005	mg/L	<0.000050	----
copper, total	7440-50-8	E468S	0.0005	mg/L	<0.00050	----
gallium, total	7440-55-3	E468S	0.0005	mg/L	<0.00050	----
iron, total	7439-89-6	E468S	0.01	mg/L	<0.010	----
lead, total	7439-92-1	E468S	0.00005	mg/L	<0.000050	----
lithium, total	7439-93-2	E468S	0.02	mg/L	<0.020	----
magnesium, total	7439-95-4	E468S	1	mg/L	<1.0	----
manganese, total	7439-96-5	E468S	0.0002	mg/L	<0.00020	----
molybdenum, total	7439-98-7	E468S	0.0001	mg/L	<0.00010	----
nickel, total	7440-02-0	E468S	0.0005	mg/L	<0.00050	----
phosphorus, total	7723-14-0	E468S	0.05	mg/L	<0.050	----
potassium, total	7440-09-7	E468S	1	mg/L	<1.0	----
rhenium, total	7440-15-5	E468S	0.0005	mg/L	<0.00050	----
rubidium, total	7440-17-7	E468S	0.005	mg/L	<0.0050	----
selenium, total	7782-49-2	E468S	0.0005	mg/L	<0.00050	----
silver, total	7440-22-4	E468S	0.0001	mg/L	<0.00010	----
strontium, total	7440-24-6	E468S	0.01	mg/L	<0.010	----
sulfur, total	7704-34-9	E468S	5	mg/L	<5.0	----
tellurium, total	13494-80-9	E468S	0.0005	mg/L	<0.00050	----
thallium, total	7440-28-0	E468S	0.00005	mg/L	<0.000050	----
thorium, total	7440-29-1	E468S	0.0005	mg/L	<0.00050	----
tin, total	7440-31-5	E468S	0.001	mg/L	<0.0010	----
titanium, total	7440-32-6	E468S	0.005	mg/L	<0.0050	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 260246) - continued						
tungsten, total	7440-33-7	E468S	0.001	mg/L	<0.0010	----
uranium, total	7440-61-1	E468S	0.00005	mg/L	<0.000050	----
vanadium, total	7440-62-2	E468S	0.0005	mg/L	<0.00050	----
yttrium, total	7440-65-5	E468S	0.0005	mg/L	<0.00050	----
zinc, total	7440-66-6	E468S	0.003	mg/L	<0.0030	----
zirconium, total	7440-67-7	E468S	0.0005	mg/L	<0.00050	----
Total Metals (QCLot: 264851)						
mercury, total	7439-97-6	E508S	0.000005	mg/L	<0.0000050	----
Dissolved Metals (QCLot: 260358)						
silicon, dissolved	7440-21-3	E469S.NaSi	1	mg/L	<1.0	----
sodium, dissolved	17341-25-2	E469S.NaSi	2.5	mg/L	<2.5	----
Dissolved Metals (QCLot: 260359)						
aluminum, dissolved	7429-90-5	E469S	0.005	mg/L	<0.0050	----
antimony, dissolved	7440-36-0	E469S	0.001	mg/L	<0.0010	----
arsenic, dissolved	7440-38-2	E469S	0.0004	mg/L	<0.00040	----
barium, dissolved	7440-39-3	E469S	0.001	mg/L	<0.0010	----
beryllium, dissolved	7440-41-7	E469S	0.0005	mg/L	<0.00050	----
bismuth, dissolved	7440-69-9	E469S	0.0005	mg/L	<0.00050	----
boron, dissolved	7440-42-8	E469S	0.3	mg/L	<0.30	----
cadmium, dissolved	7440-43-9	E469S	0.00001	mg/L	<0.000010	----
calcium, dissolved	7440-70-2	E469S	1	mg/L	<1.0	----
cesium, dissolved	7440-46-2	E469S	0.0005	mg/L	<0.00050	----
chromium, dissolved	7440-47-3	E469S	0.0005	mg/L	<0.00050	----
cobalt, dissolved	7440-48-4	E469S	0.00005	mg/L	<0.000050	----
copper, dissolved	7440-50-8	E469S	0.0002	mg/L	<0.00020	----
gallium, dissolved	7440-55-3	E469S	0.0005	mg/L	<0.00050	----
iron, dissolved	7439-89-6	E469S	0.01	mg/L	<0.010	----
lead, dissolved	7439-92-1	E469S	0.00005	mg/L	<0.000050	----
lithium, dissolved	7439-93-2	E469S	0.02	mg/L	<0.020	----
magnesium, dissolved	7439-95-4	E469S	1	mg/L	<1.0	----
manganese, dissolved	7439-96-5	E469S	0.0001	mg/L	<0.00010	----
molybdenum, dissolved	7439-98-7	E469S	0.0001	mg/L	<0.00010	----
nickel, dissolved	7440-02-0	E469S	0.0005	mg/L	<0.00050	----
phosphorus, dissolved	7723-14-0	E469S	0.05	mg/L	<0.050	----
potassium, dissolved	7440-09-7	E469S	1	mg/L	<1.0	----
rhenium, dissolved	7440-15-5	E469S	0.0005	mg/L	<0.00050	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 260359) - continued						
rubidium, dissolved	7440-17-7	E469S	0.005	mg/L	<0.0050	----
selenium, dissolved	7782-49-2	E469S	0.0005	mg/L	<0.00050	----
silver, dissolved	7440-22-4	E469S	0.0001	mg/L	<0.00010	----
strontium, dissolved	7440-24-6	E469S	0.01	mg/L	<0.010	----
sulfur, dissolved	7704-34-9	E469S	5	mg/L	<5.0	----
tellurium, dissolved	13494-80-9	E469S	0.0005	mg/L	<0.00050	----
thallium, dissolved	7440-28-0	E469S	0.00005	mg/L	<0.000050	----
thorium, dissolved	7440-29-1	E469S	0.0005	mg/L	<0.00050	----
tin, dissolved	7440-31-5	E469S	0.001	mg/L	<0.0010	----
titanium, dissolved	7440-32-6	E469S	0.005	mg/L	<0.0050	----
tungsten, dissolved	7440-33-7	E469S	0.001	mg/L	<0.0010	----
uranium, dissolved	7440-61-1	E469S	0.00005	mg/L	<0.000050	----
vanadium, dissolved	7440-62-2	E469S	0.0005	mg/L	<0.00050	----
yttrium, dissolved	7440-65-5	E469S	0.0005	mg/L	<0.00050	----
zinc, dissolved	7440-66-6	E469S	0.001	mg/L	<0.0010	----
zirconium, dissolved	7440-67-7	E469S	0.0005	mg/L	<0.00050	----
Dissolved Metals (QCLot: 263871)						
mercury, dissolved	7439-97-6	E509S	0.000005	mg/L	<0.0000050	----
Volatile Organic Compounds (QCLot: 263791)						
benzene	71-43-2	E611A	0.5	µg/L	<0.50	----
ethylbenzene	100-41-4	E611A	0.5	µg/L	<0.50	----
methyl-tert-butyl ether [MTBE]	1634-04-4	E611A	0.5	µg/L	<0.50	----
styrene	100-42-5	E611A	0.5	µg/L	<0.50	----
toluene	108-88-3	E611A	0.5	µg/L	<0.50	----
xylene, m+p-	179601-23-1	E611A	0.4	µg/L	<0.40	----
xylene, o-	95-47-6	E611A	0.3	µg/L	<0.30	----
Hydrocarbons (QCLot: 263155)						
F2 (C10-C16)	----	E601	100	µg/L	<100	----
F3 (C16-C34)	----	E601	250	µg/L	<250	----
F4 (C34-C50)	----	E601	250	µg/L	<250	----
Hydrocarbons (QCLot: 263792)						
F1 (C6-C10)	----	E581.VH+F1	100	µg/L	<100	----
Polycyclic Aromatic Hydrocarbons (QCLot: 263156)						
acenaphthene	83-32-9	E641A	0.01	µg/L	<0.010	----
acenaphthylene	208-96-8	E641A	0.01	µg/L	<0.010	----
acridine	260-94-6	E641A	0.01	µg/L	<0.010	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Polycyclic Aromatic Hydrocarbons (QCLot: 263156) - continued						
anthracene	120-12-7	E641A	0.01	µg/L	<0.010	----
benz(a)anthracene	56-55-3	E641A	0.01	µg/L	<0.010	----
benzo(a)pyrene	50-32-8	E641A	0.005	µg/L	<0.0050	----
benzo(b+j)fluoranthene	----	E641A	0.01	µg/L	<0.010	----
benzo(g,h,i)perylene	191-24-2	E641A	0.01	µg/L	<0.010	----
benzo(k)fluoranthene	207-08-9	E641A	0.01	µg/L	<0.010	----
chrysene	218-01-9	E641A	0.01	µg/L	<0.010	----
dibenz(a,h)anthracene	53-70-3	E641A	0.005	µg/L	<0.0050	----
fluoranthene	206-44-0	E641A	0.01	µg/L	<0.010	----
fluorene	86-73-7	E641A	0.01	µg/L	<0.010	----
indeno(1,2,3-c,d)pyrene	193-39-5	E641A	0.01	µg/L	<0.010	----
methylnaphthalene, 1-	90-12-0	E641A	0.01	µg/L	<0.010	----
methylnaphthalene, 2-	91-57-6	E641A	0.01	µg/L	<0.010	----
naphthalene	91-20-3	E641A	0.05	µg/L	<0.050	----
phenanthrene	85-01-8	E641A	0.02	µg/L	<0.020	----
pyrene	129-00-0	E641A	0.01	µg/L	<0.010	----
quinoline	6027-02-7	E641A	0.05	µg/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	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 260384)									
turbidity	----	E121	0.1	NTU	200 NTU	97.3	85.0	115	----
Physical Tests (QCLot: 261254)									
conductivity	----	E100S	2	µS/cm	146.9 µS/cm	98.3	80.0	120	----
Physical Tests (QCLot: 261255)									
alkalinity, total (as CaCO3)	----	E290	1	mg/L	500 mg/L	101	85.0	115	----
Physical Tests (QCLot: 261256)									
pH	----	E108	----	pH units	7 pH units	100	98.0	102	----
Physical Tests (QCLot: 261380)									
solids, total suspended [TSS]	----	E160S	2	mg/L	150 mg/L	92.2	85.0	115	----
Physical Tests (QCLot: 273148)									
solids, total dissolved [TDS]	----	E162S	10	mg/L	1000 mg/L	98.5	85.0	115	----
Anions and Nutrients (QCLot: 262405)									
Kjeldahl nitrogen, total [TKN]	----	E318S	0.05	mg/L	4 mg/L	96.0	75.0	125	----
Anions and Nutrients (QCLot: 272957)									
bromide	24959-67-9	E235S.Br	5	mg/L	0.5 mg/L	99.4	85.0	115	----
Anions and Nutrients (QCLot: 272958)									
chloride	16887-00-6	E235S.Cl	50	mg/L	100 mg/L	100.0	90.0	110	----
Anions and Nutrients (QCLot: 272959)									
fluoride	16984-48-8	E235S.F-L	0.2	mg/L	1 mg/L	100	90.0	110	----
Anions and Nutrients (QCLot: 272960)									
nitrate (as N)	14797-55-8	E235S.NO3-T	0.01	mg/L	2.5 mg/L	100	90.0	110	----
Anions and Nutrients (QCLot: 272961)									
nitrite (as N)	14797-65-0	E235S.NO2-L	0.01	mg/L	0.5 mg/L	100	90.0	110	----
Anions and Nutrients (QCLot: 272962)									
sulfate (as SO4)	14808-79-8	E235S.SO4-L	3	mg/L	100 mg/L	102	90.0	110	----
Anions and Nutrients (QCLot: 273052)									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.2 mg/L	98.3	85.0	115	----
Anions and Nutrients (QCLot: 273053)									
phosphorus, total	7723-14-0	E372S	0.002	mg/L	0.05 mg/L	93.4	80.0	120	----
Organic / Inorganic Carbon (QCLot: 262404)									
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	8.57 mg/L	99.7	80.0	120	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Spike Concentration	Recovery (%) LCS	Recovery Limits (%) Low	Recovery Limits (%) High	Qualifier
Organic / Inorganic Carbon (QCLot: 272964)									
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	8.57 mg/L	92.4	80.0	120	----
Total Metals (QCLot: 260245)									
silicon, total	7440-21-3	E468S.NaSi	1	mg/L	10 mg/L	100	80.0	120	----
sodium, total	17341-25-2	E468S.NaSi	2.5	mg/L	50 mg/L	100	80.0	120	----
Total Metals (QCLot: 260246)									
aluminum, total	7429-90-5	E468S	0.005	mg/L	2 mg/L	102	80.0	120	----
antimony, total	7440-36-0	E468S	0.001	mg/L	1 mg/L	114	80.0	120	----
arsenic, total	7440-38-2	E468S	0.0004	mg/L	1 mg/L	107	80.0	120	----
barium, total	7440-39-3	E468S	0.001	mg/L	0.25 mg/L	105	80.0	120	----
beryllium, total	7440-41-7	E468S	0.0005	mg/L	0.1 mg/L	100	80.0	120	----
bismuth, total	7440-69-9	E468S	0.0005	mg/L	1 mg/L	110	80.0	120	----
boron, total	7440-42-8	E468S	0.3	mg/L	10 mg/L	89.6	80.0	120	----
cadmium, total	7440-43-9	E468S	0.00001	mg/L	0.1 mg/L	108	80.0	120	----
calcium, total	7440-70-2	E468S	1	mg/L	50 mg/L	100	80.0	120	----
cesium, total	7440-46-2	E468S	0.0005	mg/L	0.05 mg/L	107	80.0	120	----
chromium, total	7440-47-3	E468S	0.0005	mg/L	0.25 mg/L	105	80.0	120	----
cobalt, total	7440-48-4	E468S	0.00005	mg/L	0.25 mg/L	107	80.0	120	----
copper, total	7440-50-8	E468S	0.0005	mg/L	0.25 mg/L	108	80.0	120	----
gallium, total	7440-55-3	E468S	0.0005	mg/L	0.25 mg/L	99.4	80.0	120	----
iron, total	7439-89-6	E468S	0.01	mg/L	1 mg/L	108	80.0	120	----
lead, total	7439-92-1	E468S	0.00005	mg/L	0.5 mg/L	109	80.0	120	----
lithium, total	7439-93-2	E468S	0.02	mg/L	0.25 mg/L	97.6	80.0	120	----
magnesium, total	7439-95-4	E468S	1	mg/L	50 mg/L	103	80.0	120	----
manganese, total	7439-96-5	E468S	0.0002	mg/L	0.25 mg/L	105	80.0	120	----
molybdenum, total	7439-98-7	E468S	0.0001	mg/L	0.25 mg/L	102	80.0	120	----
nickel, total	7440-02-0	E468S	0.0005	mg/L	0.5 mg/L	107	80.0	120	----
phosphorus, total	7723-14-0	E468S	0.05	mg/L	10 mg/L	114	80.0	120	----
potassium, total	7440-09-7	E468S	1	mg/L	50 mg/L	109	80.0	120	----
rhenium, total	7440-15-5	E468S	0.0005	mg/L	0.1 mg/L	103	80.0	120	----
rubidium, total	7440-17-7	E468S	0.005	mg/L	0.1 mg/L	110	80.0	120	----
selenium, total	7782-49-2	E468S	0.0005	mg/L	1 mg/L	120	80.0	120	----
silver, total	7440-22-4	E468S	0.0001	mg/L	0.1 mg/L	111	80.0	120	----
strontium, total	7440-24-6	E468S	0.01	mg/L	0.25 mg/L	104	80.0	120	----
sulfur, total	7704-34-9	E468S	5	mg/L	50 mg/L	84.1	80.0	120	----
tellurium, total	13494-80-9	E468S	0.0005	mg/L	0.1 mg/L	# 124	80.0	120	MES
thallium, total	7440-28-0	E468S	0.00005	mg/L	1 mg/L	112	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: 260246) - continued									
thorium, total	7440-29-1	E468S	0.0005	mg/L	0.1 mg/L	97.5	80.0	120	----
tin, total	7440-31-5	E468S	0.001	mg/L	0.5 mg/L	104	80.0	120	----
titanium, total	7440-32-6	E468S	0.005	mg/L	0.25 mg/L	104	80.0	120	----
tungsten, total	7440-33-7	E468S	0.001	mg/L	0.1 mg/L	102	80.0	120	----
uranium, total	7440-61-1	E468S	0.00005	mg/L	0.005 mg/L	99.2	80.0	120	----
vanadium, total	7440-62-2	E468S	0.0005	mg/L	0.5 mg/L	103	80.0	120	----
yttrium, total	7440-65-5	E468S	0.0005	mg/L	0.1 mg/L	102	80.0	120	----
zinc, total	7440-66-6	E468S	0.003	mg/L	0.5 mg/L	114	80.0	120	----
zirconium, total	7440-67-7	E468S	0.0005	mg/L	0.1 mg/L	106	80.0	120	----
Total Metals (QCLot: 264851)									
mercury, total	7439-97-6	E508S	0.000005	mg/L	0.0001 mg/L	98.8	80.0	120	----
silicon, dissolved	7440-21-3	E469S.NaSi	1	mg/L	10 mg/L	107	80.0	120	----
sodium, dissolved	17341-25-2	E469S.NaSi	2.5	mg/L	50 mg/L	103	80.0	120	----
Dissolved Metals (QCLot: 260359)									
aluminum, dissolved	7429-90-5	E469S	0.005	mg/L	2 mg/L	105	80.0	120	----
antimony, dissolved	7440-36-0	E469S	0.001	mg/L	1 mg/L	102	80.0	120	----
arsenic, dissolved	7440-38-2	E469S	0.0004	mg/L	1 mg/L	102	80.0	120	----
barium, dissolved	7440-39-3	E469S	0.001	mg/L	0.25 mg/L	106	80.0	120	----
beryllium, dissolved	7440-41-7	E469S	0.0005	mg/L	0.1 mg/L	101	80.0	120	----
bismuth, dissolved	7440-69-9	E469S	0.0005	mg/L	1 mg/L	104	80.0	120	----
boron, dissolved	7440-42-8	E469S	0.3	mg/L	10 mg/L	97.8	80.0	120	----
cadmium, dissolved	7440-43-9	E469S	0.00001	mg/L	0.1 mg/L	105	80.0	120	----
calcium, dissolved	7440-70-2	E469S	1	mg/L	50 mg/L	100	80.0	120	----
cesium, dissolved	7440-46-2	E469S	0.0005	mg/L	0.05 mg/L	98.0	80.0	120	----
chromium, dissolved	7440-47-3	E469S	0.0005	mg/L	0.25 mg/L	104	80.0	120	----
cobalt, dissolved	7440-48-4	E469S	0.00005	mg/L	0.25 mg/L	110	80.0	120	----
copper, dissolved	7440-50-8	E469S	0.0002	mg/L	0.25 mg/L	109	80.0	120	----
gallium, dissolved	7440-55-3	E469S	0.0005	mg/L	0.25 mg/L	101	80.0	120	----
iron, dissolved	7439-89-6	E469S	0.01	mg/L	1 mg/L	98.9	80.0	120	----
lead, dissolved	7439-92-1	E469S	0.00005	mg/L	0.5 mg/L	99.9	80.0	120	----
lithium, dissolved	7439-93-2	E469S	0.02	mg/L	0.25 mg/L	96.6	80.0	120	----
magnesium, dissolved	7439-95-4	E469S	1	mg/L	50 mg/L	110	80.0	120	----
manganese, dissolved	7439-96-5	E469S	0.0001	mg/L	0.25 mg/L	107	80.0	120	----
molybdenum, dissolved	7439-98-7	E469S	0.0001	mg/L	0.25 mg/L	97.0	80.0	120	----
nickel, dissolved	7440-02-0	E469S	0.0005	mg/L	0.5 mg/L	110	80.0	120	----
phosphorus, dissolved	7723-14-0	E469S	0.05	mg/L	10 mg/L	103	80.0	120	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report: Spike Concentration	Recovery (%) LCS	Recovery Limits (%) Low	Recovery Limits (%) High	Qualifier
Dissolved Metals (QCLot: 260359) - continued									
potassium, dissolved	7440-09-7	E469S	1	mg/L	50 mg/L	106	80.0	120	----
rhenium, dissolved	7440-15-5	E469S	0.0005	mg/L	0.1 mg/L	97.1	80.0	120	----
rubidium, dissolved	7440-17-7	E469S	0.005	mg/L	0.1 mg/L	106	80.0	120	----
selenium, dissolved	7782-49-2	E469S	0.0005	mg/L	1 mg/L	104	80.0	120	----
silver, dissolved	7440-22-4	E469S	0.0001	mg/L	0.1 mg/L	103	80.0	120	----
strontium, dissolved	7440-24-6	E469S	0.01	mg/L	0.25 mg/L	96.2	80.0	120	----
sulfur, dissolved	7704-34-9	E469S	5	mg/L	50 mg/L	92.4	80.0	120	----
tellurium, dissolved	13494-80-9	E469S	0.0005	mg/L	0.1 mg/L	107	80.0	120	----
thallium, dissolved	7440-28-0	E469S	0.00005	mg/L	1 mg/L	102	80.0	120	----
thorium, dissolved	7440-29-1	E469S	0.0005	mg/L	0.1 mg/L	85.6	80.0	120	----
tin, dissolved	7440-31-5	E469S	0.001	mg/L	0.5 mg/L	99.8	80.0	120	----
titanium, dissolved	7440-32-6	E469S	0.005	mg/L	0.25 mg/L	101	80.0	120	----
tungsten, dissolved	7440-33-7	E469S	0.001	mg/L	0.1 mg/L	93.5	80.0	120	----
uranium, dissolved	7440-61-1	E469S	0.00005	mg/L	0.005 mg/L	89.1	80.0	120	----
vanadium, dissolved	7440-62-2	E469S	0.0005	mg/L	0.5 mg/L	102	80.0	120	----
yttrium, dissolved	7440-65-5	E469S	0.0005	mg/L	0.1 mg/L	101	80.0	120	----
zinc, dissolved	7440-66-6	E469S	0.001	mg/L	0.5 mg/L	112	80.0	120	----
zirconium, dissolved	7440-67-7	E469S	0.0005	mg/L	0.1 mg/L	94.0	80.0	120	----
mercury, dissolved	7439-97-6	E509S	0.000005	mg/L	0.0001 mg/L	100	80.0	120	----
Volatile Organic Compounds (QCLot: 263791)									
benzene	71-43-2	E611A	0.5	µg/L	100 µg/L	96.5	70.0	130	----
ethylbenzene	100-41-4	E611A	0.5	µg/L	100 µg/L	108	70.0	130	----
methyl-tert-butyl ether [MTBE]	1634-04-4	E611A	0.5	µg/L	100 µg/L	108	70.0	130	----
styrene	100-42-5	E611A	0.5	µg/L	100 µg/L	95.6	70.0	130	----
toluene	108-88-3	E611A	0.5	µg/L	100 µg/L	95.8	70.0	130	----
xylene, m+p-	179601-23-1	E611A	0.4	µg/L	200 µg/L	94.6	70.0	130	----
xylene, o-	95-47-6	E611A	0.3	µg/L	100 µg/L	105	70.0	130	----
Hydrocarbons (QCLot: 263155)									
F2 (C10-C16)	----	E601	100	µg/L	3538 µg/L	108	70.0	130	----
F3 (C16-C34)	----	E601	250	µg/L	7053 µg/L	95.6	70.0	130	----
F4 (C34-C50)	----	E601	250	µg/L	5051 µg/L	94.2	70.0	130	----
Hydrocarbons (QCLot: 263792)									
F1 (C6-C10)	----	E581.VH+F1	100	µg/L	6310 µg/L	102	70.0	130	----
Polycyclic Aromatic Hydrocarbons (QCLot: 263156)									
acenaphthene	83-32-9	E641A	0.01	µg/L	0.5 µg/L	84.1	60.0	130	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Spike Concentration	Recovery (%) LCS	Recovery Limits (%) Low	Recovery Limits (%) High	Qualifier
					Laboratory Control Sample (LCS) Report				
Polycyclic Aromatic Hydrocarbons (QCLot: 263156) - continued									
acenaphthylene	208-96-8	E641A	0.01	µg/L	0.5 µg/L	98.2	60.0	130	----
acridine	260-94-6	E641A	0.01	µg/L	0.5 µg/L	127	60.0	130	----
anthracene	120-12-7	E641A	0.01	µg/L	0.5 µg/L	125	60.0	130	----
benz(a)anthracene	56-55-3	E641A	0.01	µg/L	0.5 µg/L	126	60.0	130	----
benzo(a)pyrene	50-32-8	E641A	0.005	µg/L	0.5 µg/L	108	60.0	130	----
benzo(b+j)fluoranthene	----	E641A	0.01	µg/L	0.5 µg/L	85.5	60.0	130	----
benzo(g,h,i)perylene	191-24-2	E641A	0.01	µg/L	0.5 µg/L	98.7	60.0	130	----
benzo(k)fluoranthene	207-08-9	E641A	0.01	µg/L	0.5 µg/L	88.9	60.0	130	----
chrysene	218-01-9	E641A	0.01	µg/L	0.5 µg/L	106	60.0	130	----
dibenz(a,h)anthracene	53-70-3	E641A	0.005	µg/L	0.5 µg/L	116	60.0	130	----
fluoranthene	206-44-0	E641A	0.01	µg/L	0.5 µg/L	113	60.0	130	----
fluorene	86-73-7	E641A	0.01	µg/L	0.5 µg/L	99.3	60.0	130	----
indeno(1,2,3-c,d)pyrene	193-39-5	E641A	0.01	µg/L	0.5 µg/L	119	60.0	130	----
methylnaphthalene, 1-	90-12-0	E641A	0.01	µg/L	0.5 µg/L	76.9	60.0	130	----
methylnaphthalene, 2-	91-57-6	E641A	0.01	µg/L	0.5 µg/L	73.7	60.0	130	----
naphthalene	91-20-3	E641A	0.05	µg/L	0.5 µg/L	79.7	50.0	130	----
phenanthrene	85-01-8	E641A	0.02	µg/L	0.5 µg/L	109	60.0	130	----
pyrene	129-00-0	E641A	0.01	µg/L	0.5 µg/L	116	60.0	130	----
quinoline	6027-02-7	E641A	0.05	µg/L	0.5 µg/L	127	60.0	130	----

Qualifiers

Qualifier	*Description*
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).*

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: 262405)										
VA21B6250-002	MP-05 ENE	Kjeldahl nitrogen, total [TKN]	----	E318S	2.78 mg/L	2.5 mg/L	111	70.0	130	----
Anions and Nutrients (QCLot: 272957)										
VA21B6250-002	MP-05 ENE	bromide	24959-67-9	E235S.Br	48.2 mg/L	50 mg/L	96.5	75.0	125	----
Anions and Nutrients (QCLot: 272958)										
VA21B6250-002	MP-05 ENE	chloride	16887-00-6	E235S.Cl	9670 mg/L	10000 mg/L	96.7	75.0	125	----
Anions and Nutrients (QCLot: 272959)										
VA21B6250-002	MP-05 ENE	fluoride	16984-48-8	E235S.F-L	9.56 mg/L	10 mg/L	95.6	75.0	125	----
Anions and Nutrients (QCLot: 272960)										
VA21B6250-002	MP-05 ENE	nitrate (as N)	14797-55-8	E235S.NO3-T	7.36 mg/L	7.5 mg/L	98.1	75.0	125	----
Anions and Nutrients (QCLot: 272961)										
VA21B6250-002	MP-05 ENE	nitrite (as N)	14797-65-0	E235S.NO2-L	4.95 mg/L	5 mg/L	99.0	75.0	125	----
Anions and Nutrients (QCLot: 272962)										
VA21B6250-002	MP-05 ENE	sulfate (as SO4)	14808-79-8	E235S.SO4-L	ND mg/L	1000 mg/L	ND	75.0	125	----
Anions and Nutrients (QCLot: 273052)										
VA21B6250-002	MP-05 ENE	ammonia, total (as N)	7664-41-7	E298	0.0982 mg/L	0.1 mg/L	98.2	75.0	125	----
Anions and Nutrients (QCLot: 273053)										
VA21B6250-002	MP-05 ENE	phosphorus, total	7723-14-0	E372S	0.0917 mg/L	0.1 mg/L	91.7	70.0	130	----
Organic / Inorganic Carbon (QCLot: 262404)										
VA21B6095-002	Anonymous	carbon, total organic [TOC]	----	E355-L	5.11 mg/L	5 mg/L	102	70.0	130	----
Organic / Inorganic Carbon (QCLot: 272964)										
VA21B6250-002	MP-05 ENE	carbon, dissolved organic [DOC]	----	E358-L	4.50 mg/L	5 mg/L	89.9	70.0	130	----
Total Metals (QCLot: 260245)										
VA21B6250-002	MP-05 ENE	silicon, total	7440-21-3	E468S.NaSi	480 mg/L	500 mg/L	96.0	70.0	130	----
		sodium, total	17341-25-2	E468S.NaSi	ND mg/L	100 mg/L	ND	70.0	130	----
Total Metals (QCLot: 260246)										
VA21B6250-002	MP-05 ENE	aluminum, total	7429-90-5	E468S	0.422 mg/L	0.4 mg/L	106	70.0	130	----
		antimony, total	7440-36-0	E468S	0.0412 mg/L	0.04 mg/L	103	70.0	130	----
		arsenic, total	7440-38-2	E468S	0.0404 mg/L	0.04 mg/L	101	70.0	130	----

Sub-Matrix: **Water**

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Spike Concentration	Spike Target	Recovery (%) MS	Recovery Limits (%) Low	Recovery Limits (%) High	Qualifier
Total Metals (QCLot: 260246) - continued										
VA21B6250-002	MP-05 ENE	barium, total	7440-39-3	E468S	0.0394 mg/L	0.04 mg/L	98.5	70.0	130	----
		beryllium, total	7440-41-7	E468S	0.0893 mg/L	0.08 mg/L	112	70.0	130	----
		bismuth, total	7440-69-9	E468S	0.0183 mg/L	0.02 mg/L	91.4	70.0	130	----
		boron, total	7440-42-8	E468S	ND mg/L	0.2 mg/L	ND	70.0	130	----
		cadmium, total	7440-43-9	E468S	0.00738 mg/L	0.008 mg/L	92.2	70.0	130	----
		calcium, total	7440-70-2	E468S	ND mg/L	8 mg/L	ND	70.0	130	----
		cesium, total	7440-46-2	E468S	0.0202 mg/L	0.02 mg/L	101	70.0	130	----
		chromium, total	7440-47-3	E468S	0.0846 mg/L	0.08 mg/L	106	70.0	130	----
		cobalt, total	7440-48-4	E468S	0.0403 mg/L	0.04 mg/L	101	70.0	130	----
		copper, total	7440-50-8	E468S	0.0378 mg/L	0.04 mg/L	94.4	70.0	130	----
		gallium, total	7440-55-3	E468S	0.00536 mg/L	0.005 mg/L	107	70.0	130	----
		iron, total	7439-89-6	E468S	4.12 mg/L	4 mg/L	103	70.0	130	----
		lead, total	7439-92-1	E468S	0.0371 mg/L	0.04 mg/L	92.8	70.0	130	----
		lithium, total	7439-93-2	E468S	0.218 mg/L	0.2 mg/L	109	70.0	130	----
		magnesium, total	7439-95-4	E468S	ND mg/L	2 mg/L	ND	70.0	130	----
		manganese, total	7439-96-5	E468S	0.0426 mg/L	0.04 mg/L	106	70.0	130	----
		molybdenum, total	7439-98-7	E468S	0.0400 mg/L	0.04 mg/L	99.9	70.0	130	----
		nickel, total	7440-02-0	E468S	0.0773 mg/L	0.08 mg/L	96.6	70.0	130	----
		phosphorus, total	7723-14-0	E468S	23.1 mg/L	20 mg/L	115	70.0	130	----
		potassium, total	7440-09-7	E468S	ND mg/L	8 mg/L	ND	70.0	130	----
		rhenium, total	7440-15-5	E468S	0.00524 mg/L	0.005 mg/L	105	70.0	130	----
		rubidium, total	7440-17-7	E468S	ND mg/L	0.04 mg/L	ND	70.0	130	----
		selenium, total	7782-49-2	E468S	0.0811 mg/L	0.08 mg/L	101	70.0	130	----
		silver, total	7440-22-4	E468S	0.00753 mg/L	0.008 mg/L	94.2	70.0	130	----
		strontium, total	7440-24-6	E468S	ND mg/L	0.04 mg/L	ND	70.0	130	----
		sulfur, total	7704-34-9	E468S	ND mg/L	40 mg/L	ND	70.0	130	----
		tellurium, total	13494-80-9	E468S	0.0712 mg/L	0.08 mg/L	89.0	70.0	130	----
		thallium, total	7440-28-0	E468S	0.00759 mg/L	0.008 mg/L	94.9	70.0	130	----
		thorium, total	7440-29-1	E468S	0.0415 mg/L	0.04 mg/L	104	70.0	130	----
		tin, total	7440-31-5	E468S	0.0390 mg/L	0.04 mg/L	97.4	70.0	130	----
		titanium, total	7440-32-6	E468S	0.0860 mg/L	0.08 mg/L	108	70.0	130	----
		tungsten, total	7440-33-7	E468S	0.0398 mg/L	0.04 mg/L	99.4	70.0	130	----
		uranium, total	7440-61-1	E468S	0.00777 mg/L	0.008 mg/L	97.2	70.0	130	----
		vanadium, total	7440-62-2	E468S	0.221 mg/L	0.2 mg/L	110	70.0	130	----
		yttrium, total	7440-65-5	E468S	0.00560 mg/L	0.005 mg/L	112	70.0	130	----
		zinc, total	7440-66-6	E468S	0.740 mg/L	0.8 mg/L	92.6	70.0	130	----
		zirconium, total	7440-67-7	E468S	0.0898 mg/L	0.08 mg/L	112	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: 264851)										
VA21B6250-002	MP-05 ENE	mercury, total	7439-97-6	E508S	0.0000961 mg/L	0.0001 mg/L	96.1	70.0	130	----
Dissolved Metals (QCLot: 260358)										
VA21B6112-003	Anonymous	sodium, dissolved	17341-25-2	E469S.NaSi	99.0 mg/L	100 mg/L	99.0	70.0	130	----
VA21B6112-003	Anonymous	silicon, dissolved	7440-21-3	E469S.NaSi	484 mg/L	500 mg/L	96.9	70.0	130	----
Dissolved Metals (QCLot: 260359)										
VA21B6112-003	Anonymous	aluminum, dissolved	7429-90-5	E469S	0.390 mg/L	0.4 mg/L	97.6	70.0	130	----
		antimony, dissolved	7440-36-0	E469S	0.0373 mg/L	0.04 mg/L	93.4	70.0	130	----
		arsenic, dissolved	7440-38-2	E469S	0.0382 mg/L	0.04 mg/L	95.5	70.0	130	----
		barium, dissolved	7440-39-3	E469S	0.0383 mg/L	0.04 mg/L	95.8	70.0	130	----
		beryllium, dissolved	7440-41-7	E469S	0.0780 mg/L	0.08 mg/L	97.6	70.0	130	----
		bismuth, dissolved	7440-69-9	E469S	0.0201 mg/L	0.02 mg/L	101	70.0	130	----
		boron, dissolved	7440-42-8	E469S	0.17 mg/L	0.2 mg/L	84.0	70.0	130	----
		cadmium, dissolved	7440-43-9	E469S	0.00805 mg/L	0.008 mg/L	100	70.0	130	----
		calcium, dissolved	7440-70-2	E469S	7.5 mg/L	8 mg/L	93.7	70.0	130	----
		cesium, dissolved	7440-46-2	E469S	0.0191 mg/L	0.02 mg/L	95.4	70.0	130	----
		chromium, dissolved	7440-47-3	E469S	0.0799 mg/L	0.08 mg/L	99.9	70.0	130	----
		cobalt, dissolved	7440-48-4	E469S	0.0406 mg/L	0.04 mg/L	101	70.0	130	----
		copper, dissolved	7440-50-8	E469S	0.0417 mg/L	0.04 mg/L	104	70.0	130	----
		gallium, dissolved	7440-55-3	E469S	0.00525 mg/L	0.005 mg/L	105	70.0	130	----
		iron, dissolved	7439-89-6	E469S	3.99 mg/L	4 mg/L	99.8	70.0	130	----
		lead, dissolved	7439-92-1	E469S	0.0408 mg/L	0.04 mg/L	102	70.0	130	----
		lithium, dissolved	7439-93-2	E469S	0.192 mg/L	0.2 mg/L	95.9	70.0	130	----
		magnesium, dissolved	7439-95-4	E469S	2.0 mg/L	2 mg/L	99.2	70.0	130	----
		manganese, dissolved	7439-96-5	E469S	0.0407 mg/L	0.04 mg/L	102	70.0	130	----
		molybdenum, dissolved	7439-98-7	E469S	0.0361 mg/L	0.04 mg/L	90.3	70.0	130	----
		nickel, dissolved	7440-02-0	E469S	0.0838 mg/L	0.08 mg/L	105	70.0	130	----
		phosphorus, dissolved	7723-14-0	E469S	18.6 mg/L	20 mg/L	92.8	70.0	130	----
		potassium, dissolved	7440-09-7	E469S	8.0 mg/L	8 mg/L	100	70.0	130	----
		rhenium, dissolved	7440-15-5	E469S	0.00480 mg/L	0.005 mg/L	95.9	70.0	130	----
		rubidium, dissolved	7440-17-7	E469S	0.0402 mg/L	0.04 mg/L	100	70.0	130	----
		selenium, dissolved	7782-49-2	E469S	0.0864 mg/L	0.08 mg/L	108	70.0	130	----
		silver, dissolved	7440-22-4	E469S	0.00794 mg/L	0.008 mg/L	99.2	70.0	130	----
		strontium, dissolved	7440-24-6	E469S	0.039 mg/L	0.04 mg/L	96.5	70.0	130	----
		sulfur, dissolved	7704-34-9	E469S	35.4 mg/L	40 mg/L	88.6	70.0	130	----
		tellurium, dissolved	13494-80-9	E469S	0.0863 mg/L	0.08 mg/L	108	70.0	130	----
		thallium, dissolved	7440-28-0	E469S	0.00775 mg/L	0.008 mg/L	96.9	70.0	130	----

Sub-Matrix: **Water**

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Matrix Spike (MS) Report: Spike Concentration	Spike Target	Recovery (%) MS	Recovery Limits (%) Low	Recovery Limits (%) High	Qualifier
Dissolved Metals (QCLot: 260359) - continued										
VA21B6112-003	Anonymous	thorium, dissolved	7440-29-1	E469S	0.0404 mg/L	0.04 mg/L	101	70.0	130	----
		tin, dissolved	7440-31-5	E469S	0.0375 mg/L	0.04 mg/L	93.7	70.0	130	----
		titanium, dissolved	7440-32-6	E469S	0.0771 mg/L	0.08 mg/L	96.3	70.0	130	----
		tungsten, dissolved	7440-33-7	E469S	0.0367 mg/L	0.04 mg/L	91.8	70.0	130	----
		uranium, dissolved	7440-61-1	E469S	0.00730 mg/L	0.008 mg/L	91.3	70.0	130	----
		vanadium, dissolved	7440-62-2	E469S	0.191 mg/L	0.2 mg/L	95.6	70.0	130	----
		yttrium, dissolved	7440-65-5	E469S	0.00500 mg/L	0.005 mg/L	100	70.0	130	----
		zinc, dissolved	7440-66-6	E469S	0.855 mg/L	0.8 mg/L	107	70.0	130	----
		zirconium, dissolved	7440-67-7	E469S	0.0736 mg/L	0.08 mg/L	92.0	70.0	130	----
Dissolved Metals (QCLot: 263871)										
VA21B6250-002	MP-05 ENE	mercury, dissolved	7439-97-6	E509S	0.000101 mg/L	0.0001 mg/L	101	70.0	130	----
Volatile Organic Compounds (QCLot: 263791)										
VA21B6224-002	Anonymous	benzene	71-43-2	E611A	99.9 µg/L	100 µg/L	99.9	60.0	140	----
		ethylbenzene	100-41-4	E611A	105 µg/L	100 µg/L	105	60.0	140	----
		methyl-tert-butyl ether [MTBE]	1634-04-4	E611A	105 µg/L	100 µg/L	105	60.0	140	----
		styrene	100-42-5	E611A	90.8 µg/L	100 µg/L	90.8	60.0	140	----
		toluene	108-88-3	E611A	94.4 µg/L	100 µg/L	94.4	60.0	140	----
		xylene, m+p-	179601-23-1	E611A	185 µg/L	200 µg/L	92.7	60.0	140	----
		xylene, o-	95-47-6	E611A	102 µg/L	100 µg/L	102	60.0	140	----
Hydrocarbons (QCLot: 263792)										
VA21B6250-003	MP-05 North	F1 (C6-C10)	----	E581.VH+F1	4870 µg/L	6310 µg/L	77.1	60.0	140	----

ALS www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

COC Number: 20 - 920773

Page of

Report To	Contact and company name below will appear on the final report
Company:	Golder Associates Ltd.
Contact:	Trish Tomliens / Elaine Irving
Phone:	1(250) 881- 7372
	Company address below will appear on the final report
Street:	200-2920 Virtual Way
City/Province:	Vancouver, BC
Postal Code:	V5M 0C4
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	
Contact:	

Reports / Recipients

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

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

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

Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax Patricia_Tomliens@golder.com

Email 2 Elaine_Irving@golder.com

Email 3

Invoice Recipients

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax

Email 2

Turnaround Time (TAT) Requested

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

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

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

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

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

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

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)

Project Information

ALS Account # / Quote #: Q84262

Job #: 1663724-44000-03

PO / AFE:

LSD:

ALS Lab Work Order # (ALS use only):

Oil and Gas Required Fields (client use)

AFE/Cost Center: | PO#

Major/Minor Code: | Routing Code:

Requisitioner:

Location:

ALS Contact: | Sampler:

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

ALS Sample # (ALS use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	General (pH, alkalinity, TSS, turbidity, conductivity)	Dissolved metals (F/P)	Total metals (P)	Dissolved mercury (F/P)	Total mercury (P)	Total nutrients (P)	TOC, TKN (P)	BTEX/F1 (P)	F2-F4, PAH (P)	SAMPLES ON HOLD	EXTENDED STORAGE REQUIRED	SUSPECTED HAZARD (see notes)
	MP05-WNW-FBLANK-1	02-AUG-21	17:00	Seawater	10	X	X	X	X	X	X	X	X	X			
	MP-05 ENE	02-AUG-21	16:35	Seawater	6	X	X	X	X	X	X	X					
	MP-05 North	02-AUG-21	16:45	Seawater	10	X	X	X	X	X	X	X	X	X			
	MP-05 WNW	02-AUG-21	17:00	Seawater	6	X	X	X	X	X	X	X					
	MP-05 Source	02-AUG-21	15:55	Seawater	10	X	X	X	X	X	X	X	X	X			
	DUP-A	02-AUG-21		Seawater	10	X	X	X	X	X	X	X	X	X			
	MP-06 ENE	02-AUG-21	17:45	Seawater	10	X	X	X	X	X	X	X	X	X			
	MP-06 North	02-AUG-21	17:25	Seawater	6	X	X	X	X	X	X	X					
	MP-06 WNW	02-AUG-21	17:35	Seawater	6	X	X	X	X	X	X	X					
	MP-06 Source	02-AUG-21	17:15	Seawater	10	X	X	X	X	X	X	X	X	X			

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

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

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

Notes / Specify Limits for resu...

Environmental Division
Vancouver
Work Order Reference
VA21B6250
Telephone : +1 604 253 4188

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: 19 20 20

SHIPMENT RELEASE (client use)

Released by: N.O'Brien Date: 3AUG2021 Time: 645

Received by:

FINAL SHIPMENT RECEPTION (ALS use only)

Time: Received by: JC Date: AUG 05 2021 Time: 10:30AM

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

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 ack... d 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

AUG 2020 FRONT

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **VA21B6876**	Page	: 1 of 14
Client	: **Golder Associates Ltd.**	Laboratory	: Vancouver - Environmental
Contact	: Elaine Irving	Account Manager	: Amber Springer
Address	: 200-2920 Virtual Way Vancouver BC Canada V5M 0C4	Address	: 8081 Lougheed Highway Burnaby BC Canada V5A 1W9
Telephone	: ----	Telephone	: +1 604 253 4188
Project	: ----	Date Samples Received	: 12-Aug-2021 09:20
PO	: ----	Date Analysis Commenced	: 12-Aug-2021
C-O-C number	: 20-920779	Issue Date	: 30-Aug-2021 17:18
Sampler	: ----		
Site	: ----		
Quote number	: Q84262		
No. of samples received	: 9		
No. of samples analysed	: 9		

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

Signatories	*Position*	*Laboratory Department*
Aaron Yu	Laboratory Analyst	Inorganics, Burnaby, British Columbia
Angela Ren	Team Leader - Metals	Metals, Burnaby, British Columbia
Courtney Cox	Analsyt	Inorganics, Burnaby, British Columbia
Dee Lee	Analyst	Metals, Burnaby, British Columbia
Jay Jang	Lab Assistant	Metals, Burnaby, British Columbia
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Miles Gropen	Department Manager - Inorganics	Inorganics, Burnaby, British Columbia
Ophelia Chiu	Department Manager - Organics	Organics, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia
Ruby Pham	Lab Assistant	Metals, Burnaby, British Columbia
Sristika Chand	Lab Analyst	Metals, Burnaby, British Columbia
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*
-	No Unit
µg/L	micrograms per litre
µS/cm	Microsiemens per centimetre
mg/L	milligrams per litre
NTU	nephelometric turbidity units
pH units	pH units
psu	practical salinity units

<: less than.

>: greater than.

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

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

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

Qualifiers

Qualifier	*Description*
DTC	*Dissolved concentration exceeds total. Results were confirmed by re-analysis.*
HTD	*Hold time exceeded for re-analysis or dilution, but initial testing was conducted within hold time.*

Analytical Results

Sub-Matrix: **Seawater**

(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	MP-06-Source	MP-06-WNW	MP-06-North	MP-06-ENE	MP-05-ENE
				Client sampling date / time	08-Aug-2021 15:10	08-Aug-2021 15:35	08-Aug-2021 15:55	08-Aug-2021 16:10	08-Aug-2021 17:10
					VA21B6876-001	VA21B6876-002	VA21B6876-003	VA21B6876-004	VA21B6876-005
					Result	Result	Result	Result	Result
Physical Tests									
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	92.9	105	111	108	85.6
conductivity	----	E100S	2.0	µS/cm	37300	41700	46000	45200	33500
hardness (as CaCO3), dissolved	----	EC100	0.50	mg/L	4720	5490	6230	6080	4860
pH	----	E108	0.10	pH units	8.01	8.02	8.02	8.02	7.89
salinity	----	EC100S	1.0	psu	24.4	27.6	30.8	30.2	21.6
solids, total dissolved [TDS]	----	E162S	10	mg/L	27900	30300	33400	32400	24400
solids, total suspended [TSS]	----	E160S	2.0	mg/L	2.2	<2.0	3.5	<2.0	4.0
turbidity	----	E121	0.10	NTU	<0.10	0.35	0.13	0.14	0.51
Anions and Nutrients									
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
bromide	24959-67-9	E235S.Br	5.0	mg/L	50.5	54.3	63.1	60.3	44.1
chloride	16887-00-6	E235S.Cl	50	mg/L	14500	15600	18100	17200	12600
fluoride	16984-48-8	E235S.F-L	0.20	mg/L	0.60	0.69	0.77	0.76	0.63
Kjeldahl nitrogen, total [TKN]	----	E318S	0.050	mg/L	0.087	0.092	0.093	0.102	0.094
nitrate (as N)	14797-55-8	E235S.NO3-T	0.010	mg/L	<0.010	<0.010	<0.010	<0.010	0.027
nitrite (as N)	14797-65-0	E235S.NO2-L	0.010	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010
phosphorus, total	7723-14-0	E372S	0.0020	mg/L	0.0172	0.0190	0.0248	0.0210	0.0177
sulfate (as SO4)	14808-79-8	E235S.SO4-L	3.0	mg/L	1880	2130	2370	2320	1690
Organic / Inorganic Carbon									
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	0.90 HTD	1.13 HTD	1.21 HTD	1.16 HTD	1.79 HTD
carbon, total organic [TOC]	----	E355-L	0.50	mg/L	0.83	0.82	0.94	0.89	0.84
Total Metals									
aluminum, total	7429-90-5	E468S	0.0050	mg/L	0.0076	<0.0050	<0.0050	<0.0050	0.0056
antimony, total	7440-36-0	E468S	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
arsenic, total	7440-38-2	E468S	0.00040	mg/L	0.00141	0.00155	0.00162	0.00167	0.00145
barium, total	7440-39-3	E468S	0.0010	mg/L	0.0074	0.0058	0.0092	0.0073	0.0072
beryllium, total	7440-41-7	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
bismuth, total	7440-69-9	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
boron, total	7440-42-8	E468S	0.30	mg/L	3.19	3.64	3.92	3.77	3.09
cadmium, total	7440-43-9	E468S	0.000010	mg/L	0.000037	0.000035	0.000044	0.000041	0.000027

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	MP-06-Source	MP-06-WNW	MP-06-North	MP-06-ENE	MP-05-ENE
				Client sampling date / time	08-Aug-2021 15:10	08-Aug-2021 15:35	08-Aug-2021 15:55	08-Aug-2021 16:10	08-Aug-2021 17:10
					VA21B6876-001	VA21B6876-002	VA21B6876-003	VA21B6876-004	VA21B6876-005
					Result	Result	Result	Result	Result
Total Metals									
calcium, total	7440-70-2	E468S	1.0	mg/L	308	360	391	384	312
cesium, total	7440-46-2	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
chromium, total	7440-47-3	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
cobalt, total	7440-48-4	E468S	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
copper, total	7440-50-8	E468S	0.00050	mg/L	0.00052	<0.00050	<0.00050	0.00100	<0.00050
gallium, total	7440-55-3	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
iron, total	7439-89-6	E468S	0.010	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010
lead, total	7439-92-1	E468S	0.000050	mg/L	0.000070	<0.000050	<0.000050	<0.000050	<0.000050
lithium, total	7439-93-2	E468S	0.020	mg/L	0.132	0.146	0.149	0.148	0.124
magnesium, total	7439-95-4	E468S	1.0	mg/L	900	1010	1100	1110	900
manganese, total	7439-96-5	E468S	0.00020	mg/L	0.00102	0.00084	0.00056	0.00069	0.00101
mercury, total	7439-97-6	E508S	0.0000050	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, total	7439-98-7	E468S	0.00010	mg/L	0.00814	0.00913	0.00998	0.00974	0.00854
nickel, total	7440-02-0	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
phosphorus, total	7723-14-0	E468S	0.050	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050
potassium, total	7440-09-7	E468S	1.0	mg/L	305	350	385	391	313
rhenium, total	7440-15-5	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
rubidium, total	7440-17-7	E468S	0.0050	mg/L	0.0846	0.0957	0.104	0.104	0.0857
selenium, total	7782-49-2	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
silicon, total	7440-21-3	E468S.NaSi	1.0	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0
silver, total	7440-22-4	E468S	0.00010	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
sodium, total	17341-25-2	E468S.NaSi	2.5	mg/L	7740	8320	9020	9120	7560
strontium, total	7440-24-6	E468S	0.010	mg/L	5.54	6.30	7.01	6.76	5.79
sulfur, total	7704-34-9	E468S	5.0	mg/L	729	864	995	948	780
tellurium, total	13494-80-9	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
thallium, total	7440-28-0	E468S	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
thorium, total	7440-29-1	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
tin, total	7440-31-5	E468S	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
titanium, total	7440-32-6	E468S	0.0050	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
tungsten, total	7440-33-7	E468S	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
uranium, total	7440-61-1	E468S	0.000050	mg/L	0.00272	0.00235	0.00261	0.00248	0.00224

Analytical Results

Sub-Matrix: Seawater
(Matrix: Water)

Analyte	CAS Number	Method	LOR	Unit	MP-06-Source	MP-06-WNW	MP-06-North	MP-06-ENE	MP-05-ENE
				Client sampling date / time	08-Aug-2021 15:10	08-Aug-2021 15:35	08-Aug-2021 15:55	08-Aug-2021 16:10	08-Aug-2021 17:10
					VA21B6876-001	VA21B6876-002	VA21B6876-003	VA21B6876-004	VA21B6876-005
					Result	Result	Result	Result	Result
Total Metals									
vanadium, total	7440-62-2	E468S	0.00050	mg/L	0.00108	0.00126	0.00135	0.00133	0.00113
yttrium, total	7440-65-5	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
zinc, total	7440-66-6	E468S	0.0030	mg/L	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
zirconium, total	7440-67-7	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Dissolved Metals									
aluminum, dissolved	7429-90-5	E469S	0.0050	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
antimony, dissolved	7440-36-0	E469S	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
arsenic, dissolved	7440-38-2	E469S	0.00040	mg/L	0.00115	0.00138	0.00150	0.00146	0.00124
barium, dissolved	7440-39-3	E469S	0.0010	mg/L	0.0068	0.0056	0.0078	0.0072	0.0070
beryllium, dissolved	7440-41-7	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
bismuth, dissolved	7440-69-9	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
boron, dissolved	7440-42-8	E469S	0.30	mg/L	3.42	3.84	4.48	4.38	3.46
cadmium, dissolved	7440-43-9	E469S	0.000010	mg/L	0.000034	0.000033	0.000038	0.000028	0.000030
calcium, dissolved	7440-70-2	E469S	1.0	mg/L	321	367	417	408	335
cesium, dissolved	7440-46-2	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
chromium, dissolved	7440-47-3	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
cobalt, dissolved	7440-48-4	E469S	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
copper, dissolved	7440-50-8	E469S	0.00020	mg/L	0.00045	0.00049	0.00031	0.00027	0.00040
gallium, dissolved	7440-55-3	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
iron, dissolved	7439-89-6	E469S	0.010	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010
lead, dissolved	7439-92-1	E469S	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
lithium, dissolved	7439-93-2	E469S	0.020	mg/L	0.149	0.174	0.198	0.190	0.152
magnesium, dissolved	7439-95-4	E469S	1.0	mg/L	951	1110	1260	1230	978
manganese, dissolved	7439-96-5	E469S	0.00010	mg/L	0.00085	0.00083	0.00050	0.00061	0.00092
mercury, dissolved	7439-97-6	E509S	0.0000050	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, dissolved	7439-98-7	E469S	0.00010	mg/L	0.00790	0.00918	0.0103	0.00994	0.00838
nickel, dissolved	7440-02-0	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
phosphorus, dissolved	7723-14-0	E469S	0.050	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050
potassium, dissolved	7440-09-7	E469S	1.0	mg/L	314	364	417	408	320
rhenium, dissolved	7440-15-5	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
rubidium, dissolved	7440-17-7	E469S	0.0050	mg/L	0.0824	0.0961	0.109	0.107	0.0852

Analytical Results

Sub-Matrix: **Seawater**

(Matrix: **Water**)

				Client sample ID	MP-06-Source	MP-06-WNW	MP-06-North	MP-06-ENE	MP-05-ENE
				Client sampling date / time	08-Aug-2021 15:10	08-Aug-2021 15:35	08-Aug-2021 15:55	08-Aug-2021 16:10	08-Aug-2021 17:10
Analyte	CAS Number	Method	LOR	Unit	VA21B6876-001	VA21B6876-002	VA21B6876-003	VA21B6876-004	VA21B6876-005
					Result	Result	Result	Result	Result
Dissolved Metals									
selenium, dissolved	7782-49-2	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
silicon, dissolved	7440-21-3	E469S.NaSi	1.0	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0
silver, dissolved	7440-22-4	E469S	0.00010	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
sodium, dissolved	17341-25-2	E469S.NaSi	2.5	mg/L	7160	8200	9240	9020	7400
strontium, dissolved	7440-24-6	E469S	0.010	mg/L	5.49	6.36	7.26	6.99	5.78
sulfur, dissolved	7704-34-9	E469S	5.0	mg/L	773	897	1020	1020	800
tellurium, dissolved	13494-80-9	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
thallium, dissolved	7440-28-0	E469S	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
thorium, dissolved	7440-29-1	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
tin, dissolved	7440-31-5	E469S	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
titanium, dissolved	7440-32-6	E469S	0.0050	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
tungsten, dissolved	7440-33-7	E469S	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
uranium, dissolved	7440-61-1	E469S	0.000050	mg/L	0.00493 DTC	0.00254	0.00267	0.00259	0.00230
vanadium, dissolved	7440-62-2	E469S	0.00050	mg/L	0.00105	0.00130	0.00140	0.00140	0.00111
yttrium, dissolved	7440-65-5	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
zinc, dissolved	7440-66-6	E469S	0.0010	mg/L	0.0013	<0.0010	0.0011	<0.0010	0.0012
zirconium, dissolved	7440-67-7	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
dissolved mercury filtration location	----	EP509	-	-	Field	Field	Field	Field	Field
dissolved metals filtration location	----	EP421	-	-	Field	Field	Field	Field	Field
Volatile Organic Compounds [Fuels]									
benzene	71-43-2	E611A	0.50	µg/L	<0.50	----	----	<0.50	----
ethylbenzene	100-41-4	E611A	0.50	µg/L	<0.50	----	----	<0.50	----
methyl-tert-butyl ether [MTBE]	1634-04-4	E611A	0.50	µg/L	<0.50	----	----	<0.50	----
styrene	100-42-5	E611A	0.50	µg/L	<0.50	----	----	<0.50	----
toluene	108-88-3	E611A	0.50	µg/L	<0.50	----	----	<0.50	----
xylene, m+p-	179601-23-1	E611A	0.40	µg/L	<0.40	----	----	<0.40	----
xylene, o-	95-47-6	E611A	0.30	µg/L	<0.30	----	----	<0.30	----
xylenes, total	1330-20-7	E611A	0.50	µg/L	<0.50	----	----	<0.50	----
Volatile Organic Compounds Surrogates									
bromofluorobenzene, 4-	460-00-4	E611A	1.0	%	97.3	----	----	89.5	----
difluorobenzene, 1,4-	540-36-3	E611A	1.0	%	119	----	----	80.4	----

Analytical Results

Sub-Matrix: Seawater

(Matrix: Water)

				Client sample ID	MP-06-Source	MP-06-WNW	MP-06-North	MP-06-ENE	MP-05-ENE
				Client sampling date / time	08-Aug-2021 15:10	08-Aug-2021 15:35	08-Aug-2021 15:55	08-Aug-2021 16:10	08-Aug-2021 17:10
Analyte	CAS Number	Method	LOR	Unit	VA21B6876-001	VA21B6876-002	VA21B6876-003	VA21B6876-004	VA21B6876-005
					Result	Result	Result	Result	Result
Hydrocarbons									
F2 (C10-C16)	----	E601	100	µg/L	<100	----	----	<100	----
F3 (C16-C34)	----	E601	250	µg/L	<250	----	----	<250	----
F4 (C34-C50)	----	E601	250	µg/L	<250	----	----	<250	----
VHw (C6-C10)	----	E581.VH+F1	100	µg/L	<100	----	----	<100	----
F1-BTEX	----	EC580	100	µg/L	<100	----	----	<100	----
VPHw	----	EC580A	100	µg/L	<100	----	----	<100	----
F1 (C6-C10)	----	E581.VH+F1	100	µg/L	<100	----	----	<100	----
Hydrocarbons Surrogates									
bromobenzotrifluoride, 2- (F2-F4 surr)	392-83-6	E601	1.0	%	79.2	----	----	78.1	----
dichlorotoluene, 3,4-	97-75-0	E581.VH+F1	1.0	%	122	----	----	94.4	----
Polycyclic Aromatic Hydrocarbons									
acenaphthene	83-32-9	E641A	0.010	µg/L	<0.010	----	----	<0.010	----
acenaphthylene	208-96-8	E641A	0.010	µg/L	<0.010	----	----	<0.010	----
acridine	260-94-6	E641A	0.010	µg/L	<0.010	----	----	<0.010	----
anthracene	120-12-7	E641A	0.010	µg/L	<0.010	----	----	<0.010	----
benz(a)anthracene	56-55-3	E641A	0.010	µg/L	<0.010	----	----	<0.010	----
benzo(a)pyrene	50-32-8	E641A	0.0050	µg/L	<0.0050	----	----	<0.0050	----
benzo(b+j)fluoranthene	----	E641A	0.010	µg/L	<0.010	----	----	<0.010	----
benzo(b+j+k)fluoranthene	----	E641A	0.015	µg/L	<0.015	----	----	<0.015	----
benzo(g,h,i)perylene	191-24-2	E641A	0.010	µg/L	<0.010	----	----	<0.010	----
benzo(k)fluoranthene	207-08-9	E641A	0.010	µg/L	<0.010	----	----	<0.010	----
chrysene	218-01-9	E641A	0.010	µg/L	<0.010	----	----	<0.010	----
dibenz(a,h)anthracene	53-70-3	E641A	0.0050	µg/L	<0.0050	----	----	<0.0050	----
fluoranthene	206-44-0	E641A	0.010	µg/L	<0.010	----	----	<0.010	----
fluorene	86-73-7	E641A	0.010	µg/L	<0.010	----	----	<0.010	----
indeno(1,2,3-c,d)pyrene	193-39-5	E641A	0.010	µg/L	<0.010	----	----	<0.010	----
methylnaphthalene, 1-	90-12-0	E641A	0.010	µg/L	<0.010	----	----	<0.010	----
methylnaphthalene, 1+2-	----	E641A	0.015	µg/L	<0.015	----	----	<0.015	----
methylnaphthalene, 2-	91-57-6	E641A	0.010	µg/L	0.013	----	----	<0.010	----
naphthalene	91-20-3	E641A	0.050	µg/L	<0.050	----	----	<0.050	----
phenanthrene	85-01-8	E641A	0.020	µg/L	<0.020	----	----	<0.020	----

Analytical Results

Sub-Matrix: **Seawater**

(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	MP-06-Source	MP-06-WNW	MP-06-North	MP-06-ENE	MP-05-ENE
				Client sampling date / time	08-Aug-2021 15:10	08-Aug-2021 15:35	08-Aug-2021 15:55	08-Aug-2021 16:10	08-Aug-2021 17:10
					VA21B6876-001	VA21B6876-002	VA21B6876-003	VA21B6876-004	VA21B6876-005
					Result	Result	Result	Result	Result
Polycyclic Aromatic Hydrocarbons									
pyrene	129-00-0	E641A	0.010	µg/L	<0.010	----	----	<0.010	----
quinoline	6027-02-7	E641A	0.050	µg/L	<0.050	----	----	<0.050	----
B(a)P total potency equivalents [B(a)P TPE]	----	E641A	0.010	µg/L	<0.010	----	----	<0.010	----
PAHs, high molecular weight (BC AWQ)	----	E641A	0.030	µg/L	<0.030	----	----	<0.030	----
PAHs, low molecular weight (BC AWQ)	----	E641A	0.060	µg/L	<0.060	----	----	<0.060	----
PAHs, total (EPA 16)	----	E641A	0.065	µg/L	<0.065	----	----	<0.065	----
Polycyclic Aromatic Hydrocarbons Surrogates									
chrysene-d12	1719-03-5	E641A	0.1	%	77.3	----	----	92.6	----
naphthalene-d8	1146-65-2	E641A	0.1	%	85.2	----	----	102	----
phenanthrene-d10	1517-22-2	E641A	0.1	%	98.2	----	----	88.8	----

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

Analytical Results

Sub-Matrix: **Seawater**

(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	MP-05-Source	MP-05-North	MP-05-WNW	DUP-B	----
Client sampling date / time					08-Aug-2021 17:16	08-Aug-2021 17:23	08-Aug-2021 17:32	08-Aug-2021	----
					VA21B6876-006	VA21B6876-007	VA21B6876-008	VA21B6876-009	--------
					Result	Result	Result	Result	----
Physical Tests									
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	92.7	91.6	91.9	92.9	----
conductivity	----	E100S	2.0	µS/cm	37300	37000	36600	37300	----
hardness (as CaCO3), dissolved	----	EC100	0.50	mg/L	4730	4840	4630	4630	----
pH	----	E108	0.10	pH units	8.00	7.99	8.00	7.99	----
salinity	----	EC100S	1.0	psu	24.4	24.1	23.8	24.4	----
solids, total dissolved [TDS]	----	E162S	10	mg/L	25000	25000	25300	25800	----
solids, total suspended [TSS]	----	E160S	2.0	mg/L	<2.0	4.6	<2.0	<2.0	----
turbidity	----	E121	0.10	NTU	0.13	0.34	0.29	0.16	----
Anions and Nutrients									
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	----
bromide	24959-67-9	E235S.Br	5.0	mg/L	47.9	49.5	49.8	49.1	----
chloride	16887-00-6	E235S.Cl	50	mg/L	13700	14200	14200	14200	----
fluoride	16984-48-8	E235S.F-L	0.20	mg/L	0.65	0.66	0.66	0.68	----
Kjeldahl nitrogen, total [TKN]	----	E318S	0.050	mg/L	0.106	0.084	0.089	0.084	----
nitrate (as N)	14797-55-8	E235S.NO3-T	0.010	mg/L	0.212	<0.010	<0.010	<0.010	----
nitrite (as N)	14797-65-0	E235S.NO2-L	0.010	mg/L	<0.010	<0.010	<0.010	<0.010	----
phosphorus, total	7723-14-0	E372S	0.0020	mg/L	0.0350	0.0169	0.0171	0.0167	----
sulfate (as SO4)	14808-79-8	E235S.SO4-L	3.0	mg/L	1870	1840	1890	1950	----
Organic / Inorganic Carbon									
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	1.27 HTD	1.34 HTD	1.06 HTD	1.18 HTD	----
carbon, total organic [TOC]	----	E355-L	0.50	mg/L	0.79	0.78	0.86	0.92	----
Total Metals									
aluminum, total	7429-90-5	E468S	0.0050	mg/L	0.0076	0.0070	0.0064	0.0091	----
antimony, total	7440-36-0	E468S	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	----
arsenic, total	7440-38-2	E468S	0.00040	mg/L	0.00131	0.00138	0.00128	0.00132	----
barium, total	7440-39-3	E468S	0.0010	mg/L	0.0072	0.0073	0.0074	0.0073	----
beryllium, total	7440-41-7	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
bismuth, total	7440-69-9	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
boron, total	7440-42-8	E468S	0.30	mg/L	3.06	3.05	3.06	3.08	----
cadmium, total	7440-43-9	E468S	0.000010	mg/L	0.000031	0.000035	0.000026	0.000027	----
calcium, total	7440-70-2	E468S	1.0	mg/L	308	306	312	311	----

Analytical Results

Sub-Matrix: **Seawater**

(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	MP-05-Source	MP-05-North	MP-05-WNW	DUP-B	----
				Client sampling date / time	08-Aug-2021 17:16	08-Aug-2021 17:23	08-Aug-2021 17:32	08-Aug-2021	----
					VA21B6876-006	VA21B6876-007	VA21B6876-008	VA21B6876-009	--------
					Result	Result	Result	Result	----
Total Metals									
cesium, total	7440-46-2	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
chromium, total	7440-47-3	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
cobalt, total	7440-48-4	E468S	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	----
copper, total	7440-50-8	E468S	0.00050	mg/L	<0.00050	0.00059	<0.00050	0.00065	----
gallium, total	7440-55-3	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
iron, total	7439-89-6	E468S	0.010	mg/L	0.010	<0.010	<0.010	<0.010	----
lead, total	7439-92-1	E468S	0.000050	mg/L	<0.000050	<0.000050	<0.000050	0.000076	----
lithium, total	7439-93-2	E468S	0.020	mg/L	0.122	0.122	0.123	0.122	----
magnesium, total	7439-95-4	E468S	1.0	mg/L	874	896	866	878	----
manganese, total	7439-96-5	E468S	0.00020	mg/L	0.00108	0.00094	0.00108	0.00100	----
mercury, total	7439-97-6	E508S	0.0000050	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	----
molybdenum, total	7439-98-7	E468S	0.00010	mg/L	0.00817	0.00825	0.00814	0.00822	----
nickel, total	7440-02-0	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
phosphorus, total	7723-14-0	E468S	0.050	mg/L	0.070	<0.050	<0.050	<0.050	----
potassium, total	7440-09-7	E468S	1.0	mg/L	307	320	310	308	----
rhenium, total	7440-15-5	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
rubidium, total	7440-17-7	E468S	0.0050	mg/L	0.0820	0.0830	0.0823	0.0813	----
selenium, total	7782-49-2	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
silicon, total	7440-21-3	E468S.NaSi	1.0	mg/L	<1.0	<1.0	<1.0	<1.0	----
silver, total	7440-22-4	E468S	0.00010	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	----
sodium, total	17341-25-2	E468S.NaSi	2.5	mg/L	7480	7400	7410	7360	----
strontium, total	7440-24-6	E468S	0.010	mg/L	5.65	5.79	5.68	5.69	----
sulfur, total	7704-34-9	E468S	5.0	mg/L	759	761	742	745	----
tellurium, total	13494-80-9	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
thallium, total	7440-28-0	E468S	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	----
thorium, total	7440-29-1	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
tin, total	7440-31-5	E468S	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	----
titanium, total	7440-32-6	E468S	0.0050	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	----
tungsten, total	7440-33-7	E468S	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	----
uranium, total	7440-61-1	E468S	0.000050	mg/L	0.00216	0.00216	0.00223	0.00272	----
vanadium, total	7440-62-2	E468S	0.00050	mg/L	0.00107	0.00113	0.00111	0.00109	----

Analytical Results

Sub-Matrix: **Seawater**

(Matrix: **Water**)

				Client sample ID	MP-05-Source	MP-05-North	MP-05-WNW	DUP-B	----
				Client sampling date / time	08-Aug-2021 17:16	08-Aug-2021 17:23	08-Aug-2021 17:32	08-Aug-2021	----
Analyte	CAS Number	Method	LOR	Unit	VA21B6876-006	VA21B6876-007	VA21B6876-008	VA21B6876-009	--------
					Result	Result	Result	Result	----
Total Metals									
yttrium, total	7440-65-5	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
zinc, total	7440-66-6	E468S	0.0030	mg/L	<0.0030	<0.0030	<0.0030	<0.0030	----
zirconium, total	7440-67-7	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
Dissolved Metals									
aluminum, dissolved	7429-90-5	E469S	0.0050	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	----
antimony, dissolved	7440-36-0	E469S	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	----
arsenic, dissolved	7440-38-2	E469S	0.00040	mg/L	0.00117	0.00116	0.00115	0.00122	----
barium, dissolved	7440-39-3	E469S	0.0010	mg/L	0.0069	0.0070	0.0068	0.0070	----
beryllium, dissolved	7440-41-7	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
bismuth, dissolved	7440-69-9	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
boron, dissolved	7440-42-8	E469S	0.30	mg/L	3.36	3.50	3.45	3.34	----
cadmium, dissolved	7440-43-9	E469S	0.000010	mg/L	0.000024	0.000028	0.000028	0.000025	----
calcium, dissolved	7440-70-2	E469S	1.0	mg/L	331	333	330	319	----
cesium, dissolved	7440-46-2	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
chromium, dissolved	7440-47-3	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
cobalt, dissolved	7440-48-4	E469S	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	----
copper, dissolved	7440-50-8	E469S	0.00020	mg/L	0.00058	0.00048	0.00030	0.00046	----
gallium, dissolved	7440-55-3	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
iron, dissolved	7439-89-6	E469S	0.010	mg/L	<0.010	<0.010	<0.010	<0.010	----
lead, dissolved	7439-92-1	E469S	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	----
lithium, dissolved	7439-93-2	E469S	0.020	mg/L	0.151	0.152	0.150	0.148	----
magnesium, dissolved	7439-95-4	E469S	1.0	mg/L	948	974	925	931	----
manganese, dissolved	7439-96-5	E469S	0.00010	mg/L	0.00095	0.00089	0.00095	0.00086	----
mercury, dissolved	7439-97-6	E509S	0.0000050	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	----
molybdenum, dissolved	7439-98-7	E469S	0.00010	mg/L	0.00807	0.00832	0.00836	0.00823	----
nickel, dissolved	7440-02-0	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
phosphorus, dissolved	7723-14-0	E469S	0.050	mg/L	<0.050	<0.050	<0.050	<0.050	----
potassium, dissolved	7440-09-7	E469S	1.0	mg/L	316	322	309	303	----
rhenium, dissolved	7440-15-5	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
rubidium, dissolved	7440-17-7	E469S	0.0050	mg/L	0.0832	0.0848	0.0806	0.0823	----
selenium, dissolved	7782-49-2	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----

Analytical Results

Sub-Matrix: Seawater
(Matrix: Water)

Analyte	CAS Number	Method	LOR	Unit	MP-05-Source	MP-05-North	MP-05-WNW	DUP-B	----
				Client sampling date / time	08-Aug-2021 17:16	08-Aug-2021 17:23	08-Aug-2021 17:32	08-Aug-2021	----
					VA21B6876-006	VA21B6876-007	VA21B6876-008	VA21B6876-009	--------
					Result	Result	Result	Result	----
Dissolved Metals									
silicon, dissolved	7440-21-3	E469S.NaSi	1.0	mg/L	<1.0	<1.0	<1.0	<1.0	----
silver, dissolved	7440-22-4	E469S	0.00010	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	----
sodium, dissolved	17341-25-2	E469S.NaSi	2.5	mg/L	7310	7610	7260	7610	----
strontium, dissolved	7440-24-6	E469S	0.010	mg/L	5.61	5.82	5.72	5.61	----
sulfur, dissolved	7704-34-9	E469S	5.0	mg/L	781	793	780	774	----
tellurium, dissolved	13494-80-9	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
thallium, dissolved	7440-28-0	E469S	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	----
thorium, dissolved	7440-29-1	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
tin, dissolved	7440-31-5	E469S	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	----
titanium, dissolved	7440-32-6	E469S	0.0050	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	----
tungsten, dissolved	7440-33-7	E469S	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	----
uranium, dissolved	7440-61-1	E469S	0.000050	mg/L	0.00223	0.00221	0.00238	0.00500 DTC	----
vanadium, dissolved	7440-62-2	E469S	0.00050	mg/L	0.00110	0.00109	0.00104	0.00104	----
yttrium, dissolved	7440-65-5	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
zinc, dissolved	7440-66-6	E469S	0.0010	mg/L	0.0014	0.0033	0.0023	0.0014	----
zirconium, dissolved	7440-67-7	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
dissolved mercury filtration location	----	EP509	-	-	Field	Field	Field	Field	----
dissolved metals filtration location	----	EP421	-	-	Field	Field	Field	Field	----
Volatile Organic Compounds [Fuels]									
benzene	71-43-2	E611A	0.50	µg/L	<0.50	<0.50	----	<0.50	----
ethylbenzene	100-41-4	E611A	0.50	µg/L	<0.50	<0.50	----	<0.50	----
methyl-tert-butyl ether [MTBE]	1634-04-4	E611A	0.50	µg/L	<0.50	<0.50	----	<0.50	----
styrene	100-42-5	E611A	0.50	µg/L	<0.50	<0.50	----	<0.50	----
toluene	108-88-3	E611A	0.50	µg/L	<0.50	<0.50	----	<0.50	----
xylene, m+p-	179601-23-1	E611A	0.40	µg/L	<0.40	<0.40	----	<0.40	----
xylene, o-	95-47-6	E611A	0.30	µg/L	<0.30	<0.30	----	<0.30	----
xylenes, total	1330-20-7	E611A	0.50	µg/L	<0.50	<0.50	----	<0.50	----
Volatile Organic Compounds Surrogates									
bromofluorobenzene, 4-	460-00-4	E611A	1.0	%	95.0	97.8	----	96.3	----
difluorobenzene, 1,4-	540-36-3	E611A	1.0	%	84.3	122	----	118	----
Hydrocarbons									

Analytical Results

Sub-Matrix: **Seawater**

(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	MP-05-Source	MP-05-North	MP-05-WNW	DUP-B	----
				Client sampling date / time	08-Aug-2021 17:16	08-Aug-2021 17:23	08-Aug-2021 17:32	08-Aug-2021	----
					VA21B6876-006	VA21B6876-007	VA21B6876-008	VA21B6876-009	--------
					Result	Result	Result	Result	----
Hydrocarbons									
F2 (C10-C16)	----	E601	100	µg/L	<100	<100	----	<100	----
F3 (C16-C34)	----	E601	250	µg/L	<250	<250	----	<250	----
F4 (C34-C50)	----	E601	250	µg/L	<250	<250	----	<250	----
VHw (C6-C10)	----	E581.VH+F1	100	µg/L	<100	<100	----	<100	----
F1-BTEX	----	EC580	100	µg/L	<100	<100	----	<100	----
VPHw	----	EC580A	100	µg/L	<100	<100	----	<100	----
F1 (C6-C10)	----	E581.VH+F1	100	µg/L	<100	<100	----	<100	----
Hydrocarbons Surrogates									
bromobenzotrifluoride, 2- (F2-F4 surr)	392-83-6	E601	1.0	%	80.8	78.4	----	81.8	----
dichlorotoluene, 3,4-	97-75-0	E581.VH+F1	1.0	%	114	85.9	----	77.8	----
Polycyclic Aromatic Hydrocarbons									
acenaphthene	83-32-9	E641A	0.010	µg/L	<0.010	<0.010	----	<0.010	----
acenaphthylene	208-96-8	E641A	0.010	µg/L	<0.010	<0.010	----	<0.010	----
acridine	260-94-6	E641A	0.010	µg/L	<0.010	<0.010	----	<0.010	----
anthracene	120-12-7	E641A	0.010	µg/L	<0.010	<0.010	----	<0.010	----
benz(a)anthracene	56-55-3	E641A	0.010	µg/L	<0.010	<0.010	----	<0.010	----
benzo(a)pyrene	50-32-8	E641A	0.0050	µg/L	<0.0050	<0.0050	----	<0.0050	----
benzo(b+j)fluoranthene	----	E641A	0.010	µg/L	<0.010	<0.010	----	<0.010	----
benzo(b+j+k)fluoranthene	----	E641A	0.015	µg/L	<0.015	<0.015	----	<0.015	----
benzo(g,h,i)perylene	191-24-2	E641A	0.010	µg/L	<0.010	<0.010	----	<0.010	----
benzo(k)fluoranthene	207-08-9	E641A	0.010	µg/L	<0.010	<0.010	----	<0.010	----
chrysene	218-01-9	E641A	0.010	µg/L	<0.010	<0.010	----	<0.010	----
dibenz(a,h)anthracene	53-70-3	E641A	0.0050	µg/L	<0.0050	<0.0050	----	<0.0050	----
fluoranthene	206-44-0	E641A	0.010	µg/L	<0.010	<0.010	----	<0.010	----
fluorene	86-73-7	E641A	0.010	µg/L	<0.010	<0.010	----	<0.010	----
indeno(1,2,3-c,d)pyrene	193-39-5	E641A	0.010	µg/L	<0.010	<0.010	----	<0.010	----
methylnaphthalene, 1-	90-12-0	E641A	0.010	µg/L	<0.010	<0.010	----	<0.010	----
methylnaphthalene, 1+2-	----	E641A	0.015	µg/L	<0.015	<0.015	----	0.018	----
methylnaphthalene, 2-	91-57-6	E641A	0.010	µg/L	<0.010	<0.010	----	0.018	----
naphthalene	91-20-3	E641A	0.050	µg/L	<0.050	<0.050	----	<0.050	----
phenanthrene	85-01-8	E641A	0.020	µg/L	<0.020	<0.020	----	<0.020	----

Analytical Results

Sub-Matrix: **Seawater**

(Matrix: **Water**)

				Client sample ID	MP-05-Source	MP-05-North	MP-05-WNW	DUP-B	----
				Client sampling date / time	08-Aug-2021 17:16	08-Aug-2021 17:23	08-Aug-2021 17:32	08-Aug-2021	----
Analyte	CAS Number	Method	LOR	Unit	VA21B6876-006	VA21B6876-007	VA21B6876-008	VA21B6876-009	--------
					Result	Result	Result	Result	----
Polycyclic Aromatic Hydrocarbons									
pyrene	129-00-0	E641A	0.010	µg/L	<0.010	<0.010	----	<0.010	----
quinoline	6027-02-7	E641A	0.050	µg/L	<0.050	<0.050	----	<0.050	----
B(a)P total potency equivalents [B(a)P TPE]	----	E641A	0.010	µg/L	<0.010	<0.010	----	<0.010	----
PAHs, high molecular weight (BC AWQ)	----	E641A	0.030	µg/L	<0.030	<0.030	----	<0.030	----
PAHs, low molecular weight (BC AWQ)	----	E641A	0.060	µg/L	<0.060	<0.060	----	<0.060	----
PAHs, total (EPA 16)	----	E641A	0.065	µg/L	<0.065	<0.065	----	<0.065	----
Polycyclic Aromatic Hydrocarbons Surrogates									
chrysene-d12	1719-03-5	E641A	0.1	%	79.8	83.6	----	79.6	----
naphthalene-d8	1146-65-2	E641A	0.1	%	103	101	----	108	----
phenanthrene-d10	1517-22-2	E641A	0.1	%	90.1	89.2	----	90.3	----

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

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **VA21B6876**	Page	: 1 of 35
Client	: **Golder Associates Ltd.**	Laboratory	: Vancouver - Environmental
Contact	: Elaine Irving	Account Manager	: Amber Springer
Address	: 200-2920 Virtual Way Vancouver BC Canada V5M 0C4	Address	: 8081 Lougheed Highway Burnaby, British Columbia Canada V5A 1W9
Telephone	: ----	Telephone	: +1 604 253 4188
Project	: ----	Date Samples Received	: 12-Aug-2021 09:20
PO	: ----	Issue Date	: 30-Aug-2021 17:17
C-O-C number	: 20-920779		
Sampler	: ----		
Site	: ----		
Quote number	: Q84262		
No. of samples received	: 9		
No. of samples analysed	: 9		

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 Services number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Summary of Outliers

Outliers : Quality Control Samples

- No Duplicate outliers occur.
- No Matrix Spike outliers occur.
- Method Blank value outliers occur - please see following pages for full details.
- Laboratory Control Sample (LCS) outliers occur - please see following pages for full details.
- 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.

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **Water**

Analyte Group	Laboratory sample ID	Client/Ref Sample ID	Analyte	CAS Number	Method	Result	Limits	Comment
Method Blank (MB) Values								
Physical Tests	QC-MRG2-268389001	----	alkalinity, total (as CaCO3)	----	E290	1.5 mg/L B	1.5 mg/L	Blank result exceeds permitted value

Result Qualifiers

Qualifier	*Description*
B	*Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.*

Analyte Group	Laboratory sample ID	Client/Ref Sample ID	Analyte	CAS Number	Method	Result	Limits	Comment
Laboratory Control Sample (LCS) Recoveries								
Total Metals	QC-MRG2-268818002	----	tellurium, total	13494-80-9	E468S	123 % MES	80.0-120%	Recovery greater than upper control limit
Dissolved Metals	QC-MRG2-266700002	----	sulfur, dissolved	7704-34-9	E469S	76.8 % MES	80.0-120%	Recovery less than lower control limit

Result Qualifiers

Qualifier	*Description*
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).*

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: Preparation Date	Holding Times: Rec	Holding Times: Actual	Eval	Analysis: Analysis Date	Holding Times: Rec	Holding Times: Actual	Eval
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) DUP-B	E298	08-Aug-2021	17-Aug-2021	----	----		18-Aug-2021	28 days	10 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) MP-06-Source	E298	08-Aug-2021	17-Aug-2021	----	----		18-Aug-2021	28 days	10 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) MP-06-WNW	E298	08-Aug-2021	17-Aug-2021	----	----		18-Aug-2021	28 days	10 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) MP-05-ENE	E298	08-Aug-2021	17-Aug-2021	----	----		18-Aug-2021	28 days	9 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) MP-05-North	E298	08-Aug-2021	17-Aug-2021	----	----		18-Aug-2021	28 days	9 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) MP-05-Source	E298	08-Aug-2021	17-Aug-2021	----	----		18-Aug-2021	28 days	9 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) MP-05-WNW	E298	08-Aug-2021	17-Aug-2021	----	----		18-Aug-2021	28 days	9 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) MP-06-ENE	E298	08-Aug-2021	17-Aug-2021	----	----		18-Aug-2021	28 days	9 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) MP-06-North	E298	08-Aug-2021	17-Aug-2021	----	----		18-Aug-2021	28 days	9 days	✓
Anions and Nutrients : Bromide in Seawater by IC										
HDPE DUP-B	E235S.Br	08-Aug-2021	----	----	----		23-Aug-2021	28 days	15 days	✓
Anions and Nutrients : Bromide in Seawater by IC										
HDPE MP-05-ENE	E235S.Br	08-Aug-2021	----	----	----		23-Aug-2021	28 days	15 days	✓
Anions and Nutrients : Bromide in Seawater by IC										
HDPE MP-05-North	E235S.Br	08-Aug-2021	----	----	----		23-Aug-2021	28 days	15 days	✓
Anions and Nutrients : Bromide in Seawater by IC										
HDPE MP-05-Source	E235S.Br	08-Aug-2021	----	----	----		23-Aug-2021	28 days	15 days	✓
Anions and Nutrients : Bromide in Seawater by IC										
HDPE MP-05-WNW	E235S.Br	08-Aug-2021	----	----	----		23-Aug-2021	28 days	15 days	✓
Anions and Nutrients : Bromide in Seawater by IC										
HDPE MP-06-ENE	E235S.Br	08-Aug-2021	----	----	----		23-Aug-2021	28 days	15 days	✓
Anions and Nutrients : Bromide in Seawater by IC										
HDPE MP-06-North	E235S.Br	08-Aug-2021	----	----	----		23-Aug-2021	28 days	15 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Holding Times: Rec	Holding Times: Actual	Eval	Analysis: Analysis Date	Holding Times: Rec	Holding Times: Actual	Eval
Anions and Nutrients : Bromide in Seawater by IC										
HDPE MP-06-Source	E235S.Br	08-Aug-2021	----	----	----		23-Aug-2021	28 days	15 days	✓
Anions and Nutrients : Bromide in Seawater by IC										
HDPE MP-06-WNW	E235S.Br	08-Aug-2021	----	----	----		23-Aug-2021	28 days	15 days	✓
Anions and Nutrients : Chloride in Seawater by IC										
HDPE DUP-B	E235S.Cl	08-Aug-2021	----	----	----		23-Aug-2021	28 days	15 days	✓
Anions and Nutrients : Chloride in Seawater by IC										
HDPE MP-05-ENE	E235S.Cl	08-Aug-2021	----	----	----		23-Aug-2021	28 days	15 days	✓
Anions and Nutrients : Chloride in Seawater by IC										
HDPE MP-05-North	E235S.Cl	08-Aug-2021	----	----	----		23-Aug-2021	28 days	15 days	✓
Anions and Nutrients : Chloride in Seawater by IC										
HDPE MP-05-Source	E235S.Cl	08-Aug-2021	----	----	----		23-Aug-2021	28 days	15 days	✓
Anions and Nutrients : Chloride in Seawater by IC										
HDPE MP-05-WNW	E235S.Cl	08-Aug-2021	----	----	----		23-Aug-2021	28 days	15 days	✓
Anions and Nutrients : Chloride in Seawater by IC										
HDPE MP-06-ENE	E235S.Cl	08-Aug-2021	----	----	----		23-Aug-2021	28 days	15 days	✓
Anions and Nutrients : Chloride in Seawater by IC										
HDPE MP-06-North	E235S.Cl	08-Aug-2021	----	----	----		23-Aug-2021	28 days	15 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Anions and Nutrients : Chloride in Seawater by IC										
HDPE MP-06-Source	E235S.Cl	08-Aug-2021	----	----	----		23-Aug-2021	28 days	15 days	✓
Anions and Nutrients : Chloride in Seawater by IC										
HDPE MP-06-WNW	E235S.Cl	08-Aug-2021	----	----	----		23-Aug-2021	28 days	15 days	✓
Anions and Nutrients : Fluoride in Seawater by IC (Low Level)										
HDPE DUP-B	E235S.F-L	08-Aug-2021	----	----	----		23-Aug-2021	28 days	15 days	✓
Anions and Nutrients : Fluoride in Seawater by IC (Low Level)										
HDPE MP-05-ENE	E235S.F-L	08-Aug-2021	----	----	----		23-Aug-2021	28 days	15 days	✓
Anions and Nutrients : Fluoride in Seawater by IC (Low Level)										
HDPE MP-05-North	E235S.F-L	08-Aug-2021	----	----	----		23-Aug-2021	28 days	15 days	✓
Anions and Nutrients : Fluoride in Seawater by IC (Low Level)										
HDPE MP-05-Source	E235S.F-L	08-Aug-2021	----	----	----		23-Aug-2021	28 days	15 days	✓
Anions and Nutrients : Fluoride in Seawater by IC (Low Level)										
HDPE MP-05-WNW	E235S.F-L	08-Aug-2021	----	----	----		23-Aug-2021	28 days	15 days	✓
Anions and Nutrients : Fluoride in Seawater by IC (Low Level)										
HDPE MP-06-ENE	E235S.F-L	08-Aug-2021	----	----	----		23-Aug-2021	28 days	15 days	✓
Anions and Nutrients : Fluoride in Seawater by IC (Low Level)										
HDPE MP-06-North	E235S.F-L	08-Aug-2021	----	----	----		23-Aug-2021	28 days	15 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Anions and Nutrients : Fluoride in Seawater by IC (Low Level)										
HDPE MP-06-Source	E235S.F-L	08-Aug-2021	----	----	----		23-Aug-2021	28 days	15 days	✓
Anions and Nutrients : Fluoride in Seawater by IC (Low Level)										
HDPE MP-06-WNW	E235S.F-L	08-Aug-2021	----	----	----		23-Aug-2021	28 days	15 days	✓
Anions and Nutrients : Nitrate in Seawater by IC (Trace Level)										
HDPE MP-05-ENE	E235S.NO3-T	08-Aug-2021	----	----	----		23-Aug-2021	3 days	15 days	× EHTL
Anions and Nutrients : Nitrate in Seawater by IC (Trace Level)										
HDPE MP-05-North	E235S.NO3-T	08-Aug-2021	----	----	----		23-Aug-2021	3 days	15 days	× EHTL
Anions and Nutrients : Nitrate in Seawater by IC (Trace Level)										
HDPE MP-05-Source	E235S.NO3-T	08-Aug-2021	----	----	----		23-Aug-2021	3 days	15 days	× EHTL
Anions and Nutrients : Nitrate in Seawater by IC (Trace Level)										
HDPE MP-05-WNW	E235S.NO3-T	08-Aug-2021	----	----	----		23-Aug-2021	3 days	15 days	× EHTL
Anions and Nutrients : Nitrate in Seawater by IC (Trace Level)										
HDPE DUP-B	E235S.NO3-T	08-Aug-2021	----	----	----		23-Aug-2021	3 days	15 days	× EHTR
Anions and Nutrients : Nitrate in Seawater by IC (Trace Level)										
HDPE MP-06-ENE	E235S.NO3-T	08-Aug-2021	----	----	----		23-Aug-2021	3 days	15 days	× EHTR
Anions and Nutrients : Nitrate in Seawater by IC (Trace Level)										
HDPE MP-06-North	E235S.NO3-T	08-Aug-2021	----	----	----		23-Aug-2021	3 days	15 days	× EHTR

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Anions and Nutrients : Nitrate in Seawater by IC (Trace Level)										
HDPE MP-06-Source	E235S.NO3-T	08-Aug-2021	----	----	----		23-Aug-2021	3 days	15 days	× EHTR
Anions and Nutrients : Nitrate in Seawater by IC (Trace Level)										
HDPE MP-06-WNW	E235S.NO3-T	08-Aug-2021	----	----	----		23-Aug-2021	3 days	15 days	× EHTR
Anions and Nutrients : Nitrite in Seawater by IC (Low Level)										
HDPE MP-05-ENE	E235S.NO2-L	08-Aug-2021	----	----	----		23-Aug-2021	3 days	15 days	× EHTL
Anions and Nutrients : Nitrite in Seawater by IC (Low Level)										
HDPE MP-05-North	E235S.NO2-L	08-Aug-2021	----	----	----		23-Aug-2021	3 days	15 days	× EHTL
Anions and Nutrients : Nitrite in Seawater by IC (Low Level)										
HDPE MP-05-Source	E235S.NO2-L	08-Aug-2021	----	----	----		23-Aug-2021	3 days	15 days	× EHTL
Anions and Nutrients : Nitrite in Seawater by IC (Low Level)										
HDPE MP-05-WNW	E235S.NO2-L	08-Aug-2021	----	----	----		23-Aug-2021	3 days	15 days	× EHTL
Anions and Nutrients : Nitrite in Seawater by IC (Low Level)										
HDPE DUP-B	E235S.NO2-L	08-Aug-2021	----	----	----		23-Aug-2021	3 days	15 days	× EHTR
Anions and Nutrients : Nitrite in Seawater by IC (Low Level)										
HDPE MP-06-ENE	E235S.NO2-L	08-Aug-2021	----	----	----		23-Aug-2021	3 days	15 days	× EHTR
Anions and Nutrients : Nitrite in Seawater by IC (Low Level)										
HDPE MP-06-North	E235S.NO2-L	08-Aug-2021	----	----	----		23-Aug-2021	3 days	15 days	× EHTR

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Nitrite in Seawater by IC (Low Level)										
HDPE										
MP-06-Source	E235S.NO2-L	08-Aug-2021	----	----	----		23-Aug-2021	3 days	15 days	✘ EHTR
Anions and Nutrients : Nitrite in Seawater by IC (Low Level)										
HDPE										
MP-06-WNW	E235S.NO2-L	08-Aug-2021	----	----	----		23-Aug-2021	3 days	15 days	✘ EHTR
Anions and Nutrients : Sulfate in Seawater by IC (Low Level)										
HDPE										
DUP-B	E235S.SO4-L	08-Aug-2021	----	----	----		23-Aug-2021	----	15 days	
Anions and Nutrients : Sulfate in Seawater by IC (Low Level)										
HDPE										
MP-05-ENE	E235S.SO4-L	08-Aug-2021	----	----	----		23-Aug-2021	----	15 days	
Anions and Nutrients : Sulfate in Seawater by IC (Low Level)										
HDPE										
MP-05-North	E235S.SO4-L	08-Aug-2021	----	----	----		23-Aug-2021	----	15 days	
Anions and Nutrients : Sulfate in Seawater by IC (Low Level)										
HDPE										
MP-05-Source	E235S.SO4-L	08-Aug-2021	----	----	----		23-Aug-2021	----	15 days	
Anions and Nutrients : Sulfate in Seawater by IC (Low Level)										
HDPE										
MP-05-WNW	E235S.SO4-L	08-Aug-2021	----	----	----		23-Aug-2021	----	15 days	
Anions and Nutrients : Sulfate in Seawater by IC (Low Level)										
HDPE										
MP-06-ENE	E235S.SO4-L	08-Aug-2021	----	----	----		23-Aug-2021	----	15 days	
Anions and Nutrients : Sulfate in Seawater by IC (Low Level)										
HDPE										
MP-06-North	E235S.SO4-L	08-Aug-2021	----	----	----		23-Aug-2021	----	15 days	

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Anions and Nutrients : Sulfate in Seawater by IC (Low Level)										
HDPE										
MP-06-Source	E235S.SO4-L	08-Aug-2021	----	----	----		23-Aug-2021	----	15 days	
Anions and Nutrients : Sulfate in Seawater by IC (Low Level)										
HDPE										
MP-06-WNW	E235S.SO4-L	08-Aug-2021	----	----	----		23-Aug-2021	----	15 days	
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence										
Amber glass total (sulfuric acid)										
DUP-B	E318S	08-Aug-2021	17-Aug-2021	----	----		18-Aug-2021	28 days	10 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence										
Amber glass total (sulfuric acid)										
MP-06-Source	E318S	08-Aug-2021	17-Aug-2021	----	----		18-Aug-2021	28 days	10 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence										
Amber glass total (sulfuric acid)										
MP-06-WNW	E318S	08-Aug-2021	17-Aug-2021	----	----		18-Aug-2021	28 days	10 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence										
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MP-05-ENE	E318S	08-Aug-2021	17-Aug-2021	----	----		18-Aug-2021	28 days	9 days	✓
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MP-05-WNW	E318S	08-Aug-2021	17-Aug-2021	----	----		18-Aug-2021	28 days	9 days	✓

Matrix: **Water**

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Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence										
Amber glass total (sulfuric acid) MP-06-ENE	E318S	08-Aug-2021	17-Aug-2021	----	----		18-Aug-2021	28 days	9 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence										
Amber glass total (sulfuric acid) MP-06-North	E318S	08-Aug-2021	17-Aug-2021	----	----		18-Aug-2021	28 days	9 days	✓
Anions and Nutrients : Total Phosphorus in Seawater by Colourimetry										
Amber glass total (sulfuric acid) DUP-B	E372S	08-Aug-2021	21-Aug-2021	----	----		22-Aug-2021	28 days	14 days	✓
Anions and Nutrients : Total Phosphorus in Seawater by Colourimetry										
Amber glass total (sulfuric acid) MP-05-ENE	E372S	08-Aug-2021	21-Aug-2021	----	----		22-Aug-2021	28 days	14 days	✓
Anions and Nutrients : Total Phosphorus in Seawater by Colourimetry										
Amber glass total (sulfuric acid) MP-05-North	E372S	08-Aug-2021	21-Aug-2021	----	----		22-Aug-2021	28 days	14 days	✓
Anions and Nutrients : Total Phosphorus in Seawater by Colourimetry										
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Anions and Nutrients : Total Phosphorus in Seawater by Colourimetry										
Amber glass total (sulfuric acid) MP-05-WNW	E372S	08-Aug-2021	21-Aug-2021	----	----		22-Aug-2021	28 days	14 days	✓
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Matrix: **Water**

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Container / Client Sample ID(s)			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
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Amber glass total (sulfuric acid) MP-06-Source	E372S	08-Aug-2021	21-Aug-2021	----	----		22-Aug-2021	28 days	14 days	✓
Anions and Nutrients : Total Phosphorus in Seawater by Colourimetry										
Amber glass total (sulfuric acid) MP-06-WNW	E372S	08-Aug-2021	21-Aug-2021	----	----		22-Aug-2021	28 days	14 days	✓
Dissolved Metals : Dissolved Mercury in Seawater by CVAAS										
Glass vial dissolved (hydrochloric acid) DUP-B	E509S	08-Aug-2021	17-Aug-2021	----	----		17-Aug-2021	28 days	9 days	✓
Dissolved Metals : Dissolved Mercury in Seawater by CVAAS										
Glass vial dissolved (hydrochloric acid) MP-05-ENE	E509S	08-Aug-2021	17-Aug-2021	----	----		17-Aug-2021	28 days	9 days	✓
Dissolved Metals : Dissolved Mercury in Seawater by CVAAS										
Glass vial dissolved (hydrochloric acid) MP-05-North	E509S	08-Aug-2021	17-Aug-2021	----	----		17-Aug-2021	28 days	9 days	✓
Dissolved Metals : Dissolved Mercury in Seawater by CVAAS										
Glass vial dissolved (hydrochloric acid) MP-05-Source	E509S	08-Aug-2021	17-Aug-2021	----	----		17-Aug-2021	28 days	9 days	✓
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Glass vial dissolved (hydrochloric acid) MP-05-WNW	E509S	08-Aug-2021	17-Aug-2021	----	----		17-Aug-2021	28 days	9 days	✓
Dissolved Metals : Dissolved Mercury in Seawater by CVAAS										
Glass vial dissolved (hydrochloric acid) MP-06-ENE	E509S	08-Aug-2021	17-Aug-2021	----	----		17-Aug-2021	28 days	9 days	✓
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Dissolved Metals : Dissolved Mercury in Seawater by CVAAS										
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Dissolved Metals : Dissolved Mercury in Seawater by CVAAS										
Glass vial dissolved (hydrochloric acid) MP-06-WNW	E509S	08-Aug-2021	17-Aug-2021	----	----		17-Aug-2021	28 days	9 days	✓
Dissolved Metals : Dissolved Metals in Seawater by CRC ICPMS (HMI)										
HDPE dissolved (nitric acid) DUP-B	E469S	08-Aug-2021	13-Aug-2021	----	----		15-Aug-2021	180 days	7 days	✓
Dissolved Metals : Dissolved Metals in Seawater by CRC ICPMS (HMI)										
HDPE dissolved (nitric acid) MP-05-ENE	E469S	08-Aug-2021	13-Aug-2021	----	----		15-Aug-2021	180 days	7 days	✓
Dissolved Metals : Dissolved Metals in Seawater by CRC ICPMS (HMI)										
HDPE dissolved (nitric acid) MP-05-North	E469S	08-Aug-2021	13-Aug-2021	----	----		15-Aug-2021	180 days	7 days	✓
Dissolved Metals : Dissolved Metals in Seawater by CRC ICPMS (HMI)										
HDPE dissolved (nitric acid) MP-05-Source	E469S	08-Aug-2021	13-Aug-2021	----	----		15-Aug-2021	180 days	7 days	✓
Dissolved Metals : Dissolved Metals in Seawater by CRC ICPMS (HMI)										
HDPE dissolved (nitric acid) MP-05-WNW	E469S	08-Aug-2021	13-Aug-2021	----	----		15-Aug-2021	180 days	7 days	✓
Dissolved Metals : Dissolved Metals in Seawater by CRC ICPMS (HMI)										
HDPE dissolved (nitric acid) MP-06-ENE	E469S	08-Aug-2021	13-Aug-2021	----	----		15-Aug-2021	180 days	7 days	✓
Dissolved Metals : Dissolved Metals in Seawater by CRC ICPMS (HMI)										
HDPE dissolved (nitric acid) MP-06-North	E469S	08-Aug-2021	13-Aug-2021	----	----		15-Aug-2021	180 days	7 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis: Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Metals in Seawater by CRC ICPMS (HMI)										
HDPE dissolved (nitric acid) MP-06-Source	E469S	08-Aug-2021	13-Aug-2021	----	----		15-Aug-2021	180 days	7 days	✓
Dissolved Metals : Dissolved Metals in Seawater by CRC ICPMS (HMI)										
HDPE dissolved (nitric acid) MP-06-WNW	E469S	08-Aug-2021	13-Aug-2021	----	----		15-Aug-2021	180 days	7 days	✓
Dissolved Metals : Dissolved Sodium and Silicon in Seawater by CRC ICPMS										
HDPE dissolved (nitric acid) DUP-B	E469S.NaSi	08-Aug-2021	13-Aug-2021	----	----		16-Aug-2021	180 days	8 days	✓
Dissolved Metals : Dissolved Sodium and Silicon in Seawater by CRC ICPMS										
HDPE dissolved (nitric acid) MP-05-ENE	E469S.NaSi	08-Aug-2021	13-Aug-2021	----	----		16-Aug-2021	180 days	8 days	✓
Dissolved Metals : Dissolved Sodium and Silicon in Seawater by CRC ICPMS										
HDPE dissolved (nitric acid) MP-05-North	E469S.NaSi	08-Aug-2021	13-Aug-2021	----	----		16-Aug-2021	180 days	8 days	✓
Dissolved Metals : Dissolved Sodium and Silicon in Seawater by CRC ICPMS										
HDPE dissolved (nitric acid) MP-05-Source	E469S.NaSi	08-Aug-2021	13-Aug-2021	----	----		16-Aug-2021	180 days	8 days	✓
Dissolved Metals : Dissolved Sodium and Silicon in Seawater by CRC ICPMS										
HDPE dissolved (nitric acid) MP-05-WNW	E469S.NaSi	08-Aug-2021	13-Aug-2021	----	----		16-Aug-2021	180 days	8 days	✓
Dissolved Metals : Dissolved Sodium and Silicon in Seawater by CRC ICPMS										
HDPE dissolved (nitric acid) MP-06-ENE	E469S.NaSi	08-Aug-2021	13-Aug-2021	----	----		16-Aug-2021	180 days	8 days	✓
Dissolved Metals : Dissolved Sodium and Silicon in Seawater by CRC ICPMS										
HDPE dissolved (nitric acid) MP-06-North	E469S.NaSi	08-Aug-2021	13-Aug-2021	----	----		16-Aug-2021	180 days	8 days	✓

Matrix: **Water**

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

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Dissolved Metals : Dissolved Sodium and Silicon in Seawater by CRC ICPMS										
HDPE dissolved (nitric acid) MP-06-Source	E469S.NaSi	08-Aug-2021	13-Aug-2021	----	----		16-Aug-2021	180 days	8 days	✓
Dissolved Metals : Dissolved Sodium and Silicon in Seawater by CRC ICPMS										
HDPE dissolved (nitric acid) MP-06-WNW	E469S.NaSi	08-Aug-2021	13-Aug-2021	----	----		16-Aug-2021	180 days	8 days	✓
Hydrocarbons : CCME PHC - F2-F4 by GC-FID										
Amber glass/Teflon lined cap (sodium bisulfate) MP-06-Source	E601	08-Aug-2021	16-Aug-2021	14 days	8 days	✓	19-Aug-2021	40 days	3 days	✓
Hydrocarbons : CCME PHC - F2-F4 by GC-FID										
Amber glass/Teflon lined cap (sodium bisulfate) DUP-B	E601	08-Aug-2021	17-Aug-2021	14 days	9 days	✓	18-Aug-2021	40 days	1 days	✓
Hydrocarbons : CCME PHC - F2-F4 by GC-FID										
Amber glass/Teflon lined cap (sodium bisulfate) MP-05-North	E601	08-Aug-2021	17-Aug-2021	14 days	9 days	✓	18-Aug-2021	40 days	1 days	✓
Hydrocarbons : CCME PHC - F2-F4 by GC-FID										
Amber glass/Teflon lined cap (sodium bisulfate) MP-05-Source	E601	08-Aug-2021	17-Aug-2021	14 days	9 days	✓	18-Aug-2021	40 days	1 days	✓
Hydrocarbons : CCME PHC - F2-F4 by GC-FID										
Amber glass/Teflon lined cap (sodium bisulfate) MP-06-ENE	E601	08-Aug-2021	17-Aug-2021	14 days	9 days	✓	18-Aug-2021	40 days	1 days	✓
Hydrocarbons : VH and F1 by Headspace GC-FID										
Glass vial (sodium bisulfate) DUP-B	E581.VH+F1	08-Aug-2021	19-Aug-2021	----	----		19-Aug-2021	14 days	11 days	✓
Hydrocarbons : VH and F1 by Headspace GC-FID										
Glass vial (sodium bisulfate) MP-05-North	E581.VH+F1	08-Aug-2021	19-Aug-2021	----	----		19-Aug-2021	14 days	11 days	✓

Matrix: **Water**

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

Analyte Group	Method	Sampling Date	Extraction / Preparation				Analysis			
Container / Client Sample ID(s)			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Hydrocarbons : VH and F1 by Headspace GC-FID										
Glass vial (sodium bisulfate) MP-05-Source	E581.VH+F1	08-Aug-2021	19-Aug-2021	----	----		19-Aug-2021	14 days	11 days	✓
Hydrocarbons : VH and F1 by Headspace GC-FID										
Glass vial (sodium bisulfate) MP-06-ENE	E581.VH+F1	08-Aug-2021	19-Aug-2021	----	----		19-Aug-2021	14 days	11 days	✓
Hydrocarbons : VH and F1 by Headspace GC-FID										
Glass vial (sodium bisulfate) MP-06-Source	E581.VH+F1	08-Aug-2021	19-Aug-2021	----	----		19-Aug-2021	14 days	11 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (lab preserved) MP-05-ENE	E358-L	08-Aug-2021	21-Aug-2021	3 days	13 days	✘ EHTL	22-Aug-2021	28 days	1 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (lab preserved) MP-05-North	E358-L	08-Aug-2021	21-Aug-2021	3 days	13 days	✘ EHTL	22-Aug-2021	28 days	1 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (lab preserved) MP-05-Source	E358-L	08-Aug-2021	21-Aug-2021	3 days	13 days	✘ EHTL	22-Aug-2021	28 days	1 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (lab preserved) MP-05-WNW	E358-L	08-Aug-2021	21-Aug-2021	3 days	13 days	✘ EHTL	22-Aug-2021	28 days	1 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (lab preserved) DUP-B	E358-L	08-Aug-2021	21-Aug-2021	3 days	13 days	✘ EHTR	22-Aug-2021	28 days	1 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (lab preserved) MP-06-ENE	E358-L	08-Aug-2021	21-Aug-2021	3 days	13 days	✘ EHTR	22-Aug-2021	28 days	1 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (lab preserved) MP-06-North	E358-L	08-Aug-2021	21-Aug-2021	3 days	13 days	× EHTR	22-Aug-2021	28 days	1 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (lab preserved) MP-06-Source	E358-L	08-Aug-2021	21-Aug-2021	3 days	13 days	× EHTR	22-Aug-2021	28 days	1 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (lab preserved) MP-06-WNW	E358-L	08-Aug-2021	21-Aug-2021	3 days	13 days	× EHTR	22-Aug-2021	28 days	1 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) MP-05-ENE	E355-L	08-Aug-2021	17-Aug-2021	----	----		17-Aug-2021	28 days	8 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) MP-05-North	E355-L	08-Aug-2021	17-Aug-2021	----	----		17-Aug-2021	28 days	8 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) MP-05-Source	E355-L	08-Aug-2021	17-Aug-2021	----	----		17-Aug-2021	28 days	8 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) MP-05-WNW	E355-L	08-Aug-2021	17-Aug-2021	----	----		17-Aug-2021	28 days	8 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) MP-06-ENE	E355-L	08-Aug-2021	17-Aug-2021	----	----		17-Aug-2021	28 days	8 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) MP-06-North	E355-L	08-Aug-2021	17-Aug-2021	----	----		17-Aug-2021	28 days	8 days	✓

Matrix: **Water**

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

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis: Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) DUP-B	E355-L	08-Aug-2021	17-Aug-2021	----	----		17-Aug-2021	28 days	9 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) MP-06-Source	E355-L	08-Aug-2021	17-Aug-2021	----	----		17-Aug-2021	28 days	9 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) MP-06-WNW	E355-L	08-Aug-2021	17-Aug-2021	----	----		17-Aug-2021	28 days	9 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE DUP-B	E290	08-Aug-2021	----	----	----		17-Aug-2021	14 days	9 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MP-05-ENE	E290	08-Aug-2021	----	----	----		17-Aug-2021	14 days	9 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MP-05-North	E290	08-Aug-2021	----	----	----		17-Aug-2021	14 days	9 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MP-05-Source	E290	08-Aug-2021	----	----	----		17-Aug-2021	14 days	9 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MP-05-WNW	E290	08-Aug-2021	----	----	----		17-Aug-2021	14 days	9 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MP-06-ENE	E290	08-Aug-2021	----	----	----		17-Aug-2021	14 days	9 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis: Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Alkalinity Species by Titration										
HDPE MP-06-North	E290	08-Aug-2021	----	----	----		17-Aug-2021	14 days	9 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MP-06-Source	E290	08-Aug-2021	----	----	----		17-Aug-2021	14 days	9 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MP-06-WNW	E290	08-Aug-2021	----	----	----		17-Aug-2021	14 days	9 days	✓
Physical Tests : Conductivity in Seawater										
HDPE DUP-B	E100S	08-Aug-2021	----	----	----		17-Aug-2021	28 days	9 days	✓
Physical Tests : Conductivity in Seawater										
HDPE MP-05-ENE	E100S	08-Aug-2021	----	----	----		17-Aug-2021	28 days	9 days	✓
Physical Tests : Conductivity in Seawater										
HDPE MP-05-North	E100S	08-Aug-2021	----	----	----		17-Aug-2021	28 days	9 days	✓
Physical Tests : Conductivity in Seawater										
HDPE MP-05-Source	E100S	08-Aug-2021	----	----	----		17-Aug-2021	28 days	9 days	✓
Physical Tests : Conductivity in Seawater										
HDPE MP-05-WNW	E100S	08-Aug-2021	----	----	----		17-Aug-2021	28 days	9 days	✓
Physical Tests : Conductivity in Seawater										
HDPE MP-06-ENE	E100S	08-Aug-2021	----	----	----		17-Aug-2021	28 days	9 days	✓

Matrix: **Water**

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

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Conductivity in Seawater										
HDPE MP-06-North	E100S	08-Aug-2021	----	----	----		17-Aug-2021	28 days	9 days	✓
Physical Tests : Conductivity in Seawater										
HDPE MP-06-Source	E100S	08-Aug-2021	----	----	----		17-Aug-2021	28 days	9 days	✓
Physical Tests : Conductivity in Seawater										
HDPE MP-06-WNW	E100S	08-Aug-2021	----	----	----		17-Aug-2021	28 days	9 days	✓
Physical Tests : pH by Meter										
HDPE MP-05-North	E108	08-Aug-2021	----	----	----		17-Aug-2021	0.25 hrs	217 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MP-05-Source	E108	08-Aug-2021	----	----	----		17-Aug-2021	0.25 hrs	217 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MP-05-WNW	E108	08-Aug-2021	----	----	----		17-Aug-2021	0.25 hrs	217 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MP-05-ENE	E108	08-Aug-2021	----	----	----		17-Aug-2021	0.25 hrs	218 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MP-06-ENE	E108	08-Aug-2021	----	----	----		17-Aug-2021	0.25 hrs	219 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MP-06-North	E108	08-Aug-2021	----	----	----		17-Aug-2021	0.25 hrs	219 hrs	× EHTR-FM

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Holding Times: Rec	Holding Times: Actual	Eval	Analysis: Analysis Date	Holding Times: Rec	Holding Times: Actual	Eval
Physical Tests : pH by Meter										
HDPE MP-06-WNW	E108	08-Aug-2021	----	----	----		17-Aug-2021	0.25 hrs	219 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE DUP-B	E108	08-Aug-2021	----	----	----		17-Aug-2021	0.25 hrs	220 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MP-06-Source	E108	08-Aug-2021	----	----	----		17-Aug-2021	0.25 hrs	220 hrs	× EHTR-FM
Physical Tests : TDS by Gravimetry (Seawater)										
HDPE DUP-B	E162S	08-Aug-2021	----	----	----		21-Aug-2021	7 days	13 days	× EHT
Physical Tests : TDS by Gravimetry (Seawater)										
HDPE MP-05-ENE	E162S	08-Aug-2021	----	----	----		21-Aug-2021	7 days	13 days	× EHT
Physical Tests : TDS by Gravimetry (Seawater)										
HDPE MP-05-North	E162S	08-Aug-2021	----	----	----		21-Aug-2021	7 days	13 days	× EHT
Physical Tests : TDS by Gravimetry (Seawater)										
HDPE MP-05-Source	E162S	08-Aug-2021	----	----	----		21-Aug-2021	7 days	13 days	× EHT
Physical Tests : TDS by Gravimetry (Seawater)										
HDPE MP-05-WNW	E162S	08-Aug-2021	----	----	----		21-Aug-2021	7 days	13 days	× EHT
Physical Tests : TDS by Gravimetry (Seawater)										
HDPE MP-06-ENE	E162S	08-Aug-2021	----	----	----		21-Aug-2021	7 days	13 days	× EHT

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Physical Tests : TDS by Gravimetry (Seawater)										
HDPE MP-06-North	E162S	08-Aug-2021	----	----	----		21-Aug-2021	7 days	13 days	× EHT
Physical Tests : TDS by Gravimetry (Seawater)										
HDPE MP-06-Source	E162S	08-Aug-2021	----	----	----		21-Aug-2021	7 days	13 days	× EHT
Physical Tests : TDS by Gravimetry (Seawater)										
HDPE MP-06-WNW	E162S	08-Aug-2021	----	----	----		21-Aug-2021	7 days	13 days	× EHT
Physical Tests : TSS by Gravimetry (Seawater)										
HDPE DUP-B	E160S	08-Aug-2021	----	----	----		14-Aug-2021	7 days	6 days	✓
Physical Tests : TSS by Gravimetry (Seawater)										
HDPE MP-05-ENE	E160S	08-Aug-2021	----	----	----		14-Aug-2021	7 days	6 days	✓
Physical Tests : TSS by Gravimetry (Seawater)										
HDPE MP-05-North	E160S	08-Aug-2021	----	----	----		14-Aug-2021	7 days	6 days	✓
Physical Tests : TSS by Gravimetry (Seawater)										
HDPE MP-05-Source	E160S	08-Aug-2021	----	----	----		14-Aug-2021	7 days	6 days	✓
Physical Tests : TSS by Gravimetry (Seawater)										
HDPE MP-05-WNW	E160S	08-Aug-2021	----	----	----		14-Aug-2021	7 days	6 days	✓
Physical Tests : TSS by Gravimetry (Seawater)										
HDPE MP-06-ENE	E160S	08-Aug-2021	----	----	----		14-Aug-2021	7 days	6 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis: Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : TSS by Gravimetry (Seawater)										
HDPE MP-06-North	E160S	08-Aug-2021	----	----	----		14-Aug-2021	7 days	6 days	✓
Physical Tests : TSS by Gravimetry (Seawater)										
HDPE MP-06-Source	E160S	08-Aug-2021	----	----	----		14-Aug-2021	7 days	6 days	✓
Physical Tests : TSS by Gravimetry (Seawater)										
HDPE MP-06-WNW	E160S	08-Aug-2021	----	----	----		14-Aug-2021	7 days	6 days	✓
Physical Tests : Turbidity by Nephelometry										
HDPE DUP-B	E121	08-Aug-2021	----	----	----		12-Aug-2021	3 days	4 days	✘ EHTR
Physical Tests : Turbidity by Nephelometry										
HDPE MP-06-ENE	E121	08-Aug-2021	----	----	----		12-Aug-2021	3 days	4 days	✘ EHTR
Physical Tests : Turbidity by Nephelometry										
HDPE MP-06-North	E121	08-Aug-2021	----	----	----		12-Aug-2021	3 days	4 days	✘ EHTR
Physical Tests : Turbidity by Nephelometry										
HDPE MP-06-Source	E121	08-Aug-2021	----	----	----		12-Aug-2021	3 days	4 days	✘ EHTR
Physical Tests : Turbidity by Nephelometry										
HDPE MP-06-WNW	E121	08-Aug-2021	----	----	----		12-Aug-2021	3 days	4 days	✘ EHTR
Physical Tests : Turbidity by Nephelometry										
HDPE MP-05-ENE	E121	08-Aug-2021	----	----	----		12-Aug-2021	3 days	4 days	✘

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Physical Tests : Turbidity by Nephelometry										
HDPE										
MP-05-North	E121	08-Aug-2021	----	----	----		12-Aug-2021	3 days	4 days	×
Physical Tests : Turbidity by Nephelometry										
HDPE										
MP-05-Source	E121	08-Aug-2021	----	----	----		12-Aug-2021	3 days	4 days	×
Physical Tests : Turbidity by Nephelometry										
HDPE										
MP-05-WNW	E121	08-Aug-2021	----	----	----		12-Aug-2021	3 days	4 days	×
Polycyclic Aromatic Hydrocarbons : PAHs by Hexane LVI GC-MS										
Amber glass/Teflon lined cap (sodium bisulfate)										
MP-06-Source	E641A	08-Aug-2021	16-Aug-2021	14 days	8 days	✓	18-Aug-2021	40 days	1 days	✓
Polycyclic Aromatic Hydrocarbons : PAHs by Hexane LVI GC-MS										
Amber glass/Teflon lined cap (sodium bisulfate)										
DUP-B	E641A	08-Aug-2021	17-Aug-2021	14 days	9 days	✓	17-Aug-2021	40 days	0 days	✓
Polycyclic Aromatic Hydrocarbons : PAHs by Hexane LVI GC-MS										
Amber glass/Teflon lined cap (sodium bisulfate)										
MP-05-North	E641A	08-Aug-2021	17-Aug-2021	14 days	9 days	✓	17-Aug-2021	40 days	0 days	✓
Polycyclic Aromatic Hydrocarbons : PAHs by Hexane LVI GC-MS										
Amber glass/Teflon lined cap (sodium bisulfate)										
MP-05-Source	E641A	08-Aug-2021	17-Aug-2021	14 days	9 days	✓	17-Aug-2021	40 days	0 days	✓
Polycyclic Aromatic Hydrocarbons : PAHs by Hexane LVI GC-MS										
Amber glass/Teflon lined cap (sodium bisulfate)										
MP-06-ENE	E641A	08-Aug-2021	17-Aug-2021	14 days	9 days	✓	17-Aug-2021	40 days	0 days	✓
Total Metals : Total Mercury in Seawater by CVAAS										
Glass vial total (hydrochloric acid)										
DUP-B	E508S	08-Aug-2021	----	----	----		17-Aug-2021	28 days	9 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Holding Times: Rec	Holding Times: Actual	Eval	Analysis: Analysis Date	Holding Times: Rec	Holding Times: Actual	Eval
Total Metals : Total Mercury in Seawater by CVAAS										
Glass vial total (hydrochloric acid) MP-05-ENE	E508S	08-Aug-2021	----	----	----		17-Aug-2021	28 days	9 days	✓
Total Metals : Total Mercury in Seawater by CVAAS										
Glass vial total (hydrochloric acid) MP-05-North	E508S	08-Aug-2021	----	----	----		17-Aug-2021	28 days	9 days	✓
Total Metals : Total Mercury in Seawater by CVAAS										
Glass vial total (hydrochloric acid) MP-05-Source	E508S	08-Aug-2021	----	----	----		17-Aug-2021	28 days	9 days	✓
Total Metals : Total Mercury in Seawater by CVAAS										
Glass vial total (hydrochloric acid) MP-05-WNW	E508S	08-Aug-2021	----	----	----		17-Aug-2021	28 days	9 days	✓
Total Metals : Total Mercury in Seawater by CVAAS										
Glass vial total (hydrochloric acid) MP-06-ENE	E508S	08-Aug-2021	----	----	----		17-Aug-2021	28 days	9 days	✓
Total Metals : Total Mercury in Seawater by CVAAS										
Glass vial total (hydrochloric acid) MP-06-North	E508S	08-Aug-2021	----	----	----		17-Aug-2021	28 days	9 days	✓
Total Metals : Total Mercury in Seawater by CVAAS										
Glass vial total (hydrochloric acid) MP-06-Source	E508S	08-Aug-2021	----	----	----		17-Aug-2021	28 days	9 days	✓
Total Metals : Total Mercury in Seawater by CVAAS										
Glass vial total (hydrochloric acid) MP-06-WNW	E508S	08-Aug-2021	----	----	----		17-Aug-2021	28 days	9 days	✓
Total Metals : Total Metals in Seawater by CRC ICPMS (HMI)										
HDPE total (nitric acid) DUP-B	E468S	08-Aug-2021	----	----	----		18-Aug-2021	180 days	10 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Holding Times: Rec	Holding Times: Actual	Eval	Analysis: Analysis Date	Holding Times: Rec	Holding Times: Actual	Eval
Total Metals : Total Metals in Seawater by CRC ICPMS (HMI)										
HDPE total (nitric acid) MP-05-ENE	E468S	08-Aug-2021	----	----	----		18-Aug-2021	180 days	10 days	✓
Total Metals : Total Metals in Seawater by CRC ICPMS (HMI)										
HDPE total (nitric acid) MP-05-North	E468S	08-Aug-2021	----	----	----		18-Aug-2021	180 days	10 days	✓
Total Metals : Total Metals in Seawater by CRC ICPMS (HMI)										
HDPE total (nitric acid) MP-05-Source	E468S	08-Aug-2021	----	----	----		18-Aug-2021	180 days	10 days	✓
Total Metals : Total Metals in Seawater by CRC ICPMS (HMI)										
HDPE total (nitric acid) MP-05-WNW	E468S	08-Aug-2021	----	----	----		18-Aug-2021	180 days	10 days	✓
Total Metals : Total Metals in Seawater by CRC ICPMS (HMI)										
HDPE total (nitric acid) MP-06-ENE	E468S	08-Aug-2021	----	----	----		18-Aug-2021	180 days	10 days	✓
Total Metals : Total Metals in Seawater by CRC ICPMS (HMI)										
HDPE total (nitric acid) MP-06-North	E468S	08-Aug-2021	----	----	----		18-Aug-2021	180 days	10 days	✓
Total Metals : Total Metals in Seawater by CRC ICPMS (HMI)										
HDPE total (nitric acid) MP-06-Source	E468S	08-Aug-2021	----	----	----		18-Aug-2021	180 days	10 days	✓
Total Metals : Total Metals in Seawater by CRC ICPMS (HMI)										
HDPE total (nitric acid) MP-06-WNW	E468S	08-Aug-2021	----	----	----		18-Aug-2021	180 days	10 days	✓
Total Metals : Total Sodium and Silicon in Seawater by CRC ICPMS										
HDPE total (nitric acid) DUP-B	E468S.NaSi	08-Aug-2021	----	----	----		18-Aug-2021	180 days	10 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Total Metals : Total Sodium and Silicon in Seawater by CRC ICPMS										
HDPE total (nitric acid) MP-05-ENE	E468S.NaSi	08-Aug-2021	----	----	----		18-Aug-2021	180 days	10 days	✓
Total Metals : Total Sodium and Silicon in Seawater by CRC ICPMS										
HDPE total (nitric acid) MP-05-North	E468S.NaSi	08-Aug-2021	----	----	----		18-Aug-2021	180 days	10 days	✓
Total Metals : Total Sodium and Silicon in Seawater by CRC ICPMS										
HDPE total (nitric acid) MP-05-Source	E468S.NaSi	08-Aug-2021	----	----	----		18-Aug-2021	180 days	10 days	✓
Total Metals : Total Sodium and Silicon in Seawater by CRC ICPMS										
HDPE total (nitric acid) MP-05-WNW	E468S.NaSi	08-Aug-2021	----	----	----		18-Aug-2021	180 days	10 days	✓
Total Metals : Total Sodium and Silicon in Seawater by CRC ICPMS										
HDPE total (nitric acid) MP-06-ENE	E468S.NaSi	08-Aug-2021	----	----	----		18-Aug-2021	180 days	10 days	✓
Total Metals : Total Sodium and Silicon in Seawater by CRC ICPMS										
HDPE total (nitric acid) MP-06-North	E468S.NaSi	08-Aug-2021	----	----	----		18-Aug-2021	180 days	10 days	✓
Total Metals : Total Sodium and Silicon in Seawater by CRC ICPMS										
HDPE total (nitric acid) MP-06-Source	E468S.NaSi	08-Aug-2021	----	----	----		18-Aug-2021	180 days	10 days	✓
Total Metals : Total Sodium and Silicon in Seawater by CRC ICPMS										
HDPE total (nitric acid) MP-06-WNW	E468S.NaSi	08-Aug-2021	----	----	----		18-Aug-2021	180 days	10 days	✓
Volatile Organic Compounds [Fuels] : BTEX by Headspace GC-MS										
Glass vial (sodium bisulfate) DUP-B	E611A	08-Aug-2021	19-Aug-2021	----	----		19-Aug-2021	14 days	11 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Volatile Organic Compounds [Fuels] : BTEX by Headspace GC-MS										
Glass vial (sodium bisulfate) MP-05-North	E611A	08-Aug-2021	19-Aug-2021	----	----		19-Aug-2021	14 days	11 days	✓
Volatile Organic Compounds [Fuels] : BTEX by Headspace GC-MS										
Glass vial (sodium bisulfate) MP-05-Source	E611A	08-Aug-2021	19-Aug-2021	----	----		19-Aug-2021	14 days	11 days	✓
Volatile Organic Compounds [Fuels] : BTEX by Headspace GC-MS										
Glass vial (sodium bisulfate) MP-06-ENE	E611A	08-Aug-2021	19-Aug-2021	----	----		19-Aug-2021	14 days	11 days	✓
Volatile Organic Compounds [Fuels] : BTEX by Headspace GC-MS										
Glass vial (sodium bisulfate) MP-06-Source	E611A	08-Aug-2021	19-Aug-2021	----	----		19-Aug-2021	14 days	11 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.

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).

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	268390	1	18	5.5	5.0	✓
Ammonia by Fluorescence	E298	268403	1	18	5.5	5.0	✓
Bromide in Seawater by IC	E235S.Br	272957	1	19	5.2	5.0	✓
BTEX by Headspace GC-MS	E611A	271051	1	5	20.0	5.0	✓
Chloride in Seawater by IC	E235S.Cl	272958	1	19	5.2	5.0	✓
Conductivity in Seawater	E100S	268389	1	9	11.1	5.0	✓
Dissolved Mercury in Seawater by CVAAS	E509S	268973	1	9	11.1	5.0	✓
Dissolved Metals in Seawater by CRC ICPMS (HMI)	E469S	266700	1	18	5.5	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	272964	1	19	5.2	5.0	✓
Dissolved Sodium and Silicon in Seawater by CRC ICPMS	E469S.NaSi	266701	1	18	5.5	5.0	✓
Fluoride in Seawater by IC (Low Level)	E235S.F-L	272959	1	19	5.2	5.0	✓
Nitrate in Seawater by IC (Trace Level)	E235S.NO3-T	272960	1	19	5.2	5.0	✓
Nitrite in Seawater by IC (Low Level)	E235S.NO2-L	272961	1	19	5.2	5.0	✓
pH by Meter	E108	268391	1	9	11.1	5.0	✓
Sulfate in Seawater by IC (Low Level)	E235S.SO4-L	272962	1	19	5.2	5.0	✓
TDS by Gravimetry (Seawater)	E162S	273148	1	20	5.0	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence	E318S	268404	1	9	11.1	5.0	✓
Total Mercury in Seawater by CVAAS	E508S	268622	1	10	10.0	5.0	✓
Total Metals in Seawater by CRC ICPMS (HMI)	E468S	268818	1	18	5.5	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	268402	1	18	5.5	5.0	✓
Total Phosphorus in Seawater by Colourimetry	E372S	273053	1	19	5.2	5.0	✓
Total Sodium and Silicon in Seawater by CRC ICPMS	E468S.NaSi	268819	1	18	5.5	5.0	✓
Turbidity by Nephelometry	E121	265687	1	9	11.1	5.0	✓
VH and F1 by Headspace GC-FID	E581.VH+F1	271050	1	5	20.0	5.0	✓
Laboratory Control Samples (LCS)							
Alkalinity Species by Titration	E290	268390	1	18	5.5	5.0	✓
Ammonia by Fluorescence	E298	268403	1	18	5.5	5.0	✓
Bromide in Seawater by IC	E235S.Br	272957	1	19	5.2	5.0	✓
BTEX by Headspace GC-MS	E611A	271051	1	5	20.0	5.0	✓
CCME PHC - F2-F4 by GC-FID	E601	268261	2	8	25.0	5.0	✓
Chloride in Seawater by IC	E235S.Cl	272958	1	19	5.2	5.0	✓
Conductivity in Seawater	E100S	268389	1	9	11.1	5.0	✓
Dissolved Mercury in Seawater by CVAAS	E509S	268973	1	9	11.1	5.0	✓
Dissolved Metals in Seawater by CRC ICPMS (HMI)	E469S	266700	1	18	5.5	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	272964	1	19	5.2	5.0	✓
Dissolved Sodium and Silicon in Seawater by CRC ICPMS	E469S.NaSi	266701	1	18	5.5	5.0	✓
Fluoride in Seawater by IC (Low Level)	E235S.F-L	272959	1	19	5.2	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							
Nitrate in Seawater by IC (Trace Level)	E235S.NO3-T	272960	1	19	5.2	5.0	✓
Nitrite in Seawater by IC (Low Level)	E235S.NO2-L	272961	1	19	5.2	5.0	✓
PAHs by Hexane LVI GC-MS	E641A	268258	2	28	7.1	5.0	✓
pH by Meter	E108	268391	1	9	11.1	5.0	✓
Sulfate in Seawater by IC (Low Level)	E235S.SO4-L	272962	1	19	5.2	5.0	✓
TDS by Gravimetry (Seawater)	E162S	273148	1	20	5.0	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence	E318S	268404	1	9	11.1	5.0	✓
Total Mercury in Seawater by CVAAS	E508S	268622	1	10	10.0	5.0	✓
Total Metals in Seawater by CRC ICPMS (HMI)	E468S	268818	1	18	5.5	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	268402	1	18	5.5	5.0	✓
Total Phosphorus in Seawater by Colourimetry	E372S	273053	1	19	5.2	5.0	✓
Total Sodium and Silicon in Seawater by CRC ICPMS	E468S.NaSi	268819	1	18	5.5	5.0	✓
TSS by Gravimetry (Seawater)	E160S	267171	1	9	11.1	5.0	✓
Turbidity by Nephelometry	E121	265687	1	9	11.1	5.0	✓
VH and F1 by Headspace GC-FID	E581.VH+F1	271050	1	5	20.0	5.0	✓
Method Blanks (MB)							
Alkalinity Species by Titration	E290	268390	1	18	5.5	5.0	✓
Ammonia by Fluorescence	E298	268403	1	18	5.5	5.0	✓
Bromide in Seawater by IC	E235S.Br	272957	1	19	5.2	5.0	✓
BTEX by Headspace GC-MS	E611A	271051	1	5	20.0	5.0	✓
CCME PHC - F2-F4 by GC-FID	E601	268261	2	8	25.0	5.0	✓
Chloride in Seawater by IC	E235S.Cl	272958	1	19	5.2	5.0	✓
Conductivity in Seawater	E100S	268389	1	9	11.1	5.0	✓
Dissolved Mercury in Seawater by CVAAS	E509S	268973	1	9	11.1	5.0	✓
Dissolved Metals in Seawater by CRC ICPMS (HMI)	E469S	266700	1	18	5.5	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	272964	1	19	5.2	5.0	✓
Dissolved Sodium and Silicon in Seawater by CRC ICPMS	E469S.NaSi	266701	1	18	5.5	5.0	✓
Fluoride in Seawater by IC (Low Level)	E235S.F-L	272959	1	19	5.2	5.0	✓
Nitrate in Seawater by IC (Trace Level)	E235S.NO3-T	272960	1	19	5.2	5.0	✓
Nitrite in Seawater by IC (Low Level)	E235S.NO2-L	272961	1	19	5.2	5.0	✓
PAHs by Hexane LVI GC-MS	E641A	268258	2	28	7.1	5.0	✓
Sulfate in Seawater by IC (Low Level)	E235S.SO4-L	272962	1	19	5.2	5.0	✓
TDS by Gravimetry (Seawater)	E162S	273148	1	20	5.0	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence	E318S	268404	1	9	11.1	5.0	✓
Total Mercury in Seawater by CVAAS	E508S	268622	1	10	10.0	5.0	✓
Total Metals in Seawater by CRC ICPMS (HMI)	E468S	268818	1	18	5.5	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	268402	1	18	5.5	5.0	✓
Total Phosphorus in Seawater by Colourimetry	E372S	273053	1	19	5.2	5.0	✓
Total Sodium and Silicon in Seawater by CRC ICPMS	E468S.NaSi	268819	1	18	5.5	5.0	✓
TSS by Gravimetry (Seawater)	E160S	267171	1	9	11.1	5.0	✓
Turbidity by Nephelometry	E121	265687	1	9	11.1	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							
VH and F1 by Headspace GC-FID	E581.VH+F1	271050	1	5	20.0	5.0	✓
Matrix Spikes (MS)							
Ammonia by Fluorescence	E298	268403	1	18	5.5	5.0	✓
Bromide in Seawater by IC	E235S.Br	272957	1	19	5.2	5.0	✓
BTEX by Headspace GC-MS	E611A	271051	1	5	20.0	5.0	✓
Chloride in Seawater by IC	E235S.Cl	272958	1	19	5.2	5.0	✓
Dissolved Mercury in Seawater by CVAAS	E509S	268973	1	9	11.1	5.0	✓
Dissolved Metals in Seawater by CRC ICPMS (HMI)	E469S	266700	2	18	11.1	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	272964	1	19	5.2	5.0	✓
Dissolved Sodium and Silicon in Seawater by CRC ICPMS	E469S.NaSi	266701	1	18	5.5	5.0	✓
Fluoride in Seawater by IC (Low Level)	E235S.F-L	272959	1	19	5.2	5.0	✓
Nitrate in Seawater by IC (Trace Level)	E235S.NO3-T	272960	1	19	5.2	5.0	✓
Nitrite in Seawater by IC (Low Level)	E235S.NO2-L	272961	1	19	5.2	5.0	✓
Sulfate in Seawater by IC (Low Level)	E235S.SO4-L	272962	1	19	5.2	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence	E318S	268404	1	9	11.1	5.0	✓
Total Mercury in Seawater by CVAAS	E508S	268622	1	10	10.0	5.0	✓
Total Metals in Seawater by CRC ICPMS (HMI)	E468S	268818	1	18	5.5	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	268402	1	18	5.5	5.0	✓
Total Phosphorus in Seawater by Colourimetry	E372S	273053	1	19	5.2	5.0	✓
Total Sodium and Silicon in Seawater by CRC ICPMS	E468S.NaSi	268819	1	18	5.5	5.0	✓
VH and F1 by Headspace GC-FID	E581.VH+F1	271050	1	5	20.0	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 Seawater	E100S Vancouver - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a seawater sample. Conductivity measurements are temperature-compensated to 25°C. Salinity in Practical Salinity Units is calculated.
pH by Meter	E108 Vancouver - Environmental	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
Turbidity by Nephelometry	E121 Vancouver - Environmental	Water	APHA 2130 B (mod)	Turbidity is measured by the nephelometric method, by measuring the intensity of light scatter under defined conditions.
TSS by Gravimetry (Seawater)	E160S Vancouver - 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 (Seawater)	E162S Vancouver - 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 Seawater by IC	E235S.Br Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Chloride in Seawater by IC	E235S.Cl Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Fluoride in Seawater by IC (Low Level)	E235S.F-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrite in Seawater by IC (Low Level)	E235S.NO2-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrate in Seawater by IC (Trace Level)	E235S.NO3-T Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Sulfate in Seawater by IC (Low Level)	E235S.SO4-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Alkalinity Species by Titration	E290 Vancouver - Environmental	Water	APHA 2320 B (mod)	Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.
Ammonia by Fluorescence	E298 Vancouver - 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).
Total Kjeldahl Nitrogen by Fluorescence	E318S Vancouver - Environmental	Water	APHA 4500-Norg D (mod)	Total Kjeldahl Nitrogen is determined using block digestion followed by flow-injection analysis with fluorescence detection.
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L Vancouver - 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 Vancouver - 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).
Total Phosphorus in Seawater by Colourimetry	E372S Vancouver - Environmental	Water	APHA 4500-P E (mod).	Total Phosphorus is determined colourimetrically using a discrete analyzer after heated persulfate digestion of the sample.
Total Metals in Seawater by CRC ICPMS (HMI)	E468S Vancouver - Environmental	Water	EPA 200.2/6020B (mod)	Seawater samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS (HMI Mode). This method is compliant with digestion requirements of the British Columbia Environmental Laboratory Manual.
Total Sodium and Silicon in Seawater by CRC ICPMS	E468S.NaSi Vancouver - Environmental	Water	EPA 200.2/6020B (mod)	Seawater samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS. This method is compliant with digestion requirements of the British Columbia Environmental Laboratory Manual.
Dissolved Metals in Seawater by CRC ICPMS (HMI)	E469S Vancouver - Environmental	Water	APHA 3030B/EPA 6020B (mod)	Seawater samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS (HMI Mode).

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Sodium and Silicon in Seawater by CRC ICPMS	E469S.NaSi Vancouver - Environmental	Water	APHA 3030B/EPA 6020B (mod)	Seawater samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS.
Total Mercury in Seawater by CVAAS	E508S Vancouver - Environmental	Water	EPA 1631E (mod)	Seawater samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.
Dissolved Mercury in Seawater by CVAAS	E509S Vancouver - Environmental	Water	APHA 3030B/EPA 1631E (mod)	Seawater samples are filtered (0.45 um), preserved with HCl, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.
VH and F1 by Headspace GC-FID	E581.VH+F1 Vancouver - Environmental	Water	BC MOE Lab Manual / CCME PHC in Soil - Tier 1 (mod)	Volatile Hydrocarbons (VH and F1) is analyzed by static headspace GC-FID. Samples are prepared in headspace vials and are heated and agitated on the headspace autosampler, causing VOCs to partition between the aqueous phase and the headspace in accordance with Henry's law.
CCME PHC - F2-F4 by GC-FID	E601 Vancouver - Environmental	Water	CCME PHC in Soil - Tier 1	CCME Fractions 2-4 (F2-F4) are analyzed by GC-FID.
BTEX by Headspace GC-MS	E611A Vancouver - Environmental	Water	EPA 8260D (mod)	Volatile Organic Compounds (VOCs) are analyzed by static headspace GC-MS. Samples are prepared in headspace vials and are heated and agitated on the headspace autosampler, causing VOCs to partition between the aqueous phase and the headspace in accordance with Henry's law.
PAHs by Hexane LVI GC-MS	E641A Vancouver - Environmental	Water	EPA 8270E (mod)	Polycyclic Aromatic Hydrocarbons (PAHs) are analyzed by large volume injection (LVI) GC-MS.
Dissolved Hardness (Calculated)	EC100 Vancouver - Environmental	Water	APHA 2340B	"Hardness (as CaCO3), dissolved" is calculated from the sum of dissolved Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. "Total Hardness" refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations.
Salinity in Seawater (calculation)	EC100S Vancouver - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a seawater sample. Conductivity measurements are temperature-compensated to 25°C. Salinity in Practical Salinity Units is calculated.
F1-BTEX	EC580 Vancouver - Environmental	Water	CCME PHC in Soil - Tier 1	F1-BTEX is calculated as follows: F1-BTEX = F1 (C6-C10) minus benzene, toluene, ethylbenzene and xylenes (BTEX).
VPH: VH-BTEX-Styrene	EC580A Vancouver - Environmental	Water	BC MOE Lab Manual (VPH in Water and Solids) (mod)	Volatile Petroleum Hydrocarbons (VPH) is calculated as follows: VPHw = Volatile Hydrocarbons (VH6-10) minus benzene, toluene, ethylbenzene, xylenes (BTEX) and styrene.

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Preparation for Ammonia	EP298 Vancouver - Environmental	Water		Sample preparation for Preserved Nutrients Water Quality Analysis.
Digestion for TKN in Seawater	EP318S Vancouver - Environmental	Water	APHA 4500-Norg D (mod)	Samples are digested using block digestion with Copper Sulfate Digestion Reagent and H2SO4.
Preparation for Total Organic Carbon by Combustion	EP355 Vancouver - Environmental	Water		Preparation for Total Organic Carbon by Combustion
Preparation for Dissolved Organic Carbon for Combustion	EP358 Vancouver - Environmental	Water	APHA 5310 B (mod)	Preparation for Dissolved Organic Carbon
Digestion for Total Phosphorus in water	EP372 Vancouver - Environmental	Water	APHA 4500-P E (mod).	Samples are heated with a persulfate digestion reagent.
Dissolved Metals Water Filtration	EP421 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HNO3.
Dissolved Mercury Water Filtration	EP509 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HCl.
VOCs Preparation for Headspace Analysis	EP581 Vancouver - Environmental	Water	EPA 5021A (mod)	Samples are prepared in headspace vials and are heated and agitated on the headspace autosampler. An aliquot of the headspace is then injected into the GC/MS-FID system.
PHCs and PAHs Hexane Extraction	EP601 Vancouver - Environmental	Water	EPA 3511 (mod)	Petroleum Hydrocarbons (PHCs) and Polycyclic Aromatic Hydrocarbons (PAHs) are extracted using a hexane liquid-liquid extraction.

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **VA21B6876**		Page	: 1 of 22
Client	: Golder Associates Ltd.		Laboratory	: Vancouver - Environmental
Contact	: Elaine Irving		Account Manager	: Amber Springer
Address	: 200-2920 Virtual Way Vancouver BC Canada V5M 0C4		Address	: 8081 Lougheed Highway Burnaby, British Columbia Canada V5A 1W9
Telephone	: ----		Telephone	: +1 604 253 4188
Project	: ----		Date Samples Received	: 12-Aug-2021 09:20
PO	: ----		Date Analysis Commenced	: 12-Aug-2021
C-O-C number	: 20-920779		Issue Date	: 30-Aug-2021 17:18
Sampler	: ----			
Site	: ----			
Quote number	: Q84262			
No. of samples received	: 9			
No. of samples analysed	: 9			

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 Percentage Difference (RPD) and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits
- Reference Material (RM) Report; Recovery and Acceptance Limits
- Method Blank (MB) Report; Recovery and Acceptance Limits
- Laboratory Control Sample (LCS) Report; Recovery and Acceptance Limits

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*
Aaron Yu	Laboratory Analyst	Inorganics, Burnaby, British Columbia
Angela Ren	Team Leader - Metals	Metals, Burnaby, British Columbia
Courtney Cox	Analsyt	Inorganics, Burnaby, British Columbia
Dee Lee	Analyst	Metals, Burnaby, British Columbia
Jay Jang	Lab Assistant	Metals, Burnaby, British Columbia
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Miles Gropen	Department Manager - Inorganics	Inorganics, Burnaby, British Columbia
Ophelia Chiu	Department Manager - Organics	Organics, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia
Ruby Pham	Lab Assistant	Metals, Burnaby, British Columbia
Sristika Chand	Lab Analyst	Metals, Burnaby, British Columbia
Tracy Harley	Supervisor - Water Quality Instrumentation	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 Services number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percentage Difference
# = Indicates a QC result that did not meet the ALS DQO.

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: 265687)											
VA21B6876-001	MP-06-Source	turbidity	----	E121	0.10	NTU	<0.10	0.10	0.001	Diff <2x LOR	----
Physical Tests (QC Lot: 268389)											
VA21B6876-001	MP-06-Source	conductivity	----	E100S	2.0	µS/cm	37300	37100	0.538%	20%	----
Physical Tests (QC Lot: 268390)											
VA21B6876-001	MP-06-Source	alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	92.9	91.9	1.08%	20%	----
Physical Tests (QC Lot: 268391)											
VA21B6876-001	MP-06-Source	pH	----	E108	0.10	pH units	8.01	8.01	0.00%	4%	----
Physical Tests (QC Lot: 273148)											
VA21B6250-001	Anonymous	solids, total dissolved [TDS]	----	E162S	10	mg/L	<10	<10	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 268403)											
VA21B6876-001	MP-06-Source	ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 268404)											
VA21B6876-001	MP-06-Source	Kjeldahl nitrogen, total [TKN]	----	E318S	0.050	mg/L	0.087	0.087	0.00008	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 272957)											
VA21B6250-001	Anonymous	bromide	24959-67-9	E235S.Br	5.0	mg/L	<5.0	<5.0	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 272958)											
VA21B6250-001	Anonymous	chloride	16887-00-6	E235S.Cl	50	mg/L	<50	<50	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 272959)											
VA21B6250-001	Anonymous	fluoride	16984-48-8	E235S.F-L	0.20	mg/L	<0.20	<0.20	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 272960)											
VA21B6250-001	Anonymous	nitrate (as N)	14797-55-8	E235S.NO3-T	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 272961)											
VA21B6250-001	Anonymous	nitrite (as N)	14797-65-0	E235S.NO2-L	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 272962)											
VA21B6250-001	Anonymous	sulfate (as SO4)	14808-79-8	E235S.SO4-L	3.0	mg/L	<3.0	<3.0	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 273053)											
VA21B6250-001	Anonymous	phosphorus, total	7723-14-0	E372S	0.0040	mg/L	<0.0040	<0.0040	0	Diff <2x LOR	----
Organic / Inorganic Carbon (QC Lot: 268402)											
VA21B6876-001	MP-06-Source	carbon, total organic [TOC]	----	E355-L	0.50	mg/L	0.83	0.90	0.07	Diff <2x LOR	----
Organic / Inorganic Carbon (QC Lot: 272964)											
VA21B6250-001	Anonymous	carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	<0.50	<0.50	0	Diff <2x LOR	----

Sub-Matrix: **Water**

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
					Laboratory Duplicate (DUP) Report						
Total Metals (QC Lot: 268622)											
VA21B6817-001	Anonymous	mercury, total	7439-97-6	E508S	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
Total Metals (QC Lot: 268818)											
VA21B6817-001	Anonymous	aluminum, total	7429-90-5	E468S	0.0050	mg/L	0.188	0.203	7.66%	20%	----
		antimony, total	7440-36-0	E468S	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		arsenic, total	7440-38-2	E468S	0.00040	mg/L	0.00064	0.00055	0.00009	Diff <2x LOR	----
		barium, total	7440-39-3	E468S	0.0010	mg/L	0.122	0.124	2.08%	20%	----
		beryllium, total	7440-41-7	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		bismuth, total	7440-69-9	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		boron, total	7440-42-8	E468S	0.30	mg/L	1.76	1.83	0.07	Diff <2x LOR	----
		cadmium, total	7440-43-9	E468S	0.000010	mg/L	0.000436	0.000428	1.83%	20%	----
		calcium, total	7440-70-2	E468S	1.0	mg/L	204	213	4.26%	20%	----
		cesium, total	7440-46-2	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		chromium, total	7440-47-3	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		cobalt, total	7440-48-4	E468S	0.000050	mg/L	0.000271	0.000289	0.000018	Diff <2x LOR	----
		copper, total	7440-50-8	E468S	0.00050	mg/L	0.0130	0.0133	2.22%	20%	----
		gallium, total	7440-55-3	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		iron, total	7439-89-6	E468S	0.010	mg/L	0.214	0.220	2.65%	20%	----
		lead, total	7439-92-1	E468S	0.000050	mg/L	0.000774	0.000764	1.35%	20%	----
		lithium, total	7439-93-2	E468S	0.020	mg/L	0.043	0.044	0.0008	Diff <2x LOR	----
		magnesium, total	7439-95-4	E468S	1.0	mg/L	535	543	1.49%	20%	----
		manganese, total	7439-96-5	E468S	0.00020	mg/L	0.0276	0.0279	1.16%	20%	----
		molybdenum, total	7439-98-7	E468S	0.00010	mg/L	0.00510	0.00518	1.54%	20%	----
		nickel, total	7440-02-0	E468S	0.00050	mg/L	0.00076	0.00070	0.00006	Diff <2x LOR	----
		phosphorus, total	7723-14-0	E468S	0.050	mg/L	0.060	<0.050	0.010	Diff <2x LOR	----
		potassium, total	7440-09-7	E468S	1.0	mg/L	174	175	0.564%	20%	----
		rhenium, total	7440-15-5	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		rubidium, total	7440-17-7	E468S	0.0050	mg/L	0.0546	0.0546	0.0668%	20%	----
		selenium, total	7782-49-2	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		silver, total	7440-22-4	E468S	0.00010	mg/L	0.00019	0.00018	0.000008	Diff <2x LOR	----
		strontium, total	7440-24-6	E468S	0.010	mg/L	3.64	3.70	1.47%	20%	----
		sulfur, total	7704-34-9	E468S	5.0	mg/L	428	446	4.14%	20%	----
		tellurium, total	13494-80-9	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		thallium, total	7440-28-0	E468S	0.000050	mg/L	0.000070	<0.000050	0.000020	Diff <2x LOR	----
		thorium, total	7440-29-1	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		tin, total	7440-31-5	E468S	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----

Sub-Matrix: **Water**

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
					Laboratory Duplicate (DUP) Report						
Total Metals (QC Lot: 268818) - continued											
VA21B6817-001	Anonymous	titanium, total	7440-32-6	E468S	0.0050	mg/L	0.0063	0.0064	0.00008	Diff <2x LOR	----
		tungsten, total	7440-33-7	E468S	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		uranium, total	7440-61-1	E468S	0.000050	mg/L	0.00137	0.00134	2.46%	20%	----
		vanadium, total	7440-62-2	E468S	0.00050	mg/L	0.00126	0.00124	0.00002	Diff <2x LOR	----
		yttrium, total	7440-65-5	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, total	7440-66-6	E468S	0.0030	mg/L	0.0218	0.0209	0.0010	Diff <2x LOR	----
		zirconium, total	7440-67-7	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
Total Metals (QC Lot: 268819)											
VA21B6817-001	Anonymous	silicon, total	7440-21-3	E468S.NaSi	1.0	mg/L	3.2	3.3	0.2	Diff <2x LOR	----
		sodium, total	17341-25-2	E468S.NaSi	2.5	mg/L	4500	4480	0.471%	20%	----
Dissolved Metals (QC Lot: 266700)											
VA21B6817-001	Anonymous	aluminum, dissolved	7429-90-5	E469S	0.0050	mg/L	0.0249	0.0236	0.0012	Diff <2x LOR	----
		antimony, dissolved	7440-36-0	E469S	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		arsenic, dissolved	7440-38-2	E469S	0.00040	mg/L	<0.00040	<0.00040	0	Diff <2x LOR	----
		barium, dissolved	7440-39-3	E469S	0.0010	mg/L	0.111	0.113	1.12%	20%	----
		beryllium, dissolved	7440-41-7	E469S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		bismuth, dissolved	7440-69-9	E469S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		boron, dissolved	7440-42-8	E469S	0.30	mg/L	1.80	1.81	0.003	Diff <2x LOR	----
		cadmium, dissolved	7440-43-9	E469S	0.000010	mg/L	0.000423	0.000394	6.89%	20%	----
		calcium, dissolved	7440-70-2	E469S	1.0	mg/L	215	213	0.887%	20%	----
		cesium, dissolved	7440-46-2	E469S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		chromium, dissolved	7440-47-3	E469S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		cobalt, dissolved	7440-48-4	E469S	0.000050	mg/L	0.000198	0.000196	0.000002	Diff <2x LOR	----
		copper, dissolved	7440-50-8	E469S	0.00020	mg/L	0.0104	0.0102	1.95%	20%	----
		gallium, dissolved	7440-55-3	E469S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		iron, dissolved	7439-89-6	E469S	0.010	mg/L	0.034	0.034	0.00006	Diff <2x LOR	----
		lead, dissolved	7439-92-1	E469S	0.000050	mg/L	0.000147	0.000141	0.000006	Diff <2x LOR	----
		lithium, dissolved	7439-93-2	E469S	0.020	mg/L	0.045	0.046	0.0002	Diff <2x LOR	----
		magnesium, dissolved	7439-95-4	E469S	1.0	mg/L	554	552	0.412%	20%	----
		manganese, dissolved	7439-96-5	E469S	0.00010	mg/L	0.0254	0.0250	1.61%	20%	----
		molybdenum, dissolved	7439-98-7	E469S	0.00010	mg/L	0.00480	0.00492	2.41%	20%	----
		nickel, dissolved	7440-02-0	E469S	0.00050	mg/L	0.00054	0.00055	0.000008	Diff <2x LOR	----
		phosphorus, dissolved	7723-14-0	E469S	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		potassium, dissolved	7440-09-7	E469S	1.0	mg/L	176	175	0.615%	20%	----
		rhenium, dissolved	7440-15-5	E469S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----

Sub-Matrix: **Water**

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Laboratory Duplicate (DUP) Report						
					LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Dissolved Metals (QC Lot: 266700) - continued											
VA21B6817-001	Anonymous	rubidium, dissolved	7440-17-7	E469S	0.0050	mg/L	0.0546	0.0543	0.478%	20%	----
		selenium, dissolved	7782-49-2	E469S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		silver, dissolved	7440-22-4	E469S	0.00010	mg/L	0.00015	0.00016	0.000007	Diff <2x LOR	----
		strontium, dissolved	7440-24-6	E469S	0.010	mg/L	3.56	3.56	0.0890%	20%	----
		sulfur, dissolved	7704-34-9	E469S	5.0	mg/L	429	433	0.896%	20%	----
		tellurium, dissolved	13494-80-9	E469S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		thallium, dissolved	7440-28-0	E469S	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		thorium, dissolved	7440-29-1	E469S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		tin, dissolved	7440-31-5	E469S	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		titanium, dissolved	7440-32-6	E469S	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
		tungsten, dissolved	7440-33-7	E469S	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		uranium, dissolved	7440-61-1	E469S	0.000050	mg/L	0.00140	0.00134	4.30%	20%	----
		vanadium, dissolved	7440-62-2	E469S	0.00050	mg/L	0.00077	0.00076	0.000005	Diff <2x LOR	----
		yttrium, dissolved	7440-65-5	E469S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, dissolved	7440-66-6	E469S	0.0010	mg/L	0.0193	0.0188	2.42%	20%	----
		zirconium, dissolved	7440-67-7	E469S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 266701)											
VA21B6817-001	Anonymous	silicon, dissolved	7440-21-3	E469S.NaSi	1.0	mg/L	3.1	3.0	0.07	Diff <2x LOR	----
		sodium, dissolved	17341-25-2	E469S.NaSi	2.5	mg/L	4470	4320	3.36%	20%	----
Dissolved Metals (QC Lot: 268973)											
VA21B6876-001	MP-06-Source	mercury, dissolved	7439-97-6	E509S	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
Volatile Organic Compounds (QC Lot: 271051)											
VA21B6876-001	MP-06-Source	benzene	71-43-2	E611A	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		ethylbenzene	100-41-4	E611A	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		methyl-tert-butyl ether [MTBE]	1634-04-4	E611A	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		styrene	100-42-5	E611A	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		toluene	108-88-3	E611A	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		xylene, m+p-	179601-23-1	E611A	0.40	µg/L	<0.40	<0.40	0	Diff <2x LOR	----
		xylene, o-	95-47-6	E611A	0.30	µg/L	<0.30	<0.30	0	Diff <2x LOR	----
Hydrocarbons (QC Lot: 271050)											
VA21B6876-001	MP-06-Source	F1 (C6-C10)	----	E581.VH+F1	100	µg/L	<100	<100	0.0%	30%	----
		VHw (C6-C10)	----	E581.VH+F1	100	µg/L	<100	<100	0.0%	30%	----

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: 265687)						
turbidity	----	E121	0.1	NTU	<0.10	----
Physical Tests (QCLot: 267171)						
solids, total suspended [TSS]	----	E160S	2	mg/L	<2.0	----
Physical Tests (QCLot: 268389)						
conductivity	----	E100S	2	µS/cm	<2.0	----
Physical Tests (QCLot: 268390)						
alkalinity, total (as CaCO3)	----	E290	1	mg/L	# 1.5	B
Physical Tests (QCLot: 273148)						
solids, total dissolved [TDS]	----	E162S	10	mg/L	<10	----
Anions and Nutrients (QCLot: 268403)						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 268404)						
Kjeldahl nitrogen, total [TKN]	----	E318S	0.05	mg/L	<0.050	----
Anions and Nutrients (QCLot: 272957)						
bromide	24959-67-9	E235S.Br	5	mg/L	<5.0	----
Anions and Nutrients (QCLot: 272958)						
chloride	16887-00-6	E235S.Cl	50	mg/L	<50	----
Anions and Nutrients (QCLot: 272959)						
fluoride	16984-48-8	E235S.F-L	0.2	mg/L	<0.20	----
Anions and Nutrients (QCLot: 272960)						
nitrate (as N)	14797-55-8	E235S.NO3-T	0.01	mg/L	<0.010	----
Anions and Nutrients (QCLot: 272961)						
nitrite (as N)	14797-65-0	E235S.NO2-L	0.01	mg/L	<0.010	----
Anions and Nutrients (QCLot: 272962)						
sulfate (as SO4)	14808-79-8	E235S.SO4-L	3	mg/L	<3.0	----
Anions and Nutrients (QCLot: 273053)						
phosphorus, total	7723-14-0	E372S	0.002	mg/L	<0.0040	----
Organic / Inorganic Carbon (QCLot: 268402)						
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	<0.50	----
Organic / Inorganic Carbon (QCLot: 272964)						
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	<0.50	----
Total Metals (QCLot: 268622)						
mercury, total	7439-97-6	E508S	0.000005	mg/L	<0.0000050	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 268818)						
aluminum, total	7429-90-5	E468S	0.005	mg/L	<0.0050	----
antimony, total	7440-36-0	E468S	0.001	mg/L	<0.0010	----
arsenic, total	7440-38-2	E468S	0.0004	mg/L	<0.00040	----
barium, total	7440-39-3	E468S	0.001	mg/L	<0.0010	----
beryllium, total	7440-41-7	E468S	0.0005	mg/L	<0.00050	----
bismuth, total	7440-69-9	E468S	0.0005	mg/L	<0.00050	----
boron, total	7440-42-8	E468S	0.3	mg/L	<0.30	----
cadmium, total	7440-43-9	E468S	0.00001	mg/L	<0.000010	----
calcium, total	7440-70-2	E468S	1	mg/L	<1.0	----
cesium, total	7440-46-2	E468S	0.0005	mg/L	<0.00050	----
chromium, total	7440-47-3	E468S	0.0005	mg/L	<0.00050	----
cobalt, total	7440-48-4	E468S	0.00005	mg/L	<0.000050	----
copper, total	7440-50-8	E468S	0.0005	mg/L	<0.00050	----
gallium, total	7440-55-3	E468S	0.0005	mg/L	<0.00050	----
iron, total	7439-89-6	E468S	0.01	mg/L	<0.010	----
lead, total	7439-92-1	E468S	0.00005	mg/L	<0.000050	----
lithium, total	7439-93-2	E468S	0.02	mg/L	<0.020	----
magnesium, total	7439-95-4	E468S	1	mg/L	<1.0	----
manganese, total	7439-96-5	E468S	0.0002	mg/L	<0.00020	----
molybdenum, total	7439-98-7	E468S	0.0001	mg/L	<0.00010	----
nickel, total	7440-02-0	E468S	0.0005	mg/L	<0.00050	----
phosphorus, total	7723-14-0	E468S	0.05	mg/L	<0.050	----
potassium, total	7440-09-7	E468S	1	mg/L	<1.0	----
rhenium, total	7440-15-5	E468S	0.0005	mg/L	<0.00050	----
rubidium, total	7440-17-7	E468S	0.005	mg/L	<0.0050	----
selenium, total	7782-49-2	E468S	0.0005	mg/L	<0.00050	----
silver, total	7440-22-4	E468S	0.0001	mg/L	<0.00010	----
strontium, total	7440-24-6	E468S	0.01	mg/L	<0.010	----
sulfur, total	7704-34-9	E468S	5	mg/L	<5.0	----
tellurium, total	13494-80-9	E468S	0.0005	mg/L	<0.00050	----
thallium, total	7440-28-0	E468S	0.00005	mg/L	<0.000050	----
thorium, total	7440-29-1	E468S	0.0005	mg/L	<0.00050	----
tin, total	7440-31-5	E468S	0.001	mg/L	<0.0010	----
titanium, total	7440-32-6	E468S	0.005	mg/L	<0.0050	----
tungsten, total	7440-33-7	E468S	0.001	mg/L	<0.0010	----
uranium, total	7440-61-1	E468S	0.00005	mg/L	<0.000050	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 268818) - continued						
vanadium, total	7440-62-2	E468S	0.0005	mg/L	<0.00050	----
yttrium, total	7440-65-5	E468S	0.0005	mg/L	<0.00050	----
zinc, total	7440-66-6	E468S	0.003	mg/L	<0.0030	----
zirconium, total	7440-67-7	E468S	0.0005	mg/L	<0.00050	----
Total Metals (QCLot: 268819)						
silicon, total	7440-21-3	E468S.NaSi	1	mg/L	<1.0	----
sodium, total	17341-25-2	E468S.NaSi	2.5	mg/L	<2.5	----
Dissolved Metals (QCLot: 266700)						
aluminum, dissolved	7429-90-5	E469S	0.005	mg/L	<0.0050	----
antimony, dissolved	7440-36-0	E469S	0.001	mg/L	<0.0010	----
arsenic, dissolved	7440-38-2	E469S	0.0004	mg/L	<0.00040	----
barium, dissolved	7440-39-3	E469S	0.001	mg/L	<0.0010	----
beryllium, dissolved	7440-41-7	E469S	0.0005	mg/L	<0.00050	----
bismuth, dissolved	7440-69-9	E469S	0.0005	mg/L	<0.00050	----
boron, dissolved	7440-42-8	E469S	0.3	mg/L	<0.30	----
cadmium, dissolved	7440-43-9	E469S	0.00001	mg/L	<0.000010	----
calcium, dissolved	7440-70-2	E469S	1	mg/L	<1.0	----
cesium, dissolved	7440-46-2	E469S	0.0005	mg/L	<0.00050	----
chromium, dissolved	7440-47-3	E469S	0.0005	mg/L	<0.00050	----
cobalt, dissolved	7440-48-4	E469S	0.00005	mg/L	<0.000050	----
copper, dissolved	7440-50-8	E469S	0.0002	mg/L	<0.00020	----
gallium, dissolved	7440-55-3	E469S	0.0005	mg/L	<0.00050	----
iron, dissolved	7439-89-6	E469S	0.01	mg/L	<0.010	----
lead, dissolved	7439-92-1	E469S	0.00005	mg/L	<0.000050	----
lithium, dissolved	7439-93-2	E469S	0.02	mg/L	<0.020	----
magnesium, dissolved	7439-95-4	E469S	1	mg/L	<1.0	----
manganese, dissolved	7439-96-5	E469S	0.0001	mg/L	<0.00010	----
molybdenum, dissolved	7439-98-7	E469S	0.0001	mg/L	<0.00010	----
nickel, dissolved	7440-02-0	E469S	0.0005	mg/L	<0.00050	----
phosphorus, dissolved	7723-14-0	E469S	0.05	mg/L	<0.050	----
potassium, dissolved	7440-09-7	E469S	1	mg/L	<1.0	----
rhenium, dissolved	7440-15-5	E469S	0.0005	mg/L	<0.00050	----
rubidium, dissolved	7440-17-7	E469S	0.005	mg/L	<0.0050	----
selenium, dissolved	7782-49-2	E469S	0.0005	mg/L	<0.00050	----
silver, dissolved	7440-22-4	E469S	0.0001	mg/L	<0.00010	----
strontium, dissolved	7440-24-6	E469S	0.01	mg/L	<0.010	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 266700) - continued						
sulfur, dissolved	7704-34-9	E469S	5	mg/L	<5.0	----
tellurium, dissolved	13494-80-9	E469S	0.0005	mg/L	<0.00050	----
thallium, dissolved	7440-28-0	E469S	0.00005	mg/L	<0.000050	----
thorium, dissolved	7440-29-1	E469S	0.0005	mg/L	<0.00050	----
tin, dissolved	7440-31-5	E469S	0.001	mg/L	<0.0010	----
titanium, dissolved	7440-32-6	E469S	0.005	mg/L	<0.0050	----
tungsten, dissolved	7440-33-7	E469S	0.001	mg/L	<0.0010	----
uranium, dissolved	7440-61-1	E469S	0.00005	mg/L	<0.000050	----
vanadium, dissolved	7440-62-2	E469S	0.0005	mg/L	<0.00050	----
yttrium, dissolved	7440-65-5	E469S	0.0005	mg/L	<0.00050	----
zinc, dissolved	7440-66-6	E469S	0.001	mg/L	<0.0010	----
zirconium, dissolved	7440-67-7	E469S	0.0005	mg/L	<0.00050	----
Dissolved Metals (QCLot: 266701)						
silicon, dissolved	7440-21-3	E469S.NaSi	1	mg/L	<1.0	----
sodium, dissolved	17341-25-2	E469S.NaSi	2.5	mg/L	<2.5	----
Dissolved Metals (QCLot: 268973)						
mercury, dissolved	7439-97-6	E509S	0.000005	mg/L	<0.0000050	----
Volatile Organic Compounds (QCLot: 271051)						
benzene	71-43-2	E611A	0.5	µg/L	<0.50	----
ethylbenzene	100-41-4	E611A	0.5	µg/L	<0.50	----
methyl-tert-butyl ether [MTBE]	1634-04-4	E611A	0.5	µg/L	<0.50	----
styrene	100-42-5	E611A	0.5	µg/L	<0.50	----
toluene	108-88-3	E611A	0.5	µg/L	<0.50	----
xylene, m+p-	179601-23-1	E611A	0.4	µg/L	<0.40	----
xylene, o-	95-47-6	E611A	0.3	µg/L	<0.30	----
Hydrocarbons (QCLot: 268261)						
F2 (C10-C16)	----	E601	100	µg/L	<100	----
F3 (C16-C34)	----	E601	250	µg/L	<250	----
F4 (C34-C50)	----	E601	250	µg/L	<250	----
Hydrocarbons (QCLot: 268299)						
F2 (C10-C16)	----	E601	100	µg/L	<100	----
F3 (C16-C34)	----	E601	250	µg/L	<250	----
F4 (C34-C50)	----	E601	250	µg/L	<250	----
Hydrocarbons (QCLot: 271050)						
F1 (C6-C10)	----	E581.VH+F1	100	µg/L	<100	----
VHw (C6-C10)	----	E581.VH+F1	100	µg/L	<100	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Polycyclic Aromatic Hydrocarbons (QCLot: 268258)						
acenaphthene	83-32-9	E641A	0.01	µg/L	<0.010	----
acenaphthylene	208-96-8	E641A	0.01	µg/L	<0.010	----
acridine	260-94-6	E641A	0.01	µg/L	<0.010	----
anthracene	120-12-7	E641A	0.01	µg/L	<0.010	----
benz(a)anthracene	56-55-3	E641A	0.01	µg/L	<0.010	----
benzo(a)pyrene	50-32-8	E641A	0.005	µg/L	<0.0050	----
benzo(b+j)fluoranthene	----	E641A	0.01	µg/L	<0.010	----
benzo(g,h,i)perylene	191-24-2	E641A	0.01	µg/L	<0.010	----
benzo(k)fluoranthene	207-08-9	E641A	0.01	µg/L	<0.010	----
chrysene	218-01-9	E641A	0.01	µg/L	<0.010	----
dibenz(a,h)anthracene	53-70-3	E641A	0.005	µg/L	<0.0050	----
fluoranthene	206-44-0	E641A	0.01	µg/L	<0.010	----
fluorene	86-73-7	E641A	0.01	µg/L	<0.010	----
indeno(1,2,3-c,d)pyrene	193-39-5	E641A	0.01	µg/L	<0.010	----
methylnaphthalene, 1-	90-12-0	E641A	0.01	µg/L	<0.010	----
methylnaphthalene, 2-	91-57-6	E641A	0.01	µg/L	<0.010	----
naphthalene	91-20-3	E641A	0.05	µg/L	<0.050	----
phenanthrene	85-01-8	E641A	0.02	µg/L	<0.020	----
pyrene	129-00-0	E641A	0.01	µg/L	<0.010	----
quinoline	6027-02-7	E641A	0.05	µg/L	<0.050	----
Polycyclic Aromatic Hydrocarbons (QCLot: 268298)						
acenaphthene	83-32-9	E641A	0.01	µg/L	<0.010	----
acenaphthylene	208-96-8	E641A	0.01	µg/L	<0.010	----
acridine	260-94-6	E641A	0.01	µg/L	<0.010	----
anthracene	120-12-7	E641A	0.01	µg/L	<0.010	----
benz(a)anthracene	56-55-3	E641A	0.01	µg/L	<0.010	----
benzo(a)pyrene	50-32-8	E641A	0.005	µg/L	<0.0050	----
benzo(b+j)fluoranthene	----	E641A	0.01	µg/L	<0.010	----
benzo(g,h,i)perylene	191-24-2	E641A	0.01	µg/L	<0.010	----
benzo(k)fluoranthene	207-08-9	E641A	0.01	µg/L	<0.010	----
chrysene	218-01-9	E641A	0.01	µg/L	<0.010	----
dibenz(a,h)anthracene	53-70-3	E641A	0.005	µg/L	<0.0050	----
fluoranthene	206-44-0	E641A	0.01	µg/L	<0.010	----
fluorene	86-73-7	E641A	0.01	µg/L	<0.010	----
indeno(1,2,3-c,d)pyrene	193-39-5	E641A	0.01	µg/L	<0.010	----
methylnaphthalene, 1-	90-12-0	E641A	0.01	µg/L	<0.010	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Polycyclic Aromatic Hydrocarbons (QCLot: 268298) - continued						
methylnaphthalene, 2-	91-57-6	E641A	0.01	µg/L	<0.010	----
naphthalene	91-20-3	E641A	0.05	µg/L	<0.050	----
phenanthrene	85-01-8	E641A	0.02	µg/L	<0.020	----
pyrene	129-00-0	E641A	0.01	µg/L	<0.010	----
quinoline	6027-02-7	E641A	0.05	µg/L	<0.050	----

Qualifiers

Qualifier	*Description*
B	*Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.*

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: 265687)									
turbidity	----	E121	0.1	NTU	200 NTU	105	85.0	115	----
Physical Tests (QCLot: 267171)									
solids, total suspended [TSS]	----	E160S	2	mg/L	150 mg/L	103	85.0	115	----
Physical Tests (QCLot: 268389)									
conductivity	----	E100S	2	µS/cm	146.9 µS/cm	100	80.0	120	----
Physical Tests (QCLot: 268390)									
alkalinity, total (as CaCO3)	----	E290	1	mg/L	500 mg/L	102	85.0	115	----
Physical Tests (QCLot: 268391)									
pH	----	E108	----	pH units	7 pH units	100	98.0	102	----
Physical Tests (QCLot: 273148)									
solids, total dissolved [TDS]	----	E162S	10	mg/L	1000 mg/L	98.5	85.0	115	----
Anions and Nutrients (QCLot: 268403)									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.2 mg/L	100	85.0	115	----
Anions and Nutrients (QCLot: 268404)									
Kjeldahl nitrogen, total [TKN]	----	E318S	0.05	mg/L	4 mg/L	102	75.0	125	----
Anions and Nutrients (QCLot: 272957)									
bromide	24959-67-9	E235S.Br	5	mg/L	0.5 mg/L	99.4	85.0	115	----
Anions and Nutrients (QCLot: 272958)									
chloride	16887-00-6	E235S.Cl	50	mg/L	100 mg/L	100.0	90.0	110	----
Anions and Nutrients (QCLot: 272959)									
fluoride	16984-48-8	E235S.F-L	0.2	mg/L	1 mg/L	100	90.0	110	----
Anions and Nutrients (QCLot: 272960)									
nitrate (as N)	14797-55-8	E235S.NO3-T	0.01	mg/L	2.5 mg/L	100	90.0	110	----
Anions and Nutrients (QCLot: 272961)									
nitrite (as N)	14797-65-0	E235S.NO2-L	0.01	mg/L	0.5 mg/L	100	90.0	110	----
Anions and Nutrients (QCLot: 272962)									
sulfate (as SO4)	14808-79-8	E235S.SO4-L	3	mg/L	100 mg/L	102	90.0	110	----
Anions and Nutrients (QCLot: 273053)									
phosphorus, total	7723-14-0	E372S	0.002	mg/L	0.05 mg/L	93.4	80.0	120	----
Organic / Inorganic Carbon (QCLot: 268402)									
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	8.57 mg/L	100	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
Organic / Inorganic Carbon (QCLot: 272964)									
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	8.57 mg/L	92.4	80.0	120	----
Total Metals (QCLot: 268622)									
mercury, total	7439-97-6	E508S	0.000005	mg/L	0.0001 mg/L	97.3	80.0	120	----
Total Metals (QCLot: 268818)									
aluminum, total	7429-90-5	E468S	0.005	mg/L	2 mg/L	113	80.0	120	----
antimony, total	7440-36-0	E468S	0.001	mg/L	1 mg/L	110	80.0	120	----
arsenic, total	7440-38-2	E468S	0.0004	mg/L	1 mg/L	104	80.0	120	----
barium, total	7440-39-3	E468S	0.001	mg/L	0.25 mg/L	113	80.0	120	----
beryllium, total	7440-41-7	E468S	0.0005	mg/L	0.1 mg/L	103	80.0	120	----
bismuth, total	7440-69-9	E468S	0.0005	mg/L	1 mg/L	115	80.0	120	----
boron, total	7440-42-8	E468S	0.3	mg/L	2 mg/L	80.9	80.0	120	----
cadmium, total	7440-43-9	E468S	0.00001	mg/L	0.1 mg/L	111	80.0	120	----
calcium, total	7440-70-2	E468S	1	mg/L	50 mg/L	106	80.0	120	----
cesium, total	7440-46-2	E468S	0.0005	mg/L	0.05 mg/L	105	80.0	120	----
chromium, total	7440-47-3	E468S	0.0005	mg/L	0.25 mg/L	108	80.0	120	----
cobalt, total	7440-48-4	E468S	0.00005	mg/L	0.25 mg/L	113	80.0	120	----
copper, total	7440-50-8	E468S	0.0005	mg/L	0.25 mg/L	111	80.0	120	----
gallium, total	7440-55-3	E468S	0.0005	mg/L	0.25 mg/L	107	80.0	120	----
iron, total	7439-89-6	E468S	0.01	mg/L	1 mg/L	110	80.0	120	----
lead, total	7439-92-1	E468S	0.00005	mg/L	0.5 mg/L	113	80.0	120	----
lithium, total	7439-93-2	E468S	0.02	mg/L	0.25 mg/L	102	80.0	120	----
magnesium, total	7439-95-4	E468S	1	mg/L	50 mg/L	105	80.0	120	----
manganese, total	7439-96-5	E468S	0.0002	mg/L	0.25 mg/L	110	80.0	120	----
molybdenum, total	7439-98-7	E468S	0.0001	mg/L	0.25 mg/L	107	80.0	120	----
nickel, total	7440-02-0	E468S	0.0005	mg/L	0.5 mg/L	110	80.0	120	----
phosphorus, total	7723-14-0	E468S	0.05	mg/L	10 mg/L	108	80.0	120	----
potassium, total	7440-09-7	E468S	1	mg/L	50 mg/L	110	80.0	120	----
rhenium, total	7440-15-5	E468S	0.0005	mg/L	0.1 mg/L	107	80.0	120	----
rubidium, total	7440-17-7	E468S	0.005	mg/L	0.1 mg/L	111	80.0	120	----
selenium, total	7782-49-2	E468S	0.0005	mg/L	1 mg/L	113	80.0	120	----
silver, total	7440-22-4	E468S	0.0001	mg/L	0.1 mg/L	110	80.0	120	----
strontium, total	7440-24-6	E468S	0.01	mg/L	0.25 mg/L	110	80.0	120	----
sulfur, total	7704-34-9	E468S	5	mg/L	50 mg/L	100.0	80.0	120	----
tellurium, total	13494-80-9	E468S	0.0005	mg/L	0.1 mg/L	# 123	80.0	120	MES
thallium, total	7440-28-0	E468S	0.00005	mg/L	1 mg/L	116	80.0	120	----
thorium, total	7440-29-1	E468S	0.0005	mg/L	0.1 mg/L	94.2	80.0	120	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Spike Concentration	Recovery (%) LCS	Recovery Limits (%) Low	Recovery Limits (%) High	Qualifier
Total Metals (QCLot: 268818) - continued									
tin, total	7440-31-5	E468S	0.001	mg/L	0.5 mg/L	109	80.0	120	----
titanium, total	7440-32-6	E468S	0.005	mg/L	0.25 mg/L	104	80.0	120	----
tungsten, total	7440-33-7	E468S	0.001	mg/L	0.1 mg/L	105	80.0	120	----
uranium, total	7440-61-1	E468S	0.00005	mg/L	0.005 mg/L	99.1	80.0	120	----
vanadium, total	7440-62-2	E468S	0.0005	mg/L	0.5 mg/L	108	80.0	120	----
yttrium, total	7440-65-5	E468S	0.0005	mg/L	0.1 mg/L	108	80.0	120	----
zinc, total	7440-66-6	E468S	0.003	mg/L	0.5 mg/L	116	80.0	120	----
zirconium, total	7440-67-7	E468S	0.0005	mg/L	0.1 mg/L	99.0	80.0	120	----
Total Metals (QCLot: 268819)									
silicon, total	7440-21-3	E468S.NaSi	1	mg/L	10 mg/L	105	80.0	120	----
sodium, total	17341-25-2	E468S.NaSi	2.5	mg/L	50 mg/L	107	80.0	120	----
Dissolved Metals (QCLot: 266700)									
aluminum, dissolved	7429-90-5	E469S	0.005	mg/L	2 mg/L	97.6	80.0	120	----
antimony, dissolved	7440-36-0	E469S	0.001	mg/L	1 mg/L	109	80.0	120	----
arsenic, dissolved	7440-38-2	E469S	0.0004	mg/L	1 mg/L	101	80.0	120	----
barium, dissolved	7440-39-3	E469S	0.001	mg/L	0.25 mg/L	103	80.0	120	----
beryllium, dissolved	7440-41-7	E469S	0.0005	mg/L	0.1 mg/L	95.9	80.0	120	----
bismuth, dissolved	7440-69-9	E469S	0.0005	mg/L	1 mg/L	111	80.0	120	----
boron, dissolved	7440-42-8	E469S	0.3	mg/L	10 mg/L	82.4	80.0	120	----
cadmium, dissolved	7440-43-9	E469S	0.00001	mg/L	0.1 mg/L	102	80.0	120	----
calcium, dissolved	7440-70-2	E469S	1	mg/L	50 mg/L	96.0	80.0	120	----
cesium, dissolved	7440-46-2	E469S	0.0005	mg/L	0.05 mg/L	102	80.0	120	----
chromium, dissolved	7440-47-3	E469S	0.0005	mg/L	0.25 mg/L	100	80.0	120	----
cobalt, dissolved	7440-48-4	E469S	0.00005	mg/L	0.25 mg/L	102	80.0	120	----
copper, dissolved	7440-50-8	E469S	0.0002	mg/L	0.25 mg/L	102	80.0	120	----
gallium, dissolved	7440-55-3	E469S	0.0005	mg/L	0.25 mg/L	94.6	80.0	120	----
iron, dissolved	7439-89-6	E469S	0.01	mg/L	1 mg/L	102	80.0	120	----
lead, dissolved	7439-92-1	E469S	0.00005	mg/L	0.5 mg/L	104	80.0	120	----
lithium, dissolved	7439-93-2	E469S	0.02	mg/L	0.25 mg/L	94.2	80.0	120	----
magnesium, dissolved	7439-95-4	E469S	1	mg/L	50 mg/L	101	80.0	120	----
manganese, dissolved	7439-96-5	E469S	0.0001	mg/L	0.25 mg/L	102	80.0	120	----
molybdenum, dissolved	7439-98-7	E469S	0.0001	mg/L	0.25 mg/L	96.9	80.0	120	----
nickel, dissolved	7440-02-0	E469S	0.0005	mg/L	0.5 mg/L	103	80.0	120	----
phosphorus, dissolved	7723-14-0	E469S	0.05	mg/L	10 mg/L	103	80.0	120	----
potassium, dissolved	7440-09-7	E469S	1	mg/L	50 mg/L	103	80.0	120	----
rhenium, dissolved	7440-15-5	E469S	0.0005	mg/L	0.1 mg/L	104	80.0	120	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report: Spike Concentration	Recovery (%) LCS	Recovery Limits (%) Low	Recovery Limits (%) High	Qualifier
Dissolved Metals (QCLot: 266700) - continued									
rubidium, dissolved	7440-17-7	E469S	0.005	mg/L	0.1 mg/L	102	80.0	120	----
selenium, dissolved	7782-49-2	E469S	0.0005	mg/L	1 mg/L	109	80.0	120	----
silver, dissolved	7440-22-4	E469S	0.0001	mg/L	0.1 mg/L	105	80.0	120	----
strontium, dissolved	7440-24-6	E469S	0.01	mg/L	0.25 mg/L	97.7	80.0	120	----
sulfur, dissolved	7704-34-9	E469S	5	mg/L	50 mg/L	# 76.8	80.0	120	MES
tellurium, dissolved	13494-80-9	E469S	0.0005	mg/L	0.1 mg/L	116	80.0	120	----
thallium, dissolved	7440-28-0	E469S	0.00005	mg/L	1 mg/L	110	80.0	120	----
thorium, dissolved	7440-29-1	E469S	0.0005	mg/L	0.1 mg/L	96.3	80.0	120	----
tin, dissolved	7440-31-5	E469S	0.001	mg/L	0.5 mg/L	98.7	80.0	120	----
titanium, dissolved	7440-32-6	E469S	0.005	mg/L	0.25 mg/L	97.9	80.0	120	----
tungsten, dissolved	7440-33-7	E469S	0.001	mg/L	0.1 mg/L	98.0	80.0	120	----
uranium, dissolved	7440-61-1	E469S	0.00005	mg/L	0.005 mg/L	99.8	80.0	120	----
vanadium, dissolved	7440-62-2	E469S	0.0005	mg/L	0.5 mg/L	97.7	80.0	120	----
yttrium, dissolved	7440-65-5	E469S	0.0005	mg/L	0.1 mg/L	96.8	80.0	120	----
zinc, dissolved	7440-66-6	E469S	0.001	mg/L	0.5 mg/L	104	80.0	120	----
zirconium, dissolved	7440-67-7	E469S	0.0005	mg/L	0.1 mg/L	102	80.0	120	----
silicon, dissolved	7440-21-3	E469S.NaSi	1	mg/L	10 mg/L	102	80.0	120	----
sodium, dissolved	17341-25-2	E469S.NaSi	2.5	mg/L	50 mg/L	101	80.0	120	----
mercury, dissolved	7439-97-6	E509S	0.000005	mg/L	0.0001 mg/L	89.9	80.0	120	----
Volatile Organic Compounds (QCLot: 271051)									
benzene	71-43-2	E611A	0.5	µg/L	100 µg/L	79.5	70.0	130	----
ethylbenzene	100-41-4	E611A	0.5	µg/L	100 µg/L	92.4	70.0	130	----
methyl-tert-butyl ether [MTBE]	1634-04-4	E611A	0.5	µg/L	100 µg/L	82.9	70.0	130	----
styrene	100-42-5	E611A	0.5	µg/L	100 µg/L	78.8	70.0	130	----
toluene	108-88-3	E611A	0.5	µg/L	100 µg/L	79.6	70.0	130	----
xylene, m+p-	179601-23-1	E611A	0.4	µg/L	200 µg/L	83.2	70.0	130	----
xylene, o-	95-47-6	E611A	0.3	µg/L	100 µg/L	90.0	70.0	130	----
Hydrocarbons (QCLot: 268261)									
F2 (C10-C16)	----	E601	100	µg/L	3538 µg/L	107	70.0	130	----
F3 (C16-C34)	----	E601	250	µg/L	7053 µg/L	102	70.0	130	----
F4 (C34-C50)	----	E601	250	µg/L	5051 µg/L	87.4	70.0	130	----
Hydrocarbons (QCLot: 268299)									
F2 (C10-C16)	----	E601	100	µg/L	3538 µg/L	100	70.0	130	----
F3 (C16-C34)	----	E601	250	µg/L	7053 µg/L	93.4	70.0	130	----
F4 (C34-C50)	----	E601	250	µg/L	5051 µg/L	95.7	70.0	130	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Spike Concentration	Recovery (%) LCS	Recovery Limits (%) Low	Recovery Limits (%) High	Qualifier
Hydrocarbons (QCLot: 271050)									
F1 (C6-C10)	----	E581.VH+F1	100	µg/L	6310 µg/L	97.2	70.0	130	----
VHw (C6-C10)	----	E581.VH+F1	100	µg/L	6310 µg/L	86.2	70.0	130	----
Polycyclic Aromatic Hydrocarbons (QCLot: 268258)									
acenaphthene	83-32-9	E641A	0.01	µg/L	0.5 µg/L	106	60.0	130	----
acenaphthylene	208-96-8	E641A	0.01	µg/L	0.5 µg/L	111	60.0	130	----
acridine	260-94-6	E641A	0.01	µg/L	0.5 µg/L	124	60.0	130	----
anthracene	120-12-7	E641A	0.01	µg/L	0.701 µg/L	87.3	60.0	130	----
benz(a)anthracene	56-55-3	E641A	0.01	µg/L	0.743 µg/L	87.8	60.0	130	----
benzo(a)pyrene	50-32-8	E641A	0.005	µg/L	0.5 µg/L	111	60.0	130	----
benzo(b+j)fluoranthene	----	E641A	0.01	µg/L	0.5 µg/L	84.3	60.0	130	----
benzo(g,h,i)perylene	191-24-2	E641A	0.01	µg/L	0.5 µg/L	114	60.0	130	----
benzo(k)fluoranthene	207-08-9	E641A	0.01	µg/L	0.5 µg/L	94.2	60.0	130	----
chrysene	218-01-9	E641A	0.01	µg/L	0.705 µg/L	85.9	60.0	130	----
dibenz(a,h)anthracene	53-70-3	E641A	0.005	µg/L	0.685 µg/L	87.9	60.0	130	----
fluoranthene	206-44-0	E641A	0.01	µg/L	0.681 µg/L	87.4	60.0	130	----
fluorene	86-73-7	E641A	0.01	µg/L	0.5 µg/L	116	60.0	130	----
indeno(1,2,3-c,d)pyrene	193-39-5	E641A	0.01	µg/L	0.749 µg/L	92.2	60.0	130	----
methylnaphthalene, 1-	90-12-0	E641A	0.01	µg/L	0.5 µg/L	98.5	60.0	130	----
methylnaphthalene, 2-	91-57-6	E641A	0.01	µg/L	0.5 µg/L	93.9	60.0	130	----
naphthalene	91-20-3	E641A	0.05	µg/L	0.5 µg/L	93.4	50.0	130	----
phenanthrene	85-01-8	E641A	0.02	µg/L	0.5 µg/L	117	60.0	130	----
pyrene	129-00-0	E641A	0.01	µg/L	0.705 µg/L	86.6	60.0	130	----
quinoline	6027-02-7	E641A	0.05	µg/L	0.5 µg/L	120	60.0	130	----
Polycyclic Aromatic Hydrocarbons (QCLot: 268298)									
acenaphthene	83-32-9	E641A	0.01	µg/L	0.5 µg/L	121	60.0	130	----
acenaphthylene	208-96-8	E641A	0.01	µg/L	0.5 µg/L	120	60.0	130	----
acridine	260-94-6	E641A	0.01	µg/L	0.5 µg/L	101	60.0	130	----
anthracene	120-12-7	E641A	0.01	µg/L	0.5 µg/L	115	60.0	130	----
benz(a)anthracene	56-55-3	E641A	0.01	µg/L	0.5 µg/L	106	60.0	130	----
benzo(a)pyrene	50-32-8	E641A	0.005	µg/L	0.5 µg/L	117	60.0	130	----
benzo(b+j)fluoranthene	----	E641A	0.01	µg/L	0.5 µg/L	99.8	60.0	130	----
benzo(g,h,i)perylene	191-24-2	E641A	0.01	µg/L	0.5 µg/L	126	60.0	130	----
benzo(k)fluoranthene	207-08-9	E641A	0.01	µg/L	0.5 µg/L	120	60.0	130	----
chrysene	218-01-9	E641A	0.01	µg/L	0.5 µg/L	130	60.0	130	----
dibenz(a,h)anthracene	53-70-3	E641A	0.005	µg/L	0.5 µg/L	108	60.0	130	----
fluoranthene	206-44-0	E641A	0.01	µg/L	0.5 µg/L	126	60.0	130	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Spike	Recovery (%)	Recovery Limits (%)		Qualifier
					Concentration	LCS	Low	High	
Polycyclic Aromatic Hydrocarbons (QCLot: 268298) - continued									
fluorene	86-73-7	E641A	0.01	µg/L	0.5 µg/L	125	60.0	130	----
indeno(1,2,3-c,d)pyrene	193-39-5	E641A	0.01	µg/L	0.5 µg/L	124	60.0	130	----
methylnaphthalene, 1-	90-12-0	E641A	0.01	µg/L	0.5 µg/L	122	60.0	130	----
methylnaphthalene, 2-	91-57-6	E641A	0.01	µg/L	0.5 µg/L	119	60.0	130	----
naphthalene	91-20-3	E641A	0.05	µg/L	0.5 µg/L	123	50.0	130	----
phenanthrene	85-01-8	E641A	0.02	µg/L	0.5 µg/L	106	60.0	130	----
pyrene	129-00-0	E641A	0.01	µg/L	0.5 µg/L	128	60.0	130	----
quinoline	6027-02-7	E641A	0.05	µg/L	0.5 µg/L	110	60.0	130	----

Laboratory Control Sample (LCS) Report

Qualifiers

Qualifier	Description
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).

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: 268403)										
VA21B6876-002	MP-06-WNW	ammonia, total (as N)	7664-41-7	E298	0.115 mg/L	0.1 mg/L	115	75.0	125	----
Anions and Nutrients (QCLot: 268404)										
VA21B6876-002	MP-06-WNW	Kjeldahl nitrogen, total [TKN]	----	E318S	2.95 mg/L	2.5 mg/L	118	70.0	130	----
Anions and Nutrients (QCLot: 272957)										
VA21B6250-002	Anonymous	bromide	24959-67-9	E235S.Br	48.2 mg/L	50 mg/L	96.5	75.0	125	----
Anions and Nutrients (QCLot: 272958)										
VA21B6250-002	Anonymous	chloride	16887-00-6	E235S.Cl	9670 mg/L	10000 mg/L	96.7	75.0	125	----
Anions and Nutrients (QCLot: 272959)										
VA21B6250-002	Anonymous	fluoride	16984-48-8	E235S.F-L	9.56 mg/L	10 mg/L	95.6	75.0	125	----
Anions and Nutrients (QCLot: 272960)										
VA21B6250-002	Anonymous	nitrate (as N)	14797-55-8	E235S.NO3-T	7.36 mg/L	7.5 mg/L	98.1	75.0	125	----
Anions and Nutrients (QCLot: 272961)										
VA21B6250-002	Anonymous	nitrite (as N)	14797-65-0	E235S.NO2-L	4.95 mg/L	5 mg/L	99.0	75.0	125	----
Anions and Nutrients (QCLot: 272962)										
VA21B6250-002	Anonymous	sulfate (as SO4)	14808-79-8	E235S.SO4-L	ND mg/L	1000 mg/L	ND	75.0	125	----
Anions and Nutrients (QCLot: 273053)										
VA21B6250-002	Anonymous	phosphorus, total	7723-14-0	E372S	0.0917 mg/L	0.1 mg/L	91.7	70.0	130	----
Organic / Inorganic Carbon (QCLot: 268402)										
VA21B6876-002	MP-06-WNW	carbon, total organic [TOC]	----	E355-L	5.07 mg/L	5 mg/L	101	70.0	130	----
Organic / Inorganic Carbon (QCLot: 272964)										
VA21B6250-002	Anonymous	carbon, dissolved organic [DOC]	----	E358-L	4.50 mg/L	5 mg/L	89.9	70.0	130	----
Total Metals (QCLot: 268622)										
VA21B6876-001	MP-06-Source	mercury, total	7439-97-6	E508S	0.0000948 mg/L	0.0001 mg/L	94.8	70.0	130	----
Total Metals (QCLot: 268818)										
VA21B6876-001	MP-06-Source	aluminum, total	7429-90-5	E468S	0.436 mg/L	0.4 mg/L	109	70.0	130	----
		antimony, total	7440-36-0	E468S	0.0381 mg/L	0.04 mg/L	95.3	70.0	130	----
		arsenic, total	7440-38-2	E468S	0.0364 mg/L	0.04 mg/L	91.1	70.0	130	----
		barium, total	7440-39-3	E468S	0.0402 mg/L	0.04 mg/L	100	70.0	130	----

Sub-Matrix: **Water**

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
					Concentration	Target	MS	Low	High	Qualifier
Total Metals (QCLot: 268818) - continued										
VA21B6876-001	MP-06-Source	beryllium, total	7440-41-7	E468S	0.0768 mg/L	0.08 mg/L	96.0	70.0	130	----
		bismuth, total	7440-69-9	E468S	0.0171 mg/L	0.02 mg/L	85.3	70.0	130	----
		boron, total	7440-42-8	E468S	ND mg/L	0.2 mg/L	ND	70.0	130	----
		cadmium, total	7440-43-9	E468S	0.00736 mg/L	0.008 mg/L	91.9	70.0	130	----
		calcium, total	7440-70-2	E468S	ND mg/L	8 mg/L	ND	70.0	130	----
		cesium, total	7440-46-2	E468S	0.0192 mg/L	0.02 mg/L	96.0	70.0	130	----
		chromium, total	7440-47-3	E468S	0.0802 mg/L	0.08 mg/L	100	70.0	130	----
		cobalt, total	7440-48-4	E468S	0.0382 mg/L	0.04 mg/L	95.4	70.0	130	----
		copper, total	7440-50-8	E468S	0.0356 mg/L	0.04 mg/L	89.0	70.0	130	----
		gallium, total	7440-55-3	E468S	0.00540 mg/L	0.005 mg/L	108	70.0	130	----
		iron, total	7439-89-6	E468S	3.99 mg/L	4 mg/L	99.7	70.0	130	----
		lead, total	7439-92-1	E468S	0.0350 mg/L	0.04 mg/L	87.6	70.0	130	----
		lithium, total	7439-93-2	E468S	0.162 mg/L	0.2 mg/L	81.1	70.0	130	----
		magnesium, total	7439-95-4	E468S	ND mg/L	2 mg/L	ND	70.0	130	----
		manganese, total	7439-96-5	E468S	0.0398 mg/L	0.04 mg/L	99.5	70.0	130	----
		molybdenum, total	7439-98-7	E468S	0.0393 mg/L	0.04 mg/L	98.4	70.0	130	----
		nickel, total	7440-02-0	E468S	0.0728 mg/L	0.08 mg/L	91.0	70.0	130	----
		phosphorus, total	7723-14-0	E468S	22.7 mg/L	20 mg/L	113	70.0	130	----
		potassium, total	7440-09-7	E468S	ND mg/L	8 mg/L	ND	70.0	130	----
		rhenium, total	7440-15-5	E468S	0.00497 mg/L	0.005 mg/L	99.5	70.0	130	----
		rubidium, total	7440-17-7	E468S	ND mg/L	0.04 mg/L	ND	70.0	130	----
		selenium, total	7782-49-2	E468S	0.0779 mg/L	0.08 mg/L	97.4	70.0	130	----
		silver, total	7440-22-4	E468S	0.00703 mg/L	0.008 mg/L	87.9	70.0	130	----
		strontium, total	7440-24-6	E468S	ND mg/L	0.04 mg/L	ND	70.0	130	----
		sulfur, total	7704-34-9	E468S	ND mg/L	40 mg/L	ND	70.0	130	----
		tellurium, total	13494-80-9	E468S	0.0735 mg/L	0.08 mg/L	91.9	70.0	130	----
		thallium, total	7440-28-0	E468S	0.00740 mg/L	0.008 mg/L	92.5	70.0	130	----
		thorium, total	7440-29-1	E468S	0.0374 mg/L	0.04 mg/L	93.5	70.0	130	----
		tin, total	7440-31-5	E468S	0.0377 mg/L	0.04 mg/L	94.3	70.0	130	----
		titanium, total	7440-32-6	E468S	0.0858 mg/L	0.08 mg/L	107	70.0	130	----
		tungsten, total	7440-33-7	E468S	0.0374 mg/L	0.04 mg/L	93.4	70.0	130	----
		uranium, total	7440-61-1	E468S	0.00664 mg/L	0.008 mg/L	83.0	70.0	130	----
		vanadium, total	7440-62-2	E468S	0.210 mg/L	0.2 mg/L	105	70.0	130	----
		yttrium, total	7440-65-5	E468S	0.00615 mg/L	0.005 mg/L	123	70.0	130	----
		zinc, total	7440-66-6	E468S	0.748 mg/L	0.8 mg/L	93.6	70.0	130	----
		zirconium, total	7440-67-7	E468S	0.0828 mg/L	0.08 mg/L	103	70.0	130	----

Sub-Matrix: **Water**

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
					Concentration	Target	MS	Low	High	Qualifier
Total Metals (QCLot: 268819)										
VA21B6876-001	MP-06-Source	silicon, total	7440-21-3	E468S.NaSi	495 mg/L	500 mg/L	99.0	70.0	130	----
		sodium, total	17341-25-2	E468S.NaSi	ND mg/L	100 mg/L	ND	70.0	130	----
Dissolved Metals (QCLot: 266700)										
VA21B6876-001	MP-06-Source	uranium, dissolved	7440-61-1	E469S	0.00708 mg/L	0.008 mg/L	88.5	70.0	130	----
VA21B6876-001	MP-06-Source	aluminum, dissolved	7429-90-5	E469S	0.419 mg/L	0.4 mg/L	105	70.0	130	----
		antimony, dissolved	7440-36-0	E469S	0.0385 mg/L	0.04 mg/L	96.2	70.0	130	----
		arsenic, dissolved	7440-38-2	E469S	0.0360 mg/L	0.04 mg/L	90.0	70.0	130	----
		barium, dissolved	7440-39-3	E469S	0.0367 mg/L	0.04 mg/L	91.6	70.0	130	----
		beryllium, dissolved	7440-41-7	E469S	0.0842 mg/L	0.08 mg/L	105	70.0	130	----
		bismuth, dissolved	7440-69-9	E469S	0.0166 mg/L	0.02 mg/L	83.0	70.0	130	----
		boron, dissolved	7440-42-8	E469S	ND mg/L	0.2 mg/L	ND	70.0	130	----
		cadmium, dissolved	7440-43-9	E469S	0.00680 mg/L	0.008 mg/L	85.0	70.0	130	----
		calcium, dissolved	7440-70-2	E469S	ND mg/L	8 mg/L	ND	70.0	130	----
		cesium, dissolved	7440-46-2	E469S	0.0197 mg/L	0.02 mg/L	98.5	70.0	130	----
		chromium, dissolved	7440-47-3	E469S	0.0790 mg/L	0.08 mg/L	98.7	70.0	130	----
		cobalt, dissolved	7440-48-4	E469S	0.0367 mg/L	0.04 mg/L	91.7	70.0	130	----
		copper, dissolved	7440-50-8	E469S	0.0341 mg/L	0.04 mg/L	85.3	70.0	130	----
		gallium, dissolved	7440-55-3	E469S	0.00508 mg/L	0.005 mg/L	102	70.0	130	----
		iron, dissolved	7439-89-6	E469S	3.70 mg/L	4 mg/L	92.6	70.0	130	----
		lead, dissolved	7439-92-1	E469S	0.0342 mg/L	0.04 mg/L	85.4	70.0	130	----
		lithium, dissolved	7439-93-2	E469S	0.201 mg/L	0.2 mg/L	100	70.0	130	----
		magnesium, dissolved	7439-95-4	E469S	ND mg/L	2 mg/L	ND	70.0	130	----
		manganese, dissolved	7439-96-5	E469S	0.0400 mg/L	0.04 mg/L	99.9	70.0	130	----
		molybdenum, dissolved	7439-98-7	E469S	0.0389 mg/L	0.04 mg/L	97.2	70.0	130	----
		nickel, dissolved	7440-02-0	E469S	0.0705 mg/L	0.08 mg/L	88.2	70.0	130	----
		phosphorus, dissolved	7723-14-0	E469S	22.1 mg/L	20 mg/L	110	70.0	130	----
		potassium, dissolved	7440-09-7	E469S	ND mg/L	8 mg/L	ND	70.0	130	----
		rhenium, dissolved	7440-15-5	E469S	0.00493 mg/L	0.005 mg/L	98.7	70.0	130	----
		rubidium, dissolved	7440-17-7	E469S	ND mg/L	0.04 mg/L	ND	70.0	130	----
		selenium, dissolved	7782-49-2	E469S	0.0726 mg/L	0.08 mg/L	90.8	70.0	130	----
		silver, dissolved	7440-22-4	E469S	0.00715 mg/L	0.008 mg/L	89.4	70.0	130	----
		strontium, dissolved	7440-24-6	E469S	ND mg/L	0.04 mg/L	ND	70.0	130	----
		sulfur, dissolved	7704-34-9	E469S	ND mg/L	40 mg/L	ND	70.0	130	----
		tellurium, dissolved	13494-80-9	E469S	0.0661 mg/L	0.08 mg/L	82.6	70.0	130	----
		thallium, dissolved	7440-28-0	E469S	0.00705 mg/L	0.008 mg/L	88.1	70.0	130	----
		thorium, dissolved	7440-29-1	E469S	0.0394 mg/L	0.04 mg/L	98.6	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Dissolved Metals (QCLot: 266700) - continued										
VA21B6876-001	MP-06-Source	tin, dissolved	7440-31-5	E469S	0.0370 mg/L	0.04 mg/L	92.5	70.0	130	----
		titanium, dissolved	7440-32-6	E469S	0.0827 mg/L	0.08 mg/L	103	70.0	130	----
		tungsten, dissolved	7440-33-7	E469S	0.0365 mg/L	0.04 mg/L	91.3	70.0	130	----
		vanadium, dissolved	7440-62-2	E469S	0.204 mg/L	0.2 mg/L	102	70.0	130	----
		yttrium, dissolved	7440-65-5	E469S	0.00598 mg/L	0.005 mg/L	120	70.0	130	----
		zinc, dissolved	7440-66-6	E469S	0.658 mg/L	0.8 mg/L	82.2	70.0	130	----
		zirconium, dissolved	7440-67-7	E469S	0.0862 mg/L	0.08 mg/L	108	70.0	130	----
Dissolved Metals (QCLot: 266701)										
VA21B6876-001	MP-06-Source	silicon, dissolved	7440-21-3	E469S.NaSi	475 mg/L	500 mg/L	95.1	70.0	130	----
		sodium, dissolved	17341-25-2	E469S.NaSi	ND mg/L	100 mg/L	ND	70.0	130	----
Dissolved Metals (QCLot: 268973)										
VA21B6876-002	MP-06-WNW	mercury, dissolved	7439-97-6	E509S	0.0000769 mg/L	0.0001 mg/L	76.9	70.0	130	----
Volatile Organic Compounds (QCLot: 271051)										
VA21B6876-006	MP-05-Source	benzene	71-43-2	E611A	80.4 µg/L	100 µg/L	80.4	60.0	140	----
		ethylbenzene	100-41-4	E611A	86.9 µg/L	100 µg/L	86.9	60.0	140	----
		methyl-tert-butyl ether [MTBE]	1634-04-4	E611A	83.2 µg/L	100 µg/L	83.2	60.0	140	----
		styrene	100-42-5	E611A	75.4 µg/L	100 µg/L	75.4	60.0	140	----
		toluene	108-88-3	E611A	74.9 µg/L	100 µg/L	74.9	60.0	140	----
		xylene, m+p-	179601-23-1	E611A	154 µg/L	200 µg/L	77.1	60.0	140	----
		xylene, o-	95-47-6	E611A	85.4 µg/L	100 µg/L	85.4	60.0	140	----
Hydrocarbons (QCLot: 271050)										
VA21B6876-004	MP-06-ENE	F1 (C6-C10)	----	E581.VH+F1	4530 µg/L	6310 µg/L	71.8	60.0	140	----
		VHw (C6-C10)	----	E581.VH+F1	4000 µg/L	6310 µg/L	63.4	60.0	140	----

16°C

Chain of Custody (COC) / Analytical Request Form

ALS www.alsglobal.com

Canada Toll Free: 1 800 668 9878

COC Number: 20 - 920779

Page

Environmental Division
Vancouver
Work Order Reference
VA21B6876

Telephone : +1 604 253 4188

Report To	Contact and company name below will appear on the final report
Company:	Golder Associates Ltd.
Contact:	Trish Tomliens / Elaine Irving
Phone:	1 (250) 881 7372
	Company address below will appear on the final report
Street:	200-2920 Virtual way
City/Province:	Vancouver, BC
Postal Code:	V5M 0C4
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	
Contact:	

Reports / Recipients

Select Report Format: ☑ PDF ☑ EXCEL ☐ EDD (DIGITAL)
Merge QC/QCI Reports with COA ☑ YES ☐ NO ☐ N/A
☐ Compare Results to Criteria on Report - provide details below if box checked
Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax: Patricia_Tomliens@golder.com
Email 2: Elaine_Irving@golder.com
Email 3:

Invoice Recipients

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax:
Email 2:

Turnaround Time (TAT) Requested

☑ Routine [R] if received by 3pm M-F - no surcharges apply
☐ 4 day [P4] if received by 3pm M-F - 20% rush surcharge minimum
☐ 3 day [P3] if received by 3pm M-F - 25% rush surcharge minimum
☐ 2 day [P2] if received by 3pm M-F - 50% rush surcharge minimum
☐ 1 day [E] if received by 3pm M-F - 100% rush surcharge minimum
☐ Same day [E2] if received by 10am M-S - 200% rush surcharge. Additiona may apply to rush requests on weekends, statutory holidays and non-routin

Date and Time Required for all E&P TATs:

For all tests with rush TATs requested, please cont

Project Information

ALS Account # / Quote #:
Job #:
PO / AFE:
LSD:

ALS Lab Work Order # (ALS use only): 6876

Oil and Gas Required Fields (client use)

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

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

ALS Sample # (ALS use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	General (pH, alkalinity, TDS, turbidity, Conductivity)	Dissolved metals (F/P)	Total metals (P)	Dissolved mercury (F/P)	Total Mercury (P)	Total nutrients (P)	TOC, TKN (P)	BTEX/F1 (P)	F2-F4, PAH (P)	SAMPLES ON HOLD	EXTENDED STORAGE REQUIRED	SUSPECTED HAZARD (see notes)
1	MP-06-Source	08-AUG-21	15:10	Seawater	10	X	X	X	X	X	X	X	X	X			
2	MP-06-WNW	08-AUG-21	15:35	Seawater	6	X	X	X	X	X	X	X					
3	MP-06-North	08-AUG-21	15:55	Seawater	6	X	X	X	X	X	X	X					
4	MP-06-ENE	08-AUG-21	16:10	Seawater	10	X	X	X	X	X	X	X	X	X			
5	MP-05-ENE	08-AUG-21	17:10	Seawater	6	X	X	X	X	X	X	X					
6	MP-05-Source	08-AUG-21	17:16	Seawater	10	X	X	X	X	X	X	X	X	X			
7	MP05-North	08-AUG-21	17:23	Seawater	10	X	X	X	X	X	X	X	X	X			
8	MP-05-WNW	08-AUG-21	17:32	Seawater	6	X	X	X	X	X	X	X					
9	DUP-B	08-AUG-21		Seawater	10	X	X	X	X	X	X	X	X	X			
10																	

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)

Temp 16°C in cooler. Changed ice in both coolers. Transported 2 coolers from LUX to FedEx in Mtl.

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: 6 7

SHIPMENT RELEASE (client use)		INITIAL SHIPMENT RECEPTION (ALS use only)			FINAL SHIPMENT RECEPTION (ALS use only)		
Released by: Jeremy Corbin	Date: Aug 8, 21 Time:	Received by: Emily Charny Tissier	Date: Aug 11, 2021	Time: 2:39 pm	Received by: JC ice cube	Date: AUG 12 2021	Time: 9:20 AM

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

AUG 12 2021

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.

AUG 2020 FRONT

CERTIFICATE OF ANALYSIS

Work Order	: **VA21B7536**	Page	: 1 of 6
Client	: **Golder Associates Ltd.**	Laboratory	: Vancouver - Environmental
Contact	: Elaine Irving	Account Manager	: Amber Springer
Address	: 200-2920 Virtual Way Vancouver BC Canada V5M 0C4	Address	: 8081 Lougheed Highway Burnaby BC Canada V5A 1W9
Telephone	: ----	Telephone	: +1 604 253 4188
Project	: 1663724-44000-03	Date Samples Received	: 19-Aug-2021 08:25
PO	: ----	Date Analysis Commenced	: 19-Aug-2021
C-O-C number	: 20-920783	Issue Date	: 01-Sep-2021 10:04
Sampler	: ----		
Site	: ----		
Quote number	: Q84262		
No. of samples received	: 3		
No. of samples analysed	: 3		

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	*Position*	*Laboratory Department*
Angela Ren	Team Leader - Metals	Metals, Burnaby, British Columbia
Angelo Salandanan	Lab Assistant	Metals, Burnaby, British Columbia
Caleb Deroche	Lab Analyst	Metals, Burnaby, British Columbia
Dee Lee	Analyst	Metals, Burnaby, British Columbia
Kevin Duarte	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics, Burnaby, British Columbia
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*
-	No Unit
µS/cm	Microsiemens per centimetre
mg/L	milligrams per litre
NTU	nephelometric turbidity units
pH units	pH units
psu	practical salinity 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: **Seawater**

(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	TR Ref1	TR Ref2	DUP-D	----	----
				Client sampling date / time	15-Aug-2021 14:30	15-Aug-2021 17:00	15-Aug-2021	----	----
					VA21B7536-001	VA21B7536-002	VA21B7536-003	--------	--------
					Result	Result	Result	----	----
Physical Tests									
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	93.4	93.7	92.4	----	----
conductivity	----	E100S	2.0	µS/cm	36900	38100	37300	----	----
hardness (as CaCO3), dissolved	----	EC100	0.50	mg/L	4300	4460	4250	----	----
pH	----	E108	0.10	pH units	7.89	7.89	7.90	----	----
salinity	----	EC100S	1.0	psu	22.8	23.6	23.1	----	----
solids, total dissolved [TDS]	----	E162S	10	mg/L	27600	28000	25600	----	----
solids, total suspended [TSS]	----	E160S	2.0	mg/L	<2.0	<2.0	<2.0	----	----
turbidity	----	E121	0.10	NTU	1.45	0.68	0.67	----	----
Anions and Nutrients									
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	<0.0050	<0.0050	<0.0050	----	----
bromide	24959-67-9	E235S.Br	5.0	mg/L	44.5	44.6	42.6	----	----
chloride	16887-00-6	E235S.Cl	50	mg/L	13000	13100	12600	----	----
fluoride	16984-48-8	E235S.F-L	0.20	mg/L	0.56	0.61	0.60	----	----
Kjeldahl nitrogen, total [TKN]	----	E318S	0.050	mg/L	0.068	0.065	0.073	----	----
nitrate (as N)	14797-55-8	E235S.NO3-T	0.010	mg/L	<0.010	<0.010	0.018	----	----
nitrite (as N)	14797-65-0	E235S.NO2-L	0.010	mg/L	<0.010	<0.010	<0.010	----	----
phosphorus, total	7723-14-0	E372S	0.0020	mg/L	0.0130	0.0135	0.0118	----	----
sulfate (as SO4)	14808-79-8	E235S.SO4-L	3.0	mg/L	1790	1840	1790	----	----
Organic / Inorganic Carbon									
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	1.13	1.10	0.95	----	----
carbon, total organic [TOC]	----	E355-L	0.50	mg/L	0.81	0.81	0.79	----	----
Total Metals									
aluminum, total	7429-90-5	E468S	0.0050	mg/L	0.0161	0.0353	0.0171	----	----
antimony, total	7440-36-0	E468S	0.0010	mg/L	<0.0010	<0.0010	<0.0010	----	----
arsenic, total	7440-38-2	E468S	0.00040	mg/L	0.00108	0.00106	0.00106	----	----
barium, total	7440-39-3	E468S	0.0010	mg/L	0.0078	0.0078	0.0079	----	----
beryllium, total	7440-41-7	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	----	----
bismuth, total	7440-69-9	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	----	----
boron, total	7440-42-8	E468S	0.30	mg/L	2.95	3.02	3.02	----	----
cadmium, total	7440-43-9	E468S	0.000010	mg/L	0.000031	0.000030	0.000030	----	----

Analytical Results

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

				Client sample ID	TR Ref1	TR Ref2	DUP-D	----	----
				Client sampling date / time	15-Aug-2021 14:30	15-Aug-2021 17:00	15-Aug-2021	----	----
Analyte	CAS Number	Method	LOR	Unit	VA21B7536-001	VA21B7536-002	VA21B7536-003	--------	--------
					Result	Result	Result	----	----
Total Metals									
calcium, total	7440-70-2	E468S	1.0	mg/L	309	324	311	----	----
cesium, total	7440-46-2	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	----	----
chromium, total	7440-47-3	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	----	----
cobalt, total	7440-48-4	E468S	0.000050	mg/L	<0.000050	<0.000050	<0.000050	----	----
copper, total	7440-50-8	E468S	0.00050	mg/L	0.00131	0.00059	0.00131	----	----
gallium, total	7440-55-3	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	----	----
iron, total	7439-89-6	E468S	0.010	mg/L	0.013	0.016	0.014	----	----
lead, total	7439-92-1	E468S	0.000050	mg/L	<0.000050	<0.000050	<0.000050	----	----
lithium, total	7439-93-2	E468S	0.020	mg/L	0.138	0.142	0.137	----	----
magnesium, total	7439-95-4	E468S	1.0	mg/L	928	942	951	----	----
manganese, total	7439-96-5	E468S	0.00020	mg/L	0.00110	0.00115	0.00113	----	----
mercury, total	7439-97-6	E508S	0.0000050	mg/L	<0.0000050	<0.0000050	<0.0000050	----	----
molybdenum, total	7439-98-7	E468S	0.00010	mg/L	0.00770	0.00782	0.00765	----	----
nickel, total	7440-02-0	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	----	----
phosphorus, total	7723-14-0	E468S	0.050	mg/L	<0.050	<0.050	<0.050	----	----
potassium, total	7440-09-7	E468S	1.0	mg/L	332	349	352	----	----
rhenium, total	7440-15-5	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	----	----
rubidium, total	7440-17-7	E468S	0.0050	mg/L	0.0854	0.0863	0.0899	----	----
selenium, total	7782-49-2	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	----	----
silicon, total	7440-21-3	E468S.NaSi	1.0	mg/L	<1.0	<1.0	<1.0	----	----
silver, total	7440-22-4	E468S	0.00010	mg/L	<0.00010	<0.00010	<0.00010	----	----
sodium, total	17341-25-2	E468S.NaSi	2.5	mg/L	6820	6970	6710	----	----
strontium, total	7440-24-6	E468S	0.010	mg/L	5.12	5.44	5.33	----	----
sulfur, total	7704-34-9	E468S	5.0	mg/L	875	896	863	----	----
tellurium, total	13494-80-9	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	----	----
thallium, total	7440-28-0	E468S	0.000050	mg/L	<0.000050	<0.000050	<0.000050	----	----
thorium, total	7440-29-1	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	----	----
tin, total	7440-31-5	E468S	0.0010	mg/L	<0.0010	<0.0010	<0.0010	----	----
titanium, total	7440-32-6	E468S	0.0050	mg/L	<0.0050	<0.0050	<0.0050	----	----
tungsten, total	7440-33-7	E468S	0.0010	mg/L	<0.0010	<0.0010	<0.0010	----	----
uranium, total	7440-61-1	E468S	0.000050	mg/L	0.00213	0.00215	0.00212	----	----

Analytical Results

Sub-Matrix: **Seawater**

(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	TR Ref1	TR Ref2	DUP-D	----	----
				Client sampling date / time	15-Aug-2021 14:30	15-Aug-2021 17:00	15-Aug-2021	----	----
					VA21B7536-001	VA21B7536-002	VA21B7536-003	--------	--------
					Result	Result	Result	----	----
Total Metals									
vanadium, total	7440-62-2	E468S	0.00050	mg/L	0.00112	0.00116	0.00117	----	----
yttrium, total	7440-65-5	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	----	----
zinc, total	7440-66-6	E468S	0.0030	mg/L	<0.0030	<0.0030	<0.0030	----	----
zirconium, total	7440-67-7	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	----	----
Dissolved Metals									
aluminum, dissolved	7429-90-5	E469S	0.0050	mg/L	<0.0050	<0.0050	<0.0050	----	----
antimony, dissolved	7440-36-0	E469S	0.0010	mg/L	<0.0010	<0.0010	<0.0010	----	----
arsenic, dissolved	7440-38-2	E469S	0.00040	mg/L	0.00107	0.00111	0.00100	----	----
barium, dissolved	7440-39-3	E469S	0.0010	mg/L	0.0071	0.0074	0.0071	----	----
beryllium, dissolved	7440-41-7	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	----	----
bismuth, dissolved	7440-69-9	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	----	----
boron, dissolved	7440-42-8	E469S	0.30	mg/L	2.86	2.98	2.89	----	----
cadmium, dissolved	7440-43-9	E469S	0.000010	mg/L	0.000028	0.000029	0.000022	----	----
calcium, dissolved	7440-70-2	E469S	1.0	mg/L	279	288	284	----	----
cesium, dissolved	7440-46-2	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	----	----
chromium, dissolved	7440-47-3	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	----	----
cobalt, dissolved	7440-48-4	E469S	0.000050	mg/L	<0.000050	<0.000050	<0.000050	----	----
copper, dissolved	7440-50-8	E469S	0.00020	mg/L	0.00036	0.00044	0.00023	----	----
gallium, dissolved	7440-55-3	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	----	----
iron, dissolved	7439-89-6	E469S	0.010	mg/L	<0.010	<0.010	<0.010	----	----
lead, dissolved	7439-92-1	E469S	0.000050	mg/L	<0.000050	<0.000050	<0.000050	----	----
lithium, dissolved	7439-93-2	E469S	0.020	mg/L	0.122	0.125	0.120	----	----
magnesium, dissolved	7439-95-4	E469S	1.0	mg/L	876	908	860	----	----
manganese, dissolved	7439-96-5	E469S	0.00010	mg/L	0.00082	0.00077	0.00076	----	----
mercury, dissolved	7439-97-6	E509S	0.0000050	mg/L	<0.0000050	<0.0000050	<0.0000050	----	----
molybdenum, dissolved	7439-98-7	E469S	0.00010	mg/L	0.00750	0.00765	0.00763	----	----
nickel, dissolved	7440-02-0	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	----	----
phosphorus, dissolved	7723-14-0	E469S	0.050	mg/L	<0.050	<0.050	<0.050	----	----
potassium, dissolved	7440-09-7	E469S	1.0	mg/L	291	304	285	----	----
rhenium, dissolved	7440-15-5	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	----	----
rubidium, dissolved	7440-17-7	E469S	0.0050	mg/L	0.0790	0.0827	0.0774	----	----

Analytical Results

Sub-Matrix: **Seawater**

(Matrix: **Water**)

				Client sample ID	TR Ref1	TR Ref2	DUP-D	----	----
				Client sampling date / time	15-Aug-2021 14:30	15-Aug-2021 17:00	15-Aug-2021	----	----
Analyte	CAS Number	Method	LOR	Unit	VA21B7536-001	VA21B7536-002	VA21B7536-003	--------	--------
					Result	Result	Result	----	----
Dissolved Metals									
selenium, dissolved	7782-49-2	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	----	----
silicon, dissolved	7440-21-3	E469S.NaSi	1.0	mg/L	<1.0	<1.0	<1.0	----	----
silver, dissolved	7440-22-4	E469S	0.00010	mg/L	<0.00010	<0.00010	<0.00010	----	----
sodium, dissolved	17341-25-2	E469S.NaSi	2.5	mg/L	6720	7010	6670	----	----
strontium, dissolved	7440-24-6	E469S	0.010	mg/L	5.30	5.33	5.27	----	----
sulfur, dissolved	7704-34-9	E469S	5.0	mg/L	702	737	726	----	----
tellurium, dissolved	13494-80-9	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	----	----
thallium, dissolved	7440-28-0	E469S	0.000050	mg/L	<0.000050	<0.000050	<0.000050	----	----
thorium, dissolved	7440-29-1	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	----	----
tin, dissolved	7440-31-5	E469S	0.0010	mg/L	<0.0010	<0.0010	<0.0010	----	----
titanium, dissolved	7440-32-6	E469S	0.0050	mg/L	<0.0050	<0.0050	<0.0050	----	----
tungsten, dissolved	7440-33-7	E469S	0.0010	mg/L	<0.0010	<0.0010	<0.0010	----	----
uranium, dissolved	7440-61-1	E469S	0.000050	mg/L	0.00215	0.00219	0.00216	----	----
vanadium, dissolved	7440-62-2	E469S	0.00050	mg/L	0.00108	0.00105	0.00097	----	----
yttrium, dissolved	7440-65-5	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	----	----
zinc, dissolved	7440-66-6	E469S	0.0010	mg/L	<0.0010	<0.0010	<0.0010	----	----
zirconium, dissolved	7440-67-7	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	----	----
dissolved mercury filtration location	----	EP509	-	-	Field	Field	Field	----	----
dissolved metals filtration location	----	EP421	-	-	Field	Field	Field	----	----

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

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **VA21B7536**	Page	: 1 of 16
Client	: **Golder Associates Ltd.**	Laboratory	: Vancouver - Environmental
Contact	: Elaine Irving	Account Manager	: Amber Springer
Address	: 200-2920 Virtual Way Vancouver BC Canada V5M 0C4	Address	: 8081 Lougheed Highway Burnaby, British Columbia Canada V5A 1W9
Telephone	: ----	Telephone	: +1 604 253 4188
Project	: 1663724-44000-03	Date Samples Received	: 19-Aug-2021 08:25
PO	: ----	Issue Date	: 01-Sep-2021 10:04
C-O-C number	: 20-920783		
Sampler	: ----		
Site	: ----		
Quote number	: Q84262		
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 Services number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

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	*Method*	*Sampling Date*	*Extraction / Preparation*				*Analysis*			
Container / Client Sample ID(s)			*Preparation Date*	*Holding Times Rec*	*Holding Times Actual*	*Eval*	*Analysis Date*	*Holding Times Rec*	*Holding Times Actual*	*Eval*
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) DUP-D	E298	15-Aug-2021	25-Aug-2021	----	----		25-Aug-2021	28 days	10 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) TR Ref1	E298	15-Aug-2021	25-Aug-2021	----	----		25-Aug-2021	28 days	10 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) TR Ref2	E298	15-Aug-2021	25-Aug-2021	----	----		25-Aug-2021	28 days	10 days	✓
Anions and Nutrients : Bromide in Seawater by IC										
HDPE DUP-D	E235S.Br	15-Aug-2021	----	----	----		21-Aug-2021	28 days	5 days	✓
Anions and Nutrients : Bromide in Seawater by IC										
HDPE TR Ref1	E235S.Br	15-Aug-2021	----	----	----		21-Aug-2021	28 days	5 days	✓
Anions and Nutrients : Bromide in Seawater by IC										
HDPE TR Ref2	E235S.Br	15-Aug-2021	----	----	----		21-Aug-2021	28 days	5 days	✓
Anions and Nutrients : Chloride in Seawater by IC										
HDPE DUP-D	E235S.Cl	15-Aug-2021	----	----	----		21-Aug-2021	28 days	5 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 : Chloride in Seawater by IC										
HDPE TR Ref1	E235S.Cl	15-Aug-2021	----	----	----		21-Aug-2021	28 days	5 days	✓
Anions and Nutrients : Chloride in Seawater by IC										
HDPE TR Ref2	E235S.Cl	15-Aug-2021	----	----	----		21-Aug-2021	28 days	5 days	✓
Anions and Nutrients : Fluoride in Seawater by IC (Low Level)										
HDPE DUP-D	E235S.F-L	15-Aug-2021	----	----	----		21-Aug-2021	28 days	5 days	✓
Anions and Nutrients : Fluoride in Seawater by IC (Low Level)										
HDPE TR Ref1	E235S.F-L	15-Aug-2021	----	----	----		21-Aug-2021	28 days	5 days	✓
Anions and Nutrients : Fluoride in Seawater by IC (Low Level)										
HDPE TR Ref2	E235S.F-L	15-Aug-2021	----	----	----		21-Aug-2021	28 days	5 days	✓
Anions and Nutrients : Nitrate in Seawater by IC (Trace Level)										
HDPE TR Ref2	E235S.NO3-T	15-Aug-2021	----	----	----		21-Aug-2021	3 days	5 days	× EHTL
Anions and Nutrients : Nitrate in Seawater by IC (Trace Level)										
HDPE DUP-D	E235S.NO3-T	15-Aug-2021	----	----	----		21-Aug-2021	3 days	5 days	× EHTR
Anions and Nutrients : Nitrate in Seawater by IC (Trace Level)										
HDPE TR Ref1	E235S.NO3-T	15-Aug-2021	----	----	----		21-Aug-2021	3 days	5 days	× EHTR
Anions and Nutrients : Nitrite in Seawater by IC (Low Level)										
HDPE TR Ref2	E235S.NO2-L	15-Aug-2021	----	----	----		21-Aug-2021	3 days	5 days	× EHTL

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 Seawater by IC (Low Level)										
HDPE DUP-D	E235S.NO2-L	15-Aug-2021	----	----	----		21-Aug-2021	3 days	5 days	✘ EHTR
Anions and Nutrients : Nitrite in Seawater by IC (Low Level)										
HDPE TR Ref1	E235S.NO2-L	15-Aug-2021	----	----	----		21-Aug-2021	3 days	5 days	✘ EHTR
Anions and Nutrients : Sulfate in Seawater by IC (Low Level)										
HDPE DUP-D	E235S.SO4-L	15-Aug-2021	----	----	----		21-Aug-2021	----	5 days	
Anions and Nutrients : Sulfate in Seawater by IC (Low Level)										
HDPE TR Ref1	E235S.SO4-L	15-Aug-2021	----	----	----		21-Aug-2021	----	5 days	
Anions and Nutrients : Sulfate in Seawater by IC (Low Level)										
HDPE TR Ref2	E235S.SO4-L	15-Aug-2021	----	----	----		21-Aug-2021	----	5 days	
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence										
Amber glass total (sulfuric acid) DUP-D	E318S	15-Aug-2021	25-Aug-2021	----	----		29-Aug-2021	28 days	14 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence										
Amber glass total (sulfuric acid) TR Ref1	E318S	15-Aug-2021	25-Aug-2021	----	----		29-Aug-2021	28 days	14 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence										
Amber glass total (sulfuric acid) TR Ref2	E318S	15-Aug-2021	25-Aug-2021	----	----		29-Aug-2021	28 days	14 days	✓
Anions and Nutrients : Total Phosphorus in Seawater by Colourimetry										
Amber glass total (sulfuric acid) DUP-D	E372S	15-Aug-2021	25-Aug-2021	----	----		26-Aug-2021	28 days	11 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis: Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Total Phosphorus in Seawater by Colourimetry										
Amber glass total (sulfuric acid) TR Ref1	E372S	15-Aug-2021	25-Aug-2021	----	----		26-Aug-2021	28 days	11 days	✓
Anions and Nutrients : Total Phosphorus in Seawater by Colourimetry										
Amber glass total (sulfuric acid) TR Ref2	E372S	15-Aug-2021	25-Aug-2021	----	----		26-Aug-2021	28 days	11 days	✓
Dissolved Metals : Dissolved Mercury in Seawater by CVAAS										
Glass vial dissolved (hydrochloric acid) DUP-D	E509S	15-Aug-2021	25-Aug-2021	----	----		25-Aug-2021	28 days	10 days	✓
Dissolved Metals : Dissolved Mercury in Seawater by CVAAS										
Glass vial dissolved (hydrochloric acid) TR Ref1	E509S	15-Aug-2021	25-Aug-2021	----	----		25-Aug-2021	28 days	10 days	✓
Dissolved Metals : Dissolved Mercury in Seawater by CVAAS										
Glass vial dissolved (hydrochloric acid) TR Ref2	E509S	15-Aug-2021	25-Aug-2021	----	----		25-Aug-2021	28 days	10 days	✓
Dissolved Metals : Dissolved Metals in Seawater by CRC ICPMS (HMI)										
HDPE dissolved (nitric acid) DUP-D	E469S	15-Aug-2021	25-Aug-2021	----	----		25-Aug-2021	180 days	10 days	✓
Dissolved Metals : Dissolved Metals in Seawater by CRC ICPMS (HMI)										
HDPE dissolved (nitric acid) TR Ref1	E469S	15-Aug-2021	25-Aug-2021	----	----		25-Aug-2021	180 days	10 days	✓
Dissolved Metals : Dissolved Metals in Seawater by CRC ICPMS (HMI)										
HDPE dissolved (nitric acid) TR Ref2	E469S	15-Aug-2021	25-Aug-2021	----	----		25-Aug-2021	180 days	9 days	✓
Dissolved Metals : Dissolved Sodium and Silicon in Seawater by CRC ICPMS										
HDPE dissolved (nitric acid) TR Ref2	E469S.NaSi	15-Aug-2021	25-Aug-2021	----	----		25-Aug-2021	180 days	10 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Dissolved Metals : Dissolved Sodium and Silicon in Seawater by CRC ICPMS										
HDPE dissolved (nitric acid) DUP-D	E469S.NaSi	15-Aug-2021	25-Aug-2021	----	----		25-Aug-2021	180 days	11 days	✓
Dissolved Metals : Dissolved Sodium and Silicon in Seawater by CRC ICPMS										
HDPE dissolved (nitric acid) TR Ref1	E469S.NaSi	15-Aug-2021	25-Aug-2021	----	----		25-Aug-2021	180 days	11 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (lab preserved) TR Ref2	E358-L	15-Aug-2021	25-Aug-2021	3 days	10 days	✖ EHTL	26-Aug-2021	28 days	0 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (lab preserved) DUP-D	E358-L	15-Aug-2021	25-Aug-2021	3 days	10 days	✖ EHTR	26-Aug-2021	28 days	0 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (lab preserved) TR Ref1	E358-L	15-Aug-2021	25-Aug-2021	3 days	10 days	✖ EHTR	26-Aug-2021	28 days	0 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) DUP-D	E355-L	15-Aug-2021	25-Aug-2021	----	----		25-Aug-2021	28 days	10 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) TR Ref1	E355-L	15-Aug-2021	25-Aug-2021	----	----		25-Aug-2021	28 days	10 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) TR Ref2	E355-L	15-Aug-2021	25-Aug-2021	----	----		25-Aug-2021	28 days	10 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE DUP-D	E290	15-Aug-2021	----	----	----		20-Aug-2021	14 days	5 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Physical Tests : Alkalinity Species by Titration										
HDPE TR Ref1	E290	15-Aug-2021	----	----	----		20-Aug-2021	14 days	5 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE TR Ref2	E290	15-Aug-2021	----	----	----		20-Aug-2021	14 days	5 days	✓
Physical Tests : Conductivity in Seawater										
HDPE DUP-D	E100S	15-Aug-2021	----	----	----		20-Aug-2021	28 days	5 days	✓
Physical Tests : Conductivity in Seawater										
HDPE TR Ref1	E100S	15-Aug-2021	----	----	----		20-Aug-2021	28 days	5 days	✓
Physical Tests : Conductivity in Seawater										
HDPE TR Ref2	E100S	15-Aug-2021	----	----	----		20-Aug-2021	28 days	5 days	✓
Physical Tests : pH by Meter										
HDPE TR Ref2	E108	15-Aug-2021	----	----	----		20-Aug-2021	0.25 hrs	108 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE DUP-D	E108	15-Aug-2021	----	----	----		20-Aug-2021	0.25 hrs	110 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE TR Ref1	E108	15-Aug-2021	----	----	----		20-Aug-2021	0.25 hrs	111 hrs	× EHTR-FM
Physical Tests : TDS by Gravimetry (Seawater)										
HDPE DUP-D	E162S	15-Aug-2021	----	----	----		21-Aug-2021	7 days	6 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Physical Tests : TDS by Gravimetry (Seawater)										
HDPE TR Ref1	E162S	15-Aug-2021	----	----	----		21-Aug-2021	7 days	6 days	✓
Physical Tests : TDS by Gravimetry (Seawater)										
HDPE TR Ref2	E162S	15-Aug-2021	----	----	----		21-Aug-2021	7 days	6 days	✓
Physical Tests : TSS by Gravimetry (Seawater)										
HDPE DUP-D	E160S	15-Aug-2021	----	----	----		20-Aug-2021	7 days	5 days	✓
Physical Tests : TSS by Gravimetry (Seawater)										
HDPE TR Ref1	E160S	15-Aug-2021	----	----	----		20-Aug-2021	7 days	5 days	✓
Physical Tests : TSS by Gravimetry (Seawater)										
HDPE TR Ref2	E160S	15-Aug-2021	----	----	----		20-Aug-2021	7 days	5 days	✓
Physical Tests : Turbidity by Nephelometry										
HDPE TR Ref2	E121	15-Aug-2021	----	----	----		24-Aug-2021	3 days	9 days	× EHTL
Physical Tests : Turbidity by Nephelometry										
HDPE DUP-D	E121	15-Aug-2021	----	----	----		24-Aug-2021	3 days	9 days	× EHTR
Physical Tests : Turbidity by Nephelometry										
HDPE TR Ref1	E121	15-Aug-2021	----	----	----		24-Aug-2021	3 days	9 days	× EHTR
Total Metals : Total Mercury in Seawater by CVAAS										
Glass vial total (hydrochloric acid) DUP-D	E508S	15-Aug-2021	----	----	----		25-Aug-2021	28 days	10 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Total Metals : Total Mercury in Seawater by CVAAS										
Glass vial total (hydrochloric acid) TR Ref1	E508S	15-Aug-2021	----	----	----		25-Aug-2021	28 days	10 days	✓
Total Metals : Total Mercury in Seawater by CVAAS										
Glass vial total (hydrochloric acid) TR Ref2	E508S	15-Aug-2021	----	----	----		25-Aug-2021	28 days	10 days	✓
Total Metals : Total Metals in Seawater by CRC ICPMS (HMI)										
HDPE total (nitric acid) DUP-D	E468S	15-Aug-2021	----	----	----		25-Aug-2021	180 days	10 days	✓
Total Metals : Total Metals in Seawater by CRC ICPMS (HMI)										
HDPE total (nitric acid) TR Ref1	E468S	15-Aug-2021	----	----	----		25-Aug-2021	180 days	10 days	✓
Total Metals : Total Metals in Seawater by CRC ICPMS (HMI)										
HDPE total (nitric acid) TR Ref2	E468S	15-Aug-2021	----	----	----		25-Aug-2021	180 days	10 days	✓
Total Metals : Total Sodium and Silicon in Seawater by CRC ICPMS										
HDPE total (nitric acid) DUP-D	E468S.NaSi	15-Aug-2021	----	----	----		25-Aug-2021	180 days	10 days	✓
Total Metals : Total Sodium and Silicon in Seawater by CRC ICPMS										
HDPE total (nitric acid) TR Ref1	E468S.NaSi	15-Aug-2021	----	----	----		25-Aug-2021	180 days	10 days	✓
Total Metals : Total Sodium and Silicon in Seawater by CRC ICPMS										
HDPE total (nitric acid) TR Ref2	E468S.NaSi	15-Aug-2021	----	----	----		25-Aug-2021	180 days	10 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.

EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.

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	271647	1	8	12.5	5.0	✓
Ammonia by Fluorescence	E298	275666	1	20	5.0	5.0	✓
Bromide in Seawater by IC	E235S.Br	272456	1	3	33.3	5.0	✓
Chloride in Seawater by IC	E235S.Cl	272457	1	4	25.0	5.0	✓
Conductivity in Seawater	E100S	271650	1	3	33.3	5.0	✓
Dissolved Mercury in Seawater by CVAAS	E509S	275533	1	12	8.3	5.0	✓
Dissolved Metals in Seawater by CRC ICPMS (HMI)	E469S	274067	1	5	20.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	276240	1	12	8.3	5.0	✓
Dissolved Sodium and Silicon in Seawater by CRC ICPMS	E469S.NaSi	274068	1	3	33.3	5.0	✓
Fluoride in Seawater by IC (Low Level)	E235S.F-L	272458	1	3	33.3	5.0	✓
Nitrate in Seawater by IC (Trace Level)	E235S.NO3-T	272459	1	3	33.3	5.0	✓
Nitrite in Seawater by IC (Low Level)	E235S.NO2-L	272460	1	3	33.3	5.0	✓
pH by Meter	E108	271648	1	14	7.1	5.0	✓
Sulfate in Seawater by IC (Low Level)	E235S.SO4-L	272461	1	3	33.3	5.0	✓
TDS by Gravimetry (Seawater)	E162S	273148	2	26	7.6	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence	E318S	275669	1	3	33.3	5.0	✓
Total Mercury in Seawater by CVAAS	E508S	275419	1	11	9.0	5.0	✓
Total Metals in Seawater by CRC ICPMS (HMI)	E468S	274655	1	20	5.0	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	275663	1	20	5.0	5.0	✓
Total Phosphorus in Seawater by Colourimetry	E372S	275545	1	16	6.2	5.0	✓
Total Sodium and Silicon in Seawater by CRC ICPMS	E468S.NaSi	274656	1	20	5.0	5.0	✓
Turbidity by Nephelometry	E121	274492	1	20	5.0	5.0	✓
Laboratory Control Samples (LCS)							
Alkalinity Species by Titration	E290	271647	1	8	12.5	5.0	✓
Ammonia by Fluorescence	E298	275666	1	20	5.0	5.0	✓
Bromide in Seawater by IC	E235S.Br	272456	1	3	33.3	5.0	✓
Chloride in Seawater by IC	E235S.Cl	272457	1	4	25.0	5.0	✓
Conductivity in Seawater	E100S	271650	1	3	33.3	5.0	✓
Dissolved Mercury in Seawater by CVAAS	E509S	275533	1	12	8.3	5.0	✓
Dissolved Metals in Seawater by CRC ICPMS (HMI)	E469S	274067	1	5	20.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	276240	1	12	8.3	5.0	✓
Dissolved Sodium and Silicon in Seawater by CRC ICPMS	E469S.NaSi	274068	1	3	33.3	5.0	✓
Fluoride in Seawater by IC (Low Level)	E235S.F-L	272458	1	3	33.3	5.0	✓
Nitrate in Seawater by IC (Trace Level)	E235S.NO3-T	272459	1	3	33.3	5.0	✓
Nitrite in Seawater by IC (Low Level)	E235S.NO2-L	272460	1	3	33.3	5.0	✓
pH by Meter	E108	271648	1	14	7.1	5.0	✓
Sulfate in Seawater by IC (Low Level)	E235S.SO4-L	272461	1	3	33.3	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							
TDS by Gravimetry (Seawater)	E162S	273148	2	26	7.6	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence	E318S	275669	1	3	33.3	5.0	✓
Total Mercury in Seawater by CVAAS	E508S	275419	1	11	9.0	5.0	✓
Total Metals in Seawater by CRC ICPMS (HMI)	E468S	274655	1	20	5.0	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	275663	1	20	5.0	5.0	✓
Total Phosphorus in Seawater by Colourimetry	E372S	275545	1	16	6.2	5.0	✓
Total Sodium and Silicon in Seawater by CRC ICPMS	E468S.NaSi	274656	1	20	5.0	5.0	✓
TSS by Gravimetry (Seawater)	E160S	272077	1	14	7.1	5.0	✓
Turbidity by Nephelometry	E121	274492	1	20	5.0	5.0	✓
Method Blanks (MB)							
Alkalinity Species by Titration	E290	271647	1	8	12.5	5.0	✓
Ammonia by Fluorescence	E298	275666	1	20	5.0	5.0	✓
Bromide in Seawater by IC	E235S.Br	272456	1	3	33.3	5.0	✓
Chloride in Seawater by IC	E235S.Cl	272457	1	4	25.0	5.0	✓
Conductivity in Seawater	E100S	271650	1	3	33.3	5.0	✓
Dissolved Mercury in Seawater by CVAAS	E509S	275533	1	12	8.3	5.0	✓
Dissolved Metals in Seawater by CRC ICPMS (HMI)	E469S	274067	1	5	20.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	276240	1	12	8.3	5.0	✓
Dissolved Sodium and Silicon in Seawater by CRC ICPMS	E469S.NaSi	274068	1	3	33.3	5.0	✓
Fluoride in Seawater by IC (Low Level)	E235S.F-L	272458	1	3	33.3	5.0	✓
Nitrate in Seawater by IC (Trace Level)	E235S.NO3-T	272459	1	3	33.3	5.0	✓
Nitrite in Seawater by IC (Low Level)	E235S.NO2-L	272460	1	3	33.3	5.0	✓
Sulfate in Seawater by IC (Low Level)	E235S.SO4-L	272461	1	3	33.3	5.0	✓
TDS by Gravimetry (Seawater)	E162S	273148	2	26	7.6	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence	E318S	275669	1	3	33.3	5.0	✓
Total Mercury in Seawater by CVAAS	E508S	275419	1	11	9.0	5.0	✓
Total Metals in Seawater by CRC ICPMS (HMI)	E468S	274655	1	20	5.0	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	275663	1	20	5.0	5.0	✓
Total Phosphorus in Seawater by Colourimetry	E372S	275545	1	16	6.2	5.0	✓
Total Sodium and Silicon in Seawater by CRC ICPMS	E468S.NaSi	274656	1	20	5.0	5.0	✓
TSS by Gravimetry (Seawater)	E160S	272077	1	14	7.1	5.0	✓
Turbidity by Nephelometry	E121	274492	1	20	5.0	5.0	✓
Matrix Spikes (MS)							
Ammonia by Fluorescence	E298	275666	1	20	5.0	5.0	✓
Bromide in Seawater by IC	E235S.Br	272456	1	3	33.3	5.0	✓
Chloride in Seawater by IC	E235S.Cl	272457	1	4	25.0	5.0	✓
Dissolved Mercury in Seawater by CVAAS	E509S	275533	1	12	8.3	5.0	✓
Dissolved Metals in Seawater by CRC ICPMS (HMI)	E469S	274067	1	5	20.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	276240	1	12	8.3	5.0	✓
Dissolved Sodium and Silicon in Seawater by CRC ICPMS	E469S.NaSi	274068	1	3	33.3	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							
Fluoride in Seawater by IC (Low Level)	E235S.F-L	272458	1	3	33.3	5.0	✓
Nitrate in Seawater by IC (Trace Level)	E235S.NO3-T	272459	1	3	33.3	5.0	✓
Nitrite in Seawater by IC (Low Level)	E235S.NO2-L	272460	1	3	33.3	5.0	✓
Sulfate in Seawater by IC (Low Level)	E235S.SO4-L	272461	1	3	33.3	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence	E318S	275669	1	3	33.3	5.0	✓
Total Mercury in Seawater by CVAAS	E508S	275419	1	11	9.0	5.0	✓
Total Metals in Seawater by CRC ICPMS (HMI)	E468S	274655	1	20	5.0	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	275663	1	20	5.0	5.0	✓
Total Phosphorus in Seawater by Colourimetry	E372S	275545	1	16	6.2	5.0	✓
Total Sodium and Silicon in Seawater by CRC ICPMS	E468S.NaSi	274656	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 Seawater	E100S Vancouver - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a seawater sample. Conductivity measurements are temperature-compensated to 25°C. Salinity in Practical Salinity Units is calculated.
pH by Meter	E108 Vancouver - Environmental	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
Turbidity by Nephelometry	E121 Vancouver - Environmental	Water	APHA 2130 B (mod)	Turbidity is measured by the nephelometric method, by measuring the intensity of light scatter under defined conditions.
TSS by Gravimetry (Seawater)	E160S Vancouver - 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 (Seawater)	E162S Vancouver - 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 Seawater by IC	E235S.Br Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Chloride in Seawater by IC	E235S.Cl Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Fluoride in Seawater by IC (Low Level)	E235S.F-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrite in Seawater by IC (Low Level)	E235S.NO2-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrate in Seawater by IC (Trace Level)	E235S.NO3-T Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Sulfate in Seawater by IC (Low Level)	E235S.SO4-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Alkalinity Species by Titration	E290 Vancouver - Environmental	Water	APHA 2320 B (mod)	Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.
Ammonia by Fluorescence	E298 Vancouver - 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).
Total Kjeldahl Nitrogen by Fluorescence	E318S Vancouver - Environmental	Water	APHA 4500-Norg D (mod)	Total Kjeldahl Nitrogen is determined using block digestion followed by flow-injection analysis with fluorescence detection.
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L Vancouver - 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 Vancouver - 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).
Total Phosphorus in Seawater by Colourimetry	E372S Vancouver - Environmental	Water	APHA 4500-P E (mod).	Total Phosphorus is determined colourimetrically using a discrete analyzer after heated persulfate digestion of the sample.
Total Metals in Seawater by CRC ICPMS (HMI)	E468S Vancouver - Environmental	Water	EPA 200.2/6020B (mod)	Seawater samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS (HMI Mode). This method is compliant with digestion requirements of the British Columbia Environmental Laboratory Manual.
Total Sodium and Silicon in Seawater by CRC ICPMS	E468S.NaSi Vancouver - Environmental	Water	EPA 200.2/6020B (mod)	Seawater samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS. This method is compliant with digestion requirements of the British Columbia Environmental Laboratory Manual.
Dissolved Metals in Seawater by CRC ICPMS (HMI)	E469S Vancouver - Environmental	Water	APHA 3030B/EPA 6020B (mod)	Seawater samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS (HMI Mode).

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Sodium and Silicon in Seawater by CRC ICPMS	E469S.NaSi Vancouver - Environmental	Water	APHA 3030B/EPA 6020B (mod)	Seawater samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS.
Total Mercury in Seawater by CVAAS	E508S Vancouver - Environmental	Water	EPA 1631E (mod)	Seawater samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.
Dissolved Mercury in Seawater by CVAAS	E509S Vancouver - Environmental	Water	APHA 3030B/EPA 1631E (mod)	Seawater samples are filtered (0.45 um), preserved with HCl, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.
Dissolved Hardness (Calculated)	EC100 Vancouver - Environmental	Water	APHA 2340B	"Hardness (as CaCO3), dissolved" is calculated from the sum of dissolved Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. "Total Hardness" refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations.
Salinity in Seawater (calculation)	EC100S Vancouver - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a seawater sample. Conductivity measurements are temperature-compensated to 25°C. Salinity in Practical Salinity Units is calculated.

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Preparation for Ammonia	EP298 Vancouver - Environmental	Water		Sample preparation for Preserved Nutrients Water Quality Analysis.
Digestion for TKN in Seawater	EP318S Vancouver - Environmental	Water	APHA 4500-Norg D (mod)	Samples are digested using block digestion with Copper Sulfate Digestion Reagent and H2SO4.
Preparation for Total Organic Carbon by Combustion	EP355 Vancouver - Environmental	Water		Preparation for Total Organic Carbon by Combustion
Preparation for Dissolved Organic Carbon for Combustion	EP358 Vancouver - Environmental	Water	APHA 5310 B (mod)	Preparation for Dissolved Organic Carbon
Digestion for Total Phosphorus in water	EP372 Vancouver - Environmental	Water	APHA 4500-P E (mod).	Samples are heated with a persulfate digestion reagent.
Dissolved Metals Water Filtration	EP421	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HNO3.

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
	Vancouver - Environmental			
Dissolved Mercury Water Filtration	EP509 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HCl.

QUALITY CONTROL REPORT

Work Order	:**VA21B7536**	Page	: 1 of 18
Client	: Golder Associates Ltd.	Laboratory	: Vancouver - Environmental
Contact	: Elaine Irving	Account Manager	: Amber Springer
Address	: 200-2920 Virtual Way Vancouver BC Canada V5M 0C4	Address	: 8081 Lougheed Highway Burnaby, British Columbia Canada V5A 1W9
Telephone	: ----	Telephone	: +1 604 253 4188
Project	: 1663724-44000-03	Date Samples Received	: 19-Aug-2021 08:25
PO	: ----	Date Analysis Commenced	: 19-Aug-2021
C-O-C number	: 20-920783	Issue Date	: 01-Sep-2021 10:04
Sampler	: ----		
Site	: ----		
Quote number	: Q84262		
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 Percentage Difference (RPD) and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits
- Reference Material (RM) Report; Recovery and Acceptance Limits
- Method Blank (MB) Report; Recovery and Acceptance Limits
- Laboratory Control Sample (LCS) Report; Recovery and Acceptance Limits

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*
Angela Ren	Team Leader - Metals	Metals, Burnaby, British Columbia
Angelo Salandanan	Lab Assistant	Metals, Burnaby, British Columbia
Caleb Deroche	Lab Analyst	Metals, Burnaby, British Columbia
Dee Lee	Analyst	Metals, Burnaby, British Columbia
Kevin Duarte	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics, Burnaby, British Columbia
Tracy Harley	Supervisor - Water Quality Instrumentation	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 Services number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percentage Difference
# = Indicates a QC result that did not meet the ALS DQO.

Laboratory Duplicate (DUP) Report

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

Sub-Matrix: **Water**

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
					Laboratory Duplicate (DUP) Report						
Physical Tests (QC Lot: 271647)											
VA21B7536-001	TR Ref1	alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	93.4	94.3	0.959%	20%	----
Physical Tests (QC Lot: 271648)											
VA21B7493-001	Anonymous	pH	----	E108	0.10	pH units	8.10	8.08	0.247%	4%	----
Physical Tests (QC Lot: 271650)											
VA21B7536-001	TR Ref1	conductivity	----	E100S	2.0	µS/cm	36900	37000	0.271%	20%	----
Physical Tests (QC Lot: 273148)											
VA21B6250-001	Anonymous	solids, total dissolved [TDS]	----	E162S	10	mg/L	<10	<10	0	Diff <2x LOR	----
Physical Tests (QC Lot: 273149)											
VA21B7536-002	TR Ref2	solids, total dissolved [TDS]	----	E162S	80	mg/L	28000	24600	12.7%	20%	----
Physical Tests (QC Lot: 274492)											
VA21B7494-001	Anonymous	turbidity	----	E121	0.10	NTU	26.9	24.9	7.57%	15%	----
Anions and Nutrients (QC Lot: 272456)											
VA21B7536-001	TR Ref1	bromide	24959-67-9	E235S.Br	5.0	mg/L	44.5	43.3	1.2	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 272457)											
VA21B7536-001	TR Ref1	chloride	16887-00-6	E235S.Cl	50	mg/L	13000	12800	1.58%	20%	----
Anions and Nutrients (QC Lot: 272458)											
VA21B7536-001	TR Ref1	fluoride	16984-48-8	E235S.F-L	0.20	mg/L	0.56	0.56	0.006	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 272459)											
VA21B7536-001	TR Ref1	nitrate (as N)	14797-55-8	E235S.NO3-T	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 272460)											
VA21B7536-001	TR Ref1	nitrite (as N)	14797-65-0	E235S.NO2-L	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 272461)											
VA21B7536-001	TR Ref1	sulfate (as SO4)	14808-79-8	E235S.SO4-L	3.0	mg/L	1790	1730	3.52%	20%	----
Anions and Nutrients (QC Lot: 275545)											
VA21B7533-001	Anonymous	phosphorus, total	7723-14-0	E372S	0.0040	mg/L	0.0306	0.0317	0.0011	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 275666)											
VA21B7487-001	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 275669)											
VA21B7536-001	TR Ref1	Kjeldahl nitrogen, total [TKN]	----	E318S	0.050	mg/L	0.068	0.067	0.0006	Diff <2x LOR	----
Organic / Inorganic Carbon (QC Lot: 275663)											
VA21B7487-001	Anonymous	carbon, total organic [TOC]	----	E355-L	0.50	mg/L	<0.50	<0.50	0	Diff <2x LOR	----

Sub-Matrix: **Water**

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
					Laboratory Duplicate (DUP) Report						
Organic / Inorganic Carbon (QC Lot: 276240)											
VA21B7536-001	TR Ref1	carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	1.13	1.02	0.11	Diff <2x LOR	----
Total Metals (QC Lot: 274655)											
VA21B7535-006	Anonymous	aluminum, total	7429-90-5	E468S	0.0050	mg/L	0.0638	0.0660	3.38%	20%	----
		antimony, total	7440-36-0	E468S	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		arsenic, total	7440-38-2	E468S	0.00040	mg/L	0.00162	0.00164	0.00003	Diff <2x LOR	----
		barium, total	7440-39-3	E468S	0.0010	mg/L	0.0098	0.0104	6.37%	20%	----
		beryllium, total	7440-41-7	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		bismuth, total	7440-69-9	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		boron, total	7440-42-8	E468S	0.30	mg/L	4.16	4.09	1.76%	20%	----
		cadmium, total	7440-43-9	E468S	0.000010	mg/L	0.000059	0.000061	0.000002	Diff <2x LOR	----
		calcium, total	7440-70-2	E468S	1.0	mg/L	423	434	2.43%	20%	----
		cesium, total	7440-46-2	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		chromium, total	7440-47-3	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		cobalt, total	7440-48-4	E468S	0.000050	mg/L	0.000092	0.000092	0.00000007	Diff <2x LOR	----
		copper, total	7440-50-8	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		gallium, total	7440-55-3	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		iron, total	7439-89-6	E468S	0.010	mg/L	0.111	0.113	1.49%	20%	----
		lead, total	7439-92-1	E468S	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		lithium, total	7439-93-2	E468S	0.020	mg/L	0.197	0.187	0.010	Diff <2x LOR	----
		magnesium, total	7439-95-4	E468S	1.0	mg/L	1320	1340	2.08%	20%	----
		manganese, total	7439-96-5	E468S	0.00020	mg/L	0.0254	0.0264	3.87%	20%	----
		molybdenum, total	7439-98-7	E468S	0.00010	mg/L	0.0106	0.0105	0.709%	20%	----
		nickel, total	7440-02-0	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		phosphorus, total	7723-14-0	E468S	0.050	mg/L	0.103	0.085	0.018	Diff <2x LOR	----
		potassium, total	7440-09-7	E468S	1.0	mg/L	473	489	3.35%	20%	----
		rhenium, total	7440-15-5	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		rubidium, total	7440-17-7	E468S	0.0050	mg/L	0.119	0.121	1.72%	20%	----
		selenium, total	7782-49-2	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		silver, total	7440-22-4	E468S	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		strontium, total	7440-24-6	E468S	0.010	mg/L	7.21	7.17	0.560%	20%	----
		sulfur, total	7704-34-9	E468S	5.0	mg/L	1230	1240	0.308%	20%	----
		tellurium, total	13494-80-9	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		thallium, total	7440-28-0	E468S	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		thorium, total	7440-29-1	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		tin, total	7440-31-5	E468S	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----

Sub-Matrix: **Water**

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
					Laboratory Duplicate (DUP) Report						
Total Metals (QC Lot: 274655) - continued											
VA21B7535-006	Anonymous	titanium, total	7440-32-6	E468S	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
		tungsten, total	7440-33-7	E468S	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		uranium, total	7440-61-1	E468S	0.000050	mg/L	0.00274	0.00265	3.15%	20%	----
		vanadium, total	7440-62-2	E468S	0.00050	mg/L	0.00208	0.00216	0.00008	Diff <2x LOR	----
		yttrium, total	7440-65-5	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, total	7440-66-6	E468S	0.0030	mg/L	<0.0030	<0.0030	0	Diff <2x LOR	----
		zirconium, total	7440-67-7	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
Total Metals (QC Lot: 274656)											
VA21B7535-006	Anonymous	silicon, total	7440-21-3	E468S.NaSi	1.0	mg/L	1.6	<1.0	0.6	Diff <2x LOR	----
		sodium, total	17341-25-2	E468S.NaSi	2.5	mg/L	9140	9480	3.70%	20%	----
Total Metals (QC Lot: 275419)											
VA21B7440-025	Anonymous	mercury, total	7439-97-6	E508S	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 274067)											
VA21B7536-001	TR Ref1	aluminum, dissolved	7429-90-5	E469S	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
		antimony, dissolved	7440-36-0	E469S	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		arsenic, dissolved	7440-38-2	E469S	0.00040	mg/L	0.00107	0.00105	0.00002	Diff <2x LOR	----
		barium, dissolved	7440-39-3	E469S	0.0010	mg/L	0.0071	0.0070	0.00004	Diff <2x LOR	----
		beryllium, dissolved	7440-41-7	E469S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		bismuth, dissolved	7440-69-9	E469S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		boron, dissolved	7440-42-8	E469S	0.30	mg/L	2.86	2.82	0.05	Diff <2x LOR	----
		cadmium, dissolved	7440-43-9	E469S	0.000010	mg/L	0.000028	0.000022	0.000006	Diff <2x LOR	----
		calcium, dissolved	7440-70-2	E469S	1.0	mg/L	279	276	1.18%	20%	----
		cesium, dissolved	7440-46-2	E469S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		chromium, dissolved	7440-47-3	E469S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		cobalt, dissolved	7440-48-4	E469S	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		copper, dissolved	7440-50-8	E469S	0.00020	mg/L	0.00036	0.00028	0.00008	Diff <2x LOR	----
		gallium, dissolved	7440-55-3	E469S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		iron, dissolved	7439-89-6	E469S	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		lead, dissolved	7439-92-1	E469S	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		lithium, dissolved	7439-93-2	E469S	0.020	mg/L	0.122	0.121	0.0007	Diff <2x LOR	----
		magnesium, dissolved	7439-95-4	E469S	1.0	mg/L	876	877	0.0995%	20%	----
		manganese, dissolved	7439-96-5	E469S	0.00010	mg/L	0.00082	0.00077	0.00005	Diff <2x LOR	----
		molybdenum, dissolved	7439-98-7	E469S	0.00010	mg/L	0.00750	0.00761	1.37%	20%	----
		nickel, dissolved	7440-02-0	E469S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		phosphorus, dissolved	7723-14-0	E469S	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----

Sub-Matrix: **Water**

Laboratory Duplicate (DUP) Report

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Dissolved Metals (QC Lot: 274067) - continued											
VA21B7536-001	TR Ref1	potassium, dissolved	7440-09-7	E469S	1.0	mg/L	291	293	0.667%	20%	----
		rhenium, dissolved	7440-15-5	E469S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		rubidium, dissolved	7440-17-7	E469S	0.0050	mg/L	0.0790	0.0780	1.19%	20%	----
		selenium, dissolved	7782-49-2	E469S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		silver, dissolved	7440-22-4	E469S	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		strontium, dissolved	7440-24-6	E469S	0.010	mg/L	5.30	5.18	2.28%	20%	----
		sulfur, dissolved	7704-34-9	E469S	5.0	mg/L	702	738	4.92%	20%	----
		tellurium, dissolved	13494-80-9	E469S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		thallium, dissolved	7440-28-0	E469S	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		thorium, dissolved	7440-29-1	E469S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		tin, dissolved	7440-31-5	E469S	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		titanium, dissolved	7440-32-6	E469S	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
		tungsten, dissolved	7440-33-7	E469S	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		uranium, dissolved	7440-61-1	E469S	0.000050	mg/L	0.00215	0.00215	0.133%	20%	----
		vanadium, dissolved	7440-62-2	E469S	0.00050	mg/L	0.00108	0.00098	0.00010	Diff <2x LOR	----
		yttrium, dissolved	7440-65-5	E469S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, dissolved	7440-66-6	E469S	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		zirconium, dissolved	7440-67-7	E469S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 274068)											
VA21B7536-001	TR Ref1	silicon, dissolved	7440-21-3	E469S.NaSi	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		sodium, dissolved	17341-25-2	E469S.NaSi	2.5	mg/L	6720	6700	0.234%	20%	----
Dissolved Metals (QC Lot: 275533)											
VA21B7536-001	TR Ref1	mercury, dissolved	7439-97-6	E509S	0.0000050	mg/L	<0.0000050	<0.0000050	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: 271647)						
alkalinity, total (as CaCO3)	----	E290	1	mg/L	<1.0	----
Physical Tests (QCLot: 271650)						
conductivity	----	E100S	2	μS/cm	<2.0	----
Physical Tests (QCLot: 272077)						
solids, total suspended [TSS]	----	E160S	2	mg/L	<2.0	----
Physical Tests (QCLot: 273148)						
solids, total dissolved [TDS]	----	E162S	10	mg/L	<10	----
Physical Tests (QCLot: 273149)						
solids, total dissolved [TDS]	----	E162S	10	mg/L	<10	----
Physical Tests (QCLot: 274492)						
turbidity	----	E121	0.1	NTU	<0.10	----
Anions and Nutrients (QCLot: 272456)						
bromide	24959-67-9	E235S.Br	5	mg/L	<5.0	----
Anions and Nutrients (QCLot: 272457)						
chloride	16887-00-6	E235S.Cl	50	mg/L	<50	----
Anions and Nutrients (QCLot: 272458)						
fluoride	16984-48-8	E235S.F-L	0.2	mg/L	<0.20	----
Anions and Nutrients (QCLot: 272459)						
nitrate (as N)	14797-55-8	E235S.NO3-T	0.01	mg/L	<0.030	----
Anions and Nutrients (QCLot: 272460)						
nitrite (as N)	14797-65-0	E235S.NO2-L	0.01	mg/L	<0.010	----
Anions and Nutrients (QCLot: 272461)						
sulfate (as SO4)	14808-79-8	E235S.SO4-L	3	mg/L	<3.0	----
Anions and Nutrients (QCLot: 275545)						
phosphorus, total	7723-14-0	E372S	0.002	mg/L	<0.0040	----
Anions and Nutrients (QCLot: 275666)						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 275669)						
Kjeldahl nitrogen, total [TKN]	----	E318S	0.05	mg/L	<0.050	----
Organic / Inorganic Carbon (QCLot: 275663)						
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	<0.50	----
Organic / Inorganic Carbon (QCLot: 276240)						
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	<0.50	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 274655)						
aluminum, total	7429-90-5	E468S	0.005	mg/L	<0.0050	----
antimony, total	7440-36-0	E468S	0.001	mg/L	<0.0010	----
arsenic, total	7440-38-2	E468S	0.0004	mg/L	<0.00040	----
barium, total	7440-39-3	E468S	0.001	mg/L	<0.0010	----
beryllium, total	7440-41-7	E468S	0.0005	mg/L	<0.00050	----
bismuth, total	7440-69-9	E468S	0.0005	mg/L	<0.00050	----
boron, total	7440-42-8	E468S	0.3	mg/L	<0.30	----
cadmium, total	7440-43-9	E468S	0.00001	mg/L	<0.000010	----
calcium, total	7440-70-2	E468S	1	mg/L	<1.0	----
cesium, total	7440-46-2	E468S	0.0005	mg/L	<0.00050	----
chromium, total	7440-47-3	E468S	0.0005	mg/L	<0.00050	----
cobalt, total	7440-48-4	E468S	0.00005	mg/L	<0.000050	----
copper, total	7440-50-8	E468S	0.0005	mg/L	<0.00050	----
gallium, total	7440-55-3	E468S	0.0005	mg/L	<0.00050	----
iron, total	7439-89-6	E468S	0.01	mg/L	<0.010	----
lead, total	7439-92-1	E468S	0.00005	mg/L	<0.000050	----
lithium, total	7439-93-2	E468S	0.02	mg/L	<0.020	----
magnesium, total	7439-95-4	E468S	1	mg/L	<1.0	----
manganese, total	7439-96-5	E468S	0.0002	mg/L	<0.00020	----
molybdenum, total	7439-98-7	E468S	0.0001	mg/L	<0.00010	----
nickel, total	7440-02-0	E468S	0.0005	mg/L	<0.00050	----
phosphorus, total	7723-14-0	E468S	0.05	mg/L	<0.050	----
potassium, total	7440-09-7	E468S	1	mg/L	<1.0	----
rhenium, total	7440-15-5	E468S	0.0005	mg/L	<0.00050	----
rubidium, total	7440-17-7	E468S	0.005	mg/L	<0.0050	----
selenium, total	7782-49-2	E468S	0.0005	mg/L	<0.00050	----
silver, total	7440-22-4	E468S	0.0001	mg/L	<0.00010	----
strontium, total	7440-24-6	E468S	0.01	mg/L	<0.010	----
sulfur, total	7704-34-9	E468S	5	mg/L	<5.0	----
tellurium, total	13494-80-9	E468S	0.0005	mg/L	<0.00050	----
thallium, total	7440-28-0	E468S	0.00005	mg/L	<0.000050	----
thorium, total	7440-29-1	E468S	0.0005	mg/L	<0.00050	----
tin, total	7440-31-5	E468S	0.001	mg/L	<0.0010	----
titanium, total	7440-32-6	E468S	0.005	mg/L	<0.0050	----
tungsten, total	7440-33-7	E468S	0.001	mg/L	<0.0010	----
uranium, total	7440-61-1	E468S	0.00005	mg/L	<0.000050	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 274655) - continued						
vanadium, total	7440-62-2	E468S	0.0005	mg/L	<0.00050	----
yttrium, total	7440-65-5	E468S	0.0005	mg/L	<0.00050	----
zinc, total	7440-66-6	E468S	0.003	mg/L	<0.0030	----
zirconium, total	7440-67-7	E468S	0.0005	mg/L	<0.00050	----
Total Metals (QCLot: 274656)						
silicon, total	7440-21-3	E468S.NaSi	1	mg/L	<1.0	----
sodium, total	17341-25-2	E468S.NaSi	2.5	mg/L	<2.5	----
Total Metals (QCLot: 275419)						
mercury, total	7439-97-6	E508S	0.000005	mg/L	<0.0000050	----
Dissolved Metals (QCLot: 274067)						
aluminum, dissolved	7429-90-5	E469S	0.005	mg/L	<0.0050	----
antimony, dissolved	7440-36-0	E469S	0.001	mg/L	<0.0010	----
arsenic, dissolved	7440-38-2	E469S	0.0004	mg/L	<0.00040	----
barium, dissolved	7440-39-3	E469S	0.001	mg/L	<0.0010	----
beryllium, dissolved	7440-41-7	E469S	0.0005	mg/L	<0.00050	----
bismuth, dissolved	7440-69-9	E469S	0.0005	mg/L	<0.00050	----
boron, dissolved	7440-42-8	E469S	0.3	mg/L	<0.30	----
cadmium, dissolved	7440-43-9	E469S	0.00001	mg/L	<0.000010	----
calcium, dissolved	7440-70-2	E469S	1	mg/L	<1.0	----
cesium, dissolved	7440-46-2	E469S	0.0005	mg/L	<0.00050	----
chromium, dissolved	7440-47-3	E469S	0.0005	mg/L	<0.00050	----
cobalt, dissolved	7440-48-4	E469S	0.00005	mg/L	<0.000050	----
copper, dissolved	7440-50-8	E469S	0.0002	mg/L	<0.00020	----
gallium, dissolved	7440-55-3	E469S	0.0005	mg/L	<0.00050	----
iron, dissolved	7439-89-6	E469S	0.01	mg/L	<0.010	----
lead, dissolved	7439-92-1	E469S	0.00005	mg/L	<0.000050	----
lithium, dissolved	7439-93-2	E469S	0.02	mg/L	<0.020	----
magnesium, dissolved	7439-95-4	E469S	1	mg/L	<1.0	----
manganese, dissolved	7439-96-5	E469S	0.0001	mg/L	<0.00010	----
molybdenum, dissolved	7439-98-7	E469S	0.0001	mg/L	<0.00010	----
nickel, dissolved	7440-02-0	E469S	0.0005	mg/L	<0.00050	----
phosphorus, dissolved	7723-14-0	E469S	0.05	mg/L	<0.050	----
potassium, dissolved	7440-09-7	E469S	1	mg/L	<1.0	----
rhenium, dissolved	7440-15-5	E469S	0.0005	mg/L	<0.00050	----
rubidium, dissolved	7440-17-7	E469S	0.005	mg/L	<0.0050	----
selenium, dissolved	7782-49-2	E469S	0.0005	mg/L	<0.00050	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 274067) - continued						
silver, dissolved	7440-22-4	E469S	0.0001	mg/L	<0.00010	----
strontium, dissolved	7440-24-6	E469S	0.01	mg/L	<0.010	----
sulfur, dissolved	7704-34-9	E469S	5	mg/L	<5.0	----
tellurium, dissolved	13494-80-9	E469S	0.0005	mg/L	<0.00050	----
thallium, dissolved	7440-28-0	E469S	0.00005	mg/L	<0.000050	----
thorium, dissolved	7440-29-1	E469S	0.0005	mg/L	<0.00050	----
tin, dissolved	7440-31-5	E469S	0.001	mg/L	<0.0010	----
titanium, dissolved	7440-32-6	E469S	0.005	mg/L	<0.0050	----
tungsten, dissolved	7440-33-7	E469S	0.001	mg/L	<0.0010	----
uranium, dissolved	7440-61-1	E469S	0.00005	mg/L	<0.000050	----
vanadium, dissolved	7440-62-2	E469S	0.0005	mg/L	<0.00050	----
yttrium, dissolved	7440-65-5	E469S	0.0005	mg/L	<0.00050	----
zinc, dissolved	7440-66-6	E469S	0.001	mg/L	<0.0010	----
zirconium, dissolved	7440-67-7	E469S	0.0005	mg/L	<0.00050	----
Dissolved Metals (QCLot: 274068)						
silicon, dissolved	7440-21-3	E469S.NaSi	1	mg/L	<1.0	----
sodium, dissolved	17341-25-2	E469S.NaSi	2.5	mg/L	<2.5	----
Dissolved Metals (QCLot: 275533)						
mercury, dissolved	7439-97-6	E509S	0.000005	mg/L	<0.0000050	----

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: 271647)									
alkalinity, total (as CaCO3)	----	E290	1	mg/L	500 mg/L	98.6	85.0	115	----
Physical Tests (QCLot: 271648)									
pH	----	E108	----	pH units	7 pH units	100	98.0	102	----
Physical Tests (QCLot: 271650)									
conductivity	----	E100S	2	µS/cm	146.9 µS/cm	101	80.0	120	----
Physical Tests (QCLot: 272077)									
solids, total suspended [TSS]	----	E160S	2	mg/L	150 mg/L	104	85.0	115	----
Physical Tests (QCLot: 273148)									
solids, total dissolved [TDS]	----	E162S	10	mg/L	1000 mg/L	98.5	85.0	115	----
Physical Tests (QCLot: 273149)									
solids, total dissolved [TDS]	----	E162S	10	mg/L	1000 mg/L	103	85.0	115	----
Physical Tests (QCLot: 274492)									
turbidity	----	E121	0.1	NTU	200 NTU	101	85.0	115	----
Anions and Nutrients (QCLot: 272456)									
bromide	24959-67-9	E235S.Br	5	mg/L	0.5 mg/L	99.3	85.0	115	----
Anions and Nutrients (QCLot: 272457)									
chloride	16887-00-6	E235S.Cl	50	mg/L	100 mg/L	101	90.0	110	----
Anions and Nutrients (QCLot: 272458)									
fluoride	16984-48-8	E235S.F-L	0.2	mg/L	1 mg/L	102	90.0	110	----
Anions and Nutrients (QCLot: 272459)									
nitrate (as N)	14797-55-8	E235S.NO3-T	0.01	mg/L	2.5 mg/L	101	90.0	110	----
Anions and Nutrients (QCLot: 272460)									
nitrite (as N)	14797-65-0	E235S.NO2-L	0.01	mg/L	0.5 mg/L	98.8	90.0	110	----
Anions and Nutrients (QCLot: 272461)									
sulfate (as SO4)	14808-79-8	E235S.SO4-L	3	mg/L	100 mg/L	102	90.0	110	----
Anions and Nutrients (QCLot: 275545)									
phosphorus, total	7723-14-0	E372S	0.002	mg/L	0.05 mg/L	95.7	80.0	120	----
Anions and Nutrients (QCLot: 275666)									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.2 mg/L	102	85.0	115	----
Anions and Nutrients (QCLot: 275669)									
Kjeldahl nitrogen, total [TKN]	----	E318S	0.05	mg/L	4 mg/L	92.7	75.0	125	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Spike Concentration	Recovery (%) LCS	Recovery Limits (%) Low	Recovery Limits (%) High	Qualifier
Organic / Inorganic Carbon (QCLot: 275663)									
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	8.57 mg/L	104	80.0	120	----
Organic / Inorganic Carbon (QCLot: 276240)									
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	8.57 mg/L	98.7	80.0	120	----
Total Metals (QCLot: 274655)									
aluminum, total	7429-90-5	E468S	0.005	mg/L	2 mg/L	102	80.0	120	----
antimony, total	7440-36-0	E468S	0.001	mg/L	1 mg/L	102	80.0	120	----
arsenic, total	7440-38-2	E468S	0.0004	mg/L	1 mg/L	102	80.0	120	----
barium, total	7440-39-3	E468S	0.001	mg/L	0.25 mg/L	102	80.0	120	----
beryllium, total	7440-41-7	E468S	0.0005	mg/L	0.1 mg/L	104	80.0	120	----
bismuth, total	7440-69-9	E468S	0.0005	mg/L	1 mg/L	110	80.0	120	----
boron, total	7440-42-8	E468S	0.3	mg/L	10 mg/L	99.3	80.0	120	----
cadmium, total	7440-43-9	E468S	0.00001	mg/L	0.1 mg/L	107	80.0	120	----
calcium, total	7440-70-2	E468S	1	mg/L	50 mg/L	100	80.0	120	----
cesium, total	7440-46-2	E468S	0.0005	mg/L	0.05 mg/L	95.7	80.0	120	----
chromium, total	7440-47-3	E468S	0.0005	mg/L	0.25 mg/L	102	80.0	120	----
cobalt, total	7440-48-4	E468S	0.00005	mg/L	0.25 mg/L	107	80.0	120	----
copper, total	7440-50-8	E468S	0.0005	mg/L	0.25 mg/L	108	80.0	120	----
gallium, total	7440-55-3	E468S	0.0005	mg/L	0.25 mg/L	101	80.0	120	----
iron, total	7439-89-6	E468S	0.01	mg/L	1 mg/L	108	80.0	120	----
lead, total	7439-92-1	E468S	0.00005	mg/L	0.5 mg/L	107	80.0	120	----
lithium, total	7439-93-2	E468S	0.02	mg/L	0.25 mg/L	101	80.0	120	----
magnesium, total	7439-95-4	E468S	1	mg/L	50 mg/L	100	80.0	120	----
manganese, total	7439-96-5	E468S	0.0002	mg/L	0.25 mg/L	103	80.0	120	----
molybdenum, total	7439-98-7	E468S	0.0001	mg/L	0.25 mg/L	96.1	80.0	120	----
nickel, total	7440-02-0	E468S	0.0005	mg/L	0.5 mg/L	106	80.0	120	----
phosphorus, total	7723-14-0	E468S	0.05	mg/L	10 mg/L	104	80.0	120	----
potassium, total	7440-09-7	E468S	1	mg/L	50 mg/L	103	80.0	120	----
rhenium, total	7440-15-5	E468S	0.0005	mg/L	0.1 mg/L	98.6	80.0	120	----
rubidium, total	7440-17-7	E468S	0.005	mg/L	0.1 mg/L	106	80.0	120	----
selenium, total	7782-49-2	E468S	0.0005	mg/L	1 mg/L	112	80.0	120	----
silver, total	7440-22-4	E468S	0.0001	mg/L	0.1 mg/L	103	80.0	120	----
strontium, total	7440-24-6	E468S	0.01	mg/L	0.25 mg/L	97.8	80.0	120	----
sulfur, total	7704-34-9	E468S	5	mg/L	50 mg/L	89.0	80.0	120	----
tellurium, total	13494-80-9	E468S	0.0005	mg/L	0.1 mg/L	110	80.0	120	----
thallium, total	7440-28-0	E468S	0.00005	mg/L	1 mg/L	96.9	80.0	120	----
thorium, total	7440-29-1	E468S	0.0005	mg/L	0.1 mg/L	93.5	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: 274655) - continued									
tin, total	7440-31-5	E468S	0.001	mg/L	0.5 mg/L	97.9	80.0	120	----
titanium, total	7440-32-6	E468S	0.005	mg/L	0.25 mg/L	102	80.0	120	----
tungsten, total	7440-33-7	E468S	0.001	mg/L	0.1 mg/L	98.9	80.0	120	----
uranium, total	7440-61-1	E468S	0.00005	mg/L	0.005 mg/L	101	80.0	120	----
vanadium, total	7440-62-2	E468S	0.0005	mg/L	0.5 mg/L	99.9	80.0	120	----
yttrium, total	7440-65-5	E468S	0.0005	mg/L	0.1 mg/L	100	80.0	120	----
zinc, total	7440-66-6	E468S	0.003	mg/L	0.5 mg/L	106	80.0	120	----
zirconium, total	7440-67-7	E468S	0.0005	mg/L	0.1 mg/L	92.3	80.0	120	----
Total Metals (QCLot: 274656)									
silicon, total	7440-21-3	E468S.NaSi	1	mg/L	10 mg/L	105	80.0	120	----
sodium, total	17341-25-2	E468S.NaSi	2.5	mg/L	50 mg/L	101	80.0	120	----
Total Metals (QCLot: 275419)									
mercury, total	7439-97-6	E508S	0.000005	mg/L	0.0001 mg/L	98.5	80.0	120	----
Dissolved Metals (QCLot: 274067)									
aluminum, dissolved	7429-90-5	E469S	0.005	mg/L	2 mg/L	101	80.0	120	----
antimony, dissolved	7440-36-0	E469S	0.001	mg/L	1 mg/L	106	80.0	120	----
arsenic, dissolved	7440-38-2	E469S	0.0004	mg/L	1 mg/L	100	80.0	120	----
barium, dissolved	7440-39-3	E469S	0.001	mg/L	0.25 mg/L	101	80.0	120	----
beryllium, dissolved	7440-41-7	E469S	0.0005	mg/L	0.1 mg/L	100	80.0	120	----
bismuth, dissolved	7440-69-9	E469S	0.0005	mg/L	1 mg/L	105	80.0	120	----
boron, dissolved	7440-42-8	E469S	0.3	mg/L	10 mg/L	97.0	80.0	120	----
cadmium, dissolved	7440-43-9	E469S	0.00001	mg/L	0.1 mg/L	107	80.0	120	----
calcium, dissolved	7440-70-2	E469S	1	mg/L	50 mg/L	100	80.0	120	----
cesium, dissolved	7440-46-2	E469S	0.0005	mg/L	0.05 mg/L	103	80.0	120	----
chromium, dissolved	7440-47-3	E469S	0.0005	mg/L	0.25 mg/L	100	80.0	120	----
cobalt, dissolved	7440-48-4	E469S	0.00005	mg/L	0.25 mg/L	107	80.0	120	----
copper, dissolved	7440-50-8	E469S	0.0002	mg/L	0.25 mg/L	105	80.0	120	----
gallium, dissolved	7440-55-3	E469S	0.0005	mg/L	0.25 mg/L	100	80.0	120	----
iron, dissolved	7439-89-6	E469S	0.01	mg/L	1 mg/L	111	80.0	120	----
lead, dissolved	7439-92-1	E469S	0.00005	mg/L	0.5 mg/L	106	80.0	120	----
lithium, dissolved	7439-93-2	E469S	0.02	mg/L	0.25 mg/L	100	80.0	120	----
magnesium, dissolved	7439-95-4	E469S	1	mg/L	50 mg/L	104	80.0	120	----
manganese, dissolved	7439-96-5	E469S	0.0001	mg/L	0.25 mg/L	104	80.0	120	----
molybdenum, dissolved	7439-98-7	E469S	0.0001	mg/L	0.25 mg/L	99.2	80.0	120	----
nickel, dissolved	7440-02-0	E469S	0.0005	mg/L	0.5 mg/L	105	80.0	120	----
phosphorus, dissolved	7723-14-0	E469S	0.05	mg/L	10 mg/L	107	80.0	120	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report: Spike Concentration	Recovery (%) LCS	Recovery Limits (%) Low	Recovery Limits (%) High	Qualifier
Dissolved Metals (QCLot: 274067) - continued									
potassium, dissolved	7440-09-7	E469S	1	mg/L	50 mg/L	100	80.0	120	----
rhenium, dissolved	7440-15-5	E469S	0.0005	mg/L	0.1 mg/L	104	80.0	120	----
rubidium, dissolved	7440-17-7	E469S	0.005	mg/L	0.1 mg/L	99.8	80.0	120	----
selenium, dissolved	7782-49-2	E469S	0.0005	mg/L	1 mg/L	108	80.0	120	----
silver, dissolved	7440-22-4	E469S	0.0001	mg/L	0.1 mg/L	107	80.0	120	----
strontium, dissolved	7440-24-6	E469S	0.01	mg/L	0.25 mg/L	102	80.0	120	----
sulfur, dissolved	7704-34-9	E469S	5	mg/L	50 mg/L	102	80.0	120	----
tellurium, dissolved	13494-80-9	E469S	0.0005	mg/L	0.1 mg/L	114	80.0	120	----
thallium, dissolved	7440-28-0	E469S	0.00005	mg/L	1 mg/L	110	80.0	120	----
thorium, dissolved	7440-29-1	E469S	0.0005	mg/L	0.1 mg/L	97.6	80.0	120	----
tin, dissolved	7440-31-5	E469S	0.001	mg/L	0.5 mg/L	102	80.0	120	----
titanium, dissolved	7440-32-6	E469S	0.005	mg/L	0.25 mg/L	93.8	80.0	120	----
tungsten, dissolved	7440-33-7	E469S	0.001	mg/L	0.1 mg/L	101	80.0	120	----
uranium, dissolved	7440-61-1	E469S	0.00005	mg/L	0.005 mg/L	107	80.0	120	----
vanadium, dissolved	7440-62-2	E469S	0.0005	mg/L	0.5 mg/L	96.2	80.0	120	----
yttrium, dissolved	7440-65-5	E469S	0.0005	mg/L	0.1 mg/L	100	80.0	120	----
zinc, dissolved	7440-66-6	E469S	0.001	mg/L	0.5 mg/L	107	80.0	120	----
zirconium, dissolved	7440-67-7	E469S	0.0005	mg/L	0.1 mg/L	96.8	80.0	120	----
silicon, dissolved	7440-21-3	E469S.NaSi	1	mg/L	10 mg/L	98.8	80.0	120	----
sodium, dissolved	17341-25-2	E469S.NaSi	2.5	mg/L	50 mg/L	95.3	80.0	120	----
mercury, dissolved	7439-97-6	E509S	0.000005	mg/L	0.0001 mg/L	99.1	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: 272456)										
VA21B7536-002	TR Ref2	bromide	24959-67-9	E235S.Br	48.6 mg/L	50 mg/L	97.1	75.0	125	----
Anions and Nutrients (QCLot: 272457)										
VA21B7536-002	TR Ref2	chloride	16887-00-6	E235S.Cl	ND mg/L	10000 mg/L	ND	75.0	125	----
Anions and Nutrients (QCLot: 272458)										
VA21B7536-002	TR Ref2	fluoride	16984-48-8	E235S.F-L	10.4 mg/L	10 mg/L	104	75.0	125	----
Anions and Nutrients (QCLot: 272459)										
VA21B7536-002	TR Ref2	nitrate (as N)	14797-55-8	E235S.NO3-T	7.30 mg/L	7.5 mg/L	97.3	75.0	125	----
Anions and Nutrients (QCLot: 272460)										
VA21B7536-002	TR Ref2	nitrite (as N)	14797-65-0	E235S.NO2-L	4.84 mg/L	5 mg/L	96.8	75.0	125	----
Anions and Nutrients (QCLot: 272461)										
VA21B7536-002	TR Ref2	sulfate (as SO4)	14808-79-8	E235S.SO4-L	ND mg/L	1000 mg/L	ND	75.0	125	----
Anions and Nutrients (QCLot: 275545)										
VA21B7533-002	Anonymous	phosphorus, total	7723-14-0	E372S	0.0766 mg/L	0.1 mg/L	76.6	70.0	130	----
Anions and Nutrients (QCLot: 275666)										
VA21B7487-002	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.106 mg/L	0.1 mg/L	106	75.0	125	----
Anions and Nutrients (QCLot: 275669)										
VA21B7536-002	TR Ref2	Kjeldahl nitrogen, total [TKN]	----	E318S	2.69 mg/L	2.5 mg/L	107	70.0	130	----
Organic / Inorganic Carbon (QCLot: 275663)										
VA21B7487-002	Anonymous	carbon, total organic [TOC]	----	E355-L	5.00 mg/L	5 mg/L	100	70.0	130	----
Organic / Inorganic Carbon (QCLot: 276240)										
VA21B7536-002	TR Ref2	carbon, dissolved organic [DOC]	----	E358-L	5.29 mg/L	5 mg/L	106	70.0	130	----
Total Metals (QCLot: 274655)										
VA21B7535-007	Anonymous	aluminum, total	7429-90-5	E468S	0.515 mg/L	0.4 mg/L	129	70.0	130	----
		antimony, total	7440-36-0	E468S	0.0374 mg/L	0.04 mg/L	93.4	70.0	130	----
		arsenic, total	7440-38-2	E468S	0.0376 mg/L	0.04 mg/L	93.9	70.0	130	----
		barium, total	7440-39-3	E468S	0.0423 mg/L	0.04 mg/L	106	70.0	130	----
		beryllium, total	7440-41-7	E468S	0.0906 mg/L	0.08 mg/L	113	70.0	130	----
		bismuth, total	7440-69-9	E468S	0.0164 mg/L	0.02 mg/L	82.2	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: 274655) - continued										
VA21B7535-007	Anonymous	boron, total	7440-42-8	E468S	ND mg/L	0.2 mg/L	ND	70.0	130	----
		cadmium, total	7440-43-9	E468S	0.00710 mg/L	0.008 mg/L	88.8	70.0	130	----
		calcium, total	7440-70-2	E468S	ND mg/L	8 mg/L	ND	70.0	130	----
		cesium, total	7440-46-2	E468S	0.0196 mg/L	0.02 mg/L	97.8	70.0	130	----
		chromium, total	7440-47-3	E468S	0.0910 mg/L	0.08 mg/L	114	70.0	130	----
		cobalt, total	7440-48-4	E468S	0.0400 mg/L	0.04 mg/L	100	70.0	130	----
		copper, total	7440-50-8	E468S	0.0356 mg/L	0.04 mg/L	89.0	70.0	130	----
		gallium, total	7440-55-3	E468S	0.00587 mg/L	0.005 mg/L	117	70.0	130	----
		iron, total	7439-89-6	E468S	4.25 mg/L	4 mg/L	106	70.0	130	----
		lead, total	7439-92-1	E468S	0.0342 mg/L	0.04 mg/L	85.6	70.0	130	----
		lithium, total	7439-93-2	E468S	0.213 mg/L	0.2 mg/L	107	70.0	130	----
		magnesium, total	7439-95-4	E468S	ND mg/L	2 mg/L	ND	70.0	130	----
		manganese, total	7439-96-5	E468S	0.0451 mg/L	0.04 mg/L	113	70.0	130	----
		molybdenum, total	7439-98-7	E468S	0.0407 mg/L	0.04 mg/L	102	70.0	130	----
		nickel, total	7440-02-0	E468S	0.0736 mg/L	0.08 mg/L	92.0	70.0	130	----
		phosphorus, total	7723-14-0	E468S	25.1 mg/L	20 mg/L	126	70.0	130	----
		potassium, total	7440-09-7	E468S	ND mg/L	8 mg/L	ND	70.0	130	----
		rhenium, total	7440-15-5	E468S	0.00470 mg/L	0.005 mg/L	94.0	70.0	130	----
		rubidium, total	7440-17-7	E468S	ND mg/L	0.04 mg/L	ND	70.0	130	----
		selenium, total	7782-49-2	E468S	0.0814 mg/L	0.08 mg/L	102	70.0	130	----
		silver, total	7440-22-4	E468S	0.00685 mg/L	0.008 mg/L	85.7	70.0	130	----
		strontium, total	7440-24-6	E468S	ND mg/L	0.04 mg/L	ND	70.0	130	----
		sulfur, total	7704-34-9	E468S	ND mg/L	40 mg/L	ND	70.0	130	----
		tellurium, total	13494-80-9	E468S	0.0654 mg/L	0.08 mg/L	81.8	70.0	130	----
		thallium, total	7440-28-0	E468S	0.00654 mg/L	0.008 mg/L	81.8	70.0	130	----
		thorium, total	7440-29-1	E468S	0.0382 mg/L	0.04 mg/L	95.6	70.0	130	----
		tin, total	7440-31-5	E468S	0.0354 mg/L	0.04 mg/L	88.6	70.0	130	----
		titanium, total	7440-32-6	E468S	0.178 mg/L	0.16 mg/L	111	70.0	130	----
		tungsten, total	7440-33-7	E468S	0.0372 mg/L	0.04 mg/L	93.0	70.0	130	----
		uranium, total	7440-61-1	E468S	0.00734 mg/L	0.008 mg/L	91.7	70.0	130	----
		vanadium, total	7440-62-2	E468S	0.238 mg/L	0.2 mg/L	119	70.0	130	----
		yttrium, total	7440-65-5	E468S	0.0110 mg/L	0.01 mg/L	110	70.0	130	----
		zinc, total	7440-66-6	E468S	0.691 mg/L	0.8 mg/L	86.4	70.0	130	----
		zirconium, total	7440-67-7	E468S	0.0872 mg/L	0.08 mg/L	109	70.0	130	----
Total Metals (QCLot: 274656)										
VA21B7535-007	Anonymous	silicon, total	7440-21-3	E468S.NaSi	490 mg/L	500 mg/L	98.0	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: 274656) - continued										
VA21B7535-007	Anonymous	sodium, total	17341-25-2	E468S.NaSi	ND mg/L	100 mg/L	ND	70.0	130	----
Total Metals (QCLot: 275419)										
VA21B7440-026	Anonymous	mercury, total	7439-97-6	E508S	0.0000979 mg/L	0.0001 mg/L	97.9	70.0	130	----
Dissolved Metals (QCLot: 274067)										
VA21B7536-002	TR Ref2	aluminum, dissolved	7429-90-5	E469S	0.426 mg/L	0.4 mg/L	106	70.0	130	----
		antimony, dissolved	7440-36-0	E469S	0.0387 mg/L	0.04 mg/L	96.8	70.0	130	----
		arsenic, dissolved	7440-38-2	E469S	0.0364 mg/L	0.04 mg/L	91.1	70.0	130	----
		barium, dissolved	7440-39-3	E469S	0.0381 mg/L	0.04 mg/L	95.2	70.0	130	----
		beryllium, dissolved	7440-41-7	E469S	0.0779 mg/L	0.08 mg/L	97.3	70.0	130	----
		bismuth, dissolved	7440-69-9	E469S	0.0165 mg/L	0.02 mg/L	82.4	70.0	130	----
		boron, dissolved	7440-42-8	E469S	ND mg/L	0.2 mg/L	ND	70.0	130	----
		cadmium, dissolved	7440-43-9	E469S	0.00703 mg/L	0.008 mg/L	87.9	70.0	130	----
		calcium, dissolved	7440-70-2	E469S	ND mg/L	8 mg/L	ND	70.0	130	----
		cesium, dissolved	7440-46-2	E469S	0.0205 mg/L	0.02 mg/L	102	70.0	130	----
		chromium, dissolved	7440-47-3	E469S	0.0802 mg/L	0.08 mg/L	100	70.0	130	----
		cobalt, dissolved	7440-48-4	E469S	0.0378 mg/L	0.04 mg/L	94.4	70.0	130	----
		copper, dissolved	7440-50-8	E469S	0.0345 mg/L	0.04 mg/L	86.2	70.0	130	----
		gallium, dissolved	7440-55-3	E469S	0.00528 mg/L	0.005 mg/L	106	70.0	130	----
		iron, dissolved	7439-89-6	E469S	3.97 mg/L	4 mg/L	99.3	70.0	130	----
		lead, dissolved	7439-92-1	E469S	0.0340 mg/L	0.04 mg/L	85.1	70.0	130	----
		lithium, dissolved	7439-93-2	E469S	0.180 mg/L	0.2 mg/L	90.0	70.0	130	----
		magnesium, dissolved	7439-95-4	E469S	ND mg/L	2 mg/L	ND	70.0	130	----
		manganese, dissolved	7439-96-5	E469S	0.0409 mg/L	0.04 mg/L	102	70.0	130	----
		molybdenum, dissolved	7439-98-7	E469S	0.0404 mg/L	0.04 mg/L	101	70.0	130	----
		nickel, dissolved	7440-02-0	E469S	0.0703 mg/L	0.08 mg/L	87.9	70.0	130	----
		phosphorus, dissolved	7723-14-0	E469S	22.7 mg/L	20 mg/L	113	70.0	130	----
		potassium, dissolved	7440-09-7	E469S	ND mg/L	8 mg/L	ND	70.0	130	----
		rhenium, dissolved	7440-15-5	E469S	0.00480 mg/L	0.005 mg/L	96.0	70.0	130	----
		rubidium, dissolved	7440-17-7	E469S	ND mg/L	0.04 mg/L	ND	70.0	130	----
		selenium, dissolved	7782-49-2	E469S	0.0754 mg/L	0.08 mg/L	94.3	70.0	130	----
		silver, dissolved	7440-22-4	E469S	0.00722 mg/L	0.008 mg/L	90.2	70.0	130	----
		strontium, dissolved	7440-24-6	E469S	ND mg/L	0.04 mg/L	ND	70.0	130	----
		sulfur, dissolved	7704-34-9	E469S	ND mg/L	40 mg/L	ND	70.0	130	----
		tellurium, dissolved	13494-80-9	E469S	0.0716 mg/L	0.08 mg/L	89.5	70.0	130	----
		thallium, dissolved	7440-28-0	E469S	0.00725 mg/L	0.008 mg/L	90.7	70.0	130	----
		thorium, dissolved	7440-29-1	E469S	0.0391 mg/L	0.04 mg/L	97.7	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Dissolved Metals (QCLot: 274067) - continued										
VA21B7536-002	TR Ref2	tin, dissolved	7440-31-5	E469S	0.0376 mg/L	0.04 mg/L	93.9	70.0	130	----
		titanium, dissolved	7440-32-6	E469S	0.0813 mg/L	0.08 mg/L	102	70.0	130	----
		tungsten, dissolved	7440-33-7	E469S	0.0380 mg/L	0.04 mg/L	95.0	70.0	130	----
		uranium, dissolved	7440-61-1	E469S	0.00755 mg/L	0.008 mg/L	94.4	70.0	130	----
		vanadium, dissolved	7440-62-2	E469S	0.206 mg/L	0.2 mg/L	103	70.0	130	----
		yttrium, dissolved	7440-65-5	E469S	0.00590 mg/L	0.005 mg/L	118	70.0	130	----
		zinc, dissolved	7440-66-6	E469S	0.679 mg/L	0.8 mg/L	84.9	70.0	130	----
		zirconium, dissolved	7440-67-7	E469S	0.0823 mg/L	0.08 mg/L	103	70.0	130	----
Dissolved Metals (QCLot: 274068)										
VA21B7536-002	TR Ref2	silicon, dissolved	7440-21-3	E469S.NaSi	475 mg/L	500 mg/L	95.0	70.0	130	----
		sodium, dissolved	17341-25-2	E469S.NaSi	ND mg/L	100 mg/L	ND	70.0	130	----
Dissolved Metals (QCLot: 275533)										
VA21B7536-002	TR Ref2	mercury, dissolved	7439-97-6	E509S	0.0000973 mg/L	0.0001 mg/L	97.3	70.0	130	----

Chain of Custody (COC) / Analytical Request Form

ALS www.alsglobal.com

Canada Toll Free: 1 800 668 9878

COC Number: 20 - 920783

Page 1 of 1

Report To	Contact and company name below will appear on the final report
Company:	Golder Associates
Contact:	Trish Tomliens / Elaine Irving
Phone:	250-881-7372
	Company address below will appear on the final report
Street:	200-2920 Virtual Way
City/Province:	Vancouver, BC
Postal Code:	V5M 0C4
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	
Contact:	

Reports / Recipients

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

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

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

Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax: Ptomliens@golder.com

Email 2: Elaine_Irving@golder.com

Email 3:

Invoice Recipients

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax:

Email 2:

Turnaround Time (TAT) Requested

- ☑ Routine [R] if received by 3pm M-F - no surcharges apply
- ☐ 4 day [P4] if received by 3pm M-F - 20% rush surcharge minimum
- ☐ 3 day [P3] if received by 3pm M-F - 25% rush surcharge minimum
- ☐ 2 day [P2] if received by 3pm M-F - 50% rush surcharge minimum
- ☐ 1 day [E] if received by 3pm M-F - 100% rush surcharge minimum
- ☐ Same day [E2] if received by 10am M-S - 200% rush surcharge. Additional fees may apply to rush requests on weekends, statutory holidays and non-routine tests

AFFIX ALS BARCODE LABEL HERE (ALS use only)

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

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

Project Information

ALS Account # / Quote #:	Q84262
Job #:	1663724-44000-03
PO / AFE:	
LSD:	
ALS Lab Work Order # (ALS use only):	7536

Oil and Gas Required Fields (client use)

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

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

ALS Sample # (ALS use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	General (pH, alkalinity, TSS, turbidity, Anions, Conductivity)	Total Metals (P)	Dissolved Metals (F/P)	Total Mercury (P)	Dissolved Mercury (F/P)	Nutrients (P)	SAMPLES ON HOLD	EXTENDED STORAGE REQUIRED	SUSPECTED HAZARD (see notes)
	TR Ref 1	15-AUG-21	14:30	Seawater	6	X	X	X	X	X	X			
	TR Ref 2	15-AUG-21	17:00	Seawater	6	X	X	X	X	X	X			
	DUP-D	15-AUG-21		Seawater	6	X	X	X	X	X	X			

Environmental Division
Vancouver
Work Order Reference
VA21B7536
Telephone : +1 604 253 4188

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

... by selecting from drop-down below ... 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: 9 | 3 | 8

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (ALS use only)			FINAL SHIPMENT RECEPTION (ALS use only)		
Released by: Kristin Westman	Date: 17 AUG 2021	Time: 10:15	Received by:	Date:	Time:	Received by: JC	Date: 19 Aug	Time: 825 AM

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

AUG 2020 FRONT

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

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

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **VA21B7539**	Page	: 1 of 15
Amendment	: **1**		
Client	: **Golder Associates Ltd.**	Laboratory	: Vancouver - Environmental
Contact	: Elaine Irving	Account Manager	: Amber Springer
Address	: 200-2920 Virtual Way Vancouver BC Canada V5M 0C4	Address	: 8081 Lougheed Highway Burnaby BC Canada V5A 1W9
Telephone	: ----	Telephone	: +1 604 253 4188
Project	: 1663724-44000-03	Date Samples Received	: 19-Aug-2021 08:25
PO	: ----	Date Analysis Commenced	: 19-Aug-2021
C-O-C number	: 20-920780	Issue Date	: 07-Sep-2021 14:15
Sampler	: ----		
Site	: ----		
Quote number	: Q84262		
No. of samples received	: 9		
No. of samples analysed	: 9		

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

Signatories	*Position*	*Laboratory Department*
Angela Ren	Team Leader - Metals	Metals, Burnaby, British Columbia
Caleb Deroche	Lab Analyst	Metals, Burnaby, British Columbia
Dee Lee	Analyst	Metals, Burnaby, British Columbia
Janice Leung	Supervisor - Organics Instrumentation	Organics, Burnaby, British Columbia
Kevin Duarte	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics, Burnaby, British Columbia
Paul Cushing	Team Leader - Organics	Organics, Burnaby, British Columbia
Ruby Pham	Lab Assistant	Metals, Burnaby, British Columbia
Sristika Chand	Lab Analyst	Metals, Burnaby, British Columbia
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*
-	No Unit
µg/L	micrograms per litre
µS/cm	Microsiemens per centimetre
mg/L	milligrams per litre
NTU	nephelometric turbidity units
pH units	pH units
psu	practical salinity 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.

Workorder Comments

Amended COA(1): PAH data is included.

Analytical Results

Sub-Matrix: **Seawater**

(Matrix: **Water**)

				Client sample ID	MP-06 Source	MP-06 North	MP-06 ENE	MP-06 WNW	MP-05 Source
				Client sampling date / time	16-Aug-2021 10:25	16-Aug-2021 10:55	16-Aug-2021 11:05	16-Aug-2021 10:45	16-Aug-2021 13:40
Analyte	CAS Number	Method	LOR	Unit	VA21B7539-001	VA21B7539-002	VA21B7539-003	VA21B7539-004	VA21B7539-005
					Result	Result	Result	Result	Result
Physical Tests									
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	87.7	106	103	98.4	88.9
conductivity	----	E100S	2.0	μS/cm	5550	46300	42600	41100	9690
hardness (as CaCO3), dissolved	----	EC100	0.50	mg/L	473	5150	4620	4570	933
pH	----	E108	0.10	pH units	8.04	7.95	7.93	7.92	8.02
salinity	----	EC100S	1.0	psu	2.9	29.3	26.7	25.7	5.3
solids, total dissolved [TDS]	----	E162S	10	mg/L	3450	32000	27400	26200	5730
solids, total suspended [TSS]	----	E160S	2.0	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0
turbidity	----	E121	0.10	NTU	1.10	0.45	0.60	0.71	0.88
Anions and Nutrients									
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
bromide	24959-67-9	E235S.Br	5.0	mg/L	5.1	56.6	54.0	52.0	10.1
chloride	16887-00-6	E235S.Cl	50	mg/L	1660	16800	15900	15400	3140
fluoride	16984-48-8	E235S.F-L	0.20	mg/L	<0.20	0.77	0.78	0.76	0.20
Kjeldahl nitrogen, total [TKN]	----	E318S	0.050	mg/L	0.081	0.097	0.075	0.081	0.069
nitrate (as N)	14797-55-8	E235S.NO3-T	0.010	mg/L	<0.010	<0.010	<0.010	<0.010	0.021
nitrite (as N)	14797-65-0	E235S.NO2-L	0.010	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010
phosphorus, total	7723-14-0	E372S	0.0020	mg/L	0.0040	0.0170	0.0174	0.0157	<0.0040
sulfate (as SO4)	14808-79-8	E235S.SO4-L	3.0	mg/L	233	2340	2120	2080	440
Organic / Inorganic Carbon									
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	1.26	1.04	1.01	1.11	1.18
carbon, total organic [TOC]	----	E355-L	0.50	mg/L	1.30	1.18	1.02	1.07	1.24
Total Metals									
aluminum, total	7429-90-5	E468S	0.0050	mg/L	0.0292	0.0097	0.0123	0.0124	0.0239
antimony, total	7440-36-0	E468S	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
arsenic, total	7440-38-2	E468S	0.00040	mg/L	<0.00040	0.00133	0.00123	0.00122	<0.00040
barium, total	7440-39-3	E468S	0.0010	mg/L	0.0047	0.0075	0.0077	0.0080	0.0048
beryllium, total	7440-41-7	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
bismuth, total	7440-69-9	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
boron, total	7440-42-8	E468S	0.30	mg/L	0.45	3.66	3.48	3.20	0.72
cadmium, total	7440-43-9	E468S	0.000010	mg/L	<0.000010	0.000041	0.000030	0.000030	<0.000010

Analytical Results

Sub-Matrix: **Seawater**

(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	MP-06 Source	MP-06 North	MP-06 ENE	MP-06 WNW	MP-05 Source
				Client sampling date / time	16-Aug-2021 10:25	16-Aug-2021 10:55	16-Aug-2021 11:05	16-Aug-2021 10:45	16-Aug-2021 13:40
					VA21B7539-001	VA21B7539-002	VA21B7539-003	VA21B7539-004	VA21B7539-005
					Result	Result	Result	Result	Result
Total Metals									
calcium, total	7440-70-2	E468S	1.0	mg/L	55.8	402	365	345	84.5
cesium, total	7440-46-2	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
chromium, total	7440-47-3	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
cobalt, total	7440-48-4	E468S	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
copper, total	7440-50-8	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
gallium, total	7440-55-3	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
iron, total	7439-89-6	E468S	0.010	mg/L	0.031	0.010	<0.010	<0.010	0.029
lead, total	7439-92-1	E468S	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
lithium, total	7439-93-2	E468S	0.020	mg/L	<0.020	0.176	0.155	0.149	0.032
magnesium, total	7439-95-4	E468S	1.0	mg/L	102	1170	1050	1030	195
manganese, total	7439-96-5	E468S	0.00020	mg/L	0.00140	0.00100	0.00097	0.00130	0.00131
mercury, total	7439-97-6	E508S	0.0000050	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, total	7439-98-7	E468S	0.00010	mg/L	0.00106	0.00959	0.00891	0.00866	0.00186
nickel, total	7440-02-0	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
phosphorus, total	7723-14-0	E468S	0.050	mg/L	<0.050	<0.050	<0.050	0.052	<0.050
potassium, total	7440-09-7	E468S	1.0	mg/L	33.2	447	397	386	64.8
rhenium, total	7440-15-5	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
rubidium, total	7440-17-7	E468S	0.0050	mg/L	0.0099	0.111	0.0986	0.0972	0.0191
selenium, total	7782-49-2	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
silicon, total	7440-21-3	E468S.NaSi	1.0	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0
silver, total	7440-22-4	E468S	0.00010	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
sodium, total	17341-25-2	E468S.NaSi	2.5	mg/L	833	8830	7900	5630	1610
strontium, total	7440-24-6	E468S	0.010	mg/L	0.624	6.57	6.08	5.89	1.15
sulfur, total	7704-34-9	E468S	5.0	mg/L	80.1	1180	1030	1010	161
tellurium, total	13494-80-9	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
thallium, total	7440-28-0	E468S	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
thorium, total	7440-29-1	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
tin, total	7440-31-5	E468S	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
titanium, total	7440-32-6	E468S	0.0050	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
tungsten, total	7440-33-7	E468S	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
uranium, total	7440-61-1	E468S	0.000050	mg/L	0.00159	0.00262	0.00234	0.00232	0.00167

Analytical Results

Sub-Matrix: **Seawater**

(Matrix: **Water**)

				Client sample ID	MP-06 Source	MP-06 North	MP-06 ENE	MP-06 WNW	MP-05 Source
				Client sampling date / time	16-Aug-2021 10:25	16-Aug-2021 10:55	16-Aug-2021 11:05	16-Aug-2021 10:45	16-Aug-2021 13:40
Analyte	CAS Number	Method	LOR	Unit	VA21B7539-001	VA21B7539-002	VA21B7539-003	VA21B7539-004	VA21B7539-005
					Result	Result	Result	Result	Result
Total Metals									
vanadium, total	7440-62-2	E468S	0.00050	mg/L	<0.00050	0.00145	0.00130	0.00133	<0.00050
yttrium, total	7440-65-5	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
zinc, total	7440-66-6	E468S	0.0030	mg/L	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
zirconium, total	7440-67-7	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Dissolved Metals									
aluminum, dissolved	7429-90-5	E469S	0.0050	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
antimony, dissolved	7440-36-0	E469S	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
arsenic, dissolved	7440-38-2	E469S	0.00040	mg/L	<0.00040	0.00133	0.00123	0.00117	<0.00040
barium, dissolved	7440-39-3	E469S	0.0010	mg/L	0.0044	0.0068	0.0070	0.0071	0.0044
beryllium, dissolved	7440-41-7	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
bismuth, dissolved	7440-69-9	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
boron, dissolved	7440-42-8	E469S	0.30	mg/L	0.36	3.34	2.98	2.89	0.71
cadmium, dissolved	7440-43-9	E469S	0.000010	mg/L	<0.000010	0.000031	0.000030	0.000024	<0.000010
calcium, dissolved	7440-70-2	E469S	1.0	mg/L	46.8	349	306	310	78.4
cesium, dissolved	7440-46-2	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
chromium, dissolved	7440-47-3	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
cobalt, dissolved	7440-48-4	E469S	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
copper, dissolved	7440-50-8	E469S	0.00020	mg/L	0.00047	0.00022	0.00022	0.00032	0.00034
gallium, dissolved	7440-55-3	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
iron, dissolved	7439-89-6	E469S	0.010	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010
lead, dissolved	7439-92-1	E469S	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
lithium, dissolved	7439-93-2	E469S	0.020	mg/L	<0.020	0.146	0.125	0.122	0.026
magnesium, dissolved	7439-95-4	E469S	1.0	mg/L	86.6	1040	936	923	179
manganese, dissolved	7439-96-5	E469S	0.00010	mg/L	0.00054	0.00070	0.00074	0.00105	0.00061
mercury, dissolved	7439-97-6	E509S	0.0000050	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, dissolved	7439-98-7	E469S	0.00010	mg/L	0.00088	0.00938	0.00830	0.00845	0.00178
nickel, dissolved	7440-02-0	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
phosphorus, dissolved	7723-14-0	E469S	0.050	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050
potassium, dissolved	7440-09-7	E469S	1.0	mg/L	26.0	365	327	318	56.4
rhenium, dissolved	7440-15-5	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
rubidium, dissolved	7440-17-7	E469S	0.0050	mg/L	0.0079	0.0984	0.0888	0.0856	0.0162

Analytical Results

Sub-Matrix: **Seawater**

(Matrix: **Water**)

				Client sample ID	MP-06 Source	MP-06 North	MP-06 ENE	MP-06 WNW	MP-05 Source
				Client sampling date / time	16-Aug-2021 10:25	16-Aug-2021 10:55	16-Aug-2021 11:05	16-Aug-2021 10:45	16-Aug-2021 13:40
Analyte	CAS Number	Method	LOR	Unit	VA21B7539-001	VA21B7539-002	VA21B7539-003	VA21B7539-004	VA21B7539-005
					Result	Result	Result	Result	Result
Dissolved Metals									
selenium, dissolved	7782-49-2	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
silicon, dissolved	7440-21-3	E469S.NaSi	1.0	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0
silver, dissolved	7440-22-4	E469S	0.00010	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
sodium, dissolved	17341-25-2	E469S.NaSi	2.5	mg/L	691	8500	7540	7590	1520
strontium, dissolved	7440-24-6	E469S	0.010	mg/L	0.534	6.60	5.83	5.83	1.15
sulfur, dissolved	7704-34-9	E469S	5.0	mg/L	62.3	930	831	784	139
tellurium, dissolved	13494-80-9	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
thallium, dissolved	7440-28-0	E469S	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
thorium, dissolved	7440-29-1	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
tin, dissolved	7440-31-5	E469S	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
titanium, dissolved	7440-32-6	E469S	0.0050	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
tungsten, dissolved	7440-33-7	E469S	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
uranium, dissolved	7440-61-1	E469S	0.000050	mg/L	0.00152	0.00257	0.00227	0.00225	0.00149
vanadium, dissolved	7440-62-2	E469S	0.00050	mg/L	<0.00050	0.00128	0.00110	0.00106	<0.00050
yttrium, dissolved	7440-65-5	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
zinc, dissolved	7440-66-6	E469S	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
zirconium, dissolved	7440-67-7	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
dissolved mercury filtration location	----	EP509	-	-	Field	Field	Field	Field	Field
dissolved metals filtration location	----	EP421	-	-	Field	Field	Field	Field	Field
Volatile Organic Compounds [Fuels]									
benzene	71-43-2	E611A	0.50	µg/L	<0.50	----	<0.50	----	<0.50
ethylbenzene	100-41-4	E611A	0.50	µg/L	<0.50	----	<0.50	----	<0.50
methyl-tert-butyl ether [MTBE]	1634-04-4	E611A	0.50	µg/L	<0.50	----	<0.50	----	<0.50
styrene	100-42-5	E611A	0.50	µg/L	<0.50	----	<0.50	----	<0.50
toluene	108-88-3	E611A	0.50	µg/L	<0.50	----	<0.50	----	<0.50
xylene, m+p-	179601-23-1	E611A	0.40	µg/L	<0.40	----	<0.40	----	<0.40
xylene, o-	95-47-6	E611A	0.30	µg/L	<0.30	----	<0.30	----	<0.30
xylenes, total	1330-20-7	E611A	0.50	µg/L	<0.50	----	<0.50	----	<0.50
Volatile Organic Compounds Surrogates									
bromofluorobenzene, 4-	460-00-4	E611A	1.0	%	95.5	----	89.7	----	91.3
difluorobenzene, 1,4-	540-36-3	E611A	1.0	%	91.9	----	70.2	----	91.6

Analytical Results

Sub-Matrix: **Seawater**

(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	MP-06 Source	MP-06 North	MP-06 ENE	MP-06 WNW	MP-05 Source
				Client sampling date / time	16-Aug-2021 10:25	16-Aug-2021 10:55	16-Aug-2021 11:05	16-Aug-2021 10:45	16-Aug-2021 13:40
					VA21B7539-001	VA21B7539-002	VA21B7539-003	VA21B7539-004	VA21B7539-005
					Result	Result	Result	Result	Result
Hydrocarbons									
F2 (C10-C16)	----	E601	100	µg/L	<100	----	<100	----	<100
F3 (C16-C34)	----	E601	250	µg/L	<250	----	<250	----	<250
F4 (C34-C50)	----	E601	250	µg/L	<250	----	<250	----	<250
VHw (C6-C10)	----	E581.VH+F1	100	µg/L	<100	----	<100	----	<100
F1-BTEX	----	EC580	100	µg/L	<100	----	<100	----	<100
VPHw	----	EC580A	100	µg/L	<100	----	<100	----	<100
F1 (C6-C10)	----	E581.VH+F1	100	µg/L	<100	----	<100	----	<100
Hydrocarbons Surrogates									
bromobenzotrifluoride, 2- (F2-F4 surr)	392-83-6	E601	1.0	%	78.4	----	79.3	----	78.0
dichlorotoluene, 3,4-	97-75-0	E581.VH+F1	1.0	%	104	----	86.7	----	78.7
Polycyclic Aromatic Hydrocarbons									
acenaphthene	83-32-9	E641A	0.010	µg/L	<0.010	----	<0.010	----	<0.010
acenaphthylene	208-96-8	E641A	0.010	µg/L	<0.010	----	<0.010	----	<0.010
acridine	260-94-6	E641A	0.010	µg/L	<0.010	----	<0.010	----	<0.010
anthracene	120-12-7	E641A	0.010	µg/L	<0.010	----	<0.010	----	<0.010
benz(a)anthracene	56-55-3	E641A	0.010	µg/L	<0.010	----	<0.010	----	<0.010
benzo(a)pyrene	50-32-8	E641A	0.0050	µg/L	<0.0050	----	<0.0050	----	<0.0050
benzo(b+j)fluoranthene	----	E641A	0.010	µg/L	<0.010	----	<0.010	----	<0.010
benzo(b+j+k)fluoranthene	----	E641A	0.015	µg/L	<0.015	----	<0.015	----	<0.015
benzo(g,h,i)perylene	191-24-2	E641A	0.010	µg/L	<0.010	----	<0.010	----	<0.010
benzo(k)fluoranthene	207-08-9	E641A	0.010	µg/L	<0.010	----	<0.010	----	<0.010
chrysene	218-01-9	E641A	0.010	µg/L	<0.010	----	<0.010	----	<0.010
dibenz(a,h)anthracene	53-70-3	E641A	0.0050	µg/L	<0.0050	----	<0.0050	----	<0.0050
fluoranthene	206-44-0	E641A	0.010	µg/L	<0.010	----	<0.010	----	<0.010
fluorene	86-73-7	E641A	0.010	µg/L	<0.010	----	<0.010	----	<0.010
indeno(1,2,3-c,d)pyrene	193-39-5	E641A	0.010	µg/L	<0.010	----	<0.010	----	<0.010
methylnaphthalene, 1-	90-12-0	E641A	0.010	µg/L	<0.010	----	<0.010	----	<0.010
methylnaphthalene, 1+2-	----	E641A	0.015	µg/L	<0.015	----	<0.015	----	<0.015
methylnaphthalene, 2-	91-57-6	E641A	0.010	µg/L	<0.010	----	<0.010	----	<0.010
naphthalene	91-20-3	E641A	0.050	µg/L	<0.050	----	<0.050	----	<0.050
phenanthrene	85-01-8	E641A	0.020	µg/L	<0.020	----	<0.020	----	<0.020

Analytical Results

Sub-Matrix: **Seawater**

(Matrix: Water)

				Client sample ID	MP-06 Source	MP-06 North	MP-06 ENE	MP-06 WNW	MP-05 Source
				Client sampling date / time	16-Aug-2021 10:25	16-Aug-2021 10:55	16-Aug-2021 11:05	16-Aug-2021 10:45	16-Aug-2021 13:40
Analyte	CAS Number	Method	LOR	Unit	VA21B7539-001	VA21B7539-002	VA21B7539-003	VA21B7539-004	VA21B7539-005
					Result	Result	Result	Result	Result
Polycyclic Aromatic Hydrocarbons									
pyrene	129-00-0	E641A	0.010	µg/L	<0.010	----	<0.010	----	<0.010
quinoline	6027-02-7	E641A	0.050	µg/L	<0.050	----	<0.050	----	<0.050
B(a)P total potency equivalents [B(a)P TPE]	----	E641A	0.010	µg/L	<0.010	----	<0.010	----	<0.010
PAHs, high molecular weight (BC AWQ)	----	E641A	0.030	µg/L	<0.030	----	<0.030	----	<0.030
PAHs, low molecular weight (BC AWQ)	----	E641A	0.060	µg/L	<0.060	----	<0.060	----	<0.060
PAHs, total (EPA 16)	----	E641A	0.065	µg/L	<0.065	----	<0.065	----	<0.065
Polycyclic Aromatic Hydrocarbons Surrogates									
chrysene-d12	1719-03-5	E641A	0.1	%	82.7	----	83.4	----	75.4
naphthalene-d8	1146-65-2	E641A	0.1	%	88.0	----	97.9	----	88.5
phenanthrene-d10	1517-22-2	E641A	0.1	%	111	----	112	----	104

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

Analytical Results

Sub-Matrix: **Seawater**

(Matrix: **Water**)

				Client sample ID	MP-05 North	MP-05 ENE	MP-05 WNW	DUP-C	----
				Client sampling date / time	16-Aug-2021 13:25	16-Aug-2021 13:50	16-Aug-2021 13:35	16-Aug-2021 13:55	----
Analyte	CAS Number	Method	LOR	Unit	VA21B7539-006	VA21B7539-007	VA21B7539-008	VA21B7539-009	--------
					Result	Result	Result	Result	----
Physical Tests									
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	87.4	90.2	89.1	89.7	----
conductivity	----	E100S	2.0	µS/cm	11100	14200	12300	12600	----
hardness (as CaCO3), dissolved	----	EC100	0.50	mg/L	1100	1340	1200	1260	----
pH	----	E108	0.10	pH units	8.01	8.01	8.01	7.97	----
salinity	----	EC100S	1.0	psu	6.2	8.0	6.9	7.0	----
solids, total dissolved [TDS]	----	E162S	10	mg/L	6360	8100	7140	7420	----
solids, total suspended [TSS]	----	E160S	2.0	mg/L	<2.0	<2.0	<2.0	<2.0	----
turbidity	----	E121	0.10	NTU	0.69	0.99	0.87	0.81	----
Anions and Nutrients									
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	----
bromide	24959-67-9	E235S.Br	5.0	mg/L	12.0	15.4	12.8	13.2	----
chloride	16887-00-6	E235S.Cl	50	mg/L	3790	4740	3990	4170	----
fluoride	16984-48-8	E235S.F-L	0.20	mg/L	0.22	0.28	0.24	0.25	----
Kjeldahl nitrogen, total [TKN]	----	E318S	0.050	mg/L	0.092	0.094	0.097	0.085	----
nitrate (as N)	14797-55-8	E235S.NO3-T	0.010	mg/L	<0.010	0.028	<0.010	0.049	----
nitrite (as N)	14797-65-0	E235S.NO2-L	0.010	mg/L	<0.010	<0.010	<0.010	<0.010	----
phosphorus, total	7723-14-0	E372S	0.0020	mg/L	<0.0040	0.0072	0.0044	0.0134	----
sulfate (as SO4)	14808-79-8	E235S.SO4-L	3.0	mg/L	508	652	559	582	----
Organic / Inorganic Carbon									
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	1.22	1.16	1.14	1.08	----
carbon, total organic [TOC]	----	E355-L	0.50	mg/L	1.24	1.22	1.15	1.16	----
Total Metals									
aluminum, total	7429-90-5	E468S	0.0050	mg/L	0.0236	0.0247	0.0293	0.0239	----
antimony, total	7440-36-0	E468S	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	----
arsenic, total	7440-38-2	E468S	0.00040	mg/L	<0.00040	0.00045	<0.00040	0.00041	----
barium, total	7440-39-3	E468S	0.0010	mg/L	0.0050	0.0051	0.0052	0.0052	----
beryllium, total	7440-41-7	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
bismuth, total	7440-69-9	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
boron, total	7440-42-8	E468S	0.30	mg/L	0.86	1.08	1.00	1.04	----
cadmium, total	7440-43-9	E468S	0.000010	mg/L	<0.000010	0.000011	0.000010	<0.000010	----
calcium, total	7440-70-2	E468S	1.0	mg/L	95.4	114	107	112	----

Analytical Results

Sub-Matrix: **Seawater**

(Matrix: **Water**)

				Client sample ID	MP-05 North	MP-05 ENE	MP-05 WNW	DUP-C	----
				Client sampling date / time	16-Aug-2021 13:25	16-Aug-2021 13:50	16-Aug-2021 13:35	16-Aug-2021 13:55	----
Analyte	CAS Number	Method	LOR	Unit	VA21B7539-006	VA21B7539-007	VA21B7539-008	VA21B7539-009	--------
					Result	Result	Result	Result	----
Total Metals									
cesium, total	7440-46-2	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
chromium, total	7440-47-3	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	0.00172	----
cobalt, total	7440-48-4	E468S	0.000050	mg/L	<0.000050	<0.000050	<0.000050	0.000066	----
copper, total	7440-50-8	E468S	0.00050	mg/L	0.00054	<0.00050	<0.00050	<0.00050	----
gallium, total	7440-55-3	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
iron, total	7439-89-6	E468S	0.010	mg/L	0.028	0.032	0.032	0.040	----
lead, total	7439-92-1	E468S	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	----
lithium, total	7439-93-2	E468S	0.020	mg/L	0.037	0.048	0.042	0.043	----
magnesium, total	7439-95-4	E468S	1.0	mg/L	234	295	258	275	----
manganese, total	7439-96-5	E468S	0.00020	mg/L	0.00140	0.00144	0.00137	0.00167	----
mercury, total	7439-97-6	E508S	0.0000050	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	----
molybdenum, total	7439-98-7	E468S	0.00010	mg/L	0.00216	0.00268	0.00244	0.00251	----
nickel, total	7440-02-0	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	0.00225	----
phosphorus, total	7723-14-0	E468S	0.050	mg/L	<0.050	<0.050	<0.050	<0.050	----
potassium, total	7440-09-7	E468S	1.0	mg/L	78.3	100	91.3	95.9	----
rhenium, total	7440-15-5	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
rubidium, total	7440-17-7	E468S	0.0050	mg/L	0.0224	0.0278	0.0254	0.0261	----
selenium, total	7782-49-2	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
silicon, total	7440-21-3	E468S.NaSi	1.0	mg/L	<1.0	<1.0	<1.0	<1.0	----
silver, total	7440-22-4	E468S	0.00010	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	----
sodium, total	17341-25-2	E468S.NaSi	2.5	mg/L	1880	2280	2020	2110	----
strontium, total	7440-24-6	E468S	0.010	mg/L	1.38	1.75	1.58	1.68	----
sulfur, total	7704-34-9	E468S	5.0	mg/L	194	250	229	242	----
tellurium, total	13494-80-9	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
thallium, total	7440-28-0	E468S	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	----
thorium, total	7440-29-1	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
tin, total	7440-31-5	E468S	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	----
titanium, total	7440-32-6	E468S	0.0050	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	----
tungsten, total	7440-33-7	E468S	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	----
uranium, total	7440-61-1	E468S	0.000050	mg/L	0.00172	0.00229	0.00174	0.00182	----
vanadium, total	7440-62-2	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----

Analytical Results

Sub-Matrix: **Seawater**

(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	MP-05 North	MP-05 ENE	MP-05 WNW	DUP-C	----
				Client sampling date / time	16-Aug-2021 13:25	16-Aug-2021 13:50	16-Aug-2021 13:35	16-Aug-2021 13:55	----
					VA21B7539-006	VA21B7539-007	VA21B7539-008	VA21B7539-009	--------
					Result	Result	Result	Result	----
Total Metals									
yttrium, total	7440-65-5	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
zinc, total	7440-66-6	E468S	0.0030	mg/L	<0.0030	<0.0030	<0.0030	<0.0030	----
zirconium, total	7440-67-7	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
Dissolved Metals									
aluminum, dissolved	7429-90-5	E469S	0.0050	mg/L	<0.0050	<0.0050	<0.0050	0.0051	----
antimony, dissolved	7440-36-0	E469S	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	----
arsenic, dissolved	7440-38-2	E469S	0.00040	mg/L	<0.00040	0.00040	<0.00040	<0.00040	----
barium, dissolved	7440-39-3	E469S	0.0010	mg/L	0.0045	0.0046	0.0044	0.0045	----
beryllium, dissolved	7440-41-7	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
bismuth, dissolved	7440-69-9	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
boron, dissolved	7440-42-8	E469S	0.30	mg/L	0.78	0.95	0.86	0.93	----
cadmium, dissolved	7440-43-9	E469S	0.000010	mg/L	<0.000010	<0.000010	0.000012	<0.000010	----
calcium, dissolved	7440-70-2	E469S	1.0	mg/L	85.7	101	92.6	98.0	----
cesium, dissolved	7440-46-2	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
chromium, dissolved	7440-47-3	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
cobalt, dissolved	7440-48-4	E469S	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	----
copper, dissolved	7440-50-8	E469S	0.00020	mg/L	0.00088	0.00037	0.00037	0.00042	----
gallium, dissolved	7440-55-3	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
iron, dissolved	7439-89-6	E469S	0.010	mg/L	<0.010	<0.010	<0.010	<0.010	----
lead, dissolved	7439-92-1	E469S	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	----
lithium, dissolved	7439-93-2	E469S	0.020	mg/L	0.031	0.037	0.035	0.038	----
magnesium, dissolved	7439-95-4	E469S	1.0	mg/L	216	265	236	247	----
manganese, dissolved	7439-96-5	E469S	0.00010	mg/L	0.00060	0.00069	0.00062	0.00059	----
mercury, dissolved	7439-97-6	E509S	0.0000050	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	----
molybdenum, dissolved	7439-98-7	E469S	0.00010	mg/L	0.00202	0.00242	0.00232	0.00232	----
nickel, dissolved	7440-02-0	E469S	0.00050	mg/L	0.00051	<0.00050	<0.00050	<0.00050	----
phosphorus, dissolved	7723-14-0	E469S	0.050	mg/L	<0.050	<0.050	<0.050	<0.050	----
potassium, dissolved	7440-09-7	E469S	1.0	mg/L	68.3	86.4	76.5	79.0	----
rhenium, dissolved	7440-15-5	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
rubidium, dissolved	7440-17-7	E469S	0.0050	mg/L	0.0197	0.0241	0.0222	0.0227	----
selenium, dissolved	7782-49-2	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----

Analytical Results

Sub-Matrix: **Seawater**

(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	MP-05 North	MP-05 ENE	MP-05 WNW	DUP-C	----
				Client sampling date / time	16-Aug-2021 13:25	16-Aug-2021 13:50	16-Aug-2021 13:35	16-Aug-2021 13:55	----
					VA21B7539-006	VA21B7539-007	VA21B7539-008	VA21B7539-009	--------
					Result	Result	Result	Result	----
Dissolved Metals									
silicon, dissolved	7440-21-3	E469S.NaSi	1.0	mg/L	<1.0	<1.0	<1.0	<1.0	----
silver, dissolved	7440-22-4	E469S	0.00010	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	----
sodium, dissolved	17341-25-2	E469S.NaSi	2.5	mg/L	1820	2190	2020	2020	----
strontium, dissolved	7440-24-6	E469S	0.010	mg/L	1.33	1.62	1.50	1.54	----
sulfur, dissolved	7704-34-9	E469S	5.0	mg/L	164	211	186	195	----
tellurium, dissolved	13494-80-9	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
thallium, dissolved	7440-28-0	E469S	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	----
thorium, dissolved	7440-29-1	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
tin, dissolved	7440-31-5	E469S	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	----
titanium, dissolved	7440-32-6	E469S	0.0050	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	----
tungsten, dissolved	7440-33-7	E469S	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	----
uranium, dissolved	7440-61-1	E469S	0.000050	mg/L	0.00160	0.00212	0.00166	0.00171	----
vanadium, dissolved	7440-62-2	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
yttrium, dissolved	7440-65-5	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
zinc, dissolved	7440-66-6	E469S	0.0010	mg/L	<0.0010	<0.0010	0.0013	<0.0010	----
zirconium, dissolved	7440-67-7	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
dissolved mercury filtration location	----	EP509	-	-	Field	Field	Field	Field	----
dissolved metals filtration location	----	EP421	-	-	Field	Field	Field	Field	----
Volatile Organic Compounds [Fuels]									
benzene	71-43-2	E611A	0.50	µg/L	<0.50	----	----	----	----
ethylbenzene	100-41-4	E611A	0.50	µg/L	<0.50	----	----	----	----
methyl-tert-butyl ether [MTBE]	1634-04-4	E611A	0.50	µg/L	<0.50	----	----	----	----
styrene	100-42-5	E611A	0.50	µg/L	<0.50	----	----	----	----
toluene	108-88-3	E611A	0.50	µg/L	<0.50	----	----	----	----
xylene, m+p-	179601-23-1	E611A	0.40	µg/L	<0.40	----	----	----	----
xylene, o-	95-47-6	E611A	0.30	µg/L	<0.30	----	----	----	----
xylenes, total	1330-20-7	E611A	0.50	µg/L	<0.50	----	----	----	----
Volatile Organic Compounds Surrogates									
bromofluorobenzene, 4-	460-00-4	E611A	1.0	%	93.1	----	----	----	----
difluorobenzene, 1,4-	540-36-3	E611A	1.0	%	93.9	----	----	----	----
Hydrocarbons									

Analytical Results

Sub-Matrix: **Seawater**

(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	MP-05 North	MP-05 ENE	MP-05 WNW	DUP-C	----
				Client sampling date / time	16-Aug-2021 13:25	16-Aug-2021 13:50	16-Aug-2021 13:35	16-Aug-2021 13:55	----
					VA21B7539-006	VA21B7539-007	VA21B7539-008	VA21B7539-009	--------
					Result	Result	Result	Result	----
Hydrocarbons									
F2 (C10-C16)	----	E601	100	µg/L	<100	----	----	----	----
F3 (C16-C34)	----	E601	250	µg/L	<250	----	----	----	----
F4 (C34-C50)	----	E601	250	µg/L	<250	----	----	----	----
VHw (C6-C10)	----	E581.VH+F1	100	µg/L	<100	----	----	----	----
F1-BTEX	----	EC580	100	µg/L	<100	----	----	----	----
VPHw	----	EC580A	100	µg/L	<100	----	----	----	----
F1 (C6-C10)	----	E581.VH+F1	100	µg/L	<100	----	----	----	----
Hydrocarbons Surrogates									
bromobenzotrifluoride, 2- (F2-F4 surr)	392-83-6	E601	1.0	%	77.9	----	----	----	----
dichlorotoluene, 3,4-	97-75-0	E581.VH+F1	1.0	%	120	----	----	----	----
Polycyclic Aromatic Hydrocarbons									
acenaphthene	83-32-9	E641A	0.010	µg/L	<0.010	----	----	----	----
acenaphthylene	208-96-8	E641A	0.010	µg/L	<0.010	----	----	----	----
acridine	260-94-6	E641A	0.010	µg/L	<0.010	----	----	----	----
anthracene	120-12-7	E641A	0.010	µg/L	<0.010	----	----	----	----
benz(a)anthracene	56-55-3	E641A	0.010	µg/L	<0.010	----	----	----	----
benzo(a)pyrene	50-32-8	E641A	0.0050	µg/L	<0.0050	----	----	----	----
benzo(b+j)fluoranthene	----	E641A	0.010	µg/L	<0.010	----	----	----	----
benzo(b+j+k)fluoranthene	----	E641A	0.015	µg/L	<0.015	----	----	----	----
benzo(g,h,i)perylene	191-24-2	E641A	0.010	µg/L	<0.010	----	----	----	----
benzo(k)fluoranthene	207-08-9	E641A	0.010	µg/L	<0.010	----	----	----	----
chrysene	218-01-9	E641A	0.010	µg/L	<0.010	----	----	----	----
dibenz(a,h)anthracene	53-70-3	E641A	0.0050	µg/L	<0.0050	----	----	----	----
fluoranthene	206-44-0	E641A	0.010	µg/L	<0.010	----	----	----	----
fluorene	86-73-7	E641A	0.010	µg/L	<0.010	----	----	----	----
indeno(1,2,3-c,d)pyrene	193-39-5	E641A	0.010	µg/L	<0.010	----	----	----	----
methylnaphthalene, 1-	90-12-0	E641A	0.010	µg/L	<0.010	----	----	----	----
methylnaphthalene, 1+2-	----	E641A	0.015	µg/L	<0.015	----	----	----	----
methylnaphthalene, 2-	91-57-6	E641A	0.010	µg/L	<0.010	----	----	----	----
naphthalene	91-20-3	E641A	0.050	µg/L	<0.050	----	----	----	----
phenanthrene	85-01-8	E641A	0.020	µg/L	<0.020	----	----	----	----

Analytical Results

Sub-Matrix: **Seawater**

(Matrix: Water)

				Client sample ID	MP-05 North	MP-05 ENE	MP-05 WNW	DUP-C	----
				Client sampling date / time	16-Aug-2021 13:25	16-Aug-2021 13:50	16-Aug-2021 13:35	16-Aug-2021 13:55	----
Analyte	CAS Number	Method	LOR	Unit	VA21B7539-006	VA21B7539-007	VA21B7539-008	VA21B7539-009	--------
					Result	Result	Result	Result	----
Polycyclic Aromatic Hydrocarbons									
pyrene	129-00-0	E641A	0.010	µg/L	<0.010	----	----	----	----
quinoline	6027-02-7	E641A	0.050	µg/L	<0.050	----	----	----	----
B(a)P total potency equivalents [B(a)P TPE]	----	E641A	0.010	µg/L	<0.010	----	----	----	----
PAHs, high molecular weight (BC AWQ)	----	E641A	0.030	µg/L	<0.030	----	----	----	----
PAHs, low molecular weight (BC AWQ)	----	E641A	0.060	µg/L	<0.060	----	----	----	----
PAHs, total (EPA 16)	----	E641A	0.065	µg/L	<0.065	----	----	----	----
Polycyclic Aromatic Hydrocarbons Surrogates									
chrysene-d12	1719-03-5	E641A	0.1	%	85.9	----	----	----	----
naphthalene-d8	1146-65-2	E641A	0.1	%	98.5	----	----	----	----
phenanthrene-d10	1517-22-2	E641A	0.1	%	117	----	----	----	----

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

ALS Environmental

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **VA21B7539**	Page	: 1 of 34
Amendment	: **1**		
Client	: **Golder Associates Ltd.**	Laboratory	: Vancouver - Environmental
Contact	: Elaine Irving	Account Manager	: Amber Springer
Address	: 200-2920 Virtual Way Vancouver BC Canada V5M 0C4	Address	: 8081 Lougheed Highway Burnaby, British Columbia Canada V5A 1W9
Telephone	: ----	Telephone	: +1 604 253 4188
Project	: 1663724-44000-03	Date Samples Received	: 19-Aug-2021 08:25
PO	: ----	Issue Date	: 07-Sep-2021 14:15
C-O-C number	: 20-920780		
Sampler	: ----		
Site	: ----		
Quote number	: Q84262		
No. of samples received	: 9		
No. of samples analysed	: 9		

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 Services number is a unique identifier assigned to discrete substances.

DQO: Data Quality Objective.

LOR: Limit of Reporting (detection limit).

RPD: Relative Percent Difference.

Summary of Outliers

Outliers : Quality Control Samples

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

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

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

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Analysis Holding Time Compliance

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

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

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

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

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) DUP-C	E298	16-Aug-2021	24-Aug-2021	----	----		24-Aug-2021	28 days	8 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) MP-05 ENE	E298	16-Aug-2021	24-Aug-2021	----	----		24-Aug-2021	28 days	8 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) MP-05 North	E298	16-Aug-2021	24-Aug-2021	----	----		24-Aug-2021	28 days	8 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) MP-05 Source	E298	16-Aug-2021	24-Aug-2021	----	----		24-Aug-2021	28 days	8 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) MP-05 WNW	E298	16-Aug-2021	24-Aug-2021	----	----		24-Aug-2021	28 days	8 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) MP-06 ENE	E298	16-Aug-2021	24-Aug-2021	----	----		24-Aug-2021	28 days	8 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) MP-06 North	E298	16-Aug-2021	24-Aug-2021	----	----		24-Aug-2021	28 days	8 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis: Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) MP-06 Source	E298	16-Aug-2021	24-Aug-2021	----	----		24-Aug-2021	28 days	8 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) MP-06 WNW	E298	16-Aug-2021	24-Aug-2021	----	----		24-Aug-2021	28 days	8 days	✓
Anions and Nutrients : Bromide in Seawater by IC										
HDPE DUP-C	E235S.Br	16-Aug-2021	----	----	----		24-Aug-2021	28 days	8 days	✓
Anions and Nutrients : Bromide in Seawater by IC										
HDPE MP-05 ENE	E235S.Br	16-Aug-2021	----	----	----		24-Aug-2021	28 days	8 days	✓
Anions and Nutrients : Bromide in Seawater by IC										
HDPE MP-05 North	E235S.Br	16-Aug-2021	----	----	----		24-Aug-2021	28 days	8 days	✓
Anions and Nutrients : Bromide in Seawater by IC										
HDPE MP-05 Source	E235S.Br	16-Aug-2021	----	----	----		24-Aug-2021	28 days	8 days	✓
Anions and Nutrients : Bromide in Seawater by IC										
HDPE MP-05 WNW	E235S.Br	16-Aug-2021	----	----	----		24-Aug-2021	28 days	8 days	✓
Anions and Nutrients : Bromide in Seawater by IC										
HDPE MP-06 ENE	E235S.Br	16-Aug-2021	----	----	----		24-Aug-2021	28 days	8 days	✓
Anions and Nutrients : Bromide in Seawater by IC										
HDPE MP-06 North	E235S.Br	16-Aug-2021	----	----	----		24-Aug-2021	28 days	8 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Anions and Nutrients : Bromide in Seawater by IC										
HDPE										
MP-06 Source	E235S.Br	16-Aug-2021	----	----	----		24-Aug-2021	28 days	8 days	✓
Anions and Nutrients : Bromide in Seawater by IC										
HDPE										
MP-06 WNW	E235S.Br	16-Aug-2021	----	----	----		24-Aug-2021	28 days	8 days	✓
Anions and Nutrients : Chloride in Seawater by IC										
HDPE										
DUP-C	E235S.Cl	16-Aug-2021	----	----	----		24-Aug-2021	28 days	8 days	✓
Anions and Nutrients : Chloride in Seawater by IC										
HDPE										
MP-05 ENE	E235S.Cl	16-Aug-2021	----	----	----		24-Aug-2021	28 days	8 days	✓
Anions and Nutrients : Chloride in Seawater by IC										
HDPE										
MP-05 North	E235S.Cl	16-Aug-2021	----	----	----		24-Aug-2021	28 days	8 days	✓
Anions and Nutrients : Chloride in Seawater by IC										
HDPE										
MP-05 Source	E235S.Cl	16-Aug-2021	----	----	----		24-Aug-2021	28 days	8 days	✓
Anions and Nutrients : Chloride in Seawater by IC										
HDPE										
MP-05 WNW	E235S.Cl	16-Aug-2021	----	----	----		24-Aug-2021	28 days	8 days	✓
Anions and Nutrients : Chloride in Seawater by IC										
HDPE										
MP-06 ENE	E235S.Cl	16-Aug-2021	----	----	----		24-Aug-2021	28 days	8 days	✓
Anions and Nutrients : Chloride in Seawater by IC										
HDPE										
MP-06 North	E235S.Cl	16-Aug-2021	----	----	----		24-Aug-2021	28 days	8 days	✓

Matrix: **Water**

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

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis: Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Chloride in Seawater by IC										
HDPE MP-06 Source	E235S.Cl	16-Aug-2021	----	----	----		24-Aug-2021	28 days	8 days	✓
Anions and Nutrients : Chloride in Seawater by IC										
HDPE MP-06 WNW	E235S.Cl	16-Aug-2021	----	----	----		24-Aug-2021	28 days	8 days	✓
Anions and Nutrients : Fluoride in Seawater by IC (Low Level)										
HDPE DUP-C	E235S.F-L	16-Aug-2021	----	----	----		24-Aug-2021	28 days	8 days	✓
Anions and Nutrients : Fluoride in Seawater by IC (Low Level)										
HDPE MP-05 ENE	E235S.F-L	16-Aug-2021	----	----	----		24-Aug-2021	28 days	8 days	✓
Anions and Nutrients : Fluoride in Seawater by IC (Low Level)										
HDPE MP-05 North	E235S.F-L	16-Aug-2021	----	----	----		24-Aug-2021	28 days	8 days	✓
Anions and Nutrients : Fluoride in Seawater by IC (Low Level)										
HDPE MP-05 Source	E235S.F-L	16-Aug-2021	----	----	----		24-Aug-2021	28 days	8 days	✓
Anions and Nutrients : Fluoride in Seawater by IC (Low Level)										
HDPE MP-05 WNW	E235S.F-L	16-Aug-2021	----	----	----		24-Aug-2021	28 days	8 days	✓
Anions and Nutrients : Fluoride in Seawater by IC (Low Level)										
HDPE MP-06 ENE	E235S.F-L	16-Aug-2021	----	----	----		24-Aug-2021	28 days	8 days	✓
Anions and Nutrients : Fluoride in Seawater by IC (Low Level)										
HDPE MP-06 North	E235S.F-L	16-Aug-2021	----	----	----		24-Aug-2021	28 days	8 days	✓

Matrix: **Water**

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

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Anions and Nutrients : Fluoride in Seawater by IC (Low Level)										
HDPE MP-06 Source	E235S.F-L	16-Aug-2021	----	----	----		24-Aug-2021	28 days	8 days	✓
Anions and Nutrients : Fluoride in Seawater by IC (Low Level)										
HDPE MP-06 WNW	E235S.F-L	16-Aug-2021	----	----	----		24-Aug-2021	28 days	8 days	✓
Anions and Nutrients : Nitrate in Seawater by IC (Trace Level)										
HDPE DUP-C	E235S.NO3-T	16-Aug-2021	----	----	----		24-Aug-2021	3 days	8 days	× EHTL
Anions and Nutrients : Nitrate in Seawater by IC (Trace Level)										
HDPE MP-05 ENE	E235S.NO3-T	16-Aug-2021	----	----	----		24-Aug-2021	3 days	8 days	× EHTL
Anions and Nutrients : Nitrate in Seawater by IC (Trace Level)										
HDPE MP-05 North	E235S.NO3-T	16-Aug-2021	----	----	----		24-Aug-2021	3 days	8 days	× EHTL
Anions and Nutrients : Nitrate in Seawater by IC (Trace Level)										
HDPE MP-05 Source	E235S.NO3-T	16-Aug-2021	----	----	----		24-Aug-2021	3 days	8 days	× EHTL
Anions and Nutrients : Nitrate in Seawater by IC (Trace Level)										
HDPE MP-05 WNW	E235S.NO3-T	16-Aug-2021	----	----	----		24-Aug-2021	3 days	8 days	× EHTL
Anions and Nutrients : Nitrate in Seawater by IC (Trace Level)										
HDPE MP-06 ENE	E235S.NO3-T	16-Aug-2021	----	----	----		24-Aug-2021	3 days	8 days	× EHTL
Anions and Nutrients : Nitrate in Seawater by IC (Trace Level)										
HDPE MP-06 North	E235S.NO3-T	16-Aug-2021	----	----	----		24-Aug-2021	3 days	8 days	× EHTL

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Holding Times: Rec	Holding Times: Actual	Eval	Analysis: Analysis Date	Holding Times: Rec	Holding Times: Actual	Eval
Anions and Nutrients : Nitrate in Seawater by IC (Trace Level)										
HDPE MP-06 Source	E235S.NO3-T	16-Aug-2021	----	----	----		24-Aug-2021	3 days	8 days	× EHTL
Anions and Nutrients : Nitrate in Seawater by IC (Trace Level)										
HDPE MP-06 WNW	E235S.NO3-T	16-Aug-2021	----	----	----		24-Aug-2021	3 days	8 days	× EHTL
Anions and Nutrients : Nitrite in Seawater by IC (Low Level)										
HDPE DUP-C	E235S.NO2-L	16-Aug-2021	----	----	----		24-Aug-2021	3 days	8 days	× EHTL
Anions and Nutrients : Nitrite in Seawater by IC (Low Level)										
HDPE MP-05 ENE	E235S.NO2-L	16-Aug-2021	----	----	----		24-Aug-2021	3 days	8 days	× EHTL
Anions and Nutrients : Nitrite in Seawater by IC (Low Level)										
HDPE MP-05 North	E235S.NO2-L	16-Aug-2021	----	----	----		24-Aug-2021	3 days	8 days	× EHTL
Anions and Nutrients : Nitrite in Seawater by IC (Low Level)										
HDPE MP-05 Source	E235S.NO2-L	16-Aug-2021	----	----	----		24-Aug-2021	3 days	8 days	× EHTL
Anions and Nutrients : Nitrite in Seawater by IC (Low Level)										
HDPE MP-05 WNW	E235S.NO2-L	16-Aug-2021	----	----	----		24-Aug-2021	3 days	8 days	× EHTL
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HDPE MP-06 ENE	E235S.NO2-L	16-Aug-2021	----	----	----		24-Aug-2021	3 days	8 days	× EHTL
Anions and Nutrients : Nitrite in Seawater by IC (Low Level)										
HDPE MP-06 North	E235S.NO2-L	16-Aug-2021	----	----	----		24-Aug-2021	3 days	8 days	× EHTL

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Anions and Nutrients : Nitrite in Seawater by IC (Low Level)										
HDPE MP-06 Source	E235S.NO2-L	16-Aug-2021	----	----	----		24-Aug-2021	3 days	8 days	× EHTL
Anions and Nutrients : Nitrite in Seawater by IC (Low Level)										
HDPE MP-06 WNW	E235S.NO2-L	16-Aug-2021	----	----	----		24-Aug-2021	3 days	8 days	× EHTL
Anions and Nutrients : Sulfate in Seawater by IC (Low Level)										
HDPE DUP-C	E235S.SO4-L	16-Aug-2021	----	----	----		24-Aug-2021	----	8 days	
Anions and Nutrients : Sulfate in Seawater by IC (Low Level)										
HDPE MP-05 ENE	E235S.SO4-L	16-Aug-2021	----	----	----		24-Aug-2021	----	8 days	
Anions and Nutrients : Sulfate in Seawater by IC (Low Level)										
HDPE MP-05 North	E235S.SO4-L	16-Aug-2021	----	----	----		24-Aug-2021	----	8 days	
Anions and Nutrients : Sulfate in Seawater by IC (Low Level)										
HDPE MP-05 Source	E235S.SO4-L	16-Aug-2021	----	----	----		24-Aug-2021	----	8 days	
Anions and Nutrients : Sulfate in Seawater by IC (Low Level)										
HDPE MP-05 WNW	E235S.SO4-L	16-Aug-2021	----	----	----		24-Aug-2021	----	8 days	
Anions and Nutrients : Sulfate in Seawater by IC (Low Level)										
HDPE MP-06 ENE	E235S.SO4-L	16-Aug-2021	----	----	----		24-Aug-2021	----	8 days	
Anions and Nutrients : Sulfate in Seawater by IC (Low Level)										
HDPE MP-06 North	E235S.SO4-L	16-Aug-2021	----	----	----		24-Aug-2021	----	8 days	

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Anions and Nutrients : Sulfate in Seawater by IC (Low Level)										
HDPE MP-06 Source	E235S.SO4-L	16-Aug-2021	----	----	----		24-Aug-2021	----	8 days	
Anions and Nutrients : Sulfate in Seawater by IC (Low Level)										
HDPE MP-06 WNW	E235S.SO4-L	16-Aug-2021	----	----	----		24-Aug-2021	----	8 days	
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence										
Amber glass total (sulfuric acid) DUP-C	E318S	16-Aug-2021	24-Aug-2021	----	----		30-Aug-2021	28 days	14 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence										
Amber glass total (sulfuric acid) MP-05 ENE	E318S	16-Aug-2021	24-Aug-2021	----	----		30-Aug-2021	28 days	14 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence										
Amber glass total (sulfuric acid) MP-05 North	E318S	16-Aug-2021	24-Aug-2021	----	----		30-Aug-2021	28 days	14 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence										
Amber glass total (sulfuric acid) MP-05 Source	E318S	16-Aug-2021	24-Aug-2021	----	----		30-Aug-2021	28 days	14 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence										
Amber glass total (sulfuric acid) MP-05 WNW	E318S	16-Aug-2021	24-Aug-2021	----	----		30-Aug-2021	28 days	14 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence										
Amber glass total (sulfuric acid) MP-06 ENE	E318S	16-Aug-2021	24-Aug-2021	----	----		30-Aug-2021	28 days	14 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence										
Amber glass total (sulfuric acid) MP-06 North	E318S	16-Aug-2021	24-Aug-2021	----	----		30-Aug-2021	28 days	14 days	✓

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Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence										
Amber glass total (sulfuric acid) MP-06 Source	E318S	16-Aug-2021	24-Aug-2021	----	----		30-Aug-2021	28 days	14 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence										
Amber glass total (sulfuric acid) MP-06 WNW	E318S	16-Aug-2021	24-Aug-2021	----	----		30-Aug-2021	28 days	14 days	✓
Anions and Nutrients : Total Phosphorus in Seawater by Colourimetry										
Amber glass total (sulfuric acid) DUP-C	E372S	16-Aug-2021	24-Aug-2021	----	----		26-Aug-2021	28 days	10 days	✓
Anions and Nutrients : Total Phosphorus in Seawater by Colourimetry										
Amber glass total (sulfuric acid) MP-05 ENE	E372S	16-Aug-2021	24-Aug-2021	----	----		26-Aug-2021	28 days	10 days	✓
Anions and Nutrients : Total Phosphorus in Seawater by Colourimetry										
Amber glass total (sulfuric acid) MP-05 North	E372S	16-Aug-2021	24-Aug-2021	----	----		26-Aug-2021	28 days	10 days	✓
Anions and Nutrients : Total Phosphorus in Seawater by Colourimetry										
Amber glass total (sulfuric acid) MP-05 Source	E372S	16-Aug-2021	24-Aug-2021	----	----		26-Aug-2021	28 days	10 days	✓
Anions and Nutrients : Total Phosphorus in Seawater by Colourimetry										
Amber glass total (sulfuric acid) MP-05 WNW	E372S	16-Aug-2021	24-Aug-2021	----	----		26-Aug-2021	28 days	10 days	✓
Anions and Nutrients : Total Phosphorus in Seawater by Colourimetry										
Amber glass total (sulfuric acid) MP-06 ENE	E372S	16-Aug-2021	24-Aug-2021	----	----		26-Aug-2021	28 days	10 days	✓
Anions and Nutrients : Total Phosphorus in Seawater by Colourimetry										
Amber glass total (sulfuric acid) MP-06 North	E372S	16-Aug-2021	24-Aug-2021	----	----		26-Aug-2021	28 days	10 days	✓

Matrix: **Water**

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

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Anions and Nutrients : Total Phosphorus in Seawater by Colourimetry										
Amber glass total (sulfuric acid) MP-06 Source	E372S	16-Aug-2021	24-Aug-2021	----	----		26-Aug-2021	28 days	10 days	✓
Anions and Nutrients : Total Phosphorus in Seawater by Colourimetry										
Amber glass total (sulfuric acid) MP-06 WNW	E372S	16-Aug-2021	24-Aug-2021	----	----		26-Aug-2021	28 days	10 days	✓
Dissolved Metals : Dissolved Mercury in Seawater by CVAAS										
Glass vial dissolved (hydrochloric acid) DUP-C	E509S	16-Aug-2021	25-Aug-2021	----	----		25-Aug-2021	28 days	9 days	✓
Dissolved Metals : Dissolved Mercury in Seawater by CVAAS										
Glass vial dissolved (hydrochloric acid) MP-05 ENE	E509S	16-Aug-2021	25-Aug-2021	----	----		25-Aug-2021	28 days	9 days	✓
Dissolved Metals : Dissolved Mercury in Seawater by CVAAS										
Glass vial dissolved (hydrochloric acid) MP-05 North	E509S	16-Aug-2021	25-Aug-2021	----	----		25-Aug-2021	28 days	9 days	✓
Dissolved Metals : Dissolved Mercury in Seawater by CVAAS										
Glass vial dissolved (hydrochloric acid) MP-05 Source	E509S	16-Aug-2021	25-Aug-2021	----	----		25-Aug-2021	28 days	9 days	✓
Dissolved Metals : Dissolved Mercury in Seawater by CVAAS										
Glass vial dissolved (hydrochloric acid) MP-05 WNW	E509S	16-Aug-2021	25-Aug-2021	----	----		25-Aug-2021	28 days	9 days	✓
Dissolved Metals : Dissolved Mercury in Seawater by CVAAS										
Glass vial dissolved (hydrochloric acid) MP-06 ENE	E509S	16-Aug-2021	25-Aug-2021	----	----		25-Aug-2021	28 days	9 days	✓
Dissolved Metals : Dissolved Mercury in Seawater by CVAAS										
Glass vial dissolved (hydrochloric acid) MP-06 North	E509S	16-Aug-2021	25-Aug-2021	----	----		25-Aug-2021	28 days	9 days	✓

Matrix: **Water**

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

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis: Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Mercury in Seawater by CVAAS										
Glass vial dissolved (hydrochloric acid) MP-06 Source	E509S	16-Aug-2021	25-Aug-2021	----	----		25-Aug-2021	28 days	9 days	✓
Dissolved Metals : Dissolved Mercury in Seawater by CVAAS										
Glass vial dissolved (hydrochloric acid) MP-06 WNW	E509S	16-Aug-2021	25-Aug-2021	----	----		25-Aug-2021	28 days	9 days	✓
Dissolved Metals : Dissolved Metals in Seawater by CRC ICPMS (HMI)										
HDPE dissolved (nitric acid) DUP-C	E469S	16-Aug-2021	23-Aug-2021	----	----		25-Aug-2021	180 days	9 days	✓
Dissolved Metals : Dissolved Metals in Seawater by CRC ICPMS (HMI)										
HDPE dissolved (nitric acid) MP-05 ENE	E469S	16-Aug-2021	23-Aug-2021	----	----		25-Aug-2021	180 days	9 days	✓
Dissolved Metals : Dissolved Metals in Seawater by CRC ICPMS (HMI)										
HDPE dissolved (nitric acid) MP-05 North	E469S	16-Aug-2021	23-Aug-2021	----	----		25-Aug-2021	180 days	9 days	✓
Dissolved Metals : Dissolved Metals in Seawater by CRC ICPMS (HMI)										
HDPE dissolved (nitric acid) MP-05 Source	E469S	16-Aug-2021	23-Aug-2021	----	----		25-Aug-2021	180 days	9 days	✓
Dissolved Metals : Dissolved Metals in Seawater by CRC ICPMS (HMI)										
HDPE dissolved (nitric acid) MP-05 WNW	E469S	16-Aug-2021	23-Aug-2021	----	----		25-Aug-2021	180 days	9 days	✓
Dissolved Metals : Dissolved Metals in Seawater by CRC ICPMS (HMI)										
HDPE dissolved (nitric acid) MP-06 ENE	E469S	16-Aug-2021	23-Aug-2021	----	----		25-Aug-2021	180 days	9 days	✓
Dissolved Metals : Dissolved Metals in Seawater by CRC ICPMS (HMI)										
HDPE dissolved (nitric acid) MP-06 North	E469S	16-Aug-2021	23-Aug-2021	----	----		25-Aug-2021	180 days	9 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis: Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Metals in Seawater by CRC ICPMS (HMI)										
HDPE dissolved (nitric acid) MP-06 Source	E469S	16-Aug-2021	23-Aug-2021	----	----		25-Aug-2021	180 days	9 days	✓
Dissolved Metals : Dissolved Metals in Seawater by CRC ICPMS (HMI)										
HDPE dissolved (nitric acid) MP-06 WNW	E469S	16-Aug-2021	23-Aug-2021	----	----		25-Aug-2021	180 days	9 days	✓
Dissolved Metals : Dissolved Sodium and Silicon in Seawater by CRC ICPMS										
HDPE dissolved (nitric acid) DUP-C	E469S.NaSi	16-Aug-2021	23-Aug-2021	----	----		25-Aug-2021	180 days	9 days	✓
Dissolved Metals : Dissolved Sodium and Silicon in Seawater by CRC ICPMS										
HDPE dissolved (nitric acid) MP-05 ENE	E469S.NaSi	16-Aug-2021	23-Aug-2021	----	----		25-Aug-2021	180 days	9 days	✓
Dissolved Metals : Dissolved Sodium and Silicon in Seawater by CRC ICPMS										
HDPE dissolved (nitric acid) MP-05 North	E469S.NaSi	16-Aug-2021	23-Aug-2021	----	----		25-Aug-2021	180 days	9 days	✓
Dissolved Metals : Dissolved Sodium and Silicon in Seawater by CRC ICPMS										
HDPE dissolved (nitric acid) MP-05 Source	E469S.NaSi	16-Aug-2021	23-Aug-2021	----	----		25-Aug-2021	180 days	9 days	✓
Dissolved Metals : Dissolved Sodium and Silicon in Seawater by CRC ICPMS										
HDPE dissolved (nitric acid) MP-05 WNW	E469S.NaSi	16-Aug-2021	23-Aug-2021	----	----		25-Aug-2021	180 days	9 days	✓
Dissolved Metals : Dissolved Sodium and Silicon in Seawater by CRC ICPMS										
HDPE dissolved (nitric acid) MP-06 ENE	E469S.NaSi	16-Aug-2021	23-Aug-2021	----	----		25-Aug-2021	180 days	9 days	✓
Dissolved Metals : Dissolved Sodium and Silicon in Seawater by CRC ICPMS										
HDPE dissolved (nitric acid) MP-06 North	E469S.NaSi	16-Aug-2021	23-Aug-2021	----	----		25-Aug-2021	180 days	9 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis: Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Sodium and Silicon in Seawater by CRC ICPMS										
HDPE dissolved (nitric acid) MP-06 Source	E469S.NaSi	16-Aug-2021	23-Aug-2021	----	----		25-Aug-2021	180 days	9 days	✓
Dissolved Metals : Dissolved Sodium and Silicon in Seawater by CRC ICPMS										
HDPE dissolved (nitric acid) MP-06 WNW	E469S.NaSi	16-Aug-2021	23-Aug-2021	----	----		25-Aug-2021	180 days	9 days	✓
Hydrocarbons : CCME PHC - F2-F4 by GC-FID										
Amber glass/Teflon lined cap (sodium bisulfate) MP-05 North	E601	16-Aug-2021	23-Aug-2021	14 days	7 days	✓	24-Aug-2021	40 days	1 days	✓
Hydrocarbons : CCME PHC - F2-F4 by GC-FID										
Amber glass/Teflon lined cap (sodium bisulfate) MP-05 Source	E601	16-Aug-2021	23-Aug-2021	14 days	7 days	✓	24-Aug-2021	40 days	1 days	✓
Hydrocarbons : CCME PHC - F2-F4 by GC-FID										
Amber glass/Teflon lined cap (sodium bisulfate) MP-06 ENE	E601	16-Aug-2021	23-Aug-2021	14 days	7 days	✓	24-Aug-2021	40 days	1 days	✓
Hydrocarbons : CCME PHC - F2-F4 by GC-FID										
Amber glass/Teflon lined cap (sodium bisulfate) MP-06 Source	E601	16-Aug-2021	23-Aug-2021	14 days	7 days	✓	24-Aug-2021	40 days	1 days	✓
Hydrocarbons : VH and F1 by Headspace GC-FID										
Glass vial (sodium bisulfate) MP-05 North	E581.VH+F1	16-Aug-2021	24-Aug-2021	----	----		25-Aug-2021	14 days	8 days	✓
Hydrocarbons : VH and F1 by Headspace GC-FID										
Glass vial (sodium bisulfate) MP-05 Source	E581.VH+F1	16-Aug-2021	24-Aug-2021	----	----		25-Aug-2021	14 days	8 days	✓
Hydrocarbons : VH and F1 by Headspace GC-FID										
Glass vial (sodium bisulfate) MP-06 ENE	E581.VH+F1	16-Aug-2021	24-Aug-2021	----	----		25-Aug-2021	14 days	8 days	✓

Matrix: **Water**

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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
Hydrocarbons : VH and F1 by Headspace GC-FID										
Glass vial (sodium bisulfate) MP-06 Source	E581.VH+F1	16-Aug-2021	24-Aug-2021	----	----		25-Aug-2021	14 days	8 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (lab preserved) DUP-C	E358-L	16-Aug-2021	25-Aug-2021	3 days	9 days	× EHTL	26-Aug-2021	28 days	0 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (lab preserved) MP-05 ENE	E358-L	16-Aug-2021	25-Aug-2021	3 days	9 days	× EHTL	26-Aug-2021	28 days	0 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (lab preserved) MP-05 North	E358-L	16-Aug-2021	25-Aug-2021	3 days	9 days	× EHTL	26-Aug-2021	28 days	0 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (lab preserved) MP-05 Source	E358-L	16-Aug-2021	25-Aug-2021	3 days	9 days	× EHTL	26-Aug-2021	28 days	0 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (lab preserved) MP-05 WNW	E358-L	16-Aug-2021	25-Aug-2021	3 days	9 days	× EHTL	26-Aug-2021	28 days	0 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (lab preserved) MP-06 ENE	E358-L	16-Aug-2021	25-Aug-2021	3 days	9 days	× EHTL	26-Aug-2021	28 days	0 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (lab preserved) MP-06 North	E358-L	16-Aug-2021	25-Aug-2021	3 days	9 days	× EHTL	26-Aug-2021	28 days	0 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (lab preserved) MP-06 Source	E358-L	16-Aug-2021	25-Aug-2021	3 days	9 days	× EHTL	26-Aug-2021	28 days	0 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
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (lab preserved) MP-06 WNW	E358-L	16-Aug-2021	25-Aug-2021	3 days	9 days	× EHTL	26-Aug-2021	28 days	0 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) DUP-C	E355-L	16-Aug-2021	24-Aug-2021	----	----		24-Aug-2021	28 days	8 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) MP-05 ENE	E355-L	16-Aug-2021	24-Aug-2021	----	----		24-Aug-2021	28 days	8 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) MP-05 North	E355-L	16-Aug-2021	24-Aug-2021	----	----		24-Aug-2021	28 days	8 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) MP-05 Source	E355-L	16-Aug-2021	24-Aug-2021	----	----		24-Aug-2021	28 days	8 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) MP-05 WNW	E355-L	16-Aug-2021	24-Aug-2021	----	----		24-Aug-2021	28 days	8 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) MP-06 ENE	E355-L	16-Aug-2021	24-Aug-2021	----	----		24-Aug-2021	28 days	8 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) MP-06 North	E355-L	16-Aug-2021	24-Aug-2021	----	----		24-Aug-2021	28 days	8 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) MP-06 Source	E355-L	16-Aug-2021	24-Aug-2021	----	----		24-Aug-2021	28 days	8 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) MP-06 WNW	E355-L	16-Aug-2021	24-Aug-2021	----	----		24-Aug-2021	28 days	8 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE DUP-C	E290	16-Aug-2021	----	----	----		20-Aug-2021	14 days	4 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MP-05 ENE	E290	16-Aug-2021	----	----	----		20-Aug-2021	14 days	4 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MP-05 North	E290	16-Aug-2021	----	----	----		20-Aug-2021	14 days	4 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MP-05 Source	E290	16-Aug-2021	----	----	----		20-Aug-2021	14 days	4 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MP-05 WNW	E290	16-Aug-2021	----	----	----		20-Aug-2021	14 days	4 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MP-06 ENE	E290	16-Aug-2021	----	----	----		20-Aug-2021	14 days	4 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MP-06 North	E290	16-Aug-2021	----	----	----		20-Aug-2021	14 days	4 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MP-06 Source	E290	16-Aug-2021	----	----	----		20-Aug-2021	14 days	4 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis: Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Alkalinity Species by Titration										
HDPE MP-06 WNW	E290	16-Aug-2021	----	----	----		20-Aug-2021	14 days	4 days	✓
Physical Tests : Conductivity in Seawater										
HDPE DUP-C	E100S	16-Aug-2021	----	----	----		20-Aug-2021	28 days	4 days	✓
Physical Tests : Conductivity in Seawater										
HDPE MP-05 ENE	E100S	16-Aug-2021	----	----	----		20-Aug-2021	28 days	4 days	✓
Physical Tests : Conductivity in Seawater										
HDPE MP-05 North	E100S	16-Aug-2021	----	----	----		20-Aug-2021	28 days	4 days	✓
Physical Tests : Conductivity in Seawater										
HDPE MP-05 Source	E100S	16-Aug-2021	----	----	----		20-Aug-2021	28 days	4 days	✓
Physical Tests : Conductivity in Seawater										
HDPE MP-05 WNW	E100S	16-Aug-2021	----	----	----		20-Aug-2021	28 days	4 days	✓
Physical Tests : Conductivity in Seawater										
HDPE MP-06 ENE	E100S	16-Aug-2021	----	----	----		20-Aug-2021	28 days	4 days	✓
Physical Tests : Conductivity in Seawater										
HDPE MP-06 North	E100S	16-Aug-2021	----	----	----		20-Aug-2021	28 days	4 days	✓
Physical Tests : Conductivity in Seawater										
HDPE MP-06 Source	E100S	16-Aug-2021	----	----	----		20-Aug-2021	28 days	4 days	✓

Matrix: **Water**

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

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Conductivity in Seawater										
HDPE MP-06 WNW	E100S	16-Aug-2021	----	----	----		20-Aug-2021	28 days	4 days	✓
Physical Tests : pH by Meter										
HDPE DUP-C	E108	16-Aug-2021	----	----	----		20-Aug-2021	0.25 hrs	88 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MP-05 ENE	E108	16-Aug-2021	----	----	----		20-Aug-2021	0.25 hrs	88 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MP-05 North	E108	16-Aug-2021	----	----	----		20-Aug-2021	0.25 hrs	88 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MP-05 Source	E108	16-Aug-2021	----	----	----		20-Aug-2021	0.25 hrs	88 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MP-05 WNW	E108	16-Aug-2021	----	----	----		20-Aug-2021	0.25 hrs	88 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MP-06 ENE	E108	16-Aug-2021	----	----	----		20-Aug-2021	0.25 hrs	90 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MP-06 North	E108	16-Aug-2021	----	----	----		20-Aug-2021	0.25 hrs	91 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MP-06 Source	E108	16-Aug-2021	----	----	----		20-Aug-2021	0.25 hrs	91 hrs	× EHTR-FM

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Physical Tests : pH by Meter										
HDPE MP-06 WNW	E108	16-Aug-2021	----	----	----		20-Aug-2021	0.25 hrs	91 hrs	× EHTR-FM
Physical Tests : TDS by Gravimetry (Seawater)										
HDPE DUP-C	E162S	16-Aug-2021	----	----	----		23-Aug-2021	7 days	7 days	✓
Physical Tests : TDS by Gravimetry (Seawater)										
HDPE MP-05 ENE	E162S	16-Aug-2021	----	----	----		23-Aug-2021	7 days	7 days	✓
Physical Tests : TDS by Gravimetry (Seawater)										
HDPE MP-05 North	E162S	16-Aug-2021	----	----	----		23-Aug-2021	7 days	7 days	✓
Physical Tests : TDS by Gravimetry (Seawater)										
HDPE MP-05 Source	E162S	16-Aug-2021	----	----	----		23-Aug-2021	7 days	7 days	✓
Physical Tests : TDS by Gravimetry (Seawater)										
HDPE MP-05 WNW	E162S	16-Aug-2021	----	----	----		23-Aug-2021	7 days	7 days	✓
Physical Tests : TDS by Gravimetry (Seawater)										
HDPE MP-06 ENE	E162S	16-Aug-2021	----	----	----		23-Aug-2021	7 days	7 days	✓
Physical Tests : TDS by Gravimetry (Seawater)										
HDPE MP-06 North	E162S	16-Aug-2021	----	----	----		23-Aug-2021	7 days	7 days	✓
Physical Tests : TDS by Gravimetry (Seawater)										
HDPE MP-06 Source	E162S	16-Aug-2021	----	----	----		23-Aug-2021	7 days	7 days	✓

Matrix: **Water**

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Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : TDS by Gravimetry (Seawater)										
HDPE MP-06 WNW	E162S	16-Aug-2021	----	----	----		23-Aug-2021	7 days	7 days	✓
Physical Tests : TSS by Gravimetry (Seawater)										
HDPE DUP-C	E160S	16-Aug-2021	----	----	----		21-Aug-2021	7 days	5 days	✓
Physical Tests : TSS by Gravimetry (Seawater)										
HDPE MP-05 ENE	E160S	16-Aug-2021	----	----	----		21-Aug-2021	7 days	5 days	✓
Physical Tests : TSS by Gravimetry (Seawater)										
HDPE MP-05 North	E160S	16-Aug-2021	----	----	----		21-Aug-2021	7 days	5 days	✓
Physical Tests : TSS by Gravimetry (Seawater)										
HDPE MP-05 Source	E160S	16-Aug-2021	----	----	----		21-Aug-2021	7 days	5 days	✓
Physical Tests : TSS by Gravimetry (Seawater)										
HDPE MP-05 WNW	E160S	16-Aug-2021	----	----	----		21-Aug-2021	7 days	5 days	✓
Physical Tests : TSS by Gravimetry (Seawater)										
HDPE MP-06 ENE	E160S	16-Aug-2021	----	----	----		21-Aug-2021	7 days	5 days	✓
Physical Tests : TSS by Gravimetry (Seawater)										
HDPE MP-06 North	E160S	16-Aug-2021	----	----	----		21-Aug-2021	7 days	5 days	✓
Physical Tests : TSS by Gravimetry (Seawater)										
HDPE MP-06 Source	E160S	16-Aug-2021	----	----	----		21-Aug-2021	7 days	5 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis: Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : TSS by Gravimetry (Seawater)										
HDPE MP-06 WNW	E160S	16-Aug-2021	----	----	----		21-Aug-2021	7 days	5 days	✓
Physical Tests : Turbidity by Nephelometry										
HDPE DUP-C	E121	16-Aug-2021	----	----	----		22-Aug-2021	3 days	6 days	× EHTL
Physical Tests : Turbidity by Nephelometry										
HDPE MP-05 ENE	E121	16-Aug-2021	----	----	----		22-Aug-2021	3 days	6 days	× EHTL
Physical Tests : Turbidity by Nephelometry										
HDPE MP-05 North	E121	16-Aug-2021	----	----	----		22-Aug-2021	3 days	6 days	× EHTL
Physical Tests : Turbidity by Nephelometry										
HDPE MP-05 Source	E121	16-Aug-2021	----	----	----		22-Aug-2021	3 days	6 days	× EHTL
Physical Tests : Turbidity by Nephelometry										
HDPE MP-05 WNW	E121	16-Aug-2021	----	----	----		22-Aug-2021	3 days	6 days	× EHTL
Physical Tests : Turbidity by Nephelometry										
HDPE MP-06 ENE	E121	16-Aug-2021	----	----	----		22-Aug-2021	3 days	6 days	× EHTL
Physical Tests : Turbidity by Nephelometry										
HDPE MP-06 North	E121	16-Aug-2021	----	----	----		22-Aug-2021	3 days	6 days	× EHTL
Physical Tests : Turbidity by Nephelometry										
HDPE MP-06 Source	E121	16-Aug-2021	----	----	----		22-Aug-2021	3 days	6 days	× EHTL

Matrix: **Water**

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

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Turbidity by Nephelometry										
HDPE MP-06 WNW	E121	16-Aug-2021	----	----	----		22-Aug-2021	3 days	6 days	× EHTL
Polycyclic Aromatic Hydrocarbons : PAHs by Hexane LVI GC-MS										
Amber glass/Teflon lined cap (sodium bisulfate) MP-05 North	E641A	16-Aug-2021	03-Sep-2021	14 days	18 days	× EHT	04-Sep-2021	40 days	0 days	✓
Polycyclic Aromatic Hydrocarbons : PAHs by Hexane LVI GC-MS										
Amber glass/Teflon lined cap (sodium bisulfate) MP-05 Source	E641A	16-Aug-2021	03-Sep-2021	14 days	18 days	× EHT	04-Sep-2021	40 days	0 days	✓
Polycyclic Aromatic Hydrocarbons : PAHs by Hexane LVI GC-MS										
Amber glass/Teflon lined cap (sodium bisulfate) MP-06 ENE	E641A	16-Aug-2021	03-Sep-2021	14 days	18 days	× EHT	04-Sep-2021	40 days	0 days	✓
Polycyclic Aromatic Hydrocarbons : PAHs by Hexane LVI GC-MS										
Amber glass/Teflon lined cap (sodium bisulfate) MP-06 Source	E641A	16-Aug-2021	03-Sep-2021	14 days	18 days	× EHT	04-Sep-2021	40 days	0 days	✓
Total Metals : Total Mercury in Seawater by CVAAS										
Glass vial total (hydrochloric acid) DUP-C	E508S	16-Aug-2021	----	----	----		25-Aug-2021	28 days	9 days	✓
Total Metals : Total Mercury in Seawater by CVAAS										
Glass vial total (hydrochloric acid) MP-05 ENE	E508S	16-Aug-2021	----	----	----		25-Aug-2021	28 days	9 days	✓
Total Metals : Total Mercury in Seawater by CVAAS										
Glass vial total (hydrochloric acid) MP-05 North	E508S	16-Aug-2021	----	----	----		25-Aug-2021	28 days	9 days	✓
Total Metals : Total Mercury in Seawater by CVAAS										
Glass vial total (hydrochloric acid) MP-05 Source	E508S	16-Aug-2021	----	----	----		25-Aug-2021	28 days	9 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
Total Metals : Total Mercury in Seawater by CVAAS										
Glass vial total (hydrochloric acid) MP-05 WNW	E508S	16-Aug-2021	----	----	----		25-Aug-2021	28 days	9 days	✓
Total Metals : Total Mercury in Seawater by CVAAS										
Glass vial total (hydrochloric acid) MP-06 ENE	E508S	16-Aug-2021	----	----	----		25-Aug-2021	28 days	9 days	✓
Total Metals : Total Mercury in Seawater by CVAAS										
Glass vial total (hydrochloric acid) MP-06 North	E508S	16-Aug-2021	----	----	----		25-Aug-2021	28 days	9 days	✓
Total Metals : Total Mercury in Seawater by CVAAS										
Glass vial total (hydrochloric acid) MP-06 Source	E508S	16-Aug-2021	----	----	----		25-Aug-2021	28 days	9 days	✓
Total Metals : Total Mercury in Seawater by CVAAS										
Glass vial total (hydrochloric acid) MP-06 WNW	E508S	16-Aug-2021	----	----	----		25-Aug-2021	28 days	9 days	✓
Total Metals : Total Metals in Seawater by CRC ICPMS (HMI)										
HDPE total (nitric acid) DUP-C	E468S	16-Aug-2021	----	----	----		25-Aug-2021	180 days	9 days	✓
Total Metals : Total Metals in Seawater by CRC ICPMS (HMI)										
HDPE total (nitric acid) MP-05 ENE	E468S	16-Aug-2021	----	----	----		25-Aug-2021	180 days	9 days	✓
Total Metals : Total Metals in Seawater by CRC ICPMS (HMI)										
HDPE total (nitric acid) MP-05 North	E468S	16-Aug-2021	----	----	----		25-Aug-2021	180 days	9 days	✓
Total Metals : Total Metals in Seawater by CRC ICPMS (HMI)										
HDPE total (nitric acid) MP-05 Source	E468S	16-Aug-2021	----	----	----		25-Aug-2021	180 days	9 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Holding Times: Rec	Holding Times: Actual	Eval	Analysis: Analysis Date	Holding Times: Rec	Holding Times: Actual	Eval
Total Metals : Total Metals in Seawater by CRC ICPMS (HMI)										
HDPE total (nitric acid) MP-05 WNW	E468S	16-Aug-2021	----	----	----		25-Aug-2021	180 days	9 days	✓
Total Metals : Total Metals in Seawater by CRC ICPMS (HMI)										
HDPE total (nitric acid) MP-06 ENE	E468S	16-Aug-2021	----	----	----		25-Aug-2021	180 days	9 days	✓
Total Metals : Total Metals in Seawater by CRC ICPMS (HMI)										
HDPE total (nitric acid) MP-06 North	E468S	16-Aug-2021	----	----	----		25-Aug-2021	180 days	9 days	✓
Total Metals : Total Metals in Seawater by CRC ICPMS (HMI)										
HDPE total (nitric acid) MP-06 Source	E468S	16-Aug-2021	----	----	----		25-Aug-2021	180 days	9 days	✓
Total Metals : Total Metals in Seawater by CRC ICPMS (HMI)										
HDPE total (nitric acid) MP-06 WNW	E468S	16-Aug-2021	----	----	----		25-Aug-2021	180 days	9 days	✓
Total Metals : Total Sodium and Silicon in Seawater by CRC ICPMS										
HDPE total (nitric acid) DUP-C	E468S.NaSi	16-Aug-2021	----	----	----		25-Aug-2021	180 days	9 days	✓
Total Metals : Total Sodium and Silicon in Seawater by CRC ICPMS										
HDPE total (nitric acid) MP-05 ENE	E468S.NaSi	16-Aug-2021	----	----	----		25-Aug-2021	180 days	9 days	✓
Total Metals : Total Sodium and Silicon in Seawater by CRC ICPMS										
HDPE total (nitric acid) MP-05 North	E468S.NaSi	16-Aug-2021	----	----	----		25-Aug-2021	180 days	9 days	✓
Total Metals : Total Sodium and Silicon in Seawater by CRC ICPMS										
HDPE total (nitric acid) MP-05 Source	E468S.NaSi	16-Aug-2021	----	----	----		25-Aug-2021	180 days	9 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Total Metals : Total Sodium and Silicon in Seawater by CRC ICPMS										
HDPE total (nitric acid) MP-05 WNW	E468S.NaSi	16-Aug-2021	----	----	----		25-Aug-2021	180 days	9 days	✓
Total Metals : Total Sodium and Silicon in Seawater by CRC ICPMS										
HDPE total (nitric acid) MP-06 ENE	E468S.NaSi	16-Aug-2021	----	----	----		25-Aug-2021	180 days	9 days	✓
Total Metals : Total Sodium and Silicon in Seawater by CRC ICPMS										
HDPE total (nitric acid) MP-06 North	E468S.NaSi	16-Aug-2021	----	----	----		25-Aug-2021	180 days	9 days	✓
Total Metals : Total Sodium and Silicon in Seawater by CRC ICPMS										
HDPE total (nitric acid) MP-06 Source	E468S.NaSi	16-Aug-2021	----	----	----		25-Aug-2021	180 days	9 days	✓
Total Metals : Total Sodium and Silicon in Seawater by CRC ICPMS										
HDPE total (nitric acid) MP-06 WNW	E468S.NaSi	16-Aug-2021	----	----	----		25-Aug-2021	180 days	9 days	✓
Volatile Organic Compounds [Fuels] : BTEX by Headspace GC-MS										
Glass vial (sodium bisulfate) MP-05 North	E611A	16-Aug-2021	24-Aug-2021	----	----		25-Aug-2021	14 days	8 days	✓
Volatile Organic Compounds [Fuels] : BTEX by Headspace GC-MS										
Glass vial (sodium bisulfate) MP-05 Source	E611A	16-Aug-2021	24-Aug-2021	----	----		25-Aug-2021	14 days	8 days	✓
Volatile Organic Compounds [Fuels] : BTEX by Headspace GC-MS										
Glass vial (sodium bisulfate) MP-06 ENE	E611A	16-Aug-2021	24-Aug-2021	----	----		25-Aug-2021	14 days	8 days	✓
Volatile Organic Compounds [Fuels] : BTEX by Headspace GC-MS										
Glass vial (sodium bisulfate) MP-06 Source	E611A	16-Aug-2021	24-Aug-2021	----	----		25-Aug-2021	14 days	8 days	✓

Legend & Qualifier Definitions

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

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).

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	271653	1	9	11.1	5.0	✓
Ammonia by Fluorescence	E298	274289	1	19	5.2	5.0	✓
Bromide in Seawater by IC	E235S.Br	274514	1	18	5.5	5.0	✓
BTEX by Headspace GC-MS	E611A	274060	1	14	7.1	5.0	✓
Chloride in Seawater by IC	E235S.Cl	274515	1	18	5.5	5.0	✓
Conductivity in Seawater	E100S	271652	1	9	11.1	5.0	✓
Dissolved Mercury in Seawater by CVAAS	E509S	275533	1	12	8.3	5.0	✓
Dissolved Metals in Seawater by CRC ICPMS (HMI)	E469S	273997	1	18	5.5	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	276240	1	12	8.3	5.0	✓
Dissolved Sodium and Silicon in Seawater by CRC ICPMS	E469S.NaSi	273998	1	12	8.3	5.0	✓
Fluoride in Seawater by IC (Low Level)	E235S.F-L	274516	1	18	5.5	5.0	✓
Nitrate in Seawater by IC (Trace Level)	E235S.NO3-T	274517	1	18	5.5	5.0	✓
Nitrite in Seawater by IC (Low Level)	E235S.NO2-L	274518	1	18	5.5	5.0	✓
pH by Meter	E108	271651	1	20	5.0	5.0	✓
Sulfate in Seawater by IC (Low Level)	E235S.SO4-L	274519	1	18	5.5	5.0	✓
TDS by Gravimetry (Seawater)	E162S	273892	1	18	5.5	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence	E318S	274291	1	9	11.1	5.0	✓
Total Mercury in Seawater by CVAAS	E508S	275439	1	20	5.0	5.0	✓
Total Metals in Seawater by CRC ICPMS (HMI)	E468S	274655	2	40	5.0	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	274286	1	19	5.2	5.0	✓
Total Phosphorus in Seawater by Colourimetry	E372S	274288	1	9	11.1	5.0	✓
Total Sodium and Silicon in Seawater by CRC ICPMS	E468S.NaSi	274656	2	40	5.0	5.0	✓
Turbidity by Nephelometry	E121	273563	1	19	5.2	5.0	✓
VH and F1 by Headspace GC-FID	E581.VH+F1	274061	1	10	10.0	5.0	✓
Laboratory Control Samples (LCS)							
Alkalinity Species by Titration	E290	271653	1	9	11.1	5.0	✓
Ammonia by Fluorescence	E298	274289	1	19	5.2	5.0	✓
Bromide in Seawater by IC	E235S.Br	274514	1	18	5.5	5.0	✓
BTEX by Headspace GC-MS	E611A	274060	1	14	7.1	5.0	✓
CCME PHC - F2-F4 by GC-FID	E601	273798	1	9	11.1	5.0	✓
Chloride in Seawater by IC	E235S.Cl	274515	1	18	5.5	5.0	✓
Conductivity in Seawater	E100S	271652	1	9	11.1	5.0	✓
Dissolved Mercury in Seawater by CVAAS	E509S	275533	1	12	8.3	5.0	✓
Dissolved Metals in Seawater by CRC ICPMS (HMI)	E469S	273997	1	18	5.5	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	276240	1	12	8.3	5.0	✓
Dissolved Sodium and Silicon in Seawater by CRC ICPMS	E469S.NaSi	273998	1	12	8.3	5.0	✓
Fluoride in Seawater by IC (Low Level)	E235S.F-L	274516	1	18	5.5	5.0	✓

Matrix: **Water**

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

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	Method	QC Lot #	QC	Regular	Actual	Expected	Evaluation
Laboratory Control Samples (LCS) - Continued							
Nitrate in Seawater by IC (Trace Level)	E235S.NO3-T	274517	1	18	5.5	5.0	✓
Nitrite in Seawater by IC (Low Level)	E235S.NO2-L	274518	1	18	5.5	5.0	✓
PAHs by Hexane LVI GC-MS	E641A	284186	1	6	16.6	5.0	✓
pH by Meter	E108	271651	1	20	5.0	5.0	✓
Sulfate in Seawater by IC (Low Level)	E235S.SO4-L	274519	1	18	5.5	5.0	✓
TDS by Gravimetry (Seawater)	E162S	273892	1	18	5.5	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence	E318S	274291	1	9	11.1	5.0	✓
Total Mercury in Seawater by CVAAS	E508S	275439	1	20	5.0	5.0	✓
Total Metals in Seawater by CRC ICPMS (HMI)	E468S	274655	2	40	5.0	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	274286	1	19	5.2	5.0	✓
Total Phosphorus in Seawater by Colourimetry	E372S	274288	1	9	11.1	5.0	✓
Total Sodium and Silicon in Seawater by CRC ICPMS	E468S.NaSi	274656	2	40	5.0	5.0	✓
TSS by Gravimetry (Seawater)	E160S	272739	1	20	5.0	5.0	✓
Turbidity by Nephelometry	E121	273563	1	19	5.2	5.0	✓
VH and F1 by Headspace GC-FID	E581.VH+F1	274061	1	10	10.0	5.0	✓
Method Blanks (MB)							
Alkalinity Species by Titration	E290	271653	1	9	11.1	5.0	✓
Ammonia by Fluorescence	E298	274289	1	19	5.2	5.0	✓
Bromide in Seawater by IC	E235S.Br	274514	1	18	5.5	5.0	✓
BTEX by Headspace GC-MS	E611A	274060	1	14	7.1	5.0	✓
CCME PHC - F2-F4 by GC-FID	E601	273798	1	9	11.1	5.0	✓
Chloride in Seawater by IC	E235S.Cl	274515	1	18	5.5	5.0	✓
Conductivity in Seawater	E100S	271652	1	9	11.1	5.0	✓
Dissolved Mercury in Seawater by CVAAS	E509S	275533	1	12	8.3	5.0	✓
Dissolved Metals in Seawater by CRC ICPMS (HMI)	E469S	273997	1	18	5.5	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	276240	1	12	8.3	5.0	✓
Dissolved Sodium and Silicon in Seawater by CRC ICPMS	E469S.NaSi	273998	1	12	8.3	5.0	✓
Fluoride in Seawater by IC (Low Level)	E235S.F-L	274516	1	18	5.5	5.0	✓
Nitrate in Seawater by IC (Trace Level)	E235S.NO3-T	274517	1	18	5.5	5.0	✓
Nitrite in Seawater by IC (Low Level)	E235S.NO2-L	274518	1	18	5.5	5.0	✓
PAHs by Hexane LVI GC-MS	E641A	284186	1	6	16.6	5.0	✓
Sulfate in Seawater by IC (Low Level)	E235S.SO4-L	274519	1	18	5.5	5.0	✓
TDS by Gravimetry (Seawater)	E162S	273892	1	18	5.5	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence	E318S	274291	1	9	11.1	5.0	✓
Total Mercury in Seawater by CVAAS	E508S	275439	1	20	5.0	5.0	✓
Total Metals in Seawater by CRC ICPMS (HMI)	E468S	274655	2	40	5.0	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	274286	1	19	5.2	5.0	✓
Total Phosphorus in Seawater by Colourimetry	E372S	274288	1	9	11.1	5.0	✓
Total Sodium and Silicon in Seawater by CRC ICPMS	E468S.NaSi	274656	2	40	5.0	5.0	✓
TSS by Gravimetry (Seawater)	E160S	272739	1	20	5.0	5.0	✓
Turbidity by Nephelometry	E121	273563	1	19	5.2	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*
Method Blanks (MB) - Continued							
VH and F1 by Headspace GC-FID	E581.VH+F1	274061	1	10	10.0	5.0	✓
Matrix Spikes (MS)							
Ammonia by Fluorescence	E298	274289	1	19	5.2	5.0	✓
Bromide in Seawater by IC	E235S.Br	274514	1	18	5.5	5.0	✓
BTEX by Headspace GC-MS	E611A	274060	1	14	7.1	5.0	✓
Chloride in Seawater by IC	E235S.Cl	274515	1	18	5.5	5.0	✓
Dissolved Mercury in Seawater by CVAAS	E509S	275533	1	12	8.3	5.0	✓
Dissolved Metals in Seawater by CRC ICPMS (HMI)	E469S	273997	1	18	5.5	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	276240	1	12	8.3	5.0	✓
Dissolved Sodium and Silicon in Seawater by CRC ICPMS	E469S.NaSi	273998	1	12	8.3	5.0	✓
Fluoride in Seawater by IC (Low Level)	E235S.F-L	274516	1	18	5.5	5.0	✓
Nitrate in Seawater by IC (Trace Level)	E235S.NO3-T	274517	1	18	5.5	5.0	✓
Nitrite in Seawater by IC (Low Level)	E235S.NO2-L	274518	1	18	5.5	5.0	✓
Sulfate in Seawater by IC (Low Level)	E235S.SO4-L	274519	1	18	5.5	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence	E318S	274291	1	9	11.1	5.0	✓
Total Mercury in Seawater by CVAAS	E508S	275439	1	20	5.0	5.0	✓
Total Metals in Seawater by CRC ICPMS (HMI)	E468S	274655	2	40	5.0	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	274286	1	19	5.2	5.0	✓
Total Phosphorus in Seawater by Colourimetry	E372S	274288	1	9	11.1	5.0	✓
Total Sodium and Silicon in Seawater by CRC ICPMS	E468S.NaSi	274656	2	40	5.0	5.0	✓
VH and F1 by Headspace GC-FID	E581.VH+F1	274061	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 Seawater	E100S Vancouver - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a seawater sample. Conductivity measurements are temperature-compensated to 25°C. Salinity in Practical Salinity Units is calculated.
pH by Meter	E108 Vancouver - Environmental	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
Turbidity by Nephelometry	E121 Vancouver - Environmental	Water	APHA 2130 B (mod)	Turbidity is measured by the nephelometric method, by measuring the intensity of light scatter under defined conditions.
TSS by Gravimetry (Seawater)	E160S Vancouver - 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 (Seawater)	E162S Vancouver - 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 Seawater by IC	E235S.Br Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Chloride in Seawater by IC	E235S.Cl Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Fluoride in Seawater by IC (Low Level)	E235S.F-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrite in Seawater by IC (Low Level)	E235S.NO2-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrate in Seawater by IC (Trace Level)	E235S.NO3-T Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Sulfate in Seawater by IC (Low Level)	E235S.SO4-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Alkalinity Species by Titration	E290 Vancouver - Environmental	Water	APHA 2320 B (mod)	Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.
Ammonia by Fluorescence	E298 Vancouver - 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).
Total Kjeldahl Nitrogen by Fluorescence	E318S Vancouver - Environmental	Water	APHA 4500-Norg D (mod)	Total Kjeldahl Nitrogen is determined using block digestion followed by flow-injection analysis with fluorescence detection.
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L Vancouver - 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 Vancouver - 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).
Total Phosphorus in Seawater by Colourimetry	E372S Vancouver - Environmental	Water	APHA 4500-P E (mod).	Total Phosphorus is determined colourimetrically using a discrete analyzer after heated persulfate digestion of the sample.
Total Metals in Seawater by CRC ICPMS (HMI)	E468S Vancouver - Environmental	Water	EPA 200.2/6020B (mod)	Seawater samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS (HMI Mode). This method is compliant with digestion requirements of the British Columbia Environmental Laboratory Manual.
Total Sodium and Silicon in Seawater by CRC ICPMS	E468S.NaSi Vancouver - Environmental	Water	EPA 200.2/6020B (mod)	Seawater samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS. This method is compliant with digestion requirements of the British Columbia Environmental Laboratory Manual.
Dissolved Metals in Seawater by CRC ICPMS (HMI)	E469S Vancouver - Environmental	Water	APHA 3030B/EPA 6020B (mod)	Seawater samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS (HMI Mode).

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Sodium and Silicon in Seawater by CRC ICPMS	E469S.NaSi Vancouver - Environmental	Water	APHA 3030B/EPA 6020B (mod)	Seawater samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS.
Total Mercury in Seawater by CVAAS	E508S Vancouver - Environmental	Water	EPA 1631E (mod)	Seawater samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.
Dissolved Mercury in Seawater by CVAAS	E509S Vancouver - Environmental	Water	APHA 3030B/EPA 1631E (mod)	Seawater samples are filtered (0.45 um), preserved with HCl, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.
VH and F1 by Headspace GC-FID	E581.VH+F1 Vancouver - Environmental	Water	BC MOE Lab Manual / CCME PHC in Soil - Tier 1 (mod)	Volatile Hydrocarbons (VH and F1) is analyzed by static headspace GC-FID. Samples are prepared in headspace vials and are heated and agitated on the headspace autosampler, causing VOCs to partition between the aqueous phase and the headspace in accordance with Henry's law.
CCME PHC - F2-F4 by GC-FID	E601 Vancouver - Environmental	Water	CCME PHC in Soil - Tier 1	CCME Fractions 2-4 (F2-F4) are analyzed by GC-FID.
BTEX by Headspace GC-MS	E611A Vancouver - Environmental	Water	EPA 8260D (mod)	Volatile Organic Compounds (VOCs) are analyzed by static headspace GC-MS. Samples are prepared in headspace vials and are heated and agitated on the headspace autosampler, causing VOCs to partition between the aqueous phase and the headspace in accordance with Henry's law.
PAHs by Hexane LVI GC-MS	E641A Vancouver - Environmental	Water	EPA 8270E (mod)	Polycyclic Aromatic Hydrocarbons (PAHs) are analyzed by large volume injection (LVI) GC-MS.
Dissolved Hardness (Calculated)	EC100 Vancouver - Environmental	Water	APHA 2340B	"Hardness (as CaCO3), dissolved" is calculated from the sum of dissolved Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. "Total Hardness" refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations.
Salinity in Seawater (calculation)	EC100S Vancouver - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a seawater sample. Conductivity measurements are temperature-compensated to 25°C. Salinity in Practical Salinity Units is calculated.
F1-BTEX	EC580 Vancouver - Environmental	Water	CCME PHC in Soil - Tier 1	F1-BTEX is calculated as follows: F1-BTEX = F1 (C6-C10) minus benzene, toluene, ethylbenzene and xylenes (BTEX).
VPH: VH-BTEX-Styrene	EC580A Vancouver - Environmental	Water	BC MOE Lab Manual (VPH in Water and Solids) (mod)	Volatile Petroleum Hydrocarbons (VPH) is calculated as follows: VPHw = Volatile Hydrocarbons (VH6-10) minus benzene, toluene, ethylbenzene, xylenes (BTEX) and styrene.

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Preparation for Ammonia	EP298 Vancouver - Environmental	Water		Sample preparation for Preserved Nutrients Water Quality Analysis.
Digestion for TKN in Seawater	EP318S Vancouver - Environmental	Water	APHA 4500-Norg D (mod)	Samples are digested using block digestion with Copper Sulfate Digestion Reagent and H2SO4.
Preparation for Total Organic Carbon by Combustion	EP355 Vancouver - Environmental	Water		Preparation for Total Organic Carbon by Combustion
Preparation for Dissolved Organic Carbon for Combustion	EP358 Vancouver - Environmental	Water	APHA 5310 B (mod)	Preparation for Dissolved Organic Carbon
Digestion for Total Phosphorus in water	EP372 Vancouver - Environmental	Water	APHA 4500-P E (mod).	Samples are heated with a persulfate digestion reagent.
Dissolved Metals Water Filtration	EP421 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HNO3.
Dissolved Mercury Water Filtration	EP509 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HCl.
VOCs Preparation for Headspace Analysis	EP581 Vancouver - Environmental	Water	EPA 5021A (mod)	Samples are prepared in headspace vials and are heated and agitated on the headspace autosampler. An aliquot of the headspace is then injected into the GC/MS-FID system.
PHCs and PAHs Hexane Extraction	EP601 Vancouver - Environmental	Water	EPA 3511 (mod)	Petroleum Hydrocarbons (PHCs) and Polycyclic Aromatic Hydrocarbons (PAHs) are extracted using a hexane liquid-liquid extraction.

QUALITY CONTROL REPORT

Work Order	: **VA21B7539**		
Amendment	: **1**		
Client	: Golder Associates Ltd.	Laboratory	: Vancouver - Environmental
Contact	: Elaine Irving	Account Manager	: Amber Springer
Address	: 200-2920 Virtual Way Vancouver BC Canada V5M 0C4	Address	: 8081 Lougheed Highway Burnaby, British Columbia Canada V5A 1W9
Telephone	: ----	Telephone	: +1 604 253 4188
Project	: 1663724-44000-03	Date Samples Received	: 19-Aug-2021 08:25
PO	: ----	Date Analysis Commenced	: 19-Aug-2021
C-O-C number	: 20-920780	Issue Date	: 07-Sep-2021 14:15
Sampler	: ----		
Site	: ----		
Quote number	: Q84262		
No. of samples received	: 9		
No. of samples analysed	: 9		

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 Percentage Difference (RPD) and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits
- Reference Material (RM) Report; Recovery and Acceptance Limits
- Method Blank (MB) Report; Recovery and Acceptance Limits
- Laboratory Control Sample (LCS) Report; Recovery and Acceptance Limits

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*
Angela Ren	Team Leader - Metals	Metals, Burnaby, British Columbia
Caleb Deroche	Lab Analyst	Metals, Burnaby, British Columbia
Dee Lee	Analyst	Metals, Burnaby, British Columbia
Janice Leung	Supervisor - Organics Instrumentation	Organics, Burnaby, British Columbia
Kevin Duarte	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
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Paul Cushing	Team Leader - Organics	Organics, Burnaby, British Columbia
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Tracy Harley	Supervisor - Water Quality Instrumentation	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 Services number is a unique identifier assigned to discrete substances.

DQO = Data Quality Objective.

LOR = Limit of Reporting (detection limit).

RPD = Relative Percentage Difference

= Indicates a QC result that did not meet the ALS DQO.

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: 271651)											
VA21B7539-003	MP-06 ENE	pH	----	E108	0.10	pH units	7.93	7.92	0.126%	4%	----
Physical Tests (QC Lot: 271652)											
VA21B7539-003	MP-06 ENE	conductivity	----	E100S	2.0	µS/cm	42600	42500	0.235%	20%	----
Physical Tests (QC Lot: 271653)											
VA21B7539-003	MP-06 ENE	alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	103	102	0.195%	20%	----
Physical Tests (QC Lot: 273563)											
VA21B7537-001	Anonymous	turbidity	----	E121	0.10	NTU	0.58	0.53	0.05	Diff <2x LOR	----
Physical Tests (QC Lot: 273892)											
VA21B7539-001	MP-06 Source	solids, total dissolved [TDS]	----	E162S	40	mg/L	3450	3220	6.93%	20%	----
Anions and Nutrients (QC Lot: 274288)											
VA21B7539-001	MP-06 Source	phosphorus, total	7723-14-0	E372S	0.0040	mg/L	0.0040	<0.0040	0.00004	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 274289)											
VA21B7537-001	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 274291)											
VA21B7539-001	MP-06 Source	Kjeldahl nitrogen, total [TKN]	----	E318S	0.050	mg/L	0.081	0.098	0.017	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 274514)											
VA21B7539-001	MP-06 Source	bromide	24959-67-9	E235S.Br	5.0	mg/L	5.1	5.0	0.04	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 274515)											
VA21B7539-001	MP-06 Source	chloride	16887-00-6	E235S.Cl	50	mg/L	1660	1660	0.254%	20%	----
Anions and Nutrients (QC Lot: 274516)											
VA21B7539-001	MP-06 Source	fluoride	16984-48-8	E235S.F-L	0.20	mg/L	<0.20	<0.20	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 274517)											
VA21B7539-001	MP-06 Source	nitrate (as N)	14797-55-8	E235S.NO3-T	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 274518)											
VA21B7539-001	MP-06 Source	nitrite (as N)	14797-65-0	E235S.NO2-L	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 274519)											
VA21B7539-001	MP-06 Source	sulfate (as SO4)	14808-79-8	E235S.SO4-L	3.0	mg/L	233	234	0.429%	20%	----
Organic / Inorganic Carbon (QC Lot: 274286)											
VA21B7537-001	Anonymous	carbon, total organic [TOC]	----	E355-L	0.50	mg/L	3.39	3.54	0.15	Diff <2x LOR	----
Organic / Inorganic Carbon (QC Lot: 276240)											
VA21B7536-001	Anonymous	carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	1.13	1.02	0.11	Diff <2x LOR	----

Sub-Matrix: **Water**

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
					Laboratory Duplicate (DUP) Report						
Total Metals (QC Lot: 274655)											
VA21B7535-006	Anonymous	aluminum, total	7429-90-5	E468S	0.0050	mg/L	0.0638	0.0660	3.38%	20%	----
		antimony, total	7440-36-0	E468S	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		arsenic, total	7440-38-2	E468S	0.00040	mg/L	0.00162	0.00164	0.00003	Diff <2x LOR	----
		barium, total	7440-39-3	E468S	0.0010	mg/L	0.0098	0.0104	6.37%	20%	----
		beryllium, total	7440-41-7	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		bismuth, total	7440-69-9	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		boron, total	7440-42-8	E468S	0.30	mg/L	4.16	4.09	1.76%	20%	----
		cadmium, total	7440-43-9	E468S	0.000010	mg/L	0.000059	0.000061	0.000002	Diff <2x LOR	----
		calcium, total	7440-70-2	E468S	1.0	mg/L	423	434	2.43%	20%	----
		cesium, total	7440-46-2	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		chromium, total	7440-47-3	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		cobalt, total	7440-48-4	E468S	0.000050	mg/L	0.000092	0.000092	0.00000007	Diff <2x LOR	----
		copper, total	7440-50-8	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		gallium, total	7440-55-3	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		iron, total	7439-89-6	E468S	0.010	mg/L	0.111	0.113	1.49%	20%	----
		lead, total	7439-92-1	E468S	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		lithium, total	7439-93-2	E468S	0.020	mg/L	0.197	0.187	0.010	Diff <2x LOR	----
		magnesium, total	7439-95-4	E468S	1.0	mg/L	1320	1340	2.08%	20%	----
		manganese, total	7439-96-5	E468S	0.00020	mg/L	0.0254	0.0264	3.87%	20%	----
		molybdenum, total	7439-98-7	E468S	0.00010	mg/L	0.0106	0.0105	0.709%	20%	----
		nickel, total	7440-02-0	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		phosphorus, total	7723-14-0	E468S	0.050	mg/L	0.103	0.085	0.018	Diff <2x LOR	----
		potassium, total	7440-09-7	E468S	1.0	mg/L	473	489	3.35%	20%	----
		rhenium, total	7440-15-5	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		rubidium, total	7440-17-7	E468S	0.0050	mg/L	0.119	0.121	1.72%	20%	----
		selenium, total	7782-49-2	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		silver, total	7440-22-4	E468S	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		strontium, total	7440-24-6	E468S	0.010	mg/L	7.21	7.17	0.560%	20%	----
		sulfur, total	7704-34-9	E468S	5.0	mg/L	1230	1240	0.308%	20%	----
		tellurium, total	13494-80-9	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		thallium, total	7440-28-0	E468S	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		thorium, total	7440-29-1	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		tin, total	7440-31-5	E468S	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		titanium, total	7440-32-6	E468S	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
		tungsten, total	7440-33-7	E468S	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----

Sub-Matrix: **Water**

Laboratory Duplicate (DUP) Report

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Total Metals (QC Lot: 274655) - continued											
VA21B7535-006	Anonymous	uranium, total	7440-61-1	E468S	0.000050	mg/L	0.00274	0.00265	3.15%	20%	----
		vanadium, total	7440-62-2	E468S	0.00050	mg/L	0.00208	0.00216	0.00008	Diff <2x LOR	----
		yttrium, total	7440-65-5	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, total	7440-66-6	E468S	0.0030	mg/L	<0.0030	<0.0030	0	Diff <2x LOR	----
		zirconium, total	7440-67-7	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
Total Metals (QC Lot: 274656)											
VA21B7535-006	Anonymous	silicon, total	7440-21-3	E468S.NaSi	1.0	mg/L	1.6	<1.0	0.6	Diff <2x LOR	----
		sodium, total	17341-25-2	E468S.NaSi	2.5	mg/L	9140	9480	3.70%	20%	----
Total Metals (QC Lot: 274666)											
VA21B7539-008	MP-05 WNW	aluminum, total	7429-90-5	E468S	0.0050	mg/L	0.0293	0.0270	0.0023	Diff <2x LOR	----
		antimony, total	7440-36-0	E468S	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		arsenic, total	7440-38-2	E468S	0.00040	mg/L	<0.00040	<0.00040	0	Diff <2x LOR	----
		barium, total	7440-39-3	E468S	0.0010	mg/L	0.0052	0.0053	0.00002	Diff <2x LOR	----
		beryllium, total	7440-41-7	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		bismuth, total	7440-69-9	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		boron, total	7440-42-8	E468S	0.30	mg/L	1.00	1.01	0.003	Diff <2x LOR	----
		cadmium, total	7440-43-9	E468S	0.000010	mg/L	0.000010	0.000012	0.000002	Diff <2x LOR	----
		calcium, total	7440-70-2	E468S	1.0	mg/L	107	106	0.542%	20%	----
		cesium, total	7440-46-2	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		chromium, total	7440-47-3	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		cobalt, total	7440-48-4	E468S	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		copper, total	7440-50-8	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		gallium, total	7440-55-3	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		iron, total	7439-89-6	E468S	0.010	mg/L	0.032	0.032	0.0004	Diff <2x LOR	----
		lead, total	7439-92-1	E468S	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		lithium, total	7439-93-2	E468S	0.020	mg/L	0.042	0.042	0.0002	Diff <2x LOR	----
		magnesium, total	7439-95-4	E468S	1.0	mg/L	258	262	1.50%	20%	----
		manganese, total	7439-96-5	E468S	0.00020	mg/L	0.00137	0.00134	0.00004	Diff <2x LOR	----
		molybdenum, total	7439-98-7	E468S	0.00010	mg/L	0.00244	0.00246	1.01%	20%	----
		nickel, total	7440-02-0	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		phosphorus, total	7723-14-0	E468S	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		potassium, total	7440-09-7	E468S	1.0	mg/L	91.3	90.8	0.576%	20%	----
		rhenium, total	7440-15-5	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		rubidium, total	7440-17-7	E468S	0.0050	mg/L	0.0254	0.0251	0.0003	Diff <2x LOR	----
		selenium, total	7782-49-2	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----

Sub-Matrix: **Water**

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Laboratory Duplicate (DUP) Report						
					LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Total Metals (QC Lot: 274666) - continued											
VA21B7539-008	MP-05 WNW	silver, total	7440-22-4	E468S	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		strontium, total	7440-24-6	E468S	0.010	mg/L	1.58	1.55	1.88%	20%	----
		sulfur, total	7704-34-9	E468S	5.0	mg/L	229	226	1.42%	20%	----
		tellurium, total	13494-80-9	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		thallium, total	7440-28-0	E468S	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		thorium, total	7440-29-1	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		tin, total	7440-31-5	E468S	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		titanium, total	7440-32-6	E468S	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
		tungsten, total	7440-33-7	E468S	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		uranium, total	7440-61-1	E468S	0.000050	mg/L	0.00174	0.00175	0.458%	20%	----
		vanadium, total	7440-62-2	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		yttrium, total	7440-65-5	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, total	7440-66-6	E468S	0.0030	mg/L	<0.0030	<0.0030	0	Diff <2x LOR	----
		zirconium, total	7440-67-7	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
Total Metals (QC Lot: 274667)											
VA21B7539-008	MP-05 WNW	silicon, total	7440-21-3	E468S.NaSi	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		sodium, total	17341-25-2	E468S.NaSi	2.5	mg/L	2020	2090	3.38%	20%	----
Total Metals (QC Lot: 275439)											
VA21B7535-013	Anonymous	mercury, total	7439-97-6	E508S	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 273997)											
VA21B7432-001	Anonymous	aluminum, dissolved	7429-90-5	E469S	0.0050	mg/L	0.0258	0.0251	0.0007	Diff <2x LOR	----
		antimony, dissolved	7440-36-0	E469S	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		arsenic, dissolved	7440-38-2	E469S	0.00040	mg/L	<0.00040	<0.00040	0	Diff <2x LOR	----
		barium, dissolved	7440-39-3	E469S	0.0010	mg/L	0.164	0.171	4.01%	20%	----
		beryllium, dissolved	7440-41-7	E469S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		bismuth, dissolved	7440-69-9	E469S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		boron, dissolved	7440-42-8	E469S	0.30	mg/L	1.12	1.14	0.02	Diff <2x LOR	----
		cadmium, dissolved	7440-43-9	E469S	0.000010	mg/L	0.000594	0.000590	0.669%	20%	----
		calcium, dissolved	7440-70-2	E469S	1.0	mg/L	165	167	1.15%	20%	----
		cesium, dissolved	7440-46-2	E469S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		chromium, dissolved	7440-47-3	E469S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		cobalt, dissolved	7440-48-4	E469S	0.000050	mg/L	0.000446	0.000478	0.000032	Diff <2x LOR	----
		copper, dissolved	7440-50-8	E469S	0.00020	mg/L	0.0130	0.0130	0.0109%	20%	----
		gallium, dissolved	7440-55-3	E469S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		iron, dissolved	7439-89-6	E469S	0.010	mg/L	0.138	0.139	1.12%	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
Dissolved Metals (QC Lot: 273997) - continued											
VA21B7432-001	Anonymous	lead, dissolved	7439-92-1	E469S	0.000050	mg/L	0.000234	0.000235	0.000001	Diff <2x LOR	----
		lithium, dissolved	7439-93-2	E469S	0.020	mg/L	<0.020	<0.020	0	Diff <2x LOR	----
		magnesium, dissolved	7439-95-4	E469S	1.0	mg/L	373	387	3.69%	20%	----
		manganese, dissolved	7439-96-5	E469S	0.00010	mg/L	0.0899	0.0914	1.62%	20%	----
		molybdenum, dissolved	7439-98-7	E469S	0.00010	mg/L	0.00287	0.00298	3.73%	20%	----
		nickel, dissolved	7440-02-0	E469S	0.00050	mg/L	0.00064	0.00066	0.00002	Diff <2x LOR	----
		phosphorus, dissolved	7723-14-0	E469S	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		potassium, dissolved	7440-09-7	E469S	1.0	mg/L	118	121	2.57%	20%	----
		rhenium, dissolved	7440-15-5	E469S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		rubidium, dissolved	7440-17-7	E469S	0.0050	mg/L	0.0398	0.0406	0.0009	Diff <2x LOR	----
		selenium, dissolved	7782-49-2	E469S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		silver, dissolved	7440-22-4	E469S	0.00010	mg/L	0.00017	0.00018	0.00001	Diff <2x LOR	----
		strontium, dissolved	7440-24-6	E469S	0.010	mg/L	2.78	2.82	1.63%	20%	----
		sulfur, dissolved	7704-34-9	E469S	5.0	mg/L	300	306	1.89%	20%	----
		tellurium, dissolved	13494-80-9	E469S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		thallium, dissolved	7440-28-0	E469S	0.000050	mg/L	0.000053	0.000050	0.000003	Diff <2x LOR	----
		thorium, dissolved	7440-29-1	E469S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		tin, dissolved	7440-31-5	E469S	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		titanium, dissolved	7440-32-6	E469S	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
		tungsten, dissolved	7440-33-7	E469S	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		uranium, dissolved	7440-61-1	E469S	0.000050	mg/L	0.000338	0.000340	0.000002	Diff <2x LOR	----
		vanadium, dissolved	7440-62-2	E469S	0.00050	mg/L	0.00064	0.00064	0.000007	Diff <2x LOR	----
		yttrium, dissolved	7440-65-5	E469S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, dissolved	7440-66-6	E469S	0.0010	mg/L	0.0329	0.0336	2.16%	20%	----
		zirconium, dissolved	7440-67-7	E469S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 273998)											
VA21B7432-001	Anonymous	silicon, dissolved	7440-21-3	E469S.NaSi	1.0	mg/L	3.9	3.9	0.02	Diff <2x LOR	----
		sodium, dissolved	17341-25-2	E469S.NaSi	2.5	mg/L	3260	3200	1.89%	20%	----
Dissolved Metals (QC Lot: 275533)											
VA21B7536-001	Anonymous	mercury, dissolved	7439-97-6	E509S	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
Volatile Organic Compounds (QC Lot: 274060)											
VA21B7455-013	Anonymous	benzene	71-43-2	E611A	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		ethylbenzene	100-41-4	E611A	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		methyl-tert-butyl ether [MTBE]	1634-04-4	E611A	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		styrene	100-42-5	E611A	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----

Sub-Matrix: **Water**

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Laboratory Duplicate (DUP) Report						
					LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Volatile Organic Compounds (QC Lot: 274060) - continued											
VA21B7455-013	Anonymous	toluene	108-88-3	E611A	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		xylene, m+p-	179601-23-1	E611A	0.40	µg/L	<0.40	<0.40	0	Diff <2x LOR	----
		xylene, o-	95-47-6	E611A	0.30	µg/L	<0.30	<0.30	0	Diff <2x LOR	----
Hydrocarbons (QC Lot: 274061)											
VA21B7484-001	Anonymous	F1 (C6-C10)	----	E581.VH+F1	100	µg/L	<100	<100	0.0%	30%	----
		VHw (C6-C10)	----	E581.VH+F1	100	µg/L	<100	<100	0.0%	30%	----

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: 271652)						
conductivity	----	E100S	2	μS/cm	<2.0	----
Physical Tests (QCLot: 271653)						
alkalinity, total (as CaCO3)	----	E290	1	mg/L	1.3	----
Physical Tests (QCLot: 272739)						
solids, total suspended [TSS]	----	E160S	2	mg/L	<2.0	----
Physical Tests (QCLot: 273563)						
turbidity	----	E121	0.1	NTU	<0.10	----
Physical Tests (QCLot: 273892)						
solids, total dissolved [TDS]	----	E162S	10	mg/L	<10	----
Anions and Nutrients (QCLot: 274288)						
phosphorus, total	7723-14-0	E372S	0.002	mg/L	<0.0040	----
Anions and Nutrients (QCLot: 274289)						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 274291)						
Kjeldahl nitrogen, total [TKN]	----	E318S	0.05	mg/L	<0.050	----
Anions and Nutrients (QCLot: 274514)						
bromide	24959-67-9	E235S.Br	5	mg/L	<5.0	----
Anions and Nutrients (QCLot: 274515)						
chloride	16887-00-6	E235S.Cl	50	mg/L	<50	----
Anions and Nutrients (QCLot: 274516)						
fluoride	16984-48-8	E235S.F-L	0.2	mg/L	<0.20	----
Anions and Nutrients (QCLot: 274517)						
nitrate (as N)	14797-55-8	E235S.NO3-T	0.01	mg/L	<0.010	----
Anions and Nutrients (QCLot: 274518)						
nitrite (as N)	14797-65-0	E235S.NO2-L	0.01	mg/L	<0.010	----
Anions and Nutrients (QCLot: 274519)						
sulfate (as SO4)	14808-79-8	E235S.SO4-L	3	mg/L	<3.0	----
Organic / Inorganic Carbon (QCLot: 274286)						
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	<0.50	----
Organic / Inorganic Carbon (QCLot: 276240)						
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	<0.50	----
Total Metals (QCLot: 274655)						
aluminum, total	7429-90-5	E468S	0.005	mg/L	<0.0050	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 274655) - continued						
antimony, total	7440-36-0	E468S	0.001	mg/L	<0.0010	----
arsenic, total	7440-38-2	E468S	0.0004	mg/L	<0.00040	----
barium, total	7440-39-3	E468S	0.001	mg/L	<0.0010	----
beryllium, total	7440-41-7	E468S	0.0005	mg/L	<0.00050	----
bismuth, total	7440-69-9	E468S	0.0005	mg/L	<0.00050	----
boron, total	7440-42-8	E468S	0.3	mg/L	<0.30	----
cadmium, total	7440-43-9	E468S	0.00001	mg/L	<0.000010	----
calcium, total	7440-70-2	E468S	1	mg/L	<1.0	----
cesium, total	7440-46-2	E468S	0.0005	mg/L	<0.00050	----
chromium, total	7440-47-3	E468S	0.0005	mg/L	<0.00050	----
cobalt, total	7440-48-4	E468S	0.00005	mg/L	<0.000050	----
copper, total	7440-50-8	E468S	0.0005	mg/L	<0.00050	----
gallium, total	7440-55-3	E468S	0.0005	mg/L	<0.00050	----
iron, total	7439-89-6	E468S	0.01	mg/L	<0.010	----
lead, total	7439-92-1	E468S	0.00005	mg/L	<0.000050	----
lithium, total	7439-93-2	E468S	0.02	mg/L	<0.020	----
magnesium, total	7439-95-4	E468S	1	mg/L	<1.0	----
manganese, total	7439-96-5	E468S	0.0002	mg/L	<0.00020	----
molybdenum, total	7439-98-7	E468S	0.0001	mg/L	<0.00010	----
nickel, total	7440-02-0	E468S	0.0005	mg/L	<0.00050	----
phosphorus, total	7723-14-0	E468S	0.05	mg/L	<0.050	----
potassium, total	7440-09-7	E468S	1	mg/L	<1.0	----
rhenium, total	7440-15-5	E468S	0.0005	mg/L	<0.00050	----
rubidium, total	7440-17-7	E468S	0.005	mg/L	<0.0050	----
selenium, total	7782-49-2	E468S	0.0005	mg/L	<0.00050	----
silver, total	7440-22-4	E468S	0.0001	mg/L	<0.00010	----
strontium, total	7440-24-6	E468S	0.01	mg/L	<0.010	----
sulfur, total	7704-34-9	E468S	5	mg/L	<5.0	----
tellurium, total	13494-80-9	E468S	0.0005	mg/L	<0.00050	----
thallium, total	7440-28-0	E468S	0.00005	mg/L	<0.000050	----
thorium, total	7440-29-1	E468S	0.0005	mg/L	<0.00050	----
tin, total	7440-31-5	E468S	0.001	mg/L	<0.0010	----
titanium, total	7440-32-6	E468S	0.005	mg/L	<0.0050	----
tungsten, total	7440-33-7	E468S	0.001	mg/L	<0.0010	----
uranium, total	7440-61-1	E468S	0.00005	mg/L	<0.000050	----
vanadium, total	7440-62-2	E468S	0.0005	mg/L	<0.00050	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 274655) - continued						
yttrium, total	7440-65-5	E468S	0.0005	mg/L	<0.00050	----
zinc, total	7440-66-6	E468S	0.003	mg/L	<0.0030	----
zirconium, total	7440-67-7	E468S	0.0005	mg/L	<0.00050	----
Total Metals (QCLot: 274656)						
silicon, total	7440-21-3	E468S.NaSi	1	mg/L	<1.0	----
sodium, total	17341-25-2	E468S.NaSi	2.5	mg/L	<2.5	----
Total Metals (QCLot: 274666)						
aluminum, total	7429-90-5	E468S	0.005	mg/L	<0.0050	----
antimony, total	7440-36-0	E468S	0.001	mg/L	<0.0010	----
arsenic, total	7440-38-2	E468S	0.0004	mg/L	<0.00040	----
barium, total	7440-39-3	E468S	0.001	mg/L	<0.0010	----
beryllium, total	7440-41-7	E468S	0.0005	mg/L	<0.00050	----
bismuth, total	7440-69-9	E468S	0.0005	mg/L	<0.00050	----
boron, total	7440-42-8	E468S	0.3	mg/L	<0.30	----
cadmium, total	7440-43-9	E468S	0.00001	mg/L	<0.000010	----
calcium, total	7440-70-2	E468S	1	mg/L	<1.0	----
cesium, total	7440-46-2	E468S	0.0005	mg/L	<0.00050	----
chromium, total	7440-47-3	E468S	0.0005	mg/L	<0.00050	----
cobalt, total	7440-48-4	E468S	0.00005	mg/L	<0.000050	----
copper, total	7440-50-8	E468S	0.0005	mg/L	<0.00050	----
gallium, total	7440-55-3	E468S	0.0005	mg/L	<0.00050	----
iron, total	7439-89-6	E468S	0.01	mg/L	<0.010	----
lead, total	7439-92-1	E468S	0.00005	mg/L	<0.000050	----
lithium, total	7439-93-2	E468S	0.02	mg/L	<0.020	----
magnesium, total	7439-95-4	E468S	1	mg/L	<1.0	----
manganese, total	7439-96-5	E468S	0.0002	mg/L	<0.00020	----
molybdenum, total	7439-98-7	E468S	0.0001	mg/L	<0.00010	----
nickel, total	7440-02-0	E468S	0.0005	mg/L	<0.00050	----
phosphorus, total	7723-14-0	E468S	0.05	mg/L	<0.050	----
potassium, total	7440-09-7	E468S	1	mg/L	<1.0	----
rhenium, total	7440-15-5	E468S	0.0005	mg/L	<0.00050	----
rubidium, total	7440-17-7	E468S	0.005	mg/L	<0.0050	----
selenium, total	7782-49-2	E468S	0.0005	mg/L	<0.00050	----
silver, total	7440-22-4	E468S	0.0001	mg/L	<0.00010	----
strontium, total	7440-24-6	E468S	0.01	mg/L	<0.010	----
sulfur, total	7704-34-9	E468S	5	mg/L	<5.0	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 274666) - continued						
tellurium, total	13494-80-9	E468S	0.0005	mg/L	<0.00050	----
thallium, total	7440-28-0	E468S	0.00005	mg/L	<0.000050	----
thorium, total	7440-29-1	E468S	0.0005	mg/L	<0.00050	----
tin, total	7440-31-5	E468S	0.001	mg/L	<0.0010	----
titanium, total	7440-32-6	E468S	0.005	mg/L	<0.0050	----
tungsten, total	7440-33-7	E468S	0.001	mg/L	<0.0010	----
uranium, total	7440-61-1	E468S	0.00005	mg/L	<0.000050	----
vanadium, total	7440-62-2	E468S	0.0005	mg/L	<0.00050	----
yttrium, total	7440-65-5	E468S	0.0005	mg/L	<0.00050	----
zinc, total	7440-66-6	E468S	0.003	mg/L	<0.0030	----
zirconium, total	7440-67-7	E468S	0.0005	mg/L	<0.00050	----
Total Metals (QCLot: 274667)						
silicon, total	7440-21-3	E468S.NaSi	1	mg/L	<1.0	----
sodium, total	17341-25-2	E468S.NaSi	2.5	mg/L	<2.5	----
Total Metals (QCLot: 275439)						
mercury, total	7439-97-6	E508S	0.000005	mg/L	<0.0000050	----
Dissolved Metals (QCLot: 273997)						
aluminum, dissolved	7429-90-5	E469S	0.005	mg/L	<0.0050	----
antimony, dissolved	7440-36-0	E469S	0.001	mg/L	<0.0010	----
arsenic, dissolved	7440-38-2	E469S	0.0004	mg/L	<0.00040	----
barium, dissolved	7440-39-3	E469S	0.001	mg/L	<0.0010	----
beryllium, dissolved	7440-41-7	E469S	0.0005	mg/L	<0.00050	----
bismuth, dissolved	7440-69-9	E469S	0.0005	mg/L	<0.00050	----
boron, dissolved	7440-42-8	E469S	0.3	mg/L	<0.30	----
cadmium, dissolved	7440-43-9	E469S	0.00001	mg/L	<0.000010	----
calcium, dissolved	7440-70-2	E469S	1	mg/L	<1.0	----
cesium, dissolved	7440-46-2	E469S	0.0005	mg/L	<0.00050	----
chromium, dissolved	7440-47-3	E469S	0.0005	mg/L	<0.00050	----
cobalt, dissolved	7440-48-4	E469S	0.00005	mg/L	<0.000050	----
copper, dissolved	7440-50-8	E469S	0.0002	mg/L	<0.00020	----
gallium, dissolved	7440-55-3	E469S	0.0005	mg/L	<0.00050	----
iron, dissolved	7439-89-6	E469S	0.01	mg/L	<0.010	----
lead, dissolved	7439-92-1	E469S	0.00005	mg/L	<0.000050	----
lithium, dissolved	7439-93-2	E469S	0.02	mg/L	<0.020	----
magnesium, dissolved	7439-95-4	E469S	1	mg/L	<1.0	----
manganese, dissolved	7439-96-5	E469S	0.0001	mg/L	<0.00010	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 273997) - continued						
molybdenum, dissolved	7439-98-7	E469S	0.0001	mg/L	<0.00010	----
nickel, dissolved	7440-02-0	E469S	0.0005	mg/L	<0.00050	----
phosphorus, dissolved	7723-14-0	E469S	0.05	mg/L	<0.050	----
potassium, dissolved	7440-09-7	E469S	1	mg/L	<1.0	----
rhenium, dissolved	7440-15-5	E469S	0.0005	mg/L	<0.00050	----
rubidium, dissolved	7440-17-7	E469S	0.005	mg/L	<0.0050	----
selenium, dissolved	7782-49-2	E469S	0.0005	mg/L	<0.00050	----
silver, dissolved	7440-22-4	E469S	0.0001	mg/L	<0.00010	----
strontium, dissolved	7440-24-6	E469S	0.01	mg/L	<0.010	----
sulfur, dissolved	7704-34-9	E469S	5	mg/L	<5.0	----
tellurium, dissolved	13494-80-9	E469S	0.0005	mg/L	<0.00050	----
thallium, dissolved	7440-28-0	E469S	0.00005	mg/L	<0.000050	----
thorium, dissolved	7440-29-1	E469S	0.0005	mg/L	<0.00050	----
tin, dissolved	7440-31-5	E469S	0.001	mg/L	<0.0010	----
titanium, dissolved	7440-32-6	E469S	0.005	mg/L	<0.0050	----
tungsten, dissolved	7440-33-7	E469S	0.001	mg/L	<0.0010	----
uranium, dissolved	7440-61-1	E469S	0.00005	mg/L	<0.000050	----
vanadium, dissolved	7440-62-2	E469S	0.0005	mg/L	<0.00050	----
yttrium, dissolved	7440-65-5	E469S	0.0005	mg/L	<0.00050	----
zinc, dissolved	7440-66-6	E469S	0.001	mg/L	<0.0010	----
zirconium, dissolved	7440-67-7	E469S	0.0005	mg/L	<0.00050	----
Dissolved Metals (QCLot: 273998)						
silicon, dissolved	7440-21-3	E469S.NaSi	1	mg/L	<1.0	----
sodium, dissolved	17341-25-2	E469S.NaSi	2.5	mg/L	<2.5	----
Dissolved Metals (QCLot: 275533)						
mercury, dissolved	7439-97-6	E509S	0.000005	mg/L	<0.0000050	----
Volatile Organic Compounds (QCLot: 274060)						
benzene	71-43-2	E611A	0.5	µg/L	<0.50	----
ethylbenzene	100-41-4	E611A	0.5	µg/L	<0.50	----
methyl-tert-butyl ether [MTBE]	1634-04-4	E611A	0.5	µg/L	<0.50	----
styrene	100-42-5	E611A	0.5	µg/L	<0.50	----
toluene	108-88-3	E611A	0.5	µg/L	<0.50	----
xylene, m+p-	179601-23-1	E611A	0.4	µg/L	<0.40	----
xylene, o-	95-47-6	E611A	0.3	µg/L	<0.30	----
Hydrocarbons (QCLot: 273798)						
F2 (C10-C16)	----	E601	100	µg/L	<100	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Hydrocarbons (QCLot: 273798) - continued						
F3 (C16-C34)	----	E601	250	µg/L	<250	----
F4 (C34-C50)	----	E601	250	µg/L	<250	----
Hydrocarbons (QCLot: 274061)						
F1 (C6-C10)	----	E581.VH+F1	100	µg/L	<100	----
VHw (C6-C10)	----	E581.VH+F1	100	µg/L	<100	----
Polycyclic Aromatic Hydrocarbons (QCLot: 284186)						
acenaphthene	83-32-9	E641A	0.01	µg/L	<0.010	----
acenaphthylene	208-96-8	E641A	0.01	µg/L	<0.010	----
acridine	260-94-6	E641A	0.01	µg/L	<0.010	----
anthracene	120-12-7	E641A	0.01	µg/L	<0.010	----
benz(a)anthracene	56-55-3	E641A	0.01	µg/L	<0.010	----
benzo(a)pyrene	50-32-8	E641A	0.005	µg/L	<0.0050	----
benzo(b+j)fluoranthene	----	E641A	0.01	µg/L	<0.010	----
benzo(g,h,i)perylene	191-24-2	E641A	0.01	µg/L	<0.010	----
benzo(k)fluoranthene	207-08-9	E641A	0.01	µg/L	<0.010	----
chrysene	218-01-9	E641A	0.01	µg/L	<0.010	----
dibenz(a,h)anthracene	53-70-3	E641A	0.005	µg/L	<0.0050	----
fluoranthene	206-44-0	E641A	0.01	µg/L	<0.010	----
fluorene	86-73-7	E641A	0.01	µg/L	<0.010	----
indeno(1,2,3-c,d)pyrene	193-39-5	E641A	0.01	µg/L	<0.010	----
methylnaphthalene, 1-	90-12-0	E641A	0.01	µg/L	<0.010	----
methylnaphthalene, 2-	91-57-6	E641A	0.01	µg/L	<0.010	----
naphthalene	91-20-3	E641A	0.05	µg/L	<0.050	----
phenanthrene	85-01-8	E641A	0.02	µg/L	<0.020	----
pyrene	129-00-0	E641A	0.01	µg/L	<0.010	----
quinoline	6027-02-7	E641A	0.05	µg/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	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 271651)									
pH	----	E108	----	pH units	7 pH units	99.8	98.0	102	----
Physical Tests (QCLot: 271652)									
conductivity	----	E100S	2	µS/cm	146.9 µS/cm	102	80.0	120	----
Physical Tests (QCLot: 271653)									
alkalinity, total (as CaCO3)	----	E290	1	mg/L	500 mg/L	96.6	85.0	115	----
Physical Tests (QCLot: 272739)									
solids, total suspended [TSS]	----	E160S	2	mg/L	150 mg/L	94.6	85.0	115	----
Physical Tests (QCLot: 273563)									
turbidity	----	E121	0.1	NTU	200 NTU	101	85.0	115	----
Physical Tests (QCLot: 273892)									
solids, total dissolved [TDS]	----	E162S	10	mg/L	1000 mg/L	97.0	85.0	115	----
Anions and Nutrients (QCLot: 274288)									
phosphorus, total	7723-14-0	E372S	0.002	mg/L	0.05 mg/L	93.4	80.0	120	----
Anions and Nutrients (QCLot: 274289)									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.2 mg/L	99.1	85.0	115	----
Anions and Nutrients (QCLot: 274291)									
Kjeldahl nitrogen, total [TKN]	----	E318S	0.05	mg/L	4 mg/L	103	75.0	125	----
Anions and Nutrients (QCLot: 274514)									
bromide	24959-67-9	E235S.Br	5	mg/L	0.5 mg/L	97.9	85.0	115	----
Anions and Nutrients (QCLot: 274515)									
chloride	16887-00-6	E235S.Cl	50	mg/L	100 mg/L	101	90.0	110	----
Anions and Nutrients (QCLot: 274516)									
fluoride	16984-48-8	E235S.F-L	0.2	mg/L	1 mg/L	95.8	90.0	110	----
Anions and Nutrients (QCLot: 274517)									
nitrate (as N)	14797-55-8	E235S.NO3-T	0.01	mg/L	2.5 mg/L	101	90.0	110	----
Anions and Nutrients (QCLot: 274518)									
nitrite (as N)	14797-65-0	E235S.NO2-L	0.01	mg/L	0.5 mg/L	96.0	90.0	110	----
Anions and Nutrients (QCLot: 274519)									
sulfate (as SO4)	14808-79-8	E235S.SO4-L	3	mg/L	100 mg/L	101	90.0	110	----
Organic / Inorganic Carbon (QCLot: 274286)									
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	8.57 mg/L	99.0	80.0	120	----

Sub-Matrix: **Water**

Laboratory Control Sample (LCS) Report

Analyte	CAS Number	Method	LOR	Unit	Spike Concentration	Recovery (%) LCS	Recovery Limits (%) Low	Recovery Limits (%) High	Qualifier
Organic / Inorganic Carbon (QCLot: 276240)									
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	8.57 mg/L	98.7	80.0	120	----
Total Metals (QCLot: 274655)									
aluminum, total	7429-90-5	E468S	0.005	mg/L	2 mg/L	102	80.0	120	----
antimony, total	7440-36-0	E468S	0.001	mg/L	1 mg/L	102	80.0	120	----
arsenic, total	7440-38-2	E468S	0.0004	mg/L	1 mg/L	102	80.0	120	----
barium, total	7440-39-3	E468S	0.001	mg/L	0.25 mg/L	102	80.0	120	----
beryllium, total	7440-41-7	E468S	0.0005	mg/L	0.1 mg/L	104	80.0	120	----
bismuth, total	7440-69-9	E468S	0.0005	mg/L	1 mg/L	110	80.0	120	----
boron, total	7440-42-8	E468S	0.3	mg/L	10 mg/L	99.3	80.0	120	----
cadmium, total	7440-43-9	E468S	0.00001	mg/L	0.1 mg/L	107	80.0	120	----
calcium, total	7440-70-2	E468S	1	mg/L	50 mg/L	100	80.0	120	----
cesium, total	7440-46-2	E468S	0.0005	mg/L	0.05 mg/L	95.7	80.0	120	----
chromium, total	7440-47-3	E468S	0.0005	mg/L	0.25 mg/L	102	80.0	120	----
cobalt, total	7440-48-4	E468S	0.00005	mg/L	0.25 mg/L	107	80.0	120	----
copper, total	7440-50-8	E468S	0.0005	mg/L	0.25 mg/L	108	80.0	120	----
gallium, total	7440-55-3	E468S	0.0005	mg/L	0.25 mg/L	101	80.0	120	----
iron, total	7439-89-6	E468S	0.01	mg/L	1 mg/L	108	80.0	120	----
lead, total	7439-92-1	E468S	0.00005	mg/L	0.5 mg/L	107	80.0	120	----
lithium, total	7439-93-2	E468S	0.02	mg/L	0.25 mg/L	101	80.0	120	----
magnesium, total	7439-95-4	E468S	1	mg/L	50 mg/L	100	80.0	120	----
manganese, total	7439-96-5	E468S	0.0002	mg/L	0.25 mg/L	103	80.0	120	----
molybdenum, total	7439-98-7	E468S	0.0001	mg/L	0.25 mg/L	96.1	80.0	120	----
nickel, total	7440-02-0	E468S	0.0005	mg/L	0.5 mg/L	106	80.0	120	----
phosphorus, total	7723-14-0	E468S	0.05	mg/L	10 mg/L	104	80.0	120	----
potassium, total	7440-09-7	E468S	1	mg/L	50 mg/L	103	80.0	120	----
rhenium, total	7440-15-5	E468S	0.0005	mg/L	0.1 mg/L	98.6	80.0	120	----
rubidium, total	7440-17-7	E468S	0.005	mg/L	0.1 mg/L	106	80.0	120	----
selenium, total	7782-49-2	E468S	0.0005	mg/L	1 mg/L	112	80.0	120	----
silver, total	7440-22-4	E468S	0.0001	mg/L	0.1 mg/L	103	80.0	120	----
strontium, total	7440-24-6	E468S	0.01	mg/L	0.25 mg/L	97.8	80.0	120	----
sulfur, total	7704-34-9	E468S	5	mg/L	50 mg/L	89.0	80.0	120	----
tellurium, total	13494-80-9	E468S	0.0005	mg/L	0.1 mg/L	110	80.0	120	----
thallium, total	7440-28-0	E468S	0.00005	mg/L	1 mg/L	96.9	80.0	120	----
thorium, total	7440-29-1	E468S	0.0005	mg/L	0.1 mg/L	93.5	80.0	120	----
tin, total	7440-31-5	E468S	0.001	mg/L	0.5 mg/L	97.9	80.0	120	----
titanium, total	7440-32-6	E468S	0.005	mg/L	0.25 mg/L	102	80.0	120	----
tungsten, total	7440-33-7	E468S	0.001	mg/L	0.1 mg/L	98.9	80.0	120	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Spike Concentration	Recovery (%) LCS	Recovery Limits (%) Low	Recovery Limits (%) High	Qualifier
Total Metals (QCLot: 274655) - continued									
uranium, total	7440-61-1	E468S	0.00005	mg/L	0.005 mg/L	101	80.0	120	----
vanadium, total	7440-62-2	E468S	0.0005	mg/L	0.5 mg/L	99.9	80.0	120	----
yttrium, total	7440-65-5	E468S	0.0005	mg/L	0.1 mg/L	100	80.0	120	----
zinc, total	7440-66-6	E468S	0.003	mg/L	0.5 mg/L	106	80.0	120	----
zirconium, total	7440-67-7	E468S	0.0005	mg/L	0.1 mg/L	92.3	80.0	120	----
Total Metals (QCLot: 274656)									
silicon, total	7440-21-3	E468S.NaSi	1	mg/L	10 mg/L	105	80.0	120	----
sodium, total	17341-25-2	E468S.NaSi	2.5	mg/L	50 mg/L	101	80.0	120	----
Total Metals (QCLot: 274666)									
aluminum, total	7429-90-5	E468S	0.005	mg/L	2 mg/L	97.3	80.0	120	----
antimony, total	7440-36-0	E468S	0.001	mg/L	1 mg/L	105	80.0	120	----
arsenic, total	7440-38-2	E468S	0.0004	mg/L	1 mg/L	101	80.0	120	----
barium, total	7440-39-3	E468S	0.001	mg/L	0.25 mg/L	104	80.0	120	----
beryllium, total	7440-41-7	E468S	0.0005	mg/L	0.1 mg/L	106	80.0	120	----
bismuth, total	7440-69-9	E468S	0.0005	mg/L	1 mg/L	109	80.0	120	----
boron, total	7440-42-8	E468S	0.3	mg/L	10 mg/L	98.6	80.0	120	----
cadmium, total	7440-43-9	E468S	0.00001	mg/L	0.1 mg/L	108	80.0	120	----
calcium, total	7440-70-2	E468S	1	mg/L	50 mg/L	102	80.0	120	----
cesium, total	7440-46-2	E468S	0.0005	mg/L	0.05 mg/L	98.1	80.0	120	----
chromium, total	7440-47-3	E468S	0.0005	mg/L	0.25 mg/L	103	80.0	120	----
cobalt, total	7440-48-4	E468S	0.00005	mg/L	0.25 mg/L	108	80.0	120	----
copper, total	7440-50-8	E468S	0.0005	mg/L	0.25 mg/L	107	80.0	120	----
gallium, total	7440-55-3	E468S	0.0005	mg/L	0.25 mg/L	103	80.0	120	----
iron, total	7439-89-6	E468S	0.01	mg/L	1 mg/L	109	80.0	120	----
lead, total	7439-92-1	E468S	0.00005	mg/L	0.5 mg/L	108	80.0	120	----
lithium, total	7439-93-2	E468S	0.02	mg/L	0.25 mg/L	109	80.0	120	----
magnesium, total	7439-95-4	E468S	1	mg/L	50 mg/L	99.8	80.0	120	----
manganese, total	7439-96-5	E468S	0.0002	mg/L	0.25 mg/L	103	80.0	120	----
molybdenum, total	7439-98-7	E468S	0.0001	mg/L	0.25 mg/L	97.5	80.0	120	----
nickel, total	7440-02-0	E468S	0.0005	mg/L	0.5 mg/L	106	80.0	120	----
phosphorus, total	7723-14-0	E468S	0.05	mg/L	10 mg/L	101	80.0	120	----
potassium, total	7440-09-7	E468S	1	mg/L	50 mg/L	102	80.0	120	----
rhenium, total	7440-15-5	E468S	0.0005	mg/L	0.1 mg/L	102	80.0	120	----
rubidium, total	7440-17-7	E468S	0.005	mg/L	0.1 mg/L	104	80.0	120	----
selenium, total	7782-49-2	E468S	0.0005	mg/L	1 mg/L	111	80.0	120	----
silver, total	7440-22-4	E468S	0.0001	mg/L	0.1 mg/L	106	80.0	120	----
strontium, total	7440-24-6	E468S	0.01	mg/L	0.25 mg/L	100	80.0	120	----

Sub-Matrix: **Water**

Laboratory Control Sample (LCS) Report

Analyte	CAS Number	Method	LOR	Unit	Spike Concentration	Recovery (%) LCS	Recovery Limits (%) Low	Recovery Limits (%) High	Qualifier
Total Metals (QCLot: 274666) - continued									
sulfur, total	7704-34-9	E468S	5	mg/L	50 mg/L	98.5	80.0	120	----
tellurium, total	13494-80-9	E468S	0.0005	mg/L	0.1 mg/L	110	80.0	120	----
thallium, total	7440-28-0	E468S	0.00005	mg/L	1 mg/L	99.6	80.0	120	----
thorium, total	7440-29-1	E468S	0.0005	mg/L	0.1 mg/L	96.8	80.0	120	----
tin, total	7440-31-5	E468S	0.001	mg/L	0.5 mg/L	99.7	80.0	120	----
titanium, total	7440-32-6	E468S	0.005	mg/L	0.25 mg/L	99.2	80.0	120	----
tungsten, total	7440-33-7	E468S	0.001	mg/L	0.1 mg/L	97.4	80.0	120	----
uranium, total	7440-61-1	E468S	0.00005	mg/L	0.005 mg/L	104	80.0	120	----
vanadium, total	7440-62-2	E468S	0.0005	mg/L	0.5 mg/L	99.5	80.0	120	----
yttrium, total	7440-65-5	E468S	0.0005	mg/L	0.1 mg/L	100	80.0	120	----
zinc, total	7440-66-6	E468S	0.003	mg/L	0.5 mg/L	105	80.0	120	----
zirconium, total	7440-67-7	E468S	0.0005	mg/L	0.1 mg/L	94.2	80.0	120	----
Total Metals (QCLot: 274667)									
silicon, total	7440-21-3	E468S.NaSi	1	mg/L	10 mg/L	91.9	80.0	120	----
sodium, total	17341-25-2	E468S.NaSi	2.5	mg/L	50 mg/L	98.4	80.0	120	----
Total Metals (QCLot: 275439)									
mercury, total	7439-97-6	E508S	0.000005	mg/L	0.0001 mg/L	97.2	80.0	120	----
Dissolved Metals (QCLot: 273997)									
aluminum, dissolved	7429-90-5	E469S	0.005	mg/L	2 mg/L	95.3	80.0	120	----
antimony, dissolved	7440-36-0	E469S	0.001	mg/L	1 mg/L	102	80.0	120	----
arsenic, dissolved	7440-38-2	E469S	0.0004	mg/L	1 mg/L	96.0	80.0	120	----
barium, dissolved	7440-39-3	E469S	0.001	mg/L	0.25 mg/L	94.8	80.0	120	----
beryllium, dissolved	7440-41-7	E469S	0.0005	mg/L	0.1 mg/L	95.2	80.0	120	----
bismuth, dissolved	7440-69-9	E469S	0.0005	mg/L	1 mg/L	103	80.0	120	----
boron, dissolved	7440-42-8	E469S	0.3	mg/L	10 mg/L	92.3	80.0	120	----
cadmium, dissolved	7440-43-9	E469S	0.00001	mg/L	0.1 mg/L	101	80.0	120	----
calcium, dissolved	7440-70-2	E469S	1	mg/L	50 mg/L	94.5	80.0	120	----
cesium, dissolved	7440-46-2	E469S	0.0005	mg/L	0.05 mg/L	99.1	80.0	120	----
chromium, dissolved	7440-47-3	E469S	0.0005	mg/L	0.25 mg/L	97.8	80.0	120	----
cobalt, dissolved	7440-48-4	E469S	0.00005	mg/L	0.25 mg/L	102	80.0	120	----
copper, dissolved	7440-50-8	E469S	0.0002	mg/L	0.25 mg/L	100	80.0	120	----
gallium, dissolved	7440-55-3	E469S	0.0005	mg/L	0.25 mg/L	100	80.0	120	----
iron, dissolved	7439-89-6	E469S	0.01	mg/L	1 mg/L	104	80.0	120	----
lead, dissolved	7439-92-1	E469S	0.00005	mg/L	0.5 mg/L	102	80.0	120	----
lithium, dissolved	7439-93-2	E469S	0.02	mg/L	0.25 mg/L	97.2	80.0	120	----
magnesium, dissolved	7439-95-4	E469S	1	mg/L	50 mg/L	95.5	80.0	120	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
					Concentration	LCS	Low	High	Qualifier
Dissolved Metals (QCLot: 273997) - continued									
manganese, dissolved	7439-96-5	E469S	0.0001	mg/L	0.25 mg/L	97.8	80.0	120	----
molybdenum, dissolved	7439-98-7	E469S	0.0001	mg/L	0.25 mg/L	95.0	80.0	120	----
nickel, dissolved	7440-02-0	E469S	0.0005	mg/L	0.5 mg/L	99.6	80.0	120	----
phosphorus, dissolved	7723-14-0	E469S	0.05	mg/L	10 mg/L	95.2	80.0	120	----
potassium, dissolved	7440-09-7	E469S	1	mg/L	50 mg/L	96.3	80.0	120	----
rhenium, dissolved	7440-15-5	E469S	0.0005	mg/L	0.1 mg/L	97.4	80.0	120	----
rubidium, dissolved	7440-17-7	E469S	0.005	mg/L	0.1 mg/L	94.8	80.0	120	----
selenium, dissolved	7782-49-2	E469S	0.0005	mg/L	1 mg/L	103	80.0	120	----
silver, dissolved	7440-22-4	E469S	0.0001	mg/L	0.1 mg/L	101	80.0	120	----
strontium, dissolved	7440-24-6	E469S	0.01	mg/L	0.25 mg/L	97.4	80.0	120	----
sulfur, dissolved	7704-34-9	E469S	5	mg/L	50 mg/L	89.5	80.0	120	----
tellurium, dissolved	13494-80-9	E469S	0.0005	mg/L	0.1 mg/L	106	80.0	120	----
thallium, dissolved	7440-28-0	E469S	0.00005	mg/L	1 mg/L	105	80.0	120	----
thorium, dissolved	7440-29-1	E469S	0.0005	mg/L	0.1 mg/L	93.4	80.0	120	----
tin, dissolved	7440-31-5	E469S	0.001	mg/L	0.5 mg/L	97.3	80.0	120	----
titanium, dissolved	7440-32-6	E469S	0.005	mg/L	0.25 mg/L	91.8	80.0	120	----
tungsten, dissolved	7440-33-7	E469S	0.001	mg/L	0.1 mg/L	95.1	80.0	120	----
uranium, dissolved	7440-61-1	E469S	0.00005	mg/L	0.005 mg/L	99.8	80.0	120	----
vanadium, dissolved	7440-62-2	E469S	0.0005	mg/L	0.5 mg/L	94.2	80.0	120	----
yttrium, dissolved	7440-65-5	E469S	0.0005	mg/L	0.1 mg/L	93.4	80.0	120	----
zinc, dissolved	7440-66-6	E469S	0.001	mg/L	0.5 mg/L	104	80.0	120	----
zirconium, dissolved	7440-67-7	E469S	0.0005	mg/L	0.1 mg/L	92.6	80.0	120	----
silicon, dissolved	7440-21-3	E469S.NaSi	1	mg/L	10 mg/L	97.8	80.0	120	----
sodium, dissolved	17341-25-2	E469S.NaSi	2.5	mg/L	50 mg/L	93.4	80.0	120	----
mercury, dissolved	7439-97-6	E509S	0.000005	mg/L	0.0001 mg/L	99.1	80.0	120	----
Volatile Organic Compounds (QCLot: 274060)									
benzene	71-43-2	E611A	0.5	µg/L	100 µg/L	94.7	70.0	130	----
ethylbenzene	100-41-4	E611A	0.5	µg/L	100 µg/L	90.2	70.0	130	----
methyl-tert-butyl ether [MTBE]	1634-04-4	E611A	0.5	µg/L	100 µg/L	103	70.0	130	----
styrene	100-42-5	E611A	0.5	µg/L	100 µg/L	101	70.0	130	----
toluene	108-88-3	E611A	0.5	µg/L	100 µg/L	94.1	70.0	130	----
xylene, m+p-	179601-23-1	E611A	0.4	µg/L	200 µg/L	95.4	70.0	130	----
xylene, o-	95-47-6	E611A	0.3	µg/L	100 µg/L	95.8	70.0	130	----
Hydrocarbons (QCLot: 273798)									
F2 (C10-C16)	----	E601	100	µg/L	3538 µg/L	111	70.0	130	----
F3 (C16-C34)	----	E601	250	µg/L	7053 µg/L	104	70.0	130	----

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Hydrocarbons (QCLot: 273798) - continued									
F4 (C34-C50)	----	E601	250	µg/L	5051 µg/L	97.7	70.0	130	----
Hydrocarbons (QCLot: 274061)									
F1 (C6-C10)	----	E581.VH+F1	100	µg/L	6310 µg/L	104	70.0	130	----
VHw (C6-C10)	----	E581.VH+F1	100	µg/L	6310 µg/L	91.5	70.0	130	----
Polycyclic Aromatic Hydrocarbons (QCLot: 284186)									
acenaphthene	83-32-9	E641A	0.01	µg/L	0.5 µg/L	103	60.0	130	----
acenaphthylene	208-96-8	E641A	0.01	µg/L	0.5 µg/L	108	60.0	130	----
acridine	260-94-6	E641A	0.01	µg/L	0.5 µg/L	101	60.0	130	----
anthracene	120-12-7	E641A	0.01	µg/L	0.5 µg/L	121	60.0	130	----
benz(a)anthracene	56-55-3	E641A	0.01	µg/L	0.5 µg/L	122	60.0	130	----
benzo(a)pyrene	50-32-8	E641A	0.005	µg/L	0.5 µg/L	110	60.0	130	----
benzo(b+j)fluoranthene	----	E641A	0.01	µg/L	0.5 µg/L	87.4	60.0	130	----
benzo(g,h,i)perylene	191-24-2	E641A	0.01	µg/L	0.5 µg/L	102	60.0	130	----
benzo(k)fluoranthene	207-08-9	E641A	0.01	µg/L	0.5 µg/L	86.8	60.0	130	----
chrysene	218-01-9	E641A	0.01	µg/L	0.5 µg/L	110	60.0	130	----
dibenz(a,h)anthracene	53-70-3	E641A	0.005	µg/L	0.5 µg/L	114	60.0	130	----
fluoranthene	206-44-0	E641A	0.01	µg/L	0.5 µg/L	109	60.0	130	----
fluorene	86-73-7	E641A	0.01	µg/L	0.5 µg/L	106	60.0	130	----
indeno(1,2,3-c,d)pyrene	193-39-5	E641A	0.01	µg/L	0.5 µg/L	125	60.0	130	----
methylnaphthalene, 1-	90-12-0	E641A	0.01	µg/L	0.5 µg/L	96.7	60.0	130	----
methylnaphthalene, 2-	91-57-6	E641A	0.01	µg/L	0.5 µg/L	95.8	60.0	130	----
naphthalene	91-20-3	E641A	0.05	µg/L	0.5 µg/L	97.6	50.0	130	----
phenanthrene	85-01-8	E641A	0.02	µg/L	0.5 µg/L	113	60.0	130	----
pyrene	129-00-0	E641A	0.01	µg/L	0.5 µg/L	112	60.0	130	----
quinoline	6027-02-7	E641A	0.05	µg/L	0.5 µg/L	102	60.0	130	----

Matrix Spike (MS) Report

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

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Anions and Nutrients (QCLot: 274288)										
VA21B7539-002	MP-06 North	phosphorus, total	7723-14-0	E372S	0.0807 mg/L	0.1 mg/L	80.7	70.0	130	----
Anions and Nutrients (QCLot: 274289)										
VA21B7537-002	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.104 mg/L	0.1 mg/L	104	75.0	125	----
Anions and Nutrients (QCLot: 274291)										
VA21B7539-002	MP-06 North	Kjeldahl nitrogen, total [TKN]	----	E318S	2.95 mg/L	2.5 mg/L	118	70.0	130	----
Anions and Nutrients (QCLot: 274514)										
VA21B7539-002	MP-06 North	bromide	24959-67-9	E235S.Br	ND mg/L	50 mg/L	ND	75.0	125	----
Anions and Nutrients (QCLot: 274515)										
VA21B7539-002	MP-06 North	chloride	16887-00-6	E235S.Cl	ND mg/L	10000 mg/L	ND	75.0	125	----
Anions and Nutrients (QCLot: 274516)										
VA21B7539-002	MP-06 North	fluoride	16984-48-8	E235S.F-L	8.20 mg/L	10 mg/L	82.0	75.0	125	----
Anions and Nutrients (QCLot: 274517)										
VA21B7539-002	MP-06 North	nitrate (as N)	14797-55-8	E235S.NO3-T	7.50 mg/L	7.5 mg/L	100	75.0	125	----
Anions and Nutrients (QCLot: 274518)										
VA21B7539-002	MP-06 North	nitrite (as N)	14797-65-0	E235S.NO2-L	1.43 mg/L	1.5 mg/L	95.1	75.0	125	----
Anions and Nutrients (QCLot: 274519)										
VA21B7539-002	MP-06 North	sulfate (as SO4)	14808-79-8	E235S.SO4-L	ND mg/L	1000 mg/L	ND	75.0	125	----
Organic / Inorganic Carbon (QCLot: 274286)										
VA21B7537-002	Anonymous	carbon, total organic [TOC]	----	E355-L	5.09 mg/L	5 mg/L	102	70.0	130	----
Organic / Inorganic Carbon (QCLot: 276240)										
VA21B7536-002	Anonymous	carbon, dissolved organic [DOC]	----	E358-L	5.29 mg/L	5 mg/L	106	70.0	130	----
Total Metals (QCLot: 274655)										
VA21B7535-007	Anonymous	aluminum, total	7429-90-5	E468S	0.515 mg/L	0.4 mg/L	129	70.0	130	----
		antimony, total	7440-36-0	E468S	0.0374 mg/L	0.04 mg/L	93.4	70.0	130	----
		arsenic, total	7440-38-2	E468S	0.0376 mg/L	0.04 mg/L	93.9	70.0	130	----
		barium, total	7440-39-3	E468S	0.0423 mg/L	0.04 mg/L	106	70.0	130	----
		beryllium, total	7440-41-7	E468S	0.0906 mg/L	0.08 mg/L	113	70.0	130	----
		bismuth, total	7440-69-9	E468S	0.0164 mg/L	0.02 mg/L	82.2	70.0	130	----

Sub-Matrix: **Water**

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
					Concentration	Target	MS	Low	High	Qualifier
Total Metals (QCLot: 274655) - continued										
VA21B7535-007	Anonymous	boron, total	7440-42-8	E468S	ND mg/L	0.2 mg/L	ND	70.0	130	----
		cadmium, total	7440-43-9	E468S	0.00710 mg/L	0.008 mg/L	88.8	70.0	130	----
		calcium, total	7440-70-2	E468S	ND mg/L	8 mg/L	ND	70.0	130	----
		cesium, total	7440-46-2	E468S	0.0196 mg/L	0.02 mg/L	97.8	70.0	130	----
		chromium, total	7440-47-3	E468S	0.0910 mg/L	0.08 mg/L	114	70.0	130	----
		cobalt, total	7440-48-4	E468S	0.0400 mg/L	0.04 mg/L	100	70.0	130	----
		copper, total	7440-50-8	E468S	0.0356 mg/L	0.04 mg/L	89.0	70.0	130	----
		gallium, total	7440-55-3	E468S	0.00587 mg/L	0.005 mg/L	117	70.0	130	----
		iron, total	7439-89-6	E468S	4.25 mg/L	4 mg/L	106	70.0	130	----
		lead, total	7439-92-1	E468S	0.0342 mg/L	0.04 mg/L	85.6	70.0	130	----
		lithium, total	7439-93-2	E468S	0.213 mg/L	0.2 mg/L	107	70.0	130	----
		magnesium, total	7439-95-4	E468S	ND mg/L	2 mg/L	ND	70.0	130	----
		manganese, total	7439-96-5	E468S	0.0451 mg/L	0.04 mg/L	113	70.0	130	----
		molybdenum, total	7439-98-7	E468S	0.0407 mg/L	0.04 mg/L	102	70.0	130	----
		nickel, total	7440-02-0	E468S	0.0736 mg/L	0.08 mg/L	92.0	70.0	130	----
		phosphorus, total	7723-14-0	E468S	25.1 mg/L	20 mg/L	126	70.0	130	----
		potassium, total	7440-09-7	E468S	ND mg/L	8 mg/L	ND	70.0	130	----
		rhenium, total	7440-15-5	E468S	0.00470 mg/L	0.005 mg/L	94.0	70.0	130	----
		rubidium, total	7440-17-7	E468S	ND mg/L	0.04 mg/L	ND	70.0	130	----
		selenium, total	7782-49-2	E468S	0.0814 mg/L	0.08 mg/L	102	70.0	130	----
		silver, total	7440-22-4	E468S	0.00685 mg/L	0.008 mg/L	85.7	70.0	130	----
		strontium, total	7440-24-6	E468S	ND mg/L	0.04 mg/L	ND	70.0	130	----
		sulfur, total	7704-34-9	E468S	ND mg/L	40 mg/L	ND	70.0	130	----
		tellurium, total	13494-80-9	E468S	0.0654 mg/L	0.08 mg/L	81.8	70.0	130	----
		thallium, total	7440-28-0	E468S	0.00654 mg/L	0.008 mg/L	81.8	70.0	130	----
		thorium, total	7440-29-1	E468S	0.0382 mg/L	0.04 mg/L	95.6	70.0	130	----
		tin, total	7440-31-5	E468S	0.0354 mg/L	0.04 mg/L	88.6	70.0	130	----
		titanium, total	7440-32-6	E468S	0.178 mg/L	0.16 mg/L	111	70.0	130	----
		tungsten, total	7440-33-7	E468S	0.0372 mg/L	0.04 mg/L	93.0	70.0	130	----
		uranium, total	7440-61-1	E468S	0.00734 mg/L	0.008 mg/L	91.7	70.0	130	----
		vanadium, total	7440-62-2	E468S	0.238 mg/L	0.2 mg/L	119	70.0	130	----
		yttrium, total	7440-65-5	E468S	0.0110 mg/L	0.01 mg/L	110	70.0	130	----
		zinc, total	7440-66-6	E468S	0.691 mg/L	0.8 mg/L	86.4	70.0	130	----
		zirconium, total	7440-67-7	E468S	0.0872 mg/L	0.08 mg/L	109	70.0	130	----
Total Metals (QCLot: 274656)										
VA21B7535-007	Anonymous	silicon, total	7440-21-3	E468S.NaSi	490 mg/L	500 mg/L	98.0	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: 274656) - continued										
VA21B7535-007	Anonymous	sodium, total	17341-25-2	E468S.NaSi	ND mg/L	100 mg/L	ND	70.0	130	----
Total Metals (QCLot: 274666)										
VA21B7539-009	DUP-C	aluminum, total	7429-90-5	E468S	0.426 mg/L	0.4 mg/L	106	70.0	130	----
		antimony, total	7440-36-0	E468S	0.0388 mg/L	0.04 mg/L	97.0	70.0	130	----
		arsenic, total	7440-38-2	E468S	0.0385 mg/L	0.04 mg/L	96.2	70.0	130	----
		barium, total	7440-39-3	E468S	0.0399 mg/L	0.04 mg/L	99.7	70.0	130	----
		beryllium, total	7440-41-7	E468S	0.0867 mg/L	0.08 mg/L	108	70.0	130	----
		bismuth, total	7440-69-9	E468S	0.0194 mg/L	0.02 mg/L	97.1	70.0	130	----
		boron, total	7440-42-8	E468S	ND mg/L	0.2 mg/L	ND	70.0	130	----
		cadmium, total	7440-43-9	E468S	0.00762 mg/L	0.008 mg/L	95.3	70.0	130	----
		calcium, total	7440-70-2	E468S	ND mg/L	8 mg/L	ND	70.0	130	----
		cesium, total	7440-46-2	E468S	0.0199 mg/L	0.02 mg/L	99.7	70.0	130	----
		chromium, total	7440-47-3	E468S	0.0830 mg/L	0.08 mg/L	104	70.0	130	----
		cobalt, total	7440-48-4	E468S	0.0402 mg/L	0.04 mg/L	101	70.0	130	----
		copper, total	7440-50-8	E468S	0.0378 mg/L	0.04 mg/L	94.6	70.0	130	----
		gallium, total	7440-55-3	E468S	0.00564 mg/L	0.005 mg/L	113	70.0	130	----
		iron, total	7439-89-6	E468S	4.17 mg/L	4 mg/L	104	70.0	130	----
		lead, total	7439-92-1	E468S	0.0372 mg/L	0.04 mg/L	93.0	70.0	130	----
		lithium, total	7439-93-2	E468S	0.214 mg/L	0.2 mg/L	107	70.0	130	----
		magnesium, total	7439-95-4	E468S	ND mg/L	2 mg/L	ND	70.0	130	----
		manganese, total	7439-96-5	E468S	0.0423 mg/L	0.04 mg/L	106	70.0	130	----
		molybdenum, total	7439-98-7	E468S	0.0407 mg/L	0.04 mg/L	102	70.0	130	----
		nickel, total	7440-02-0	E468S	0.0743 mg/L	0.08 mg/L	92.9	70.0	130	----
		phosphorus, total	7723-14-0	E468S	22.4 mg/L	20 mg/L	112	70.0	130	----
		potassium, total	7440-09-7	E468S	ND mg/L	8 mg/L	ND	70.0	130	----
		rhenium, total	7440-15-5	E468S	0.00504 mg/L	0.005 mg/L	101	70.0	130	----
		rubidium, total	7440-17-7	E468S	0.0416 mg/L	0.04 mg/L	104	70.0	130	----
		selenium, total	7782-49-2	E468S	0.0853 mg/L	0.08 mg/L	106	70.0	130	----
		silver, total	7440-22-4	E468S	0.00742 mg/L	0.008 mg/L	92.7	70.0	130	----
		strontium, total	7440-24-6	E468S	ND mg/L	0.04 mg/L	ND	70.0	130	----
		sulfur, total	7704-34-9	E468S	ND mg/L	40 mg/L	ND	70.0	130	----
		tellurium, total	13494-80-9	E468S	0.0703 mg/L	0.08 mg/L	87.9	70.0	130	----
		thallium, total	7440-28-0	E468S	0.00698 mg/L	0.008 mg/L	87.2	70.0	130	----
		thorium, total	7440-29-1	E468S	0.0401 mg/L	0.04 mg/L	100	70.0	130	----
		tin, total	7440-31-5	E468S	0.0369 mg/L	0.04 mg/L	92.3	70.0	130	----
		titanium, total	7440-32-6	E468S	0.0911 mg/L	0.08 mg/L	114	70.0	130	----

Sub-Matrix: **Water**

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Spike Concentration	Spike Target	Recovery (%) MS	Recovery Limits (%) Low	Recovery Limits (%) High	Qualifier
Total Metals (QCLot: 274666) - continued										
VA21B7539-009	DUP-C	tungsten, total	7440-33-7	E468S	0.0412 mg/L	0.04 mg/L	103	70.0	130	----
		uranium, total	7440-61-1	E468S	0.00766 mg/L	0.008 mg/L	95.7	70.0	130	----
		vanadium, total	7440-62-2	E468S	0.216 mg/L	0.2 mg/L	108	70.0	130	----
		yttrium, total	7440-65-5	E468S	0.00602 mg/L	0.005 mg/L	120	70.0	130	----
		zinc, total	7440-66-6	E468S	0.716 mg/L	0.8 mg/L	89.5	70.0	130	----
		zirconium, total	7440-67-7	E468S	0.0849 mg/L	0.08 mg/L	106	70.0	130	----
Total Metals (QCLot: 274667)										
VA21B7539-009	DUP-C	silicon, total	7440-21-3	E468S.NaSi	457 mg/L	500 mg/L	91.4	70.0	130	----
		sodium, total	17341-25-2	E468S.NaSi	ND mg/L	100 mg/L	ND	70.0	130	----
Total Metals (QCLot: 275439)										
VA21B7535-014	Anonymous	mercury, total	7439-97-6	E508S	0.0000960 mg/L	0.0001 mg/L	96.0	70.0	130	----
Dissolved Metals (QCLot: 273997)										
VA21B7539-001	MP-06 Source	aluminum, dissolved	7429-90-5	E469S	0.395 mg/L	0.4 mg/L	98.7	70.0	130	----
		antimony, dissolved	7440-36-0	E469S	0.0370 mg/L	0.04 mg/L	92.5	70.0	130	----
		arsenic, dissolved	7440-38-2	E469S	0.0372 mg/L	0.04 mg/L	93.1	70.0	130	----
		barium, dissolved	7440-39-3	E469S	0.0371 mg/L	0.04 mg/L	92.8	70.0	130	----
		beryllium, dissolved	7440-41-7	E469S	0.0746 mg/L	0.08 mg/L	93.2	70.0	130	----
		bismuth, dissolved	7440-69-9	E469S	0.0174 mg/L	0.02 mg/L	86.9	70.0	130	----
		boron, dissolved	7440-42-8	E469S	ND mg/L	0.2 mg/L	ND	70.0	130	----
		cadmium, dissolved	7440-43-9	E469S	0.00769 mg/L	0.008 mg/L	96.1	70.0	130	----
		calcium, dissolved	7440-70-2	E469S	ND mg/L	8 mg/L	ND	70.0	130	----
		cesium, dissolved	7440-46-2	E469S	0.0192 mg/L	0.02 mg/L	95.8	70.0	130	----
		chromium, dissolved	7440-47-3	E469S	0.0769 mg/L	0.08 mg/L	96.1	70.0	130	----
		cobalt, dissolved	7440-48-4	E469S	0.0386 mg/L	0.04 mg/L	96.4	70.0	130	----
		copper, dissolved	7440-50-8	E469S	0.0377 mg/L	0.04 mg/L	94.3	70.0	130	----
		gallium, dissolved	7440-55-3	E469S	0.00510 mg/L	0.005 mg/L	102	70.0	130	----
		iron, dissolved	7439-89-6	E469S	3.89 mg/L	4 mg/L	97.3	70.0	130	----
		lead, dissolved	7439-92-1	E469S	0.0356 mg/L	0.04 mg/L	89.0	70.0	130	----
		lithium, dissolved	7439-93-2	E469S	0.181 mg/L	0.2 mg/L	90.4	70.0	130	----
		magnesium, dissolved	7439-95-4	E469S	ND mg/L	2 mg/L	ND	70.0	130	----
		manganese, dissolved	7439-96-5	E469S	0.0389 mg/L	0.04 mg/L	97.2	70.0	130	----
		molybdenum, dissolved	7439-98-7	E469S	0.0369 mg/L	0.04 mg/L	92.2	70.0	130	----
		nickel, dissolved	7440-02-0	E469S	0.0744 mg/L	0.08 mg/L	93.0	70.0	130	----
		phosphorus, dissolved	7723-14-0	E469S	21.1 mg/L	20 mg/L	106	70.0	130	----
		potassium, dissolved	7440-09-7	E469S	ND mg/L	8 mg/L	ND	70.0	130	----
		rhenium, dissolved	7440-15-5	E469S	0.00481 mg/L	0.005 mg/L	96.2	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Dissolved Metals (QCLot: 273997) - continued										
VA21B7539-001	MP-06 Source	rubidium, dissolved	7440-17-7	E469S	0.0377 mg/L	0.04 mg/L	94.2	70.0	130	----
		selenium, dissolved	7782-49-2	E469S	0.0782 mg/L	0.08 mg/L	97.7	70.0	130	----
		silver, dissolved	7440-22-4	E469S	0.00723 mg/L	0.008 mg/L	90.4	70.0	130	----
		strontium, dissolved	7440-24-6	E469S	ND mg/L	0.04 mg/L	ND	70.0	130	----
		sulfur, dissolved	7704-34-9	E469S	ND mg/L	40 mg/L	ND	70.0	130	----
		tellurium, dissolved	13494-80-9	E469S	0.0750 mg/L	0.08 mg/L	93.7	70.0	130	----
		thallium, dissolved	7440-28-0	E469S	0.00740 mg/L	0.008 mg/L	92.5	70.0	130	----
		thorium, dissolved	7440-29-1	E469S	0.0392 mg/L	0.04 mg/L	98.0	70.0	130	----
		tin, dissolved	7440-31-5	E469S	0.0381 mg/L	0.04 mg/L	95.2	70.0	130	----
		titanium, dissolved	7440-32-6	E469S	0.0748 mg/L	0.08 mg/L	93.5	70.0	130	----
		tungsten, dissolved	7440-33-7	E469S	0.0364 mg/L	0.04 mg/L	90.9	70.0	130	----
		uranium, dissolved	7440-61-1	E469S	0.00718 mg/L	0.008 mg/L	89.7	70.0	130	----
		vanadium, dissolved	7440-62-2	E469S	0.190 mg/L	0.2 mg/L	95.3	70.0	130	----
		yttrium, dissolved	7440-65-5	E469S	0.00509 mg/L	0.005 mg/L	102	70.0	130	----
		zinc, dissolved	7440-66-6	E469S	0.776 mg/L	0.8 mg/L	97.0	70.0	130	----
		zirconium, dissolved	7440-67-7	E469S	0.0774 mg/L	0.08 mg/L	96.8	70.0	130	----
Dissolved Metals (QCLot: 273998)										
VA21B7539-001	MP-06 Source	silicon, dissolved	7440-21-3	E469S.NaSi	457 mg/L	500 mg/L	91.5	70.0	130	----
		sodium, dissolved	17341-25-2	E469S.NaSi	ND mg/L	100 mg/L	ND	70.0	130	----
Dissolved Metals (QCLot: 275533)										
VA21B7536-002	Anonymous	mercury, dissolved	7439-97-6	E509S	0.0000973 mg/L	0.0001 mg/L	97.3	70.0	130	----
Volatile Organic Compounds (QCLot: 274060)										
VA21B7455-014	Anonymous	benzene	71-43-2	E611A	103 µg/L	100 µg/L	103	60.0	140	----
		ethylbenzene	100-41-4	E611A	100 µg/L	100 µg/L	100	60.0	140	----
		methyl-tert-butyl ether [MTBE]	1634-04-4	E611A	111 µg/L	100 µg/L	111	60.0	140	----
		styrene	100-42-5	E611A	110 µg/L	100 µg/L	110	60.0	140	----
		toluene	108-88-3	E611A	81.6 µg/L	100 µg/L	81.6	60.0	140	----
		xylene, m+p-	179601-23-1	E611A	209 µg/L	200 µg/L	105	60.0	140	----
		xylene, o-	95-47-6	E611A	105 µg/L	100 µg/L	105	60.0	140	----
Hydrocarbons (QCLot: 274061)										
VA21B7539-001	MP-06 Source	F1 (C6-C10)	----	E581.VH+F1	7350 µg/L	6310 µg/L	116	60.0	140	----
		VHw (C6-C10)	----	E581.VH+F1	6740 µg/L	6310 µg/L	107	60.0	140	----

ALS www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

COC Number: 20 - 920780

Page 1 of 1

Report To	Contact and company name below will appear on the final report
Company:	Golder Associates
Contact:	Trish Tomliens / Elaine Irving
Phone:	250-881-7372
Company address below will appear on the final report	
Street:	200-2920 Virtual Way
City/Province:	Vancouver, BC
Postal Code:	V5M 0C4
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	
Contact:	

Project Information

ALS Account # / Quote #: Q84262

Job #: 1663724-44000-03

PO / AFE:

LSD:

ALS Lab Work Order # (ALS use only): 7539

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: Ptomliens@golder.com

Email 2: Elaine_Irving@golder.com

Email 3

Invoice Recipients

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax

Email 2

Oil and Gas Required Fields (client use)

AFE/Cost Center: | PO#

Major/Minor Code: | Routing Code:

Requisitioner:

Location:

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 non-routine tests

AFFIX ALS BARCODE LABEL HERE (ALS use only)

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

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

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	General (pH, alkalinity, TSS, turbidity, conductivity)	Dissolved metals (F/P)	Total Metals (P)	Dissolved mercury (F/P)	Total Mercury (P)	TOC, TKN (P)	BTEX/F1 (P)	F2-F4/PAH (P)	SAMPLES ON HOLD	EXTENDED STORAGE REQUIRED	SUSPECTED HAZARD (see notes)
1	MP-06 Source	16-Aug-21	10:25	Seawater	10	X	X	X	X	X	X	X	X			
2	MP-06 North	16-Aug-21	10:55	Seawater	6	X	X	X	X	X	X					
3	MP-06 ENE	16-Aug-21	11:05	Seawater	10	X	X	X	X	X	X	X	X			
4	MP-06 WNW	16-Aug-21	10:45	Seawater	6	X	X	X	X	X	X					
5	MP-05 Source	16-Aug-21	13:40	Seawater	10	X	X	X	X	X	X	X	X			
6	MP-05 North	16-Aug-21	13:25	Seawater	10	X	X	X	X	X	X	X	X			
7	MP-05 ENE	16-Aug-21	13:50	Seawater	6	X	X	X	X	X	X					
8	MP-05 WNW	16-Aug-21	13:35	Seawater	6	X	X	X	X	X	X					
9	DUP-C	16-Aug-21	13:55	Seawater	6	X	X	X	X	X	X					

Environmental Division
Vancouver
Work Order Reference
VA21B7539

Telephone : +1 604 253 4188

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

...electing from drop-down below

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 3 8

SHIPMENT RELEASE (client use)		...PMENT RECEPTION (ALS use only)		FINAL SHIPMENT RECEPTION (ALS use only)		
Released by:	Date:	Date:	Time:	Received by: JC	Date: 19 Aug	Time: 825 Am

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

Failure to complete all portions of this form may delay analysis. Please fill in this form ... ees 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, pl...

AUG 2020 FRONT

Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **VA21B7949**	Page	: 1 of 14
Client	: **Golder Associates Ltd.**	Laboratory	: Vancouver - Environmental
Contact	: Elaine Irving	Account Manager	: Amber Springer
Address	: 200-2920 Virtual Way Vancouver BC Canada V5M 0C4	Address	: 8081 Lougheed Highway Burnaby BC Canada V5A 1W9
Telephone	: ----	Telephone	: +1 604 253 4188
Project	: 1663724-44000-03	Date Samples Received	: 24-Aug-2021 08:20
PO	: ----	Date Analysis Commenced	: 25-Aug-2021
C-O-C number	: 20-920786	Issue Date	: 03-Sep-2021 09:55
Sampler	: ----		
Site	: ----		
Quote number	: Q84262		
No. of samples received	: 9		
No. of samples analysed	: 9		

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

Signatories	*Position*	*Laboratory Department*
Angelo Salandanan	Lab Assistant	Metals, Burnaby, British Columbia
Caleb Deroche	Lab Analyst	Metals, Burnaby, British Columbia
Dee Lee	Analyst	Metals, Burnaby, British Columbia
Janice Leung	Supervisor - Organics Instrumentation	Organics, Burnaby, British Columbia
Kevin Duarte	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics, Burnaby, British Columbia
Miles Gropen	Department Manager - Inorganics	Inorganics, Burnaby, British Columbia
Ophelia Chiu	Department Manager - Organics	Organics, Burnaby, British Columbia
Paul Cushing	Team Leader - Organics	Organics, Burnaby, British Columbia
Sristika Chand	Lab Analyst	Metals, 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 Unit
µg/L	micrograms per litre
µS/cm	Microsiemens per centimetre
mg/L	milligrams per litre
NTU	nephelometric turbidity units
pH units	pH units
psu	practical salinity 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*
DLM	*Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).*
DTC	*Dissolved concentration exceeds total. Results were confirmed by re-analysis.*
RRV	*Reported result verified by repeat analysis.*

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	MP-06 Source	MP-06 North	MP-06 ENE	MP-06 WNW	MP-05 Source
				Client sampling date / time	19-Aug-2021 10:31	19-Aug-2021 10:58	19-Aug-2021 10:46	19-Aug-2021 11:08	19-Aug-2021 09:17
					VA21B7949-001	VA21B7949-002	VA21B7949-003	VA21B7949-004	VA21B7949-005
					Result	Result	Result	Result	Result
Physical Tests									
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	89.1	110	106	100	91.0
conductivity	----	E100S	2.0	µS/cm	3260	47100	44600	43400	9470
hardness (as CaCO3), dissolved	----	EC100	0.50	mg/L	366	6780	5640	5580	996
pH	----	E108	0.10	pH units	8.06	7.95	7.95	7.95	8.02
salinity	----	EC100S	1.0	psu	1.7	30.0	28.2	27.4	5.2
solids, total dissolved [TDS]	----	E162S	10	mg/L	1970	35900	32200	32900	5690
solids, total suspended [TSS]	----	E160S	2.0	mg/L	<2.0	2.2	<2.0	<2.0	<2.0
turbidity	----	E121	0.10	NTU	0.60	0.18	0.15	0.15	0.70
Anions and Nutrients									
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
bromide	24959-67-9	E235S.Br	5.0	mg/L	<5.0	46.3	43.4	43.6	7.9
chloride	16887-00-6	E235S.Cl	50	mg/L	932	14400	13800	13900	2920
fluoride	16984-48-8	E235S.F-L	0.20	mg/L	<0.20	0.78	0.78	0.79	<0.20
Kjeldahl nitrogen, total [TKN]	----	E318S	0.050	mg/L	0.112	0.109	0.097	0.096	0.115
nitrate (as N)	14797-55-8	E235S.NO3-T	0.010	mg/L	0.011	0.026	<0.010	<0.010	0.012
nitrite (as N)	14797-65-0	E235S.NO2-L	0.010	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010
phosphorus, total	7723-14-0	E372S	0.0020	mg/L	0.0130	0.0222	0.0182	0.0186	0.0097
sulfate (as SO4)	14808-79-8	E235S.SO4-L	3.0	mg/L	132	2240	2110	2070	395
Organic / Inorganic Carbon									
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	1.29	1.16	1.27	1.01	1.63
carbon, total organic [TOC]	----	E355-L	0.50	mg/L	1.03	1.12	0.99	0.99	1.54
Total Metals									
aluminum, total	7429-90-5	E468S	0.0050	mg/L	0.0176	0.0056	0.0078	0.0134	0.0166
antimony, total	7440-36-0	E468S	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
arsenic, total	7440-38-2	E468S	0.00040	mg/L	<0.00040	0.00144	0.00138	0.00134	<0.00040
barium, total	7440-39-3	E468S	0.0010	mg/L	0.0042	0.0073	0.0079	0.0081	0.0049
beryllium, total	7440-41-7	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
bismuth, total	7440-69-9	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
boron, total	7440-42-8	E468S	0.30	mg/L	<0.30	4.14	3.86	3.83	0.86
cadmium, total	7440-43-9	E468S	0.000010	mg/L	<0.000010	0.000044	0.000037	0.000045	<0.000010

Analytical Results

Sub-Matrix: Seawater
(Matrix: Water)

				Client sample ID	MP-06 Source	MP-06 North	MP-06 ENE	MP-06 WNW	MP-05 Source
				Client sampling date / time	19-Aug-2021 10:31	19-Aug-2021 10:58	19-Aug-2021 10:46	19-Aug-2021 11:08	19-Aug-2021 09:17
Analyte	CAS Number	Method	LOR	Unit	VA21B7949-001	VA21B7949-002	VA21B7949-003	VA21B7949-004	VA21B7949-005
					Result	Result	Result	Result	Result
Total Metals									
calcium, total	7440-70-2	E468S	1.0	mg/L	42.1	416	394	394	89.1
cesium, total	7440-46-2	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
chromium, total	7440-47-3	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
cobalt, total	7440-48-4	E468S	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
copper, total	7440-50-8	E468S	0.00050	mg/L	0.00214	<0.00050	<0.00050	<0.00050	<0.00050
gallium, total	7440-55-3	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
iron, total	7439-89-6	E468S	0.010	mg/L	0.012	<0.010	<0.010	0.014	0.015
lead, total	7439-92-1	E468S	0.000050	mg/L	0.000053	<0.000050	0.000057	0.000480	<0.000050
lithium, total	7439-93-2	E468S	0.020	mg/L	<0.020	0.184	0.175	0.167	0.034
magnesium, total	7439-95-4	E468S	1.0	mg/L	60.8	1220	1140	1110	198
manganese, total	7439-96-5	E468S	0.00020	mg/L	0.00082	0.00058	0.00078	0.00137	0.00105
mercury, total	7439-97-6	E508S	0.0000050	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, total	7439-98-7	E468S	0.00010	mg/L	0.00061	0.00993	0.00937	0.00918	0.00187
nickel, total	7440-02-0	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
phosphorus, total	7723-14-0	E468S	0.050	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050
potassium, total	7440-09-7	E468S	1.0	mg/L	18.7	454	437	430	68.5
rhenium, total	7440-15-5	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
rubidium, total	7440-17-7	E468S	0.0050	mg/L	0.0062	0.116	0.110	0.106	0.0199
selenium, total	7782-49-2	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
silicon, total	7440-21-3	E468S.NaSi	1.0	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0
silver, total	7440-22-4	E468S	0.00010	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
sodium, total	17341-25-2	E468S.NaSi	2.5	mg/L	489	9050	8470	8260	1680
strontium, total	7440-24-6	E468S	0.010	mg/L	0.332	6.76	6.30	6.22	1.18
sulfur, total	7704-34-9	E468S	5.0	mg/L	45.7	1200	1150	1140	176
tellurium, total	13494-80-9	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
thallium, total	7440-28-0	E468S	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
thorium, total	7440-29-1	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
tin, total	7440-31-5	E468S	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
titanium, total	7440-32-6	E468S	0.0050	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
tungsten, total	7440-33-7	E468S	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
uranium, total	7440-61-1	E468S	0.000050	mg/L	0.00140	0.00259	0.00237	0.00232	0.00184

Analytical Results

Sub-Matrix: **Seawater**

(Matrix: **Water**)

				Client sample ID	MP-06 Source	MP-06 North	MP-06 ENE	MP-06 WNW	MP-05 Source
				Client sampling date / time	19-Aug-2021 10:31	19-Aug-2021 10:58	19-Aug-2021 10:46	19-Aug-2021 11:08	19-Aug-2021 09:17
Analyte	CAS Number	Method	LOR	Unit	VA21B7949-001	VA21B7949-002	VA21B7949-003	VA21B7949-004	VA21B7949-005
					Result	Result	Result	Result	Result
Total Metals									
vanadium, total	7440-62-2	E468S	0.00050	mg/L	<0.00050	0.00153	0.00146	0.00136	<0.00050
yttrium, total	7440-65-5	E468S	0.00050	mg/L	<0.00050	<0.00100 DLM	<0.00050	<0.00050	<0.00050
zinc, total	7440-66-6	E468S	0.0030	mg/L	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
zirconium, total	7440-67-7	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Dissolved Metals									
aluminum, dissolved	7429-90-5	E469S	0.0050	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
antimony, dissolved	7440-36-0	E469S	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
arsenic, dissolved	7440-38-2	E469S	0.00040	mg/L	<0.00040	0.00140	0.00137	0.00122	<0.00040
barium, dissolved	7440-39-3	E469S	0.0010	mg/L	0.0040	0.0075	0.0074	0.0076	0.0048
beryllium, dissolved	7440-41-7	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
bismuth, dissolved	7440-69-9	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
boron, dissolved	7440-42-8	E469S	0.30	mg/L	<0.30	3.91	3.34	3.34	0.67
cadmium, dissolved	7440-43-9	E469S	0.000010	mg/L	<0.000010	0.000038	0.000033	0.000038	<0.000010
calcium, dissolved	7440-70-2	E469S	1.0	mg/L	40.1	408	362	354	78.9
cesium, dissolved	7440-46-2	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
chromium, dissolved	7440-47-3	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
cobalt, dissolved	7440-48-4	E469S	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
copper, dissolved	7440-50-8	E469S	0.00020	mg/L	0.00059	0.00037	0.00130 DTC	0.00023	0.00083 DTC
gallium, dissolved	7440-55-3	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
iron, dissolved	7439-89-6	E469S	0.010	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010
lead, dissolved	7439-92-1	E469S	0.000050	mg/L	<0.000050	<0.000050	0.000105	<0.000050	<0.000050
lithium, dissolved	7439-93-2	E469S	0.020	mg/L	<0.020	0.190	0.161	0.159	0.028
magnesium, dissolved	7439-95-4	E469S	1.0	mg/L	64.7	1400	1150	1140	194
manganese, dissolved	7439-96-5	E469S	0.00010	mg/L	0.00045	0.00052	0.00059	0.00069	0.00070
mercury, dissolved	7439-97-6	E509S	0.0000050	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, dissolved	7439-98-7	E469S	0.00010	mg/L	0.00061	0.0103	0.00916	0.00907	0.00177
nickel, dissolved	7440-02-0	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
phosphorus, dissolved	7723-14-0	E469S	0.050	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050
potassium, dissolved	7440-09-7	E469S	1.0	mg/L	18.8	459	383	383	61.2
rhenium, dissolved	7440-15-5	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
rubidium, dissolved	7440-17-7	E469S	0.0050	mg/L	0.0060	0.111	0.103	0.102	0.0184

Analytical Results

Sub-Matrix: **Seawater**

(Matrix: **Water**)

				Client sample ID	MP-06 Source	MP-06 North	MP-06 ENE	MP-06 WNW	MP-05 Source
				Client sampling date / time	19-Aug-2021 10:31	19-Aug-2021 10:58	19-Aug-2021 10:46	19-Aug-2021 11:08	19-Aug-2021 09:17
Analyte	CAS Number	Method	LOR	Unit	VA21B7949-001	VA21B7949-002	VA21B7949-003	VA21B7949-004	VA21B7949-005
					Result	Result	Result	Result	Result
Dissolved Metals									
selenium, dissolved	7782-49-2	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
silicon, dissolved	7440-21-3	E469S.NaSi	1.0	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0
silver, dissolved	7440-22-4	E469S	0.00010	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
sodium, dissolved	17341-25-2	E469S.NaSi	2.5	mg/L	524	9960	9330	9190	1730
strontium, dissolved	7440-24-6	E469S	0.010	mg/L	0.355	7.08	6.42	6.27	1.12
sulfur, dissolved	7704-34-9	E469S	5.0	mg/L	43.7	1170	943	948	145
tellurium, dissolved	13494-80-9	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
thallium, dissolved	7440-28-0	E469S	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
thorium, dissolved	7440-29-1	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
tin, dissolved	7440-31-5	E469S	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
titanium, dissolved	7440-32-6	E469S	0.0050	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
tungsten, dissolved	7440-33-7	E469S	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
uranium, dissolved	7440-61-1	E469S	0.000050	mg/L	0.00146	0.00250	0.00247	0.00234	0.00199
vanadium, dissolved	7440-62-2	E469S	0.00050	mg/L	<0.00050	0.00146	0.00131	0.00129	<0.00050
yttrium, dissolved	7440-65-5	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
zinc, dissolved	7440-66-6	E469S	0.0010	mg/L	0.0011	<0.0010	0.0012	<0.0010	<0.0010
zirconium, dissolved	7440-67-7	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
dissolved mercury filtration location	----	EP509	-	-	Field	Field	Field	Field	Field
dissolved metals filtration location	----	EP421	-	-	Field	Field	Field	Field	Field
Volatile Organic Compounds [Fuels]									
benzene	71-43-2	E611A	0.50	µg/L	<0.50	----	<0.50	----	<0.50
ethylbenzene	100-41-4	E611A	0.50	µg/L	<0.50	----	<0.50	----	<0.50
methyl-tert-butyl ether [MTBE]	1634-04-4	E611A	0.50	µg/L	<0.50	----	<0.50	----	<0.50
styrene	100-42-5	E611A	0.50	µg/L	<0.50	----	<0.50	----	<0.50
toluene	108-88-3	E611A	0.50	µg/L	<0.50	----	<0.50	----	<0.50
xylene, m+p-	179601-23-1	E611A	0.40	µg/L	<0.40	----	<0.40	----	<0.40
xylene, o-	95-47-6	E611A	0.30	µg/L	<0.30	----	<0.30	----	<0.30
xylenes, total	1330-20-7	E611A	0.50	µg/L	<0.50	----	<0.50	----	<0.50
Volatile Organic Compounds Surrogates									
bromofluorobenzene, 4-	460-00-4	E611A	1.0	%	111	----	109	----	109
difluorobenzene, 1,4-	540-36-3	E611A	1.0	%	107	----	106	----	108

Analytical Results

Sub-Matrix: **Seawater**

(Matrix: **Water)**

				Client sample ID	MP-06 Source	MP-06 North	MP-06 ENE	MP-06 WNW	MP-05 Source
				Client sampling date / time	19-Aug-2021 10:31	19-Aug-2021 10:58	19-Aug-2021 10:46	19-Aug-2021 11:08	19-Aug-2021 09:17
Analyte	CAS Number	Method	LOR	Unit	VA21B7949-001	VA21B7949-002	VA21B7949-003	VA21B7949-004	VA21B7949-005
					Result	Result	Result	Result	Result
Hydrocarbons									
F2 (C10-C16)	----	E601	100	µg/L	<100	----	<100	----	<100
F3 (C16-C34)	----	E601	250	µg/L	<250	----	<250	----	<250
F4 (C34-C50)	----	E601	250	µg/L	<250	----	<250	----	<250
TEH (C10-C50)	----	E601	400	µg/L	<400	----	<400	----	<400
TEH (C16-C50)	----	E601	400	µg/L	<400	----	<400	----	<400
VHw (C6-C10)	----	E581.VH+F1	100	µg/L	<100	----	<100	----	<100
F1-BTEX	----	EC580	100	µg/L	<100	----	<100	----	<100
VPHw	----	EC580A	100	µg/L	<100	----	<100	----	<100
F1 (C6-C10)	----	E581.VH+F1	100	µg/L	<100	----	<100	----	<100
Hydrocarbons Surrogates									
bromobenzotrifluoride, 2- (F2-F4 surr)	392-83-6	E601	1.0	%	82.8	----	78.5	----	78.2
dichlorotoluene, 3,4-	97-75-0	E581.VH+F1	1.0	%	98.0	----	99.2	----	103
Polycyclic Aromatic Hydrocarbons									
acenaphthene	83-32-9	E641A	0.010	µg/L	<0.010	----	<0.010	----	<0.010
acenaphthylene	208-96-8	E641A	0.010	µg/L	<0.010	----	<0.010	----	<0.010
acridine	260-94-6	E641A	0.010	µg/L	<0.010	----	<0.010	----	<0.010
anthracene	120-12-7	E641A	0.010	µg/L	<0.010	----	<0.010	----	<0.010
benz(a)anthracene	56-55-3	E641A	0.010	µg/L	<0.010	----	<0.010	----	<0.010
benzo(a)pyrene	50-32-8	E641A	0.0050	µg/L	<0.0050	----	<0.0050	----	<0.0050
benzo(b+j)fluoranthene	----	E641A	0.010	µg/L	<0.010	----	<0.010	----	<0.010
benzo(b+j+k)fluoranthene	----	E641A	0.015	µg/L	<0.015	----	<0.015	----	<0.015
benzo(g,h,i)perylene	191-24-2	E641A	0.010	µg/L	<0.010	----	<0.010	----	<0.010
benzo(k)fluoranthene	207-08-9	E641A	0.010	µg/L	<0.010	----	<0.010	----	<0.010
chrysene	218-01-9	E641A	0.010	µg/L	<0.010	----	<0.010	----	<0.010
dibenz(a,h)anthracene	53-70-3	E641A	0.0050	µg/L	<0.0050	----	<0.0050	----	<0.0050
fluoranthene	206-44-0	E641A	0.010	µg/L	<0.010	----	<0.010	----	<0.010
fluorene	86-73-7	E641A	0.010	µg/L	<0.010	----	<0.010	----	<0.010
indeno(1,2,3-c,d)pyrene	193-39-5	E641A	0.010	µg/L	<0.010	----	<0.010	----	<0.010
methylnaphthalene, 1-	90-12-0	E641A	0.010	µg/L	<0.010	----	<0.010	----	<0.010
methylnaphthalene, 1+2-	----	E641A	0.015	µg/L	<0.015	----	<0.015	----	<0.015
methylnaphthalene, 2-	91-57-6	E641A	0.010	µg/L	<0.010	----	<0.010	----	<0.010

Analytical Results

Sub-Matrix: **Seawater**

(Matrix: **Water)**

				Client sample ID	MP-06 Source	MP-06 North	MP-06 ENE	MP-06 WNW	MP-05 Source
				Client sampling date / time	19-Aug-2021 10:31	19-Aug-2021 10:58	19-Aug-2021 10:46	19-Aug-2021 11:08	19-Aug-2021 09:17
Analyte	*CAS Number*	*Method*	*LOR*	*Unit*	**VA21B7949-001**	**VA21B7949-002**	**VA21B7949-003**	**VA21B7949-004**	**VA21B7949-005**
					Result	Result	Result	Result	Result
Polycyclic Aromatic Hydrocarbons									
naphthalene	91-20-3	E641A	0.050	µg/L	<0.050	----	<0.050	----	<0.050
phenanthrene	85-01-8	E641A	0.020	µg/L	<0.020	----	<0.020	----	<0.020
pyrene	129-00-0	E641A	0.010	µg/L	<0.010	----	<0.010	----	<0.010
quinoline	6027-02-7	E641A	0.050	µg/L	<0.050	----	<0.050	----	<0.050
B(a)P total potency equivalents [B(a)P TPE]	----	E641A	0.010	µg/L	<0.010	----	<0.010	----	<0.010
PAHs, high molecular weight (BC AWQ)	----	E641A	0.030	µg/L	<0.030	----	<0.030	----	<0.030
PAHs, low molecular weight (BC AWQ)	----	E641A	0.060	µg/L	<0.060	----	<0.060	----	<0.060
PAHs, total (EPA 16)	----	E641A	0.065	µg/L	<0.065	----	<0.065	----	<0.065
Polycyclic Aromatic Hydrocarbons Surrogates									
chrysene-d12	1719-03-5	E641A	0.1	%	83.5	----	79.2	----	80.0
naphthalene-d8	1146-65-2	E641A	0.1	%	98.9	----	98.2	----	97.5
phenanthrene-d10	1517-22-2	E641A	0.1	%	111	----	109	----	110

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

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	MP-05 North	MP-05 ENE	MP-05 WNW	MP-05-Source-FBLANK3	----
Client sampling date / time					19-Aug-2021 09:54	19-Aug-2021 09:37	19-Aug-2021 10:15	19-Aug-2021 09:25	----
					VA21B7949-006	VA21B7949-007	VA21B7949-008	VA21B7949-009	--------
					Result	Result	Result	Result	----
Physical Tests									
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	90.8	92.4	91.9	<1.0	----
conductivity	----	E100S	2.0	µS/cm	11900	9730	11200	<2.0	----
hardness (as CaCO3), dissolved	----	EC100	0.50	mg/L	1270	1020	1220	<1.00	----
pH	----	E108	0.10	pH units	7.99	8.02	7.99	5.10	----
salinity	----	EC100S	1.0	psu	6.7	5.4	6.2	<1.0	----
solids, total dissolved [TDS]	----	E162S	10	mg/L	8050	6390	7070	<10	----
solids, total suspended [TSS]	----	E160S	2.0	mg/L	<2.0	<2.0	<2.0	<2.0	----
turbidity	----	E121	0.10	NTU	0.54	0.60	0.46	<0.10	----
Anions and Nutrients									
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	----
bromide	24959-67-9	E235S.Br	5.0	mg/L	12.8	10.2	10.4	<5.0	----
chloride	16887-00-6	E235S.Cl	50	mg/L	3950	3300	3590	<50	----
fluoride	16984-48-8	E235S.F-L	0.20	mg/L	0.21	<0.20	<0.20	<0.20	----
Kjeldahl nitrogen, total [TKN]	----	E318S	0.050	mg/L	0.088	0.100	0.088	<0.050	----
nitrate (as N)	14797-55-8	E235S.NO3-T	0.010	mg/L	<0.010	0.043	<0.010	<0.010	----
nitrite (as N)	14797-65-0	E235S.NO2-L	0.010	mg/L	<0.010	<0.010	<0.010	<0.010	----
phosphorus, total	7723-14-0	E372S	0.0020	mg/L	0.0076	0.0120	0.0072	<0.0040	----
sulfate (as SO4)	14808-79-8	E235S.SO4-L	3.0	mg/L	509	398	482	<3.0	----
Organic / Inorganic Carbon									
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	1.47	1.53	1.34	<0.50	----
carbon, total organic [TOC]	----	E355-L	0.50	mg/L	1.40	1.39	1.37	<0.50	----
Total Metals									
aluminum, total	7429-90-5	E468S	0.0050	mg/L	0.0219	0.0165	0.0182	<0.0050	----
antimony, total	7440-36-0	E468S	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	----
arsenic, total	7440-38-2	E468S	0.00040	mg/L	<0.00040	<0.00040	<0.00040	<0.00040	----
barium, total	7440-39-3	E468S	0.0010	mg/L	0.0052	0.0050	0.0050	<0.0010	----
beryllium, total	7440-41-7	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
bismuth, total	7440-69-9	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
boron, total	7440-42-8	E468S	0.30	mg/L	1.02	0.78	0.91	<0.30	----
cadmium, total	7440-43-9	E468S	0.000010	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	----
calcium, total	7440-70-2	E468S	1.0	mg/L	107	87.5	98.9	<1.0	----

Analytical Results

Sub-Matrix: **Seawater**

(Matrix: **Water**)

				Client sample ID	MP-05 North	MP-05 ENE	MP-05 WNW	MP-05-Source-FBLANK3	----
				Client sampling date / time	19-Aug-2021 09:54	19-Aug-2021 09:37	19-Aug-2021 10:15	19-Aug-2021 09:25	----
Analyte	CAS Number	Method	LOR	Unit	VA21B7949-006	VA21B7949-007	VA21B7949-008	VA21B7949-009	--------
					Result	Result	Result	Result	----
Total Metals									
cesium, total	7440-46-2	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
chromium, total	7440-47-3	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
cobalt, total	7440-48-4	E468S	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	----
copper, total	7440-50-8	E468S	0.00050	mg/L	0.00191	0.00185	<0.00050	<0.00050	----
gallium, total	7440-55-3	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
iron, total	7439-89-6	E468S	0.010	mg/L	0.018	0.015	0.016	<0.010	----
lead, total	7439-92-1	E468S	0.000050	mg/L	0.000056	0.000179	<0.000050	<0.000050	----
lithium, total	7439-93-2	E468S	0.020	mg/L	0.041	0.031	0.037	<0.020	----
magnesium, total	7439-95-4	E468S	1.0	mg/L	247	184	225	<1.0	----
manganese, total	7439-96-5	E468S	0.00020	mg/L	0.00120	0.00106	0.00101	<0.00020	----
mercury, total	7439-97-6	E508S	0.0000050	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	----
molybdenum, total	7439-98-7	E468S	0.00010	mg/L	0.00224	0.00176	0.00216	<0.00010	----
nickel, total	7440-02-0	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
phosphorus, total	7723-14-0	E468S	0.050	mg/L	<0.050	<0.050	<0.050	<0.050	----
potassium, total	7440-09-7	E468S	1.0	mg/L	86.7	63.3	81.0	<1.0	----
rhenium, total	7440-15-5	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
rubidium, total	7440-17-7	E468S	0.0050	mg/L	0.0244	0.0182	0.0229	<0.0050	----
selenium, total	7782-49-2	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
silicon, total	7440-21-3	E468S.NaSi	1.0	mg/L	<1.0	<1.0	<1.0	<1.0	----
silver, total	7440-22-4	E468S	0.00010	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	----
sodium, total	17341-25-2	E468S.NaSi	2.5	mg/L	2040	1540	1960	<2.5	----
strontium, total	7440-24-6	E468S	0.010	mg/L	1.46	1.12	1.38	<0.010	----
sulfur, total	7704-34-9	E468S	5.0	mg/L	224	167	206	<5.0	----
tellurium, total	13494-80-9	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
thallium, total	7440-28-0	E468S	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	----
thorium, total	7440-29-1	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
tin, total	7440-31-5	E468S	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	----
titanium, total	7440-32-6	E468S	0.0050	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	----
tungsten, total	7440-33-7	E468S	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	----
uranium, total	7440-61-1	E468S	0.000050	mg/L	0.00192	0.00189	0.00180	<0.000050	----
vanadium, total	7440-62-2	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----

Analytical Results

Sub-Matrix: Seawater
(Matrix: Water)

Analyte	CAS Number	Method	LOR	Unit	MP-05 North	MP-05 ENE	MP-05 WNW	MP-05-Source-FBLANK3	----
				Client sampling date / time	19-Aug-2021 09:54	19-Aug-2021 09:37	19-Aug-2021 10:15	19-Aug-2021 09:25	----
					VA21B7949-006	VA21B7949-007	VA21B7949-008	VA21B7949-009	--------
					Result	Result	Result	Result	----
Total Metals									
yttrium, total	7440-65-5	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
zinc, total	7440-66-6	E468S	0.0030	mg/L	<0.0030	<0.0030	<0.0030	<0.0030	----
zirconium, total	7440-67-7	E468S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
Dissolved Metals									
aluminum, dissolved	7429-90-5	E469S	0.0050	mg/L	<0.0050	0.0061	<0.0050	<0.0050	----
antimony, dissolved	7440-36-0	E469S	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	----
arsenic, dissolved	7440-38-2	E469S	0.00040	mg/L	<0.00040	<0.00040	<0.00040	<0.00040	----
barium, dissolved	7440-39-3	E469S	0.0010	mg/L	0.0051	0.0048	0.0049	<0.0010	----
beryllium, dissolved	7440-41-7	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
bismuth, dissolved	7440-69-9	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
boron, dissolved	7440-42-8	E469S	0.30	mg/L	0.83	0.64	0.78	<0.30	----
cadmium, dissolved	7440-43-9	E469S	0.000010	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	----
calcium, dissolved	7440-70-2	E469S	1.0	mg/L	91.9	78.2	88.6	<1.0	----
cesium, dissolved	7440-46-2	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
chromium, dissolved	7440-47-3	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
cobalt, dissolved	7440-48-4	E469S	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	----
copper, dissolved	7440-50-8	E469S	0.00020	mg/L	0.00061	0.00081	0.00068	<0.00020	----
gallium, dissolved	7440-55-3	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
iron, dissolved	7439-89-6	E469S	0.010	mg/L	<0.010	<0.010	<0.010	<0.010	----
lead, dissolved	7439-92-1	E469S	0.000050	mg/L	<0.000050	0.000094	0.000069	<0.000050	----
lithium, dissolved	7439-93-2	E469S	0.020	mg/L	0.035	0.027	0.033	<0.020	----
magnesium, dissolved	7439-95-4	E469S	1.0	mg/L	253	200	242	<1.0	----
manganese, dissolved	7439-96-5	E469S	0.00010	mg/L	0.00064	0.00070	0.00056	<0.00010	----
mercury, dissolved	7439-97-6	E509S	0.0000050	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	----
molybdenum, dissolved	7439-98-7	E469S	0.00010	mg/L	0.00228	0.00173	0.00209	<0.00010	----
nickel, dissolved	7440-02-0	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
phosphorus, dissolved	7723-14-0	E469S	0.050	mg/L	<0.050	<0.050	<0.050	<0.050	----
potassium, dissolved	7440-09-7	E469S	1.0	mg/L	78.4	60.2	73.5	<1.0	----
rhenium, dissolved	7440-15-5	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
rubidium, dissolved	7440-17-7	E469S	0.0050	mg/L	0.0234	0.0183	0.0214	<0.0050	----
selenium, dissolved	7782-49-2	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----

Analytical Results

Sub-Matrix: Seawater

(Matrix: Water)

Analyte	CAS Number	Method	LOR	Unit	MP-05 North	MP-05 ENE	MP-05 WNW	MP-05-Source-FBLANK3	----
Client sampling date / time					19-Aug-2021 09:54	19-Aug-2021 09:37	19-Aug-2021 10:15	19-Aug-2021 09:25	----
					VA21B7949-006	VA21B7949-007	VA21B7949-008	VA21B7949-009	--------
					Result	Result	Result	Result	----
Dissolved Metals									
silicon, dissolved	7440-21-3	E469S.NaSi	1.0	mg/L	<1.0	<1.0	<1.0	<1.0	----
silver, dissolved	7440-22-4	E469S	0.00010	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	----
sodium, dissolved	17341-25-2	E469S.NaSi	2.5	mg/L	2180	1730	2080	<2.5	----
strontium, dissolved	7440-24-6	E469S	0.010	mg/L	1.44	1.11	1.37	<0.010	----
sulfur, dissolved	7704-34-9	E469S	5.0	mg/L	194	144	187	<5.0	----
tellurium, dissolved	13494-80-9	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
thallium, dissolved	7440-28-0	E469S	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	----
thorium, dissolved	7440-29-1	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
tin, dissolved	7440-31-5	E469S	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	----
titanium, dissolved	7440-32-6	E469S	0.0050	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	----
tungsten, dissolved	7440-33-7	E469S	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	----
uranium, dissolved	7440-61-1	E469S	0.000050	mg/L	0.00195	0.00194	0.00184	<0.000050	----
vanadium, dissolved	7440-62-2	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
yttrium, dissolved	7440-65-5	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
zinc, dissolved	7440-66-6	E469S	0.0010	mg/L	0.0011	<0.0010	0.0011	<0.0010	----
zirconium, dissolved	7440-67-7	E469S	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
dissolved mercury filtration location	----	EP509	-	-	Field	Field	Field	Field	----
dissolved metals filtration location	----	EP421	-	-	Field	Field	Field	Field	----
Volatile Organic Compounds [Fuels]									
benzene	71-43-2	E611A	0.50	µg/L	<0.50	----	----	<0.50	----
ethylbenzene	100-41-4	E611A	0.50	µg/L	<0.50	----	----	<0.50	----
methyl-tert-butyl ether [MTBE]	1634-04-4	E611A	0.50	µg/L	<0.50	----	----	<0.50	----
styrene	100-42-5	E611A	0.50	µg/L	<0.50	----	----	<0.50	----
toluene	108-88-3	E611A	0.50	µg/L	<0.50	----	----	<0.50	----
xylene, m+p-	179601-23-1	E611A	0.40	µg/L	<0.40	----	----	<0.40	----
xylene, o-	95-47-6	E611A	0.30	µg/L	<0.30	----	----	<0.30	----
xylenes, total	1330-20-7	E611A	0.50	µg/L	<0.50	----	----	<0.50	----
Volatile Organic Compounds Surrogates									
bromofluorobenzene, 4-	460-00-4	E611A	1.0	%	84.8	----	----	86.8	----
difluorobenzene, 1,4-	540-36-3	E611A	1.0	%	98.2	----	----	99.5	----
Hydrocarbons									

Analytical Results

Sub-Matrix: **Seawater**

(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	MP-05 North	MP-05 ENE	MP-05 WNW	MP-05-Source-FBLANK3	----
				Client sampling date / time	19-Aug-2021 09:54	19-Aug-2021 09:37	19-Aug-2021 10:15	19-Aug-2021 09:25	----
					VA21B7949-006	VA21B7949-007	VA21B7949-008	VA21B7949-009	--------
					Result	Result	Result	Result	----
Hydrocarbons									
F2 (C10-C16)	----	E601	100	µg/L	<100	----	----	<100	----
F3 (C16-C34)	----	E601	250	µg/L	<250	----	----	<250	----
F4 (C34-C50)	----	E601	250	µg/L	<250	----	----	<250	----
TEH (C10-C50)	----	E601	400	µg/L	<400	----	----	<400	----
TEH (C16-C50)	----	E601	400	µg/L	<400	----	----	<400	----
VHw (C6-C10)	----	E581.VH+F1	100	µg/L	<100	----	----	<100	----
F1-BTEX	----	EC580	100	µg/L	<100	----	----	<100	----
VPHw	----	EC580A	100	µg/L	<100	----	----	<100	----
F1 (C6-C10)	----	E581.VH+F1	100	µg/L	<100	----	----	<100	----
Hydrocarbons Surrogates									
bromobenzotrifluoride, 2- (F2-F4 surr)	392-83-6	E601	1.0	%	80.4	----	----	73.3	----
dichlorotoluene, 3,4-	97-75-0	E581.VH+F1	1.0	%	87.3	----	----	100	----
Polycyclic Aromatic Hydrocarbons									
acenaphthene	83-32-9	E641A	0.010	µg/L	<0.010	----	----	<0.010	----
acenaphthylene	208-96-8	E641A	0.010	µg/L	<0.010	----	----	<0.010	----
acridine	260-94-6	E641A	0.010	µg/L	<0.010	----	----	<0.010	----
anthracene	120-12-7	E641A	0.010	µg/L	<0.010	----	----	<0.010	----
benz(a)anthracene	56-55-3	E641A	0.010	µg/L	<0.010	----	----	<0.010	----
benzo(a)pyrene	50-32-8	E641A	0.0050	µg/L	<0.0050	----	----	<0.0050	----
benzo(b+j)fluoranthene	----	E641A	0.010	µg/L	<0.010	----	----	<0.010	----
benzo(b+j+k)fluoranthene	----	E641A	0.015	µg/L	<0.015	----	----	<0.015	----
benzo(g,h,i)perylene	191-24-2	E641A	0.010	µg/L	<0.010	----	----	<0.010	----
benzo(k)fluoranthene	207-08-9	E641A	0.010	µg/L	<0.010	----	----	<0.010	----
chrysene	218-01-9	E641A	0.010	µg/L	<0.010	----	----	<0.010	----
dibenz(a,h)anthracene	53-70-3	E641A	0.0050	µg/L	<0.0050	----	----	<0.0050	----
fluoranthene	206-44-0	E641A	0.010	µg/L	<0.010	----	----	<0.010	----
fluorene	86-73-7	E641A	0.010	µg/L	<0.010	----	----	<0.010	----
indeno(1,2,3-c,d)pyrene	193-39-5	E641A	0.010	µg/L	<0.010	----	----	<0.010	----
methylnaphthalene, 1-	90-12-0	E641A	0.010	µg/L	<0.010	----	----	<0.010	----
methylnaphthalene, 1+2-	----	E641A	0.015	µg/L	<0.015	----	----	0.015	----
methylnaphthalene, 2-	91-57-6	E641A	0.010	µg/L	<0.010	----	----	0.015 RRV	----

Analytical Results

Sub-Matrix: **Seawater**

(Matrix: **Water)**

				Client sample ID	MP-05 North	MP-05 ENE	MP-05 WNW	MP-05-Source-FBLANK3	----
				Client sampling date / time	19-Aug-2021 09:54	19-Aug-2021 09:37	19-Aug-2021 10:15	19-Aug-2021 09:25	----
Analyte	CAS Number	Method	LOR	Unit	VA21B7949-006	VA21B7949-007	VA21B7949-008	VA21B7949-009	--------
					Result	Result	Result	Result	----
Polycyclic Aromatic Hydrocarbons									
naphthalene	91-20-3	E641A	0.050	µg/L	<0.050	----	----	<0.050	----
phenanthrene	85-01-8	E641A	0.020	µg/L	<0.020	----	----	<0.020	----
pyrene	129-00-0	E641A	0.010	µg/L	<0.010	----	----	<0.010	----
quinoline	6027-02-7	E641A	0.050	µg/L	<0.050	----	----	<0.050	----
B(a)P total potency equivalents [B(a)P TPE]	----	E641A	0.010	µg/L	<0.010	----	----	<0.010	----
PAHs, high molecular weight (BC AWQ)	----	E641A	0.030	µg/L	<0.030	----	----	<0.030	----
PAHs, low molecular weight (BC AWQ)	----	E641A	0.060	µg/L	<0.060	----	----	<0.060	----
PAHs, total (EPA 16)	----	E641A	0.065	µg/L	<0.065	----	----	<0.065	----
Polycyclic Aromatic Hydrocarbons Surrogates									
chrysene-d12	1719-03-5	E641A	0.1	%	80.8	----	----	94.2	----
naphthalene-d8	1146-65-2	E641A	0.1	%	95.6	----	----	105	----
phenanthrene-d10	1517-22-2	E641A	0.1	%	104	----	----	120	----

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

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **VA21B7949**	Page	: 1 of 35
Client	: **Golder Associates Ltd.**	Laboratory	: Vancouver - Environmental
Contact	: Elaine Irving	Account Manager	: Amber Springer
Address	: 200-2920 Virtual Way Vancouver BC Canada V5M 0C4	Address	: 8081 Lougheed Highway Burnaby, British Columbia Canada V5A 1W9
Telephone	: ----	Telephone	: +1 604 253 4188
Project	: 1663724-44000-03	Date Samples Received	: 24-Aug-2021 08:20
PO	: ----	Issue Date	: 03-Sep-2021 09:55
C-O-C number	: 20-920786		
Sampler	: ----		
Site	: ----		
Quote number	: Q84262		
No. of samples received	: 9		
No. of samples analysed	: 9		

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 Services number is a unique identifier assigned to discrete substances.

DQO: Data Quality Objective.

LOR: Limit of Reporting (detection limit).

RPD: Relative Percent Difference.

Summary of Outliers

Outliers : Quality Control Samples

- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- Method Blank value outliers occur - please see following pages for full details.
- 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.

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **Water**

Analyte Group	Laboratory sample ID	Client/Ref Sample ID	Analyte	CAS Number	Method	Result	Limits	Comment
Method Blank (MB) Values								
Physical Tests	QC-MRG2-276123001	----	alkalinity, total (as CaCO3)	----	E290	1.6 mg/L B	1.5 mg/L	Blank result exceeds permitted value

Result Qualifiers

Qualifier	Description
B	Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.

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: Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis: Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) MP-05 ENE	E298	19-Aug-2021	28-Aug-2021	----	----		29-Aug-2021	28 days	10 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) MP-05 North	E298	19-Aug-2021	28-Aug-2021	----	----		29-Aug-2021	28 days	10 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) MP-05 Source	E298	19-Aug-2021	28-Aug-2021	----	----		29-Aug-2021	28 days	10 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) MP-05 WNW	E298	19-Aug-2021	28-Aug-2021	----	----		29-Aug-2021	28 days	10 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) MP-05-Source-FBLANK3	E298	19-Aug-2021	28-Aug-2021	----	----		29-Aug-2021	28 days	10 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) MP-06 ENE	E298	19-Aug-2021	28-Aug-2021	----	----		29-Aug-2021	28 days	10 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) MP-06 North	E298	19-Aug-2021	28-Aug-2021	----	----		29-Aug-2021	28 days	10 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 : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) MP-06 Source	E298	19-Aug-2021	28-Aug-2021	----	----		29-Aug-2021	28 days	10 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) MP-06 WNW	E298	19-Aug-2021	28-Aug-2021	----	----		29-Aug-2021	28 days	10 days	✓
Anions and Nutrients : Bromide in Seawater by IC										
HDPE MP-05 ENE	E235S.Br	19-Aug-2021	----	----	----		25-Aug-2021	28 days	6 days	✓
Anions and Nutrients : Bromide in Seawater by IC										
HDPE MP-05 North	E235S.Br	19-Aug-2021	----	----	----		25-Aug-2021	28 days	6 days	✓
Anions and Nutrients : Bromide in Seawater by IC										
HDPE MP-05 Source	E235S.Br	19-Aug-2021	----	----	----		25-Aug-2021	28 days	6 days	✓
Anions and Nutrients : Bromide in Seawater by IC										
HDPE MP-05 WNW	E235S.Br	19-Aug-2021	----	----	----		25-Aug-2021	28 days	6 days	✓
Anions and Nutrients : Bromide in Seawater by IC										
HDPE MP-05-Source-FBLANK3	E235S.Br	19-Aug-2021	----	----	----		25-Aug-2021	28 days	6 days	✓
Anions and Nutrients : Bromide in Seawater by IC										
HDPE MP-06 ENE	E235S.Br	19-Aug-2021	----	----	----		25-Aug-2021	28 days	6 days	✓
Anions and Nutrients : Bromide in Seawater by IC										
HDPE MP-06 North	E235S.Br	19-Aug-2021	----	----	----		25-Aug-2021	28 days	6 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 : Bromide in Seawater by IC										
HDPE MP-06 Source	E235S.Br	19-Aug-2021	----	----	----		25-Aug-2021	28 days	6 days	✓
Anions and Nutrients : Bromide in Seawater by IC										
HDPE MP-06 WNW	E235S.Br	19-Aug-2021	----	----	----		25-Aug-2021	28 days	6 days	✓
Anions and Nutrients : Chloride in Seawater by IC										
HDPE MP-05 ENE	E235S.Cl	19-Aug-2021	----	----	----		25-Aug-2021	28 days	6 days	✓
Anions and Nutrients : Chloride in Seawater by IC										
HDPE MP-05 North	E235S.Cl	19-Aug-2021	----	----	----		25-Aug-2021	28 days	6 days	✓
Anions and Nutrients : Chloride in Seawater by IC										
HDPE MP-05 Source	E235S.Cl	19-Aug-2021	----	----	----		25-Aug-2021	28 days	6 days	✓
Anions and Nutrients : Chloride in Seawater by IC										
HDPE MP-05 WNW	E235S.Cl	19-Aug-2021	----	----	----		25-Aug-2021	28 days	6 days	✓
Anions and Nutrients : Chloride in Seawater by IC										
HDPE MP-05-Source-FBLANK3	E235S.Cl	19-Aug-2021	----	----	----		25-Aug-2021	28 days	6 days	✓
Anions and Nutrients : Chloride in Seawater by IC										
HDPE MP-06 ENE	E235S.Cl	19-Aug-2021	----	----	----		25-Aug-2021	28 days	6 days	✓
Anions and Nutrients : Chloride in Seawater by IC										
HDPE MP-06 North	E235S.Cl	19-Aug-2021	----	----	----		25-Aug-2021	28 days	6 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Anions and Nutrients : Chloride in Seawater by IC										
HDPE MP-06 Source	E235S.Cl	19-Aug-2021	----	----	----		25-Aug-2021	28 days	6 days	✓
Anions and Nutrients : Chloride in Seawater by IC										
HDPE MP-06 WNW	E235S.Cl	19-Aug-2021	----	----	----		25-Aug-2021	28 days	6 days	✓
Anions and Nutrients : Fluoride in Seawater by IC (Low Level)										
HDPE MP-05 ENE	E235S.F-L	19-Aug-2021	----	----	----		25-Aug-2021	28 days	6 days	✓
Anions and Nutrients : Fluoride in Seawater by IC (Low Level)										
HDPE MP-05 North	E235S.F-L	19-Aug-2021	----	----	----		25-Aug-2021	28 days	6 days	✓
Anions and Nutrients : Fluoride in Seawater by IC (Low Level)										
HDPE MP-05 Source	E235S.F-L	19-Aug-2021	----	----	----		25-Aug-2021	28 days	6 days	✓
Anions and Nutrients : Fluoride in Seawater by IC (Low Level)										
HDPE MP-05 WNW	E235S.F-L	19-Aug-2021	----	----	----		25-Aug-2021	28 days	6 days	✓
Anions and Nutrients : Fluoride in Seawater by IC (Low Level)										
HDPE MP-05-Source-FBLANK3	E235S.F-L	19-Aug-2021	----	----	----		25-Aug-2021	28 days	6 days	✓
Anions and Nutrients : Fluoride in Seawater by IC (Low Level)										
HDPE MP-06 ENE	E235S.F-L	19-Aug-2021	----	----	----		25-Aug-2021	28 days	6 days	✓
Anions and Nutrients : Fluoride in Seawater by IC (Low Level)										
HDPE MP-06 North	E235S.F-L	19-Aug-2021	----	----	----		25-Aug-2021	28 days	6 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 : Fluoride in Seawater by IC (Low Level)										
HDPE MP-06 Source	E235S.F-L	19-Aug-2021	----	----	----		25-Aug-2021	28 days	6 days	✓
Anions and Nutrients : Fluoride in Seawater by IC (Low Level)										
HDPE MP-06 WNW	E235S.F-L	19-Aug-2021	----	----	----		25-Aug-2021	28 days	6 days	✓
Anions and Nutrients : Nitrate in Seawater by IC (Trace Level)										
HDPE MP-05 ENE	E235S.NO3-T	19-Aug-2021	----	----	----		25-Aug-2021	3 days	6 days	× EHTR
Anions and Nutrients : Nitrate in Seawater by IC (Trace Level)										
HDPE MP-05 North	E235S.NO3-T	19-Aug-2021	----	----	----		25-Aug-2021	3 days	6 days	× EHTR
Anions and Nutrients : Nitrate in Seawater by IC (Trace Level)										
HDPE MP-05 Source	E235S.NO3-T	19-Aug-2021	----	----	----		25-Aug-2021	3 days	6 days	× EHTR
Anions and Nutrients : Nitrate in Seawater by IC (Trace Level)										
HDPE MP-05 WNW	E235S.NO3-T	19-Aug-2021	----	----	----		25-Aug-2021	3 days	6 days	× EHTR
Anions and Nutrients : Nitrate in Seawater by IC (Trace Level)										
HDPE MP-05-Source-FBLANK3	E235S.NO3-T	19-Aug-2021	----	----	----		25-Aug-2021	3 days	6 days	× EHTR
Anions and Nutrients : Nitrate in Seawater by IC (Trace Level)										
HDPE MP-06 ENE	E235S.NO3-T	19-Aug-2021	----	----	----		25-Aug-2021	3 days	6 days	× EHTR
Anions and Nutrients : Nitrate in Seawater by IC (Trace Level)										
HDPE MP-06 North	E235S.NO3-T	19-Aug-2021	----	----	----		25-Aug-2021	3 days	6 days	× EHTR

Matrix: **Water**

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

Analyte Group	Method	Sampling Date	Extraction / Preparation				Analysis			
Container / Client Sample ID(s)			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Nitrate in Seawater by IC (Trace Level)										
HDPE MP-06 Source	E235S.NO3-T	19-Aug-2021	----	----	----		25-Aug-2021	3 days	6 days	× EHTR
Anions and Nutrients : Nitrate in Seawater by IC (Trace Level)										
HDPE MP-06 WNW	E235S.NO3-T	19-Aug-2021	----	----	----		25-Aug-2021	3 days	6 days	× EHTR
Anions and Nutrients : Nitrite in Seawater by IC (Low Level)										
HDPE MP-05 ENE	E235S.NO2-L	19-Aug-2021	----	----	----		25-Aug-2021	3 days	6 days	× EHTR
Anions and Nutrients : Nitrite in Seawater by IC (Low Level)										
HDPE MP-05 North	E235S.NO2-L	19-Aug-2021	----	----	----		25-Aug-2021	3 days	6 days	× EHTR
Anions and Nutrients : Nitrite in Seawater by IC (Low Level)										
HDPE MP-05 Source	E235S.NO2-L	19-Aug-2021	----	----	----		25-Aug-2021	3 days	6 days	× EHTR
Anions and Nutrients : Nitrite in Seawater by IC (Low Level)										
HDPE MP-05 WNW	E235S.NO2-L	19-Aug-2021	----	----	----		25-Aug-2021	3 days	6 days	× EHTR
Anions and Nutrients : Nitrite in Seawater by IC (Low Level)										
HDPE MP-05-Source-FBLANK3	E235S.NO2-L	19-Aug-2021	----	----	----		25-Aug-2021	3 days	6 days	× EHTR
Anions and Nutrients : Nitrite in Seawater by IC (Low Level)										
HDPE MP-06 ENE	E235S.NO2-L	19-Aug-2021	----	----	----		25-Aug-2021	3 days	6 days	× EHTR
Anions and Nutrients : Nitrite in Seawater by IC (Low Level)										
HDPE MP-06 North	E235S.NO2-L	19-Aug-2021	----	----	----		25-Aug-2021	3 days	6 days	× EHTR

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Anions and Nutrients : Nitrite in Seawater by IC (Low Level)										
HDPE MP-06 Source	E235S.NO2-L	19-Aug-2021	----	----	----		25-Aug-2021	3 days	6 days	× EHTR
Anions and Nutrients : Nitrite in Seawater by IC (Low Level)										
HDPE MP-06 WNW	E235S.NO2-L	19-Aug-2021	----	----	----		25-Aug-2021	3 days	6 days	× EHTR
Anions and Nutrients : Sulfate in Seawater by IC (Low Level)										
HDPE MP-05 ENE	E235S.SO4-L	19-Aug-2021	----	----	----		25-Aug-2021	----	6 days	
Anions and Nutrients : Sulfate in Seawater by IC (Low Level)										
HDPE MP-05 North	E235S.SO4-L	19-Aug-2021	----	----	----		25-Aug-2021	----	6 days	
Anions and Nutrients : Sulfate in Seawater by IC (Low Level)										
HDPE MP-05 Source	E235S.SO4-L	19-Aug-2021	----	----	----		25-Aug-2021	----	6 days	
Anions and Nutrients : Sulfate in Seawater by IC (Low Level)										
HDPE MP-05 WNW	E235S.SO4-L	19-Aug-2021	----	----	----		25-Aug-2021	----	6 days	
Anions and Nutrients : Sulfate in Seawater by IC (Low Level)										
HDPE MP-05-Source-FBLANK3	E235S.SO4-L	19-Aug-2021	----	----	----		25-Aug-2021	----	6 days	
Anions and Nutrients : Sulfate in Seawater by IC (Low Level)										
HDPE MP-06 ENE	E235S.SO4-L	19-Aug-2021	----	----	----		25-Aug-2021	----	6 days	
Anions and Nutrients : Sulfate in Seawater by IC (Low Level)										
HDPE MP-06 North	E235S.SO4-L	19-Aug-2021	----	----	----		25-Aug-2021	----	6 days	

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Holding Times: Rec	Holding Times: Actual	Eval	Analysis: Analysis Date	Holding Times: Rec	Holding Times: Actual	Eval
Anions and Nutrients : Sulfate in Seawater by IC (Low Level)										
HDPE MP-06 Source	E235S.SO4-L	19-Aug-2021	----	----	----		25-Aug-2021	----	6 days	
Anions and Nutrients : Sulfate in Seawater by IC (Low Level)										
HDPE MP-06 WNW	E235S.SO4-L	19-Aug-2021	----	----	----		25-Aug-2021	----	6 days	
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence										
Amber glass total (sulfuric acid) MP-05 ENE	E318S	19-Aug-2021	28-Aug-2021	----	----		01-Sep-2021	28 days	14 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence										
Amber glass total (sulfuric acid) MP-05 North	E318S	19-Aug-2021	28-Aug-2021	----	----		01-Sep-2021	28 days	14 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence										
Amber glass total (sulfuric acid) MP-05 Source	E318S	19-Aug-2021	28-Aug-2021	----	----		01-Sep-2021	28 days	14 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence										
Amber glass total (sulfuric acid) MP-05 WNW	E318S	19-Aug-2021	28-Aug-2021	----	----		01-Sep-2021	28 days	14 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence										
Amber glass total (sulfuric acid) MP-05-Source-FBLANK3	E318S	19-Aug-2021	28-Aug-2021	----	----		01-Sep-2021	28 days	14 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence										
Amber glass total (sulfuric acid) MP-06 ENE	E318S	19-Aug-2021	28-Aug-2021	----	----		01-Sep-2021	28 days	14 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence										
Amber glass total (sulfuric acid) MP-06 North	E318S	19-Aug-2021	28-Aug-2021	----	----		01-Sep-2021	28 days	14 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Holding Times: Rec	Holding Times: Actual	Eval	Analysis: Analysis Date	Holding Times: Rec	Holding Times: Actual	Eval
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence										
Amber glass total (sulfuric acid) MP-06 Source	E318S	19-Aug-2021	28-Aug-2021	----	----		01-Sep-2021	28 days	14 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence										
Amber glass total (sulfuric acid) MP-06 WNW	E318S	19-Aug-2021	28-Aug-2021	----	----		01-Sep-2021	28 days	14 days	✓
Anions and Nutrients : Total Phosphorus in Seawater by Colourimetry										
Amber glass total (sulfuric acid) MP-05 ENE	E372S	19-Aug-2021	28-Aug-2021	----	----		29-Aug-2021	28 days	10 days	✓
Anions and Nutrients : Total Phosphorus in Seawater by Colourimetry										
Amber glass total (sulfuric acid) MP-05 North	E372S	19-Aug-2021	28-Aug-2021	----	----		29-Aug-2021	28 days	10 days	✓
Anions and Nutrients : Total Phosphorus in Seawater by Colourimetry										
Amber glass total (sulfuric acid) MP-05 Source	E372S	19-Aug-2021	28-Aug-2021	----	----		29-Aug-2021	28 days	10 days	✓
Anions and Nutrients : Total Phosphorus in Seawater by Colourimetry										
Amber glass total (sulfuric acid) MP-05 WNW	E372S	19-Aug-2021	28-Aug-2021	----	----		29-Aug-2021	28 days	10 days	✓
Anions and Nutrients : Total Phosphorus in Seawater by Colourimetry										
Amber glass total (sulfuric acid) MP-05-Source-FBLANK3	E372S	19-Aug-2021	28-Aug-2021	----	----		29-Aug-2021	28 days	10 days	✓
Anions and Nutrients : Total Phosphorus in Seawater by Colourimetry										
Amber glass total (sulfuric acid) MP-06 ENE	E372S	19-Aug-2021	28-Aug-2021	----	----		29-Aug-2021	28 days	10 days	✓
Anions and Nutrients : Total Phosphorus in Seawater by Colourimetry										
Amber glass total (sulfuric acid) MP-06 North	E372S	19-Aug-2021	28-Aug-2021	----	----		29-Aug-2021	28 days	10 days	✓

Matrix: **Water**

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

Analyte Group Container / Client Sample ID(s)	*Method*	*Sampling Date*	*Extraction / Preparation* Preparation Date	Holding Times Rec	Holding Times Actual	Eval	*Analysis* Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Total Phosphorus in Seawater by Colourimetry										
Amber glass total (sulfuric acid) MP-06 Source	E372S	19-Aug-2021	28-Aug-2021	----	----		29-Aug-2021	28 days	10 days	✓
Anions and Nutrients : Total Phosphorus in Seawater by Colourimetry										
Amber glass total (sulfuric acid) MP-06 WNW	E372S	19-Aug-2021	28-Aug-2021	----	----		29-Aug-2021	28 days	10 days	✓
Dissolved Metals : Dissolved Mercury in Seawater by CVAAS										
Glass vial dissolved (hydrochloric acid) MP-05 ENE	E509S	19-Aug-2021	26-Aug-2021	----	----		26-Aug-2021	28 days	7 days	✓
Dissolved Metals : Dissolved Mercury in Seawater by CVAAS										
Glass vial dissolved (hydrochloric acid) MP-05 North	E509S	19-Aug-2021	26-Aug-2021	----	----		26-Aug-2021	28 days	7 days	✓
Dissolved Metals : Dissolved Mercury in Seawater by CVAAS										
Glass vial dissolved (hydrochloric acid) MP-05 Source	E509S	19-Aug-2021	26-Aug-2021	----	----		26-Aug-2021	28 days	7 days	✓
Dissolved Metals : Dissolved Mercury in Seawater by CVAAS										
Glass vial dissolved (hydrochloric acid) MP-05 WNW	E509S	19-Aug-2021	26-Aug-2021	----	----		26-Aug-2021	28 days	7 days	✓
Dissolved Metals : Dissolved Mercury in Seawater by CVAAS										
Glass vial dissolved (hydrochloric acid) MP-05-Source-FBLANK3	E509S	19-Aug-2021	26-Aug-2021	----	----		26-Aug-2021	28 days	7 days	✓
Dissolved Metals : Dissolved Mercury in Seawater by CVAAS										
Glass vial dissolved (hydrochloric acid) MP-06 ENE	E509S	19-Aug-2021	26-Aug-2021	----	----		26-Aug-2021	28 days	7 days	✓
Dissolved Metals : Dissolved Mercury in Seawater by CVAAS										
Glass vial dissolved (hydrochloric acid) MP-06 North	E509S	19-Aug-2021	26-Aug-2021	----	----		26-Aug-2021	28 days	7 days	✓

Matrix: **Water**

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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
Dissolved Metals : Dissolved Mercury in Seawater by CVAAS										
Glass vial dissolved (hydrochloric acid) MP-06 Source	E509S	19-Aug-2021	26-Aug-2021	----	----		26-Aug-2021	28 days	7 days	✓
Dissolved Metals : Dissolved Mercury in Seawater by CVAAS										
Glass vial dissolved (hydrochloric acid) MP-06 WNW	E509S	19-Aug-2021	26-Aug-2021	----	----		26-Aug-2021	28 days	7 days	✓
Dissolved Metals : Dissolved Metals in Seawater by CRC ICPMS (HMI)										
HDPE dissolved (nitric acid) MP-05 ENE	E469S	19-Aug-2021	26-Aug-2021	----	----		26-Aug-2021	180 days	7 days	✓
Dissolved Metals : Dissolved Metals in Seawater by CRC ICPMS (HMI)										
HDPE dissolved (nitric acid) MP-05 North	E469S	19-Aug-2021	26-Aug-2021	----	----		26-Aug-2021	180 days	7 days	✓
Dissolved Metals : Dissolved Metals in Seawater by CRC ICPMS (HMI)										
HDPE dissolved (nitric acid) MP-05 Source	E469S	19-Aug-2021	26-Aug-2021	----	----		26-Aug-2021	180 days	7 days	✓
Dissolved Metals : Dissolved Metals in Seawater by CRC ICPMS (HMI)										
HDPE dissolved (nitric acid) MP-05 WNW	E469S	19-Aug-2021	26-Aug-2021	----	----		26-Aug-2021	180 days	7 days	✓
Dissolved Metals : Dissolved Metals in Seawater by CRC ICPMS (HMI)										
HDPE dissolved (nitric acid) MP-05-Source-FBLANK3	E469S	19-Aug-2021	26-Aug-2021	----	----		26-Aug-2021	180 days	7 days	✓
Dissolved Metals : Dissolved Metals in Seawater by CRC ICPMS (HMI)										
HDPE dissolved (nitric acid) MP-06 ENE	E469S	19-Aug-2021	26-Aug-2021	----	----		26-Aug-2021	180 days	7 days	✓
Dissolved Metals : Dissolved Metals in Seawater by CRC ICPMS (HMI)										
HDPE dissolved (nitric acid) MP-06 North	E469S	19-Aug-2021	26-Aug-2021	----	----		26-Aug-2021	180 days	7 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Dissolved Metals : Dissolved Metals in Seawater by CRC ICPMS (HMI)										
HDPE dissolved (nitric acid) MP-06 Source	E469S	19-Aug-2021	26-Aug-2021	----	----		26-Aug-2021	180 days	7 days	✓
Dissolved Metals : Dissolved Metals in Seawater by CRC ICPMS (HMI)										
HDPE dissolved (nitric acid) MP-06 WNW	E469S	19-Aug-2021	26-Aug-2021	----	----		26-Aug-2021	180 days	7 days	✓
Dissolved Metals : Dissolved Sodium and Silicon in Seawater by CRC ICPMS										
HDPE dissolved (nitric acid) MP-05 ENE	E469S.NaSi	19-Aug-2021	26-Aug-2021	----	----		26-Aug-2021	180 days	7 days	✓
Dissolved Metals : Dissolved Sodium and Silicon in Seawater by CRC ICPMS										
HDPE dissolved (nitric acid) MP-05 North	E469S.NaSi	19-Aug-2021	26-Aug-2021	----	----		26-Aug-2021	180 days	7 days	✓
Dissolved Metals : Dissolved Sodium and Silicon in Seawater by CRC ICPMS										
HDPE dissolved (nitric acid) MP-05 Source	E469S.NaSi	19-Aug-2021	26-Aug-2021	----	----		26-Aug-2021	180 days	7 days	✓
Dissolved Metals : Dissolved Sodium and Silicon in Seawater by CRC ICPMS										
HDPE dissolved (nitric acid) MP-05 WNW	E469S.NaSi	19-Aug-2021	26-Aug-2021	----	----		26-Aug-2021	180 days	7 days	✓
Dissolved Metals : Dissolved Sodium and Silicon in Seawater by CRC ICPMS										
HDPE dissolved (nitric acid) MP-05-Source-FBLANK3	E469S.NaSi	19-Aug-2021	26-Aug-2021	----	----		26-Aug-2021	180 days	7 days	✓
Dissolved Metals : Dissolved Sodium and Silicon in Seawater by CRC ICPMS										
HDPE dissolved (nitric acid) MP-06 ENE	E469S.NaSi	19-Aug-2021	26-Aug-2021	----	----		26-Aug-2021	180 days	7 days	✓
Dissolved Metals : Dissolved Sodium and Silicon in Seawater by CRC ICPMS										
HDPE dissolved (nitric acid) MP-06 North	E469S.NaSi	19-Aug-2021	26-Aug-2021	----	----		26-Aug-2021	180 days	7 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis: Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Sodium and Silicon in Seawater by CRC ICPMS										
HDPE dissolved (nitric acid) MP-06 Source	E469S.NaSi	19-Aug-2021	26-Aug-2021	----	----		26-Aug-2021	180 days	7 days	✓
Dissolved Metals : Dissolved Sodium and Silicon in Seawater by CRC ICPMS										
HDPE dissolved (nitric acid) MP-06 WNW	E469S.NaSi	19-Aug-2021	26-Aug-2021	----	----		26-Aug-2021	180 days	7 days	✓
Hydrocarbons : CCME PHC - F2-F4 by GC-FID										
Amber glass/Teflon lined cap (sodium bisulfate) MP-05 North	E601	19-Aug-2021	27-Aug-2021	14 days	8 days	✓	30-Aug-2021	40 days	3 days	✓
Hydrocarbons : CCME PHC - F2-F4 by GC-FID										
Amber glass/Teflon lined cap (sodium bisulfate) MP-05 Source	E601	19-Aug-2021	27-Aug-2021	14 days	8 days	✓	30-Aug-2021	40 days	3 days	✓
Hydrocarbons : CCME PHC - F2-F4 by GC-FID										
Amber glass/Teflon lined cap (sodium bisulfate) MP-05-Source-FBLANK3	E601	19-Aug-2021	27-Aug-2021	14 days	8 days	✓	30-Aug-2021	40 days	3 days	✓
Hydrocarbons : CCME PHC - F2-F4 by GC-FID										
Amber glass/Teflon lined cap (sodium bisulfate) MP-06 ENE	E601	19-Aug-2021	27-Aug-2021	14 days	8 days	✓	30-Aug-2021	40 days	3 days	✓
Hydrocarbons : CCME PHC - F2-F4 by GC-FID										
Amber glass/Teflon lined cap (sodium bisulfate) MP-06 Source	E601	19-Aug-2021	27-Aug-2021	14 days	8 days	✓	30-Aug-2021	40 days	3 days	✓
Hydrocarbons : VH and F1 by Headspace GC-FID										
Glass vial (sodium bisulfate) MP-05 North	E581.VH+F1	19-Aug-2021	30-Aug-2021	----	----		31-Aug-2021	14 days	12 days	✓
Hydrocarbons : VH and F1 by Headspace GC-FID										
Glass vial (sodium bisulfate) MP-05 Source	E581.VH+F1	19-Aug-2021	30-Aug-2021	----	----		31-Aug-2021	14 days	12 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Holding Times: Rec	Holding Times: Actual	Eval	Analysis: Analysis Date	Holding Times: Rec	Holding Times: Actual	Eval
Hydrocarbons : VH and F1 by Headspace GC-FID										
Glass vial (sodium bisulfate) MP-05-Source-FBLANK3	E581.VH+F1	19-Aug-2021	30-Aug-2021	----	----		31-Aug-2021	14 days	12 days	✓
Hydrocarbons : VH and F1 by Headspace GC-FID										
Glass vial (sodium bisulfate) MP-06 ENE	E581.VH+F1	19-Aug-2021	30-Aug-2021	----	----		31-Aug-2021	14 days	12 days	✓
Hydrocarbons : VH and F1 by Headspace GC-FID										
Glass vial (sodium bisulfate) MP-06 Source	E581.VH+F1	19-Aug-2021	30-Aug-2021	----	----		31-Aug-2021	14 days	12 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (lab preserved) MP-05 ENE	E358-L	19-Aug-2021	27-Aug-2021	3 days	8 days	× EHTR	27-Aug-2021	28 days	0 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (lab preserved) MP-05 North	E358-L	19-Aug-2021	27-Aug-2021	3 days	8 days	× EHTR	27-Aug-2021	28 days	0 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (lab preserved) MP-05 Source	E358-L	19-Aug-2021	27-Aug-2021	3 days	8 days	× EHTR	27-Aug-2021	28 days	0 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (lab preserved) MP-05 WNW	E358-L	19-Aug-2021	27-Aug-2021	3 days	8 days	× EHTR	27-Aug-2021	28 days	0 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (lab preserved) MP-05-Source-FBLANK3	E358-L	19-Aug-2021	27-Aug-2021	3 days	8 days	× EHTR	27-Aug-2021	28 days	0 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (lab preserved) MP-06 ENE	E358-L	19-Aug-2021	27-Aug-2021	3 days	8 days	× EHTR	27-Aug-2021	28 days	0 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis: Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (lab preserved) MP-06 North	E358-L	19-Aug-2021	27-Aug-2021	3 days	8 days	× EHTR	27-Aug-2021	28 days	0 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (lab preserved) MP-06 Source	E358-L	19-Aug-2021	27-Aug-2021	3 days	8 days	× EHTR	27-Aug-2021	28 days	0 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (lab preserved) MP-06 WNW	E358-L	19-Aug-2021	27-Aug-2021	3 days	8 days	× EHTR	27-Aug-2021	28 days	0 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) MP-05 ENE	E355-L	19-Aug-2021	28-Aug-2021	----	----		29-Aug-2021	28 days	10 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) MP-05 North	E355-L	19-Aug-2021	28-Aug-2021	----	----		29-Aug-2021	28 days	10 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) MP-05 Source	E355-L	19-Aug-2021	28-Aug-2021	----	----		29-Aug-2021	28 days	10 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) MP-05 WNW	E355-L	19-Aug-2021	28-Aug-2021	----	----		29-Aug-2021	28 days	10 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) MP-05-Source-FBLANK3	E355-L	19-Aug-2021	28-Aug-2021	----	----		29-Aug-2021	28 days	10 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) MP-06 ENE	E355-L	19-Aug-2021	28-Aug-2021	----	----		29-Aug-2021	28 days	10 days	✓

Matrix: **Water**

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

Analyte Group	Method	Sampling Date	Extraction / Preparation				Analysis			
Container / Client Sample ID(s)			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) MP-06 North	E355-L	19-Aug-2021	28-Aug-2021	----	----		29-Aug-2021	28 days	10 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) MP-06 Source	E355-L	19-Aug-2021	28-Aug-2021	----	----		29-Aug-2021	28 days	10 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) MP-06 WNW	E355-L	19-Aug-2021	28-Aug-2021	----	----		29-Aug-2021	28 days	10 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MP-05 ENE	E290	19-Aug-2021	----	----	----		25-Aug-2021	14 days	6 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MP-05 North	E290	19-Aug-2021	----	----	----		25-Aug-2021	14 days	6 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MP-05 Source	E290	19-Aug-2021	----	----	----		25-Aug-2021	14 days	6 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MP-05 WNW	E290	19-Aug-2021	----	----	----		25-Aug-2021	14 days	6 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MP-05-Source-FBLANK3	E290	19-Aug-2021	----	----	----		25-Aug-2021	14 days	6 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MP-06 ENE	E290	19-Aug-2021	----	----	----		25-Aug-2021	14 days	6 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Physical Tests : Alkalinity Species by Titration										
HDPE										
MP-06 North	E290	19-Aug-2021	----	----	----		25-Aug-2021	14 days	6 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE										
MP-06 Source	E290	19-Aug-2021	----	----	----		25-Aug-2021	14 days	6 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE										
MP-06 WNW	E290	19-Aug-2021	----	----	----		25-Aug-2021	14 days	6 days	✓
Physical Tests : Conductivity in Seawater										
HDPE										
MP-05 ENE	E100S	19-Aug-2021	----	----	----		25-Aug-2021	28 days	6 days	✓
Physical Tests : Conductivity in Seawater										
HDPE										
MP-05 North	E100S	19-Aug-2021	----	----	----		25-Aug-2021	28 days	6 days	✓
Physical Tests : Conductivity in Seawater										
HDPE										
MP-05 Source	E100S	19-Aug-2021	----	----	----		25-Aug-2021	28 days	6 days	✓
Physical Tests : Conductivity in Seawater										
HDPE										
MP-05 WNW	E100S	19-Aug-2021	----	----	----		25-Aug-2021	28 days	6 days	✓
Physical Tests : Conductivity in Seawater										
HDPE										
MP-05-Source-FBLANK3	E100S	19-Aug-2021	----	----	----		25-Aug-2021	28 days	6 days	✓
Physical Tests : Conductivity in Seawater										
HDPE										
MP-06 ENE	E100S	19-Aug-2021	----	----	----		25-Aug-2021	28 days	6 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Physical Tests : Conductivity in Seawater										
HDPE MP-06 North	E100S	19-Aug-2021	----	----	----		25-Aug-2021	28 days	6 days	✓
Physical Tests : Conductivity in Seawater										
HDPE MP-06 Source	E100S	19-Aug-2021	----	----	----		25-Aug-2021	28 days	6 days	✓
Physical Tests : Conductivity in Seawater										
HDPE MP-06 WNW	E100S	19-Aug-2021	----	----	----		25-Aug-2021	28 days	6 days	✓
Physical Tests : pH by Meter										
HDPE MP-06 North	E108	19-Aug-2021	----	----	----		25-Aug-2021	0.25 hrs	149 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MP-06 WNW	E108	19-Aug-2021	----	----	----		25-Aug-2021	0.25 hrs	149 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MP-05 North	E108	19-Aug-2021	----	----	----		25-Aug-2021	0.25 hrs	150 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MP-05 WNW	E108	19-Aug-2021	----	----	----		25-Aug-2021	0.25 hrs	150 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MP-06 ENE	E108	19-Aug-2021	----	----	----		25-Aug-2021	0.25 hrs	150 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MP-06 Source	E108	19-Aug-2021	----	----	----		25-Aug-2021	0.25 hrs	150 hrs	× EHTR-FM

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Physical Tests : pH by Meter										
HDPE MP-05 ENE	E108	19-Aug-2021	----	----	----		25-Aug-2021	0.25 hrs	151 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MP-05 Source	E108	19-Aug-2021	----	----	----		25-Aug-2021	0.25 hrs	151 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MP-05-Source-FBLANK3	E108	19-Aug-2021	----	----	----		25-Aug-2021	0.25 hrs	151 hrs	× EHTR-FM
Physical Tests : TDS by Gravimetry (Seawater)										
HDPE MP-05 ENE	E162S	19-Aug-2021	----	----	----		25-Aug-2021	7 days	7 days	✓
Physical Tests : TDS by Gravimetry (Seawater)										
HDPE MP-05 North	E162S	19-Aug-2021	----	----	----		25-Aug-2021	7 days	7 days	✓
Physical Tests : TDS by Gravimetry (Seawater)										
HDPE MP-05 Source	E162S	19-Aug-2021	----	----	----		25-Aug-2021	7 days	7 days	✓
Physical Tests : TDS by Gravimetry (Seawater)										
HDPE MP-05 WNW	E162S	19-Aug-2021	----	----	----		25-Aug-2021	7 days	7 days	✓
Physical Tests : TDS by Gravimetry (Seawater)										
HDPE MP-05-Source-FBLANK3	E162S	19-Aug-2021	----	----	----		25-Aug-2021	7 days	7 days	✓
Physical Tests : TDS by Gravimetry (Seawater)										
HDPE MP-06 ENE	E162S	19-Aug-2021	----	----	----		25-Aug-2021	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: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Physical Tests : TDS by Gravimetry (Seawater)										
HDPE MP-06 North	E162S	19-Aug-2021	----	----	----		25-Aug-2021	7 days	7 days	✓
Physical Tests : TDS by Gravimetry (Seawater)										
HDPE MP-06 Source	E162S	19-Aug-2021	----	----	----		25-Aug-2021	7 days	7 days	✓
Physical Tests : TDS by Gravimetry (Seawater)										
HDPE MP-06 WNW	E162S	19-Aug-2021	----	----	----		25-Aug-2021	7 days	7 days	✓
Physical Tests : TSS by Gravimetry (Seawater)										
HDPE MP-05 ENE	E160S	19-Aug-2021	----	----	----		25-Aug-2021	7 days	7 days	✓
Physical Tests : TSS by Gravimetry (Seawater)										
HDPE MP-05 North	E160S	19-Aug-2021	----	----	----		25-Aug-2021	7 days	7 days	✓
Physical Tests : TSS by Gravimetry (Seawater)										
HDPE MP-05 Source	E160S	19-Aug-2021	----	----	----		25-Aug-2021	7 days	7 days	✓
Physical Tests : TSS by Gravimetry (Seawater)										
HDPE MP-05 WNW	E160S	19-Aug-2021	----	----	----		25-Aug-2021	7 days	7 days	✓
Physical Tests : TSS by Gravimetry (Seawater)										
HDPE MP-05-Source-FBLANK3	E160S	19-Aug-2021	----	----	----		25-Aug-2021	7 days	7 days	✓
Physical Tests : TSS by Gravimetry (Seawater)										
HDPE MP-06 ENE	E160S	19-Aug-2021	----	----	----		25-Aug-2021	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: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Physical Tests : TSS by Gravimetry (Seawater)										
HDPE MP-06 North	E160S	19-Aug-2021	----	----	----		25-Aug-2021	7 days	7 days	✓
Physical Tests : TSS by Gravimetry (Seawater)										
HDPE MP-06 Source	E160S	19-Aug-2021	----	----	----		25-Aug-2021	7 days	7 days	✓
Physical Tests : TSS by Gravimetry (Seawater)										
HDPE MP-06 WNW	E160S	19-Aug-2021	----	----	----		25-Aug-2021	7 days	7 days	✓
Physical Tests : Turbidity by Nephelometry										
HDPE MP-05 ENE	E121	19-Aug-2021	----	----	----		25-Aug-2021	3 days	6 days	× EHTR
Physical Tests : Turbidity by Nephelometry										
HDPE MP-05 North	E121	19-Aug-2021	----	----	----		25-Aug-2021	3 days	6 days	× EHTR
Physical Tests : Turbidity by Nephelometry										
HDPE MP-05 Source	E121	19-Aug-2021	----	----	----		25-Aug-2021	3 days	6 days	× EHTR
Physical Tests : Turbidity by Nephelometry										
HDPE MP-05 WNW	E121	19-Aug-2021	----	----	----		25-Aug-2021	3 days	6 days	× EHTR
Physical Tests : Turbidity by Nephelometry										
HDPE MP-05-Source-FBLANK3	E121	19-Aug-2021	----	----	----		25-Aug-2021	3 days	6 days	× EHTR
Physical Tests : Turbidity by Nephelometry										
HDPE MP-06 ENE	E121	19-Aug-2021	----	----	----		25-Aug-2021	3 days	6 days	× EHTR

Matrix: **Water**

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Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Holding Times: Rec	Holding Times: Actual	Eval	Analysis: Analysis Date	Holding Times: Rec	Holding Times: Actual	Eval
Physical Tests : Turbidity by Nephelometry										
HDPE MP-06 North	E121	19-Aug-2021	----	----	----		25-Aug-2021	3 days	6 days	× EHTR
Physical Tests : Turbidity by Nephelometry										
HDPE MP-06 Source	E121	19-Aug-2021	----	----	----		25-Aug-2021	3 days	6 days	× EHTR
Physical Tests : Turbidity by Nephelometry										
HDPE MP-06 WNW	E121	19-Aug-2021	----	----	----		25-Aug-2021	3 days	6 days	× EHTR
Polycyclic Aromatic Hydrocarbons : PAHs by Hexane LVI GC-MS										
Amber glass/Teflon lined cap (sodium bisulfate) MP-05 North	E641A	19-Aug-2021	27-Aug-2021	14 days	8 days	✓	29-Aug-2021	40 days	2 days	✓
Polycyclic Aromatic Hydrocarbons : PAHs by Hexane LVI GC-MS										
Amber glass/Teflon lined cap (sodium bisulfate) MP-05 Source	E641A	19-Aug-2021	27-Aug-2021	14 days	8 days	✓	29-Aug-2021	40 days	2 days	✓
Polycyclic Aromatic Hydrocarbons : PAHs by Hexane LVI GC-MS										
Amber glass/Teflon lined cap (sodium bisulfate) MP-05-Source-FBLANK3	E641A	19-Aug-2021	27-Aug-2021	14 days	8 days	✓	29-Aug-2021	40 days	2 days	✓
Polycyclic Aromatic Hydrocarbons : PAHs by Hexane LVI GC-MS										
Amber glass/Teflon lined cap (sodium bisulfate) MP-06 ENE	E641A	19-Aug-2021	27-Aug-2021	14 days	8 days	✓	29-Aug-2021	40 days	2 days	✓
Polycyclic Aromatic Hydrocarbons : PAHs by Hexane LVI GC-MS										
Amber glass/Teflon lined cap (sodium bisulfate) MP-06 Source	E641A	19-Aug-2021	27-Aug-2021	14 days	8 days	✓	29-Aug-2021	40 days	2 days	✓
Total Metals : Total Mercury in Seawater by CVAAS										
Glass vial total (hydrochloric acid) MP-05 ENE	E508S	19-Aug-2021	----	----	----		27-Aug-2021	28 days	8 days	✓

Matrix: **Water**

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Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Total Metals : Total Mercury in Seawater by CVAAS										
Glass vial total (hydrochloric acid) MP-05 North	E508S	19-Aug-2021	----	----	----		27-Aug-2021	28 days	8 days	✓
Total Metals : Total Mercury in Seawater by CVAAS										
Glass vial total (hydrochloric acid) MP-05 Source	E508S	19-Aug-2021	----	----	----		27-Aug-2021	28 days	8 days	✓
Total Metals : Total Mercury in Seawater by CVAAS										
Glass vial total (hydrochloric acid) MP-05 WNW	E508S	19-Aug-2021	----	----	----		27-Aug-2021	28 days	8 days	✓
Total Metals : Total Mercury in Seawater by CVAAS										
Glass vial total (hydrochloric acid) MP-05-Source-FBLANK3	E508S	19-Aug-2021	----	----	----		27-Aug-2021	28 days	8 days	✓
Total Metals : Total Mercury in Seawater by CVAAS										
Glass vial total (hydrochloric acid) MP-06 ENE	E508S	19-Aug-2021	----	----	----		27-Aug-2021	28 days	8 days	✓
Total Metals : Total Mercury in Seawater by CVAAS										
Glass vial total (hydrochloric acid) MP-06 North	E508S	19-Aug-2021	----	----	----		27-Aug-2021	28 days	8 days	✓
Total Metals : Total Mercury in Seawater by CVAAS										
Glass vial total (hydrochloric acid) MP-06 Source	E508S	19-Aug-2021	----	----	----		27-Aug-2021	28 days	8 days	✓
Total Metals : Total Mercury in Seawater by CVAAS										
Glass vial total (hydrochloric acid) MP-06 WNW	E508S	19-Aug-2021	----	----	----		27-Aug-2021	28 days	8 days	✓
Total Metals : Total Metals in Seawater by CRC ICPMS (HMI)										
HDPE total (nitric acid) MP-05 ENE	E468S	19-Aug-2021	----	----	----		25-Aug-2021	180 days	6 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Holding Times: Rec	Holding Times: Actual	Eval	Analysis: Analysis Date	Holding Times: Rec	Holding Times: Actual	Eval
Total Metals : Total Metals in Seawater by CRC ICPMS (HMI)										
HDPE total (nitric acid) MP-05 North	E468S	19-Aug-2021	----	----	----		25-Aug-2021	180 days	6 days	✓
Total Metals : Total Metals in Seawater by CRC ICPMS (HMI)										
HDPE total (nitric acid) MP-05 Source	E468S	19-Aug-2021	----	----	----		25-Aug-2021	180 days	6 days	✓
Total Metals : Total Metals in Seawater by CRC ICPMS (HMI)										
HDPE total (nitric acid) MP-05 WNW	E468S	19-Aug-2021	----	----	----		25-Aug-2021	180 days	6 days	✓
Total Metals : Total Metals in Seawater by CRC ICPMS (HMI)										
HDPE total (nitric acid) MP-05-Source-FBLANK3	E468S	19-Aug-2021	----	----	----		25-Aug-2021	180 days	6 days	✓
Total Metals : Total Metals in Seawater by CRC ICPMS (HMI)										
HDPE total (nitric acid) MP-06 ENE	E468S	19-Aug-2021	----	----	----		25-Aug-2021	180 days	6 days	✓
Total Metals : Total Metals in Seawater by CRC ICPMS (HMI)										
HDPE total (nitric acid) MP-06 North	E468S	19-Aug-2021	----	----	----		25-Aug-2021	180 days	6 days	✓
Total Metals : Total Metals in Seawater by CRC ICPMS (HMI)										
HDPE total (nitric acid) MP-06 Source	E468S	19-Aug-2021	----	----	----		25-Aug-2021	180 days	6 days	✓
Total Metals : Total Metals in Seawater by CRC ICPMS (HMI)										
HDPE total (nitric acid) MP-06 WNW	E468S	19-Aug-2021	----	----	----		25-Aug-2021	180 days	6 days	✓
Total Metals : Total Sodium and Silicon in Seawater by CRC ICPMS										
HDPE total (nitric acid) MP-05 North	E468S.NaSi	19-Aug-2021	----	----	----		25-Aug-2021	180 days	6 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Total Metals : Total Sodium and Silicon in Seawater by CRC ICPMS										
HDPE total (nitric acid) MP-05 WNW	E468S.NaSi	19-Aug-2021	----	----	----		25-Aug-2021	180 days	6 days	✓
Total Metals : Total Sodium and Silicon in Seawater by CRC ICPMS										
HDPE total (nitric acid) MP-06 ENE	E468S.NaSi	19-Aug-2021	----	----	----		25-Aug-2021	180 days	6 days	✓
Total Metals : Total Sodium and Silicon in Seawater by CRC ICPMS										
HDPE total (nitric acid) MP-06 North	E468S.NaSi	19-Aug-2021	----	----	----		25-Aug-2021	180 days	6 days	✓
Total Metals : Total Sodium and Silicon in Seawater by CRC ICPMS										
HDPE total (nitric acid) MP-06 Source	E468S.NaSi	19-Aug-2021	----	----	----		25-Aug-2021	180 days	6 days	✓
Total Metals : Total Sodium and Silicon in Seawater by CRC ICPMS										
HDPE total (nitric acid) MP-06 WNW	E468S.NaSi	19-Aug-2021	----	----	----		25-Aug-2021	180 days	6 days	✓
Total Metals : Total Sodium and Silicon in Seawater by CRC ICPMS										
HDPE total (nitric acid) MP-05 ENE	E468S.NaSi	19-Aug-2021	----	----	----		25-Aug-2021	180 days	7 days	✓
Total Metals : Total Sodium and Silicon in Seawater by CRC ICPMS										
HDPE total (nitric acid) MP-05 Source	E468S.NaSi	19-Aug-2021	----	----	----		25-Aug-2021	180 days	7 days	✓
Total Metals : Total Sodium and Silicon in Seawater by CRC ICPMS										
HDPE total (nitric acid) MP-05-Source-FBLANK3	E468S.NaSi	19-Aug-2021	----	----	----		25-Aug-2021	180 days	7 days	✓
Volatile Organic Compounds [Fuels] : BTEX by Headspace GC-MS										
Glass vial (sodium bisulfate) MP-05 North	E611A	19-Aug-2021	30-Aug-2021	----	----		31-Aug-2021	14 days	12 days	✓

Matrix: **Water**

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

Analyte Group	*Method*	*Sampling Date*	*Extraction / Preparation*				*Analysis*			
Container / Client Sample ID(s)			*Preparation Date*	*Holding Times Rec*	*Holding Times Actual*	*Eval*	*Analysis Date*	*Holding Times Rec*	*Holding Times Actual*	*Eval*
Volatile Organic Compounds [Fuels] : BTEX by Headspace GC-MS										
Glass vial (sodium bisulfate) MP-05 Source	E611A	19-Aug-2021	30-Aug-2021	----	----		31-Aug-2021	14 days	12 days	✓
Volatile Organic Compounds [Fuels] : BTEX by Headspace GC-MS										
Glass vial (sodium bisulfate) MP-05-Source-FBLANK3	E611A	19-Aug-2021	30-Aug-2021	----	----		31-Aug-2021	14 days	12 days	✓
Volatile Organic Compounds [Fuels] : BTEX by Headspace GC-MS										
Glass vial (sodium bisulfate) MP-06 ENE	E611A	19-Aug-2021	30-Aug-2021	----	----		31-Aug-2021	14 days	12 days	✓
Volatile Organic Compounds [Fuels] : BTEX by Headspace GC-MS										
Glass vial (sodium bisulfate) MP-06 Source	E611A	19-Aug-2021	30-Aug-2021	----	----		31-Aug-2021	14 days	12 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	276123	1	20	5.0	5.0	✓
Ammonia by Fluorescence	E298	278671	1	18	5.5	5.0	✓
Bromide in Seawater by IC	E235S.Br	276227	1	9	11.1	5.0	✓
BTEX by Headspace GC-MS	E611A	279502	2	30	6.6	5.0	✓
Chloride in Seawater by IC	E235S.Cl	276228	1	9	11.1	5.0	✓
Conductivity in Seawater	E100S	276125	1	9	11.1	5.0	✓
Dissolved Mercury in Seawater by CVAAS	E509S	277158	1	9	11.1	5.0	✓
Dissolved Metals in Seawater by CRC ICPMS (HMI)	E469S	276744	2	13	15.3	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	277906	1	9	11.1	5.0	✓
Dissolved Sodium and Silicon in Seawater by CRC ICPMS	E469S.NaSi	276745	1	13	7.6	5.0	✓
Fluoride in Seawater by IC (Low Level)	E235S.F-L	276229	1	9	11.1	5.0	✓
Nitrate in Seawater by IC (Trace Level)	E235S.NO3-T	276230	1	9	11.1	5.0	✓
Nitrite in Seawater by IC (Low Level)	E235S.NO2-L	276231	1	9	11.1	5.0	✓
pH by Meter	E108	276124	1	20	5.0	5.0	✓
Sulfate in Seawater by IC (Low Level)	E235S.SO4-L	276232	1	9	11.1	5.0	✓
TDS by Gravimetry (Seawater)	E162S	276449	1	9	11.1	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence	E318S	278674	1	9	11.1	5.0	✓
Total Mercury in Seawater by CVAAS	E508S	277628	1	9	11.1	5.0	✓
Total Metals in Seawater by CRC ICPMS (HMI)	E468S	275621	1	9	11.1	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	278673	1	9	11.1	5.0	✓
Total Phosphorus in Seawater by Colourimetry	E372S	278672	1	18	5.5	5.0	✓
Total Sodium and Silicon in Seawater by CRC ICPMS	E468S.NaSi	275622	1	9	11.1	5.0	✓
Turbidity by Nephelometry	E121	275633	1	11	9.0	5.0	✓
VH and F1 by Headspace GC-FID	E581.VH+F1	279503	2	20	10.0	5.0	✓
Laboratory Control Samples (LCS)							
Alkalinity Species by Titration	E290	276123	1	20	5.0	5.0	✓
Ammonia by Fluorescence	E298	278671	1	18	5.5	5.0	✓
Bromide in Seawater by IC	E235S.Br	276227	1	9	11.1	5.0	✓
BTEX by Headspace GC-MS	E611A	279502	2	30	6.6	5.0	✓
CCME PHC - F2-F4 by GC-FID	E601	278286	1	10	10.0	5.0	✓
Chloride in Seawater by IC	E235S.Cl	276228	1	9	11.1	5.0	✓
Conductivity in Seawater	E100S	276125	1	9	11.1	5.0	✓
Dissolved Mercury in Seawater by CVAAS	E509S	277158	1	9	11.1	5.0	✓
Dissolved Metals in Seawater by CRC ICPMS (HMI)	E469S	276744	1	13	7.6	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	277906	1	9	11.1	5.0	✓
Dissolved Sodium and Silicon in Seawater by CRC ICPMS	E469S.NaSi	276745	1	13	7.6	5.0	✓
Fluoride in Seawater by IC (Low Level)	E235S.F-L	276229	1	9	11.1	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							
Nitrate in Seawater by IC (Trace Level)	E235S.NO3-T	276230	1	9	11.1	5.0	✓
Nitrite in Seawater by IC (Low Level)	E235S.NO2-L	276231	1	9	11.1	5.0	✓
PAHs by Hexane LVI GC-MS	E641A	278285	1	10	10.0	5.0	✓
pH by Meter	E108	276124	1	20	5.0	5.0	✓
Sulfate in Seawater by IC (Low Level)	E235S.SO4-L	276232	1	9	11.1	5.0	✓
TDS by Gravimetry (Seawater)	E162S	276449	1	9	11.1	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence	E318S	278674	1	9	11.1	5.0	✓
Total Mercury in Seawater by CVAAS	E508S	277628	1	9	11.1	5.0	✓
Total Metals in Seawater by CRC ICPMS (HMI)	E468S	275621	1	9	11.1	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	278673	1	9	11.1	5.0	✓
Total Phosphorus in Seawater by Colourimetry	E372S	278672	1	18	5.5	5.0	✓
Total Sodium and Silicon in Seawater by CRC ICPMS	E468S.NaSi	275622	1	9	11.1	5.0	✓
TSS by Gravimetry (Seawater)	E160S	276447	2	26	7.6	5.0	✓
Turbidity by Nephelometry	E121	275633	1	11	9.0	5.0	✓
VH and F1 by Headspace GC-FID	E581.VH+F1	279503	2	20	10.0	5.0	✓
Method Blanks (MB)							
Alkalinity Species by Titration	E290	276123	1	20	5.0	5.0	✓
Ammonia by Fluorescence	E298	278671	1	18	5.5	5.0	✓
Bromide in Seawater by IC	E235S.Br	276227	1	9	11.1	5.0	✓
BTEX by Headspace GC-MS	E611A	279502	2	30	6.6	5.0	✓
CCME PHC - F2-F4 by GC-FID	E601	278286	1	10	10.0	5.0	✓
Chloride in Seawater by IC	E235S.Cl	276228	1	9	11.1	5.0	✓
Conductivity in Seawater	E100S	276125	1	9	11.1	5.0	✓
Dissolved Mercury in Seawater by CVAAS	E509S	277158	1	9	11.1	5.0	✓
Dissolved Metals in Seawater by CRC ICPMS (HMI)	E469S	276744	1	13	7.6	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	277906	1	9	11.1	5.0	✓
Dissolved Sodium and Silicon in Seawater by CRC ICPMS	E469S.NaSi	276745	1	13	7.6	5.0	✓
Fluoride in Seawater by IC (Low Level)	E235S.F-L	276229	1	9	11.1	5.0	✓
Nitrate in Seawater by IC (Trace Level)	E235S.NO3-T	276230	1	9	11.1	5.0	✓
Nitrite in Seawater by IC (Low Level)	E235S.NO2-L	276231	1	9	11.1	5.0	✓
PAHs by Hexane LVI GC-MS	E641A	278285	1	10	10.0	5.0	✓
Sulfate in Seawater by IC (Low Level)	E235S.SO4-L	276232	1	9	11.1	5.0	✓
TDS by Gravimetry (Seawater)	E162S	276449	1	9	11.1	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence	E318S	278674	1	9	11.1	5.0	✓
Total Mercury in Seawater by CVAAS	E508S	277628	1	9	11.1	5.0	✓
Total Metals in Seawater by CRC ICPMS (HMI)	E468S	275621	1	9	11.1	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	278673	1	9	11.1	5.0	✓
Total Phosphorus in Seawater by Colourimetry	E372S	278672	1	18	5.5	5.0	✓
Total Sodium and Silicon in Seawater by CRC ICPMS	E468S.NaSi	275622	1	9	11.1	5.0	✓
TSS by Gravimetry (Seawater)	E160S	276447	2	26	7.6	5.0	✓
Turbidity by Nephelometry	E121	275633	1	11	9.0	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*
Method Blanks (MB) - Continued							
VH and F1 by Headspace GC-FID	E581.VH+F1	279503	2	20	10.0	5.0	✓
Matrix Spikes (MS)							
Ammonia by Fluorescence	E298	278671	1	18	5.5	5.0	✓
Bromide in Seawater by IC	E235S.Br	276227	1	9	11.1	5.0	✓
BTEX by Headspace GC-MS	E611A	279502	2	30	6.6	5.0	✓
Chloride in Seawater by IC	E235S.Cl	276228	1	9	11.1	5.0	✓
Dissolved Mercury in Seawater by CVAAS	E509S	277158	1	9	11.1	5.0	✓
Dissolved Metals in Seawater by CRC ICPMS (HMI)	E469S	276744	1	13	7.6	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	277906	1	9	11.1	5.0	✓
Dissolved Sodium and Silicon in Seawater by CRC ICPMS	E469S.NaSi	276745	1	13	7.6	5.0	✓
Fluoride in Seawater by IC (Low Level)	E235S.F-L	276229	1	9	11.1	5.0	✓
Nitrate in Seawater by IC (Trace Level)	E235S.NO3-T	276230	1	9	11.1	5.0	✓
Nitrite in Seawater by IC (Low Level)	E235S.NO2-L	276231	1	9	11.1	5.0	✓
Sulfate in Seawater by IC (Low Level)	E235S.SO4-L	276232	1	9	11.1	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence	E318S	278674	1	9	11.1	5.0	✓
Total Mercury in Seawater by CVAAS	E508S	277628	1	9	11.1	5.0	✓
Total Metals in Seawater by CRC ICPMS (HMI)	E468S	275621	1	9	11.1	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	278673	1	9	11.1	5.0	✓
Total Phosphorus in Seawater by Colourimetry	E372S	278672	1	18	5.5	5.0	✓
Total Sodium and Silicon in Seawater by CRC ICPMS	E468S.NaSi	275622	1	9	11.1	5.0	✓
VH and F1 by Headspace GC-FID	E581.VH+F1	279503	2	20	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 Seawater	E100S Vancouver - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a seawater sample. Conductivity measurements are temperature-compensated to 25°C. Salinity in Practical Salinity Units is calculated.
pH by Meter	E108 Vancouver - Environmental	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
Turbidity by Nephelometry	E121 Vancouver - Environmental	Water	APHA 2130 B (mod)	Turbidity is measured by the nephelometric method, by measuring the intensity of light scatter under defined conditions.
TSS by Gravimetry (Seawater)	E160S Vancouver - 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 (Seawater)	E162S Vancouver - 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 Seawater by IC	E235S.Br Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Chloride in Seawater by IC	E235S.Cl Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Fluoride in Seawater by IC (Low Level)	E235S.F-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrite in Seawater by IC (Low Level)	E235S.NO2-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrate in Seawater by IC (Trace Level)	E235S.NO3-T Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Sulfate in Seawater by IC (Low Level)	E235S.SO4-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Alkalinity Species by Titration	E290 Vancouver - Environmental	Water	APHA 2320 B (mod)	Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.
Ammonia by Fluorescence	E298 Vancouver - 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).
Total Kjeldahl Nitrogen by Fluorescence	E318S Vancouver - Environmental	Water	APHA 4500-Norg D (mod)	Total Kjeldahl Nitrogen is determined using block digestion followed by flow-injection analysis with fluorescence detection.
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L Vancouver - Environmental	Water	APHA 5310 B (mod)	Total Organic Carbon (Non-Purgeable), also known as NPOC (total), is a direct measurement of TOC after an acidified sample has been purged to remove inorganic carbon (IC). Analysis is by high temperature combustion with infrared detection of CO2. NPOC does not include volatile organic species that are purged off with IC. For samples where the majority of total carbon (TC) is comprised of IC (which is common), this method is more accurate and more reliable than the TOC by subtraction method (i.e. TC minus TIC).
Dissolved Organic Carbon by Combustion (Low Level)	E358-L Vancouver - Environmental	Water	APHA 5310 B (mod)	Dissolved Organic Carbon (Non-Purgeable), also known as NPOC (dissolved), is a direct measurement of DOC after a filtered (0.45 micron) sample has been acidified and purged to remove inorganic carbon (IC). Analysis is by high temperature combustion with infrared detection of CO2. NPOC does not include volatile organic species that are purged off with IC. For samples where the majority of DC (dissolved carbon) is comprised of IC (which is common), this method is more accurate and more reliable than the DOC by subtraction method (i.e. DC minus DIC).
Total Phosphorus in Seawater by Colourimetry	E372S Vancouver - Environmental	Water	APHA 4500-P E (mod).	Total Phosphorus is determined colourimetrically using a discrete analyzer after heated persulfate digestion of the sample.
Total Metals in Seawater by CRC ICPMS (HMI)	E468S Vancouver - Environmental	Water	EPA 200.2/6020B (mod)	Seawater samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS (HMI Mode). This method is compliant with digestion requirements of the British Columbia Environmental Laboratory Manual.
Total Sodium and Silicon in Seawater by CRC ICPMS	E468S.NaSi Vancouver - Environmental	Water	EPA 200.2/6020B (mod)	Seawater samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS. This method is compliant with digestion requirements of the British Columbia Environmental Laboratory Manual.
Dissolved Metals in Seawater by CRC ICPMS (HMI)	E469S Vancouver - Environmental	Water	APHA 3030B/EPA 6020B (mod)	Seawater samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS (HMI Mode).

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Sodium and Silicon in Seawater by CRC ICPMS	E469S.NaSi Vancouver - Environmental	Water	APHA 3030B/EPA 6020B (mod)	Seawater samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS.
Total Mercury in Seawater by CVAAS	E508S Vancouver - Environmental	Water	EPA 1631E (mod)	Seawater samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.
Dissolved Mercury in Seawater by CVAAS	E509S Vancouver - Environmental	Water	APHA 3030B/EPA 1631E (mod)	Seawater samples are filtered (0.45 um), preserved with HCl, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.
VH and F1 by Headspace GC-FID	E581.VH+F1 Vancouver - Environmental	Water	BC MOE Lab Manual / CCME PHC in Soil - Tier 1 (mod)	Volatile Hydrocarbons (VH and F1) is analyzed by static headspace GC-FID. Samples are prepared in headspace vials and are heated and agitated on the headspace autosampler, causing VOCs to partition between the aqueous phase and the headspace in accordance with Henry's law.
CCME PHC - F2-F4 by GC-FID	E601 Vancouver - Environmental	Water	CCME PHC in Soil - Tier 1	CCME Fractions 2-4 (F2-F4) are analyzed by GC-FID.
BTEX by Headspace GC-MS	E611A Vancouver - Environmental	Water	EPA 8260D (mod)	Volatile Organic Compounds (VOCs) are analyzed by static headspace GC-MS. Samples are prepared in headspace vials and are heated and agitated on the headspace autosampler, causing VOCs to partition between the aqueous phase and the headspace in accordance with Henry's law.
PAHs by Hexane LVI GC-MS	E641A Vancouver - Environmental	Water	EPA 8270E (mod)	Polycyclic Aromatic Hydrocarbons (PAHs) are analyzed by large volume injection (LVI) GC-MS.
Dissolved Hardness (Calculated)	EC100 Vancouver - Environmental	Water	APHA 2340B	"Hardness (as CaCO3), dissolved" is calculated from the sum of dissolved Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. "Total Hardness" refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations.
Salinity in Seawater (calculation)	EC100S Vancouver - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a seawater sample. Conductivity measurements are temperature-compensated to 25°C. Salinity in Practical Salinity Units is calculated.
F1-BTEX	EC580 Vancouver - Environmental	Water	CCME PHC in Soil - Tier 1	F1-BTEX is calculated as follows: F1-BTEX = F1 (C6-C10) minus benzene, toluene, ethylbenzene and xylenes (BTEX).
VPH: VH-BTEX-Styrene	EC580A Vancouver - Environmental	Water	BC MOE Lab Manual (VPH in Water and Solids) (mod)	Volatile Petroleum Hydrocarbons (VPH) is calculated as follows: VPHw = Volatile Hydrocarbons (VH6-10) minus benzene, toluene, ethylbenzene, xylenes (BTEX) and styrene.

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Preparation for Ammonia	EP298 Vancouver - Environmental	Water		Sample preparation for Preserved Nutrients Water Quality Analysis.
Digestion for TKN in Seawater	EP318S Vancouver - Environmental	Water	APHA 4500-Norg D (mod)	Samples are digested using block digestion with Copper Sulfate Digestion Reagent and H2SO4.
Preparation for Total Organic Carbon by Combustion	EP355 Vancouver - Environmental	Water		Preparation for Total Organic Carbon by Combustion
Preparation for Dissolved Organic Carbon for Combustion	EP358 Vancouver - Environmental	Water	APHA 5310 B (mod)	Preparation for Dissolved Organic Carbon
Digestion for Total Phosphorus in water	EP372 Vancouver - Environmental	Water	APHA 4500-P E (mod).	Samples are heated with a persulfate digestion reagent.
Dissolved Metals Water Filtration	EP421 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HNO3.
Dissolved Mercury Water Filtration	EP509 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HCl.
VOCs Preparation for Headspace Analysis	EP581 Vancouver - Environmental	Water	EPA 5021A (mod)	Samples are prepared in headspace vials and are heated and agitated on the headspace autosampler. An aliquot of the headspace is then injected into the GC/MS-FID system.
PHCs and PAHs Hexane Extraction	EP601 Vancouver - Environmental	Water	EPA 3511 (mod)	Petroleum Hydrocarbons (PHCs) and Polycyclic Aromatic Hydrocarbons (PAHs) are extracted using a hexane liquid-liquid extraction.

QUALITY CONTROL REPORT

Work Order	: **VA21B7949**		
Client	: Golder Associates Ltd.	Laboratory	: Vancouver - Environmental
Contact	: Elaine Irving	Account Manager	: Amber Springer
Address	: 200-2920 Virtual Way Vancouver BC Canada V5M 0C4	Address	: 8081 Lougheed Highway Burnaby, British Columbia Canada V5A 1W9
Telephone	: ----	Telephone	: +1 604 253 4188
Project	: 1663724-44000-03	Date Samples Received	: 24-Aug-2021 08:20
PO	: ----	Date Analysis Commenced	: 25-Aug-2021
C-O-C number	: 20-920786	Issue Date	: 03-Sep-2021 09:55
Sampler	: ----		
Site	: ----		
Quote number	: Q84262		
No. of samples received	: 9		
No. of samples analysed	: 9		

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 Percentage Difference (RPD) and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits
- Reference Material (RM) Report; Recovery and Acceptance Limits
- Method Blank (MB) Report; Recovery and Acceptance Limits
- Laboratory Control Sample (LCS) Report; Recovery and Acceptance Limits

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.

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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 Services number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percentage Difference
# = Indicates a QC result that did not meet the ALS DQO.

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: 275633)											
VA21B7933-001	Anonymous	turbidity	----	E121	0.10	NTU	1.79	1.90	5.64%	15%	----
Physical Tests (QC Lot: 276123)											
VA21B7949-001	MP-06 Source	alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	89.1	87.7	1.58%	20%	----
Physical Tests (QC Lot: 276124)											
VA21B7949-001	MP-06 Source	pH	----	E108	0.10	pH units	8.06	8.05	0.124%	4%	----
Physical Tests (QC Lot: 276125)											
VA21B7949-001	MP-06 Source	conductivity	----	E100S	2.0	µS/cm	3260	3260	0.00%	20%	----
Physical Tests (QC Lot: 276449)											
VA21B7949-001	MP-06 Source	solids, total dissolved [TDS]	----	E162S	20	mg/L	1970	1840	6.74%	20%	----
Anions and Nutrients (QC Lot: 276227)											
VA21B7949-001	MP-06 Source	bromide	24959-67-9	E235S.Br	5.0	mg/L	<5.0	<5.0	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 276228)											
VA21B7949-001	MP-06 Source	chloride	16887-00-6	E235S.Cl	50	mg/L	932	933	0.0716%	20%	----
Anions and Nutrients (QC Lot: 276229)											
VA21B7949-001	MP-06 Source	fluoride	16984-48-8	E235S.F-L	0.20	mg/L	<0.20	<0.20	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 276230)											
VA21B7949-001	MP-06 Source	nitrate (as N)	14797-55-8	E235S.NO3-T	0.010	mg/L	0.011	<0.010	0.0010	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 276231)											
VA21B7949-001	MP-06 Source	nitrite (as N)	14797-65-0	E235S.NO2-L	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 276232)											
VA21B7949-001	MP-06 Source	sulfate (as SO4)	14808-79-8	E235S.SO4-L	3.0	mg/L	132	132	0.136%	20%	----
Anions and Nutrients (QC Lot: 278671)											
VA21B7949-001	MP-06 Source	ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 278672)											
VA21B7949-001	MP-06 Source	phosphorus, total	7723-14-0	E372S	0.0040	mg/L	0.0130	0.0121	0.0009	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 278674)											
VA21B7949-001	MP-06 Source	Kjeldahl nitrogen, total [TKN]	----	E318S	0.050	mg/L	0.112	0.119	0.007	Diff <2x LOR	----
Organic / Inorganic Carbon (QC Lot: 277906)											
VA21B7949-001	MP-06 Source	carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	1.29	1.35	0.07	Diff <2x LOR	----
Organic / Inorganic Carbon (QC Lot: 278673)											
VA21B7949-001	MP-06 Source	carbon, total organic [TOC]	----	E355-L	0.50	mg/L	1.03	1.64	0.61	Diff <2x LOR	----

Sub-Matrix: **Water**

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
					Laboratory Duplicate (DUP) Report						
Total Metals (QC Lot: 275621)											
VA21B7949-001	MP-06 Source	aluminum, total	7429-90-5	E468S	0.0050	mg/L	0.0176	0.0154	0.0022	Diff <2x LOR	----
		antimony, total	7440-36-0	E468S	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		arsenic, total	7440-38-2	E468S	0.00040	mg/L	<0.00040	<0.00040	0	Diff <2x LOR	----
		barium, total	7440-39-3	E468S	0.0010	mg/L	0.0042	0.0042	0.00006	Diff <2x LOR	----
		beryllium, total	7440-41-7	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		bismuth, total	7440-69-9	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		boron, total	7440-42-8	E468S	0.30	mg/L	<0.30	<0.30	0	Diff <2x LOR	----
		cadmium, total	7440-43-9	E468S	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		calcium, total	7440-70-2	E468S	1.0	mg/L	42.1	42.1	0.165%	20%	----
		cesium, total	7440-46-2	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		chromium, total	7440-47-3	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		cobalt, total	7440-48-4	E468S	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		copper, total	7440-50-8	E468S	0.00050	mg/L	0.00214	0.00210	0.00004	Diff <2x LOR	----
		gallium, total	7440-55-3	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		iron, total	7439-89-6	E468S	0.010	mg/L	0.012	0.013	0.0004	Diff <2x LOR	----
		lead, total	7439-92-1	E468S	0.000050	mg/L	0.000053	<0.000050	0.000003	Diff <2x LOR	----
		lithium, total	7439-93-2	E468S	0.020	mg/L	<0.020	<0.020	0	Diff <2x LOR	----
		magnesium, total	7439-95-4	E468S	1.0	mg/L	60.8	61.7	1.44%	20%	----
		manganese, total	7439-96-5	E468S	0.00020	mg/L	0.00082	0.00080	0.00002	Diff <2x LOR	----
		molybdenum, total	7439-98-7	E468S	0.00010	mg/L	0.00061	0.00061	0.000003	Diff <2x LOR	----
		nickel, total	7440-02-0	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		phosphorus, total	7723-14-0	E468S	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		potassium, total	7440-09-7	E468S	1.0	mg/L	18.7	19.4	3.65%	20%	----
		rhenium, total	7440-15-5	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		rubidium, total	7440-17-7	E468S	0.0050	mg/L	0.0062	0.0062	0.00002	Diff <2x LOR	----
		selenium, total	7782-49-2	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		silver, total	7440-22-4	E468S	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		strontium, total	7440-24-6	E468S	0.010	mg/L	0.332	0.343	3.20%	20%	----
		sulfur, total	7704-34-9	E468S	5.0	mg/L	45.7	44.5	1.2	Diff <2x LOR	----
		tellurium, total	13494-80-9	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		thallium, total	7440-28-0	E468S	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		thorium, total	7440-29-1	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		tin, total	7440-31-5	E468S	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		titanium, total	7440-32-6	E468S	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
		tungsten, total	7440-33-7	E468S	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----

Sub-Matrix: **Water**

Laboratory Duplicate (DUP) Report

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Total Metals (QC Lot: 275621) - continued											
VA21B7949-001	MP-06 Source	uranium, total	7440-61-1	E468S	0.000050	mg/L	0.00140	0.00143	1.97%	20%	----
		vanadium, total	7440-62-2	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		yttrium, total	7440-65-5	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, total	7440-66-6	E468S	0.0030	mg/L	<0.0030	<0.0030	0	Diff <2x LOR	----
		zirconium, total	7440-67-7	E468S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
Total Metals (QC Lot: 275622)											
VA21B7949-001	MP-06 Source	silicon, total	7440-21-3	E468S.NaSi	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		sodium, total	17341-25-2	E468S.NaSi	2.5	mg/L	489	490	0.118%	20%	----
Total Metals (QC Lot: 277628)											
VA21B7949-001	MP-06 Source	mercury, total	7439-97-6	E508S	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 276744)											
VA21B7949-001	MP-06 Source	copper, dissolved	7440-50-8	E469S	0.00020	mg/L	0.00059	0.00059	0.000001	Diff <2x LOR	----
VA21B7949-001	MP-06 Source	aluminum, dissolved	7429-90-5	E469S	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
		antimony, dissolved	7440-36-0	E469S	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		arsenic, dissolved	7440-38-2	E469S	0.00040	mg/L	<0.00040	<0.00040	0	Diff <2x LOR	----
		barium, dissolved	7440-39-3	E469S	0.0010	mg/L	0.0040	0.0044	0.0003	Diff <2x LOR	----
		beryllium, dissolved	7440-41-7	E469S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		bismuth, dissolved	7440-69-9	E469S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		boron, dissolved	7440-42-8	E469S	0.30	mg/L	<0.30	<0.30	0	Diff <2x LOR	----
		cadmium, dissolved	7440-43-9	E469S	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		calcium, dissolved	7440-70-2	E469S	1.0	mg/L	40.1	41.1	2.41%	20%	----
		cesium, dissolved	7440-46-2	E469S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		chromium, dissolved	7440-47-3	E469S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		cobalt, dissolved	7440-48-4	E469S	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		gallium, dissolved	7440-55-3	E469S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		iron, dissolved	7439-89-6	E469S	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		lead, dissolved	7439-92-1	E469S	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		lithium, dissolved	7439-93-2	E469S	0.020	mg/L	<0.020	<0.020	0	Diff <2x LOR	----
		magnesium, dissolved	7439-95-4	E469S	1.0	mg/L	64.7	69.6	7.28%	20%	----
		manganese, dissolved	7439-96-5	E469S	0.00010	mg/L	0.00045	0.00049	0.00004	Diff <2x LOR	----
		molybdenum, dissolved	7439-98-7	E469S	0.00010	mg/L	0.00061	0.00061	0.000003	Diff <2x LOR	----
		nickel, dissolved	7440-02-0	E469S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		phosphorus, dissolved	7723-14-0	E469S	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		potassium, dissolved	7440-09-7	E469S	1.0	mg/L	18.8	19.7	4.29%	20%	----
		rhenium, dissolved	7440-15-5	E469S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----

Sub-Matrix: **Water**

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Laboratory Duplicate (DUP) Report						
					LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Dissolved Metals (QC Lot: 276744) - continued											
VA21B7949-001	MP-06 Source	rubidium, dissolved	7440-17-7	E469S	0.0050	mg/L	0.0060	0.0061	0.0002	Diff <2x LOR	----
		selenium, dissolved	7782-49-2	E469S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		silver, dissolved	7440-22-4	E469S	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		strontium, dissolved	7440-24-6	E469S	0.010	mg/L	0.355	0.359	1.07%	20%	----
		sulfur, dissolved	7704-34-9	E469S	5.0	mg/L	43.7	43.4	0.4	Diff <2x LOR	----
		tellurium, dissolved	13494-80-9	E469S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		thallium, dissolved	7440-28-0	E469S	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		thorium, dissolved	7440-29-1	E469S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		tin, dissolved	7440-31-5	E469S	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		titanium, dissolved	7440-32-6	E469S	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
		tungsten, dissolved	7440-33-7	E469S	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		uranium, dissolved	7440-61-1	E469S	0.000050	mg/L	0.00146	0.00149	2.15%	20%	----
		vanadium, dissolved	7440-62-2	E469S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		yttrium, dissolved	7440-65-5	E469S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, dissolved	7440-66-6	E469S	0.0010	mg/L	0.0011	<0.0010	0.0001	Diff <2x LOR	----
		zirconium, dissolved	7440-67-7	E469S	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 276745)											
VA21B7949-001	MP-06 Source	silicon, dissolved	7440-21-3	E469S.NaSi	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		sodium, dissolved	17341-25-2	E469S.NaSi	2.5	mg/L	524	536	2.27%	20%	----
Dissolved Metals (QC Lot: 277158)											
VA21B7949-001	MP-06 Source	mercury, dissolved	7439-97-6	E509S	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
Volatile Organic Compounds (QC Lot: 279502)											
VA21B7908-001	Anonymous	benzene	71-43-2	E611A	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		ethylbenzene	100-41-4	E611A	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		methyl-tert-butyl ether [MTBE]	1634-04-4	E611A	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		styrene	100-42-5	E611A	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		toluene	108-88-3	E611A	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		xylene, m+p-	179601-23-1	E611A	0.40	µg/L	<0.40	<0.40	0	Diff <2x LOR	----
		xylene, o-	95-47-6	E611A	0.30	µg/L	<0.30	<0.30	0	Diff <2x LOR	----
Volatile Organic Compounds (QC Lot: 279811)											
VA21B7949-006	MP-05 North	benzene	71-43-2	E611A	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		ethylbenzene	100-41-4	E611A	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		methyl-tert-butyl ether [MTBE]	1634-04-4	E611A	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		styrene	100-42-5	E611A	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		toluene	108-88-3	E611A	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----

Sub-Matrix: **Water**

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
					Laboratory Duplicate (DUP) Report						
Volatile Organic Compounds (QC Lot: 279811) - continued											
VA21B7949-006	MP-05 North	xylene, m+p-	179601-23-1	E611A	0.40	µg/L	<0.40	<0.40	0	Diff <2x LOR	----
		xylene, o-	95-47-6	E611A	0.30	µg/L	<0.30	<0.30	0	Diff <2x LOR	----
Hydrocarbons (QC Lot: 279503)											
VA21B7908-001	Anonymous	F1 (C6-C10)	----	E581.VH+F1	100	µg/L	<100	<100	0.0%	30%	----
		VHw (C6-C10)	----	E581.VH+F1	100	µg/L	<100	<100	0.0%	30%	----
Hydrocarbons (QC Lot: 279810)											
VA21B7949-006	MP-05 North	F1 (C6-C10)	----	E581.VH+F1	100	µg/L	<100	<100	0.0%	30%	----
		VHw (C6-C10)	----	E581.VH+F1	100	µg/L	<100	<100	0.0%	30%	----

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: 275633)						
turbidity	----	E121	0.1	NTU	<0.10	----
Physical Tests (QCLot: 276123)						
alkalinity, total (as CaCO3)	----	E290	1	mg/L	# 1.6	B
Physical Tests (QCLot: 276125)						
conductivity	----	E100S	2	μS/cm	<2.0	----
Physical Tests (QCLot: 276447)						
solids, total suspended [TSS]	----	E160S	2	mg/L	<2.0	----
Physical Tests (QCLot: 276448)						
solids, total suspended [TSS]	----	E160S	2	mg/L	<2.0	----
Physical Tests (QCLot: 276449)						
solids, total dissolved [TDS]	----	E162S	10	mg/L	<10	----
Anions and Nutrients (QCLot: 276227)						
bromide	24959-67-9	E235S.Br	5	mg/L	<5.0	----
Anions and Nutrients (QCLot: 276228)						
chloride	16887-00-6	E235S.Cl	50	mg/L	<50	----
Anions and Nutrients (QCLot: 276229)						
fluoride	16984-48-8	E235S.F-L	0.2	mg/L	<0.20	----
Anions and Nutrients (QCLot: 276230)						
nitrate (as N)	14797-55-8	E235S.NO3-T	0.01	mg/L	<0.010	----
Anions and Nutrients (QCLot: 276231)						
nitrite (as N)	14797-65-0	E235S.NO2-L	0.01	mg/L	<0.010	----
Anions and Nutrients (QCLot: 276232)						
sulfate (as SO4)	14808-79-8	E235S.SO4-L	3	mg/L	<3.0	----
Anions and Nutrients (QCLot: 278671)						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 278672)						
phosphorus, total	7723-14-0	E372S	0.002	mg/L	<0.0040	----
Anions and Nutrients (QCLot: 278674)						
Kjeldahl nitrogen, total [TKN]	----	E318S	0.05	mg/L	<0.050	----
Organic / Inorganic Carbon (QCLot: 277906)						
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	<0.50	----
Organic / Inorganic Carbon (QCLot: 278673)						
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	<0.50	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 275621)						
aluminum, total	7429-90-5	E468S	0.005	mg/L	<0.0050	----
antimony, total	7440-36-0	E468S	0.001	mg/L	<0.0010	----
arsenic, total	7440-38-2	E468S	0.0004	mg/L	<0.00040	----
barium, total	7440-39-3	E468S	0.001	mg/L	<0.0010	----
beryllium, total	7440-41-7	E468S	0.0005	mg/L	<0.00050	----
bismuth, total	7440-69-9	E468S	0.0005	mg/L	<0.00050	----
boron, total	7440-42-8	E468S	0.3	mg/L	<0.30	----
cadmium, total	7440-43-9	E468S	0.00001	mg/L	<0.000010	----
calcium, total	7440-70-2	E468S	1	mg/L	<1.0	----
cesium, total	7440-46-2	E468S	0.0005	mg/L	<0.00050	----
chromium, total	7440-47-3	E468S	0.0005	mg/L	<0.00050	----
cobalt, total	7440-48-4	E468S	0.00005	mg/L	<0.000050	----
copper, total	7440-50-8	E468S	0.0005	mg/L	<0.00050	----
gallium, total	7440-55-3	E468S	0.0005	mg/L	<0.00050	----
iron, total	7439-89-6	E468S	0.01	mg/L	<0.010	----
lead, total	7439-92-1	E468S	0.00005	mg/L	<0.000050	----
lithium, total	7439-93-2	E468S	0.02	mg/L	<0.020	----
magnesium, total	7439-95-4	E468S	1	mg/L	<1.0	----
manganese, total	7439-96-5	E468S	0.0002	mg/L	<0.00020	----
molybdenum, total	7439-98-7	E468S	0.0001	mg/L	<0.00010	----
nickel, total	7440-02-0	E468S	0.0005	mg/L	<0.00050	----
phosphorus, total	7723-14-0	E468S	0.05	mg/L	<0.050	----
potassium, total	7440-09-7	E468S	1	mg/L	<1.0	----
rhenium, total	7440-15-5	E468S	0.0005	mg/L	<0.00050	----
rubidium, total	7440-17-7	E468S	0.005	mg/L	<0.0050	----
selenium, total	7782-49-2	E468S	0.0005	mg/L	<0.00050	----
silver, total	7440-22-4	E468S	0.0001	mg/L	<0.00010	----
strontium, total	7440-24-6	E468S	0.01	mg/L	<0.010	----
sulfur, total	7704-34-9	E468S	5	mg/L	<5.0	----
tellurium, total	13494-80-9	E468S	0.0005	mg/L	<0.00050	----
thallium, total	7440-28-0	E468S	0.00005	mg/L	<0.000050	----
thorium, total	7440-29-1	E468S	0.0005	mg/L	<0.00050	----
tin, total	7440-31-5	E468S	0.001	mg/L	<0.0010	----
titanium, total	7440-32-6	E468S	0.005	mg/L	<0.0050	----
tungsten, total	7440-33-7	E468S	0.001	mg/L	<0.0010	----
uranium, total	7440-61-1	E468S	0.00005	mg/L	<0.000050	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 275621) - continued						
vanadium, total	7440-62-2	E468S	0.0005	mg/L	<0.00050	----
yttrium, total	7440-65-5	E468S	0.0005	mg/L	<0.00050	----
zinc, total	7440-66-6	E468S	0.003	mg/L	<0.0030	----
zirconium, total	7440-67-7	E468S	0.0005	mg/L	<0.00050	----
Total Metals (QCLot: 275622)						
silicon, total	7440-21-3	E468S.NaSi	1	mg/L	<1.0	----
sodium, total	17341-25-2	E468S.NaSi	2.5	mg/L	<2.5	----
Total Metals (QCLot: 277628)						
mercury, total	7439-97-6	E508S	0.000005	mg/L	<0.0000050	----
Dissolved Metals (QCLot: 276744)						
aluminum, dissolved	7429-90-5	E469S	0.005	mg/L	<0.0050	----
antimony, dissolved	7440-36-0	E469S	0.001	mg/L	<0.0010	----
arsenic, dissolved	7440-38-2	E469S	0.0004	mg/L	<0.00040	----
barium, dissolved	7440-39-3	E469S	0.001	mg/L	<0.0010	----
beryllium, dissolved	7440-41-7	E469S	0.0005	mg/L	<0.00050	----
bismuth, dissolved	7440-69-9	E469S	0.0005	mg/L	<0.00050	----
boron, dissolved	7440-42-8	E469S	0.3	mg/L	<0.30	----
cadmium, dissolved	7440-43-9	E469S	0.00001	mg/L	<0.000010	----
calcium, dissolved	7440-70-2	E469S	1	mg/L	<1.0	----
cesium, dissolved	7440-46-2	E469S	0.0005	mg/L	<0.00050	----
chromium, dissolved	7440-47-3	E469S	0.0005	mg/L	<0.00050	----
cobalt, dissolved	7440-48-4	E469S	0.00005	mg/L	<0.000050	----
copper, dissolved	7440-50-8	E469S	0.0002	mg/L	<0.00020	----
gallium, dissolved	7440-55-3	E469S	0.0005	mg/L	<0.00050	----
iron, dissolved	7439-89-6	E469S	0.01	mg/L	<0.010	----
lead, dissolved	7439-92-1	E469S	0.00005	mg/L	<0.000050	----
lithium, dissolved	7439-93-2	E469S	0.02	mg/L	<0.020	----
magnesium, dissolved	7439-95-4	E469S	1	mg/L	<1.0	----
manganese, dissolved	7439-96-5	E469S	0.0001	mg/L	<0.00010	----
molybdenum, dissolved	7439-98-7	E469S	0.0001	mg/L	<0.00010	----
nickel, dissolved	7440-02-0	E469S	0.0005	mg/L	<0.00050	----
phosphorus, dissolved	7723-14-0	E469S	0.05	mg/L	<0.050	----
potassium, dissolved	7440-09-7	E469S	1	mg/L	<1.0	----
rhenium, dissolved	7440-15-5	E469S	0.0005	mg/L	<0.00050	----
rubidium, dissolved	7440-17-7	E469S	0.005	mg/L	<0.0050	----
selenium, dissolved	7782-49-2	E469S	0.0005	mg/L	<0.00050	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 276744) - continued						
silver, dissolved	7440-22-4	E469S	0.0001	mg/L	<0.00010	----
strontium, dissolved	7440-24-6	E469S	0.01	mg/L	<0.010	----
sulfur, dissolved	7704-34-9	E469S	5	mg/L	<5.0	----
tellurium, dissolved	13494-80-9	E469S	0.0005	mg/L	<0.00050	----
thallium, dissolved	7440-28-0	E469S	0.00005	mg/L	<0.000050	----
thorium, dissolved	7440-29-1	E469S	0.0005	mg/L	<0.00050	----
tin, dissolved	7440-31-5	E469S	0.001	mg/L	<0.0010	----
titanium, dissolved	7440-32-6	E469S	0.005	mg/L	<0.0050	----
tungsten, dissolved	7440-33-7	E469S	0.001	mg/L	<0.0010	----
uranium, dissolved	7440-61-1	E469S	0.00005	mg/L	<0.000050	----
vanadium, dissolved	7440-62-2	E469S	0.0005	mg/L	<0.00050	----
yttrium, dissolved	7440-65-5	E469S	0.0005	mg/L	<0.00050	----
zinc, dissolved	7440-66-6	E469S	0.001	mg/L	<0.0010	----
zirconium, dissolved	7440-67-7	E469S	0.0005	mg/L	<0.00050	----
Dissolved Metals (QCLot: 276745)						
silicon, dissolved	7440-21-3	E469S.NaSi	1	mg/L	<1.0	----
sodium, dissolved	17341-25-2	E469S.NaSi	2.5	mg/L	<2.5	----
Dissolved Metals (QCLot: 277158)						
mercury, dissolved	7439-97-6	E509S	0.000005	mg/L	<0.0000050	----
Volatile Organic Compounds (QCLot: 279502)						
benzene	71-43-2	E611A	0.5	µg/L	<0.50	----
ethylbenzene	100-41-4	E611A	0.5	µg/L	<0.50	----
methyl-tert-butyl ether [MTBE]	1634-04-4	E611A	0.5	µg/L	<0.50	----
styrene	100-42-5	E611A	0.5	µg/L	<0.50	----
toluene	108-88-3	E611A	0.5	µg/L	<0.50	----
xylene, m+p-	179601-23-1	E611A	0.4	µg/L	<0.40	----
xylene, o-	95-47-6	E611A	0.3	µg/L	<0.30	----
Volatile Organic Compounds (QCLot: 279811)						
benzene	71-43-2	E611A	0.5	µg/L	<0.50	----
ethylbenzene	100-41-4	E611A	0.5	µg/L	<0.50	----
methyl-tert-butyl ether [MTBE]	1634-04-4	E611A	0.5	µg/L	<0.50	----
styrene	100-42-5	E611A	0.5	µg/L	<0.50	----
toluene	108-88-3	E611A	0.5	µg/L	<0.50	----
xylene, m+p-	179601-23-1	E611A	0.4	µg/L	<0.40	----
xylene, o-	95-47-6	E611A	0.3	µg/L	<0.30	----
Hydrocarbons (QCLot: 278286)						

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Hydrocarbons (QCLot: 278286) - continued						
F2 (C10-C16)	----	E601	100	µg/L	<100	----
F3 (C16-C34)	----	E601	250	µg/L	<250	----
F4 (C34-C50)	----	E601	250	µg/L	<250	----
Hydrocarbons (QCLot: 279503)						
F1 (C6-C10)	----	E581.VH+F1	100	µg/L	<100	----
VHw (C6-C10)	----	E581.VH+F1	100	µg/L	<100	----
Hydrocarbons (QCLot: 279810)						
F1 (C6-C10)	----	E581.VH+F1	100	µg/L	<100	----
VHw (C6-C10)	----	E581.VH+F1	100	µg/L	<100	----
Polycyclic Aromatic Hydrocarbons (QCLot: 278285)						
acenaphthene	83-32-9	E641A	0.01	µg/L	<0.010	----
acenaphthylene	208-96-8	E641A	0.01	µg/L	<0.010	----
acridine	260-94-6	E641A	0.01	µg/L	<0.010	----
anthracene	120-12-7	E641A	0.01	µg/L	<0.010	----
benz(a)anthracene	56-55-3	E641A	0.01	µg/L	<0.010	----
benzo(a)pyrene	50-32-8	E641A	0.005	µg/L	<0.0050	----
benzo(b+j)fluoranthene	----	E641A	0.01	µg/L	<0.010	----
benzo(g,h,i)perylene	191-24-2	E641A	0.01	µg/L	<0.010	----
benzo(k)fluoranthene	207-08-9	E641A	0.01	µg/L	<0.010	----
chrysene	218-01-9	E641A	0.01	µg/L	<0.010	----
dibenz(a,h)anthracene	53-70-3	E641A	0.005	µg/L	<0.0050	----
fluoranthene	206-44-0	E641A	0.01	µg/L	<0.010	----
fluorene	86-73-7	E641A	0.01	µg/L	<0.010	----
indeno(1,2,3-c,d)pyrene	193-39-5	E641A	0.01	µg/L	<0.010	----
methylnaphthalene, 1-	90-12-0	E641A	0.01	µg/L	<0.010	----
methylnaphthalene, 2-	91-57-6	E641A	0.01	µg/L	<0.010	----
naphthalene	91-20-3	E641A	0.05	µg/L	<0.050	----
phenanthrene	85-01-8	E641A	0.02	µg/L	<0.020	----
pyrene	129-00-0	E641A	0.01	µg/L	<0.010	----
quinoline	6027-02-7	E641A	0.05	µg/L	<0.050	----

Qualifiers

Qualifier	*Description*
B	*Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.*

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**

Analyte	CAS Number	Method	LOR	Unit	Spike Concentration	Recovery (%) LCS	Recovery Limits (%) Low	Recovery Limits (%) High	Qualifier
Physical Tests (QCLot: 275633)									
turbidity	----	E121	0.1	NTU	200 NTU	101	85.0	115	----
Physical Tests (QCLot: 276123)									
alkalinity, total (as CaCO3)	----	E290	1	mg/L	500 mg/L	97.3	85.0	115	----
Physical Tests (QCLot: 276124)									
pH	----	E108	----	pH units	7 pH units	99.8	98.0	102	----
Physical Tests (QCLot: 276125)									
conductivity	----	E100S	2	µS/cm	146.9 µS/cm	102	80.0	120	----
Physical Tests (QCLot: 276447)									
solids, total suspended [TSS]	----	E160S	2	mg/L	150 mg/L	95.8	85.0	115	----
Physical Tests (QCLot: 276448)									
solids, total suspended [TSS]	----	E160S	2	mg/L	150 mg/L	98.2	85.0	115	----
Physical Tests (QCLot: 276449)									
solids, total dissolved [TDS]	----	E162S	10	mg/L	1000 mg/L	99.0	85.0	115	----
Anions and Nutrients (QCLot: 276227)									
bromide	24959-67-9	E235S.Br	5	mg/L	0.5 mg/L	100	85.0	115	----
Anions and Nutrients (QCLot: 276228)									
chloride	16887-00-6	E235S.Cl	50	mg/L	100 mg/L	102	90.0	110	----
Anions and Nutrients (QCLot: 276229)									
fluoride	16984-48-8	E235S.F-L	0.2	mg/L	1 mg/L	96.4	90.0	110	----
Anions and Nutrients (QCLot: 276230)									
nitrate (as N)	14797-55-8	E235S.NO3-T	0.01	mg/L	2.5 mg/L	102	90.0	110	----
Anions and Nutrients (QCLot: 276231)									
nitrite (as N)	14797-65-0	E235S.NO2-L	0.01	mg/L	0.5 mg/L	96.5	90.0	110	----
Anions and Nutrients (QCLot: 276232)									
sulfate (as SO4)	14808-79-8	E235S.SO4-L	3	mg/L	100 mg/L	104	90.0	110	----
Anions and Nutrients (QCLot: 278671)									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.2 mg/L	95.3	85.0	115	----
Anions and Nutrients (QCLot: 278672)									
phosphorus, total	7723-14-0	E372S	0.002	mg/L	0.05 mg/L	93.9	80.0	120	----
Anions and Nutrients (QCLot: 278674)									
Kjeldahl nitrogen, total [TKN]	----	E318S	0.05	mg/L	4 mg/L	104	75.0	125	----

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Organic / Inorganic Carbon (QCLot: 277906)									
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	8.57 mg/L	99.6	80.0	120	----
Organic / Inorganic Carbon (QCLot: 278673)									
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	8.57 mg/L	92.6	80.0	120	----
Total Metals (QCLot: 275621)									
aluminum, total	7429-90-5	E468S	0.005	mg/L	2 mg/L	103	80.0	120	----
antimony, total	7440-36-0	E468S	0.001	mg/L	1 mg/L	103	80.0	120	----
arsenic, total	7440-38-2	E468S	0.0004	mg/L	1 mg/L	102	80.0	120	----
barium, total	7440-39-3	E468S	0.001	mg/L	0.25 mg/L	106	80.0	120	----
beryllium, total	7440-41-7	E468S	0.0005	mg/L	0.1 mg/L	103	80.0	120	----
bismuth, total	7440-69-9	E468S	0.0005	mg/L	1 mg/L	109	80.0	120	----
cadmium, total	7440-43-9	E468S	0.00001	mg/L	0.1 mg/L	106	80.0	120	----
calcium, total	7440-70-2	E468S	1	mg/L	50 mg/L	103	80.0	120	----
cesium, total	7440-46-2	E468S	0.0005	mg/L	0.05 mg/L	97.7	80.0	120	----
chromium, total	7440-47-3	E468S	0.0005	mg/L	0.25 mg/L	104	80.0	120	----
cobalt, total	7440-48-4	E468S	0.00005	mg/L	0.25 mg/L	107	80.0	120	----
copper, total	7440-50-8	E468S	0.0005	mg/L	0.25 mg/L	107	80.0	120	----
gallium, total	7440-55-3	E468S	0.0005	mg/L	0.25 mg/L	108	80.0	120	----
iron, total	7439-89-6	E468S	0.01	mg/L	1 mg/L	107	80.0	120	----
lead, total	7439-92-1	E468S	0.00005	mg/L	0.5 mg/L	110	80.0	120	----
lithium, total	7439-93-2	E468S	0.02	mg/L	0.25 mg/L	107	80.0	120	----
magnesium, total	7439-95-4	E468S	1	mg/L	50 mg/L	101	80.0	120	----
manganese, total	7439-96-5	E468S	0.0002	mg/L	0.25 mg/L	103	80.0	120	----
molybdenum, total	7439-98-7	E468S	0.0001	mg/L	0.25 mg/L	99.3	80.0	120	----
nickel, total	7440-02-0	E468S	0.0005	mg/L	0.5 mg/L	106	80.0	120	----
phosphorus, total	7723-14-0	E468S	0.05	mg/L	10 mg/L	106	80.0	120	----
potassium, total	7440-09-7	E468S	1	mg/L	50 mg/L	105	80.0	120	----
rhenium, total	7440-15-5	E468S	0.0005	mg/L	0.1 mg/L	101	80.0	120	----
rubidium, total	7440-17-7	E468S	0.005	mg/L	0.1 mg/L	105	80.0	120	----
selenium, total	7782-49-2	E468S	0.0005	mg/L	1 mg/L	114	80.0	120	----
silver, total	7440-22-4	E468S	0.0001	mg/L	0.1 mg/L	107	80.0	120	----
strontium, total	7440-24-6	E468S	0.01	mg/L	0.25 mg/L	103	80.0	120	----
sulfur, total	7704-34-9	E468S	5	mg/L	50 mg/L	94.4	80.0	120	----
tellurium, total	13494-80-9	E468S	0.0005	mg/L	0.1 mg/L	109	80.0	120	----
thallium, total	7440-28-0	E468S	0.00005	mg/L	1 mg/L	99.0	80.0	120	----
thorium, total	7440-29-1	E468S	0.0005	mg/L	0.1 mg/L	94.4	80.0	120	----
tin, total	7440-31-5	E468S	0.001	mg/L	0.5 mg/L	98.9	80.0	120	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Spike Concentration	Recovery (%) LCS	Recovery Limits (%) Low	Recovery Limits (%) High	Qualifier
Total Metals (QCLot: 275621) - continued									
titanium, total	7440-32-6	E468S	0.005	mg/L	0.25 mg/L	101	80.0	120	----
tungsten, total	7440-33-7	E468S	0.001	mg/L	0.1 mg/L	97.4	80.0	120	----
uranium, total	7440-61-1	E468S	0.00005	mg/L	0.005 mg/L	101	80.0	120	----
vanadium, total	7440-62-2	E468S	0.0005	mg/L	0.5 mg/L	99.6	80.0	120	----
yttrium, total	7440-65-5	E468S	0.0005	mg/L	0.1 mg/L	96.7	80.0	120	----
zinc, total	7440-66-6	E468S	0.003	mg/L	0.5 mg/L	112	80.0	120	----
zirconium, total	7440-67-7	E468S	0.0005	mg/L	0.1 mg/L	95.4	80.0	120	----
Total Metals (QCLot: 275622)									
silicon, total	7440-21-3	E468S.NaSi	1	mg/L	10 mg/L	98.3	80.0	120	----
sodium, total	17341-25-2	E468S.NaSi	2.5	mg/L	50 mg/L	103	80.0	120	----
Total Metals (QCLot: 277628)									
mercury, total	7439-97-6	E508S	0.000005	mg/L	0.0001 mg/L	94.0	80.0	120	----
Dissolved Metals (QCLot: 276744)									
aluminum, dissolved	7429-90-5	E469S	0.005	mg/L	2 mg/L	101	80.0	120	----
antimony, dissolved	7440-36-0	E469S	0.001	mg/L	1 mg/L	99.6	80.0	120	----
arsenic, dissolved	7440-38-2	E469S	0.0004	mg/L	1 mg/L	106	80.0	120	----
barium, dissolved	7440-39-3	E469S	0.001	mg/L	0.25 mg/L	107	80.0	120	----
beryllium, dissolved	7440-41-7	E469S	0.0005	mg/L	0.1 mg/L	108	80.0	120	----
bismuth, dissolved	7440-69-9	E469S	0.0005	mg/L	1 mg/L	96.8	80.0	120	----
boron, dissolved	7440-42-8	E469S	0.3	mg/L	10 mg/L	98.0	80.0	120	----
cadmium, dissolved	7440-43-9	E469S	0.00001	mg/L	0.1 mg/L	105	80.0	120	----
calcium, dissolved	7440-70-2	E469S	1	mg/L	50 mg/L	102	80.0	120	----
cesium, dissolved	7440-46-2	E469S	0.0005	mg/L	0.05 mg/L	92.7	80.0	120	----
chromium, dissolved	7440-47-3	E469S	0.0005	mg/L	0.25 mg/L	101	80.0	120	----
cobalt, dissolved	7440-48-4	E469S	0.00005	mg/L	0.25 mg/L	107	80.0	120	----
copper, dissolved	7440-50-8	E469S	0.0002	mg/L	0.25 mg/L	108	80.0	120	----
gallium, dissolved	7440-55-3	E469S	0.0005	mg/L	0.25 mg/L	105	80.0	120	----
iron, dissolved	7439-89-6	E469S	0.01	mg/L	1 mg/L	104	80.0	120	----
lead, dissolved	7439-92-1	E469S	0.00005	mg/L	0.5 mg/L	108	80.0	120	----
lithium, dissolved	7439-93-2	E469S	0.02	mg/L	0.25 mg/L	104	80.0	120	----
magnesium, dissolved	7439-95-4	E469S	1	mg/L	50 mg/L	110	80.0	120	----
manganese, dissolved	7439-96-5	E469S	0.0001	mg/L	0.25 mg/L	104	80.0	120	----
molybdenum, dissolved	7439-98-7	E469S	0.0001	mg/L	0.25 mg/L	96.6	80.0	120	----
nickel, dissolved	7440-02-0	E469S	0.0005	mg/L	0.5 mg/L	106	80.0	120	----
phosphorus, dissolved	7723-14-0	E469S	0.05	mg/L	10 mg/L	90.2	80.0	120	----
potassium, dissolved	7440-09-7	E469S	1	mg/L	50 mg/L	106	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: 276744) - continued									
rhenium, dissolved	7440-15-5	E469S	0.0005	mg/L	0.1 mg/L	99.5	80.0	120	----
rubidium, dissolved	7440-17-7	E469S	0.005	mg/L	0.1 mg/L	104	80.0	120	----
selenium, dissolved	7782-49-2	E469S	0.0005	mg/L	1 mg/L	120	80.0	120	----
silver, dissolved	7440-22-4	E469S	0.0001	mg/L	0.1 mg/L	104	80.0	120	----
strontium, dissolved	7440-24-6	E469S	0.01	mg/L	0.25 mg/L	100.0	80.0	120	----
sulfur, dissolved	7704-34-9	E469S	5	mg/L	50 mg/L	97.1	80.0	120	----
tellurium, dissolved	13494-80-9	E469S	0.0005	mg/L	0.1 mg/L	119	80.0	120	----
thallium, dissolved	7440-28-0	E469S	0.00005	mg/L	1 mg/L	99.1	80.0	120	----
thorium, dissolved	7440-29-1	E469S	0.0005	mg/L	0.1 mg/L	87.7	80.0	120	----
tin, dissolved	7440-31-5	E469S	0.001	mg/L	0.5 mg/L	95.0	80.0	120	----
titanium, dissolved	7440-32-6	E469S	0.005	mg/L	0.25 mg/L	104	80.0	120	----
tungsten, dissolved	7440-33-7	E469S	0.001	mg/L	0.1 mg/L	95.6	80.0	120	----
uranium, dissolved	7440-61-1	E469S	0.00005	mg/L	0.005 mg/L	99.2	80.0	120	----
vanadium, dissolved	7440-62-2	E469S	0.0005	mg/L	0.5 mg/L	99.9	80.0	120	----
yttrium, dissolved	7440-65-5	E469S	0.0005	mg/L	0.1 mg/L	94.2	80.0	120	----
zinc, dissolved	7440-66-6	E469S	0.001	mg/L	0.5 mg/L	115	80.0	120	----
zirconium, dissolved	7440-67-7	E469S	0.0005	mg/L	0.1 mg/L	93.7	80.0	120	----
silicon, dissolved	7440-21-3	E469S.NaSi	1	mg/L	10 mg/L	102	80.0	120	----
sodium, dissolved	17341-25-2	E469S.NaSi	2.5	mg/L	50 mg/L	107	80.0	120	----
mercury, dissolved	7439-97-6	E509S	0.000005	mg/L	0.0001 mg/L	99.3	80.0	120	----
Volatile Organic Compounds (QCLot: 279502)									
benzene	71-43-2	E611A	0.5	µg/L	100 µg/L	102	70.0	130	----
ethylbenzene	100-41-4	E611A	0.5	µg/L	100 µg/L	103	70.0	130	----
methyl-tert-butyl ether [MTBE]	1634-04-4	E611A	0.5	µg/L	100 µg/L	105	70.0	130	----
styrene	100-42-5	E611A	0.5	µg/L	100 µg/L	101	70.0	130	----
toluene	108-88-3	E611A	0.5	µg/L	100 µg/L	108	70.0	130	----
xylene, m+p-	179601-23-1	E611A	0.4	µg/L	200 µg/L	112	70.0	130	----
xylene, o-	95-47-6	E611A	0.3	µg/L	100 µg/L	101	70.0	130	----
Volatile Organic Compounds (QCLot: 279811)									
benzene	71-43-2	E611A	0.5	µg/L	100 µg/L	97.8	70.0	130	----
ethylbenzene	100-41-4	E611A	0.5	µg/L	100 µg/L	89.5	70.0	130	----
methyl-tert-butyl ether [MTBE]	1634-04-4	E611A	0.5	µg/L	100 µg/L	103	70.0	130	----
styrene	100-42-5	E611A	0.5	µg/L	100 µg/L	96.4	70.0	130	----
toluene	108-88-3	E611A	0.5	µg/L	100 µg/L	97.6	70.0	130	----
xylene, m+p-	179601-23-1	E611A	0.4	µg/L	200 µg/L	107	70.0	130	----
xylene, o-	95-47-6	E611A	0.3	µg/L	100 µg/L	98.0	70.0	130	----

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
Hydrocarbons (QCLot: 278286)									
F2 (C10-C16)	----	E601	100	µg/L	3538 µg/L	110	70.0	130	----
F3 (C16-C34)	----	E601	250	µg/L	7053 µg/L	100	70.0	130	----
F4 (C34-C50)	----	E601	250	µg/L	5051 µg/L	99.2	70.0	130	----
Hydrocarbons (QCLot: 279503)									
F1 (C6-C10)	----	E581.VH+F1	100	µg/L	6310 µg/L	92.2	70.0	130	----
VHw (C6-C10)	----	E581.VH+F1	100	µg/L	6310 µg/L	92.0	70.0	130	----
Hydrocarbons (QCLot: 279810)									
F1 (C6-C10)	----	E581.VH+F1	100	µg/L	6310 µg/L	95.4	70.0	130	----
VHw (C6-C10)	----	E581.VH+F1	100	µg/L	6310 µg/L	87.2	70.0	130	----
Polycyclic Aromatic Hydrocarbons (QCLot: 278285)									
acenaphthene	83-32-9	E641A	0.01	µg/L	0.5 µg/L	98.8	60.0	130	----
acenaphthylene	208-96-8	E641A	0.01	µg/L	0.5 µg/L	106	60.0	130	----
acridine	260-94-6	E641A	0.01	µg/L	0.5 µg/L	106	60.0	130	----
anthracene	120-12-7	E641A	0.01	µg/L	0.5 µg/L	121	60.0	130	----
benz(a)anthracene	56-55-3	E641A	0.01	µg/L	0.5 µg/L	120	60.0	130	----
benzo(a)pyrene	50-32-8	E641A	0.005	µg/L	0.5 µg/L	99.6	60.0	130	----
benzo(b+j)fluoranthene	----	E641A	0.01	µg/L	0.5 µg/L	74.5	60.0	130	----
benzo(g,h,i)perylene	191-24-2	E641A	0.01	µg/L	0.5 µg/L	89.8	60.0	130	----
benzo(k)fluoranthene	207-08-9	E641A	0.01	µg/L	0.5 µg/L	78.2	60.0	130	----
chrysene	218-01-9	E641A	0.01	µg/L	0.5 µg/L	109	60.0	130	----
dibenz(a,h)anthracene	53-70-3	E641A	0.005	µg/L	0.5 µg/L	105	60.0	130	----
fluoranthene	206-44-0	E641A	0.01	µg/L	0.5 µg/L	106	60.0	130	----
fluorene	86-73-7	E641A	0.01	µg/L	0.5 µg/L	109	60.0	130	----
indeno(1,2,3-c,d)pyrene	193-39-5	E641A	0.01	µg/L	0.5 µg/L	130	60.0	130	----
methylnaphthalene, 1-	90-12-0	E641A	0.01	µg/L	0.5 µg/L	107	60.0	130	----
methylnaphthalene, 2-	91-57-6	E641A	0.01	µg/L	0.5 µg/L	107	60.0	130	----
naphthalene	91-20-3	E641A	0.05	µg/L	0.5 µg/L	103	50.0	130	----
phenanthrene	85-01-8	E641A	0.02	µg/L	0.5 µg/L	109	60.0	130	----
pyrene	129-00-0	E641A	0.01	µg/L	0.5 µg/L	110	60.0	130	----
quinoline	6027-02-7	E641A	0.05	µg/L	0.5 µg/L	106	60.0	130	----

Matrix Spike (MS) Report

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

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Anions and Nutrients (QCLot: 276227)										
VA21B7949-002	MP-06 North	bromide	24959-67-9	E235S.Br	52.5 mg/L	50 mg/L	105	75.0	125	----
Anions and Nutrients (QCLot: 276228)										
VA21B7949-002	MP-06 North	chloride	16887-00-6	E235S.Cl	ND mg/L	10000 mg/L	ND	75.0	125	----
Anions and Nutrients (QCLot: 276229)										
VA21B7949-002	MP-06 North	fluoride	16984-48-8	E235S.F-L	7.86 mg/L	10 mg/L	78.6	75.0	125	----
Anions and Nutrients (QCLot: 276230)										
VA21B7949-002	MP-06 North	nitrate (as N)	14797-55-8	E235S.NO3-T	7.64 mg/L	7.5 mg/L	102	75.0	125	----
Anions and Nutrients (QCLot: 276231)										
VA21B7949-002	MP-06 North	nitrite (as N)	14797-65-0	E235S.NO2-L	4.37 mg/L	5 mg/L	87.4	75.0	125	----
Anions and Nutrients (QCLot: 276232)										
VA21B7949-002	MP-06 North	sulfate (as SO4)	14808-79-8	E235S.SO4-L	ND mg/L	1000 mg/L	ND	75.0	125	----
Anions and Nutrients (QCLot: 278671)										
VA21B7949-002	MP-06 North	ammonia, total (as N)	7664-41-7	E298	0.101 mg/L	0.1 mg/L	101	75.0	125	----
Anions and Nutrients (QCLot: 278672)										
VA21B7949-002	MP-06 North	phosphorus, total	7723-14-0	E372S	0.0935 mg/L	0.1 mg/L	93.5	70.0	130	----
Anions and Nutrients (QCLot: 278674)										
VA21B7949-002	MP-06 North	Kjeldahl nitrogen, total [TKN]	----	E318S	2.83 mg/L	2.5 mg/L	113	70.0	130	----
Organic / Inorganic Carbon (QCLot: 277906)										
VA21B7949-002	MP-06 North	carbon, dissolved organic [DOC]	----	E358-L	4.99 mg/L	5 mg/L	99.8	70.0	130	----
Organic / Inorganic Carbon (QCLot: 278673)										
VA21B7949-002	MP-06 North	carbon, total organic [TOC]	----	E355-L	5.01 mg/L	5 mg/L	100	70.0	130	----
Total Metals (QCLot: 275621)										
VA21B7949-002	MP-06 North	aluminum, total	7429-90-5	E468S	0.495 mg/L	0.4 mg/L	124	70.0	130	----
		antimony, total	7440-36-0	E468S	0.0363 mg/L	0.04 mg/L	90.8	70.0	130	----
		arsenic, total	7440-38-2	E468S	0.0366 mg/L	0.04 mg/L	91.5	70.0	130	----
		barium, total	7440-39-3	E468S	0.0412 mg/L	0.04 mg/L	103	70.0	130	----
		beryllium, total	7440-41-7	E468S	0.0957 mg/L	0.08 mg/L	120	70.0	130	----
		bismuth, total	7440-69-9	E468S	0.0157 mg/L	0.02 mg/L	78.4	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: 275621) - continued										
VA21B7949-002	MP-06 North	boron, total	7440-42-8	E468S	ND mg/L	0.2 mg/L	ND	70.0	130	----
		cadmium, total	7440-43-9	E468S	0.00682 mg/L	0.008 mg/L	85.3	70.0	130	----
		calcium, total	7440-70-2	E468S	ND mg/L	8 mg/L	ND	70.0	130	----
		cesium, total	7440-46-2	E468S	0.0189 mg/L	0.02 mg/L	94.3	70.0	130	----
		chromium, total	7440-47-3	E468S	0.0886 mg/L	0.08 mg/L	111	70.0	130	----
		cobalt, total	7440-48-4	E468S	0.0383 mg/L	0.04 mg/L	95.8	70.0	130	----
		copper, total	7440-50-8	E468S	0.0344 mg/L	0.04 mg/L	86.0	70.0	130	----
		gallium, total	7440-55-3	E468S	0.00615 mg/L	0.005 mg/L	123	70.0	130	----
		iron, total	7439-89-6	E468S	4.16 mg/L	4 mg/L	104	70.0	130	----
		lead, total	7439-92-1	E468S	0.0329 mg/L	0.04 mg/L	82.2	70.0	130	----
		lithium, total	7439-93-2	E468S	0.234 mg/L	0.2 mg/L	117	70.0	130	----
		magnesium, total	7439-95-4	E468S	ND mg/L	2 mg/L	ND	70.0	130	----
		manganese, total	7439-96-5	E468S	0.0446 mg/L	0.04 mg/L	111	70.0	130	----
		molybdenum, total	7439-98-7	E468S	0.0400 mg/L	0.04 mg/L	100	70.0	130	----
		nickel, total	7440-02-0	E468S	0.0717 mg/L	0.08 mg/L	89.6	70.0	130	----
		phosphorus, total	7723-14-0	E468S	23.9 mg/L	20 mg/L	120	70.0	130	----
		potassium, total	7440-09-7	E468S	ND mg/L	8 mg/L	ND	70.0	130	----
		rhenium, total	7440-15-5	E468S	0.00449 mg/L	0.005 mg/L	89.8	70.0	130	----
		rubidium, total	7440-17-7	E468S	ND mg/L	0.04 mg/L	ND	70.0	130	----
		selenium, total	7782-49-2	E468S	0.0800 mg/L	0.08 mg/L	100.0	70.0	130	----
		silver, total	7440-22-4	E468S	0.00673 mg/L	0.008 mg/L	84.1	70.0	130	----
		strontium, total	7440-24-6	E468S	ND mg/L	0.04 mg/L	ND	70.0	130	----
		sulfur, total	7704-34-9	E468S	ND mg/L	40 mg/L	ND	70.0	130	----
		tellurium, total	13494-80-9	E468S	0.0629 mg/L	0.08 mg/L	78.7	70.0	130	----
		thallium, total	7440-28-0	E468S	0.00649 mg/L	0.008 mg/L	81.2	70.0	130	----
		thorium, total	7440-29-1	E468S	0.0374 mg/L	0.04 mg/L	93.6	70.0	130	----
		tin, total	7440-31-5	E468S	0.0345 mg/L	0.04 mg/L	86.2	70.0	130	----
		titanium, total	7440-32-6	E468S	0.100 mg/L	0.08 mg/L	125	70.0	130	----
		tungsten, total	7440-33-7	E468S	0.0364 mg/L	0.04 mg/L	90.9	70.0	130	----
		uranium, total	7440-61-1	E468S	0.00690 mg/L	0.008 mg/L	86.3	70.0	130	----
		vanadium, total	7440-62-2	E468S	0.230 mg/L	0.2 mg/L	115	70.0	130	----
		yttrium, total	7440-65-5	E468S	0.0124 mg/L	0.01 mg/L	124	70.0	130	----
		zinc, total	7440-66-6	E468S	0.669 mg/L	0.8 mg/L	83.6	70.0	130	----
		zirconium, total	7440-67-7	E468S	0.0856 mg/L	0.08 mg/L	107	70.0	130	----
Total Metals (QCLot: 275622)										
VA21B7949-002	MP-06 North	silicon, total	7440-21-3	E468S.NaSi	459 mg/L	500 mg/L	91.8	70.0	130	----

Sub-Matrix: **Water**

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
					Concentration	Target	MS	Low	High	Qualifier
Total Metals (QCLot: 275622) - continued										
VA21B7949-002	MP-06 North	sodium, total	17341-25-2	E468S.NaSi	ND mg/L	100 mg/L	ND	70.0	130	----
Total Metals (QCLot: 277628)										
VA21B7949-002	MP-06 North	mercury, total	7439-97-6	E508S	0.0000904 mg/L	0.0001 mg/L	90.4	70.0	130	----
Dissolved Metals (QCLot: 276744)										
VA21B7949-002	MP-06 North	aluminum, dissolved	7429-90-5	E469S	0.516 mg/L	0.4 mg/L	129	70.0	130	----
		antimony, dissolved	7440-36-0	E469S	0.0381 mg/L	0.04 mg/L	95.3	70.0	130	----
		arsenic, dissolved	7440-38-2	E469S	0.0361 mg/L	0.04 mg/L	90.2	70.0	130	----
		barium, dissolved	7440-39-3	E469S	0.0428 mg/L	0.04 mg/L	107	70.0	130	----
		beryllium, dissolved	7440-41-7	E469S	0.0950 mg/L	0.08 mg/L	119	70.0	130	----
		bismuth, dissolved	7440-69-9	E469S	0.0168 mg/L	0.02 mg/L	84.1	70.0	130	----
		boron, dissolved	7440-42-8	E469S	ND mg/L	0.2 mg/L	ND	70.0	130	----
		cadmium, dissolved	7440-43-9	E469S	0.00667 mg/L	0.008 mg/L	83.4	70.0	130	----
		calcium, dissolved	7440-70-2	E469S	ND mg/L	8 mg/L	ND	70.0	130	----
		cesium, dissolved	7440-46-2	E469S	0.0200 mg/L	0.02 mg/L	100	70.0	130	----
		chromium, dissolved	7440-47-3	E469S	0.0871 mg/L	0.08 mg/L	109	70.0	130	----
		cobalt, dissolved	7440-48-4	E469S	0.0382 mg/L	0.04 mg/L	95.5	70.0	130	----
		copper, dissolved	7440-50-8	E469S	0.0332 mg/L	0.04 mg/L	83.1	70.0	130	----
		gallium, dissolved	7440-55-3	E469S	0.00581 mg/L	0.005 mg/L	116	70.0	130	----
		iron, dissolved	7439-89-6	E469S	4.18 mg/L	4 mg/L	105	70.0	130	----
		lead, dissolved	7439-92-1	E469S	0.0352 mg/L	0.04 mg/L	88.1	70.0	130	----
		lithium, dissolved	7439-93-2	E469S	0.229 mg/L	0.2 mg/L	114	70.0	130	----
		magnesium, dissolved	7439-95-4	E469S	ND mg/L	2 mg/L	ND	70.0	130	----
		manganese, dissolved	7439-96-5	E469S	0.0445 mg/L	0.04 mg/L	111	70.0	130	----
		molybdenum, dissolved	7439-98-7	E469S	0.0447 mg/L	0.04 mg/L	112	70.0	130	----
		nickel, dissolved	7440-02-0	E469S	0.0697 mg/L	0.08 mg/L	87.1	70.0	130	----
		phosphorus, dissolved	7723-14-0	E469S	20.3 mg/L	20 mg/L	101	70.0	130	----
		potassium, dissolved	7440-09-7	E469S	ND mg/L	8 mg/L	ND	70.0	130	----
		rhenium, dissolved	7440-15-5	E469S	0.00424 mg/L	0.005 mg/L	84.8	70.0	130	----
		rubidium, dissolved	7440-17-7	E469S	ND mg/L	0.04 mg/L	ND	70.0	130	----
		selenium, dissolved	7782-49-2	E469S	0.0763 mg/L	0.08 mg/L	95.4	70.0	130	----
		silver, dissolved	7440-22-4	E469S	0.00737 mg/L	0.008 mg/L	92.2	70.0	130	----
		strontium, dissolved	7440-24-6	E469S	ND mg/L	0.04 mg/L	ND	70.0	130	----
		sulfur, dissolved	7704-34-9	E469S	ND mg/L	40 mg/L	ND	70.0	130	----
		tellurium, dissolved	13494-80-9	E469S	0.0683 mg/L	0.08 mg/L	85.3	70.0	130	----
		thallium, dissolved	7440-28-0	E469S	0.00688 mg/L	0.008 mg/L	85.9	70.0	130	----
		thorium, dissolved	7440-29-1	E469S	0.0384 mg/L	0.04 mg/L	96.1	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*
Dissolved Metals (QCLot: 276744) - continued										
VA21B7949-002	MP-06 North	tin, dissolved	7440-31-5	E469S	0.0370 mg/L	0.04 mg/L	92.4	70.0	130	----
		titanium, dissolved	7440-32-6	E469S	0.103 mg/L	0.08 mg/L	129	70.0	130	----
		tungsten, dissolved	7440-33-7	E469S	0.0389 mg/L	0.04 mg/L	97.2	70.0	130	----
		uranium, dissolved	7440-61-1	E469S	0.00739 mg/L	0.008 mg/L	92.4	70.0	130	----
		vanadium, dissolved	7440-62-2	E469S	0.230 mg/L	0.2 mg/L	115	70.0	130	----
		yttrium, dissolved	7440-65-5	E469S	0.00592 mg/L	0.005 mg/L	118	70.0	130	----
		zinc, dissolved	7440-66-6	E469S	0.656 mg/L	0.8 mg/L	82.0	70.0	130	----
		zirconium, dissolved	7440-67-7	E469S	0.0930 mg/L	0.08 mg/L	116	70.0	130	----
Dissolved Metals (QCLot: 276745)										
VA21B7949-002	MP-06 North	silicon, dissolved	7440-21-3	E469S.NaSi	479 mg/L	500 mg/L	95.8	70.0	130	----
		sodium, dissolved	17341-25-2	E469S.NaSi	ND mg/L	100 mg/L	ND	70.0	130	----
Dissolved Metals (QCLot: 277158)										
VA21B7949-002	MP-06 North	mercury, dissolved	7439-97-6	E509S	0.0000964 mg/L	0.0001 mg/L	96.4	70.0	130	----
Volatile Organic Compounds (QCLot: 279502)										
VA21B7908-002	Anonymous	benzene	71-43-2	E611A	98.5 µg/L	100 µg/L	98.5	60.0	140	----
		ethylbenzene	100-41-4	E611A	99.7 µg/L	100 µg/L	99.7	60.0	140	----
		methyl-tert-butyl ether [MTBE]	1634-04-4	E611A	102 µg/L	100 µg/L	102	60.0	140	----
		styrene	100-42-5	E611A	98.9 µg/L	100 µg/L	98.9	60.0	140	----
		toluene	108-88-3	E611A	103 µg/L	100 µg/L	103	60.0	140	----
		xylene, m+p-	179601-23-1	E611A	221 µg/L	200 µg/L	110	60.0	140	----
		xylene, o-	95-47-6	E611A	99.4 µg/L	100 µg/L	99.4	60.0	140	----
Volatile Organic Compounds (QCLot: 279811)										
VA21B7949-009	MP-05-Source-FBLANK3	benzene	71-43-2	E611A	87.3 µg/L	100 µg/L	87.3	60.0	140	----
		ethylbenzene	100-41-4	E611A	80.4 µg/L	100 µg/L	80.4	60.0	140	----
		methyl-tert-butyl ether [MTBE]	1634-04-4	E611A	98.6 µg/L	100 µg/L	98.6	60.0	140	----
		styrene	100-42-5	E611A	86.9 µg/L	100 µg/L	86.9	60.0	140	----
		toluene	108-88-3	E611A	80.6 µg/L	100 µg/L	80.6	60.0	140	----
		xylene, m+p-	179601-23-1	E611A	190 µg/L	200 µg/L	94.8	60.0	140	----
		xylene, o-	95-47-6	E611A	87.9 µg/L	100 µg/L	87.9	60.0	140	----
Hydrocarbons (QCLot: 279503)										
VA21B7949-001	MP-06 Source	F1 (C6-C10)	----	E581.VH+F1	5450 µg/L	6310 µg/L	86.4	60.0	140	----
		VHw (C6-C10)	----	E581.VH+F1	5330 µg/L	6310 µg/L	84.4	60.0	140	----
Hydrocarbons (QCLot: 279810)										
VA21B8055-001	Anonymous	F1 (C6-C10)	----	E581.VH+F1	4360 µg/L	6310 µg/L	69.2	60.0	140	----
		VHw (C6-C10)	----	E581.VH+F1	3940 µg/L	6310 µg/L	62.5	60.0	140	----

ALS www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

COC Number: 20 - 920786

Canada Toll Free: 1 800 668 9878

Page of

Report To	Contact and company name below will appear on the final report
Company:	Golder Associates
Contact:	Trish Tomlieus/Elaine Irving
Phone:	250-881-7372
	Company address below will appear on the final report
Street:	200-2920 Virtual Way
City/Province:	Vancouver, BC
Postal Code:	V5M 0C4
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	
Contact:	

Reports / Recipients

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

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

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

Select Distribution: ☐ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax: ptomlieus@golder.com

Email 2: Elaine_Irving@golder.com

Email 3:

Invoice Recipients

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax:

Email 2:

Turnaround Time (TAT) Requested

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

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

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

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

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

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

AFFIX ALS BARCODE LABEL HERE (ALS use only)

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

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

Project Information

ALS Account # / Quote #: Q84262

Job #: 1663724-44000-03

PO / AFE:

LSD:

ALS Lab Work Order # (ALS use only): 7949

Oil and Gas Required Fields (client use)

AFE/Cost Center: PO#

Major/Minor Code: Routing Code:

Requisitioner:

Location:

ALS Contact: Sampler:

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

ALS Sample # (ALS use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	General (pH, alkalinity, TSS, turbidity, conductivity)	Dissolved Metals (F/P)	Total Metals (P)	Dissolved Mercury (F/P)	Total Mercury (P)	TOC, TKN (P)	BTEX/F1 (P)	F2-F4/PAH (P)	SAMPLES ON HOLD	EXTENDED STORAGE REQUIRED	SUSPECTED HAZARD (see notes)
	HP-06 Source	19-Aug-21	10:31	seawater	10	X	X	X	X	X	X	X	X			
	HP-06 North	19-Aug-21	10:58	↓	6	X	X	X	X	X	X					
	HP-06 ENE	19-Aug-21	10:46		10	X	X	X	X	X	X	X	X			
	HP-06 WNW	19-Aug-21	11:08		6	X	X	X	X	X	X					
	HP-05 Source	19-Aug-21	9:17		10	X	X	X	X	X	X	X	X			
	HP-05 North	19-Aug-21	9:54		10	X	X	X	X	X	X	X	X			
	HP-05 ENE	19-Aug-21	9:37		6	X	X	X	X	X	X					
	HP-05 WNW	19-Aug-21	10:15		6	X	X	X	X	X	X					
	HP-05-Source-FBLANK3	19-Aug-21	9:25		10	X	X	X	X	X	X	X	X			

Environmental Division
Vancouver
Work Order Reference
VA21B7949
Telephone : +1 604 253 4188

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)

August 22, 2021 Both cooler opened to add ice & to freeze ice pack.
August 23, 2021 07:30 ET. Both cooler opened to replace ice with ice packs.

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: 6.6 C

SHIPMENT RELEASE (client use)		INITIAL SHIPMENT RECEPTION (ALS use only)			FINAL SHIPMENT RECEPTION (ALS use only)		
Released by: Jeremy Corbin	Date: 19 Aug 2021 Time:	Received by:	Date:	Time:	Received by: JCQ	Date: 24 June	Time: 8:20AM

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

AUG 2020 FRONT

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

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

APPENDIX 2C

Marine Water Quality - Screening Table

Appendix XX: Water Quality Screening
Table for Marine Environmental Effects Monitoring Program 2021

Parameter	CCME AQUATIC MARINE WATER - LONG TERM	CCME AQUATIC MARINE WATER - SHORT TERM	Unit																				
			Station	MP-05																			
			Sample Name			MP-05 ENE					MP-05 North					MP-05-Source					MP-05 WNW		
			Sample Date	2021-08-02	2021-08-16	2021-08-19	2021-08-08	2021-08-14	2021-08-02	2021-08-16	2021-08-19	2021-08-08	2021-08-14	2021-08-08	2021-08-14	2021-08-02	2021-08-16	2021-08-19	2021-08-02	2021-08-16	2021-08-19	2021-08-08	2021-08-14
			FIELD_SDG	VA21B6250	VA21B7539	VA21B7949	VA21B6876	YL2101029	VA21B6250	VA21B7539	VA21B7949	VA21B6876	YL2101029	VA21B6876	YL2101029	VA21B6250	VA21B7539	VA21B7949	VA21B6250	VA21B7539	VA21B7949	VA21B6876	YL2101029
			SAMPLE_TYPE_CODE	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Anions + Nutrients																							
Alkalinity, Total as CaCO3			µg/L	91800	90200	92400	85600	102000	85700	87400	90800	91600	93100	92700	88100	86800	88900	91000	88800	89100	91900	91900	95900
Bromide (Br)			µg/L	25500	15400	10200	44100	39900	18800	12000	12800	49500	< 5000	47900	13200	18200	10100	7900	20900	12800	10400	49800	48400
Chloride (Cl)			µg/L	7700000	4740000	3300000	12600000	12000000	5470000	3790000	3950000	14200000	< 50000	13700000	4090000	5320000	3140000	2920000	6050000	3990000	3590000	14200000	14300000
Fluoride (F)			µg/L	320	280	< 200	630	760	260	220	210	660	620	650	250	240	200	< 200	290	240	< 200	660	700
Nitrate (as N)	339000	45000	µg/L	< 10	28	43	27	< 10	< 10	< 10	< 10	< 10	< 10	212	< 10	53	21	12	12	< 10	< 10	< 10	< 10
Nitrite (as N)			µg/L	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Ammonia (as N)			µg/L	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Total Kjeldahl Nitrogen			µg/L	96	94	100	94	< 50	80	92	88	84	< 50	106	< 50	85	69	115	85	97	88	89	< 50
Sulfate (SO4)			µg/L	1060000	652000	398000	1690000	2080000	779000	508000	509000	1840000	1600000	1870000	570000	738000	440000	395000	912000	559000	482000	1890000	1900000
Phosphorus, Total			µg/L	10.7	7.2	12.0	17.7	17.8	16.6	< 4.0	7.6	16.9	13.3	35.0	9.5	13.3	< 4.0	9.7	10.9	4.4	7.2	17.1	16.3
Phosphorus, Dissolved			µg/L	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50
Carbons																							
Dissolved Organic Carbon			µg/L	1380	1160	1530	1790	1030	< 500	1220	1470	1340	970	1270	1040	1150	1180	1630	1150	1140	1340	1060	990
Field + Physical																							
Conductivity			uS/cm	21900	14200	9730	33500	40100	16800	11100	11900	37000	31500	37300	12100	15900	9690	9470	19600	12300	11200	36600	37100
Total Dissolved Solids			µg/L	14100000	8100000	6390000	24400000	26000000	10700000	6360000	8050000	25000000	21400000	25000000	7000000	10500000	5730000	5690000	12400000	7140000	7070000	25300000	23000000
Total Suspended Solids			µg/L	< 2000	< 2000	< 2000	4000	< 2000	< 2000	< 2000	< 2000	4600	< 2000	< 2000	2700	< 2000	< 2000	< 2000	< 2000	< 2000	< 2000	< 2000	4700
Turbidity			NTU	0.49	0.99	0.60	0.51	0.10	0.31	0.69	0.54	0.34	0.44	0.13	1.68	0.37	0.88	0.70	0.26	0.87	0.46	0.29	0.16
Salinity			PSU	13.2	8.0	5.4	21.6	25.5	9.9	6.2	6.7	24.1	19.5	24.4	6.9	9.3	5.3	5.2	11.7	6.9	6.2	23.8	23.4
Total Organic Carbon			µg/L	970	1220	1390	840	960	930	1240	1400	780	940	790	980	1040	1240	1540	890	1150	1370	860	970
Dissolved Organic Carbon			µg/L	1380	1160	1530	1790	1030	< 500	1220	1470	1340	970	1270	1040	1150	1180	1630	1150	1140	1340	1060	990
Hardness, Calcium Carbonate (Dissolved)			µg/L	2640000	1340000	1020000	4860000	4640000	1990000	1100000	1270000	4840000	3240000	4730000	1140000	1830000	933000	996000	2300000	1200000	1220000	4630000	4220000
Hardness, Calcium Carbonate (Total)			µg/L	2770000	-	-	-	-	2020000	-	-	-	-	-	-	1930000	-	-	2410000	-	-	-	-
Hydrocarbons																							
Acenaphthene			µg/L	-	-	-	-	-	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	-	-	-	-	-
Acenaphthylene			µg/L	-	-	-	-	-	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	-	-	-	-	-
Acridine			µg/L	-	-	-	-	-	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	-	-	-	-	-
Anthracene			µg/L	-	-	-	-	-	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	-	-	-	-	-
Benz(a)anthracene			µg/L	-	-	-	-	-	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	-	-	-	-	-
Benzo(a)pyrene			µg/L	-	-	-	-	-	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	-	-	-	-	-
Benzo(g,h,i)perylene			µg/L	-	-	-	-	-	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	-	-	-	-	-
Benzo(k)fluoranthene			µg/L	-	-	-	-	-	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	-	-	-	-	-
Chrysene			µg/L	-	-	-	-	-	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	-	-	-	-	-
Dibenz(a,h)anthracene			µg/L	-	-	-	-	-	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	-	-	-	-	-
Fluoranthene			µg/L	-	-	-	-	-	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	-	-	-	-	-
Benzo(b,j) fluoranthene			µg/L	-	-	-	-	-	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	-	-	-	-	-
Fluorene			µg/L	-	-	-	-	-	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	-	-	-	-	-
Indeno(1,2,3-c,d)pyrene			µg/L	-	-	-	-	-	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	-	-	-	-	-
Naphthalene	1.4		µg/L	-	-	-	-	-	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	-	-	-	-	-
Phenanthrene			µg/L	-	-	-	-	-	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	-	-	-	-	-
Pyrene			µg/L	-	-	-	-	-	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	-	-	-	-	-
Quinoline			µg/L	-	-	-	-	-	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	-	-	-	-	-
1- & 2-Methylnaphthalene			µg/L	-	-	-	-	-	-	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	-	< 0.015	< 0.015	-	-	-	-	-
2-methylnaphthalene			µg/L	-	-	-	-	-	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	0.013	< 0.010	< 0.010	< 0.010	-	-	-	-	-
PAH, Low Molecular Weight			µg/L	-	-	-	-	-	-	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	-	< 0.06	< 0.06	-	-	-	-	-
PAH, High Molecular Weight			µg/L	-	-	-	-	-	-	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	-	< 0.03	< 0.03	-	-	-	-	-
VPH (C6-C10)			µg/L	-	-	-	-	-	-	< 100	< 100	< 100	< 100	< 100	< 100	-	< 100	< 100	-	-	-	-	-
Petroleum Hydrocarbons - F1 (C6-C10)			µg/L	-	-	-	-	-	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100	-	-	-	-	-
Petroleum Hydrocarbons - F2 (C10-C16)			µg/L	-	-	-	-	-	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100	-	-	-	-	-
Petroleum Hydrocarbons - F3 (C16-C34)			µg/L	-	-	-	-	-	< 250	< 250	< 250	< 250	< 250	< 250	< 250	< 250	< 250	< 250	-	-	-	-	-
Petroleum Hydrocarbons - F4 (C34-C50)			µg/L	-	-	-	-	-	< 250	< 250	< 250	< 250	< 250	< 250	< 250	< 250	< 250	< 250	-	-	-	-	-
1-Methylnaphthalene			µg/L	-	-	-	-	-	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	-	-	-	-	-
Benzo[b,j,k]fluoranthene			µg/L	-	-	-	-	-	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	-	-	-	-	-
Volatile Hydrocarbons (C6-C10)			µg/L	-	-	-	-	-	-	< 100	< 100	< 100	< 100	< 100	< 100	-	< 100	< 100	-	-	-	-	-
Volatile Petroleum Hydrocarbons (C6-C10)			µg/L	-	-	-	-	-	-	< 100	< 100	< 100	< 100	< 100	< 100	-	< 100	< 100	-	-	-	-	-
PAHs, total (EPA16)			µg/L	-	-	-	-	-	-	< 0.065	< 0.065	< 0.065	< 0.065	< 0.065	< 0.065	-	< 0.065	< 0.065	-	-	-	-	-
Benzo(a)pyrene Total Potency Equivalence (TPE)			µg/L	-	-	-	-	-	-	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	-	< 0.010	< 0.010	-	-	-	-	-
Metals, Dissolved																							
pH	7.0 - 8.7		pH units	7.96	8.01	8.02	7.89	7.96	7.96	8.01	7.99	7.99	7.96	8.00	8.02	7.98	8.02	8.02	7.98	8.01	7.99	8.00	7.95
Aluminum			µg/L	< 5.0	< 5.0	6.1	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Antimony			µg/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Arsenic	12.5		µg/L	0.67	0.40	< 0.40	1.24	1.37	0.45	< 0.40	< 0.40	1.16	0.96	1.17	< 0.40	0.48	< 0.40	< 0.40	0.54	< 0.40	< 0.40	1.15	1.20
Barium			µg/L	5.4	4.6	4.8	7.0	7.6	4.8	4.5	5.1	7.0	6.5	6.9	4.5	4.7	4.4	4.8	5.0	4.4	4.9	6.8	7.6
Beryllium			µg/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Bismuth			µg/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Boron			µg/L	1750	950	640	3460	3100	1290	780	830	3500	2220	3360	840	1210	710	670	1520	860	780	3450	2840
Cadmium	0.12		µg/L	0.019	< 0.010	< 0.010	0.030	0.026	0.015	< 0.010	< 0.010	0.028	0.019	0.024	0.012	0.016	< 0.010	< 0.010	0.014	0.012	< 0.010	0.028	0.025
Calcium			µg/L	183000	101000	78200	335000	306000	139000	85700	91900	333000	224000	331000	93600	131000	78400	78900	159000	92600	88600	330000	284000
Chromium			µg/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Cobalt			µg/L	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
Copper			µg/L	0.31	0.37	0.81	0.40	0.72	0.38	0.88	0.61	0.48	0.28	0.58	0.27	0.57	0.34	0.83	0.35	0.37	0.68	0.30	0.51
Iron			µg/L	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Lead			µg/L	< 0.050	< 0.050	0.094	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	0.069	< 0.050	< 0.050
Lithium			µg/L	74	37	27	152	124	52	31	35	152	89	151	32	48	26	28	63	35	33	150	118
Magnesium			µg/L	530000	265000	200000	978000	940000	398000	216000	253000	974000	650000	948000	220000	366000	179000	194000	463000	236000	242000	925000	853000
Manganese			µg/L	0.60	0.69	0.70	0.92	0.70	0.57	0.60	0.64	0.89	0.72	0.95	0.49	0.58	0.61	0.70	0.57	0.62	0.56	0.95	0.74
Mercury	0.016		µg/L	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Molybdenum			µg/L	4.40	2.42	1.73	8.38	7.92	3.19	2.02	2.28	8.32	5.91	8.07	2.21	3.00	1.78	1.77	3.71	2.32	2.09	8.36	7.60
Nickel			µg/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	0.51	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Phosphorus			µg/L	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50
Potassium			µg/L	165000	86400	60200	320000	332000	121000	68300	78400	322000	220000	316000	74900	113000	56400	61200	144000	76500	73500	309000	298000
Selenium			µg/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Silicon			µg/L	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000
Silver		7.5	µg/L	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Sodium			µg/L	4440000	2190000	1730000	7400000	7300000	3060000	1820000	2180000	7610000	5410000	7310000	2010000	3240000	1520000	1730000	3760000	2020000	2080000	7260000	6930000
Strontium			µg/L	2950	1620	1110	5780	5460	2190	1330	1440	5820	4070	5610	1460	2090	1150	1120	2570	1500	1370	5720	5220
Sulphur (Colloidal)			µg/L	398000	211000	144000	800000	790000	282000	164000	194000	793000	540000	781000	194000	262000	139000	145000	337000	186000	187000	780000	725000
Tellurium			µg/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Thallium			µg/L	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
Thorium-232			µg/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Tin			µg/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Titanium			µg/L	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Uranium			µg/L	1.49	2.12	1.94	2.30	2.18	1.37	1.60	1.95	2.21	1.83	2.23	1.30	1.37	1.49	1.99	1.45	1.66	1.84	2.38	2.05
Vanadium			µg/L	0.57	< 0.50	< 0.50	1.11	1.14	< 0.50	< 0.50	< 0.50	1.09	0.76	1.10	< 0.50	< 0.50	< 0.50	< 0.50	0.51	< 0.50	< 0.50	1.04	0.98
Zinc			µg/L	< 1.0	< 1.0	< 1.0	1.2	< 1.0	< 1.0	< 1.0	1.1	3.3	1.1	1.4	< 1.0	2.2	< 1.0	< 1.0	< 1.0	1.3	1.1	2.3	< 1.0
Zirconium			µg/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Hardness, Calcium Carbonate			µg/L	2640000	1340000	1020000	4860000	4640000	1990000	1100000	1270000	4840000	3240000	4730000	1140000	1830000	933000	996000	2300000	1200000	1220000	4630000	4220000
Cesium			µg/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Rhenium			µg/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Rubidium			µg/L	43.0	24.1	18.3	85.2	90.4	32.1	19.7	23.4	84.8	64.0	83.2	21.6	30.1	16.2	18.4	37.6	22.2	21.4	80.6	83.3
Tungsten			µg/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Gallium			µg/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Yttrium			µg/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Metals, Total																							
pH	7.0 - 8.7		pH units	7.96	8.01	8.02	7.89	7.96	7.96	8.01	7.99	7.99	7.96	8.00	8.02	7.98	8.02	8.02	7.98	8.01	7.99	8.00	7.95
Aluminum			µg/L	20.1	24.7	16.5	5.6	8.8	11.5	23.6	21.9	7.0	17.1	7.6	37.4	15.3	23.9	16.6	10.0	29.3	18.2	6.4	10.7
Antimony			µg/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Arsenic	12.5		µg/L	0.72	0.45	< 0.40	1.45	1.11	0.59	< 0.40	< 0.40	1.38	0.92	1.31	0.42	0.51	< 0.40	< 0.40	0.64	< 0.40	< 0.40	1.28	1.11
Barium			µg/L	5.5	5.1	5.0	7.2	7.0	5.0	5.0	5.2	7.3	6.4	7.2	4.6	5.0	4.8	4.9	5.3	5.2	5.0	7.4	7.1
Beryllium			µg/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Bismuth			µg/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Boron			µg/L	1860	1080	780	3090	2800	1380	860	1020	3050	2290	3060	970	1370	720	860	1650	1000	910	3060	2750
Cadmium	0.12		µg/L	0.019	0.011	< 0.010	0.027	0.031	0.016	< 0.010	< 0.010	0.035	0.024	0.031	< 0.010	0.016	< 0.010	< 0.010	0.013	0.010	< 0.010	0.026	0.025
Calcium			µg/L	187000	114000	87500	312000	303000	141000	95400	107000	306000	233000	308000	102000	137000	84500	89100	165000	107000	98900	312000	281000
Chromium	1.5		µg/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Cobalt			µg/L	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
Copper			µg/L	< 0.50	< 0.50	1.85	< 0.50	0.68	< 0.50	0.54	1.91	0.59	< 0.50	< 0.50	< 0.50	2.02	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	1.12
Iron			µg/L	29	32	15	< 10	< 10	12	28	18	< 10	25	10	49	15	29	15	12	32	16	< 10	12
Lead			µg/L	< 0.050	< 0.050	0.179	< 0.050	< 0.050	< 0.050	< 0.050	0.056	< 0.050	< 0.050	< 0.050	0.066	0.080	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
Lithium			µg/L	84	48	31	124	122	61	37	41	122	99	122	38	57	32	34	73	42	37	123	121
Magnesium			µg/L	560000	295000	184000	900000	907000	404000	234000	247000	896000	713000	874000	268000	386000	195000	198000	486000	258000	225000	866000	860000
Manganese			µg/L	1.07	1.44	1.06	1.01	0.93	0.79	1.40	1.20	0.94	1.32	1.08	1.79	0.88	1.31	1.05	0.83	1.37	1.01	1.08	1.07
Mercury	0.016		µg/L	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Molybdenum			µg/L	4.55	2.68	1.76	8.54	8.28	3.33	2.16	2.24	8.25	6.47	8.17	2.39	3.07	1.86	1.87	3.86	2.44	2.16	8.14	7.50
Nickel			µg/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	1.47	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Phosphorus			µg/L	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	70	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50
Potassium			µg/L	175000	100000	63300	313000	321000	125000	78300	86700	320000	243000	307000	85700	119000	64800	68500	150000	91300	81000	310000	296000
Selenium			µg/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Silicon			µg/L	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000
Silver		7.5	µg/L	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Sodium			µg/L	4140000	2280000	1540000	7560000	7890000	3080000	1880000	2040000	7400000	5940000	7480000	2210000	2910000	1610000	1680000	3650000	2020000	1960000	7410000	7140000
Strontium			µg/L	3070	1750	1120	5790	5840	2260	1380	1460	5790	4420	5650	1640	2150	1150	1180	2680	1580	1380	5680	5310
Sulphur (Colloidal)			µg/L	409000	250000	167000	780000	837000	288000	194000	224000	761000	621000	759000	209000	278000	161000	176000	354000	229000	206000	742000	743000
Tellurium			µg/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Thallium			µg/L	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
Thorium-232			µg/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Tin			µg/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Titanium			µg/L	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Uranium			µg/L	1.78	2.29	1.89	2.24	2.23	1.61	1.72	1.92	2.16	2.01	2.16	1.55	1.62	1.67	1.84	1.66	1.74	1.80	2.23	2.19
Vanadium			µg/L	0.74	< 0.50	< 0.50	1.13	1.13	0.52	< 0.50	< 0.50	1.13	0.92	1.07	< 0.50	0.50	< 0.50	< 0.50	0.61	< 0.50	< 0.50	1.11	1.05
Zinc			µg/L	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	83.7	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Zirconium			µg/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Hardness			µg/L	2770000	-	-	-	-	2020000	-	-	-	-	-	-	1930000	-	-	2410000	-	-	-	-
Tungsten			µg/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Rubidium			µg/L	49.0	27.8	18.2	85.7	86.3	35.1	22.4	24.4	83.0	66.1	82.0	23.6	34.5	19.1	19.9	42.2	25.4	22.9	82.3	80.8
Rhenium			µg/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Cesium			µg/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Yttrium			µg/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Gallium			µg/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
VHCs																							
Volatile Hydrocarbons (C6-C10)			µg/L	-	-	-	-	-	-	< 100	< 100	< 100	< 100	< 100	< 100	-	< 100	< 100	-	-	-	-	-
Volatile Petroleum Hydrocarbons (C6-C10)			µg/L	-	-	-	-	-	-	< 100	< 100	< 100	< 100	< 100	< 100	-	< 100	< 100	-	-	-	-	-
VOCs + BTEX																							
Benzene	110		µg/L	-	-	-	-	-	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	-	-	-	-	-
Ethylbenzene	25		µg/L	-	-	-	-	-	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	-	-	-	-	-
Styrene			µg/L	-	-	-	-	-	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	-	-	-	-	-
Toluene	215		µg/L	-	-	-	-	-	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	-	-	-	-	-
Xylenes, Total			µg/L	-	-	-	-	-	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	-	-	-	-	-
o-Xylene			µg/L	-	-	-	-	-	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	-	-	-	-	-
m,p-Xylenes			µg/L	-	-	-	-	-	< 0.40	< 0.40	< 0.40	< 0.40	< 0.40	< 0.40	< 0.40	< 0.40	< 0.40	< 0.40	-	-	-	-	-
Methyl tert-Butyl Ether	5000		µg/L	-	-	-	-	-	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	-	-	-	-	-
SUM OF BTEX			µg/L	-	-	-	-	-	< 1.0	-	-	-	-	-	-	< 1.0	-	-	-	-	-	-	-
Total Extractable Petroleum Hydrocarbons (C16-50)			µg/L	-	-	-	-	-	-	-	< 400	-	-	-	-	-	-	< 400	-	-	-	-	-
Total Extractable Petroleum Hydrocarbons (C10-C50)			µg/L	-	-	-	-	-	-	-	< 400	-	-	-	-	-	-	< 400	-	-	-	-	-

Notes:
(VI) - hexavalent chromium
BTEX - Benzene, Toluene, Ethylene and Xylene; F1, F2, F3. F4 - Fractions of hydrocarbons; CCME - Canadian Council of Ministers for the Environment; MP-05 - monitoring stations west of the or dock; MP-06 - monitoring stations east of the ore dock; N - nitrogen; NTU - Nephelometric Turbidity Units; pH - scale of acidity; VOC - volatile organic carbons; µm - microgram per liter; µS/cm - milliSiemens per centimeter; % - percentage; "-" - no value; < - less than detection limit

CCME AQUATIC MARINE WATER - LONG TERM
CCME AQUATIC MARINE WATER - SHORT TERM

Appendix XX: Water Quality Screening
Table for Marine Environmental Effects Monitoring Program 2021

Parameter	CCME AQUATIC MARINE WATER - LONG TERM	CCME AQUATIC MARINE WATER - SHORT TERM	Unit																				
			Station											MP-06									
			Sample Name			MP-06 ENE					MP-06 North					MP-06 Source					MP-06 WNW		
			Sample Date	2021-08-02	2021-08-16	2021-08-19	2021-08-08	2021-08-14	2021-08-02	2021-08-16	2021-08-19	2021-08-08	2021-08-14	2021-08-02	2021-08-16	2021-08-19	2021-08-08	2021-08-14	2021-08-02	2021-08-16	2021-08-19	2021-08-08	2021-08-14
			FIELD_SDG	VA21B6250	VA21B7539	VA21B7949	VA21B6876	YL2101029	VA21B6250	VA21B7539	VA21B7949	VA21B6876	YL2101029	VA21B6250	VA21B7539	VA21B7949	VA21B6876	YL2101029	VA21B6250	VA21B7539	VA21B7949	VA21B6876	YL2101029
			SAMPLE_TYPE_CODE	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Anions + Nutrients																							
Alkalinity, Total as CaCO3			µg/L	89700	103000	106000	108000	91200	84500	106000	110000	111000	94000	89000	87700	89100	92900	92600	84800	98400	100000	105000	92900
Bromide (Br)			µg/L	26400	54000	43400	60300	33600	15400	56600	46300	63100	32800	24000	5100	< 5000	50500	35100	14700	52000	43600	54300	34200
Chloride (Cl)			µg/L	7730000	15900000	13800000	17200000	10200000	4520000	16800000	14400000	18100000	9960000	6980000	1660000	932000	14500000	10600000	4300000	15400000	13900000	15600000	10400000
Fluoride (F)			µg/L	340	780	780	760	530	220	770	780	770	500	300	< 200	< 200	600	540	200	760	790	690	530
Nitrate (as N)	339000	45000	µg/L	< 10	< 10	< 10	< 10	< 10	< 10	< 10	26	< 10	< 10	10	< 10	11	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Nitrite (as N)			µg/L	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Ammonia (as N)			µg/L	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Total Kjeldahl Nitrogen			µg/L	90	75	97	102	< 50	84	97	109	93	85	84	81	112	87	< 50	84	81	96	92	< 50
Sulfate (SO4)			µg/L	1060000	2120000	2110000	2320000	1380000	630000	2340000	2240000	2370000	1330000	943000	233000	132000	1880000	1400000	618000	2080000	2070000	2130000	1400000
Phosphorus, Total			µg/L	9.8	17.4	18.2	21.0	15.6	8.8	17.0	22.2	24.8	18.3	6.9	4.0	13.0	17.2	14.6	6.0	15.7	18.6	19.0	16.4
Phosphorus, Dissolved			µg/L	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50
Carbons																							
Dissolved Organic Carbon			µg/L	1120	1010	1270	1160	1090	950	1040	1160	1210	1110	1020	1260	1290	900	1050	1190	1110	1010	1130	1210
Field + Physical																							
Conductivity			uS/cm	21900	42600	44600	45200	28000	13700	46300	47100	46000	27000	20100	5550	3260	37300	28200	13300	41100	43400	41700	28000
Total Dissolved Solids			µg/L	13800000	27400000	32200000	32400000	17200000	8450000	32000000	35900000	33400000	16100000	12200000	3450000	1970000	27900000	16900000	7740000	26200000	32900000	30300000	17000000
Total Suspended Solids			µg/L	< 2000	< 2000	< 2000	< 2000	7900	< 2000	< 2000	2200	3500	< 2000	< 2000	< 2000	< 2000	2200	4700	< 2000	< 2000	< 2000	< 2000	2700
Turbidity			NTU	0.20	0.60	0.15	0.14	1.26	0.22	0.45	0.18	0.13	0.52	0.20	1.10	0.60	< 0.10	0.86	0.19	0.71	0.15	0.35	1.02
Salinity			PSU	13.2	26.7	28.2	30.2	17.2	7.9	29.3	30.0	30.8	16.5	12.0	2.9	1.7	24.4	17.3	7.7	25.7	27.4	27.6	17.2
Total Organic Carbon			µg/L	950	1020	990	890	1050	940	1180	1120	940	990	970	1300	1030	830	1000	860	1070	990	820	1020
Dissolved Organic Carbon			µg/L	1120	1010	1270	1160	1090	950	1040	1160	1210	1110	1020	1260	1290	900	1050	1190	1110	1010	1130	1210
Hardness, Calcium Carbonate (Dissolved)			µg/L	2630000	4620000	5640000	6080000	3050000	1560000	5150000	6780000	6230000	2870000	2250000	473000	366000	4720000	3040000	1530000	4570000	5580000	5490000	3210000
Hardness, Calcium Carbonate (Total)			µg/L	2740000	-	-	-	-	1590000	-	-	-	-	2420000	-	-	-	-	1600000	-	-	-	-
Hydrocarbons																							
Acenaphthene			µg/L	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	-	-	-	-	-	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	-	-	-	-	-
Acenaphthylene			µg/L	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	-	-	-	-	-	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	-	-	-	-	-
Acridine			µg/L	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	-	-	-	-	-	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	-	-	-	-	-
Anthracene			µg/L	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	-	-	-	-	-	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	-	-	-	-	-
Benz(a)anthracene			µg/L	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	-	-	-	-	-	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	-	-	-	-	-
Benzo(a)pyrene			µg/L	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	-	-	-	-	-	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	-	-	-	-	-
Benzo(g,h,i)perylene			µg/L	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	-	-	-	-	-	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	-	-	-	-	-
Benzo(k)fluoranthene			µg/L	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	-	-	-	-	-	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	-	-	-	-	-
Chrysene			µg/L	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	-	-	-	-	-	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	-	-	-	-	-
Dibenz(a,h)anthracene			µg/L	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	-	-	-	-	-	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	-	-	-	-	-
Fluoranthene			µg/L	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	-	-	-	-	-	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	-	-	-	-	-
Benzo(b,j) fluoranthene			µg/L	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	-	-	-	-	-	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	-	-	-	-	-
Fluorene			µg/L	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	-	-	-	-	-	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	-	-	-	-	-
Indeno(1,2,3-c,d)pyrene			µg/L	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	-	-	-	-	-	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	-	-	-	-	-
Naphthalene	1.4		µg/L	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	-	-	-	-	-	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	-	-	-	-	-
Phenanthrene			µg/L	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	-	-	-	-	-	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	-	-	-	-	-
Pyrene			µg/L	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	-	-	-	-	-	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	-	-	-	-	-
Quinoline			µg/L	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	-	-	-	-	-	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	-	-	-	-	-
1- & 2-Methylnaphthalene			µg/L	-	< 0.015	< 0.015	< 0.015	< 0.015	-	-	-	-	-	-	< 0.015	< 0.015	< 0.015	< 0.015	-	-	-	-	-
2-methylnaphthalene			µg/L	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	-	-	-	-	-	< 0.010	< 0.010	< 0.010	0.013	< 0.010	-	-	-	-	-
PAH, Low Molecular Weight			µg/L	-	< 0.06	< 0.06	< 0.06	< 0.06	-	-	-	-	-	-	< 0.06	< 0.06	< 0.06	< 0.06	-	-	-	-	-
PAH, High Molecular Weight			µg/L	-	< 0.03	< 0.03	< 0.03	< 0.03	-	-	-	-	-	-	< 0.03	< 0.03	< 0.03	< 0.03	-	-	-	-	-
VPH (C6-C10)			µg/L	-	< 100	< 100	< 100	< 100	-	-	-	-	-	-	< 100	< 100	< 100	< 100	-	-	-	-	-
Petroleum Hydrocarbons - F1 (C6-C10)			µg/L	< 100	< 100	< 100	< 100	< 100	-	-	-	-	-	< 100	< 100	< 100	< 100	< 100	-	-	-	-	-
Petroleum Hydrocarbons - F2 (C10-C16)			µg/L	< 100	< 100	< 100	< 100	< 100	-	-	-	-	-	< 100	< 100	< 100	< 100	< 100	-	-	-	-	-
Petroleum Hydrocarbons - F3 (C16-C34)			µg/L	< 250	< 250	< 250	< 250	< 250	-	-	-	-	-	< 250	< 250	< 250	< 250	< 250	-	-	-	-	-
Petroleum Hydrocarbons - F4 (C34-C50)			µg/L	< 250	< 250	< 250	< 250	< 250	-	-	-	-	-	< 250	< 250	< 250	< 250	< 250	-	-	-	-	-
1-Methylnaphthalene			µg/L	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	-	-	-	-	-	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	-	-	-	-	-
Benzo[b,j,k]fluoranthene			µg/L	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	-	-	-	-	-	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	-	-	-	-	-
Volatile Hydrocarbons (C6-C10)			µg/L	-	< 100	< 100	< 100	< 100	-	-	-	-	-	-	< 100	< 100	< 100	< 100	-	-	-	-	-
Volatile Petroleum Hydrocarbons (C6-C10)			µg/L	-	< 100	< 100	< 100	< 100	-	-	-	-	-	-	< 100	< 100	< 100	< 100	-	-	-	-	-
PAHs, total (EPA16)			µg/L	-	< 0.065	< 0.065	< 0.065	< 0.065	-	-	-	-	-	-	< 0.065	< 0.065	< 0.065	< 0.065	-	-	-	-	-
Benzo(a)pyrene Total Potency Equivalence (TPE)			µg/L	-	< 0.010	< 0.010	< 0.010	< 0.010	-	-	-	-	-	-	< 0.010	< 0.010	< 0.010	< 0.010	-	-	-	-	-
Metals, Dissolved																							
pH	7.0 - 8.7		pH units	7.96	7.93	7.95	8.02	7.96	7.99	7.95	7.95	8.02	7.96	7.98	8.04	8.06	8.01	7.96	8.00	7.92	7.95	8.02	7.96
Aluminum			µg/L	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Antimony			µg/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Arsenic	12.5		µg/L	0.58	1.23	1.37	1.46	0.84	< 0.40	1.33	1.40	1.50	0.81	0.58	< 0.40	< 0.40	1.15	0.87	< 0.40	1.17	1.22	1.38	0.91
Barium			µg/L	5.2	7.0	7.4	7.2	6.5	4.5	6.8	7.5	7.8	6.2	5.1	4.4	4.0	6.8	6.4	4.4	7.1	7.6	5.6	6.6
Beryllium			µg/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Bismuth			µg/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Boron			µg/L	1720	2980	3340	4380	2130	1060	3340	3910	4480	2100	1500	360	< 300	3420	2120	1020	2890	3340	3840	2200
Cadmium	0.12		µg/L	0.017	0.030	0.033	0.028	0.024	< 0.010	0.031	0.038	0.038	0.018	0.012	< 0.010	< 0.010	0.034	0.024	0.012	0.024	0.038	0.033	0.022
Calcium			µg/L	183000	306000	362000	408000	214000	117000	349000	408000	417000	206000	158000	46800	40100	321000	207000	112000	310000	354000	367000	217000
Chromium			µg/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Cobalt			µg/L	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
Copper			µg/L	0.33	0.22	1.30	0.27	0.39	0.36	0.22	0.37	0.31	0.52	0.42	0.47	0.59	0.45	0.35	0.33	0.32	0.23	0.49	0.39
Iron			µg/L	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Lead			µg/L	< 0.050	< 0.050	0.105	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
Lithium			µg/L	76	125	161	190	88	42	146	190	198	88	63	< 20	< 20	149	89	41	122	159	174	90
Magnesium			µg/L	528000	936000	1150000	1230000	610000	309000	1040000	1400000	1260000	572000	451000	86600	64700	951000	614000	304000	923000	1140000	1110000	647000
Manganese			µg/L	0.57	0.74	0.59	0.61	0.84	0.49	0.70	0.52	0.50	0.75	0.63	0.54	0.45	0.85	0.77	0.50	1.05	0.69	0.83	0.77
Mercury	0.016		µg/L	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Molybdenum			µg/L	4.25	8.30	9.16	9.94	5.48	2.51	9.38	10.3	10.3	5.37	3.78	0.88	0.61	7.90	5.50	2.49	8.45	9.07	9.18	5.73
Nickel			µg/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Phosphorus			µg/L	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50
Potassium			µg/L	164000	327000	383000	408000	211000	94000	365000	459000	417000	192000	142000	26000	18800	314000	210000	94200	318000	383000	364000	214000
Selenium			µg/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Silicon			µg/L	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000
Silver		7.5	µg/L	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Sodium			µg/L	4560000	7540000	9330000	9020000	5210000	2650000	8500000	9960000	9240000	4830000	3860000	691000	524000	7160000	5150000	2700000	7590000	9190000	8200000	5230000
Strontium			µg/L	2960	5830	6420	6990	3750	1720	6600	7080	7260	3550	2570	534	355	5490	3720	1760	5830	6270	6360	3830
Sulphur (Colloidal)			µg/L	394000	831000	943000	1020000	500000	217000	930000	1170000	1020000	460000	324000	62300	43700	773000	526000	223000	784000	948000	897000	521000
Tellurium			µg/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Thallium			µg/L	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
Thorium-232			µg/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Tin			µg/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Titanium			µg/L	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Uranium			µg/L	1.48	2.27	2.47	2.59	2.31	1.18	2.57	2.50	2.67	2.14	3.41	1.52	1.46	4.93	1.88	1.17	2.25	2.34	2.54	1.88
Vanadium			µg/L	0.58	1.10	1.31	1.40	0.70	< 0.50	1.28	1.46	1.40	0.71	< 0.50	< 0.50	< 0.50	1.05	0.73	< 0.50	1.06	1.29	1.30	0.79
Zinc			µg/L	< 1.0	< 1.0	1.2	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	1.1	< 1.0	1.6	< 1.0	1.1	1.3	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Zirconium			µg/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Hardness, Calcium Carbonate			µg/L	2630000	4620000	5640000	6080000	3050000	1560000	5150000	6780000	6230000	2870000	2250000	473000	366000	4720000	3040000	1530000	4570000	5580000	5490000	3210000
Cesium			µg/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Rhenium			µg/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Rubidium			µg/L	43.2	88.8	103	107	60.5	25.2	98.4	111	109	57.4	37.8	7.9	6.0	82.4	61.7	25.8	85.6	102	96.1	61.9
Tungsten			µg/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Gallium			µg/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Yttrium			µg/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Metals, Total																							
pH	7.0 - 8.7		pH units	7.96	7.93	7.95	8.02	7.96	7.99	7.95	7.95	8.02	7.96	7.98	8.04	8.06	8.01	7.96	8.00	7.92	7.95	8.02	7.96
Aluminum			µg/L	10.4	12.3	7.8	< 5.0	38.3	8.7	9.7	5.6	< 5.0	25.0	9.2	29.2	17.6	7.6	34.8	9.6	12.4	13.4	< 5.0	33.4
Antimony			µg/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Arsenic	12.5		µg/L	0.69	1.23	1.38	1.67	0.82	0.43	1.33	1.44	1.62	0.83	0.65	< 0.40	< 0.40	1.41	0.87	0.43	1.22	1.34	1.55	0.82
Barium			µg/L	5.6	7.7	7.9	7.3	6.2	4.5	7.5	7.3	9.2	6.2	5.3	4.7	4.2	7.4	6.4	4.5	8.0	8.1	5.8	6.3
Beryllium			µg/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Bismuth			µg/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Boron			µg/L	1910	3480	3860	3770	2060	1090	3660	4140	3920	1980	1670	450	< 300	3190	2050	1130	3200	3830	3640	2040
Cadmium	0.12		µg/L	0.020	0.030	0.037	0.041	0.022	0.013	0.041	0.044	0.044	0.015	0.014	< 0.010	< 0.010	0.037	0.018	0.014	0.030	0.045	0.035	0.026
Calcium			µg/L	190000	365000	394000	384000	213000	118000	402000	416000	391000	207000	169000	55800	42100	308000	213000	118000	345000	394000	360000	212000
Chromium	1.5		µg/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Cobalt			µg/L	< 0.050	< 0.050	< 0.050	< 0.050	0.059	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	0.050
Copper			µg/L	< 0.50	< 0.50	< 0.50	1.00	0.54	< 0.50	< 0.50	< 0.50	< 0.50	0.58	< 0.50	< 0.50	2.14	0.52	0.70	< 0.50	< 0.50	< 0.50	< 0.50	0.66
Iron			µg/L	11	< 10	< 10	< 10	71	11	10	< 10	< 10	37	12	31	12	< 10	60	13	< 10	14	< 10	57
Lead			µg/L	< 0.050	< 0.050	0.057	< 0.050	0.106	< 0.050	< 0.050	< 0.050	< 0.050	0.050	< 0.050	< 0.050	0.053	0.070	0.075	< 0.050	< 0.050	0.480	< 0.050	0.078
Lithium			µg/L	84	155	175	148	86	45	176	184	149	84	72	< 20	< 20	132	89	46	149	167	146	88
Magnesium			µg/L	550000	1050000	1140000	1110000	620000	314000	1170000	1220000	1100000	607000	486000	102000	60800	900000	627000	316000	1030000	1110000	1010000	628000
Manganese			µg/L	0.80	0.97	0.78	0.69	2.64	0.74	1.00	0.58	0.56	1.48	0.91	1.40	0.82	1.02	1.99	0.75	1.30	1.37	0.84	1.88
Mercury	0.016		µg/L	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Molybdenum			µg/L	4.67	8.91	9.37	9.74	5.59	2.54	9.59	9.93	9.98	5.36	4.12	1.06	0.61	8.14	5.40	2.67	8.66	9.18	9.13	5.64
Nickel			µg/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Phosphorus			µg/L	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	52	< 50	< 50	< 50
Potassium			µg/L	174000	397000	437000	391000	214000	97100	447000	454000	385000	208000	149000	33200	18700	305000	210000	97500	386000	430000	350000	219000
Selenium			µg/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Silicon			µg/L	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000
Silver		7.5	µg/L	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Sodium			µg/L	4250000	7900000	8470000	9120000	5210000	2430000	8830000	9050000	9020000	5120000	3630000	833000	489000	7740000	5500000	2480000	5630000	8260000	8320000	5230000
Strontium			µg/L	3190	6080	6300	6760	4030	1760	6570	6760	7010	3810	2740	624	332	5540	3930	1820	5890	6220	6300	3880
Sulphur (Colloidal)			µg/L	433000	1030000	1150000	948000	517000	230000	1180000	1200000	995000	496000	350000	80100	45700	729000	549000	230000	1010000	1140000	864000	523000
Tellurium			µg/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Thallium			µg/L	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
Thorium-232			µg/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Tin			µg/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Titanium			µg/L	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Uranium			µg/L	1.72	2.34	2.37	2.48	2.46	1.36	2.62	2.59	2.61	2.12	3.88	1.59	1.40	2.72	2.06	1.36	2.32	2.32	2.35	2.04
Vanadium			µg/L	0.68	1.30	1.46	1.33	0.93	< 0.50	1.45	1.53	1.35	0.84	0.59	< 0.50	< 0.50	1.08	0.88	< 0.50	1.33	1.36	1.26	0.87
Zinc			µg/L	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Zirconium			µg/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Hardness			µg/L	2740000	-	-	-	-	1590000	-	-	-	-	2420000	-	-	-	-	1600000	-	-	-	-
Tungsten			µg/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Rubidium			µg/L	48.5	98.6	110	104	57.6	28.6	111	116	104	56.9	42.4	9.9	6.2	84.6	57.5	28.2	97.2	106	95.7	59.5
Rhenium			µg/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Cesium			µg/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Yttrium			µg/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 1.00	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Gallium			µg/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
VHCs																							
Volatile Hydrocarbons (C6-C10)			µg/L	-	< 100	< 100	< 100	< 100	-	-	-	-	-	-	< 100	< 100	< 100	< 100	-	-	-	-	-
Volatile Petroleum Hydrocarbons (C6-C10)			µg/L	-	< 100	< 100	< 100	< 100	-	-	-	-	-	-	< 100	< 100	< 100	< 100	-	-	-	-	-
VOCs + BTEX																							
Benzene	110		µg/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	-	-	-	-	-	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	-	-	-	-	-
Ethylbenzene	25		µg/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	-	-	-	-	-	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	-	-	-	-	-
Styrene			µg/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	-	-	-	-	-	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	-	-	-	-	-
Toluene	215		µg/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	-	-	-	-	-	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	-	-	-	-	-
Xylenes, Total			µg/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	-	-	-	-	-	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	-	-	-	-	-
o-Xylene			µg/L	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	-	-	-	-	-	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	-	-	-	-	-
m,p-Xylenes			µg/L	< 0.40	< 0.40	< 0.40	< 0.40	< 0.40	-	-	-	-	-	< 0.40	< 0.40	< 0.40	< 0.40	< 0.40	-	-	-	-	-
Methyl tert-Butyl Ether	5000		µg/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	-	-	-	-	-	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	-	-	-	-	-
SUM OF BTEX			µg/L	< 1.0	-	-	-	-	-	-	-	-	-	< 1.0	-	-	-	-	-	-	-	-	-
Total Extractable Petroleum Hydrocarbons (C16-50)			µg/L	-	-	< 400	-	-	-	-	-	-	-	-	-	< 400	-	-	-	-	-	-	-
Total Extractable Petroleum Hydrocarbons (C10-C50)			µg/L	-	-	< 400	-	-	-	-	-	-	-	-	-	< 400	-	-	-	-	-	-	-

Notes:
(VI)- hexavalent chromium
BTEX - Benzene, Toluene, Ethylene and Xylene; F1, F2, F3. F4 - Fractions of hydrocarbons; CCME - Canadian Council of Ministers for the Environment; MP-05 - monitoring stations west of the or dock; MP-06 - monitoring stations east of the ore dock; N - nitrogen; NTU - Nephelometric Turbidity Units; pH - scale of acidity; VOC - volatile organic carbons; µm - microgram per liter; µS/cm - milliSiemens per centimeter; % - percentage; "-" - no value; < - less than detection limit

CCME AQUATIC MARINE WATER - LONG TERM
CCME AQUATIC MARINE WATER - SHORT TERM

APPENDIX 2D

QA/QC

1.0 QAQC RESULTS

This appendix describes the QAQC results for surface water sampled for the 2021 MEEMP conducted at Milne Port and in Milne Inlet during the 2021 open-water season. Water quality samples were collected during five sampling events scheduled between 2 August and 19 August 2021, to monitor for potential changes in water quality associated with site drainage and treated effluent discharges to the marine environment (including iron ore stockpile run-off). Samples were collected weekly over this period; however, the fourth and fifth sampling events were conducted two days apart to align with the confirmed active site discharge at MP-05. Four additional water quality stations downstream from discharge MP-06 were monitored in 2021, similar to 2020.

Most chemical analyses on surface water samples were completed within the sample hold time requirements, with the exception of some hold time exceedances for parameters such as DOC, anions, and nutrients (nitrite, nitrate), TDS, and turbidity. Although hold time exceedances were documented, the hold times for the parameters in question are relatively short, and given the remote location of the site, such exceedances were unavoidable. The data should still be comparable to previous yearly measurements as similar issues with hold time exceedances have been encountered on an annual basis.

ALS is certified by the Canadian Association for Laboratory Accreditation (CALA) for the analyses conducted. The analytical laboratory also incorporated and reported the results of internal QA/QC checks. These were used to assess the reliability, accuracy, and reproducibility of the data. Reports from the laboratory are provided in Appendix 2B and were reviewed by Golder. Data reported by the laboratory were considered reliable according to the accredited laboratory QA/QC assessment.

From the field blanks collected during the field program, measured concentrations were all less than the analytical detection limit (Table 1). Sample detection limits were increased by ALS for dissolved hardness, TDS, and total phosphorus.

To demonstrate that the samples and analytical results can be considered valid, representative, and reproducible, five field duplicate samples were collected. The RPD between field duplicate sample results was used to assess duplicate sample data. The RPD is a measure of the variability between two outcomes from the same procedure or process and is calculated as:

$$RPD = \frac{absolute\ value\ (sample\ concentration - duplicate\ concentration)}{mean\ concentration} \times 100$$

An RPD less than 20% for inorganic parameters in water is considered acceptable (BC ENV 2020[1]). The QA/QC results of field RPDs are provided in Table 2 below. For this sample pair, the data quality objective of RPDs less than 20% were met, where they could be calculated, except for one instance of dissolved uranium (23%) and one instance of turbidity (74%) (Table 2). Where the parameter concentrations were less than five times the detection limit, a difference factor (DF)[2] was calculated and all DFs were below 2 except for one instance, where nitrate had a DF of 2.1.

Based on the above assessment, the QA/QC results indicate that the water chemistry data collected during the 2021 MEEMP were of acceptable quality.

[1] BC ENV (British Columbia Ministry of Environment and Climate Change Strategy). 2020. British Columbia Environmental Laboratory Manual, Section A: Laboratory Quality Assurance/Quality Control. 2020 Edition. April 2020. Available online at: <https://www2.gov.bc.ca/assets/gov/environment/research-monitoring-and-reporting/monitoring/emre/lab-manual/title-page-2020.pdf>.

[2] Absolute difference between two values divided by the method detection limit

Table 1 - Results of Water Quality QAQC Duplicate Sample Results
Milne Port, 2021

Sample ID	Units	MP-05 Source	DUP-A	Reported Detection Limit	Mean	Relative Percent Difference (RPD)	Difference Factor (DF)	MP-06 Source	DUP-B	Reported Detection Limit	Mean	Relative Percent Difference (RPD)	Difference Factor (DF)	MP-05 ENE	DUP-C	Reported Detection Limit	Mean	Relative Percent Difference (RPD)	Difference Factor (DF)	TR Ref1	DUP-D	Reported Detection Limit	Mean	Relative Percent Difference (RPD)	Difference Factor (DF)
Date Sampled		2021-08-02	2021-08-02					2021-08-16	2021-08-08					2021-08-16	2021-08-16					2021-08-15	2021-08-15				
Laboratory ID		VA21B6250	VA21B6250					VA21B7539	VA21B6876					VA21B7539	VA21B7539					VA21B7536	VA21B7536				
QA/QC		FDA	FD					FDA	FD					FDA	FD					FDA	FD				
Anions and Nutrients																									
Alkalinity, Total as CaCO3	µg/L	86800	88000	1000	87400	1%	NA	92900	92900	1000	92900	0%	NA	90200	89700	1000	89950	1%	NA	93400	92400	1000	92900	1%	NA
Bromide (Br)	µg/L	18200	18500	5000	18350	NA	0.1	50500	49100	5000	49800	3%	NA	15400	13200	5000	14300	NA	0.4	44500	42600	5000	43550	4%	NA
Chloride (Cl)	µg/L	5320000	5440000	50000	5380000	2%	NA	14500000	14200000	50000	14350000	2%	NA	4740000	4170000	50000	4455000	13%	NA	13000000	12600000	50000	12800000	3%	NA
Fluoride (F)	µg/L	240	250	200	245	NA	0.1	600	680	200	640	NA	0.4	280	250	200	265	NA	0.2	560	600	200	580	NA	0.2
Nitrate (as N)	µg/L	53	53	10	53.0	0%	NA	< 10	< 10	10	NC	NC	NC	28	49	10	39	NA	**2.1**	< 10	18	10	NC	NC	NC
Nitrite (as N)	µg/L	< 10	< 10	10	NC	NC	NC	< 10	< 10	10	NC	NC	NC	< 10	< 10	10	NC	NC	NC	< 10	< 10	10	NC	NC	NC
Ammonia (as N)	µg/L	< 5.0	< 5.0	5	NC	NC	NC	< 5.0	< 5.0	5	NC	NC	NC	< 5.0	< 5.0	5	NC	NC	NC	< 5.0	< 5.0	5	NC	NC	NC
Total Kjeldahl Nitrogen	µg/L	85	92	50	89	NA	0.1	87	84	50	86	NA	0.1	94	85	50	90	NA	0.2	68	73	50	71	NA	0.1
Sulfate (SO4)	µg/L	738000	739000	3000	738500	0%	NA	1880000	1950000	3000	1915000	4%	NA	652000	582000	3000	617000	11%	NA	1790000	1790000	3000	1790000	0%	NA
Field and Physical																									
pH	pH Units	7.98	7.98	0.1	7.98	0%	NA	8.01	7.99	0.1	8	0%	NA	8.01	7.97	0.1	7.99	1%	NA	7.89	7.9	0.1	7.90	0%	NA
Conductivity	uS/cm	15900	16000	2.0	15950	1%	NA	37300	37300	2.0	37300	0%	NA	14200	12600	2.0	13400	12%	NA	36900	37300	2.0	37100	1%	NA
Total Dissolved Solids	µg/L	10500000	9250000	10000	9875000	13%	NA	27900000	25800000	10000	26850000	8%	NA	8100000	7420000	10000	7760000	9%	NA	27600000	25600000	10000	26600000	8%	NA
Total Suspended Solids	µg/L	< 2000	< 2000	2000	NC	NC	NC	2200	< 2000	2000	NC	NC	NC	< 2000	< 2000	2000	NC	NC	NC	< 2000	< 2000	2000	NC	NC	NC
Turbidity	NTU	0.37	0.38	0.10	0.38	NA	0.1	< 0.10	0.16	0.10	NC	NC	NC	0.99	0.81	0.10	0.90	20%	NA	1.45	0.67	0.10	1.1	**74%**	NA
Salinity	PSU	9.3	9.4	1.0	9.4	1%	NA	24.4	24.4	1.0	24.4	0%	NA	8.0	7.0	1.0	7.5	13%	NA	22.8	23.1	1.0	23.0	1%	NA
Total Organic Carbon	µg/L	1040	960	500	1000	NA	0.2	830	920	500	875	NA	0.2	1220	1160	500	1190	NA	0.1	810	790	500	800	NA	0.0
Dissolved Organic Carbon	µg/L	1150	1010	500	1080	NA	0.3	900	1180	500	1040	NA	0.6	1160	1080	500	1120	NA	0.2	1130	950	500	1040	NA	0.4
Hardness, Calcium Carbonate (Dissolved)	µg/L	1830000	1860000	500	1845000	2%	NA	4720000	4630000	500	4675000	2%	NA	1340000	1260000	500	1300000	6%	NA	4300000	4250000	500	4275000	1%	NA
Hardness, Calcium Carbonate (Total)	µg/L	1930000	1980000	600	1955000	3%	NA	-	-	600	NC	NC	NC	-	-	600	NC	NC	NC	-	-	600	NC	NC	NC
Metals, Dissolved																									
Aluminum (Al)	µg/L	< 5.0	< 5.0	5	NC	NC	NC	< 5.0	< 5.0	5	NC	NC	NC	< 5.0	5.1	5	NC	NC	NC	< 5.0	< 5.0	5	NC	NC	NC
Antimony (Sb)	µg/L	< 1.0	< 1.0	1	NC	NC	NC	< 1.0	< 1.0	1	NC	NC	NC	< 1.0	< 1.0	1	NC	NC	NC	< 1.0	< 1.0	1	NC	NC	NC
Arsenic (As)	µg/L	0.48	0.47	0.4	0.48	NA	0.0	1.15	1.22	0.4	1.19	NA	0.2	0.40	< 0.40	0.4	NC	NC	NC	1.07	1.00	0.4	1.04	NA	0.2
Barium (Ba)	µg/L	4.7	4.8	1	4.8	NA	0.1	6.8	7.0	1	6.9	3%	NA	4.6	4.5	1	4.6	NA	0.1	7.1	7.1	1	7.1	0%	NA
Beryllium (Be)	µg/L	< 0.50	< 0.50	0.5	NC	NC	NC	< 0.50	< 0.50	0.5	NC	NC	NC	< 0.50	< 0.50	0.5	NC	NC	NC	< 0.50	< 0.50	0.5	NC	NC	NC
Bismuth (Bi)	µg/L	< 0.50	< 0.50	0.5	NC	NC	NC	< 0.50	< 0.50	0.5	NC	NC	NC	< 0.50	< 0.50	0.5	NC	NC	NC	< 0.50	< 0.50	0.5	NC	NC	NC
Boron (B)	µg/L	1210	1300	300	1255	NA	0.3	3420	3340	300	3380	2%	NA	950	930	300	940	NA	0.1	2860	2890	300	2875	1%	NA
Cadmium (Cd)	µg/L	0.016	0.017	0.01	0.017	NA	0.1	0.034	0.025	0.01	0.030	NA	0.9	< 0.010	< 0.010	0.01	NC	NC	NC	0.028	0.022	0.01	0.025	NA	0.6
Calcium (Ca)	µg/L	131000	137000	1000	134000	4%	NA	321000	319000	1000	320000	1%	NA	101000	98000	1000	99500	3%	NA	279000	284000	1000	281500	2%	NA
Cesium	µg/L	< 0.50	< 0.50	0.5	NC	NC	NC	< 0.50	< 0.50	0.5	NC	NC	NC	< 0.50	< 0.50	0.5	NC	NC	NC	< 0.50	< 0.50	0.5	NC	NC	NC
Chromium (Cr)	µg/L	< 0.50	< 0.50	0.5	NC	NC	NC	< 0.50	< 0.50	0.5	NC	NC	NC	< 0.50	< 0.50	0.5	NC	NC	NC	< 0.50	< 0.50	0.5	NC	NC	NC
Cobalt (Co)	µg/L	< 0.050	< 0.050	0.05	NC	NC	NC	< 0.050	< 0.050	0.05	NC	NC	NC	< 0.050	< 0.050	0.05	NC	NC	NC	< 0.050	< 0.050	0.05	NC	NC	NC
Copper (Cu)	µg/L	0.57	0.56	0.2	0.57	NA	0.0	0.45	0.46	0.2	0.46	NA	0.1	0.37	0.42	0.2	0.40	NA	0.3	0.36	0.23	0.2	0.30	NA	0.7
Gallium	µg/L	< 0.50	< 0.50	0.5	NC	NC	NC	< 0.50	< 0.50	0.5	NC	NC	NC	< 0.50	< 0.50	0.5	NC	NC	NC	< 0.50	< 0.50	0.5	NC	NC	NC
Iron (Fe)	µg/L	< 10	< 10	10	NC	NC	NC	< 10	< 10	10	NC	NC	NC	< 10	< 10	10	NC	NC	NC	< 10	< 10	10	NC	NC	NC
Lead (Pb)	µg/L	< 0.050	< 0.050	0.05	NC	NC	NC	< 0.050	< 0.050	0.05	NC	NC	NC	< 0.050	< 0.050	0.05	NC	NC	NC	< 0.050	< 0.050	0.05	NC	NC	NC
Lithium (Li)	µg/L	48	53	20	51	NA	0.3	149	148	20	149	1%	NA	37	38	20	38	NA	0.1	122	120	20	121	2%	NA
Magnesium (Mg)	µg/L	366000	369000	1000	367500	1%	NA	951000	931000	1000	941000	2%	NA	265000	247000	1000	256000	7%	NA	876000	860000	1000	868000	2%	NA
Manganese (Mn)	µg/L	0.58	0.58	0.1	0.58	0%	NA	0.85	0.86	0.1	0.86	1%	NA	0.69	0.59	0.1	0.64	16%	NA	0.82	0.76	0.1	0.79	8%	NA
Mercury (Hg)	µg/L	< 0.0050	< 0.0050	0.005	NC	NC	NC	< 0.0050	< 0.0050	0.005	NC	NC	NC	< 0.0050	< 0.0050	0.005	NC	NC	NC	< 0.0050	< 0.0050	0.005	NC	NC	NC
Molybdenum (Mo)	µg/L	3.00	3.29	0.1	3.15	9%	NA	7.9	8.23	0.1	8.1	4%	NA	2.42	2.32	0.1	2.37	4%	NA	7.50	7.63	0.1	7.57	2%	NA
Nickel (Ni)	µg/L	< 0.50	< 0.50	0.5	NC	NC	NC	< 0.50	< 0.50	0.5	NC	NC	NC	< 0.50	< 0.50	0.5	NC	NC	NC	< 0.50	< 0.50	0.5	NC	NC	NC
Phosphorus (P)	µg/L	< 50	< 50	50	NC	NC	NC	< 50	< 50	50	NC	NC	NC	< 50	< 50	50	NC	NC	NC	< 50	< 50	50	NC	NC	NC
Potassium (K)	µg/L	113000	116000	1000	114500	3%	NA	314000	303000	1000	308500	4%	NA	86400	79000	1000	82700	9%	NA	291000	285000	1000	288000	2%	NA
Rhenium	µg/L	< 0.50	< 0.50	0.5	NC	NC	NC	< 0.50	< 0.50	0.5	NC	NC	NC	< 0.50	< 0.50	0.5	NC	NC	NC	< 0.50	< 0.50	0.5	NC	NC	NC
Rubidium	µg/L	30.1	30.6	5	30.4	2%	NA	82.4	82.3	5	82	0%	NA	24.1	22.7	5	23.4	NA	0.3	79.0	77.4	5	78.2	2%	NA
Selenium (Se)	µg/L	< 0.50	< 0.50	0.5	NC	NC	NC	< 0.50	< 0.50	0.5	NC	NC	NC	< 0.50	< 0.50	0.5	NC	NC	NC	< 0.50	< 0.50	0.5	NC	NC	NC
Silicon	µg/L	< 1000	< 1000	1000	NC	NC	NC	< 1000	< 1000	1000	NC	NC	NC	< 1000	< 1000	1000	NC	NC	NC	< 1000	< 1000	1000	NC	NC	NC
Silver (Ag)	µg/L	< 0.10	< 0.10	0.1	NC	NC	NC	< 0.10	< 0.10	0.1	NC	NC	NC	< 0.10	< 0.10	0.1	NC	NC	NC	< 0.10	< 0.10	0.1	NC	NC	NC
Sodium (Na)	µg/L	3240000	3110000	2500	3175000	4%	NA	7160000	7610000	2500	7385000	6%	NA	2190000	2020000	2500	2105000	8%	NA	6720000	6670000	2500	6695000	1%	NA
Strontium (Sr)	µg/L	2090	2210	10	2150	6%	NA	5490	5610	10	5550	2%	NA	1620	1540	10	1580	5%	NA	5300	5270	10	5285	1%	NA
Sulfur (S)	µg/L	262000	273000	5000	267500	4%	NA	773000	774000	5000	773500	0%	NA	211000	195000	5000	203000	8%	NA	702000	726000	5000	714000	3%	NA
Tellurium	µg/L	< 0.50	< 0.50	0.5	NC	NC	NC	< 0.50	< 0.50	0.5	NC	NC	NC	< 0.50	< 0.50	0.5	NC	NC	NC	< 0.50	< 0.50	0.5	NC	NC	NC
Thallium (Tl)	µg/L	< 0.050	< 0.050	0.05	NC	NC	NC	< 0.050	< 0.050	0.05	NC	NC	NC	< 0.050	< 0.050	0.05	NC	NC	NC	< 0.050	< 0.050	0.05	NC	NC	NC
Thorium-232	µg/L	< 0.50	< 0.50	0.5	NC	NC	NC	< 0.50	< 0.50	0.5	NC	NC	NC	< 0.50	< 0.50	0.5	NC	NC	NC	< 0.50	< 0.50	0.5	NC	NC	NC
Tin (Sn)	µg/L	< 1.0	< 1.0	1	NC	NC	NC	< 1.0	< 1.0	1	NC	NC	NC	< 1.0	< 1.0	1	NC	NC	NC	< 1.0	< 1.0	1	NC	NC	NC
Titanium (Ti)	µg/L	< 5.0	< 5.0	5	NC	NC	NC	< 5.0	< 5.0	5	NC	NC	NC	< 5.0	< 5.0	5	NC	NC	NC	< 5.0	< 5.0	5	NC	NC	NC
Tungsten (W)	µg/L	< 1.0	< 1.0	1	NC	NC	NC	< 1.0	< 1.0	1	NC	NC	NC	< 1.0	< 1.0	1	NC	NC	NC	< 1.0	< 1.0	1	NC	NC	NC
Uranium (U)	µg/L	1.37	1.47	0.05	1.42	7%	NA	4.93	5.00	0.05	4.97	1%	NA	2.12	1.71	0.05	1.92	**21%**	NA	2.15	2.16	0.05	2.16	0%	NA
Vanadium (V)	µg/L	< 0.50	< 0.50	0.5	NC	NC	NC	1.05	1.04	0.5	1.05	NA	0.0	< 0.50	< 0.50	0.5	NC	NC	NC	1.08	0.97	0.5	1.03	NA	0.2
Yttrium	µg/L	< 0.50	< 0.50	0.5	NC	NC	NC	< 0.50	< 0.50	0.5	NC	NC	NC	< 0.50	< 0.50	0.5	NC	NC	NC	< 0.50	< 0.50	0.5	NC	NC	NC
Zinc (Zn)	µg/L	2.2	2.7	1	2.5	NA	0.5	1.3	1.4	1	1.4	NA	0.1	< 1.0	< 1.0	1	NC	NC	NC	< 1.0	< 1.0	1	NC	NC	NC
µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L

Table 1 - Results of Water Quality QAQC Duplicate Sample Results
Milne Port, 2021

Metals, Total																									
Aluminum	µg/L	15.3	8.2	5	11.750	NA	1.4	7.6	9.1	5	8.4	NA	0.3	24.7	23.9	5	24.3	NA	0.2	16.1	17.1	5	16.6	NA	0.2
Antimony	µg/L	< 1.0	< 1.0	1	NC	NC	NC	< 1.0	< 1.0	1	NC	NC	NC	< 1.0	< 1.0	1	NC	NC	NC	< 1.0	< 1.0	1	NC	NC	NC
Arsenic	µg/L	0.51	0.53	0.4	0.52	NA	0.1	1.41	1.32	0.4	1.37	NA	0.2	0.45	0.41	0.4	0.43	NA	0.1	1.08	1.06	0.4	1.07	NA	0.1
Barium	µg/L	5.0	5.0	1	5.0	NA	0.0	7.4	7.3	1	7.35	1%	NA	5.1	5.2	1	5.2	2%	NA	7.8	7.9	1	7.9	1%	NA
Beryllium	µg/L	< 0.50	< 0.50	0.5	NC	NC	NC	< 0.50	< 0.50	0.5	NC	NC	NC	< 0.50	< 0.50	0.5	NC	NC	NC	< 0.50	< 0.50	0.5	NC	NC	NC
Bismuth	µg/L	< 0.50	< 0.50	0.5	NC	NC	NC	< 0.50	< 0.50	0.5	NC	NC	NC	< 0.50	< 0.50	0.5	NC	NC	NC	< 0.50	< 0.50	0.5	NC	NC	NC
Boron	µg/L	1370	1410	300	1390	NA	0.1	3190	3080	300	3135	4%	NA	1080	1040	300	1060	NA	0.1	2950	3020	300	2985	2%	NA
Cadmium	µg/L	0.016	0.019	0.01	0.018	NA	0.3	0.037	0.027	0.01	0.032	NA	1.0	0.011	< 0.010	0.01	NC	NC	NC	0.031	0.030	0.01	0.031	NA	0.1
Calcium	µg/L	137000	140000	1000	138500	2%	NA	308000	311000	1000	309500	1%	NA	114000	112000	1000	113000	2%	NA	309000	311000	1000	310000	1%	NA
Cesium	µg/L	< 0.50	< 0.50	0.5	NC	NC	NC	< 0.50	< 0.50	0.5	NC	NC	NC	< 0.50	< 0.50	0.5	NC	NC	NC	< 0.50	< 0.50	0.5	NC	NC	NC
Chromium	µg/L	< 0.50	< 0.50	0.5	NC	NC	NC	< 0.50	< 0.50	0.5	NC	NC	NC	< 0.50	1.72	0.5	NC	NC	NC	< 0.50	< 0.50	0.5	NC	NC	NC
Cobalt	µg/L	< 0.050	< 0.050	0.05	NC	NC	NC	< 0.050	< 0.050	0.05	NC	NC	NC	< 0.050	0.066	0.05	NC	NC	NC	< 0.050	< 0.050	0.05	NC	NC	NC
Copper	µg/L	2.02	< 0.50	0.5	NC	NC	NC	0.52	0.65	0.5	0.59	NA	0.3	< 0.50	< 0.50	0.5	NC	NC	NC	1.31	1.31	0.5	1.31	NA	0.0
Gallium	µg/L	< 0.50	< 0.50	0.5	NC	NC	NC	< 0.50	< 0.50	0.5	NC	NC	NC	< 0.50	< 0.50	0.5	NC	NC	NC	< 0.50	< 0.50	0.5	NC	NC	NC
Iron	µg/L	15	< 10	10	NC	NC	NC	< 10	< 10	10	NC	NC	NC	32	40	10	36	NA	0.8	13	14	10	14	NA	0.1
Lead	µg/L	0.080	< 0.050	0.05	NC	NC	NC	0.07	0.076	0.05	0.07	NA	0.1	< 0.050	< 0.050	0.05	NC	NC	NC	< 0.050	< 0.050	0.05	NC	NC	NC
Lithium	µg/L	57	60	20	59	NA	0.2	132	122	20	127	8%	NA	48	43	20	46	NA	0.3	138	137	20	138	1%	NA
Magnesium	µg/L	386000	395000	1000	390500	2%	NA	900000	878000	1000	889000	2%	NA	295000	275000	1000	285000	7%	NA	928000	951000	1000	939500	2%	NA
Manganese	µg/L	0.88	0.64	0.2	0.76	NA	1.2	1.02	1.00	0.2	1.01	2%	NA	1.44	1.67	0.2	1.56	15%	NA	1.10	1.13	0.2	1.12	3%	NA
Mercury	µg/L	< 0.0050	< 0.0050	0.005	NC	NC	NC	< 0.0050	< 0.0050	0.005	NC	NC	NC	< 0.0050	< 0.0050	0.005	NC	NC	NC	< 0.0050	< 0.0050	0.005	NC	NC	NC
Molybdenum	µg/L	3.07	3.39	0.1	3.23	10%	NA	8.14	8.22	0.1	8.18	1%	NA	2.68	2.51	0.1	2.60	7%	NA	7.70	7.65	0.1	7.68	1%	NA
Nickel	µg/L	1.47	< 0.50	0.5	NC	NC	NC	< 0.50	< 0.50	0.5	NC	NC	NC	< 0.50	2.25	0.5	NC	NC	NC	< 0.50	< 0.50	0.5	NC	NC	NC
Phosphorus	µg/L	< 50	< 50	50	NC	NC	NC	< 50	< 50	50	NC	NC	NC	< 50	< 50	50	NC	NC	NC	< 50	< 50	50	NC	NC	NC
Potassium	µg/L	119000	122000	1000	120500	2%	NA	305000	308000	1000	306500	1%	NA	100000	95900	1000	97950	4%	NA	332000	352000	1000	342000	6%	NA
Rubidium	µg/L	34.5	34.8	0.5	34.7	1%	NA	84.6	81.3	0.5	83.0	4%	NA	27.8	26.1	0.5	27.0	6%	NA	85.4	89.9	0.5	87.7	5%	NA
Rhenium	µg/L	< 0.50	< 0.50	5	NC	NC	NC	< 0.50	< 0.50	5	NC	NC	NC	< 0.50	< 0.50	5	NC	NC	NC	< 0.50	< 0.50	5	NC	NC	NC
Selenium	µg/L	< 0.50	< 0.50	0.5	NC	NC	NC	< 0.50	< 0.50	0.5	NC	NC	NC	< 0.50	< 0.50	0.5	NC	NC	NC	< 0.50	< 0.50	0.5	NC	NC	NC
Silicon	µg/L	< 1000	< 1000	1000	NC	NC	NC	< 1000	< 1000	1000	NC	NC	NC	< 1000	< 1000	1000	NC	NC	NC	< 1000	< 1000	1000	NC	NC	NC
Silver	µg/L	< 0.10	< 0.10	0.1	NC	NC	NC	< 0.10	< 0.10	0.1	NC	NC	NC	< 0.10	< 0.10	0.1	NC	NC	NC	< 0.10	< 0.10	0.1	NC	NC	NC
Sodium	µg/L	2910000	3000000	2500	2955000	3%	NA	7740000	7360000	2500	7550000	5%	NA	2280000	2110000	2500	2195000	8%	NA	6820000	6710000	2500	6765000	2%	NA
Strontium	µg/L	2150	2240	10	2195	4%	NA	5540	5690	10	5615	3%	NA	1750	1680	10	1715	4%	NA	5120	5330	10	5225	4%	NA
Sulphur (Colloidal)	µg/L	278000	283000	5000	280500	2%	NA	729000	745000	5000	737000	2%	NA	250000	242000	5000	246000	3%	NA	875000	863000	5000	869000	1%	NA
Tellurium	µg/L	< 0.50	< 0.50	0.5	NC	NC	NC	< 0.50	< 0.50	0.5	NC	NC	NC	< 0.50	< 0.50	0.5	NC	NC	NC	< 0.50	< 0.50	0.5	NC	NC	NC
Thallium	µg/L	< 0.050	< 0.050	0.05	NC	NC	NC	< 0.050	< 0.050	0.05	NC	NC	NC	< 0.050	< 0.050	0.05	NC	NC	NC	< 0.050	< 0.050	0.05	NC	NC	NC
Thorium-232	µg/L	< 0.50	< 0.50	0.5	NC	NC	NC	< 0.50	< 0.50	0.5	NC	NC	NC	< 0.50	< 0.50	0.5	NC	NC	NC	< 0.50	< 0.50	0.5	NC	NC	NC
Tin	µg/L	< 1.0	< 1.0	1	NC	NC	NC	< 1.0	< 1.0	1	NC	NC	NC	< 1.0	< 1.0	1	NC	NC	NC	< 1.0	< 1.0	1	NC	NC	NC
Titanium	µg/L	< 5.0	< 5.0	5	NC	NC	NC	< 5.0	< 5.0	5	NC	NC	NC	< 5.0	< 5.0	5	NC	NC	NC	< 5.0	< 5.0	5	NC	NC	NC
Tungsten	µg/L	< 1.0	< 1.0	1	NC	NC	NC	< 1.0	< 1.0	1	NC	NC	NC	< 1.0	< 1.0	1	NC	NC	NC	< 1.0	< 1.0	1	NC	NC	NC
Uranium	µg/L	1.62	1.63	0.05	1.63	1%	NA	2.72	2.72	0.05	2.72	0%	NA	2.29	1.82	0.05	2.06	**23%**	NA	2.13	2.12	0.05	2.13	0%	NA
Vanadium	µg/L	0.50	< 0.50	0.5	NC	NC	NC	1.08	1.09	0.5	1.09	NA	0.0	< 0.50	< 0.50	0.5	NC	NC	NC	1.12	1.17	0.5	1.15	NA	0.1
Yttrium	µg/L	< 0.50	< 0.50	0.5	NC	NC	NC	< 0.50	< 0.50	0.5	NC	NC	NC	< 0.50	< 0.50	0.5	NC	NC	NC	< 0.50	< 0.50	0.5	NC	NC	NC
Zinc	µg/L	83.7	< 3.0	3	NC	NC	NC	< 3.0	< 3.0	3	NC	NC	NC	< 3.0	< 3.0	3	NC	NC	NC	< 3.0	< 3.0	3	NC	NC	NC
Zirconium	µg/L	< 0.50	< 0.50	0.5	NC	NC	NC	< 0.50	< 0.50	0.5	NC	NC	NC	< 0.50	< 0.50	0.5	NC	NC	NC	< 0.50	< 0.50	0.5	NC	NC	NC
Hydrocarbons																									
Acenaphthene	µg/L	< 0.010	< 0.010	0.01	NC	NC	NC	< 0.010	< 0.010	0.01	NC	NC	NC	-	-	0.01	NC	NC	NC	-	-	0.01	NC	NC	NC
Acenaphthylene	µg/L	< 0.010	< 0.010	0.01	NC	NC	NC	< 0.010	< 0.010	0.01	NC	NC	NC	-	-	0.01	NC	NC	NC	-	-	0.01	NC	NC	NC
Acridine	µg/L	< 0.010	< 0.010	0.01	NC	NC	NC	< 0.010	< 0.010	0.01	NC	NC	NC	-	-	0.01	NC	NC	NC	-	-	0.01	NC	NC	NC
Anthracene	µg/L	< 0.010	< 0.010	0.01	NC	NC	NC	< 0.010	< 0.010	0.01	NC	NC	NC	-	-	0.01	NC	NC	NC	-	-	0.01	NC	NC	NC
Benz(a)anthracene	µg/L	< 0.010	< 0.010	0.01	NC	NC	NC	< 0.010	< 0.010	0.01	NC	NC	NC	-	-	0.01	NC	NC	NC	-	-	0.01	NC	NC	NC
Benzo(a)pyrene	µg/L	< 0.0050	< 0.0050	0.05	NC	NC	NC	< 0.0050	< 0.0050	0.05	NC	NC	NC	-	-	0.05	NC	NC	NC	-	-	0.05	NC	NC	NC
Benzo(g,h,i)perylene	µg/L	< 0.010	< 0.010	0.01	NC	NC	NC	< 0.010	< 0.010	0.01	NC	NC	NC	-	-	0.01	NC	NC	NC	-	-	0.01	NC	NC	NC
Benzo(k)fluoranthene	µg/L	< 0.010	< 0.010	0.01	NC	NC	NC	< 0.010	< 0.010	0.01	NC	NC	NC	-	-	0.01	NC	NC	NC	-	-	0.01	NC	NC	NC
Chrysene	µg/L	< 0.010	< 0.010	0.01	NC	NC	NC	< 0.010	< 0.010	0.01	NC	NC	NC	-	-	0.01	NC	NC	NC	-	-	0.01	NC	NC	NC
Dibenz(a,h)anthracene	µg/L	< 0.0050	< 0.0050	0.05	NC	NC	NC	< 0.0050	< 0.0050	0.05	NC	NC	NC	-	-	0.05	NC	NC	NC	-	-	0.05	NC	NC	NC
Fluoranthene	µg/L	< 0.010	< 0.010	0.01	NC	NC	NC	< 0.010	< 0.010	0.01	NC	NC	NC	-	-	0.01	NC	NC	NC	-	-	0.01	NC	NC	NC
Benzo(b,j) fluoranthene	µg/L	< 0.010	< 0.010	0.01	NC	NC	NC	< 0.010	< 0.010	0.01	NC	NC	NC	-	-	0.01	NC	NC	NC	-	-	0.01	NC	NC	NC
Fluorene	µg/L	< 0.010	< 0.010	0.01	NC	NC	NC	< 0.010	< 0.010	0.01	NC	NC	NC	-	-	0.01	NC	NC	NC	-	-	0.01	NC	NC	NC
Indeno(1,2,3-c,d)pyrene	µg/L	< 0.010	< 0.010	0.01	NC	NC	NC	< 0.010	< 0.010	0.01	NC	NC	NC	-	-	0.01	NC	NC	NC	-	-	0.01	NC	NC	NC
Naphthalene	µg/L	< 0.050	< 0.050	0.05	NC	NC	NC	< 0.050	< 0.050	0.05	NC	NC	NC	-	-	0.05	NC	NC	NC	-	-	0.05	NC	NC	NC
Phenanthrene	µg/L	< 0.020	< 0.020	0.02	NC	NC	NC	< 0.020	< 0.020	0.02	NC	NC	NC	-	-	0.02	NC	NC	NC	-	-	0.02	NC	NC	NC
Pyrene	µg/L	< 0.010	< 0.010	0.01	NC	NC	NC	< 0.010	< 0.010	0.01	NC	NC	NC	-	-	0.01	NC	NC	NC	-	-	0.01	NC	NC	NC
Quinoline	µg/L	< 0.050	< 0.050	0.05	NC	NC	NC	< 0.050	< 0.050	0.05	NC	NC	NC	-	-	0.05	NC	NC	NC	-	-	0.05	NC	NC	NC
1- & 2-Methylnaphthalene	µg/L	-	-	0.01	NC	NC	NC	< 0.015	0.018	0.01	NC	NC	NC	-	-	0.01	NC	NC	NC	-	-	0.01	NC	NC	NC
2-methylnaphthalene	µg/L	< 0.010	< 0.010	0.01	NC	NC	NC	0.013	0.018	0.01	0.016	NA	0.5	-	-	0.01	NC	NC	NC	-	-	0.01	NC	NC	NC
Petroleum Hydrocarbons - F1 (C6-C10)	µg/L	< 100	< 100	100	NC	NC	NC	< 100	< 100	100	NC	NC	NC	-	-	100	NC	NC	NC	-	-	100	NC	NC	NC
Petroleum Hydrocarbons - F2 (C10-C16)	µg/L	< 100	< 100	100	NC	NC	NC	< 100	< 100	100	NC	NC	NC	-	-	100	NC	NC	NC	-	-	100	NC	NC	NC
Petroleum Hydrocarbons - F3 (C16-C34)	µg/L	< 250	< 250	250	NC	NC	NC	< 250	< 250	250	NC	NC	NC	-	-	250	NC	NC	NC	-	-	250	NC	NC	NC
Petroleum Hydrocarbons - F4 (C34-C50)	µg/L	< 250	< 250	250	NC	NC	NC	< 250	< 250	250	NC	NC	NC	-	-	250	NC	NC	NC	-	-	250	NC	NC	NC
1-Methylnaphthalene	µg/L	< 0.010	< 0.010	0.01	NC	NC	NC	< 0.010	< 0.010	0.01	NC	NC	NC	-	-	0.01	NC	NC	NC	-	-	0.01	NC	NC	NC
Benzo[b,j,k]fluoranthene	µg/L	< 0.015	< 0.015	0.015	NC	NC	NC	< 0.015	< 0.015	0.015	NC	NC	NC	-	-	0.015	NC	NC	NC	-	-	0.015	NC	NC	NC
VHCs																									
Volatile Hydrocarbons (C6-C10)	µg/L	-	-	100	NC	NC	NC	< 100	< 100	100	NC	NC	NC	-	-	100	NC	NC	NC	-	-	100	NC	NC	NC
Volatile Petroleum Hydrocarbons (C6-C10)	µg/L	-	-	100	NC	NC	NC	< 100	< 100	100	NC	NC	NC	-	-	100	NC	NC	NC	-	-	100	NC	NC	NC
VOCs and BTEX																									
Benzene	µg/L	< 0.50	< 0.50	0.5	NC	NC	NC	< 0.50	< 0.50	0.5	NC	NC	NC	-	-	0.5	NC	NC	NC	-	-	0.5	NC	NC	NC
Ethylbenzene	µg/L	< 0.50	< 0.50	0.5	NC	NC	NC	< 0.50	< 0.50	0.5	NC	NC	NC	-	-	0.5	NC	NC	NC	-	-	0.5	NC	NC	NC
Styrene	µg/L	< 0.50	< 0.50	0.5	NC	NC	NC	< 0.50	< 0.50	0.5	NC	NC	NC	-	-	0.5	NC	NC	NC	-	-	0.5	NC	NC	NC
Toluene	µg/L	< 0.50	< 0.50	0.5	NC	NC	NC	< 0.50	< 0.50	0.5	NC	NC	NC	-	-	0.5	NC	NC	NC	-	-	0.5	NC	NC	NC
Xylenes, Total	µg/L	< 0.50	< 0.50	0.5	NC	NC	NC	< 0.50	< 0.50	0.5	NC	NC	NC	-	-	0.5	NC	NC	NC	-	-	0.5	NC	NC	NC
o-Xylene	µg/L	< 0.30	< 0.30	0.3	NC	NC	NC	< 0.30	< 0.30	0.3	NC	NC	NC	-	-	0.3	NC	NC	NC	-	-	0.3	NC	NC	NC
m,p-Xylenes	µg/L	< 0.40	< 0.40	0.4	NC	NC	NC	< 0.40	< 0.40	0.4	NC	NC	NC	-	-	0.4	NC	NC	NC	-	-	0.4	NC	NC	NC
Methyl tert-Butyl Ether	µg/L	< 0.50	< 0.50	0.5	NC	NC	NC	< 0.50	< 0.50	0.5	NC	NC	NC	-	-	0.5	NC	NC	NC	-	-	0.5	NC	NC	NC
SUM OF BTEX	µg/L	< 1.0	< 1.0	1	NC	NC	NC	-	-	1	NC	NC	NC	-	-	1	NC	NC	NC	-	-	1	NC	NC	NC

Notes:
DF = difference factor; FDA = field duplicate available; FD = field duplicate; Mean = average of two values; mg/kg = miligrams per kilogram; NA = not applicable; NC = not calculated; QA/QC = Quality Assurance/Quality Control; RPD = releative percent difference; < = less than detection limit; VHC = volatile hydrocarbons; VOCs = volatile organic compounds; BTEX = benzen, toluene, ethylbenzene and xylene

When different detection limits are used for the sample and duplicate results, and one detectable result is reported at a value below the detection limit of a non-detectable result, the RPD is not calculated.

Relative percent difference (RPD) = the difference between two values divided by the mean of the two values. RPD is calculated when the concentration is greater than five times the detection limit.

Acceptable RPD for in sediment is less than or equal to 20%.

Difference factor (DF) = absolute difference between two values divided by the method detection limit. The DF is calculated when the concentration is less than five times the detection limit.

Acceptable DF is less than or equal to 2.0.

Bold values indicate an exceedance of the acceptable RPD or DF.

Sample ID	Units	Reported Detection Limit (RDL)	MP-05- WNW-FBLANK-1	MP-06-North FBlank-2	MP-05-Source-FBLANK3
Date Sampled			02-Aug-2021	14-Aug-2021	19-Aug-2021
Laboratory ID			VA21B6250-001	YL2101029-001	VA21B7949-009
Anions and Nutrients					
Alkalinity, Total as CaCO3	µg/L	1000	< 1000	< 1000	< 1000
Bromide (Br)	µg/L	5000	< 5000	< 5000	< 5000
Chloride (Cl)	µg/L	50000	< 50000	< 50000	< 50000
Fluoride (F)	µg/L	200	< 200	< 200	< 200
Nitrate (as N)	µg/L	10	< 10	< 10	< 10
Nitrite (as N)	µg/L	10	< 10	< 10	< 10
Ammonia (as N)	µg/L	5	< 5.0	< 5.0	< 5.0
Total Kjeldahl Nitrogen	µg/L	50	< 50	< 50	< 50
Sulfate (SO4)	µg/L	3000	< 3000	< 3000	< 3000
Field and Physical					
pH	pH Units	0.1	5.35	6.37	5.1
Conductivity	µS/cm	2.0	< 2.0	< 2.0	< 2.0
Total Dissolved Solids	µg/L	10000	< 10000	< 10000	< 10000
Total Suspended Solids	µg/L	2000	< 2000	< 2000	< 2000
Turbidity	NTU	0.10	< 0.10	< 0.10	< 0.10
Salinity	PSU	1.0	< 1.0	< 1.0	< 1.0
Total Organic Carbon	µg/L	500	< 500	< 500	< 500
Dissolved Organic Carbon	µg/L	500	< 500	< 500	< 500
Hardness, Calcium Carbonate (Dissolved)	µg/L	500	< 1000	< 1000	< 1000
Hardness, Calcium Carbonate (Total)	µg/L	600	< 1000	-	-
Metals, Dissolved					
Aluminum (Al)	µg/L	5	< 5.0	< 5.0	< 5.0
Antimony (Sb)	µg/L	1	< 1.0	< 1.0	< 1.0
Arsenic (As)	µg/L	0.4	< 0.40	< 0.40	< 0.40
Barium (Ba)	µg/L	1	< 1.0	< 1.0	< 1.0
Beryllium (Be)	µg/L	0.5	< 0.50	< 0.50	< 0.50
Bismuth (Bi)	µg/L	0.5	< 0.50	< 0.50	< 0.50
Boron (B)	µg/L	300	< 300	< 300	< 300
Cadmium (Cd)	µg/L	0.01	< 0.010	< 0.010	< 0.010
Calcium (Ca)	µg/L	1000	< 1000	< 1000	< 1000
Cesium	µg/L	0.5	< 0.50	< 0.50	< 0.50
Chromium (Cr)	µg/L	0.5	< 0.50	< 0.50	< 0.50
Cobalt (Co)	µg/L	0.05	< 0.050	< 0.050	< 0.050
Copper (Cu)	µg/L	0.2	< 0.20	< 0.20	< 0.20
Gallium	µg/L	0.5	< 0.50	< 0.50	< 0.50
Iron (Fe)	µg/L	10	< 10	< 10	< 10
Lead (Pb)	µg/L	0.05	< 0.050	< 0.050	< 0.050
Lithium (Li)	µg/L	20	< 20	< 20	< 20
Magnesium (Mg)	µg/L	1000	< 1000	< 1000	< 1000
Manganese (Mn)	µg/L	0.1	< 0.10	< 0.10	< 0.10
Mercury (Hg)	µg/L	0.005	< 0.0050	< 0.0050	< 0.0050
Molybdenum (Mo)	µg/L	0.1	< 0.10	< 0.10	< 0.10
Nickel (Ni)	µg/L	0.5	< 0.50	< 0.50	< 0.50
Phosphorus (P)	µg/L	50	< 50	< 50	< 50
Potassium (K)	µg/L	1000	< 1000	< 1000	< 1000
Rhenium	µg/L	0.5	< 0.50	< 0.50	< 0.50
Rubidium	µg/L	5	< 5.0	< 5.0	< 5.0
Selenium (Se)	µg/L	0.5	< 0.50	< 0.50	< 0.50
Silicon	µg/L	1000	< 1000	< 1000	< 1000
Silver (Ag)	µg/L	0.1	< 0.10	< 0.10	< 0.10
Sodium (Na)	µg/L	2500	< 2500	< 2500	< 2500
Strontium (Sr)	µg/L	10	< 10	< 10	< 10
Sulfur (S)	µg/L	5000	< 5000	< 5000	< 5000
Tellurium	µg/L	0.5	< 0.50	< 0.50	< 0.50
Thallium (Tl)	µg/L	0.05	< 0.050	< 0.050	< 0.050
Thorium-232	µg/L	0.5	< 0.50	< 0.50	< 0.50
Tin (Sn)	µg/L	1	< 1.0	< 1.0	< 1.0
Titanium (Ti)	µg/L	5	< 5.0	< 5.0	< 5.0
Tungsten (W)	µg/L	1	< 1.0	< 1.0	< 1.0
Uranium (U)	µg/L	0.05	< 0.050	< 0.050	< 0.050
Vanadium (V)	µg/L	0.5	< 0.50	< 0.50	< 0.50
Yttrium	µg/L	0.5	< 0.50	< 0.50	< 0.50
Zinc (Zn)	µg/L	1	< 1.0	< 1.0	< 1.0
Zirconium (Zr)	µg/L	0.5	< 0.50	< 0.50	< 0.50
Metals, Total					
Aluminum	µg/L	5	< 5.0	< 5.0	< 5.0
Antimony	µg/L	1	< 1.0	< 1.0	< 1.0
Arsenic	µg/L	0.4	< 0.40	< 0.40	< 0.40
Barium	µg/L	1	< 1.0	< 1.0	< 1.0
Beryllium	µg/L	0.5	< 0.50	< 0.50	< 0.50
Bismuth	µg/L	0.5	< 0.50	< 0.50	< 0.50
Boron	µg/L	300	< 300	< 300	< 300
Cadmium	µg/L	0.01	< 0.010	< 0.010	< 0.010
Calcium	µg/L	1000	< 1000	< 1000	< 1000
Cesium	µg/L	0.5	< 0.50	< 0.50	< 0.50
Chromium	µg/L	0.5	< 0.50	< 0.50	< 0.50
Cobalt	µg/L	0.05	< 0.050	< 0.050	< 0.050
Copper	µg/L	0.5	< 0.50	< 0.50	< 0.50
Gallium	µg/L	0.5	< 0.50	< 0.50	< 0.50
Iron	µg/L	10	< 10	< 10	< 10
Lead	µg/L	0.05	< 0.050	< 0.050	< 0.050
Lithium	µg/L	20	< 20	< 20	< 20
Magnesium	µg/L	1000	< 1000	< 1000	< 1000
Manganese	µg/L	0.2	< 0.20	< 0.20	< 0.20
Mercury	µg/L	0.005	< 0.0050	< 0.0050	< 0.0050
Molybdenum	µg/L	0.1	< 0.10	< 0.10	< 0.10
Nickel	µg/L	0.5	< 0.50	< 0.50	< 0.50
Phosphorus	µg/L	50	< 50	< 50	< 50
Potassium	µg/L	1000	< 1000	< 1000	< 1000
Rubidium	µg/L	0.5	< 5.0	< 5.0	< 5.0
Rhenium	µg/L	5	< 0.50	< 0.50	< 0.50
Selenium	µg/L	0.5	< 0.50	< 0.50	< 0.50
Silicon	µg/L	1000	< 1000	< 1000	< 1000
Silver	µg/L	0.1	< 0.10	< 0.10	< 0.10
Sodium	µg/L	2500	< 2500	< 2500	< 2500
Strontium	µg/L	10	< 10	< 10	< 10
Sulphur (Colloidal)	µg/L	5000	< 5000	< 5000	< 5000
Tellurium	µg/L	0.5	< 0.50	< 0.50	< 0.50
Thallium	µg/L	0.05	< 0.050	< 0.050	< 0.050
Thorium-232	µg/L	0.5	< 0.50	< 0.50	< 0.50
Tin	µg/L	1	< 1.0	< 1.0	< 1.0
Titanium	µg/L	5	< 5.0	< 5.0	< 5.0
Tungsten	µg/L	1	< 1.0	< 1.0	< 1.0
Uranium	µg/L	0.05	< 0.050	< 0.050	< 0.050
Vanadium	µg/L	0.5	< 0.50	< 0.50	< 0.50
Yttrium	µg/L	0.5	< 0.50	< 0.50	< 0.50
Zinc	µg/L	3	< 3.0	< 3.0	< 3.0
Zirconium	µg/L	0.5	0.65	< 0.50	< 0.50
Hydrocarbons					
Acenaphthene	µg/L	0.01	< 0.010	-	< 0.010
Acenaphthylene	µg/L	0.01	< 0.010	-	< 0.010
Acridine	µg/L	0.01	< 0.010	-	< 0.010
Anthracene	µg/L	0.01	< 0.010	-	< 0.010
Benz(a)anthracene	µg/L	0.01	< 0.010	-	< 0.010
Benzo(a)pyrene	µg/L	0.05	< 0.0050	-	< 0.0050
Benzo(g,h,i)perylene	µg/L	0.01	< 0.010	-	< 0.010
Benzo(k)fluoranthene	µg/L	0.01	< 0.010	-	< 0.010
Chrysene	µg/L	0.01	< 0.010	-	< 0.010
Dibenz(a,h)anthracene	µg/L	0.05	< 0.0050	-	< 0.0050
Fluoranthene	µg/L	0.01	< 0.010	-	< 0.010
Benzo(b,j) fluoranthene	µg/L	0.01	< 0.010	-	< 0.010
Fluorene	µg/L	0.01	< 0.010	-	< 0.010
Indeno(1,2,3-c,d)pyrene	µg/L	0.01	< 0.010	-	< 0.010
Naphthalene	µg/L	0.05	< 0.050	-	< 0.050
Phenanthrene	µg/L	0.02	< 0.020	-	< 0.020
Pyrene	µg/L	0.01	< 0.010	-	< 0.010
Quinoline	µg/L	0.05	< 0.050	-	< 0.050
1- & 2-Methylnaphthalene	µg/L	0.01	-	-	0.015
2-methylnaphthalene	µg/L	0.01	< 0.010	-	0.015
Petroleum Hydrocarbons - F1 (C6-C10)	µg/L	100	< 100	-	< 100
Petroleum Hydrocarbons - F2 (C10-C16)	µg/L	100	< 100	-	< 100
Petroleum Hydrocarbons - F3 (C16-C34)	µg/L	250	< 250	-	< 250
Petroleum Hydrocarbons - F4 (C34-C50)	µg/L	250	< 250	-	< 250
1-Methylnaphthalene	µg/L	0.01	< 0.010	-	< 0.010
Benzo[b,j,k]fluoranthene	µg/L	0.015	< 0.015	-	< 0.015
VHCs					
Volatile Hydrocarbons (C6-C10)	µg/L	100	-	-	< 100
Volatile Petroleum Hydrocarbons (C6-C10)	µg/L	100	-	-	< 100
VOCs and BTEX					
Benzene	µg/L	0.5	< 0.50	-	< 0.50
Ethylbenzene	µg/L	0.5	< 0.50	-	< 0.50
Styrene	µg/L	0.5	< 0.50	-	< 0.50
Toluene	µg/L	0.5	< 0.50	-	< 0.50
Xylenes, Total	µg/L	0.5	< 0.50	-	< 0.50
o-Xylene	µg/L	0.3	< 0.30	-	< 0.30
m,p-Xylenes	µg/L	0.4	< 0.40	-	< 0.40
Methyl tert-Butyl Ether	µg/L	0.5	< 0.50	-	< 0.50
SUM OF BTEX	µg/L	1	< 1.0	-	-

Notes:

µg/L = micrograms per litre; cm = centimeter; RDL = reported detection limit; < = less than detection limit; VHC = volatile hydrocarbons;
VOCs = volatile organic compounds; BTEX = benzen, toluene, ethylbenzene and xylene

Bolded values indicate parameter concentrations that are greater than 5-times the detection limit.

APPENDIX 2E

Marine Water Quality - Annual Comparison Tables

Table 1: Marine Water Quality - Receiving Environment Annual Summary Statistics from 2015 to 2021 for the MP-05 and MP-06 Milne Port Site Discharges (all five stations sampled per discharge)

Parameter	CCME Marine WQG for Protection of Aquatic Life[(a)]		2015 (MP-05) n = 12			2016 (MP-05) n = 20			2017 (MP-05) n = 20			2018 (MP-05) n = 20			2019 (MP-05) n = 20			2020 (MP-05) n = 20			2020 (MP-06) n = 20			2021 (MP-05) n = 20			2021 (MP-06) n = 20		
	Short Term	Long Term	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max
Physical																													
pH	—	7.0–8.7	7.8	7.5	7.9	7.8	7.7	7.9	7.8	7.0	8.0	8.0	7.9	8.1	8.0	7.9	8.2	8.0	7.9	8.1	8.0	8.0	8.0	7.7	5.1	8.0	8.0	7.9	8.1
Salinity (ppt)	—	Within 10% of background ppt	NR	NR	NR	NR	NR	NR	13.9	4.1	24.4	8.8	5.4	19.3	20.7	6.4	31.5	7.2	4.1	11.4	10.0	4.6	29.4	13.2	5.2	25.5	19.7	1.7	30.8
TSS (mg/L)	**<25 mg/L above background**	**<5 mg/L above background**	1.2	0.5	2.2	1.6	1.0	3.0	4.2	< 2.0	**25.5**	1.4	1.0	4.3	1.3	< 2.0	2.9	2.0	<2.0	2.6	2.3	<2.0	7.5	2.4	<2.0	4.7	2.6	<2.0	7.9
Turbidity (NTU)	**<8 NTU above background**	**<2 NTU above background**	0.2	0.1	0.9	0.4	0.1	1.0	1.1	0.3	**9.6**	0.7	0.2	**2.5**	0.3	< 0.1	0.7	0.4	0.2	0.7	0.27	<0.1	0.44	0.5	0.1	1.68	0.5	<0.1	1.3
Nutrients (mg/L)																													
Nitrate (as N)	339	45	0.04	0.03	0.2	0.16	0.05	0.6	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	0.02	<0.01	0.13	0.02	< 0.01	0.3	0.03	<0.01	0.2	0.011	< 0.01	0.3
Total Metals (µg/L)																													
Aluminum	—	—	NR	< 50	50	16	9	25	25	8	142	18	8	48	25	< 5	334	13.9	6.5	26.5	11	5.4	24.2	16.6	5.6	37.4	15	<5.0	38.3
Arsenic	—	12.5	< 10	< 10	< 10	< 10	< 10	< 10	< 2	< 2	< 2	< 2	< 2	< 2	1	< 0.4	1.6	0.5	<0.4	0.7	0.6	<0.4	1.4	0.73	<0.40	1.45	1.0	<0.40	1.7
Cadmium	—	0.12	< 0.01	< 0.01	< 0.01	0.02	0.01	0.02	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.03	< 0.01	0.05	0.01	<0.01	0.15	0.01	<0.010	0.02	0.018	<0.010	0.04	0.03	<0.01	0.05
Chromium	—	1.5 (Cr[VI])	< 10	< 10	< 10	< 10	< 10	< 10	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	0.3	< 0.5	0.5	<0.5	<0.5	<0.5	0.6	<0.5	2.4	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Copper	—	—	< 20	< 20	< 20	< 20	< 20	< 20	0.61	< 0.5	1.0	0.6	< 0.5	0.9	1.7	< 0.5	11	<0.5	<0.5	<0.5	0.51	<0.5	0.7	0.8	<0.5	2.0	0.6	<0.5	2.1
Iron	—	—	< 500	< 500	< 500	< 500	< 500	< 500	40	< 10	286	25.3	< 10	93	14	< 10	20	17	<10	33	14	<10	53	19	<10	49	21	<10	71
Mercury	—	**0.016**	0.01	0.01	**0.03**	< 0.013	< 0.013	< 0.013	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.003	< 0.005	< 0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Silver	7.5	—	< 1	< 1	< 1	< 1	< 1	< 1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
PAHs (µg/L)																													
Naphthalene	—	1.4	NR	NR	NR	NR	NR	NR	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05

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FINAL REPORT

Chapter 3.0 Marine Sediment Quality

2021 Marine Environmental Effects Monitoring Program (MEEMP) and Non-Indigenous Species/Aquatic Invasive Species (NIS/AIS) Monitoring Program

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21 October 2022

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ACRONYMS AND ABBREVIATIONS

Acronym or Abbreviation	Definition
ALS	ALS Canada Ltd.
BC MOE	BC Ministry of Environment and Climate Change Strategy
CCME	Canadian Council of Ministers of the Environment
Cm	centimetres
DQOs	Data Quality Objectives
FCSAP	Federal Contaminated Sites Action Plan
ISQGs	Interim Sediment Quality Guidelines
m^2	metre squared
MDL	Method Detection Limit
MEEMP	Marine Environmental Effects Monitoring Program
MEWG	Marine Environmental Working Group
NOAA	National Oceanic and Atmospheric Administration
PAHs	Polycyclic aromatic hydrocarbons
PELs	Probable Effect Level
%	percent
QA/QC	Quality Assurance / Quality Check
QC	Quality Check
QIA	Qikiqtani Inuit Association
RPD	Relative Percent Difference
SW	West Transect
VOCs	Volatile Organic Compounds
WSQG	Working Sediment Quality Guidelines

3.0 SEDIMENT QUALITY

3.1 Introduction

The 2021 sediment sampling program for the MEEMP was focussed on targeted sediment sampling at station SW-2, located along the West transect between the Ore Dock and the mouth of Phillips Creek. Station SW-2 was considered an outlier in the 2020 sediment dataset because of considerably lower fines and higher sand content compared to other stations sampled along the West transect in 2020 and, also, when compared to previous years of sampling at this location. Through the Marine Environmental Working Group (MEWG) process, the Qikiqtani Inuit Association (QIA) requested data from previous years of sampling at SW-2 be revisited to investigate whether changes observed at this station could be Project-related (Technical Comment 25 on the 2020 MEEMP Report), and Baffinland committed to conduct directed sampling during the 2021 open-water season to address this.

This component was developed in consideration of the monitoring requirements outlined in the PC Conditions described in Chapter 1.0, Table 1-2. Project Certificate (PC) Conditions related to the monitoring include PC Conditions No. 76, 87, 89, 91, 99 (a), and 99 (c).

3.1.1 Objectives

The overall MEEMP objectives are outlined in Section 1.3. The objectives of the targeted SW-2 sampling for 2021 are to:

- Conduct targeted follow-up sampling of sediment composition and quality at Station SW-2 to evaluate whether the changes at this station observed in 2020 have persisted and whether they are Project-related.
- Verify predictions made in the FEIS and other submissions to the Nunavut Impact Review Board (NIRB) regarding effects on sediment quality, as applicable.
- Recommend any necessary and appropriate changes to the sediment quality component of the MEEMP for future years.
- Address comments provided by the QIA and MEWG on the 2020 MEEMP Report.

3.2 Study Design

3.2.1 Modifications to the Program (2021)

In the 2020 MEEMP Report, Golder (2021a) reported that monitoring results to date have not identified Project-induced changes to sediment quality in the marine receiving environment. Given there have been three consecutive years of implementation, the joint radial benthic and sediment sampling program was not conducted in 2021 – commensurate with the lack of directional trends observed to date which indicate that the Project has not adversely impacted marine sediments in Milne Inlet. The data show that measured parameters are generally consistent with previous years, within thresholds in the interim CCME sediment quality guidelines, and do not show spatial patterns attributable to Project activities. The power analysis provided in Appendix 3E confirms that in 2019 and 2020 there was adequate statistical power to be able to detect Project-related changes, despite a reduced number of stations sampled in 2019 due to logistical challenges.

Baffinland is committed to continued implementation of the full sampling program with an adjusted monitoring frequency of every 3 years, which is more consistent with routine biological sampling for other mining effects monitoring programs (e.g., the federal Environmental Effects Monitoring Program [EEM]).

3.2.2 Sampling Parameters and Indicators

For marine sediment quality, parameters measured included particle size, organic carbon, nutrients, metals, and hydrocarbons. A sub-set of these parameters (i.e., percent fines, nutrients, metals, and hydrocarbons) were identified as sediment quality indicators to assess the potential for environmental effects from the Project. To provide early warning of environmental effects from the Project, applicable sediment quality guidelines were used as thresholds, where they exist (i.e., Canadian Council of Ministers of the Environment [CCME] sediment quality guidelines for the protection of aquatic life in marine environments [CCME 2014]).

3.3 Materials and Methods

3.3.1 Field Methodology

One sediment sample and one duplicate sample were collected from SW-2 (Table 3-1; Figure 8-1) along with a co-located benthic infauna sample (Section 4.0). The sample was submitted for the same chemical analyses performed in 2020 for the MEEMP program (i.e., particle size, organic carbon, nutrients, metals, and hydrocarbons).

Table 3-1: Sediment Sampling Locations at Milne Port (2021)

Station Name	UTM Coordinates (Zone 17W)		Approximate Lateral Distance Along Transect (m)	Water Depth in Chart Datum (m)
	Easting	Northing		
West Transect				
SW-2	503064	7976526	224	15.1

Sediment samples were collected using a standard Van Veen grab sampler (area of 0.1 m^2). Each grab sample was examined for acceptability based on the following criteria:

- The sampler was fully closed.
- There was adequate penetration depth (i.e., sediment volume greater than 25% full).
- The sample did not appear overfilled or disturbed, and the sample did not appear to have been collected on an angle.
- The sampler did not appear to be leaking sediment at a substantial rate (i.e., the top of the sediment profile did not appear to be sloping inwards).

Upon acceptance, the overlying water in the grab was removed using a siphon tube or turkey baster, taking care to minimize the loss of sediment from the surface of the grab contents. After decanting, the sample consisted of sediment with minimal overlying water visible. Two terra core samples were taken from the undisturbed sediments and placed into pre-labeled methanol preserved vials for volatile organic compounds (VOCs). A description of the sediment with respect to colour, particle size, depth of sediment horizon sampled, grab penetration depth and presence of non-sediment materials (e.g., shells, debris, biota) was recorded on the sediment collection log. Prior to the sample collection, a stainless-steel spoon and bowl were cleaned with laboratory-grade detergent and rinsed with de-ionized (analyte-free) water. The remaining top 5 cm of sediment from the grab sample was removed from the center of the grab using a stainless-steel spoon and transferred to a stainless-steel bowl. The sediment was then homogenized, and aliquots transferred to clean, laboratory supplied sampling containers. Photographs were taken of the sample in the grab and homogenized (Appendix 3A).

Physical and chemical parameters were analyzed in the sediment sample collected from station SW-2 along the west transect. A field duplicate quality control (QC) sample was also collected. These samples were sent to ALS Canada Ltd. (ALS) for analysis of the following parameters:

- Particle size distribution (Wentworth scale)
- Organic and inorganic carbon
- Total petroleum hydrocarbons
- Volatile organic compounds
- Polycyclic aromatic hydrocarbons (PAHs)
- Trace metals (including mercury)

3.3.2 Data Analysis

Data analysis involved characterization of the physical composition of sediments and screening of parameters against applicable sediment quality guidelines.

3.3.2.1 Comparison to Sediment Quality Guidelines

Concentrations of metals and hydrocarbons were compared to CCME Interim Sediment Quality Guidelines (ISQGs) and Probable Effect Level (PELs) for the protection of aquatic life in the marine environment (CCME 2014), which apply in the Project jurisdiction. The CCME ISQGs are intended to represent concentrations below which adverse biological effects are rarely expected to occur. By comparison, the CCME PELs are intended to represent concentrations above which adverse effects are predicted to occur frequently, based on a concurrence data set with sediment chemical concentration and benthic invertebrate effects data from other sites. Notably, the Federal Contaminated Sites Action Plan (FCSAP) guidance for working harbours (FCSAP 2018) recommends use of PELs over ISQGs for screening primary contaminants of potential concern, as screening with ISQGs is considered overly conservative and does not always correlate well with observed effects under field conditions (FCSAP 2018).

To provide a screening value to inform the sediment evaluation, in the absence of a CCME guideline, metals and hydrocarbons were compared to British Columbia Working Sediment Quality Guidelines (WSQG) (BC MOE 2020a), and the National Oceanic and Atmospheric Administration (NOAA) sediment benchmarks (Buchman 2008), following direction provided by the MEWG.

3.3.3 Quality Management

The overall goal of the sediment sampling program is to collect high-quality data, which is achieved through the consistent application of QA/QC measures. These quality management procedures were applied to the field collection, data analysis, and reporting tasks for the targeted sampling in 2021 to verify that the data presented are valid and of acceptable quality to objectives outlined in Section 3.1.1.

3.3.3.1 Field QA/QC

Field staff were trained to be proficient in standardized sampling procedures, data recording using standard forms, and equipment operations applicable to the monitoring program. Field work was completed according to specified instructions and established technical procedures for standard sample collection, preservation, handling, storage, and shipping procedures.

General quality assurance and quality control (QA/QC) tasks applicable to the sediment quality program included, but were not limited to, the following:

- Preparing geo-referenced field maps for use during the surveys to accurately document sampling locations and project-specific data collection forms to standardize the field data collection process.
- Maintaining regular communications between the Project Manager and field staff.
- Collecting and processing samples by qualified experienced personnel.
- Placing samples in appropriate clean containers in such a way that no foreign material was introduced to the sample and handled carefully so there would be no loss of material.
- Collecting Quality Control (duplicate) sample in the field.
- Rinsing and filtering equipment including the Van Veen grab sampler, materials collection totes, field splitter and sieves with seawater between stations. Visual inspection confirmed that materials were not retained on equipment before use on the next station.
- Checking and validating field survey data sheets before leaving the station.
- Selecting accredited laboratories for sample analysis. Performance quality of selected laboratories were verified through Golder’s internal vendor approval and assessment procedures.
- Using chain-of-custody documentation to track sample shipments to the individual subcontractor laboratories.
- Packaging and shipping samples to the laboratory in accordance with required holding times and storage conditions.

3.3.3.2 Laboratory and Data Analysis QA/QC

Laboratory QA/QC reports were reviewed upon receipt to confirm adherence to sample hold times and laboratory data quality objectives (DQOs), and that the appropriate QA/QC information had been reported. Laboratory QA/QC included verification of recommended sample holding times and the analysis of laboratory control samples, laboratory duplicates, and spiked samples to assess precision and accuracy of analytical methods.

One field duplicate was sampled and identified as Duplicate A (blind sample) collected from the same discrete homogenized grab sample (a split sample) as the “original” sample. To assess variability between field duplicates, the Relative Percent Difference (RPD) was calculated as follows:

$$RPD = \left(\frac{sample - duplicate}{(sample + duplicate)/2}\right) \times 100$$

In accordance with the BC Field Sampling Manual (BC MOE 2020b) and CCME (2016), an RPD value of >50% was used to identify differences between original and duplicate samples. Values less than five times the Method Detection Limit (MDL) were not included in the RPD calculations because analytical variability near the MDL is higher and does not provide a good measure of variability associated with the collection of field samples.

3.3.4 Sediment Quality QA/QC Results

The 2021 sediment quality data are considered valid based on the following results of the QA/QC assessment:

- Chemical analyses on the sediment samples were completed within the sample hold time requirements
- Data reported by the laboratory are considered reliable according to the accredited laboratory QA/QC assessment
- There was low variability and high precision between duplicate samples, with the exception of a number of metals (Appendix 3D). Observed differences between the duplicate and the original sediment sample for these metals could be a result of heterogeneity in concentrations inherent within the sediment matrix, or ‘incomplete’ homogenization of the sediment sample such that subsampling for laboratory analysis may have introduced some variability. The data are considered to be reliable because accounting for variability does not substantially change the data screening results at the metal concentrations reported.

Overall, the QA/QC results indicate that the sediment data collected during the 2021 sampling program are of acceptable quality to meet the objectives stated in Section 3.1.

3.4 Results

3.4.1 Sediment Grain Size Composition

Sample photographs and sediment logs from the field program are provided in Appendix 3A and Appendix 3B, respectively. Analytical laboratory reports are provided in Appendix 3C and the compiled dataset screened to applicable sediment quality guidelines is provided in Appendix 3D along with the QA/QC results.

Sediment grain size at SW-2 appears to have become coarser/sandier with a decreased content of fines observed since 2018. Gravel content is highly variable, showing no directional trend (Table 3-2).

Table 3-2: Summary of SW-2 Sediment Grain Composition in 2018 to 2021.

Particle Size	Units	2018[1]	2019	2020	2021
Clay (<0.004mm)	%	5.9	3.3	<1.0	<1.0
Silt (0.063-0.004mm)	%	26.2	11.2	2.7	2.6
Sand (2.0-0.063mm)	%	55.3	83.0	95.7	88.5
Gravel (>2.0mm)	%	12.6	2.5	<1.0	8.9

3.4.2 Comparison to Sediment Quality Guidelines

In 2021, concentrations of metals in sediment collected from SW-2 were below applicable sediment quality guidelines for the protection of aquatic life and hydrocarbon concentrations were not detected (Appendix 3D). Iron concentration in 2021 was comparable to concentrations measured in previous years at this station.

3.5 Discussion

Sediment grain size is shown to be more variable along the West and East transects than the offshore (North and NorthEast) transects, with both sand and fines present in variable proportions along the transects depending on the station location. This variability is likely largely driven by local interactions between sediment transport drivers (i.e., waves and currents), coastal topography, and freshwater inputs from Phillips Creek. However, several lines of evidence support the interpretation that the coarsening of sediment observed at SW-2 in recent years (i.e., decreased fines content) is related to propeller scour and not simply a result of natural variability. This includes direct observations in 2020 of high propellor wash events in the area (i.e., generated by tugs when operating inshore of the Ore Dock), propellor wash model results which indicate the zone of influence overlaps with SW-2, and diver observations of a large elliptical pocket of course substrate where the soft overlying sediment has been washed out (similar to other observed and modelled propellor wash scours).

Collectively, the available sediment quality data available for station SW-2 suggests localized physical disturbance to the substrate has occurred. Scour from propellor-generated currents by berthing ore carriers is the most likely mechanism given the site’s proximity to the Ore Dock. The observed changes in sediment size distribution could be attributed to small-scale shifts in the position of bedforms formed under the propellor-generated currents,

[1] Value reported for 2018 is an average of the 3 replicate samples collected in that sampling year.

which act to mobilize finer sediments resulting in local coarsening of the substrate. Changes in sediment grain size can drive associated effects to benthic infaunal communities, as strong relationships exist between the distribution and abundance of infaunal invertebrates inhabiting soft-bottom environments and the size and texture of sediments.

Propwash effects around the Ore Dock in Milne Port are consistent with FEIS predictions, which forecasted the potential for minor and localized sediment disturbance associated with propwash and overall negligible residual effects on sediment quality in Milne Port. While substrates have remained predominantly sandy since 2018, there has been further coarsening in the last two years at station SW-2. While changes in sediment composition at this site impacted the benthic community, as evidenced by results documented in 2020, these impacts do not appear to be long-lasting; in 2021, the benthic community at SW-2 was substantially more diverse (returned to 2019 levels) and abundant (an order of magnitude increase) compared to 2020, which demonstrates the ability of these organisms to rebound and potentially reach a new, post-disturbance equilibrium (explained in greater detail in Chapter 4.0).

3.6 Conclusions and Recommendations

In general, the measured sediment quality parameters at SW-2 are consistent with previous years, are below CCME sediment quality guidelines, and do not suggest a compromised environment due to Project operations. However, available sediment monitoring data for station SW-2 (2018-2021) indicates that the grain size composition has changed at this location in a manner that is consistent with the expected effects of propellor wash (i.e., higher sand and lower fines content in the sediment). Overall, monitoring results remain within original FEIS predictions, which forecasted the potential for minor and localized sediment disturbance associated with propwash, which is expected to stabilize over time. It is recommended to continue targeted sampling in 2022 at SW-2 as part of ongoing monitoring of Project effects relative to impact predictions.

3.7 Closure

We trust this information is sufficient for your needs at this time. Should you have any questions or concerns, please do not hesitate to contact the undersigned at 250-881-7372.

Golder Associates Ltd.

Trish Tomliens, BSc, EPt
Benthic Ecologist

Reviewed by:

Elaine Irving, PhD, RPBio
Senior Environmental Scientist

Phil Osborne, PhD, PGeo
Principal, Senior Coastal Geomorphologist

https://golderassociates.sharepoint.com/sites/11206g/deliverables (do not use)/issued to client_for wp/300-399/1663724-349c-r-rev0/1663724-349c-r-rev0-44000 2021 meemp 3.0 sediment quality_21oct2022.docx

3.8 References

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APPENDIX A

Photographs

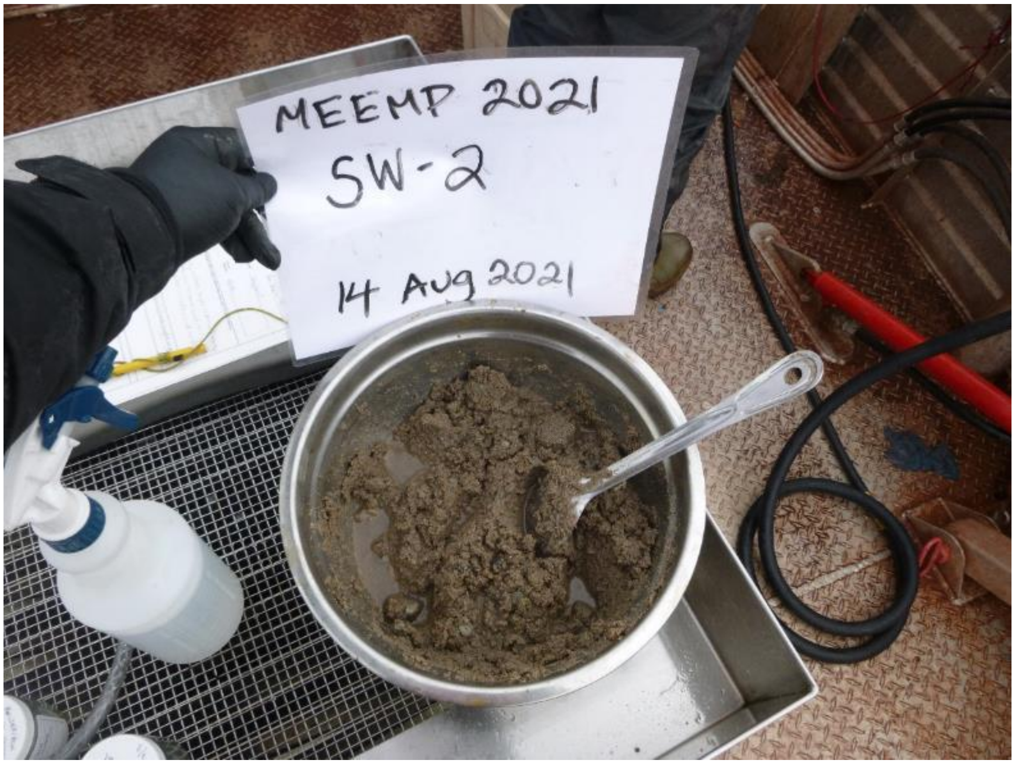

Photo 1 – Homogenized sediment sample collected at station SW-2 on 14 August 2021.

Photo 2 – Van Veen grab set and ready for deployment on 10 August 2021.

Photo 3 – Benthic sample on 1.0 cm sieve, collected at station SW-2 on 14 August 2021.

Photo 4 – Benthic sample on 0.5 mm sieve, collected at station SW-2 on 14 August 2021.

APPENDIX B

Marine Sediment Logs - 2021

SEDIMENT SAMPLING LOG

Project No:	1663724-44000/03	Project Title:	Baffinland 2021 -
Date:	14 Aug 2021	Inspected by:	TT
Station Number (ID):	SW-2/DUP A	Sampling Method:	Van Veen
Weather:	Light rain, 10-12 kts (gusts to 15 kts)	Lat/Longitude:	Waypoint
Sampling Depth:	17.6m		
# of Attempts to Obtain Sample:	IIII	Time of Collection:	12:34 - 13:15

Sediment Description (including colour, type/grain size, anthropogenic debris, organic material, shell, wood, odour, HC sheen, staining, organisms/biota etc.):

Sand - wet, loose, low plasticity, surface layer is brown overtop of greyish black layer, <0% fines, fine to coarse sand, <5% gravel (rounded), shell debris, Similipecten, no odour and no sheen present

Approx % collected in grab sample 1-15-20%, 6cm), 2 (10-15%, 5cm), 3-rock caught in grab %
4-(40-45%, 6.5cm)

Photograph Notes (grab, sampling location, field sampling methods, public use, etc):

Photo of homogenized sample

Sample Control Number (SCN):

Analysis for:

- ☑ Full Metals
- ☑ Grain Size
- ☐ PCB
- ☐ Other VOC, BTEX
- ☑ PAH
- ☐ Benthic
- ☐ Dioxins and Furans
- ☐ TBT
- ☐ AVS CEM
- ☐ PFOA/PFOS

AEC: ______ # of Grabs for Analysis: ______

Other Notes:

* 6 jars, 4 vials and 2 bags

SAMPLE NUMBER: ________

APPENDIX C

Sediment Quality Laboratory Data

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **VA21B7543**	Page	: 1 of 6
Client	: **Golder Associates Ltd.**	Laboratory	: Vancouver - Environmental
Contact	: Elaine Irving	Account Manager	: Amber Springer
Address	: 200-2920 Virtual Way Vancouver BC Canada V5M 0C4	Address	: 8081 Lougheed Highway Burnaby BC Canada V5A 1W9
Telephone	: ----	Telephone	: +1 604 253 4188
Project	: 1663724-44000-03	Date Samples Received	: 19-Aug-2021 08:25
PO	: ----	Date Analysis Commenced	: 21-Aug-2021
C-O-C number	: 20-920782	Issue Date	: 27-Aug-2021 16:37
Sampler	: ----		
Site	: ----		
Quote number	: Q84262		
No. of samples received	: 5		
No. of samples analysed	: 5		

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

Signatories	*Position*	*Laboratory Department*
Caleb Deroche	Lab Analyst	Metals, Burnaby, British Columbia
Hedy Lai	Team Leader - Inorganics	Inorganics, Saskatoon, Saskatchewan
Kevin Duarte	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Ophelia Chiu	Department Manager - Organics	Organics, Burnaby, British Columbia
Paul Cushing	Team Leader - Organics	Organics, Burnaby, British Columbia
Xihua Yao	Laboratory Analyst	Inorganics, Saskatoon, Saskatchewan

General Comments

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

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

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

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

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances

LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	No Unit
%	percent
mg/kg	milligrams per kilogram
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*
LSRA	*Low surrogate recovery was observed due to adsorptive material in sample (e.g. charcoal). Results for other analytes within the same test represent solvent extractable concentrations*
SUR-ND	*Surrogate recovery marginally exceeded ALS DQO. Reported non-detect results for associated samples were deemed to be unaffected.*

Analytical Results

Sub-Matrix: **Sediment**
(Matrix: **Soil/Solid**)

Analyte	CAS Number	Method	LOR	Unit	TR Ref1	TR Ref2	DUP-B	SW-2	DUP A
Client sampling date / time					15-Aug-2021 15:45	15-Aug-2021 16:30	15-Aug-2021	14-Aug-2021 13:15	14-Aug-2021
					VA21B7543-001	VA21B7543-002	VA21B7543-003	VA21B7543-004	VA21B7543-005
					Result	Result	Result	Result	Result
Physical Tests									
moisture	----	E144	0.25	%	24.6	39.7	39.6	14.7	14.4
pH (1:2 soil:water)	----	E108	0.10	pH units	8.37	8.22	8.21	8.90	8.89
Particle Size									
clay (<0.004mm)	----	EC184E	1.0	%	5.7	4.4	4.2	<1.0	<1.0
silt (0.063mm - 0.004mm)	----	EC184E	1.0	%	26.7	21.9	22.4	2.6	2.2
sand (2.0mm - 0.063mm)	----	EC184E	1.0	%	57.4	68.3	71.1	88.5	87.2
gravel (>2mm)	----	EC184E	1.0	%	10.2	5.4	2.3	8.9	10.6
Organic / Inorganic Carbon									
carbon, total [TC]	----	E351	0.050	%	1.16	1.39	1.45	1.27	1.11
carbon, inorganic [IC]	----	E354	0.050	%	0.524	0.355	0.378	0.936	0.811
carbon, inorganic [IC], (as CaCO3 equivalent)	----	E354	0.40	%	4.37	2.96	3.15	7.80	6.76
carbon, total organic [TOC]	----	EC356	0.050	%	0.636	1.04	1.07	0.334	0.299
organic matter	----	EC356	0.10	%	1.10	1.79	1.84	0.58	0.52
Metals									
aluminum	7429-90-5	E440	50	mg/kg	18400	6770	8260	8860	1450
antimony	7440-36-0	E440	0.10	mg/kg	0.16	<0.10	<0.10	<0.10	<0.10
arsenic	7440-38-2	E440	0.10	mg/kg	2.63	2.60	2.66	2.83	0.44
barium	7440-39-3	E440	0.50	mg/kg	48.6	32.7	32.0	32.2	4.46
beryllium	7440-41-7	E440	0.10	mg/kg	0.22	0.51	0.52	0.56	<0.10
bismuth	7440-69-9	E440	0.20	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20
boron	7440-42-8	E440	5.0	mg/kg	<5.0	19.1	36.5	35.1	9.1
cadmium	7440-43-9	E440	0.020	mg/kg	0.054	0.049	0.113	0.098	<0.020
calcium	7440-70-2	E440	50	mg/kg	11900	16100	9110	9550	23500
chromium	7440-47-3	E440	0.50	mg/kg	51.6	15.6	14.6	16.0	5.70
cobalt	7440-48-4	E440	0.10	mg/kg	10.3	3.59	3.97	4.28	0.97
copper	7440-50-8	E440	0.50	mg/kg	39.5	5.03	9.10	9.24	1.16
iron	7439-89-6	E440	50	mg/kg	28300	13000	12900	14400	3050
lead	7439-92-1	E440	0.50	mg/kg	1.52	5.18	6.96	7.33	1.06
lithium	7439-93-2	E440	2.0	mg/kg	4.9	16.1	17.7	17.8	6.2
magnesium	7439-95-4	E440	20	mg/kg	6020	11400	8870	10000	11200

Analytical Results

Sub-Matrix: **Sediment**

(Matrix: **Soil/Solid)**

Analyte	CAS Number	Method	LOR	Unit	TR Ref1	TR Ref2	DUP-B	SW-2	DUP A
				Client sampling date / time	15-Aug-2021 15:45	15-Aug-2021 16:30	15-Aug-2021	14-Aug-2021 13:15	14-Aug-2021
					VA21B7543-001	VA21B7543-002	VA21B7543-003	VA21B7543-004	VA21B7543-005
					Result	Result	Result	Result	Result
Metals									
manganese	7439-96-5	E440	1.0	mg/kg	414	109	91.2	99.4	39.4
mercury	7439-97-6	E510	0.0050	mg/kg	<0.0050	0.0063	0.0064	<0.0050	<0.0050
molybdenum	7439-98-7	E440	0.10	mg/kg	2.11	0.80	1.70	1.66	0.11
nickel	7440-02-0	E440	0.50	mg/kg	22.8	8.86	10.0	11.2	2.99
phosphorus	7723-14-0	E440	50	mg/kg	365	662	410	483	80
potassium	7440-09-7	E440	100	mg/kg	580	1730	2480	2590	740
selenium	7782-49-2	E440	0.20	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20
silver	7440-22-4	E440	0.10	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10
sodium	7440-23-5	E440	50	mg/kg	774	3190	5800	6770	1520
strontium	7440-24-6	E440	0.50	mg/kg	42.8	21.9	26.0	26.6	15.2
sulfur	7704-34-9	E440	1000	mg/kg	<1000	<1000	2400	2500	<1000
thallium	7440-28-0	E440	0.050	mg/kg	<0.050	0.100	0.115	0.115	<0.050
tin	7440-31-5	E440	2.0	mg/kg	<2.0	<2.0	<2.0	<2.0	<2.0
titanium	7440-32-6	E440	1.0	mg/kg	2260	340	257	256	110
tungsten	7440-33-7	E440	0.50	mg/kg	11.9	<0.50	<0.50	<0.50	<0.50
uranium	7440-61-1	E440	0.050	mg/kg	0.253	2.13	1.82	1.78	0.213
vanadium	7440-62-2	E440	0.20	mg/kg	95.3	22.4	21.2	22.3	4.91
zinc	7440-66-6	E440	2.0	mg/kg	30.3	22.1	24.7	26.9	4.8
zirconium	7440-67-7	E440	1.0	mg/kg	11.0	10.3	7.3	8.6	1.5
Volatile Organic Compounds [Fuels]									
benzene	71-43-2	E611A	0.0050	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
ethylbenzene	100-41-4	E611A	0.015	mg/kg	<0.015	<0.015	<0.015	<0.015	<0.015
toluene	108-88-3	E611A	0.050	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050
xylene, m+p-	179601-23-1	E611A	0.050	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050
xylene, o-	95-47-6	E611A	0.050	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050
xylenes, total	1330-20-7	E611A	0.075	mg/kg	<0.075	<0.075	<0.075	<0.075	<0.075
Volatile Organic Compounds Surrogates									
bromofluorobenzene, 4-	460-00-4	E611A	0.10	%	91.9	87.2	40.7 SUR-ND	71.4	84.7
difluorobenzene, 1,4-	540-36-3	E611A	0.10	%	97.2	87.3	41.0 SUR-ND	83.0	100
Hydrocarbons									
F1 (C6-C10)	----	E581.VH+F1	5.0	mg/kg	<5.0	<5.0	<5.0	<5.0	<5.0

Analytical Results

Sub-Matrix: **Sediment**

(Matrix: **Soil/Solid**)

				Client sample ID	TR Ref1	TR Ref2	DUP-B	SW-2	DUP A
				Client sampling date / time	15-Aug-2021 15:45	15-Aug-2021 16:30	15-Aug-2021	14-Aug-2021 13:15	14-Aug-2021
Analyte	*CAS Number*	*Method*	*LOR*	*Unit*	VA21B7543-001	VA21B7543-002	VA21B7543-003	VA21B7543-004	VA21B7543-005
					Result	Result	Result	Result	Result
Hydrocarbons									
F1-BTEX	----	EC580	5.0	mg/kg	<5.0	<5.0	<5.0	<5.0	<5.0
F2 (C10-C16)	----	E601.SG	30	mg/kg	<30	<30	<30	<30	<30
F3 (C16-C34)	----	E601.SG	50	mg/kg	<50	56	51	<50	<50
F4 (C34-C50)	----	E601.SG	50	mg/kg	<50	<50	<50	<50	<50
chromatogram to baseline at nC50	----	E601.SG	-	-	Yes	Yes	Yes	Yes	Yes
Hydrocarbons Surrogates									
bromobenzotrifluoride, 2- (F2-F4 surr)	392-83-6	E601.SG	1.0	%	85.2	83.8	81.9	83.9	86.2
dichlorotoluene, 3,4-	97-75-0	E581.VH+F1	1.0	%	101	77.6	76.4	34.0 LSRA	28.6 LSRA
Polycyclic Aromatic Hydrocarbons									
acenaphthene	83-32-9	E641A-L	0.0050	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
acenaphthylene	208-96-8	E641A-L	0.0050	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
acridine	260-94-6	E641A-L	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010
anthracene	120-12-7	E641A-L	0.0040	mg/kg	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
benz(a)anthracene	56-55-3	E641A-L	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010
benzo(a)pyrene	50-32-8	E641A-L	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010
benzo(b+j)fluoranthene	----	E641A-L	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010
benzo(b+j+k)fluoranthene	----	E641A-L	0.015	mg/kg	<0.015	<0.015	<0.015	<0.015	<0.015
benzo(g,h,i)perylene	191-24-2	E641A-L	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010
benzo(k)fluoranthene	207-08-9	E641A-L	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010
chrysene	218-01-9	E641A-L	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010
dibenz(a,h)anthracene	53-70-3	E641A-L	0.0050	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
fluoranthene	206-44-0	E641A-L	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010
fluorene	86-73-7	E641A-L	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010
indeno(1,2,3-c,d)pyrene	193-39-5	E641A-L	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010
methylnaphthalene, 1-	90-12-0	E641A-L	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010
methylnaphthalene, 1+2-	----	E641A-L	0.015	mg/kg	<0.015	<0.015	<0.015	<0.015	<0.015
methylnaphthalene, 2-	91-57-6	E641A-L	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010
naphthalene	91-20-3	E641A-L	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010
phenanthrene	85-01-8	E641A-L	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010
pyrene	129-00-0	E641A-L	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010
quinoline	6027-02-7	E641A-L	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010

Analytical Results

Sub-Matrix: **Sediment**

(Matrix: **Soil/Solid**)

				Client sample ID	TR Ref1	TR Ref2	DUP-B	SW-2	DUP A
				Client sampling date / time	15-Aug-2021 15:45	15-Aug-2021 16:30	15-Aug-2021	14-Aug-2021 13:15	14-Aug-2021
Analyte	CAS Number	Method	LOR	Unit	VA21B7543-001	VA21B7543-002	VA21B7543-003	VA21B7543-004	VA21B7543-005
					Result	Result	Result	Result	Result
Polycyclic Aromatic Hydrocarbons									
B(a)P total potency equivalents [B(a)P TPE]	----	E641A-L	0.020	mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020
IACR (CCME)	----	E641A-L	0.150	-	<0.150	<0.150	<0.150	<0.150	<0.150
IACR AB (coarse)	----	E641A-L	0.10	-	----	----	----	<0.10	<0.10
IACR AB (fine)	----	E641A-L	0.10	-	----	----	<0.10	<0.10	<0.10
PAHs, total (BC Sched 3.4)	----	E641A-L	0.040	mg/kg	<0.040	<0.040	<0.040	<0.040	<0.040
PAHs, total (EPA 16 - DAS)	----	E641A-L	0.140	mg/kg	----	----	<0.140	<0.140	<0.140
PAHs, total (EPA 16)	----	E641A-L	0.040	mg/kg	<0.040	<0.040	<0.040	<0.040	<0.040
Polycyclic Aromatic Hydrocarbons Surrogates									
acridine-d9	34749-75-2	E641A-L	0.1	%	106	112	102	110	104
chrysene-d12	1719-03-5	E641A-L	0.1	%	123	127	116	129	123
naphthalene-d8	1146-65-2	E641A-L	0.1	%	102	105	94.6	104	100
phenanthrene-d10	1517-22-2	E641A-L	0.1	%	105	108	98.4	108	103

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

ALS Environmental

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **VA21B7543**	Page	:
Client	: **Golder Associates Ltd.**	Laboratory	: Vancouver - Environmental
Contact	: Elaine Irving	Account Manager	: Amber Springer
Address	: 200-2920 Virtual Way Vancouver BC Canada V5M 0C4	Address	: 8081 Lougheed Highway Burnaby, British Columbia Canada V5A 1W9
Telephone	: ----	Telephone	: +1 604 253 4188
Project	: 1663724-44000-03	Date Samples Received	: 19-Aug-2021 08:25
PO	: ----	Issue Date	: 27-Aug-2021 16:37
C-O-C number	: 20-920782		
Sampler	: ----		
Site	: ----		
Quote number	: Q84262		
No. of samples received	: 5		
No. of samples analysed	: 5		

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 Services number is a unique identifier assigned to discrete substances.

DQO: Data Quality Objective.

LOR: Limit of Reporting (detection limit).

RPD: Relative Percent Difference.

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- Duplicate outliers occur - please see following pages for full details.
- Test sample Surrogate recovery outliers exist for all regular sample matrices - please see following pages for full details.

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.

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **Soil/Solid**

Analyte Group	Laboratory sample ID	Client/Ref Sample ID	Analyte	CAS Number	Method	Result	Limits	Comment
Duplicate (DUP) RPDs								
Metals	Anonymous	Anonymous	lead	7439-92-1	E440	41.6 % DUP-H	40%	Duplicate RPD does not meet the DQO for this test.

Result Qualifiers

Qualifier	*Description*
DUP-H	*Duplicate results outside ALS DQO, due to sample heterogeneity.*

Regular Sample Surrogates

Sub-Matrix: **Sediment**

Analyte Group	Laboratory sample ID	Client/Ref Sample ID	Analyte	CAS Number	Result	Limits	Comment
Samples Submitted							
Volatile Organic Compounds Surrogates	VA21B7543-003	DUP-B	bromofluorobenzene, 4-	460-00-4	40.7 %	70.0-130 %	Recovery less than lower data quality objective
Volatile Organic Compounds Surrogates	VA21B7543-003	DUP-B	difluorobenzene, 1,4-	540-36-3	41.0 %	70.0-130 %	Recovery less than lower data quality objective
Hydrocarbons Surrogates	VA21B7543-004	SW-2	dichlorotoluene, 3,4-	97-75-0	34.0 %	70.0-130 %	Recovery less than lower data quality objective
Hydrocarbons Surrogates	VA21B7543-005	DUP A	dichlorotoluene, 3,4-	97-75-0	28.6 %	70.0-130 %	Recovery less than lower data quality objective

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: **Soil/Solid**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis: Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Hydrocarbons : CCME PHC - F2-F4 by GC-FID										
Glass soil jar/Teflon lined cap DUP A	E601.SG	14-Aug-2021	24-Aug-2021	14 days	10 days	✓	27-Aug-2021	40 days	3 days	✓
Hydrocarbons : CCME PHC - F2-F4 by GC-FID										
Glass soil jar/Teflon lined cap SW-2	E601.SG	14-Aug-2021	24-Aug-2021	14 days	10 days	✓	27-Aug-2021	40 days	3 days	✓
Hydrocarbons : CCME PHC - F2-F4 by GC-FID										
Glass soil jar/Teflon lined cap DUP-B	E601.SG	15-Aug-2021	24-Aug-2021	14 days	9 days	✓	27-Aug-2021	40 days	3 days	✓
Hydrocarbons : CCME PHC - F2-F4 by GC-FID										
Glass soil jar/Teflon lined cap TR Ref1	E601.SG	15-Aug-2021	24-Aug-2021	14 days	9 days	✓	27-Aug-2021	40 days	3 days	✓
Hydrocarbons : CCME PHC - F2-F4 by GC-FID										
Glass soil jar/Teflon lined cap TR Ref2	E601.SG	15-Aug-2021	24-Aug-2021	14 days	9 days	✓	27-Aug-2021	40 days	3 days	✓
Hydrocarbons : VH and F1 by Headspace GC-FID										
Glass soil methanol vial DUP-B	E581.VH+F1	15-Aug-2021	24-Aug-2021	----	----		26-Aug-2021	40 days	10 days	✓
Hydrocarbons : VH and F1 by Headspace GC-FID										
Glass soil methanol vial TR Ref1	E581.VH+F1	15-Aug-2021	24-Aug-2021	----	----		26-Aug-2021	40 days	10 days	✓

Matrix: **Soil/Solid**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis: Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Hydrocarbons : VH and F1 by Headspace GC-FID										
Glass soil methanol vial TR Ref2	E581.VH+F1	15-Aug-2021	24-Aug-2021	----	----		26-Aug-2021	40 days	10 days	✓
Hydrocarbons : VH and F1 by Headspace GC-FID										
Glass soil methanol vial DUP A	E581.VH+F1	14-Aug-2021	24-Aug-2021	----	----		26-Aug-2021	40 days	11 days	✓
Hydrocarbons : VH and F1 by Headspace GC-FID										
Glass soil methanol vial SW-2	E581.VH+F1	14-Aug-2021	24-Aug-2021	----	----		26-Aug-2021	40 days	11 days	✓
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap DUP-B	E510	15-Aug-2021	25-Aug-2021	----	----		25-Aug-2021	28 days	10 days	✓
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap TR Ref1	E510	15-Aug-2021	25-Aug-2021	----	----		25-Aug-2021	28 days	10 days	✓
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap TR Ref2	E510	15-Aug-2021	25-Aug-2021	----	----		25-Aug-2021	28 days	10 days	✓
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap DUP A	E510	14-Aug-2021	25-Aug-2021	----	----		25-Aug-2021	28 days	11 days	✓
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap SW-2	E510	14-Aug-2021	25-Aug-2021	----	----		25-Aug-2021	28 days	11 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap DUP-B	E440	15-Aug-2021	25-Aug-2021	----	----		25-Aug-2021	180 days	10 days	✓

Matrix: **Soil/Solid**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis: Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap TR Ref1	E440	15-Aug-2021	25-Aug-2021	----	----		25-Aug-2021	180 days	10 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap TR Ref2	E440	15-Aug-2021	25-Aug-2021	----	----		25-Aug-2021	180 days	10 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap DUP A	E440	14-Aug-2021	25-Aug-2021	----	----		25-Aug-2021	180 days	11 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap SW-2	E440	14-Aug-2021	25-Aug-2021	----	----		25-Aug-2021	180 days	11 days	✓
Organic / Inorganic Carbon : Total Carbon by Combustion										
LDPE bag DUP A	E351	14-Aug-2021	----	----	----		24-Aug-2021	180 days	0 days	✓
Organic / Inorganic Carbon : Total Carbon by Combustion										
Glass soil jar/Teflon lined cap DUP-B	E351	15-Aug-2021	----	----	----		24-Aug-2021	180 days	0 days	✓
Organic / Inorganic Carbon : Total Carbon by Combustion										
LDPE bag SW-2	E351	14-Aug-2021	----	----	----		24-Aug-2021	180 days	0 days	✓
Organic / Inorganic Carbon : Total Carbon by Combustion										
LDPE bag TR Ref1	E351	15-Aug-2021	----	----	----		24-Aug-2021	180 days	0 days	✓
Organic / Inorganic Carbon : Total Carbon by Combustion										
LDPE bag TR Ref2	E351	15-Aug-2021	----	----	----		24-Aug-2021	180 days	0 days	✓

Matrix: **Soil/Solid**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Holding Times: Rec	Holding Times: Actual	Eval	Analysis: Analysis Date	Holding Times: Rec	Holding Times: Actual	Eval
Organic / Inorganic Carbon : Total Inorganic Carbon by Acetic Acid pH Standard Curve										
LDPE bag DUP A	E354	14-Aug-2021	----	----	----		23-Aug-2021	----	----	
Organic / Inorganic Carbon : Total Inorganic Carbon by Acetic Acid pH Standard Curve										
Glass soil jar/Teflon lined cap DUP-B	E354	15-Aug-2021	----	----	----		23-Aug-2021	----	----	
Organic / Inorganic Carbon : Total Inorganic Carbon by Acetic Acid pH Standard Curve										
LDPE bag SW-2	E354	14-Aug-2021	----	----	----		23-Aug-2021	----	----	
Organic / Inorganic Carbon : Total Inorganic Carbon by Acetic Acid pH Standard Curve										
LDPE bag TR Ref1	E354	15-Aug-2021	----	----	----		23-Aug-2021	----	----	
Organic / Inorganic Carbon : Total Inorganic Carbon by Acetic Acid pH Standard Curve										
LDPE bag TR Ref2	E354	15-Aug-2021	----	----	----		23-Aug-2021	----	----	
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap DUP A	E144	14-Aug-2021	----	----	----		24-Aug-2021	0 days	----	
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap DUP-B	E144	15-Aug-2021	----	----	----		24-Aug-2021	0 days	----	
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap SW-2	E144	14-Aug-2021	----	----	----		24-Aug-2021	0 days	----	
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap TR Ref1	E144	15-Aug-2021	----	----	----		24-Aug-2021	0 days	----	

Matrix: **Soil/Solid**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap TR Ref2	E144	15-Aug-2021	----	----	----		24-Aug-2021	0 days	----	
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
Glass soil jar/Teflon lined cap DUP-B	E108	15-Aug-2021	25-Aug-2021	----	----		25-Aug-2021	30 days	10 days	✓
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
Glass soil jar/Teflon lined cap TR Ref1	E108	15-Aug-2021	25-Aug-2021	----	----		25-Aug-2021	30 days	10 days	✓
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
Glass soil jar/Teflon lined cap TR Ref2	E108	15-Aug-2021	25-Aug-2021	----	----		25-Aug-2021	30 days	10 days	✓
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
Glass soil jar/Teflon lined cap DUP A	E108	14-Aug-2021	25-Aug-2021	----	----		25-Aug-2021	30 days	11 days	✓
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
Glass soil jar/Teflon lined cap SW-2	E108	14-Aug-2021	25-Aug-2021	----	----		25-Aug-2021	30 days	11 days	✓
Polycyclic Aromatic Hydrocarbons : PAHs by Hex:Ace GC-MS (Low Level CCME)										
Glass soil jar/Teflon lined cap DUP A	E641A-L	14-Aug-2021	24-Aug-2021	14 days	10 days	✓	26-Aug-2021	40 days	2 days	✓
Polycyclic Aromatic Hydrocarbons : PAHs by Hex:Ace GC-MS (Low Level CCME)										
Glass soil jar/Teflon lined cap SW-2	E641A-L	14-Aug-2021	24-Aug-2021	14 days	10 days	✓	26-Aug-2021	40 days	2 days	✓
Polycyclic Aromatic Hydrocarbons : PAHs by Hex:Ace GC-MS (Low Level CCME)										
Glass soil jar/Teflon lined cap DUP-B	E641A-L	15-Aug-2021	24-Aug-2021	14 days	9 days	✓	26-Aug-2021	40 days	2 days	✓

Matrix: **Soil/Solid**

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

Analyte Group Container / Client Sample ID(s)	*Method*	*Sampling Date*	*Extraction / Preparation* Preparation Date	Holding Times Rec	Holding Times Actual	Eval	*Analysis* Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Polycyclic Aromatic Hydrocarbons : PAHs by Hex:Ace GC-MS (Low Level CCME)										
Glass soil jar/Teflon lined cap TR Ref1	E641A-L	15-Aug-2021	24-Aug-2021	14 days	9 days	✓	26-Aug-2021	40 days	2 days	✓
Polycyclic Aromatic Hydrocarbons : PAHs by Hex:Ace GC-MS (Low Level CCME)										
Glass soil jar/Teflon lined cap TR Ref2	E641A-L	15-Aug-2021	24-Aug-2021	14 days	9 days	✓	26-Aug-2021	40 days	2 days	✓
Volatile Organic Compounds [Fuels] : BTEX by Headspace GC-MS										
Glass soil methanol vial DUP-B	E611A	15-Aug-2021	24-Aug-2021	----	----		26-Aug-2021	40 days	10 days	✓
Volatile Organic Compounds [Fuels] : BTEX by Headspace GC-MS										
Glass soil methanol vial TR Ref1	E611A	15-Aug-2021	24-Aug-2021	----	----		26-Aug-2021	40 days	10 days	✓
Volatile Organic Compounds [Fuels] : BTEX by Headspace GC-MS										
Glass soil methanol vial TR Ref2	E611A	15-Aug-2021	24-Aug-2021	----	----		26-Aug-2021	40 days	10 days	✓
Volatile Organic Compounds [Fuels] : BTEX by Headspace GC-MS										
Glass soil methanol vial DUP A	E611A	14-Aug-2021	24-Aug-2021	----	----		26-Aug-2021	40 days	11 days	✓
Volatile Organic Compounds [Fuels] : BTEX by Headspace GC-MS										
Glass soil methanol vial SW-2	E611A	14-Aug-2021	24-Aug-2021	----	----		26-Aug-2021	40 days	11 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: **Soil/Solid**

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)							
BTEX by Headspace GC-MS	E611A	275058	1	15	6.6	5.0	✓
CCME PHC - F2-F4 by GC-FID	E601.SG	274450	1	5	20.0	5.0	✓
Mercury in Soil/Solid by CVAAS	E510	274452	1	10	10.0	5.0	✓
Metals in Soil/Solid by CRC ICPMS	E440	274451	1	11	9.0	5.0	✓
Moisture Content by Gravimetry	E144	274458	1	16	6.2	5.0	✓
PAHs by Hex:Ace GC-MS (Low Level CCME)	E641A-L	274448	1	14	7.1	5.0	✓
pH by Meter (1:2 Soil:Water Extraction)	E108	274457	1	10	10.0	5.0	✓
Total Carbon by Combustion	E351	274583	1	10	10.0	5.0	✓
Total Inorganic Carbon by Acetic Acid pH Standard Curve	E354	273818	1	10	10.0	5.0	✓
VH and F1 by Headspace GC-FID	E581.VH+F1	275057	1	15	6.6	5.0	✓
Laboratory Control Samples (LCS)							
BTEX by Headspace GC-MS	E611A	275058	1	15	6.6	5.0	✓
CCME PHC - F2-F4 by GC-FID	E601.SG	274450	1	5	20.0	5.0	✓
Mercury in Soil/Solid by CVAAS	E510	274452	2	10	20.0	10.0	✓
Metals in Soil/Solid by CRC ICPMS	E440	274451	2	11	18.1	10.0	✓
Moisture Content by Gravimetry	E144	274458	1	16	6.2	5.0	✓
PAHs by Hex:Ace GC-MS (Low Level CCME)	E641A-L	274448	1	14	7.1	5.0	✓
pH by Meter (1:2 Soil:Water Extraction)	E108	274457	1	10	10.0	5.0	✓
Total Carbon by Combustion	E351	274583	2	10	20.0	10.0	✓
Total Inorganic Carbon by Acetic Acid pH Standard Curve	E354	273818	2	10	20.0	10.0	✓
VH and F1 by Headspace GC-FID	E581.VH+F1	275057	1	15	6.6	5.0	✓
Method Blanks (MB)							
BTEX by Headspace GC-MS	E611A	275058	1	15	6.6	5.0	✓
CCME PHC - F2-F4 by GC-FID	E601.SG	274450	1	5	20.0	5.0	✓
Mercury in Soil/Solid by CVAAS	E510	274452	1	10	10.0	5.0	✓
Metals in Soil/Solid by CRC ICPMS	E440	274451	1	11	9.0	5.0	✓
Moisture Content by Gravimetry	E144	274458	1	16	6.2	5.0	✓
PAHs by Hex:Ace GC-MS (Low Level CCME)	E641A-L	274448	1	14	7.1	5.0	✓
Total Carbon by Combustion	E351	274583	1	10	10.0	5.0	✓
Total Inorganic Carbon by Acetic Acid pH Standard Curve	E354	273818	1	10	10.0	5.0	✓
VH and F1 by Headspace GC-FID	E581.VH+F1	275057	1	15	6.6	5.0	✓
Matrix Spikes (MS)							
BTEX by Headspace GC-MS	E611A	275058	1	15	6.6	5.0	✓
CCME PHC - F2-F4 by GC-FID	E601.SG	274450	1	5	20.0	5.0	✓
PAHs by Hex:Ace GC-MS (Low Level CCME)	E641A-L	274448	1	14	7.1	5.0	✓
VH and F1 by Headspace GC-FID	E581.VH+F1	275057	1	15	6.6	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
pH by Meter (1:2 Soil:Water Extraction)	E108 Vancouver - Environmental	Soil/Solid	BC Lab Manual	pH is determined by potentiometric measurement with a pH electrode at ambient laboratory temperature (normally 20 ± 5°C), and is carried out in accordance with procedures described in the BC Lab Manual (prescriptive method). The procedure involves mixing the dried (at <60 ºC) and sieved (10mesh/2mm) sample with ultra pure water at a 1:2 ratio of sediment to water. The pH is then measured by a standard pH probe.
Moisture Content by Gravimetry	E144 Vancouver - Environmental	Soil/Solid	CCME PHC in Soil - Tier 1	Moisture is measured gravimetrically by drying the sample at 105°C. Moisture content is calculated as the weight loss (due to water) divided by the wet weight of the sample, expressed as a percentage.
Total Carbon by Combustion	E351 Saskatoon - Environmental	Soil/Solid	CSSS (2008) 21.2 (mod)	Total Carbon is determined by the high temperature combustion method with measurement by an infrared detector.
Total Inorganic Carbon by Acetic Acid pH Standard Curve	E354 Saskatoon - Environmental	Soil/Solid	CSSS (2008) 20.2	Total Inorganic Carbon is determined by acetic acid pH standard curve, where a known quantity of acetic acid is consumed by reaction with carbonates in the soil. The pH of the resulting solution is measured and compared against a standard curve relating pH to weight of carbonate.
Metals in Soil/Solid by CRC ICPMS	E440 Vancouver - Environmental	Soil/Solid	EPA 6020B (mod)	This method is intended to liberate metals that may be environmentally available. Samples are dried, then sieved through a 2 mm sieve, and digested with HNO3 and HCl. Dependent on sample matrix, some metals may be only partially recovered, including Al, Ba, Be, Cr, Sr, Ti, Tl, V, W, and Zr. Silicate minerals are not solubilized. Volatile forms of sulfur (including sulfide) may not be captured, as they may be lost during sampling, storage, or digestion. Elemental Sulfur may be poorly recovered by this method. Analysis is by Collision/Reaction Cell ICPMS.
Mercury in Soil/Solid by CVAAS	E510 Vancouver - Environmental	Soil/Solid	EPA 200.2/1631 Appendix (mod)	Samples are dried, then sieved through a 2 mm sieve, and digested with HNO3 and HCl, followed by CVAAS analysis.
VH and F1 by Headspace GC-FID	E581.VH+F1 Vancouver - Environmental	Soil/Solid	BC MOE Lab Manual / CCME PHC in Soil - Tier 1 (mod)	Volatile Hydrocarbons (VH and F1) is analyzed by static headspace GC-FID. Samples are prepared in headspace vials and are heated and agitated on the headspace autosampler, causing VOCs to partition between the aqueous phase and the headspace in accordance with Henry's law.
CCME PHC - F2-F4 by GC-FID	E601.SG Vancouver - Environmental	Soil/Solid	CCME PHC in Soil - Tier 1	Sample extracts are subjected to in-situ silica gel treatment prior to analysis by GC-FID for CCME Fractions 2-4 (F2-F4).

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
BTEX by Headspace GC-MS	E611A Vancouver - Environmental	Soil/Solid	EPA 8260D (mod)	Volatile Organic Compounds (VOCs) are analyzed by static headspace GC-MS. Samples are prepared in headspace vials and are heated and agitated on the headspace autosampler, causing VOCs to partition between the aqueous phase and the headspace in accordance with Henry's law.
PAHs by Hex:Ace GC-MS (Low Level CCME)	E641A-L Vancouver - Environmental	Soil/Solid	EPA 8270E (mod)	Polycyclic Aromatic Hydrocarbons (PAHs) are extracted with hexane/acetone and analyzed by GC-MS. If reported, IACR (index of additive cancer risk, unitless) and B(a)P toxic potency equivalent (in soil concentration units) are calculated as per CCME PAH Soil Quality Guidelines fact sheet (2010) or ABT1.
Particle Size Analysis (Pipette) - MMER Classification	EC184E Saskatoon - Environmental	Soil/Solid	Metal Mining Technical Guidance for Environmental Effects Monitoring (2012)	The particle size determination is performed by various methods to generate a Grain Size curve. The data from the curve is then used to produce particle size ranges based on the Metal Mining Effluent Regulations (MMER) classification system for Environmental Effects Monitoring.
Total Organic Carbon (Calculated) in soil	EC356 Saskatoon - Environmental	Soil/Solid	CSSS (2008) 21.2	Total Organic Carbon (TOC) is calculated by the difference between total carbon (TC) and total inorganic carbon (TIC).
F1-BTEX	EC580 Vancouver - Environmental	Soil/Solid	CCME PHC in Soil - Tier 1	F1-BTEX is calculated as follows: F1-BTEX = F1 (C6-C10) minus benzene, toluene, ethylbenzene and xylenes (BTEX).

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Leach 1:2 Soil:Water for pH/EC	EP108 Vancouver - Environmental	Soil/Solid	BC WLAP METHOD: PH, ELECTROMETRIC, SOIL	The procedure involves mixing the dried (at <60°C) and sieved (No. 10 / 2mm) sample with deionized/distilled water at a 1:2 ratio of sediment to water.
Digestion for Metals and Mercury	EP440 Vancouver - Environmental	Soil/Solid	EPA 200.2 (mod)	Samples are dried, then sieved through a 2 mm sieve, and digested with HNO3 and HCl. This method is intended to liberate metals that may be environmentally available.
VOCs Methanol Extraction for Headspace Analysis	EP581 Vancouver - Environmental	Soil/Solid	EPA 5035A (mod)	VOCs in samples are extracted with methanol. Extracts are then prepared in headspace vials and are heated and agitated on the headspace autosampler, causing VOCs to partition between the aqueous phase and the headspace in accordance with Henry's law.
PHCs and PAHs Hexane-Acetone Tumbler Extraction	EP601 Vancouver - Environmental	Soil/Solid	CCME PHC in Soil - Tier 1 (mod)	Samples are subsampled and Petroleum Hydrocarbons (PHC) and PAHs are extracted with 1:1 hexane:acetone using a rotary extractor.
Dry and Grind	EPP442 Saskatoon - Environmental	Soil/Solid	Soil Sampling and Methods of Analysis, Carter 2008	After removal of any coarse fragments and reservation of wet subsamples a portion of homogenized sample is set in a tray and dried at less than 60°C until dry. The sample is then particle size reduced with an automated crusher or mortar and pestle, typically to <2 mm. Further size reduction may be needed for particular tests.

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **VA21B7543**		
Client	: Golder Associates Ltd.	Laboratory	: Vancouver - Environmental
Contact	: Elaine Irving	Account Manager	: Amber Springer
Address	: 200-2920 Virtual Way Vancouver BC Canada V5M 0C4	Address	: 8081 Lougheed Highway Burnaby, British Columbia Canada V5A 1W9
Telephone	: ----	Telephone	: +1 604 253 4188
Project	: 1663724-44000-03	Date Samples Received	: 19-Aug-2021 08:25
PO	: ----	Date Analysis Commenced	: 21-Aug-2021
C-O-C number	: 20-920782	Issue Date	: 27-Aug-2021 16:37
Sampler	: ----		
Site	: ----		
Quote number	: Q84262		
No. of samples received	: 5		
No. of samples analysed	: 5		

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 Percentage Difference (RPD) and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits
- Reference Material (RM) Report; Recovery and Acceptance Limits
- Method Blank (MB) Report; Recovery and Acceptance Limits
- Laboratory Control Sample (LCS) Report; Recovery and Acceptance Limits

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.

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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 Services number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percentage Difference
# = Indicates a QC result that did not meet the ALS DQO.

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: **Soil/Solid**

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: 274457)											
VA21B7509-001	Anonymous	pH (1:2 soil:water)	----	E108	0.10	pH units	6.15	6.17	0.3%	5%	----
Physical Tests (QC Lot: 274458)											
VA21B5201-028	Anonymous	moisture	----	E144	0.25	%	2.47	2.61	5.38%	20%	----
Organic / Inorganic Carbon (QC Lot: 273818)											
VA21B7543-001	TR Ref1	carbon, inorganic [IC]	----	E354	0.050	%	0.524	0.529	0.885%	20%	----
Organic / Inorganic Carbon (QC Lot: 274583)											
YL2101055-011	Anonymous	carbon, total [TC]	----	E351	0.050	%	7.81	7.81	0.0376%	20%	----
Metals (QC Lot: 274451)											
VA21B5201-024	Anonymous	aluminum	7429-90-5	E440	50	mg/kg	25500	23200	9.10%	40%	----
		antimony	7440-36-0	E440	0.10	mg/kg	0.85	0.66	26.1%	30%	----
		arsenic	7440-38-2	E440	0.10	mg/kg	6.48	7.00	7.64%	30%	----
		barium	7440-39-3	E440	0.50	mg/kg	85.9	76.2	12.0%	40%	----
		beryllium	7440-41-7	E440	0.10	mg/kg	0.41	0.40	0.01	Diff <2x LOR	----
		bismuth	7440-69-9	E440	0.20	mg/kg	<0.20	<0.20	0	Diff <2x LOR	----
		boron	7440-42-8	E440	5.0	mg/kg	<5.0	<5.0	0	Diff <2x LOR	----
		cadmium	7440-43-9	E440	0.020	mg/kg	0.295	0.266	10.2%	30%	----
		calcium	7440-70-2	E440	50	mg/kg	8540	7900	7.77%	30%	----
		chromium	7440-47-3	E440	0.50	mg/kg	30.6	25.1	19.9%	30%	----
		cobalt	7440-48-4	E440	0.10	mg/kg	11.8	13.1	10.4%	30%	----
		copper	7440-50-8	E440	0.50	mg/kg	32.3	29.7	8.29%	30%	----
		iron	7439-89-6	E440	50	mg/kg	33300	30800	7.90%	30%	----
		lead	7439-92-1	E440	0.50	mg/kg	9.08	5.95	41.6%	40%	DUP-H
		lithium	7439-93-2	E440	2.0	mg/kg	26.0	25.0	3.60%	30%	----
		magnesium	7439-95-4	E440	20	mg/kg	10000	9460	6.10%	30%	----
		manganese	7439-96-5	E440	1.0	mg/kg	588	553	6.14%	30%	----
		molybdenum	7439-98-7	E440	0.10	mg/kg	0.73	0.52	33.2%	40%	----
		nickel	7440-02-0	E440	0.50	mg/kg	21.7	19.3	11.3%	30%	----
		phosphorus	7723-14-0	E440	50	mg/kg	530	562	5.93%	30%	----
		potassium	7440-09-7	E440	100	mg/kg	1050	860	20.6%	40%	----
		selenium	7782-49-2	E440	0.20	mg/kg	0.27	<0.20	0.07	Diff <2x LOR	----
		silver	7440-22-4	E440	0.10	mg/kg	0.11	0.12	0.006	Diff <2x LOR	----

Sub-Matrix: **Soil/Solid**

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
					Laboratory Duplicate (DUP) Report						
Metals (QC Lot: 274451) - continued											
VA21B5201-024	Anonymous	sodium	7440-23-5	E440	50	mg/kg	229	207	22	Diff <2x LOR	----
		strontium	7440-24-6	E440	0.50	mg/kg	61.5	52.5	15.6%	40%	----
		sulfur	7704-34-9	E440	1000	mg/kg	<1000	<1000	0	Diff <2x LOR	----
		thallium	7440-28-0	E440	0.050	mg/kg	0.078	0.077	0.0005	Diff <2x LOR	----
		tin	7440-31-5	E440	2.0	mg/kg	<2.0	<2.0	0	Diff <2x LOR	----
		titanium	7440-32-6	E440	1.0	mg/kg	1440	1340	7.00%	40%	----
		tungsten	7440-33-7	E440	0.50	mg/kg	<0.50	<0.50	0	Diff <2x LOR	----
		uranium	7440-61-1	E440	0.050	mg/kg	0.477	0.463	2.88%	30%	----
		vanadium	7440-62-2	E440	0.20	mg/kg	85.4	81.2	5.07%	30%	----
		zinc	7440-66-6	E440	2.0	mg/kg	85.9	81.7	5.03%	30%	----
		zirconium	7440-67-7	E440	1.0	mg/kg	6.7	7.2	7.91%	30%	----
Metals (QC Lot: 274452)											
VA21B7509-001	Anonymous	mercury	7439-97-6	E510	0.0500	mg/kg	0.0540	0.0556	0.0016	Diff <2x LOR	----
Volatile Organic Compounds (QC Lot: 275058)											
VA21B7543-001	TR Ref1	benzene	71-43-2	E611A	0.0050	mg/kg	<0.0050	<0.0050	0	Diff <2x LOR	----
		ethylbenzene	100-41-4	E611A	0.015	mg/kg	<0.015	<0.015	0	Diff <2x LOR	----
		toluene	108-88-3	E611A	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	----
		xylene, m+p-	179601-23-1	E611A	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	----
		xylene, o-	95-47-6	E611A	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	----
Hydrocarbons (QC Lot: 274450)											
VA21B7543-001	TR Ref1	F2 (C10-C16)	----	E601.SG	30	mg/kg	<30	<30	0	Diff <2x LOR	----
		F3 (C16-C34)	----	E601.SG	50	mg/kg	<50	<50	0	Diff <2x LOR	----
		F4 (C34-C50)	----	E601.SG	50	mg/kg	<50	<50	0	Diff <2x LOR	----
Hydrocarbons (QC Lot: 275057)											
VA21B7543-001	TR Ref1	F1 (C6-C10)	----	E581.VH+F1	5.0	mg/kg	<5.0	<5.0	0	Diff <2x LOR	----
Polycyclic Aromatic Hydrocarbons (QC Lot: 274448)											
VA21B5201-028	Anonymous	acenaphthene	83-32-9	E641A-L	0.0050	mg/kg	<0.0050	<0.0050	0	Diff <2x LOR	----
		acenaphthylene	208-96-8	E641A-L	0.0050	mg/kg	<0.0050	<0.0050	0	Diff <2x LOR	----
		acridine	260-94-6	E641A-L	0.025	mg/kg	<0.025	<0.025	0	Diff <2x LOR	----
		anthracene	120-12-7	E641A-L	0.0040	mg/kg	<0.0040	<0.0040	0	Diff <2x LOR	----
		benz(a)anthracene	56-55-3	E641A-L	0.010	mg/kg	<0.010	<0.010	0	Diff <2x LOR	----
		benzo(a)pyrene	50-32-8	E641A-L	0.010	mg/kg	<0.010	<0.010	0	Diff <2x LOR	----
		benzo(b+j)fluoranthene	----	E641A-L	0.010	mg/kg	<0.010	<0.010	0	Diff <2x LOR	----
		benzo(g,h,i)perylene	191-24-2	E641A-L	0.010	mg/kg	<0.010	<0.010	0	Diff <2x LOR	----
		benzo(k)fluoranthene	207-08-9	E641A-L	0.010	mg/kg	<0.010	<0.010	0	Diff <2x LOR	----

Sub-Matrix: **Soil/Solid**

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Laboratory Duplicate (DUP) Report						
					LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Polycyclic Aromatic Hydrocarbons (QC Lot: 274448) - continued											
VA21B5201-028	Anonymous	chrysene	218-01-9	E641A-L	0.010	mg/kg	<0.010	<0.010	0	Diff <2x LOR	----
		dibenz(a,h)anthracene	53-70-3	E641A-L	0.0050	mg/kg	<0.0050	<0.0050	0	Diff <2x LOR	----
		fluoranthene	206-44-0	E641A-L	0.010	mg/kg	<0.010	<0.010	0	Diff <2x LOR	----
		fluorene	86-73-7	E641A-L	0.010	mg/kg	<0.010	<0.010	0	Diff <2x LOR	----
		indeno(1,2,3-c,d)pyrene	193-39-5	E641A-L	0.010	mg/kg	<0.010	<0.010	0	Diff <2x LOR	----
		methylnaphthalene, 1-	90-12-0	E641A-L	0.010	mg/kg	<0.010	<0.010	0	Diff <2x LOR	----
		methylnaphthalene, 2-	91-57-6	E641A-L	0.010	mg/kg	<0.010	<0.010	0	Diff <2x LOR	----
		naphthalene	91-20-3	E641A-L	0.010	mg/kg	<0.010	<0.010	0	Diff <2x LOR	----
		phenanthrene	85-01-8	E641A-L	0.010	mg/kg	<0.010	<0.010	0	Diff <2x LOR	----
		pyrene	129-00-0	E641A-L	0.010	mg/kg	<0.010	<0.010	0	Diff <2x LOR	----
		quinoline	6027-02-7	E641A-L	0.010	mg/kg	<0.010	<0.010	0	Diff <2x LOR	----

Qualifiers

Qualifier	*Description*
DUP-H	*Duplicate results outside ALS DQO, due to sample heterogeneity.*

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: **Soil/Solid**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 274458)						
moisture	----	E144	0.25	%	<0.25	----
Organic / Inorganic Carbon (QCLot: 273818)						
carbon, inorganic [IC]	----	E354	0.05	%	<0.050	----
Organic / Inorganic Carbon (QCLot: 274583)						
carbon, total [TC]	----	E351	0.05	%	<0.050	----
Metals (QCLot: 274451)						
aluminum	7429-90-5	E440	50	mg/kg	<50	----
antimony	7440-36-0	E440	0.1	mg/kg	<0.10	----
arsenic	7440-38-2	E440	0.1	mg/kg	<0.10	----
barium	7440-39-3	E440	0.5	mg/kg	<0.50	----
beryllium	7440-41-7	E440	0.1	mg/kg	<0.10	----
bismuth	7440-69-9	E440	0.2	mg/kg	<0.20	----
boron	7440-42-8	E440	5	mg/kg	<5.0	----
cadmium	7440-43-9	E440	0.02	mg/kg	<0.020	----
calcium	7440-70-2	E440	50	mg/kg	<50	----
chromium	7440-47-3	E440	0.5	mg/kg	<0.50	----
cobalt	7440-48-4	E440	0.1	mg/kg	<0.10	----
copper	7440-50-8	E440	0.5	mg/kg	<0.50	----
iron	7439-89-6	E440	50	mg/kg	<50	----
lead	7439-92-1	E440	0.5	mg/kg	<0.50	----
lithium	7439-93-2	E440	2	mg/kg	<2.0	----
magnesium	7439-95-4	E440	20	mg/kg	<20	----
manganese	7439-96-5	E440	1	mg/kg	<1.0	----
molybdenum	7439-98-7	E440	0.1	mg/kg	<0.10	----
nickel	7440-02-0	E440	0.5	mg/kg	<0.50	----
phosphorus	7723-14-0	E440	50	mg/kg	<50	----
potassium	7440-09-7	E440	100	mg/kg	<100	----
selenium	7782-49-2	E440	0.2	mg/kg	<0.20	----
silver	7440-22-4	E440	0.1	mg/kg	<0.10	----
sodium	7440-23-5	E440	50	mg/kg	<50	----
strontium	7440-24-6	E440	0.5	mg/kg	<0.50	----
sulfur	7704-34-9	E440	1000	mg/kg	<1000	----
thallium	7440-28-0	E440	0.05	mg/kg	<0.050	----

Sub-Matrix: **Soil/Solid**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Metals (QCLot: 274451) - continued						
tin	7440-31-5	E440	2	mg/kg	<2.0	----
titanium	7440-32-6	E440	1	mg/kg	<1.0	----
tungsten	7440-33-7	E440	0.5	mg/kg	<0.50	----
uranium	7440-61-1	E440	0.05	mg/kg	<0.050	----
vanadium	7440-62-2	E440	0.2	mg/kg	<0.20	----
zinc	7440-66-6	E440	2	mg/kg	<2.0	----
zirconium	7440-67-7	E440	1	mg/kg	<1.0	----
Metals (QCLot: 274452)						
mercury	7439-97-6	E510	0.005	mg/kg	<0.0050	----
Volatile Organic Compounds (QCLot: 275058)						
benzene	71-43-2	E611A	0.005	mg/kg	<0.0050	----
ethylbenzene	100-41-4	E611A	0.015	mg/kg	<0.015	----
toluene	108-88-3	E611A	0.05	mg/kg	<0.050	----
xylene, m+p-	179601-23-1	E611A	0.05	mg/kg	<0.050	----
xylene, o-	95-47-6	E611A	0.05	mg/kg	<0.050	----
Hydrocarbons (QCLot: 274450)						
F2 (C10-C16)	----	E601.SG	25	mg/kg	<25	----
F3 (C16-C34)	----	E601.SG	50	mg/kg	<50	----
F4 (C34-C50)	----	E601.SG	50	mg/kg	<50	----
Hydrocarbons (QCLot: 275057)						
F1 (C6-C10)	----	E581.VH+F1	5	mg/kg	<5.0	----
Polycyclic Aromatic Hydrocarbons (QCLot: 274448)						
acenaphthene	83-32-9	E641A-L	0.005	mg/kg	<0.0050	----
acenaphthylene	208-96-8	E641A-L	0.005	mg/kg	<0.0050	----
acridine	260-94-6	E641A-L	0.01	mg/kg	<0.010	----
anthracene	120-12-7	E641A-L	0.004	mg/kg	<0.0040	----
benz(a)anthracene	56-55-3	E641A-L	0.01	mg/kg	<0.010	----
benzo(a)pyrene	50-32-8	E641A-L	0.01	mg/kg	<0.010	----
benzo(b+j)fluoranthene	----	E641A-L	0.01	mg/kg	<0.010	----
benzo(g,h,i)perylene	191-24-2	E641A-L	0.01	mg/kg	<0.010	----
benzo(k)fluoranthene	207-08-9	E641A-L	0.01	mg/kg	<0.010	----
chrysene	218-01-9	E641A-L	0.01	mg/kg	<0.010	----
dibenz(a,h)anthracene	53-70-3	E641A-L	0.005	mg/kg	<0.0050	----
fluoranthene	206-44-0	E641A-L	0.01	mg/kg	<0.010	----
fluorene	86-73-7	E641A-L	0.01	mg/kg	<0.010	----
indeno(1,2,3-c,d)pyrene	193-39-5	E641A-L	0.01	mg/kg	<0.010	----

Sub-Matrix: **Soil/Solid**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Polycyclic Aromatic Hydrocarbons (QCLot: 274448) - continued						
methylnaphthalene, 1-	90-12-0	E641A-L	0.01	mg/kg	<0.010	----
methylnaphthalene, 2-	91-57-6	E641A-L	0.01	mg/kg	<0.010	----
naphthalene	91-20-3	E641A-L	0.01	mg/kg	<0.010	----
phenanthrene	85-01-8	E641A-L	0.01	mg/kg	<0.010	----
pyrene	129-00-0	E641A-L	0.01	mg/kg	<0.010	----
quinoline	6027-02-7	E641A-L	0.01	mg/kg	<0.010	----

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: **Soil/Solid**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 274457)									
pH (1:2 soil:water)	----	E108	----	pH units	6 pH units	99.8	95.0	105	----
Physical Tests (QCLot: 274458)									
moisture	----	E144	0.25	%	50 %	98.9	90.0	110	----
Organic / Inorganic Carbon (QCLot: 273818)									
carbon, inorganic [IC]	----	E354	0.05	%	0.5 %	94.2	90.0	110	----
Organic / Inorganic Carbon (QCLot: 274583)									
carbon, total [TC]	----	E351	0.05	%	48 %	102	90.0	110	----
Metals (QCLot: 274451)									
aluminum	7429-90-5	E440	50	mg/kg	200 mg/kg	100	80.0	120	----
antimony	7440-36-0	E440	0.1	mg/kg	100 mg/kg	99.6	80.0	120	----
arsenic	7440-38-2	E440	0.1	mg/kg	100 mg/kg	95.9	80.0	120	----
barium	7440-39-3	E440	0.5	mg/kg	25 mg/kg	105	80.0	120	----
beryllium	7440-41-7	E440	0.1	mg/kg	10 mg/kg	104	80.0	120	----
bismuth	7440-69-9	E440	0.2	mg/kg	100 mg/kg	97.9	80.0	120	----
boron	7440-42-8	E440	5	mg/kg	100 mg/kg	100	80.0	120	----
cadmium	7440-43-9	E440	0.02	mg/kg	10 mg/kg	95.8	80.0	120	----
calcium	7440-70-2	E440	50	mg/kg	5000 mg/kg	104	80.0	120	----
chromium	7440-47-3	E440	0.5	mg/kg	25 mg/kg	97.8	80.0	120	----
cobalt	7440-48-4	E440	0.1	mg/kg	25 mg/kg	96.6	80.0	120	----
copper	7440-50-8	E440	0.5	mg/kg	25 mg/kg	96.2	80.0	120	----
iron	7439-89-6	E440	50	mg/kg	100 mg/kg	96.8	80.0	120	----
lead	7439-92-1	E440	0.5	mg/kg	50 mg/kg	100	80.0	120	----
lithium	7439-93-2	E440	2	mg/kg	25 mg/kg	107	80.0	120	----
magnesium	7439-95-4	E440	20	mg/kg	5000 mg/kg	102	80.0	120	----
manganese	7439-96-5	E440	1	mg/kg	25 mg/kg	100	80.0	120	----
molybdenum	7439-98-7	E440	0.1	mg/kg	25 mg/kg	104	80.0	120	----
nickel	7440-02-0	E440	0.5	mg/kg	50 mg/kg	98.1	80.0	120	----
phosphorus	7723-14-0	E440	50	mg/kg	1000 mg/kg	88.0	80.0	120	----
potassium	7440-09-7	E440	100	mg/kg	5000 mg/kg	101	80.0	120	----
selenium	7782-49-2	E440	0.2	mg/kg	100 mg/kg	98.0	80.0	120	----
silver	7440-22-4	E440	0.1	mg/kg	10 mg/kg	101	80.0	120	----
sodium	7440-23-5	E440	50	mg/kg	5000 mg/kg	95.8	80.0	120	----

Sub-Matrix: **Soil/Solid**

Analyte	CAS Number	Method	LOR	Unit	Spike Concentration	Recovery (%) LCS	Recovery Limits (%) Low	Recovery Limits (%) High	Qualifier
Metals (QCLot: 274451) - continued									
strontium	7440-24-6	E440	0.5	mg/kg	25 mg/kg	103	80.0	120	----
sulfur	7704-34-9	E440	1000	mg/kg	5000 mg/kg	91.5	80.0	120	----
thallium	7440-28-0	E440	0.05	mg/kg	100 mg/kg	98.4	80.0	120	----
tin	7440-31-5	E440	2	mg/kg	50 mg/kg	95.8	80.0	120	----
titanium	7440-32-6	E440	1	mg/kg	25 mg/kg	93.7	80.0	120	----
tungsten	7440-33-7	E440	0.5	mg/kg	10 mg/kg	98.3	80.0	120	----
uranium	7440-61-1	E440	0.05	mg/kg	0.5 mg/kg	100	80.0	120	----
vanadium	7440-62-2	E440	0.2	mg/kg	50 mg/kg	98.9	80.0	120	----
zinc	7440-66-6	E440	2	mg/kg	50 mg/kg	93.9	80.0	120	----
zirconium	7440-67-7	E440	1	mg/kg	10 mg/kg	96.6	80.0	120	----
Metals (QCLot: 274452)									
mercury	7439-97-6	E510	0.005	mg/kg	0.1 mg/kg	108	80.0	120	----
Volatile Organic Compounds (QCLot: 275058)									
benzene	71-43-2	E611A	0.005	mg/kg	2.5 mg/kg	103	70.0	130	----
ethylbenzene	100-41-4	E611A	0.015	mg/kg	2.5 mg/kg	93.6	70.0	130	----
toluene	108-88-3	E611A	0.05	mg/kg	2.5 mg/kg	98.1	70.0	130	----
xylene, m+p-	179601-23-1	E611A	0.05	mg/kg	5 mg/kg	99.1	70.0	130	----
xylene, o-	95-47-6	E611A	0.05	mg/kg	2.5 mg/kg	100	70.0	130	----
Hydrocarbons (QCLot: 274450)									
F2 (C10-C16)	----	E601.SG	25	mg/kg	618.75 mg/kg	108	70.0	130	----
F3 (C16-C34)	----	E601.SG	50	mg/kg	1242.49 mg/kg	100	70.0	130	----
F4 (C34-C50)	----	E601.SG	50	mg/kg	993.9 mg/kg	93.4	70.0	130	----
Hydrocarbons (QCLot: 275057)									
F1 (C6-C10)	----	E581.VH+F1	5	mg/kg	93.6 mg/kg	123	70.0	130	----
Polycyclic Aromatic Hydrocarbons (QCLot: 274448)									
acenaphthene	83-32-9	E641A-L	0.005	mg/kg	0.5 mg/kg	113	60.0	130	----
acenaphthylene	208-96-8	E641A-L	0.005	mg/kg	0.5 mg/kg	109	60.0	130	----
acridine	260-94-6	E641A-L	0.01	mg/kg	0.5 mg/kg	104	60.0	130	----
anthracene	120-12-7	E641A-L	0.004	mg/kg	0.5 mg/kg	112	60.0	130	----
benz(a)anthracene	56-55-3	E641A-L	0.01	mg/kg	0.5 mg/kg	107	60.0	130	----
benzo(a)pyrene	50-32-8	E641A-L	0.01	mg/kg	0.5 mg/kg	112	60.0	130	----
benzo(b+j)fluoranthene	----	E641A-L	0.01	mg/kg	0.5 mg/kg	108	60.0	130	----
benzo(g,h,i)perylene	191-24-2	E641A-L	0.01	mg/kg	0.5 mg/kg	108	60.0	130	----
benzo(k)fluoranthene	207-08-9	E641A-L	0.01	mg/kg	0.5 mg/kg	115	60.0	130	----

Sub-Matrix: **Soil/Solid**

Analyte	CAS Number	Method	LOR	Unit	Spike Concentration	Recovery (%) LCS	Recovery Limits (%) Low	Recovery Limits (%) High	Qualifier
Polycyclic Aromatic Hydrocarbons (QCLot: 274448) - continued									
chrysene	218-01-9	E641A-L	0.01	mg/kg	0.5 mg/kg	114	60.0	130	----
dibenz(a,h)anthracene	53-70-3	E641A-L	0.005	mg/kg	0.5 mg/kg	109	60.0	130	----
fluoranthene	206-44-0	E641A-L	0.01	mg/kg	0.5 mg/kg	114	60.0	130	----
fluorene	86-73-7	E641A-L	0.01	mg/kg	0.5 mg/kg	112	60.0	130	----
indeno(1,2,3-c,d)pyrene	193-39-5	E641A-L	0.01	mg/kg	0.5 mg/kg	107	60.0	130	----
methylnaphthalene, 1-	90-12-0	E641A-L	0.01	mg/kg	0.5 mg/kg	101	60.0	130	----
methylnaphthalene, 2-	91-57-6	E641A-L	0.01	mg/kg	0.5 mg/kg	94.6	60.0	130	----
naphthalene	91-20-3	E641A-L	0.01	mg/kg	0.5 mg/kg	88.2	50.0	130	----
phenanthrene	85-01-8	E641A-L	0.01	mg/kg	0.5 mg/kg	112	60.0	130	----
pyrene	129-00-0	E641A-L	0.01	mg/kg	0.5 mg/kg	118	60.0	130	----
quinoline	6027-02-7	E641A-L	0.01	mg/kg	0.5 mg/kg	95.8	60.0	130	----

Matrix Spike (MS) Report

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

Sub-Matrix: **Soil/Solid**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Volatile Organic Compounds (QCLot: 275058)										
VA21B7543-001	TR Ref1	benzene	71-43-2	E611A	3.27 mg/kg	4.6875 mg/kg	125	60.0	140	----
		ethylbenzene	100-41-4	E611A	2.96 mg/kg	4.6875 mg/kg	113	60.0	140	----
		toluene	108-88-3	E611A	3.09 mg/kg	4.6875 mg/kg	118	60.0	140	----
		xylene, m+p-	179601-23-1	E611A	6.20 mg/kg	9.375 mg/kg	119	60.0	140	----
		xylene, o-	95-47-6	E611A	3.16 mg/kg	4.6875 mg/kg	121	60.0	140	----
Hydrocarbons (QCLot: 274450)										
VA21B7543-002	TR Ref2	F2 (C10-C16)	----	E601.SG	450 mg/kg	618.75 mg/kg	95.9	60.0	140	----
		F3 (C16-C34)	----	E601.SG	842 mg/kg	1242.49 mg/kg	89.3	60.0	140	----
		F4 (C34-C50)	----	E601.SG	606 mg/kg	993.9 mg/kg	80.4	60.0	140	----
Hydrocarbons (QCLot: 275057)										
VA21B7543-002	TR Ref2	F1 (C6-C10)	----	E581.VH+F1	147 mg/kg	187.5 mg/kg	105	60.0	140	----
Polycyclic Aromatic Hydrocarbons (QCLot: 274448)										
VA21B7509-001	Anonymous	acenaphthene	83-32-9	E641A-L	0.389 mg/kg	0.5 mg/kg	98.6	50.0	140	----
		acenaphthylene	208-96-8	E641A-L	0.376 mg/kg	0.5 mg/kg	95.4	50.0	140	----
		acridine	260-94-6	E641A-L	0.321 mg/kg	0.5 mg/kg	81.4	50.0	140	----
		anthracene	120-12-7	E641A-L	0.391 mg/kg	0.5 mg/kg	99.2	50.0	140	----
		benz(a)anthracene	56-55-3	E641A-L	0.375 mg/kg	0.5 mg/kg	95.0	50.0	140	----
		benzo(a)pyrene	50-32-8	E641A-L	0.385 mg/kg	0.5 mg/kg	97.6	50.0	140	----
		benzo(b+j)fluoranthene	----	E641A-L	0.366 mg/kg	0.5 mg/kg	92.9	50.0	140	----
		benzo(g,h,i)perylene	191-24-2	E641A-L	0.369 mg/kg	0.5 mg/kg	93.7	50.0	140	----
		benzo(k)fluoranthene	207-08-9	E641A-L	0.381 mg/kg	0.5 mg/kg	96.6	50.0	140	----
		chrysene	218-01-9	E641A-L	0.382 mg/kg	0.5 mg/kg	96.8	50.0	140	----
		dibenz(a,h)anthracene	53-70-3	E641A-L	0.374 mg/kg	0.5 mg/kg	94.8	50.0	140	----
		fluoranthene	206-44-0	E641A-L	0.382 mg/kg	0.5 mg/kg	96.9	50.0	140	----
		fluorene	86-73-7	E641A-L	0.388 mg/kg	0.5 mg/kg	98.4	50.0	140	----
		indeno(1,2,3-c,d)pyrene	193-39-5	E641A-L	0.366 mg/kg	0.5 mg/kg	92.8	50.0	140	----
		methylnaphthalene, 1-	90-12-0	E641A-L	0.370 mg/kg	0.5 mg/kg	93.8	50.0	140	----
		methylnaphthalene, 2-	91-57-6	E641A-L	0.349 mg/kg	0.5 mg/kg	88.5	50.0	140	----
		naphthalene	91-20-3	E641A-L	0.348 mg/kg	0.5 mg/kg	88.3	50.0	140	----
		phenanthrene	85-01-8	E641A-L	0.382 mg/kg	0.5 mg/kg	97.0	50.0	140	----
		pyrene	129-00-0	E641A-L	0.405 mg/kg	0.5 mg/kg	103	50.0	140	----

Sub-Matrix: **Soil/Solid**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Polycyclic Aromatic Hydrocarbons (QCLot: 274448) - continued										
VA21B7509-001	Anonymous	quinoline	6027-02-7	E641A-L	0.326 mg/kg	0.5 mg/kg	82.7	50.0	140	----

Reference Material (RM) Report

A Reference Material (RM) is a homogenous material with known and well-established analyte concentrations. RMs are processed in an identical manner to test samples, and are used to monitor and control the accuracy and precision of a test method for a typical sample matrix. RM results are expressed as percent recovery of the target analyte concentration. RM targets may be certified target concentrations provided by the RM supplier, or may be ALS long-term mean values (for empirical test methods).

Sub-Matrix: **Soil/Solid**

Laboratory sample ID	Reference Material ID	Analyte	CAS Number	Method	RM Target Concentration	Recovery (%) RM	Recovery Limits (%) Low	Recovery Limits (%) High	Qualifier
Organic / Inorganic Carbon (QCLot: 273818)									
QC-273818-003	RM	carbon, inorganic [IC]	----	E354	0.383 %	93.7	80.0	120	----
Organic / Inorganic Carbon (QCLot: 274583)									
QC-274583-003	RM	carbon, total [TC]	----	E351	1.4 %	104	80.0	120	----
Metals (QCLot: 274451)									
QC-274451-003	SCP SS-2	aluminum	7429-90-5	E440	9817 mg/kg	110	70.0	130	----
QC-274451-003	SCP SS-2	antimony	7440-36-0	E440	3.99 mg/kg	102	70.0	130	----
QC-274451-003	SCP SS-2	arsenic	7440-38-2	E440	3.73 mg/kg	109	70.0	130	----
QC-274451-003	SCP SS-2	barium	7440-39-3	E440	105 mg/kg	109	70.0	130	----
QC-274451-003	SCP SS-2	beryllium	7440-41-7	E440	0.349 mg/kg	111	70.0	130	----
QC-274451-003	SCP SS-2	boron	7440-42-8	E440	8.5 mg/kg	128	40.0	160	----
QC-274451-003	SCP SS-2	cadmium	7440-43-9	E440	0.91 mg/kg	99.7	70.0	130	----
QC-274451-003	SCP SS-2	calcium	7440-70-2	E440	31082 mg/kg	104	70.0	130	----
QC-274451-003	SCP SS-2	chromium	7440-47-3	E440	101 mg/kg	110	70.0	130	----
QC-274451-003	SCP SS-2	cobalt	7440-48-4	E440	6.9 mg/kg	103	70.0	130	----
QC-274451-003	SCP SS-2	copper	7440-50-8	E440	123 mg/kg	102	70.0	130	----
QC-274451-003	SCP SS-2	iron	7439-89-6	E440	23558 mg/kg	103	70.0	130	----
QC-274451-003	SCP SS-2	lead	7439-92-1	E440	267 mg/kg	107	70.0	130	----
QC-274451-003	SCP SS-2	lithium	7439-93-2	E440	9.5 mg/kg	110	70.0	130	----
QC-274451-003	SCP SS-2	magnesium	7439-95-4	E440	5509 mg/kg	104	70.0	130	----
QC-274451-003	SCP SS-2	manganese	7439-96-5	E440	269 mg/kg	110	70.0	130	----
QC-274451-003	SCP SS-2	molybdenum	7439-98-7	E440	1.03 mg/kg	113	70.0	130	----
QC-274451-003	SCP SS-2	nickel	7440-02-0	E440	26.7 mg/kg	105	70.0	130	----
QC-274451-003	SCP SS-2	phosphorus	7723-14-0	E440	752 mg/kg	102	70.0	130	----
QC-274451-003	SCP SS-2	potassium	7440-09-7	E440	1587 mg/kg	116	70.0	130	----
QC-274451-003	SCP SS-2	sodium	7440-23-5	E440	797 mg/kg	105	70.0	130	----
QC-274451-003	SCP SS-2	strontium	7440-24-6	E440	86.1 mg/kg	106	70.0	130	----
QC-274451-003	SCP SS-2	thallium	7440-28-0	E440	0.0786 mg/kg	105	40.0	160	----
QC-274451-003	SCP SS-2	tin	7440-31-5	E440	10.6 mg/kg	102	70.0	130	----
QC-274451-003	SCP SS-2	titanium	7440-32-6	E440	839 mg/kg	118	70.0	130	----

Sub-Matrix: **Soil/Solid**

Laboratory sample ID	Reference Material ID	Analyte	CAS Number	Method	Reference Material (RM) Report: RM Target Concentration	Recovery (%) RM	Recovery Limits (%) Low	High	Qualifier
Metals (QCLot: 274451) - continued									
QC-274451-003	SCP SS-2	uranium	7440-61-1	E440	0.52 mg/kg	114	70.0	130	----
QC-274451-003	SCP SS-2	vanadium	7440-62-2	E440	32.7 mg/kg	109	70.0	130	----
QC-274451-003	SCP SS-2	zinc	7440-66-6	E440	297 mg/kg	100	70.0	130	----
QC-274451-003	SCP SS-2	zirconium	7440-67-7	E440	5.73 mg/kg	96.3	70.0	130	----
Metals (QCLot: 274452)									
QC-274452-003	SCP SS-2	mercury	7439-97-6	E510	0.059 mg/kg	101	70.0	130	----

ALS www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

COC Number: 20 - 920782

Page 1 of 1

Report To	Contact and company name below will appear on the final report
Company:	Golder Associates
Contact:	Trish Tomliens/Elaine Irving
Phone:	250-881-7372
	Company address below will appear on the final report
Street:	200-2920 Virtual Way
City/Province:	Vancouver, BC
Postal Code:	V5M 0C4
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	
Contact:	

Reports / Recipients

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

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

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

Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax: Ptomliens@golder.com

Email 2: Elaine_Irving@golder.com

Email 3:

Invoice Recipients

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax:

Email 2:

Turnaround Time (TAT) Requested

- ☑ Routine [R] if received by 3pm M-F - no surcharges apply
- ☐ 4 day [P4] if received by 3pm M-F - 20% rush surcharge minimum
- ☐ 3 day [P3] if received by 3pm M-F - 25% rush surcharge minimum
- ☐ 2 day [P2] if received by 3pm M-F - 50% rush surcharge minimum
- ☐ 1 day [E] if received by 3pm M-F - 100% rush surcharge minimum
- ☐ Same day [E2] if received by 10am M-S - 200% rush surcharge. Additional fees may apply to rush requests on weekends, statutory holidays and non-routine tests

AFFIX ALS BARCODE LABEL HERE (ALS use only)

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

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

Project Information

ALS Account # / Quote #: Q84262

Job #: 1663724-44000-03

PO / AFE:

LSD:

ALS Lab Work Order # (ALS use only): 7543

Oil and Gas Required Fields (client use)

AFE/Cost Center: | PO#:

Major/Minor Code: | Routing Code:

Requisitioner:

Location:

ALS Contact: | Sampler:

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

ALS Sample # (ALS use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	Particle Size	Moisture	PAH	TOC, TIC	Metals	BTEX/F1 (P)	F2-F4	SAMPLES ON HOLD	EXTENDED STORAGE REQUIRED	SUSPECTED HAZARD (see notes)
1	TR Ref1	15-Aug-21	15:45	sediment	6	X	X	X	X	X	X	X			
2	TR Ref2	15-Aug-21	16:30	sediment	6	X	X	X	X	X	X	X			
3	DUP-B	15-Aug-21		sediment	5	X	X	X	X	X	X	X			
4	SW-2	14-Aug-21	13:15	sediment	6	X	X	X	X	X	X	X			
5	DUP A	14-Aug-21		sediment	6	X	X	X	X	X	X	X			

Environmental Division
Vancouver
Work Order Reference
VA21B7543
Telephone : +1 604 253 4188

Drinking Water (DW) Samples[1] (client use) ... it 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 3 8

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (ALS use only)			FINAL SHIPMENT RECEPTION (ALS use only)		
Released by: Kaitlin Westman	Date: 17 AUG 2021	Time: 17:15	Received by:	Date:	Time:	Received by: JC	Date: 19 Aug 2021	Time: 8:25 Am

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION   WHITE - LABORATORY COPY   YELLOW - CLIENT COPY   AUG 2020 FRONT

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

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

APPENDIX D

Marine Sediment - Screening Table and QA/QC Results

Table D.1 - Sediment Analytical Results for Milne Port Sampling Station SW-2
Baffinland 2018-2021

Sample ID	Lowest Detection Limits	Units	CCME [1]		NOAA Sediment Benchmarks							Eco Tox EqP(@1% TOC)	SW-2-1	SW-2-2	SW-2-3	SW-2	SW-2	SW-2
Date Sampled Time Sampled Laboratory Sample ID QA/QC Parent Sample ID			ISQG	PEL	T_{20}	TEL	ERL	T_{50}	PEL	ERM	AET		11-Aug-2018 12:55 L2148903-4	11-Aug-2018 13:00 L2148903-5	11-Aug-2018 13:05 L2148903-6	27-Sep-2019 10:25 L2359868-3	5-Aug-2020 - L2487428-2	14-Aug-2021 13:15 VA21B7543-004 FDA
Physical Parameters																		
Moisture	0.25	%	-	-	-	-	-	-	-	-	-	-	23.1	-	-	22.6	18.10	14.7
pH (1:2 soil:water)	0.1	pH units	-	-	-	-	-	-	-	-	-	-	8.21	8.22	8.22	8.25	8.98	8.90
Particle Size																		
clay (<0.004mm)	1	%	-	-	-	-	-	-	-	-	-	-	5.3	6.7	5.6	3.3	<1.0	<1.0
silt (0.063mm - 0.004mm)	1	%	-	-	-	-	-	-	-	-	-	-	23.4	26.8	28.3	11.2	2.7	2.6
sand (2.0mm - 0.063mm)	1	%	-	-	-	-	-	-	-	-	-	-	62.6	49.9	53.3	83	95.7	88.5
gravel (>2mm)	1	%	-	-	-	-	-	-	-	-	-	-	8.7	16.5	12.7	2.5	<1.0	8.9
Organic / Inorganic Carbon																		
carbon, inorganic	0.05	%	-	-	-	-	-	-	-	-	-	-	1.14	1.31	1.35	0.947	1.04	0.936
carbon, total	0.05	%	-	-	-	-	-	-	-	-	-	-	-	-	-	2.22	2.1	1.27
carbon, total organic	0.05	%	-	-	-	-	-	-	-	-	-	-	2.07	2.54	2.72	1.27	1.06	0.334
carbon, inorganic (as CaCO3 equivalent)	0.4	%	-	-	-	-	-	-	-	-	-	-	-	-	-	7.89	8.63	7.80
organic matter	0.1	%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.58
Metals																		
Aluminum	50	mg/kg	-	-	-	-	-	-	-	-	18000	-	4480	5110	5300	2570	1710	8860
Antimony	0.1	mg/kg	-	-	0.63	-	-	2.4	-	-	9.3	-	<0.10	<0.10	<0.10	<0.10	< 0.10	<0.10
Arsenic	0.1	mg/kg	7.24	41.6	7.4	7.24	8.2	20	41.6	70	35	-	4.54	3.85	4.43	2.6	0.51	2.83
Barium	0.5	mg/kg	-	-	-	130.1	-	-	-	-	48	-	15	16.4	18	9.26	5.11	32.2
Beryllium	0.1	mg/kg	-	-	-	-	-	-	-	-	-	-	0.28	0.29	0.32	0.17	0.10	0.56
Bismuth	0.2	mg/kg	-	-	-	-	-	-	-	-	-	-	<0.20	<0.20	<0.20	<0.20	< 0.20	<0.20
Boron	5	mg/kg	-	-	-	-	-	-	-	-	-	-	30.2	34.5	35	16	9.9	35.1
Cadmium	0.02	mg/kg	0.7	4.2	0.38	0.68	1.2	1.4	4.21	9.6	3	-	0.034	0.084	0.041	<0.020	< 0.020	0.098
Calcium	50	mg/kg	-	-	-	-	-	-	-	-	-	-	60500	70400	66900	36100	22100	9550
Chromium	0.5	mg/kg	52.3	160	49	52.3	81	141	160	370	62	-	16.2	17.1	17.7	10.2	7.02	16.0
Cobalt	0.1	mg/kg	-	-	-	-	-	-	-	-	10	-	2.83	2.92	3.1	1.72	1.23	4.28
Copper	0.5	mg/kg	18.7	108	32	18.7	34	94	108	270	390	-	4.71	5.6	5.76	3.15	1.54	9.24
Iron	50	mg/kg	-	-	-	-	-	-	-	-	220000	-	12700	10900	12800	8500	3610	14400
Lead	0.5	mg/kg	30.2	112	30	30.24	46.7	94	112	218	400	-	3.78	4.42	4.49	2.35	1.26	7.33
Lithium	2	mg/kg	-	-	-	-	-	-	-	-	-	-	20.7	22.1	23.6	11.1	6.9	17.8
Magnesium	20	mg/kg	-	-	-	-	-	-	-	-	-	-	30900	32900	33800	20700	12200	10000
Manganese	1	mg/kg	-	-	-	-	-	-	-	-	260	-	118	117	125	80	43.8	99.4
Mercury	0.005	mg/kg	0.13	0.7	0.14	0.13	0.15	0.48	0.7	0.71	0.41	-	0.007	0.0097	0.0094	<0.0050	< 0.0050	<0.0050
Molybdenum	0.1	mg/kg	-	-	-	-	-	-	-	-		-	0.38	0.33	0.39	0.2	0.20	1.66
Nickel	0.5	mg/kg	30[(a)]	50[(a)]	15	15.9	20.9	47	42.8	51.6	110	-	8.54	9.29	9.62	5.3	4.56	11.2
Phosphorus	50	mg/kg	-	-	-	-	-	-	-	-	-	-	402	463	506	340	135	483
Potassium	100	mg/kg	-	-	-	-	-	-	-	-	-	-	2170	2320	2320	1240	770	2590
Selenium	0.2	mg/kg	-	-	-	-	-	-	-	-	1	-	<0.20	0.22	<0.20	<0.20	< 0.20	<0.20
Silver	0.1	mg/kg	1[(a)]	2.2[(a)]	0.23	0.73	1	1.1	1.77	3.7	3.1	-	<0.10	<0.10	<0.10	<0.10	< 0.10	<0.10
Sodium	50	mg/kg	-	-	-	-	-	-	-	-	-	-	3380	4410	2850	2300	2150	6770
Strontium	0.5	mg/kg	-	-	-	-	-	-	-	-	-	-	45.6	76.9	46.8	23.8	14.0	26.6
Sulfur	1000	mg/kg	-	-	-	-	-	-	-	-	-	-	<1000	<1000	<1000	<1000	< 1000	2500
Thallium	0.05	mg/kg	-	-	-	-	-	-	-	-	-	-	0.093	0.094	0.102	0.053	< 0.050	0.115
Tin	2	mg/kg	-	-	-	0.048	-	-	-	-	3.4	-	<2.0	<2.0	<2.0	<2.0	< 2.0	<2.0
Titanium	1	mg/kg	-	-	-	-	-	-	-	-	-	-	288	256	278	172	136	256
Tungsten	0.5	mg/kg	-	-	-	-	-	-	-	-	-	-	<0.50	<0.50	<0.50	<0.50	< 0.50	<0.50
Uranium	0.05	mg/kg	-	-	-	-	-	-	-	-	-	-	0.617	0.694	0.746	0.45	0.250	1.78
Vanadium	0.2	mg/kg	-	-	-	-	-	-	-	-	57	-	17.1	19.3	19.6	10.4	6.10	22.3
Zinc	2	mg/kg	124	271	94	124	150	245	271	410	410	-	13.5	14.3	15.6	8.9	5.9	26.9
Zirconium	1	mg/kg	-	-	-	-	-	-	-	-	-	-	4.4	4.1	4.4	2.9	1.7	8.6
VOCs																		
benzene	0.0050	mg/kg	-	-	-	-	-	-	-	-	-	0.06	<0.0050	-	-	<0.0050	< 0.0050	<0.0050
ethylbenzene	0.015	mg/kg	-	-	-	-	-	-	-	-	0.004	3.6	<0.015	-	-	<0.015	< 0.050	<0.015
toluene	0.050	mg/kg	-	-	-	-	-	-	-	-	-	0.67	<0.050	-	-	<0.050	< 0.015	<0.050
xylene, m+p-	0.050	mg/kg	-	-	-	-	-	-	-	-	-	0.025	<0.050	-	-	<0.050	< 0.050	<0.050
xylene, o-	0.050	mg/kg	-	-	-	-	-	-	-	-	-	-	<0.050	-	-	<0.050	< 0.050	<0.050
xylenes, total	0.075	mg/kg	-	-	-	-	-	-	-	-	0.004	-	<0.075	-	-	<0.075	< 0.075	<0.075
Hydrocarbons																		
F1 (C6-C10)	5.0	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	<10	< 10	<5.0
F1-BTEX	5.0	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	< 10	<5.0
F2 (C10-C16)	30	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	< 30	<30
F3 (C16-C34)	50	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	< 50	<50
F4 (C34-C50)	50	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	< 50	<50

Table D.1 - Sediment Analytical Results for Milne Port Sampling Station SW-2
Baffinland 2018-2021

Sample ID Date Sampled Time Sampled Laboratory Sample ID QA/QC Parent Sample ID	Lowest Detection Limits	Units	CCME [1] ISQG	CCME [1] PEL	NOAA Sediment Benchmarks T_{20}	NOAA TEL	NOAA ERL	NOAA T_{50}	NOAA PEL	NOAA ERM	NOAA AET	Eco Tox EqP(@1% TOC)	SW-2-1 11-Aug-2018 12:55 L2148903-4	SW-2-2 11-Aug-2018 13:00 L2148903-5	SW-2-3 11-Aug-2018 13:05 L2148903-6	SW-2 27-Sep-2019 10:25 L2359868-3	SW-2 5-Aug-2020 - L2487428-2	SW-2 14-Aug-2021 13:15 VA21B7543-004 FDA
PAHs																		
acenaphthene	0.0050	mg/kg	0.00671	0.0889	0.019	0.007	0.016	0.116	0.089	0.500	0.130	-	<0.0050	-	-	<0.0050	< 0.0050	<0.0050
anthracene	0.0040	mg/kg	0.0469	0.245	0.034	0.0469	0.0853	0.29	0.245	1.1	0.28	-	<0.0040	-	-	<0.0040	< 0.0040	<0.0040
benz(a)anthracene	0.010	mg/kg	0.0748	0.693	0.061	0.0748	0.261	0.466	0.693	1.6	0.96	-	<0.010	-	-	<0.010	< 0.010	<0.010
benzo(a)pyrene	0.010	mg/kg	0.0888	0.763	0.069	0.0888	0.43	0.52	0.763	1.6	1.1	-	<0.010	-	-	<0.010	< 0.020	<0.010
benzo(b+j)fluoranthene	0.010	mg/kg	-	-	0.13	-	-	1.107	-	-	1.8	-	<0.010	-	-	<0.010	< 0.010	<0.010
benzo(b+j+k)fluoranthene	0.015	mg/kg	-	-	-	-	-	-	-	-	-	-	<0.015	-	-	<0.015	< 0.015	<0.015
benzo(g,h,i)perylene	0.010	mg/kg	0.31[(a)]	0.78[(a)]	-	-	-	-	-	-	-	-	<0.010	-	-	<0.010	< 0.010	<0.010
benzo(k)fluoranthene	0.010	mg/kg	2.3[(a)]	4.5[(a)]	0.07	-	-	0.537	-	-	1.8	-	<0.010	-	-	<0.010	< 0.010	<0.010
chrysene	0.010	mg/kg	0.108	0.846	0.082	0.108	0.384	0.65	0.846	2.8	0.95	-	<0.010	-	-	<0.010	< 0.010	<0.010
dibenz(a,h)anthracene	0.0050	mg/kg	0.00622	0.135	0.019	0.00622	0.0634	0.113	0.135	0.26	0.23	-	<0.0050	-	-	<0.0050	< 0.0050	<0.0050
fluoranthene	0.010	mg/kg	0.113	1.494	0.119	0.113	0.6	1.034	1.494	5.1	1.3	-	<0.010	-	-	<0.010	< 0.010	<0.010
fluorene	0.010	mg/kg	0.0212	0.144	0.019	0.0212	0.019	0.114	0.144	0.54	0.12	0.54	<0.010	-	-	<0.010	< 0.010	<0.010
indeno(1,2,3-c,d)pyrene	0.010	mg/kg	0.34[(a)]	0.88[(a)]	0.068	-	-	0.488	-	-	0.6	-	<0.010	-	-	<0.010	< 0.010	<0.010
methylnaphthalene, 1+2-	0.015	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-		< 0.010	<0.015
methylnaphthalene, 1-	0.010	mg/kg	-	-	0.021	-	-	0.094	-	-	-	-	<0.050	-	-	<0.050	< 0.010	<0.010
methylnaphthalene, 2-	0.010	mg/kg	0.0202	0.201	0.021	0.0202	0.07	0.128	0.201	0.67	0.064	-	<0.010	-	-	<0.010	< 0.010	<0.010
naphthalene	0.010	mg/kg	0.0346	0.391	0.03	0.0346	0.16	0.217	0.391	2.1	0.23	0.48	<0.010	-	-	<0.010	< 0.010	<0.010
phenanthrene	0.010	mg/kg	0.0867	0.544	0.068	0.0867	0.24	0.455	0.544	1.5	0.66	-	<0.010	-	-	<0.010	< 0.010	<0.010
pyrene	0.010	mg/kg	0.153	1.398	0.125	0.153	0.665	0.932	1.398	2.6	2.4	-	<0.010	-	-	<0.010	< 0.010	<0.010
quinoline	0.010	mg/kg	-	-	-	-	-	-	-	-	-	-	<0.050	-	-	<0.050	< 0.050	<0.010
B(a)P total potency equivalents [B(a)P TPE]	0.020	mg/kg	-	-	-	-	-	-	-	-	-	-	<0.020	-	-	<0.020	< 0.020	<0.020
IACR (CCME)	0.150	-	-	-	-	-	-	-	-	-	-	-	<0.15	-	-	<0.15	< 0.15	<0.150
IACR AB (coarse)	0.10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.10
IACR AB (fine)	0.10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.10
PAHs, total (BC Sched 3.4)	0.040	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.040
PAHs, total (EPA 16 - DAS)	0.140	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.140
PAHs, total (EPA 16)	0.040	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.040

Notes

[1] Canadian Council of Ministers of the Environment (CCME). 1999. Canadian Sediment Quality Guidelines for the Protection of Aquatic Life. In: Canadian Environmental Quality Guidleines, 1999, Canadian Council of Ministers of the Environment, Winnipeg, MB.

[(a)]Guideline value substituted with the BC ENV Working Sediment Guideline in the absence of an applicable CCME Sediment Guideline
BC ENV = British Columbia Ministry of Environment; CCME = Canadian Council of Miniters of the Environment; ISQG = interim sediment quality guidelines; mg/kg = miligram per kilogram; NOAA = National Oceanic and Atmospheric Administration; PEL = probable effects levels; REL = Effect Range Low; SWQG = working sediment quality guidelines; T20 = Concentrations corresponding to 20% probability of observing toxicity; TEL= Threshold Effects Levels; T50 = Concentrations corresponding to 50% probably of observing toxicity; PEL = Probable Effect Levels; pH = scale of acidity; % - percentage; "-" = no value or no result available

Value	Greater than CCME ISQG guideline
Value	Greater than CCME ISQG and PEL guidelines
Value	Greater than BC ENV working lower SWQG
Value	Greater than BC ENV working upper SWQG
Value	Greater than NOAA sediment Benchmarks T_{20} guideline
Value	Greater than NOAA sediment Benchmarks TEL guideline
Value	Greater than NOAA sediment Benchmarks ERLguideline
Value	Greater than NOAA sediment Benchmarks T_{50} guideline
Value	Greater than NOAA sediment Benchmarks PEL guideline

Date Sampled	**Lowest Detection Limits**	**Units**	14-Aug-2021	14-Aug-2021	Relative Percent Difference (RPD)
Time Sampled			13:15	00:00	
Laboratory Sample ID			VA21B7543-004	VA21B7543-005	
QA/QC			FDA	FD	
Parent Sample ID				SW-2	
Physical Parameters					
Moisture	0.25	%	14.7	14.4	2%
pH (1:2 soil:water)	0.1	pH units	8.90	8.89	0%
Particle Size					
clay (<0.004mm)	1	%	<1.0	<1.0	NA
silt (0.063mm - 0.004mm)	1	%	2.6	2.2	NA
sand (2.0mm - 0.063mm)	1	%	88.5	87.2	1%
gravel (>2mm)	1	%	8.9	10.6	17%
Organic / Inorganic Carbon					
carbon, inorganic	0.05	%	0.936	0.811	14%
carbon, total	0.05	%	1.27	1.11	13%
carbon, total organic	0.05	%	0.334	0.299	11%
carbon, inorganic (as CaCO3 equivalent)	0.4	%	7.80	6.76	14%
organic matter	0.1	%	0.58	0.52	11%
Metals					
Aluminum	50	mg/kg	8860	1450	**144%**
Antimony	0.1	mg/kg	<0.10	<0.10	NA
Arsenic	0.1	mg/kg	2.83	0.44	**146%**
Barium	0.5	mg/kg	32.2	4.46	**151%**
Beryllium	0.1	mg/kg	0.56	<0.10	NA
Bismuth	0.2	mg/kg	<0.20	<0.20	NA
Boron	5	mg/kg	35.1	9.1	**118%**
Cadmium	0.02	mg/kg	0.098	<0.020	NA
Calcium	50	mg/kg	9550	23500	**84%**
Chromium	0.5	mg/kg	16.0	5.70	**95%**
Cobalt	0.1	mg/kg	4.28	0.97	**126%**
Copper	0.5	mg/kg	9.24	1.16	**155%**
Iron	50	mg/kg	14400	3050	**130%**
Lead	0.5	mg/kg	7.33	1.06	**149%**
Lithium	2	mg/kg	17.8	6.2	**97%**
Magnesium	20	mg/kg	10000	11200	11%
Manganese	1	mg/kg	99.4	39.4	**86%**
Mercury	0.005	mg/kg	<0.0050	<0.0050	NA
Molybdenum	0.1	mg/kg	1.66	0.11	**175%**
Nickel	0.5	mg/kg	11.2	2.99	**116%**
Phosphorus	50	mg/kg	483	80	**143%**
Potassium	100	mg/kg	2590	740	**111%**
Selenium	0.2	mg/kg	<0.20	<0.20	NA
Silver	0.1	mg/kg	<0.10	<0.10	NA
Sodium	50	mg/kg	6770	1520	**127%**
Strontium	0.5	mg/kg	26.6	15.2	**55%**
Sulfur	1000	mg/kg	2500	<1000	NA
Thallium	0.05	mg/kg	0.115	<0.050	NA
Tin	2	mg/kg	<2.0	<2.0	NA
Titanium	1	mg/kg	256	110	**80%**
Tungsten	0.5	mg/kg	<0.50	<0.50	NA
Uranium	0.05	mg/kg	1.78	0.213	**157%**
Vanadium	0.2	mg/kg	22.3	4.91	**128%**
Zinc	2	mg/kg	26.9	4.8	**139%**
Zirconium	1	mg/kg	8.6	1.5	**141%**

Date Sampled	**Lowest Detection Limits**	**Units**	14-Aug-2021	14-Aug-2021	Relative Percent Difference (RPD)
Time Sampled			13:15	00:00	
Laboratory Sample ID			VA21B7543-004	VA21B7543-005	
QA/QC			FDA	FD	
Parent Sample ID				SW-2	
VOCs					
benzene	0.0050	mg/kg	<0.0050	<0.0050	NA
ethylbenzene	0.015	mg/kg	<0.015	<0.015	NA
toluene	0.050	mg/kg	<0.050	<0.050	NA
xylene, m+p-	0.050	mg/kg	<0.050	<0.050	NA
xylene, o-	0.050	mg/kg	<0.050	<0.050	NA
xylenes, total	0.075	mg/kg	<0.075	<0.075	NA
Hydrocarbons					
F1 (C6-C10)	5.0	mg/kg	<5.0	<5.0	NA
F1-BTEX	5.0	mg/kg	<5.0	<5.0	NA
F2 (C10-C16)	30	mg/kg	<30	<30	NA
F3 (C16-C34)	50	mg/kg	<50	<50	NA
F4 (C34-C50)	50	mg/kg	<50	<50	NA
PAHs					
acenaphthene	0.0050	mg/kg	<0.0050	<0.0050	NA
acenaphthylene	0.0050	mg/kg	<0.0050	<0.0050	NA
acridine	0.010	mg/kg	<0.010	<0.010	NA
anthracene	0.0040	mg/kg	<0.0040	<0.0040	NA
benz(a)anthracene	0.010	mg/kg	<0.010	<0.010	NA
benzo(a)pyrene	0.010	mg/kg	<0.010	<0.010	NA
benzo(b+j)fluoranthene	0.010	mg/kg	<0.010	<0.010	NA
benzo(b+j+k)fluoranthene	0.015	mg/kg	<0.015	<0.015	NA
benzo(g,h,i)perylene	0.010	mg/kg	<0.010	<0.010	NA
benzo(k)fluoranthene	0.010	mg/kg	<0.010	<0.010	NA
chrysene	0.010	mg/kg	<0.010	<0.010	NA
dibenz(a,h)anthracene	0.0050	mg/kg	<0.0050	<0.0050	NA
fluoranthene	0.010	mg/kg	<0.010	<0.010	NA
fluorene	0.010	mg/kg	<0.010	<0.010	NA
indeno(1,2,3-c,d)pyrene	0.010	mg/kg	<0.010	<0.010	NA
methylnaphthalene, 1+2-	0.015	mg/kg	<0.015	<0.015	NA
methylnaphthalene, 1-	0.010	mg/kg	<0.010	<0.010	NA
methylnaphthalene, 2-	0.010	mg/kg	<0.010	<0.010	NA
naphthalene	0.010	mg/kg	<0.010	<0.010	NA
phenanthrene	0.010	mg/kg	<0.010	<0.010	NA
pyrene	0.010	mg/kg	<0.010	<0.010	NA
quinoline	0.010	mg/kg	<0.010	<0.010	NA
B(a)P total potency equivalents [B(a)P TPE]	0.020	mg/kg	<0.020	<0.020	NA
IACR (CCME)	0.150	-	<0.150	<0.150	NA
IACR AB (coarse)	0.10	-	<0.10	<0.10	NA
IACR AB (fine)	0.10	-	<0.10	<0.10	NA
PAHs, total (BC Sched 3.4)	0.040	mg/kg	<0.040	<0.040	NA
PAHs, total (EPA 16 - DAS)	0.140	mg/kg	<0.140	<0.140	NA
PAHs, total (EPA 16)	0.040	mg/kg	<0.040	<0.040	NA

Notes

CCME = Canadian Council of Miniters of the Environment; DAS = Disposal at Sea; FDA = field duplicate available; IACR = index of additive cancer risk; ID = identification; mg/kg = miligram per kilogram; NA = not applicable; PAH = Polycyclic Aromatic Hydrocarbons; QA/QC = quality assurance / quality control; RPD = Relative Percent Difference; % = percent, < = below detection limit; > = greater than; - = no data

Bold values indicate an exceedance of the acceptable RPD of 50%.

APPENDIX E

Power Analysis - Marine Sediment

POWER ANALYSIS - METHODS

A Type I error is concluding there is a significant effect when none exists (i.e., a false positive). Alpha (α) is the probability of committing a Type I error. A Type II error is the probability of concluding there is no significant effect when there is a real effect of some specified magnitude (i.e., a false negative). Beta (β) is the probability of committing a Type II error. The power of a statistical test (1 - β) is the probability of detecting a real effect. In this analysis, the Type I error-rate (α), also referred to as the significance level, was set to 0.05. The desired minimum statistical power was 80%, which corresponds to a type II error-rate of 0.2. Power analyses were conducted to assess the power of statistical tests under multiple effect sizes. For each model, a set of effect sizes was created, based on preliminary power analyses, so that power >80% was achieved at the largest absolute values of effect sizes, but also so that power is assessed at a range of effect sizes. Both negative and positive effect sizes were used, to assess the power of detecting either a reduction or an increase in values of the response variables. Since the analysis focused on assessment of changes to statistical power at different effect sizes, the power analysis used the observed samples sizes from the collected data.

Data Simulation following Effect Size Application

The power to detect statistically significant effects was estimated using residual bootstrapping in R v. 4.0.3 (R 2020), following the approach of Fox and Weisberg (2018). The general approach was to simulate data based on the model selected for interpretation, the observed sample size, and the residuals, and re-run the models that were used for the original analysis using the simulated data. The data simulation and analysis were repeated 1,000 times, and the proportion of repetitions where the *P*-values of interest were significant ($P<0.05$) was interpreted as the statistical power of the test.

To produce simulated data, the original model was used to predict values of the response variable, and the raw residuals (i.e. the difference between the predicted and observed value for each observation) from the original model were calculated and retained. The predicted values were then adjusted according to the effect size, depending on analysis (see below for details). For each iteration of the simulation, the residuals from the original analysis were sampled with replacement, and then summed with effect size-adjusted model predictions, to produce a set of simulated data. Adding the residuals to the effect size-adjusted predictions was done to create a level of variability in the simulated data that was similar to the observed data. The simulated data were then analyzed using the same model structure as the original analysis.

Effect sizes and statistical tests were applied differently to different models and datasets, as detailed below.

Effect Sizes

In this power analysis, the question of interest was the models' power to detect between-year differences at various distances within transect. To assess this, the effect size was applied to the effect of year. Specifically, the effect size was applied as a percentage difference relative to the observed values in 2020. Where the response variable was transformed prior to analysis, the effect sizes were applied to back-transformed values on the original scale of the response variable. An example of the effect size application to a dataset with a parabolic relationship between the response variable and year is provided in Figure 1. For datasets with a linear relationship with distance, the application of the year-based effect size would be similar but result in parallel lines.

The simulated data based on effect sizes applied to values of the response variable from 2020 were combined with simulated data from previous years (with an effect size of zero). This combined dataset was analyzed using the model from the original analysis in the main report and the *P*-values for the effects of year on the response variable were retained, which included both the main effect of year and any interactions with year. If any of these *P*-values were less than 0.05, it was considered a significant overall effect of year. The proportion of repetitions with *P*-values less than 0.05 was interpreted as the statistical power.

Following the test of the overall year effect, multiple comparisons between years at several distances along each transect were performed with the Dunn–Šidák adjustment for multiple comparisons using the package emmeans (Lenth 2019). The *P*-values of each comparison were retained, and the magnitude of difference between the least squares means (i.e., model predictions) at each comparison was calculated as a simple difference between the predicted value of a previous year and the predicted value of the next year (e.g., estimate in 2014 minus estimate in 2020). The values were back-transformed prior to magnitude calculation, if applicable. Only comparisons with 2020 were shown in the results, since the effect size was applied to the 2020 data. For each effect size, the median value of magnitude of difference was retained, and the proportion of repetitions with *P*-values less than 0.05 at each transect and distance was interpreted as the statistical power of the multiple comparisons to detect a year effect. Comparing values from previous years to simulated data from 2020 was done to assess how much higher or lower the 2020 values would have to be to detect a significant difference relative to previous years.

Power Analysis – Reporting of Results

Power curves were produced, showing statistical power as a function of effect size in percentages (for overall effects) or the median magnitude of difference between the two values compared in multiple comparisons. Reporting the effect size as a magnitude of difference in the original units of the response variable, rather than as a percent difference from 2020 values, was done to make the results easier to interpret, as the ecological importance of the difference may be easier to judge on the original scale of the variable. Horizontal lines were added to visualize statistical power values of 0.8 (hereafter sufficient power) and 0.9 (hereafter high power), and a vertical line was added to visualize the magnitude of difference (or the slope value, for linear relationships) that was observed in the original data.

In the multiple comparisons of year effects, an effect size equal to twice the standard deviation (SD) of the residuals for each transect in 2020 was calculated as a simple difference between predicted and observed values. This was displayed on the plots in addition to the observed between-year effect sizes, to visualize the magnitude difference required to have sufficient power to detect between-year effects in relation to the observed variability in 2020.

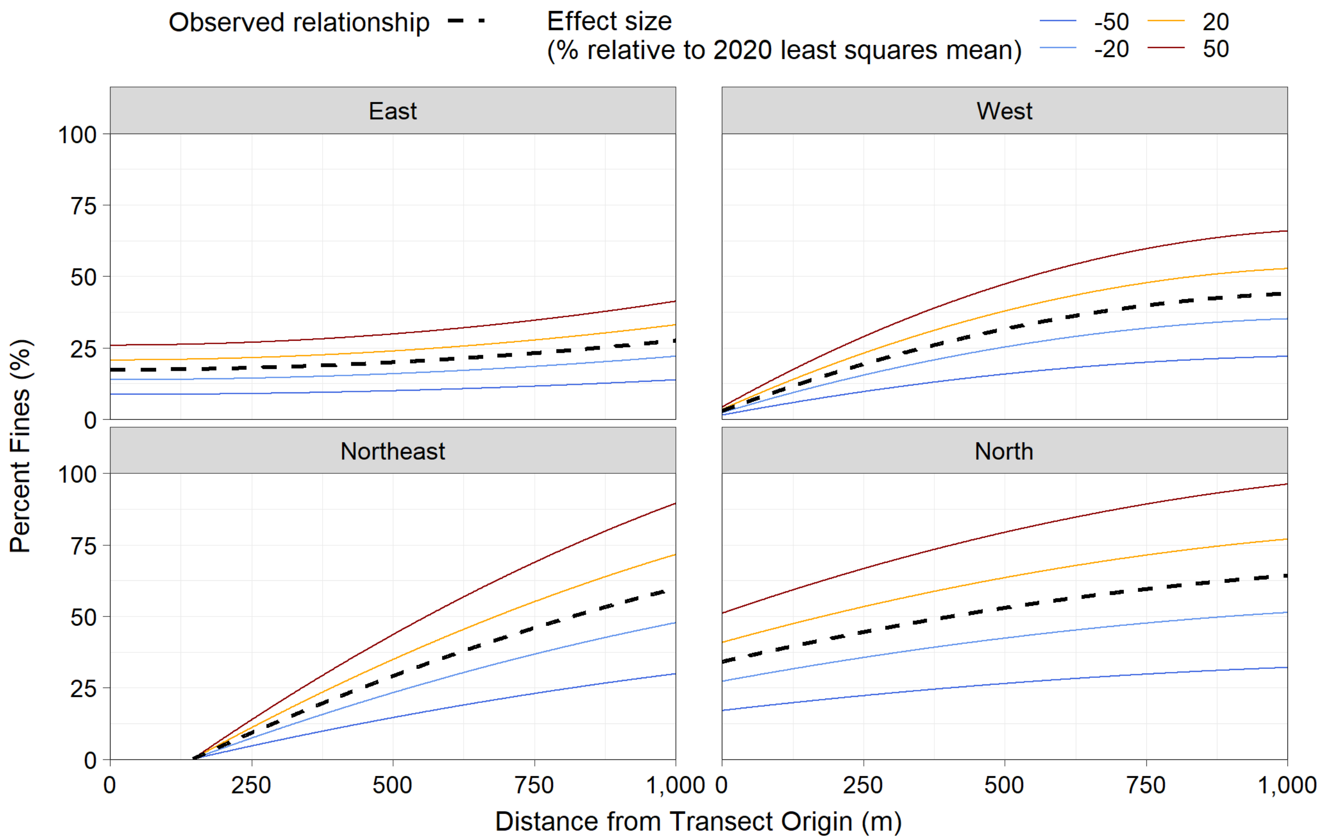

Figure 1 Application of effect sizes to examine effect of sampling year in a parabolic relationship (2019-2020 percent fines model).

POWER ANALYSIS – RESULTS

Sediment Quality – Percent Fines in 2019-2020

The power analysis indicated that the analysis of percent fines data collected in 2019-2020 had high power (>0.9) to detect an overall effect of year or an overall significant difference in year effects between the sampled transects and distances at the observed effect size (indicated by the vertical line in Figure 2). This is consistent with the finding of a significant three-way interaction between distance, sampling year, and transect in the original analysis of percent fines (Section 3.4.5.1 in the 2020 MEEMP report [Golder 2021]).

In multiple comparisons between 2019 and 2020, the power analysis indicated that along the East Transect, there was sufficient power to detect significant differences at effect sizes of ±2 SDs at most distances along the transect (Figure 3). Observed magnitudes of difference were small, ranging between -6% (at 200 m) and -0.3% (at 1,000 m). Along the Northeast Transect, there was sufficient power to detect differences at the ±2 SD effect size at distances of 1,000 m and 1,500 m (Figure 4). Observed magnitudes of difference were between -14% (at 500 m) and +1% (at 1,000 m). Along the Northwest Transect, statistical power was sufficient to detect a ±2 SD effect size at 500 m and 1,000 m distances (Figure 5). The observed magnitudes of difference in percent fines ranged between -18% and +2% at distances from 200 m to 1,500 m. Along the West Transect, statistical power was sufficient to detect a ±2 SD effect size at 500 m and 1,000 m distances (Figure 6). The observed magnitudes of difference in percent fines ranged between --9% (at 1,000 m) and +8% (at 500 m).

Overall, power to detect effects between years was highest mid-transect (i.e., 500 m and 1,000 m from the Ore Dock) along all four examined transects. Power was sufficient to detect a ±2 SD effect size, however observed effect sizes were small, resulting in lack of significant differences between years in the original analysis (Section 3.4.5.1 in Golder 2021).

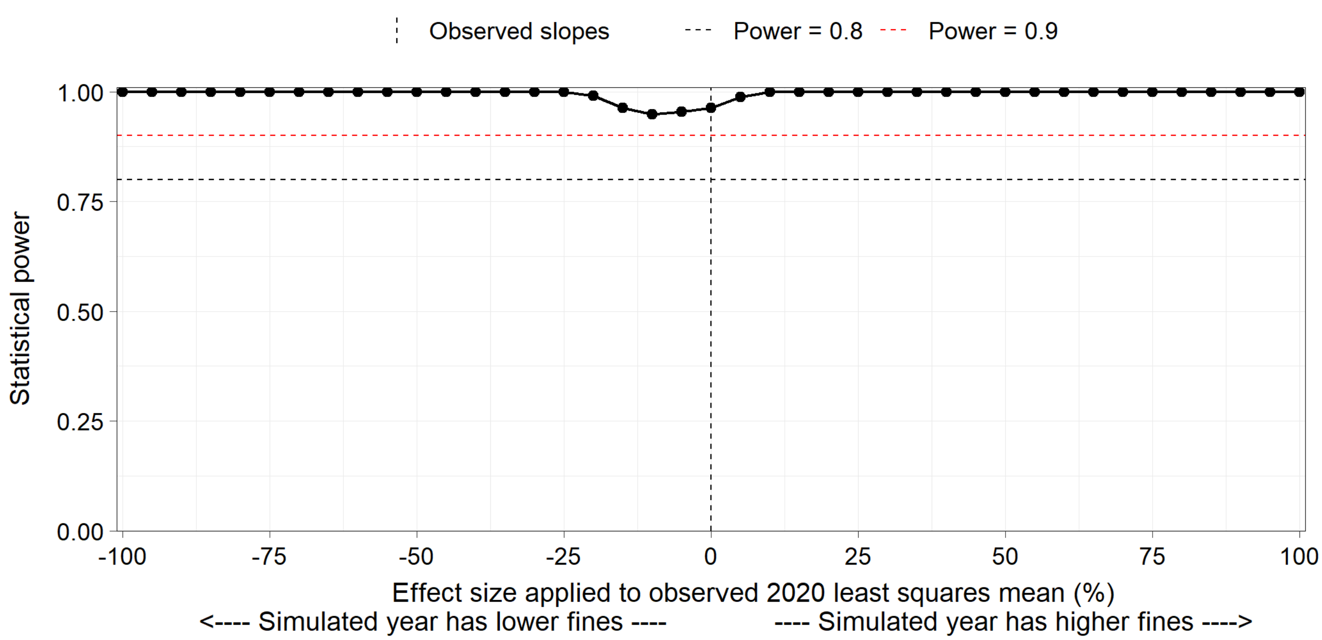

Figure 2 Statistical power of the overall model of 2019-2020 percent fines to detect a significant year effect (as main effect or interaction with either distance or distance and transect).

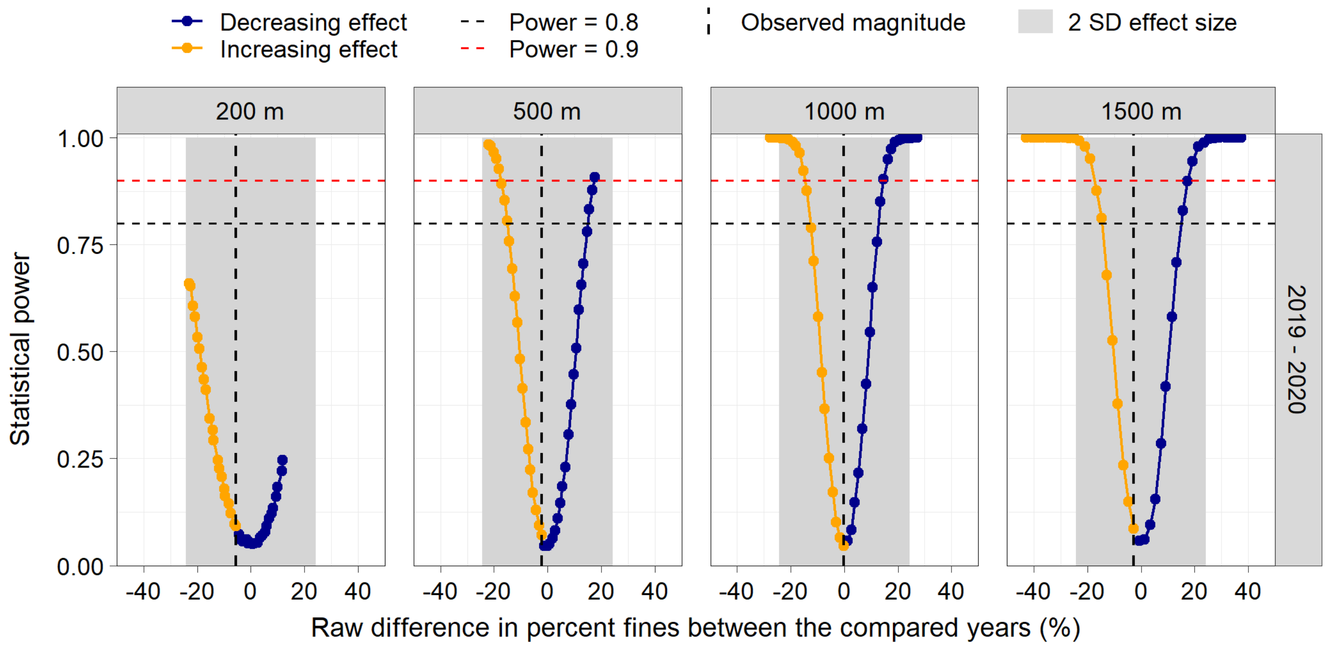

Figure 3 Statistical power of multiple comparisons between years at select distances along the East Transect relative to the difference in percent fines. Each panel shows a separate comparison, with the distances compared displayed at the top of the panel.

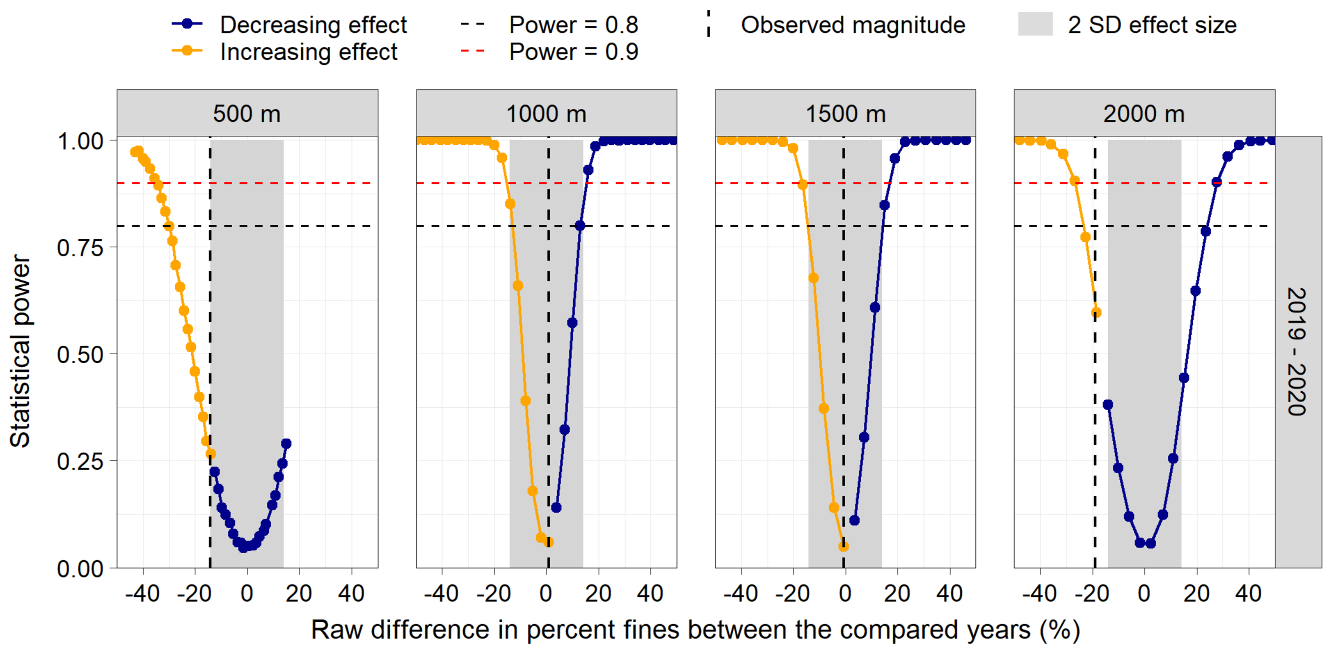

Figure 4 Statistical power of multiple comparisons between years at select distances along the Northeast Transect relative to the difference in percent fines. Each panel shows a separate comparison, with the distances compared displayed at the top of the panel.

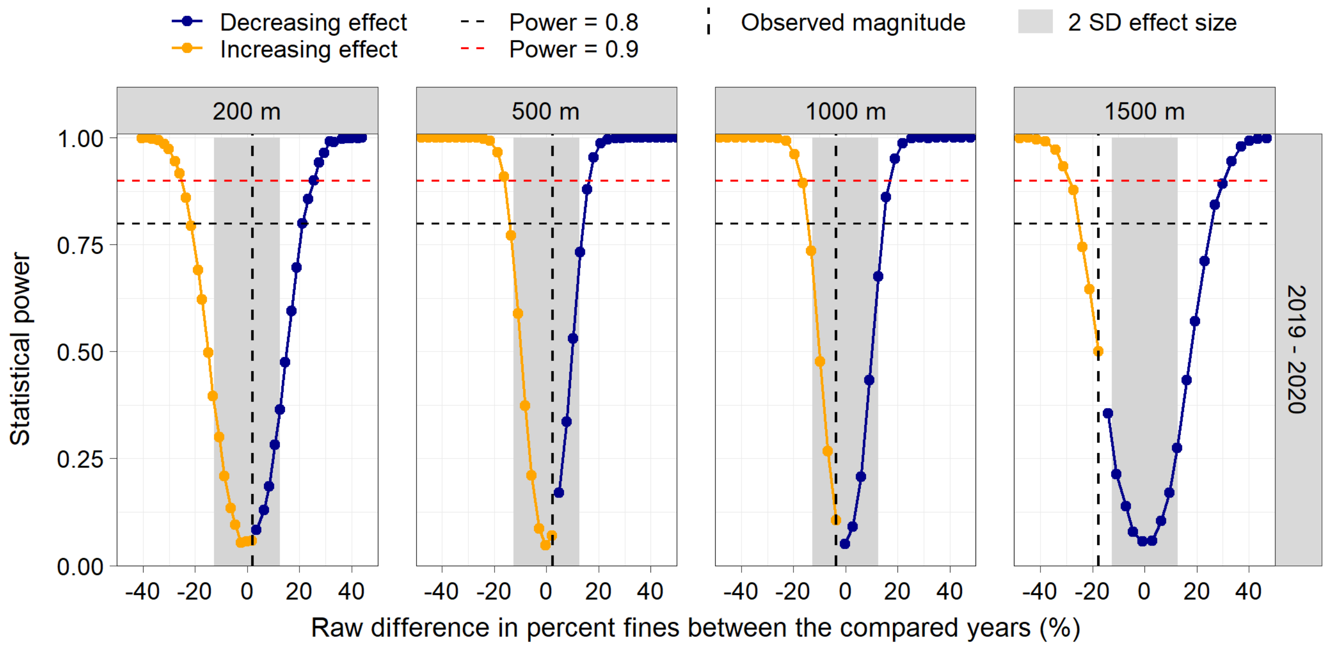

Figure 5 Statistical power of multiple comparisons between years at select distances along the Northwest Transect relative to the difference in percent fines. Each panel shows a separate comparison, with the distances compared displayed at the top of the panel.

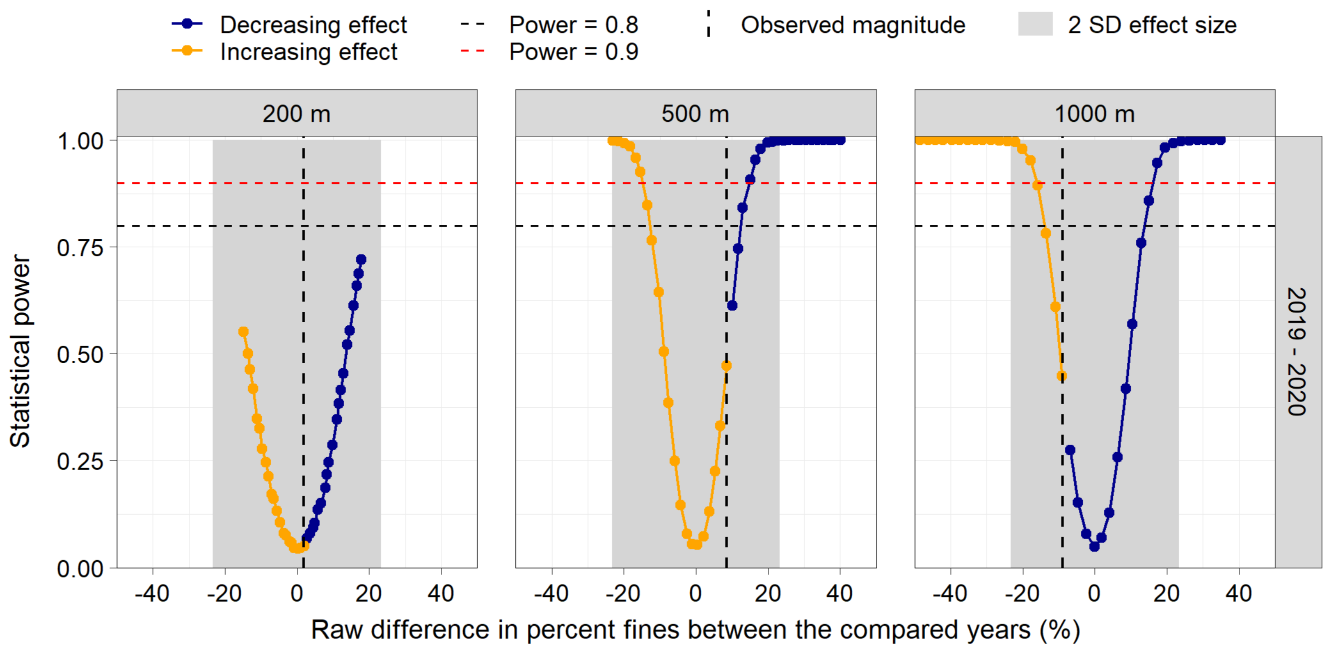

Figure 6 Statistical power of multiple comparisons between years at select distances along the East Transect relative to the difference in percent fines. Each panel shows a separate comparison, with the distances compared displayed at the top of the panel.

Sediment Quality – Percent Fines in 2014-2020

The power analysis indicated that the analysis of 2014-2020 percent fines data had high power (>0.9) to detect an overall effect of year or an overall significant difference in year effects between the sampled transects and distances at the observed effect size (indicated by the vertical line in Figure 7). This is consistent with the finding of a significant three-way interaction between, distance, sampling year, and transect in the original analysis of percent fines (p-value <0.001; Section 3.4.5.1 in Golder 2021).

In multiple comparisons between all years, the power analysis indicated that along the East Transect, there was sufficient power to detect significant differences at ±2 SD magnitudes of difference in percent fines at 500 m, 1,000 m, and 1,500 m distances from the Ore Dock (Figure 8). Along the North Transect, there was low power to detect differences at the observed magnitudes and at the ±2 SD effect size at all distances (Figure 9). Along the North Transect, the magnitude of difference in percent fines between 2020 and a previous sampling year had to be at least 25% for a statistical power value of 0.8 at a distance of 200 m, at least 18% at a distance of 500 m, and at least 19% at a distance of 1,000 m. In comparison, the 2 SD effect size was only equivalent to ~6% fines, and the test therefore had insufficient power to detect a difference of ±2 SD at all distances. Along the West Transect, there was sufficient power to detect significant differences under the observed the ±2 SD effect size relative to 2020 transect-specific regression residuals at 500 m (most years) and 1,000 m (2015-2020 and 2019-2020 comparisons; Figure 10).

Overall, power to detect effects between years was highest mid-transect (e.g., 500 m) along all three examined transects, and not sufficient to detect observed effect sizes. This is consistent with not finding significant differences between years at any of the examined transects and distances in the original analysis (Section 3.4.5.1 in Golder 2021). Power to detect ±2 SD effect sizes was sufficient (>0.8) at multiple distances and year comparisons along the East and West transects, but not along the North Transect, where a minimum of 18% difference in percent fines between 2020 and a previous sampling year was required for sufficient power.

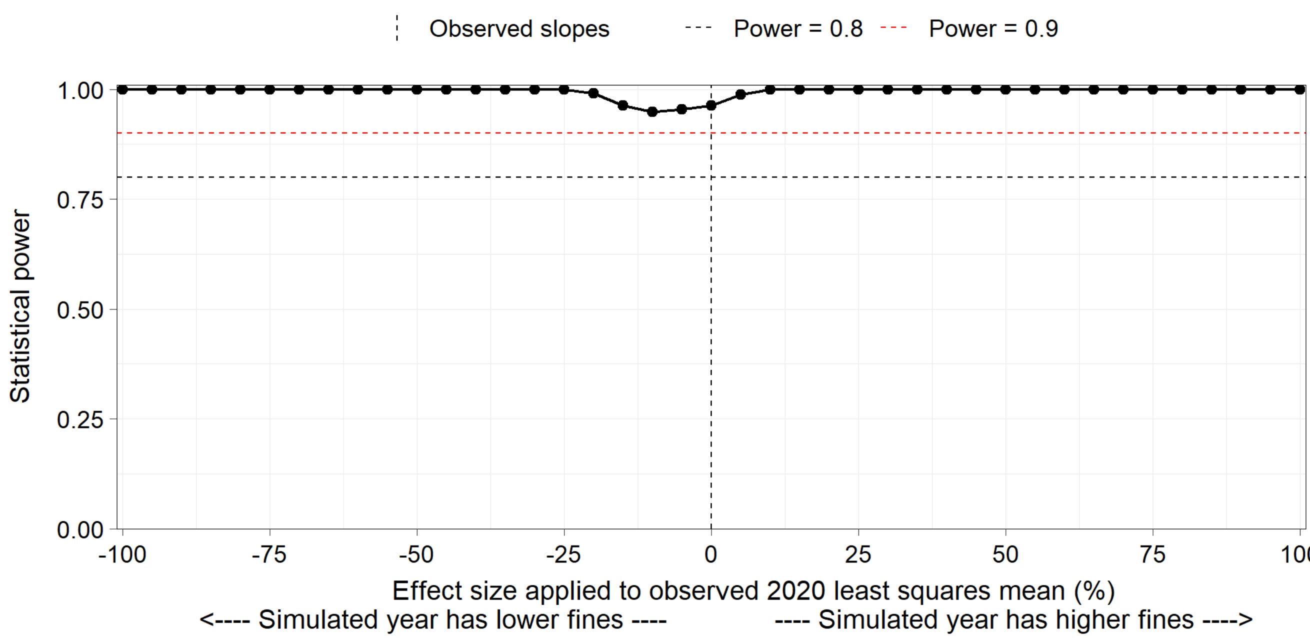

Figure 7 Statistical power of the overall model of 2014-2020 percent fines to detect a significant year effect (as main effect or interaction with either distance or distance and transect).

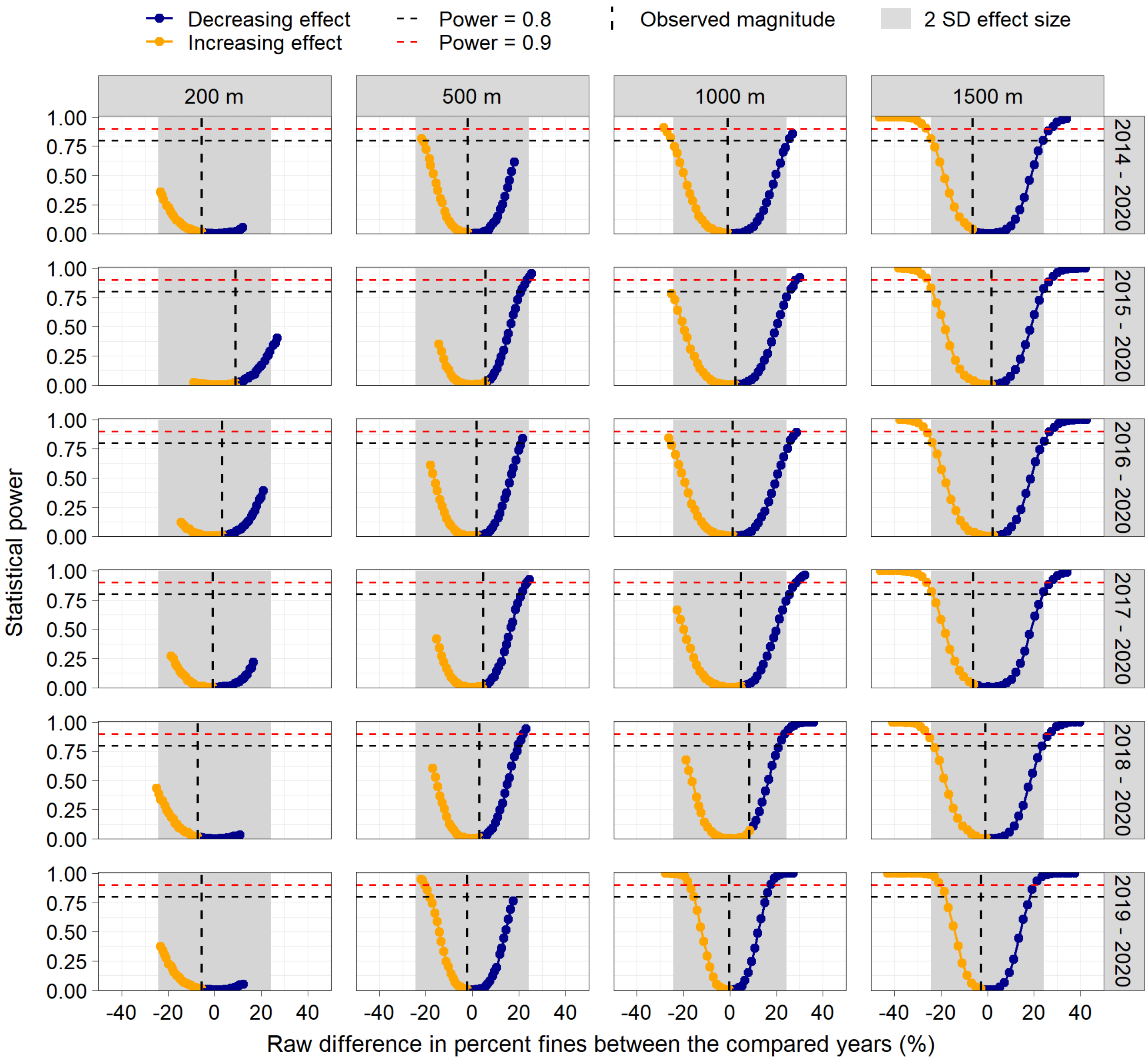

Figure 8 Statistical power of multiple comparisons between years at three distances along the East Transect relative to the difference in percent fines between the compared years. Each panel shows a separate comparison, with the years compared displayed on the right and the distance at which the comparison is performed displayed at the top.

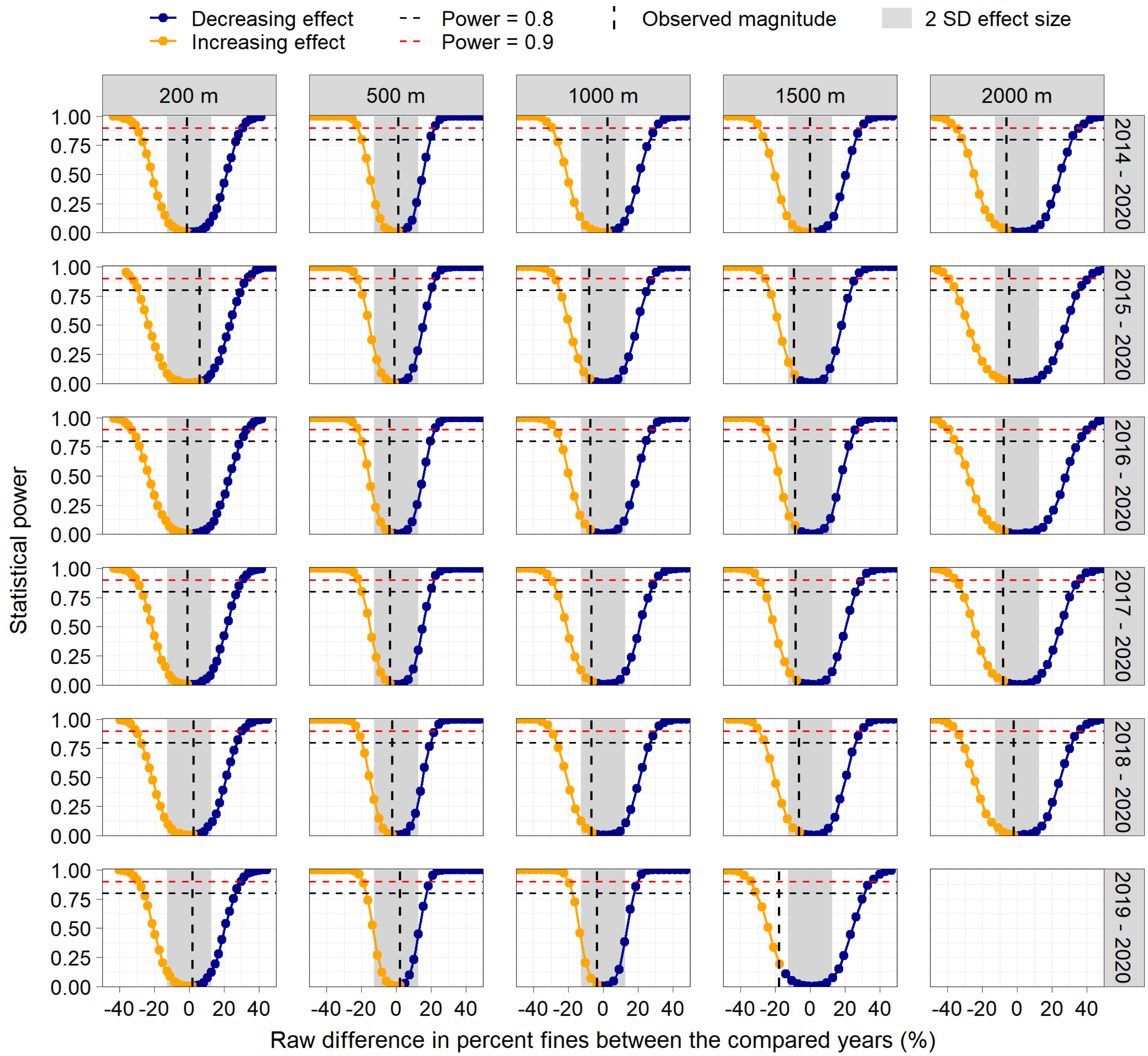

Figure 9 Statistical power of multiple comparisons between years at three distances along the North Transect relative to the difference in percent fines between the compared years. Each panel shows a separate comparison, with the years compared displayed on the right and the distance at which the comparison is performed displayed at the top.

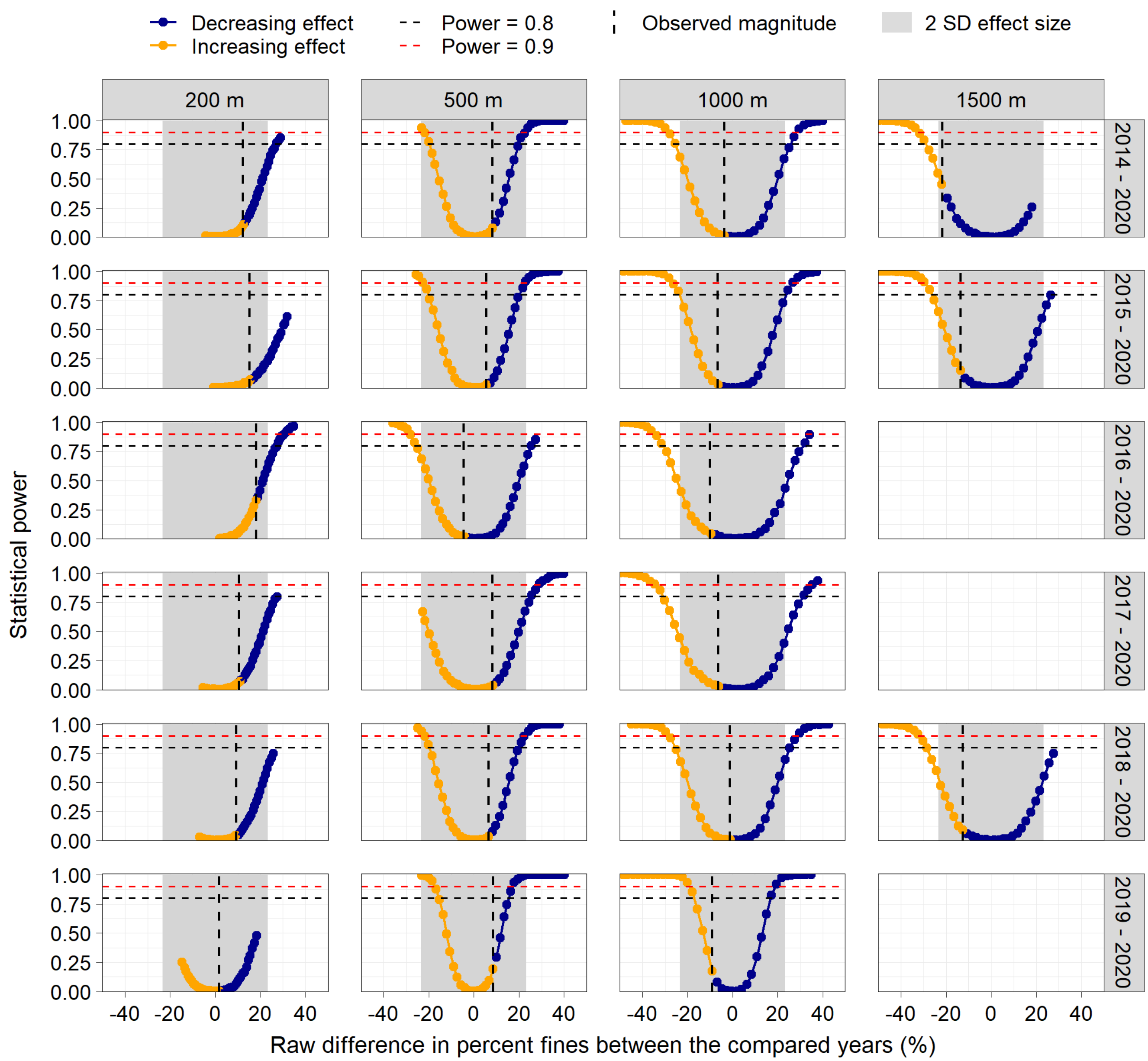

Figure 10 Statistical power of multiple comparisons between years at three distances along the West Transect relative to the difference in percent fines between the compared years. Each panel shows a separate comparison, with the years compared displayed on the right and the distance at which the comparison is performed displayed at the top.

Sediment Quality – Iron Content in 2019-2020

The power analysis indicated that the analysis of fines-adjusted iron content collected in 2019-2020 had high power (>0.9) to detect an overall effect of year or an overall significant difference in year effects between the sampled transects and distances at the observed effect size (indicated by the vertical line in Figure 11). This is consistent with the finding of a significant three-way interaction between distance, sampling year, and transect in the original analysis of percent fines (Section 3.4.6.1 in Golder 2021).

In multiple comparisons between 2019 and 2020, the power analysis indicated that along the East Transect, there was sufficient power to detect significant differences at effect sizes of ±2 SDs at most distances along the transect (Figure 12). Along the Northeast Transect, there was not sufficient power to detect differences at the ±2 SD effect size (Figure 13), since the low variability resulted in a very low standard deviation value (2.0 mg iron/g fines). Observed magnitudes of difference were between +3.6 mg/g fines (at 1,500 m) and +6.1 mg/g fines (at 500 m). Along the Northwest Transect, statistical power was also not sufficient to detect a ±2 SD effect size (Figure 14), due to the very low variability (standard deviation of 2.1 mg iron/g fines). The observed magnitudes of difference in fines-adjusted iron content ranged between -1.7 mg iron/g fines (200 m and 500 m) and +12.2 mg iron/g fines (at 1,500 m, where power was sufficient to detect the observed effect size). Along the West Transect, statistical power was sufficient to detect a ±2 SD effect size at the three assessed distances (Figure 15). The observed magnitudes of difference in fines-adjusted iron content ranged between –11.8 mg/g fines (at 200 m) and +6.8 mg/g fines (at 1,000 m).

Overall, power to detect effects between years was highest mid-transect (i.e., 500 m and 1,000 m from the Ore Dock) along all four examined transects. Power was sufficient to detect a ±2 SD effect size, and some observed effect sizes (e.g., West Transect at 500 m) were sufficient for high power, consistent with the detection of significant differences between years in the original analysis (Section 3.4.6.1 in Golder 2021).

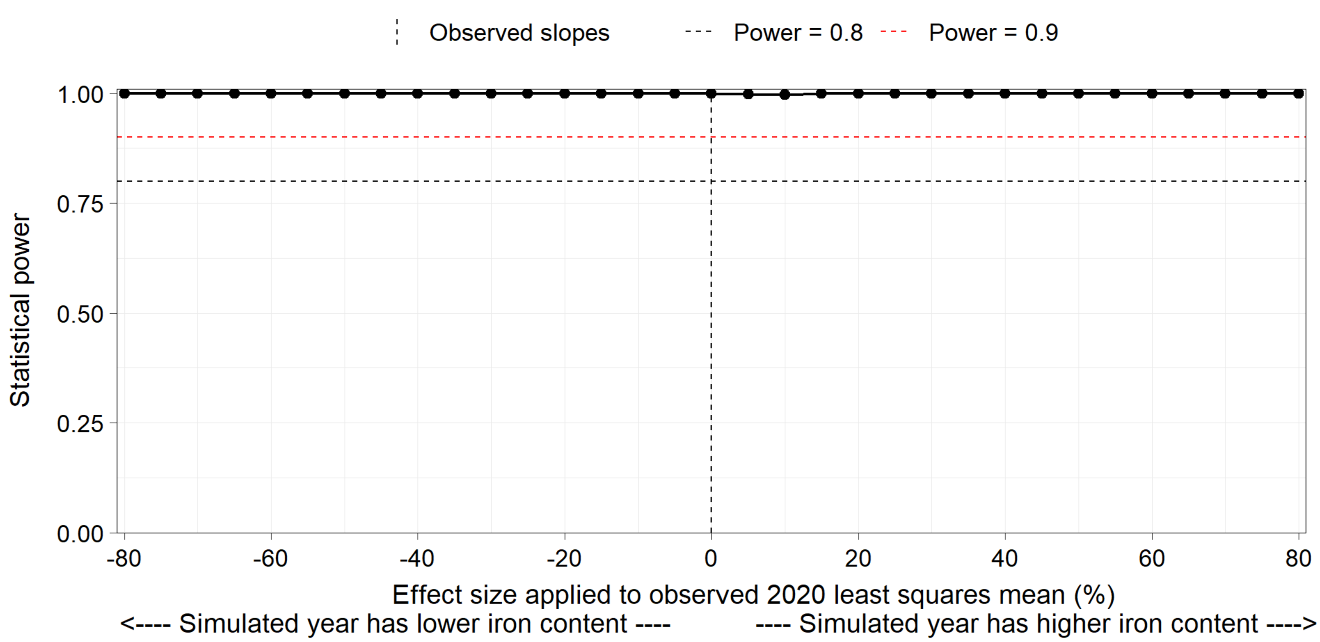

Figure 11 Statistical power of the overall model of 2019-2020 fines-adjusted iron content to detect a significant year effect (as main effect or interaction with either distance or distance and transect).

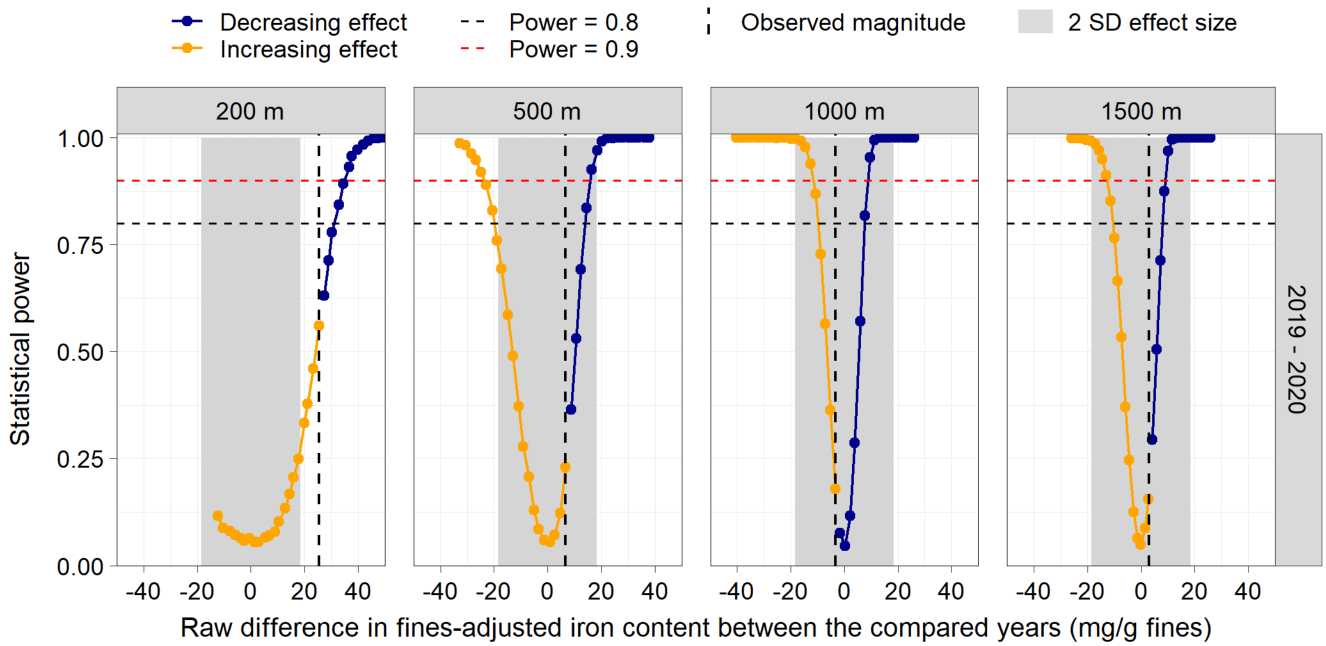

Figure 12 Statistical power of multiple comparisons between years at select distances along the East Transect relative to the difference in fines-adjusted iron content. Each panel shows a separate comparison, with the distances compared displayed at the top of the panel.

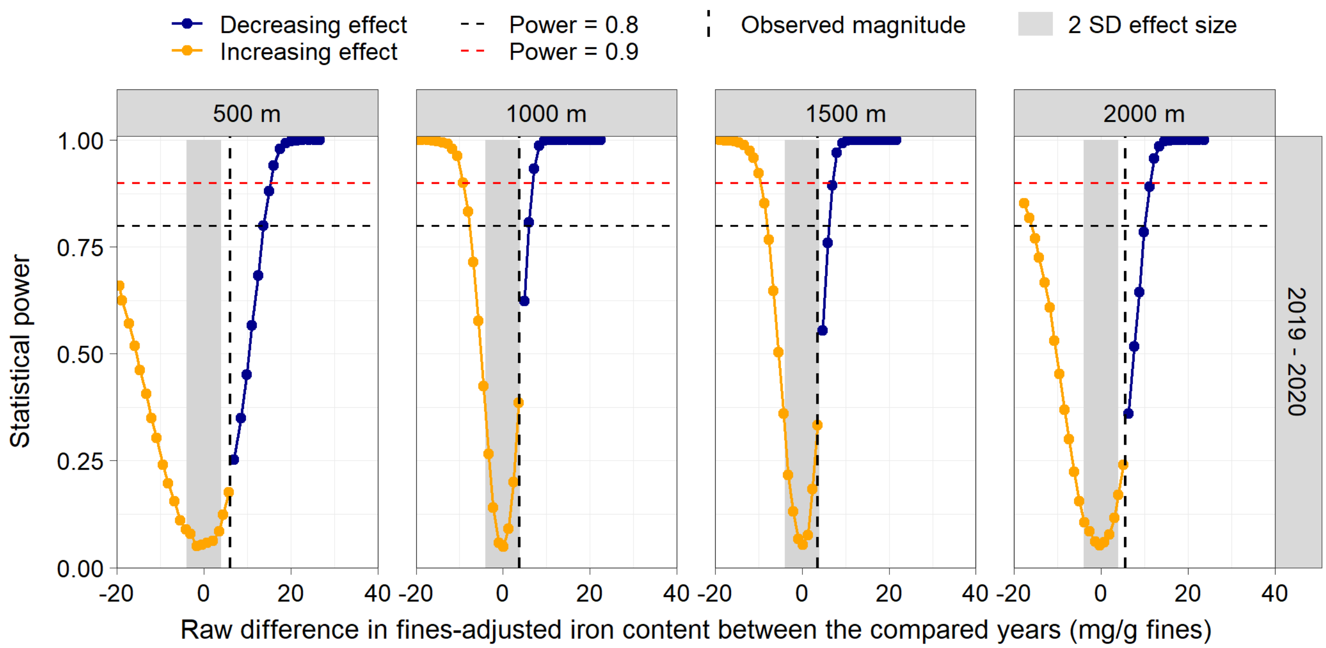

Figure 13 Statistical power of multiple comparisons between years at select distances along the Northeast Transect relative to the difference in fines-adjusted iron content. Each panel shows a separate comparison, with the distances compared displayed at the top of the panel.

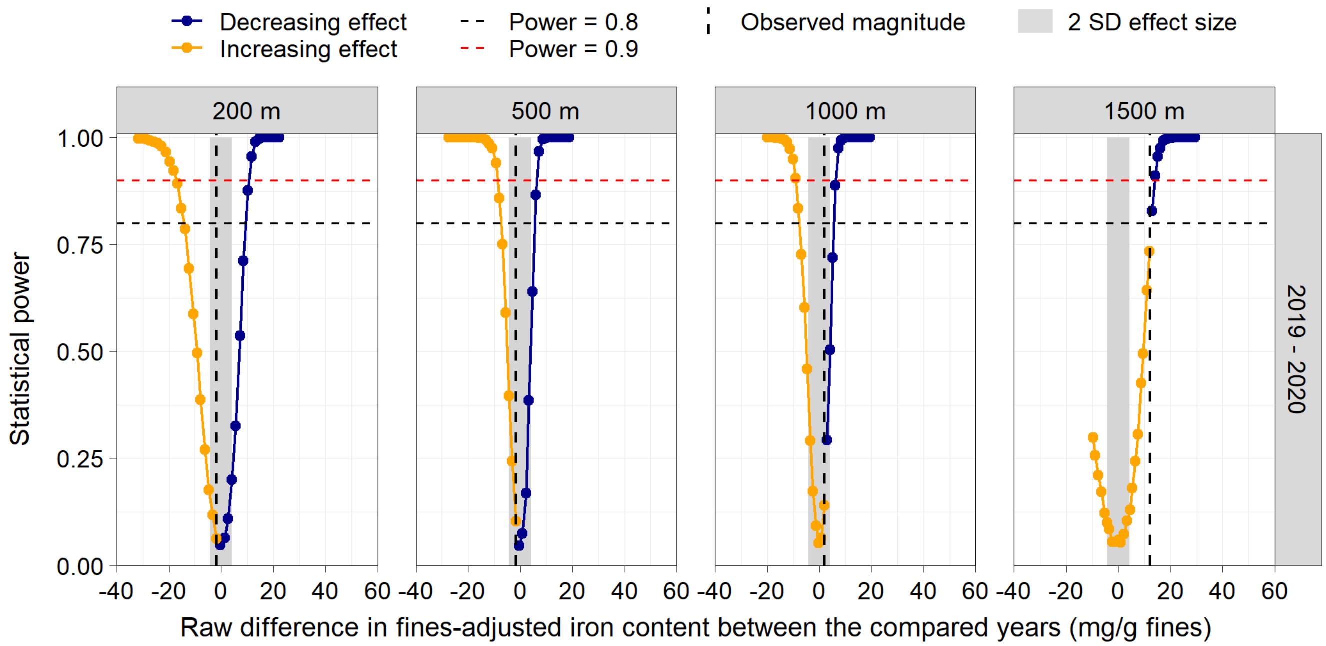

Figure 14 Statistical power of multiple comparisons between years at select distances along the Northwest Transect relative to the difference in fines-adjusted iron content. Each panel shows a separate comparison, with the distances compared displayed at the top of the panel.

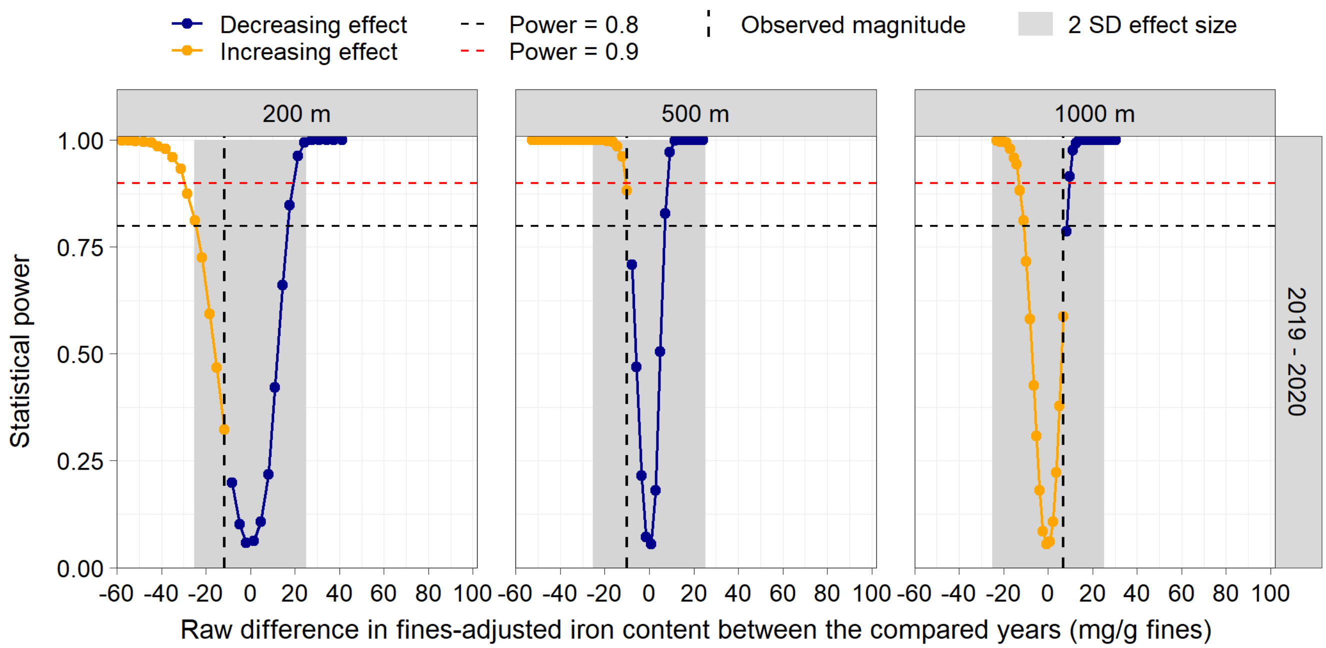

Figure 15 Statistical power of multiple comparisons between years at select distances along the West Transect relative to the difference in fines-adjusted iron content. Each panel shows a separate comparison, with the distances compared displayed at the top of the panel.

Sediment Quality – Iron Content in 2014-2020

The power analysis indicated that the analysis of 2014-2020 percent fines data had high power (>0.9) to detect an overall effect of year or an overall significant difference in year effects between the sampled transects and distances at the observed effect size (indicated by the vertical line in Figure 16). This is consistent with the finding of a significant three-way interaction between distance, sampling year, and transect in the original analysis of fines-adjusted iron (p-value=0.001; Section 3.4.6.1 in Golder 2021).

In multiple comparisons between all years, the power analysis indicated that along the East Transect, there was sufficient power to detect significant differences at ±2 SD magnitudes of difference fines-adjusted iron content at 500 m, 1,000 m, and 1,500 m distances from the Ore Dock (Figure 17). Along the North Transect, there was low power to detect differences at the ±2 SD effect size at all distances (Figure 18), due to the low variability in iron levels at this transect (standard deviation value of 2.1 mg iron/g fines). Along the North Transect, the magnitude of difference in fines-adjusted iron content between 2020 and a previous sampling year had to be at least 10% for a statistical power value of 0.8 at a distance of 200 m, at least 9 mg/g fines at a distance of 500 m, and at least 8 mg/g fines at a distance of 1,000 m. In comparison, the 2 SD effect size was only equivalent to ~4 mg iron/g fines, and the test therefore had insufficient power to detect a difference of ±2 SD at all distances.

Along the West Transect, there was sufficient power to detect significant differences under the ±2 SD effect size relative to 2020 transect-specific regression residuals at 200 m (all years, increasing effect only), 500 m (most years) and 1,000 m (most years; Figure 19).

Overall, power to detect effects between years was highest mid-transect (e.g., 500 m) along all three examined transects. Power to detect ±2 SD effect sizes was sufficient (>0.8) at multiple distances and year comparisons along the East and West transects, but not along the North Transect, where a minimum of 8 mg/g fines difference in iron content between 2020 and a previous sampling year was required for sufficient power. Most observed effect sizes were small, resulting in low power to detect them. This is consistent with not finding significant differences between most years at the examined transects and distances in the original analysis (Section 3.4.6.1 in Golder 2021).

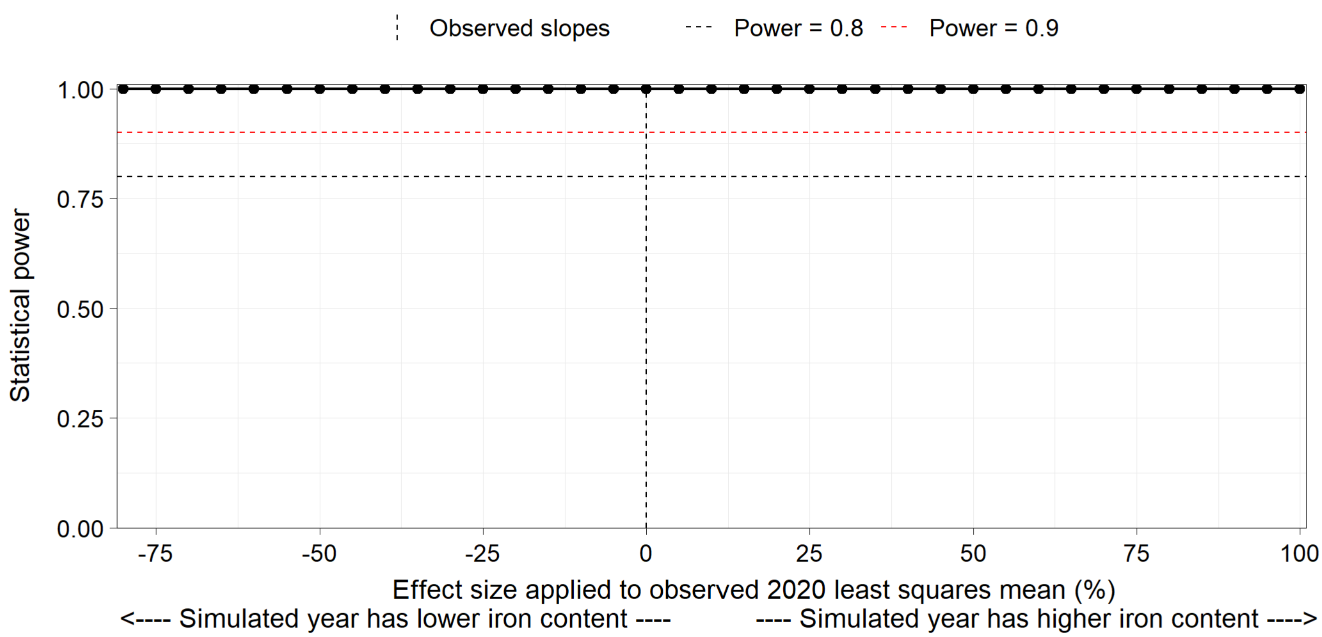

Figure 16 Statistical power of the overall model of 2014-2020 fines-adjusted iron content to detect a significant year effect (as main effect or interaction with either distance or distance and transect).

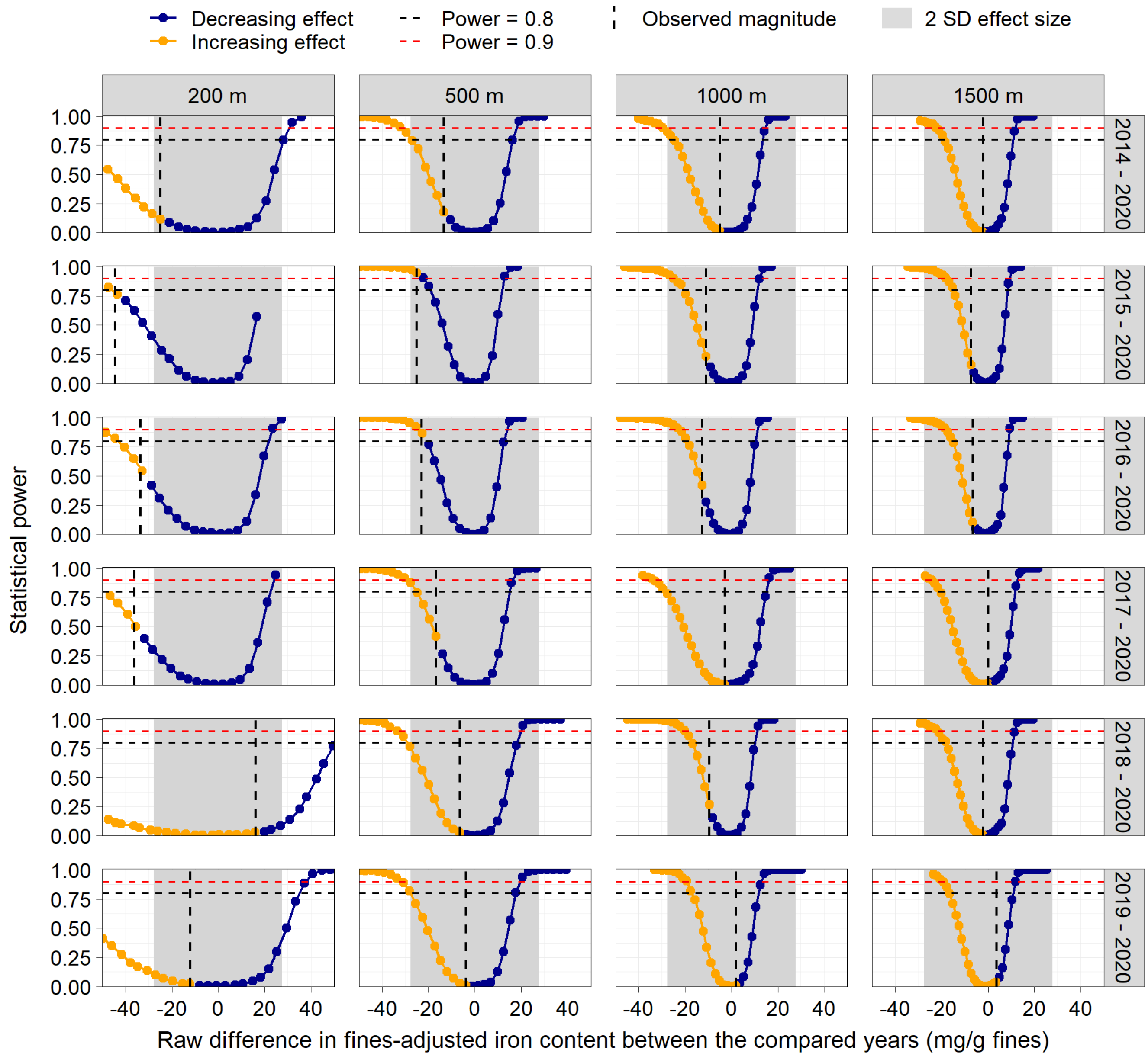

Figure 17 Statistical power of multiple comparisons between years at three distances along the East Transect relative to the difference in fines-adjusted iron content between the compared years. Each panel shows a separate comparison, with the years compared displayed on the right and the distance at which the comparison is performed displayed at the top.

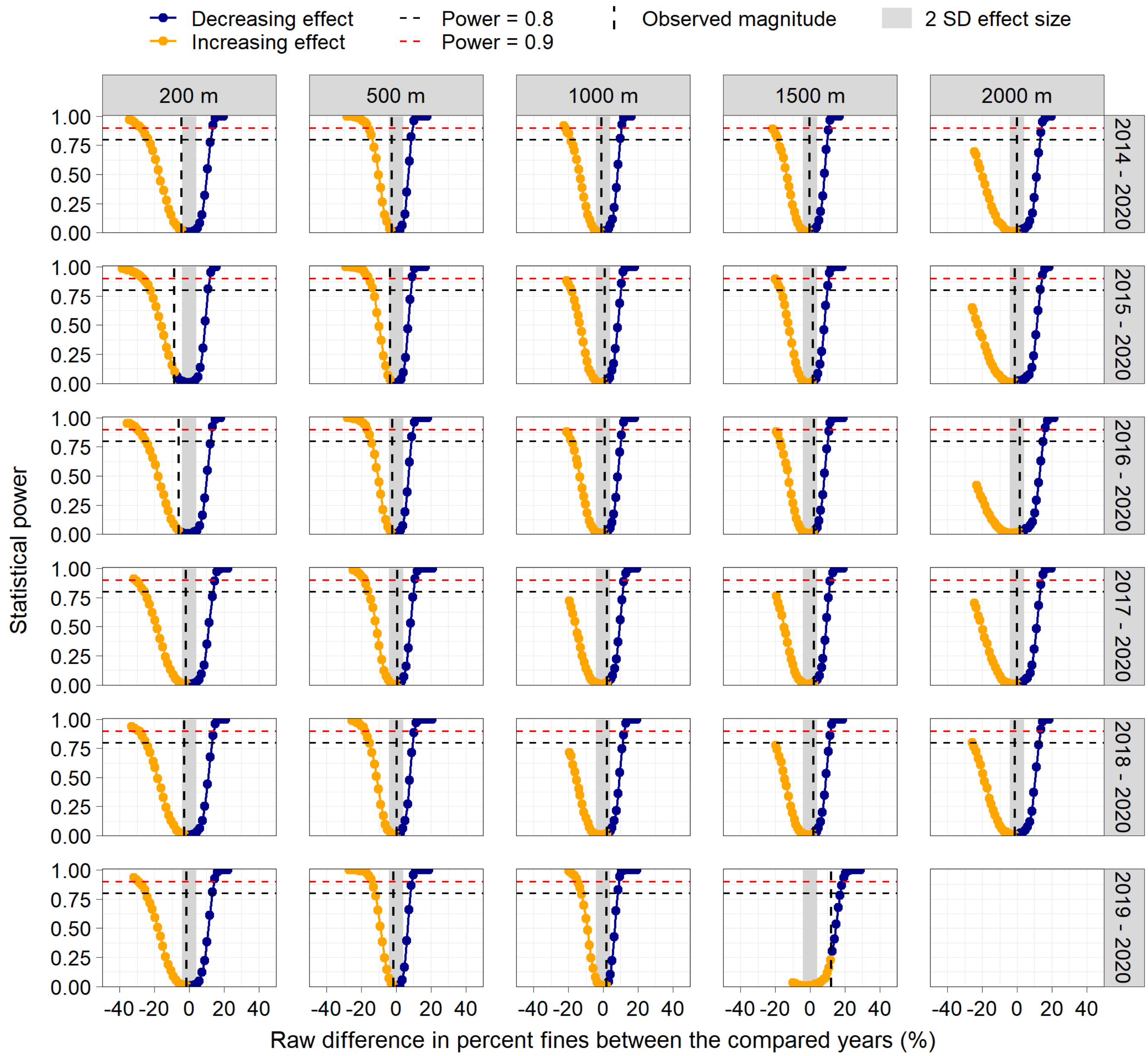

Figure 18 Statistical power of multiple comparisons between years at three distances along the North Transect relative to the difference in fines-adjusted iron content between the compared years. Each panel shows a separate comparison, with the years compared displayed on the right and the distance at which the comparison is performed displayed at the top.

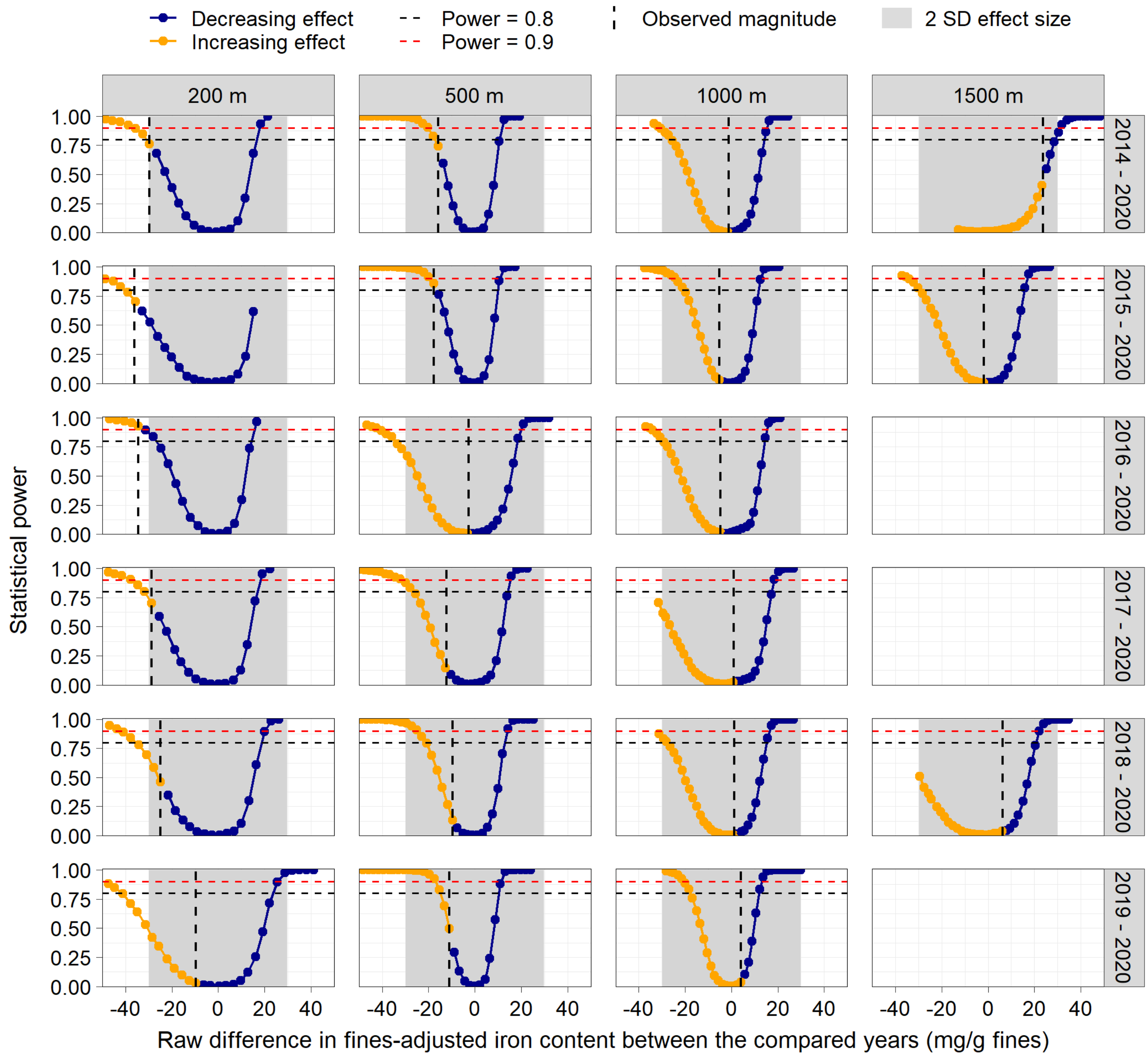

Figure 19 Statistical power of multiple comparisons between years at three distances along the West Transect relative to the difference in fines-adjusted iron content between the compared years. Each panel shows a separate comparison, with the years compared displayed on the right and the distance at which the comparison is performed displayed at the top.

Benthos – Total Density in 2019-2020

The power analysis indicated that the analysis of benthos density collected in 2019-2020 had high power (>0.9) to detect an overall effect of year or an overall significant difference in year effects between the sampled transects and distances at the observed effect size (indicated by the vertical line in Figure 20). This is consistent with the finding of a significant two-way interaction between sampling year and transect in the original analysis of benthos density (Section 4.4.3.1.1 in Golder 2021).

In multiple comparisons between 2019 and 2020, the power analysis indicated that along the East Transect, there was sufficient power to detect significant differences at effect sizes of ±2 SDs at most distances along the transect (Figure 21). The variability of benthos density was high, resulting in a wide ±2 SD effect size (standard deviation value of 10,967 organisms/m²). The analysis had sufficient power to detect considerably smaller effect sizes – e.g., a raw difference of 8,500 organisms/m² at 650 m and 6,100 organisms/m² at 1,000 m from the Ore Dock. Along the Northeast Transect, there was sufficient power to detect differences at the +2 SD effect size (but not -2 SD effects) at both 650 m and 1,000 m distances (Figure 22). Observed magnitudes of difference were between 1,116 organisms/m² (at 1,500 m) and 2,750 organisms/m² (at 650 m). Along the Northwest Transect, statistical power was also sufficient to detect a +2 SD effect size at both 650 m and 1,000 m from the Ore Dock (Figure 23). The observed magnitudes of difference in benthos density ranged between -3,634 organisms/m² (at 1,000 m) and -1,256 organisms/m² (150 m). The original analysis detected a significant difference between 2019 and 2020 at both 650 m and 1,000 m from the Ore Dock (Section 4.4.3.1.1 in Golder 2021). Along the West Transect, statistical power was not sufficient to detect a ±2 SD effect size at the three assessed distances (Figure 24). The observed magnitudes of difference in benthos density ranged between 3,244 organisms/m² (at 150 m) and 4,244 organisms/m² (at 1,000 m).

Overall, power to detect effects between years was highest mid-transect (i.e., 500 m from the Ore Dock) along all four examined transects. Power was sufficient to detect a ±2 SD effect size at three of the four transects. Some observed effect sizes (e.g., Northwest Transect at 650 m and 1,000 m) were sufficient for high power, consistent with the detection of significant differences between years in the original analysis (Section 4.4.3.1.1 in Golder 2021).

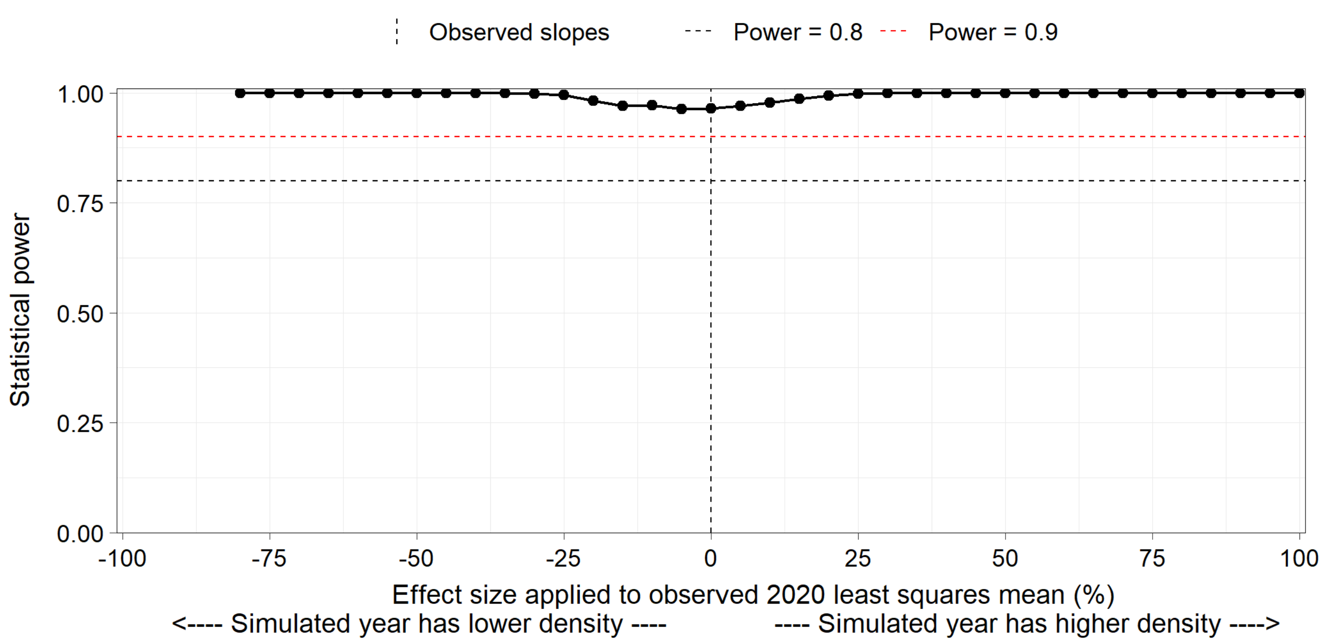

Figure 20 Statistical power of the overall model of 2019-2020 benthos density to detect a significant year effect (as main effect or interaction with either distance or distance and transect).

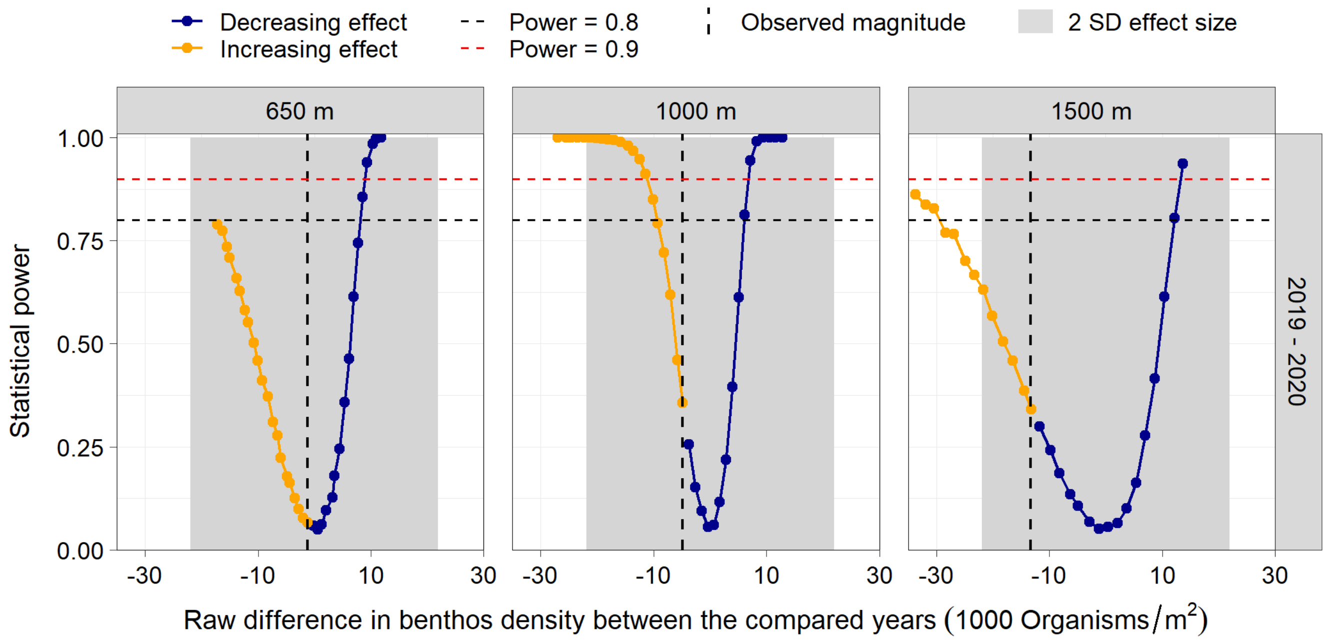

Figure 21 Statistical power of multiple comparisons between years at select distances along the East Transect relative to the difference in benthos density. Each panel shows a separate comparison, with the distances compared displayed at the top of the panel.

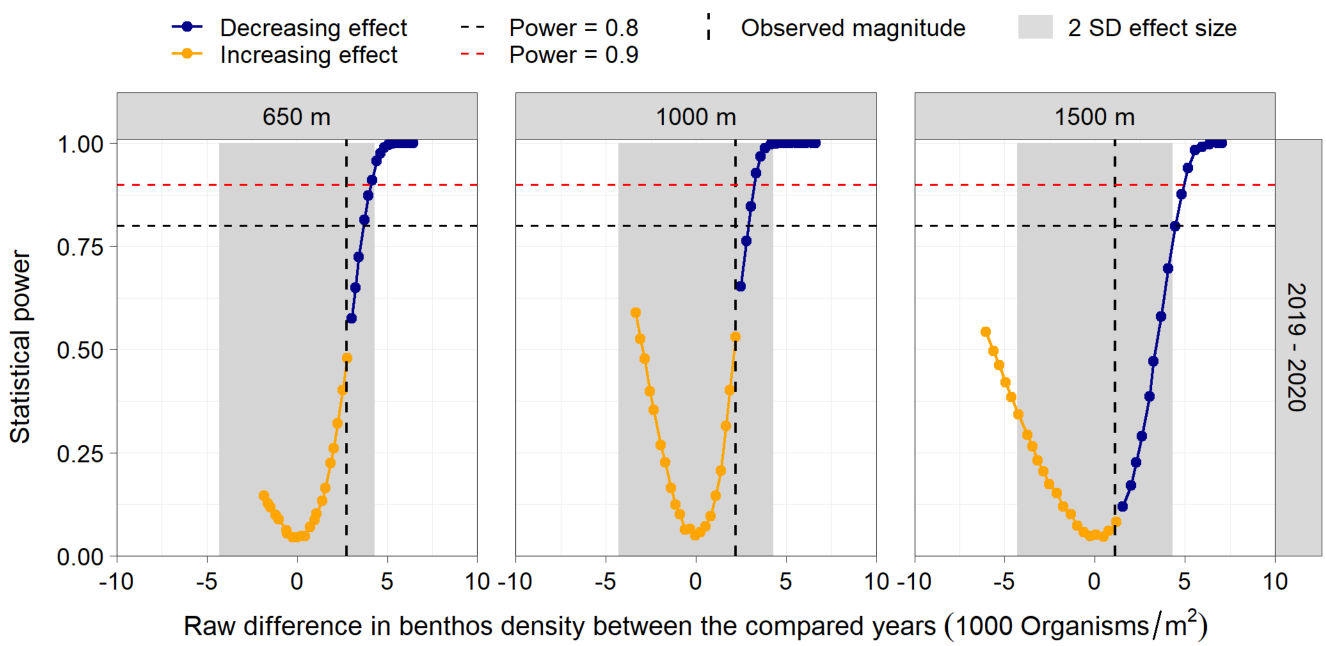

Figure 22 Statistical power of multiple comparisons between years at select distances along the Northeast Transect relative to the difference in benthos density. Each panel shows a separate comparison, with the distances compared displayed at the top of the panel.

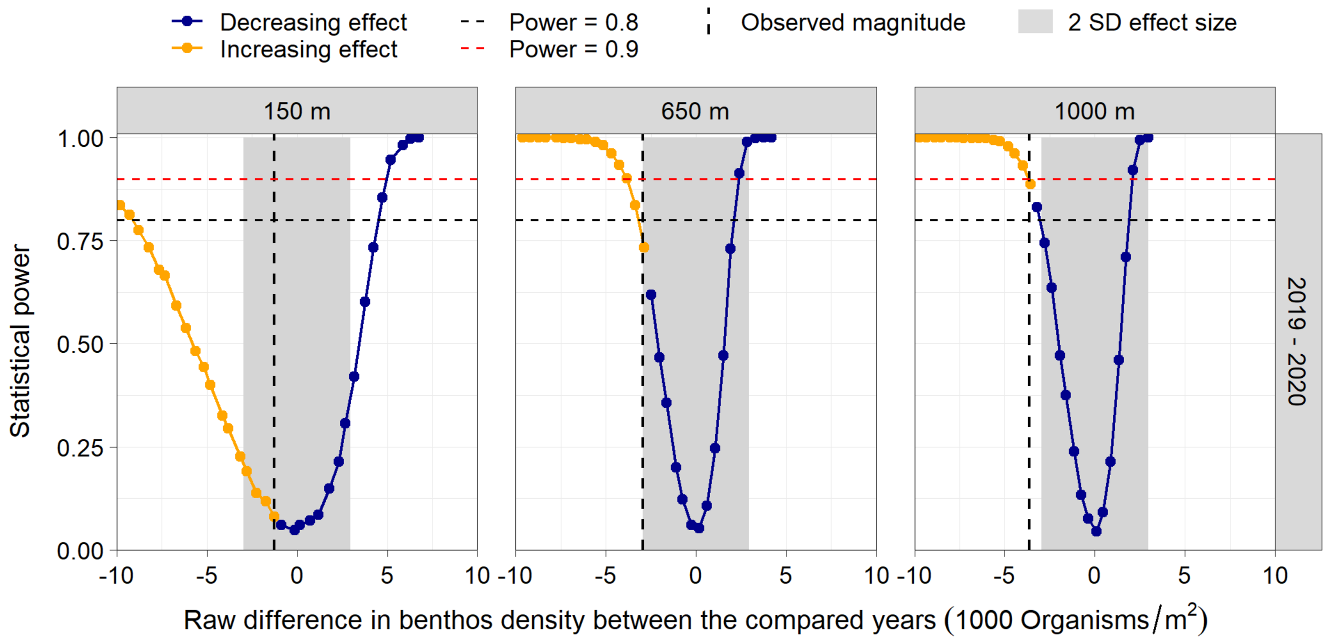

Figure 23 Statistical power of multiple comparisons between years at select distances along the Northwest Transect relative to the difference in benthos density. Each panel shows a separate comparison, with the distances compared displayed at the top of the panel.

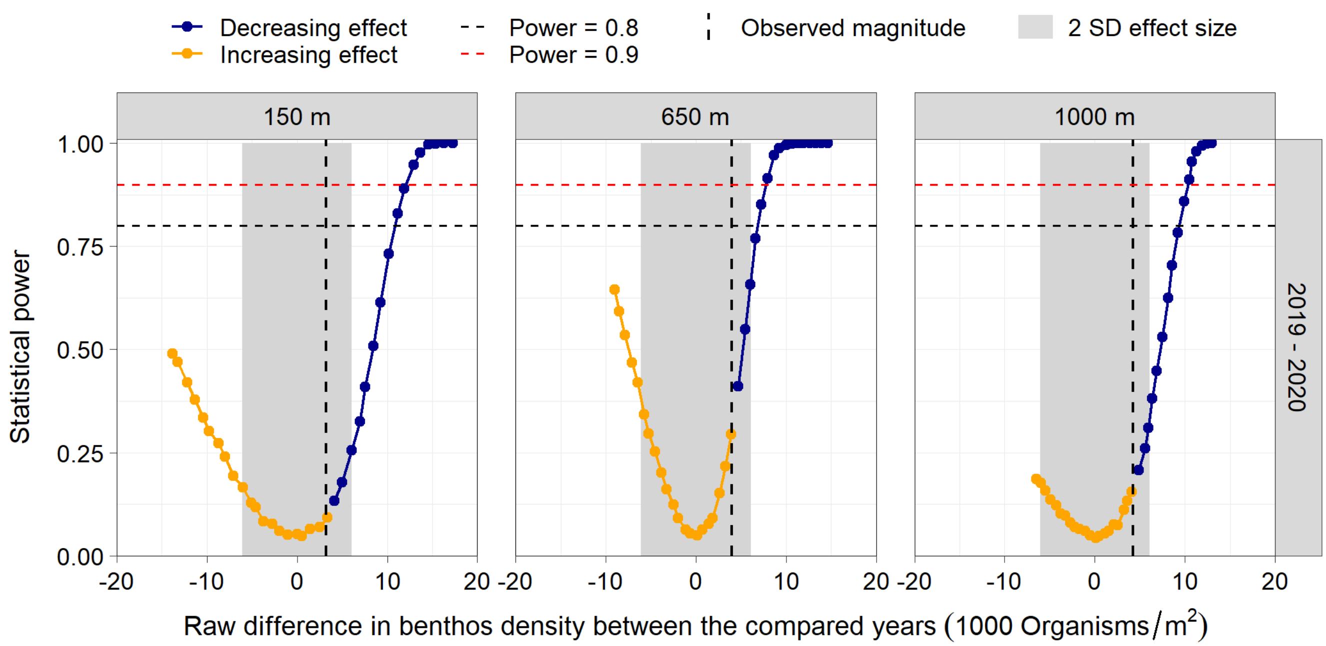

Figure 24 Statistical power of multiple comparisons between years at select distances along the West Transect relative to the difference in benthos density. Each panel shows a separate comparison, with the distances compared displayed at the top of the panel.

Benthos – Total Density in 2018-2020

The power analysis indicated that the analysis of benthos density collected in 2018-2020 had high power (>0.9) to detect an overall effect of year or an overall significant difference in year effects between the sampled transects and distances at the observed effect size (indicated by the vertical line in Figure 29). This is consistent with the finding of a significant main effect of sampling year in the original analysis of benthos density (Section 4.4.3.1.2 in Golder 2021).

In multiple comparisons between sampling years, the power analysis indicated that along the East Transect, there was sufficient power to detect significant differences between the three sampling years at effect sizes of ±2 SDs at all distances along the transect (Figure 26). The variability of benthos density was high, resulting in a wide ±2 SD effect size (standard deviation value of 10,659 organisms/m²). The analysis had sufficient power to detect considerably smaller effect sizes – e.g., a raw difference of 5,878 organisms/m² at 1000 m from the Ore Dock. Along the North Transect, there was sufficient power to detect differences at the +2 SD effect size (but not -2 SD effects) at all distances except for 150 m, and a -2 SD difference at a distance of 1,000 m when comparing between 2019 and 2020 (Figure 27). Observed magnitudes of difference were between -3,125 organisms/m² (at 1,500 m, 2019-2020 comparison) and -1,507 organisms/m² (at 150 m, 2019-2020 comparison). The original analysis detected a significant difference between 2019 and 2020 at both 650 m and 1,000 m from the Ore Dock (Section 4.4.3.1.2 in Golder 2021). Along the West Transect, statistical power was sufficient to detect a +2 SD (but not -2 SD) effect size at three of the four assessed distances in comparisons between 2018 and 2020 (Figure 28).

Overall, power to detect effects between years was high along the North Transect, and at 1,000 m from the Ore Dock at the East and West transect. Power was sufficient to detect a ±2 SD effect size for at least some of the comparisons at the three transects. Two observed effect sizes (i.e., North Transect at 650 m and 1,000 m) were sufficient for high power, consistent with the detection of significant differences between years in the original analysis (Section 4.4.3.1.2 in Golder 2021).

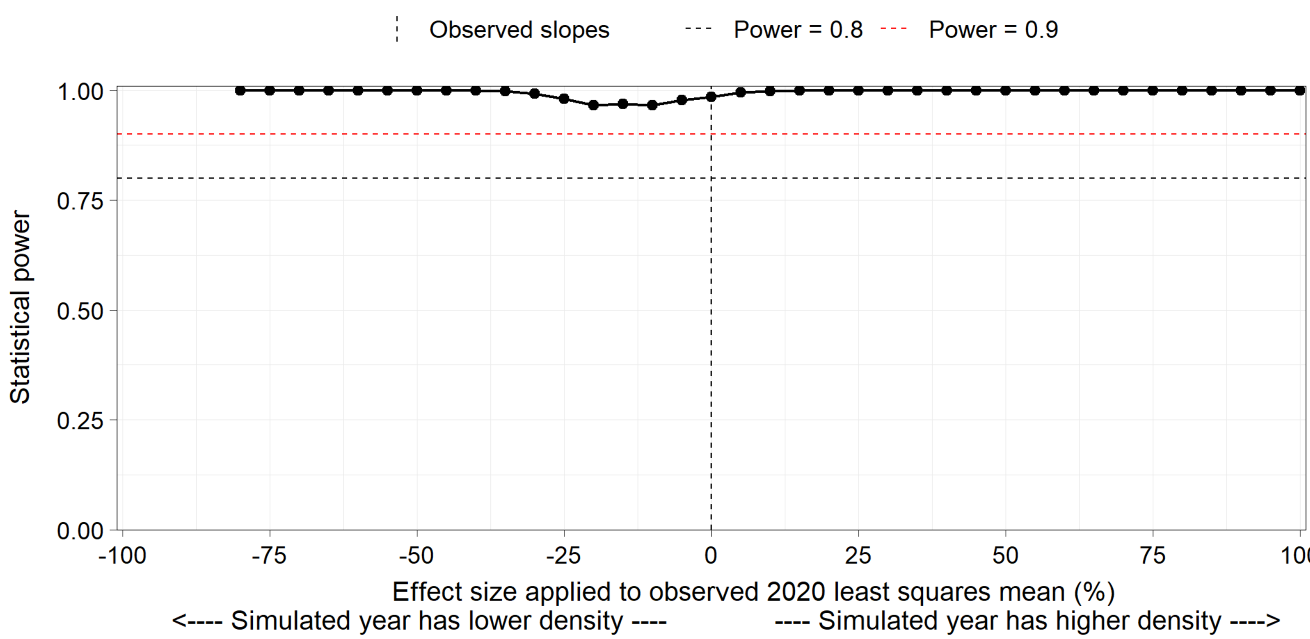

Figure 25 Statistical power of the overall model of 2018-2020 benthos density to detect a significant year effect (as main effect or interaction with either distance or distance and transect).

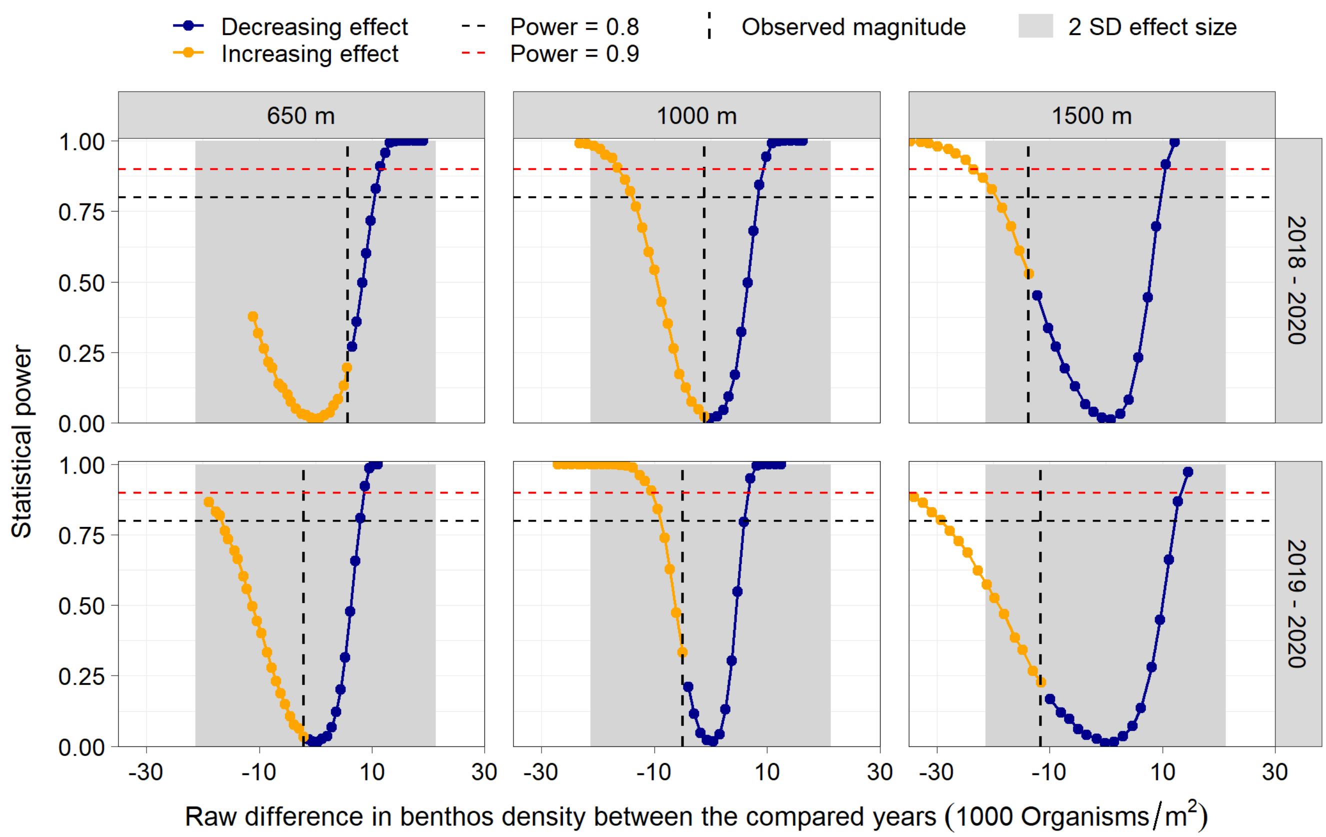

Figure 26 Statistical power of multiple comparisons between years at select distances along the East Transect relative to the difference in benthos density. Each panel shows a separate comparison, with the distances compared displayed at the top of the panel.

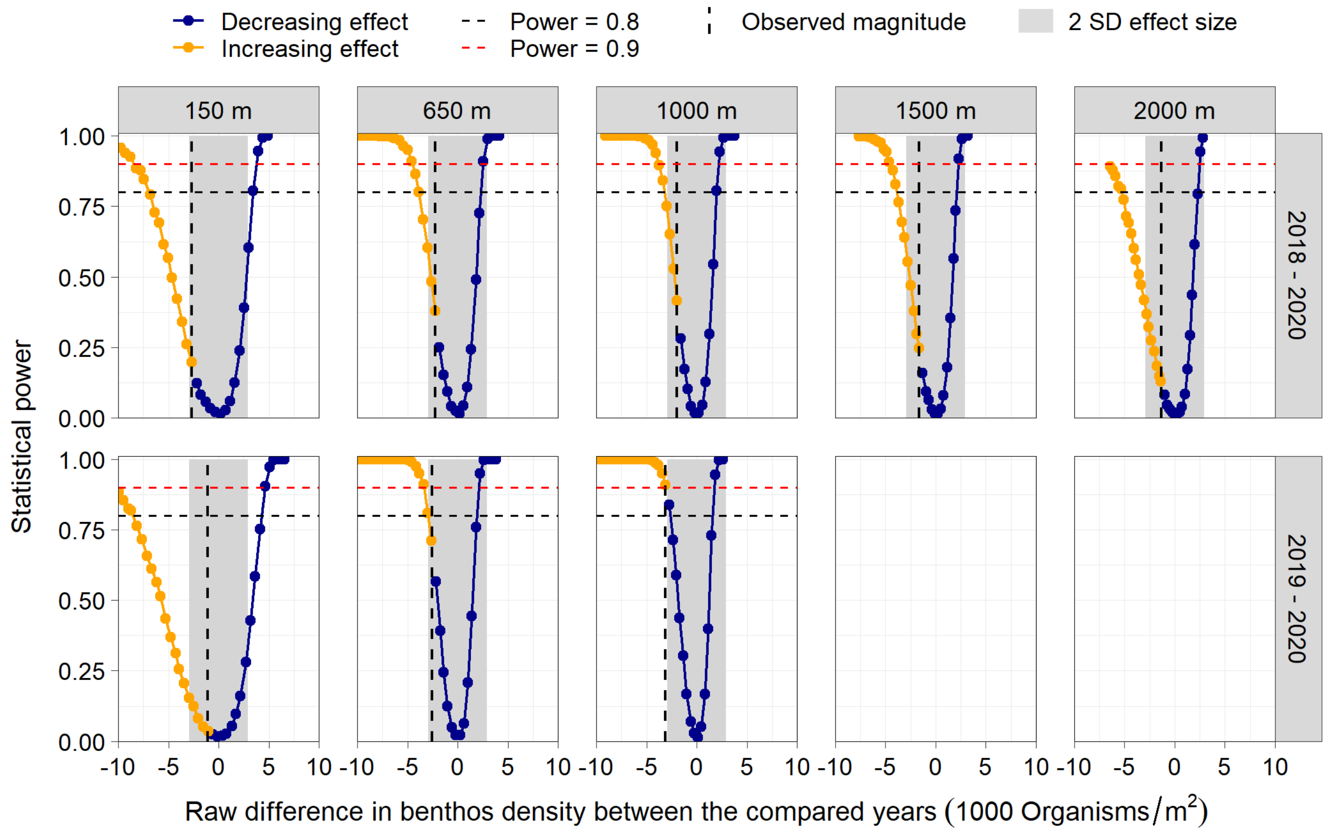

Figure 27 Statistical power of multiple comparisons between years at select distances along the North Transect relative to the difference in benthos density. Each panel shows a separate comparison, with the distances compared displayed at the top of the panel.

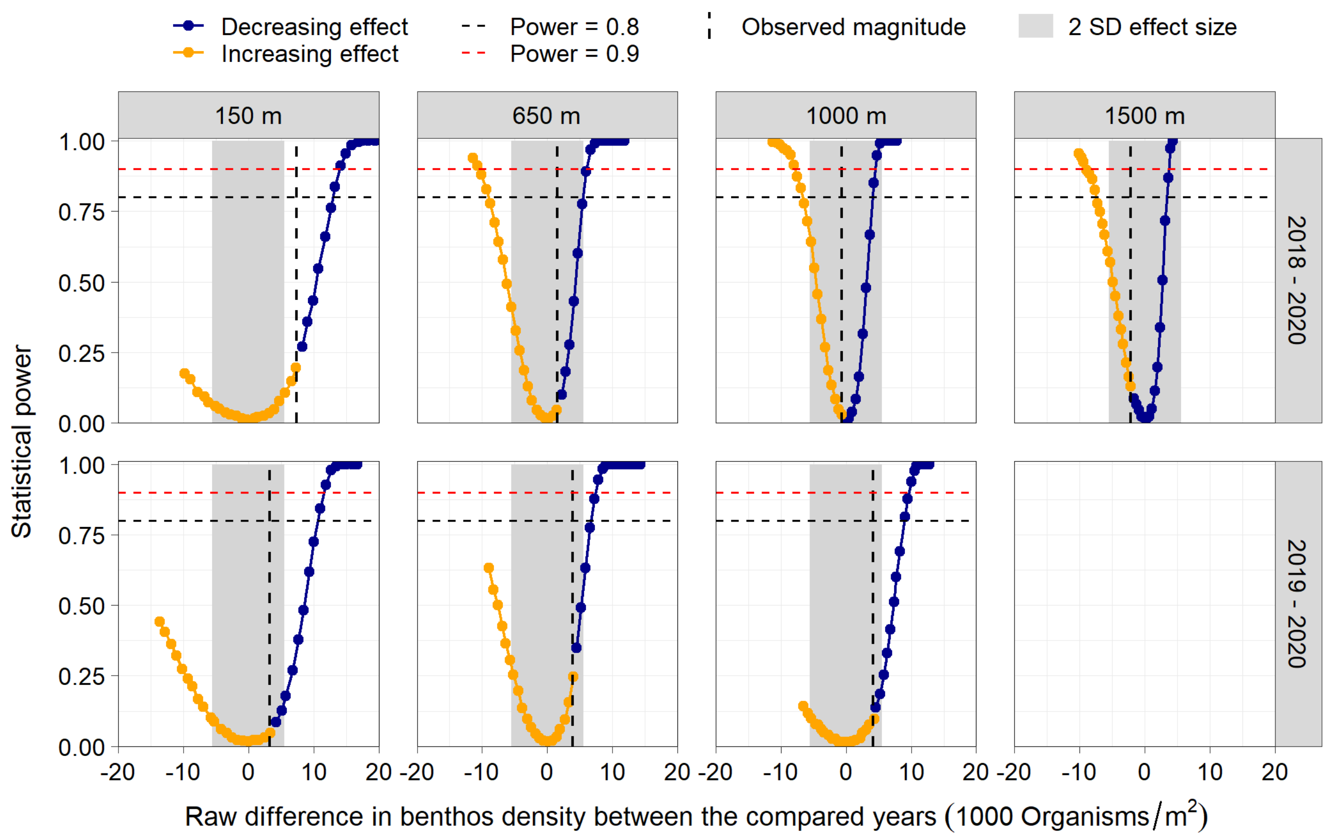

Figure 28 Statistical power of multiple comparisons between years at select distances along the West Transect relative to the difference in benthos density. Each panel shows a separate comparison, with the distances compared displayed at the top of the panel.

Benthos – Total Richness in 2019-2020

The power analysis indicated that the analysis of benthos density collected in 2019-2020 had high power (>0.9) to detect an overall effect of year or an overall significant difference in year effects between the sampled transects and distances at the observed effect size (indicated by the vertical line in Figure 29). This is consistent with the finding of a significant main effect of sampling year in the original analysis of benthos density (Section 4.4.3.2.1 in Golder 2021).

In multiple comparisons between 2019 and 2020, the power analysis indicated that along the East Transect, there was sufficient power to detect significant differences at effect sizes of ±2 SDs at 1,000 m but not the other two examined distances (Figure 30). Observed effect sizes were smaller, resulting in lack of significant differences between years in the original analysis. Along the Northeast Transect, there was sufficient power to detect differences at the ±2 SD effect size at all three examined distances (Figure 31). Observed magnitudes of difference were between 4 taxa (at 1,500 m) and 13 taxa (at 650 m). A significant difference between years was detected at 1,000 m (difference of 9 taxa between years). Along the Northwest Transect, statistical power was also sufficient to detect a ±2 SD effect size, but only at 650 m from the Ore Dock (Figure 32). Along the West Transect, statistical power was sufficient to detect a ±2 SD effect size at 1,000 m and a +2 SD effect size at 650 m from the Ore Dock (Figure 33). The largest observed magnitude (26 taxa) was recorded at 150 m from the Ore Dock and was found to be significantly different (Section 4.4.3.2.1 in Golder 2021).

Overall, power to detect effects between years was highest at 650 m for both West and Northwest transect, and at 1,000 m for both East and Northeast transects. Power was sufficient to detect a ±2 SD effect size at all four transects. Some observed effect sizes (e.g., Northeast Transect at 1,000 m and West Transect at 150 m) were sufficient for high power, consistent with the detection of significant differences between years in the original analysis (Section 4.4.3.2.1 in Golder 2021).

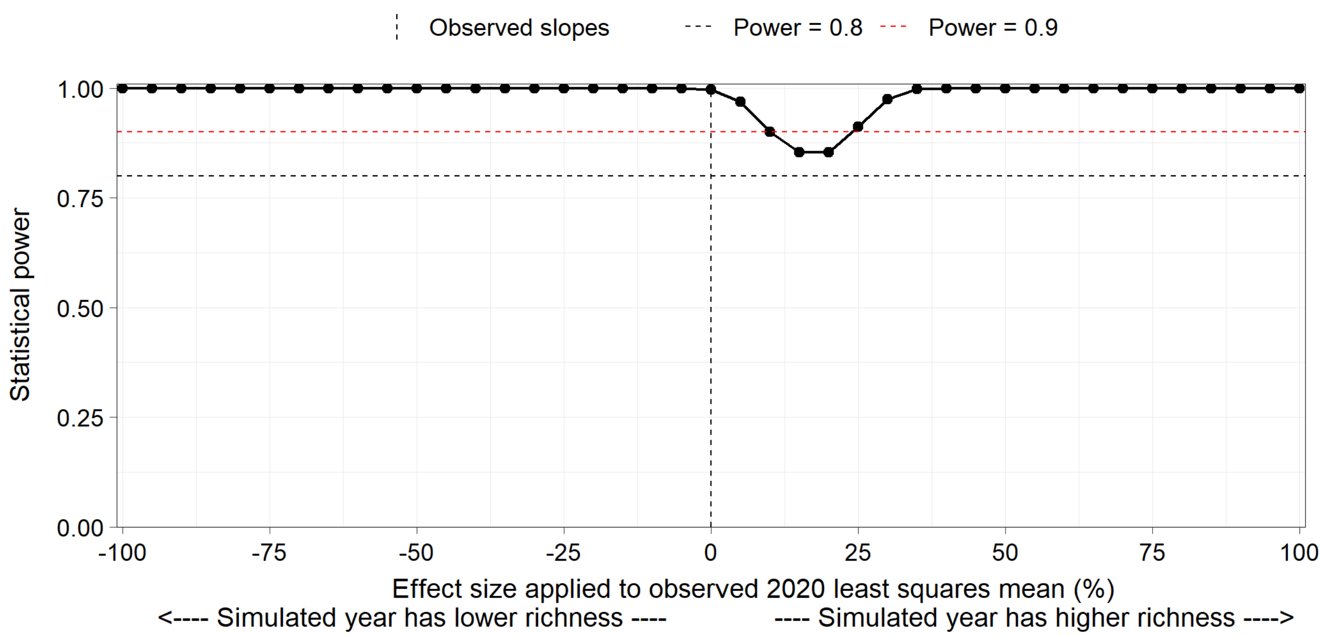

Figure 29 Statistical power of the overall model of 2019-2020 benthos richness to detect a significant year effect (as main effect or interaction with either distance or distance and transect).

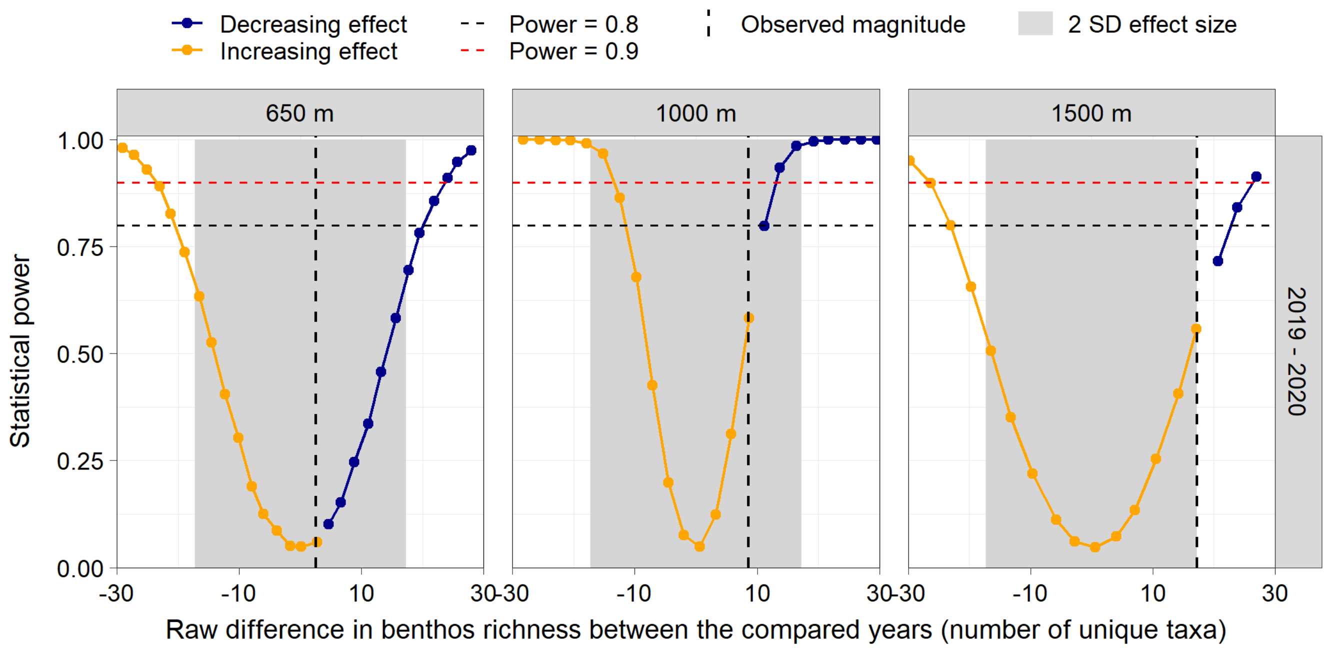

Figure 30 Statistical power of multiple comparisons between years at select distances along the East Transect relative to the difference in benthos richness. Each panel shows a separate comparison, with the distances compared displayed at the top of the panel.

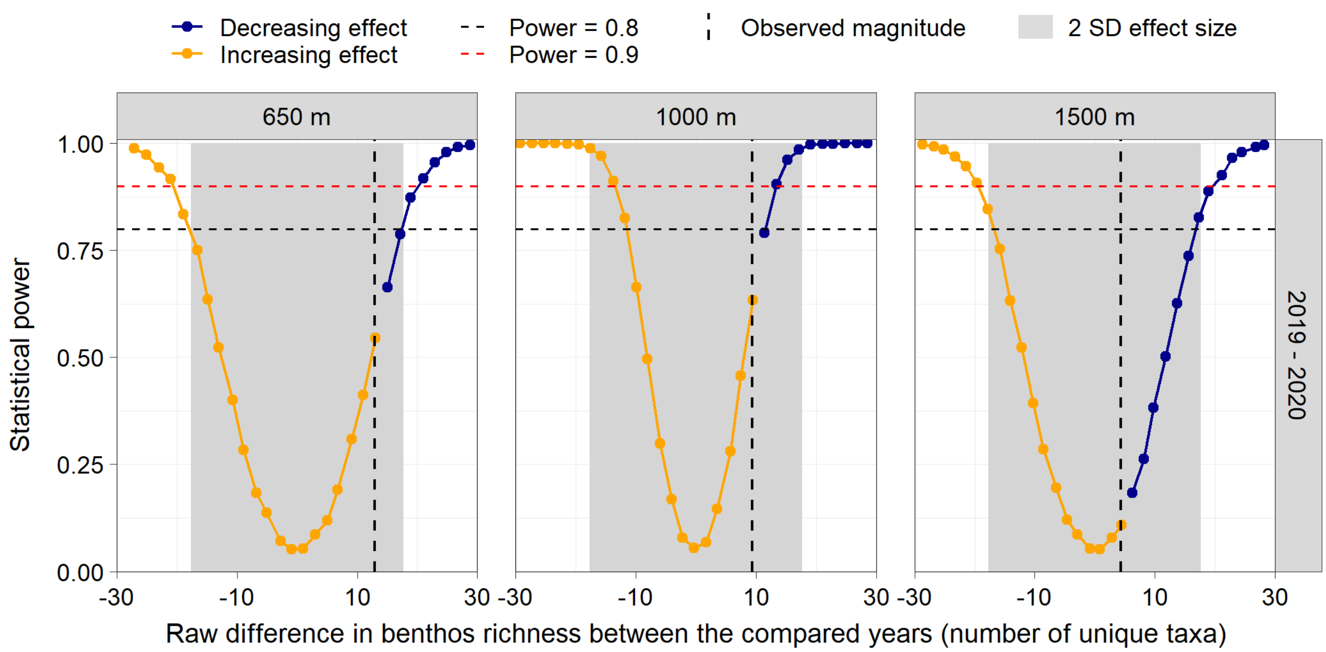

Figure 31 Statistical power of multiple comparisons between years at select distances along the Northeast Transect relative to the difference in benthos richness. Each panel shows a separate comparison, with the distances compared displayed at the top of the panel.

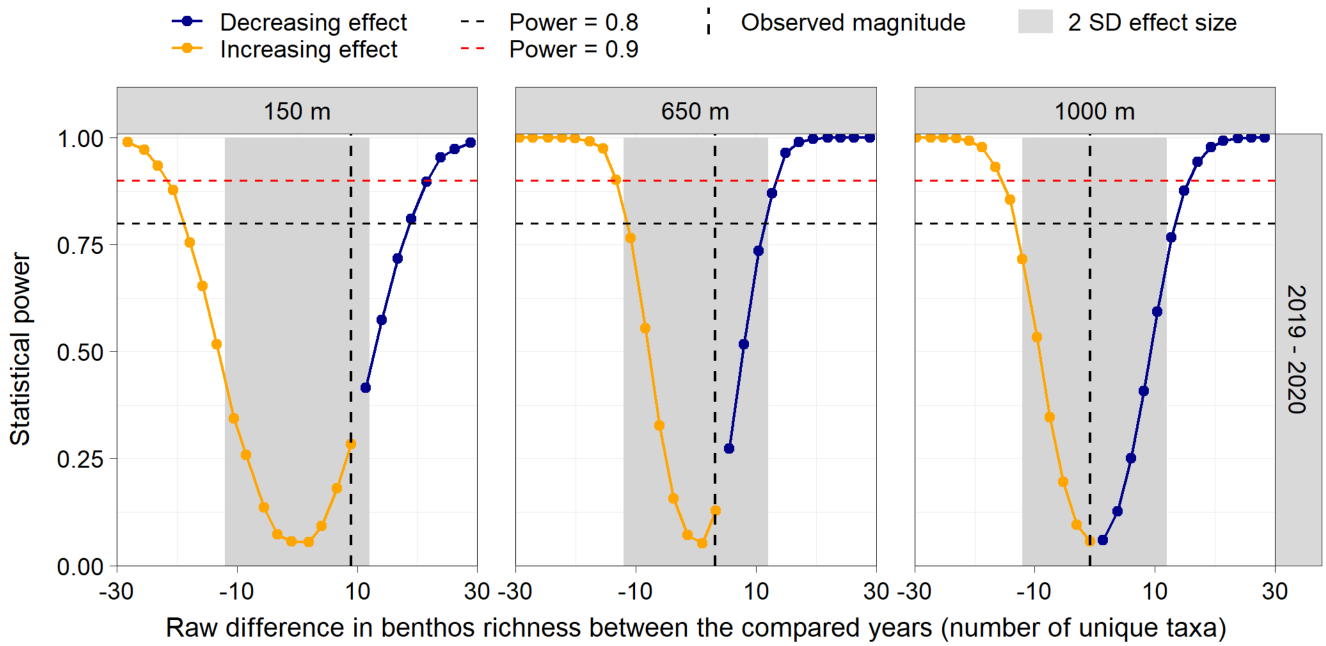

Figure 32 Statistical power of multiple comparisons between years at select distances along the Northwest Transect relative to the difference in benthos richness. Each panel shows a separate comparison, with the distances compared displayed at the top of the panel.

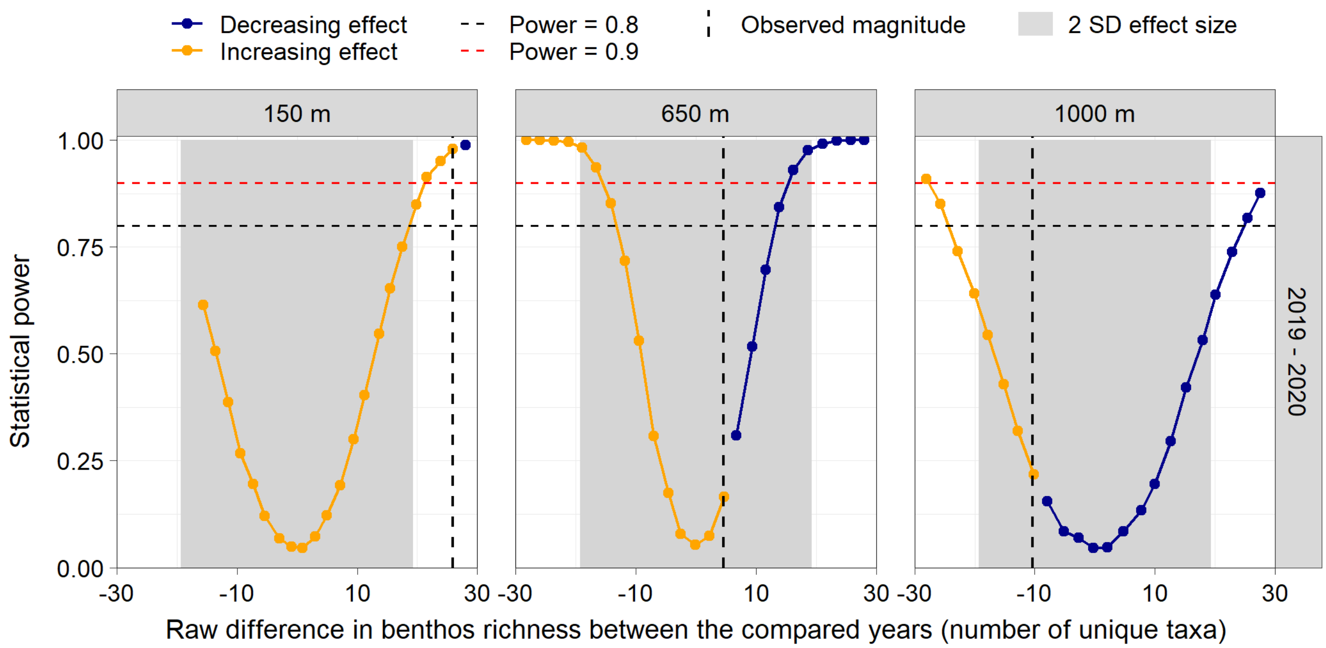

Figure 33 Statistical power of multiple comparisons between years at select distances along the West Transect relative to the difference in benthos richness. Each panel shows a separate comparison, with the distances compared displayed at the top of the panel.

Benthos – Total Richness in 2018-2020

The power analysis indicated that the analysis of benthos richness collected in 2018-2020 had high power (>0.9) to detect an overall effect of year or an overall significant difference in year effects between the sampled transects and distances at the observed effect size (indicated by the vertical line in Figure 34). This is consistent with the finding of a significant three-way interaction between distance, transect, and sampling year in the original analysis of benthos richness (Section 4.4.3.2.2 in Golder 2021).

In multiple comparisons between sampling years, the power analysis indicated that along the East Transect, there was sufficient power to detect significant differences between the three sampling years at effect sizes of ±2 SDs 1,000 m (comparisons of 2018-2020 and 2019-2020) and at a distance of 650 m (2018-2020 comparison only; Figure 35). The analysis had sufficient power to detect a raw difference of 11 taxa at 1,000 m from the Ore Dock (2019-2020 comparison). Along the North Transect, there was sufficient power to detect differences at the ±2 SD effect size only at 650 m when comparing between 2019 and 2020 (Figure 36). Observed magnitudes of difference were between -1 taxa (at 1,000 m, 2019-2020 comparison) and 16 taxa (at 2000 m, 2018-2020 comparison). The original analysis detected a significant difference between 2018 and 2020 at 1,000 m from the Ore Dock (Section 4.4.3.2.2 in Golder 2021). Along the West Transect, statistical power was sufficient to detect a ±2 SD effect size at three of the four assessed distances in comparisons between 2018 and 2020 and at 650 m in comparisons between 2019 and 2020 (Figure 37). The original analysis detected a significant difference between 2019 and 2020 at 150 m from the Ore Dock (Section 4.4.3.2.2 in Golder 2021).

Overall, power to detect effects between years was sufficient to detect a ±2 SD effect size for at least some of the comparisons at the three transects. Several observed effect sizes (e.g., West Transect at 150 m when comparing between 2019 and 2020) were sufficient for high power, consistent with the detection of significant differences between years in the original analysis (Section 4.4.3.2.2 in Golder 2021).

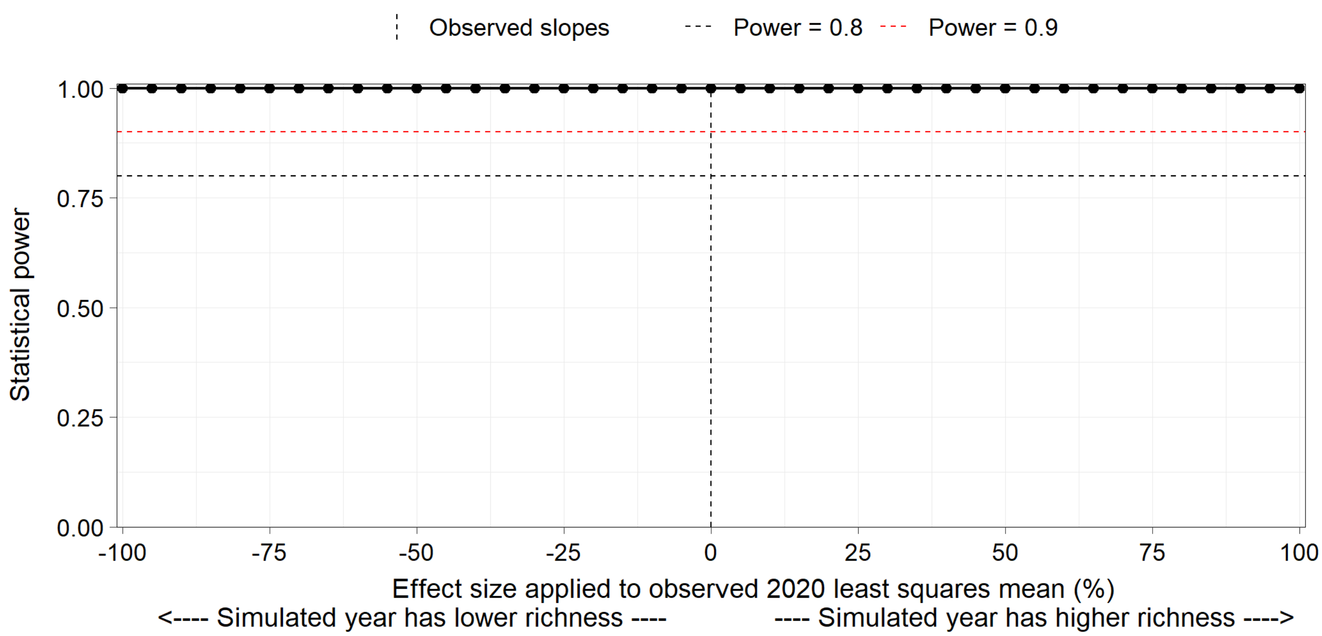

Figure 34 Statistical power of the overall model of 2018-2020 benthos richness to detect a significant year effect (as main effect or interaction with either distance or distance and transect).

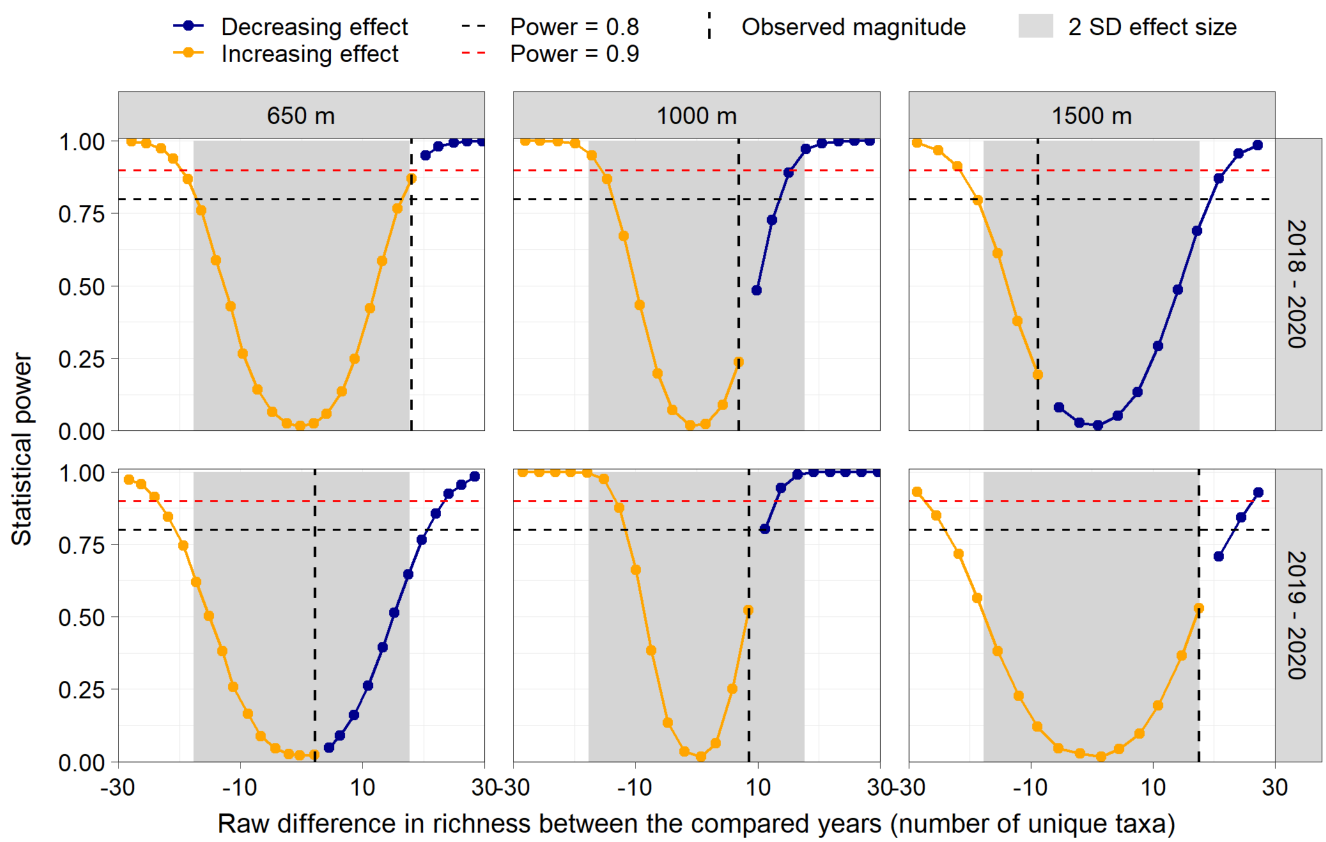

Figure 35 Statistical power of multiple comparisons between years at select distances along the East Transect relative to the difference in benthos richness. Each panel shows a separate comparison, with the distances compared displayed at the top of the panel.

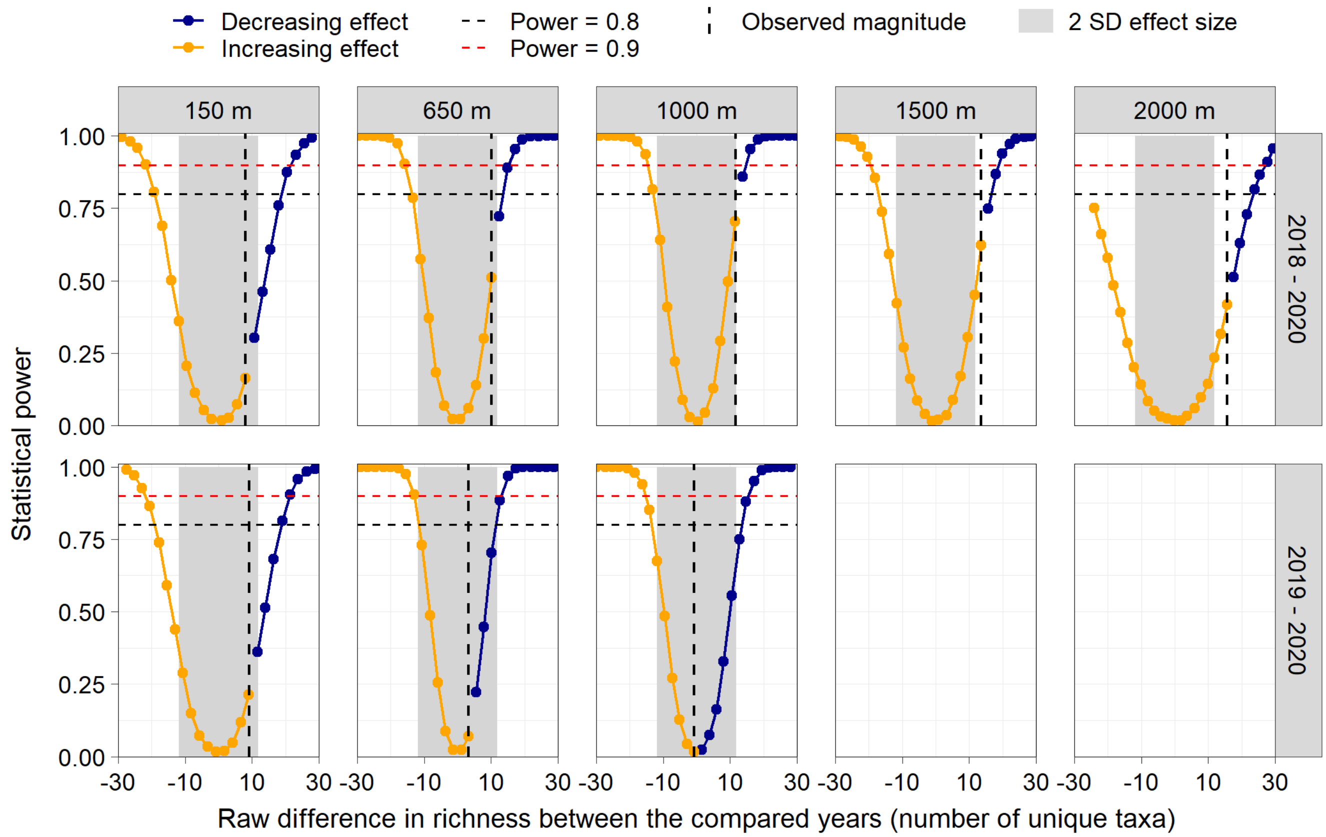

Figure 36 Statistical power of multiple comparisons between years at select distances along the North Transect relative to the difference in benthos richness. Each panel shows a separate comparison, with the distances compared displayed at the top of the panel.

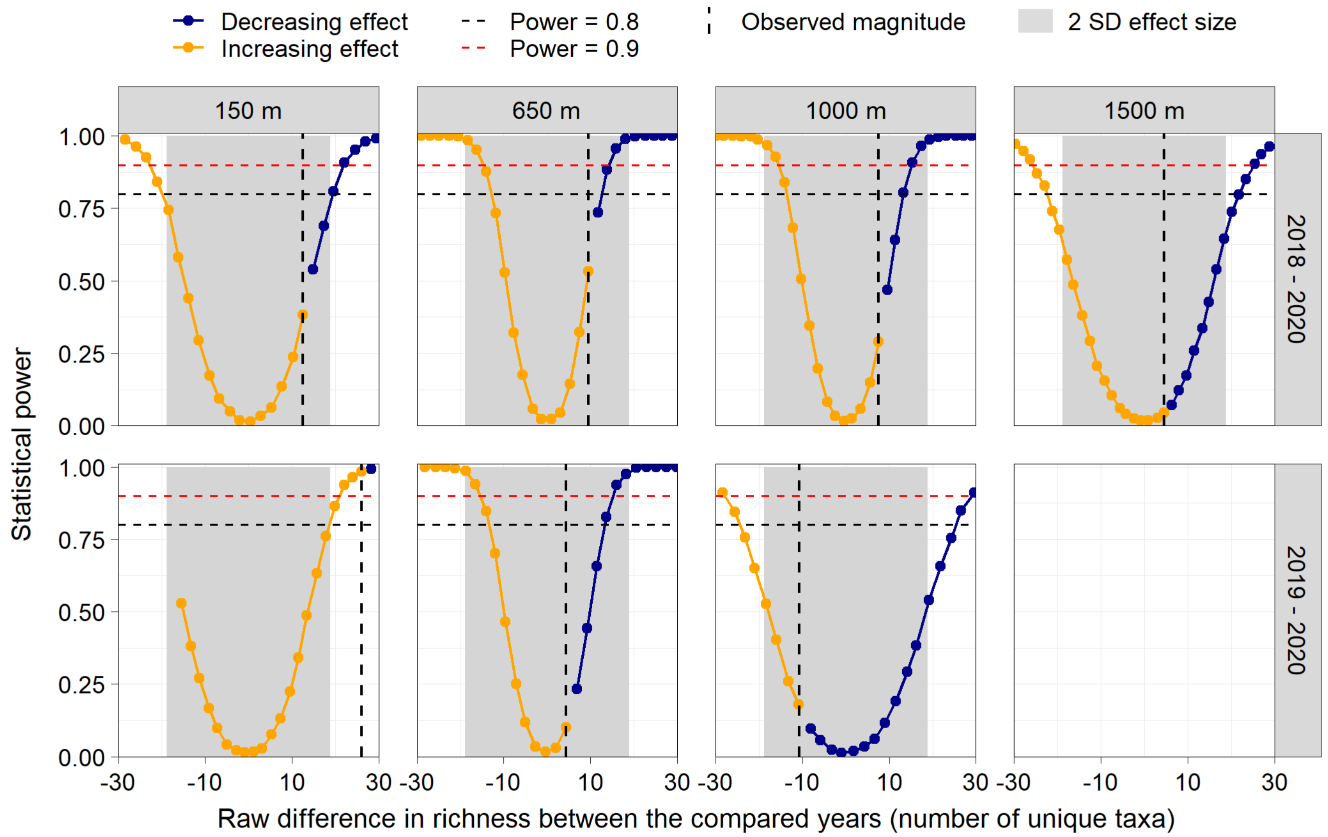

Figure 37 Statistical power of multiple comparisons between years at select distances along the West Transect relative to the difference in benthos richness. Each panel shows a separate comparison, with the distances compared displayed at the top of the panel.

Benthos – SDI in 2019-2020

The power analysis indicated that the analysis of benthos SDI collected in 2019-2020 had high power (>0.9) to detect an overall effect of year or an overall significant difference in year effects between the sampled transects and distances at the observed effect size (indicated by the vertical line in Figure 38). This is consistent with the finding of a significant three-way interaction between distance from the Ore Dock, transect, and sampling year (Section 4.4.3.3.1 in Golder 2021).

In multiple comparisons between 2019 and 2020, the power analysis indicated that along the East Transect, there was not sufficient power to detect significant differences at effect sizes of ±2 SDs (Figure 39), due to the low data variability (standard deviation value of 0.018). Observed effect sizes were larger, ranging from -0.071 (at 65 m) to +0.011 (at 1,000 m), resulting in a significant difference between years in the original analysis at 650 m from the Ore Dock. Along the Northeast Transect, there was sufficient power to detect differences at the ±2 SD effect size at 650 m and 1,000 m distances (Figure 40). Observed magnitudes of difference were much lower, resulting in lack of significant differences found in the original analysis. Along the Northwest Transect, statistical power was not sufficient to detect a ±2 SD effect size at any of the distances (Figure 41) due to the low variability in the data (standard deviation value of 0.014). Observed effect sizes were similar or smaller than the ±2 SD value, resulting in lack of significant differences between years in the original analysis. Along the West Transect, statistical power was sufficient to detect a ±2 SD effect size at 650 m but not at the two other distances (Figure 42). At both 650 m and 1,000 m distances, observed magnitudes were larger than ±2 SD (values of 0.216 and 0.490), resulting in significant differences between years (Section 4.4.3.3.1 in Golder 2021).

Overall, power to detect effects between years was highest at 650 m for both West and Northwest transect, and at 1,000 m for both East and Northeast transects. Power was sufficient to detect a ±2 SD effect size at Northeast and West transects, but not at Northwest and East transects. Some observed effect sizes (e.g., East Transect at 650 m and West Transect at 650 m) were sufficient for high power, consistent with the detection of significant differences between years in the original analysis (Section 4.4.3.3.1 in Golder 2021).

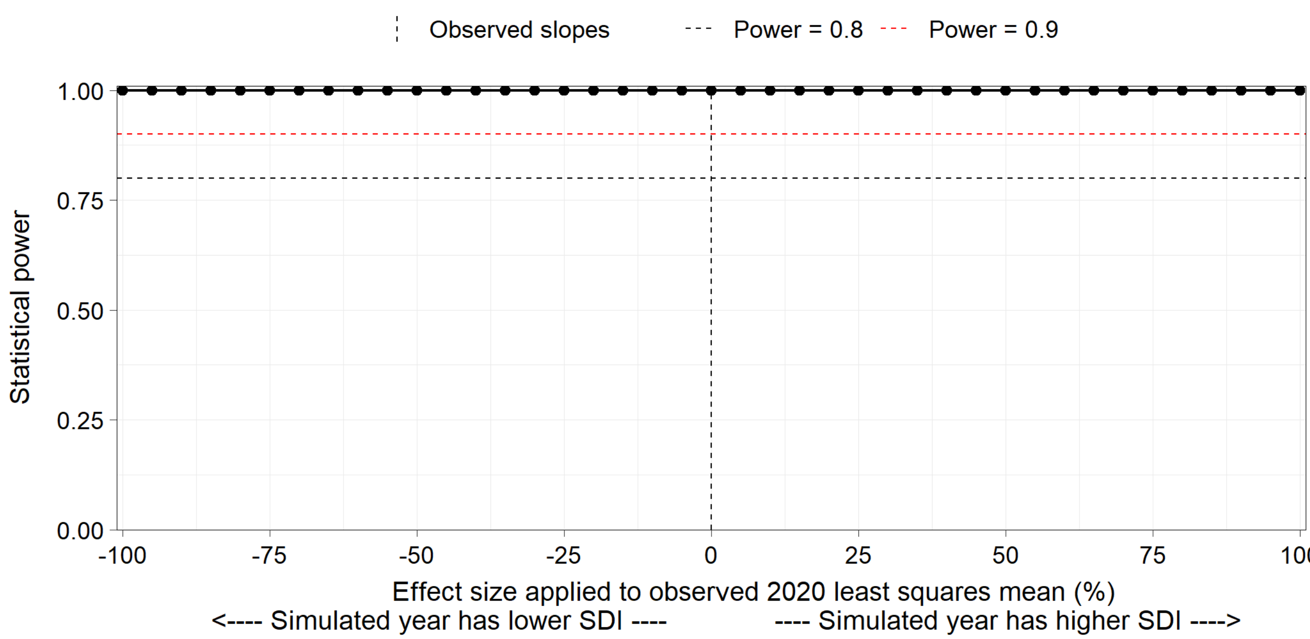

Figure 38 Statistical power of the overall model of 2019-2020 benthos SDI to detect a significant year effect (as main effect or interaction with either distance or distance and transect).

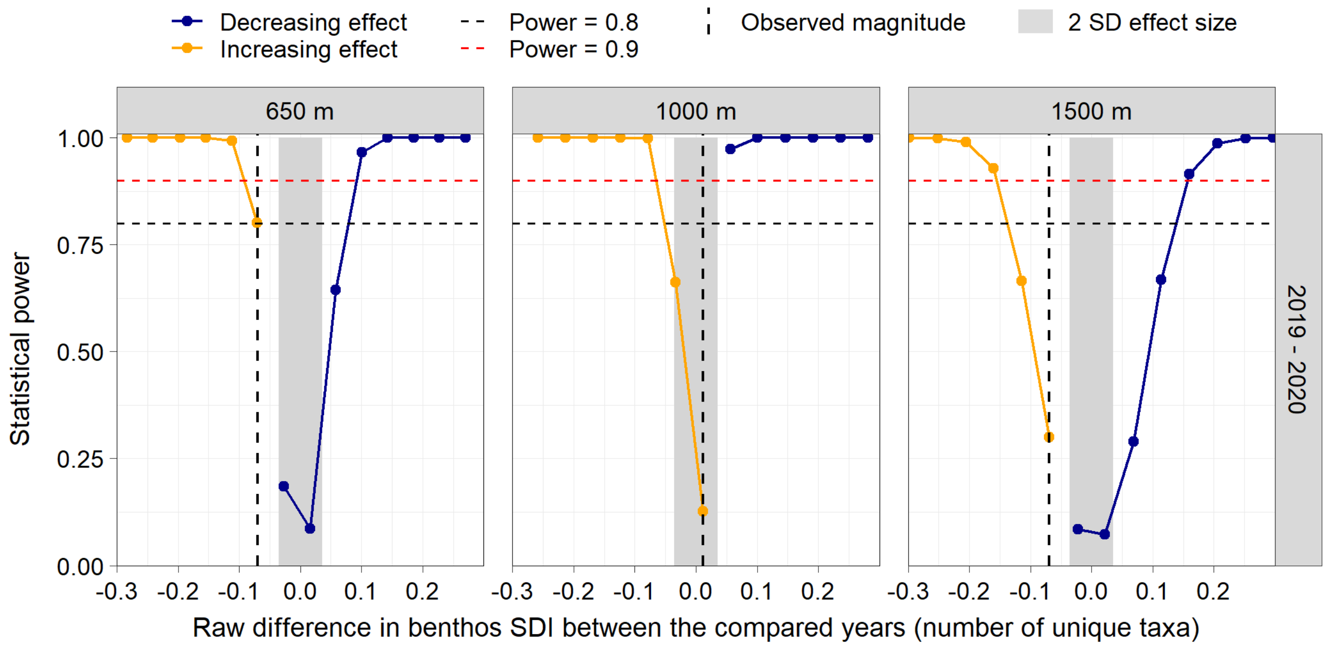

Figure 39 Statistical power of multiple comparisons between years at select distances along the East Transect relative to the difference in benthos SDI. Each panel shows a separate comparison, with the distances compared displayed at the top of the panel.

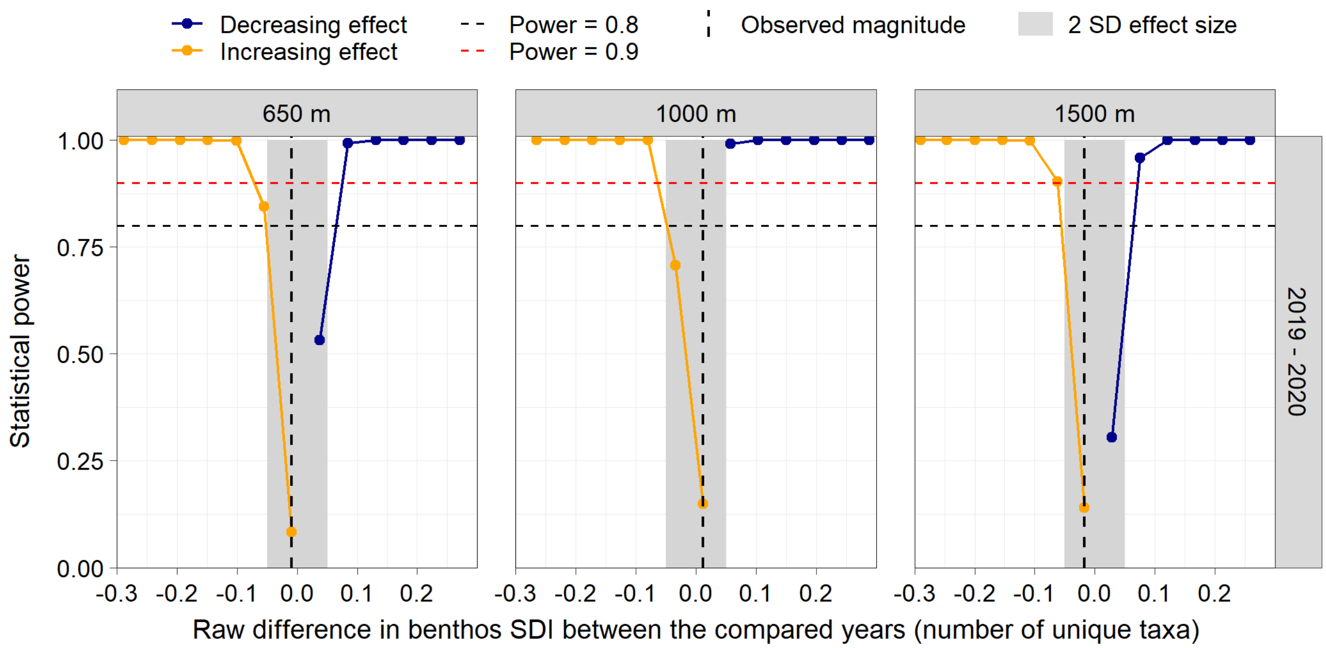

Figure 40 Statistical power of multiple comparisons between years at select distances along the Northeast Transect relative to the difference in benthos SDI. Each panel shows a separate comparison, with the distances compared displayed at the top of the panel.

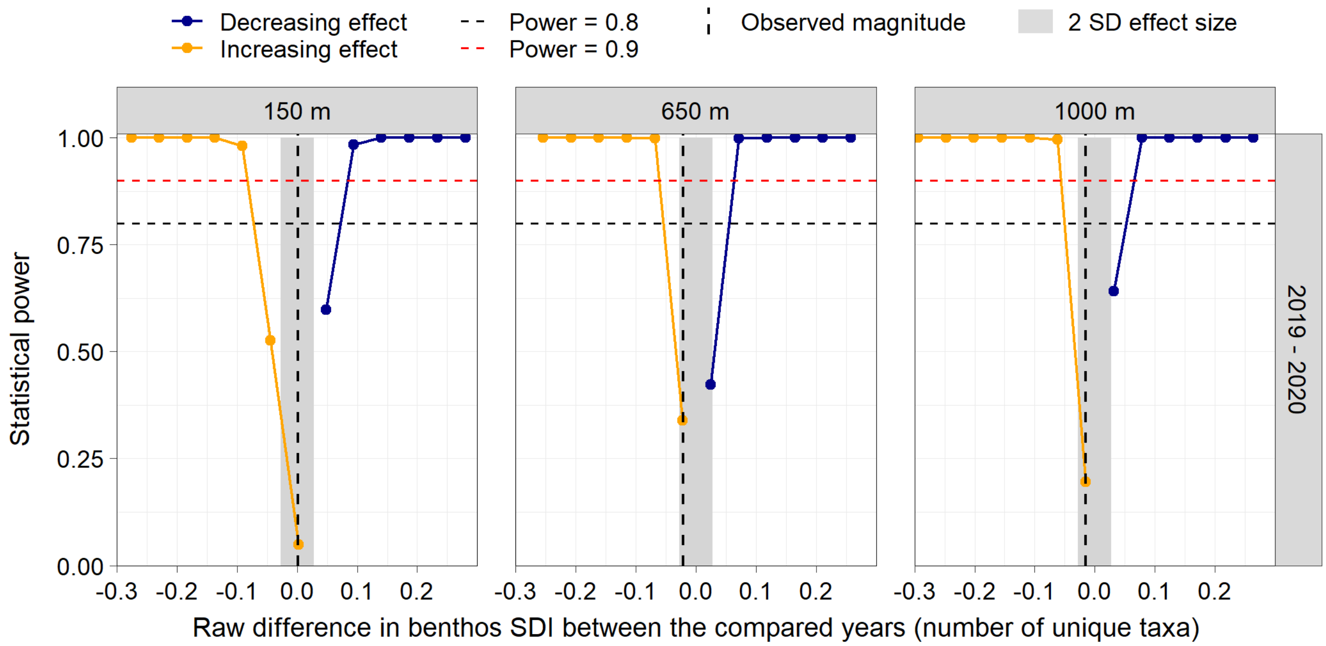

Figure 41 Statistical power of multiple comparisons between years at select distances along the Northwest Transect relative to the difference in benthos SDI. Each panel shows a separate comparison, with the distances compared displayed at the top of the panel.

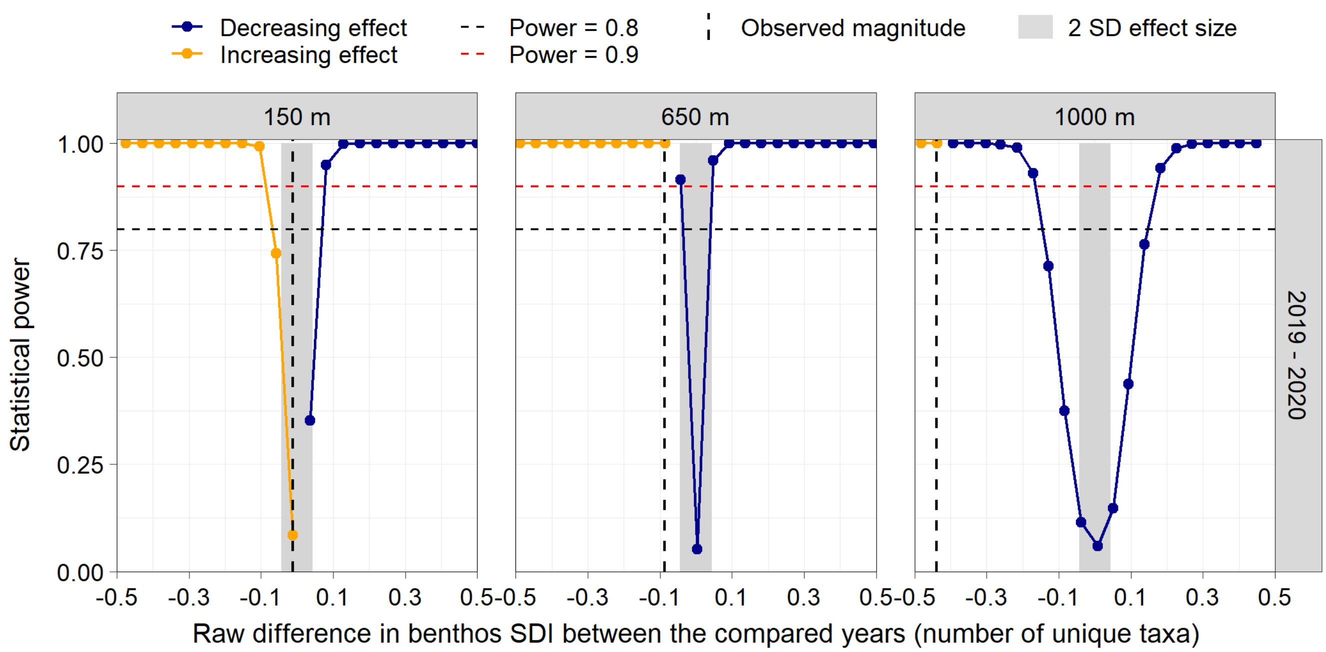

Figure 42 Statistical power of multiple comparisons between years at select distances along the West Transect relative to the difference in benthos SDI. Each panel shows a separate comparison, with the distances compared displayed at the top of the panel.

Benthos – SEI in 2019-2020

The power analysis indicated that the analysis of benthos SEI collected in 2019-2020 had high power (>0.9) to detect an overall effect of year or an overall significant difference in year effects between the sampled transects and distances at the observed effect size (indicated by the vertical line in Figure 43). This is consistent with the finding of a significant main effect of sampling year in the original analysis (Section 4.4.3.4.1 in Golder 2021).

In multiple comparisons between 2019 and 2020, the power analysis indicated that along the East Transect, there was sufficient power to detect significant differences at effect sizes of ±2 SDs at 1,000 m distance (Figure 44. Along the Northeast Transect, there was also sufficient power to detect differences at the ±2 SD effect size at 650 m distance (Figure 45). Observed magnitudes of difference were larger than the ±2 SD effects at 650 m and 1,500 m distances (raw difference in SEI values of -0.122 and -0.133, respectively), resulting in significant differences found in the original analysis. Along the Northwest Transect, statistical power was sufficient to detect a ±2 SD effect size at both 650 m and 1,000 m distances (Figure 46), with the 650 m observed effect size (SEI difference of -0.119) being sufficient to be detected in the original analysis. Along the West Transect, statistical power was sufficient to detect a ±2 SD effect size at 650 m but not at the two other distances (Figure 47). At both 150 m and 650 m distances, observed magnitudes were larger than ±2 SD (SEI differences of -0.144 and -0.198, respectively), resulting in significant differences between years (Section 4.4.3.4.1 in Golder 2021).

Overall, power to detect effects between years was highest at 650 m for both West and Northwest transect, and at 1,000 m for both East and Northeast transects. Power was sufficient to detect a ±2 SD effect size at all four transects. Some observed effect sizes (e.g., Northeast Transect at 650 m and West Transect at 150 m) were sufficient for high power, consistent with the detection of significant differences between years in the original analysis (Section 4.4.3.4.1 in Golder 2021).

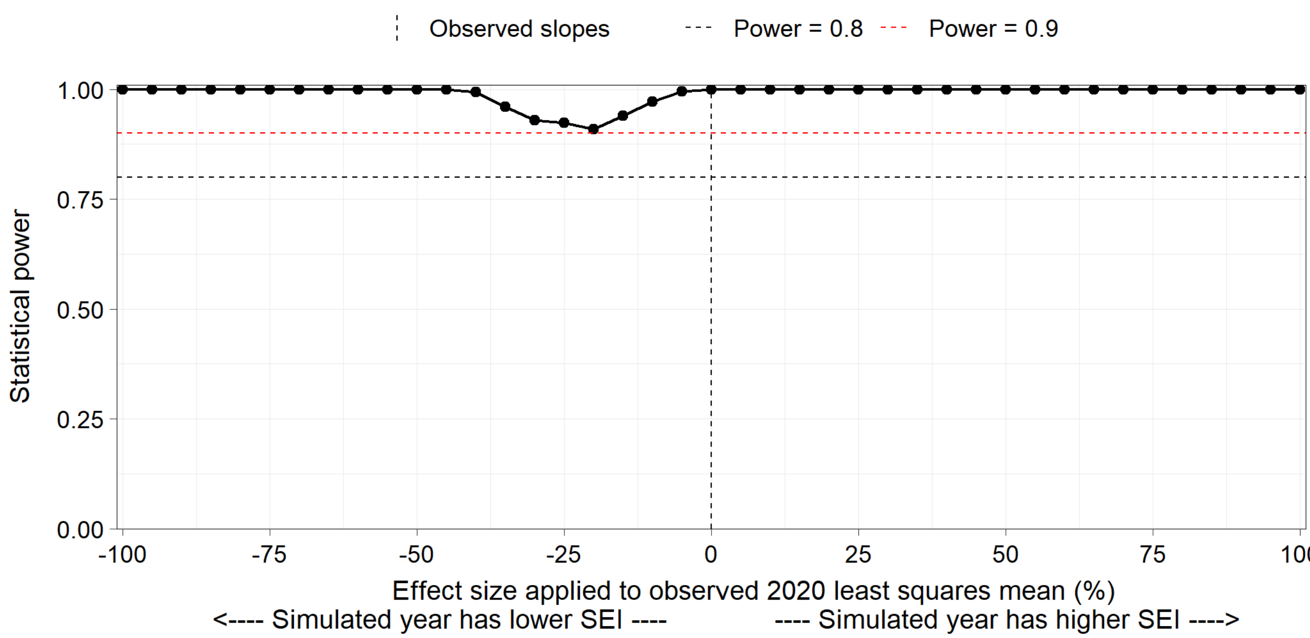

Figure 43 Statistical power of the overall model of 2019-2020 benthos SEI to detect a significant year effect (as main effect or interaction with either distance or distance and transect).

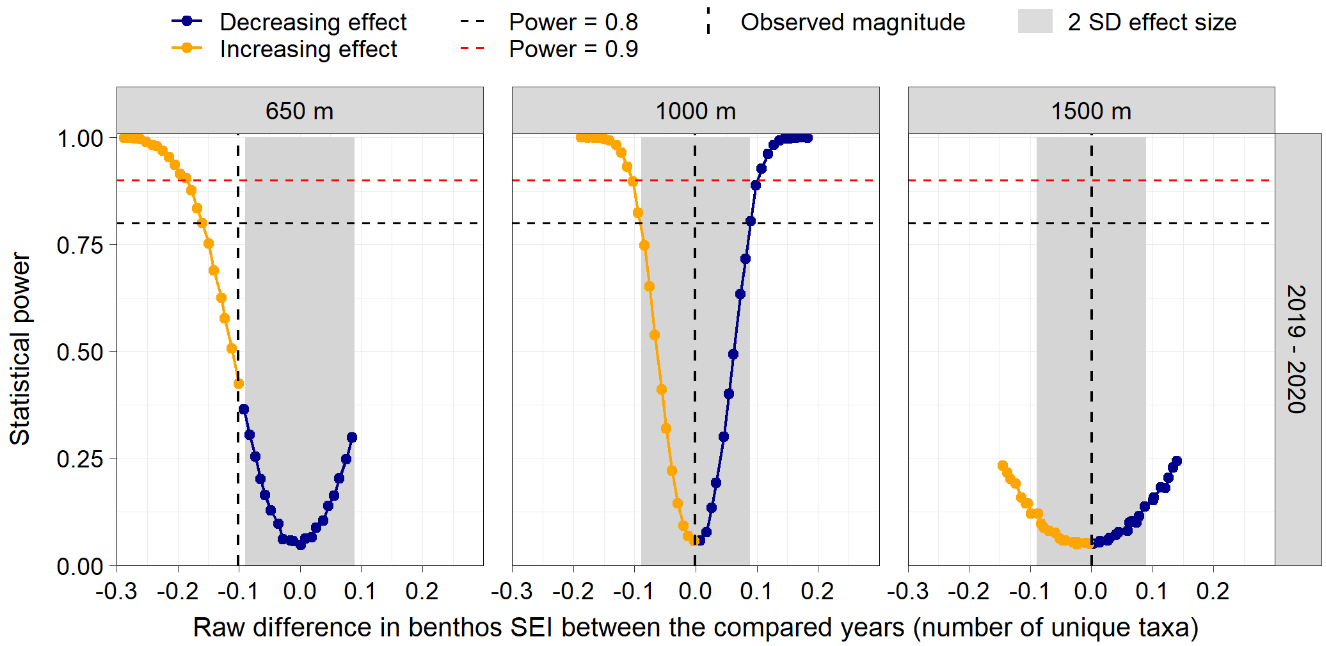

Figure 44 Statistical power of multiple comparisons between years at select distances along the East Transect relative to the difference in benthos SEI. Each panel shows a separate comparison, with the distances compared displayed at the top of the panel.

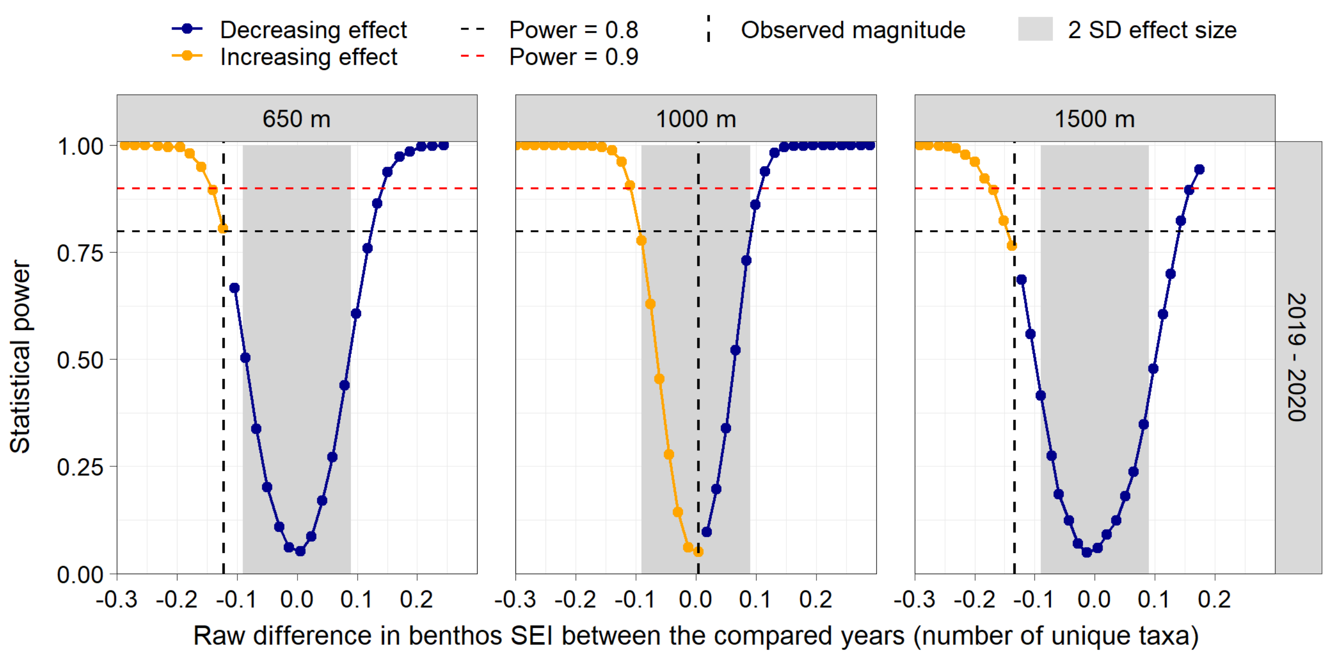

Figure 45 Statistical power of multiple comparisons between years at select distances along the Northeast Transect relative to the difference in benthos SEI. Each panel shows a separate comparison, with the distances compared displayed at the top of the panel.

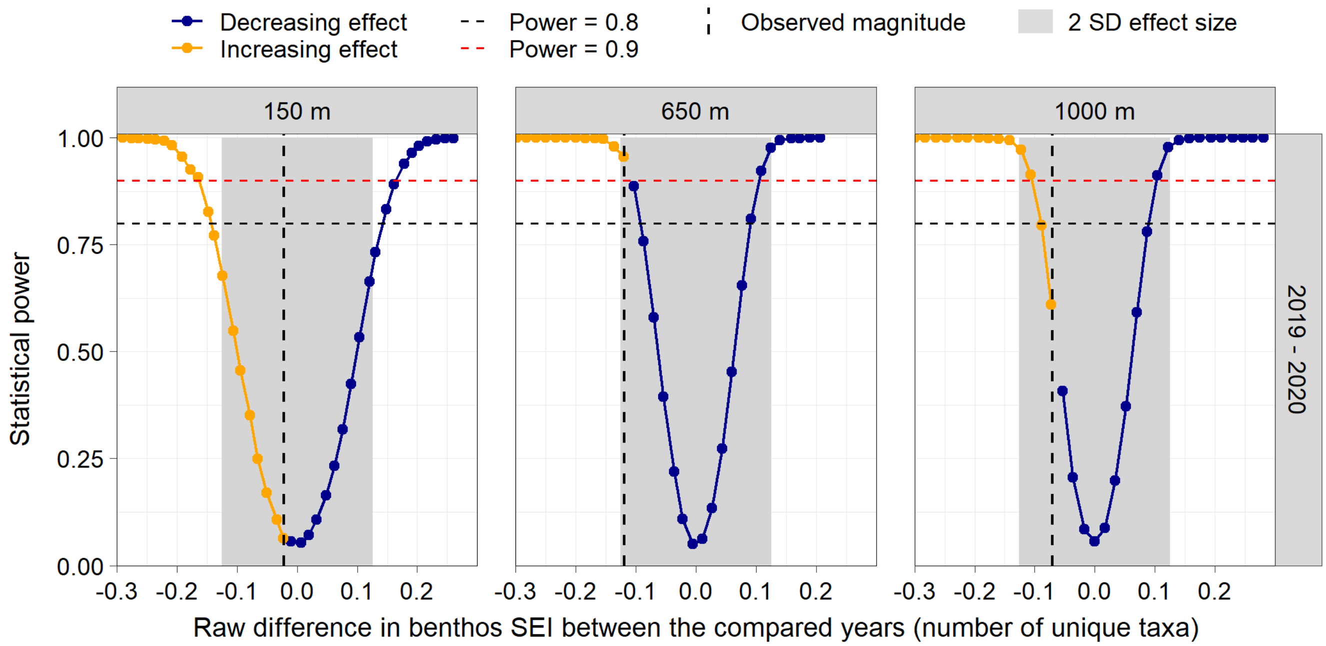

Figure 46 Statistical power of multiple comparisons between years at select distances along the Northwest Transect relative to the difference in benthos SEI. Each panel shows a separate comparison, with the distances compared displayed at the top of the panel.

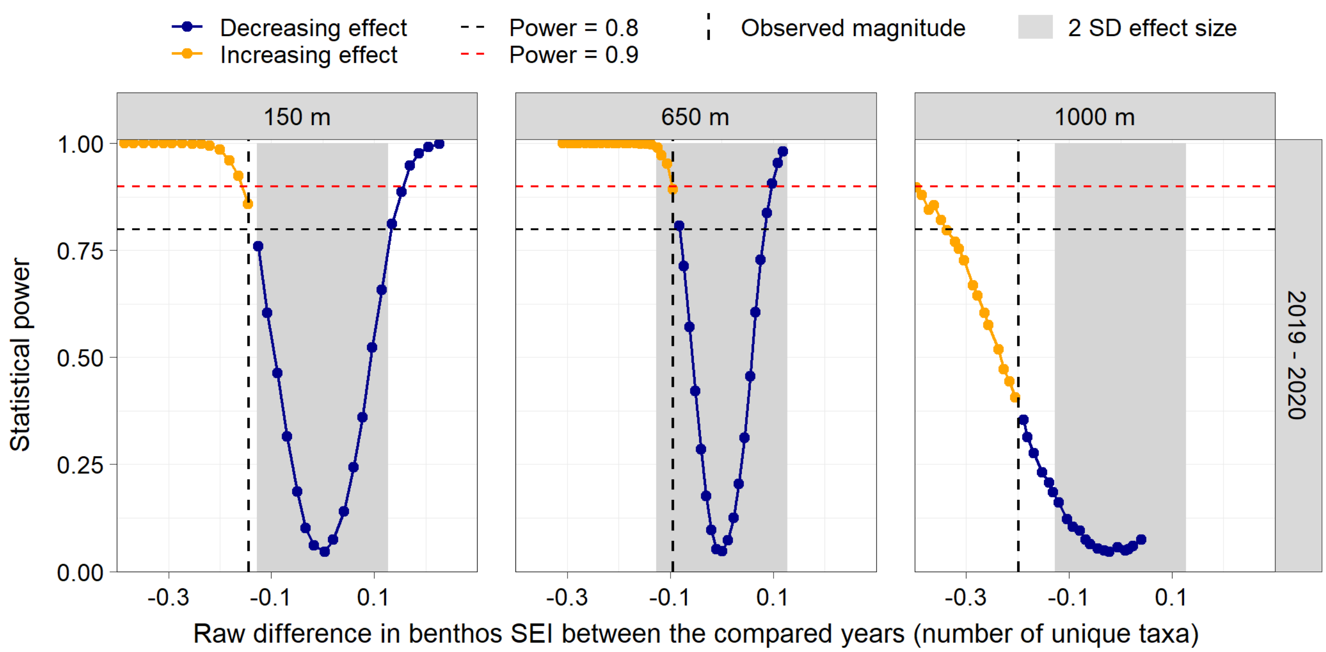

Figure 47 Statistical power of multiple comparisons between years at select distances along the West Transect relative to the difference in benthos SEI. Each panel shows a separate comparison, with the distances compared displayed at the top of the panel.

POWER ANALYSIS – SUMMARY

Summary of Findings

- Percent fines, 2019-2020 – statistical power was sufficient to detect magnitude differences of ±2SD between 2020 and 2019 sampling years at three of the four transects.
- Percent fines, 2014-2020 - statistical power was sufficient to detect magnitude differences of ±2SD between 2020 and a previous sampling year at two of the three transects.
- Iron content, 2019-2020 - statistical power was sufficient to detect magnitude differences of ±2SD between 2020 and 2019 sampling years at two of the four transects.
- Iron content, 2014-2020 - statistical power was sufficient to detect magnitude differences of ±2SD between 2020 and a previous sampling year at two of the three transects
- Benthos total density, 2019-2020 - statistical power was sufficient to detect magnitude differences of ±2SD between 2020 and 2019 sampling years at three of the four transects.
- Benthos total density, 2018-2020 - statistical power was sufficient to detect magnitude differences of ±2SD between 2020 and a previous sampling year at two of the three transects.
- Benthos richness, 2019-2020 - statistical power was sufficient to detect magnitude differences of ±2SD between 2020 and 2019 sampling years at all four transects.
- Benthos richness, 2018-2020 - statistical power was sufficient to detect magnitude differences of ±2SD between 2020 and a previous sampling year at all three transects.
- Benthos SDI, 2019-2020 - statistical power was sufficient to detect magnitude differences of ±2SD between 2020 and 2019 sampling years at two of the four transects.
- Benthos SEI, 2019-2020 - statistical power was sufficient to detect magnitude differences of ±2SD between 2020 and 2019 sampling years at all four transects.

Implications of Power Analysis Results

- The results suggested sufficient power to detect distance effects (within 2019 data) for all variables, under reasonable magnitudes of effect. That is, data collected in 2019 are deemed sufficient to identify ecologically relevant changes in the variables of interest along the sampled transects.
- The results suggested that to detect a year effect, magnitude differences had to be considerably higher than the magnitude differences required to detect a distance effect within 2019 data (e.g., 16-18% fines to detect a year effect, versus 2-4% fines to detect a distance effect). In the case of sediment quality, these magnitude differences were deemed ecologically reasonable given their observed values (e.g., 16-18% fines, 1,000-1,400 mg/kg iron content). In the case of benthos, the detection of year effects required a high magnitude of difference (e.g., 2,000-8,000 organisms/m^2 change in density and 12-13 taxa/sample). Therefore, for benthos analyses, it is possible that the current sample size may not be sufficient to detect a year effect under an ecologically significant effect size.

- In 2019, the number of benthos samples collected was lower than planned, due to technical difficulties. It is expected that the number of samples going forward will match the full sampling design, thereby increasing sample size and improving power. Since current sample size is sufficient to detect distance effects within the sampling year, and since sample size in the future is expected to increase relative to 2019, the statistical power of the analyses will be assessed in 2020, and the sampling design will be re-evaluated if deemed necessary.

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FINAL REPORT

Chapter 4.0 Benthic Infauna

2021 Marine Environmental Effects Monitoring Program (MEEMP) and Non-Indigenous Species/Aquatic Invasive Species (NIS/AIS) Monitoring Program

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Baffinland Iron Mines Corporation

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1663724-349d-R-Rev0-44000

21 October 2022

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ACRONYMS AND ABBREVIATIONS

Acronym or Abbreviation	Definition
Biologica	Biologica Environmental Services Ltd.
cm	Centimetres
ERP	Early Revenue Phase
FEIS	Final Environmental Impact Statement
HDPE	High-density polyethylene
L	Litres
LSA	Local Study Area
m^2	square metres
mm	Millimetres
MEEMP	Marine Environmental Effects Monitoring Program
NIRB	Nunavut Impact Review Board
NIS/AIS	Non-Indigenous and Aquatic Invasive Species
Org/m^2	Organisms per squared meter
PC	Project Certificate
p_i	Proportion of the i^{th} taxon
%	Percent
QA/QC	Quality Assurance/Quality Control
QIA	Qikiqtani Inuit Association
S	Total number of taxa
SDI	Simpson's Diversity Index
SEI	Simpson's Evenness Index
SEM	Sikumiut Environmental Management Ltd.
SW	West Transect
x	Magnification factor
>	Greater than
<	Less than

4.0 BENTHIC INFAUNA

4.1 Introduction

The 2021 benthic infaunal sampling program for the MEEMP was focussed on targeted sampling at station SW-2, located along the West transect between the Ore Dock and the mouth of Phillips Creek. Station SW-2 was considered an outlier in the 2020 benthic community dataset because of considerably lower benthos density and richness values compared to other stations sampled along the West transect in 2020 and, also, when compared to previous years of sampling at SW-2. Through the MEWG process, the Qikiqtani Inuit Association (QIA) requested data from previous years of sampling at SW-2 be revisited to investigate whether changes observed at this station could be Project-related (Technical Comment 25 on the 2020 MEEMP), and Baffinland committed to conduct targeted sampling during the 2021 open-water season to address this.

This component was developed in consideration of the monitoring requirements outlined in the PC Conditions described in Chapter 1.0, Table 1-2. Project Certificate (PC) Conditions related to the monitoring include PC Conditions No. 99 (a), and 99 (c).

4.1.1 Objectives

The overall MEEMP objectives are outlined in Section 1.3 of Chapter 1.0 (Program Overview). The objectives of the 2021 benthic infaunal sampling program were as follows:

- Conduct targeted follow up sampling of benthic invertebrate communities at station SW-2.
- Evaluate whether the changes in benthic communities at this station observed in 2020 have persisted into 2021 and whether they are Project-related.
- Verify predictions made in the FEIS and other submissions to the Nunavut Impact Review Board (NIRB) regarding effects on benthic infauna communities, as applicable.
- Recommend any necessary and appropriate changes to the benthic infauna component of the MEEMP for future years.
- Address QIA Comments on the 2020 MEEMP Report.

4.2 Study Design

4.2.1 Modifications to the Program (2021)

After three consecutive years of implementation, the full joint radial benthic and sediment sampling program was not conducted in 2021; rather, sampling effort focussed on a single station, SW-2, from which anomalous results in benthic community indices were reported. The decision to scale-back the program was based on the lack of directional trends observed to date, across all indicators (with the exception of SW-2), which indicate that the Project has not adversely impacted benthic communities in Milne Inlet. While it is recognized that the full sampling program was not completed in 2019, due to logistical challenges, the power analysis provided in Appendix 3E confirms that in 2019 and 2020 there was adequate statistical power to be able to detect Project-related changes.

Baffinland is committed to continued implementation of the joint radial benthic and sediment sampling program with an adjusted monitoring frequency of every 3 years, which is more consistent with routine biological sampling for other mining effects monitoring programs (e.g., the federal Environmental Effects Monitoring Program [EEM]).

Station SW-2 stood out as an anomaly in 2020 due to reductions in benthic infauna indicators and a coarser sediment composition relative to other coastal stations along the West Transect. To determine whether Project activities contributed to these differences, targeted benthic infauna and sediment quality sampling was performed at station SW-2.

In addition, benthic infauna samples were also collected from 17 stations for the Non-Indigenous and Aquatic Invasive Species (NIS/AIS) 2021 monitoring program (including at station SW-2) (see Chapter 8.0).

4.2.2 Indicators

For benthic infauna, four endpoints are adopted as effect indicators:

- total density
- taxa richness
- Simpson's diversity index
- Simpson's evenness index.

Benthic Community Effect Indicators

Taxonomic identifications and abundance data provided by Biologica for 2021 (Appendix 8A-2) were used to calculate community indicators to assess benthic infaunal invertebrate communities at station SW-2. These indicators included: density, richness (to the lowest practicable level), Simpson's Diversity Index, and Simpson's Evenness Index.

Organism Density

Total invertebrate density was calculated as the number of organisms per square metre (org/m^2) for each station. The surface area of the Van Veen (0.1 m^2) was multiplied by three to account for the three composite grab samples using the following equation:

$$\frac{\textit{number of organisms per station}}{(\textit{grab sampler area} \times 3 \textit{ composites})}$$

Richness

Richness is the total number of unique taxa per station. Richness provides an indication of the diversity of benthic invertebrates in an area; a higher richness value typically indicates a healthier and balanced community. Because the three composite grab samples from each station were combined prior to taxonomy, the richness metric indicated the variety of taxa on a station-wide basis (i.e., replicate station richness) rather than the average number of taxa per individual grab.

Simpson's Diversity Index

Simpson's Diversity Index (SDI) measures the proportional distribution of organisms in the community. The SDI considers the variety of taxa and also how evenly the total density is distributed among these taxa. Certain conditions may favour one taxa over another, resulting in the community being dominated by a few taxa, which is reflected in decreased diversity (Simpson 1949). The SDI values range between zero and one, where lower values indicate a less diverse community and higher values indicate a more diverse community. The SDI was calculated using the formula provided by Krebs (Krebs 1999):

$$SDI = 1 - \sum_{i=1}^{S} (p_i)^2$$

Where:

- SDI = Simpson's diversity index
- S = the total number of taxa
- p_i = the proportion of the i^{th} taxon

Simpson's Evenness Index

Simpson's Evenness Index (SEI) is a measure of how evenly the total invertebrate density is distributed among the taxa present at the station. The SEI is included along with the SDI to provide context as to whether richness or the distribution of total density among taxa is driving the SDI values. The SEI is also expressed as a value between one and zero, with one representing high evenness (i.e., equal numbers of all taxa present in a sample) and zero representing low evenness (i.e., a high degree of dominance by one or a few taxa). The SEI values were calculated using the following formula (Smith and Wilson 1996):

$$SEI = 1 / \sum_{i=1}^{S} (p_i)^2 / S$$

Where:

- SEI = Simpson's evenness index
- S = the total number of taxa
- p_i = the proportion of the i^{th} taxon

4.3 Materials and Methods

4.3.1 Field Methodology

A single benthic infauna sample was collected from SW-2 (Figure 8-1) along with a co-located sediment sample and duplicate to provide supporting sediment quality information (Section 3.0). The benthic sample was collected as a composite of three individual grabs using a standard Van Veen sampler with a surface area of 0.1 m^2. Each grab sample was examined for acceptability using the criteria outlined in Section 3.3.1 and, upon acceptance, the three individual grab samples were split using a field splitter purpose-built for this program due to the large volume of the Van Veen sampler.

The composite material was gently rinsed with filtered seawater through a 1-cm mesh sieve to initially remove larger organisms that could otherwise become damaged when the composite material was subsequently filtered through a 0.5 mm mesh sieve. The 1-cm sieved sample was either retained as a whole sample, or further split into ½ or ¼, such that a reasonable volume would be submitted to the taxonomy laboratory. Large debris, such as gravel and cobble, were checked for encrusting fauna and included in the sample jar if potential encrusting epifauna were observed. The 1-cm mesh sieved composited material was further split in half, totalling a ¼ field split. The ¼ field split sample was retained and transferred to an aluminum sieving table. The sample was gently rinsed through a 0.5-mm mesh sieve with filtered seawater. A representative photograph was taken of the sieved sample, including a visible sample label (Appendix 3A). Remaining material on the sieve was placed in pre-labeled 1-L wide-mouth high-density polyethylene (HDPE) sample jars and preserved in a 10% buffered formalin solution. The containers were then sealed and inverted several times to promote homogenization with the formalin. Containers were labeled internally and externally with water-resistant labels. The sample was sent to Biologica Environmental Services Ltd. (Biologica) for sorting and taxonomic identifications, as per the previous MEEMP programs. Details on laboratory methods are provided in Appendix 8A-3.

4.3.2 Data Analysis

Data Screening

The benthic sample sent to Biologica was sorted using dissecting microscopes at 10-40x magnification. The 1-cm sample fraction was processed based on the field split (no further splitting by Biologica). The fine 0.5mm sample fraction (¼ field split) was further split into another quarter (¼) by Biologica for a final 1/16 split of the composite sample, using a Caton tray. The sample was spread evenly on a Caton grid and subsampled via sequential random quadrat sorting. Sorting continued until a minimum ¼ split was reached and taxonomic identifications were carried out to the lowest practicable level.

Taxonomy data provided by Biologica were screened for incidental organisms not considered to be part of the marine benthic community, such as freshwater, terrestrial, planktonic, and parasitic taxa. Meiofauna, such as nematodes, were removed from benthic analysis because these species often fall through the 0.5-mm mesh sieve used to separate benthic infauna from sediments in the field. Nematode species counts would thus not represent true population numbers at each station and could bias station comparisons of total abundance, relative abundance, and species diversity. Eliminated taxa, not expected to have significant direct exposure to sediments, included Nematoda (meiofauna), fish (Pisces indet.), and some Ostracoda (planktonic), Balanomorpha (planktonic), and Copepoda (parasitic) taxa.

4.3.3 Quality Management

Quality assurance and quality control (QA/QC) procedures were applied to the field collection, data analysis, and reporting tasks within the benthic infauna component to verify that the data presented were valid and of acceptable quality to address objectives stated in Section 4.1.1.

4.3.3.1 Field QA/QC

QA/QC measures undertaken to confirm benthic infauna sample integrity are the same as those described for sediment quality as described in Section 3.3.3.1.

4.3.3.2 Laboratory and Data Analysis QA/QC

Biologica laboratory QA/QC measures included an assessment of sorting recovery, identification error, and precision/accuracy of sub-sampling. Laboratory procedures included sample sorting measures, spot-checks, preliminary counting of major groups, and collaborative identification to accurately identify species to their lowest practicable level. Further detailed discussion of the laboratory QA/QC procedures used by Biologica and the findings of their QA/QC assessment are provided in their laboratory reports in Appendix 8A-2, 8A-3 and 8D-3.

Benthic data received from Biologica were reviewed upon receipt to verify that specified laboratory data quality objectives were met. No inconsistencies were noted that required follow up with the laboratory. Screening of the benthic data and calculation of the benthic indicators were reviewed by a second biologist for accuracy.

4.4 Results

This section describes results for the benthic infaunal sample collected from station SW-2 along the West transect; results from the co-located sediment sample are discussed in Chapter 3.0. Representative photographs from the field program are provided in Appendix 3A. The laboratory results and methods report provided by Biologica is provided in Appendix 8A-2 and 8A-3. A summary of benthic data collected from SW-2 over the time period 2018 to 2021 is provided in Table 4-1.

Table 4-1: Summary of Benthic Invertebrate Community Indicators at Station SW-2 (2018-2021)

Sampling Year	Total Density (org/m^2)	Total Richness	Simpson's Diversity Index (SDI)	Simpson's Evenness Index (SEI)
2018	13,818	61	Not calculated	Not calculated
2019	10,184	66	0.93	0.23
2020	130	6	0.66	0.49
2021	6,622	36	0.94	0.47

Anomalous results were recorded in 2020 in the form of substantially reduced density, richness, and diversity values relative to previous years at this station (Table 4-1). In 2021, the benthic community showed signs of rebound in terms of the number and types of invertebrates present. Order of magnitude increases were realized for density and richness indicators as well as an increase in diversity.

4.5 Discussion

Evaluation of benthic community indicators show an increase in total density, richness, and diversity in 2021 relative to the 2020 sampling program; specifically, order of magnitude increases in density and richness were recorded while diversity increased to a similar level noted in 2019. While small-scale spatial variation may partially contribute to the changes documented at SW-2 -- given that it is well known that benthic infaunal communities can show these kinds of differences in population metrics at the smallest spatial scales -- it alone cannot explain the results observed given similar changes were not seen at the other 59 stations sampled in 2020.

Rather, it is most likely that propellor wash from berthing ore carriers acted to mobilize finer sediments resulting in a coarsening of sediments at this station. Strong relationships exist between the distribution and abundance of infaunal invertebrates inhabiting soft-bottom environments and the size and texture of sediments; typically, higher abundance, biomass, and diversity are associated with smaller (i.e., finer) grain sizes (Coblentz et al. 2015). Hence, the loss of finer-grained sediment from SW-2 seems to have driven a concomitant reduction in benthic community indices; however, this change appears to have been temporary as order of magnitude increases in density and richness were recorded in 2021. It is important to note that benthic infaunal invertebrate communities are inherently dynamic and continually changing in response to various types and scales of disturbance (Thistle 1981, Zajac and Whitlatch 1982a, b). Moreover, these organisms have life history characteristics that make them resilient to disturbance, including: short generation time – life cycles are often less than one year (Warwick 1984); broadcast spawning – releasing sperm and eggs into the water column (Crimaldi and Zimmer 2014); and a larval (planktonic) phase, whereby they can disperse tens or even thousands of kilometres from their source (Pechenik 1999). Thus, the recovery at station SW-2 documented in 2021 has likely been facilitated by localised breeding and immigration of adults, and/or supply of larvae, from nearby unaffected areas (Hill et al. 2011).

Areas of sediment disturbance by propwash effects around the Ore Dock in Milne Port are consistent with what was predicted in the FEIS, which forecast the potential for minor and localized disturbances to sediment via propellor-generated currents with an overall negligible impact on sediment quality in the marine environment Baffinland (2012). As described in Chapter 3.0 (Sediment Quality), while substrates have been predominantly sandy since 2018, there has been a shift to coarser substrates in the last two years at station SW-2. The benthic community at this station seems to have rebounded from the impacts associated with changes in grain size, showing substantially more diversity (returned to 2019 levels) and higher abundance and richness (order of magnitude increases) in 2021 compared to 2020. Overall, monitoring results remain within original FEIS predictions, which forecasted negligible residual effects on sediment quality and benthic infaunal communities.

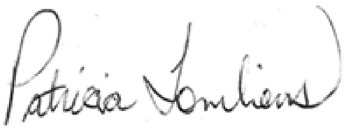
4.6 Conclusions and Recommendations

Collectively, the four years of data available at station SW-2 indicate that some physical disturbance has occurred, mostly likely a result of propellor-generated currents from berthing ore carriers. Targeted sampling at this station in 2021 indicates that the benthic infauna community appears to be in rebound from this disturbance, evidenced by substantial increases in monitoring metrics such as density and diversity; however, fine-scale spatial variation can also at least partially explain the results observed. Overall, monitoring results are consistent with FEIS predictions, which indicated the potential for localized resuspension of fine-grained sediments from propellor-generated currents and associated alteration to benthic community composition. Moving forward, it is recommended to continue targeted sampling in 2022 to increase understanding of natural variability as well as to monitor for additional changes in benthic community indicators at this site. Continued monitoring at this station may also help elucidate the relative contributions of natural spatial variability and propwash to the trends observed.

4.7 Closure

We trust this information is sufficient for your needs at this time. Should you have any questions or concerns, please do not hesitate to contact Philippe Rouget, on behalf of the undersigned, at 250-881-7372.

Golder Associates Ltd.



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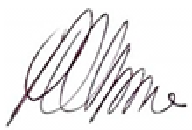

Phil Osborne, PhD, PGeo
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FINAL REPORT

Chapter 5.0 Substrate, Macroflora and Benthic Epifauna

2021 Marine Environmental Effects Monitoring Program (MEEMP) and Non-Indigenous Species / Aquatic Invasive Species (NIS/AIS) Monitoring Program

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21 October 2022

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ACRONYMS AND ABBREVIATIONS

Acronym or Abbreviation	Definition
AIS/NIS	Aquatic Invasive Species/ Non-Indigenous Species
BACI	Before-After-Control-Impact
CD	Chart Datum
EEM	Environmental Effects Monitoring
ERP	Early Revenue Phase
FEIS	Final Environmental Impact Statement
M	meter
Mm	millimeter
MANOVA	Multivariate Analysis of Variance
MEEMP	Marine Environmental Effects Monitoring Program
MFEAP	Marine Foreshore Environment Assessment Procedure
NIS/AIS	Non-Indigenous Species/Aquatic Invasive Species
No.	Number
org./quadrat	Organism per quadrat
PC	Project Certificate
QA/QC	Quality Assurance and Quality Control
ROV	Remotely Operated Vehicle
SDI	Simpson's Diversity Index
Unid.	unidentified
ZOI	Zone of Influence
%	Percent

5.0 SUBSTRATE, MACROFLORA AND BENTHIC EPIFAUNA

5.1 Introduction

This chapter presents the results of the substrate, macroflora and benthic epifaunal monitoring program, a component of the larger Marine Environmental Effects Monitoring Program (MEEMP) conducted at Milne Port and in Milne Inlet during the 2021 open-water season. This component was developed in consideration of the potential Project-related impacts to the marine environment as identified in the 2012 Final Environmental Impact Statement (FEIS, Baffinland 2012) and subsequent addendums, as well as monitoring requirements outlined in the Project Certificate (PC) Conditions described in in Chapter 1.0, Table 1-2. PC Conditions related to the monitoring of substrate, macroflora, and epifauna included PC Conditions No. 76, 83 (a), 87, 99 (a), and 99 (c).

5.1.1 Objectives

The overall MEEMP objectives are outlined in Section 1.3 of Chapter 1.0 (Program Overview). Objectives specific to the substrate, macroflora, and benthic epifaunal component are as follows:

- Monitor potential changes in substrate conditions or in the macrofloral and benthic epifaunal community at Milne Port and in a nearby Reference Area for the purpose of identifying Project-related effects.
- Verify predictions made in the FEIS regarding effects on Arctic char *(Salvelinus alpinus)* habitat.
- Recommend necessary and appropriate changes to survey methodology for future years, if warranted.

5.2 Study Design

5.2.1 Background

The 2014 to 2017 MEEMP study design monitored for changes to the benthic community with epifauna[1] and epiflora[2] as indicators, using towed underwater video transect surveys. The use of epifauna and epiflora as effect indicators deviated from the standard Environmental Effects Monitoring (EEM) methodology (Environment Canada 2010; 2012) and presented a number of challenges, including 1) high temporal and spatial variability due to the mobile and transient nature of many epifaunal species, 2) typical low resolution of video survey data compared to laboratory analysis for species identification, enumeration and substrate classification, and 3) difficulty in distinguishing between live epiflora (e.g., kelp) and detrital vegetation debris using video survey methods, which can result in inaccurate results.

In 2018, a new survey design was implemented, based on a Before-After-Control-Impact (BACI) approach. Towed underwater video transects were replaced with five belt transects (1 m x 5 m plots) permanently installed on the seabed in each exposure (impact) and reference (control) areas. Monitoring was conducted using a remotely operated vehicle (ROV) underwater video system. In addition to informing this component of the MEEMP, taxonomic data were also used to inform the NIS/AIS program (Chapter 8.0). In 2019, underwater video monitoring of epifauna and macroflora communities within permanent belt transects continued for a second year.

[1] benthic invertebrates living on the substrate

[2] marine vegetation attached to the substrate (e.g. kelp)

The belt transects deployed in 2018 were composed of two 1-m-long, 5-cm-diameter aluminum pipes filled with concrete connected by two 5-m-long steel chains attached to both ends of the pipes (Figure 5-1). In 2019, it was determined that the flexible design was not suitable for the environment, as five of the ten deployed transects were dragged from their original position due to presumed interactions with the sea-ice during spring break-out or had become embedded in the sediment and thus obscured from detection.

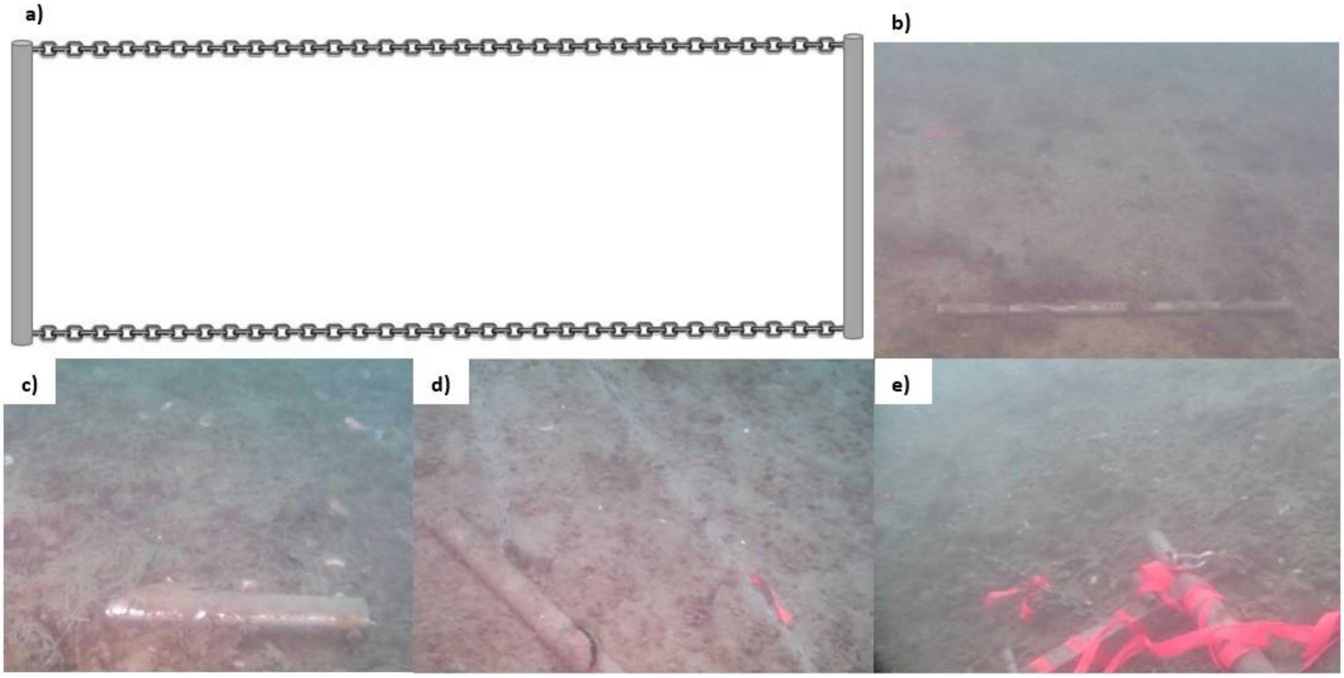

Figure 5-1: Belt Transects Used for Epifauna and Macroflora Surveys in 2018-2019. a) Diagram of Belt Transect Layout; b) Photo of Deployed Belt Transect; c, d and e) Belt Transects Embedded in Sediment and/or Shifted from Original Deployment Position

5.2.2 Modifications to the Program (2020 and 2021)

The program was modified in 2020 to replace the belt transects described above, which had been determined to be ineffective due to a large number of the deployed transects being dragged out of position or embedded within the underlying sediment within one year of deployment, presumably due to interactions with sea-ice. Modifications to the program in 2020 included the use of divers to undertake biophysical surveys of permanent, heavy-duty steel quadrats to improve the resolution of taxonomic identification. A total of ten 1 m x 1 m square quadrats were fabricated onsite in 2020 and installed on the sea bottom in Milne Port, five in the exposure area (Q1 through Q5) and five in a reference area (Q6 through Q10) (Figure 5-2). An additional ten square steel quadrats were fabricated and deployed in 2021 (Q11 through Q20; 5 in each exposure and reference area), doubling the total number of quadrats relative to 2020.

Surveys conducted in 2020 indicated that Q9 was dominated by hard substrate (boulder) and supported different ecological communities relative to the soft substrate quadrats. Therefore, in 2021, Q9 was relocated to a different area to maintain comparability between quadrats.

In previous years, taxonomic resolution was relatively coarse because of poor visibility due to suspended particles in the water column and the use of a ROV-based underwater video survey for monitoring. Survey of the quadrats was performed by a combination of divers and ROV in 2020[3] and exclusively by divers in 2021. Rationale for dropping use of the ROV is that divers are more accurately able to distinguish unique taxa (i.e., differentiate between detrital algae or non-living organisms), move vegetation aside to observe the underlying substrate and marine organisms, and collect specimens from the quadrats for identification purposes.

5.2.3 Indicators

Effect indicators selected to evaluate potential Project-induced changes in substrate, macroflora and epifauna include taxa richness (number of unique taxa present), relative abundance, Simpson's Diversity Index (SDI), density (motile taxa) and percent cover (macroflora and sessile invertebrates). These indicators are described in detail in Section 5.3.2. The indicators are calculated from data collected in both reference and exposure areas and analyzed statistically to evaluate Project-related effects within the study area.

The 2020 field season was the first year in which data were collected using steel quadrats, precluding the ability to make quantitative temporal comparisons to previous years. Upon reviewing the data collected in 2020, it was noted that the data had been collected with a coarser taxonomic resolution than in 2021 (due to differing field methodologies), which would affect how the data compared between the two survey years. Therefore, quantitative comparisons to 2020 data could not be made and a qualitative comparison has been provided where reasonable to do so. The 2021 quadrat survey results will serve as a benchmark for quantitative comparisons to future survey years so long as field methodologies remain consistent.

5.3 Materials and Methods

5.3.1 Field Methodology

Twenty 1 m x 1 m square steel quadrats were fabricated on site and were inset with 0.075 m metal bars to create nine smaller squares (sub-quadrats, approximately 0.22 m x 0.22 m) to allow for accurate and repeatable area measurements and scaling (for ROV observations). The quadrats were slowly lowered to the sea floor from a vessel: ten in the exposure area and ten in a reference area (Table 5-1, Figure 5-2). The reference area was established in 2013 and selected for its proximity to Milne Port while residing outside of the main zone of influence (ZOI) of Project activities (SEM 2014). Ten of the quadrats (Q1 through Q10) were deployed and surveyed in 2020, and an additional ten quadrats were deployed in 2021 (Q11 through Q20). The quadrats were deployed from the field vessel at the locations of the old belt transects, in water depths of approximately -5 to -16 m Chart Datum (CD). Each quadrat was marked with fluorescent spray paint to aid in relocating them in subsequent surveys.

[3] Divers surveyed quadrats in the reference area (Q6, Q8, Q9, Q10), but were unable to survey the quadrats in the exposure area due to time constraints in the field program (these were subsequently completed using ROV-video surveys).

Table 5-1: Quadrat Locations

Area	Quadrat	UTM Coordinates (17W)		Depth (m below CD) [1]	Deployment Date	Survey Date (2021)
		Easting (m)	Northing (m)			
Milne Port	Q1	502828	7976382	-9.1	12 August 2020	14 August
	Q2	503039	7976480	-9.8	12 August 2020	Not surveyed[2]
	Q3	504208	7976659	-10.9	12 August 2020	15 August
	Q4	504363	7976611	-12.2	12 August 2020	6 August
	Q5	504802	7976731	-12.4	12 August 2020	6 August
	Q11	502820	7976371	-7.6	10 August 2021	14 August
	Q12	503041	7976474	-6.0	7 August 2021	11 August
	Q13	504210	7976643	-8.0	10 August 2021	15 August
	Q14	504350	7976589	-7.7	6 August 2021	16 August
	Q15	504800	7976721	-7.4	6 August 2021	6 August
Reference Area	Q6	506563	7979107	-15.9	13 August 2020	8 August
	Q7	506774	7979170	-10.2	13 August 2020	16 August
	Q8	506957	7979457	-10.7	13 August 2020	16 August
	Q9	506963	7979448	-9.3	11 August 2021[3]	Not surveyed[4]
	Q10	506584	7979115	-6.5	13 August 2020	8 August
	Q16	506567	7979090	-5.7	8 August 2021	8 August
	Q17	506774	7979163	-8.9	11 August 2021	16 August
	Q18	506956	7979452	-10.2	11 August 2021	16 August
	Q19	506961	7979458	-8.0	11 August 2021	Not surveyed[4]
	Q20	506588	7979125	-11.2	8 August 2021	8 August

Note: [1] Diver depth gauge was converted to meters chart datum (CD), estimated using tide table for Milne Inlet, Nunavut (http://www.tides.gc.ca/eng [accessed October 2021]). The negative (-) numbers indicate 'below' CD. [2] Q2 was not located by divers. [3] Q9 was relocated from hard substrate to soft substrate. [4] Q9 and Q19 were not surveyed due to time constraints.

Figure 5-2: Locations of Survey Quadrats for Monitoring Substrate, Macroflora and Epifauna (2021)

Field surveys of the quadrats were conducted in August 2021 by Golder's occupational (SCUBA-based) dive team composed of marine biologists and scientific divers. The dive team is certified in accordance with Canadian Standard Association Z275:4-97 and WorkSafe BC Regulations Part 24. Dive surveys were conducted from Baffinland's 30-foot Research Vessel.

Field surveys included the following components:

- Deployment of additional ten steel quadrats: five in exposure area and five in the Reference Area.
- Retrieval and relocation of Q9 from hard substrate to soft substrate.
- Subtidal dive quadrat surveys to quantitatively evaluate macroalgae, sessile and motile invertebrates and fish occurrence (commonly termed epifauna) within both the exposure area and reference area.
- Opportunistic observations[4] of macroalgae, fish and motile/sessile invertebrates during quadrat surveying.

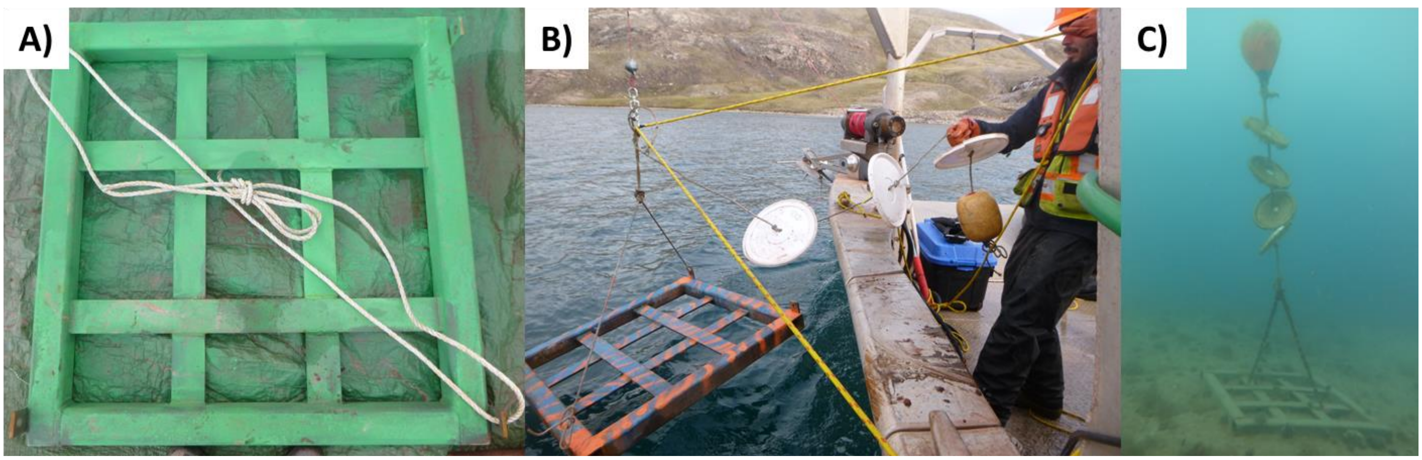

Figure 5-3: A) Example of 1 x 1 m Steel Quadrat Deployed in 2021; B) Active Deployment of Survey Quadrat; C) Underwater Photo of Quadrat (Q5) With Attached Settlement Plates for NIS/AIS Monitoring.

5.3.1.1 Quadrat Survey

Biophysical data within each quadrat was recorded by one diver while another diver collected representative photographs of the survey quadrat[5]. Observations within the sub-quadrats were recorded in a systematic way, with the top end of the quadrat (sub-quadrat 1,2,3) on the upslope and the bottom of the quadrat (sub-quadrat 7,8,9) on the down slope so the observations by sub-quadrat could be repeatable each year. A quadrat specific marker (a string with knots) was added to each of the quadrats deployed in 2021 at the corner representing sub-quadrat 1.

[4] Opportunistic observations refer to observations that were recorded during diver-collected photo or video to document presence/absence in a qualitative manner rather than quantitatively assessed during the quadrat survey.

[5] Underwater imagery collected using a SONY RX100 V camera in Fantasea underwater housing and Big Blue video light for all underwater surveys. The camera has high definition video capability and still photography features.

Quantitative data were collected in general accordance with DFO's Marine Foreshore Environmental Assessment Procedure (DFO 2002). Quadrat data were recorded on project-specific datasheets, and included the following information[6]:

- Substrate type was visually estimated according to the size ranges: bedrock; boulder (>256 mm diameter); cobble (64 to 256 mm); gravel (2 to 64 mm); sand (0.0625 to 2 mm); silt/mud/clay (<0.0625 mm) and relative composition (i.e., as a percent areal coverage).
- Macroalgae was identified to the lowest practical level (LPL) and total areal coverage was estimated.
- Sessile invertebrates, such as clams and mussels, were identified to LPL and total areal coverage was estimated (as above).
- Motile invertebrates (e.g., urchins, limpets) and fish were identified to LPL and enumerated. Abundance was estimated if relatively large numbers of motile species were present.
- Photographs showing representative biological features and aiding in species identification were taken.

During the 2021 field program, divers were unable to relocate quadrat Q2 after undertaking a thorough search along the depth contour -3 to -12 m CD (Q2 was deployed in approximately -10 m CD), extending approximately 25 m to the west and east of the original Q2 location. This quadrat was assumed to have been dragged from its original position by sea-ice during the spring break-out period. Quadrats Q9 and Q19 were not surveyed in 2021 due to time constraints resulting from several storm days which precluded dive operations.

5.3.1.2 Opportunistic Specimen Collection

Opportunistic samples of epifauna and macroflora were collected to enhance taxonomic resolution, particularly in cases where organisms may be suspected to be non-indigenous to the area. Specimens were collected using the following protocol:

- Divers collected specimens into sealed ziploc bags and brought to the surface in a mesh bag.
- Discretion was used to sample only one representative individual or portion of a macroalgae to avoid over-harvesting from the quadrats which could have future implications on the community assemblage (experimental design interaction).
- Samples were placed into 120-mL clear glass jars and preserved. Macroflora samples collected for DNA barcoding were preserved with 90% ethanol and samples collected for taxonomic analysis were preserved in a 10% buffered formalin solution. The jars were then sealed and inverted several times to promote homogenization and saturation with the preservative. Jars were labeled internally and externally with water-resistant labels.
- Samples were sent to Biologica Environmental Services Ltd. (Biologica) for taxonomic identifications and genetic analysis (DNA-barcoding) (macroflora only). Macroflora samples sent for DNA-barcoding were first analyzed for morphological identification by an algae taxonomist (Dr. Sandra Lindstrom, UBC) to verify DNA sequencing success. Whole specimen or tissue samples of taxa sent for DNA verification were sent to the Canadian Centre for DNA Barcoding (CCDB) at the University of Guelph for barcoding.

[6] Recorded data were in general accordance with Fisheries and Oceans Canada (DFO) Marine Foreshore Environment Assessment Procedure (MFEAP) (provided in Appendix A)

5.3.2 Data Analysis

Diver-collected quadrat data were entered into an electronic database by one biologist and verified by second biologist for transcription errors. Field-based identifications were updated where lab identifications of opportunistically sampled specimens resulted in improved taxonomic resolution.

Statistical analysis was based on four indicators: taxa richness (to the lowest practicable level), relative abundance, Simpson's Diversity Index, organism density (motile taxa) and percent cover (macroflora and sessile invertebrates).

Due to inconsistent sampling methodologies between 2021 and previous survey years, a quantitative statistical analysis was not possible between the 2021 quadrat survey data and that from previous years (i.e., interannual comparisons). A qualitative comparison between years has been provided. Results from 2021 surveys will act as a baseline to monitor for changes in future survey years, with 2021 comprising the first year of quantitative annual comparisons.

Richness

Richness is defined as the total number of unique taxa per quadrat. This metric provides an indication of the diversity (number of different species) in the local ecological community. A higher richness value typically indicates a healthier and more balanced community. Mean taxa richness and standard error of the mean was calculated based on number of taxa by area (Exposure, Reference).

Simpson's Diversity Index

Simpson's Diversity Index (SDI) measures the proportional distribution of organisms in the community, which considers the density and taxonomic richness of the community. Certain conditions may favour one taxa over another, resulting in the community being dominated by a few taxa, which is reflected in decreased diversity (Simpson 1949). The SDI values range between zero and one, where lower values indicate a less diverse community dominated by few taxonomic groups and higher values indicate a community consisting of more taxa among which density is more evenly distributed. The SDI was calculated using the formula provided by Krebs (Krebs 1999):

$$SDI = 1 - \sum_{i=1}^{S} (p_i)^2$$

Where:

- SDI = Simpson's Diversity Index
- S = the total number of taxa
- p_i = the proportion of the i^{th} taxon (of each unique taxa out of the total abundance of the sample)

For categorization of diversity, SDI values <0.250 were considered to have very low diversity, 0.250 to 0.499 had low diversity, 0.500 to 0.750 were moderately diverse and >0.750 were considered to have high diversity (Table 5-2).

Table 5-2: Diversity Categories for Simpson's Diversity Index (SDI) Values

SDI Value	Diversity Category
<0.250	Very Low
0.250 through 0.499	Low
0.500 through 0.750	Moderate
>0.750	High

Mean SDI and standard error of the mean were calculated for each exposure and reference areas.

Organism Density

For motile invertebrates and fish, mean density (organisms/quadrat) and standard error of the mean were calculated for each exposure and reference areas.

Percent Cover

For macroalgae and sessile invertebrates, mean percent areal cover (total cover) and standard error of the mean was calculated by area (Exposure, Reference). Relative abundance was calculated as percent cover standardized out of 100% for substrate, macroflora, sessile and motile epifauna.

5.3.2.1 Statistical Analysis

5.3.2.1.1 ANOVA and ANCOVA

Differences in substrate, detritus and debris, macroalgae, and benthic epifauna between the exposure area and reference area were analyzed using an analysis of variance (ANOVA) and/or an analysis of covariance (ANCOVA). The ANOVA compares the means of a variable between two or more groups; specifically for these analyses, a one-way ANOVA was used as opposed to a two-way ANOVA as only one independent variable was tested (i.e., exposure versus reference site). The ANCOVA is an extension of the ANOVA and is used to compare the means of a variable between two or more groups while correcting for variability due to another variable (i.e., covariate). Both analyses seek an F value, which is the ratio of the two mean square values being tested, and a p-value, which is calculated based on the F value. A large F value indicates that the variation among the group means is higher than can be accounted for by chance (Zar 2010). Percent cover, density, taxa richness, and diversity (i.e., SDI) of macroflora, sessile, and motile benthic epifauna were used as dependent variables. P-values <0.05 are considered to indicate significance between groups. Analysis was conducted using R statistical software version 4.1.2 (R Core Team 2013).

5.3.2.1.2 Taxa Accumulation

A taxa accumulation curve was calculated for quadrats surveyed in 2021 to provide an estimate of the effort required to fully characterize the quadrat benthic community assemblage, in accordance with Baffinland’s commitment made in response to DFO Technical Comment 17 on the 2020 MEEMP and NIS/AIS Monitoring Program Report (Golder 2021). A taxa accumulation curve illustrates how the number of unique taxa (or species) increases as the number of samples are accumulated; in other words, the harder one looks (i.e., the higher the sampling effort), the more unique taxa are found. The curve reaches an asymptote when all taxa within the given community assemblage have been sampled and the community assemblage is assumed to have been fully described. The observed species (or taxa) curve (S_{obs}) is plotted and the sample (i.e., quadrat) order is randomized and permutated 999 times, resulting in an averaged curve describing a smooth relationship of the average number of species (or taxa) for each number of replicates and the standard error of the mean (i.e. permutations). This is equivalent to station-based rarefaction curves. Analysis was conducted using PRIMER-E statistical software version 7 (Clarke and Gorley 2014, Clarke and Gorley 2015).

5.3.2.1.3 Power Analysis

A power analysis was conducted using the 2021 data to estimate the sample size needed to detect Project-related change based on levels of observed variability among quadrats, in accordance with Baffinland's commitment made in response to DFO Technical Comment 16 and 17 on the 2020 MEEMP and NIS/AIS Monitoring Program Report (Golder 2021).

5.3.3 Quality Management

Quality assurance and quality control (QA/QC) procedures were applied to the field collection, data analysis, and reporting tasks within the chapter component to verify that the data presented were valid and of acceptable quality to address objectives stated in Section 5.1.1.

5.3.3.1 Field QA/QC

QA/QC measures for quantitative and qualitative data collected during quadrat surveys, included:

- Field survey data sheets were checked and cross-validated before in the field.
- Taxa identifications, including common and species name, were verified using references[7].
- Dive survey video, photographs and datasheets were saved to a laptop computer and external hard drive at the end of each field day. Once in the office, the survey data were uploaded to Golder's SharePoint site.

5.3.3.2 Laboratory and Data Analysis QA/QC

The following QA/QC measures were implemented:

- Taxa common name/species name and recorded observations were verified using references[7].
- Transcribed diver-collected data was reviewed for transcription errors by a second biologist.
- Calculations were verified by a second biologist for errors as part of the data review process.

[7] References used during the surveys, included: Mecklenburg et al. (2007), Küpper et al. (2016), Coad and Reist (2018), Golder (2021), WoRMS (2021), Guiry and Guiry (2021)

5.4 Results

This section presents results form the 2021 quadrat sampling program at Milne Port. Representative photographs are provided in Appendix 5B. Quadrat/transect data in tabulated form are presented in Appendix 5C. ANOVA / ANCOVA results are presented in Appendix 5D. Results of the power analysis are provided in Appendix 5E. A taxa list with common and scientific names is provided in Appendix 5F. Taxonomy and algae DNA barcoding results are presented in Appendix 8B-2 (Chapter 8.0).

During field surveys, it was noted that Q12 had been deployed too shallow (-6 m CD) from desired target depth (-7 to -9 m CD) in an area consisting of a high percentage of sand (approximately 90%), trace macroalgae (6%) and no sessile or motile epifauna (Appendix 5B – Photo 1). Macroalgae and epifuana was observed within deeper depths at this location; therefore, the placement of this quadrat within the shallows is considered an outlier. The results from Q12 were not included in the data analysis for 2021 and the location of Q12 should be reassessed for future surveys.

5.4.1 Substrate

Substrate was composed predominantly of silt and sand for all quadrats in both the exposure area and reference area (Figure 5-4, Figure 5-5A), as observed in previous years. Quadrats Q1, Q11, Q14 within the exposure area contained majority sand (ranging 55 to 59%), while silt was more dominant in the other quadrats within both the exposure area (ranging between 50 to 72%) and reference area (ranging between 55 and 79%). The ANOVA/ANCOVA analyses found significant differences in the percent cover of substrate types between the exposure area and reference area for sand and silt, with p-values of 0.003 and 0.032, respectively (Table 5-3). Specifically, the ANCOVA results indicate that silt was slightly higher in the reference area compared to the exposure area; this could be explained by the larger proportion of sand in Q1, Q11, and Q14 within the exposure area.

Other substrate types present in small proportions within each area included cobble (0 to 4%), gravel (0 to 12%), and shell (0-6%). Bedrock was observed in small proportions in Q20 (6% bedrock). When surveying Q20, it was noted that the quadrat had traveled across the sediment surface interface over a steep slope during deployment, causing the sediment to be disturbed and exposing some underlaying bedrock (Appendix 5B – Photo 43). Generally, the proportion of substrate types are similar between the exposure area and reference area, although the substrate recorded in the reference area quadrats do contain slightly higher silt.

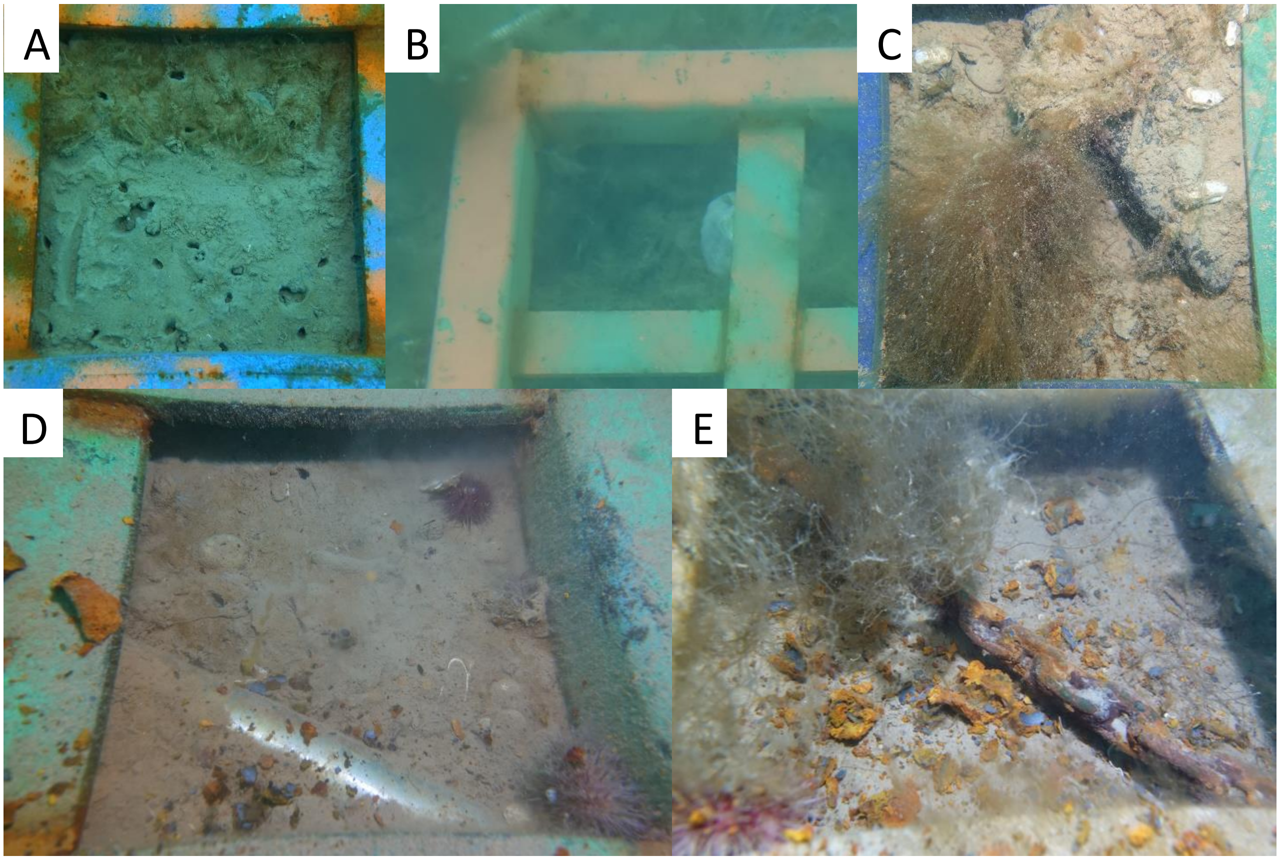

Figure 5-4: Substrate Types Observed in Survey Quadrats at Milne Port: A) Silt/Sand, B) Cobble, C) Bedrock and D) Anthropogenic Debris (i.e., Metal Frame from Old Belt Transect and Chain).

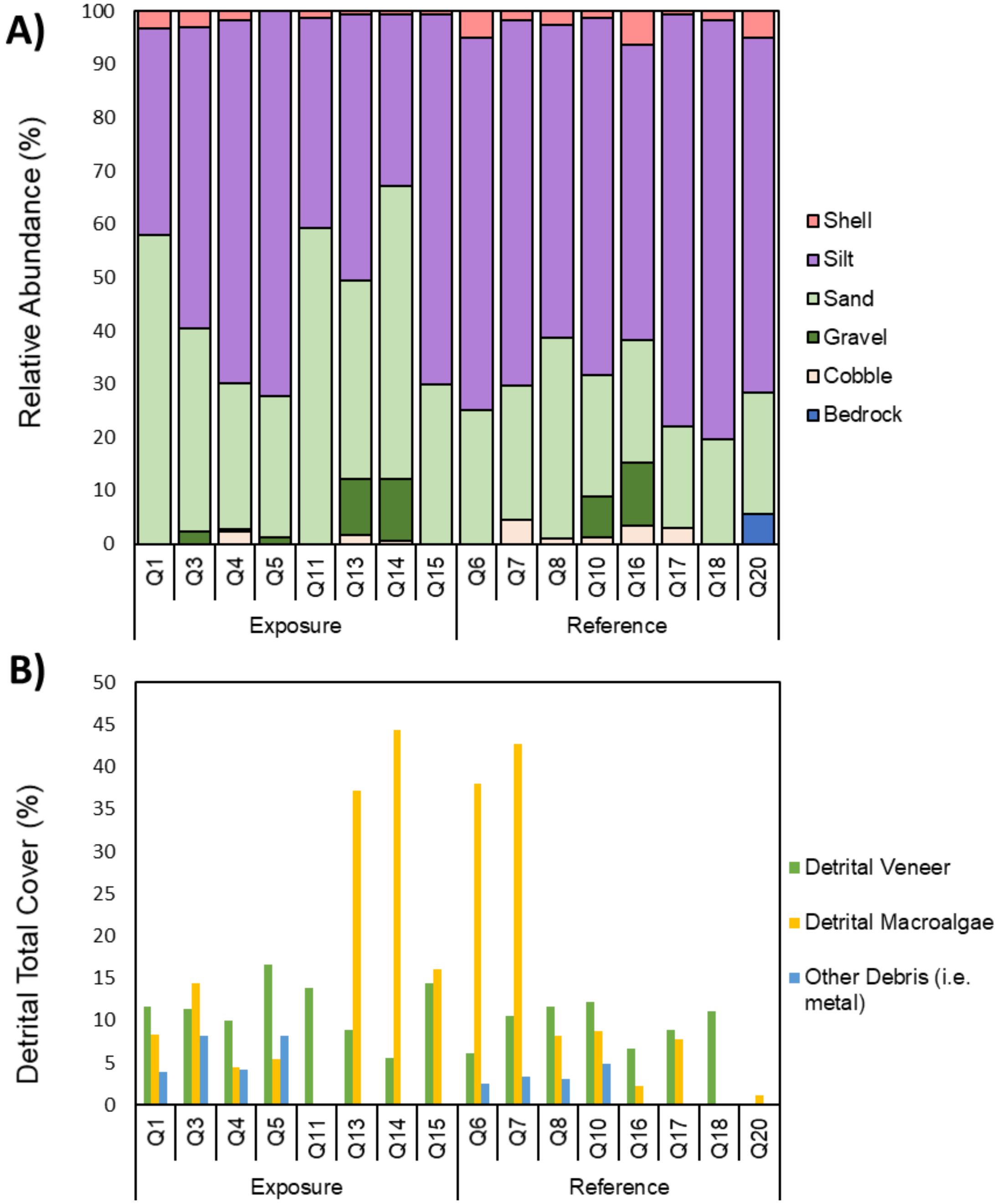

Figure 5-5: Relative Abundance of Substrate Types (A) and Total Percent Cover of Detrital Veneer, Macroalgae and other Anthropogenic Debris (B) during Quadrat Surveys in Milne Port (2021).

Detritus and debris were present in all quadrats in 2021 (Figure 5-5B). Total percent cover of detritus and debris was calculated separately from substrate composition, as it was present over the existing substrate, resulting in overall percent compositions greater than 100%. Detritus and debris were categorized into three groups: detrital veneer, detrital macroalgae, and other debris (i.e. metal). The detrital veneer was organic and appeared to consist of phytoplankton/diatoms and silt; this layer was present within equal ranges between the exposure area (6 to 17%) and reference area (0 to 12%). Detrital (or drift) macroalgae was present in all quadrats in various percent cover, except for Q11 in the exposure area and Q18 in the reference area, which had none. Highest percent cover was recorded in Q13, Q14, Q6, and Q7 (ranging 37 to 44%). Other debris consisted of rusting metal pieces from the suspended anchor chain maintaining the settlement plates buoyant (used for NIS/AIS monitoring [Chapter 8]) above the quadrat, for those quadrats deployed in 2020 (Q1 through Q10). It also includes aluminum metal piping from the old belt transects observed in Q5, as was noted in 2020. No significant differences were found between the reference area and the exposure area for detrital/debris cover (Table 5-3).

Power to detect the observed effect size was only sufficient for percent fines (that is, the combined silt and clay values), but not for detrital algae or detrital veneer (Appendix 5E). An analysis based on eight samples (quadrats) would have sufficient power to detect an effect size of ±40% for percent fines. An increase in effort to 25 quadrats per area would result in sufficient power to detect a ±40% effect size for detrital veneer, but not detrital algae.

Table 5-3: ANOVA and ANCOVA Results of Parameter Effects of Percent Cover on Substrate and Detrital Types – Quadrat Surveys at Milne Port (2021)

Response	Covariate	Percent (%) Cover	
		F-value	Pr(>F)
Bedrock[1]	-	-	-
Cobble	-	2.386	0.143
Gravel	Depth (m)	0.006[2]	0.937
Sand	-	**13.010**	**0.003**
Silt	Depth (m)	**5.700**	**0.032**
Shell	-	3.997	0.064
Detrital/Debris Cover			
Organic Veneer	-	3.398	0.086
Detrital Algae	-	0.046	0.833
Debris (e.g., metal)	Depth (m)	0.456	0.510

Note: Substrate composition refers to the number of substrate types per quadrat location. Residuals and intercept are not presented in this table. See Appendix 5D for full results. Bold text indicates significant p-value <0.05.

[1] Bedrock was not analyzed due to not enough data present between sites.

[2] A Kruskall-Wallis Test, the non-parametric version of an ANOVA, was run instead of an ANOVA on cobble as the data did not meet the assumptions of an ANOVA. Instead of an f-value, a chi-squared value is given.

5.4.2 Macroflora

Macroflora identified in quadrats belonged to three larger taxonomic classifications: Ochrophyta (brown algae), Rhodophyta (red algae) and Chlorophyceae (green algae). Samples opportunistically collected and sent to laboratories for identification improved taxonomic resolution of the 2021 quadrat data compared to earlier years. DNA barcoding results matched the identifications based on morphological features (see Table 8-10 in Chapter 8 for a comparison of results and Appendix 8D-4 for laboratory results). Brown algae were resolved to seven distinct taxa, four of which were defined to species level: rockweed (*Fucus distichus*), sugar kelp (*Saccharina latissima*), sieve kelp (*Agarum clathratum*) and *Halosiphon tomentosus* (Appendix 5B – Photo 16, 19, 20, 39). Two filamentous brown algae were identified to genus level – *Pylaiella* spp. and acid weed (*Desmarestia* spp.) – while a third filamentous brown algae was identified as cf. *Coelocladia arctica*[8] by the taxonomic laboratory (Appendix 5B – Photo 32, 39, 45). Red algae were identified to four distinct taxa, of which three were resolved to species level via taxonomic analysis of samples: *Savoiea arctica*, *Coccotylus truncatus*, and Dilsea [*Dilsea socialis*]) (Appendix 5B – Photo 18, 24, 40). An encrusting coralline red algae was identified to the Order Corallinales, though morphological similarities between taxa within the Order prevented further resolution. Green algae were categorized as two types of filamentous algae, distinguished from one another based on general morphology. Taxonomic analysis confirmed one to be *Chaetomorpha melagonium* (Appendix 5B – Photo 25); however, the other was not collected and remains unidentified.

Macroalgae percent cover varied among quadrats (from 2 to 38%) but were in the same range in both exposure and reference areas (18 ± 5% and 18 ± 4%, respectively) (Table 5-4; Figure 5-6). A total of six out of 16 quadrats surveyed had macroalgae cover above 29%, including three in the exposure area (Q13, Q14, and Q15) and three in the reference area (Q7, Q16, and Q17; Figure 5-6A). The most abundant macroalgae type was brown filamentous algae (various taxa), present in all quadrats except Q1 (Figure 5-6B). *Pylaiella* spp. is a brown filamentous alga, abundant within several quadrats, but unique from other brown algae taxa in the dataset due to it being a fast-growing ephemeral macroalgae. Ephemeral algae are transient, exist for a short period of time, and vary widely in abundance during a given period; in contrast, other brown algae found in the surveys are slower-growing annual or perennial species whose growing characteristics do not fluctuate as much. Sugar kelp (*Saccharina latissima*) and sieve kelp (*Agarum clathratum*) were present in generally low proportions in several quadrats within both exposure and reference areas, although Q5 in the exposure area contained 48% sieve kelp.

Taxa richness was similar between the exposure area and reference areas, ranging between two to seven taxa, and three to six taxa, respectively (Figure 5-6C). SDI ranged between Very Low (<0.250) to Moderate (0.500 to 0.750) in the exposure area and Low (0.250 to 0.499) to High (>0.750) in the reference area (Figure 5-6D), with similar mean values for each area (0.513 ± 0.084 and 0.545 ± 0.040, respectively). Diversity was highest at Q15 and lowest at Q14, both occurring in the exposure area. SDI was high in Q15 due to six unique taxa present in roughly equal proportions, while Q14 had moderate taxa richness (4), but a low SDI as a result of the presence of a single dominant taxon – acid weed (*Desmarestia* spp.) at 93% relative abundance.

No statistically significant differences were detected between the exposure area and reference area for any of the indicators measured (i.e., total percent cover, taxa richness, or SDI (Table 5-5). Overall, these results indicate that the exposure and reference areas were comparable for these indicators. Power to detect the observed effect size was not sufficient for any of the macroflora variables (Appendix 5E). An increase in effort to 25 quadrats per area would result in sufficient power to detect a ±40% effect size for all three variables.

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[8] cf. "compare with", in taxonomy refers to a taxonomic designation that indicates an inexact match to the indicated taxon. The specimen may represent a similar related species, an undescribed morph, or the specimen may be lacking characteristics that allow for a positive identification.

It should be noted that quadrats with high macroalgae cover in 2020 were observed to have high detrital algae cover in 2021, suggesting that there was little distinction made between attached/living and detrital macroflora in 2020. Regardless, a quantitative interannual comparison of macroalgae percent cover was not performed due to a change in survey methods (i.e., from video to divers with opportunistic sample collection) in 2021 that considerably improved taxonomic resolution (thereby influencing taxa richness and diversity calculations) between the two years.

Table 5-4: Quadrat Survey Results for Macroflora - Milne Port (2021)

Survey Area	Quadrat	Macroalgae			
		Total Cover (%)	Taxa Richness	SDI	Dominant Taxa
Exposure	Q1	9	2	0.208	*Pylaiella* spp., *Coccotylus truncatus*
	Q3	3	3	0.528	cf. *Coelocladia arctica*, *Pylaiella* spp.
	Q4	8	2	0.484	Acid weed, red filamentous algae
	Q5	3	3	0.636	Sieve kelp, acid weed
	Q11	13	7	0.685	*Pylaiella* spp., *Coccotylus truncatus*, *Halosiphon tomentosus*
	Q13	38	5	0.606	cf. *Coelocladia arctica*, acid weed
	Q14	36	4	0.125	Acid weed, sugar kelp
	Q15	31	6	0.832	cf. *Coelocladia arctica*, *Coccotylus truncatus*, brown filamentous algae
	Mean ± SE	**18 ± 5**	**4 ± 0.7**	**0.513 ± 0.084**	
Reference	Q6	2	3	0.508	Brown filamentous algae, green filamentous algae
	Q7	29	5	0.618	Acid weed, cf. *Coelocladia arctica*, *Coccotylus truncatus*
	Q8	11	5	0.512	*Halosiphon tomentosus*, green filamentous algae, acid weed
	Q10	13	3	0.310	*Pylaiella* spp., brown filamentous algae
	Q16	29	6	0.508	*Pylaiella* spp., Dilsea
	Q17	38	6	0.604	Acid weed, *Pylaiella* spp., *Coccotylus truncatus*
	Q18	13	5	0.663	Acid weed, *Pylaiella* spp., *Halosiphon tomentosus*
	Q20	10	4	0.638	Acid weed, sugar kelp
	Mean ± SE	**18 ± 4**	**5 ± 0.4**	**0.545 ± 0.040**	

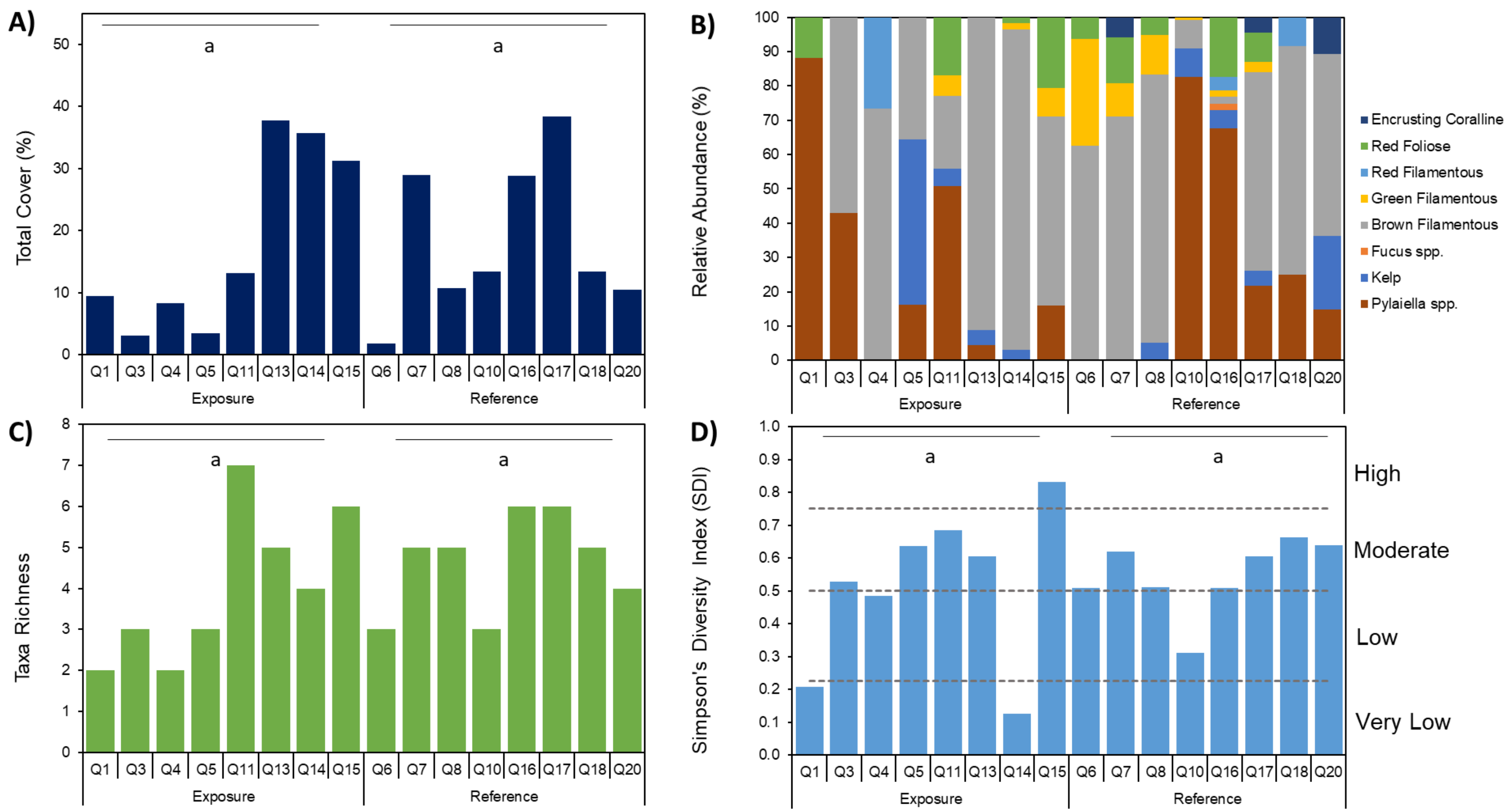

Figure 5-6: Total Percent Cover (A), Relative Abundance (B), Taxa Richness and (C) Simpson's Diversity Index (D) of Macroflora Recorded in Survey Quadrats in Milne Port in 2021. Letters Indicate Statistical Significance (p<0.05) Between Groups.

Table 5-5: ANOVA and ANCOVA Results of Parameter Effects of Total Percent Cover, Taxa Richness, Simpson's Diversity Index on Macroflora – Quadrat Surveys in Milne Port (2021)

Response	Covariate	F-value	Pr(>F)
Total Percent Cover	-	1.218	0.287
Taxa Richness	Depth (m)	1.258	0.281
Simpson's Diversity Index (SDI)	Percent (%) Cover of Fines (Silt/Clay)	0.964	0.343

Note: Residuals and intercept are not presented in this table. Response variables without a covariate were analyzed using an ANOVA while response variables with covariates were analyzed using an ANCOVA. See Appendix 5D for full results. Bold text indicates significant p-value <0.05.

5.4.3 Benthic Epifauna

Benthic epifauna identified in the quadrats belonged to seven phyla: Annelida (worms), Platyhelminthes, Cnidaria, Arthropoda, Chordata, Echinodermata, and Mollusca. Taxonomic identification of collected specimens improved resolution of the 2021 quadrat data compared to earlier years.

Phylum Annelida was represented by three distinct taxa, one of which was identified to species level (cone worm [*Cistenides granulata*], Appendix 5B – Photo 3). Two species of sabellid worms (Family Sabellidae) were distinguished but unable to be identified (Appendix 5B – Photo 23) while a single flat worm (Phylum Platyhelminthes) was observed and also remains unidentified. The phylum Echinodermata was represented by brittle stars (Family Ophiuridae) and green urchin (*Strongylocentrotus droebachiensis*), and the phylum Cnidaria was represented by an individual burrowing anemone, Ceriantharia indet. (Appendix 5B – Photo 26, 31). The majority of species identified in the quadrats belonged to the phylum Mollusca, with four species identified: wrinkled rock borer clam (*Hiatella arctica*), icelandic scallop (*Chlamys islandica*), northern astarte clam (*Astarte borealis*), and Greenland glass-scallop (*Similipecten greenlandicus)* (Appendix 5B – Photo 8, 28, 29, 43). Several specimens were able to be resolved as far as genus, including: blunt gaper (*Mya* spp.), Margarite snail (*Margarites* spp.), and clams of the genus Astarte and Macoma (Appendix 5B – Photo 7, 40). Phylum Arthropoda was represented by two species of shrimp (Pandalus shrimp [*Pandalus* spp.], and sculptured shrimp [*Sclerocrangon boreas*]) (Appendix 5B – Photo 13. 27), as well as unidentified barnacles and amphipods. Phylum Chordata was represented by tunicates (Subphylum Tunicata) of which one was identified to genus level (*Polycarpa* spp.), fish from the sculpin family (Cottidae) and a type of pout (cf. *Gymnelus* spp.) (Appendix 5B – Photo 4, 15, 44)

5.4.3.1 Sessile Epifauna

Total percent cover of sessile epifauna varied among quadrats in both exposure and reference areas but, on average, was lower in the reference area (26 ± 3% and 18 ± 4%, respectively) (Table 5-6, Figure 5-7). Wrinkled rock borer clam was the dominant sessile epifauna taxa in the majority of quadrats, aside from Q10, Q14, Q16, and Q17 where cone and sabellid worms were the most dominant taxa. The 2021 results are consistent with 2020 results, where wrinkled rock borer clam was the most dominant taxa for most quadrats, while cone worms, unidentified tube worms, and feather worms (these could be Sabellid worms) were the dominant taxa in Q10.

Taxa richness was similar between the exposure area (5 ± 0.5 taxa) and reference area (6 ± 0.6 taxa) (Figure 5-7C). Taxa richness values were higher in several quadrats in 2021 compared to 2020, which is attributed to changes in survey methodology that improved taxonomic resolution. SDI ranged between Very Low (<0.250) to Moderate (0.500 to 0.750) in both areas (Figure 5-6D), with no difference in mean values (0.427 ± 0.055 SDI for exposure area; 0.479 ± 0.079 SDI for reference area). Diversity was very low for Q1, Q8, and Q18 due to a high proportion of wrinkled-rock borer clam dominating the total percent cover. Because taxa richness is part of the SDI calculation, comparing this indicator between the two years is not warranted as it is already accounted for.

No statistically significant differences were detected between the exposure area and reference area for total percent cover, taxa richness, or diversity (SDI) of sessile epifauna (Table 5-7). Overall, this suggests that the exposure and reference areas were comparable with respect to these indicators; however, the power analysis indicated that there was inadequate power to detect the observed effect size for any of the assessed variables (Appendix 5E). An increase in survey effort to 25 quadrats per area would be needed to have sufficient power to detect a ±40% effect size for SDI and taxa richness, but not for sessile epifauna density.

Table 5-6: Quadrat Survey Results for Sessile Epifauna - Milne Port (2021)

Survey Area	Quadrat	Sessile Epifauna			
		Total Cover (%)	Taxa Richness	SDI	Dominant Taxa
Exposure	Q1	32	5	0.215	Wrinkled rock-borer, cone worm
	Q3	32	5	0.420	Wrinkled rock-borer, blunt gaper
	Q4	16	7	0.341	Wrinkled rock-borer, cone worm
	Q5	19	5	0.586	Wrinkled rock-borer, unidentified (unid.) clam
	Q11	35	6	0.363	Wrinkled rock-borer, cone worm
	Q13	24	4	0.658	Wrinkled rock-borer, cone worm, sabellid worm
	Q14	13	3	0.547	Sabellid worm, cone worm, wrinkled rock-borer
	Q15	34	3	0.285	Wrinkled rock-borer, cone worm
	Mean ± SE	**26 ± 3**	**5 ± 0.5**	**0.427 ± 0.055**	
Reference	Q6	10	6	0.468	Wrinkled rock-borer, blunt gaper
	Q7	7	7	0.713	Wrinkled rock-borer, sabellid worm, burrowing anemone
	Q8	37	8	0.201	Wrinkled rock-borer, blunt gaper
	Q10	9	4	0.655	Cone worm, wrinkled rock-borer
	Q16	14	6	0.620	Cone worm, wrinkled rock-borer, blunt gaper
	Q17	6	5	0.645	Sabellid worm, wrinkled rock-borer
	Q18	31	5	0.109	Wrinkled rock-borer, blunt gaper
	Q20	30	9	0.422	Wrinkled rock-borer, cone worm
	Mean ± SE	**18 ± 4**	**6 ± 0.6**	**0.479 ± 0.079**	

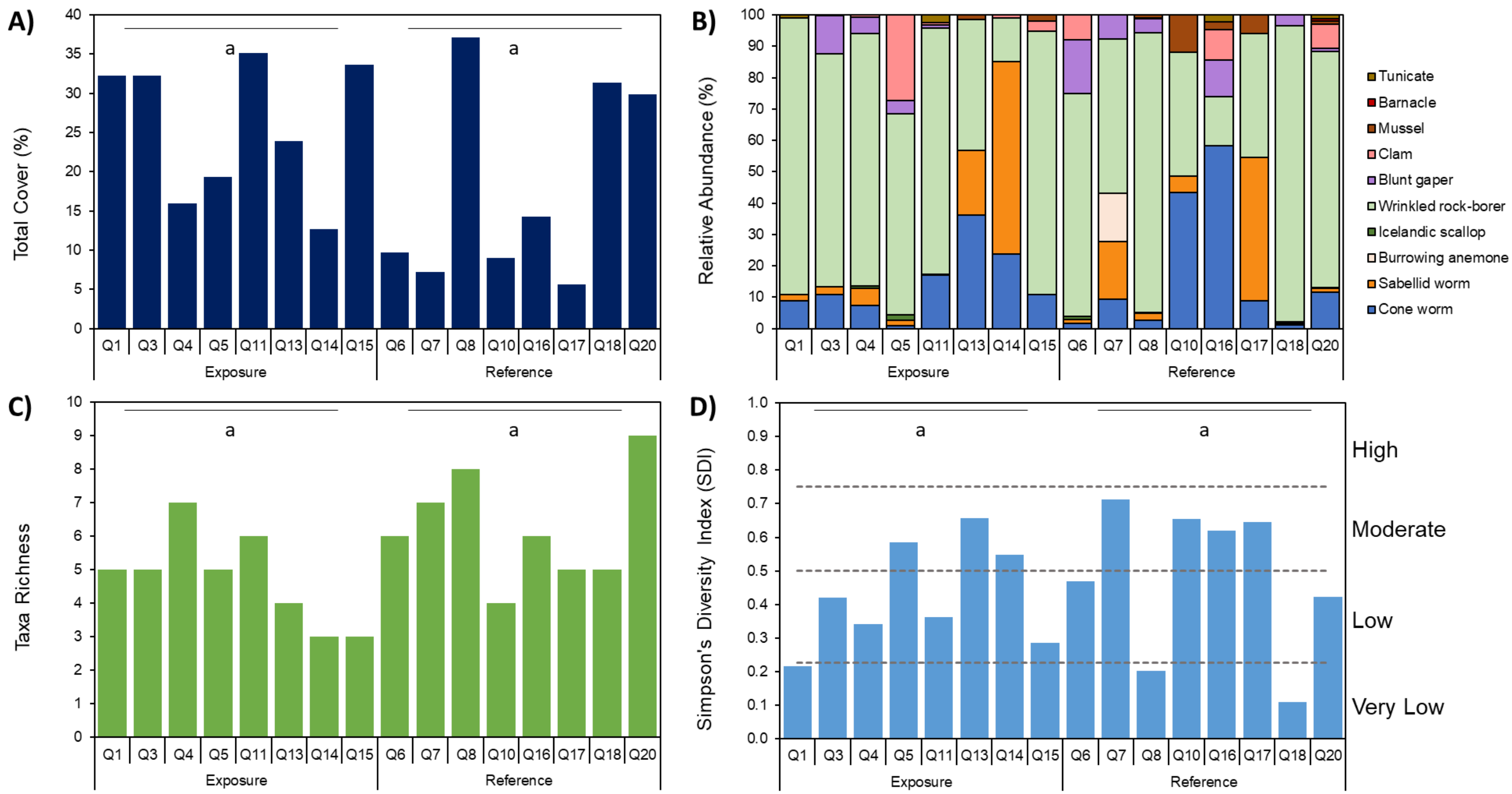

Figure 5-7: Total Percent Cover (A), Relative Abundance (B), Taxa Richness and (C) Simpson's Diversity Index (D)) of Sessile Epifauna Recorded in Survey Quadrats in Milne Port (2021). Letters Indicate Statistical Significance ($p<0.05$) Between Groups.

Table 5-7: ANOVA and ANCOVA Results of Parameter Effects of Total Percent Cover, Taxa Richness, and Simpson's Diversity Index on Sessile Epifauna – Quadrat Surveys in Milne Port (2021)

Response	Covariate	F-value	Pr(>F)
Percent Cover	Percent (%) Cover of Fines (Silt/Clay)	1.194	0.293
Taxa Richness	-	0.664	0.428
Diversity (SDI)	-	0.951	0.345

Note: Residuals and intercept are not presented in this table. Response variables without a covariate were analyzed using an ANOVA while response variables with covariates were analyzed using an ANCOVA. See Appendix 5D for full results. Bold text indicates significant p-value <0.05.

5.4.3.2 Motile Epifauna

Motile epifauna density was generally low but within the same range for the exposure and reference areas, where all quadrats contained densities below 20 organisms/quadrat except for Q6, which had a density of 74 organisms/quadrat (Table 5-8, Figure 5-8). Q13 and Q15 contained no motile epifauna. Green urchins were the dominant motile epifaunal species recorded in the exposure area; however, Icelandic glass-scallop was the sole motile organism recorded in Q11. In contrast, several quadrats in the reference area were largely dominated by brittle stars (Q6, Q8, Q10, Q18, and Q20), while others contained a variety of taxa (Q7, Q16, and Q17) (Figure 5-8B).

Taxa richness was similar between the two survey areas (ranging 0 – 4 in exposure area; 1 - 5 in the reference area) (Figure 5-8C). Several quadrats within both the exposure area and reference area had a diversity of zero: these were quadrats without any motile epifauna (Q13 and Q15) or quadrats that contained only one or two organisms of a single taxa (Q8, Q10, Q11, and Q14) (Figure 5-8D). SDI reached as high as moderate (0.500 to 0.750) in quadrats within the exposure area and up to High (>0.750) in the reference area. A similar variation in taxa richness and diversity between exposure and reference area was observed in 2020 and 2021, indicating that there is no difference between the years.

No statistically significant differences were detected between the exposure and references for any indicators measured (i.e., density, taxa richness, or diversity (SDI); Table 5-7). Overall, these results indicate that the exposure and reference areas were comparable for these indicators, however, the power analysis indicated that there was inadequate power to detect the observed effect size for any of the assessed variables (Appendix 5E). An increase in survey effort to 25 quadrats per area would be needed to have sufficient power to detect a ±40% effect size for density and taxa richness, but not for SDI.

Table 5-8: Quadrat Survey Results for Motile Epifauna - Milne Port (2021)

Survey Area	Quadrat	Motile Epifauna			
		Density (org/quadrat)	Taxa Richness	SDI	Dominant Taxa
Exposure	Q1	9	4	0.519	Green urchin
	Q3	16	4	0.602	Green urchin, brittle star
	Q4	13	4	0.391	Green urchin
	Q5	20	4	0.415	Green urchin
	Q11	1	1	0.000	Icelandic scallop
	Q13	0	0	0.000	No motile epifauna
	Q14	1	1	0.000	Green urchin
	Q15	0	0	0.000	No motile epifauna
	Mean ± SE	**8 ± 3**	**2 ± 0.7**	**0.241 ± 0.094**	
Reference	Q6	74	5	0.371	Brittle star
	Q7	5	4	0.720	Brittle star
	Q8	2	1	0.000	Brittle star
	Q10	1	1	0.000	Brittle star
	Q16	4	3	0.813	Snail, brittle star, margarite snail
	Q17	3	3	0.667	Brittle star, snail, limpet
	Q18	2	2	0.500	Brittle star, juvenile fish
	Q20	13	3	0.272	Brittle star
	Mean ± SE	**13 ± 9**	**3 ± 0.5**	**0.418 ± 0.111**	

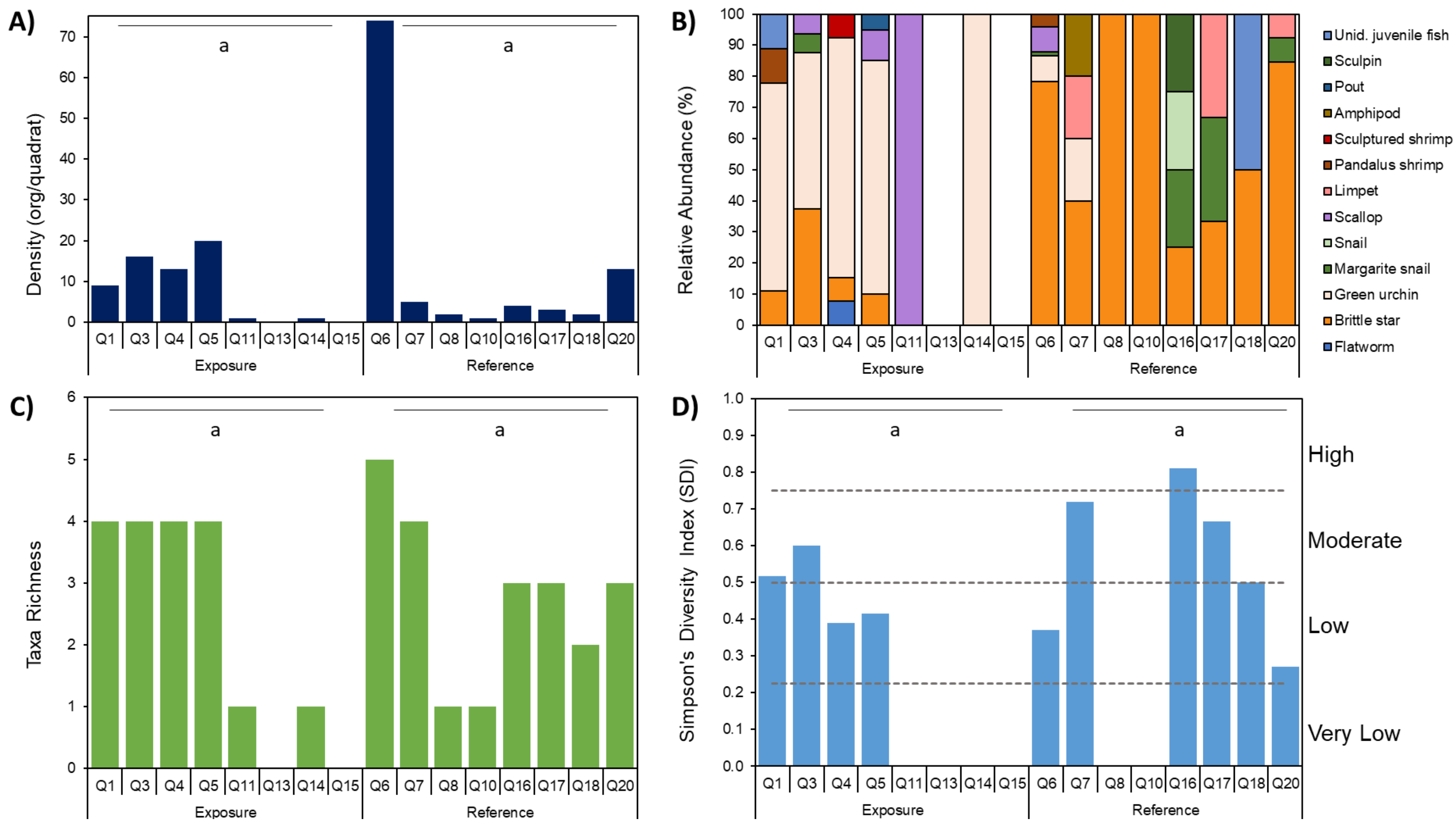

Figure 5-8: Density (A), Relative Abundance (B), Taxa Richness and (C) Simpson's Diversity Index (D) of Motile Epifauna Recorded in Survey Quadrats in Milne Port in 2021. Letters Indicate Statistical Significance (p<0.05) Between Groups.

Table 5-9: ANOVA and ANCOVA Results of Parameter Effects of Total Percent Cover, Taxa Richness, and Simpson's Diversity Index on Motile Epifauna – Quadrat Surveys in Milne Port (2021)

Response	Covariate	F-value	Pr(>F)
Density	Depth (m)	0.001	0.974
Taxa Richness	Depth (m)	0.094	0.763
Diversity (SDI)	Percent (%) Cover of Fines (Silt/Clay)	0.376	0.220

Note: Residuals and intercept are not presented in this table. Response variables without a covariate were analyzed using an ANOVA while response variables with covariates were analyzed using an ANCOVA. See Appendix 5D for full results. Bold text indicates significant p-value <0.05.

5.4.4 Relative Richness and Diversity

Taxa richness varied between and among quadrats (Figure 5-9A), with no apparent relationship observed between macroflora, sessile epifauna, or motile epifauna. Statistical analysis yielded no significant differences between the exposure area or reference area for any of the comparisons. Overall, Q7 and Q8 in the reference area stand out as harbouring the overall greatest taxa richness with the highest values for each macroflora, sessile and motile epifauna relative to other quadrats.

Diversity of macroflora, sessile epifauna and motile epifauna ranged from very low to high (Figure 5-9B); however, statistically significant differences in diversity were not found for any of the comparisons. Overall, Q7 and Q17 displayed the greatest diversity, where macrofauna, sessile and motile epifauna values were all characterized as moderate. No quadrat had Very Low or Low diversity values across all benthic community components (i.e., macroflora, sessile or motile epifauna).

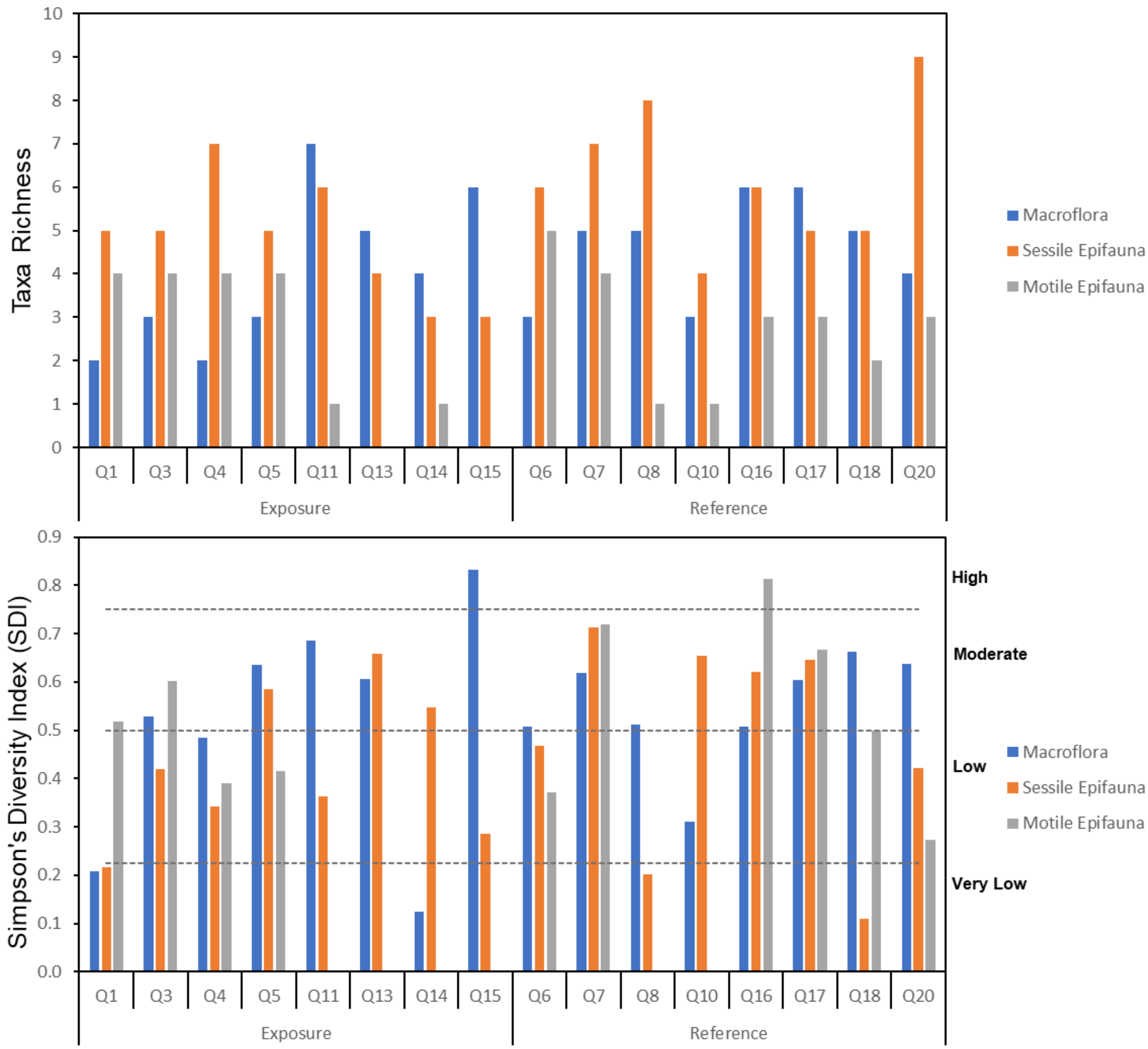

Figure 5-9: Taxa Richness (A) and Simpson's Diversity Index (SDI) (B) for Macroflora, Sessile Epifauna and Motile Epifauna – Quadrat Surveys in Milne Port (2021).

5.4.5 Sampling Effort

A taxa accumulation curve was calculated for quadrats surveyed in 2021 to provide an estimate of the effort required to fully characterize the quadrat benthic community assemblage (macroalgae, sessile and motile epifauna) (Figure 5-10). The accumulated species (or taxa) observed curve (S_{obs}) shows the mean number of species (or taxa) for each number of permutation and Standard Error (SE) of the mean.

The taxa accumulation curve for the 2021 sampling effort approached, but did not reach, an asymptote for the 17 quadrats sampled. This indicates that sampling in 2021 did not full attain levels to fully describe the overall benthic community assemblage.

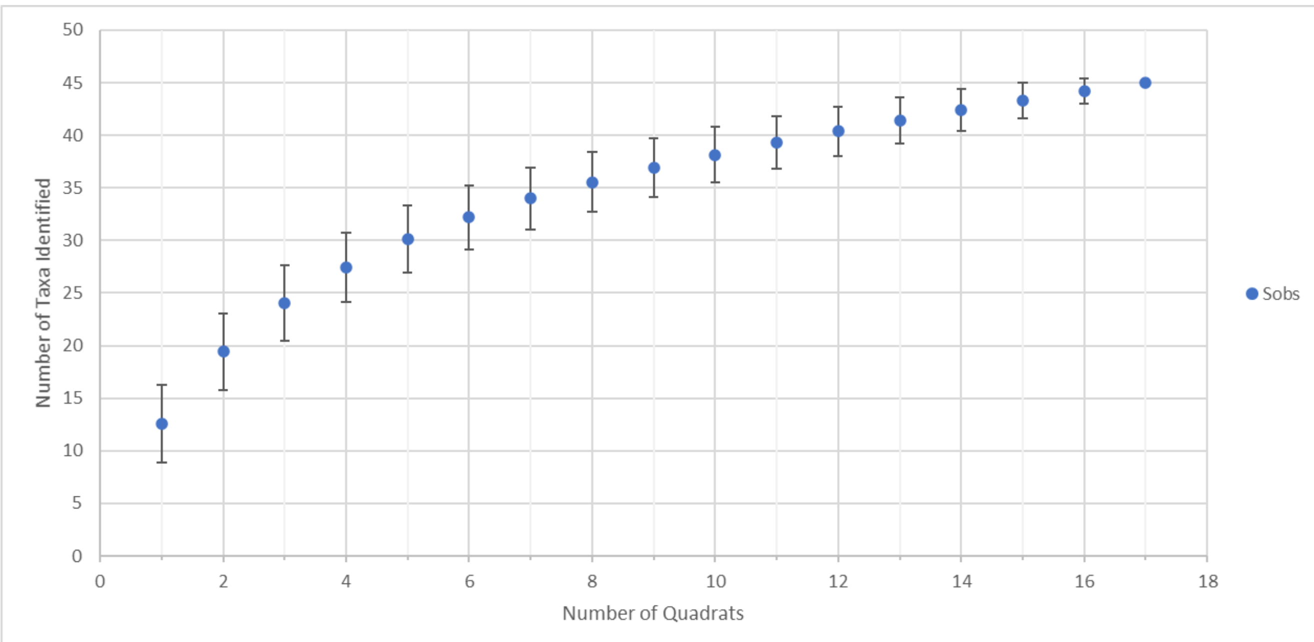

Figure 5-10: Taxa Accumulation Curve for Quadrat Benthic Community Assemblage in Milne Port (2021).

5.4.6 Opportunistic Fish Observations

A species of eelpout (*Lycodes* spp.) was observed residing within the hollow frame of Q1 in Milne Port (Appendix B - Photo 6). Identification to species level was not possible because only part of the head was visible.

When searching for Q2 in Milne port, several sand lance (*Ammodytes* spp.) where observed emerging from the sandy sediment (-4 to -6 m CD depth) as divers approached, however their elusive behaviour precluded video/photo documentation.

5.5 Discussion

Taxonomic resolution was improved in 2021 due to the exclusive use of divers for data collection, which enabled opportunistic collection of samples for taxonomic and/or genetic analysis. In contrast, the methodology employed in 2020 used a combination of ROV underwater video surveys and dive surveys, hence taxonomic resolution was relatively coarse. Accordingly, quantitative comparisons between the two years were not possible and the 2021 quadrat survey results will serve as a baseline for future years. Golder recommends that methodologies remain consistent moving forward to allow for multi-year comparisons.

Substrate type was similar among quadrats and between the exposure and reference areas. A detrital layer, comprised of organic detritus and other debris, was present in all quadrats; the extent and composition of the detrital layer was variable with no significant differences between reference and exposure areas. Substrate within the quadrats was dominated by soft silt and sand, consistent with what has been previously documented. While there were some statistically significant differences in sand and silt percent cover between the exposure and reference areas (silt was slightly higher in the reference area), these likely reflect natural variability driven by the dynamic estuarine nature of Milne Port, which produces fine-scale spatial variation in substrate characteristics due to internal mixing and sediment redistribution processes as well as the influence of features such as Phillips Creek. Similar macroflora and benthic epifaunal taxa were observed in 2021 as in previous years (2018-2020). Indicators (i.e., percent cover, density, species richness, and diversity) were shown to be variable within and among quadrats and between the reference and exposure areas; however, no statistically significant differences were noted between the exposure and reference areas for any of the indicators evaluated. Overall, results of this survey suggest that substrate, macrofloral and epibenthic community assemblages are comparable between the exposure and reference areas with no obvious evidence of Project-related influence or impairment.

The survey design in 2021 aimed to sample a total of 20 quadrats; however, four of these quadrats could not be surveyed in 2021 for various reasons. Quadrat Q2 could not be relocated after an extensive dive search, and time constraints prevented surveying Q9 and Q19 due to several inclement weather days that prevented safe diving operations. Q12 was excluded from the data analysis as an outlier, having been deployed in shallow water (-6 m CD) susceptible to ice scour, which limits macroflora and epifauna density. Effect size was explored on 2021 data using a power analysis to estimate the sample size needed to detect Project-related change based on levels of observed variability among quadrats, and whether the sample size (16 quadrats) was adequate to fully describe the benthic community assemblage. The results of the power analysis indicate that the power to detect the observed effect size was not sufficient for any of the assessed variables (indicators). This was not unexpected given epifaunal communities are commonly associated with high temporal and spatial variability; this is the reason standard EEM practice generally recommends monitoring benthic infauna rather than epifauna (Environment Canada 2012). In addition, the taxa accumulation curve completed for the 2021 epifauna data suggested that the benthic community assemblage has not been fully characterized by the current sampling effort (i.e., 16 quadrats), although the curve appears to be reaching its asymptote.

The results of the power analysis indicate that the sample size of the current study design is not sufficient for detecting small-scale differences between exposure and reference area, though large-scale differences would likely be noted. An increase in effort to 25 quadrats per area would result in sufficient power to detect a ±40% effect size for most, but not all, indicators; however, the diving effort involved with surveying a total of 50 quadrats within the limited open-water season in the region would not be realistic to complete within the timeframe available for summer field program. Use of alternative and/or supplemental methodologies, such as ROV and underwater video, have already been explored in previous years and replaced with divers due to challenges in collecting data at acceptable taxonomic resolution. Three options were discussed with the MEWG about how best to move forward: (i) remove this component entirely from the MEEMP and focus on other components that have the ability to detect change with statistical power (e.g., benthic infauna, sediment quality); (ii) maintain the current sampling methodology (as this has produced the highest resolution in the data thus far) and current sampling effort (i.e., detection of large-scale trends only), accepting the associated statistical limitations; or, (iii) add a minimum of two additional quadrats in each survey area to increase the number of indices for which ±40% change can be detected from two to six. It was ultimately decided to increase the number of quadrats in each area by three, to 13, for a total sample size of 26 quadrats across both areas. The additional quadrats will be deployed in summer 2022.

5.6 Conclusions and Recommendations

Surveys in 2021 exclusively utilized divers to collect quadrat data, which improved taxonomic resolution for characterizing the benthic community assemblage. It is recommended that a diver-based methodology permanently replace the combined use of ROVs and underwater video. Not only will this enable data collection to occur in a standardized manner, but also enables collection of specimens for taxonomic verification and hence improves the resolution of this component. Future dive surveys should analyze the quadrats as a whole (not by sub-quadrat) to reduce diving time. Further, a new quadrat should be deployed to replace the missing quadrat (Q2) and the location of Q12 should be moved to a deeper site so that it can be included in analyses moving forward. Future field surveys should incorporate enough field days to buffer for inclement weather.

Overall, macrofloral and benthic epifaunal community assemblages are comparable between exposure and reference areas. Observations reveal no evidence of spatial or temporal trends that might be associated with Project-induced effects from construction or operation activities and Milne Port. However, these results should be interpreted with some caution, as a power analysis and a taxa accumulation curve on 2021 data indicate that the current sample size of 16 quadrats is not adequate to detect small-scale significant differences in indicators in substrate, macroflora, or benthic epifauna, or to fully characterize the benthic community assemblage. Rather, the number of quadrats would need to more than double (at least 25 quadrats in each area) to detect a 40% change (i.e., effect size).

Given that sampling effort to date has not been adequate to detect community change with acceptable statistical power, three additional survey quadrats will be deployed in each of the study and reference areas (total of six additional quadrats) in 2022. This is a commitment made by Baffinland through ongoing discussions with the MEWG.

5.7 Closure

We trust this information is sufficient for your needs at this time. Should you have any questions or concerns, please do not hesitate to contact Phil Rouget, on behalf of the undersigned, at 604-230-7630.

Golder Associates Ltd.

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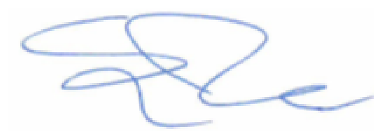

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APPENDIX 5A

Marine Foreshore Environmental Assessment Procedure

MARINE FORESHORE ENVIRONMENTAL ASSESSMENT PROCEDURE

Marine development projects have the potential to effect fish[1] and fish habitat[2]. Fisheries and Oceans Canada (DFO) is responsible for the protection and management of fish habitats under the authority of the *Fisheries Act* and may request plans, specifications and environmental assessments specific to marine projects where more detailed information is required. Assessments may be necessary for all types of projects, including, but not limited to aquaculture, log handling, industrial port development, marinas, private moorage facilities, marine repair facilities, pipeline or outfall installations, vessel launches or barge ramps, dredging projects and shoreline protection projects (breakwaters and seawalls). Presented below are standardized, transect-based assessment procedures intended to provide DFO with the basic information required to determine the potential effects of a development project on fish habitat.

Assessment Area

For comparative purposes, the assessment area should include both the foreshore site proposed for development as well as the adjacent foreshore. This will provide a context for the project and may provide data about cumulative effects if similar developments already occur on-site. A large scale site plan, preferably an enlargement of the hydrographic chart, with a small scale insert of the general geographic location will serve as a base map of the study area.

Tidal Height and Water Depth Measurements

The lowest normal tide (0.0 m), or chart datum, will be used as the reference point for the measurement of tidal height and water depth. Tidal height is recorded as positive relative to chart datum, while water depth below chart datum will be recorded as a negative value. For example, if the assessment is made when the tide is at 2 m, and observations are taken at a water depth of 6 m, then the depth will be recorded as -4 m. Tidal height will be corrected using the closest secondary port to the reference port found in the Canadian Tide and Current Tables, with further correction made for daylight savings time as required.

Transect Layout

Transects should be established perpendicular to the shoreline at regular intervals both within and adjacent to the proposed or active development area so as to sample representative fish habitat conditions. A preliminary low water reconnaissance or dive survey may be advisable to establish

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[1] shellfish, crustaceans, marine animals and any parts of shellfish, crustaceans or marine animals, and the eggs, sperm, spawn, larvae, spat and juvenile stages of fish, shellfish, crustaceans and marine animals;

[2] shellfish, crustaceans, marine animals and any parts of shellfish, crustaceans or marine animals, and the eggs, sperm, spawn, larvae, spat and juvenile stages of fish, shellfish, crustaceans and marine animals;

appropriate boundaries for the assessment. Transects should begin at the highest high water mark (HHWM: distance referenced as Station 0.0 m) and, at a minimum, extend to a depth of -20 m (–30 m if the development has the potential to effect deeper benthic habitats). Though small-scale intertidal projects may only require intertidal transects, care must be taken to ensure that a representative sample is collected across the proposed development area. Procedural manuals are available from DFO if sampling of intertidal clam or benthic invertebrates is required. To ensure complete assessment of marine plants and animals in the photic zone, deeper transects may be necessary, especially to determine the effects of sunken debris or woodwaste accumulations resulting from existing developments. Transects should be spaced approximately 25 m apart, although this interval may vary depending on the width of the site. The number of transects required will depend on the nature of the foreshore development proposed, anticipated effects of the development, and local site conditions (tides and currents, geography, fetch, geology, etc.). Transects should be individually numbered and indicated on the site plan, and their commencement point referenced to benchmarks, where possible.

Recording Observations

Habitat inventories should be conducted during the more productive spring and summer months. At that time, algae and saltmarsh species are more readily identifiable, enabling a better assessment of the productive capacity of the site.

Observations should be recorded every 5 m along the transect or at significant changes in habitat type. Observations should include substrate type and composition, presence and relative abundance of marine animals and plants, and any other notable features (e.g., debris accumulations) using the following format:

Substrate

Substrate types are to be subdivided into the following size class categories:

- Bedrock
- Boulder (>256 mm diameter)
- Cobble (64-256 mm diameter)
- Gravel (2-64 mm diameter)
- Sand (0.0625-2 mm diameter)
- Silt/Mud/Clay (<0.0625 mm diameter)

Substrate types are recorded cumulatively as percentages out of a total of 100% (e.g., Boulder 5%; Cobble 15%; Gravel 60%, Sand 20%)

Marine Plants

Marine plants include rooted vascular vegetation (e.g., eelgrass, saltmarsh vegetation, etc.) and marine algae (e.g., rockweed, kelp, etc.). Marine plant observations are recorded as percent areal coverage estimated per 5 m × 1 m transect segment. Observations can be recorded as percentages (5%, 10%, 15%, etc.) or by utilizing the following areal coverage classes:

+	<5%
1	5-25%
2	>25-50%
3	>50-75%
4	>75-100%

Sessile Animals

Many marine animals permanently attached to substrates function as important fish habitat (e.g., barnacles, bay mussels, etc.). Sessile animals are recorded as percent areal coverage along the transect line using either estimated percentages or by areal coverage classes, as presented above.

Motile Animals

Motile animals include fish and marine invertebrates such as crabs and snails. These can be individually counted along the transect or, where too numerous, their estimated numbers can be recorded. Population estimates will most likely be applied to species such as herring or mysid shrimp that naturally occur in large numbers.

Other Features

Accumulations of wood bark and debris, sunken logs or other waste materials arising from onsite or nearby development activities should also be recorded. For wood bark and related small size debris, observations are recorded as percent areal coverage estimates per 5 m × 1 m transect segment and estimated deposition depth (e.g., 15% / 10 cm). For larger materials (sunken logs, wood chunks, etc.), observations can be recorded by individual piece count or by estimate of percent areal coverage.

Observations should be correlated to the transect distance from the HHWM and (corrected) tidal height or water depth (e.g., Sta. 0+80 m / +4.5 m), with information compiled in tabular form, by transect. Common names of observed animals and plants are acceptable for the data table; a species list with scientific names should, however, be appended to the report.

General marine plant categories (e.g., rockweed, eelgrass, bull kelp, saltmarsh, etc.) and any other notable features should be sketched to scale directly on a copy of the site plan, drawings or photographs of the site. A site profile should be prepared for each transect showing the slope of the foreshore and the location of indicator marine plants or invertebrates. A sketch of the proposed marine development should be superimposed over the site plan so that any potential effect of the project on fish habitat is clear. Compensatory habitat proposed for offsetting altered habitat should also be sketched on site maps and profiles to enable review of the positioning of replacement habitat relative to the project.

Photographic Documentation

It is essential to produce a photographic record along the intertidal and subtidal transects. A videographic record of subtidal transects is also recommended. Photos and videos provide a real-time record of characteristic fish habitat at the proposed site and can be invaluable to future post-development site monitoring. Photographic records also facilitate comparison of the productivity of natural habitats with any compensatory habitat constructed to offset habitat losses. As visibility may be a problem, careful attention should be given to appropriate tidal levels, and midday lighting conditions are recommended. Aerial photos, taken at low tide, are often useful to put the site into context with the surrounding area and to verify information provided from other sources.

Assessment reports should include photographs of representative fish habitat types. Depending upon the scope of the proposed foreshore development, an unedited, labelled copy of the assessment video may also be required for the report submission. The video footage should be referenced with pertinent information (e.g., time, date, depth, heading, etc.), and a written or recorded interpretation should accompany the video.

Summary of information to be submitted

1. Basemap showing tenure area boundaries, surrounding area, transect locations and sampling stations
2. Shoreline video/photographs of intertidal zone
3. Underwater video/photographs of transects
4. Tabular data for each transect describing substrate type and composition, marine plants, sessile and motile marine animals, and other notable features
5. Habitat map showing location of different substrate types, plants, animals and operational infrastructure
6. Profile diagrams of each transect showing slope, sediment types and the major marine plants or animals observed
7. Photographs of site and aerial photographs if available.

APPENDIX 5B

Photographs

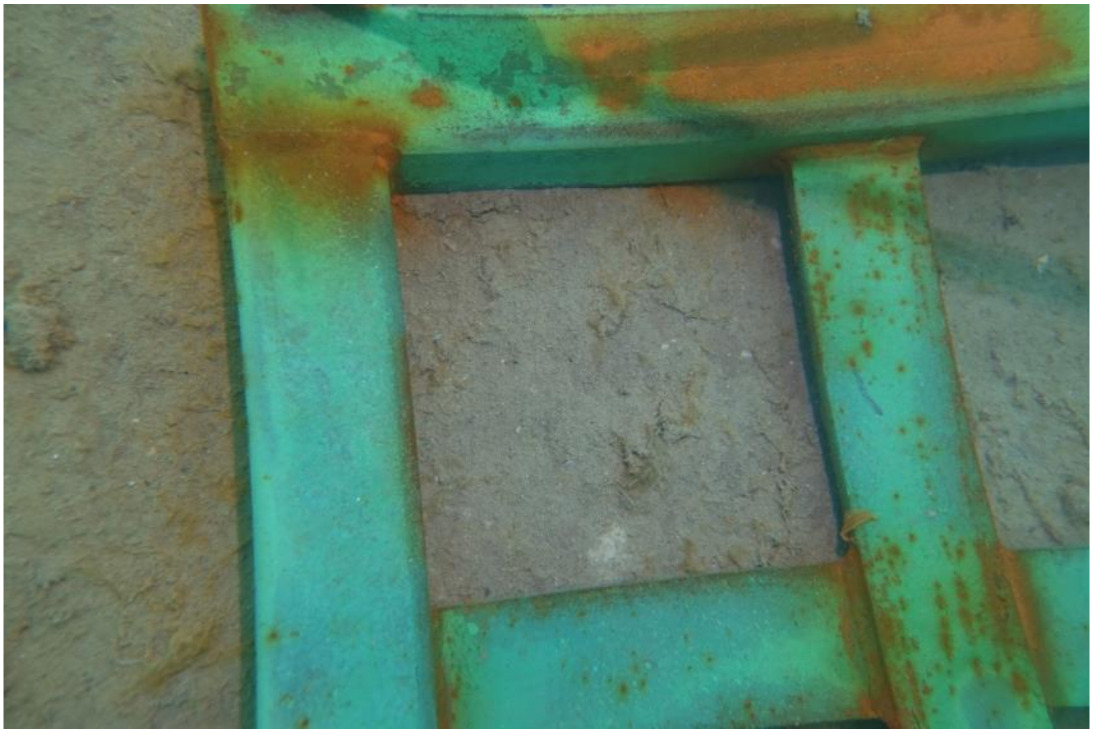

Photo 1: Photo of Q12 deployed in Milne Port in 2021.

Photo 2: Diver surveying Q11 in Milne Port (2021).

Photo 3: Wrinkled Rock-borer Clam (*Hiatella artica*) and Cone Worm (*Cistenides granulata,* Yellow Arrow) in Q1 in Milne Port (2021).

Photo 4: Orange Tunicate (*Polycarpa* spp.) Identified in Q1 in in Milne Port (2021).

Photo 5: Shrimp (*Pandalus* spp.) and Brown Filamentous Algae Recorded in Q1 in Milne Port (2021).

Photo 6: Eelpout (*Lycodes* spp.) Inside Steel Frame of Q1 in Milne Port (2021).

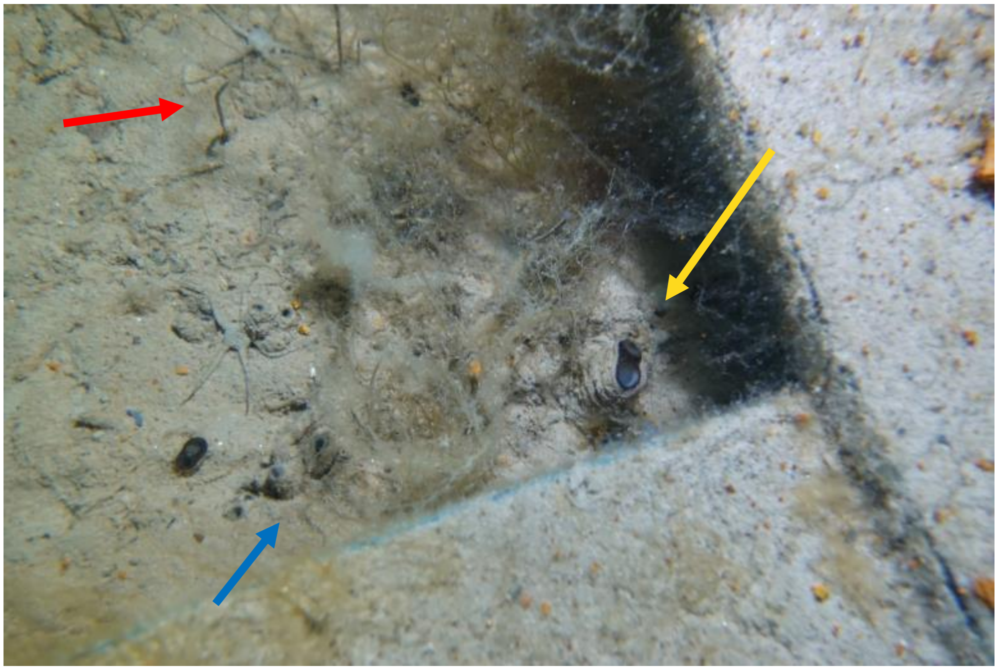

Photo 7: Blunt Gaper (*Mya* spp., Yellow Arrow), Wrinkled Rock-borer Clam (Blue Arrow), Brittle Star and Polychaete Tube Casing (Red Arrow) in Q3 in Milne Port (2021).

Photo 8: Icelandic Scallop (*Chlamys islandica*) in Q3 in Milne Port (2021).

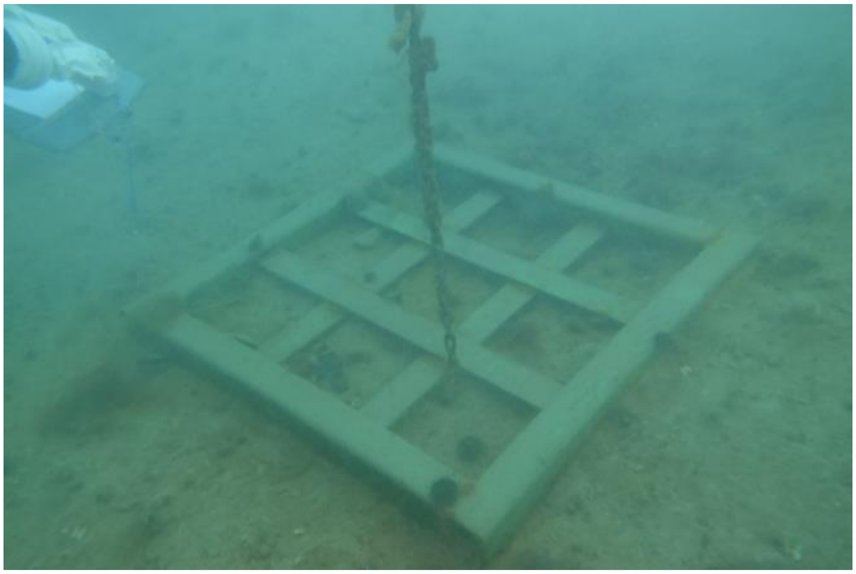

Photo 9: Photo of Q4 in Milne Port (2021).

Photo 10: Green Urchin (*Strongylocentrotus droebachiensis*) Observed in Q4 in Milne Port (2021).

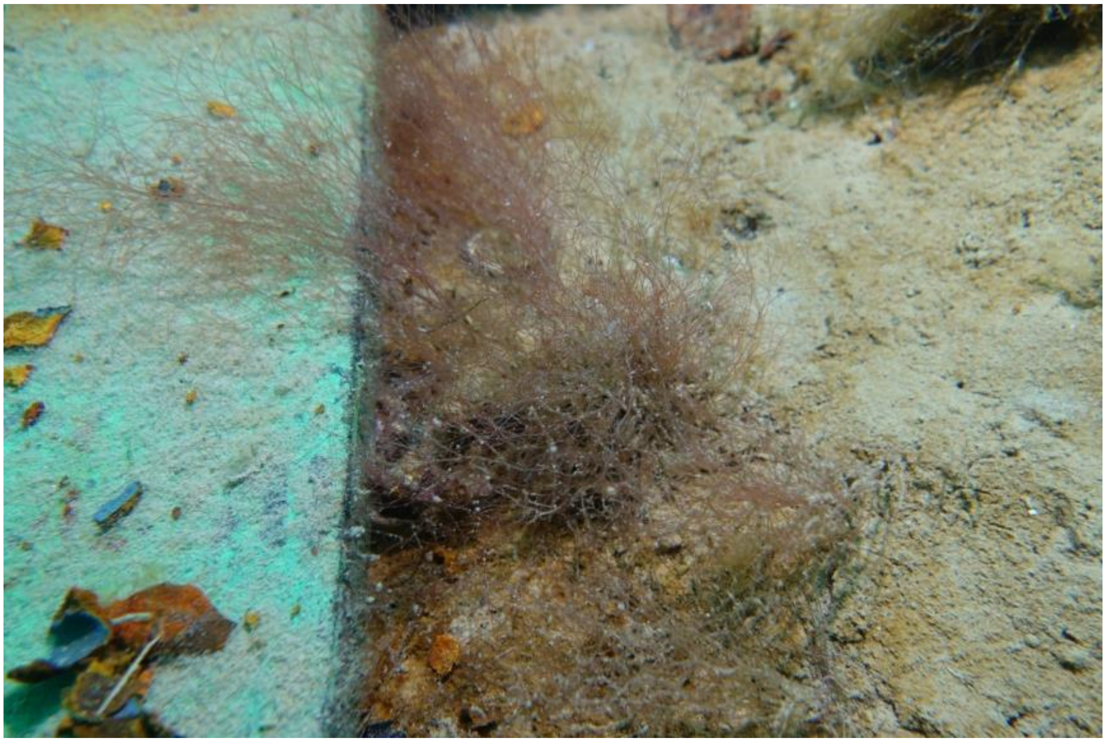

Photo 11: Red Filamentous Macroalgae in Q4 in Milne Port (2021).

Photo 12: Whelk (*Buccinum hydrophanum*) Recorded on Quadrat Frame (Q4) in Milne Port (2021).

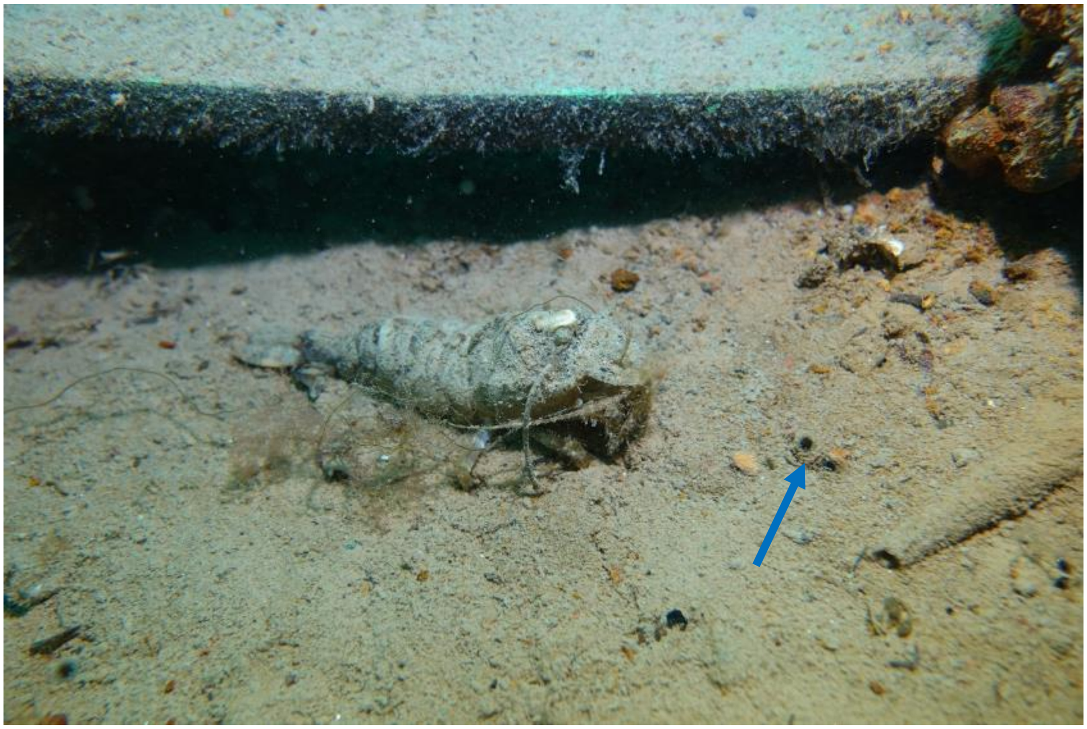

Photo 13: Wrinkled Rock-borer Clam Siphons (Blue Arrow) and Shrimp (*Sclerocrangon boreas*) Recorded in Q4 in Milne Port (2021).

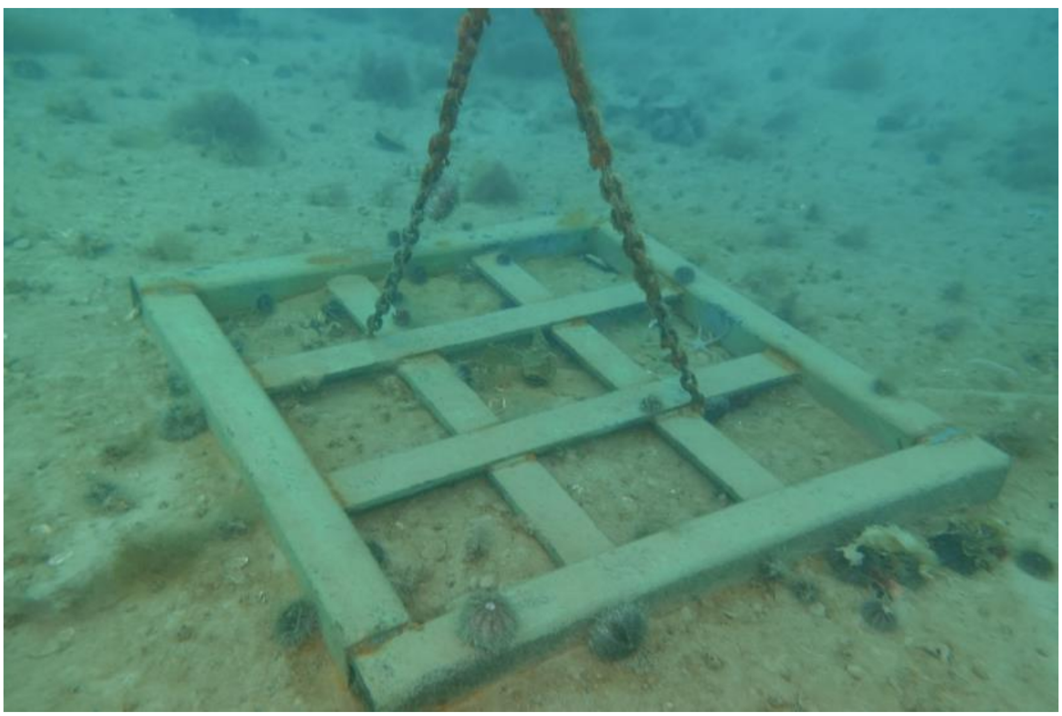

Photo 14: Photo of Q5 in Milne Port (2021).

Photo 15: Pout (*Gymnelus* spp.) observed in Q5 in Milne Port (2021).

Photo 16: Sieve Kelp (*Agarum clathratum*) and Green urchin in Q5 in Milne Port (2021).

Photo 17: Photo of Q5 in Milne Port (2021) Showing Old Belt Transect Frame, Green Urchin, Brittle Star and Wrinkled Rock-borer Clam.

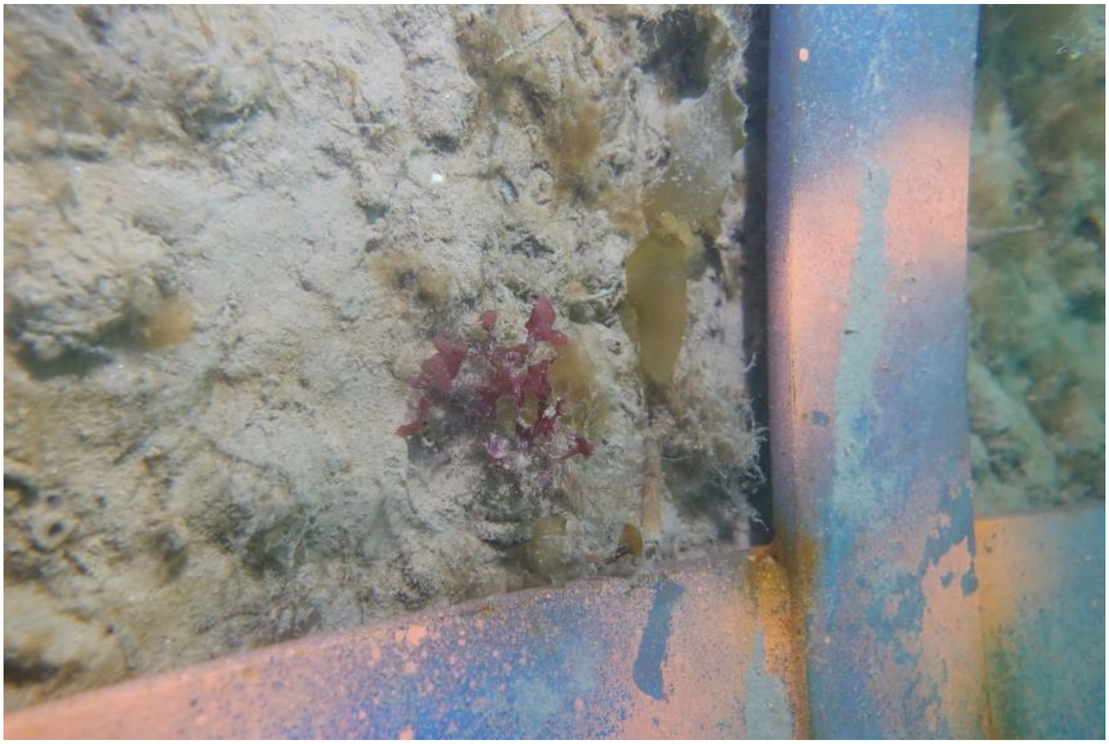

Photo 18: Sugar Kelp (*Saccharina latissima*) and Red Foliose Algae (*Coccotylus truncatus*) in Q11 in Milne Port (2021).

Photo 19: Brown Filamentous Algae (*Halosiphon tomentosus)* in Q11 in Milne Port (2021).

Photo 20: Sugar Kelp and Brown Filamentous Algae in Q13 in Milne Port (2021).

Photo 21: Sabellid Worm, Brown Filamentous Algae (*H. tomentosus*) and Sugar Kelp in Q13 in Milne Port (2021).

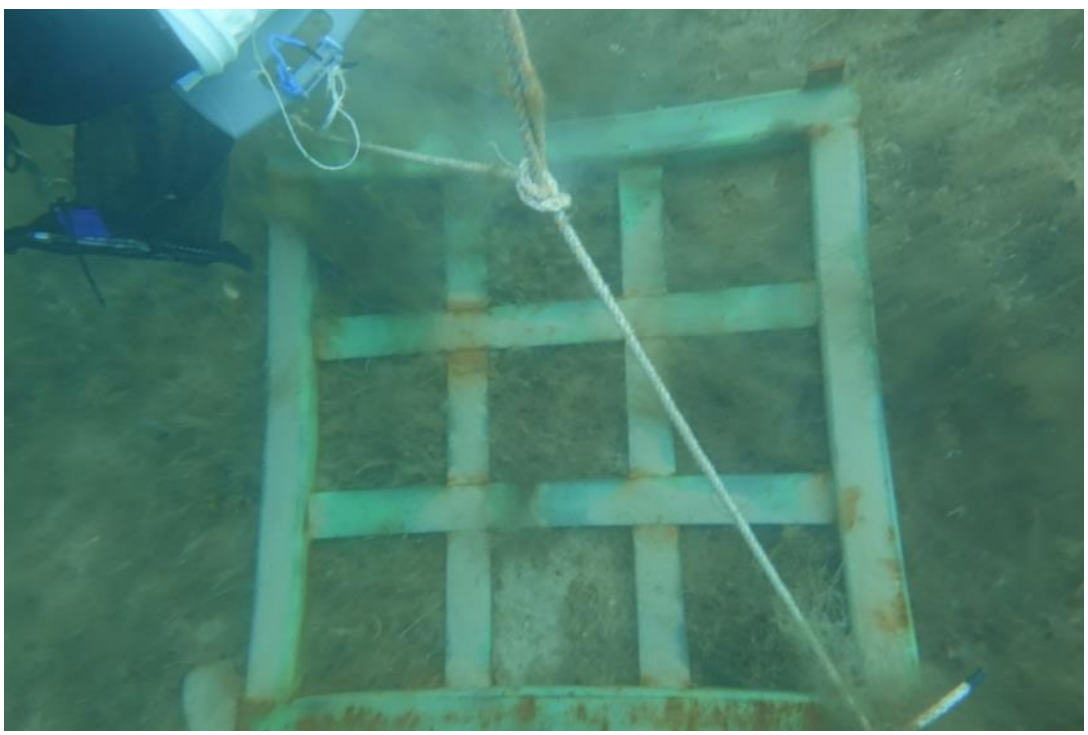

Photo 22: Photo of Q14 in Milne Port (2021).

Photo 23: Sabellid Worm, Polychaete Worm Casing and Brown Filamentous Algae in Q14 in Milne Port (2021).

Photo 24: Photo of Q15 With Red Foliose Algae (*Coccotylus truncatus*), Green Filamentous Algae, Brown Filamentous Algae (cf. *Coelocladia arctica*) in Milne Port (2021).

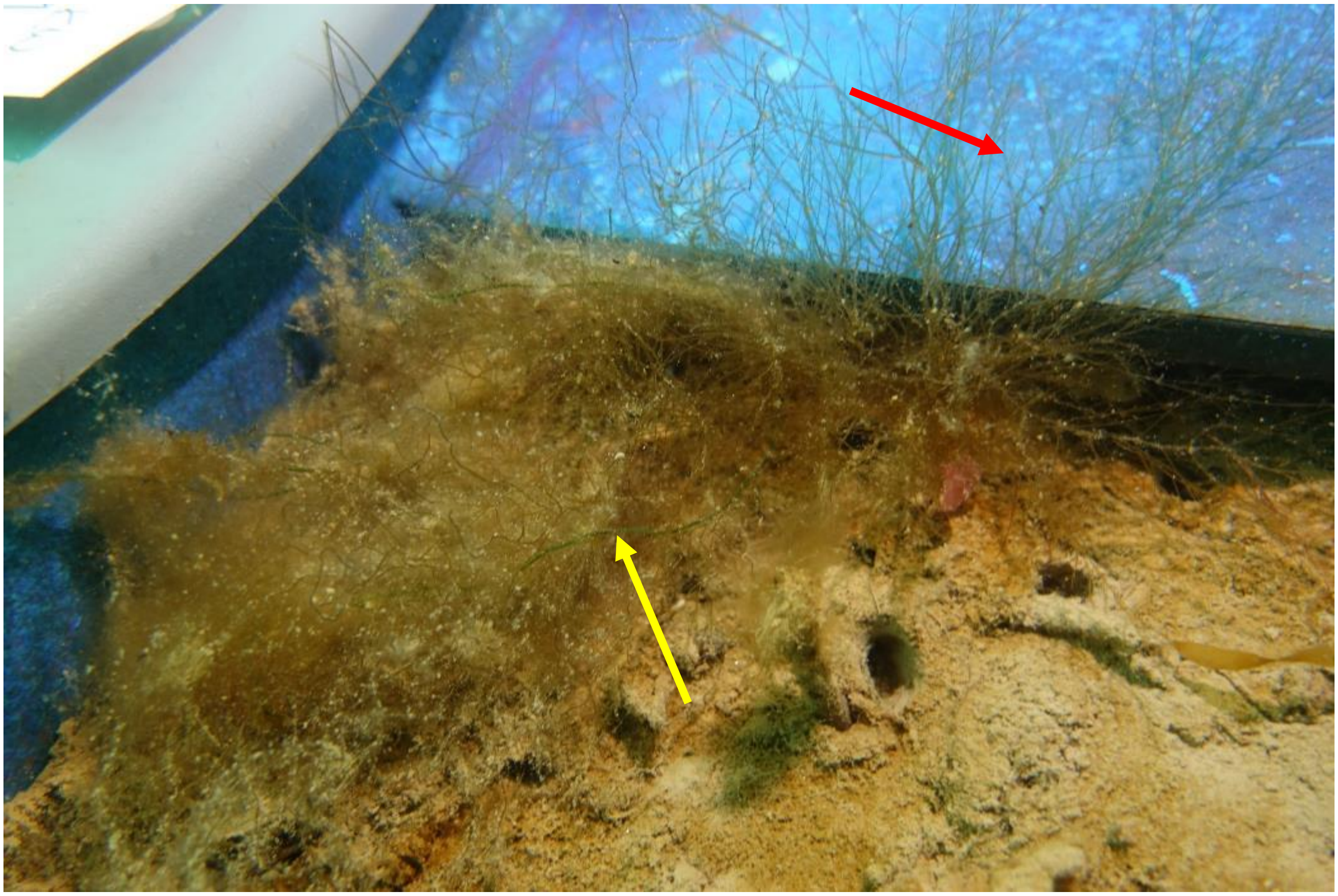

Photo 25: Green Filamentous Algae (*Chaetomorpha melagonium*, Yellow Arrow) and Acid Weed (*Desmarestia* sp., Red Arrow) in Q15 in Milne Port (2021).

Photo 26: Brittle Stars, Green Urchin, Greenland Scallop (*Similipecten greenlandicus*) and Detrital Algae in Q6 in Reference Area (2021).

Photo 27: Shrimp (*Pandalus* spp.) and Icelandic Scallop in Q6 in Reference Area (2021).

Photo 28: Greenland Scallop, Brittle Stars, Siphon of Wrinkled Rock-borer Clam) and Brown Diatoms on Sediment in Q6 in Reference Area (2021).

Photo 29: Wrinkled Rock-borer Clam, Brittle stars and Brown Diatoms on Sediment in Q6 in Reference Area (2021).

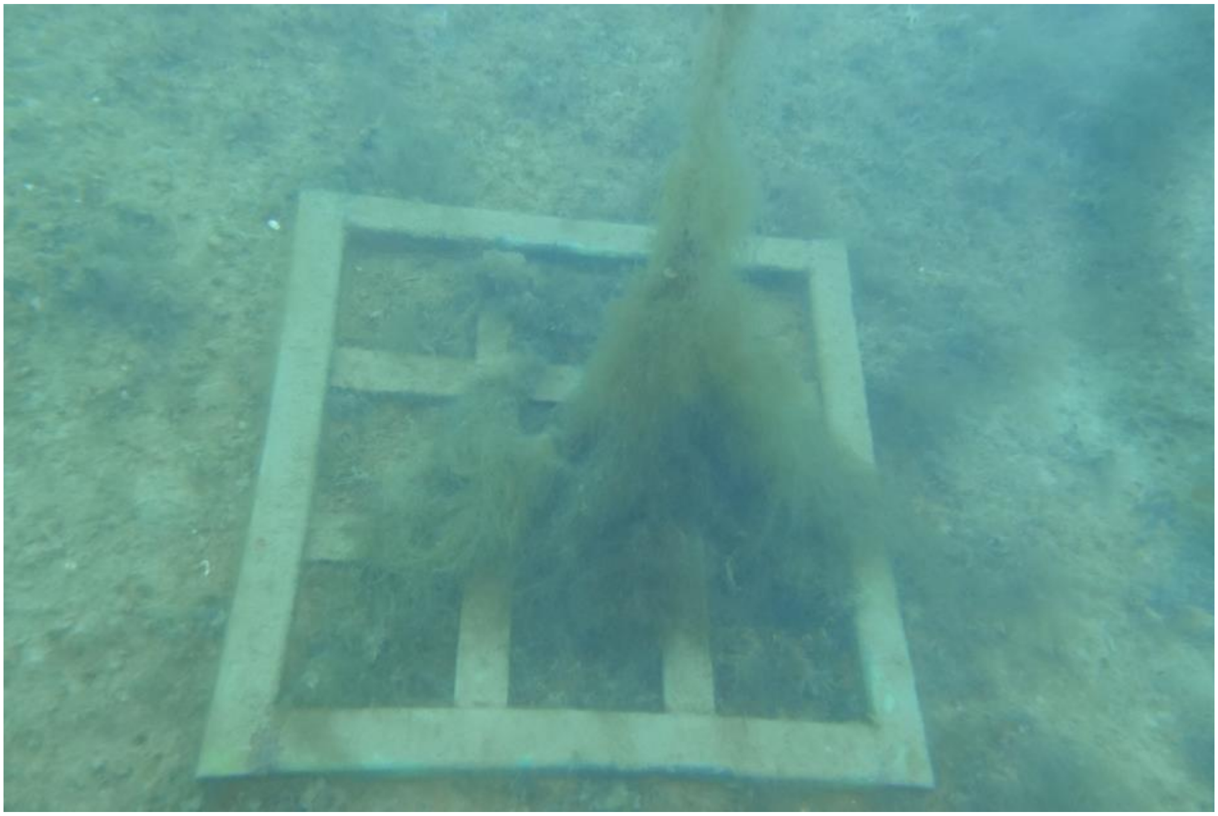

Photo 30: Photo of Q7 in Reference Area (2021) Showing Macroalgae Attached to Suspended Chain.

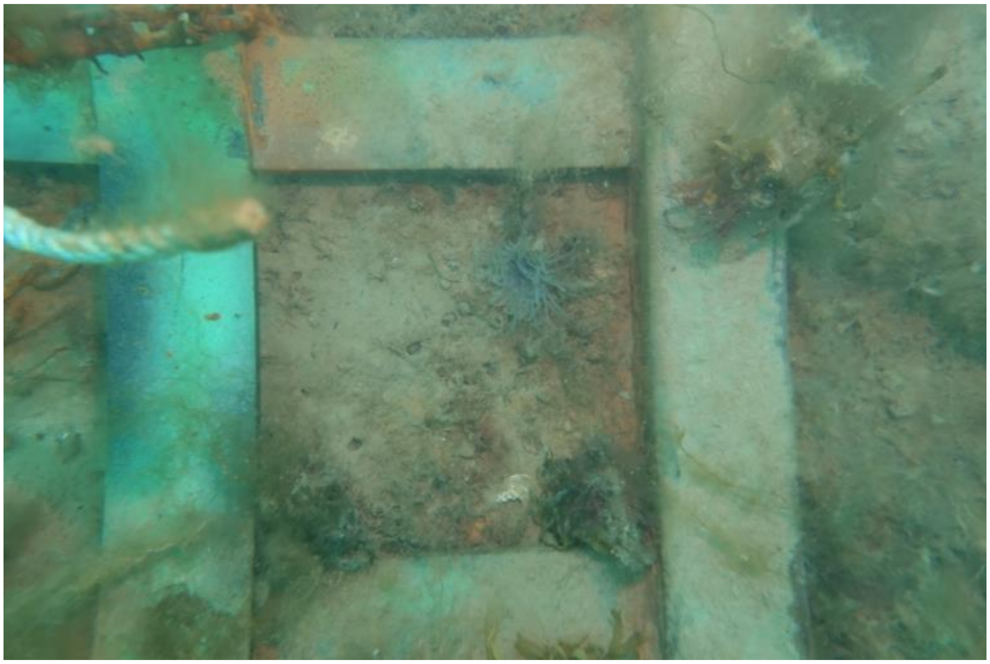

Photo 31: Burrowing Anemone (Ceriantharia indet.), Green Urchin Covered in Detrital Algae, Wrinkled Rock-borer Clam, Brown Filamentous Algae (cf. *Coelocladia arctica*) in Q7 in Reference Area (2021).

Photo 32: Acid Weed in Q7 in Reference Area (2021).

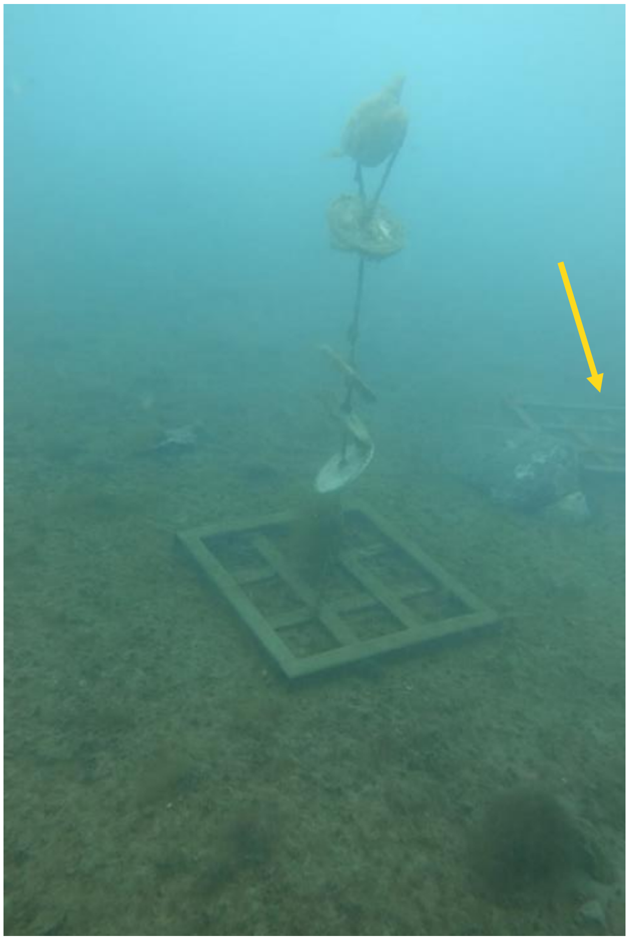

Photo 33: Photo of Q8 and Q18 (Yellow Arrow) in Reference Area (2021).

Photo 34: Wrinkled Rock-borer Clam Siphons, Greenland scallop and Brown Diatoms on Sediment in Q8 in Reference Area (2021).

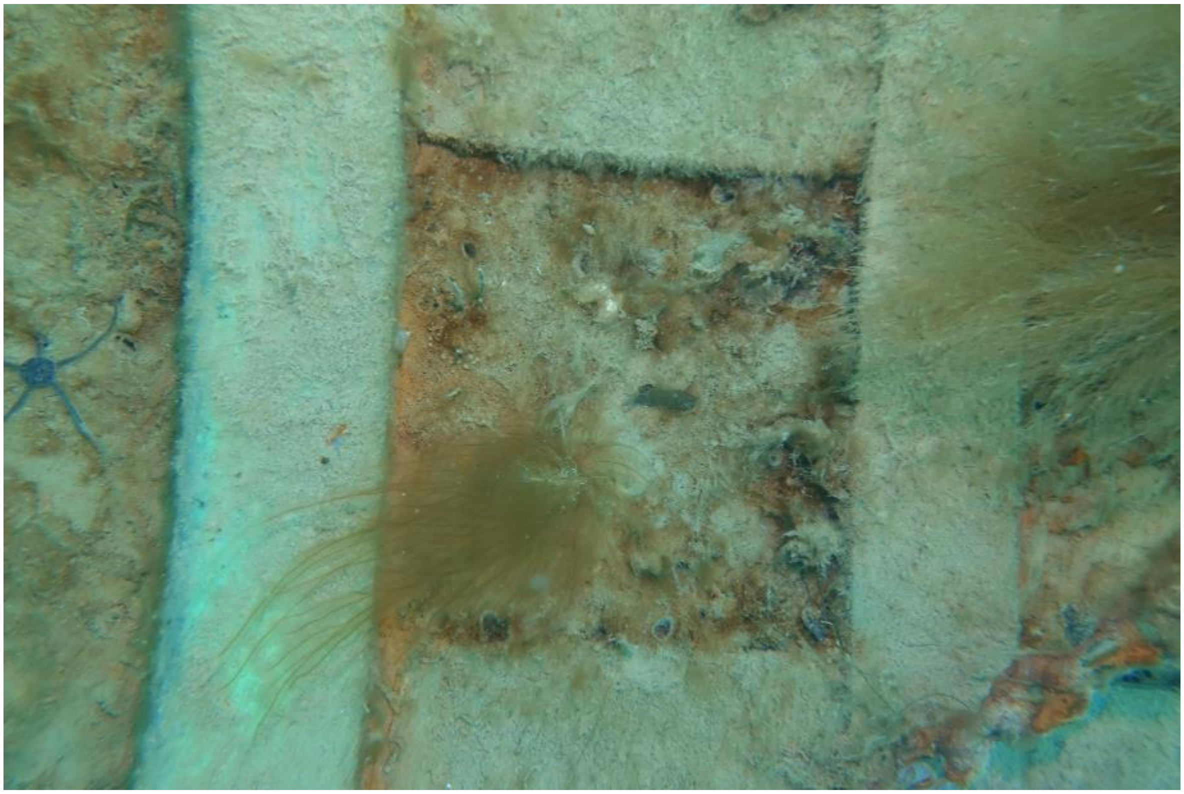

Photo 35: Photo of Q8 with *H. tomentosus* and Siphon Holes of Wrinkled Rock-borer Clam and Blunt Gaper in Reference Area (2021).

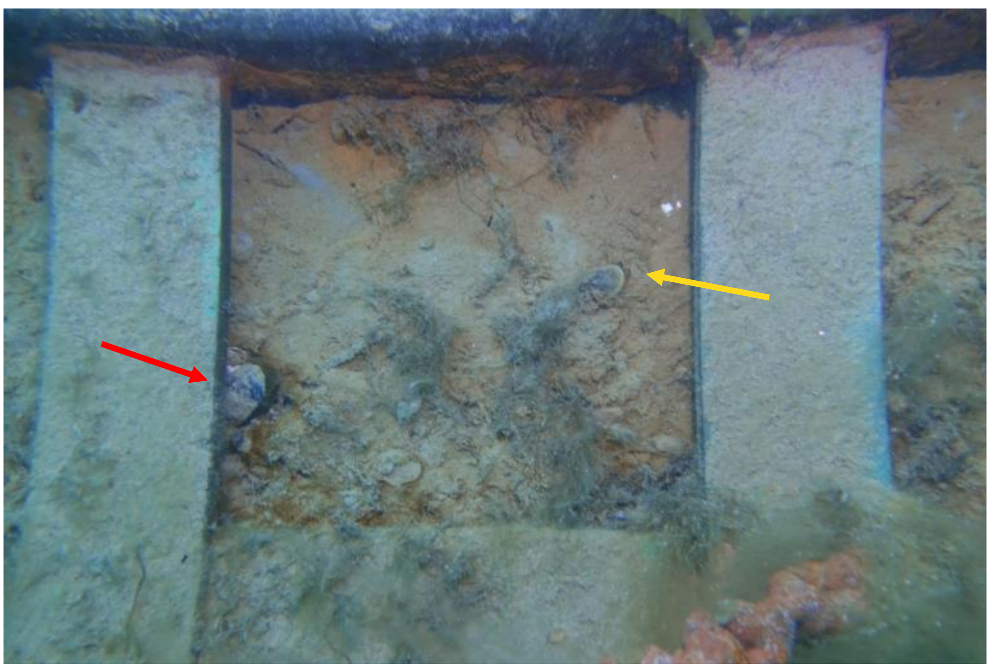

Photo 36: Photo of Q10 with Unidentified Mussel (Red Arrow), Olive Green Mussel (Yellow Arrow) and Brown Filamentous Algae in Reference Area (2021).

Photo 37: Sugar Kelp in Q10 in Reference Area (2021).

Photo 38: Sculpin (Cottidae indet.) in Q16 in Reference Area (2021).

Photo 39: Sugar Kelp and *Pylaiella* spp. in Q16 in Reference Area (2021).

Photo 40: Snail (Margarite spp.) and Dilsea (*Dilsea socialis*) in Q16 in Reference Area (2021).

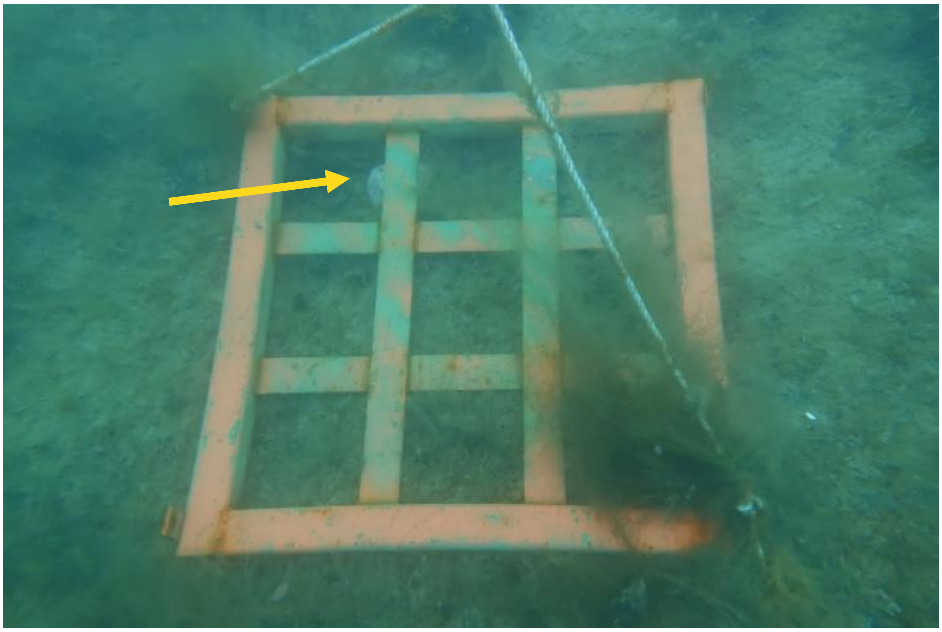

Photo 41: Q17 in Reference Area (2021). Cobble with Encrusting Coralline Algae (Yellow Arrow) and Detrital Algae.

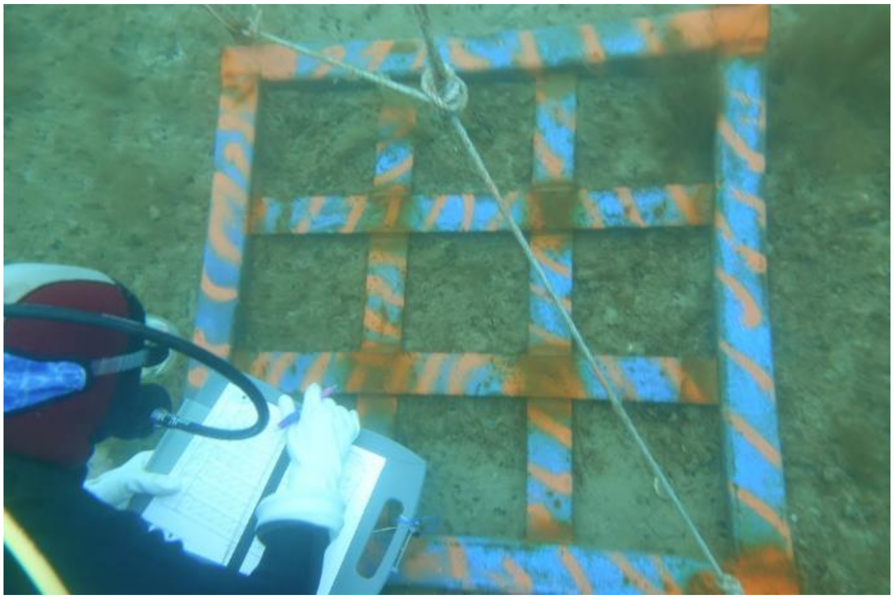

Photo 42: Diver Surveying Q18 in Reference Area (2021).

Photo 43: Brittle star, Sugar Kelp and Exposed Wrinkled Rock-borer Clam in Q20 in Reference Area (2021).

Photo 44: Orange Tunicate (Polycarpa spp.) and Brittle Star in Q20 in Reference Area (2021).

Photo 45: Photo of Q20 with Bedrock and Silt/Sand Substrate, Acid Weed and Wrinkled Rock-borer Clam in Reference Area (2021).

APPENDIX 5C

Quadrat Survey Data

Location/Quadrat Number	UTM (17W) Easting (m)	UTM (17W) Northing (m)	Survey Date	Quadrat Sub-number	Depth (m) Chart Datum	Substrate (% cover)									Macroalgae (% Cover)																
																Kelp		Brown						Green			Red				
						Bedrock	Cobble	Gravel	Sand	Silt	Shell -whole/crushed	Detrital veneer	Other debris (i.e., metal)	Brown diatom mat	Detrital Algae	Sugar kelp Saccharina latissima	Sieve kelp Agarum clathratum	Rockweed Fucus distichus	Pylaiella spp.	Halosiphon tomentosus	Acid weed Desmarestia spp.	Brown filamentous 1 cf. Coelocladia arctica	Brown filamentous algae	Chaetomorpha melagonium	Short green filamentous 1 indet. 1	Green filamentous indet.	Savoiea arctica	Coccotylus truncatus	Dilsea socialis	Red filamentous Rhodophyta indet.	Encrusting coralline Corallinales indet.
Q1	502828	7976382	14-Aug-21	1	-8.9	-	-	-	60	40	<5	30	-	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				2	-9.0	-	-	-	60	40	<5	15	-	-	2-	-	-	-	-	-	-	-	-	-	-	-	-	<5	-	-	-
				3	-9.1	-	-	-	60	40	-	15	-	-	15	-	-	-	5	-	-	-	-	-	-	-	-	<5	-	-	-
				4	-9.0	-	-	-	60	40	<5	10	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				5	-9.2	-	-	-	60	40	<5	10	15	-	-	-	-	-	10	-	-	-	-	-	-	-	-	-	-	-	-
				6	-9.3	-	-	-	60	40	-	5	<1	-	-	-	-	-	15	-	-	-	-	-	-	-	-	-	-	-	-
				7	-9.2	-	-	-	60	40	<5	10	-	-	-	-	-	-	10	-	-	-	-	-	-	-	-	-	-	-	-
				8	-9.3	-	-	-	60	40	-	5	7	-	-	-	-	-	20	-	-	-	-	-	-	-	-	-	-	-	-
				9	-9.3	-	-	-	60	40	<5	5	7	-	-	-	-	-	15	-	-	-	-	-	-	-	-	-	-	-	-
Q3	504208	7976659	15-Aug-21	1	-10.4	-	-	5	40	50	5	7	<5	-	-	-	-	-	<5	-	1	-	-	-	-	-	-	-	-	-	-
				2	-11.0	-	-	5	35	50	10	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				3	-11.1	-	-	-	40	60	-	20	-	-	15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				4	-11.0	-	-	-	40	60	-	10	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				5	-11.0	-	-	-	40	60	-	0	45	20	3-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				6	-11.0	-	-	5	35	55	5	20	<2	-	-	-	-	-	-	-	-	10	-	-	-	-	-	-	-	-	-
				7	-11.0	-	-	5	38	57	<1	5	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				8	-10.8	-	-	-	37	58	<5	10	7	-	5	-	-	-	7	-	-	5	-	-	-	-	-	-	-	-	-
				9	-10.9	-	-	-	40	60	<1	20	5	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Q4	504363	7976611	06-Aug-21	1	-12.1	-	-	-	30	70	-	10	-	2	2	-	-	-	-	-	20	-	-	-	-	-	-	-	-	-	-
				2	-12.2	-	-	-	25	70	5	10	<1	10	-	-	-	-	-	-	5	-	-	-	-	-	-	-	-	-	-
				3	-12.2	-	-	-	30	70	<2	10	<1	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				4	-12.2	-	-	5	23	70	2	10	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				5	-12.3	-	-	-	28	70	2	10	5	5	-	-	-	-	-	-	5	-	-	-	-	-	-	-	-	<5	-
				6	-12.2	-	-	-	30	70	-	10	5	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15	-
				7	-12.2	-	-	-	25	70	5	10	10	10	-	-	-	-	-	-	10	-	-	-	-	-	-	-	-	-	-
				8	-12.3	-	20	-	25	55	-	10	5	5	-	-	-	-	-	-	10	-	5	-	-	-	-	-	-	-	-
				9	-12.3	-	-	-	30	70	-	10	10	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Q5	504802	7976731	06-Aug-21	1	-12.4	-	-	5	30	65	-	20	-	5	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	-	-
				2	-12.4	-	-	-	30	70	-	20	<1	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				3	-12.4	-	-	<5	30	65	-	20	20	<5	-	-	-	-	-	-	5	-	-	-	-	-	-	-	-	-	-
				4	-12.4	-	-	-	25	75	-	20	5	5	-	-	-	-	-	-	5	-	-	-	-	-	-	-	-	-	-
				5	-12.4	-	-	-	25	75	-	10	27	<5	35	-	15	-	<5	-	-	-	-	-	-	-	-	-	-	-	-
				6	-12.4	-	-	-	25	75	-	20	-	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				7	-12.4	-	-	-	25	75	-	10	<1	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				8	-12.4	-	-	-	25	75	-	10	20	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				9	-12.4	-	-	-	25	75	-	20	-	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Q6	506563	7979107	08-Aug-21	1	-15.4	-	-	-	25	70	5	-	-	-	8-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				2	-15.7	-	-	-	25	70	5	<5	-	10	-	-	-	-	-	-	-	-	<5	-	-	<5	-	<1	-	-	-
				3	-15.9	-	-	-	30	70	-	10	-	20	2-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				4	-16.0	-	-	-	25	70	5	10	-	<5	-	-	-	-	-	-	-	-	5	-	-	-	-	-	-	-	-
				5	-16.0	-	-	-	25	70	5	10	20	5	5-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				6	-16.0	-	-	-	30	70	-	10	-	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				7	-16.0	-	-	-	25	70	5	10	<2	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				8	-16.2	-	-	-	20	70	10	-	-	-	7-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				9	-16.2	-	-	-	20	70	10	-	-	-	1--	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Q7	506774	7979170	16-Aug-21	1	-10.1	-	-	-	30	70	<1	20	-	-	4-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				2	-10.1	-	10	-	25	65	-	20	-	10	2-	-	-	-	-	-	5	10	-	-	-	-	-	<5	-	-	-
				3	-10.2	-	-	-	30	70	-	15	2	7	15	-	-	-	-	-	5	-	-	<5	-	-	-	-	-	-	-
				4	-10.1	-	-	-	25	70	5	20	-	5	1-	-	-	-	-	-	10	-	-	<5	-	-	-	<5	-	-	-
				5	-10.1	-	-	-	20	80	<5	-	25	-	1--	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				6	-10.2	-	-	-	20	80	-	10	-	-	3-	-	-	-	-	-	-	10	-	<5	-	-	-	<5	-	-	-
				7	-10.2	-	-	-	30	70	<5	5	3	20	4-	-	-	-	-	-	25	-	-	10	-	-	-	-	-	-	-
				8	-10.2	-	-	-	30	70	-	-	-	-	1--	-	-	-	-	-	75	20	-	-	-	-	-	5	-	-	20
				9	-10.2	-	30	-	20	50	-	5	-	-	-	-	-	-	-	-	40	-	-	-	-	-	-	15	-	-	-
Q8	506957	7979457	16-Aug-21	1	-10.5	-	-	-	35	60	5	10	-	30	45	-	-	-	-	5	-	-	-	-	-	-	-	-	-	-	-
				2	-10.7	-	5	-	35	60	-	10	-	35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				3	-10.7	-	5	-	35	60	-	10	2	35	-	-	-	-	-	-	-	-	-	-	-	<5	-	-	-	-	-
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				5	-10.7	-	-	-	40	60	<5	10	20	35	-	-	-	-	-	5	-	-	-	-	-	-	-	-	-	-	-
				6	-10.7	-	-	-	40	60	-	10	-	30	-	-	-	-	-	10	-	-	-	-	-	-	-	-	-	-	-
				7	-10.7	-	-	-	40	60	<8	15	5	20	-	-	-	-	-	5	-	-	-	-	-	-	-	-	-	-	-
				8	-10.7	-	-	-	40	60	-	15	<1	35	-	-	-	-	-	15	-	-	-	-	-	<5	-	-	-	-	-
				9	-10.7	-	-	-	40	60	-	15	-	5	-	-	-	-	-	10	-	-	-	-	-	<1	-	5	-	-	-
Q10	506584	7979115	08-Aug-21	1	-6.1	-	-	20	20	60	-	10	<1	2	-	-	-	-	10	-	-	-	-	-	-	-	-	-	-	-	-
				2	-6.4	-	-	5	25	70	-	20	<1	10	-	-	-	-	-	-	-	-	10	-	-	-	-	-	-	-	-
				3	-6.5	-	-	-	25	70	5	10	-	-	-	-	-	-	10	-	-	-	-	-	-	-	-	-	-	-	-
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				5	-6.6	-	-	10	20	70	-	10	35	-	-	-	-	-	10	-	-	-	-	-	-	-	-	-	-	-	-
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				8	-6.6	-	-	10	20	70	-	10	-	-	5	-	-	-	20	-	-	-	-	-	-	-	-	-	-	-	-
				9	-6.9	-	-	-	25	70	5	10	-	2	-	<5	-	-	5	-	-	-	-	-	-	-	-	-	-	-	-
Q11	502820	7976371	14-Aug-21	1	-7.5	-	-	-	60	40	-	20	-	-	-	5	-	-	10	-	-	-	-	<1	-	-	-	5	-	-	-
				2	-7.6	-	-	-	60	40	<1	20	-	<1	-	-	-	-	5	-	-	-	-	-	-	-	-	5	-	-	-
				3	-7.5	-	-	-	60	40	-	15	-	-	-	-	-	-	15	-	-	-	-	-	-	-	-	5	-	-	-
				4	-7.6	-	-	-	60	40	<5	20	-	-	-	-	-	-	5	-	-	-	-	-	-	-	-	-	-	-	-
				5	-7.6	-	-	-	60	40	<1	10	-	-	-	<1	-	-	20	-	-	-	-	-	-	-	-	5	-	-	-
				6	-7.6	-	-	-	60	40	<1	10	-	-	-	-	-	-	-	15	-	-	-	-	-	-	-	-	-	-	-
				7	-7.6	-	-	-	60	40	<1	10	-	-	-	-	-	-	-	-	5	-	-	1	<5	-	-	-	-	-	-
				8	-7.7	-	-	-	60	40	<1	10	-	-	-	-	-	-	<5	-	5	-	-	-	-	-	-	-	-	-	-
				9	-7.7	-	-	-	60	40	<1	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Q12	503041	7976474	11-Aug-21	1	-6.0	-	-	-	90	10	-	15	-	-	-	-	-	-	<5	-	-	-	-	-	-	-	-	-	-	-	-
				2	-6.0	-	-	5	85	10	-	15	-	-	-	-	-	-	5	-	-	-	-	-	-	-	-	-	-	-	-
				3	-6.0	-	-	7	83	10	-	15	-	-	-	-	-	-	<5	-	-	-	-	-	-	-	-	-	-	-	-
				4	-6.0	-	-	<1	82	10	8	15	-	-	-	-	-	-	5	-	-	-	-	-	-	-	-	-	-	-	-
				5	-6.0	-	-	-	90	10	-	15	-	-	-	-	-	-	<1	-	-	-	-	-	-	-	-	-	-	-	-
				6	-6.0	-	-	<5	85	10	5	10	-	-	-	-	-	-	<5	-	-	-	-	-	-	-	-	-	-	-	-
				7	-6.0	-	10	-	85	5	-	10	-	-	-	-	-	-	10	-	5	-	-	-	-	-	-	-	-	-	-
				8	-6.0	-	-	-	90	10	-	10	-	-	-	-	-	-	<5	-	5	-	-	-	-	-	-	-	-	-	-
				9	-6.0	-	-	-	90	10	-	10	-	-	5	-	-	-	<5	-	-	-	-	-	-	-	-	-	-	-	-
Q13	504210	7976643	15-Aug-21	1	-7.9	-	-	10	40	50	-	10	-	5	1-	<5	-	-	-	-	10	-	-	-	-	-	-	-	-	-	-
				2	-7.9	-	5	10	38	47	<5	5	-	-	45	-	-	-	-	-	10	5	-	-	-	-	-	-	-	-	-
				3	-7.9	-	-	10	40	50	-	5	-	-	8-	-	-	-	-	-	-	60	-	-	-	-	-	-	-	-	-
				4	-8.0	-	-	5	35	60	-	10	-	1	65	<5	-	-	10	-	35	-	-	-	-	-	-	-	-	-	-
				5	-8.1	-	-	10	40	50	-	15	-	2	1-	5	-	-	-	5	-	10	-	-	-	-	-	-	-	-	-
				6	-8.1	-	-	10	40	50	-	5	-	-	15	-	-	-	-	5	15	25	-	-	-	-	-	-	-	-	-
				7	-8.1	-	-	10	40	50	-	15	-	-	4-	-	-	-	-	-	30	5	-	-	-	-	-	-	-	-	-
				8	-8.1	-	10	10	35	45	-	10	-	-	3-	-	-	-	5	-	15	30	-	-	-	-	-	-	-	-	-
				9	-8.1	-	-	20	30	50	-	5	-	-	4-	-	-	-	-	-	30	20	-	-	-	-	-	-	-	-	-

Location/Quadrat Number	Quadrat Sub-number	Invertebrates (Sessile: % cover; Motile: number of Individuals)																											Fish		
		Annelida				Platyhelminthes	Echinodermata		Cnidaria	Mollusca													Crustacea				Tunicata				
		Cone worm Cistenides granulata	Small sabellid worm spp. 1 Sabellidae indet.	Large sabellid worm spp. 2 Sabellidae indet.	tubes Polychaeta indet.	Flat worm Platyhelminthes	Brittle star Ophiuridae indet.	Green urchin Strongylocentrotus droebachiensis	Burrowing anemone Ceriantharia indet.	Margarite snail Margarites spp.	Snail Vetigastropoda indet.	Scallop Similipecten greenlandicus	Icelandic scallop Chlamys islandica	Wrinkled rock-borer Hiatella arctica	Blunt gaper Mya spp.	Northern astarte Astarte borealis	Astarte Clam Astarte spp.	Macoma clam Macoma spp.	Clam Bivalvia indet.	Limpet Lottiidae indet.	Mussel Mytilida indet.	Green mussel spp. 1 Mytilida indet.	Pandalus shrimp Pandalus spp.	Sculptured shrimp Sclerocrangon boreas	Barnacle Balanomorpha indet.	Amphipod Amphipoda indet.	Orange tunicate spp. 1 Polycarpa spp.	Tunicate Tunicata indet.	Pout cf. Gymnelus spp.	Sculpin Cottidae indet.	Unid. Juvenile fish
Q1	1	6	-	1	-	-	-	2	-	-	-	-	-	60	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
	2	-	-	-	-	-	-	1	-	-	-	-	-	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
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	4	5	-	-	-	-	-	1	-	-	-	-	-	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	5	6	2	-	-	-	-	-	-	-	-	-	-	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	6	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	3	-	-	-	-
	7	5	1	-	-	-	1	-	-	-	-	-	-	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	8	2	-	1	-	-	-	-	-	-	-	-	-	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	9	3	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Q3	1	-	-	-	-	-	-	1	-	-	-	-	-	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
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	3	5	-	-	-	-	1	2	-	-	-	-	-	16	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
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	2	5	1	-	-	-	-	-	-	-	-	-	-	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
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Q14	504350	7976589	16-Aug-21	1	-7.6	-	5	10	35	50	-	10	-	3	45	-	-	-	-	-	30	-	-	-	-	-	-	-	-	-	-	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	-	-	-	-	-	-
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				3	-7.7	-	-	5	60	35	-	5	-	-	4-	-	-	-	-	-	40	-	-	-	-	-	-	-	-	-	-	-	10	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
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				7	-7.7	-	-	15	60	25	-	5	-	-	1--	5	-	-	-	-	40	-	-	-	-	-	-	-	-	-	-	3	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
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				9	-7.8	-	-	15	60	25	-	5	-	-	1-	-	-	-	-	-	25	-	-	-	-	-	-	-	-	-	-	-	10	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Q15	504800	7976721	06-Aug-21	1	-7.4	-	-	-	30	70	-	20	-	15	-	-	-	-	10	-	10	15	-	1	-	-	-	<5	-	-	-	6	-	-	-	-	-	-	-	-	-	-	-	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				2	-7.4	-	-	-	30	70	-	10	-	2	-	-	-	-	-	-	-	10	-	1	10	-	-	15	-	-	-	8	-	-	-	-	-	-	-	-	-	-	-	24	-	-	-	-	10	-	-	-	-	-	-	-	-	-	-	-
				3	-7.4	-	-	-	30	70	-	10	-	-	8-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				4	-7.4	-	-	-	30	70	-	10	-	5	25	-	-	-	10	-	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				5	-7.4	-	-	-	30	70	<5	20	-	7	-	-	-	-	5	-	-	15	-	1	-	-	-	10	-	-	-	8	-	-	-	-	-	-	-	-	-	-	-	40	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-
				6	-7.4	-	-	-	30	70	-	15	-	5	-	-	-	-	5	-	10	10	-	-	-	-	-	-	-	-	-	8	-	-	1	-	-	-	-	-	-	-	-	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				7	-7.6	-	-	-	30	70	-	10	-	7	-	-	-	-	5	-	-	-	20	<5	-	-	-	15	-	-	-	5	-	-	-	-	-	-	-	-	-	-	-	30	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-
				8	-7.6	-	-	-	30	70	-	15	-	2	-	-	-	-	5	-	-	20	30	-	-	-	-	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				9	-7.5	-	-	-	30	70	-	20	-	2	-	-	-	-	5	-	-	10	-	<5	-	-	-	<5	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Q16	506567	7979090	08-Aug-21	1	-5.6	-	-	20	20	50	10	5	-	-	2-	-	-	-	15	-	-	-	-	-	-	-	-	-	10	-	-	21	-	-	-	-	-	-	-	-	-	-	-	14	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-
				2	-5.6	-	-	10	25	55	10	10	-	-	-	-	-	-	20	-	-	-	-	-	-	-	-	-	15	-	-	12	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	3	-	-	-	-	-	3	-	-	1	-
				3	-5.7	-	-	12	23	55	10	10	-	-	-	-	-	-	15	-	-	-	-	-	-	-	-	-	10	-	-	11	-	-	-	-	-	-	-	-	-	-	-	-	13	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				4	-5.7	-	25	12	12	44	7	10	-	-	-	-	-	<5	-	-	-	-	<5	<5	-	-	-	-	10	10	-	5	-	-	-	-	-	-	-	1	-	-	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				5	-5.7	-	-	5	35	60	<5	5	-	-	-	10	-	-	5	-	-	-	-	-	-	-	-	-	-	-	-	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				6	-5.7	-	5	10	25	60	<5	5	-	-	-	-	-	-	20	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				7	-5.7	-	-	20	20	55	5	5	-	-	-	2	-	-	10	-	-	-	-	-	-	-	-	-	-	-	-	11	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1	-	8	-	-	-	-	-	-	-	-	-	-	-
				8	-5.8	-	-	20	20	55	5	5	-	-	-	2	-	-	10	-	-	-	-	-	-	-	-	-	-	-	-	6	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				9	-5.9	-	-	-	30	70	-	5	-	-	-	-	-	-	80	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Q17	506774	7979163	16-Aug-21	1	-8.9	-	15	-	15	70	-	-	-	7	7-	-	-	-	-	-	-	-	-	-	-	<5	-	-	-	-	15	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
				2	-9.0	-	12	-	18	70	-	10	-	<5	-	-	-	-	-	-	45	-	-	-	-	-	-	-	-	-	-	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				3	-8.9	-	-	-	20	80	<5	10	-	10	-	-	-	-	10	-	-	-	-	-	-	5	-	<5	-	-	-	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				4	-8.9	-	-	-	20	80	-	10	-	15	-	-	-	-	10	-	5	-	-	-	-	-	-	-	-	-	-	-	6	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				5	-8.9	-	-	-	20	80	-	10	-	-	-	-	-	-	10	-	10	-	-	-	-	-	-	-	-	-	-	-	5	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				6	-8.9	-	-	-	20	80	-	10	-	10	-	5	-	-	15	-	20	-	-	-	-	-	-	15	-	-	-	2	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				7	-9.0	-	-	-	20	80	-	10	-	10	-	-	-	-	15	-	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				8	-9.0	-	-	-	20	80	-	10	-	-	-	-	-	-	15	-	40	-	-	-	-	-	-	-	-	-	-	2	-	1	-	-	1	-	-	-	-	-	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				9	-9.0	-	-	-	20	80	-	10	-	-	-	10	-	-	-	-	40	-	-	-	-	-	-	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-
Q18	506956	7979452	16-Aug-21	1	-9.8	-	-	-	20	80	-	-	-	40	-	-	-	-	-	5	-	-	-	-	-	-	-	-	-	-	-	3	1	-	-	-	-	-	-	-	-	-	-	38	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				2	-10.1	-	-	-	20	80	-	20	-	40	-	-	-	-	-	-	20	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	36	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				3	-10.1	-	-	-	20	80	-	20	-	30	-	-	-	-	-	-	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				4	-10.2	-	-	-	20	80	-	10	-	30	-	-	-	-	<5	-	-	-	-	-	-	-	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
				5	-10.4	-	-	-	20	80	-	15	-	15	-	-	-	-	5	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	22	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				6	-10.4	-	-	-	20	80	-	10	-	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				7	-10.3	-	-	-	20	80	<5	10	-	20	-	-	-	-	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				8	-10.3	-	-	-	20	80	<5	10	-	-	-	-	-	-	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	46	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				9	-10.3	-	-	-	20	80	<5	5	-	20	-	-	-	-	-	-	-	-	-	-	-	-	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Q20	506588	7979125	08-Aug-21	1	-10.9	-	-	-	25	70	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	2	-	-	-	-	-	-	16	3	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-
				2	-11.0	-	-	-	25	70	5	-	-	-	-	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	5	-	-	-	-	-	-	46	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				3	-11.1	-	-	-	25	70	5	-	-	-	-	<5	-	-	-	-	5	-	-	-	-	-	-	-	-	-	-	8	-	3	-	-	-	-	-	-	-	-	-	60	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
				4	-11.2	-	-	-	25	70	5	-	-	-	5	<5	-	-	10	-	5	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	1	-	-	-	6	-	-	<1	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-
				5	-11.3	50	-	-	5	40	5	-	-	-	-	-	-	-	-	-	25	-	-	-	-	-	-	-	-	-	10	6	-	-	-	-	-	-	-	-	-	-	1	14	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
				6	-11.4	-	-	-	25	70	5	-	-	-	-	-	-	-	-	-	15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	26	-	5	2	-	-	-	-	-	-	-	-	-	-	-	-	-
				7	-11.3	-	-	-	25	70	5	-	-	-	-	-	-	-	<2	-	-	-	-	-	-	-	-	-	-	-	-	5	-	-	-	-	3	-	-	-	-	-	-	4	-	-	5	-	-	-	3	-	-	-	-	-	-	-	-	-
				8	-11.2	-	-	-	25	70	5	-	-	-	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	-	-	-	-	-	-	-	-	-	-	-	10	-	-	<1	-	<1	-	-	-	-	-	-	-	-	-	-	-
				9	-11.2	-	-	-	25	70	5	-	-	-	5	-	-	-	<2	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	1	-	-	-	-	-	-	20	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-

Notes: P = Present [1]Tubes: likley sabellid worm, though animal inside tube was not observed during survey. Grey highlighting indicates sessile invertebrates

APPENDIX 5D

ANOVA and ANCOVA Analysis

APP 5D_ANOVA/ANCOVA 2021

NOB

14 February 2022

```
## -- Attaching packages --------------------------------------- tidyverse
1.3.1 --

## v ggplot2 3.3.5     v purrr   0.3.4
## v tibble  3.1.6     v dplyr   1.0.7
## v tidyr   1.2.0     v stringr 1.4.0
## v readr   2.1.2     v forcats 0.5.1

## -- Conflicts ------------------------------------------
tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()

##
## Attaching package: 'rstatix'

## The following object is masked from 'package:stats':
##
##     filter

## Loading required package: carData

##
## Attaching package: 'car'

## The following object is masked from 'package:dplyr':
##
##     recode

## The following object is masked from 'package:purrr':
##
##     some

# Correlation Tests for Substrate

## Bedrock - Depth
cor.test(anco.quad$depth, anco.quad$bedrock, method = "pearson")

##
##  Pearson's product-moment correlation
##
## data:  anco.quad$depth and anco.quad$bedrock
## t = -0.66622, df = 15, p-value = 0.5154
## alternative hypothesis: true correlation is not equal to 0
```

```
## 95 percent confidence interval:
##  -0.6011856  0.3387175
## sample estimates:
##        cor
## -0.1695267
```

```r
## Bedrock ~ Fines
cor.test(anco.quad$fines, anco.quad$bedrock, method = "pearson")
```

```
##
##  Pearson's product-moment correlation
##
## data:  anco.quad$fines and anco.quad$bedrock
## t = 0.46907, df = 15, p-value = 0.6458
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.3825153  0.5680520
## sample estimates:
##       cor
## 0.1202352
```

```r
## Boulder ~ Depth
cor.test(anco.quad$depth, anco.quad$boulder, method = "pearson")
```

```
##
##  Pearson's product-moment correlation
##
## data:  anco.quad$depth and anco.quad$boulder
## t = NA, df = 15, p-value = NA
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  NA NA
## sample estimates:
## cor
##  NA
```

```r
# Boulder ~ Fines
cor.test(anco.quad$fines, anco.quad$boulder, method = "pearson")
```

```
##
##  Pearson's product-moment correlation
##
## data:  anco.quad$fines and anco.quad$boulder
## t = NA, df = 15, p-value = NA
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  NA NA
## sample estimates:
## cor
##  NA
```

```r
## Cobble ~ Depth
cor.test(anco.quad$depth, anco.quad$cobble, method = "pearson")

##
##  Pearson's product-moment correlation
##
## data:  anco.quad$depth and anco.quad$cobble
## t = 0.91804, df = 15, p-value = 0.3731
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.2811681  0.6403075
## sample estimates:
##       cor
## 0.2306467

## Cobble ~ Fines
cor.test(anco.quad$fines, anco.quad$cobble, method = "pearson")

##
##  Pearson's product-moment correlation
##
## data:  anco.quad$fines and anco.quad$cobble
## t = 0.5413, df = 15, p-value = 0.5963
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.3666191  0.5804448
## sample estimates:
##       cor
## 0.1384165

## Gravel ~ Depth
cor.test(anco.quad$depth, anco.quad$gravel, method = "pearson")

##
##  Pearson's product-moment correlation
##
## data:  anco.quad$depth and anco.quad$gravel
## t = 2.4288, df = 15, p-value = 0.02819
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  0.06801017 0.80608910
## sample estimates:
##       cor
## 0.5312878

## Gravel ~ Fines
cor.test(anco.quad$fines, anco.quad$gravel, method = "pearson")

##
##  Pearson's product-moment correlation
##
```

```
## data:  anco.quad$fines and anco.quad$gravel
## t = -1.2526, df = 15, p-value = 0.2295
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.6867865  0.2029402
## sample estimates:
##        cor
## -0.3077203
```

```
## Sand ~ Depth
cor.test(anco.quad$depth, anco.quad$sand, method = "pearson")
```

```
##
##  Pearson's product-moment correlation
##
## data:  anco.quad$depth and anco.quad$sand
## t = 1.6648, df = 15, p-value = 0.1167
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.1058280  0.7358735
## sample estimates:
##       cor
## 0.3949038
```

```
## Sand ~ Fines
cor.test(anco.quad$fines, anco.quad$sand, method = "pearson")
```

```
##
##  Pearson's product-moment correlation
##
## data:  anco.quad$fines and anco.quad$sand
## t = -11.947, df = 15, p-value = 4.593e-09
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.9826296 -0.8670476
## sample estimates:
##        cor
## -0.9512617
```

```
## Shell ~ Depth
cor.test(anco.quad$depth, anco.quad$shell, method = "pearson")
```

```
##
##  Pearson's product-moment correlation
##
## data:  anco.quad$depth and anco.quad$shell
## t = -0.87214, df = 15, p-value = 0.3969
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.6334445  0.2917671
## sample estimates:
```

```
##        cor
## -0.2196856
```

```r
## Shell ~ Fines
cor.test(anco.quad$fines, anco.quad$shell, method = "pearson")
```

```
##
##  Pearson's product-moment correlation
##
## data:  anco.quad$fines and anco.quad$shell
## t = 0.17732, df = 15, p-value = 0.8616
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.4446836  0.5150589
## sample estimates:
##       cor
## 0.0457367
```

```r
## Detrial veneer ~ Depth
cor.test(anco.quad$depth, anco.quad$detrital.veneer, method = "pearson")
```

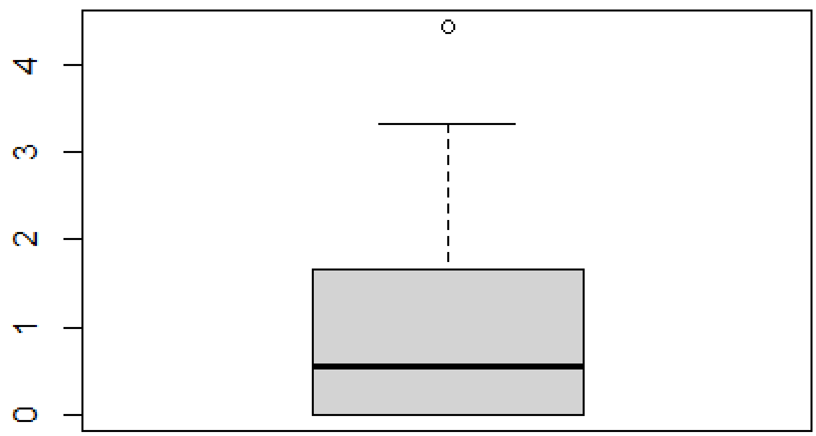
```
##
##  Pearson's product-moment correlation
##
## data:  anco.quad$depth and anco.quad$detrital.veneer
## t = 0.65806, df = 15, p-value = 0.5205
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.3405540  0.5998583
## sample estimates:
##       cor
## 0.1675097
```

```r
## Detrial veneer ~ Fines
cor.test(anco.quad$fines, anco.quad$detrital.veneer, method = "pearson")
```

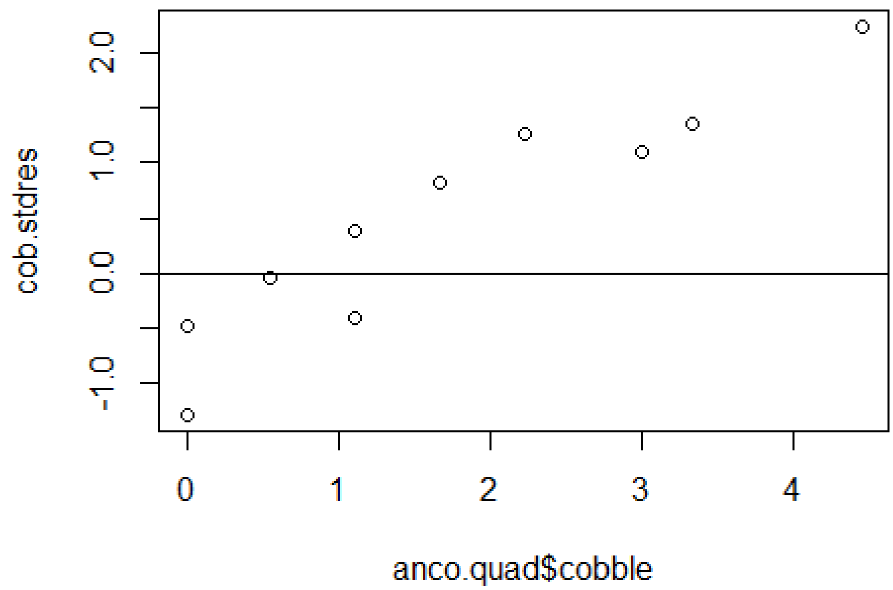
```
##
##  Pearson's product-moment correlation
##
## data:  anco.quad$fines and anco.quad$detrital.veneer
## t = -0.19659, df = 15, p-value = 0.8468
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.5187005  0.4406881
## sample estimates:
##         cor
## -0.05069443
```

```r
## Debris other - Depth
cor.test(anco.quad$depth, anco.quad$debris.other, method = "pearson")
```

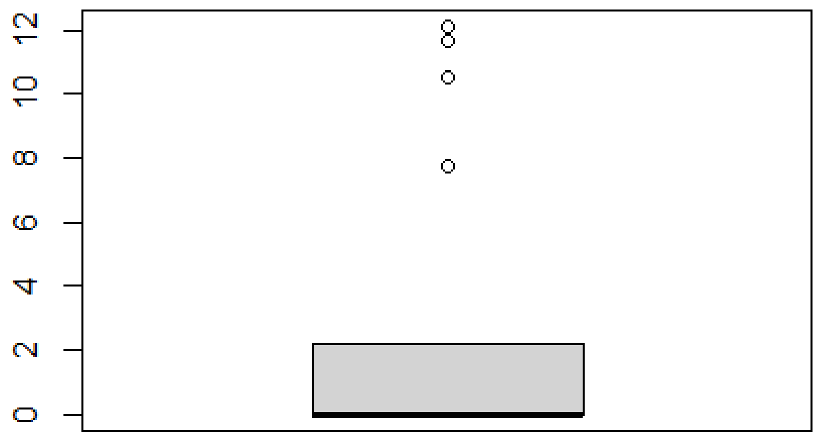
```
##
##  Pearson's product-moment correlation
##
## data:  anco.quad$depth and anco.quad$debris.other
## t = -1.8869, df = 15, p-value = 0.07869
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.75886822  0.05405098
## sample estimates:
##       cor
## -0.437972

## Debris other - Fines
cor.test(anco.quad$fines, anco.quad$debris.other, method = "pearson")

##
##  Pearson's product-moment correlation
##
## data:  anco.quad$fines and anco.quad$debris.other
## t = 0.91468, df = 15, p-value = 0.3748
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.2819455  0.6398091
## sample estimates:
##       cor
## 0.2298472

# Assumption Testing for ANOVA/ANCOVA

## Cobble, covariate = na
### Outliers
boxplot(anco.quad$cobble)
```



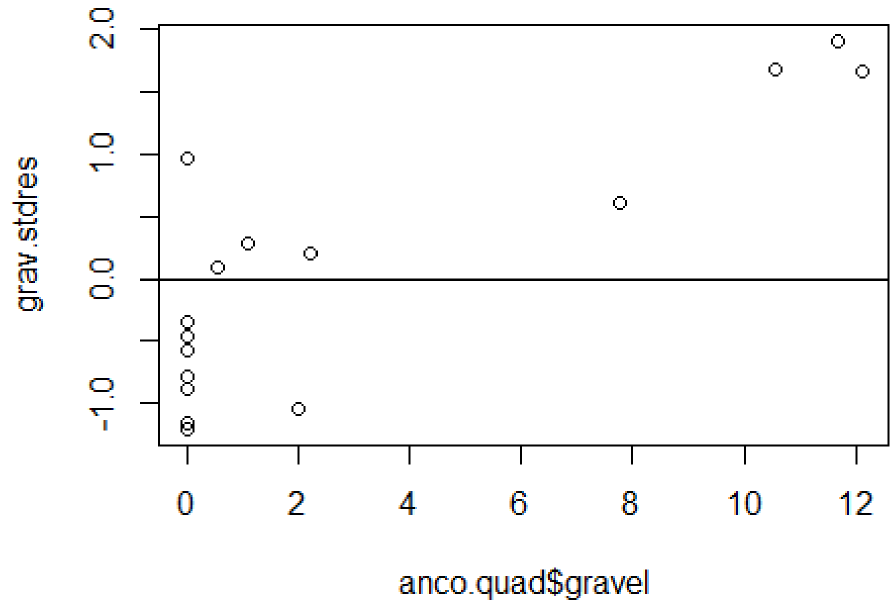

```
boxplot.stats(anco.quad$cobble)$out # 4.444, 3.333

## [1] 4.444444

model.cob.0 <- lm(cobble ~ site, data = anco.quad)
cob.stdres <- rstandard(model.cob.0)
cob.stdres

##           1           2           3           4           5           6
## -0.48766062 -0.48766062  1.26791762 -0.48766062 -0.48766062  0.39012850
##           7           8           9          10          11          12
##  0.82902306 -0.04876606 -0.48766062 -1.29391510  2.24499799 -0.40918683
##          13          14          15          16          17
## -0.40918683  1.36026972  1.09485124 -1.29391510 -1.29391510

plot(anco.quad$cobble, cob.stdres)
abline(0,0)
```




```
### Normality of Residuals
model.cob <- lm(cobble ~  site, data = anco.quad)
shapiro.test(model.cob$residuals)

##
##  Shapiro-Wilk normality test
##
## data:  model.cob$residuals
## W = 0.90107, p-value = 0.0708

### Homogeneity of Variance
leveneTest(model.cob$residuals ~ site, data = anco.quad)

## Levene's Test for Homogeneity of Variance (center = median)
##       Df F value Pr(>F)
## group  1  2.3135  0.149
##       15

## Gravel, covariate = Depth
### Outliers
boxplot(anco.quad$gravel)
```

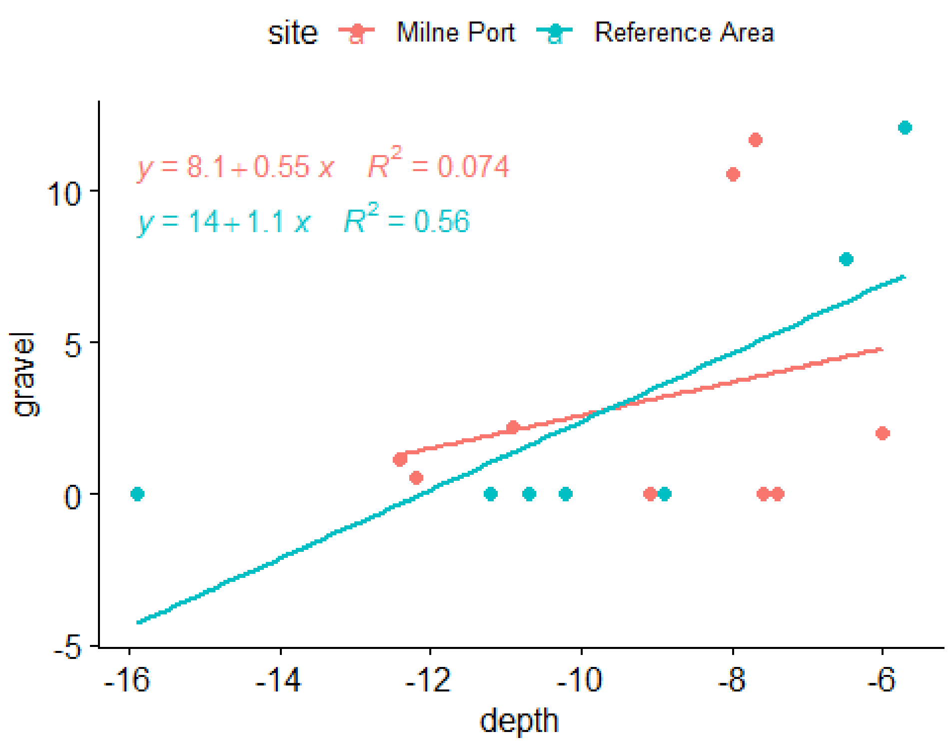



```
boxplot.stats(anco.quad$gravel)$out

## [1] 10.555556 11.666667  7.777778 12.111111

model.grv.0 <- lm(gravel ~ depth + site, data = anco.quad)
grav.stdres <- rstandard(model.grv.0)
plot(anco.quad$gravel, grav.stdres)
abline(0,0)
```

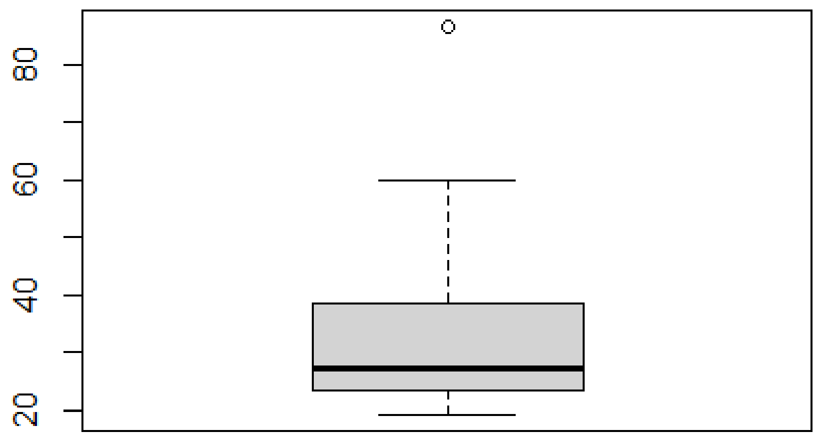



```
### Normality of Residuals
model.grv <- lm(gravel ~ depth + site, data = anco.quad)
shapiro.test(model.grv$residuals)

##
##  Shapiro-Wilk normality test
##
## data:  model.grv$residuals
## W = 0.91194, p-value = 0.1079

### Homogeneity of Regression Slopes
anco.quad %>% anova_test(gravel ~ site*depth)

## Coefficient covariances computed by hccm()

## ANOVA Table (type II tests)
##
##       Effect DFn DFd     F     p p<.05     ges
## 1       site   1  13 0.006 0.938       0.00048
## 2      depth   1  13 5.218 0.040     * 0.28600
## 3 site:depth   1  13 0.496 0.494       0.03700

### Homogeneity of Variance
levene_test(model.grv$residuals ~ site, data = anco.quad)

## # A tibble: 1 x 4
##     df1   df2 statistic     p
```

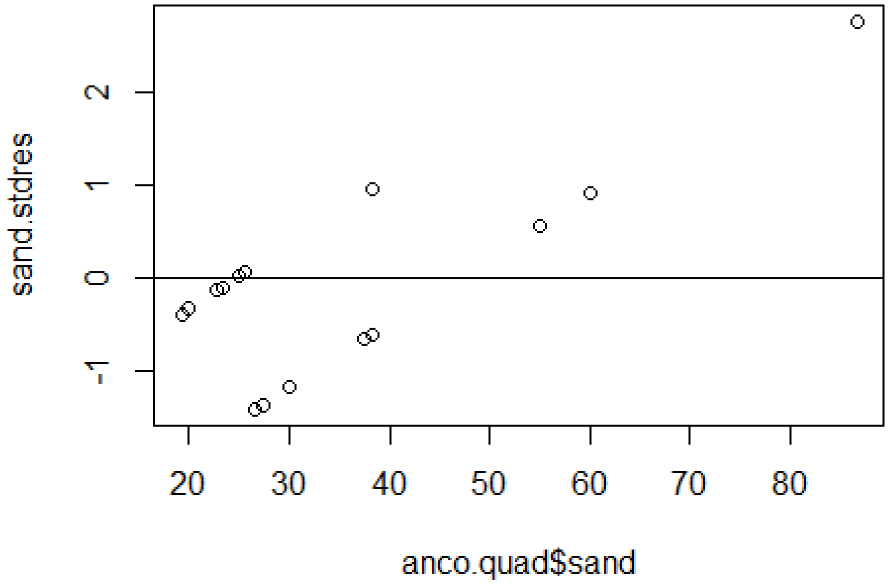
```
##    <int> <int>      <dbl> <dbl>
## 1     1    15      0.795 0.387

### Linearity
ggscatter(
  anco.quad, x = "depth", y = "gravel",
  color = "site", add = "reg.line"
)+
  stat_regline_equation(
    aes(label = paste(..eq.label.., ..rr.label.., sep = "~~~~"), color =
site)
  )

## `geom_smooth()` using formula 'y ~ x'
```



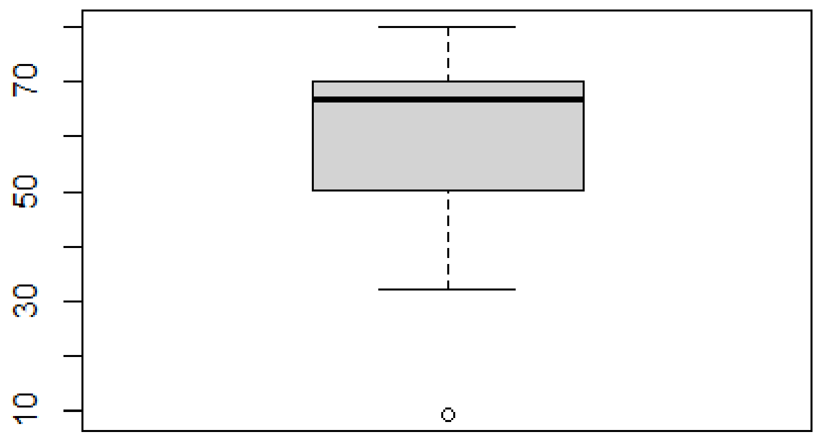

```
## Sand, covariate = na
### Outliers
boxplot(anco.quad$sand)
```



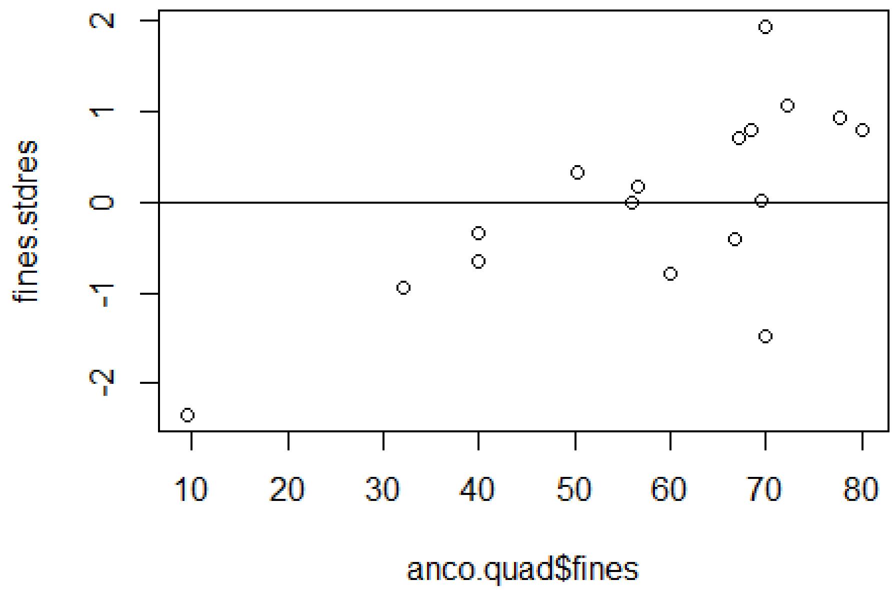

```
boxplot.stats(anco.quad$sand)$out

## [1] 86.66667

model.sand <- lm(sand ~ site, data = anco.quad)
sand.stdres <- rstandard(model.sand)
sand.stdres

##           1           2           3           4           5           6
##  0.91687018 -0.59261121 -1.35896331 -1.40540889  0.91687018  2.77469344
##           7           8           9          10          11          12
## -0.64679773  0.56852832 -1.17318098  0.02633217  0.06534279  0.96258709
##          13          14          15          16          17
## -0.12971032 -0.09069970 -0.37937829 -0.32476342 -0.12971032

plot(anco.quad$sand, sand.stdres)
abline(0,0)
```




```
###Log transformation
anco.quad$sand.LOG <- log10(anco.quad$sand)
### Normality of Residuals
model.snd <- lm(sand.LOG ~ site, data = anco.quad)
shapiro.test(model.snd$residuals)

##
##  Shapiro-Wilk normality test
##
## data:  model.snd$residuals
## W = 0.96451, p-value = 0.7171

### Homogeneity of Variance
levene_test(model.snd$residuals ~ site, data = anco.quad)

## # A tibble: 1 x 4
##     df1   df2 statistic      p
##   <int> <int>     <dbl>  <dbl>
## 1     1    15      4.04 0.0628

### Fines, covariate = Depth
### Outliers
boxplot(anco.quad$fines)
```

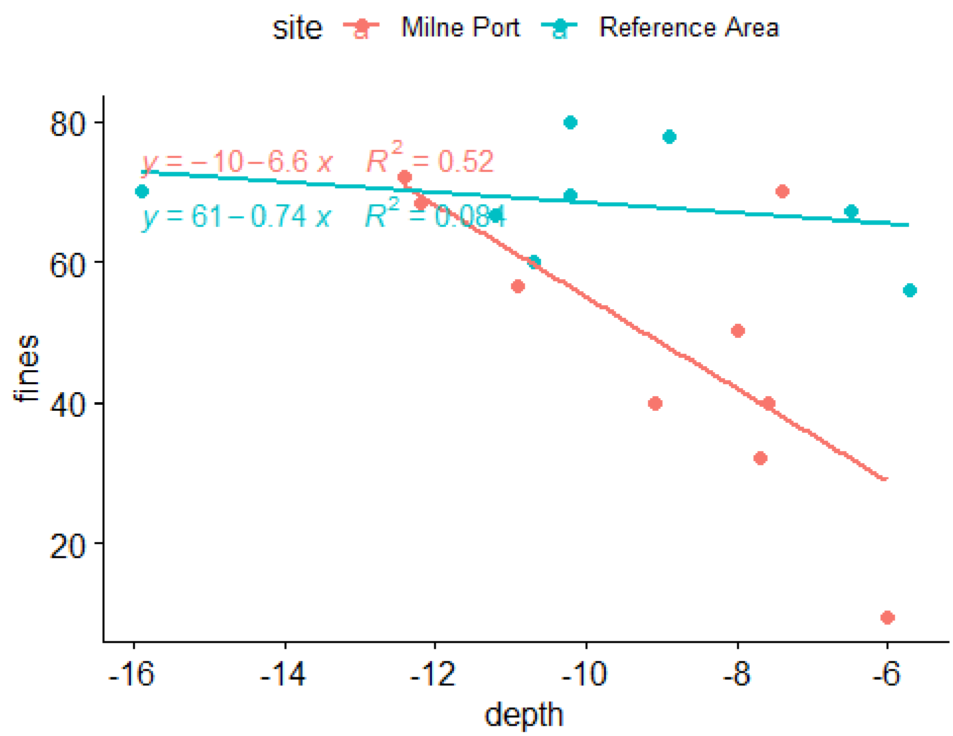



```
boxplot.stats(anco.quad$fines)$out

## [1] 9.444444

model.fines <- lm(fines ~ depth + site, data = anco.quad)
fines.stdres <- rstandard(model.fines)
plot(anco.quad$fines, fines.stdres)
abline(0,0)
```

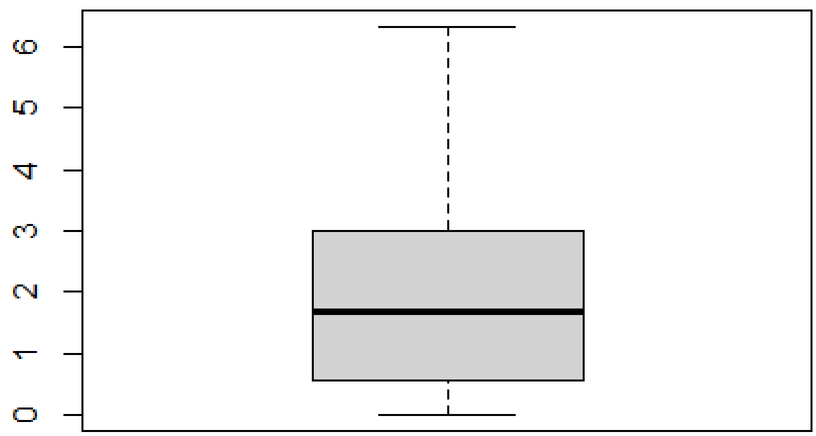



```
### Normality of Residuals
model.fine <- lm(fines ~ depth + site, data = anco.quad)
shapiro.test(model.fine$residuals)

##
##  Shapiro-Wilk normality test
##
## data:  model.fine$residuals
## W = 0.98147, p-value = 0.9693

### Homogeneity of Regression Slopes
anco.quad %>% anova_test(fines ~ site*depth)

## Coefficient covariances computed by hccm()

## ANOVA Table (type II tests)
##
##       Effect DFn DFd     F     p p<.05   ges
## 1       site   1  13 7.551 0.017     * 0.367
## 2      depth   1  13 6.029 0.029     * 0.317
## 3 site:depth   1  13 5.548 0.035     * 0.299

### Homogeneity of Variance
levene_test(model.fine$residuals ~ site, data = anco.quad)

## # A tibble: 1 x 4
##     df1   df2 statistic     p
```

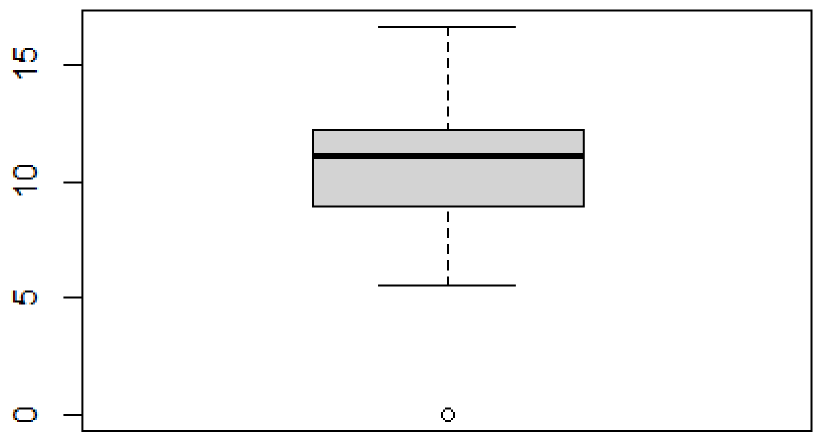
```
##    <int> <int>      <dbl> <dbl>
## 1      1     15       1.06 0.319

### Linearity
ggscatter(
  anco.quad, x = "depth", y = "fines",
  color = "site", add = "reg.line"
)+
  stat_regline_equation(
    aes(label = paste(..eq.label.., ..rr.label.., sep = "~~~~"), color =
site)
  )

## `geom_smooth()` using formula 'y ~ x'
```



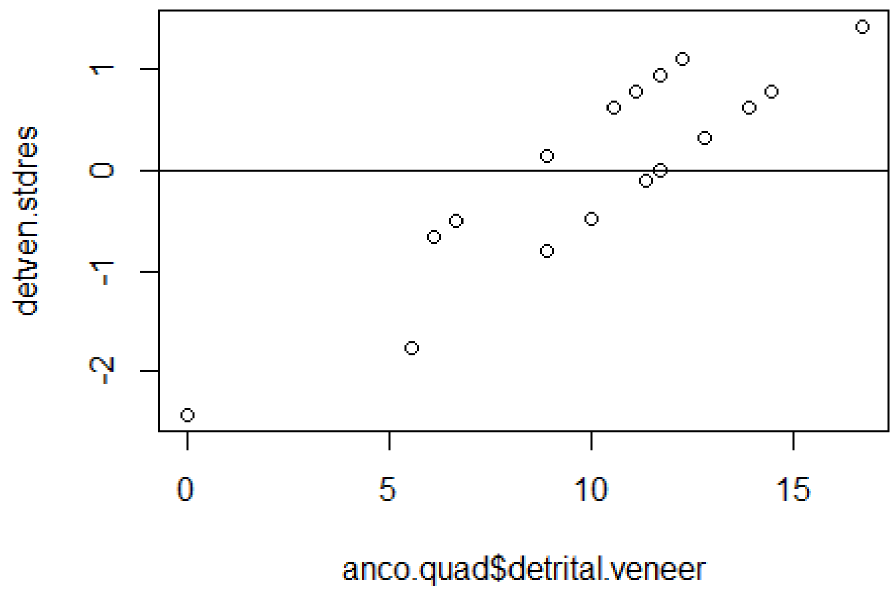

```
### Shell, covariate = na
### Outliers
boxplot(anco.quad$shell)
```



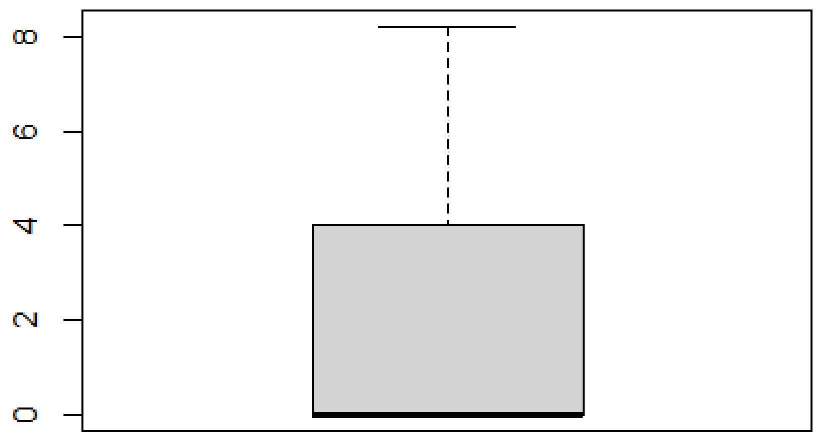

```
boxplot.stats(anco.quad$shell)$out

## numeric(0)

### Normality of Residuals
model.shell <- lm(shell ~  site, data = anco.quad)
shapiro.test(model.shell$residuals)

##
##  Shapiro-Wilk normality test
##
## data:  model.shell$residuals
## W = 0.93159, p-value = 0.2314

### Homogeneity of Variance
leveneTest(model.shell$residuals ~ site, data = anco.quad)

## Levene's Test for Homogeneity of Variance (center = median)
##       Df F value Pr(>F)
## group  1  2.4423  0.139
##       15

### Detrital Veneer, covariate = na \
### Outliers
boxplot(anco.quad$detrital.veneer)
```




```
boxplot.stats(anco.quad$detrital.veneer)$out

## [1] 0

model.detven <- lm(detrital.veneer ~ site, data = anco.quad)
detven.stdres <- rstandard(model.detven)
detven.stdres

##            1            2            3            4            5
6
## -0.007116307 -0.103186471 -0.487467115  1.433936114  0.633351435
0.313117564
##            7            8            9           10           11
12
## -0.807700987 -1.768402601  0.793468369 -0.665703646  0.625357971
0.948123375
##           13           14           15           16           17
##  1.109506075 -0.504320944  0.141209864  0.786740671 -2.440913367

plot(anco.quad$detrital.veneer, detven.stdres)
abline(0,0)
```

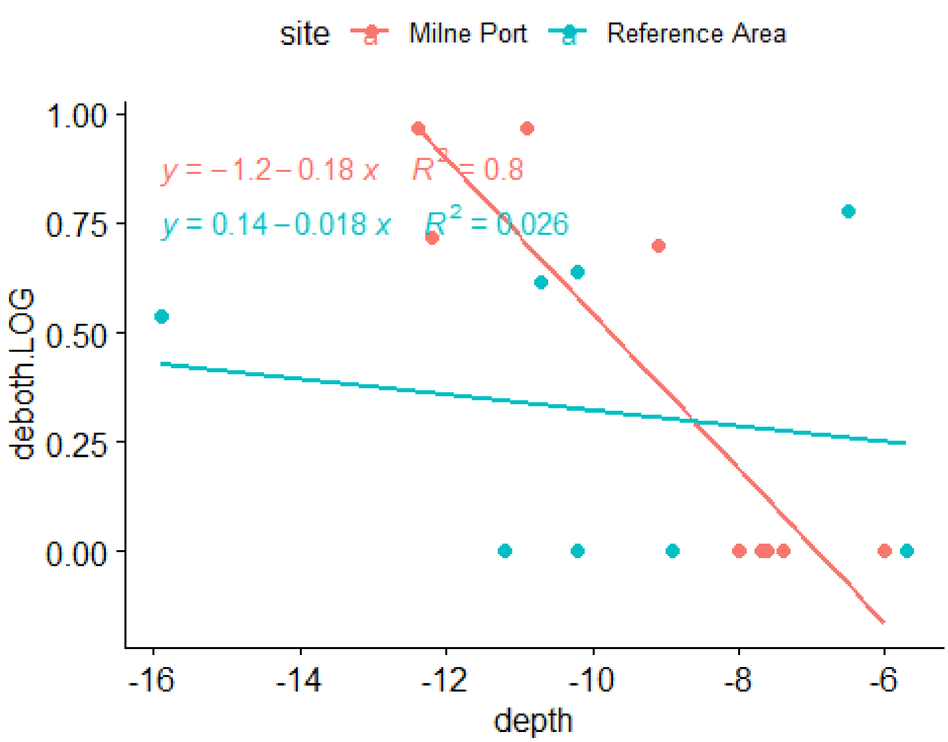



```
### Normality of Residuals
model.det.ven <- lm(detrital.veneer ~  site, data = anco.quad)
shapiro.test(model.det.ven$residuals)

##
##  Shapiro-Wilk normality test
##
## data:  model.det.ven$residuals
## W = 0.93467, p-value = 0.2603

### Homogeneity of Variance
leveneTest(model.det.ven$residuals ~ site, data = anco.quad)

## Levene's Test for Homogeneity of Variance (center = median)
##       Df F value Pr(>F)
## group  1  0.2027  0.659
##       15

### Debris Other, covariate = Depth
### Outliers
boxplot(anco.quad$debris.other)
```

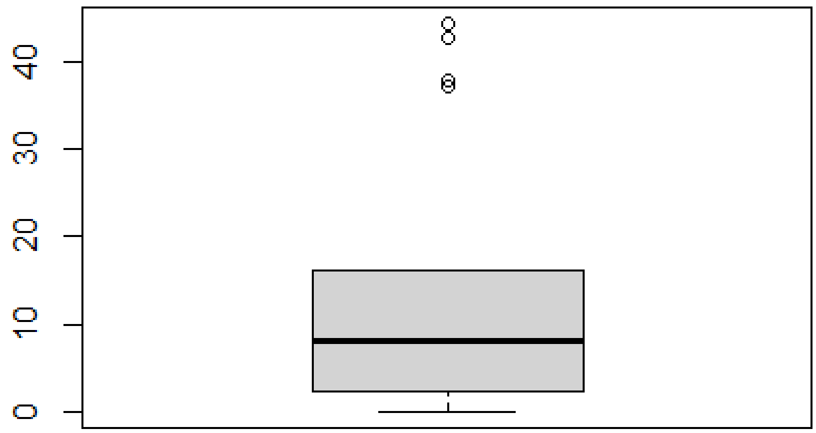



```
boxplot.stats(anco.quad$debris.other)$out

## numeric(0)

### Log transformation
anco.quad$deboth.LOG <- log10(anco.quad$debris.other + 1)
### Normality of Residuals
model <- lm(deboth.LOG ~ depth + site, data = anco.quad)
shapiro.test(model$residuals)

##
##  Shapiro-Wilk normality test
##
## data:  model$residuals
## W = 0.8997, p-value = 0.06715

### Homogeneity of Regression Slopes
anco.quad %>% anova_test(deboth.LOG ~ site*depth)

## Coefficient covariances computed by hccm()

## ANOVA Table (type II tests)
##
##       Effect DFn DFd     F     p p<.05   ges
## 1       site   1  13 0.666 0.429       0.049
## 2      depth   1  13 7.584 0.016     * 0.368
## 3 site:depth   1  13 7.438 0.017     * 0.364
```

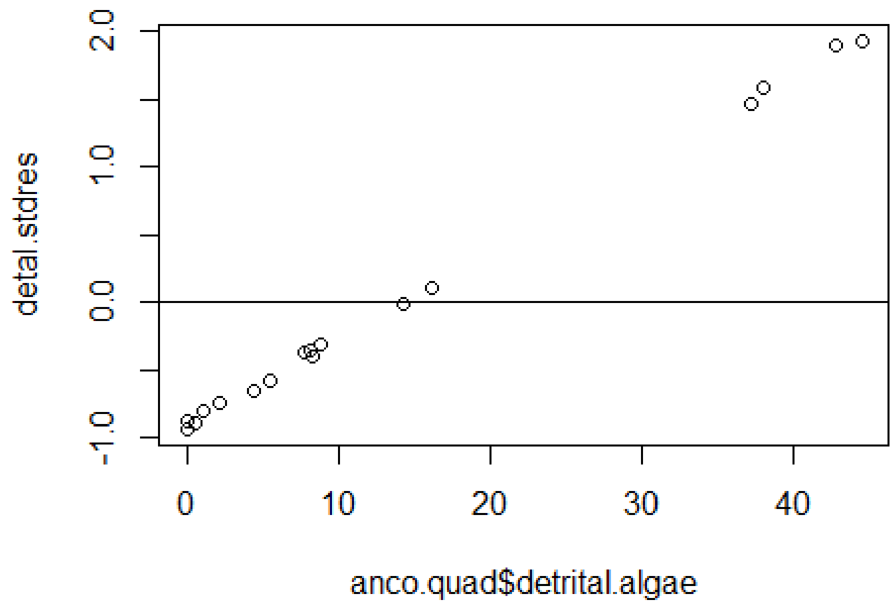
```
### Homogeneity of Variance
levene_test(model$residuals ~ site, data = anco.quad)

## # A tibble: 1 x 4
##     df1   df2 statistic     p
##   <int> <int>     <dbl> <dbl>
## 1     1    15     0.345 0.566

### Linearity
ggscatter(
  anco.quad, x = "depth", y = "deboth.LOG",
  color = "site", add = "reg.line"
)+
  stat_regline_equation(
    aes(label = paste(..eq.label.., ..rr.label.., sep = "~~~~"), color =
site)
  )

## `geom_smooth()` using formula 'y ~ x'
```



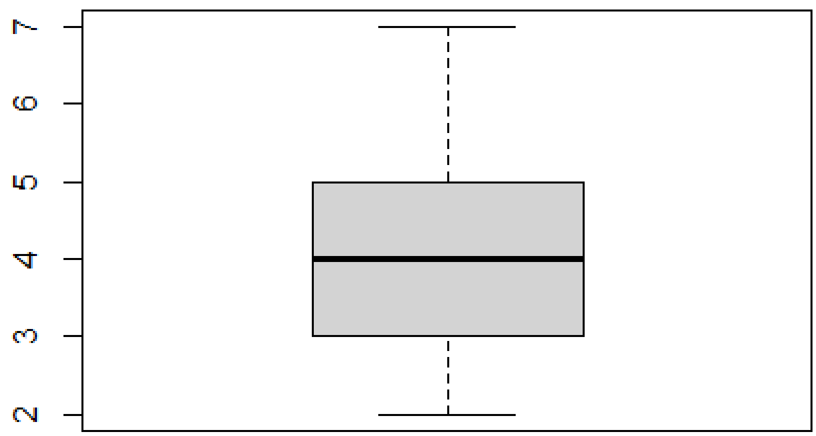

```
### Detrital algae, covariate = na \
### Outliers
boxplot(anco.quad$detrital.algae)
```



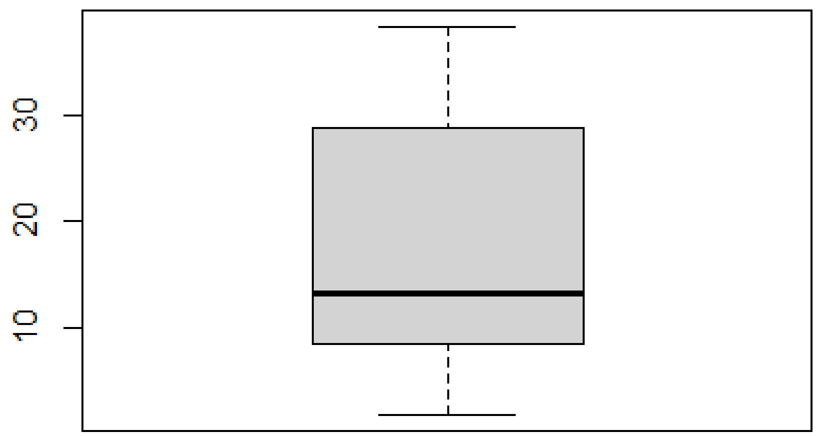

```
boxplot.stats(anco.quad$detrital.algae)$out

## [1] 37.22222 44.44444 38.00000 42.77778

model.detal <- lm(detrital.algae ~ site, data = anco.quad)
detal.stdres <- rstandard(model.detal)
detal.stdres

##           1           2           3           4           5           6
## -0.40105445 -0.01355452 -0.65221181 -0.58762849 -0.93924879 -0.90336917
##           7           8           9          10          11          12
##  1.46468593  1.93112102  0.10126027  1.58847122  1.89947526 -0.35711220
##          13          14          15          16          17
## -0.31371628 -0.74044276 -0.37881015 -0.88509580 -0.81276928

plot(anco.quad$detrital.algae, detal.stdres)
abline(0,0)
```




```
### Log transformation
anco.quad$detal.LOG <- log10(anco.quad$detrital.algae + 1)
### Normality of Residuals
model.det.al <- lm(detal.LOG ~  site, data = anco.quad)
shapiro.test(model.det.al$residuals)

##
##  Shapiro-Wilk normality test
##
## data:  model.det.al$residuals
## W = 0.93994, p-value = 0.3175

### Homogeneity of Variance
leveneTest(model.det.al$residuals ~ site, data = anco.quad)

## Levene's Test for Homogeneity of Variance (center = median)
##       Df F value Pr(>F)
## group  1  0.0035 0.9537
##       15

## Macroflora Taxa Richness, covariate = na
### Outliers
boxplot(anco.quad$macro.taxa.richness)
```

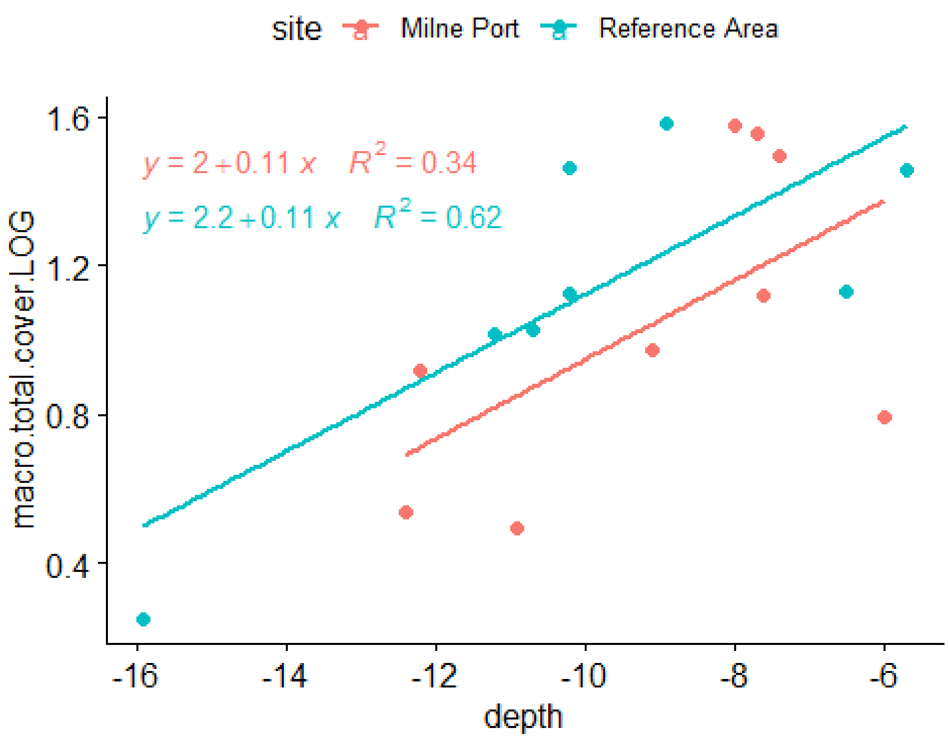



```
boxplot.stats(anco.quad$macro.taxa.richness)$out

## integer(0)

### Normalty of Residuals
model.mtr <- lm(macro.taxa.richness ~  site, data = anco.quad)
shapiro.test(model.mtr$residuals)

##
##  Shapiro-Wilk normality test
##
## data:  model.mtr$residuals
## W = 0.921, p-value = 0.1535

###  Homogeneity of Variance
leveneTest(model.mtr$residuals ~ site, data = anco.quad)

## Levene's Test for Homogeneity of Variance (center = median)
##       Df F value Pr(>F)
## group  1  1.0787 0.3154
##       15

## Macroflora Total Cover, covariate = Depth
###  OUTLIERS
boxplot(anco.quad$macro.total.cover, y = "macro.total.cover")
```

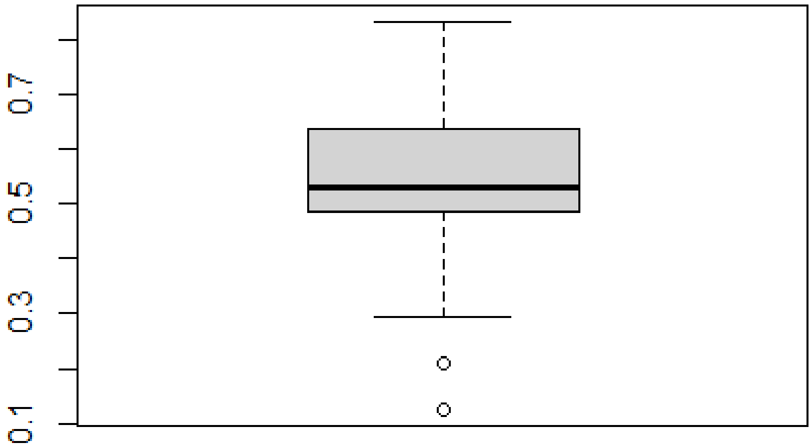



```
boxplot.stats(anco.quad$macro.total.cover)$out

## numeric(0)

### Log transformation
anco.quad$macro.total.cover.LOG <- log10(anco.quad$macro.total.cover)
###  Normality of Residuals
model <- lm(macro.total.cover.LOG ~ depth + site, data = anco.quad)
shapiro.test(model$residuals)

##
##  Shapiro-Wilk normality test
##
## data:  model$residuals
## W = 0.95049, p-value = 0.4644

###  Homogeneity of Regression Slopes
anco.quad %>% anova_test(macro.total.cover.LOG ~ site*depth)

## Coefficient covariances computed by hccm()

## ANOVA Table (type II tests)
##
##       Effect DFn DFd        F     p p<.05      ges
## 1       site   1  13  1.16900 0.299       8.20e-02
## 2      depth   1  13 11.67200 0.005     * 4.73e-01
## 3 site:depth   1  13  0.00044 0.984       3.38e-05
```

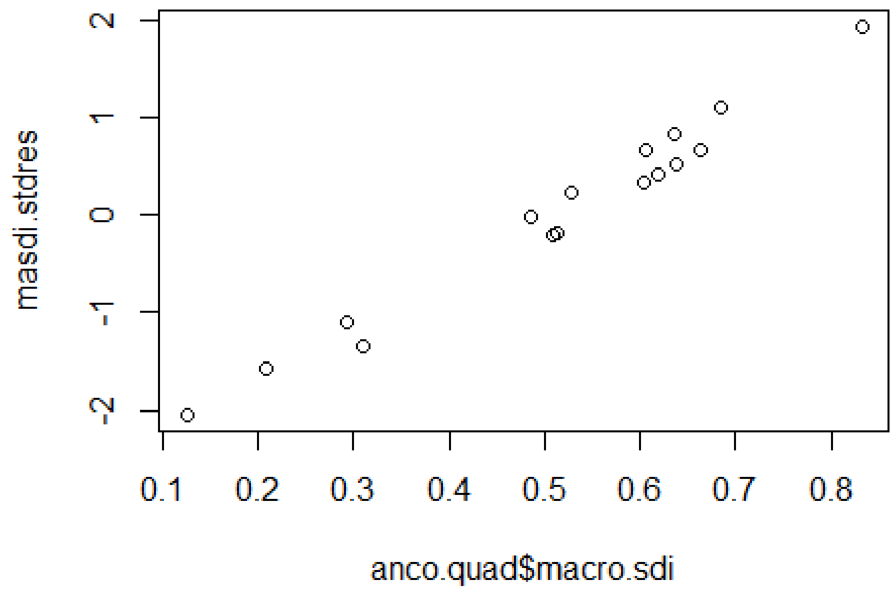
```r
###  Homogeneity of Variance
levene_test(model$residuals ~ site, data = anco.quad)

## # A tibble: 1 x 4
##     df1   df2 statistic     p
##   <int> <int>     <dbl> <dbl>
## 1     1    15     0.903 0.357

###  Linearity
ggscatter(
  anco.quad, x = "depth", y = "macro.total.cover.LOG",
  color = "site", add = "reg.line"
)+
  stat_regline_equation(
    aes(label = paste(..eq.label.., ..rr.label.., sep = "~~~~"), color =
site)
)

## `geom_smooth()` using formula 'y ~ x'
```




```r
## Macroflora SDI, covariate = fines
### Outliers
boxplot(anco.quad$macro.sdi)
```

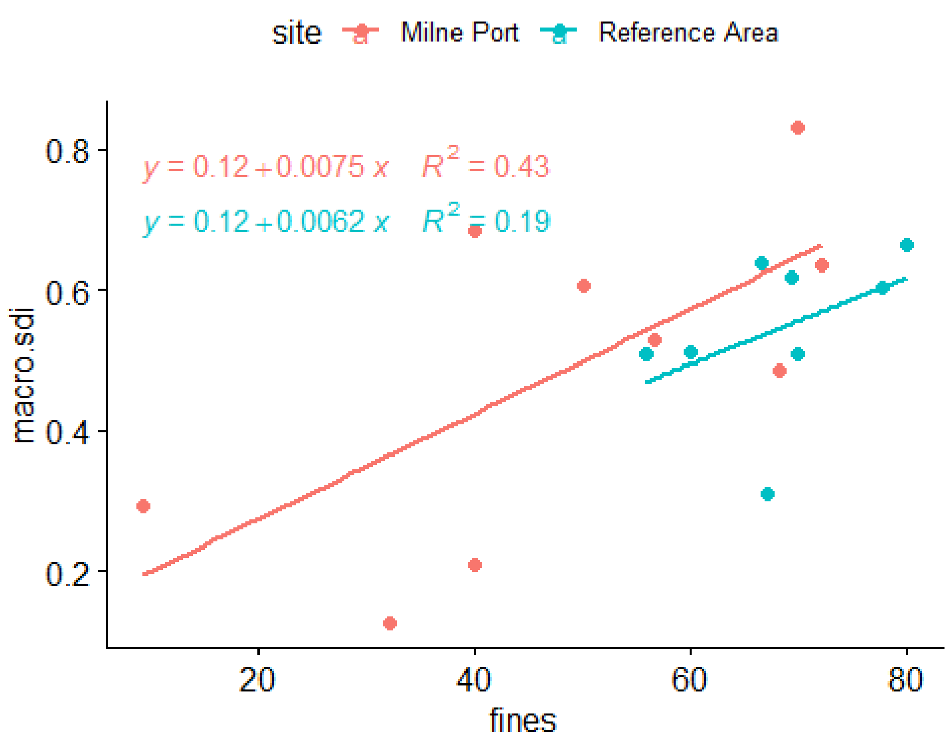



```
boxplot.stats(anco.quad$macro.sdi)$out

## [1] 0.2076125 0.1249988

model.masdi <- lm(macro.sdi ~ site, data = anco.quad)
masdi.stdres <- rstandard(model.masdi)
masdi.stdres

##           1           2           3           4           5           6 
## -1.58029479  0.22270899 -0.02270065  0.82887856  1.10413233 -1.09779522 
##           7           8           9          10          11          12 
##  0.65862240 -2.04512029  1.93156868 -0.21239795  0.41441887 -0.18778435 
##          13          14          15          16          17 
## -1.33368806 -0.21278432  0.33588527  0.66876919  0.52758135

plot(anco.quad$macro.sdi, masdi.stdres)  # no outliers with res > 3.5
```

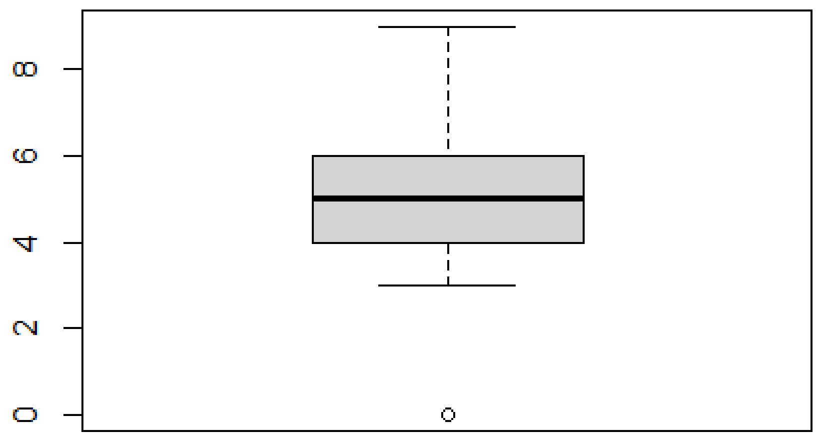



```
### Normality of Residuals
model <- lm(macro.sdi ~ fines + site, data = anco.quad)
shapiro.test(model$residuals) # p-value = 0.1696

##
##  Shapiro-Wilk normality test
##
## data:  model$residuals
## W = 0.9503, p-value = 0.4613

### Homogeneity of Regression Slopes
anco.quad %>% anova_test(macro.sdi ~ site*fines)

## Coefficient covariances computed by hccm()

## ANOVA Table (type II tests)
##
##       Effect DFn DFd     F     p p<.05   ges
## 1       site   1  13 0.897 0.361       0.065
## 2      fines   1  13 8.316 0.013     * 0.390
## 3 site:fines   1  13 0.028 0.870       0.002

### Homogeneity of Variance
levene_test(model$residuals ~ site, data = anco.quad)

## # A tibble: 1 x 4
##     df1   df2 statistic     p
```

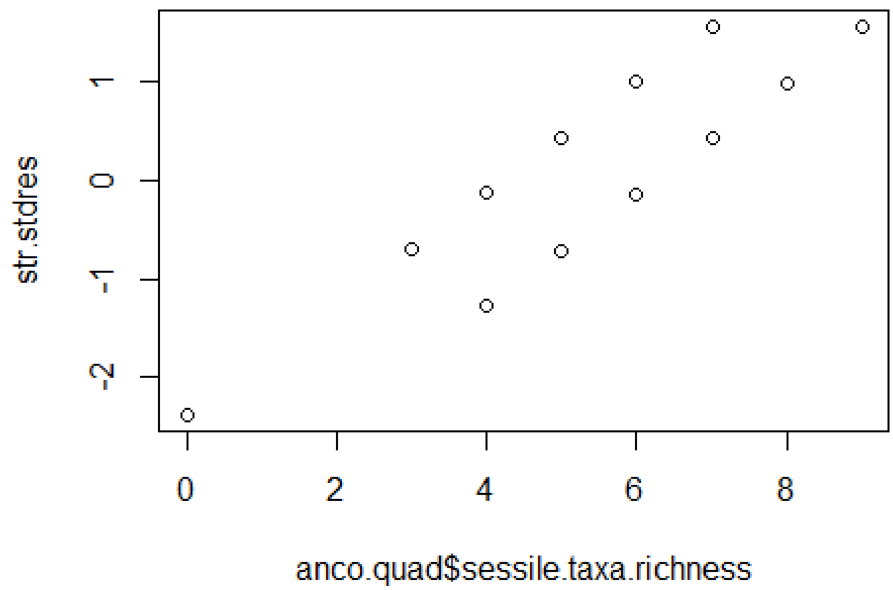
```
##    <int> <int>      <dbl>  <dbl>
## 1      1    15       3.17 0.0954

### Linearity
ggscatter(
  anco.quad, x = "fines", y = "macro.sdi",
  color = "site", add = "reg.line"
)+
  stat_regline_equation(
    aes(label = paste(..eq.label.., ..rr.label.., sep = "~~~~"), color =
site)
  )

## `geom_smooth()` using formula 'y ~ x'
```




```
## Sessile Taxa Richness, covariate = fines
### Outliers
boxplot(anco.quad$sessile.taxa.richness)
```

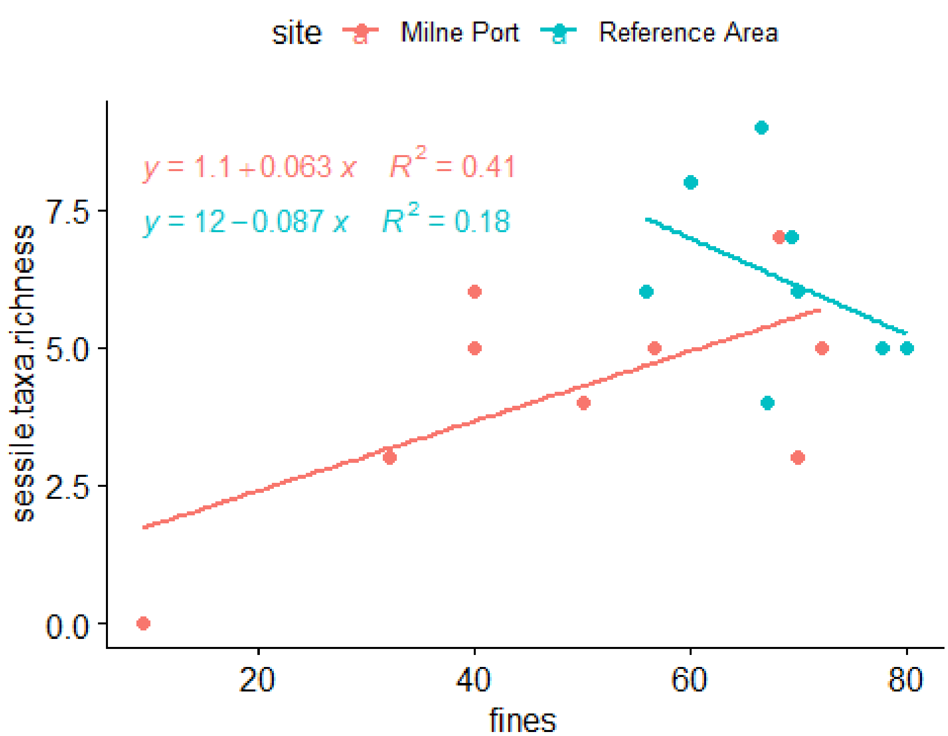



```
boxplot.stats(anco.quad$sessile.taxa.richness)$out

## [1] 0

model.str <- lm(sessile.taxa.richness ~ site, data = anco.quad)
str.stdres <- rstandard(model.str)
str.stdres

##          1          2          3          4          5          6 
7 
##  0.4386438  0.4386438  1.5665850  0.4386438  1.0026144 -2.3812092 -
0.1253268 
##          8          9         10         11         12         13 
14 
## -0.6892974 -0.6892974 -0.1421072  0.4263217  0.9947506 -1.2789651 -
0.1421072 
##         15         16         17 
## -0.7105362 -0.7105362  1.5631795

plot(anco.quad$sessile.taxa.richness, str.stdres)  # no outliers with res > 
3.5
```

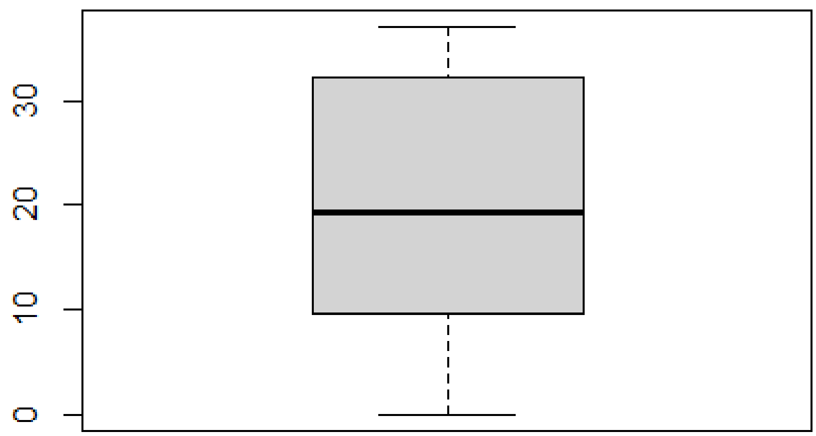



```
### Normality of Residuals
model <- lm(sessile.taxa.richness ~ fines + site, data = anco.quad)
shapiro.test(model$residuals) # p-value = 0.1696

##
##  Shapiro-Wilk normality test
##
## data:  model$residuals
## W = 0.94172, p-value = 0.3391

### Homogeneity of Regression Slopes
anco.quad %>% anova_test(sessile.taxa.richness ~ site*fines)

## Coefficient covariances computed by hccm()

## ANOVA Table (type II tests)
##
##       Effect DFn DFd     F     p p<.05   ges
## 1       site   1  13 1.388 0.260       0.096
## 2      fines   1  13 2.915 0.112       0.183
## 3 site:fines   1  13 3.275 0.094       0.201

### Homogeneity of variance
levene_test(model$residuals ~ site, data = anco.quad)

## # A tibble: 1 x 4
##     df1   df2 statistic     p
```

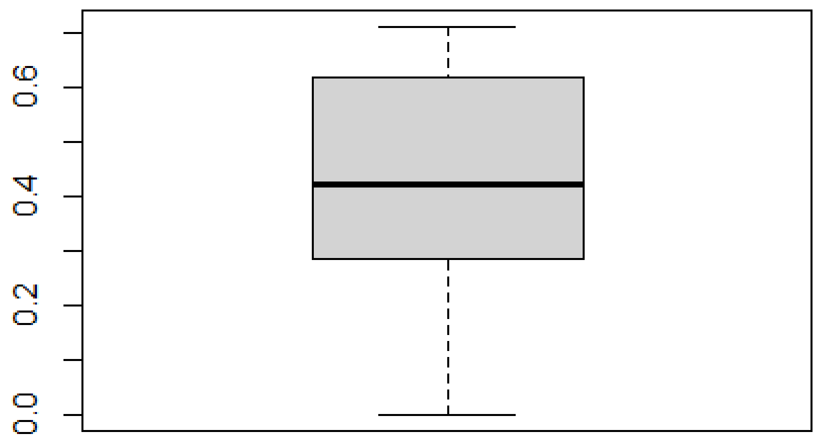
```
##    <int> <int>      <dbl> <dbl>
## 1      1    15      0.318 0.581

### Linearity
ggscatter(
  anco.quad, x = "fines", y = "sessile.taxa.richness",
  color = "site", add = "reg.line"
)+
  stat_regline_equation(
    aes(label = paste(..eq.label.., ..rr.label.., sep = "~~~~"), color =
site)
  )

## `geom_smooth()` using formula 'y ~ x'
```



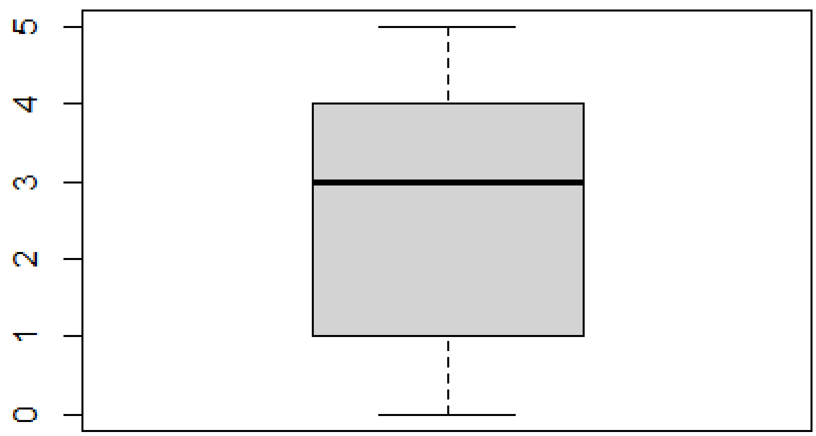

```
## Sessile Total Cover, covariate = na ###
### Outliers
boxplot(anco.quad$sessile.total.cover)
```




```
boxplot.stats(anco.quad$sessile.total.cover)$out

## numeric(0)

### Normality of Residuals
model.stc <- lm(sessile.total.cover ~  site, data = anco.quad)
shapiro.test(model.stc$residuals) # p-value = 0.1535

##
##  Shapiro-Wilk normality test
##
## data:  model.stc$residuals
## W = 0.93385, p-value = 0.2522

### Homogeneity of Variance
leveneTest(model.stc$residuals ~ site, data = anco.quad)

## Levene's Test for Homogeneity of Variance (center = median)
##       Df F value Pr(>F)
## group  1  0.0367 0.8506
##       15

## Sessile SDI, covariate = na
### Outliers
boxplot(anco.quad$sessile.sdi)
```



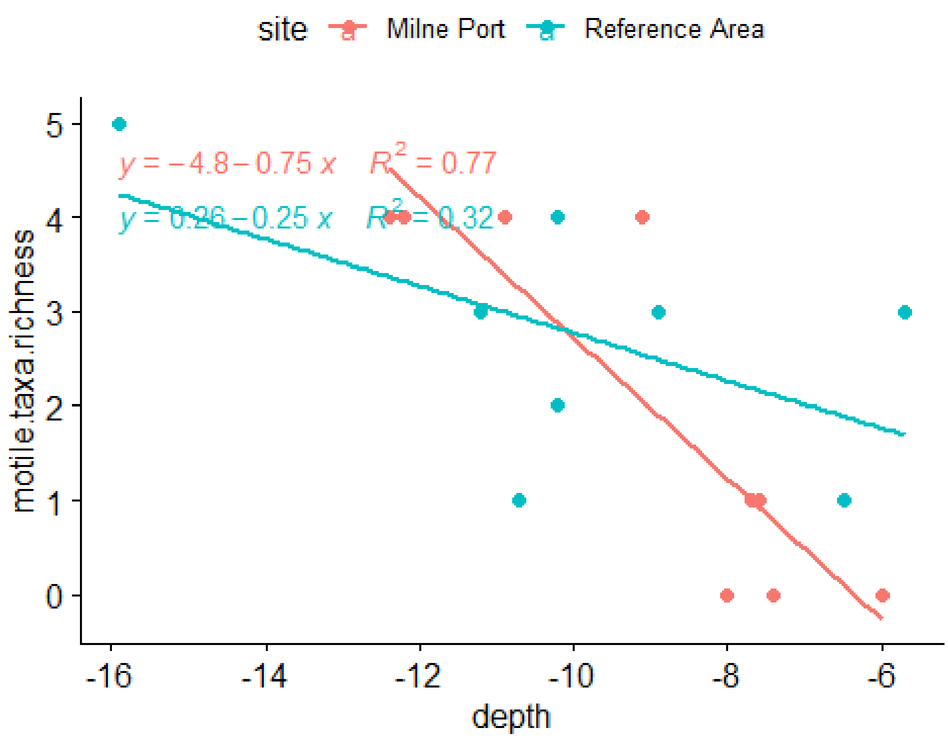

```
boxplot.stats(anco.quad$sessile.sdi)$out

## numeric(0)

### Normality of Residuals
model.ssdi <- lm(sessile.sdi ~  site, data = anco.quad)
shapiro.test(model.ssdi$residuals) # p-value = 0.1535

##
##  Shapiro-Wilk normality test
##
## data:  model.ssdi$residuals
## W = 0.92537, p-value = 0.182

### Homogeneity of Variance
leveneTest(model.ssdi$residuals ~ site, data = anco.quad)

## Levene's Test for Homogeneity of Variance (center = median)
##       Df F value Pr(>F)
## group  1  0.2135 0.6507
##       15

## Motile Taxa Richness, covariate = depth
### OUTLIERS
boxplot(anco.quad$motile.taxa.richness)
```



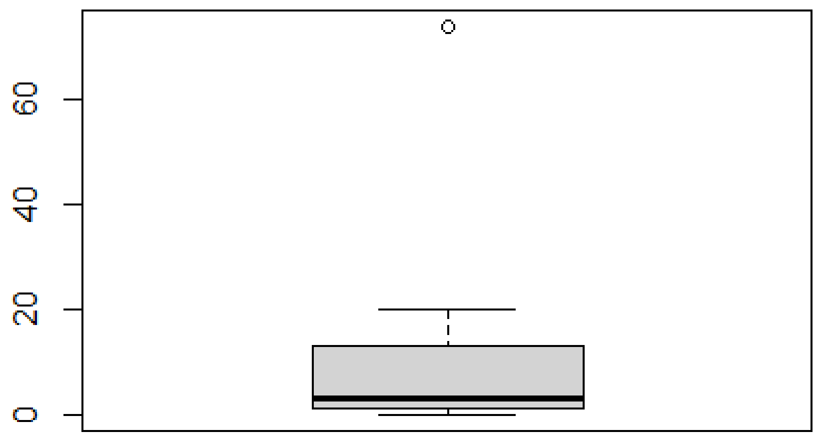

```
boxplot.stats(anco.quad$motile.taxa.richness)$out

## integer(0)

### Normality of Residuals
model <- lm(motile.taxa.richness ~ depth + site, data = anco.quad)
shapiro.test(model$residuals) # p-value = 0.1696

##
##  Shapiro-Wilk normality test
##
## data:  model$residuals
## W = 0.96763, p-value = 0.7757

### Homogeneity of Regression Slopes
anco.quad %>% anova_test(motile.taxa.richness ~ site*depth)

## Coefficient covariances computed by hccm()

## ANOVA Table (type II tests)
##
##       Effect DFn DFd      F     p p<.05   ges
## 1       site   1  13  0.447 0.516       0.033
## 2      depth   1  13 17.260 0.001     * 0.570
## 3 site:depth   1  13  5.211 0.040     * 0.286

### Homogeneity of Variance
levene_test(model$residuals ~ site, data = anco.quad)
```

```
## # A tibble: 1 x 4
##     df1   df2 statistic     p
##   <int> <int>     <dbl> <dbl>
## 1     1    15 0.0000260 0.996
```

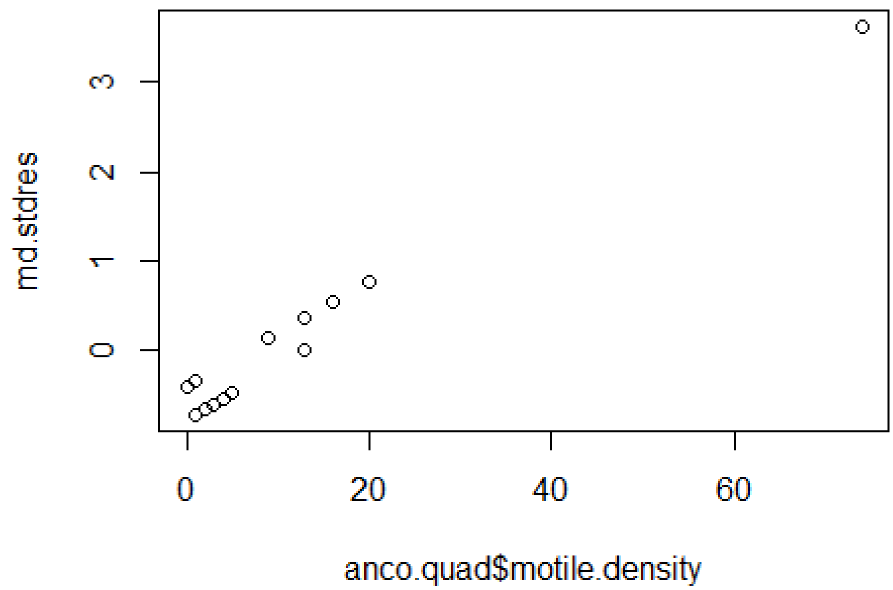
```
### Linearity
ggscatter(
  anco.quad, x = "depth", y = "motile.taxa.richness",
  color = "site", add = "reg.line"
)+
  stat_regline_equation(
    aes(label = paste(..eq.label.., ..rr.label.., sep = "~~~~"), color =
site)
  )

## `geom_smooth()` using formula 'y ~ x'
```




```
## Motile Density, covariate = Depth
### OUTLIERS
boxplot(anco.quad$motile.density)
```

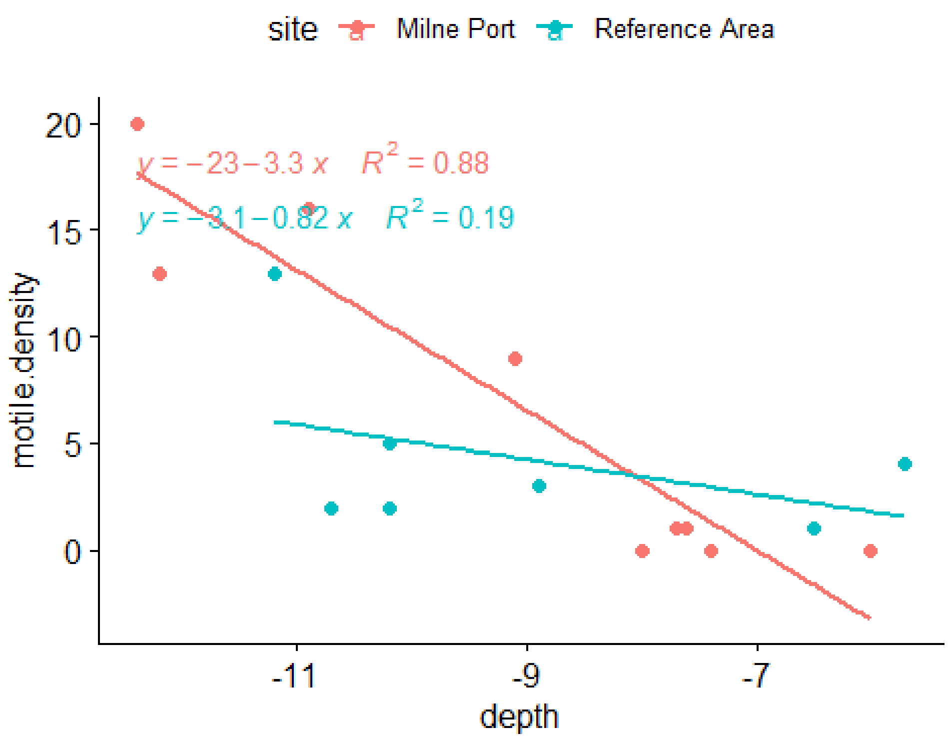



```
boxplot.stats(anco.quad$motile.density)$out

## [1] 74

model.md <- lm(motile.density ~ site, data = anco.quad)
md.stdres <- rstandard(model.md)
md.stdres

##          1          2          3          4          5          6          
7 
##  0.1374930  0.5499719  0.3731952  0.7856742 -0.3339115 -0.3928371 -
0.3928371 
##          8          9         10         11         12         13         
14 
## -0.3339115 -0.3928371  3.6228746 -0.4751311 -0.6533053 -0.7126966 -
0.5345225 
##         15         16         17 
## -0.5939139 -0.6533053  0.0000000

plot(anco.quad$motile.density, md.stdres)  # 1 > 3.5
```

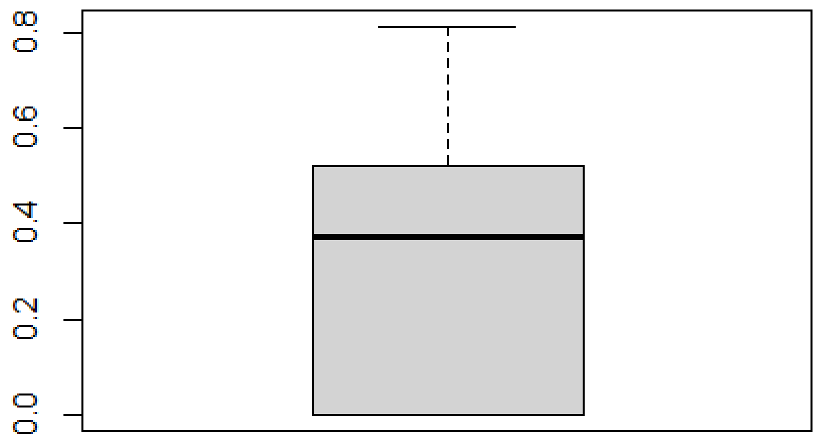



```
outliers <- boxplot(anco.quad$motile.density, plot=FALSE)$out
anco.quad.md <- anco.quad[-which(anco.quad$motile.density %in% outliers),]
### Normality of Residuals
model <- lm(motile.density ~ depth + site, data = anco.quad.md)
shapiro.test(model$residuals) # p-value = 0.1696

##
##  Shapiro-Wilk normality test
##
## data:  model$residuals
## W = 0.95749, p-value = 0.6165

### Homogeneity of Regression Slopes
anco.quad.md %>% anova_test(motile.density ~ site*depth)

## Coefficient covariances computed by hccm()

## ANOVA Table (type II tests)
##
##       Effect DFn DFd      F        p p<.05   ges
## 1       site   1  12  1.958 0.187000       0.140
## 2      depth   1  12 30.509 0.000131     * 0.718
## 3 site:depth   1  12  8.406 0.013000     * 0.412

### Homogeneity of Variance
levene_test(model$residuals ~ site, data = anco.quad.md)
```

```
## # A tibble: 1 x 4
##     df1   df2 statistic     p
##   <int> <int>     <dbl> <dbl>
## 1     1    14     0.639 0.438

### Linearity
ggscatter(
  anco.quad.md, x = "depth", y = "motile.density",
  color = "site", add = "reg.line"
)+
  stat_regline_equation(
    aes(label = paste(..eq.label.., ..rr.label.., sep = "~~~~"), color =
site)
  )

## `geom_smooth()` using formula 'y ~ x'
```



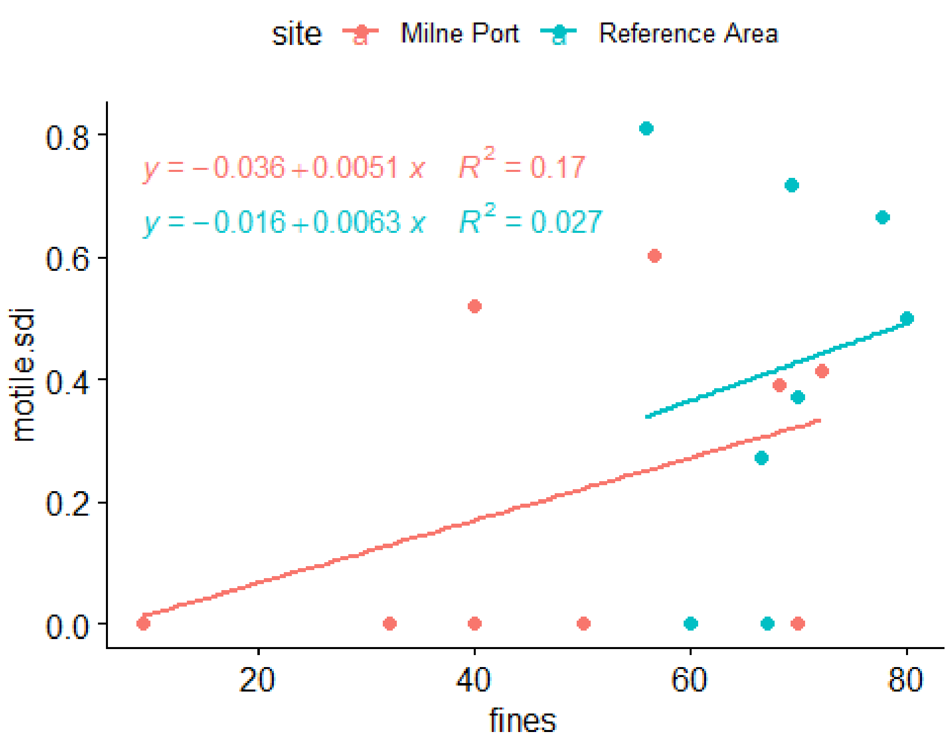

```
## Motile SDI, covariate = Fines
### Outliers
boxplot(anco.quad$motile.sdi)
```




```
boxplot.stats(anco.quad$motile.sdi)$out

## numeric(0)

### Normality of Residuals
model <- lm(motile.sdi ~ fines + site, data = anco.quad)
shapiro.test(model$residuals) # p-value = 0.1696

##
##  Shapiro-Wilk normality test
##
## data:  model$residuals
## W = 0.96321, p-value = 0.6924

### Homogeneity of Regression Slopes
anco.quad %>% anova_test(motile.sdi ~ site*fines)

## Coefficient covariances computed by hccm()

## ANOVA Table (type II tests)
##
##       Effect DFn DFd     F     p p<.05      ges
## 1       site   1  13 0.349 0.565       0.026000
## 2      fines   1  13 1.245 0.285       0.087000
## 3 site:fines   1  13 0.007 0.935       0.000534

### Homogeneity of Variance
levene_test(model$residuals ~ site, data = anco.quad)
```

```
## # A tibble: 1 x 4
##     df1   df2 statistic     p
##   <int> <int>     <dbl> <dbl>
## 1     1    15     0.612 0.446
```

```
### Linearity
ggscatter(
  anco.quad, x = "fines", y = "motile.sdi",
  color = "site", add = "reg.line"
)+
  stat_regline_equation(
    aes(label = paste(..eq.label.., ..rr.label.., sep = "~~~~"), color =
site)
  )

## `geom_smooth()` using formula 'y ~ x'
```




```
# ANOVA/ANCOVA Testing and Post-Hoc Testing

## Cobble
res.aov.cob <- anco.quad %>% anova_test(cobble ~ site)

## Coefficient covariances computed by hccm()

res.aov.cob

## ANOVA Table (type II tests)
##
```

```
##   Effect DFn DFd     F     p p<.05   ges
## 1   site   1  15 2.386 0.143       0.137

pwc <- anco.quad %>% tukey_hsd(cobble ~ site)
pwc

## # A tibble: 1 x 9
##   term  group1  group2 null.value estimate conf.low conf.high p.adj
p.adj.signif
## * <chr> <chr>   <chr>       <dbl>    <dbl>    <dbl>     <dbl> <dbl> <chr>
## 1 site  Milne ~ Refer~          0     1.01   -0.383      2.40 0.143 ns

## Gravel + Depth
res.aov.grav <- anco.quad %>% anova_test(gravel ~ depth + site)

## Coefficient covariances computed by hccm()

get_anova_table(res.aov.grav)

## ANOVA Table (type II tests)
##
##   Effect DFn DFd     F     p p<.05      ges
## 1  depth   1  14 5.413 0.036     * 0.279000
## 2   site   1  14 0.006 0.937       0.000462

grav <- anco.quad %>%
  emmeans_test(
    gravel ~ site, covariate = depth,
    p.adjust.method = "bonferroni"
  )
grav

## # A tibble: 1 x 9
##   term       .y.    group1     group2      df statistic     p p.adj
p.adj.signif
## * <chr>      <chr>  <chr>      <chr>    <dbl>     <dbl> <dbl> <dbl> <chr>
## 1 depth*site gravel Milne Port Referen~    14   -0.0804 0.937 0.937 ns

get_emmeans(grav)

## # A tibble: 2 x 8
##   depth site           emmean    se    df conf.low conf.high method
##   <dbl> <fct>           <dbl> <dbl> <dbl>    <dbl>     <dbl> <chr>
## 1 -9.45 Milne Port       2.75  1.38    14   -0.212      5.71 Emmeans test
## 2 -9.45 Reference Area   2.91  1.46    14   -0.231      6.05 Emmeans test

## Sand
res.aov.sand <- anco.quad %>% anova_test(sand.LOG ~ site)

## Coefficient covariances computed by hccm()

res.aov.sand
```

```
## ANOVA Table (type II tests)
##
##   Effect DFn DFd     F     p p<.05   ges
## 1   site   1  15 13.01 0.003     * 0.464
```

```
pwc <- anco.quad %>% tukey_hsd(sand.LOG ~ site)
pwc
```

```
## # A tibble: 1 x 9
##   term  group1     group2         null.value estimate conf.low conf.high
p.adj
## * <chr> <chr>      <chr>               <dbl>    <dbl>    <dbl>     <dbl>
<dbl>
## 1 site  Milne Port Reference Area          0   -0.255   -0.405    -0.104
0.00259
## # ... with 1 more variable: p.adj.signif <chr>
```

```
## Fines + Depth
res.aov.fines <- anco.quad %>% anova_test(fines ~ depth + site)
```

```
## Coefficient covariances computed by hccm()
```

```
get_anova_table(res.aov.fines)
```

```
## ANOVA Table (type II tests)
##
##   Effect DFn DFd     F     p p<.05   ges
## 1  depth   1  14 4.551 0.051       0.245
## 2   site   1  14 5.700 0.032     * 0.289
```

```
fines <- anco.quad %>%
  emmeans_test(
    fines ~ site, covariate = depth,
    p.adjust.method = "bonferroni"
  )
fines
```

```
## # A tibble: 1 x 9
##   term       .y.   group1     group2     df statistic      p  p.adj
p.adj.signif
## * <chr>      <chr> <chr>      <chr>   <dbl>     <dbl>  <dbl>  <dbl> <chr>
## 1 depth*site fines Milne Port Refere~    14     -2.39 0.0316 0.0316 *
```

```
get_emmeans(fines)
```

```
## # A tibble: 2 x 8
##   depth site           emmean    se    df conf.low conf.high method
##   <dbl> <fct>           <dbl> <dbl> <dbl>    <dbl>     <dbl> <chr>
## 1 -9.45 Milne Port       50.0  4.85    14     39.6      60.4 Emmeans test
## 2 -9.45 Reference Area   67.0  5.15    14     56.0      78.1 Emmeans test
```

```
## Shell
res.aov.shell <- anco.quad %>% anova_test(shell ~ site)

## Coefficient covariances computed by hccm()

res.aov.shell

## ANOVA Table (type II tests)
##
##   Effect DFn DFd     F     p p<.05  ges
## 1   site   1  15 3.997 0.064       0.21

pwc <- anco.quad %>% tukey_hsd(shell ~ site)
pwc

## # A tibble: 1 x 9
##   term  group1  group2 null.value estimate conf.low conf.high p.adj
p.adj.signif
## * <chr> <chr>   <chr>       <dbl>    <dbl>    <dbl>     <dbl> <dbl> <chr>
## 1 site  Milne ~ Refer~          0     1.63   -0.108      3.37 0.064 ns

## Detrital Veneer
res.aov.detven <- anco.quad %>% anova_test(detrital.veneer ~ site)

## Coefficient covariances computed by hccm()

res.aov.detven

## ANOVA Table (type II tests)
##
##   Effect DFn DFd     F     p p<.05   ges
## 1   site   1  15 3.382 0.086       0.184

pwc.dv <- anco.quad %>% tukey_hsd(detrital.veneer ~ site)
pwc.dv

## # A tibble: 1 x 9
##   term  group1 group2 null.value estimate conf.low conf.high  p.adj
p.adj.signif
## * <chr> <chr>  <chr>       <dbl>    <dbl>    <dbl>     <dbl>  <dbl> <chr>
## 1 site  Milne~ Refer~          0    -3.29    -7.10     0.523 0.0858 ns

## Debris Other + Depth
anco.quad$deboth.LOG <- log10(anco.quad$debris.other + 1)
res.aov.dbo <- anco.quad %>% anova_test(deboth.LOG ~ depth + site)

## Coefficient covariances computed by hccm()

get_anova_table(res.aov.dbo)

## ANOVA Table (type II tests)
##
##   Effect DFn DFd     F     p p<.05   ges
```

```
## 1  depth   1  14 5.195 0.039     * 0.271
## 2   site   1  14 0.456 0.510       0.032

dbo <- anco.quad %>%
  emmeans_test(
    deboth.LOG ~ site, covariate = depth,
    p.adjust.method = "bonferroni"
  )
dbo

## # A tibble: 1 x 9
##   term       .y.        group1   group2    df statistic     p p.adj
p.adj.signif
## * <chr>      <chr>      <chr>    <chr>  <dbl>     <dbl> <dbl> <dbl> <chr>
## 1 depth*site deboth.LOG Milne P~ Refer~    14     0.675 0.510 0.510 ns

get_emmeans(dbo)

## # A tibble: 2 x 8
##   depth site            emmean    se    df conf.low conf.high method
##   <dbl> <fct>            <dbl> <dbl> <dbl>    <dbl>     <dbl> <chr>
## 1 -9.45 Milne Port       0.404 0.121    14   0.146      0.663 Emmeans test
## 2 -9.45 Reference Area   0.284 0.128    14   0.0101     0.559 Emmeans test

## Detrital Algae
anco.quad$detal.LOG <- log10(anco.quad$detrital.algae + 1)
res.aov.detal <- anco.quad %>% anova_test(detal.LOG ~ site)

## Coefficient covariances computed by hccm()

res.aov.detal

## ANOVA Table (type II tests)
##
##   Effect DFn DFd     F     p p<.05   ges
## 1   site   1  15 0.046 0.833       0.003

pwc.da <- anco.quad %>% tukey_hsd(detal.LOG ~ site)
pwc.da

## # A tibble: 1 x 9
##   term  group1  group2 null.value estimate conf.low conf.high p.adj
p.adj.signif
## * <chr> <chr>   <chr>       <dbl>    <dbl>    <dbl>     <dbl> <dbl> <chr>
## 1 site  Milne ~ Refer~          0  -0.0598   -0.652     0.532 0.833 ns

## Macroalgae Taxa Richness
res.aov.mtr <- anco.quad %>% anova_test(macro.taxa.richness ~ site)

## Coefficient covariances computed by hccm()

res.aov.mtr
```

```
## ANOVA Table (type II tests)
##
##   Effect DFn DFd     F     p p<.05   ges
## 1   site   1  15 1.218 0.287       0.075
```

```
pwc.mtr <- anco.quad %>% tukey_hsd(macro.taxa.richness ~ site)
pwc.mtr
```

```
## # A tibble: 1 x 9
##   term  group1  group2 null.value estimate conf.low conf.high p.adj
p.adj.signif
## * <chr> <chr>   <chr>       <dbl>    <dbl>    <dbl>     <dbl> <dbl> <chr>
## 1 site  Milne ~ Refer~          0    0.847   -0.789      2.48 0.287 ns
```

```
## Macroalgae Total Cover + Depth
res.aov.mtc <- anco.quad %>% anova_test(macro.total.cover.LOG ~ depth + site)
```

```
## Coefficient covariances computed by hccm()
```

```
get_anova_table(res.aov.mtc)
```

```
## ANOVA Table (type II tests)
##
##   Effect DFn DFd      F     p p<.05   ges
## 1  depth   1  14 12.569 0.003     * 0.473
## 2   site   1  14  1.258 0.281       0.082
```

```
mtc <- anco.quad %>%
  emmeans_test(
    macro.total.cover.LOG ~ site, covariate = depth,
    p.adjust.method = "bonferroni"
  )
mtc
```

```
## # A tibble: 1 x 9
##   term       .y.          group1 group2    df statistic     p p.adj
p.adj.signif
## * <chr>      <chr>        <chr>  <chr>  <dbl>     <dbl> <dbl> <dbl> <chr>
## 1 depth*site macro.total~ Milne~ Refer~    14     -1.12 0.281 0.281 ns
```

```
get_emmeans(mtc)
```

```
## # A tibble: 2 x 8
##   depth site           emmean    se    df conf.low conf.high method
##   <dbl> <fct>           <dbl> <dbl> <dbl>    <dbl>     <dbl> <chr>
## 1 -9.45 Milne Port       1.01 0.105    14    0.782      1.23 Emmeans test
## 2 -9.45 Reference Area   1.18 0.112    14    0.941      1.42 Emmeans test
```

```
## Macroalgae Taxa Richness
res.aov.mtr <- anco.quad %>% anova_test(macro.taxa.richness ~ site)
```

```
## Coefficient covariances computed by hccm()
```

```
res.aov.mtr

## ANOVA Table (type II tests)
##
##   Effect DFn DFd     F     p p<.05   ges
## 1   site   1  15 1.218 0.287       0.075

pwc.mtr <- anco.quad %>% tukey_hsd(macro.taxa.richness ~ site)
pwc.mtr

## # A tibble: 1 x 9
##   term  group1  group2 null.value estimate conf.low conf.high p.adj
p.adj.signif
## * <chr> <chr>   <chr>       <dbl>    <dbl>    <dbl>     <dbl> <dbl> <chr>
## 1 site  Milne ~ Refer~          0    0.847   -0.789      2.48 0.287 ns

## Macroalgae SDI + Fines
res.aov.masdi <- anco.quad %>% anova_test(macro.sdi ~ fines + site)

## Coefficient covariances computed by hccm()

get_anova_table(res.aov.masdi)

## ANOVA Table (type II tests)
##
##   Effect DFn DFd     F     p p<.05   ges
## 1  fines   1  14 8.936 0.010     * 0.390
## 2   site   1  14 0.964 0.343       0.064

masdi <- anco.quad %>%
  emmeans_test(
    macro.sdi~ site, covariate = fines,
    p.adjust.method = "bonferroni"
  )
masdi

## # A tibble: 1 x 9
##   term       .y.       group1    group2    df statistic     p p.adj
p.adj.signif
## * <chr>      <chr>     <chr>     <chr>  <dbl>     <dbl> <dbl> <dbl> <chr>
## 1 fines*site macro.sdi Milne Po~ Refer~    14     0.982 0.343 0.343 ns

get_emmeans(masdi)

## # A tibble: 2 x 8
##   fines site           emmean     se    df conf.low conf.high method
##   <dbl> <fct>           <dbl>  <dbl> <dbl>    <dbl>     <dbl> <chr>
## 1  58.0 Milne Port      0.556 0.0556    14    0.437     0.675 Emmeans test
## 2  58.0 Reference Area  0.469 0.0596    14    0.342     0.597 Emmeans test

## Sessile Taxa Richness + Fines
res.aov.str <- anco.quad %>% anova_test(sessile.taxa.richness ~ fines + site)
```

```
## Coefficient covariances computed by hccm()

get_anova_table(res.aov.str)

## ANOVA Table (type II tests)
##
##   Effect DFn DFd     F     p p<.05   ges
## 1  fines   1  14 2.507 0.136       0.152
## 2   site   1  14 1.194 0.293       0.079

str <- anco.quad %>%
  emmeans_test(
    sessile.taxa.richness ~ site, covariate = fines,
    p.adjust.method = "bonferroni"
  )
str

## # A tibble: 1 x 9
##   term       .y.          group1 group2    df statistic     p p.adj
p.adj.signif
## * <chr>      <chr>        <chr>  <chr>  <dbl>     <dbl> <dbl> <dbl> <chr>
## 1 fines*site sessile.tax~ Milne~ Refer~    14     -1.09 0.293 0.293 ns

get_emmeans(str)

## # A tibble: 2 x 8
##   fines site           emmean    se    df conf.low conf.high method
##   <dbl> <fct>           <dbl> <dbl> <dbl>    <dbl>     <dbl> <chr>
## 1  58.0 Milne Port       4.64 0.654    14     3.24      6.05 Emmeans test
## 2  58.0 Reference Area   5.78 0.701    14     4.27      7.28 Emmeans test

## Sessile Total Cover
res.aov.stc <- anco.quad %>% anova_test(sessile.total.cover ~ site)

## Coefficient covariances computed by hccm()

res.aov.stc

## ANOVA Table (type II tests)
##
##   Effect DFn DFd     F     p p<.05   ges
## 1   site   1  15 0.664 0.428       0.042

pwc.stc <- anco.quad %>% tukey_hsd(sessile.total.cover ~ site)
pwc.stc

## # A tibble: 1 x 9
##   term  group1  group2 null.value estimate conf.low conf.high p.adj
p.adj.signif
## * <chr> <chr>   <chr>       <dbl>    <dbl>    <dbl>     <dbl> <dbl> <chr>
## 1 site  Milne ~ Refer~          0    -4.86    -17.6      7.85 0.428 ns
```

```
## Sessile SDI
res.aov.ssdi <- anco.quad %>% anova_test(sessile.sdi ~ site)

## Coefficient covariances computed by hccm()

res.aov.ssdi

## ANOVA Table (type II tests)
##
##   Effect DFn DFd     F     p p<.05  ges
## 1   site   1  15 0.951 0.345       0.06

pwc.ssdi <- anco.quad %>% tukey_hsd(sessile.sdi ~ site)
pwc.ssdi

## # A tibble: 1 x 9
##   term  group1  group2 null.value estimate conf.low conf.high p.adj
p.adj.signif
## * <chr> <chr>   <chr>       <dbl>    <dbl>    <dbl>     <dbl> <dbl> <chr>
## 1 site  Milne ~ Refer~          0    0.101   -0.120     0.323 0.345 ns

## Motile Taxa Richness + Depth
res.aov.motr <- anco.quad %>% anova_test(motile.taxa.richness ~ fines + site)

## Coefficient covariances computed by hccm()

get_anova_table(res.aov.motr)

## ANOVA Table (type II tests)
##
##   Effect DFn DFd     F     p p<.05      ges
## 1  fines   1  14 2.314 0.150       1.42e-01
## 2   site   1  14 0.001 0.974       8.12e-05

motr <- anco.quad %>%
  emmeans_test(
    motile.taxa.richness ~ site, covariate = fines,
    p.adjust.method = "bonferroni"
  )
motr

## # A tibble: 1 x 9
##   term       .y.          group1 group2    df statistic     p p.adj
p.adj.signif
## * <chr>      <chr>        <chr>  <chr>  <dbl>     <dbl> <dbl> <dbl> <chr>
## 1 fines*site motile.taxa~ Milne~ Refer~    14    0.0337 0.974 0.974 ns

get_emmeans(motr)

## # A tibble: 2 x 8
##   fines site           emmean    se    df conf.low conf.high method
##   <dbl> <fct>           <dbl> <dbl> <dbl>    <dbl>     <dbl> <chr>
```

```
## 1  58.0 Milne Port       2.37 0.596    14    1.09       3.65 Emmeans test
## 2  58.0 Reference Area   2.34 0.638    14    0.967      3.70 Emmeans test

### Motile Density + Depth
res.aov.md <- anco.quad %>% anova_test(motile.density ~ depth + site)

## Coefficient covariances computed by hccm()

get_anova_table(res.aov.md)

## ANOVA Table (type II tests)
##
##   Effect DFn DFd      F        p p<.05   ges
## 1  depth   1  14 22.784 0.000297     * 0.619
## 2   site   1  14  0.094 0.763000       0.007

md <- anco.quad %>%
  emmeans_test(
    motile.density ~ site, covariate = depth,
    p.adjust.method = "bonferroni"
  )
md

## # A tibble: 1 x 9
##   term       .y.           group1 group2    df statistic     p p.adj
p.adj.signif
## * <chr>      <chr>         <chr>  <chr>  <dbl>     <dbl> <dbl> <dbl> <chr>
## 1 depth*site motile.dens~ Milne~ Refer~    14    -0.307 0.763 0.763 ns

get_emmeans(md)

## # A tibble: 2 x 8
##   depth site           emmean    se    df conf.low conf.high method
##   <dbl> <fct>           <dbl> <dbl> <dbl>    <dbl>     <dbl> <chr>
## 1 -9.45 Milne Port       8.83  3.86    14    0.553      17.1 Emmeans test
## 2 -9.45 Reference Area  10.6   4.10    14    1.78       19.4 Emmeans test

## Motile SDI + Fines
res.aov.msdi <- anco.quad %>% anova_test(motile.sdi ~ fines + site)

## Coefficient covariances computed by hccm()

get_anova_table(res.aov.msdi)

## ANOVA Table (type II tests)
##
##   Effect DFn DFd     F     p p<.05   ges
## 1  fines   1  14 1.340 0.266       0.087
## 2   site   1  14 0.376 0.550       0.026

msdi <- anco.quad %>%
  emmeans_test(
    motile.sdi ~ site, covariate = depth,
```

```
    p.adjust.method = "bonferroni"
  )
msdi
```

```
## # A tibble: 1 x 9
##   term       .y.        group1   group2    df statistic     p p.adj
p.adj.signif
## * <chr>      <chr>      <chr>    <chr>  <dbl>     <dbl> <dbl> <dbl> <chr>
## 1 depth*site motile.sdi Milne P~ Refer~    14     -1.28 0.220 0.220 ns
```

```
get_emmeans(msdi)
```

```
## # A tibble: 2 x 8
##   depth site            emmean     se    df conf.low conf.high method
##   <dbl> <fct>            <dbl>  <dbl> <dbl>    <dbl>     <dbl> <chr>
## 1 -9.45 Milne Port       0.224 0.0970    14   0.0157     0.432 Emmeans test
## 2 -9.45 Reference Area   0.407 0.103     14   0.186      0.628 Emmeans test
```

APPENDIX 5E

Power Analysis

POWER ANALYSIS – BENTHIC EPIFAUNA AND MACROFLORA

This section presents the results of a power analysis undertaken for the 2021 benthic epifauna and macroflora monitoring data at Milne Port.

METHODS

A Type I error is concluding there is a significant effect when none exists (i.e., a false positive). Alpha (α) is the probability of committing a Type I error. A Type II error is the probability of concluding there is no significant effect when there is a real effect of some specified magnitude (i.e., a false negative). Beta (β) is the probability of committing a Type II error. The power of a statistical test (1 - β) is the probability of detecting a real effect. In this analysis, the Type I error-rate (α), also referred to as the significance level, was set to 0.05. The desired minimum statistical power was 80%, which corresponds to a type II error-rate of 0.2. Power analyses were conducted to assess the power of statistical tests under multiple effect sizes. For each model, a set of effect sizes was created, based on preliminary power analyses, so that power >80% was achieved at the largest absolute values of effect sizes, but also so that power is assessed at a range of effect sizes. Both negative and positive effect sizes were used, to assess the power of detecting either a reduction or an increase in values of the response variables. Since the analysis focused on assessment of changes to statistical power at different effect sizes, the power analysis used the observed samples sizes from the collected data.

Data Simulation following Effect Size Application

The power to detect statistically significant effects was estimated using residual bootstrapping in R v. 4.0.4 (R 2021), following the approach of Fox and Weisberg (2018). The general approach was to simulate data based on the model selected for interpretation, the observed sample size (or the sample size of choice), and the residuals, and re-run the models that were used for the original analysis using the simulated data. The data simulation and analysis were repeated 1,000 times, and the proportion of repetitions where the *P*-values of interest were significant ($P<0.05$) was interpreted as the statistical power of the test.

To produce simulated data, the original model was used to predict values of the response variable, and the raw residuals (i.e. the difference between the predicted and observed value for each observation) from the original model were calculated and retained. The predicted values were then adjusted according to the effect size, depending on analysis (see below for details). For each iteration of the simulation, the residuals from the original analysis were sampled with replacement, and then summed with effect size-adjusted model predictions, to produce a set of simulated data. Adding the residuals to the effect size-adjusted predictions was done to create a level of variability in the simulated data that was similar to the observed data. The simulated data were then analyzed using the same model structure as the original analysis.

In the analysis of 2021 data, where the question of interest was the detection of change in response variables between exposure and the reference area, the effect was applied as percentage relative to the values predicted for the reference area. That is, an increasing effect size resulted in a larger difference between exposure and reference area samples (Figure 1). The simulated data were analyzed using the same model as the original analysis described in the main report, and the *P*-values for the site on the response variable were retained, which included both the main effect of site and an interaction with site (for ANCOVAs where a significant interaction between site and the covariate was found). If any of these *P*-values were less than 0.05, it was considered a significant overall effect of site. The proportion of repetitions with *P*-values less than 0.05 was interpreted as the statistical power of the overall regression for that effect size. The power analysis was performed on a range of effect sizes - 20%, 30%, and 40%, and a range of sample sizes – from the collected 17 quadrats (8 in the reference and 9 in exposure area) up to 60 samples total (30 quadrats at each site), in increments of 1 quadrat per site. Since the modeling used a normal distribution of the errors, the power to detect an effect size applies to either negative or positive effect size. That is, the 20%, 30%, and 40% effect sizes represent either a decrease or an increase of the relevant magnitude.

Power Analysis – Reporting of Results

Power curves were produced, showing statistical power as a function of sample size and effect size in percentages. Horizontal lines were added to visualize statistical power values of 0.8 (hereafter sufficient power) and 0.9 (hereafter high power), and the observed effect size was provided in the results.

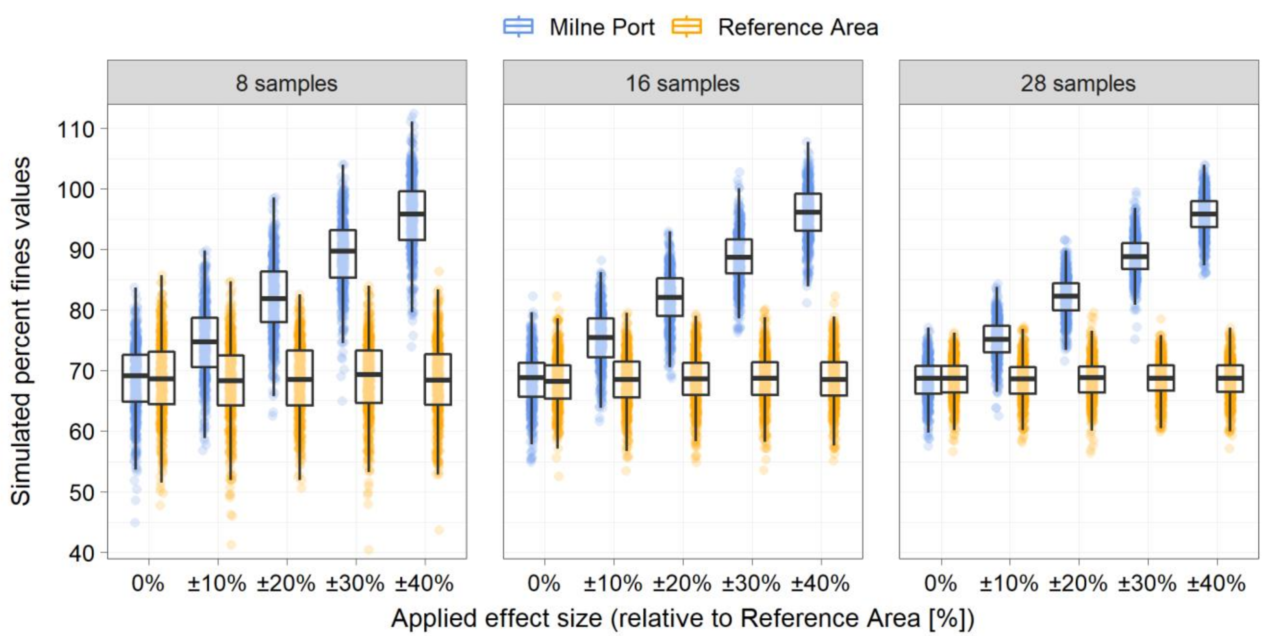


Figure 1 Application of effect sizes and simulation of increasing sample sizes to assess statistical power of detecting a difference between the reference and exposure area (2021 percent fines model).

RESULTS

The power analysis indicated that the data collected as part of the substrate, macroflora, and benthic epifauna sampling had low power to detect a ±20% effect size at the collected sample size for all examined variables (Figure 2). An increase in sample size would only result in sufficient power to detect a ±20% effect size for fines (at 12 samples taken at each of the two areas), for macroflora total percent cover (at 22 samples per area), and for sessile epifauna taxa richness (at 30 samples per area). This level of effort is prohibitive, especially given that it would still not achieve sufficient power for the remaining variables.

For an effect size of ±40%, sufficient power would be achieved for the following combinations of variables and effect sizes:

- Detrital veneer – at 18 samples per area

- Percent fines – 8 samples per area
- Macroflora:
  - SDI – 11 samples per area
  - taxa richness – 11 samples per area
  - percent cover – 9 samples per area
- Sessile epifauna:
  - SDI – at 20 samples per area
  - Taxa richness – at 8 samples per area
- Motile epifauna:
  - Density – at 13 samples per area
  - Taxa richness – at 10 samples per area
- Sufficient power was not achieved even at ±40% effect size and 30 samples per area for detrital algae, motile epifauna SDI, and sessile epifauna percent cover.

The observed effect sizes for the analyzed summary variables were as follows: 39% for detrital veneer, -24% for percent fines, 7% for detrital algae, -18% for macroflora taxa richness, -15% for macroflora total percent cover, 16% for macroflora SDI, -33% sessile epifauna taxa richness, 27% for sessile epifauna percent cover, -21% for sessile epifauna SDI, -20% for motile epifauna taxa richness, -8% for motile epifauna density, and -49% for motile epifauna SDI. This is consistent with the only significant effect found in the original analyses (given the observed effect size and sample size) being the significant difference in fines. For all other variables, either a large effect size or a large sample size would be required to detect a significant difference between the reference and exposure area.

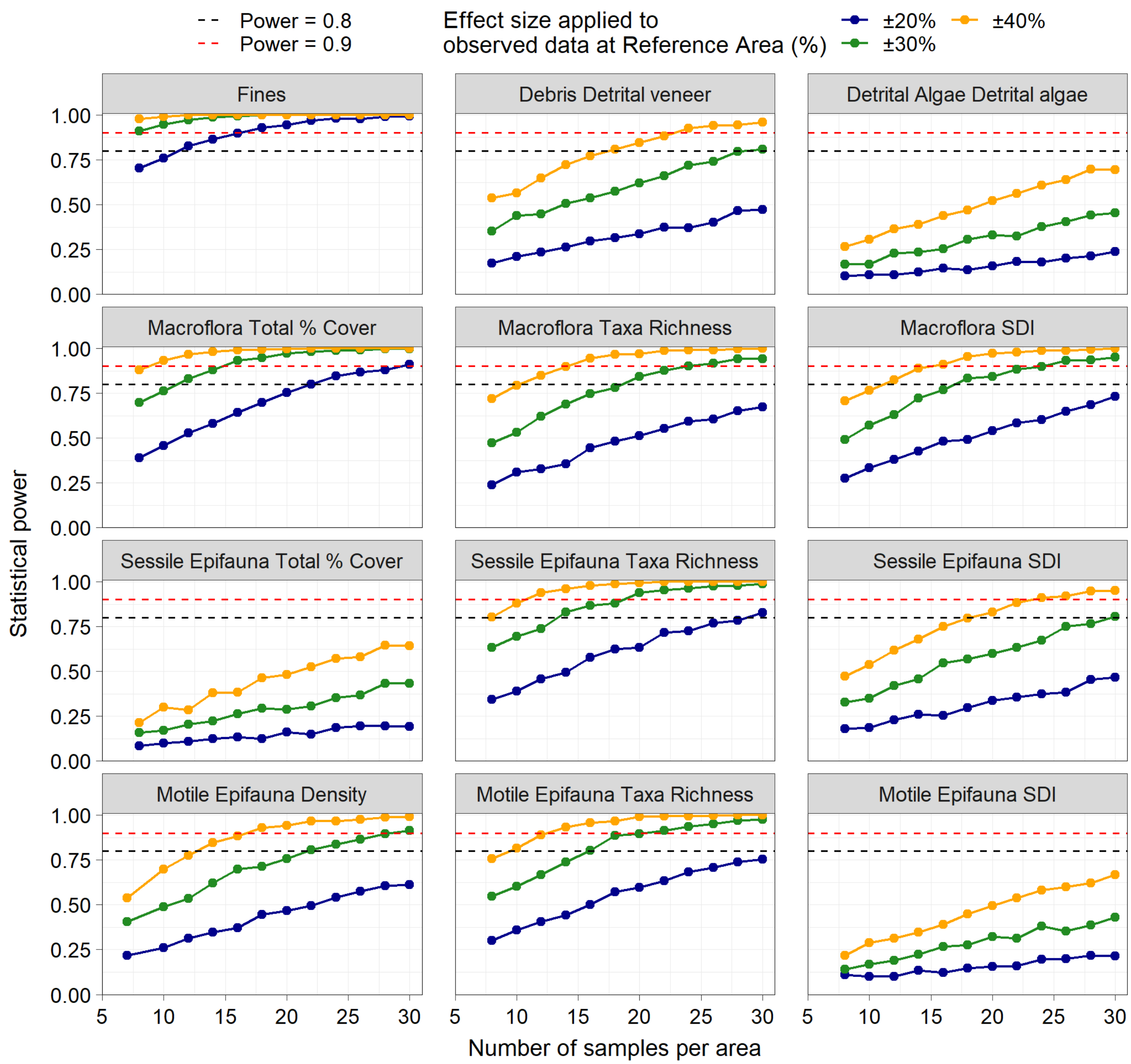


Figure 2 Statistical power of the models of summary indices detect a significant effect between the reference and exposure area based on quadrat data collected in 2021.

SUMMARY

Overall, statistical power was low to detect a ±20% effect size relative to the reference area even if sample sizes increased. For some variables, such as sessile epifauna total percent cover, motile epifauna SDI, and detrital algae, none of the assessed sample sizes and effect sizes resulted in sufficient power.

An increase in sample size to 25 quadrats per site (i.e., total of 50 quadrats) would result in sufficient power (>0.8) to detect a ±40% effect size for most variables, except for detrital algae (power of 0.64), motile epifauna SDI (power of 0.6) and sessile epifauna total percent cover (power of 0.58).

Implications of Power Analysis Results

The results indicated that none of the summary variables had sufficient power to detect a ±20% effect size given the 2021 sample size. Due to the variability in the data, either a large effect size or a large sample size (or both) would be required to consistently be able to detect a difference between the two areas. An increase to 25 quadrats per site (from the current 9 quadrats) would still not achieve sufficient power to detect a ±20% for most variables, except for percent fines and macroflora total cover. The increase in sample size, combined with setting ±40% effect sizes as the desired difference to detect would achieve sufficient power for most, but not all summary variables. This sample size would require a substantial increase in field effort.

REFERENCES

Fox, J. and Weisberg, S. 2018. Bootstrapping Regression Models in R. An Appendix to An R Companion to Applied Regression, third edition, https://socialsciences.mcmaster.ca/jfox/Books/Companion/appendices/Appendix-Bootstrapping.pdf.

R Core Team. 2021. R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL https://www.R-project.org/.

APPENDIX 5F

Taxa List

APPENDIX 5F
Taxa Identified During 2021
Quadrat Surveys in Milne Port, NU

Marine Invertebrates	
Common Name	**Scientific Name**
Cone worm	*Cistenides granulata*
Sabellid worm spp. 1	Sabellidae indet.
Sabellid worm spp. 2	Sabellidae indet.
Flat worm	Platyhelminthes indet.
Brittle star	Ophiuridae indet.
Green sea urchin	*Strongylocentrotus droebachiensis*
Burrowing Anemone	Ceriantharia indet.
Margarite snail	*Margarites* spp.
Snail	Vetigastropoda indet.
Greenland scallop	*Similipecten greenlandicus*
Icelandic scallop	*Chlamys islandica*
Wrinkled rock-borer	*Hiatella arctica*
Blunt gaper	*Mya* spp.
Northern Astarte	*Astarte borealis*
Astarte clam	Astarte spp.
Macoma clam	*Macoma* spp.
	Bivalvia indet.
Limpet	Lottiidae indet.
Mussel	Mytilida indet.
Green mussel spp. 1	Mytilida indet.
Pandalus shrimp	*Pandalus* spp.
Sculptured shrimp	*Sclerocrangon boreas*
Barnacle	Balanomorpha indet.
Amphipod	Amphipoda Indet.
Orange tunicate	*Polycarpa* spp.
Tunicate	Tunicata indet.
Macroflora	
Common Name	**Scientific Name**
Sugar kelp	*Saccharina latissima*
Sieve kelp	*Agarum clathratum*
Rockweed	*Fucus distichus*
Pylaiella	*Pylaiella* spp.
	Halosiphon tomentosus
Acid weed	*Desmarestia* spp.
Brown filamentous 1	cf. *Coelocladia arctica*
Brown filamentous algae	Phaeophyceae indet.
	Chaetomorpha melagonium
Green filamentous tuft 1	Chlorophyta indet.
	Savoiea arctica
	Coccotylus truncatus
Dilsea	*Dilsea socialis*
Red filamentous algae	Rhodophyta indet.
Encrusting coralline algae	Corallinales indet.
Fish	
Common Name	**Scientific Name**
Pout	cf. *Gymnelus* spp.
Sculpin	Family Cottidae
Unidentified juvenile fish	Pisces indet.

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FINAL REPORT

Chapter 6.0 Marine Fish Community Program

2021 Marine Environmental Effects Monitoring Program (MEEMP) and Non-Indigenous Species/Aquatic Invasive Species (NIS/AIS) Monitoring Program

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21 October 2022

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ACRONYMS AND ABBREVIATIONS

Acronym or Abbreviation	Definition
ANOVA	Analysis of Variance
Biologica	Biologica Environmental Services Ltd.
CPUE	Catch Per Unit Effort
df	Degrees of Freedom
DFO	Fisheries and Oceans Canada
DPF	Direct Project Footprint
ERP	Early Revenue Phase
FA	Fishing Area
FEIS	Final Environmental Impact Statement
h	Hour
ha	hectare
IPF	Indirect Project Footprint
m	Meter
mm	millimeter
Max	Maximum
min	Minute
Min	Minimum
MEEMP	Marine Environmental Effects Monitoring Program
MEWG	Marine Environmental Working Group
MS	Mean Squares
n	number
PC	Project Certificate
QA/QC	Quality Assurance and Quality Control
SEM	Sikumiut Environmental Management Ltd.
SD	Standard Deviation
SE	Standard Error
SS	Sum of Squares
UTM	Universal Transverse Mercator

6.0 MARINE FISH COMMUNITY PROGRAM

6.1 Introduction

This chapter presents the results of the marine fish community program, a component of the larger Marine Environmental Effects Monitoring Program (MEEMP) conducted in Milne Inlet during the 2021 open-water season. This chapter was developed in consideration of the potential Project-related effects on marine fish and fish habitat as identified in the 2012 Final Environmental Impact Statement (FEIS) and subsequent addendums, as well as monitoring requirements outlined in the Project Certificate (PC) Conditions described in Chapter 1.0, Table 1-2. PC Conditions related to the monitoring of marine fish habitat include PC Conditions No. 99 (b)(ii), 99 (c), 113, and 114. This chapter is supplementary to Chapter 7 (Marine Fish Health), which focuses on the health of the local marine fish community in Milne Port, including length frequency distributions, length-weight relationships, visual assessment of internal and external abnormalities, and tissue chemistry analysis for contaminants of concern.

6.1.1 Objectives

The objectives of the MEEMP are outlined in Section 1.3 of Chapter 1.0 (Program Overview). The objectives specific to the marine fish community program component are as follows:

- Characterize the marine fish community at Milne Port in terms of species presence, number of fish caught, and relative abundance.
- Provide species-specific and overall catch per-unit effort (CPUE) for each fishing method for 2021 catch data to better understand the efficacy of fishing methods at Milne Port.
- Compare 2021 catch statistics (total abundance and species composition) to previous years using annual data plots from 2013 to 2021.
- Test for differences in overall CPUE between 2020 and 2021, while accounting for differences in the location and number of sampling locations to better understand trends at Milne Port.

6.2 Study Design

The current study design for fishing reflects feedback from the Marine Environmental Working Group (MEWG), while maintaining consistency with the design used during previous monitoring years to facilitate comparisons of results over time. For the period of 2014 to 2017, the study design remained largely unaltered, with sampling conducted over a two-week period in August. In 2018, sampling duration was extended to 4 weeks of the open-water season instead of 2 weeks to provide a more accurate representation of the fish community. The extended sampling period was also accompanied by the addition of beach seining and angling as supplemental fishing methods.

In 2019, hoop net traps (or hoop nets) were added to the MEEMP fish sampling program as trial study to determine whether this method was more effective in capturing fish than Fukui traps (Table 6-1). This addition was made following input from the MEWG regarding low capture efficiency in Fukui traps. The use of both hoop nets and Fukui traps continued in 2021, reflecting the commitment made to the MEWG to collect three years of data to facilitate comparison of results from both trapping techniques.

In 2020, the MEEMP program trialed trawling as a fishing method in Milne Port to improve capture efficiency and community detection. Changes were also made to angling efforts in 2020 to include increased effort in targeted areas for species of interest (e.g., Fourhorn Sculpin, Arctic Char) and to better support the objectives of the MEEMP Fish Health program.

Table 6-1: Historical MEEMP Fish Capture Methods Per Year (2010-2021)

Method	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Gillnet	√	√	√	√	√	√	√	√	√	√	√	√
Angling								√	√	√	√	√
Fukui Traps				√	√	√	√	√	√	√	√	√
Hoop Nets										√	√	√
Beach Seine									√	√	√	
Trawling											√*	√
Longline												√

*Trawling in 2020 was limited to a single effort as a test of the method

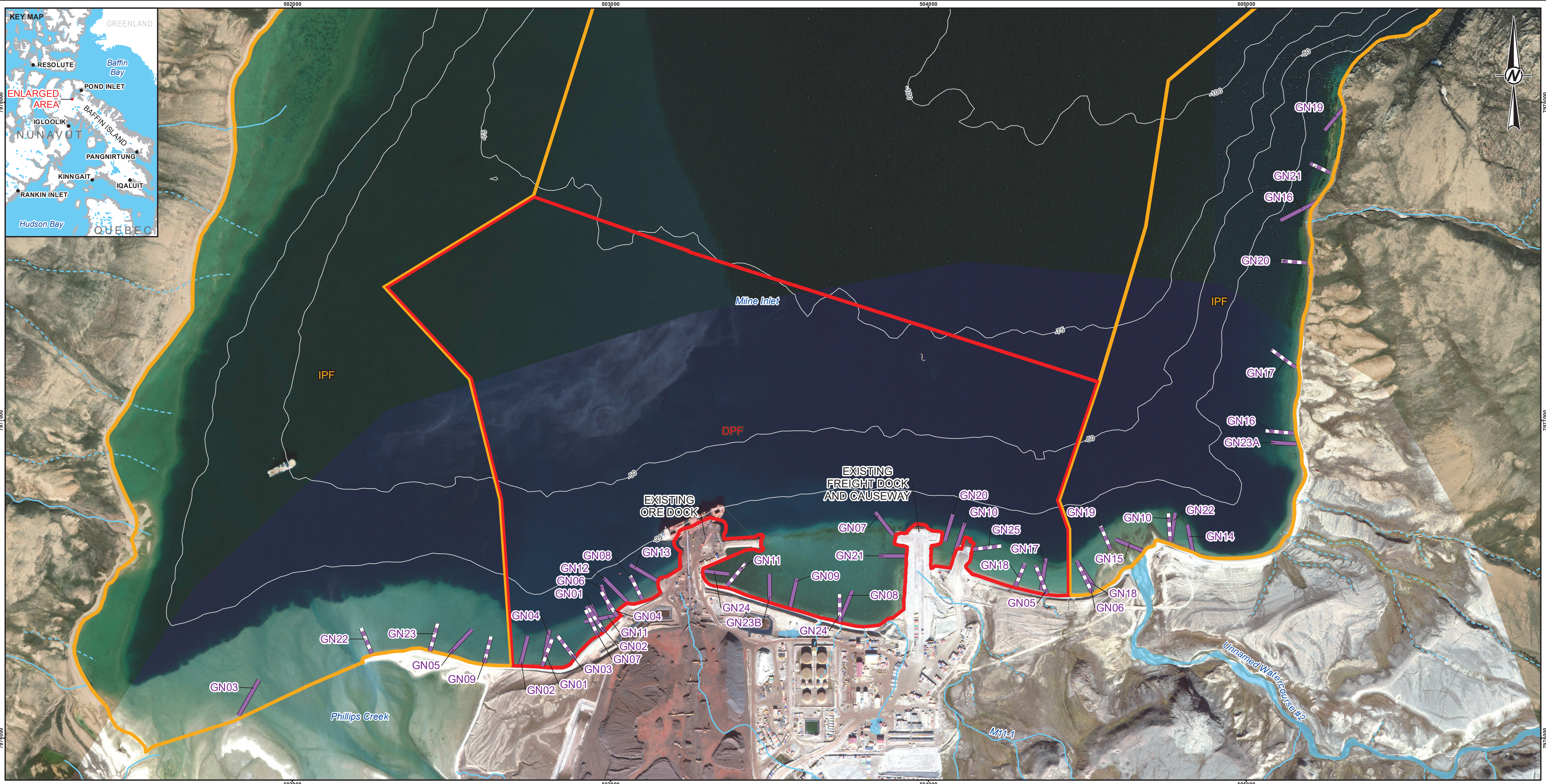
6.2.1 2021 Modifications to the Program

Changes to fishing methods for the 2021 MEEMP program included the addition of longline fishing and the discontinuation of seine netting (Table 6-1). Exploratory fishing effort was conducted at the outflow of the Tugaat River, approximately 28 km northeast of Milne Port. The Tugaat River estuary was identified as having similar characteristics to Milne Port in terms of fish habitat, and thus potentially representing a suitable reference area for the MEEMP fish health sampling program in future.

CPUE calculations were revised for three fishing methods (angling, gill net surveys, and Fukui traps) to better account for field variability. Previously, CPUE was assessed as number of fish per hour of effort (no. of fish/h of effort). For the 2021 report, CPUE metrics accounted for the number of rods used during angling (fish/h/rod), the length of the gill net adjusted to 100 m (fish/h/100 m net), and the number of Fukui traps used in a cluster (fish/h/trap). Data from 2020 were also re-calculated with the modified CPUE calculations and compared against 2021 results. CPUE data from sampling prior to 2020 have not been standardized and are therefore not included as part of this report.

Further study design modifications were made to better standardize fishing efforts and locations to facilitate interannual comparisons moving forward. In 2021, the MEEMP field program was modified to integrate two ‘Fishing Areas’ (FAs) in the vicinity of Milne Port, one directly adjacent to the project footprint (Direct Project Footprint area; DPF) and one comprising the areas immediately outside of the project footprint area to the east and west (Indirect Project Footprint; IPF). The incorporation of FAs into the study design was done to account for the variability in catch data across an exposure gradient relative to the Milne Port project footprint, standardize sampling locations between years, and better evaluate the success of fishing gear methods by increasing year-over-year comparability of data.

Figure 6-1 through 6-5 illustrate the 2020 and 2021 deployment locations for each fishing method and identify the boundaries of the two FAs. Figure 6-6 shows the location of fish sampling undertaken near the Tugaat River estuary as part of the effort to identify a suitable reference site for the fish health program.



LEGEND

- BATHYMETRIC CONTOUR (25 m INTERVAL)
- 2020 GILLNET SAMPLING LOCATION
- 2021 GILLNET SAMPLING LOCATION
- INTERMITTENT WATERCOURSE
- WATERCOURSE
- INDIRECT PROJECT FOOT PRINT (IPF)
- DIRECT PROJECT FOOT PRINT (DPF)
- WATERBODY

0 250 500
1:12,000 METRES

REFERENCE(S)
BATHYMETRY CREATED BY GOLDER FROM MULTIPLE DATA SOURCES. FREIGHT DOCK DATA PROVIDED BY HATCH, MARCH 4, 2020. ADDITIONAL MILNE PORT INFRASTRUCTURE DATA OBTAINED FROM CLIENT, MAY 2, 2020 AND MAY 28, 2018. HYDROGRAPHY DATA OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED. MILNE PORT IMAGERY CAPTURED AUGUST 2020 © 2020 DIGITAL GLOBE, INC. ADDITIONAL IMAGERY COPYRIGHT © 20190802 ESRI AND ITS LICENSORS. SOURCE: MAXAR VIVID. USED UNDER LICENSE, ALL RIGHTS RESERVED.
PROJECTION: UTM ZONE 17 DATUM: NAD 83

CLIENT
BAFFINLAND IRON MINES CORPORATION

PROJECT
MARY RIVER PROJECT

CONSULTANT
GOLDER
MEMBER OF WSP

YYYY-MM-DD	2022-09-09
DESIGNED	MR
PREPARED	AJA
REVIEWED	MR
APPROVED	PR

TITLE
GILL NET DEPLOYMENT LOCATIONS IN MILNE PORT; MEEMP 2020 AND 2021

PROJECT NO.	CONTROL	REV.	FIGURE
1663724	44000-04	0	6-1

LEGEND

- 2020 ANGLING (JIGGING) SAMPLING LOCATION
- 2021 ANGLING (JIGGING) SAMPLING LOCATION
- 2020 ANGLING (TROLLING) SAMPLING LOCATION
- 2021 ANGLING (TROLLING) SAMPLING LOCATION
- BATHYMETRIC CONTOUR (25 m INTERVAL)
- INTERMITTENT WATERCOURSE
- WATERCOURSE
- INDIRECT PROJECT FOOT PRINT (IPF)
- DIRECT PROJECT FOOT PRINT (DPF)
- WATERBODY

0 250 500
1:16,500 METRES

REFERENCE(S)

BATHYMETRY CREATED BY GOLDER FROM MULTIPLE DATA SOURCES. FREIGHT DOCK DATA PROVIDED BY HATCH, MARCH 4, 2020. ADDITIONAL MILNE PORT INFRASTRUCTURE DATA OBTAINED FROM CLIENT, MAY 2, 2020 AND MAY 28, 2018. HYDROGRAPHY DATA OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED. MILNE PORT IMAGERY CAPTURED AUGUST 2020 © 2020 DIGITAL GLOBE, INC. ADDITIONAL IMAGERY COPYRIGHT © 20190802 ESRI AND ITS LICENSORS. SOURCE: MAXAR VIVID. USED UNDER LICENSE, ALL RIGHTS RESERVED.
PROJECTION: UTM ZONE 17 DATUM: NAD 83

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BAFFINLAND IRON MINES CORPORATION

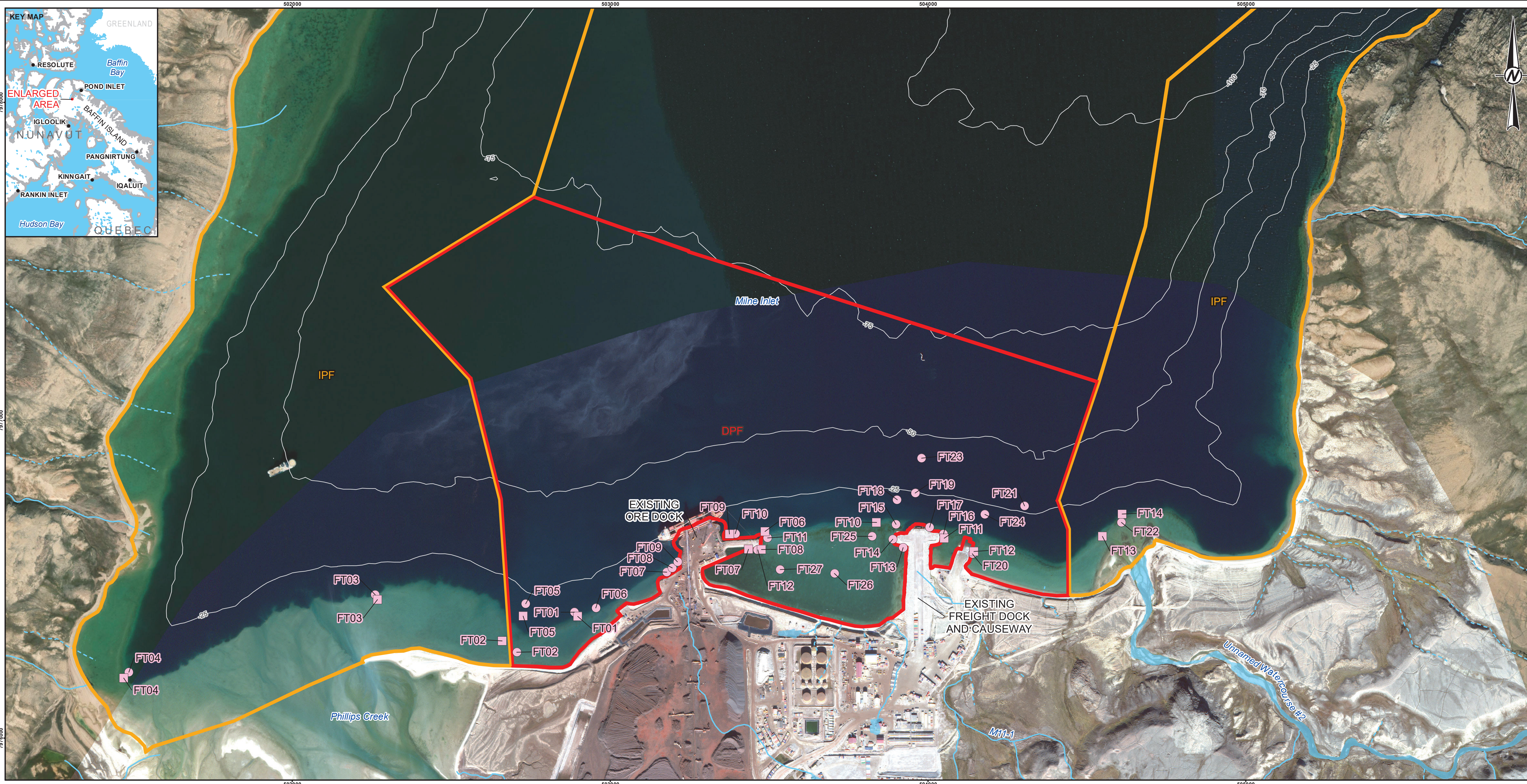
PROJECT
MARY RIVER PROJECT

CONSULTANT
GOLDER MEMBER OF WSP

YYYY-MM-DD	2022-09-09
DESIGNED	MR
PREPARED	AJA
REVIEWED	MR
APPROVED	PR

TITLE
ANGLING SAMPLE LOCATIONS IN MILNE PORT; MEEMP 2020 AND 2021

PROJECT NO.	CONTROL	REV.	FIGURE
1663724	44000-04	0	6-2



LEGEND

- 2020 FUKUI TRAP SAMPLING LOCATION
- 2021 FUKUI TRAP SAMPLING LOCATION
- BATHYMETRIC CONTOUR (25 m INTERVAL)
- INTERMITTENT WATERCOURSE
- WATERCOURSE
- INDIRECT PROJECT FOOT PRINT (IPF)
- DIRECT PROJECT FOOT PRINT (DPF)
- WATERBODY

0 250 500

1:12,000 METRES

REFERENCE(S)

BATHYMETRY CREATED BY GOLDER FROM MULTIPLE DATA SOURCES. FREIGHT DOCK DATA PROVIDED BY HATCH, MARCH 4, 2020. ADDITIONAL MILNE PORT INFRASTRUCTURE DATA OBTAINED FROM CLIENT, MAY 2, 2020 AND MAY 28, 2018. HYDROGRAPHY DATA OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED. MILNE PORT IMAGERY CAPTURED AUGUST 2020 © 2020 DIGITAL GLOBE, INC. ADDITIONAL IMAGERY COPYRIGHT © 20190802 ESRI AND ITS LICENSORS. SOURCE: MAXAR VIVID. USED UNDER LICENSE, ALL RIGHTS RESERVED.
PROJECTION: UTM ZONE 17 DATUM: NAD 83

CLIENT
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GOLDER MEMBER OF WSP

YYYY-MM-DD	2022-09-09
DESIGNED	MR
PREPARED	AJA
REVIEWED	MR
APPROVED	PR

TITLE
FUKUI TRAP DEPLOYMENT LOCATIONS IN MILNE PORT; MEEMP 2020 AND 2021

PROJECT NO.	CONTROL	REV.	FIGURE
1663724	44000-04	0	6-3

LEGEND

- 2020 HOOP NET SAMPLING LOCATION
- 2021 HOOP NET SAMPLING LOCATION
- BATHYMETRIC CONTOUR (25 m INTERVAL)
- INTERMITTENT WATERCOURSE
- WATERCOURSE
- INDIRECT PROJECT FOOT PRINT (IPF)
- DIRECT PROJECT FOOT PRINT (DPF)
- WATERBODY

0 250 500

1:12,000 METRES

REFERENCE(S)

BATHYMETRY CREATED BY GOLDER FROM MULTIPLE DATA SOURCES. FREIGHT DOCK DATA PROVIDED BY HATCH, MARCH 4, 2020. ADDITIONAL MILNE PORT INFRASTRUCTURE DATA OBTAINED FROM CLIENT, MAY 2, 2020 AND MAY 28, 2018. HYDROGRAPHY DATA OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED. MILNE PORT IMAGERY CAPTURED AUGUST 2020 © 2020 DIGITAL GLOBE, INC. ADDITIONAL IMAGERY COPYRIGHT © 20190802 ESRI AND ITS LICENSORS. SOURCE: MAXAR VIVID. USED UNDER LICENSE, ALL RIGHTS RESERVED.
PROJECTION: UTM ZONE 17 DATUM: NAD 83

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BAFFINLAND IRON MINES CORPORATION

PROJECT
MARY RIVER PROJECT

CONSULTANT
GOLDER
MEMBER OF WSP

YYYY-MM-DD	2022-09-09
DESIGNED	MR
PREPARED	AJA
REVIEWED	MR
APPROVED	PR

TITLE
HOOP NET TRAP DEPLOYMENT LOCATIONS IN MILNE PORT; MEEMP 2020 AND 2021

PROJECT NO.	CONTROL	REV.	FIGURE
1663724	44000-04	0	6-4

LEGEND

- 2021 LONG LINE SAMPLE LOCATION
- 2020 TRAWLING SAMPLE LOCATION
- 2021 TRAWLING SAMPLE LOCATION
- BATHYMETRIC CONTOUR (25 m INTERVAL)
- INTERMITTENT WATERCOURSE
- WATERCOURSE
- INDIRECT PROJECT FOOT PRINT (IPF)
- DIRECT PROJECT FOOT PRINT (DPF)
- WATERBODY

0 250 500

1:12,500 METRES

REFERENCE(S)

BATHYMETRY CREATED BY GOLDER FROM MULTIPLE DATA SOURCES. FREIGHT DOCK DATA PROVIDED BY HATCH, MARCH 4, 2020. ADDITIONAL MILNE PORT INFRASTRUCTURE DATA OBTAINED FROM CLIENT, MAY 2, 2020 AND MAY 28, 2018. HYDROGRAPHY DATA OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED. MILNE PORT IMAGERY CAPTURED AUGUST 2020 © 2020 DIGITAL GLOBE, INC. ADDITIONAL IMAGERY COPYRIGHT © 20190802 ESRI AND ITS LICENSORS. SOURCE: MAXAR VIVID. USED UNDER LICENSE, ALL RIGHTS RESERVED.
PROJECTION: UTM ZONE 17 DATUM: NAD 83

CLIENT
BAFFINLAND IRON MINES CORPORATION

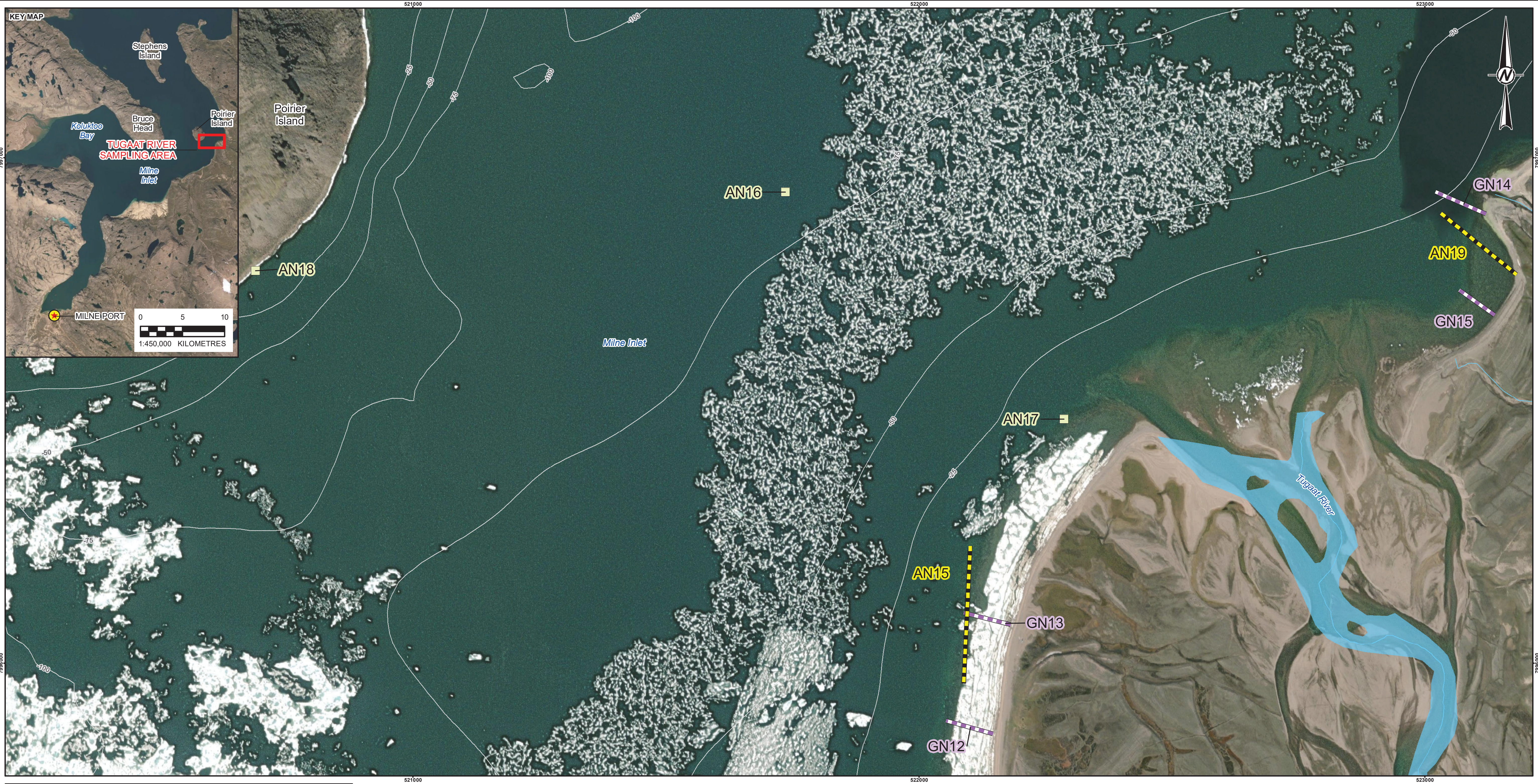
PROJECT
MARY RIVER PROJECT

CONSULTANT
GOLDER
MEMBER OF WSP

YYYY-MM-DD	2022-09-09
DESIGNED	MR
PREPARED	AJA
REVIEWED	MR
APPROVED	PR

TITLE
LONG LINE AND TRAWLING SAMPLE LOCATIONS IN MILNE PORT; MEEMP 2020 AND 2021

PROJECT NO.	CONTROL	REV.	FIGURE
1663724	44000-04	0	6-5



LEGEND

- 2021 ANGLING (JIGGING) SAMPLING LOCATION
- 2021 ANGLING (TROLLING) SAMPLING LOCATION
- 2021 GILLNET SAMPLING LOCATION
- BATHYMETRIC CONTOUR (25 m INTERVAL)
- WATERCOURSE
- WATERBODY

0 250 500
1:7,500 METRES

REFERENCE(S)
BATHYMETRY CREATED BY GOLDER FROM MULTIPLE DATA SOURCES. HYDROGRAPHY DATA OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED. IMAGERY COPYRIGHT © 20190630 2 ESRI AND ITS LICENSORS. SOURCE: MAXAR VIVID. USED UNDER LICENSE, ALL RIGHTS RESERVED.
PROJECTION: UTM ZONE 17 DATUM: NAD 83

CLIENT
BAFFINLAND IRON MINES CORPORATION

PROJECT
MARY RIVER PROJECT

CONSULTANT
GOLDER MEMBER OF WSP

YYYY-MM-DD	2022-06-30
DESIGNED	MR
PREPARED	AJA
REVIEWED	MR
APPROVED	PR

TITLE
EXPLORATORY SAMPLING LOCATIONS AT TUGAAT RIVER; MEEMP 2021

PROJECT NO.	CONTROL	REV.	FIGURE
1663724	44000-04	0	6-6

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B
25mm

6.2.2 Endpoints

CPUE is the primary metric used for characterization of the fish catch data, in addition to total number of fish caught, taxonomic richness, and relative abundance of taxa. A statistical analysis of these endpoints over the course of the entire MEEMP program (2015-2022) was not possible due to the limited sample sizes and inconsistent fishing effort data for sampling efforts conducted prior to 2020. However, a statistical comparison of CPUE data between 2020 and 2021 and between DPF and IPF areas was completed for this report. This chapter is closely linked to Chapter 7 (Fish Health and Tissue Chemistry), which includes a summary of fish length, weight, and age measurements (Section 7.2.2)

6.3 Materials and Methods

6.3.1 Field Methodology

Fish sampling was conducted in the Milne Port area from 2 to 19 August 2021 using both active (gill net, angling and trawling) and passive (longline, hoop net and Fukui trap) capture methods (Figure 6-1, Figure 6-2, Figure 6-3, Figure 6-4 and Figure 6-5). Fish sampling locations were consistent with those used in previous years, with the addition of an exploratory reference site location near the mouth of the Tugaat River sampled for the fish health program. Fishing effort in 2021 occurred over a three-week period during the open-water season. All incidental mortalities were retained and processed as described in Chapter 7.0 (Fish Health and Tissue Chemistry).

6.3.1.1 Permitting

The following scientific data collection permits were obtained prior to the start of the 2021 fish sampling program:

- Fisheries and Oceans Canada (DFO) Licence to Fish for Scientific Purposes Permit # S-21/22-1019-NU
- DFO Animal Use Protocol Permit # OPA-ACC-2022-64
- Nunavut Research Institute (NRI) Scientific Research Licence # 02 023 21R-M

Copies of permits are provided in Appendix 6A.

6.3.1.2 Fishing Areas

Recognizing that the marine fish community may differ across the Milne Port area and differences may be the result of Project-related effects, two distinct Fisheries Areas (FAs) were identified for Milne Port; one encompassing waters directly in or adjacent to the terminal infrastructure footprint (Direct Project Footprint area; DPF) and one encompassing waters outside (west and east) of the terminal infrastructure footprint (Indirect Project Footprint; IPF). The FAs reflect different exposure levels relative to terminal operations and marine berthing activities. The integration of FAs in the study design provides an opportunity to better characterize any variability in Milne Port area fish communities and standardize sampling locations among years. Coverage and effort across the FAs are determined, in part, by the effectiveness of a particular method at characterizing the fish community within an FA, consequently each FA may include a range of sampling efforts and methods. A description of the FAs is provided in Table 6-2 and their spatial arrangement is shown in Figure 6-1 to Figure 6-5.

Table 6-2: Fishing Areas (FAs) of Milne Port

Fishing Area	Area (ha)	Description
Direct Project Footprint (DPF)	192.14	The Direct Project Footprint FA (DPF) includes the immediate Area of Influence[1] adjacent to Project infrastructure, and includes shoreline in the vicinity of the Ore Dock, Ore Pile, Freight dock, and Fuel Farm. The DPF is also an area of relatively high marine traffic. The DPF habitat is characterized by mixed (sand/gravel to cobble/boulder) shoreline including coarse rock offsetting habitat along the Ore Dock and Freight Dock. The DPF FA extends 1.38 km from shore at its western boundary, and 0.98 km from shore at its eastern boundary.
Indirect Project Footprint (IPF)	405.64	The Indirect Project Footprint FA (IPF) includes areas along the shorelines to the east and west of the DPF, outside of the immediate Area of Influence. The IPF includes the mouth of Philips Creek, which is characterized by soft substrate (sand and gravel) and brackish water, as well as the shoreline to the east of the DPF, which is also characterized by brackish water due to input from Unnamed Watercourse #2, as well as substrate ranging from soft sand to mixed gravel and cobble. The IPF FA extends 2.63 km from shore at the mouth of Philips Creek at its western boundary, and 2.77 km from the southern shore of Milne Inlet at its western boundary.

[1]The immediate area of influence for port infrastructure

6.3.1.3 Gill Net

Standardized monofilament floating gill nets were used to sample shallow (i.e., up to -15 m CD) subtidal areas for characterization of pelagic fish communities present in the Milne Port area. A total of 25 gill net sets were performed from 3 to 18 August 2021 (Table 6-3). Each gill net consisted of six panels with each panel measuring 15.2 m in length and 2.4 m in width, with panel mesh sizes 2.5 cm, 3.8 cm, 5.1 cm, 6.4 cm, 7.6 cm, and 10.2 cm. The gill nets were deployed in a shore-perpendicular orientation (smallest mesh size closest to shore) and were either suspended just below the water surface or were weighted to run along the seabed. Nets were inspected for fish presence at a frequency of more than once per every two hours for the duration of deployment. Sampling locations were recorded using a Garmin GPS and logged in a field notebook. The 25 gill net sampling events were divided across the two FAs as follows: 10 sets at the IPF FA and 11 sets at the DPF FA. Four gill net sets were also performed outside of Milne Port near Tugaat River estuary as part of exploratory sampling for a fish health reference site (See Chapter 7). Total soak times ranged from 45 minutes to 4 hours and 10 minutes, with an average soak time of 2 hours and 40 minutes. Total soak time for gill net sampling was 66 hours and 36 minutes, or 60.61 net-unit (100 m) hours of effort.

Table 6-3: Summary of 2021 Fish Sampling Effort in Milne Port area - Gill Net

Station Name	Fishing Area[1]	Date (2021)	UTM Coordinates (Zone 17 W)				Total Duration (h:min)	Number of Checks[2]
			Start		End			
			Easting	Northing	Easting	Northing		
GN01	DPF	03-Aug	502785	7976226	502818	7976314	1:45	0
GN02	DPF	03-Aug	502982	7976335	502924	7976414	1:27	0
GN03	DPF	06-Aug	502890	7976249	502832	7976323	2:00	0
GN04	DPF	06-Aug	503020	7976384	502970	7976461	4:00	1
GN05	DPF	07-Aug	504373	7976453	504337	7976543	1:58	0
GN06	IPF	07-Aug	504515	7976457	504417	7976547	2:00	0
GN07	DPF	08-Aug	502960	7976323	502922	7976403	2:37	1
GN08	DPF	09-Aug	503099	7976436	503061	7976511	1:28	0
GN09	IPF	10-Aug	502602	7976235	502624	7976319	1:10	0
GN10	IPF	11-Aug	504760	7976619	504755	7976706	4:00	1
GN11	DPF	14-Aug	503366	7976479	503426	7976550	2:00	0
GN12[3]	-	15-Aug	522147	7995861	522054	7995887	2:00	0
GN13[3]	-	15-Aug	522182	7996077	522089	7996100	2:00	0
GN14[3]	-	15-Aug	523116	7996895	523021	7996932	0:45	0
GN15[3]	-	15-Aug	523133	7996676	523068	7996739	1:00	0
GN16	IPF	16-Aug	505148	7976959	505061	7976967	3:15	1
GN17	IPF	16-Aug	505080	7979223	505080	7977223	3:05	1
GN18	DPF	17-Aug	504274	7976478	504304	7976549	4:10	1
GN19	IPF	17-Aug	504573	7976595	504541	7976668	4:00	1
GN20	IPF	17-Aug	505191	7977496	505111	7977501	3:45	1
GN21	IPF	17-Aug	505264	7977779	505201	7977808	3:37	1
GN22	IPF	18-Aug	502249	7976266	502215	7976347	3:53	1
GN23	IPF	18-Aug	502432	7976273	502457	7976361	3:45	1
GN24	DPF	18-Aug	503721	7976365	503721	7976453	3:20	1
GN25	DPF	18-Aug	504141	7976594	504230	7976604	3:36	1
Total Effort							**66:36**	

[1]DPF = Direct Project Footprint; IPF = Indirect Project Footprint; – = Outside of a defined Fishing Area

[2]Number of checks represents the number of times the field team checked the net and sampled fish with the net remaining in the same location.

[3]Gill netting effort was also conducted at the Exploratory Sampling Locations at Tugaat River (Table 6-8)

6.3.1.4 Angling

Angling (jigging and trolling) was conducted over 6 days between 6 August and 18 August 2021 to characterize the demersal and pelagic fish community in Milne Port (Table 6-4). A total of 27 angling events were undertaken across the two FAs as follows: 8 events at the IPF FA and 19 events at the DPF FA. Five additional angling events (two trolling and three jigging events) were conducted outside of Milne Port near the Tugaat River estuary as part of exploratory sampling for a fish health reference site, totalling rod-hours of 3 hours and 4 minutes (See Chapter 7). The total effort in rod-hours for Milne Port was 44 hours and 44 minutes. The duration of sampling was activity-dependent, with trolling ranging between 15 and 79 minutes (n = 14) and jigging ranging between 3 and 79 minutes (n = 18). Start and end coordinates of angling efforts were recorded using a Garmin GPS and logged in a field notebook. Jigging occurred from a stationary position with two to five rods and lines deployed from the field vessel. Hooks or spoon lures were allowed to hit the bottom, then flicked upward to attract bottom fish. Trolling occurred along a pre-determined depth contour where lines with lures were cast over the side of the field vessel and spooled in towards the field vessel at a known depth to attract pelagic fish.

As part of the Fish Health Program (Chapter 7.0), 50 large-bodied Fourhorn Sculpin were required to be collected for tissue sampling. Due to the known higher abundance of this species near coarse rock substrate, angling efforts were focused in these areas, particularly on the west side of the Ore Dock (Figure 6-2).

Table 6-4: Summary of 2021 Fish Sampling Effort in Milne Port area - Angling (Jigging and Trolling)

Station Name	Fishing Area[1]	Angling Type	Date (2021)	UTM Coordinates (Zone 17W)		Duration in Rod-Hours[3] (h:min)
				Easting	Northing	
AN01	DPF	Jigging	06-Aug	503217	7976600	1:06
AN02	IPF	Jigging	07-Aug	505732	7978481	1:02
AN03	IPF	Trolling (Start)	07-Aug	504883	7976683	1:36
		Trolling (End)		504934	7976601	
AN04	DPF	Trolling (Start)	08-Aug	503220	7976558	3:12
		Trolling (End)		503167	7976507	
AN05	DPF	Jigging	09-Aug	503161	7976510	0:57
AN06	DPF	Jigging	10-Aug	503209	7976608	0:50
AN07	DPF	Trolling (Start)	10-Aug	503168	7976510	1:52
		Trolling (End)		503078	7976456	
AN08	DPF	Trolling (Start)	10-Aug	503197	7976533	3:09
		Trolling (End)		503227	7976602	
AN09	DPF	Jigging	11-Aug	503975	7976671	1:15
AN10	DPF	Jigging	11-Aug	503219	7976597	2:06
AN11	DPF	Jigging	12-Aug	503196	7976607	2:40
AN12	IPF	Trolling (Start)	12-Aug	503103	7976563	0:30
		Trolling (End)		502074	7976769	
AN13	DPF	Jigging	12-Aug	503205	7976617	0:46
AN14	DPF	Trolling (Start)	14-Aug	503367	7976582	2:40
		Trolling (End)		503439	7976600	

Station Name	Fishing Area[1]	Angling Type	Date (2021)	UTM Coordinates (Zone 17W)		Duration in Rod-Hours[3] (h:min)
				Easting	Northing	
AN15[2]	-	Trolling (Start)	15-Aug	522102	7996232	0:44
		Trolling (End)		522088	7995960	
AN16[2]	-	Jigging	15-Aug	521736	7996932	0:06
AN17[2]	-	Jigging	15-Aug	522287	7996483	1:06
AN18[2]	-	Jigging	15-Aug	520689	7996776	0:26
AN19[2]	-	Trolling (Start)	15-Aug	523032	7996890	0:42
		Trolling (End)		523181	7996769	
AN20	IPF	Jigging	16-Aug	505749	7978496	0:50
AN21	IPF	Jigging	16-Aug	505728	7978489	0:30
AN22	DPF	Trolling (Start)	16-Aug	504054	7976663	1:00
		Trolling (End)		504011	7976606	
AN23	DPF	Jigging	16-Aug	503202	7976607	1:10
AN24	IPF	Jigging	17-Aug	505720	7978481	1:00
AN25	IPF	Trolling (Start)	17-Aug	505185	7977668	2:18
		Trolling (End)		505159	797793	
AN26	DPF	Jigging	17-Aug	503333	7976681	1:45
AN27	IPF	Trolling (Start)	17-Aug	505147	7977215	2:12
		Trolling (End)		505090	7976907	
AN28	DPF	Trolling (Start)	17-Aug	503139	7976515	1:54
		Trolling (End)		503106	7976496	
AN29	DPF	Trolling (Start)	18-Aug	503913	7976488	2:51
		Trolling (End)		503907	7976600	
AN30	DPF	Jigging	18-Aug	503350	7976667	2:00
AN31	DPF	Trolling (Start)	18-Aug	504096	7976617	2:18
		Trolling (End)		504006	7976600	
AN32	DPF	Jigging	18-Aug	503218	7976603	1:15
Total Effort						**47:48**

[1]DPF = Direct Project Footprint; IPF = Indirect Project Footprint; – = Outside of a defined Fishing Area

[2]Angling effort was conducted at the Exploratory Sampling Locations at Tugaat River (Table 6-8)

[3]Rod-hours are calculated from the total hours fishing by the number of rods used

6.3.1.5 Fukui Trap

Fukui traps were used to sample demersal fish in nearshore habitat at Milne Port from 7 August to 16 August 2021 (Table 6-5). Each fukui trap set consisted of three traps connected with a line, with each trap measuring 61 cm x 46 cm x 20 cm, with 1.25 cm stretch mesh, and equipped with a bait container. Since 2019, Fukui traps have been deployed using the 'sinker' method described in Bergshoeff et al. (2019) as per a recommendation made by the MEWG. Traps were baited with Arctic Char and Fourhorn Sculpin prior to being deployed for several days at each station. A total of 14 Fukui trap sampling events were undertaken, divided between the FAs as follows: five sets at the IPF FA and nine sets at the DPF FA. (Figure 6-3). Deployment time was calculated by trap-hours (i.e., number of traps deployed by time deployed) and ranged from 6 days, 15 hours, and 36 minutes to 15 days, 1 hour, and 45 minutes, with a mean deployment time of 11 days, 11 hours, and 13 minutes. Traps with longer deployment periods were occasionally checked (i.e. every 2 to 5 days) and bait containers were refilled, if necessary, prior to redeployment. Fishing locations were recorded using a Garmin GPS and logged in a field notebook. Due to historically low CPUE in Fukui traps observed in the Milne Port area, hoop nets (Section 6.3.1.6) were used in 2021 to assess their potential as a replacement for Fukui traps. Use of Fukui traps continued in 2020 and 2021 in order to meet existing commitments to the MEWG to continue both methodologies for a minimum of 3 years to allow for a comparison between fish sampling methods and results.

Table 6-5: Summary of 2021 Fish Sampling Effort in Milne Port - Fukui Trap

Station	Fishing Area[1]	Date (2021)		UTM Coordinates (Zone 17W)		Duration in Trap-Hours[2] (h:min)	Number of Checks[3]
		Set	Pull	Easting	Northing		
FT01	DPF	07-Aug	11-Aug	502897	7976383	281:09	1
FT02	IPF	07-Aug	11-Aug	502660	7976305	281:15	1
FT03	IPF	07-Aug	11-Aug	502268	7976436	281:24	1
FT04	IPF	07-Aug	11-Aug	501468	7976188	281:33	1
FT05	DPF	07-Aug	11-Aug	502725	7976384	280:15	1
FT06	DPF	11-Aug	16-Aug	503487	7976650	361:33	0
FT07	DPF	11-Aug	16-Aug	503435	7976594	361:45	0
FT08	DPF	11-Aug	16-Aug	503476	7976593	361:24	0
FT09	DPF	11-Aug	16-Aug	503375	7976642	360:33	0
FT10	DPF	11-Aug	16-Aug	503838	7976679	361:27	0
FT11	DPF	16-Aug	18-Aug	504051	7976629	160:57	0
FT12	DPF	16-Aug	18-Aug	504154	7976587	160:42	0
FT13	IPF	16-Aug	18-Aug	504549	7976635	159:36	0
FT14	IPF	16-Aug	18-Aug	504611	7976704	159:42	0
Total Effort						3,853:15	

[1]DPF = Direct Project Footprint; IPF = Indirect Project Footprint; – = Outside of a defined Fishing Area

[2]Trap-hours are calculated from the total hours fishing by the number of traps used

[3]Number of checks represents the number of times the field team checked the trap and sampled fish with the net remaining in the same location.

6.3.1.6 Hoop Net

Hoop nets were used to sample demersal fish in nearshore habitat at Milne Port from 2 August to 16 August 2021. A total of seven hoop net sampling events were undertaken, divided between the FAs as follows: one set at the IPF FA and six sets at the DPF FA. (Figure 6-4). Fishing locations were recorded using a Garmin GPS and logged in a field notebook. Total sampling effort was 25 days, 16 hours, and 37 minutes (Table 6-6). Sampling was conducted using a single 5 m dual-chamber hoop net with 25 mm mesh. Orientation of the hoop nets varied by deployment type. Shore-based nets were set in the subtidal during low tide with the wing panels running from a minimum water depth of 0.2 m to a maximum of 1.5 m. Nets were checked every 1 to 5 days after deployment. Shore-based west and east-oriented nets were placed so the 1.0 m diameter mouth was perpendicular to the shore and the 10 m length wing panels were oriented in a wide V-shape extending outwards from the net opening, targeting fish moving through the subtidal. Shore-based north and south-oriented nets were placed so the mouth was parallel to shore either facing shore (south orientation) or open water (north orientation), targeting fish moving in and out of sources of freshwater input. Deep deployments were set with both sides of the hoop net left open to allow fish to swim into the trap from any direction. Deep deployments were baited with Arctic Char and Fourhorn Sculpin and deployed for several days at each station. Nets were periodically checked (normally once per day) and bait containers were refilled, if necessary, prior to redeployment. The hoop net was held in an open position using wooden rods and weighted on both ends to lay flat on the seabed, targeting demersal species.

Table 6-6: Summary of 2021 Fish Sampling Effort in Milne Port area – Hoop Net

Station	Fishing Area[1]	Date (2020)		UTM Coordinates (Zone 17W)		Duration (h:min)	Number of Checks[2]
		Set	Pull	Easting	Northing		
HN01	DPF	02-Aug	04-Aug	503021	7976416	52:05	1
HN02	DPF	02-Aug	07-Aug	503145	7976480	121:31	3
HN03	DPF	08-Aug	11-Aug	503003	7976400	74:10	1
HN04	DPF	08-Aug	11-Aug	504028	7976600	75:33	1
HN05	DPF	11-Aug	16-Aug	504136	7976559	122:29	0
HN06	DPF	11-Aug	16-Aug	504068	7976564	122:24	0
HN07	IPF	16-Aug	18-Aug	504563	7976634	48:25	0
Total Effort						**616:37**	

[1]DPF = Direct Project Footprint; IPF = Indirect Project Footprint; – = Outside of a defined Fishing Area

[2]Number of checks represents the number of times the field team checked the net and sampled fish with the net remaining in the same location.

6.3.1.7 Trawling

On 19 August 2021, four trawl sampling events were conducted in the Milne Port area. Trawling effort built upon the 2020 efficacy trial to target fish taxa not typically caught using other methods. The four 2021 trawling efforts were divided between the FAs as follows: three events in the IPF FA and one event in the DPF FA. Trawl sampling consisted of towing an otter trawl net behind the vessel for a set time period (between 15 minutes and 1 hour) and trawl distance (between 500 and 1,000 m). Trawling effort totaled 2 hours and 2 minutes and covered approximately 2,878 m of habitat. Start and end waypoints for otter trawl sampling were recorded using the onboard navigation system (Raymarine Axiom Hybrid Touch Pro with Navionics+ Bundle) and logged in a field notebook (Table 6-7).

The otter trawl comprised a cone shaped net composed of a 4.9 m wide diameter mouth held open by two wooden doors on either side of the opening. The front section of the net wascomposed of 38 mm stretched nylon mesh. The rear of the net (cod end) was composed of 32 mm stretched mesh. The net was deployed near bottom to target benthic/demersal fish species. Sampling locations were selected based on water depth and bottom morphology using bathymetric charts. Sample contours ranged from 30 to 50 m in depth.

The otter trawl was deployed from the vessel's hydraulic A-frame system, with the net towed slowly off the bow while the vessel slowly reversed at a speed of one knot. Once the net reached the seafloor, it was raised slightly (to ~2 to 3 m above bottom) to minimize drag impacts on the sea floor. Trawls lasted between 17 and 42 minutes.

Table 6-7: Summary of 2021 Fish Sampling Effort in Milne Port – Otter Trawl

Station Name	Fishing Area[1]	Date (2021)	UTM Coordinates (Zone 17 W)				Total Duration (h:min)	Approximate Distance[2] (m)
			Start		End			
			Easting	Northing	Easting	Northing		
TRL01	IPF	19-Aug	502222	7977862	501962	7977448	0:17	486
TRL02	IPF	19-Aug	501699	7976664	501981	7977507	0:30	887
TRL03	IPF	19-Aug	502407	7978007	502720	7978457	0:42	547
TRL04	DPF	19-Aug	503009	7976604	503945	7976821	0:33	958
Total Effort							**2:02**	**2,878**

[1]DPF = Direct Project Footprint; IPF = Indirect Project Footprint; – = Outside of a defined Fishing Area

[2]Estimated distance based on field-recorded GPS coordinates

6.3.1.8 Longline

Longline sampling was introduced to the MEEMP Program for the first time in 2021 as per Commitment No. 37 to the MEWG (Appendix 1A in Golder 2021) to target large-bodied demersal fishes. Longline efforts consisted of deploying a baited line from a vessel for a recorded duration and location. Three long lining efforts were conducted between 9 August and 11 August 2021 within Milne Port. All three longline fishing efforts were conducted within the IPF FA. No longlining efforts were conducted in the DPF due to potential interference with berthing activities and local marine traffic. One effort in the IPF (in the vicinity of the mouth of Phillips Creek) extended towards at the western extent of the DPF FA. Total sampling effort was 60 hours and 58 minutes, with a mean fishing effort among stations of 21 hours and 15 minutes (Table 6-8).

Each effort consisted of a 150 m long main line anchored to the bottom with 10 lb cannon balls. For each set, 36 hooks were baited with Arctic Char, attached at 5 m increments along the mainline and set to fish overnight. Lines were set perpendicular to shore and ranged from 15 m to 80 m in depth. Two longline efforts were conducted to the west of the ore dock and one effort was conducted in the bay to the east of the freight dock (Figure 6-3). Fishing locations were recorded using a Garmin GPS and logged in a field notebook.

Table 6-8: Summary of 2021 Fish Sampling Effort in Milne Port – Longline

Station Name	Fishing Area[1]	Date (2021)	UTM Coordinates (Zone 17 W)				Total Duration (h:min)
			Start		End		
			Easting	Northing	Easting	Northing	
LL01	IPF	09-Aug	502570	7976487	502680	7976630	15:30
LL02	IPF	09-Aug	504720	7976812	504740	7977008	27:58
LL03	IPF	09-Aug	502193	7976782	502359	7976919	20:19
Total Effort							**60:58**

[1]IPF = Indirect Project Footprint

6.3.1.9 Fish Health Reference Site - Exploratory Fishing

On 15 August 2021, one day of fishing effort was conducted along the shoreline near the Tugaat River estuary to assess the suitability of the area as a potential fish health program reference site, should one be required for future monitoring initiatives (e.g., Phase 2 monitoring). Fish sampling methods included gill netting and angling (jigging and trolling). Four gill netting sampling events were undertaken over a total sampling effort of 6 hours and 45 minutes. Five angling events were undertaken over a total sampling effort of 3 hours and 4 minutes (Table 6-9).

Table 6-9: Summary of 2021 Exploratory Fishing Effort at Tugaat River

Method	Effort	Total Duration[1] (h:min)
Gill Net	GN12	2:00
	GN13	2:00
	GN14	2:00
	GN15	0:45
Gill Net Total		6:45
Angling	AN15	0:44
	AN16	0:06
	AN17	1:06
	AN18	0:26
	AN19	0:42
Angling Total		**3:04**

[1]Angling hours were calculated to reflect Rod-hours (total hours fishing by the number of rods used)

6.3.2 Data Analysis

Consistent with previous years, figures were prepared for visualization of the fish catch data showing the cumulative number of fish taxa captured using each sampling method. Descriptive summary statistics (mean, standard deviation [SD], CPUE) were also used to compare catch data among taxa, sampling method and survey year. Descriptive summary statistics were also provided for length, weight, and age data.

Angling catch data were reported relative to 1 hour of effort and the number of rods used during each effort (fish/h/rod). Gill net catch data were reported relative to 1 hour of effort and for the length of the net adjusted to 100 m (fish/h/100m net). Fukui trap and hoop trap data were reported for a 24-hour deployment and the number of traps used for each deployment (fish/24 h/trap). Data from 2020 were re-analyzed with the 2021 updated CPUE equations and compared against 2021 results, consistent with recommendations from the MEWG for integration of a standardized method for comparing relative abundance of fish across sampling years. Trawling and longline sampling were excluded from this comparative analysis as longlines were not used in 2020 and trawling in 2020 was limited to a single test of methods effort.

For gill net, hoop net, Fukui trap, and angling datasets, trends in CPUE as a function of sampling year and sampling location (i.e., FA) were assessed using an analysis of variance (ANOVA). The assumption of normality of the model residuals were tested using the Shapiro-Wilk test, with a significance level of 0.05. As statistical comparisons did not meet the assumption of normality, the analyses were repeated using the non-parametric two-way permutational ANOVA, which does not require the data to be normally distributed. Trawling and longlining were excluded from this analysis as both gear types were not used in 2020

Potential impacts of Project operations on fish health were quantified using separate fish health metrics as described in Chapter 7.0.

6.3.3 Quality Management

6.3.3.1 Field QA/QC

Quality assurance and quality control (QA/QC) measures for quantitative and qualitative data collected during fishing surveys, included:

- Prior to fishing activities, all field members were briefed on sampling protocols and made aware of their role in data collection. Fishing methodologies were standardized to minimize the introduction of sampling error during sample collection.
- Nets and traps were cleaned between efforts and checked for breakages or failures to ensure consistency in efforts. Broken nets and traps were repaired or replaced.
- Field notes were taken during all surveys to ensure a consistent record of sampling effort using pre-prepared field sheets to ensure a complete and accurate data collection process. A second team member reviewed data from field sheets and entered them into a spreadsheet while checking for inconsistencies or missing information. A third team member reviewed the entered data for inconsistencies and thoroughness.
- Scans of the field datasheets and GPS waypoints were saved to a laptop computer and external hard drive at the end of each day.
- Fish were identified to lowest practicable level (species, where possible). Any identification that was questionable in the field was verified using fish field guides. Where there was uncertainty in the identification of an incidental mortality, the specimen was preserved and sent for identification by Biologica Environmental Services Ltd (Biologica).

6.4 Results

6.4.1 Catch Data

6.4.1.1 2021 Summary

A total of 603 fish belonging to 13 Arctic taxa were recorded in the DPF and IPF during 2021 (Table 6-10; Figure 6-7). Similar to previous sampling years (SEM 2016; SEM 2017; Golder 2018, Golder 2019, Golder 2020, Golder 2021), Arctic Char (15.50% of catch) and Fourhorn Sculpin (44.26%) were the two most common fish species captured, comprising 59.76% of the total catch in 2021. The remaining 40.24% of the total catch was composed of: Arctic Sculpin *(Myoxocephalus scorpioides,* 7.00%), Greenland Cod (*Gadus ogac,* 7.15%), Ribbed Sculpin (*Triglops pingelii,* 7.00%), Shorthorn Sculpin (*Myoxocephalus Scorpius,* 5.37%), Arctic Staghorn Sculpin (*Gymnocanthus tricuspis*, 0.75%), Arctic Alligatorfish (*Aspidophoroides olrikii,* 0.30%), Atlantic Poacher (*Leptagonus decagonus*, 0.15%), Saddled Eelpout (*Lycodes mucosus*, 0.15%), unidentified Cod sp. (1.64%), unidentified Sculpin sp. (0.45%) and unidentified Snailfish sp. (0.15%; Figure 6-7). Detailed fish catch data for 2020 and 2021 are presented in Appendix 6B.

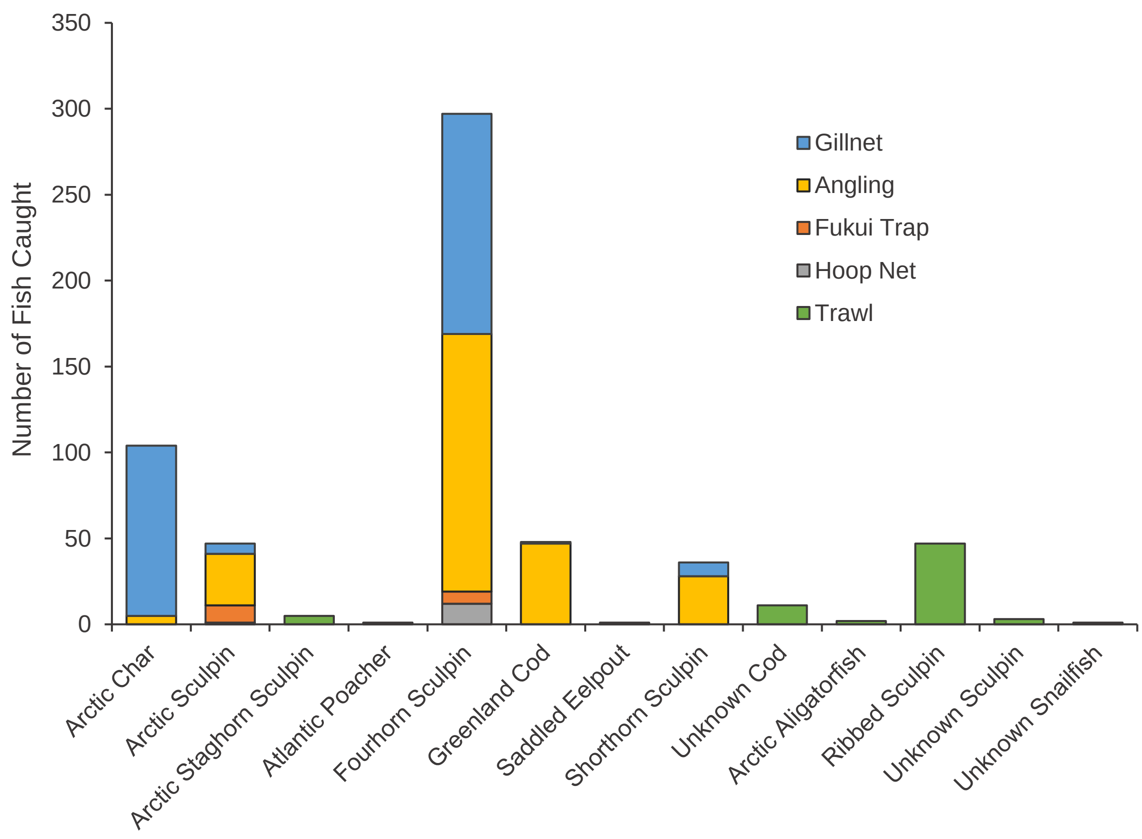


Figure 6-7: Fish Species Recorded during 2021 MEEMP Fish Sampling Program (DPF and IPF Combined).

6.4.1.2 Fish Community

A total of 2,652 fish collected in the Milne Port area (excluding sampling conducted at Tugaat River estuary) were processed between 2010 and 2021, comprising 17 different fish species and at least four indeterminate taxa that could not be identified to species in the field (i.e., unidentified Sandlance, Sculpin, Snailfish and juvenile Cod). Fish species recorded throughout the MEEMP (2010-2021) are presented in Table 6-10. Most species captured in 2021 were also recorded in previous years, with the exception of Atlantic Poacher (n = 1), Arctic Alligatorfish (n = 2), and Ribbed Sculpin (n = 47). Fish species identified in previous sampling years but not in 2021 included Sandlance (*Ammodytes* spp*)*, Longhorn Sculpin (*Myoxocephalus octodecemspinosus*), Atlantic Hookear Sculpin (*Artediellus atlanticus*), *Triglops* Sculpin (*Triglops* sp.), Polar Cod (*Arctogadus glacialis),* Arctic Cod (*Boreogadus saida*), Ninespine Stickleback (*Pungitius pungitius*), Fourline Snakeblenny (*Eumesogrammus parecisus*) and Fishdoctor (*Gymnelis viridis*). Length and weight measurements for a subset of captured fish from Milne Port in 2020 and 2021 are presented in Table 6-11, and complete length data are presented in Appendix 6B.

Table 6-10: Fish Catch Data for 2010-2021 MEEMP Fish Sampling Program (Combined Sampling Methods; Uncorrected for Effort).

Family / Common Name	Taxonomic ID	2010	2013	2014	2015	2016	2017	2018	2019	2020	2021
		Number of Fish									
Agonidae											
Atlantic Poacher	*Leptagonus decagonus*	0	0	0	0	0	0	0	0	0	1
Arctic Alligatorfish	*Aspidophoroides olrikii*	0	0	0	0	0	0	0	0	0	2
Ammodytidae											
Sandlance	*Ammodytes* spp.	0	0	0	0	0	1	1	1	6	0
Cottidae											
Arctic Sculpin	*Myoxocephalus scorpioides*	0	0	4	1	0	9	3	0	13	47
Shorthorn Sculpin	*Myoxocephalus scorpius*	50	4	9	8	18	45	78	66	74	36
Fourhorn Sculpin	*Myoxocephalus quadricornis*	7	3	39	13	18	40	147	106	388	287
Arctic Staghorn Sculpin	*Gymnocanthus tricuspis*	3	0	0	2	0	0	0	0	11	5
Longhorn Sculpin	*Myoxocephalus octodecemspinosus*	0	2	4	2	2	0	0	0	0	0
Atlantic Hookear Sculpin	*Artediellus atlanticus*	0	0	5	1	0	0	0	0	0	0
Triglops Sculpin	*Triglops* sp.	0	0	0	0	0	0	0	0	9	0
Ribbed Sculpin	*Triglops pingelii*	0	0	0	0	0	0	0	0	0	47
Unidentified Sculpin[1]	Cottidae indet.	0	0	0	12	0	0	3	0	75	3

Family / Common Name	Taxonomic ID	2010	2013	2014	2015	2016	2017	2018	2019	2020	2021
		Number of Fish									
Cyclopteridae											
Common Lumpfish	*Cyclopterus lumpus*	0	0	1	0	0	0	0	0	0	0
Gadidae											
Greenland Cod	*Gadus ogac*	4	0	1	0	0	0	0	0	57	48
Polar Cod	*Arctogadus glacialis*	0	0	0	0	0	0	0	0	70	0
Arctic Cod[2]	*Boreogadus saida*	0	0	0	0	0	0	1	0	0	0
Unidentified Cod	Gadidae indet.	0	0	0	0	0	0	0	0	0	11
Gasterosteidae											
Ninespine Stickleback	*Pungitius*	0	0	0	0	0	0	0	1	0	0
Liparidae											
Unidentified Snailfish[3]	Liparidae indet.	0	0	0	0	0	0	0	0	0	1
Salmonidae											
Arctic Char	*Salvelinus alpinus*	11	6	3	67	157	23	169	105	148	104
Stichaeidae											
Fourline Snakeblenny	*Eumesogrammus parecisus*	0	0	1	2	2	0	0	0	1	0
Zoarcidae											
Fishdoctor	*Gymnelis viridis*	0	1	0	3	0	0	0	0	0	0
Saddled Eelpout	*Lycodes mucosus*	0	0	0	0	0	0	0	0	0	1
Indeterminate											
Unidentified Species	-	0	0	0	0	0	0	1	0	0	0
Total Taxonomic Richness		**5**	**5**	**9**	**10**	**5**	**5**	**8**	**5**	**11**	**13**
Total fish captures		**75**	**16**	**67**	**111**	**197**	**118**	**403**	**279**	**852**	**671**

[1]For the Unidentified Sculpin captured in 2021, taxonomic lab results (Biologica, presented in Chapter 8.0) determined the Genus to be *Myoxocephalus*; The species identification was unknown; however results suggest it was potentially *M. aenaeus*.

[2]Fish species *Arctogadus glacialis* and *Boreogadus saida* both use the common name Arctic Cod. The 2018 report (Golder 2019) indicated an Arctic Cod was captured, referred to as *A. glacialis*. Review of the catch record and field photographs indicate this was actually *B. saida* and was corrected in the 2020 MEEMP report (Golder 2021). *Arctogadus glacialis* is referred to by the alternative common name Polar Cod.

[3]Taxinomic lab results (Biologica, presented in Chapter 8.0) identified the 2021 Unidentified Snailfish from Genus *Liparis*. The species was determined be either *L. gibbus* or *L. tunicatus*, however identifying features were not clear.

Table 6-11: Summary Statistics for Fish Length and Weight Measurements at Milne Port (2020 and 2021).

Taxon	2020						2021					
	n	Min	Max	Median	Mean	SD	n	Min	Max	Median	Mean	SD
Length (mm)												
Arctic Alligatorfish	0	-	-	-	-	-	2	69	72	71	71	2
Arctic Char	148	132	859	409	416	130	99	136	737	439	437	134
Arctic Sculpin	13	90	274	132	148	47	45	89	246	129	146	41
Arctic Staghorn Sculpin	1	168	168	168	168	-	5	90	150	122	122	26
Atlantic Poacher	0	-	-	-	-	-	2	47	71	59	59	17
Cod spp.	0	-	-	-	-	-	9	59	99	70	71	11
Fourhorn Sculpin	387	72	314	194	194	41	118	115	345	218	221	42
Fourline Snakeblenny	1	280	280	280	280	-	0	-	-	-	-	-
Greenland Cod	57	378	670	480	493	64	48	404	702	512	521	70
Ribbed Sculpin	0	-	-	-	-	-	46	74	134	95	97	11
Saddled Eelpout	0	-	-	-	-	-	1	121	121	121	121	-
Shorthorn Sculpin	74	122	421	219	241	84	36	132	415	271	292	70
Sand Lance spp.	5	132	170	168	156	18	0	-	-	-	-	-
Sculpin spp.	73	11	153	89	91	38	3	86	93	90	90	4
Snailfish spp.	0	-	-	-	-	-	1	102	102	102	102	-
Total Weight (g)												
Arctic Alligatorfish	-	0	-	-	-	-	0	-	-		-	-
Arctic Char	148	10	6710	755	1076	1092	99	23	4990	785	1129	1030
Arctic Sculpin	13	9	200	33	51	52	45	10	180	30	53	46
Arctic Staghorn Sculpin	1	91	91	91	91	-	2	30	30	30	30	0

Taxon	2020						2021					
	n	Min	Max	Median	Mean	SD	n	Min	Max	Median	Mean	SD
Atlantic Poacher	0	-	-	-	-	-	0	-	-		-	-
Cod spp.	-	0	-	-	-	-	0	-	-		-	-
Fourhorn Sculpin	388	3	925	67	82	74	296	10	370	106	123	72
Fourline Snakeblenny	0	-	-	-	-	-	0	-	-	-	-	-
Greenland Cod	57	480	3700	1240	1469	677	48	780	4930	1580	1811	920
Ribbed Sculpin	0	-	-	-	-	-	0	-	-		-	-
Saddled Eelpout	0	-	-	-	-	-	0	-	-		-	-
Sand Lance spp.	5	6	17	16	13	6	0	-	-	-	-	-
Shorthorn Sculpin	74	12	1060	135	252	271	36	18	1020	285	391	277
Sculpin spp.	63	1	31	6	11	8	0	-	-		-	-
Snailfish spp.	0	-	-	-	-	-	0	-	-		-	-
Age (y)												
Arctic Char	43.0	2.0	16.0	11.0	10.4	3.4	25.0	4.0	17.0	8.0	9.4	3.9
Fourhorn Sculpin	44.0	4.0	9.0	5.0	5.5	1.3	42.0	3.0	12.0	6.0	6.3	2.1
Greenland Cod	3.0	7.0	9.0	8.0	8.0	1.0	0.0	-	-	-	-	-

n = sample size; min = minimum; max = maximum; SD = standard deviation; SE = standard error; - = not calculated.

6.4.1.3 Fishing Areas

Arctic Char and Fourhorn Sculpin were consistently caught throughout the Milne Port area, including both the DPF and the IPF FAs (Figure 6-8). Arctic Sculpin and Greenland Cod were captured in both FAs however the majority were caught in the DPH FA. Shorthorn Sculpin were also captured in both FAs however the majority were captured in the IPF FA. Ribbed Sculpin were captured predominantly in the DPH FA.

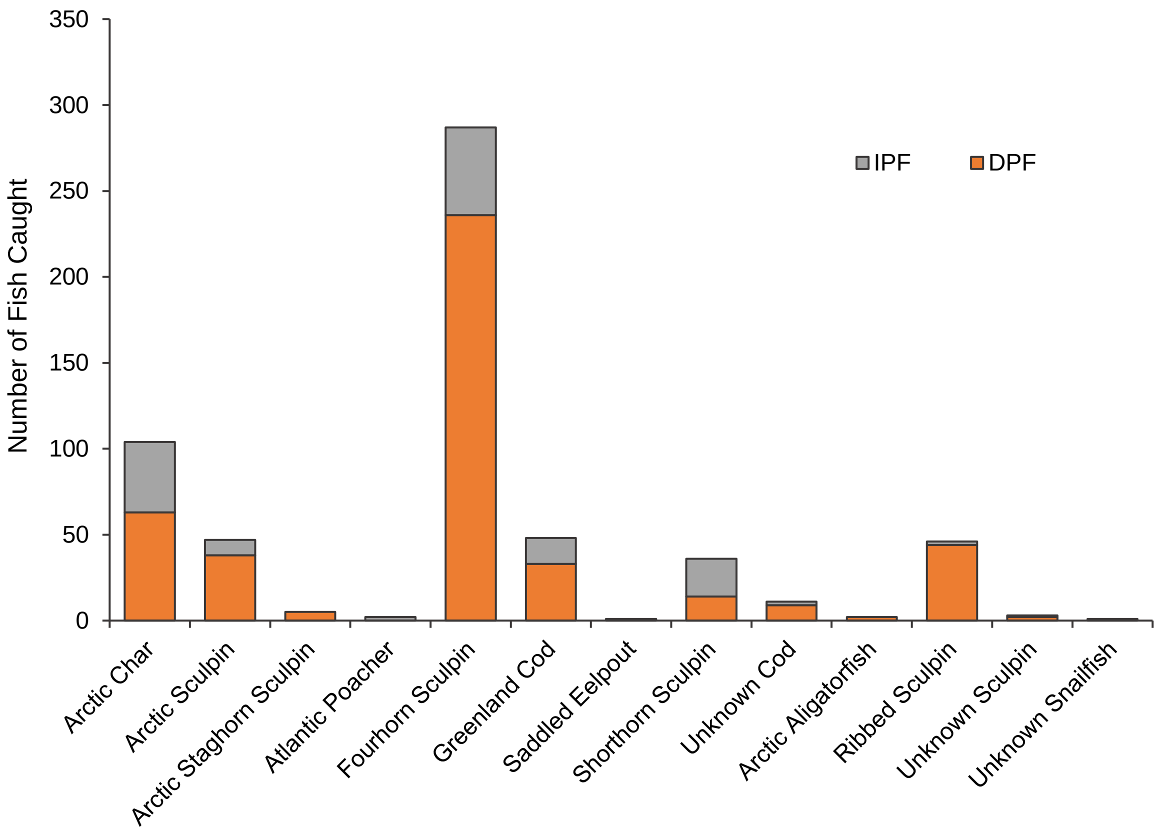
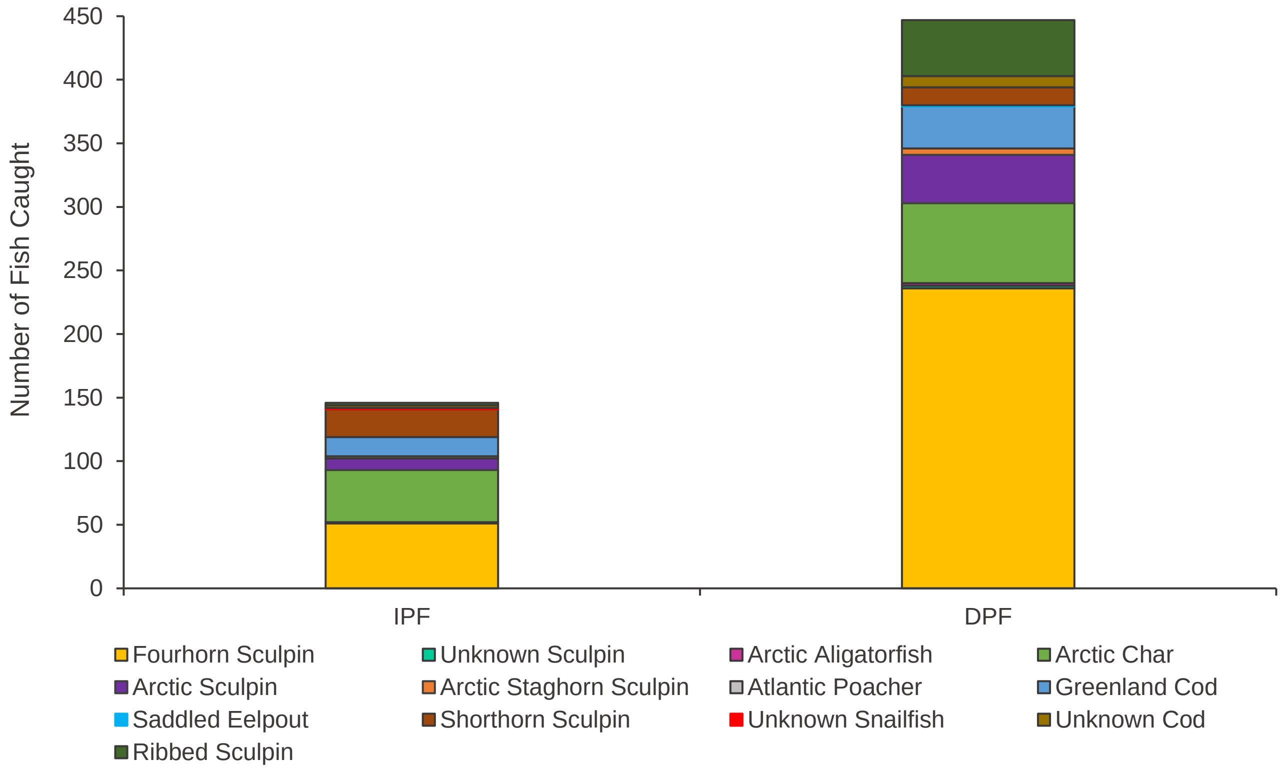


Figure 6-8: Fish Species Collected by Fishing Area (2021).

Total catch (uncorrected for effort) and taxonomic richness were higher in the DPF than the IPF FA in 2021, with a total of 447 fish captured from eleven taxa (Figure 6-9). The IPF had similar taxonomic richness (10 taxa) with a total of 146 fish captured. A total of 593 fish were captured in both FAs combined.



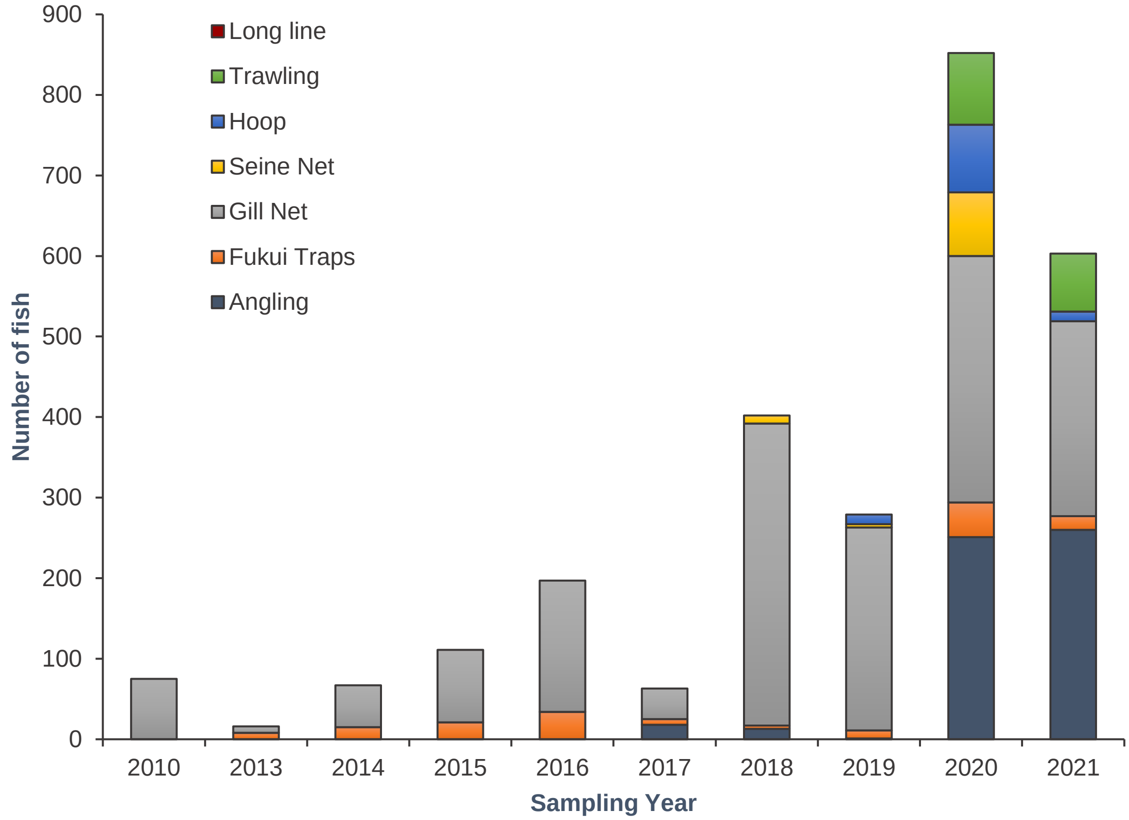
DPF = Direct Project Footprint; IPF = Indirect Project Footprint

Figure 6-9: Distribution of Fish Species by Fishing Area - 2021 MEEMP Fish Sampling Program.

6.4.1.4 Fish Capture by Method

Total fishing effort and the number of fish sampling methods used has increased over the course of the 2010-2021 MEEMP fish sampling program (Figure 6-10). Six sampling methods were used in 2020 and 2021 and yielded 852 and 447 fish captures, respectively. Angling was the most successful fishing method in terms of number of fish captured in 2021 (260 fish or 43% of total catch), whereas gill net catch was slightly less (242 fish or 40% of total catch). The fewest gear types were used in 2010, with 75 fish captured (from gill nets only), and the lowest catch was in 2013 (n = 16 fish) with two methods used. Gill nets have been a consistently successful capture method across years and have yielded the most captured fish both within a year (2018, n = 375 fish) and across years. Fukui traps have been used every year except 2010, with a high of 43 fish captured in 2020. Angling has been employed annually since 2017 with variable results: a total of 251 and 260 fish were captured in 2020 and 2021, respectively, while only one fish was caught in 2019 using this method. Seine net and hoop net efforts have both been used for 3 years (seine net from 2018 – 2020; hoop net from 2019 – 2021) and both methods yielded a similar catch (n = 93 fish and n = 96 fish, respectively). Trawling has been an effective method for fish capture and was employed in 2020 (n = 89 fish) and 2021 (n = 72 fish). Longlining was a new method employed in 2021 with no fish captured. Detailed fish catch data for 2020 and 2021 are presented in Appendix 6B.

In 2021, trawling yielded the highest taxonomic richness (9 taxa) of all sampling methods followed by angling (5 taxa) and gill netting (5 taxa; Table 6-12). Methods that yielded the lowest taxonomic richness included hoop net (1 taxon) and Fukui traps (2 taxa). In 2021, the highest CPUE was achieved by trawling in the DPF (116.4 fish/h) while longlining yielded the lowest CPUE (zero fish caught; Table 6-16). Taxon-specific CPUE for each fishing method is presented in Table 6-13.



Note: Angling = 2017 – 2021; Fukui Traps = 2013 – 2021; Gill Nets = 2010 – 2021; Seine Net = 2018 – 2020; Hoop Net = 2019 – 2021; Trawling = 2020 – 2021; Longline = 2021.

Figure 6-10: Total Fish Catch in Milne Port Area (All Methods Combined, 2010 to 2021).

Table 6-12: Taxonomic Richness by Sampling Method (2017-2021)

Method	Number of Taxa				
	2017	2018	2019	2020	2021
Angling	3	3	1	5	5
Gill Net	4	5	3	7	5
Fukui Trap	3	3	3	6	2
Hoop Net	-	-	2	6	1
Trawling	-	-	-	3	9
Longline	-	-	-	-	0

Note: - = sampling method not utilized

Table 6-13: Fish Catch Per Unit Effort (CPUE) ± Standard Deviation (SD) by Sampling Method in 2021

Common Name	Angling (fish/h/rod)	Gill Nets (fish/h/100 m)	Fukui Trap (fish/24 h/trap)	Hoop Net (fish/24 h/trap)	Trawl (fish/h)	Longline (fish)
Arctic Alligatorfish	-	-	-	-	3.63 ± -	-
Arctic Char	1.00 ± 0.30	4.23 ± 6.04	-	-	-	-
Arctic Sculpin	2.52 ± 2.09	0.47 ± 0.35	0.001 ± 0.001		1.82 ± -	-
Arctic Staghorn Sculpin	-	-	-	-	9.09 ± -	-
Atlantic Poacher	-	-	-	-	2 ± -	-
Fourhorn Sculpin	8.0 ± 10.1	3.25 ± 3.44	0.001 ± -	0.59 ± 0.70	-	-
Greenland Cod	3.22 ± 3.69	0.29 ± -	-	-	-	-
Ribbed Sculpin	-	-	-	-	28.2 ± 44.8	-
Saddled Eelpout	-	-	-	-	1.82 ± -	-
Shorthorn Sculpin	1.81 ± 1.06	0.75 ± 0.45	-	-	-	-
Unidentified Cod	-	-	-	-	6.59 ± 8.46	-
Unidentified Sculpin	-	-	-	-	2.81 ± 1.15	-
Unidentified Snailfish	-	-	-	-	2 ± -	-
TOTAL	**16.54 ± 17.26**	**8.95 ± 10.28**	**0.002 ± 0.001**	**0.60 ± 0.70**	**58.06 ± 54.40**	**-**

*Note: A subset of angling efforts used more equipment and were targeted to areas with known high abundances of Fourhorn Sculpin as part of collection efforts for fish tissue chemistry (Chapter 7.0), resulting in CPUE being higher than typically observed. N = number; SD = Standard Deviation, - = no data or data insufficient for calculation

6.4.1.5 Angling

Angling yielded the highest total catch of all fishing methods employed in 2021 (260 fish or 43% of total catch) with Fourhorn Sculpin representing 57% of all fish collected (n = 150) using this method (Figure 6-11). Fourhorn Sculpin were captured at a rate of 8.0 fish/h/rod ± 10.1 SD (Table 6-13). The second most abundant species caught by angling was Greenland Cod (17.8% of the catch) at a rate of 3.22 fish/h/rod ± 3.69 SD, followed by Arctic Sculpin (n = 30; 2.52 fish/h/rod ± 2.09 SD; 12.5% of catch; Table 6-13). Trolling accounted for 67% of the total angling catch, which included 82% Fourhorn Sculpin (n = 123) and 94% of Arctic Sculpin (n = 30) caught via angling. Jigging yielded 81% of total Greenland Cod (n = 47) caught by angling. Detailed fish catch data for 2020 and 2021 are presented in Appendix 6B.

Few fish were captured using angling methods between 2017 and 2019 (Figure 6-11). Total catch, species composition, and relative abundance were similar for angling efforts between 2020 and 2021. Differences noted for relative abundance in 2021 included lower counts of Shorthorn Sculpin and higher counts of Arctic Sculpin. Overall, Shorthorn Sculpin has been the most consistently captured taxon across years of angling. Variability of species composition over time reflects targeted effort in 2020 and 2021 for Fourhorn Sculpin and, subsequently, Greenland Cod, as both species use hard bottom substrate as their preferred habitat.

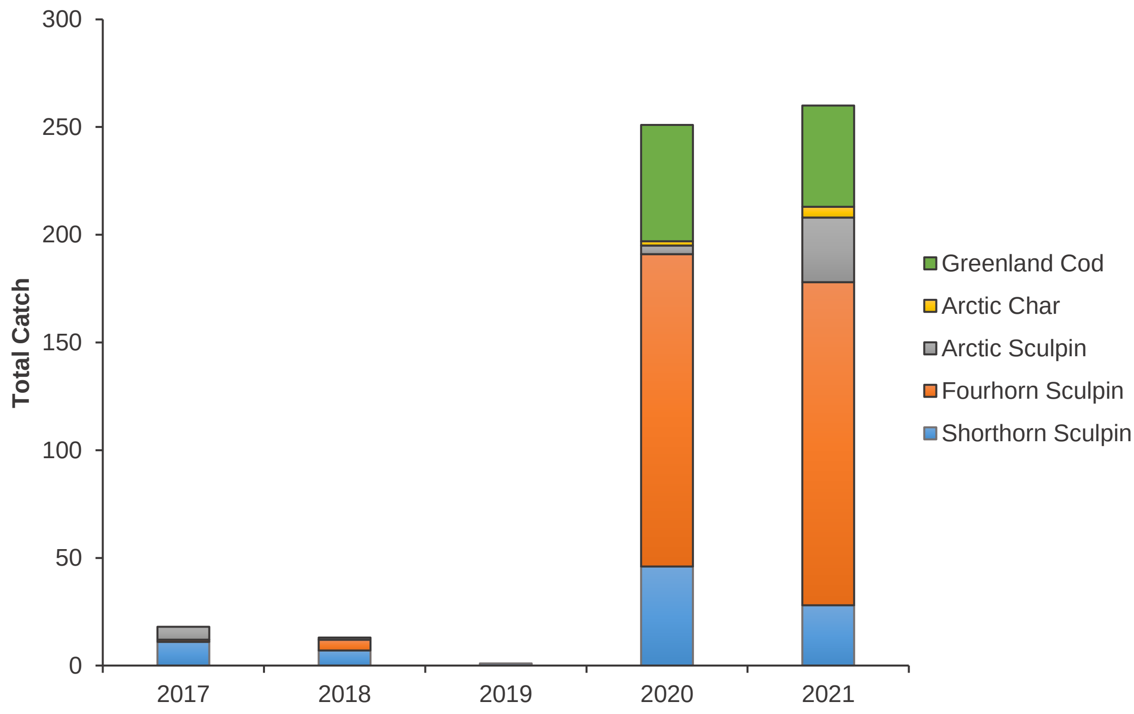


Figure 6-11: Total catch for angling in the Milne Port area (2017 to 2021)

6.4.1.6 Gill Nets

In 2021, the total number of fish captured via gill net sampling (n=242 representing 40% of total catch) was slightly lower than that captured via angling (260 fish representing 43% of total catch), whereas in all previous years, gill net sampling yielded the highest number of fish of all methods (SEM 2016, 2017; Golder 2018, 2019, 2020, 2021; Figure 6-10). In 2021, gill net CPUE was calculated at 6.25 fish/hour/100 m net ± 4.16 SD and 3.14 fish/hour/100 m net ± 2.78 SD in the DPF and IPF areas, respectively (Figure 6-12; Table 6-16). Arctic Char (n = 99, 52.6% of catch) was the species most commonly caught in gill nets in 2021 followed by Fourhorn Sculpin (n = 128, 42.5% of catch; Figure 6-12). The remaining 4.9% of the total gill net catch included Shorthorn Sculpin (n = 8 fish), Arctic Sculpin (n = 3 fish), and Greenland Cod (n = 1 fish). Highest CPUE of all species captured was Arctic Char, calculated as 4.23 fish/h/100 m ± 6.04 SD, followed by Fourhorn Sculpin at 3.25 fish/h/100 m ± 3.44 SD with all other species having a CPUE less than one (Table 6-13). Detailed fish catch data for 2020 and 2021 are presented in Appendix 6B.

Total fish catch using gill net methods in 2021 (n = 242 fish) was lower than the three years previous, with total gill net catch highest in 2018 (n = 375 fish). The composition of dominant species has remained relatively consistent from 2018 to 2021 and is represented by Arctic Char, Fourhorn Sculpin, and Shorthorn Sculpin. Both the total catch and composition of the catch in 2021 were similar to 2020 (Figure 6-12).

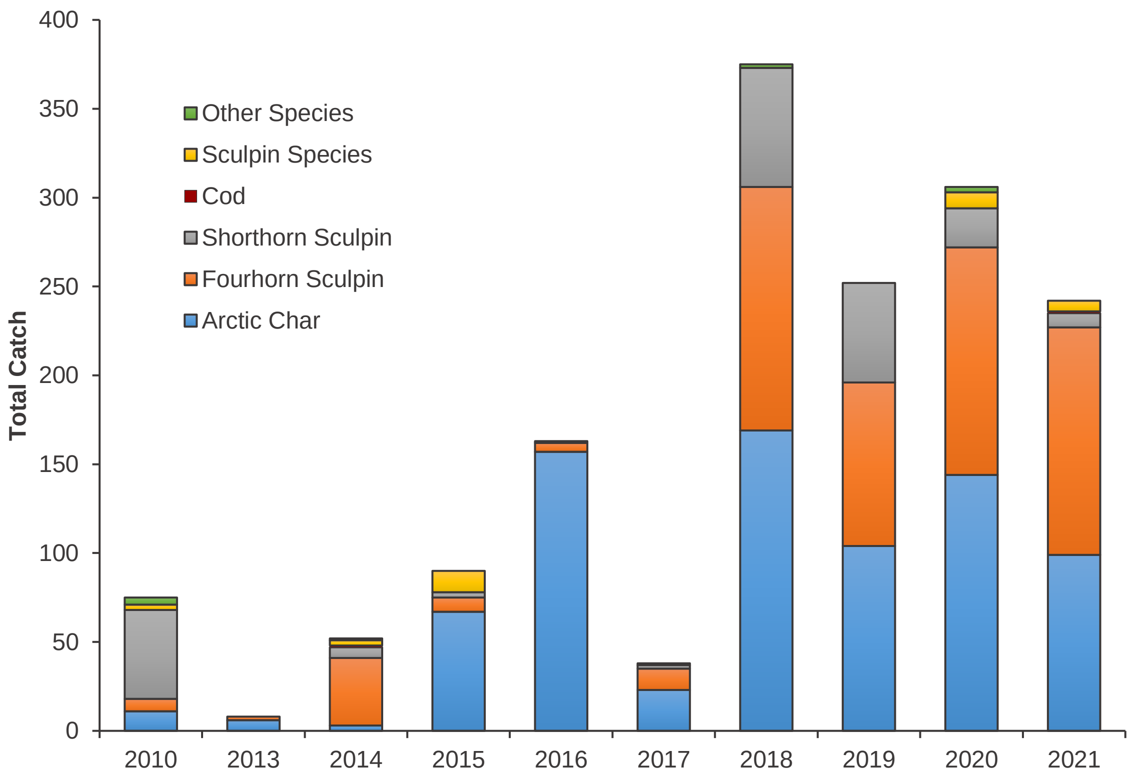


Figure 6-12: Summary of Fish Catch for Gill Net Sampling (2010-2021).

6.4.1.7 Fukui Traps

As in previous years, Fukui trap sampling CPUE was low, particularly in the DPF (Table 6-16). A total of 17 fish representing two taxa were captured. Arctic Sculpin was the most abundant species captured using Fukui traps in 2021 (n = 10, 58.8% of catch) followed closely by Fourhorn Sculpin (n = 7, 41.2% of catch). Total fish catch using Fukui trap methods was variable across years, and was lower in 2021 than in 2020. Detailed fish catch data for 2020 and 2021 are presented in Appendix 6B.

Mean CPUE for Fukui trap sampling was low relative to other sampling methods in 2020 and 2021 (Table 6-16).

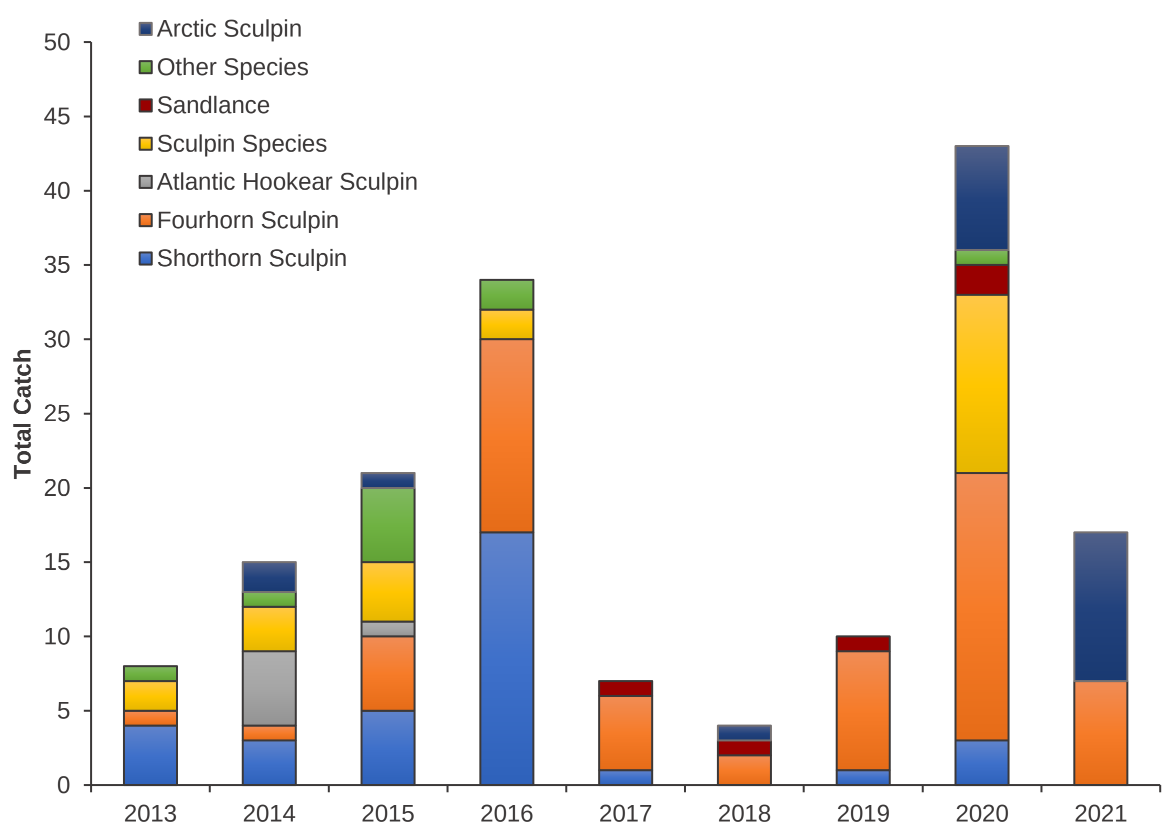


Figure 6-13: Summary of Fish Catch for Fukui Trap Sampling (2013-2021)

6.4.1.8 Hoop Nets

Hoop nets were introduced to the MEEMP fish sampling program in 2019 as a potentially more effective method for capturing demersal species than Fukui trap sampling. Hoop net total catch was lower in 2021 compared to 2020. Only one species was captured during the 2021 hoop net sampling effort. A total of 12 Fourhorn Sculpin were captured in the DPF at rate of 0.69 fish/24 h/trap ± 0.58 SD. No fish were caught using hoop net methods in the IPF area. Fourhorn Sculpin remain the most abundant species captured with hoop nets (Figure 6-14), however this is the first year where efforts yielded a single species. Detailed fish catch data for 2020 and 2021 are presented in Appendix 6B.

In both 2020 and 2021, hoop net sampling was shown to be more effective than Fukui trap sampling in the DPF FA but showed similar success rates in the IPF FA (Table 6-16).

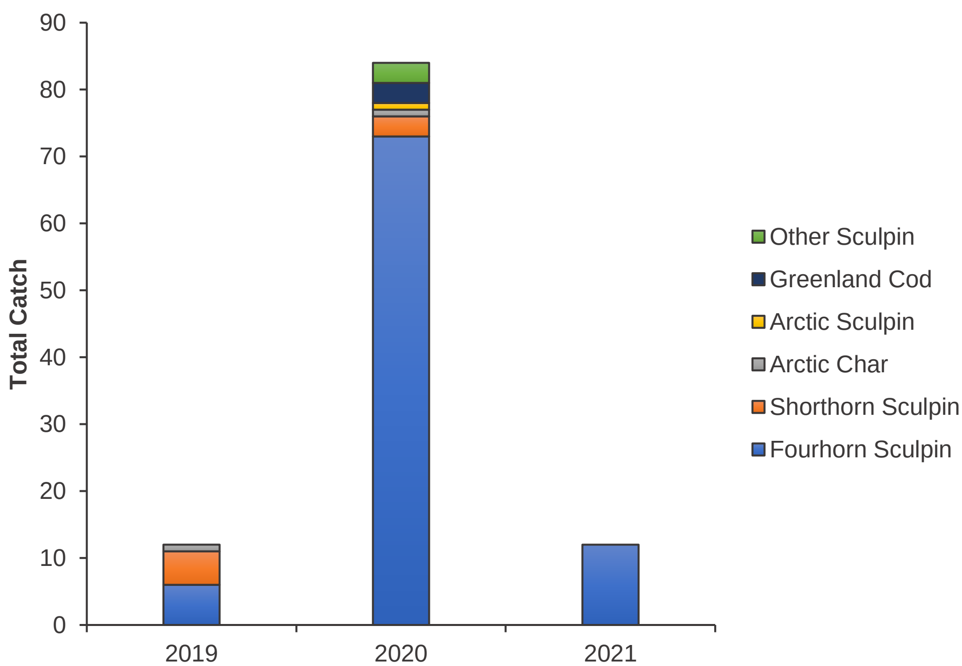


Figure 6-14: Summary of Fish Catch for Hoop Net Sampling (2019-2021)

6.4.1.9 Trawling

Trawling in 2021 yielded a total of 72 fish representing 9 taxa (six identified to species-level and three indeterminate taxa identified to genus-level; Figure 6-15; Table 6-12). Trawling total catch was lower in 2021 than 2020, and catch composition changed as well, with taxonomic richness higher in 2021 than 2020 (Figure 6-15; Table 6-12). Trawling in the DPF area resulted in the highest CPUE of all fishing methods in 2021 (116.36 fish/h; Table 6-16). The most abundant species captured via trawling was Ribbed Sculpin (n = 47; 28.2 fish/h ± 44.8 SD), with 2021 being the first year that this species was captured. An unknown juvenile Cod taxon made up 15% of the catch (n = 11; 6.59 fish/h ± 8.46 SD; Table 6-12). Other species captured included Arctic Alligatorfish (n = 2; 3.63 fish/h), Arctic Sculpin (n = 1; 1.82 fish/h), Atlantic Poacher (n = 1; 2 fish/h) and Saddled Eelpout (n = 1; 1.82 fish/h). The remaining 6% of the catch were comprised of an unknown *Myoxocephalus* sculpin taxon (n = 3; 2.81 fish/h ± 1.15 SD) and an unknown *Liparis* snailfish taxon (2 fish/h). Detailed fish catch data for 2020 and 2021 are presented in Appendix 6B.

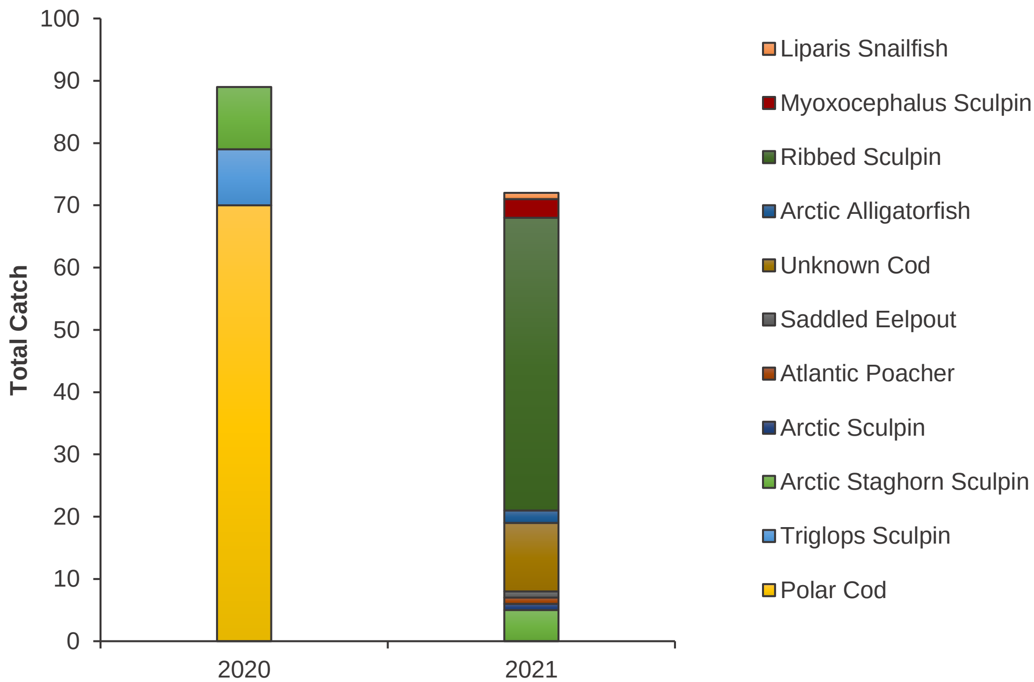


Figure 6-15: Summary of Fish Catch for Trawling (2020-2021)

6.4.1.10 Longline

Four longline efforts were conducted in 2021 with no fish caught (Table 6-14).

6.4.1.11 Exploratory Fishing at Reference Site

A total of 68 fish representing three Arctic taxa were captured at the potential reference site near Tugaat River in 2021 (Table 6-14). The majority of fish collected were Arctic char captured using gill net methods. Catch taxonomic richness was low with three taxa identified (Arctic Char, Arctic Sculpin and Fourhorn Sculpin) although effort at Tugaat River was also lower than that expended in the DPF and IPF FAs.

Table 6-14: Exploratory Fishing Location Sampling Results

Method	Sub-Method	Effort	Arctic Char	Arctic Sculpin	Fourhorn Sculpin	Total Fish Caught
Angling	Trolling	AN15	1	3	0	4
	Jigging	AN16	0	0	0	0
	Jigging	AN17	0	0	0	0
	Jigging	AN18	0	0	0	0
	Trolling	AN19	0	0	0	0
Angling Total						**4**
Gill Net		GN12	22	0	0	22
		GN13	5	0	2	7
		GN14	13	0	0	13
		GN15	22	0	0	22
Gill Net Total						**64**
Total						**68**

6.4.2 Catch Per Unit Effort (CPUE)

No statistically significant differences in CPUE were observed between FAs or between years (2020 to 2021) for any of the fish sampling methods (Table 6-15), with the exception of trolling, where CPUE increased significantly in 2021 compared to 2020 (with a 632% greater CPUE observed in 2021). However, samples sizes were generally low for most fish sampling methods, thereby limiting detection power.

Although CPUE values were not statistically different across FAs, spatial trends in CPUE were identified, including increased fish abundance in the DPF FA relative to the IPF FA. In 2021, jigging, hoop net, trolling, and gill net sampling CPUE were higher in the DPF FA compared with the IPF FA (Table 6-16).

Table 6-15: Statistical Results for CPUE by Fishing Area and Sampling Year (All Gear Types)

Gear Type	Parameter	Factor			
		Fishing Area	Sampling Year	Interaction	Residuals
Gill Net	df	1	1	1	43
	SS	7.6	11.2	156.1	3299.9
	MS	7.592	11.195	156.056	76.742
	P-value	0.9608	0.9804	0.1318	-
Angling (Jigging)	df	1	1	1	35
	SS	13.68	6.14	19.72	1484.28
	MS	13.679	6.139	19.724	42.408
	P-value	0.6863	0.6333	0.5833	-
Angling (Trolling)	df	1	1	1	15
	SS	29.854	192.918	25.387	253.304
	MS	29.854	192.918	25.387	16.887
	P-value	0.2124	**0.0014**	0.1971	-
Fukui Trap	df	1	1	1	38
	SS	0.03835	0.01645	0.00003	1.43060
	MS	0.038349	0.016455	0.000029	0.037647
	P-value	0.3004	0.6667	1.000	-
Hoop Net	df	1	1	1	14
	SS	10.711	12.373	2.546	97.141
	MS	10.7107	12.3728	2.5458	6.9386
	P-value	0.1385	0.2525	0.3151	-

Note: P-values less than 0.05 indicated in **bold**.

df = degrees of freedom; SS = Sum of Squares; MS = mean squares; - = not applicable.

Table 6-16: CPUE Summary Statistics by Fishing Area and by Gear Type (2020-2021).

Gear Type	Fishing Area	Year	No. Of Sampling Events	CPUE					
				Mean	Median	SD	SE	Min	Max
Gill Net (fish/h/100 m)	**DPF**	**2020**	16	4.01	3.58	3.13	9.04	0.50	13.90
		2021	11	6.25	4.26	5.20	4.82	0.53	18.09
	IPF	**2020**	9	8.58	2.05	17.67	2.14	0.00	58.27
		2021	10	3.14	2.78	1.71	6.88	0.28	6.05
Angling – Jigging (fish/h/rod)	**DPF**	**2020**	17	5.52	2.60	5.63	7.16	0.00	17.07
		2021	11	5.44	2.50	8.39	3.80	1.13	31.58
	IPF	**2020**	7	3.02	2.94	1.18	6.44	1.07	5.14
		2021	4	6.20	4.00	6.33	1.59	0.00	16.80
Angling – Trolling (fish/h/rod)	**DPF**	**2020**	5	0.00	0.00	0.00	0.00	0.00	0.00
		2021	8	8.19	7.53	5.11	3.54	0.75	19.29
	IPF	**2020**	2	0.37	0.37	0.37	3.31	0.00	0.73
		2021	2	0.00	-	-	-	-	-
Fukui Trap (fish/24 h/trap)	**DPF**	**2020**	25	0.13	0.05	0.21	55.05	0.00	0.76
		2021	9	0.09	0.07	0.10	28.33	0.00	0.30
	IPF	**2020**	3	0.23	0.08	0.26	5.85	0.00	0.60
		2021	5	0.18	0.26	0.12	14.67	0.00	0.30
Hoop Net (fish/24 h/trap)	**DPF**	**2020**	7	2.84	1.08	3.68	3.65	0.00	10.61
		2021	6	0.69	0.58	0.65	7.42	0.00	1.59
	IPF	**2020**	4	0.15	0.14	0.04	19.38	0.11	0.23
		2021	1	0.00	-	-	-	-	-
Trawling (fish/h)	**DPF**	**2020**	0	-	-	-	-	-	-
		2021	1	116.36	-	-	-	-	-
	IPF	**2020**	1	333.75	-	-	-	-	-
		2021	3	4.76	4.29	4.10	1.48	0.00	10.00

SD = Standard Deviation; Se = Standard Error; Min = Minimum; Max = Maximum; - = not applicable.

[1]The 2020 trawling data sample size did not support analysis by ANOVA

6.5 Discussion

Total fish catch in 2021 (603 individual fish representing 13 taxa) was greater than all previous sampling years except for 2020 (852 individual fish representing 11 taxa). As in 2020, higher catch rates in 2021 were attributed to a greater number of fish sampling methods employed (e.g., addition of trawl and hoop net sampling) and greater total effort. Species composition and relative abundance were also consistent with 2020 results. In previous survey years (2014-2019), the average number of taxa identified at Milne Port was 7 (ranging from 5 to 11). During the 2010-2019 survey period, Fourhorn Sculpin, Shorthorn Sculpin and Arctic Char generally made up approximately 90% of total catch, and in 2020 and 2021, these species were still the dominant constituents of the fish community, representing approximately 74% of the total catch. Increased fishing effort in 2020/2021, along with the addition of new gear types deployed in those years (Table 6-1), has led to higher captures of taxa that were rare or unobserved in previous years. For example, prior to 2020, Greenland Cod were only caught in 2010 and 2014 (in low numbers). However, increased angling effort undertaken in coarse rock habitat in 2020/2021 (in order to increase capture rates of Fourhorn Sculpin in support of the Fish Health Program) resulted in increased Greenland Cod catches (n=57 in 2020, n=48 in 2021). Increased trawling effort in 2021 also resulted in the capture of fish belonging to previously unobserved species (Ribbed Sculpin, Atlantic Poacher, and Arctic Alligatorfish).

Of the six fish sampling methods used in 2021, angling contributed the most to overall catch, capturing five taxa and accounting for 43% of the total catch, followed by gill net sampling which captured five taxa and accounted for 40% of the total catch. The remaining 17% of the total catch were collected via trawling (12% of catch, nine species detected), Fukui traps (3% of catch, two species detected), and hoop net sampling (2% of catch, one species detected). Similar to previous survey years, Arctic Char was the most common fish species caught during gill net sampling, followed by Fourhorn Sculpin. Gill nets remain the most effective method for capturing Arctic Char, accounting for 95% of all Arctic Char caught in 2021.

Angling effort in 2021 (sampling events = 27) was similar to 2020 (sampling events = 30) and greater than previous survey years (Golder 2019, 2019; SEM 2016, 2017). As in 2020, additional angling effort was undertaken to increase capture rates for Fourhorn Sculpin in support of the Fish Health Program (whereas historical sampling was designed to maximize spatial coverage across a range of representative habitats). The study design modification in 2020 increased CPUE relative to pre-2020 surveys. Furthermore, trolling undertaken in 2021 resulted in a significantly greater CPUE than in 2020, representing 82% of all Fourhorn Sculpin captured in Milne Port. In 2021, Fourhorn Sculpin was the most common species caught during angling efforts, followed by Greenland Cod and Arctic Sculpin. In 2020, Fourhorn Sculpin was the most common species caught during angling, followed by Shorthorn Sculpin and Greenland Cod.

The Fukui trap method was implemented in MEEMP 2013 baseline surveys and across all years CPUE for Fukui traps has been low relative to other methods, such as hoop netting. Trapping methods using Fukui traps or hoop nets are advantageous as they are passive gear types that can be deployed for extended periods at a variety of depths and over a wide range of substrate types. Hoop nets can be used to target the same habitat and depth as Fukui traps, and the addition of winged panels and a funnel shape has the potential to passively direct fish into the trap, yielding higher catch rates. Hoop nets were first introduced in 2019 as a potential method to replace Fukui traps. In both 2020 and 2021, hoop net efforts yielded a higher CPUE in the DPF FA than Fukui traps, but yielded similar CPUE to Fukui traps in the IPF FA. Both trap designs target similar species. As concluded for 2020, the recommendation remains that hoop nets should replace Fukui traps moving forward in the MEEMP.

Trawling was added to the 2020 MEEMP as a trial method for catching demersal fish species that are not typically caught using other MEEMP fishing methods and became a standard method in 2021. In general, trawling undertaken in 2020 and 2021 yielded the highest CPUE of all sampling methods and of all sampling years. Temporal changes include a reduced CPUE in 2021 (34.813 fish/h) compared to the single effort of 2020 (333.75 fish/h). The high CPUE in 2020 was related to the capture of schooling juvenile Polar Cod, which accounted for 80% of the yield in that single trawling event. Schooling behaviour is common in juvenile Arctic Cod and may also occur in Polar Cod (Mueter et al. 2016; Laidre and Heide-Jørgensen 2005). Trawling in 2021 yielded a higher taxonomic richness (9 taxa) compared to 2020 (3 taxa).

Longline sampling was added to the 2021 MEEMP as a trial method for assessing large-bodied demersal fishes typically not caught using other fishing methods. Overall, three longline events were undertaken in 2021 using baited longlines representing a total fishing time of 60 hours and 58 minutes. No fish were caught using this method. It is suspected that the bait on the longlines was eaten by amphipods (which occur in high abundances in Milne Inlet) before fish had the opportunity to be caught, as all hooks were empty or only contained bone when retrieved by the field team. Furthermore, due to the Milne Port being an active port facility, longline sets were often unable to be deployed safely without resulting in a navigational hazard for ships operating in Port. Based on these limitations, longlining is not recommended as a fish sampling method moving forward.

There were no significant area-wise differences for any among methods between FAs, however sample sizes were small, detection power was low, and some areas and gear types were not able to be assessed. Total catch was consistently higher for the DPF FA relative to the IPF FA, indicating that fish abundances are higher adjacent to Project infrastructure. In conclusion, the results generally support that existing mitigation measures are functioning as intended and that current Project activities are not resulting in adverse on the local marine fish communities in Milne Port.

6.6 Conclusions and Recommendations

In summary, this chapter addressed 2021 program objectives, including the characterization of species composition and relative abundance of fish at Milne Port. The combined datasets provide a characterization of the status of the Milne Port area marine fish community. Results show that total catch and diversity of fish species are higher now compared to previous monitoring years (i.e., prior to 2020), which reflects increased fishing effort and introduction of new fish sampling methods rather than changes in the fish community. Fishing gear efficiencies were also evaluated as a report objective, with gill nets, trawls, and angling remaining the most effective gear types for capturing fish. Importantly, higher fish abundances have been recorded closer to Project infrastructure than further away, indicating that the Project has not adversely impacted the local marine fish community. Overall, monitoring data from 2021 align with FEIS predictions, which predicted the potential for minor and localized effects on fish and fish habitat. It is recommended that standardized fishing efforts continue and efforts be divided evenly between FAs so any changes in the Milne Port area fish community at Milne Port can be identified.

6.7 Closure

We trust this information is sufficient for your needs at this time. Should you have any questions or concerns, please do not hesitate to contact Phillipe Rouget, on behalf of the undersigned, at 1-250-888-1100.

Golder Associates Ltd.

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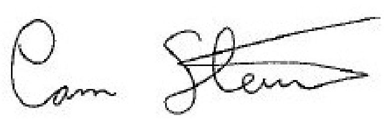

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APPENDIX 6A

Permits

Nunavummi Qaujisaqtulirijikkut / Nunavut Research Institute
Box 1720, Iqaluit, NU X0A 0H0 phone:(867) 979-7279 fax: (867) 979-7109 e-mail:
mosha.cote@arcticcollege.ca

SCIENTIFIC RESEARCH LICENSE

LICENSE # 02 023 21R-M

ISSUED TO: Megan-Lord Hoyle
Baffinland Iron Mines Corporation
2275 Upper Middle Road East, Suite 300
Oakville, Ontario
L6H 0C3 Canada

TEAM MEMBERS: Please see attached

AFFILIATION: Baffinland Iron Mines Corporation

TITLE: Mary River Project

OBJECTIVES OF RESEARCH:
Data collection and analysis for environmental monitoring and management of the Mary River project to assess Project impacts in relation to the approved environmental impact assessment;Compliance to NIRB Certificate No. 005, Amended Type "A" Water License 2AM-MRY1325 and further baseline and operating conditions analysis for future permitting.

TERMS & CONDITIONS:
The holder of the licence will be bound by the terms and conditions of the Nunavut Impact Review Board Screening Decision Report and the Department of Culture & Heritage archaeological sites terms and conditions. The license holder will abide by all special public health protection measures imposed by Nunavut's Chief Medical Officer of Health in response to the Covid-19 Pandemic, including restrictions on non-essential travel to Nunavut. These terms and conditions will form part of this licence.

DATA COLLECTION IN NU:
DATES: January 01, 2021-December 31, 2021
LOCATION: Steensby Port,Mary River,Milne Port/Road

Scientific Research License 02 023 21R-M expires on December 31, 2021
Issued at Iqaluit, NU on March 30, 2021

for Mary Ellen Thomas
Science Advisor

SCIENTIFIC RESEARCH LICENCE
NUNAVUT SCIENTISTS ACT

Fisheries and Oceans Canada   Pêches et Océans Canada

Date: October 18th 2022

To: Phil Rouget, WSP Golder

Subject: Animal Use Protocol - Letter of Approval

Dear Phil,

Your 2022 Animal Use Protocol (AUP), number OPA-ACC-2022-64: "Baffinland Iron Mines Corp, Mary River Project, 2022 Marine Environmental Effects Monitoring Program (MEEMP) and Marine Habitat Offset Monitoring Program." has been reviewed and approved by the Ontario, Prairie and Arctic Animal Care Committee (OPA-ACC). This approval is valid for 3 years.

Keep this signed letter of approval as well as the signed AUP application form for your records. Please be advised that should there be a need to revise the protocol you are requested to contact the OPA-ACC and obtain approval prior to proceeding.

The Canadian Council on Animal Care requires post approval monitoring of AUPs. The OPA-ACC will be choosing AUPs and asking for photographs or video that shows the handling or interaction of animals for these projects.

In addition, you are required to annually submit a brief report within 30 days of completion of the project outlining the unexpected changes to the protocol, the number of animals used and any unanticipated results. If injuries or mortalities occur, an incident report must be provided. A blank copy of these forms will be sent out with your final approval.

Feel free to contact me if you have any questions or concerns.

Sincerely,

Michelle Wetton-Salo

Michelle Wetton-Salo

Chairperson of OPA-ACC

Ontario, Prairie and Arctic Animal Care Committee
Arctic & Aquatic Research
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Canada

Fisheries and Oceans Canada   Pêches et Océans Canada

Date: June 29th 2021

To: Phil Rouget, Golder Associates Ltd.

Subject: FWI-ACC-2021-41 Interim Approval

Dear Phil,

Your 2021 Animal Use Protocol (AUP), number FWI-ACC-2021-41, entitled "Baffinland 2021 Marine Ecological Effects Monitoring Program and Marine Habitat Offset Monitoring Program" has been reviewed and interim approved by the Freshwater Institute Animal Care Committee. When the Animal Care Committee meets in person, a full approval will be sent as per CCAC policies.

Keep this signed letter of interim approval for your records. Please be advised that should there be a need to revise the protocol you are requested to contact the Freshwater Institute Animal Care Committee and obtain approval prior to proceeding.

In addition, you are required to submit a brief report within 30 days of completion of the project outlining the unexpected changes to the protocol, the number of animals used and any unanticipated results. If injuries or mortalities occur, an incident report must be provided. A blank copy of these forms will be sent out with your final approval.

Feel free to contact me if you have any questions or concerns.

Sincerely,

Michelle Wetton-Salo

Michelle Wetton-Salo
Chair Person of FWI-ACC

Freshwater Institute Animal Care Committee
Arctic & Aquatic Research
Ontario and Prairie Region / région de l'Ontario et des Prairies
Fisheries and Oceans Canada / Pêches et Océans Canada
501 University Crescent
Winnipeg, Manitoba R3T 2N6
Phone:204-983-5238
xca-fwisl-acc@dfo-mpo.gc.ca

Signatures of ACC Members

Andrew Chapelsky

Marc Brandson

Dr. Charlene Berkvens D.V.M., D.V.Sc.

Jessica Mai

Kerry Wautier

Travis Durhack

Brent Young

Sarah Hnytka

Interim Approval ☒ **Final Approval** ☐

APPROVAL BY THE FWI ANIMAL CARE COMMITTEE IS FOR THE PERIOD STATED ON YOUR ANIMAL USE PROTOCOL.

Licence #: S-21/22-1019-NU

Philippe Rouget
3795 Carey Road 2nd floor
Victoria, BC, CA   V8Z 6T8

Dear Philippe Rouget,

Enclosed is your Licence to Fish for Scientific Purposes issued pursuant to Section 52 of the Fishery (General) Regulations.

Failure to comply with any of the conditions specified on the attached licence may result in a contravention of the Fishery (General) Regulations.

Please be advised that this licence only permits those activities stated on your licence. Any other activity may require approval under the Fisheries Act or other legislation. It is the Project Authority's responsibility to obtain any other approvals.

Please ensure that you include the licence number and project title in any future correspondence and that you complete the Summary Harvest Report upon completion of activities under this licence.

Yours truly,

Jenna Kayakjuak
Licence Delivery Officer
Northern Operations
Arctic Region
Fisheries and Oceans Canada

Date

Enclosure

LICENCE TO FISH FOR SCIENTIFIC PURPOSES

S-21/22-1019-NU

Pursuant to Section 52 of the Fishery (General) Regulations, the Minister of Fisheries and Oceans hereby authorizes the individual(s) listed below to fish for scientific purposes, subject to the conditions specified.

Project Authority: Philippe Rouget — Golder Associates Ltd.
3795 Carey Road 2nd floor
Victoria, BC, CA V8Z 6T8

Other Personnel: Daniel Vicente (Technical Lead); Patricia Tomliens; Niallan O'Brian; Geoff Sawatzky (Boat Operator); Andrew Rippington; Kristin Westman; Bradley Cox; Jeremy Corbin

Objectives: Baffinland Iron Mines Corp. - Mary River Project - 2021 Marine Environmental Effects Monitoring Program (MEEMP) and Marine Habitat Offset Monitoring Program at Milne Port, Nunavut

The Project objectives are to conduct sampling to adhere to the terms and conditions of Baffinland to operate the Mary River Mine and Port Facility in Milne Inlet including:
1. To assess the effectiveness of fish offsetting measures in relation to the construction of the Milne freight dock.
2. To collect marine data for the Marine Ecological Effects Monitoring Program and Marine Habitat Offset Monitoring Program regulatory requirements.

CONDITIONS

Waters: Sampling at Milne Inlet to take place from Baffinland's Port Facility to Ragged Island/Mouth of Tremblay Sound

Water Body: Milne Inlet
Point A: 72° 20' N, 80° 30' W

Species: Sculpin, Fourhorn

Gear: 10 MM Mesh Gillnets and Larger
Angling
Fyke Nets
Jigging
Trolling

Total Weight	Weight Live	Weight Dead	Number Alive	Number Dead	Number Tows	Number Sets	Hours	Minutes
			500	150				

Water Body: Milne Inlet
Point A: 72° 20' N, 80° 30' W

Species: Sculpin, Arctic

Gear: 10 MM Mesh Gillnets and Larger
Angling
Fyke Nets
Trolling

Total Weight	Weight Live	Weight Dead	Number Alive	Number Dead	Number Tows	Number Sets	Hours	Minutes
			500	100				

Water Body: Milne Inlet
Point A: 72° 20' N, 80° 30' W

Species: Sculpin, Longhorn

Gear: 10 MM Mesh Gillnets and Larger
Angling
Fyke Nets
Jigging
Trolling

Total Weight	Weight Live	Weight Dead	Number Alive	Number Dead	Number Tows	Number Sets	Hours	Minutes
			500	100				

Water Body: Milne Inlet
Point A: 72° 20' N, 80° 30' W

Species: Sculpin, Shorthorn

Gear: 10 MM Mesh Gillnets and Larger
Angling
Fyke Nets
Jigging
Trolling

Total Weight	Weight Live	Weight Dead	Number Alive	Number Dead	Number Tows	Number Sets	Hours	Minutes
			500	100				

Water Body: Milne Inlet
Point A: 72° 20' N, 80° 30' W

Species: Sculpin, Atlantic Hookear

Gear: 10 MM Mesh Gillnets and Larger
Angling
Fyke Nets
Jigging
Trolling

Total Weight	Weight Live	Weight Dead	Number Alive	Number Dead	Number Tows	Number Sets	Hours	Minutes
			500	100				

Water Body: Milne Inlet
Point A: 72° 20' N, 80° 30' W

Species: Sculpin, Ribbed

Gear: 10 MM Mesh Gillnets and Larger
Angling
Fyke Nets
Jigging
Trolling

Total Weight	Weight Live	Weight Dead	Number Alive	Number Dead	Number Tows	Number Sets	Hours	Minutes
			500	100				

Water Body: **Milne Inlet**
Point A: 72° 20' N, 80° 30' W

Species: Sculpin, Arctic Staghorn

Gear: 10 MM Mesh Gillnets and Larger
Angling
Fyke Nets
Jigging
Trolling

Total Weight	Weight Live	Weight Dead	Number Alive	Number Dead	Number Tows	Number Sets	Hours	Minutes
			500	100				

Water Body: **Milne Inlet**
Point A: 72° 20' N, 80° 30' W

Species: Sculpins Spp.

Gear: 10 MM Mesh Gillnets and Larger
Angling
Fyke Nets
Jigging
Trolling

Total Weight	Weight Live	Weight Dead	Number Alive	Number Dead	Number Tows	Number Sets	Hours	Minutes
			500	100				

Water Body: **Milne Inlet**
Point A: 72° 20' N, 80° 30' W

Species: Spiny Lumpsucker

Gear: 10 MM Mesh Gillnets and Larger
Angling
Fyke Nets
Jigging
Trolling

Total Weight	Weight Live	Weight Dead	Number Alive	Number Dead	Number Tows	Number Sets	Hours	Minutes
			500	100				

Water Body: **Milne Inlet**
Point A: 72° 20' N, 80° 30' W

Species: Lumpfish

Gear: 10 MM Mesh Gillnets and Larger
Angling
Fyke Nets
Jigging
Trolling

Total Weight	Weight Live	Weight Dead	Number Alive	Number Dead	Number Tows	Number Sets	Hours	Minutes
			500	100				

Water Body: **Milne Inlet**
Point A: 72° 20' N, 80° 30' W

Species: Sand Lance, Pacific

Gear: 10 MM Mesh Gillnets and Larger
Angling
Fyke Nets
Jigging
Trolling

Total Weight	Weight Live	Weight Dead	Number Alive	Number Dead	Number Tows	Number Sets	Hours	Minutes
			500	100				

Water Body: Milne Inlet
Point A: 72° 20' N, 80° 30' W

Species: Sand Lance

Gear: 10 MM Mesh Gillnets and Larger
Angling
Fyke Nets
Jigging
Trolling

Total Weight	Weight Live	Weight Dead	Number Alive	Number Dead	Number Tows	Number Sets	Hours	Minutes
			500	100				

Water Body: Milne Inlet
Point A: 72° 20' N, 80° 30' W

Species: Stickleback, Ninespine

Gear: 10 MM Mesh Gillnets and Larger
Angling
Fyke Nets
Jigging
Trolling

Total Weight	Weight Live	Weight Dead	Number Alive	Number Dead	Number Tows	Number Sets	Hours	Minutes
			500	100				

Water Body: Milne Inlet
Point A: 72° 20' N, 80° 30' W

Species: Arctic Char (Searun)

Gear: 10 MM Mesh Gillnets and Larger
Angling
Fyke Nets
Jigging
Trolling

Total Weight	Weight Live	Weight Dead	Number Alive	Number Dead	Number Tows	Number Sets	Hours	Minutes
			500	100				

Water Body: Milne Inlet
Point A: 72° 20' N, 80° 30' W

Species: Fish Doctor

Gear: 10 MM Mesh Gillnets and Larger
Angling
Fyke Nets
Jigging

Species:

Gear: Trolling

Total Weight	Weight Live	Weight Dead	Number Alive	Number Dead	Number Tows	Number Sets	Hours	Minutes
			500	100				

Water Body: Milne Inlet
Point A: 72° 20' N, 80° 30' W

Species: Cod, Arctic

Gear: 10 MM Mesh Gillnets and Larger
Angling
Fyke Nets
Jigging
Trolling

Total Weight	Weight Live	Weight Dead	Number Alive	Number Dead	Number Tows	Number Sets	Hours	Minutes
			500	100				

Water Body: Milne Inlet
Point A: 72° 20' N, 80° 30' W

Species: Cod

Gear: 10 MM Mesh Gillnets and Larger
Angling
Fyke Nets
Jigging
Trolling

Total Weight	Weight Live	Weight Dead	Number Alive	Number Dead	Number Tows	Number Sets	Hours	Minutes
			500	100				

Water Body: Milne Inlet
Point A: 72° 20' N, 80° 30' W

Species: Cod, Greenland

Gear: 10 MM Mesh Gillnets and Larger
Angling
Fyke Nets
Jigging
Trolling

Total Weight	Weight Live	Weight Dead	Number Alive	Number Dead	Number Tows	Number Sets	Hours	Minutes
			500	100				

Water Body: Milne Inlet
Point A: 72° 20' N, 80° 30' W

Species: Eelpout

Gear: 10 MM Mesh Gillnets and Larger
Angling
Fyke Nets
Jigging
Trolling

Total Weight	Weight Live	Weight Dead	Number Alive	Number Dead	Number Tows	Number Sets	Hours	Minutes
			500	100				

Water Body: Milne Inlet
Point A: 72° 20' N, 80° 30' W

Species: Fourline Snakeblenny

Gear: 10 MM Mesh Gillnets and Larger
Angling
Fyke Nets
Jigging
Trolling

Total Weight	Weight Live	Weight Dead	Number Alive	Number Dead	Number Tows	Number Sets	Hours	Minutes
			500	100				

Water Body: Milne Inlet
Point A: 72° 20' N, 80° 30' W

Species: Eelblenny

Gear: 10 MM Mesh Gillnets and Larger
Angling
Fyke Nets
Jigging
Trolling

Total Weight	Weight Live	Weight Dead	Number Alive	Number Dead	Number Tows	Number Sets	Hours	Minutes
			500	100				

Water Body: Milne Inlet
Point A: 72° 20' N, 80° 30' W

Species: Gastropods/Shellfish

Gear: Ponar dredge
Van Veen Grab

Total Weight	Weight Live	Weight Dead	Number Alive	Number Dead	Number Tows	Number Sets	Hours	Minutes
			200	100				

Water Body: Milne Inlet
Point A: 72° 20' N, 80° 30' W

Species: Benthos

Gear: Ponar dredge
Van Veen Grab

Total Weight	Weight Live	Weight Dead	Number Alive	Number Dead	Number Tows	Number Sets	Hours	Minutes
300.00								

Fishing Period: July 01, 2021 to October 31, 2021

A copy of this licence must be available at the study site and produced at the request of a fishery officer.

Live fish may not be retained unless specified in the conditions of this licence.

The licence holder shall immediately cease fishing when the total fish killed or live sampled reaches any of the maximums set for any of the species listed.

Transportation:

Other approvals/permits may be necessary to collect or transport certain species, such as Marine Mammal Transportation Permits. For marine mammal parts, products and derivatives a Marine Mammal Transportation Licence is required for domestic transport and, for international transport a Canadian CITES Export Permit is also required.

Report on Activities:

The Project Authority will submit to the License Delivery Officer, Department of Fisheries and Oceans, within one month of the expiry date, a report stating:

i) whether or not the field work was conducted; and if conducted

ii) waterbody location, fishing coordinates, gear types used at each coordinate, numbers or amount of fish (by species) collected and/or marked and the date or period of collection.

A Summary Harvest Report template is provided by the License Delivery Officer at time of issuance of this licence .

The Project Authority also will provide a copy of any published or public access documents which result from the project . Information supplied will be used for population management purposes by the Department of Fisheries and Oceans and becomes part of the public record.

All documents should be sent to:

Fisheries and Oceans Canada
Northern Operations
Arctic Region
P.O. Box 358
Iqaluit, NU X0A 0H0

Attention: Licence Delivery Officer

Telephone: (867) 979-8005
Fax: (867) 979-8039
E-mail: XCNA-NT-NUpermit@dfo-mpo.gc.ca

Allison McPhee
A/ Regional Director, Fisheries Management
Arctic Region
Fisheries and Oceans Canada

Date

For the Minister of Fisheries and Oceans.

Pursuant to Section 52 of the Fishery (General) Regulations.

APPENDIX 6B-1

Fish Catch Data (2020)

Appendix 6B-1
Fish Capture Data

Date	Capture Method	Site	Common Name	Species	Length (mm)	Weight (g)
29-Jul-20	Angling	AN01	No fish Caught	-	-	-
31-Jul-20	Angling	AN02	Greenland Cod	*Gadus ogac*	456.0	1130.0
31-Jul-20	Angling	AN02	Greenland Cod	*Gadus ogac*	468.0	1220.0
31-Jul-20	Angling	AN02	Greenland Cod	*Gadus ogac*	455.0	1180.0
31-Jul-20	Angling	AN02	Greenland Cod	*Gadus ogac*	440.0	1000.0
31-Jul-20	Angling	AN02	Greenland Cod	*Gadus ogac*	478.0	1390.0
31-Jul-20	Angling	AN02	Greenland Cod	*Gadus ogac*	398.0	670.0
31-Jul-20	Angling	AN02	Greenland Cod	*Gadus ogac*	454.0	1180.0
31-Jul-20	Angling	AN02	Greenland Cod	*Gadus ogac*	450.0	980.0
31-Jul-20	Angling	AN02	Fourhorn Sculpin	*Myoxocephalus quadricornis*	170.0	45.0
31-Jul-20	Angling	AN02	Fourhorn Sculpin	*Myoxocephalus quadricornis*	172.0	45.5
31-Jul-20	Angling	AN03	Greenland Cod	*Gadus ogac*	621.0	2570.0
31-Jul-20	Angling	AN03	Greenland Cod	*Gadus ogac*	434.0	940.0
31-Jul-20	Angling	AN03	Greenland Cod	*Gadus ogac*	434.0	970.0
31-Jul-20	Angling	AN03	Shorthorn Sculpin	*Myoxocephalus scorpius*	412.0	930.0
31-Jul-20	Angling	AN03	Shorthorn Sculpin	*Myoxocephalus scorpius*	169.0	80.0
31-Jul-20	Angling	AN03	Shorthorn Sculpin	*Myoxocephalus scorpius*	241.0	150.0
31-Jul-20	Angling	AN03	Arctic Char	*Salvelinus alpinus*	400.0	260.0
31-Jul-20	Angling	AN04	Greenland Cod	*Gadus ogac*	498.0	1320.0
31-Jul-20	Angling	AN04	Greenland Cod	*Gadus ogac*	518.0	1790.0
31-Jul-20	Angling	AN04	Greenland Cod	*Gadus ogac*	480.0	1230.0
31-Jul-20	Angling	AN04	Greenland Cod	*Gadus ogac*	440.0	990.0
31-Jul-20	Angling	AN04	Greenland Cod	*Gadus ogac*	534.0	1540.0
31-Jul-20	Angling	AN04	Greenland Cod	*Gadus ogac*	518.0	1490.0
31-Jul-20	Angling	AN04	Greenland Cod	*Gadus ogac*	408.0	690.0
31-Jul-20	Angling	AN04	Greenland Cod	*Gadus ogac*	636.0	3060.0
31-Jul-20	Angling	AN04	Greenland Cod	*Gadus ogac*	482.0	1410.0
31-Jul-20	Angling	AN04	Greenland Cod	*Gadus ogac*	564.0	1930.0
31-Jul-20	Angling	AN04	Greenland Cod	*Gadus ogac*	442.0	1020.0
31-Jul-20	Angling	AN04	Greenland Cod	*Gadus ogac*	504.0	1580.0
31-Jul-20	Angling	AN04	Greenland Cod	*Gadus ogac*	569.0	2900.0
31-Jul-20	Angling	AN05	Greenland Cod	*Gadus ogac*	670.0	3700.0
31-Jul-20	Angling	AN05	Greenland Cod	*Gadus ogac*	446.0	1100.0
31-Jul-20	Angling	AN05	Shorthorn Sculpin	*Myoxocephalus scorpius*	366.0	680.0
31-Jul-20	Angling	AN05	Shorthorn Sculpin	*Myoxocephalus scorpius*	374.0	730.0
01-Aug-20	Angling	AN06	Greenland Cod	*Gadus ogac*	484.0	1170.0
01-Aug-20	Angling	AN06	Greenland Cod	*Gadus ogac*	520.0	1700.0
01-Aug-20	Angling	AN07	Shorthorn Sculpin	*Myoxocephalus scorpius*	185.0	93.2
02-Aug-20	Angling	AN08	Shorthorn Sculpin	*Myoxocephalus scorpius*	189.0	110.0
02-Aug-20	Angling	AN08	Shorthorn Sculpin	*Myoxocephalus scorpius*	377.0	700.0
02-Aug-20	Angling	AN09	Shorthorn Sculpin	*Myoxocephalus scorpius*	396.0	1020.0
02-Aug-20	Angling	AN09	Shorthorn Sculpin	*Myoxocephalus scorpius*	327.0	440.0
02-Aug-20	Angling	AN09	Shorthorn Sculpin	*Myoxocephalus scorpius*	232.0	180.0
02-Aug-20	Angling	AN09	Shorthorn Sculpin	*Myoxocephalus scorpius*	261.0	280.0
02-Aug-20	Angling	AN09	Shorthorn Sculpin	*Myoxocephalus scorpius*	186.0	80.0
02-Aug-20	Angling	AN09	Shorthorn Sculpin	*Myoxocephalus scorpius*	218.0	160.0
02-Aug-20	Angling	AN10	No fish Caught	-	-	-
02-Aug-20	Angling	AN11	Fourhorn Sculpin	*Myoxocephalus quadricornis*	144.0	24.0
02-Aug-20	Angling	AN11	Fourhorn Sculpin	*Myoxocephalus quadricornis*	189.0	60.0
02-Aug-20	Angling	AN11	Fourhorn Sculpin	*Myoxocephalus quadricornis*	194.0	64.2
02-Aug-20	Angling	AN11	Fourhorn Sculpin	*Myoxocephalus quadricornis*	201.0	64.8
02-Aug-20	Angling	AN11	Fourhorn Sculpin	*Myoxocephalus quadricornis*	195.0	70.4
02-Aug-20	Angling	AN11	Fourhorn Sculpin	*Myoxocephalus quadricornis*	172.0	40.4
02-Aug-20	Angling	AN11	Fourhorn Sculpin	*Myoxocephalus quadricornis*	167.0	38.1
02-Aug-20	Angling	AN11	Fourhorn Sculpin	*Myoxocephalus quadricornis*	183.0	59.6
02-Aug-20	Angling	AN11	Fourhorn Sculpin	*Myoxocephalus quadricornis*	175.0	56.6
02-Aug-20	Angling	AN11	Fourhorn Sculpin	*Myoxocephalus quadricornis*	180.0	55.6
02-Aug-20	Angling	AN11	Fourhorn Sculpin	*Myoxocephalus quadricornis*	184.0	54.4
02-Aug-20	Angling	AN11	Fourhorn Sculpin	*Myoxocephalus quadricornis*	156.0	32.3
02-Aug-20	Angling	AN11	Fourhorn Sculpin	*Myoxocephalus quadricornis*	170.0	39.3
02-Aug-20	Angling	AN11	Fourhorn Sculpin	*Myoxocephalus quadricornis*	177.0	46.6
02-Aug-20	Angling	AN11	Fourhorn Sculpin	*Myoxocephalus quadricornis*	148.0	29.8
02-Aug-20	Angling	AN11	Fourhorn Sculpin	*Myoxocephalus quadricornis*	179.0	49.4
02-Aug-20	Angling	AN11	Fourhorn Sculpin	*Myoxocephalus quadricornis*	215.0	109.3
02-Aug-20	Angling	AN11	Fourhorn Sculpin	*Myoxocephalus quadricornis*	203.0	66.8
02-Aug-20	Angling	AN11	Fourhorn Sculpin	*Myoxocephalus quadricornis*	203.0	82.6
02-Aug-20	Angling	AN11	Fourhorn Sculpin	*Myoxocephalus quadricornis*	230.0	115.5
02-Aug-20	Angling	AN11	Fourhorn Sculpin	*Myoxocephalus quadricornis*	209.0	98.6
02-Aug-20	Angling	AN11	Fourhorn Sculpin	*Myoxocephalus quadricornis*	210.0	74.0
02-Aug-20	Angling	AN11	Fourhorn Sculpin	*Myoxocephalus quadricornis*	242.0	110.0
02-Aug-20	Angling	AN11	Fourhorn Sculpin	*Myoxocephalus quadricornis*	210.0	99.2
02-Aug-20	Angling	AN11	Fourhorn Sculpin	*Myoxocephalus quadricornis*	221.0	114.3
02-Aug-20	Angling	AN11	Fourhorn Sculpin	*Myoxocephalus quadricornis*	194.0	64.1
02-Aug-20	Angling	AN11	Fourhorn Sculpin	*Myoxocephalus quadricornis*	220.0	116.7
02-Aug-20	Angling	AN11	Fourhorn Sculpin	*Myoxocephalus quadricornis*	215.0	81.8
02-Aug-20	Angling	AN11	Fourhorn Sculpin	*Myoxocephalus quadricornis*	205.0	75.4
02-Aug-20	Angling	AN11	Fourhorn Sculpin	*Myoxocephalus quadricornis*	197.0	85.0
02-Aug-20	Angling	AN11	Shorthorn Sculpin	*Myoxocephalus scorpius*	159.0	38.3
02-Aug-20	Angling	AN11	Shorthorn Sculpin	*Myoxocephalus scorpius*	142.0	25.1
02-Aug-20	Angling	AN11	Shorthorn Sculpin	*Myoxocephalus scorpius*	164.0	44.7
02-Aug-20	Angling	AN11	Shorthorn Sculpin	*Myoxocephalus scorpius*	122.0	13.5
02-Aug-20	Angling	AN11	Shorthorn Sculpin	*Myoxocephalus scorpius*	140.0	21.3
03-Aug-20	Angling	AN12	Fourhorn Sculpin	*Myoxocephalus quadricornis*	173.0	48.3
03-Aug-20	Angling	AN12	Fourhorn Sculpin	*Myoxocephalus quadricornis*	174.0	51.4
03-Aug-20	Angling	AN12	Fourhorn Sculpin	*Myoxocephalus quadricornis*	176.0	54.9
03-Aug-20	Angling	AN12	Fourhorn Sculpin	*Myoxocephalus quadricornis*	191.0	78.6
03-Aug-20	Angling	AN12	Fourhorn Sculpin	*Myoxocephalus quadricornis*	172.0	44.3
03-Aug-20	Angling	AN12	Fourhorn Sculpin	*Myoxocephalus quadricornis*	179.0	52.7
03-Aug-20	Angling	AN12	Fourhorn Sculpin	*Myoxocephalus quadricornis*	163.0	43.0

Appendix 6B-1
Fish Capture Data

Date	Capture Method	Site	Common Name	Species	Length (mm)	Weight (g)
03-Aug-20	Angling	AN12	Fourhorn Sculpin	*Myoxocephalus quadricornis*	204.0	75.0
03-Aug-20	Angling	AN12	Fourhorn Sculpin	*Myoxocephalus quadricornis*	130.0	19.0
03-Aug-20	Angling	AN12	Fourhorn Sculpin	*Myoxocephalus quadricornis*	156.0	31.0
03-Aug-20	Angling	AN12	Fourhorn Sculpin	*Myoxocephalus quadricornis*	160.0	38.7
03-Aug-20	Angling	AN12	Fourhorn Sculpin	*Myoxocephalus quadricornis*	185.0	53.1
03-Aug-20	Angling	AN12	Fourhorn Sculpin	*Myoxocephalus quadricornis*	157.0	30.0
03-Aug-20	Angling	AN12	Fourhorn Sculpin	*Myoxocephalus quadricornis*	213.0	97.2
03-Aug-20	Angling	AN12	Fourhorn Sculpin	*Myoxocephalus quadricornis*	228.0	113.9
03-Aug-20	Angling	AN12	Fourhorn Sculpin	*Myoxocephalus quadricornis*	207.0	95.4
03-Aug-20	Angling	AN12	Fourhorn Sculpin	*Myoxocephalus quadricornis*	170.0	38.7
03-Aug-20	Angling	AN12	Fourhorn Sculpin	*Myoxocephalus quadricornis*	234.0	120.0
03-Aug-20	Angling	AN12	Fourhorn Sculpin	*Myoxocephalus quadricornis*	160.0	34.4
03-Aug-20	Angling	AN12	Fourhorn Sculpin	*Myoxocephalus quadricornis*	182.0	62.4
03-Aug-20	Angling	AN12	Fourhorn Sculpin	*Myoxocephalus quadricornis*	167.0	45.3
03-Aug-20	Angling	AN12	Fourhorn Sculpin	*Myoxocephalus quadricornis*	194.0	70.0
03-Aug-20	Angling	AN12	Fourhorn Sculpin	*Myoxocephalus quadricornis*	169.0	40.3
03-Aug-20	Angling	AN12	Fourhorn Sculpin	*Myoxocephalus quadricornis*	150.0	29.5
03-Aug-20	Angling	AN12	Fourhorn Sculpin	*Myoxocephalus quadricornis*	175.0	48.8
03-Aug-20	Angling	AN12	Fourhorn Sculpin	*Myoxocephalus quadricornis*	165.0	38.9
03-Aug-20	Angling	AN12	Fourhorn Sculpin	*Myoxocephalus quadricornis*	163.0	43.1
03-Aug-20	Angling	AN12	Fourhorn Sculpin	*Myoxocephalus quadricornis*	169.0	37.4
03-Aug-20	Angling	AN12	Fourhorn Sculpin	*Myoxocephalus quadricornis*	163.0	38.6
03-Aug-20	Angling	AN12	Fourhorn Sculpin	*Myoxocephalus quadricornis*	173.0	46.7
03-Aug-20	Angling	AN12	Fourhorn Sculpin	*Myoxocephalus quadricornis*	164.0	37.2
03-Aug-20	Angling	AN12	Fourhorn Sculpin	*Myoxocephalus quadricornis*	140.0	21.1
03-Aug-20	Angling	AN12	Fourhorn Sculpin	*Myoxocephalus quadricornis*	175.0	47.6
03-Aug-20	Angling	AN12	Fourhorn Sculpin	*Myoxocephalus quadricornis*	150.0	26.6
03-Aug-20	Angling	AN12	Fourhorn Sculpin	*Myoxocephalus quadricornis*	157.0	37.7
03-Aug-20	Angling	AN12	Fourhorn Sculpin	*Myoxocephalus quadricornis*	140.0	21.7
03-Aug-20	Angling	AN12	Fourhorn Sculpin	*Myoxocephalus quadricornis*	159.0	35.2
03-Aug-20	Angling	AN12	Fourhorn Sculpin	*Myoxocephalus quadricornis*	163.0	36.1
03-Aug-20	Angling	AN12	Fourhorn Sculpin	*Myoxocephalus quadricornis*	136.0	17.7
03-Aug-20	Angling	AN12	Fourhorn Sculpin	*Myoxocephalus quadricornis*	148.0	30.2
03-Aug-20	Angling	AN12	Fourhorn Sculpin	*Myoxocephalus quadricornis*	127.0	19.0
03-Aug-20	Angling	AN12	Fourhorn Sculpin	*Myoxocephalus quadricornis*	129.0	15.7
03-Aug-20	Angling	AN12	Fourhorn Sculpin	*Myoxocephalus quadricornis*	134.0	18.9
03-Aug-20	Angling	AN12	Fourhorn Sculpin	*Myoxocephalus quadricornis*	310.0	380.0
03-Aug-20	Angling	AN12	Fourhorn Sculpin	*Myoxocephalus quadricornis*	236.0	147.7
03-Aug-20	Angling	AN12	Fourhorn Sculpin	*Myoxocephalus quadricornis*	212.0	78.1
03-Aug-20	Angling	AN12	Fourhorn Sculpin	*Myoxocephalus quadricornis*	226.0	103.8
03-Aug-20	Angling	AN12	Fourhorn Sculpin	*Myoxocephalus quadricornis*	190.0	65.5
03-Aug-20	Angling	AN12	Fourhorn Sculpin	*Myoxocephalus quadricornis*	220.0	104.0
03-Aug-20	Angling	AN12	Fourhorn Sculpin	*Myoxocephalus quadricornis*	250.0	150.0
03-Aug-20	Angling	AN12	Fourhorn Sculpin	*Myoxocephalus quadricornis*	198.0	70.6
03-Aug-20	Angling	AN12	Fourhorn Sculpin	*Myoxocephalus quadricornis*	197.0	70.4
03-Aug-20	Angling	AN12	Fourhorn Sculpin	*Myoxocephalus quadricornis*	235.0	118.8
03-Aug-20	Angling	AN12	Fourhorn Sculpin	*Myoxocephalus quadricornis*	214.0	86.3
03-Aug-20	Angling	AN12	Fourhorn Sculpin	*Myoxocephalus quadricornis*	276.0	230.0
03-Aug-20	Angling	AN12	Fourhorn Sculpin	*Myoxocephalus quadricornis*	244.0	140.0
03-Aug-20	Angling	AN12	Fourhorn Sculpin	*Myoxocephalus quadricornis*	263.0	200.0
03-Aug-20	Angling	AN12	Fourhorn Sculpin	*Myoxocephalus quadricornis*	263.0	160.0
03-Aug-20	Angling	AN12	Fourhorn Sculpin	*Myoxocephalus quadricornis*	200.0	68.4
03-Aug-20	Angling	AN12	Fourhorn Sculpin	*Myoxocephalus quadricornis*	229.0	120.0
03-Aug-20	Angling	AN12	Fourhorn Sculpin	*Myoxocephalus quadricornis*	191.0	60.0
03-Aug-20	Angling	AN12	Fourhorn Sculpin	*Myoxocephalus quadricornis*	209.0	90.9
03-Aug-20	Angling	AN12	Fourhorn Sculpin	*Myoxocephalus quadricornis*	204.0	74.8
03-Aug-20	Angling	AN12	Fourhorn Sculpin	*Myoxocephalus quadricornis*	200.0	74.7
03-Aug-20	Angling	AN12	Fourhorn Sculpin	*Myoxocephalus quadricornis*	196.0	72.1
03-Aug-20	Angling	AN12	Fourhorn Sculpin	*Myoxocephalus quadricornis*	196.0	71.5
03-Aug-20	Angling	AN12	Fourhorn Sculpin	*Myoxocephalus quadricornis*	184.0	54.3
03-Aug-20	Angling	AN12	Fourhorn Sculpin	*Myoxocephalus quadricornis*	210.0	81.6
03-Aug-20	Angling	AN12	Arctic Sculpin	*Myoxocephalus scorpioides*	145.0	36.3
03-Aug-20	Angling	AN12	Shorthorn Sculpin	*Myoxocephalus scorpius*	190.0	71.1
03-Aug-20	Angling	AN12	Shorthorn Sculpin	*Myoxocephalus scorpius*	174.0	53.3
03-Aug-20	Angling	AN12	Shorthorn Sculpin	*Myoxocephalus scorpius*	219.0	102.5
03-Aug-20	Angling	AN12	Shorthorn Sculpin	*Myoxocephalus scorpius*	200.0	73.1
05-Aug-20	Angling	AN13	Greenland Cod	*Gadus ogac*	378.0	710.0
05-Aug-20	Angling	AN13	Greenland Cod	*Gadus ogac*	436.0	830.0
05-Aug-20	Angling	AN13	Greenland Cod	*Gadus ogac*	636.0	2980.0
05-Aug-20	Angling	AN13	Greenland Cod	*Gadus ogac*	441.0	1100.0
05-Aug-20	Angling	AN13	Greenland Cod	*Gadus ogac*	610.0	2470.0
05-Aug-20	Angling	AN13	Arctic Sculpin	*Myoxocephalus scorpioides*	178.0	60.0
05-Aug-20	Angling	AN13	Shorthorn Sculpin	*Myoxocephalus scorpius*	408.0	740.0
05-Aug-20	Angling	AN14	No fish Caught	-	-	-
05-Aug-20	Angling	AN15	Fourhorn Sculpin	*Myoxocephalus quadricornis*	201.0	73.4
05-Aug-20	Angling	AN15	Fourhorn Sculpin	*Myoxocephalus quadricornis*	236.0	190.0
05-Aug-20	Angling	AN15	Fourhorn Sculpin	*Myoxocephalus quadricornis*	243.0	130.0
05-Aug-20	Angling	AN15	Fourhorn Sculpin	*Myoxocephalus quadricornis*	243.0	150.0
05-Aug-20	Angling	AN15	Fourhorn Sculpin	*Myoxocephalus quadricornis*	272.0	180.0
05-Aug-20	Angling	AN15	Fourhorn Sculpin	*Myoxocephalus quadricornis*	220.0	95.6
05-Aug-20	Angling	AN15	Fourhorn Sculpin	*Myoxocephalus quadricornis*	213.0	97.2
05-Aug-20	Angling	AN15	Fourhorn Sculpin	*Myoxocephalus quadricornis*	251.0	130.0
05-Aug-20	Angling	AN15	Fourhorn Sculpin	*Myoxocephalus quadricornis*	203.0	72.0
05-Aug-20	Angling	AN15	Fourhorn Sculpin	*Myoxocephalus quadricornis*	254.0	190.0
05-Aug-20	Angling	AN15	Fourhorn Sculpin	*Myoxocephalus quadricornis*	232.0	95.8
05-Aug-20	Angling	AN15	Fourhorn Sculpin	*Myoxocephalus quadricornis*	235.0	130.0
05-Aug-20	Angling	AN15	Fourhorn Sculpin	*Myoxocephalus quadricornis*	241.0	130.0
05-Aug-20	Angling	AN15	Fourhorn Sculpin	*Myoxocephalus quadricornis*	233.0	118.4
05-Aug-20	Angling	AN15	Fourhorn Sculpin	*Myoxocephalus quadricornis*	208.0	83.3

Appendix 6B-1
Fish Capture Data

Date	Capture Method	Site	Common Name	Species	Length (mm)	Weight (g)
05-Aug-20	Angling	AN15	Fourhorn Sculpin	*Myoxocephalus quadricornis*	217.0	83.4
05-Aug-20	Angling	AN15	Fourhorn Sculpin	*Myoxocephalus quadricornis*	231.0	130.0
05-Aug-20	Angling	AN15	Fourhorn Sculpin	*Myoxocephalus quadricornis*	253.0	150.0
05-Aug-20	Angling	AN15	Fourhorn Sculpin	*Myoxocephalus quadricornis*	205.0	82.7
05-Aug-20	Angling	AN15	Fourhorn Sculpin	*Myoxocephalus quadricornis*	228.0	100.0
05-Aug-20	Angling	AN15	Fourhorn Sculpin	*Myoxocephalus quadricornis*	200.0	71.9
05-Aug-20	Angling	AN15	Fourhorn Sculpin	*Myoxocephalus quadricornis*	199.0	79.4
05-Aug-20	Angling	AN15	Fourhorn Sculpin	*Myoxocephalus quadricornis*	197.0	68.5
05-Aug-20	Angling	AN15	Fourhorn Sculpin	*Myoxocephalus quadricornis*	195.0	69.1
05-Aug-20	Angling	AN15	Fourhorn Sculpin	*Myoxocephalus quadricornis*	208.0	78.0
05-Aug-20	Angling	AN15	Fourhorn Sculpin	*Myoxocephalus quadricornis*	204.0	77.2
05-Aug-20	Angling	AN15	Fourhorn Sculpin	*Myoxocephalus quadricornis*	192.0	64.4
05-Aug-20	Angling	AN15	Fourhorn Sculpin	*Myoxocephalus quadricornis*	211.0	86.0
05-Aug-20	Angling	AN15	Fourhorn Sculpin	*Myoxocephalus quadricornis*	207.0	80.4
05-Aug-20	Angling	AN15	Fourhorn Sculpin	*Myoxocephalus quadricornis*	181.0	56.3
05-Aug-20	Angling	AN15	Fourhorn Sculpin	*Myoxocephalus quadricornis*	209.0	86.7
05-Aug-20	Angling	AN15	Fourhorn Sculpin	*Myoxocephalus quadricornis*	191.0	70.4
05-Aug-20	Angling	AN15	Fourhorn Sculpin	*Myoxocephalus quadricornis*	179.0	48.7
05-Aug-20	Angling	AN15	Fourhorn Sculpin	*Myoxocephalus quadricornis*	210.0	88.8
05-Aug-20	Angling	AN15	Fourhorn Sculpin	*Myoxocephalus quadricornis*	219.0	96.3
05-Aug-20	Angling	AN15	Fourhorn Sculpin	*Myoxocephalus quadricornis*	194.0	52.4
05-Aug-20	Angling	AN15	Fourhorn Sculpin	*Myoxocephalus quadricornis*	175.0	51.8
05-Aug-20	Angling	AN15	Fourhorn Sculpin	*Myoxocephalus quadricornis*	193.0	71.3
05-Aug-20	Angling	AN15	Fourhorn Sculpin	*Myoxocephalus quadricornis*	242.0	120.0
05-Aug-20	Angling	AN15	Fourhorn Sculpin	*Myoxocephalus quadricornis*	148.0	29.5
05-Aug-20	Angling	AN15	Fourhorn Sculpin	*Myoxocephalus quadricornis*	189.0	65.0
05-Aug-20	Angling	AN15	Fourhorn Sculpin	*Myoxocephalus quadricornis*	162.0	37.1
06-Aug-20	Angling	AN16	Greenland Cod	*Gadus ogac*	598.0	2400.0
06-Aug-20	Angling	AN16	Greenland Cod	*Gadus ogac*	414.0	830.0
06-Aug-20	Angling	AN16	Greenland Cod	*Gadus ogac*	548.0	1880.0
06-Aug-20	Angling	AN16	Greenland Cod	*Gadus ogac*	454.0	1000.0
06-Aug-20	Angling	AN16	Greenland Cod	*Gadus ogac*	506.0	1610.0
06-Aug-20	Angling	AN16	Greenland Cod	*Gadus ogac*	497.0	1310.0
06-Aug-20	Angling	AN16	Greenland Cod	*Gadus ogac*	444.0	480.0
06-Aug-20	Angling	AN16	Greenland Cod	*Gadus ogac*	446.0	1010.0
06-Aug-20	Angling	AN16	Greenland Cod	*Gadus ogac*	520.0	1490.0
07-Aug-20	Angling	AN17	Greenland Cod	*Gadus ogac*	474.0	1210.0
07-Aug-20	Angling	AN17	Greenland Cod	*Gadus ogac*	490.0	1370.0
07-Aug-20	Angling	AN17	Greenland Cod	*Gadus ogac*	494.0	1470.0
07-Aug-20	Angling	AN17	Greenland Cod	*Gadus ogac*	628.0	2980.0
07-Aug-20	Angling	AN17	Greenland Cod	*Gadus ogac*	510.0	1420.0
08-Aug-20	Angling	AN18	Greenland Cod	*Gadus ogac*	440.0	1120.0
08-Aug-20	Angling	AN18	Greenland Cod	*Gadus ogac*	470.0	1140.0
08-Aug-20	Angling	AN18	Greenland Cod	*Gadus ogac*	451.0	1040.0
08-Aug-20	Angling	AN18	Greenland Cod	*Gadus ogac*	485.0	1330.0
08-Aug-20	Angling	AN18	Shorthorn Sculpin	*Myoxocephalus scorpius*	375.0	610.0
08-Aug-20	Angling	AN18	Shorthorn Sculpin	*Myoxocephalus scorpius*	421.0	1060.0
08-Aug-20	Angling	AN18	Shorthorn Sculpin	*Myoxocephalus scorpius*	286.0	260.0
08-Aug-20	Angling	AN18	Shorthorn Sculpin	*Myoxocephalus scorpius*	351.0	480.0
08-Aug-20	Angling	AN19	No fish Caught	-	-	-
09-Aug-20	Angling	AN20	Greenland Cod	*Gadus ogac*	513.0	1040.0
09-Aug-20	Angling	AN20	Greenland Cod	*Gadus ogac*	517.0	1710.0
09-Aug-20	Angling	AN20	Shorthorn Sculpin	*Myoxocephalus scorpius*	270.0	330.0
09-Aug-20	Angling	AN21	Shorthorn Sculpin	*Myoxocephalus scorpius*	362.0	640.0
09-Aug-20	Angling	AN21	Shorthorn Sculpin	*Myoxocephalus scorpius*	211.0	110.0
09-Aug-20	Angling	AN22	Shorthorn Sculpin	*Myoxocephalus scorpius*	155.0	60.0
09-Aug-20	Angling	AN23	Fourhorn Sculpin	*Myoxocephalus quadricornis*	192.0	68.9
09-Aug-20	Angling	AN24	No fish Caught	-	-	-
11-Aug-20	Angling	AN25	No fish Caught	-	-	-
11-Aug-20	Angling	AN26	Greenland Cod	*Gadus ogac*	475.0	1240.0
11-Aug-20	Angling	AN27(a)	No fish Caught	-	-	-
14-Aug-20	Angling	AN27(b)	Shorthorn Sculpin	*Myoxocephalus scorpius*	290.0	340.0
14-Aug-20	Angling	AN27(b)	Arctic Char	*Salvelinus alpinus*	325.0	420.0
14-Aug-20	Angling	AN28	Fourhorn Sculpin	*Myoxocephalus quadricornis*	260.0	250.0
14-Aug-20	Angling	AN28	Shorthorn Sculpin	*Myoxocephalus scorpius*	344.0	650.0
14-Aug-20	Angling	AN28	Shorthorn Sculpin	*Myoxocephalus scorpius*	373.0	760.0
14-Aug-20	Angling	AN28	Shorthorn Sculpin	*Myoxocephalus scorpius*	342.0	480.0
14-Aug-20	Angling	AN28	Shorthorn Sculpin	*Myoxocephalus scorpius*	289.0	290.0
14-Aug-20	Angling	AN28	Shorthorn Sculpin	*Myoxocephalus scorpius*	292.0	360.0
14-Aug-20	Angling	AN28	Shorthorn Sculpin	*Myoxocephalus scorpius*	250.0	180.0
14-Aug-20	Angling	AN28	Shorthorn Sculpin	*Myoxocephalus scorpius*	278.0	270.0
14-Aug-20	Angling	AN28	Shorthorn Sculpin	*Myoxocephalus scorpius*	217.0	100.0
14-Aug-20	Angling	AN28	Shorthorn Sculpin	*Myoxocephalus scorpius*	277.0	290.0
14-Aug-20	Angling	AN28	Shorthorn Sculpin	*Myoxocephalus scorpius*	232.0	170.0
14-Aug-20	Angling	AN29	Shorthorn Sculpin	*Myoxocephalus scorpius*	368.0	630.0
14-Aug-20	Angling	AN29	Shorthorn Sculpin	*Myoxocephalus scorpius*	234.0	210.0
14-Aug-20	Angling	AN29	Shorthorn Sculpin	*Myoxocephalus scorpius*	200.0	90.0
15-Aug-20	Angling	AN30	Fourhorn Sculpin	*Myoxocephalus quadricornis*	151.0	31.1
15-Aug-20	Angling	AN30	Arctic Sculpin	*Myoxocephalus scorpioides*	130.0	32.8
15-Aug-20	Angling	AN30	Arctic Sculpin	*Myoxocephalus scorpioides*	131.0	28.5
27-Jul-20	Fukui Traps	FT01	Shorthorn Sculpin	*Myoxocephalus scorpius*	200.0	11.7
28-Jul-20	Fukui Traps	FT02	No fish Caught	-	-	-
28-Jul-20	Fukui Traps	FT03	Unidentified Sculpin	Cottidae indet.	75.0	4.4
28-Jul-20	Fukui Traps	FT03	Unidentified Sculpin	Cottidae indet.	61.0	2.7
28-Jul-20	Fukui Traps	FT03	Unidentified Sculpin	Cottidae indet.	72.0	4.3
28-Jul-20	Fukui Traps	FT03	Unidentified Sculpin	Cottidae indet.	68.0	4.2
28-Jul-20	Fukui Traps	FT03	Unidentified Sculpin	Cottidae indet.	60.0	2.8
28-Jul-20	Fukui Traps	FT03	Fourhorn Sculpin	*Myoxocephalus quadricornis*	217.0	88.9
28-Jul-20	Fukui Traps	FT03	Shorthorn Sculpin	*Myoxocephalus scorpius*	124.0	22.3

Appendix 6B-1
Fish Capture Data

Date	Capture Method	Site	Common Name	Species	Length (mm)	Weight (g)
28-Jul-20	Fukui Traps	FT04	Unidentified Sculpin	Cottidae indet.	65.0	4.1
28-Jul-20	Fukui Traps	FT05	No fish Caught	-	-	-
28-Jul-20	Fukui Traps	FT06	No fish Caught	-	-	-
01-Aug-20	Fukui Traps	FT07	Unidentified Sculpin	Cottidae indet.	141.0	21.2
01-Aug-20	Fukui Traps	FT07	Unidentified Sculpin	Cottidae indet.	123.0	12.7
01-Aug-20	Fukui Traps	FT07	Fourhorn Sculpin	*Myoxocephalus quadricornis*	166.0	47.2
01-Aug-20	Fukui Traps	FT07	Fourhorn Sculpin	*Myoxocephalus quadricornis*	168.0	39.9
01-Aug-20	Fukui Traps	FT08	Fourhorn Sculpin	*Myoxocephalus quadricornis*	220.0	92.2
01-Aug-20	Fukui Traps	FT08	Arctic Sculpin	*Myoxocephalus scorpioides*	127.0	26.6
01-Aug-20	Fukui Traps	FT09	Unidentified Sculpin	Cottidae indet.	149.0	29.2
01-Aug-20	Fukui Traps	FT09	Fourhorn Sculpin	*Myoxocephalus quadricornis*	224.0	118.8
01-Aug-20	Fukui Traps	FT09	Fourhorn Sculpin	*Myoxocephalus quadricornis*	223.0	108.1
01-Aug-20	Fukui Traps	FT09	Fourhorn Sculpin	*Myoxocephalus quadricornis*	196.0	66.4
01-Aug-20	Fukui Traps	FT10	Fourhorn Sculpin	*Myoxocephalus quadricornis*	202.0	66.4
01-Aug-20	Fukui Traps	FT10	Arctic Sculpin	*Myoxocephalus scorpioides*	112.0	20.6
01-Aug-20	Fukui Traps	FT11	Sandlance	*Ammodytes* spp.	170.0	16.2
01-Aug-20	Fukui Traps	FT11	Unidentified Sculpin	Cottidae indet.	130.0	18.7
01-Aug-20	Fukui Traps	FT11	Unidentified Sculpin	Cottidae indet.	140.0	21.8
01-Aug-20	Fukui Traps	FT11	Unidentified Sculpin	Cottidae indet.	134.0	19.3
01-Aug-20	Fukui Traps	FT11	Fourhorn Sculpin	*Myoxocephalus quadricornis*	214.0	84.5
01-Aug-20	Fukui Traps	FT11	Fourhorn Sculpin	*Myoxocephalus quadricornis*	196.0	67.6
01-Aug-20	Fukui Traps	FT11	Fourhorn Sculpin	*Myoxocephalus quadricornis*	195.0	68.2
01-Aug-20	Fukui Traps	FT11	Fourhorn Sculpin	*Myoxocephalus quadricornis*	186.0	54.2
01-Aug-20	Fukui Traps	FT11	Arctic Sculpin	*Myoxocephalus scorpioides*	119.0	20.7
01-Aug-20	Fukui Traps	FT12	Fourhorn Sculpin	*Myoxocephalus quadricornis*	177.0	47.5
01-Aug-20	Fukui Traps	FT12	Arctic Sculpin	*Myoxocephalus scorpioides*	200.0	117.8
05-Aug-20	Fukui Traps	FT13	Sandlance	*Ammodytes* spp.	168.0	16.8
05-Aug-20	Fukui Traps	FT13	Fourhorn Sculpin	*Myoxocephalus quadricornis*	235.0	111.9
05-Aug-20	Fukui Traps	FT14	Arctic Sculpin	*Myoxocephalus scorpioides*	132.0	30.9
05-Aug-20	Fukui Traps	FT14	Arctic Sculpin	*Myoxocephalus scorpioides*	90.0	8.8
05-Aug-20	Fukui Traps	FT14	Shorthorn Sculpin	*Myoxocephalus scorpius*	181.0	40.0
05-Aug-20	Fukui Traps	FT15	Fourhorn Sculpin	*Myoxocephalus quadricornis*	194.0	20.0
05-Aug-20	Fukui Traps	FT16	No fish Caught	-	-	-
05-Aug-20	Fukui Traps	FT17	No fish Caught	-	-	-
11-Aug-20	Fukui Traps	FT18	Fourline Snakeblenny	*Eumesogrammus praecisus*	280.0	-
11-Aug-20	Fukui Traps	FT19	No fish Caught	-	-	-
11-Aug-20	Fukui Traps	FT20	Fourhorn Sculpin	*Myoxocephalus quadricornis*	189.0	55.6
11-Aug-20	Fukui Traps	FT20	Fourhorn Sculpin	*Myoxocephalus quadricornis*	150.0	29.6
11-Aug-20	Fukui Traps	FT20	Arctic Sculpin	*Myoxocephalus scorpioides*	138.0	37.2
11-Aug-20	Fukui Traps	FT21	No fish Caught	-	-	-
11-Aug-20	Fukui Traps	FT22	No fish Caught	-	-	-
15-Aug-20	Fukui Traps	FT23	No fish Caught	-	-	-
15-Aug-20	Fukui Traps	FT24	No fish Caught	-	-	-
15-Aug-20	Fukui Traps	FT25	No fish Caught	-	-	-
15-Aug-20	Fukui Traps	FT26	Fourhorn Sculpin	*Myoxocephalus quadricornis*	159.0	37.8
15-Aug-20	Fukui Traps	FT27	No fish Caught	-	-	-
27-Jul-20	Gill Nets	GN01	Fourhorn Sculpin	*Myoxocephalus quadricornis*	216.0	91.2
27-Jul-20	Gill Nets	GN01	Fourhorn Sculpin	*Myoxocephalus quadricornis*	198.0	61.2
27-Jul-20	Gill Nets	GN01	Fourhorn Sculpin	*Myoxocephalus quadricornis*	209.0	71.8
27-Jul-20	Gill Nets	GN01	Fourhorn Sculpin	*Myoxocephalus quadricornis*	164.0	36.2
27-Jul-20	Gill Nets	GN01	Arctic Char	*Salvelinus alpinus*	505.0	1020.0
27-Jul-20	Gill Nets	GN01	Arctic Char	*Salvelinus alpinus*	599.0	1960.0
27-Jul-20	Gill Nets	GN01	Arctic Char	*Salvelinus alpinus*	441.0	910.0
27-Jul-20	Gill Nets	GN01	Arctic Char	*Salvelinus alpinus*	272.0	120.0
27-Jul-20	Gill Nets	GN02	Unidentified Sculpin	Cottidae indet.	120.0	16.4
27-Jul-20	Gill Nets	GN02	Fourhorn Sculpin	*Myoxocephalus quadricornis*	173.0	41.0
27-Jul-20	Gill Nets	GN02	Fourhorn Sculpin	*Myoxocephalus quadricornis*	174.0	45.7
27-Jul-20	Gill Nets	GN02	Fourhorn Sculpin	*Myoxocephalus quadricornis*	227.0	114.0
27-Jul-20	Gill Nets	GN02	Arctic Char	*Salvelinus alpinus*	602.0	2320.0
27-Jul-20	Gill Nets	GN02	Arctic Char	*Salvelinus alpinus*	512.0	1320.0
28-Jul-20	Gill Nets	GN03	No fish Caught	-	-	-
28-Jul-20	Gill Nets	GN04	Unidentified Sculpin	Cottidae indet.	135.0	19.5
28-Jul-20	Gill Nets	GN04	Unidentified Sculpin	Cottidae indet.	131.0	18.6
28-Jul-20	Gill Nets	GN04	Shorthorn Sculpin	*Myoxocephalus scorpius*	188.0	52.1
28-Jul-20	Gill Nets	GN05	Fourhorn Sculpin	*Myoxocephalus quadricornis*	247.0	150.0
28-Jul-20	Gill Nets	GN06	Unidentified Sculpin	Cottidae indet.	150.0	28.7
28-Jul-20	Gill Nets	GN06	Unidentified Sculpin	Cottidae indet.	153.0	28.1
28-Jul-20	Gill Nets	GN06	Unidentified Sculpin	Cottidae indet.	128.0	18.2
28-Jul-20	Gill Nets	GN06	Arctic Staghorn Sculpin	*Gymnocanthus tricuspis*	168.0	90.7
28-Jul-20	Gill Nets	GN06	Fourhorn Sculpin	*Myoxocephalus quadricornis*	261.0	240.0
28-Jul-20	Gill Nets	GN06	Fourhorn Sculpin	*Myoxocephalus quadricornis*	192.0	66.6
28-Jul-20	Gill Nets	GN06	Fourhorn Sculpin	*Myoxocephalus quadricornis*	201.0	67.7
28-Jul-20	Gill Nets	GN06	Fourhorn Sculpin	*Myoxocephalus quadricornis*	294.0	310.0
28-Jul-20	Gill Nets	GN06	Fourhorn Sculpin	*Myoxocephalus quadricornis*	243.0	110.0
28-Jul-20	Gill Nets	GN06	Fourhorn Sculpin	*Myoxocephalus quadricornis*	211.0	79.2
28-Jul-20	Gill Nets	GN06	Fourhorn Sculpin	*Myoxocephalus quadricornis*	230.0	110.0
28-Jul-20	Gill Nets	GN06	Fourhorn Sculpin	*Myoxocephalus quadricornis*	215.0	86.9
28-Jul-20	Gill Nets	GN06	Fourhorn Sculpin	*Myoxocephalus quadricornis*	214.0	93.7
28-Jul-20	Gill Nets	GN06	Fourhorn Sculpin	*Myoxocephalus quadricornis*	238.0	112.7
28-Jul-20	Gill Nets	GN06	Fourhorn Sculpin	*Myoxocephalus quadricornis*	193.0	71.8
28-Jul-20	Gill Nets	GN06	Fourhorn Sculpin	*Myoxocephalus quadricornis*	194.0	67.0
28-Jul-20	Gill Nets	GN06	Fourhorn Sculpin	*Myoxocephalus quadricornis*	199.0	82.6
28-Jul-20	Gill Nets	GN06	Fourhorn Sculpin	*Myoxocephalus quadricornis*	185.0	65.2
28-Jul-20	Gill Nets	GN06	Fourhorn Sculpin	*Myoxocephalus quadricornis*	191.0	73.7
28-Jul-20	Gill Nets	GN06	Fourhorn Sculpin	*Myoxocephalus quadricornis*	180.0	53.2
28-Jul-20	Gill Nets	GN06	Fourhorn Sculpin	*Myoxocephalus quadricornis*	189.0	65.8
28-Jul-20	Gill Nets	GN06	Fourhorn Sculpin	*Myoxocephalus quadricornis*	184.0	59.6
28-Jul-20	Gill Nets	GN06	Fourhorn Sculpin	*Myoxocephalus quadricornis*	166.0	43.5
28-Jul-20	Gill Nets	GN06	Fourhorn Sculpin	*Myoxocephalus quadricornis*	196.0	57.1

Appendix 6B-1
Fish Capture Data

Date	Capture Method	Site	Common Name	Species	Length (mm)	Weight (g)
28-Jul-20	Gill Nets	GN06	Fourhorn Sculpin	*Myoxocephalus quadricornis*	175.0	46.4
28-Jul-20	Gill Nets	GN06	Fourhorn Sculpin	*Myoxocephalus quadricornis*	149.0	25.7
28-Jul-20	Gill Nets	GN06	Fourhorn Sculpin	*Myoxocephalus quadricornis*	157.0	35.6
28-Jul-20	Gill Nets	GN06	Fourhorn Sculpin	*Myoxocephalus quadricornis*	166.0	39.9
28-Jul-20	Gill Nets	GN06	Fourhorn Sculpin	*Myoxocephalus quadricornis*	187.0	56.5
28-Jul-20	Gill Nets	GN06	Shorthorn Sculpin	*Myoxocephalus scorpius*	152.0	27.7
28-Jul-20	Gill Nets	GN06	Shorthorn Sculpin	*Myoxocephalus scorpius*	188.0	62.9
28-Jul-20	Gill Nets	GN06	Shorthorn Sculpin	*Myoxocephalus scorpius*	153.0	29.5
28-Jul-20	Gill Nets	GN06	Shorthorn Sculpin	*Myoxocephalus scorpius*	130.0	19.2
28-Jul-20	Gill Nets	GN06	Arctic Char	*Salvelinus alpinus*	640.0	2980.0
28-Jul-20	Gill Nets	GN06	Arctic Char	*Salvelinus alpinus*	395.0	610.0
28-Jul-20	Gill Nets	GN06	Arctic Char	*Salvelinus alpinus*	348.0	480.0
28-Jul-20	Gill Nets	GN06	Arctic Char	*Salvelinus alpinus*	558.0	1980.0
28-Jul-20	Gill Nets	GN06	Arctic Char	*Salvelinus alpinus*	491.0	1300.0
28-Jul-20	Gill Nets	GN06	Arctic Char	*Salvelinus alpinus*	139.0	24.9
28-Jul-20	Gill Nets	GN06	Arctic Char	*Salvelinus alpinus*	134.0	21.9
28-Jul-20	Gill Nets	GN06	Arctic Char	*Salvelinus alpinus*	142.0	30.1
29-Jul-20	Gill Nets	GN07	Fourhorn Sculpin	*Myoxocephalus quadricornis*	226.0	96.0
29-Jul-20	Gill Nets	GN07	Fourhorn Sculpin	*Myoxocephalus quadricornis*	252.0	130.0
29-Jul-20	Gill Nets	GN07	Fourhorn Sculpin	*Myoxocephalus quadricornis*	232.0	925.0
29-Jul-20	Gill Nets	GN07	Fourhorn Sculpin	*Myoxocephalus quadricornis*	182.0	48.3
29-Jul-20	Gill Nets	GN07	Arctic Char	*Salvelinus alpinus*	652.0	3400.0
29-Jul-20	Gill Nets	GN07	Arctic Char	*Salvelinus alpinus*	542.0	1650.0
29-Jul-20	Gill Nets	GN07	Arctic Char	*Salvelinus alpinus*	528.0	1420.0
29-Jul-20	Gill Nets	GN07	Arctic Char	*Salvelinus alpinus*	516.0	1400.0
29-Jul-20	Gill Nets	GN08	Fourhorn Sculpin	*Myoxocephalus quadricornis*	172.0	44.5
29-Jul-20	Gill Nets	GN08	Fourhorn Sculpin	*Myoxocephalus quadricornis*	202.0	77.0
29-Jul-20	Gill Nets	GN08	Fourhorn Sculpin	*Myoxocephalus quadricornis*	170.0	42.4
29-Jul-20	Gill Nets	GN08	Fourhorn Sculpin	*Myoxocephalus quadricornis*	160.0	35.3
29-Jul-20	Gill Nets	GN08	Fourhorn Sculpin	*Myoxocephalus quadricornis*	160.0	36.6
29-Jul-20	Gill Nets	GN08	Fourhorn Sculpin	*Myoxocephalus quadricornis*	162.0	35.9
29-Jul-20	Gill Nets	GN08	Fourhorn Sculpin	*Myoxocephalus quadricornis*	118.0	13.2
29-Jul-20	Gill Nets	GN08	Arctic Char	*Salvelinus alpinus*	440.0	900.0
29-Jul-20	Gill Nets	GN08	Arctic Char	*Salvelinus alpinus*	142.0	22.2
29-Jul-20	Gill Nets	GN08	Arctic Char	*Salvelinus alpinus*	368.0	600.0
29-Jul-20	Gill Nets	GN09	Fourhorn Sculpin	*Myoxocephalus quadricornis*	218.0	101.3
29-Jul-20	Gill Nets	GN09	Fourhorn Sculpin	*Myoxocephalus quadricornis*	166.0	41.1
29-Jul-20	Gill Nets	GN09	Fourhorn Sculpin	*Myoxocephalus quadricornis*	184.0	59.1
29-Jul-20	Gill Nets	GN09	Fourhorn Sculpin	*Myoxocephalus quadricornis*	156.0	35.7
29-Jul-20	Gill Nets	GN09	Fourhorn Sculpin	*Myoxocephalus quadricornis*	160.0	37.2
29-Jul-20	Gill Nets	GN09	Fourhorn Sculpin	*Myoxocephalus quadricornis*	192.0	57.9
29-Jul-20	Gill Nets	GN09	Fourhorn Sculpin	*Myoxocephalus quadricornis*	170.0	47.2
29-Jul-20	Gill Nets	GN10	Fourhorn Sculpin	*Myoxocephalus quadricornis*	244.0	130.0
29-Jul-20	Gill Nets	GN10	Fourhorn Sculpin	*Myoxocephalus quadricornis*	260.0	180.0
29-Jul-20	Gill Nets	GN10	Fourhorn Sculpin	*Myoxocephalus quadricornis*	268.0	210.0
29-Jul-20	Gill Nets	GN10	Fourhorn Sculpin	*Myoxocephalus quadricornis*	200.0	74.4
29-Jul-20	Gill Nets	GN10	Fourhorn Sculpin	*Myoxocephalus quadricornis*	198.0	61.3
29-Jul-20	Gill Nets	GN10	Fourhorn Sculpin	*Myoxocephalus quadricornis*	314.0	400.0
29-Jul-20	Gill Nets	GN10	Fourhorn Sculpin	*Myoxocephalus quadricornis*	304.0	310.0
29-Jul-20	Gill Nets	GN10	Arctic Char	*Salvelinus alpinus*	638.0	3260.0
29-Jul-20	Gill Nets	GN10	Arctic Char	*Salvelinus alpinus*	422.0	720.0
29-Jul-20	Gill Nets	GN10	Arctic Char	*Salvelinus alpinus*	338.0	340.0
29-Jul-20	Gill Nets	GN10	Arctic Char	*Salvelinus alpinus*	378.0	460.0
29-Jul-20	Gill Nets	GN10	Arctic Char	*Salvelinus alpinus*	420.0	830.0
29-Jul-20	Gill Nets	GN10	Arctic Char	*Salvelinus alpinus*	352.0	490.0
29-Jul-20	Gill Nets	GN10	Arctic Char	*Salvelinus alpinus*	411.0	860.0
29-Jul-20	Gill Nets	GN10	Arctic Char	*Salvelinus alpinus*	480.0	1380.0
29-Jul-20	Gill Nets	GN10	Arctic Char	*Salvelinus alpinus*	355.0	450.0
29-Jul-20	Gill Nets	GN10	Arctic Char	*Salvelinus alpinus*	412.0	880.0
29-Jul-20	Gill Nets	GN10	Arctic Char	*Salvelinus alpinus*	528.0	1660.0
29-Jul-20	Gill Nets	GN10	Arctic Char	*Salvelinus alpinus*	427.0	870.0
29-Jul-20	Gill Nets	GN10	Arctic Char	*Salvelinus alpinus*	313.0	360.0
29-Jul-20	Gill Nets	GN10	Arctic Char	*Salvelinus alpinus*	314.0	400.0
29-Jul-20	Gill Nets	GN10	Arctic Char	*Salvelinus alpinus*	414.0	890.0
29-Jul-20	Gill Nets	GN10	Arctic Char	*Salvelinus alpinus*	326.0	450.0
29-Jul-20	Gill Nets	GN10	Arctic Char	*Salvelinus alpinus*	326.0	350.0
30-Jul-20	Gill Nets	GN11	Sandlance	*Ammodytes* spp.	168.0	16.7
30-Jul-20	Gill Nets	GN11	Fourhorn Sculpin	*Myoxocephalus quadricornis*	216.0	89.3
30-Jul-20	Gill Nets	GN11	Fourhorn Sculpin	*Myoxocephalus quadricornis*	168.0	37.5
30-Jul-20	Gill Nets	GN11	Fourhorn Sculpin	*Myoxocephalus quadricornis*	180.0	52.1
30-Jul-20	Gill Nets	GN11	Fourhorn Sculpin	*Myoxocephalus quadricornis*	201.0	86.6
30-Jul-20	Gill Nets	GN11	Fourhorn Sculpin	*Myoxocephalus quadricornis*	199.0	76.1
30-Jul-20	Gill Nets	GN11	Fourhorn Sculpin	*Myoxocephalus quadricornis*	252.0	170.0
30-Jul-20	Gill Nets	GN11	Shorthorn Sculpin	*Myoxocephalus scorpius*	150.0	25.8
30-Jul-20	Gill Nets	GN11	Shorthorn Sculpin	*Myoxocephalus scorpius*	144.0	22.4
30-Jul-20	Gill Nets	GN11	Shorthorn Sculpin	*Myoxocephalus scorpius*	129.0	15.3
30-Jul-20	Gill Nets	GN11	Arctic Char	*Salvelinus alpinus*	623.0	2760.0
30-Jul-20	Gill Nets	GN11	Arctic Char	*Salvelinus alpinus*	447.0	1100.0
30-Jul-20	Gill Nets	GN11	Arctic Char	*Salvelinus alpinus*	400.0	740.0
30-Jul-20	Gill Nets	GN11	Arctic Char	*Salvelinus alpinus*	282.0	260.0
30-Jul-20	Gill Nets	GN11	Arctic Char	*Salvelinus alpinus*	512.0	1700.0
30-Jul-20	Gill Nets	GN11	Arctic Char	*Salvelinus alpinus*	430.0	870.0
30-Jul-20	Gill Nets	GN11	Arctic Char	*Salvelinus alpinus*	668.0	4040.0
30-Jul-20	Gill Nets	GN11	Arctic Char	*Salvelinus alpinus*	459.0	1310.0
30-Jul-20	Gill Nets	GN11	Arctic Char	*Salvelinus alpinus*	478.0	1260.0
30-Jul-20	Gill Nets	GN11	Arctic Char	*Salvelinus alpinus*	460.0	1320.0
30-Jul-20	Gill Nets	GN11	Arctic Char	*Salvelinus alpinus*	462.0	1240.0
30-Jul-20	Gill Nets	GN11	Arctic Char	*Salvelinus alpinus*	432.0	1070.0
30-Jul-20	Gill Nets	GN11	Arctic Char	*Salvelinus alpinus*	439.0	940.0

Appendix 6B-1
Fish Capture Data

Date	Capture Method	Site	Common Name	Species	Length (mm)	Weight (g)
30-Jul-20	Gill Nets	GN11	Arctic Char	*Salvelinus alpinus*	409.0	780.0
30-Jul-20	Gill Nets	GN11	Arctic Char	*Salvelinus alpinus*	456.0	1370.0
30-Jul-20	Gill Nets	GN11	Arctic Char	*Salvelinus alpinus*	366.0	690.0
30-Jul-20	Gill Nets	GN11	Arctic Char	*Salvelinus alpinus*	268.0	230.0
30-Jul-20	Gill Nets	GN12	Unidentified Sculpin	Cottidae indet.	134.0	18.1
30-Jul-20	Gill Nets	GN12	Fourhorn Sculpin	*Myoxocephalus quadricornis*	295.0	260.0
30-Jul-20	Gill Nets	GN12	Shorthorn Sculpin	*Myoxocephalus scorpius*	164.0	40.2
30-Jul-20	Gill Nets	GN12	Shorthorn Sculpin	*Myoxocephalus scorpius*	290.0	370.0
30-Jul-20	Gill Nets	GN12	Arctic Char	*Salvelinus alpinus*	636.0	2910.0
01-Aug-20	Gill Nets	GN13	Unidentified Sculpin	Cottidae indet.	122.0	17.6
01-Aug-20	Gill Nets	GN13	Unidentified Sculpin	Cottidae indet.	129.0	17.3
01-Aug-20	Gill Nets	GN13	Fourhorn Sculpin	*Myoxocephalus quadricornis*	175.0	47.6
01-Aug-20	Gill Nets	GN13	Fourhorn Sculpin	*Myoxocephalus quadricornis*	125.0	13.6
01-Aug-20	Gill Nets	GN13	Fourhorn Sculpin	*Myoxocephalus quadricornis*	161.0	33.2
01-Aug-20	Gill Nets	GN13	Fourhorn Sculpin	*Myoxocephalus quadricornis*	219.0	102.0
01-Aug-20	Gill Nets	GN13	Fourhorn Sculpin	*Myoxocephalus quadricornis*	199.0	70.9
01-Aug-20	Gill Nets	GN13	Fourhorn Sculpin	*Myoxocephalus quadricornis*	185.0	55.9
01-Aug-20	Gill Nets	GN13	Fourhorn Sculpin	*Myoxocephalus quadricornis*	185.0	55.1
01-Aug-20	Gill Nets	GN13	Fourhorn Sculpin	*Myoxocephalus quadricornis*	170.0	51.2
01-Aug-20	Gill Nets	GN13	Fourhorn Sculpin	*Myoxocephalus quadricornis*	160.0	35.4
01-Aug-20	Gill Nets	GN13	Fourhorn Sculpin	*Myoxocephalus quadricornis*	184.0	64.6
01-Aug-20	Gill Nets	GN13	Fourhorn Sculpin	*Myoxocephalus quadricornis*	188.0	58.3
01-Aug-20	Gill Nets	GN13	Fourhorn Sculpin	*Myoxocephalus quadricornis*	175.0	52.9
01-Aug-20	Gill Nets	GN13	Fourhorn Sculpin	*Myoxocephalus quadricornis*	182.0	57.0
01-Aug-20	Gill Nets	GN13	Fourhorn Sculpin	*Myoxocephalus quadricornis*	168.0	36.7
01-Aug-20	Gill Nets	GN13	Fourhorn Sculpin	*Myoxocephalus quadricornis*	161.0	34.8
01-Aug-20	Gill Nets	GN13	Fourhorn Sculpin	*Myoxocephalus quadricornis*	183.0	67.0
01-Aug-20	Gill Nets	GN13	Fourhorn Sculpin	*Myoxocephalus quadricornis*	137.0	23.2
01-Aug-20	Gill Nets	GN13	Fourhorn Sculpin	*Myoxocephalus quadricornis*	198.0	65.8
01-Aug-20	Gill Nets	GN13	Fourhorn Sculpin	*Myoxocephalus quadricornis*	210.0	69.6
01-Aug-20	Gill Nets	GN13	Fourhorn Sculpin	*Myoxocephalus quadricornis*	194.0	79.7
01-Aug-20	Gill Nets	GN13	Fourhorn Sculpin	*Myoxocephalus quadricornis*	223.0	110.8
01-Aug-20	Gill Nets	GN13	Fourhorn Sculpin	*Myoxocephalus quadricornis*	211.0	90.0
01-Aug-20	Gill Nets	GN13	Shorthorn Sculpin	*Myoxocephalus scorpius*	191.0	67.3
01-Aug-20	Gill Nets	GN13	Shorthorn Sculpin	*Myoxocephalus scorpius*	186.0	51.9
01-Aug-20	Gill Nets	GN13	Shorthorn Sculpin	*Myoxocephalus scorpius*	366.0	720.0
01-Aug-20	Gill Nets	GN13	Shorthorn Sculpin	*Myoxocephalus scorpius*	194.0	63.4
01-Aug-20	Gill Nets	GN13	Arctic Char	*Salvelinus alpinus*	302.0	270.0
01-Aug-20	Gill Nets	GN13	Arctic Char	*Salvelinus alpinus*	509.0	1920.0
01-Aug-20	Gill Nets	GN13	Arctic Char	*Salvelinus alpinus*	366.0	610.0
01-Aug-20	Gill Nets	GN13	Arctic Char	*Salvelinus alpinus*	414.0	760.0
01-Aug-20	Gill Nets	GN13	Arctic Char	*Salvelinus alpinus*	374.0	720.0
02-Aug-20	Gill Nets	GN14	Fourhorn Sculpin	*Myoxocephalus quadricornis*	257.0	170.0
02-Aug-20	Gill Nets	GN14	Fourhorn Sculpin	*Myoxocephalus quadricornis*	221.0	104.8
02-Aug-20	Gill Nets	GN14	Arctic Char	*Salvelinus alpinus*	526.0	1620.0
02-Aug-20	Gill Nets	GN14	Arctic Char	*Salvelinus alpinus*	380.0	510.0
02-Aug-20	Gill Nets	GN14	Arctic Char	*Salvelinus alpinus*	850.0	6110.0
02-Aug-20	Gill Nets	GN14	Arctic Char	*Salvelinus alpinus*	425.0	520.0
02-Aug-20	Gill Nets	GN15	Arctic Char	*Salvelinus alpinus*	350.0	300.0
02-Aug-20	Gill Nets	GN15	Arctic Char	*Salvelinus alpinus*	381.0	600.0
02-Aug-20	Gill Nets	GN15	Arctic Char	*Salvelinus alpinus*	342.0	410.0
02-Aug-20	Gill Nets	GN15	Arctic Char	*Salvelinus alpinus*	361.0	520.0
02-Aug-20	Gill Nets	GN15	Arctic Char	*Salvelinus alpinus*	354.0	490.0
06-Aug-20	Gill Nets	GN16	Arctic Char	*Salvelinus alpinus*	424.0	940.0
06-Aug-20	Gill Nets	GN16	Arctic Char	*Salvelinus alpinus*	496.0	1570.0
06-Aug-20	Gill Nets	GN16	Arctic Char	*Salvelinus alpinus*	350.0	460.0
08-Aug-20	Gill Nets	GN17	Fourhorn Sculpin	*Myoxocephalus quadricornis*	184.0	70.6
08-Aug-20	Gill Nets	GN17	Fourhorn Sculpin	*Myoxocephalus quadricornis*	169.0	44.5
08-Aug-20	Gill Nets	GN17	Arctic Char	*Salvelinus alpinus*	859.0	6710.0
08-Aug-20	Gill Nets	GN17	Arctic Char	*Salvelinus alpinus*	568.0	2430.0
08-Aug-20	Gill Nets	GN17	Arctic Char	*Salvelinus alpinus*	638.0	3990.0
08-Aug-20	Gill Nets	GN17	Arctic Char	*Salvelinus alpinus*	321.0	380.0
08-Aug-20	Gill Nets	GN17	Arctic Char	*Salvelinus alpinus*	594.0	2550.0
08-Aug-20	Gill Nets	GN17	Arctic Char	*Salvelinus alpinus*	452.0	1240.0
08-Aug-20	Gill Nets	GN17	Arctic Char	*Salvelinus alpinus*	398.0	750.0
08-Aug-20	Gill Nets	GN18	Fourhorn Sculpin	*Myoxocephalus quadricornis*	226.0	80.0
08-Aug-20	Gill Nets	GN18	Fourhorn Sculpin	*Myoxocephalus quadricornis*	219.0	70.0
08-Aug-20	Gill Nets	GN18	Fourhorn Sculpin	*Myoxocephalus quadricornis*	211.0	90.0
08-Aug-20	Gill Nets	GN18	Fourhorn Sculpin	*Myoxocephalus quadricornis*	212.0	107.9
08-Aug-20	Gill Nets	GN18	Arctic Char	*Salvelinus alpinus*	674.0	3910.0
08-Aug-20	Gill Nets	GN18	Arctic Char	*Salvelinus alpinus*	453.0	1140.0
09-Aug-20	Gill Nets	GN19	Fourhorn Sculpin	*Myoxocephalus quadricornis*	228.0	120.0
09-Aug-20	Gill Nets	GN19	Fourhorn Sculpin	*Myoxocephalus quadricornis*	263.0	210.0
09-Aug-20	Gill Nets	GN19	Fourhorn Sculpin	*Myoxocephalus quadricornis*	201.0	40.0
09-Aug-20	Gill Nets	GN19	Fourhorn Sculpin	*Myoxocephalus quadricornis*	209.0	60.0
09-Aug-20	Gill Nets	GN19	Fourhorn Sculpin	*Myoxocephalus quadricornis*	189.0	30.0
09-Aug-20	Gill Nets	GN19	Fourhorn Sculpin	*Myoxocephalus quadricornis*	212.0	70.0
09-Aug-20	Gill Nets	GN19	Shorthorn Sculpin	*Myoxocephalus scorpius*	234.0	180.0
09-Aug-20	Gill Nets	GN19	Shorthorn Sculpin	*Myoxocephalus scorpius*	209.0	120.0
09-Aug-20	Gill Nets	GN19	Arctic Char	*Salvelinus alpinus*	832.0	3830.0
09-Aug-20	Gill Nets	GN19	Arctic Char	*Salvelinus alpinus*	443.0	1190.0
09-Aug-20	Gill Nets	GN19	Arctic Char	*Salvelinus alpinus*	380.0	590.0
09-Aug-20	Gill Nets	GN19	Arctic Char	*Salvelinus alpinus*	403.0	770.0
09-Aug-20	Gill Nets	GN19	Arctic Char	*Salvelinus alpinus*	414.0	840.0
09-Aug-20	Gill Nets	GN19	Arctic Char	*Salvelinus alpinus*	435.0	950.0
09-Aug-20	Gill Nets	GN19	Arctic Char	*Salvelinus alpinus*	372.0	570.0
09-Aug-20	Gill Nets	GN19	Arctic Char	*Salvelinus alpinus*	581.0	2500.0
09-Aug-20	Gill Nets	GN19	Arctic Char	*Salvelinus alpinus*	348.0	510.0
09-Aug-20	Gill Nets	GN19	Arctic Char	*Salvelinus alpinus*	326.0	320.0

Appendix 6B-1
Fish Capture Data

Date	Capture Method	Site	Common Name	Species	Length (mm)	Weight (g)
09-Aug-20	Gill Nets	GN19	Arctic Char	*Salvelinus alpinus*	410.0	810.0
09-Aug-20	Gill Nets	GN19	Arctic Char	*Salvelinus alpinus*	312.0	340.0
09-Aug-20	Gill Nets	GN19	Arctic Char	*Salvelinus alpinus*	318.0	380.0
09-Aug-20	Gill Nets	GN19	Arctic Char	*Salvelinus alpinus*	287.0	250.0
09-Aug-20	Gill Nets	GN19	Arctic Char	*Salvelinus alpinus*	425.0	740.0
09-Aug-20	Gill Nets	GN19	Arctic Char	*Salvelinus alpinus*	291.0	270.0
09-Aug-20	Gill Nets	GN19	Arctic Char	*Salvelinus alpinus*	319.0	360.0
09-Aug-20	Gill Nets	GN19	Arctic Char	*Salvelinus alpinus*	274.0	260.0
09-Aug-20	Gill Nets	GN19	Arctic Char	*Salvelinus alpinus*	312.0	340.0
09-Aug-20	Gill Nets	GN19	Arctic Char	*Salvelinus alpinus*	320.0	210.0
09-Aug-20	Gill Nets	GN19	Arctic Char	*Salvelinus alpinus*	415.0	900.0
09-Aug-20	Gill Nets	GN19	Arctic Char	*Salvelinus alpinus*	383.0	630.0
09-Aug-20	Gill Nets	GN19	Arctic Char	*Salvelinus alpinus*	342.0	460.0
11-Aug-20	Gill Nets	GN20	Fourhorn Sculpin	*Myoxocephalus quadricornis*	216.0	110.0
11-Aug-20	Gill Nets	GN20	Fourhorn Sculpin	*Myoxocephalus quadricornis*	232.0	120.0
11-Aug-20	Gill Nets	GN20	Fourhorn Sculpin	*Myoxocephalus quadricornis*	291.0	310.0
11-Aug-20	Gill Nets	GN20	Fourhorn Sculpin	*Myoxocephalus quadricornis*	264.0	210.0
11-Aug-20	Gill Nets	GN20	Fourhorn Sculpin	*Myoxocephalus quadricornis*	197.0	50.0
11-Aug-20	Gill Nets	GN20	Fourhorn Sculpin	*Myoxocephalus quadricornis*	220.0	110.0
11-Aug-20	Gill Nets	GN20	Shorthorn Sculpin	*Myoxocephalus scorpius*	234.0	170.0
11-Aug-20	Gill Nets	GN20	Shorthorn Sculpin	*Myoxocephalus scorpius*	310.0	400.0
11-Aug-20	Gill Nets	GN20	Shorthorn Sculpin	*Myoxocephalus scorpius*	249.0	200.0
11-Aug-20	Gill Nets	GN20	Arctic Char	*Salvelinus alpinus*	542.0	1780.0
11-Aug-20	Gill Nets	GN20	Arctic Char	*Salvelinus alpinus*	556.0	2060.0
11-Aug-20	Gill Nets	GN20	Arctic Char	*Salvelinus alpinus*	445.0	790.0
11-Aug-20	Gill Nets	GN20	Arctic Char	*Salvelinus alpinus*	310.0	320.0
11-Aug-20	Gill Nets	GN20	Arctic Char	*Salvelinus alpinus*	472.0	1230.0
11-Aug-20	Gill Nets	GN20	Arctic Char	*Salvelinus alpinus*	409.0	740.0
11-Aug-20	Gill Nets	GN20	Arctic Char	*Salvelinus alpinus*	373.0	500.0
11-Aug-20	Gill Nets	GN20	Arctic Char	*Salvelinus alpinus*	387.0	690.0
13-Aug-20	Gill Nets	GN21	Fourhorn Sculpin	*Myoxocephalus quadricornis*	149.0	25.0
13-Aug-20	Gill Nets	GN21	Arctic Char	*Salvelinus alpinus*	314.0	290.0
14-Aug-20	Gill Nets	GN22	Arctic Char	*Salvelinus alpinus*	636.0	3920.0
14-Aug-20	Gill Nets	GN22	Arctic Char	*Salvelinus alpinus*	463.0	1240.0
14-Aug-20	Gill Nets	GN22	Arctic Char	*Salvelinus alpinus*	468.0	1230.0
14-Aug-20	Gill Nets	GN22	Arctic Char	*Salvelinus alpinus*	281.0	280.0
14-Aug-20	Gill Nets	GN22	Arctic Char	*Salvelinus alpinus*	346.0	470.0
14-Aug-20	Gill Nets	GN22	Arctic Char	*Salvelinus alpinus*	309.0	340.0
14-Aug-20	Gill Nets	GN22	Arctic Char	*Salvelinus alpinus*	382.0	530.0
14-Aug-20	Gill Nets	GN22	Arctic Char	*Salvelinus alpinus*	515.0	1680.0
14-Aug-20	Gill Nets	GN23A	Fourhorn Sculpin	*Myoxocephalus quadricornis*	241.0	200.0
14-Aug-20	Gill Nets	GN23A	Fourhorn Sculpin	*Myoxocephalus quadricornis*	245.0	170.0
14-Aug-20	Gill Nets	GN23A	Shorthorn Sculpin	*Myoxocephalus scorpius*	264.0	280.0
14-Aug-20	Gill Nets	GN23A	Shorthorn Sculpin	*Myoxocephalus scorpius*	262.0	280.0
14-Aug-20	Gill Nets	GN23A	Shorthorn Sculpin	*Myoxocephalus scorpius*	126.0	40.0
14-Aug-20	Gill Nets	GN23A	Arctic Char	*Salvelinus alpinus*	395.0	760.0
14-Aug-20	Gill Nets	GN23A	Arctic Char	*Salvelinus alpinus*	424.0	1100.0
14-Aug-20	Gill Nets	GN23A	Arctic Char	*Salvelinus alpinus*	352.0	520.0
14-Aug-20	Gill Nets	GN23A	Arctic Char	*Salvelinus alpinus*	436.0	1120.0
14-Aug-20	Gill Nets	GN23A	Arctic Char	*Salvelinus alpinus*	587.0	2430.0
14-Aug-20	Gill Nets	GN23A	Arctic Char	*Salvelinus alpinus*	359.0	540.0
14-Aug-20	Gill Nets	GN23A	Arctic Char	*Salvelinus alpinus*	420.0	1020.0
14-Aug-20	Gill Nets	GN23A	Arctic Char	*Salvelinus alpinus*	409.0	820.0
14-Aug-20	Gill Nets	GN23A	Arctic Char	*Salvelinus alpinus*	160.0	10.0
14-Aug-20	Gill Nets	GN23A	Arctic Char	*Salvelinus alpinus*	449.0	1200.0
14-Aug-20	Gill Nets	GN23A	Arctic Char	*Salvelinus alpinus*	266.0	130.0
14-Aug-20	Gill Nets	GN23A	Arctic Char	*Salvelinus alpinus*	275.0	110.0
14-Aug-20	Gill Nets	GN23A	Arctic Char	*Salvelinus alpinus*	318.0	140.0
14-Aug-20	Gill Nets	GN23A	Arctic Char	*Salvelinus alpinus*	340.0	230.0
14-Aug-20	Gill Nets	GN23A	Arctic Char	*Salvelinus alpinus*	475.0	1240.0
14-Aug-20	Gill Nets	GN23A	Arctic Char	*Salvelinus alpinus*	330.0	420.0
14-Aug-20	Gill Nets	GN23A	Arctic Char	*Salvelinus alpinus*	360.0	510.0
14-Aug-20	Gill Nets	GN23A	Arctic Char	*Salvelinus alpinus*	308.0	310.0
14-Aug-20	Gill Nets	GN23A	Arctic Char	*Salvelinus alpinus*	298.0	250.0
15-Aug-20	Gill Nets	GN23B	Fourhorn Sculpin	*Myoxocephalus quadricornis*	177.0	40.0
15-Aug-20	Gill Nets	GN23B	Fourhorn Sculpin	*Myoxocephalus quadricornis*	181.0	40.0
15-Aug-20	Gill Nets	GN23B	Fourhorn Sculpin	*Myoxocephalus quadricornis*	257.0	170.0
15-Aug-20	Gill Nets	GN23B	Fourhorn Sculpin	*Myoxocephalus quadricornis*	179.0	40.0
15-Aug-20	Gill Nets	GN23B	Fourhorn Sculpin	*Myoxocephalus quadricornis*	214.0	90.0
15-Aug-20	Gill Nets	GN23B	Fourhorn Sculpin	*Myoxocephalus quadricornis*	178.0	40.0
15-Aug-20	Gill Nets	GN23B	Fourhorn Sculpin	*Myoxocephalus quadricornis*	145.0	20.0
15-Aug-20	Gill Nets	GN23B	Fourhorn Sculpin	*Myoxocephalus quadricornis*	224.0	130.0
15-Aug-20	Gill Nets	GN23B	Fourhorn Sculpin	*Myoxocephalus quadricornis*	178.0	40.0
15-Aug-20	Gill Nets	GN23B	Fourhorn Sculpin	*Myoxocephalus quadricornis*	158.0	30.0
15-Aug-20	Gill Nets	GN23B	Fourhorn Sculpin	*Myoxocephalus quadricornis*	202.0	89.7
15-Aug-20	Gill Nets	GN23B	Fourhorn Sculpin	*Myoxocephalus quadricornis*	163.0	40.9
15-Aug-20	Gill Nets	GN24	Fourhorn Sculpin	*Myoxocephalus quadricornis*	210.0	90.0
15-Aug-20	Gill Nets	GN24	Fourhorn Sculpin	*Myoxocephalus quadricornis*	208.0	90.0
15-Aug-20	Gill Nets	GN24	Fourhorn Sculpin	*Myoxocephalus quadricornis*	162.0	37.1
15-Aug-20	Gill Nets	GN24	Fourhorn Sculpin	*Myoxocephalus quadricornis*	207.0	80.5
15-Aug-20	Gill Nets	GN24	Fourhorn Sculpin	*Myoxocephalus quadricornis*	201.0	73.5
15-Aug-20	Gill Nets	GN24	Fourhorn Sculpin	*Myoxocephalus quadricornis*	146.0	32.7
15-Aug-20	Gill Nets	GN24	Arctic Sculpin	*Myoxocephalus scorpioides*	143.0	39.4
15-Aug-20	Gill Nets	GN24	Arctic Char	*Salvelinus alpinus*	542.0	2120.0
15-Aug-20	Gill Nets	GN24	Arctic Char	*Salvelinus alpinus*	548.0	2160.0
15-Aug-20	Gill Nets	GN24	Arctic Char	*Salvelinus alpinus*	175.0	65.2
24-Jul-20	Hoop Nets	HN01	Unidentified Sculpin	Cottidae indet.	97.0	6.2
24-Jul-20	Hoop Nets	HN01	Unidentified Sculpin	Cottidae indet.	153.0	31.0
24-Jul-20	Hoop Nets	HN01	Unidentified Sculpin	Cottidae indet.	150.0	30.9

Appendix 6B-1
Fish Capture Data

Date	Capture Method	Site	Common Name	Species	Length (mm)	Weight (g)
24-Jul-20	Hoop Nets	HN01	Fourhorn Sculpin	*Myoxocephalus quadricornis*	186.0	52.6
24-Jul-20	Hoop Nets	HN01	Fourhorn Sculpin	*Myoxocephalus quadricornis*	190.0	72.5
24-Jul-20	Hoop Nets	HN01	Fourhorn Sculpin	*Myoxocephalus quadricornis*	178.0	49.5
24-Jul-20	Hoop Nets	HN01	Fourhorn Sculpin	*Myoxocephalus quadricornis*	172.0	43.8
24-Jul-20	Hoop Nets	HN01	Fourhorn Sculpin	*Myoxocephalus quadricornis*	205.0	91.5
24-Jul-20	Hoop Nets	HN01	Fourhorn Sculpin	*Myoxocephalus quadricornis*	230.0	100.0
24-Jul-20	Hoop Nets	HN01	Fourhorn Sculpin	*Myoxocephalus quadricornis*	160.0	33.4
24-Jul-20	Hoop Nets	HN01	Fourhorn Sculpin	*Myoxocephalus quadricornis*	204.0	92.5
24-Jul-20	Hoop Nets	HN01	Fourhorn Sculpin	*Myoxocephalus quadricornis*	235.0	106.7
24-Jul-20	Hoop Nets	HN01	Fourhorn Sculpin	*Myoxocephalus quadricornis*	-	340.0
24-Jul-20	Hoop Nets	HN01	Fourhorn Sculpin	*Myoxocephalus quadricornis*	307.0	290.0
24-Jul-20	Hoop Nets	HN01	Fourhorn Sculpin	*Myoxocephalus quadricornis*	268.0	200.0
24-Jul-20	Hoop Nets	HN01	Fourhorn Sculpin	*Myoxocephalus quadricornis*	261.0	130.0
24-Jul-20	Hoop Nets	HN01	Fourhorn Sculpin	*Myoxocephalus quadricornis*	214.0	84.9
24-Jul-20	Hoop Nets	HN01	Fourhorn Sculpin	*Myoxocephalus quadricornis*	231.0	110.0
24-Jul-20	Hoop Nets	HN01	Fourhorn Sculpin	*Myoxocephalus quadricornis*	190.0	65.3
24-Jul-20	Hoop Nets	HN01	Fourhorn Sculpin	*Myoxocephalus quadricornis*	231.0	130.0
24-Jul-20	Hoop Nets	HN01	Fourhorn Sculpin	*Myoxocephalus quadricornis*	174.0	62.5
24-Jul-20	Hoop Nets	HN01	Fourhorn Sculpin	*Myoxocephalus quadricornis*	146.0	26.6
24-Jul-20	Hoop Nets	HN01	Fourhorn Sculpin	*Myoxocephalus quadricornis*	180.0	54.4
24-Jul-20	Hoop Nets	HN01	Fourhorn Sculpin	*Myoxocephalus quadricornis*	139.0	24.4
24-Jul-20	Hoop Nets	HN01	Fourhorn Sculpin	*Myoxocephalus quadricornis*	214.0	99.1
24-Jul-20	Hoop Nets	HN01	Fourhorn Sculpin	*Myoxocephalus quadricornis*	182.0	58.0
24-Jul-20	Hoop Nets	HN01	Fourhorn Sculpin	*Myoxocephalus quadricornis*	248.0	120.0
24-Jul-20	Hoop Nets	HN01	Fourhorn Sculpin	*Myoxocephalus quadricornis*	178.0	51.7
24-Jul-20	Hoop Nets	HN01	Fourhorn Sculpin	*Myoxocephalus quadricornis*	290.0	270.0
24-Jul-20	Hoop Nets	HN01	Fourhorn Sculpin	*Myoxocephalus quadricornis*	230.0	120.0
24-Jul-20	Hoop Nets	HN01	Fourhorn Sculpin	*Myoxocephalus quadricornis*	232.0	112.5
24-Jul-20	Hoop Nets	HN01	Fourhorn Sculpin	*Myoxocephalus quadricornis*	192.0	67.9
24-Jul-20	Hoop Nets	HN01	Fourhorn Sculpin	*Myoxocephalus quadricornis*	270.0	250.0
24-Jul-20	Hoop Nets	HN01	Fourhorn Sculpin	*Myoxocephalus quadricornis*	238.0	130.0
24-Jul-20	Hoop Nets	HN01	Fourhorn Sculpin	*Myoxocephalus quadricornis*	230.0	150.0
24-Jul-20	Hoop Nets	HN01	Fourhorn Sculpin	*Myoxocephalus quadricornis*	198.0	79.7
24-Jul-20	Hoop Nets	HN01	Fourhorn Sculpin	*Myoxocephalus quadricornis*	242.0	140.0
24-Jul-20	Hoop Nets	HN01	Fourhorn Sculpin	*Myoxocephalus quadricornis*	246.0	160.0
24-Jul-20	Hoop Nets	HN01	Fourhorn Sculpin	*Myoxocephalus quadricornis*	284.0	220.0
24-Jul-20	Hoop Nets	HN01	Fourhorn Sculpin	*Myoxocephalus quadricornis*	276.0	250.0
24-Jul-20	Hoop Nets	HN01	Fourhorn Sculpin	*Myoxocephalus quadricornis*	244.0	140.0
24-Jul-20	Hoop Nets	HN01	Fourhorn Sculpin	*Myoxocephalus quadricornis*	198.0	66.2
24-Jul-20	Hoop Nets	HN01	Shorthorn Sculpin	*Myoxocephalus scorpius*	184.0	64.1
24-Jul-20	Hoop Nets	HN02	No fish Caught	-	-	-
24-Jul-20	Hoop Nets	HN02	No fish Caught	-	-	-
24-Jul-20	Hoop Nets	HN02	Fourhorn Sculpin	*Myoxocephalus quadricornis*	151.0	28.3
24-Jul-20	Hoop Nets	HN02	Fourhorn Sculpin	*Myoxocephalus quadricornis*	170.0	42.6
24-Jul-20	Hoop Nets	HN02	Fourhorn Sculpin	*Myoxocephalus quadricornis*	160.0	34.4
24-Jul-20	Hoop Nets	HN02	Fourhorn Sculpin	*Myoxocephalus quadricornis*	165.0	43.1
24-Jul-20	Hoop Nets	HN02	Fourhorn Sculpin	*Myoxocephalus quadricornis*	174.0	67.1
28-Jul-20	Hoop Nets	HN03	Fourhorn Sculpin	*Myoxocephalus quadricornis*	190.0	56.4
28-Jul-20	Hoop Nets	HN03	Shorthorn Sculpin	*Myoxocephalus scorpius*	159.0	32.9
28-Jul-20	Hoop Nets	HN04	Shorthorn Sculpin	*Myoxocephalus scorpius*	177.0	36.1
31-Jul-20	Hoop Nets	HN05	Greenland Cod	*Gadus ogac*	472.0	1260.0
31-Jul-20	Hoop Nets	HN05	Fourhorn Sculpin	*Myoxocephalus quadricornis*	180.0	46.9
31-Jul-20	Hoop Nets	HN05	Fourhorn Sculpin	*Myoxocephalus quadricornis*	147.0	23.6
31-Jul-20	Hoop Nets	HN05	Fourhorn Sculpin	*Myoxocephalus quadricornis*	210.0	81.2
31-Jul-20	Hoop Nets	HN05	Fourhorn Sculpin	*Myoxocephalus quadricornis*	175.0	48.7
31-Jul-20	Hoop Nets	HN05	Fourhorn Sculpin	*Myoxocephalus quadricornis*	211.0	89.1
31-Jul-20	Hoop Nets	HN05	Fourhorn Sculpin	*Myoxocephalus quadricornis*	194.0	65.4
31-Jul-20	Hoop Nets	HN05	Fourhorn Sculpin	*Myoxocephalus quadricornis*	209.0	79.0
31-Jul-20	Hoop Nets	HN05	Fourhorn Sculpin	*Myoxocephalus quadricornis*	174.0	42.1
31-Jul-20	Hoop Nets	HN05	Fourhorn Sculpin	*Myoxocephalus quadricornis*	182.0	59.0
31-Jul-20	Hoop Nets	HN05	Fourhorn Sculpin	*Myoxocephalus quadricornis*	189.0	80.2
31-Jul-20	Hoop Nets	HN05	Fourhorn Sculpin	*Myoxocephalus quadricornis*	276.0	230.0
31-Jul-20	Hoop Nets	HN05	Fourhorn Sculpin	*Myoxocephalus quadricornis*	190.0	70.7
31-Jul-20	Hoop Nets	HN05	Fourhorn Sculpin	*Myoxocephalus quadricornis*	230.0	125.9
31-Jul-20	Hoop Nets	HN05	Fourhorn Sculpin	*Myoxocephalus quadricornis*	216.0	91.2
31-Jul-20	Hoop Nets	HN05	Fourhorn Sculpin	*Myoxocephalus quadricornis*	229.0	120.0
31-Jul-20	Hoop Nets	HN05	Fourhorn Sculpin	*Myoxocephalus quadricornis*	217.0	101.1
31-Jul-20	Hoop Nets	HN05	Fourhorn Sculpin	*Myoxocephalus quadricornis*	274.0	190.0
31-Jul-20	Hoop Nets	HN05	Fourhorn Sculpin	*Myoxocephalus quadricornis*	219.0	102.2
31-Jul-20	Hoop Nets	HN05	Fourhorn Sculpin	*Myoxocephalus quadricornis*	231.0	130.0
31-Jul-20	Hoop Nets	HN05	Fourhorn Sculpin	*Myoxocephalus quadricornis*	166.0	36.5
31-Jul-20	Hoop Nets	HN05	Fourhorn Sculpin	*Myoxocephalus quadricornis*	225.0	107.6
31-Jul-20	Hoop Nets	HN06	Fourhorn Sculpin	*Myoxocephalus quadricornis*	172.0	46.5
31-Jul-20	Hoop Nets	HN06	Fourhorn Sculpin	*Myoxocephalus quadricornis*	161.0	41.2
31-Jul-20	Hoop Nets	HN06	Fourhorn Sculpin	*Myoxocephalus quadricornis*	223.0	113.9
31-Jul-20	Hoop Nets	HN06	Fourhorn Sculpin	*Myoxocephalus quadricornis*	179.0	50.2
01-Aug-20	Hoop Nets	HN07	No fish Caught	-	-	-
02-Aug-20	Hoop Nets	HN08	Greenland Cod	*Gadus ogac*	459.0	2300.0
06-Aug-20	Hoop Nets	HN09	Fourhorn Sculpin	*Myoxocephalus quadricornis*	180.0	45.3
06-Aug-20	Hoop Nets	HN09	Fourhorn Sculpin	*Myoxocephalus quadricornis*	161.0	38.5
06-Aug-20	Hoop Nets	HN10	Fourhorn Sculpin	*Myoxocephalus quadricornis*	163.0	33.2
06-Aug-20	Hoop Nets	HN10	Arctic Char	*Salvelinus alpinus*	191.0	79.6
11-Aug-20	Hoop Nets	HN11	Greenland Cod	*Gadus ogac*	488.0	1180.0
11-Aug-20	Hoop Nets	HN11	Arctic Sculpin	*Myoxocephalus scorpioides*	274.0	200.0
24-Jul-20	Seine Nets	SN01	Unidentified Sculpin	Cottidae indet.	90.0	5.2
24-Jul-20	Seine Nets	SN01	Unidentified Sculpin	Cottidae indet.	87.0	5.1
24-Jul-20	Seine Nets	SN01	Unidentified Sculpin	Cottidae indet.	91.0	6.0
24-Jul-20	Seine Nets	SN01	Unidentified Sculpin	Cottidae indet.	95.0	7.0
24-Jul-20	Seine Nets	SN01	Unidentified Sculpin	Cottidae indet.	113.0	9.0

Appendix 6B-1
Fish Capture Data

Date	Capture Method	Site	Common Name	Species	Length (mm)	Weight (g)
24-Jul-20	Seine Nets	SN01	Unidentified Sculpin	Cottidae indet.	95.0	6.2
24-Jul-20	Seine Nets	SN01	Unidentified Sculpin	Cottidae indet.	89.0	5.2
24-Jul-20	Seine Nets	SN01	Unidentified Sculpin	Cottidae indet.	80.0	3.3
24-Jul-20	Seine Nets	SN01	Unidentified Sculpin	Cottidae indet.	80.0	3.4
24-Jul-20	Seine Nets	SN01	Fourhorn Sculpin	*Myoxocephalus quadricornis*	134.0	20.3
24-Jul-20	Seine Nets	SN01	Fourhorn Sculpin	*Myoxocephalus quadricornis*	134.0	16.6
24-Jul-20	Seine Nets	SN01	Fourhorn Sculpin	*Myoxocephalus quadricornis*	130.0	18.9
24-Jul-20	Seine Nets	SN02	Unidentified Sculpin	Cottidae indet.	135.0	19.6
24-Jul-20	Seine Nets	SN02	Unidentified Sculpin	Cottidae indet.	125.0	15.3
24-Jul-20	Seine Nets	SN02	Unidentified Sculpin	Cottidae indet.	127.0	17.2
24-Jul-20	Seine Nets	SN02	Unidentified Sculpin	Cottidae indet.	81.0	3.9
24-Jul-20	Seine Nets	SN02	Unidentified Sculpin	Cottidae indet.	80.0	4.0
24-Jul-20	Seine Nets	SN02	Unidentified Sculpin	Cottidae indet.	71.0	2.9
24-Jul-20	Seine Nets	SN02	Unidentified Sculpin	Cottidae indet.	78.0	3.1
24-Jul-20	Seine Nets	SN02	Unidentified Sculpin	Cottidae indet.	80.0	3.6
24-Jul-20	Seine Nets	SN02	Unidentified Sculpin	Cottidae indet.	80.0	3.8
24-Jul-20	Seine Nets	SN02	Unidentified Sculpin	Cottidae indet.	81.0	4.0
24-Jul-20	Seine Nets	SN02	Unidentified Sculpin	Cottidae indet.	72.0	2.6
24-Jul-20	Seine Nets	SN02	Unidentified Sculpin	Cottidae indet.	65.0	2.4
24-Jul-20	Seine Nets	SN02	Fourhorn Sculpin	*Myoxocephalus quadricornis*	187.0	65.0
24-Jul-20	Seine Nets	SN02	Fourhorn Sculpin	*Myoxocephalus quadricornis*	193.0	54.0
24-Jul-20	Seine Nets	SN03	Unidentified Sculpin	Cottidae indet.	131.0	17.7
24-Jul-20	Seine Nets	SN03	Unidentified Sculpin	Cottidae indet.	94.0	5.9
24-Jul-20	Seine Nets	SN03	Unidentified Sculpin	Cottidae indet.	91.0	5.6
24-Jul-20	Seine Nets	SN03	Unidentified Sculpin	Cottidae indet.	88.0	4.9
24-Jul-20	Seine Nets	SN03	Unidentified Sculpin	Cottidae indet.	106.0	9.3
24-Jul-20	Seine Nets	SN03	Unidentified Sculpin	Cottidae indet.	133.0	17.8
24-Jul-20	Seine Nets	SN03	Fourhorn Sculpin	*Myoxocephalus quadricornis*	177.0	37.9
24-Jul-20	Seine Nets	SN03	Fourhorn Sculpin	*Myoxocephalus quadricornis*	142.0	22.3
24-Jul-20	Seine Nets	SN04	No fish Caught	-	-	-
24-Jul-20	Seine Nets	SN05	Unidentified Sculpin	Cottidae indet.	80.0	3.3
24-Jul-20	Seine Nets	SN05	Unidentified Sculpin	Cottidae indet.	79.0	2.9
24-Jul-20	Seine Nets	SN05	Unidentified Sculpin	Cottidae indet.	71.0	2.6
24-Jul-20	Seine Nets	SN05	Unidentified Sculpin	Cottidae indet.	128.0	16.6
24-Jul-20	Seine Nets	SN06	Unidentified Sculpin	Cottidae indet.	115.0	11.4
24-Jul-20	Seine Nets	SN06	Unidentified Sculpin	Cottidae indet.	84.0	5.4
24-Jul-20	Seine Nets	SN06	Fourhorn Sculpin	*Myoxocephalus quadricornis*	163.0	46.5
24-Jul-20	Seine Nets	SN07	Sandlance	*Ammodytes* spp.	132.0	6.3
24-Jul-20	Seine Nets	SN07	Sandlance	*Ammodytes* spp.	140.0	6.6
24-Jul-20	Seine Nets	SN07	Unidentified Sculpin	Cottidae indet.	80.0	3.8
24-Jul-20	Seine Nets	SN07	Fourhorn Sculpin	*Myoxocephalus quadricornis*	144.0	23.4
24-Jul-20	Seine Nets	SN07	Fourhorn Sculpin	*Myoxocephalus quadricornis*	126.0	15.9
24-Jul-20	Seine Nets	SN07	Fourhorn Sculpin	*Myoxocephalus quadricornis*	92.0	6.0
24-Jul-20	Seine Nets	SN07	Fourhorn Sculpin	*Myoxocephalus quadricornis*	93.0	5.8
24-Jul-20	Seine Nets	SN07	Fourhorn Sculpin	*Myoxocephalus quadricornis*	87.0	5.1
24-Jul-20	Seine Nets	SN07	Fourhorn Sculpin	*Myoxocephalus quadricornis*	85.0	3.9
24-Jul-20	Seine Nets	SN07	Fourhorn Sculpin	*Myoxocephalus quadricornis*	84.0	3.9
24-Jul-20	Seine Nets	SN07	Fourhorn Sculpin	*Myoxocephalus quadricornis*	78.0	3.3
24-Jul-20	Seine Nets	SN07	Fourhorn Sculpin	*Myoxocephalus quadricornis*	84.0	3.7
24-Jul-20	Seine Nets	SN07	Fourhorn Sculpin	*Myoxocephalus quadricornis*	86.0	4.6
24-Jul-20	Seine Nets	SN07	Fourhorn Sculpin	*Myoxocephalus quadricornis*	72.0	2.6
24-Jul-20	Seine Nets	SN07	Fourhorn Sculpin	*Myoxocephalus quadricornis*	73.0	2.8
25-Jul-20	Seine Nets	SN08	Sandlance	*Ammodytes* spp.	-	-
25-Jul-20	Seine Nets	SN08	Fourhorn Sculpin	*Myoxocephalus quadricornis*	123.0	14.1
25-Jul-20	Seine Nets	SN08	Fourhorn Sculpin	*Myoxocephalus quadricornis*	115.0	11.1
25-Jul-20	Seine Nets	SN08	Fourhorn Sculpin	*Myoxocephalus quadricornis*	83.0	4.1
25-Jul-20	Seine Nets	SN08	Fourhorn Sculpin	*Myoxocephalus quadricornis*	87.0	4.8
26-Jul-20	Seine Nets	SN09	No fish Caught	-	-	-
26-Jul-20	Seine Nets	SN10	Unidentified Sculpin	Cottidae indet.	11.0	<0.5
26-Jul-20	Seine Nets	SN11	Arctic Char	*Salvelinus alpinus*	132.0	18.7
26-Jul-20	Seine Nets	SN12	Unidentified Sculpin	Cottidae indet.	118.0	13.0
26-Jul-20	Seine Nets	SN12	Unidentified Sculpin	Cottidae indet.	113.0	11.3
29-Jul-20	Seine Nets	SN13	Unidentified Sculpin	Cottidae indet.	31.0	0.5
29-Jul-20	Seine Nets	SN13	Unidentified Sculpin	Cottidae indet.	22.0	<0.5
29-Jul-20	Seine Nets	SN13	Unidentified Sculpin	Cottidae indet.	27.0	<0.5
29-Jul-20	Seine Nets	SN13	Unidentified Sculpin	Cottidae indet.	30.0	<0.5
29-Jul-20	Seine Nets	SN13	Unidentified Sculpin	Cottidae indet.	25.0	<0.5
29-Jul-20	Seine Nets	SN13	Unidentified Sculpin	Cottidae indet.	30.0	<0.5
29-Jul-20	Seine Nets	SN13	Unidentified Sculpin	Cottidae indet.	23.0	<0.5
29-Jul-20	Seine Nets	SN13	Unidentified Sculpin	Cottidae indet.	-	<0.5
29-Jul-20	Seine Nets	SN13	Unidentified Sculpin	Cottidae indet.	-	<0.5
29-Jul-20	Seine Nets	SN13	Unidentified Sculpin	Cottidae indet.	27.0	<0.5
29-Jul-20	Seine Nets	SN13	Unidentified Sculpin	Cottidae indet.	28.0	<0.5
29-Jul-20	Seine Nets	SN13	Unidentified Sculpin	Cottidae indet.	24.0	<0.5
29-Jul-20	Seine Nets	SN14	No fish Caught	-	-	-
29-Jul-20	Seine Nets	SN15	Unidentified Sculpin	Cottidae indet.	80.0	3.4
29-Jul-20	Seine Nets	SN16	Unidentified Sculpin	Cottidae indet.	91.0	6.5
29-Jul-20	Seine Nets	SN17	No fish Caught	-	-	-
29-Jul-20	Seine Nets	SN18	No fish Caught	-	-	-
13-Aug-20	Trawl	TRL01	Polar Cod	*Arctogadus glacialis*	-	-
13-Aug-20	Trawl	TRL01	Polar Cod	*Arctogadus glacialis*	-	-
13-Aug-20	Trawl	TRL01	Polar Cod	*Arctogadus glacialis*	-	-
13-Aug-20	Trawl	TRL01	Polar Cod	*Arctogadus glacialis*	-	-
13-Aug-20	Trawl	TRL01	Polar Cod	*Arctogadus glacialis*	-	-
13-Aug-20	Trawl	TRL01	Polar Cod	*Arctogadus glacialis*	-	-
13-Aug-20	Trawl	TRL01	Polar Cod	*Arctogadus glacialis*	-	-
13-Aug-20	Trawl	TRL01	Polar Cod	*Arctogadus glacialis*	-	-
13-Aug-20	Trawl	TRL01	Polar Cod	*Arctogadus glacialis*	-	-
13-Aug-20	Trawl	TRL01	Polar Cod	*Arctogadus glacialis*	-	-

Appendix 6B-1
Fish Capture Data

Date	Capture Method	Site	Common Name	Species	Length (mm)	Weight (g)
13-Aug-20	Trawl	TRL01	Polar Cod	*Arctogadus glacialis*	-	-
13-Aug-20	Trawl	TRL01	Polar Cod	*Arctogadus glacialis*	-	-
13-Aug-20	Trawl	TRL01	Polar Cod	*Arctogadus glacialis*	-	-
13-Aug-20	Trawl	TRL01	Polar Cod	*Arctogadus glacialis*	-	-
13-Aug-20	Trawl	TRL01	Polar Cod	*Arctogadus glacialis*	-	-
13-Aug-20	Trawl	TRL01	Polar Cod	*Arctogadus glacialis*	-	-
13-Aug-20	Trawl	TRL01	Polar Cod	*Arctogadus glacialis*	-	-
13-Aug-20	Trawl	TRL01	Polar Cod	*Arctogadus glacialis*	-	-
13-Aug-20	Trawl	TRL01	Polar Cod	*Arctogadus glacialis*	-	-
13-Aug-20	Trawl	TRL01	Polar Cod	*Arctogadus glacialis*	-	-
13-Aug-20	Trawl	TRL01	Polar Cod	*Arctogadus glacialis*	-	-
13-Aug-20	Trawl	TRL01	Polar Cod	*Arctogadus glacialis*	-	-
13-Aug-20	Trawl	TRL01	Polar Cod	*Arctogadus glacialis*	-	-
13-Aug-20	Trawl	TRL01	Polar Cod	*Arctogadus glacialis*	-	-
13-Aug-20	Trawl	TRL01	Polar Cod	*Arctogadus glacialis*	-	-
13-Aug-20	Trawl	TRL01	Polar Cod	*Arctogadus glacialis*	-	-
13-Aug-20	Trawl	TRL01	Polar Cod	*Arctogadus glacialis*	-	-
13-Aug-20	Trawl	TRL01	Polar Cod	*Arctogadus glacialis*	-	-
13-Aug-20	Trawl	TRL01	Polar Cod	*Arctogadus glacialis*	-	-
13-Aug-20	Trawl	TRL01	Polar Cod	*Arctogadus glacialis*	-	-
13-Aug-20	Trawl	TRL01	Polar Cod	*Arctogadus glacialis*	-	-
13-Aug-20	Trawl	TRL01	Polar Cod	*Arctogadus glacialis*	-	-
13-Aug-20	Trawl	TRL01	Polar Cod	*Arctogadus glacialis*	-	-
13-Aug-20	Trawl	TRL01	Polar Cod	*Arctogadus glacialis*	-	-
13-Aug-20	Trawl	TRL01	Polar Cod	*Arctogadus glacialis*	-	-
13-Aug-20	Trawl	TRL01	Polar Cod	*Arctogadus glacialis*	-	-
13-Aug-20	Trawl	TRL01	Polar Cod	*Arctogadus glacialis*	-	-
13-Aug-20	Trawl	TRL01	Polar Cod	*Arctogadus glacialis*	-	-
13-Aug-20	Trawl	TRL01	Polar Cod	*Arctogadus glacialis*	-	-
13-Aug-20	Trawl	TRL01	Polar Cod	*Arctogadus glacialis*	-	-
13-Aug-20	Trawl	TRL01	Polar Cod	*Arctogadus glacialis*	-	-
13-Aug-20	Trawl	TRL01	Polar Cod	*Arctogadus glacialis*	-	-
13-Aug-20	Trawl	TRL01	Polar Cod	*Arctogadus glacialis*	-	-
13-Aug-20	Trawl	TRL01	Polar Cod	*Arctogadus glacialis*	-	-
13-Aug-20	Trawl	TRL01	Polar Cod	*Arctogadus glacialis*	-	-
13-Aug-20	Trawl	TRL01	Polar Cod	*Arctogadus glacialis*	-	-
13-Aug-20	Trawl	TRL01	Polar Cod	*Arctogadus glacialis*	-	-
13-Aug-20	Trawl	TRL01	Polar Cod	*Arctogadus glacialis*	-	-
13-Aug-20	Trawl	TRL01	Polar Cod	*Arctogadus glacialis*	-	-
13-Aug-20	Trawl	TRL01	Polar Cod	*Arctogadus glacialis*	-	-
13-Aug-20	Trawl	TRL01	Polar Cod	*Arctogadus glacialis*	-	-
13-Aug-20	Trawl	TRL01	Polar Cod	*Arctogadus glacialis*	-	-
13-Aug-20	Trawl	TRL01	Polar Cod	*Arctogadus glacialis*	-	-
13-Aug-20	Trawl	TRL01	Polar Cod	*Arctogadus glacialis*	-	-
13-Aug-20	Trawl	TRL01	Polar Cod	*Arctogadus glacialis*	-	-
13-Aug-20	Trawl	TRL01	Polar Cod	*Arctogadus glacialis*	-	-
13-Aug-20	Trawl	TRL01	Polar Cod	*Arctogadus glacialis*	-	-
13-Aug-20	Trawl	TRL01	Polar Cod	*Arctogadus glacialis*	-	-
13-Aug-20	Trawl	TRL01	Polar Cod	*Arctogadus glacialis*	-	-
13-Aug-20	Trawl	TRL01	Polar Cod	*Arctogadus glacialis*	-	-
13-Aug-20	Trawl	TRL01	Polar Cod	*Arctogadus glacialis*	-	-
13-Aug-20	Trawl	TRL01	Polar Cod	*Arctogadus glacialis*	-	-
13-Aug-20	Trawl	TRL01	Polar Cod	*Arctogadus glacialis*	-	-
13-Aug-20	Trawl	TRL01	Polar Cod	*Arctogadus glacialis*	-	-
13-Aug-20	Trawl	TRL01	Polar Cod	*Arctogadus glacialis*	-	-
13-Aug-20	Trawl	TRL01	Polar Cod	*Arctogadus glacialis*	-	-
13-Aug-20	Trawl	TRL01	Polar Cod	*Arctogadus glacialis*	-	-
13-Aug-20	Trawl	TRL01	Polar Cod	*Arctogadus glacialis*	-	-
13-Aug-20	Trawl	TRL01	Polar Cod	*Arctogadus glacialis*	-	-
13-Aug-20	Trawl	TRL01	Polar Cod	*Arctogadus glacialis*	-	-
13-Aug-20	Trawl	TRL01	Arctic Staghorn Sculpin	*Gymnocanthus tricuspis*	-	-
13-Aug-20	Trawl	TRL01	Arctic Staghorn Sculpin	*Gymnocanthus tricuspis*	-	-
13-Aug-20	Trawl	TRL01	Arctic Staghorn Sculpin	*Gymnocanthus tricuspis*	-	-
13-Aug-20	Trawl	TRL01	Arctic Staghorn Sculpin	*Gymnocanthus tricuspis*	-	-
13-Aug-20	Trawl	TRL01	Arctic Staghorn Sculpin	*Gymnocanthus tricuspis*	-	-
13-Aug-20	Trawl	TRL01	Arctic Staghorn Sculpin	*Gymnocanthus tricuspis*	-	-
13-Aug-20	Trawl	TRL01	Arctic Staghorn Sculpin	*Gymnocanthus tricuspis*	-	-
13-Aug-20	Trawl	TRL01	Arctic Staghorn Sculpin	*Gymnocanthus tricuspis*	-	-
13-Aug-20	Trawl	TRL01	Arctic Staghorn Sculpin	*Gymnocanthus tricuspis*	-	-
13-Aug-20	Trawl	TRL01	Arctic Staghorn Sculpin	*Gymnocanthus tricuspis*	-	-
13-Aug-20	Trawl	TRL01	Triglops Sculpin	*Triglops* sp.	-	-
13-Aug-20	Trawl	TRL01	Triglops Sculpin	*Triglops* sp.	-	-
13-Aug-20	Trawl	TRL01	Triglops Sculpin	*Triglops* sp.	-	-
13-Aug-20	Trawl	TRL01	Triglops Sculpin	*Triglops* sp.	-	-
13-Aug-20	Trawl	TRL01	Triglops Sculpin	*Triglops* sp.	-	-
13-Aug-20	Trawl	TRL01	Triglops Sculpin	*Triglops* sp.	-	-
13-Aug-20	Trawl	TRL01	Triglops Sculpin	*Triglops* sp.	-	-
13-Aug-20	Trawl	TRL01	Triglops Sculpin	*Triglops* sp.	-	-
13-Aug-20	Trawl	TRL01	Triglops Sculpin	*Triglops* sp.	-	-

APPENDIX 6B-2

Fish Catch Data (2021)

Appendix 6B-2
Fish Capture Data

Date	Capture Method	Site	Common Name	Species	Length (mm)	Weight (g)
10-Aug-21	Angling	AN06	Arctic Char	*Salvelinus alpinus*	630	2,750
10-Aug-21	Angling	AN08	Arctic Char	*Salvelinus alpinus*	522	1,620
10-Aug-21	Angling	AN08	Arctic Char	*Salvelinus alpinus*	700	4,600
11-Aug-21	Angling	AN09	Arctic Char	*Salvelinus alpinus*	559	1,890
15-Aug-21	Angling	AN15	Arctic Char	*Salvelinus alpinus*	268	230
16-Aug-21	Angling	AN23	Arctic Char	*Salvelinus alpinus*	552	2,030
08-Aug-21	Angling	AN04	Arctic Sculpin	*Myoxocephalus scorpioides*	134	15
08-Aug-21	Angling	AN04	Arctic Sculpin	*Myoxocephalus scorpioides*	237	120
08-Aug-21	Angling	AN04	Arctic Sculpin	*Myoxocephalus scorpioides*	246	180
08-Aug-21	Angling	AN04	Arctic Sculpin	*Myoxocephalus scorpioides*	222	100
09-Aug-21	Angling	AN05	Arctic Sculpin	*Myoxocephalus scorpioides*	105	40
09-Aug-21	Angling	AN05	Arctic Sculpin	*Myoxocephalus scorpioides*	114	20
10-Aug-21	Angling	AN07	Arctic Sculpin	*Myoxocephalus scorpioides*	129	30
10-Aug-21	Angling	AN07	Arctic Sculpin	*Myoxocephalus scorpioides*	130	20
10-Aug-21	Angling	AN08	Arctic Sculpin	*Myoxocephalus scorpioides*	120	20
15-Aug-21	Angling	AN15	Arctic Sculpin	*Myoxocephalus scorpioides*	183	70
15-Aug-21	Angling	AN15	Arctic Sculpin	*Myoxocephalus scorpioides*	115	30
15-Aug-21	Angling	AN15	Arctic Sculpin	*Myoxocephalus scorpioides*	104	15
16-Aug-21	Angling	AN22	Arctic Sculpin	*Myoxocephalus scorpioides*	129	40
16-Aug-21	Angling	AN22	Arctic Sculpin	*Myoxocephalus scorpioides*	105	20
16-Aug-21	Angling	AN22	Arctic Sculpin	*Myoxocephalus scorpioides*	113	30
16-Aug-21	Angling	AN22	Arctic Sculpin	*Myoxocephalus scorpioides*	134	30
16-Aug-21	Angling	AN22	Arctic Sculpin	*Myoxocephalus scorpioides*	121	30
16-Aug-21	Angling	AN22	Arctic Sculpin	*Myoxocephalus scorpioides*	122	35
17-Aug-21	Angling	AN25	Arctic Sculpin	*Myoxocephalus scorpioides*	213	150
17-Aug-21	Angling	AN25	Arctic Sculpin	*Myoxocephalus scorpioides*	212	150
17-Aug-21	Angling	AN25	Arctic Sculpin	*Myoxocephalus scorpioides*	185	100
17-Aug-21	Angling	AN27	Arctic Sculpin	*Myoxocephalus scorpioides*	233	140
18-Aug-21	Angling	AN29	Arctic Sculpin	*Myoxocephalus scorpioides*	128	30
18-Aug-21	Angling	AN31	Arctic Sculpin	*Myoxocephalus scorpioides*	122	10
18-Aug-21	Angling	AN31	Arctic Sculpin	*Myoxocephalus scorpioides*	131	30
18-Aug-21	Angling	AN31	Arctic Sculpin	*Myoxocephalus scorpioides*	127	30
18-Aug-21	Angling	AN31	Arctic Sculpin	*Myoxocephalus scorpioides*	145	20
18-Aug-21	Angling	AN31	Arctic Sculpin	*Myoxocephalus scorpioides*	120	20
18-Aug-21	Angling	AN31	Arctic Sculpin	*Myoxocephalus scorpioides*	124	50
18-Aug-21	Angling	AN31	Arctic Sculpin	*Myoxocephalus scorpioides*	128	20
18-Aug-21	Angling	AN31	Arctic Sculpin	*Myoxocephalus scorpioides*	147	40
18-Aug-21	Angling	AN31	Arctic Sculpin	*Myoxocephalus scorpioides*	129	30
18-Aug-21	Angling	AN31	Arctic Sculpin	*Myoxocephalus scorpioides*	139	20
08-Aug-21	Angling	AN04	Fourhorn Sculpin	*Myoxocephalus quadricornis*	210	70
08-Aug-21	Angling	AN04	Fourhorn Sculpin	*Myoxocephalus quadricornis*	149	30
08-Aug-21	Angling	AN04	Fourhorn Sculpin	*Myoxocephalus quadricornis*	204	110
08-Aug-21	Angling	AN04	Fourhorn Sculpin	*Myoxocephalus quadricornis*	219	100
08-Aug-21	Angling	AN04	Fourhorn Sculpin	*Myoxocephalus quadricornis*	186	60
08-Aug-21	Angling	AN04	Fourhorn Sculpin	*Myoxocephalus quadricornis*	233	120
08-Aug-21	Angling	AN04	Fourhorn Sculpin	*Myoxocephalus quadricornis*	203	70
08-Aug-21	Angling	AN04	Fourhorn Sculpin	*Myoxocephalus quadricornis*	195	55
08-Aug-21	Angling	AN04	Fourhorn Sculpin	*Myoxocephalus quadricornis*	169	40
08-Aug-21	Angling	AN04	Fourhorn Sculpin	*Myoxocephalus quadricornis*	154	40
08-Aug-21	Angling	AN04	Fourhorn Sculpin	*Myoxocephalus quadricornis*	265	185
08-Aug-21	Angling	AN04	Fourhorn Sculpin	*Myoxocephalus quadricornis*	256	155
08-Aug-21	Angling	AN04	Fourhorn Sculpin	*Myoxocephalus quadricornis*	190	281
08-Aug-21	Angling	AN04	Fourhorn Sculpin	*Myoxocephalus quadricornis*	273	187
08-Aug-21	Angling	AN04	Fourhorn Sculpin	*Myoxocephalus quadricornis*	228	103
08-Aug-21	Angling	AN04	Fourhorn Sculpin	*Myoxocephalus quadricornis*	266	199
08-Aug-21	Angling	AN04	Fourhorn Sculpin	*Myoxocephalus quadricornis*	205	79
08-Aug-21	Angling	AN04	Fourhorn Sculpin	*Myoxocephalus quadricornis*	267	183
08-Aug-21	Angling	AN04	Fourhorn Sculpin	*Myoxocephalus quadricornis*	211	83
08-Aug-21	Angling	AN04	Fourhorn Sculpin	*Myoxocephalus quadricornis*	259	161
08-Aug-21	Angling	AN04	Fourhorn Sculpin	*Myoxocephalus quadricornis*	214	87
08-Aug-21	Angling	AN04	Fourhorn Sculpin	*Myoxocephalus quadricornis*	245	127
08-Aug-21	Angling	AN04	Fourhorn Sculpin	*Myoxocephalus quadricornis*	216	100
08-Aug-21	Angling	AN04	Fourhorn Sculpin	*Myoxocephalus quadricornis*	256	120
09-Aug-21	Angling	AN05	Fourhorn Sculpin	*Myoxocephalus quadricornis*	172	60
09-Aug-21	Angling	AN05	Fourhorn Sculpin	*Myoxocephalus quadricornis*	187	70
09-Aug-21	Angling	AN05	Fourhorn Sculpin	*Myoxocephalus quadricornis*	167	45
09-Aug-21	Angling	AN05	Fourhorn Sculpin	*Myoxocephalus quadricornis*	197	80
09-Aug-21	Angling	AN05	Fourhorn Sculpin	*Myoxocephalus quadricornis*	178	50
09-Aug-21	Angling	AN05	Fourhorn Sculpin	*Myoxocephalus quadricornis*	197	80
09-Aug-21	Angling	AN05	Fourhorn Sculpin	*Myoxocephalus quadricornis*	180	75
09-Aug-21	Angling	AN05	Fourhorn Sculpin	*Myoxocephalus quadricornis*	175	60

Appendix 6B-2
Fish Capture Data

Date	Capture Method	Site	Common Name	Species	Length (mm)	Weight (g)
09-Aug-21	Angling	AN05	Fourhorn Sculpin	*Myoxocephalus quadricornis*	188	65
09-Aug-21	Angling	AN05	Fourhorn Sculpin	*Myoxocephalus quadricornis*	198	90
09-Aug-21	Angling	AN05	Fourhorn Sculpin	*Myoxocephalus quadricornis*	169	50
09-Aug-21	Angling	AN05	Fourhorn Sculpin	*Myoxocephalus quadricornis*	184	65
09-Aug-21	Angling	AN05	Fourhorn Sculpin	*Myoxocephalus quadricornis*	178	50
09-Aug-21	Angling	AN05	Fourhorn Sculpin	*Myoxocephalus quadricornis*	172	60
09-Aug-21	Angling	AN05	Fourhorn Sculpin	*Myoxocephalus quadricornis*	250	158
09-Aug-21	Angling	AN05	Fourhorn Sculpin	*Myoxocephalus quadricornis*	228	106
09-Aug-21	Angling	AN05	Fourhorn Sculpin	*Myoxocephalus quadricornis*	309	336
09-Aug-21	Angling	AN05	Fourhorn Sculpin	*Myoxocephalus quadricornis*	206	84
09-Aug-21	Angling	AN05	Fourhorn Sculpin	*Myoxocephalus quadricornis*	253	150
09-Aug-21	Angling	AN05	Fourhorn Sculpin	*Myoxocephalus quadricornis*	211	91
09-Aug-21	Angling	AN05	Fourhorn Sculpin	*Myoxocephalus quadricornis*	257	145
09-Aug-21	Angling	AN05	Fourhorn Sculpin	*Myoxocephalus quadricornis*	211	91
09-Aug-21	Angling	AN05	Fourhorn Sculpin	*Myoxocephalus quadricornis*	209	82
09-Aug-21	Angling	AN05	Fourhorn Sculpin	*Myoxocephalus quadricornis*	228	115
09-Aug-21	Angling	AN05	Fourhorn Sculpin	*Myoxocephalus quadricornis*	214	74
09-Aug-21	Angling	AN05	Fourhorn Sculpin	*Myoxocephalus quadricornis*	251	129
09-Aug-21	Angling	AN05	Fourhorn Sculpin	*Myoxocephalus quadricornis*	233	115
10-Aug-21	Angling	AN07	Fourhorn Sculpin	*Myoxocephalus quadricornis*	211	110
10-Aug-21	Angling	AN07	Fourhorn Sculpin	*Myoxocephalus quadricornis*	249	150
10-Aug-21	Angling	AN07	Fourhorn Sculpin	*Myoxocephalus quadricornis*	221	130
10-Aug-21	Angling	AN07	Fourhorn Sculpin	*Myoxocephalus quadricornis*	168	40
10-Aug-21	Angling	AN07	Fourhorn Sculpin	*Myoxocephalus quadricornis*	237	120
10-Aug-21	Angling	AN07	Fourhorn Sculpin	*Myoxocephalus quadricornis*	194	80
10-Aug-21	Angling	AN07	Fourhorn Sculpin	*Myoxocephalus quadricornis*	178	40
10-Aug-21	Angling	AN07	Fourhorn Sculpin	*Myoxocephalus quadricornis*	224	100
10-Aug-21	Angling	AN07	Fourhorn Sculpin	*Myoxocephalus quadricornis*	255	190
10-Aug-21	Angling	AN07	Fourhorn Sculpin	*Myoxocephalus quadricornis*	213	100
10-Aug-21	Angling	AN07	Fourhorn Sculpin	*Myoxocephalus quadricornis*	170	40
10-Aug-21	Angling	AN07	Fourhorn Sculpin	*Myoxocephalus quadricornis*	198	70
10-Aug-21	Angling	AN07	Fourhorn Sculpin	*Myoxocephalus quadricornis*	179	60
10-Aug-21	Angling	AN07	Fourhorn Sculpin	*Myoxocephalus quadricornis*	162	50
10-Aug-21	Angling	AN07	Fourhorn Sculpin	*Myoxocephalus quadricornis*	177	60
10-Aug-21	Angling	AN07	Fourhorn Sculpin	*Myoxocephalus quadricornis*	156	40
10-Aug-21	Angling	AN07	Fourhorn Sculpin	*Myoxocephalus quadricornis*	190	100
10-Aug-21	Angling	AN07	Fourhorn Sculpin	*Myoxocephalus quadricornis*	179	80
10-Aug-21	Angling	AN07	Fourhorn Sculpin	*Myoxocephalus quadricornis*	176	60
10-Aug-21	Angling	AN07	Fourhorn Sculpin	*Myoxocephalus quadricornis*	159	40
10-Aug-21	Angling	AN07	Fourhorn Sculpin	*Myoxocephalus quadricornis*	196	80
10-Aug-21	Angling	AN07	Fourhorn Sculpin	*Myoxocephalus quadricornis*	179	50
10-Aug-21	Angling	AN07	Fourhorn Sculpin	*Myoxocephalus quadricornis*	148	50
10-Aug-21	Angling	AN07	Fourhorn Sculpin	*Myoxocephalus quadricornis*	230	114
10-Aug-21	Angling	AN07	Fourhorn Sculpin	*Myoxocephalus quadricornis*	312	250
10-Aug-21	Angling	AN07	Fourhorn Sculpin	*Myoxocephalus quadricornis*	280	197
10-Aug-21	Angling	AN07	Fourhorn Sculpin	*Myoxocephalus quadricornis*	215	82
10-Aug-21	Angling	AN07	Fourhorn Sculpin	*Myoxocephalus quadricornis*	325	321
10-Aug-21	Angling	AN07	Fourhorn Sculpin	*Myoxocephalus quadricornis*	216	95
10-Aug-21	Angling	AN07	Fourhorn Sculpin	*Myoxocephalus quadricornis*	249	143
10-Aug-21	Angling	AN07	Fourhorn Sculpin	*Myoxocephalus quadricornis*	248	148
10-Aug-21	Angling	AN07	Fourhorn Sculpin	*Myoxocephalus quadricornis*	225	109
10-Aug-21	Angling	AN07	Fourhorn Sculpin	*Myoxocephalus quadricornis*	239	116
10-Aug-21	Angling	AN07	Fourhorn Sculpin	*Myoxocephalus quadricornis*	214	86
10-Aug-21	Angling	AN08	Fourhorn Sculpin	*Myoxocephalus quadricornis*	250	168
10-Aug-21	Angling	AN08	Fourhorn Sculpin	*Myoxocephalus quadricornis*	276	240
10-Aug-21	Angling	AN08	Fourhorn Sculpin	*Myoxocephalus quadricornis*	263	160
10-Aug-21	Angling	AN08	Fourhorn Sculpin	*Myoxocephalus quadricornis*	276	240
10-Aug-21	Angling	AN08	Fourhorn Sculpin	*Myoxocephalus quadricornis*	215	80
10-Aug-21	Angling	AN08	Fourhorn Sculpin	*Myoxocephalus quadricornis*	212	80
10-Aug-21	Angling	AN08	Fourhorn Sculpin	*Myoxocephalus quadricornis*	174	50
10-Aug-21	Angling	AN08	Fourhorn Sculpin	*Myoxocephalus quadricornis*	193	50
14-Aug-21	Angling	AN14	Fourhorn Sculpin	*Myoxocephalus quadricornis*	221	80
14-Aug-21	Angling	AN14	Fourhorn Sculpin	*Myoxocephalus quadricornis*	181	50
16-Aug-21	Angling	AN22	Fourhorn Sculpin	*Myoxocephalus quadricornis*	239	150
16-Aug-21	Angling	AN22	Fourhorn Sculpin	*Myoxocephalus quadricornis*	234	130
16-Aug-21	Angling	AN22	Fourhorn Sculpin	*Myoxocephalus quadricornis*	241	140
16-Aug-21	Angling	AN22	Fourhorn Sculpin	*Myoxocephalus quadricornis*	210	90
16-Aug-21	Angling	AN22	Fourhorn Sculpin	*Myoxocephalus quadricornis*	184	45
17-Aug-21	Angling	AN25	Fourhorn Sculpin	*Myoxocephalus quadricornis*	294	280
17-Aug-21	Angling	AN25	Fourhorn Sculpin	*Myoxocephalus quadricornis*	287	270
17-Aug-21	Angling	AN25	Fourhorn Sculpin	*Myoxocephalus quadricornis*	247	180

Appendix 6B-2
Fish Capture Data

Date	Capture Method	Site	Common Name	Species	Length (mm)	Weight (g)
17-Aug-21	Angling	AN25	Fourhorn Sculpin	*Myoxocephalus quadricornis*	272	200
17-Aug-21	Angling	AN25	Fourhorn Sculpin	*Myoxocephalus quadricornis*	260	210
17-Aug-21	Angling	AN25	Fourhorn Sculpin	*Myoxocephalus quadricornis*	239	130
17-Aug-21	Angling	AN25	Fourhorn Sculpin	*Myoxocephalus quadricornis*	264	200
17-Aug-21	Angling	AN25	Fourhorn Sculpin	*Myoxocephalus quadricornis*	240	180
17-Aug-21	Angling	AN27	Fourhorn Sculpin	*Myoxocephalus quadricornis*	318	370
17-Aug-21	Angling	AN27	Fourhorn Sculpin	*Myoxocephalus quadricornis*	260	170
17-Aug-21	Angling	AN27	Fourhorn Sculpin	*Myoxocephalus quadricornis*	211	100
17-Aug-21	Angling	AN27	Fourhorn Sculpin	*Myoxocephalus quadricornis*	244	230
17-Aug-21	Angling	AN27	Fourhorn Sculpin	*Myoxocephalus quadricornis*	275	240
17-Aug-21	Angling	AN27	Fourhorn Sculpin	*Myoxocephalus quadricornis*	326	330
17-Aug-21	Angling	AN27	Fourhorn Sculpin	*Myoxocephalus quadricornis*	303	320
17-Aug-21	Angling	AN28	Fourhorn Sculpin	*Myoxocephalus quadricornis*	201	80
17-Aug-21	Angling	AN28	Fourhorn Sculpin	*Myoxocephalus quadricornis*	295	300
17-Aug-21	Angling	AN28	Fourhorn Sculpin	*Myoxocephalus quadricornis*	245	160
17-Aug-21	Angling	AN28	Fourhorn Sculpin	*Myoxocephalus quadricornis*	275	180
17-Aug-21	Angling	AN28	Fourhorn Sculpin	*Myoxocephalus quadricornis*	272	220
17-Aug-21	Angling	AN28	Fourhorn Sculpin	*Myoxocephalus quadricornis*	313	320
17-Aug-21	Angling	AN28	Fourhorn Sculpin	*Myoxocephalus quadricornis*	275	220
17-Aug-21	Angling	AN28	Fourhorn Sculpin	*Myoxocephalus quadricornis*	283	170
17-Aug-21	Angling	AN28	Fourhorn Sculpin	*Myoxocephalus quadricornis*	251	160
17-Aug-21	Angling	AN28	Fourhorn Sculpin	*Myoxocephalus quadricornis*	240	120
17-Aug-21	Angling	AN28	Fourhorn Sculpin	*Myoxocephalus quadricornis*	286	220
17-Aug-21	Angling	AN28	Fourhorn Sculpin	*Myoxocephalus quadricornis*	262	170
17-Aug-21	Angling	AN28	Fourhorn Sculpin	*Myoxocephalus quadricornis*	238	150
17-Aug-21	Angling	AN28	Fourhorn Sculpin	*Myoxocephalus quadricornis*	256	140
17-Aug-21	Angling	AN28	Fourhorn Sculpin	*Myoxocephalus quadricornis*	216	100
17-Aug-21	Angling	AN28	Fourhorn Sculpin	*Myoxocephalus quadricornis*	213	90
17-Aug-21	Angling	AN28	Fourhorn Sculpin	*Myoxocephalus quadricornis*	187	50
18-Aug-21	Angling	AN29	Fourhorn Sculpin	*Myoxocephalus quadricornis*	239	150
18-Aug-21	Angling	AN29	Fourhorn Sculpin	*Myoxocephalus quadricornis*	223	100
18-Aug-21	Angling	AN29	Fourhorn Sculpin	*Myoxocephalus quadricornis*	220	110
18-Aug-21	Angling	AN29	Fourhorn Sculpin	*Myoxocephalus quadricornis*	229	130
18-Aug-21	Angling	AN29	Fourhorn Sculpin	*Myoxocephalus quadricornis*	214	100
18-Aug-21	Angling	AN29	Fourhorn Sculpin	*Myoxocephalus quadricornis*	236	150
18-Aug-21	Angling	AN29	Fourhorn Sculpin	*Myoxocephalus quadricornis*	197	80
18-Aug-21	Angling	AN29	Fourhorn Sculpin	*Myoxocephalus quadricornis*	231	140
18-Aug-21	Angling	AN29	Fourhorn Sculpin	*Myoxocephalus quadricornis*	239	170
18-Aug-21	Angling	AN29	Fourhorn Sculpin	*Myoxocephalus quadricornis*	194	80
18-Aug-21	Angling	AN29	Fourhorn Sculpin	*Myoxocephalus quadricornis*	191	70
18-Aug-21	Angling	AN29	Fourhorn Sculpin	*Myoxocephalus quadricornis*	204	90
18-Aug-21	Angling	AN29	Fourhorn Sculpin	*Myoxocephalus quadricornis*	220	120
18-Aug-21	Angling	AN29	Fourhorn Sculpin	*Myoxocephalus quadricornis*	198	70
18-Aug-21	Angling	AN29	Fourhorn Sculpin	*Myoxocephalus quadricornis*	209	90
18-Aug-21	Angling	AN29	Fourhorn Sculpin	*Myoxocephalus quadricornis*	200	80
18-Aug-21	Angling	AN29	Fourhorn Sculpin	*Myoxocephalus quadricornis*	179	60
18-Aug-21	Angling	AN31	Fourhorn Sculpin	*Myoxocephalus quadricornis*	261	160
06-Aug-21	Angling	AN01	Greenland Cod	*Gadus ogac*	532	1,690
06-Aug-21	Angling	AN01	Greenland Cod	*Gadus ogac*	475	1,352
06-Aug-21	Angling	AN01	Greenland Cod	*Gadus ogac*	554	1,876
06-Aug-21	Angling	AN01	Greenland Cod	*Gadus ogac*	476	1,173
06-Aug-21	Angling	AN01	Greenland Cod	*Gadus ogac*	590	2,890
06-Aug-21	Angling	AN01	Greenland Cod	*Gadus ogac*	691	4,075
10-Aug-21	Angling	AN06	Greenland Cod	*Gadus ogac*	510	1,730
10-Aug-21	Angling	AN06	Greenland Cod	*Gadus ogac*	531	1,890
10-Aug-21	Angling	AN08	Greenland Cod	*Gadus ogac*	570	2,350
10-Aug-21	Angling	AN08	Greenland Cod	*Gadus ogac*	504	1,750
10-Aug-21	Angling	AN08	Greenland Cod	*Gadus ogac*	512	1,650
10-Aug-21	Angling	AN08	Greenland Cod	*Gadus ogac*	455	1,210
10-Aug-21	Angling	AN08	Greenland Cod	*Gadus ogac*	540	1,760
10-Aug-21	Angling	AN08	Greenland Cod	*Gadus ogac*	474	1,070
10-Aug-21	Angling	AN08	Greenland Cod	*Gadus ogac*	572	1,390
11-Aug-21	Angling	AN10	Greenland Cod	*Gadus ogac*	570	2,510
11-Aug-21	Angling	AN10	Greenland Cod	*Gadus ogac*	619	3,200
11-Aug-21	Angling	AN10	Greenland Cod	*Gadus ogac*	515	1,510
12-Aug-21	Angling	AN11	Greenland Cod	*Gadus ogac*	568	2,520
12-Aug-21	Angling	AN11	Greenland Cod	*Gadus ogac*	481	1,120
12-Aug-21	Angling	AN11	Greenland Cod	*Gadus ogac*	467	1,100
12-Aug-21	Angling	AN13	Greenland Cod	*Gadus ogac*	580	2,690
16-Aug-21	Angling	AN20	Greenland Cod	*Gadus ogac*	491	1,490
16-Aug-21	Angling	AN20	Greenland Cod	*Gadus ogac*	405	780

Appendix 6B-2
Fish Capture Data

Date	Capture Method	Site	Common Name	Species	Length (mm)	Weight (g)
16-Aug-21	Angling	AN20	Greenland Cod	*Gadus ogac*	518	1,760
16-Aug-21	Angling	AN20	Greenland Cod	*Gadus ogac*	447	970
16-Aug-21	Angling	AN20	Greenland Cod	*Gadus ogac*	495	1,370
16-Aug-21	Angling	AN20	Greenland Cod	*Gadus ogac*	696	4,930
16-Aug-21	Angling	AN20	Greenland Cod	*Gadus ogac*	642	3,420
16-Aug-21	Angling	AN20	Greenland Cod	*Gadus ogac*	440	1,040
16-Aug-21	Angling	AN20	Greenland Cod	*Gadus ogac*	512	1,320
16-Aug-21	Angling	AN20	Greenland Cod	*Gadus ogac*	470	1,210
16-Aug-21	Angling	AN20	Greenland Cod	*Gadus ogac*	444	1,170
16-Aug-21	Angling	AN21	Greenland Cod	*Gadus ogac*	568	2,180
16-Aug-21	Angling	AN23	Greenland Cod	*Gadus ogac*	529	1,990
16-Aug-21	Angling	AN23	Greenland Cod	*Gadus ogac*	454	1,120
16-Aug-21	Angling	AN23	Greenland Cod	*Gadus ogac*	504	810
17-Aug-21	Angling	AN24	Greenland Cod	*Gadus ogac*	702	4,130
17-Aug-21	Angling	AN24	Greenland Cod	*Gadus ogac*	441	1,100
17-Aug-21	Angling	AN26	Greenland Cod	*Gadus ogac*	489	1,340
17-Aug-21	Angling	AN26	Greenland Cod	*Gadus ogac*	477	1,410
18-Aug-21	Angling	AN30	Greenland Cod	*Gadus ogac*	404	780
18-Aug-21	Angling	AN30	Greenland Cod	*Gadus ogac*	515	1,800
18-Aug-21	Angling	AN30	Greenland Cod	*Gadus ogac*	530	1,960
18-Aug-21	Angling	AN30	Greenland Cod	*Gadus ogac*	590	2,510
18-Aug-21	Angling	AN32	Greenland Cod	*Gadus ogac*	469	1,220
18-Aug-21	Angling	AN32	Greenland Cod	*Gadus ogac*	522	1,710
07-Aug-21	Angling	AN02	No fish Caught	-	-	-
07-Aug-21	Angling	AN03	No fish Caught	-	-	-
12-Aug-21	Angling	AN12	No fish Caught	-	-	-
15-Aug-21	Angling	AN16	No fish Caught	-	-	-
15-Aug-21	Angling	AN17	No fish Caught	-	-	-
15-Aug-21	Angling	AN18	No fish Caught	-	-	-
15-Aug-21	Angling	AN19	No fish Caught	-	-	-
06-Aug-21	Angling	AN01	Shorthorn Sculpin	*Myoxocephalus scorpius*	400	825
09-Aug-21	Angling	AN05	Shorthorn Sculpin	*Myoxocephalus scorpius*	229	160
11-Aug-21	Angling	AN09	Shorthorn Sculpin	*Myoxocephalus scorpius*	341	400
11-Aug-21	Angling	AN09	Shorthorn Sculpin	*Myoxocephalus scorpius*	365	530
11-Aug-21	Angling	AN10	Shorthorn Sculpin	*Myoxocephalus scorpius*	272	300
16-Aug-21	Angling	AN20	Shorthorn Sculpin	*Myoxocephalus scorpius*	329	500
16-Aug-21	Angling	AN20	Shorthorn Sculpin	*Myoxocephalus scorpius*	300	340
16-Aug-21	Angling	AN20	Shorthorn Sculpin	*Myoxocephalus scorpius*	410	1,020
16-Aug-21	Angling	AN21	Shorthorn Sculpin	*Myoxocephalus scorpius*	232	140
17-Aug-21	Angling	AN24	Shorthorn Sculpin	*Myoxocephalus scorpius*	363	610
17-Aug-21	Angling	AN24	Shorthorn Sculpin	*Myoxocephalus scorpius*	345	600
17-Aug-21	Angling	AN25	Shorthorn Sculpin	*Myoxocephalus scorpius*	265	270
17-Aug-21	Angling	AN25	Shorthorn Sculpin	*Myoxocephalus scorpius*	203	110
17-Aug-21	Angling	AN25	Shorthorn Sculpin	*Myoxocephalus scorpius*	296	380
17-Aug-21	Angling	AN25	Shorthorn Sculpin	*Myoxocephalus scorpius*	255	230
17-Aug-21	Angling	AN26	Shorthorn Sculpin	*Myoxocephalus scorpius*	415	1,010
17-Aug-21	Angling	AN26	Shorthorn Sculpin	*Myoxocephalus scorpius*	278	360
17-Aug-21	Angling	AN26	Shorthorn Sculpin	*Myoxocephalus scorpius*	384	720
17-Aug-21	Angling	AN26	Shorthorn Sculpin	*Myoxocephalus scorpius*	335	600
17-Aug-21	Angling	AN26	Shorthorn Sculpin	*Myoxocephalus scorpius*	390	970
17-Aug-21	Angling	AN27	Shorthorn Sculpin	*Myoxocephalus scorpius*	233	140
17-Aug-21	Angling	AN27	Shorthorn Sculpin	*Myoxocephalus scorpius*	264	260
17-Aug-21	Angling	AN27	Shorthorn Sculpin	*Myoxocephalus scorpius*	247	220
17-Aug-21	Angling	AN27	Shorthorn Sculpin	*Myoxocephalus scorpius*	237	150
17-Aug-21	Angling	AN27	Shorthorn Sculpin	*Myoxocephalus scorpius*	233	130
17-Aug-21	Angling	AN27	Shorthorn Sculpin	*Myoxocephalus scorpius*	214	150
17-Aug-21	Angling	AN27	Shorthorn Sculpin	*Myoxocephalus scorpius*	223	210
18-Aug-21	Angling	AN30	Shorthorn Sculpin	*Myoxocephalus scorpius*	363	560
07-Aug-21	Fukui Trap	FT02	Arctic Sculpin	*Myoxocephalus scorpioides*	128	20
07-Aug-21	Fukui Trap	FT05	Arctic Sculpin	*Myoxocephalus scorpioides*	111	14
11-Aug-21	Fukui Trap	FT07	Arctic Sculpin	*Myoxocephalus scorpioides*	164	50
11-Aug-21	Fukui Trap	FT07	Arctic Sculpin	*Myoxocephalus scorpioides*	124	30
11-Aug-21	Fukui Trap	FT07	Arctic Sculpin	*Myoxocephalus scorpioides*	112	25
16-Aug-21	Fukui Trap	FT11	Arctic Sculpin	*Myoxocephalus scorpioides*	221	150
16-Aug-21	Fukui Trap	FT11	Arctic Sculpin	*Myoxocephalus scorpioides*	181	100
16-Aug-21	Fukui Trap	FT12	Arctic Sculpin	*Myoxocephalus scorpioides*	110	60
16-Aug-21	Fukui Trap	FT14	Arctic Sculpin	*Myoxocephalus scorpioides*	156	80
16-Aug-21	Fukui Trap	FT14	Arctic Sculpin	*Myoxocephalus scorpioides*	137	50
07-Aug-21	Fukui Trap	FT02	Fourhorn Sculpin	*Myoxocephalus quadricornis*	210	110
07-Aug-21	Fukui Trap	FT02	Fourhorn Sculpin	*Myoxocephalus quadricornis*	191	80
07-Aug-21	Fukui Trap	FT03	Fourhorn Sculpin	*Myoxocephalus quadricornis*	125	15

Appendix 6B-2
Fish Capture Data

Date	Capture Method	Site	Common Name	Species	Length (mm)	Weight (g)
07-Aug-21	Fukui Trap	FT04	Fourhorn Sculpin	*Myoxocephalus quadricornis*	195	75
07-Aug-21	Fukui Trap	FT04	Fourhorn Sculpin	*Myoxocephalus quadricornis*	171	47
07-Aug-21	Fukui Trap	FT04	Fourhorn Sculpin	*Myoxocephalus quadricornis*	2,102	150
11-Aug-21	Fukui Trap	FT08	Fourhorn Sculpin	*Myoxocephalus quadricornis*	271	190
07-Aug-21	Fukui Trap	FT01	No fish Caught	-	-	-
11-Aug-21	Fukui Trap	FT06	No fish Caught	-	-	-
11-Aug-21	Fukui Trap	FT09	No fish Caught	-	-	-
11-Aug-21	Fukui Trap	FT10	No fish Caught	-	-	-
16-Aug-21	Fukui Trap	FT13	No fish Caught	-	-	-
03-Aug-21	Gill net	GN01	Arctic Char	*Salvelinus alpinus*	610	2,330
03-Aug-21	Gill net	GN01	Arctic Char	*Salvelinus alpinus*	620	2,656
03-Aug-21	Gill net	GN02	Arctic Char	*Salvelinus alpinus*	339	375
03-Aug-21	Gill net	GN02	Arctic Char	*Salvelinus alpinus*	503	1,227
03-Aug-21	Gill net	GN02	Arctic Char	*Salvelinus alpinus*	400	640
03-Aug-21	Gill net	GN02	Arctic Char	*Salvelinus alpinus*	489	1,222
03-Aug-21	Gill net	GN02	Arctic Char	*Salvelinus alpinus*	540	1,601
03-Aug-21	Gill net	GN02	Arctic Char	*Salvelinus alpinus*	703	2,433
03-Aug-21	Gill net	GN02	Arctic Char	*Salvelinus alpinus*	440	825
03-Aug-21	Gill net	GN02	Arctic Char	*Salvelinus alpinus*	413	639
03-Aug-21	Gill net	GN02	Arctic Char	*Salvelinus alpinus*	494	1,172
03-Aug-21	Gill net	GN02	Arctic Char	*Salvelinus alpinus*	355	412
03-Aug-21	Gill net	GN02	Arctic Char	*Salvelinus alpinus*	400	619
03-Aug-21	Gill net	GN02	Arctic Char	*Salvelinus alpinus*	486	1,047
06-Aug-21	Gill net	GN03	Arctic Char	*Salvelinus alpinus*	549	1,348
06-Aug-21	Gill net	GN03	Arctic Char	*Salvelinus alpinus*	528	1,374
06-Aug-21	Gill net	GN03	Arctic Char	*Salvelinus alpinus*	649	2,139
06-Aug-21	Gill net	GN03	Arctic Char	*Salvelinus alpinus*	345	394
06-Aug-21	Gill net	GN03	Arctic Char	*Salvelinus alpinus*	479	822
06-Aug-21	Gill net	GN04	Arctic Char	*Salvelinus alpinus*	491	865
06-Aug-21	Gill net	GN04	Arctic Char	*Salvelinus alpinus*	379	467
06-Aug-21	Gill net	GN04	Arctic Char	*Salvelinus alpinus*	352	498
06-Aug-21	Gill net	GN04	Arctic Char	*Salvelinus alpinus*	391	576
06-Aug-21	Gill net	GN04	Arctic Char	*Salvelinus alpinus*	384	479
06-Aug-21	Gill net	GN04	Arctic Char	*Salvelinus alpinus*	533	1,388
06-Aug-21	Gill net	GN04	Arctic Char	*Salvelinus alpinus*	486	1,003
06-Aug-21	Gill net	GN04	Arctic Char	*Salvelinus alpinus*	451	742
06-Aug-21	Gill net	GN04	Arctic Char	*Salvelinus alpinus*	491	1,030
06-Aug-21	Gill net	GN04	Arctic Char	*Salvelinus alpinus*	214	105
06-Aug-21	Gill net	GN04	Arctic Char	*Salvelinus alpinus*	522	1,192
06-Aug-21	Gill net	GN04	Arctic Char	*Salvelinus alpinus*	396	520
06-Aug-21	Gill net	GN04	Arctic Char	*Salvelinus alpinus*	535	1,226
06-Aug-21	Gill net	GN04	Arctic Char	*Salvelinus alpinus*	337	339
06-Aug-21	Gill net	GN04	Arctic Char	*Salvelinus alpinus*	359	397
07-Aug-21	Gill net	GN05	Arctic Char	*Salvelinus alpinus*	464	1,110
07-Aug-21	Gill net	GN05	Arctic Char	*Salvelinus alpinus*	294	310
07-Aug-21	Gill net	GN05	Arctic Char	*Salvelinus alpinus*	509	1,220
07-Aug-21	Gill net	GN05	Arctic Char	*Salvelinus alpinus*	355	500
07-Aug-21	Gill net	GN05	Arctic Char	*Salvelinus alpinus*	321	370
07-Aug-21	Gill net	GN06	Arctic Char	*Salvelinus alpinus*	664	2,510
07-Aug-21	Gill net	GN06	Arctic Char	*Salvelinus alpinus*	437	750
07-Aug-21	Gill net	GN06	Arctic Char	*Salvelinus alpinus*	142	27
07-Aug-21	Gill net	GN06	Arctic Char	*Salvelinus alpinus*	136	23
07-Aug-21	Gill net	GN06	Arctic Char	*Salvelinus alpinus*	145	25
08-Aug-21	Gill net	GN07	Arctic Char	*Salvelinus alpinus*	574	2,400
08-Aug-21	Gill net	GN07	Arctic Char	*Salvelinus alpinus*	613	2,770
08-Aug-21	Gill net	GN07	Arctic Char	*Salvelinus alpinus*	630	3,490
09-Aug-21	Gill net	GN08	Arctic Char	*Salvelinus alpinus*	645	2,730
09-Aug-21	Gill net	GN08	Arctic Char	*Salvelinus alpinus*	557	1,980
09-Aug-21	Gill net	GN08	Arctic Char	*Salvelinus alpinus*	474	1,170
09-Aug-21	Gill net	GN08	Arctic Char	*Salvelinus alpinus*	403	610
10-Aug-21	Gill net	GN09	Arctic Char	*Salvelinus alpinus*	584	2,510
10-Aug-21	Gill net	GN09	Arctic Char	*Salvelinus alpinus*	398	660
10-Aug-21	Gill net	GN09	Arctic Char	*Salvelinus alpinus*	465	1,110
11-Aug-21	Gill net	GN10	Arctic Char	*Salvelinus alpinus*	314	340
11-Aug-21	Gill net	GN10	Arctic Char	*Salvelinus alpinus*	319	390
11-Aug-21	Gill net	GN10	Arctic Char	*Salvelinus alpinus*	427	760
11-Aug-21	Gill net	GN10	Arctic Char	*Salvelinus alpinus*	384	620
11-Aug-21	Gill net	GN10	Arctic Char	*Salvelinus alpinus*	470	1,110
11-Aug-21	Gill net	GN10	Arctic Char	*Salvelinus alpinus*	379	-
11-Aug-21	Gill net	GN10	Arctic Char	*Salvelinus alpinus*	559	-
11-Aug-21	Gill net	GN10	Arctic Char	*Salvelinus alpinus*	750	-

Appendix 6B-2
Fish Capture Data

Date	Capture Method	Site	Common Name	Species	Length (mm)	Weight (g)
11-Aug-21	Gill net	GN10	Arctic Char	*Salvelinus alpinus*	485	-
11-Aug-21	Gill net	GN10	Arctic Char	*Salvelinus alpinus*	439	-
15-Aug-21	Gill net	GN12	Arctic Char	*Salvelinus alpinus*	375	470
15-Aug-21	Gill net	GN12	Arctic Char	*Salvelinus alpinus*	243	120
15-Aug-21	Gill net	GN12	Arctic Char	*Salvelinus alpinus*	305	270
15-Aug-21	Gill net	GN12	Arctic Char	*Salvelinus alpinus*	484	1,250
15-Aug-21	Gill net	GN12	Arctic Char	*Salvelinus alpinus*	501	1,440
15-Aug-21	Gill net	GN12	Arctic Char	*Salvelinus alpinus*	533	1,990
15-Aug-21	Gill net	GN12	Arctic Char	*Salvelinus alpinus*	433	870
15-Aug-21	Gill net	GN12	Arctic Char	*Salvelinus alpinus*	510	1,270
15-Aug-21	Gill net	GN12	Arctic Char	*Salvelinus alpinus*	615	2,490
15-Aug-21	Gill net	GN12	Arctic Char	*Salvelinus alpinus*	410	570
15-Aug-21	Gill net	GN12	Arctic Char	*Salvelinus alpinus*	289	150
15-Aug-21	Gill net	GN12	Arctic Char	*Salvelinus alpinus*	333	410
15-Aug-21	Gill net	GN12	Arctic Char	*Salvelinus alpinus*	271	240
15-Aug-21	Gill net	GN12	Arctic Char	*Salvelinus alpinus*	299	270
15-Aug-21	Gill net	GN12	Arctic Char	*Salvelinus alpinus*	280	220
15-Aug-21	Gill net	GN12	Arctic Char	*Salvelinus alpinus*	291	280
15-Aug-21	Gill net	GN12	Arctic Char	*Salvelinus alpinus*	294	260
15-Aug-21	Gill net	GN12	Arctic Char	*Salvelinus alpinus*	255	190
15-Aug-21	Gill net	GN12	Arctic Char	*Salvelinus alpinus*	128	10
15-Aug-21	Gill net	GN12	Arctic Char	*Salvelinus alpinus*	470	1,020
15-Aug-21	Gill net	GN12	Arctic Char	*Salvelinus alpinus*	290	270
15-Aug-21	Gill net	GN12	Arctic Char	*Salvelinus alpinus*	254	200
15-Aug-21	Gill net	GN13	Arctic Char	*Salvelinus alpinus*	392	500
15-Aug-21	Gill net	GN13	Arctic Char	*Salvelinus alpinus*	281	230
15-Aug-21	Gill net	GN13	Arctic Char	*Salvelinus alpinus*	520	1,590
15-Aug-21	Gill net	GN13	Arctic Char	*Salvelinus alpinus*	575	2,300
15-Aug-21	Gill net	GN13	Arctic Char	*Salvelinus alpinus*	260	200
15-Aug-21	Gill net	GN14	Arctic Char	*Salvelinus alpinus*	462	1,170
15-Aug-21	Gill net	GN14	Arctic Char	*Salvelinus alpinus*	402	520
15-Aug-21	Gill net	GN14	Arctic Char	*Salvelinus alpinus*	375	580
15-Aug-21	Gill net	GN14	Arctic Char	*Salvelinus alpinus*	400	710
15-Aug-21	Gill net	GN14	Arctic Char	*Salvelinus alpinus*	418	750
15-Aug-21	Gill net	GN14	Arctic Char	*Salvelinus alpinus*	475	1,310
15-Aug-21	Gill net	GN14	Arctic Char	*Salvelinus alpinus*	336	410
15-Aug-21	Gill net	GN14	Arctic Char	*Salvelinus alpinus*	434	950
15-Aug-21	Gill net	GN14	Arctic Char	*Salvelinus alpinus*	521	760
15-Aug-21	Gill net	GN14	Arctic Char	*Salvelinus alpinus*	285	280
15-Aug-21	Gill net	GN14	Arctic Char	*Salvelinus alpinus*	442	920
15-Aug-21	Gill net	GN14	Arctic Char	*Salvelinus alpinus*	409	690
15-Aug-21	Gill net	GN14	Arctic Char	*Salvelinus alpinus*	314	300
15-Aug-21	Gill net	GN15	Arctic Char	*Salvelinus alpinus*	248	160
15-Aug-21	Gill net	GN15	Arctic Char	*Salvelinus alpinus*	374	490
15-Aug-21	Gill net	GN15	Arctic Char	*Salvelinus alpinus*	416	740
15-Aug-21	Gill net	GN15	Arctic Char	*Salvelinus alpinus*	370	700
15-Aug-21	Gill net	GN15	Arctic Char	*Salvelinus alpinus*	490	1,590
15-Aug-21	Gill net	GN15	Arctic Char	*Salvelinus alpinus*	409	800
15-Aug-21	Gill net	GN15	Arctic Char	*Salvelinus alpinus*	487	1,420
15-Aug-21	Gill net	GN15	Arctic Char	*Salvelinus alpinus*	428	910
15-Aug-21	Gill net	GN15	Arctic Char	*Salvelinus alpinus*	365	500
15-Aug-21	Gill net	GN15	Arctic Char	*Salvelinus alpinus*	402	740
15-Aug-21	Gill net	GN15	Arctic Char	*Salvelinus alpinus*	430	930
15-Aug-21	Gill net	GN15	Arctic Char	*Salvelinus alpinus*	422	760
15-Aug-21	Gill net	GN15	Arctic Char	*Salvelinus alpinus*	334	410
15-Aug-21	Gill net	GN15	Arctic Char	*Salvelinus alpinus*	348	560
15-Aug-21	Gill net	GN15	Arctic Char	*Salvelinus alpinus*	385	640
15-Aug-21	Gill net	GN15	Arctic Char	*Salvelinus alpinus*	305	350
15-Aug-21	Gill net	GN15	Arctic Char	*Salvelinus alpinus*	333	390
15-Aug-21	Gill net	GN15	Arctic Char	*Salvelinus alpinus*	404	800
15-Aug-21	Gill net	GN15	Arctic Char	*Salvelinus alpinus*	460	1,030
15-Aug-21	Gill net	GN15	Arctic Char	*Salvelinus alpinus*	421	890
15-Aug-21	Gill net	GN15	Arctic Char	*Salvelinus alpinus*	351	510
15-Aug-21	Gill net	GN15	Arctic Char	*Salvelinus alpinus*	304	270
16-Aug-21	Gill net	GN16	Arctic Char	*Salvelinus alpinus*	472	1,070
16-Aug-21	Gill net	GN16	Arctic Char	*Salvelinus alpinus*	737	4,430
16-Aug-21	Gill net	GN16	Arctic Char	*Salvelinus alpinus*	440	960
16-Aug-21	Gill net	GN16	Arctic Char	*Salvelinus alpinus*	352	490
16-Aug-21	Gill net	GN17	Arctic Char	*Salvelinus alpinus*	452	920
16-Aug-21	Gill net	GN17	Arctic Char	*Salvelinus alpinus*	335	390
16-Aug-21	Gill net	GN17	Arctic Char	*Salvelinus alpinus*	289	270

Appendix 6B-2
Fish Capture Data

Date	Capture Method	Site	Common Name	Species	Length (mm)	Weight (g)
16-Aug-21	Gill net	GN17	Arctic Char	*Salvelinus alpinus*	343	510
16-Aug-21	Gill net	GN17	Arctic Char	*Salvelinus alpinus*	434	810
17-Aug-21	Gill net	GN18	Arctic Char	*Salvelinus alpinus*	187	50
17-Aug-21	Gill net	GN18	Arctic Char	*Salvelinus alpinus*	340	470
17-Aug-21	Gill net	GN19	Arctic Char	*Salvelinus alpinus*	691	4,990
17-Aug-21	Gill net	GN19	Arctic Char	*Salvelinus alpinus*	594	2,500
17-Aug-21	Gill net	GN19	Arctic Char	*Salvelinus alpinus*	627	3,280
17-Aug-21	Gill net	GN19	Arctic Char	*Salvelinus alpinus*	290	300
17-Aug-21	Gill net	GN20	Arctic Char	*Salvelinus alpinus*	303	290
17-Aug-21	Gill net	GN20	Arctic Char	*Salvelinus alpinus*	387	610
17-Aug-21	Gill net	GN21	Arctic Char	*Salvelinus alpinus*	283	270
17-Aug-21	Gill net	GN21	Arctic Char	*Salvelinus alpinus*	226	130
17-Aug-21	Gill net	GN21	Arctic Char	*Salvelinus alpinus*	380	540
17-Aug-21	Gill net	GN21	Arctic Char	*Salvelinus alpinus*	332	430
18-Aug-21	Gill net	GN22	Arctic Char	*Salvelinus alpinus*	228	110
18-Aug-21	Gill net	GN23	Arctic Char	*Salvelinus alpinus*	470	1,250
18-Aug-21	Gill net	GN23	Arctic Char	*Salvelinus alpinus*	354	450
18-Aug-21	Gill net	GN23	Arctic Char	*Salvelinus alpinus*	465	1,110
18-Aug-21	Gill net	GN24	Arctic Char	*Salvelinus alpinus*	528	1,880
18-Aug-21	Gill net	GN25	Arctic Char	*Salvelinus alpinus*	191	110
18-Aug-21	Gill net	GN25	Arctic Char	*Salvelinus alpinus*	430	750
18-Aug-21	Gill net	GN25	Arctic Char	*Salvelinus alpinus*	282	260
18-Aug-21	Gill net	GN25	Arctic Char	*Salvelinus alpinus*	285	260
18-Aug-21	Gill net	GN25	Arctic Char	*Salvelinus alpinus*	266	160
18-Aug-21	Gill net	GN25	Arctic Char	*Salvelinus alpinus*	490	1,240
18-Aug-21	Gill net	GN25	Arctic Char	*Salvelinus alpinus*	324	350
18-Aug-21	Gill net	GN25	Arctic Char	*Salvelinus alpinus*	615	3,220
18-Aug-21	Gill net	GN25	Arctic Char	*Salvelinus alpinus*	398	710
06-Aug-21	Gill net	GN03	Arctic Sculpin	*Myoxocephalus scorpioides*	130	25
06-Aug-21	Gill net	GN03	Arctic Sculpin	*Myoxocephalus scorpioides*	125	25
17-Aug-21	Gill net	GN20	Arctic Sculpin	*Myoxocephalus scorpioides*	216	150
17-Aug-21	Gill net	GN21	Arctic Sculpin	*Myoxocephalus scorpioides*	89	20
18-Aug-21	Gill net	GN24	Arctic Sculpin	*Myoxocephalus scorpioides*	135	50
18-Aug-21	Gill net	GN25	Arctic Sculpin	*Myoxocephalus scorpioides*	108	10
03-Aug-21	Gill net	GN02	Fourhorn Sculpin	*Myoxocephalus quadricornis*	170	40
06-Aug-21	Gill net	GN03	Fourhorn Sculpin	*Myoxocephalus quadricornis*	236	159
06-Aug-21	Gill net	GN03	Fourhorn Sculpin	*Myoxocephalus quadricornis*	262	169
06-Aug-21	Gill net	GN03	Fourhorn Sculpin	*Myoxocephalus quadricornis*	181	56
06-Aug-21	Gill net	GN03	Fourhorn Sculpin	*Myoxocephalus quadricornis*	224	112
06-Aug-21	Gill net	GN03	Fourhorn Sculpin	*Myoxocephalus quadricornis*	220	105
06-Aug-21	Gill net	GN03	Fourhorn Sculpin	*Myoxocephalus quadricornis*	168	45
06-Aug-21	Gill net	GN03	Fourhorn Sculpin	*Myoxocephalus quadricornis*	189	77
06-Aug-21	Gill net	GN03	Fourhorn Sculpin	*Myoxocephalus quadricornis*	181	66
06-Aug-21	Gill net	GN03	Fourhorn Sculpin	*Myoxocephalus quadricornis*	181	66
06-Aug-21	Gill net	GN03	Fourhorn Sculpin	*Myoxocephalus quadricornis*	280	278
06-Aug-21	Gill net	GN03	Fourhorn Sculpin	*Myoxocephalus quadricornis*	220	98
06-Aug-21	Gill net	GN03	Fourhorn Sculpin	*Myoxocephalus quadricornis*	262	159
06-Aug-21	Gill net	GN03	Fourhorn Sculpin	*Myoxocephalus quadricornis*	252	166
06-Aug-21	Gill net	GN03	Fourhorn Sculpin	*Myoxocephalus quadricornis*	260	168
06-Aug-21	Gill net	GN03	Fourhorn Sculpin	*Myoxocephalus quadricornis*	239	141
06-Aug-21	Gill net	GN03	Fourhorn Sculpin	*Myoxocephalus quadricornis*	231	139
06-Aug-21	Gill net	GN03	Fourhorn Sculpin	*Myoxocephalus quadricornis*	192	64
06-Aug-21	Gill net	GN03	Fourhorn Sculpin	*Myoxocephalus quadricornis*	262	179
06-Aug-21	Gill net	GN03	Fourhorn Sculpin	*Myoxocephalus quadricornis*	169	42
06-Aug-21	Gill net	GN03	Fourhorn Sculpin	*Myoxocephalus quadricornis*	185	54
06-Aug-21	Gill net	GN03	Fourhorn Sculpin	*Myoxocephalus quadricornis*	190	150
06-Aug-21	Gill net	GN03	Fourhorn Sculpin	*Myoxocephalus quadricornis*	187	66
06-Aug-21	Gill net	GN03	Fourhorn Sculpin	*Myoxocephalus quadricornis*	191	61
06-Aug-21	Gill net	GN03	Fourhorn Sculpin	*Myoxocephalus quadricornis*	172	46
06-Aug-21	Gill net	GN03	Fourhorn Sculpin	*Myoxocephalus quadricornis*	167	39
06-Aug-21	Gill net	GN04	Fourhorn Sculpin	*Myoxocephalus quadricornis*	262	189
06-Aug-21	Gill net	GN04	Fourhorn Sculpin	*Myoxocephalus quadricornis*	276	251
06-Aug-21	Gill net	GN04	Fourhorn Sculpin	*Myoxocephalus quadricornis*	271	195
06-Aug-21	Gill net	GN04	Fourhorn Sculpin	*Myoxocephalus quadricornis*	168	46
06-Aug-21	Gill net	GN04	Fourhorn Sculpin	*Myoxocephalus quadricornis*	271	176
06-Aug-21	Gill net	GN04	Fourhorn Sculpin	*Myoxocephalus quadricornis*	245	143
06-Aug-21	Gill net	GN04	Fourhorn Sculpin	*Myoxocephalus quadricornis*	246	191
06-Aug-21	Gill net	GN04	Fourhorn Sculpin	*Myoxocephalus quadricornis*	210	100
06-Aug-21	Gill net	GN04	Fourhorn Sculpin	*Myoxocephalus quadricornis*	249	167
06-Aug-21	Gill net	GN04	Fourhorn Sculpin	*Myoxocephalus quadricornis*	239	130
06-Aug-21	Gill net	GN04	Fourhorn Sculpin	*Myoxocephalus quadricornis*	281	262

Appendix 6B-2
Fish Capture Data

Date	Capture Method	Site	Common Name	Species	Length (mm)	Weight (g)
06-Aug-21	Gill net	GN04	Fourhorn Sculpin	*Myoxocephalus quadricornis*	210	95
06-Aug-21	Gill net	GN04	Fourhorn Sculpin	*Myoxocephalus quadricornis*	243	158
06-Aug-21	Gill net	GN04	Fourhorn Sculpin	*Myoxocephalus quadricornis*	115	16
06-Aug-21	Gill net	GN04	Fourhorn Sculpin	*Myoxocephalus quadricornis*	161	29
06-Aug-21	Gill net	GN04	Fourhorn Sculpin	*Myoxocephalus quadricornis*	181	40
06-Aug-21	Gill net	GN04	Fourhorn Sculpin	*Myoxocephalus quadricornis*	222	98
06-Aug-21	Gill net	GN04	Fourhorn Sculpin	*Myoxocephalus quadricornis*	186	57
06-Aug-21	Gill net	GN04	Fourhorn Sculpin	*Myoxocephalus quadricornis*	171	60
06-Aug-21	Gill net	GN04	Fourhorn Sculpin	*Myoxocephalus quadricornis*	224	99
06-Aug-21	Gill net	GN04	Fourhorn Sculpin	*Myoxocephalus quadricornis*	290	217
06-Aug-21	Gill net	GN04	Fourhorn Sculpin	*Myoxocephalus quadricornis*	249	132
06-Aug-21	Gill net	GN04	Fourhorn Sculpin	*Myoxocephalus quadricornis*	249	154
06-Aug-21	Gill net	GN04	Fourhorn Sculpin	*Myoxocephalus quadricornis*	180	46
06-Aug-21	Gill net	GN04	Fourhorn Sculpin	*Myoxocephalus quadricornis*	246	143
06-Aug-21	Gill net	GN04	Fourhorn Sculpin	*Myoxocephalus quadricornis*	189	60
06-Aug-21	Gill net	GN04	Fourhorn Sculpin	*Myoxocephalus quadricornis*	252	165
06-Aug-21	Gill net	GN04	Fourhorn Sculpin	*Myoxocephalus quadricornis*	210	71
06-Aug-21	Gill net	GN04	Fourhorn Sculpin	*Myoxocephalus quadricornis*	206	89
06-Aug-21	Gill net	GN04	Fourhorn Sculpin	*Myoxocephalus quadricornis*	262	228
06-Aug-21	Gill net	GN04	Fourhorn Sculpin	*Myoxocephalus quadricornis*	479	822
07-Aug-21	Gill net	GN05	Fourhorn Sculpin	*Myoxocephalus quadricornis*	240	150
07-Aug-21	Gill net	GN05	Fourhorn Sculpin	*Myoxocephalus quadricornis*	206	120
07-Aug-21	Gill net	GN06	Fourhorn Sculpin	*Myoxocephalus quadricornis*	117	11
07-Aug-21	Gill net	GN06	Fourhorn Sculpin	*Myoxocephalus quadricornis*	199	100
07-Aug-21	Gill net	GN06	Fourhorn Sculpin	*Myoxocephalus quadricornis*	195	90
07-Aug-21	Gill net	GN06	Fourhorn Sculpin	*Myoxocephalus quadricornis*	230	130
08-Aug-21	Gill net	GN07	Fourhorn Sculpin	*Myoxocephalus quadricornis*	195	60
08-Aug-21	Gill net	GN07	Fourhorn Sculpin	*Myoxocephalus quadricornis*	168	60
08-Aug-21	Gill net	GN07	Fourhorn Sculpin	*Myoxocephalus quadricornis*	178	50
08-Aug-21	Gill net	GN07	Fourhorn Sculpin	*Myoxocephalus quadricornis*	175	50
08-Aug-21	Gill net	GN07	Fourhorn Sculpin	*Myoxocephalus quadricornis*	195	90
08-Aug-21	Gill net	GN07	Fourhorn Sculpin	*Myoxocephalus quadricornis*	305	320
08-Aug-21	Gill net	GN07	Fourhorn Sculpin	*Myoxocephalus quadricornis*	270	210
08-Aug-21	Gill net	GN07	Fourhorn Sculpin	*Myoxocephalus quadricornis*	257	195
08-Aug-21	Gill net	GN07	Fourhorn Sculpin	*Myoxocephalus quadricornis*	344	352
09-Aug-21	Gill net	GN08	Fourhorn Sculpin	*Myoxocephalus quadricornis*	194	45
09-Aug-21	Gill net	GN08	Fourhorn Sculpin	*Myoxocephalus quadricornis*	177	30
09-Aug-21	Gill net	GN08	Fourhorn Sculpin	*Myoxocephalus quadricornis*	200	80
09-Aug-21	Gill net	GN08	Fourhorn Sculpin	*Myoxocephalus quadricornis*	186	80
09-Aug-21	Gill net	GN08	Fourhorn Sculpin	*Myoxocephalus quadricornis*	298	124
14-Aug-21	Gill net	GN11	Fourhorn Sculpin	*Myoxocephalus quadricornis*	234	120
14-Aug-21	Gill net	GN11	Fourhorn Sculpin	*Myoxocephalus quadricornis*	188	50
15-Aug-21	Gill net	GN13	Fourhorn Sculpin	*Myoxocephalus quadricornis*	-	224
15-Aug-21	Gill net	GN13	Fourhorn Sculpin	*Myoxocephalus quadricornis*	-	234
16-Aug-21	Gill net	GN16	Fourhorn Sculpin	*Myoxocephalus quadricornis*	223	180
16-Aug-21	Gill net	GN16	Fourhorn Sculpin	*Myoxocephalus quadricornis*	238	150
16-Aug-21	Gill net	GN16	Fourhorn Sculpin	*Myoxocephalus quadricornis*	187	70
16-Aug-21	Gill net	GN16	Fourhorn Sculpin	*Myoxocephalus quadricornis*	235	150
16-Aug-21	Gill net	GN16	Fourhorn Sculpin	*Myoxocephalus quadricornis*	210	100
16-Aug-21	Gill net	GN16	Fourhorn Sculpin	*Myoxocephalus quadricornis*	248	190
16-Aug-21	Gill net	GN16	Fourhorn Sculpin	*Myoxocephalus quadricornis*	243	200
16-Aug-21	Gill net	GN16	Fourhorn Sculpin	*Myoxocephalus quadricornis*	245	190
16-Aug-21	Gill net	GN16	Fourhorn Sculpin	*Myoxocephalus quadricornis*	275	270
16-Aug-21	Gill net	GN16	Fourhorn Sculpin	*Myoxocephalus quadricornis*	301	350
16-Aug-21	Gill net	GN17	Fourhorn Sculpin	*Myoxocephalus quadricornis*	246	200
16-Aug-21	Gill net	GN17	Fourhorn Sculpin	*Myoxocephalus quadricornis*	247	210
16-Aug-21	Gill net	GN17	Fourhorn Sculpin	*Myoxocephalus quadricornis*	234	160
16-Aug-21	Gill net	GN17	Fourhorn Sculpin	*Myoxocephalus quadricornis*	180	100
16-Aug-21	Gill net	GN17	Fourhorn Sculpin	*Myoxocephalus quadricornis*	236	170
16-Aug-21	Gill net	GN17	Fourhorn Sculpin	*Myoxocephalus quadricornis*	298	360
16-Aug-21	Gill net	GN17	Fourhorn Sculpin	*Myoxocephalus quadricornis*	256	210
16-Aug-21	Gill net	GN17	Fourhorn Sculpin	*Myoxocephalus quadricornis*	240	160
16-Aug-21	Gill net	GN17	Fourhorn Sculpin	*Myoxocephalus quadricornis*	217	130
16-Aug-21	Gill net	GN17	Fourhorn Sculpin	*Myoxocephalus quadricornis*	186	80
16-Aug-21	Gill net	GN17	Fourhorn Sculpin	*Myoxocephalus quadricornis*	189	80
16-Aug-21	Gill net	GN17	Fourhorn Sculpin	*Myoxocephalus quadricornis*	210	120
17-Aug-21	Gill net	GN19	Fourhorn Sculpin	*Myoxocephalus quadricornis*	291	280
17-Aug-21	Gill net	GN19	Fourhorn Sculpin	*Myoxocephalus quadricornis*	216	80
17-Aug-21	Gill net	GN19	Fourhorn Sculpin	*Myoxocephalus quadricornis*	234	100
17-Aug-21	Gill net	GN19	Fourhorn Sculpin	*Myoxocephalus quadricornis*	239	120
17-Aug-21	Gill net	GN19	Fourhorn Sculpin	*Myoxocephalus quadricornis*	219	100

Appendix 6B-2
Fish Capture Data

Date	Capture Method	Site	Common Name	Species	Length (mm)	Weight (g)
17-Aug-21	Gill net	GN19	Fourhorn Sculpin	*Myoxocephalus quadricornis*	189	60
17-Aug-21	Gill net	GN20	Fourhorn Sculpin	*Myoxocephalus quadricornis*	249	140
17-Aug-21	Gill net	GN20	Fourhorn Sculpin	*Myoxocephalus quadricornis*	345	160
17-Aug-21	Gill net	GN20	Fourhorn Sculpin	*Myoxocephalus quadricornis*	218	90
17-Aug-21	Gill net	GN20	Fourhorn Sculpin	*Myoxocephalus quadricornis*	191	50
17-Aug-21	Gill net	GN20	Fourhorn Sculpin	*Myoxocephalus quadricornis*	194	50
17-Aug-21	Gill net	GN21	Fourhorn Sculpin	*Myoxocephalus quadricornis*	251	230
17-Aug-21	Gill net	GN21	Fourhorn Sculpin	*Myoxocephalus quadricornis*	247	190
18-Aug-21	Gill net	GN24	Fourhorn Sculpin	*Myoxocephalus quadricornis*	235	150
18-Aug-21	Gill net	GN24	Fourhorn Sculpin	*Myoxocephalus quadricornis*	230	140
18-Aug-21	Gill net	GN24	Fourhorn Sculpin	*Myoxocephalus quadricornis*	124	120
18-Aug-21	Gill net	GN24	Fourhorn Sculpin	*Myoxocephalus quadricornis*	200	80
18-Aug-21	Gill net	GN24	Fourhorn Sculpin	*Myoxocephalus quadricornis*	229	120
18-Aug-21	Gill net	GN24	Fourhorn Sculpin	*Myoxocephalus quadricornis*	160	130
18-Aug-21	Gill net	GN24	Fourhorn Sculpin	*Myoxocephalus quadricornis*	206	120
18-Aug-21	Gill net	GN24	Fourhorn Sculpin	*Myoxocephalus quadricornis*	188	80
18-Aug-21	Gill net	GN24	Fourhorn Sculpin	*Myoxocephalus quadricornis*	148	50
18-Aug-21	Gill net	GN24	Fourhorn Sculpin	*Myoxocephalus quadricornis*	159	60
18-Aug-21	Gill net	GN25	Fourhorn Sculpin	*Myoxocephalus quadricornis*	195	90
18-Aug-21	Gill net	GN25	Fourhorn Sculpin	*Myoxocephalus quadricornis*	179	80
18-Aug-21	Gill net	GN25	Fourhorn Sculpin	*Myoxocephalus quadricornis*	212	110
18-Aug-21	Gill net	GN25	Fourhorn Sculpin	*Myoxocephalus quadricornis*	223	110
17-Aug-21	Gill net	GN20	Greenland Cod	*Gadus ogac*	449	890
06-Aug-21	Gill net	GN03	Shorthorn Sculpin	*Myoxocephalus scorpius*	132	18
09-Aug-21	Gill net	GN08	Shorthorn Sculpin	*Myoxocephalus scorpius*	394	790
09-Aug-21	Gill net	GN08	Shorthorn Sculpin	*Myoxocephalus scorpius*	244	180
16-Aug-21	Gill net	GN16	Shorthorn Sculpin	*Myoxocephalus scorpius*	249	180
17-Aug-21	Gill net	GN20	Shorthorn Sculpin	*Myoxocephalus scorpius*	323	410
17-Aug-21	Gill net	GN20	Shorthorn Sculpin	*Myoxocephalus scorpius*	269	220
17-Aug-21	Gill net	GN21	Shorthorn Sculpin	*Myoxocephalus scorpius*	237	150
17-Aug-21	Gill net	GN21	Shorthorn Sculpin	*Myoxocephalus scorpius*	242	230
02-Aug-21	Hoop	HN01	Fourhorn Sculpin	*Myoxocephalus quadricornis*	280	250
02-Aug-21	Hoop	HN01	Fourhorn Sculpin	*Myoxocephalus quadricornis*	247	184
02-Aug-21	Hoop	HN01	Fourhorn Sculpin	*Myoxocephalus quadricornis*	293	204
02-Aug-21	Hoop	HN02	Fourhorn Sculpin	*Myoxocephalus quadricornis*	189	72
08-Aug-21	Hoop	HN03	Fourhorn Sculpin	*Myoxocephalus quadricornis*	157	40
08-Aug-21	Hoop	HN03	Fourhorn Sculpin	*Myoxocephalus quadricornis*	160	40
08-Aug-21	Hoop	HN03	Fourhorn Sculpin	*Myoxocephalus quadricornis*	138	10
08-Aug-21	Hoop	HN04	Fourhorn Sculpin	*Myoxocephalus quadricornis*	248	150
08-Aug-21	Hoop	HN04	Fourhorn Sculpin	*Myoxocephalus quadricornis*	178	50
08-Aug-21	Hoop	HN04	Fourhorn Sculpin	*Myoxocephalus quadricornis*	145	45
08-Aug-21	Hoop	HN04	Fourhorn Sculpin	*Myoxocephalus quadricornis*	166	50
08-Aug-21	Hoop	HN04	Fourhorn Sculpin	*Myoxocephalus quadricornis*	186	60
11-Aug-21	Hoop	HN05	No fish Caught	-	-	-
11-Aug-21	Hoop	HN06	No fish Caught	-	-	-
16-Aug-21	Hoop	HN07	No fish Caught	-	-	-
09-Aug-21	Long Line	LL01	No fish Caught	-	-	-
09-Aug-21	Long Line	LL02	No fish Caught	-	-	-
09-Aug-21	Long Line	LL03	No fish Caught	-	-	-
19-Aug-21	Trawling	TR04	Arctic Sculpin	*Myoxocephalus scorpioides*	108	-
19-Aug-21	Trawling	TR04	Arctic Staghorn Sculpin	*Gymnocanthus tricuspis*	101	-
19-Aug-21	Trawling	TR04	Arctic Staghorn Sculpin	*Gymnocanthus tricuspis*	145	30
19-Aug-21	Trawling	TR04	Arctic Staghorn Sculpin	*Gymnocanthus tricuspis*	150	30
19-Aug-21	Trawling	TR04	Arctic Staghorn Sculpin	*Gymnocanthus tricuspis*	122	-
19-Aug-21	Trawling	TR04	Arctic Staghorn Sculpin	*Gymnocanthus tricuspis*	90	-
19-Aug-21	Trawling	TR02	Atlantic Poacher	*Leptagonus decagonus*	47	-
19-Aug-21	Trawling	TR04	Arctic Alligatorfish	*Aspidophoroides olrikii*	72	-
19-Aug-21	Trawling	TR04	Arctic Alligatorfish	*Aspidophoroides olrikii*	69	-
19-Aug-21	Trawling	TR01	No fish Caught	-	-	-
19-Aug-21	Trawling	TR02	Ribbed Sculpin	*Triglops pingelii*	71	-
19-Aug-21	Trawling	TR03	Ribbed Sculpin	*Triglops pingelii*	134	-
19-Aug-21	Trawling	TR03	Ribbed Sculpin	*Triglops pingelii*	82	-
19-Aug-21	Trawling	TR04	Ribbed Sculpin	*Triglops pingelii*	118	-
19-Aug-21	Trawling	TR04	Ribbed Sculpin	*Triglops pingelii*	74	-
19-Aug-21	Trawling	TR04	Ribbed Sculpin	*Triglops pingelii*	114	-
19-Aug-21	Trawling	TR04	Ribbed Sculpin	*Triglops pingelii*	109	-
19-Aug-21	Trawling	TR04	Ribbed Sculpin	*Triglops pingelii*	92	-
19-Aug-21	Trawling	TR04	Ribbed Sculpin	*Triglops pingelii*	93	-
19-Aug-21	Trawling	TR04	Ribbed Sculpin	*Triglops pingelii*	99	-
19-Aug-21	Trawling	TR04	Ribbed Sculpin	*Triglops pingelii*	95	-
19-Aug-21	Trawling	TR04	Ribbed Sculpin	*Triglops pingelii*	87	-

Appendix 6B-2
Fish Capture Data

Date	Capture Method	Site	Common Name	Species	Length (mm)	Weight (g)
19-Aug-21	Trawling	TR04	Ribbed Sculpin	*Triglops pingelii*	95	-
19-Aug-21	Trawling	TR04	Ribbed Sculpin	*Triglops pingelii*	88	-
19-Aug-21	Trawling	TR04	Ribbed Sculpin	*Triglops pingelii*	92	-
19-Aug-21	Trawling	TR04	Ribbed Sculpin	*Triglops pingelii*	95	-
19-Aug-21	Trawling	TR04	Ribbed Sculpin	*Triglops pingelii*	96	-
19-Aug-21	Trawling	TR04	Ribbed Sculpin	*Triglops pingelii*	91	-
19-Aug-21	Trawling	TR04	Ribbed Sculpin	*Triglops pingelii*	108	-
19-Aug-21	Trawling	TR04	Ribbed Sculpin	*Triglops pingelii*	98	-
19-Aug-21	Trawling	TR04	Ribbed Sculpin	*Triglops pingelii*	117	-
19-Aug-21	Trawling	TR04	Ribbed Sculpin	*Triglops pingelii*	91	-
19-Aug-21	Trawling	TR04	Ribbed Sculpin	*Triglops pingelii*	98	-
19-Aug-21	Trawling	TR04	Ribbed Sculpin	*Triglops pingelii*	93	-
19-Aug-21	Trawling	TR04	Ribbed Sculpin	*Triglops pingelii*	96	-
19-Aug-21	Trawling	TR04	Ribbed Sculpin	*Triglops pingelii*	116	-
19-Aug-21	Trawling	TR04	Ribbed Sculpin	*Triglops pingelii*	94	-
19-Aug-21	Trawling	TR04	Ribbed Sculpin	*Triglops pingelii*	94	-
19-Aug-21	Trawling	TR04	Ribbed Sculpin	*Triglops pingelii*	110	-
19-Aug-21	Trawling	TR04	Ribbed Sculpin	*Triglops pingelii*	110	-
19-Aug-21	Trawling	TR04	Ribbed Sculpin	*Triglops pingelii*	97	-
19-Aug-21	Trawling	TR04	Ribbed Sculpin	*Triglops pingelii*	91	-
19-Aug-21	Trawling	TR04	Ribbed Sculpin	*Triglops pingelii*	94	-
19-Aug-21	Trawling	TR04	Ribbed Sculpin	*Triglops pingelii*	87	-
19-Aug-21	Trawling	TR04	Ribbed Sculpin	*Triglops pingelii*	99	-
19-Aug-21	Trawling	TR04	Ribbed Sculpin	*Triglops pingelii*	96	-
19-Aug-21	Trawling	TR04	Ribbed Sculpin	*Triglops pingelii*	102	-
19-Aug-21	Trawling	TR04	Ribbed Sculpin	*Triglops pingelii*	97	-
19-Aug-21	Trawling	TR04	Ribbed Sculpin	*Triglops pingelii*	89	-
19-Aug-21	Trawling	TR04	Ribbed Sculpin	*Triglops pingelii*	93	-
19-Aug-21	Trawling	TR04	Ribbed Sculpin	*Triglops pingelii*	94	-
19-Aug-21	Trawling	TR04	Ribbed Sculpin	*Triglops pingelii*	89	-
19-Aug-21	Trawling	TR04	Ribbed Sculpin	*Triglops pingelii*	80	-
19-Aug-21	Trawling	TR04	Ribbed Sculpin	*Triglops pingelii*	99	-
19-Aug-21	Trawling	TR04	Ribbed Sculpin	*Triglops pingelii*	88	-
19-Aug-21	Trawling	TR04	Ribbed Sculpin	*Triglops pingelii*	84	-
19-Aug-21	Trawling	TR04	Ribbed Sculpin	*Triglops pingelii*	100	-
19-Aug-21	Trawling	TR04	Saddled Eelpout	*Lycodes mucosus*	121	-
19-Aug-21	Trawling	TR02	Unidentified Cod	Gadus indet.	63	-
19-Aug-21	Trawling	TR03	Unidentified Cod	Gadus indet.	58	-
19-Aug-21	Trawling	TR04	Unidentified Cod	Gadus indet.	99	-
19-Aug-21	Trawling	TR04	Unidentified Cod	Gadus indet.	59	-
19-Aug-21	Trawling	TR04	Unidentified Cod	Gadus indet.	69	-
19-Aug-21	Trawling	TR04	Unidentified Cod	Gadus indet.	72	-
19-Aug-21	Trawling	TR04	Unidentified Cod	Gadus indet.	73	-
19-Aug-21	Trawling	TR04	Unidentified Cod	Gadus indet.	72	-
19-Aug-21	Trawling	TR04	Unidentified Cod	Gadus indet.	63	-
19-Aug-21	Trawling	TR04	Unidentified Cod	Gadus indet.	66	-
19-Aug-21	Trawling	TR04	Unidentified Cod	Gadus indet.	70	-
19-Aug-21	Trawling	TR02	Unidentified Sculpin	Myoxocephalus sp.	93	-
19-Aug-21	Trawling	TR04	Unidentified Sculpin	Myoxocephalus sp.	86	-
19-Aug-21	Trawling	TR04	Unidentified Sculpin	Myoxocephalus sp.	90	-
19-Aug-21	Trawling	TR02	Unidentified Snailfish	Liparidae indet.	102	-

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FINAL REPORT

Chapter 7.0 Fish Health and Tissue Chemistry

2021 Marine Environmental Effects Monitoring Program (MEEMP) and Non-Indigenous Species / Aquatic Invasive Species (AIS) Monitoring Program

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ACRONYMS AND ABBREVIATIONS

Acronym or Abbreviation	Definition
ANCOVA	analysis of covariance
ANOVA	analysis of variance
BC MOE	British Columbia Ministry of Environment
Biologica	Biological Environmental Services Ltd.
BV labs	Bureau Veritas Laboratories
COC	chain of custody
COPCs	contaminants of potential concern
CRC ICPMS	collision reaction cell inductively coupled plasma mass spectrometry
DL	detection limit
Dw	dry weight
EEM	Environmental Effects Monitoring
ERP	Early Revenue Phase
FEIS	2012 Final Environmental Impact Statement
G	gram
GSI	gonadosomatic index
Km	kilometre
LSI	liver somatic index
MDMER	Metal and Diamond Mining Effluent Regulations
MEEMP	Marine Environmental Effects Monitoring Program
mg/kg	milligrams per kilogram
Mm	milligram
Min	minimum
Max	maximum
N	sample size
PAH	polycyclic aromatic hydrocarbons
PC	Project Certificate
P-value	probability value
QA/QC	quality assurance and quality control
ROV	Remote operated vehicle
RPD	relative percent differences
SD	Standard Deviation
SE	Standard Error
SR	studentized residuals
Ww	wet weight
Y	year

7.0 FISH HEALTH AND TISSUE CHEMISTRY

7.1 Introduction

This chapter presents the results of the 2021 fish health and tissue chemistry monitoring program, a component of the larger Marine Environmental Effects Monitoring Program (MEEMP) conducted in Milne Inlet during the 2021 open-water season. The fish health and tissue chemistry component was developed in consideration of the potential Project-related impacts to the marine environment as identified in the 2012 Final Environmental Impact Statement (FEIS) and subsequent addendums, as well as monitoring requirements outlined in the Project Certificate (PC) Conditions described in Chapter 1.0, Table 1-2. Those related to the monitoring of Fish Health include PC Conditions No. 76, 83 (a), 99 (a), 99 (b) (ii), 99 (c), 113, and 114.

7.1.1 Objectives

Objectives for the overall MEEMP program are outlined in Section 1.3 of Chapter 1.0 (Program Overview). Objectives specific to the fish health and tissue chemistry component are as follows:

- Better align the MEEMP with the Metal and Diamond Mining Effluent Regulations (MDMER) Environmental Effects Monitoring (EEM) program (Government of Canada 2002) through the selection of sentinel species and measurements of additional health indicators to monitor for effects from the Project.
- Evaluate the health of the sentinel species Fourhorn Sculpin (*Myoxocephalus quadricornis*) and wrinkled rock-borer (*Hiatella arctica*), hereafter referred to as (*H. arctica*), through the assessment of established endpoints (see Section 7.2), length frequency distributions, length-weight relationships, and visual assessment of internal and external abnormalities.
- Compile current and historic tissue chemistry data for Arctic Char (*Salvelinus alpinus*), Fourhorn Sculpin, and *H. arctica* and assess concentrations of contaminants of potential concern (COPCs).

7.2 Study Design

The 2014 to 2021 MEEMP study design was designed to monitor for potential Project-related impacts and changes to fish health and communities through collection of fish population data using a combination of active and passive fishing methods, and through analysis of fish health parameters in incidental mortalities. During baseline and early MEEMP surveys, fish tissue sampling was limited to incidental Arctic Char mortalities, the numbers of which fluctuated from year to year and did not always yield adequate samples to support a meaningful statistical analysis.

In 2018, a local shellfish species, *H. arctica,* was added to the MEEMP as an additional effects indicator for the fish sampling program. *Hiatella arctica* is a resident species in the Project area, easily identifiable and measurable in the field, and abundant in the study area (Golder 2018). Measurement endpoints for *H. arctica* in 2018 and 2019 included age and tissue chemistry analysis.

In 2020, in anticipation of future regulatory requirements under the MDMER that may apply to monitoring if Baffinland's Phase 2 Proposal was approved, changes to the fish health and tissue chemistry program were implemented to better align the MEEMP with the MDMER EEM program (Government of Canada 2002). Fourhorn Sculpin and *H. arctica* were selected as sentinel species to monitor for effects from the Project. Lethal target sample sizes were established for Fourhorn Sculpin and *H. arctica* as part of the 2020 fish health program. Fish health effect indicators included measures of energy use (i.e., growth, reproduction), energy storage (i.e., condition) and survival (i.e., age), in addition to supporting endpoints (as appropriate for each species) such as length, body weight, the prevalence of external and internal abnormalities, organ weights, stomach fullness, parasite presence/absence, sex, life stage, and state-of-maturity (Section 7.4.1; Appendix 7B).

For fish tissue chemistry, concentrations of total metals[1] and polycyclic aromatic hydrocarbons (PAHs) were measured (Section 7.4.2; Appendix 7C) for the three species (i.e., Arctic Char, Fourhorn Sculpin, and *H. arctica*) and compared to MEEMP data from previous years, where possible. Historic data available for comparison varied for each species, with data extending back to 2010 for Arctic char intermittently, and for Fourhorn Sculpin and *H. arctica* to 2018.

7.2.1 Modifications to the Program (2021)

In 2021, a reconnaissance survey was undertaken near the Tugaat River estuary during the August field program, in an effort to identify a suitable reference area for the fish health and tissue chemistry component of the MEEMP, should one be required in future years. Water quality, sediment quality and fish community sampling were completed as part of the reconnaissance survey; a summary of the methods and results of the reconnaissance survey is provided in Appendix 7A. Other than the addition of the Tugaat River estuary, no significant modifications were made to the Fish Health or Fish Chemistry program in 2021.

7.3 Materials and Methods

7.3.1 Field Methods

Fish community sampling was conducted at various locations near Milne Port, approximately 80 km Northwest of the Mary River Project (17W 503687m E, 7976357m N) from 2 to 19 August 2021 (Figure 6-1 to Figure 6-3). Fishing effort included both active (i.e., angling, seine, trawling) and passive (i.e., Fukui traps, hoop nets, and gill netting) capture methods. Captured fish were enumerated and measured for length and weight. Capture methods are described in detail in Section 6.3.1 in Chapter 6.0—Fishing Efforts and Catch Data. A subsample of 40 Fourhorn Sculpin were retained for fish health sampling to meet target sample sizes of 20 adult males and 20 adult females. All other fish were released alive back into Milne Inlet. Incidental mortalities of Arctic Char were retained for analysis of age, stomach contents, and tissue metals concentrations.

The primary method of capture for Fourhorn Sculpin in 2021 was angling. Changes to angling methods implemented in 2020 were also used in 2021. These changes included targeted fishing efforts along coarse rock substrate at the Ore Dock following observations of high numbers of this species during habitat offset monitoring (Golder 2020b). In Remotely Operated Vehicle (ROV) footage, Fourhorn Sculpin were observed in relatively high abundances along the western and eastern sides in coarse rock habitat at depths between 1 m and 5 m. Angling (i.e., jigging) efforts were focussed on these locations, fishing from a stationary position, with two to five rods and lines deployed from the field vessel anchored adjacent to the riprap. Hooks or spoon lures (i.e., flashers) were lowered into the riprap at the target depth, then flicked upward to attract fish within the coarse rock habitat.

[1] Includes metals, metalloids, and non-metals. Metals are broadly defined as elements which are good conductors of electricity and heat, which form cations by loss of electrons, and which yield basic oxides and hydroxides (Wood et al. 2012). Metalloids share some but not all properties of metals, while non-metals mostly lack characteristics of metals.

The *H. arctica* specimens were collected opportunistically from benthic infauna samples, with a target subsample of 40 individuals retained for fish health and tissue chemistry sampling. Collection methods for benthic infauna are described in Section 4.3.1 in Chapter 4.0—Benthic Infauna. Each benthic sample was checked for the presence of *H. arctica.* Samples to be retained for the fish health and tissue chemistry program were obtained from benthic grab samples collected from the northwestern, western, eastern, and northeastern transects (Figure 3-1), with the majority of collections occurring from the western and eastern transects. In benthic grab samples where *H. arctica* numbers were greatest, a maximum of five individuals were selected. Specimens were selected for processing if the shell was intact, greater than 15 mm in length, and had no indications of damage to the umbo or hinge area.

7.3.2 Fish Processing

Fourhorn Sculpin retained for fish health sampling were held live in aerated 70 litre totes containing water from Milne Inlet until they were lethally processed at Milne Port. Both external and internal assessments were completed on lethally sampled fish following standardized procedures consistent with MDMER EEM program requirements (Environment Canada 2012). Total lengths (± 1 mm) and total body weights (± 0.001 g) of the fish were documented, and external observations of fish features (i.e., body form, eyes, skin, thymus, opercula, gills, pseudobranchs, fins, vent, and parasites) were recorded. Abnormal features (e.g., wounds, tumours, parasites, fin fraying, gill parasites, or lesions) were described in detail and photographed. Fish were sacrificed by a concussive blow to the head followed by cervical dislocation (i.e., cutting the spinal cord behind the head). Each fish was handled using new nitrile gloves and dissected on a cutting board covered in a clean sheet of plastic wrap that was changed between fish. Dissecting equipment was washed between fish in phosphate-free soap and rinsed with 10% nitric acid followed by deionized water. The condition of the internal organs (e.g., liver, spleen, gall bladder, and kidneys) was assessed immediately after opening the body cavity and documented. Any abnormalities in size, shape, or colouration of the internal organs were documented. Liver weight and an estimate of percent mesenteric fat were recorded. The gonads of each fish were removed, weighed (± 0.001 g), and photographed before assigning sex and maturity stage, based on the macroscopic features described in Table 7-1. Parasite presence and predominance were recorded, and parasite weight was documented if large parasites (e.g., tapeworms) were observed in the body cavity.

Stomachs and ageing structures (i.e., otoliths[2]) were collected from Fourhorn Sculpin and incidental mortalities of Arctic Char. Sagittal otoliths were extracted as the primary aging structure, wrapped in parchment paper, and stored dry in individually labelled coin envelopes until aging analysis. Stomach fullness was recorded, and the stomachs were removed, placed in individually labelled Nalgene containers and preserved with 10% formalin. For Fourhorn Sculpin and Arctic Char, one muscle sample (> 10 g) without skin was collected from the left dorsal side of each fish using a fillet knife rinsed with 10% nitric acid then deionized ultrafiltered water. The fillets were weighed (± 0.001 g), placed on ice in individually labelled Ziploc bags, and stored frozen until submission for metals analysis. A second muscle sample (> 10 g) without skin was collected from the right dorsal side of each fish using a fillet knife rinsed with acetone then deionized ultrafiltered water. The fillets were weighed (± 0.001 g) on tared aluminum foil, wrapped in aluminum foil, placed on ice in individually labelled Ziploc bags, and stored frozen until PAH analysis.

[2] Otoliths are a pair of bony structures located behind the eyes in fish. Counting the annual growth rings on the otoliths is a common technique in estimating the age of many fish species.

Those *H. arctica* retained for health sampling were selected based on the external condition of the shell (i.e., > 15 mm long with intact valves and no visible damage to the umbo). Individuals were measured along the largest axis (± 1 mm) and weighed (± 0.001 g), and then placed on ice in individually labelled Ziploc bags and stored frozen until further processing and tissue chemistry analysis.

Table 7-1: Gonad Maturity Stages for Male and Female Fish Used During the Fish Health Assessment, 2021

Sex	Stage	Code	Macroscopic features
Female	Unknown stage	10	Unable to determine stage.
	Immature	11	Small ovaries, often clear, blood vessels indistinct.
	Early Stage Development	12	Enlarging ovaries, blood vessels more distinct. Granular in appearance.
	Late Stage Development	13	Large ovaries filling the body cavity, prominent blood vessels. Individual oocytes visible.
	Ripe	14	Eggs released with gentle pressure on abdomen.
	Spent	15	Deflated ovaries, blood vessels prominent.
	Reabsorbing	16	Small atretic oocytes throughout the ovaries, which are hard and white.
	Resting	17	Small ovaries, blood vessels reduced but present.
Male	Unknown stage	20	Unable to determine stage.
	Immature	21	Small testes, often clear and threadlike.
	Early Stage Development	22	Small testes, semi-translucent, but easily identified.
	Late Stage Development	23	Testes large, firm and lobate. White to purplish in colour. Granular appearance.
	Ripe	24	Milt released with gentle pressure on abdomen.
	Spent	25	Small and deflated testes. Blood vessels obvious. Violet-pink in colour.
	Reabsorbing	26	Not typically observed in males.
	Resting	27	Small testes, often threadlike.

Notes:
Table modified from Brown-Peterson et al. (2011).

7.3.3 Laboratory Methods

Samples of all fish and *H. arctica* were submitted for further laboratory analysis. Arctic Char and Fourhorn Sculpin tissue samples were submitted for tissue chemistry analysis, and stomachs were submitted for contents analysis. Ageing structures of both species were submitted for age determination. Collected *H. arctica* were sent to a laboratory specialized in marine invertebrates for additional processing and subsequent submission of tissues for tissue chemistry analysis.

7.3.3.1 Bivalve Processing

Frozen *H. arctica* were processed by Biologica Environmental Services Ltd. (Biologica; Victoria, BC). *Hiatella arctica* were measured for total length, as well as wet weight (ww) of the whole organism, shells, soft tissues, and gonads. Shell dry weight (dw) was also measured. Tissue dw was estimated using a tissue moisture conversion factor of 0.369 (Brey 2001). Ages of *H. arctica* was determined using shells (Section 7.3.3.2).

7.3.3.2 Age

Otoliths extracted from Fourhorn Sculpin and Arctic Char were examined by North/South Consultants Inc. (Winnipeg, MB) to determine the age of the fish. Whole otoliths from individual fish were mounted on microscope slides to estimate age based on the number of annuli (i.e., growth rings) visible under a dissecting microscope.

For *H. arctica* ageing, each shell was sectioned through the umbo-rim axis using a lapidary saw with a diamond-impregnated blade and polished using progressively finer grit sandpaper. Polished shells were etched in a solution of 1% hydrochloric acid for one minute, rinsed with tap water, and dried. An acetate peel of the polished umbo surface was mounted on a slide and examined using a dissecting microscope. Distinct, continuous growth lines were counted to determine the age of the shell.

To verify that data quality objectives were met, 10% of both fish and *H. arctica* age estimates were independently verified by a second qualified biologist.

7.3.3.3 Stomach Contents

Enumeration and taxonomic identification of stomach contents for Arctic Char and Fourhorn Sculpin were conducted by Biologica. Percent fullness and percent digestion of each stomach was recorded before dissection and identification based on the professional judgement of the taxonomist. Prey items were identified to the lowest practical taxonomic level (e.g., species when possible) using published methods and taxonomic references. Digested and unidentifiable materials were categorized (e.g., unidentified insect parts, digested tissue, non-food, and others). The taxonomic composition within each stomach was determined as percentages of major invertebrate groups by abundance.

7.3.3.4 Tissue Chemistry

Tissue samples collected from eight Arctic Char (muscle), eight Fourhorn Sculpin (muscle), and eight *H. arctica* (composite soft tissue samples) were submitted to Bureau Veritas Laboratories (BV Labs; Burnaby, BC) for tissue chemistry analyses (Appendix 7C, Table 7C-1). *Hiatella arctica* composites were composed of two to three individuals in order to satisfy weight requirements (Table 7-2). Moisture content and metals concentrations for fish and *H. arctica* were measured in percent and milligrams per kilogram (mg/kg) ww, respectively, by oven drying and collision reaction cell inductively coupled plasma mass spectrometry (CRC ICPMS), respectively. Concentrations of PAHs for fish and *H. arctica* were measured in mg/kg ww by gas chromatography mass spectrometry. Achieved detection limits (DL) for fish and *H. arctica* are presented in Appendix 7C, Tables 7C-2 to 7C-7. Certificate of analysis forms are provided in Appendix 7E.

Table 7-2: Summary of *Hiatella arctica* Samples Sent to Bureau Veritas Laboratory for Tissue Chemistry Analysis, 2021

Composite Sample	Chemistry	Fish Identification Numbers	Number of Individuals
BAFF21UMLNHTARCOMP1	Metals	BAFF21UMLNHTAR1508	3
		BAFF21UMLNHTAR1518	
		BAFF21UMLNHTAR1530	
BAFF21UMLNHTARCOMP2	Metals	BAFF21UMLNHTAR1504	2
		BAFF21UMLNHTAR1520	
BAFF21UMLNHTARCOMP3	Metals	BAFF21UMLNHTAR1510	2
		BAFF21UMLNHTAR1528	
BAFF21UMLNHTARCOMP4	Metals	BAFF21UMLNHTAR1516	2
		BAFF21UMLNHTAR1526	
BAFF21UMLNHTARCOMP5	Metals	BAFF21UMLNHTAR1512	2
		BAFF21UMLNHTAR1532	
BAFF21UMLNHTARCOMP6	Metals	BAFF21UMLNHTAR1506	2
		BAFF21UMLNHTAR1534	
BAFF21UMLNHTARCOMP7	Metals	BAFF21UMLNHTAR1502	2
		BAFF21UMLNHTAR1514	
BAFF21UMLNHTARCOMP8	Metals	BAFF21UMLNHTAR1522	2
		BAFF21UMLNHTAR1524	
BAFF21UMLNHTARCOMP9	PAHs	BAFF21UMLNHTAR1501	2
		BAFF21UMLNHTAR1519	
BAFF21UMLNHTARCOMP10	PAHs	BAFF21UMLNHTAR1513	3
		BAFF21UMLNHTAR1515	
		BAFF21UMLNHTAR1534	
BAFF21UMLNHTARCOMP11	PAHs	BAFF21UMLNHTAR1509	2
		BAFF21UMLNHTAR1529	
BAFF21UMLNHTARCOMP12	PAHs	BAFF21UMLNHTAR1507	2
		BAFF21UMLNHTAR1527	
BAFF21UMLNHTARCOMP13	PAHs	BAFF21UMLNHTAR1505	2
		BAFF21UMLNHTAR1511	
BAFF21UMLNHTARCOMP14	PAHs	BAFF21UMLNHTAR1521	2
		BAFF21UMLNHTAR1531	
BAFF21UMLNHTARCOMP15	PAHs	BAFF21UMLNHTAR1525	2
		BAFF21UMLNHTAR1533	
BAFF21UMLNHTARCOMP16	PAHs	BAFF21UMLNHTAR1503	3
		BAFF21UMLNHTAR1517	
		BAFF21UMLNHTAR1523	

PAHs = Polycyclic aromatic hydrocarbons.

7.3.4 Data Analysis

Descriptive statistics (i.e., sample size, mean, median, standard deviation [SD], standard error [SE], minimum, and maximum values) were calculated for fish health and tissue chemistry data collected in 2021, as well as fish health endpoints and tissue concentrations of metals and PAHs in Arctic Char, Fourhorn Sculpin, and *H. arctica* available from 2018 to 2021.

Fish health indices for Fourhorn Sculpin were calculated as follows:

$$Condition\ factor = \left(\frac{body\ weight}{total\ length^3}\right) \times 100{,}000$$

$$Gonadosomatic\ index\ (GSI) = \left(\frac{gonad\ weight}{body\ weight}\right) \times 100$$

$$Liver\ somatic\ index\ (LSI) = \left(\frac{liver\ weight}{body\ weight}\right) \times 100$$

Fish health indices for *H. arctica* were calculated as follows:

$$Condition\ factor = \left(\frac{total\ wet\ weight}{total\ length^3}\right) \times 10{,}000$$

$$Mantle\ somatic\ index\ (MSI) = \left(\frac{gonad\ wet\ weight}{tissue\ wet\ weight - gonad\ wet\ weight}\right) \times 100$$

Wet weights were used to calculate condition factors for *H. arctica* because individual dw could not be obtained (i.e., fresh tissue samples were required to prepare composite samples for laboratory analyses of metals and PAHs). Weight and length measurements were reported in units of grams (g) and millimetres (mm), respectively.

7.3.4.1 Fish Health Endpoints

Fish health endpoints were compared using statistical methods for Fourhorn Sculpin and *H. arctica*. For Fourhorn Sculpin, comparisons were conducted separately by sex for endpoints presented in Table 7-3, to detect potential differences between 2020 and 2021. Differences in age were assessed using analysis of variance (ANOVA). Differences in mean size-at-age, condition, relative liver weight, and relative gonad weight among years were assessed using analysis of covariance (ANCOVA). Data analyzed by ANCOVA were $\log_{10}$ transformed prior to analysis if it increased the coefficient of determination (R^2). Significant differences between years were determined using an alpha (α) of 0.1.

Table 7-3: Statistical Procedures Used to Evaluate Fourhorn Sculpin Health

Indicator	Endpoint	Response Variable (y)	Covariate (x)	Statistical Procedure
Survival	Age	Age	n/a	ANOVA
Growth	Size-at-Age	Total Length	Age	ANCOVA
Condition	Condition	Total Weight	Total Length	ANCOVA
	Relative Liver Weight	Liver Weight	Total Weight	ANCOVA
Reproduction	Relative Gonad Weight	Gonad Weight	Total Weight	ANCOVA

ANOVA = analysis of variance; ANCOVA = analysis of covariance.

For *H. arctica*, comparisons were conducted for fish health endpoints presented in Table 7-4 to detect potential differences between 2020 and 2021. The differences in length-frequency distributions between years were assessed using the non-parametric two-sample Kolmogorov-Smirnov (K-S) test. The K-S test compares the cumulative relative distributions of total length between years by comparing the maximum percent difference between the two cumulative relative frequency distributions to a critical value. The test assesses whether the maximum percent difference is large enough to indicate that the two distributions are from different populations. Differences in total weight (i.e., whole animal ww) were assessed using ANOVA. Differences in condition were assessed using ANCOVA. Differences in relative gonad weights could not be assessed as gonad tissues were not weighed in 2020. Similar to Fourhorn Sculpin, data analyzed by ANCOVA were log_{10} transformed prior to analysis if it increased the coefficient of determination (R^2). Significant differences between years were determined using an α of 0.1.

Table 7-4: Statistical Procedures Used to Evaluate *Hiatella arctica* Health

Indicator	Endpoint	Response Variable (y)	Covariate (x)	Statistical Procedure
Survival	Length Frequency	Total Length	n/a	K-S test
Growth	Total Weight (whole animal wet weight)	Total Weight	n/a	ANOVA
Condition	Condition	Total Weight	Total Length	ANCOVA

K-S test = Kolmogorov-Smirnov test; ANOVA = analysis of variance; ANCOVA = analysis of covariance; n/a = not applicable.

7.3.4.2 Tissue Chemistry

Differences in tissue concentrations of contaminants of potential concern (COPCs), including aluminum, iron, magnesium, mercury, and selenium were compared among years (i.e., 2018, 2019, 2020, and 2021). Values below DL were substituted with half the DL and included in statistical comparisons, as per standard practice. These COPCs were identified based on the primary constituents of the Project iron ore (i.e., aluminum, magnesium, and iron), as well as metals with existing regulatory guidelines for fish tissue (i.e., mercury and selenium).

Aluminum, magnesium, and iron were compared among years using analysis of variance (ANOVA). Differences in relative body weight and tissue concentrations of mercury and selenium in Arctic Char and Fourhorn Sculpin were compared among years using analysis of covariance (ANCOVA), with length as a covariate. For *H. arctica,* length was not a significant predictor of tissue concentrations of mercury and selenium (i.e., the linear regression relationship was not significant), therefore, comparisons were made among years using ANOVA. Significant differences between years were determined using an α of 0.1.

Tissue chemistry data were presented visually using boxplots, where the median value was indicated within each box and the first and third quartiles were represented by the lower and upper bounds of each box, respectively. Lower and upper whiskers were calculated as 1.5 times the interquartile range beyond the first and third quartile. Observations outside the fences were plotted as individual points. Whiskers were extended to the minimum and maximum values within the dataset that fell within the fences. Detection limits were indicated on boxplots, and any values below a DL were not included.

7.3.4.3 Testing Assumptions for Statistical Analysis

The assumptions of ANOVA and ANCOVA are that the residuals of the data, after being fit to the model, are normally distributed and have equal variance among groups. The assumption of normality was assessed using the Shapiro-Wilk test, while Levene's test was used to assess equality of variances. Significant differences in assumptions were evaluated using an α of 0.01. If the assumptions of normality and equality of variance were not met, the data were $\log_{10}$-transformed and the assumptions were re-assessed. When the assumptions of ANOVA could not be met using a $\log_{10}$ transformation, the nonparametric Kruskal-Wallis test was used and post hoc pairwise comparisons made using Dunn's Test with Holm's *P*-value adjustment for multiple comparisons. When the assumptions of ANCOVA could not be met using $\log_{10}$ transformation, the non-parametric rank ANCOVA test was used and post hoc pairwise comparisons were made using a Tukey Honest Significant Difference test on rank metals concentrations.

In addition to the assumptions of normality and equality of variance, ANCOVA has the additional assumption that the parameter regression slopes are parallel among sampling areas. To test this assumption, the ANCOVA was conducted by first fitting separate regression models for each sampling area using a general linear model that included an interaction term between the sampling area and covariate:

Full ANCOVA model: $y = \beta_0 + \beta_1(x) + \beta_2(Year) + \beta_3(x) \times (Year) + \varepsilon$

where y is the response variable, x is the covariate, $Year$ is the sampling area indicator variable, and ε is the error term. If the coefficient β_3 of the $(x) \times (Year)$ interaction term was not significant (i.e., $p > 0.01$), then the slopes were considered parallel and the ANCOVA proceeded by testing the significance of the coefficient β_2 of the $(Year)$ term in the reduced ANCOVA model that fits separate regressions for each area, but with a common regression slope:

Reduced ANCOVA model: $y = \beta_0 + \beta_1(x) + \beta_2(Year) + \varepsilon.$

When a significant interaction was observed, the regression slopes were considered significantly different. When the covariate was a strong predictor of the response variable, and the ANCOVA had a high coefficient of determination ($R^2 > 0.8$), the test for parallel slopes had high power to detect a difference that may not be practically significant. In this case, when the interaction term in the full ANCOVA model was significant, the slopes were fixed as parallel by fitting the reduced ANCOVA model (because the reduced model explained almost as much [i.e., within 2%] of the variability in the response variable as the full model). In this case, the ANCOVA proceeded under the assumption that the regression slopes between groups were practically similar (Barrett et al., 2010).

Statistical outliers were evaluated using studentized residuals (SR) from the ANOVA and ANCOVA models. A magnitude of 3.5 for the SR was used to identify unusual observations. When an outlier was detected, the validity of the value was examined. If the outlier was determined to be the result of data entry error, the error was corrected; if the outlier was not the result of data entry error and could not be resolved otherwise, the outlier was removed from the analysis and documented.

If significant differences were detected based on the ANOVA or ANCOVA models, pairwise comparisons were made among years using a Tukey Honest Significant Difference test.

7.3.4.4 Relative Percent Difference

The relative percent differences (RPDs) in effect endpoints between years were calculated when significant differences in endpoints were observed, by expressing the difference as a percentage of the mean as follows:

$$Relative\ Percent\ Difference\ (RPD) = \frac{\bar{x}_{Year1} - \bar{x}_{Year2}}{\bar{x}_{(Year1+Year2)}} * 100$$

where $\bar{x}$ is the mean of the endpoint, and $Year_1$ and $Year_2$ refers to the years being compared.

If the statistical comparison was conducted on log_{10}-transformed data, then the RPD was calculated using geometric means. For effect endpoints analyzed using ANCOVA, RPDs were calculated using least squares means. In the instance where a rank ANCOVA model was used, RPDs were calculated using least squares means (not rank means). To confirm that differences in tissue concentrations between years were real and less likely to be attributed to low concentrations of target contaminants, analytical variability, and spatial and temporal variation, a RPD of 100% was used to differentiate stochastic differences from those of potential biological importance (Environment Canada 2012).

7.3.4.5 Power Analysis

Power analyses were performed to determine the minimum detectable difference of fish health end points and future tissue chemistry comparisons using the existing 2020 to 2021 fish health dataset and 2018 to 2021 tissue chemistry dataset. Target sample sizes for fish health endpoints were 20 Fourhorn Sculpin of each sex (40 total) and 40 *H. arctica*, and a total of eight samples for tissue chemistry for each fish species (i.e., Arctic Char, Fourhorn Sculpin, *H. arctica*). These values were then used to calculate the sensitivity of future comparisons by expressing the minimum detectable difference as a percent change in the mean. Type I (α) and Type II (β) error rates were set to 0.1 (Environment Canada 2012). Power analyses were conducted using the power and sample size function in G*Power 3.1 (Faul et al., 2007).

7.3.5 Guideline Comparison

Fish tissue concentrations of mercury and selenium for Arctic Char, Fourhorn Sculpin, and *H. arctica* sampled from 2018 to 2021 were compared to applicable tissue quality guidelines. Mercury concentrations were compared to Health Canada's Maximum Levels for Chemical Contaminants in Foods mercury consumption guideline of 0.5 mg/kg ww (Health Canada 2015). Selenium concentrations were compared to the British Columbia Ministry of Environment (BC MOE) fish tissue guidelines of 4 mg/kg dw (BC MOE 2014).

7.3.6 Quality Assurance/Quality Control

The field and laboratory quality assurance and quality control (QA/QC) procedures were implemented at each stage of the fish survey, including sampling, data entry, sample shipment, data analyses, laboratory analyses, and report preparation, to produce technically sound and scientifically defensible results.

7.3.6.1 Field QA/QC Procedures

As part of practices for field operations for this program, the following QA/QC procedures were undertaken:

- Detailed specific work instructions outlining each field task were provided to the field personnel prior to the field programs.

- A pre-field meeting with the field crew and project team lead was conducted to review the specific work instructions so that procedures were understood.
- Samples were collected by experienced personnel and were labelled, preserved and shipped according to laboratory instructions described in Golder TP 8.1-3, Fish Inventory Methods (Golder, unpublished information) and TP 8.16-0, Fish Health Assessment – Metals (Golder, unpublished information).
- Fish identification was recorded to species, where possible, with identifications verified using fish field guides.
- Field equipment (e.g., electronic scales and water quality meters) were regularly calibrated according to manufacturer's recommendations.
- Detailed field notes were recorded in pencil in waterproof field notebooks, on waterproof pre-printed field data sheets, or directly entered electronically into an excel spreadsheet.
- Field data (i.e., datasheets, notebook, and electronic spreadsheets) were checked at the end of each day for completeness and accuracy.

Samples were documented and tracked using chain of custody (COC) forms and receipt of samples by the analytical laboratory was confirmed. Field crews were responsible for managing sample shipment to the analytical laboratories. Prior to sample shipment, field crews confirmed the following:

- Required samples were collected and accounted for.
- COC and analytical request forms were completed and correct.
- Proper sample labelling and documentation procedures were followed.

7.3.6.2 QA/QC of Field and Laboratory Data

Field-collected data, datasheets, and field notebooks were reviewed for completeness and unexpected values or trends. At least 10% of the field data entered electronically were verified by a second person to identify transcription errors. Results of statistical data analyses were reviewed by an independent biologist with appropriate technical qualifications. Tables containing data summaries and statistical results were reviewed and values were verified by a second, independent individual.

7.3.6.2.1 Tissue Chemistry

The fish tissue chemistry dataset was visually assessed for outliers using scatterplots, and erroneous values were corrected, if possible (i.e., if values were identified as data entry errors). Statistical analyses and data summary tables were independently reviewed and verified by a second individual with appropriate technical qualifications. Internal laboratory QA/QC at BV Labs included analysis of duplicates to evaluate the variance in the measurement, matrix spikes to evaluate sample matrix interference, method blanks to identify laboratory contamination, reagent blanks to determine any analytical contamination, spiked blanks to evaluate method accuracy, surrogates to evaluate extraction efficiency, and QC standards used as an independent check of method accuracy. Upon receipt of the tissue chemistry data from BV Labs, standard checks were performed to screen for potential data quality issues by:

- Confirming that each requested variable was analyzed.

- Reviewing the units.
- Reviewing any hold time exceedances.
- Reviewing internal laboratory QA/QC results.

Most results met the laboratory quality acceptance criteria for representativeness (e.g., no detected concentrations in procedural blanks) and accuracy (e.g., spiked blanks, containing a known amount of analyte, within acceptable range), with the following exceptions:

- QC standards for lead were below acceptance criteria due to digestion limitations specific to certified reference materials completed when analyzing Arctic Char and Fourhorn Sculpin. This limitation does not affect results for tissue samples.
- Control limits for barium were exceeded for *H. arctica* by 15%. However, other quality control parameters were met and therefore barium data were considered acceptable.

Overall, the fish tissue chemistry data were considered reliable and representative of site conditions at the time of sampling.

7.4 Results

7.4.1 Fish Health

In 2021, fish health data were collected for Fourhorn Sculpin and *H. arctica* to supplement the existing dataset for these species in the Milne Port area. Fish health endpoints were compared between 2021 and similar data collected in 2020 to evaluate interannual variability. Fish health data collected in 2021 are provided in Appendix 7B, Tables 7B-1 to 7B-3.

7.4.1.1 Fourhorn Sculpin

A total of 40 Fourhorn Sculpin were processed from the Milne Port area during the 2021 fish health assessment, including 20 females and 20 males. Summary statistics for processed fish are provided in Table 7-5. Length-frequency distributions for Fourhorn Sculpin were left-skewed and bimodal for both female and male fish (Figure 7-1). At the time of sampling, female Fourhorn Sculpin were longer (RPD 5%) and heavier (RPD 23%) than male Fourhorn Sculpin, showing greater energy stores but lower reproductive investment, based on comparisons of median LSI (RPD 63%) and GSI (RPD 14%). Both sexes had median ages of 6, with females ranging from 3 to 10 years and males ranging from 3 to 12 years. Female Fourhorn Sculpin ranged in length from 205 mm to 344 mm and in weight from 79.0 g to 352 g. Female condition factor ranged from 0.82 to 1.14, LSI ranged from 2.48 to 7.45, and GSI ranged from 1.78 to 24.38. Male Fourhorn Sculpin ranged in length from 209 mm to 281 mm and in weight from 74.0 g to 197 g. Male condition factor ranged from 0.71 to 1.01, LSI ranged from 1.49 to 5.53 and GSI ranged from 2.51 to 6.40. Female Fourhorn Sculpin had a significantly greater relative weight compared with male Fourhorn Sculpin (*P*-value = 0.058; Figure 7-2).

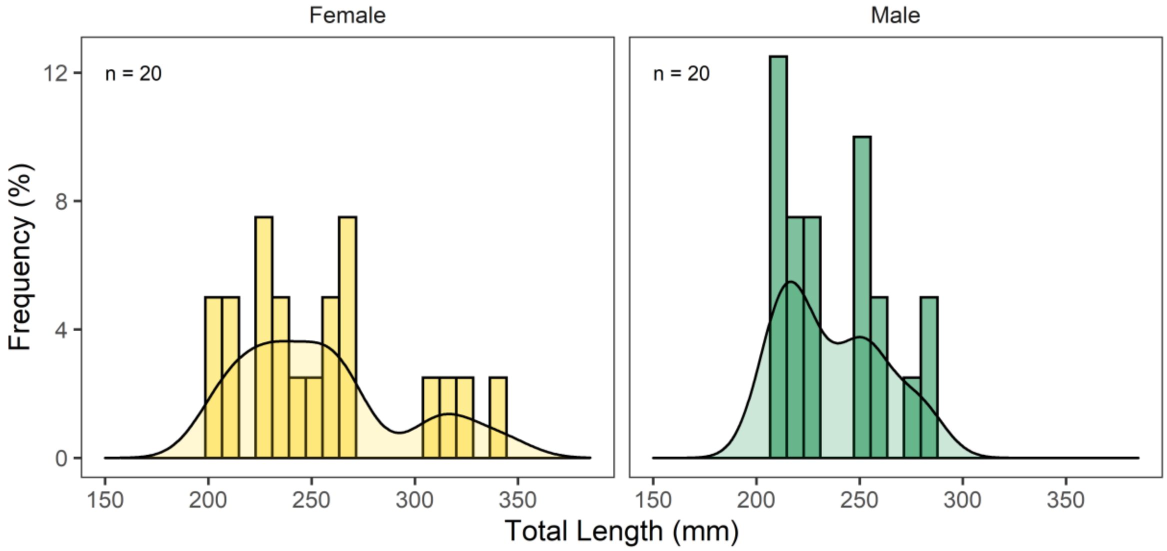


Figure 7-1: Length-Frequency Distributions of Female and Male Fourhorn Sculpin Sampled from the Milne Port Area, 2021

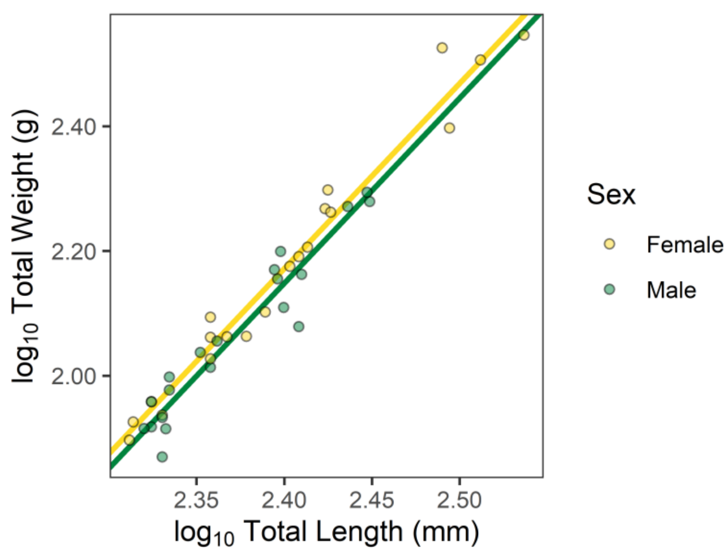


Figure 7-2: Length-Weight Relationship for Female and Male Fourhorn Sculpin Sampled from the Milne Port Area, 2021

Table 7-5: Descriptive Statistics for Fourhorn Sculpin Fish Health Endpoints Processed from the Milne Port Area, 2020 – 2021

Parameter	2020							2021						
	n	Min	Max	Median	Mean	SD	SE	*n*	Min	Max	Median	Mean	SD	SE
Female														
Total Length (mm)	22	194	310	216	226	32	6.9	20	205	344	249	255	40	9.0
Total Weight (g)	22	65.3	380	89.4	123	77.7	16.5	20	78.8	351	138	166	84.9	18.9
Carcass Weight (g)	22	54.2	238	72.6	94.5	50.0	10.6	20	49.6	234	86.1	102	51.0	11.4
Condition Factor	22	0.75	1.28	0.96	0.97	0.12	0.03	20	0.82	1.14	0.93	0.94	0.08	0.02
Liver Weight (g)	22	0.84	16.3	2.36	4.37	4.08	0.87	20	1.95	23.9	5.82	6.83	5.05	1.13
LSI	22	1.29	5.09	2.76	3.11	1.16	0.25	20	2.48	7.45	3.88	3.89	1.05	0.24
Gonad Weight (g)	22	1.05	16.3	3.26	4.52	3.84	0.82	20	1.40	81.8	4.71	10.3	17.6	3.94
GSI	22	1.33	4.99	3.53	3.38	1.09	0.23	20	1.78	24.38	3.67	4.76	4.80	1.07
Age (y)	22	4	8	5	5.4	1.1	0.2	20	3	10	6	6.2	2.0	0.5
Male														
Total Length (mm)	21	189	276	215	214	21	4.6	20	209	281	229	237	24	5.5
Total Weight (g)	21	65.4	230	89.1	98.2	37.7	8.24	20	74.0	196	111	121	38.8	8.67
Carcass Weight (g)	21	54.5	169	70.0	78.3	28.0	6.12	20	47.0	146	72.6	80.8	30.0	6.71
Condition Factor	21	0.82	1.19	0.95	0.96	0.10	0.02	20	0.71	1.01	0.90	0.89	0.08	0.02
Liver Weight (g)	21	0.607	8.08	2.14	2.54	1.67	0.37	20	1.11	8.75	2.23	2.85	1.77	0.40
LSI	21	0.86	4.09	2.56	2.47	0.87	0.19	20	1.49	5.53	2.02	2.27	0.93	0.21
Gonad Weight (g)	21	1.42	10.7	3.84	4.06	2.30	0.50	20	2.07	10.1	4.76	5.17	2.19	0.49
GSI	21	2.02	5.88	4.09	4.03	1.27	0.28	20	2.51	6.40	4.24	4.23	1.14	0.25
Age (y)	21	4	9	5	5.6	1.5	0.3	20	3	12	6	6.6	2.1	0.5

n = sample size; Min = minimum; Max = maximum; SD = standard deviation; SE = standard error; GSI = gonadosomatic index; LSI = liver somatic index

Table 7-6: Statistical Comparisons Between 2020 and 2021 for Fourhorn Sculpin, Milne Port Area

Sex	Effect Indicator	Endpoint[(a)]	Statistical Test	*n* Outlier	*n* 2020	*n* 2021	LSM 2020	LSM 2021	MSE	Interaction *P*-value	*P*-value	RPD (%)	Power Analysis: Minimum Detectable Difference	Power Analysis: Sensitivity
Female	Survival	Age	$ANOVA_{log10}$	0	22	20	0.73	0.77	0.013	n/a	0.198	nc	1.54	27%
	Growth	Size-at-Age	ANCOVA	0	22	20	234	246	334.62	0.117	**0.035**	5%	17.27	7%
	Condition (Energy Storage)	Condition	$ANCOVA_{log10}$	0	22	20	2.113	2.090	0.002	0.011	0.118	nc	12.41	9%
		Relative Liver Weight	ANCOVA	1	22	19	5.11	5.10	1.253	**0.003**[(b)]	0.981	nc	1.83	33%
	Reproduction	Relative Gonad Weight	$ANCOVA_{log10}$	1	22	19	0.620	0.608	0.017	0.308	0.783	nc	2.01	37%
Male	Survival	Age	$ANOVA_{log10}$	0	21	20	0.73	0.79	0.016	n/a	0.126	nc	1.79	30%
	Growth	Size-at-Age	ANCOVA	0	21	20	219	232	265.92	0.869	**0.013**	6%	15.38	7%
	Condition (Energy Storage)	Condition	$ANCOVA_{log10}$	0	21	20	0.397	0.333	0.023	0.691	0.203	nc	9.56	9%
		Relative Liver Weight	ANCOVA	1	20	19	2.87	2.17	0.569	0.016	**0.008**	28%	1.01	38%
	Reproduction	Relative Gonad Weight	ANCOVA	0	21	20	4.62	4.58	1.671	0.332	0.934	nc	1.22	26%

Notes:
Statistically significant values are indicated in **bold**. Statistical outliers are provided in Appendix 7B, Table 7B-6.
(a) For model components, please see Table 7-3.
(b) The difference in R^2 values between the full model (R^2 = 0.932) and the reduced model (R^2 = 0.913) was less than the threshold (0.019 < 0.020) for assuming slopes are practically parallel (Barrett et al., 2010).
n = sample size; LSM = least squares mean; MSE = mean square error; RPD = Relative Percent Difference; log_{10} = log_{10}-transformed data; ANOVA = analysis of variance; ANCOVA = analysis of covariance; n/a = not applicable; nc = not calculated.

Survival – Age

Ages of Fourhorn Sculpin were compared between 2020 and 2021. Ages of both male and female Fourhorn Sculpin captured in 2020 and 2021 were similar (Table 7-5; Figure 7-3). Mean ages did not different significantly between years for either sex (Table 7-6). Female ages ranged from 4 to 8 years in 2020 and from 3 to 10 years in 2021. Male ages ranged from 4 to 9 years in 2020 and from 3 to 12 years in 2021.

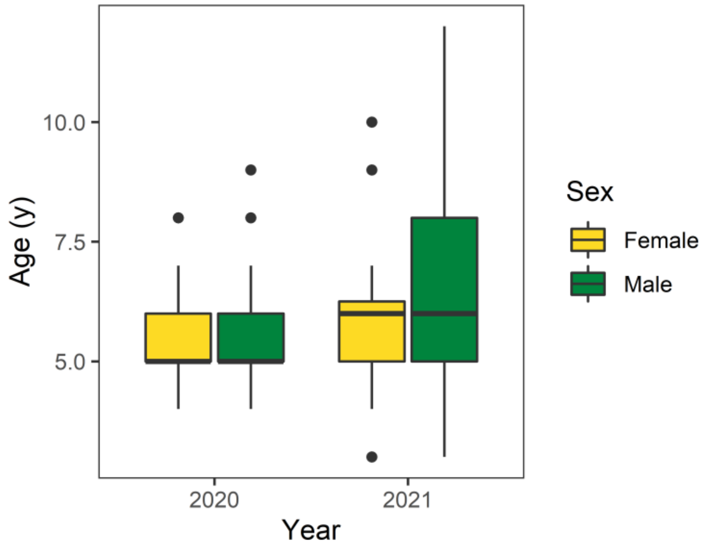


Figure 7-3: Boxplots of Ages of Female and Male Fourhorn Sculpin Sampled from the Milne Port Area, 2020 – 2021

Growth – Size-at-Age

Size-at-age was compared between 2020 and 2021 using total length-at-age (Figure 7-4). For both male and female Fourhorn Sculpin, size-at-age was greater in 2021 than in 2020 (Table 7-6). Male size-at-age differed between years by 5% while female size-at-age differed by 6%.

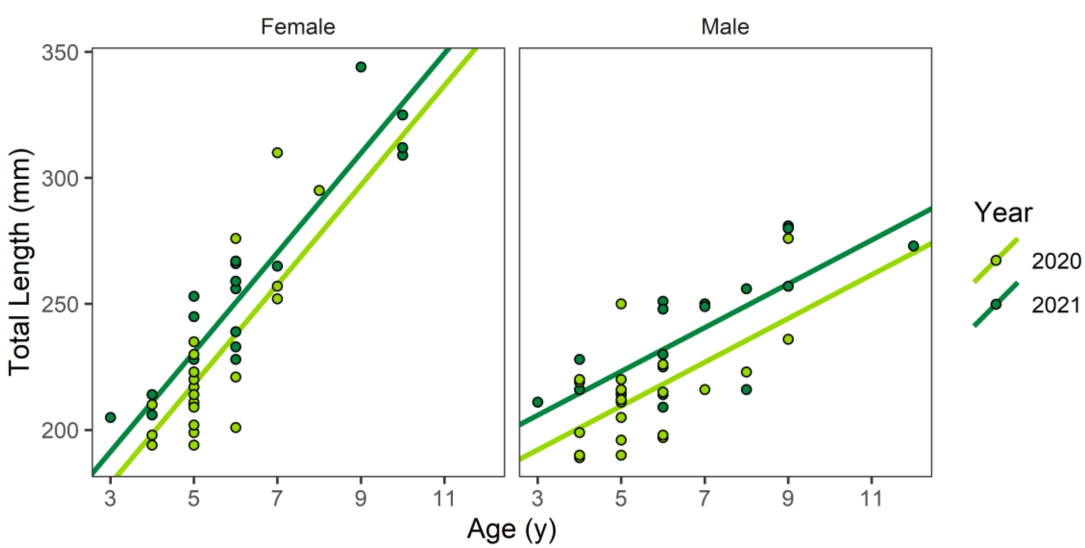


Figure 7-4: Size-at-Age Relationships for Female and Male Fourhorn Sculpin Sampled from the Milne Port Area, 2020 – 2021

Condition

Condition of Fourhorn Sculpin was compared between 2020 and 2021 using weight-at-length and relative liver weight (as liver weight-at-total weight). Weight-at-length did not differ significantly between years for either sex (Table 7-6; Figure 7-5). Condition factor, calculated as a ratio of total weight to total length, for females ranged from 0.75 to 1.28 in 2020 and 0.82 to 1.14 in 2021, and for males ranged from 0.82 to 1.19 in 2020 and 0.71 to 1.01 in 2021 (Table 7-5). Relative liver weight did not differ significantly between years for female Fourhorn Sculpin. Relative liver weight was, however, significantly lower in 2021 compared with 2020 for male Fourhorn Sculpin (Table 7-6; Figure 7-6). The relative percent difference between years for male Fourhorn Sculpin was 28%.

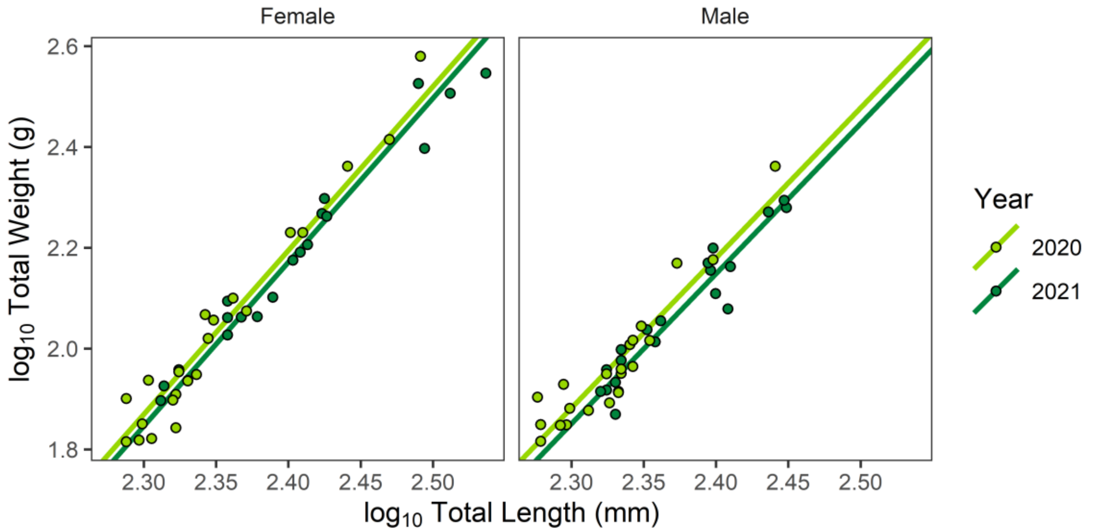
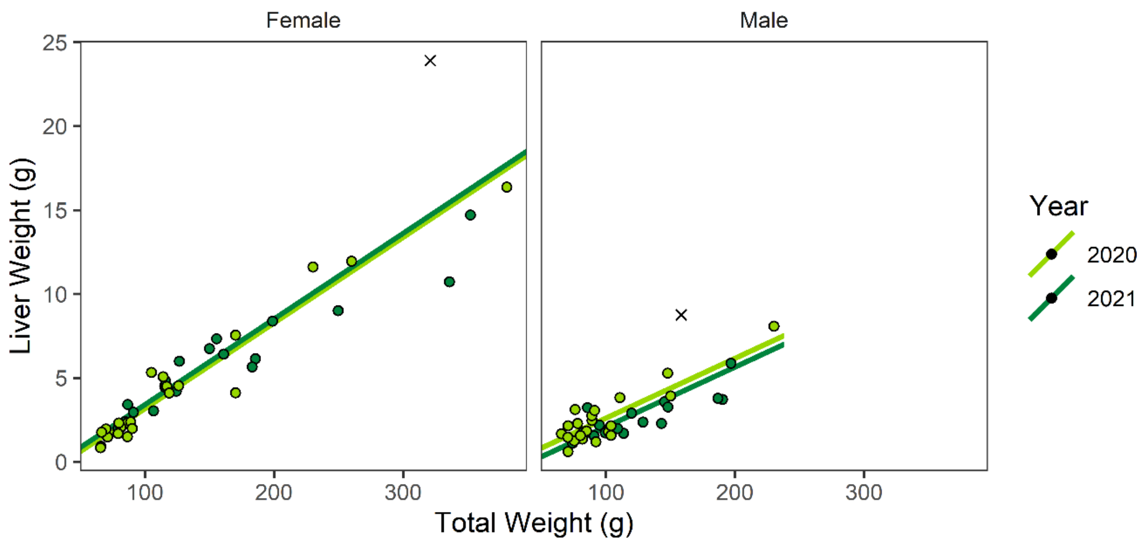


Figure 7-5: Weight-at-Length Relationships for Female and Male Fourhorn Sculpin Sampled from the Milne Port Area, 2020 – 2021.

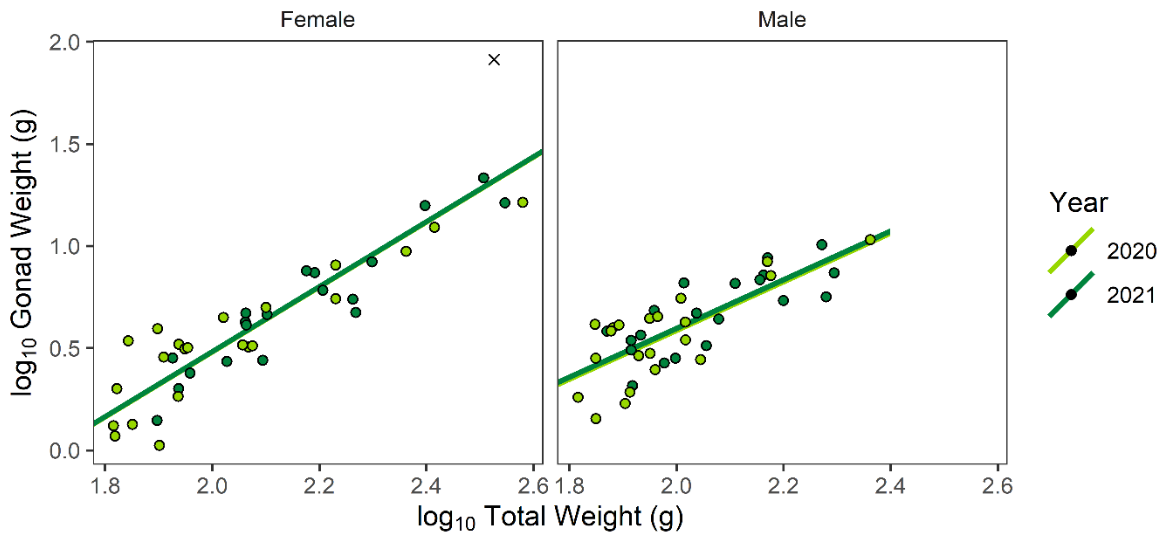


x = outlier.

Figure 7-6: Relative Liver Weight for Female and Male Fourhorn Sculpin Sampled from the Milne Port Area, 2020 – 2021.

Reproduction

Relative gonad weights were compared between 2020 and 2021 using relationships between gonad weight and total weight in male and female Fourhorn Sculpin (Figure 7-7). No significant difference in relative gonad weight was found for female or male Fourhorn Sculpin (Table 7-6).



x = outlier.

Figure 7-7: Relative Gonad Weight for Female and Male Fourhorn Sculpin Sampled from the Milne Port Area, 2020 – 2021.

Abnormalities

Few abnormalities were observed in Fourhorn Sculpin sampled from the Milne Port area (Table 7-7). No external abnormalities or parasites were observed on any individuals. Internal abnormalities primarily consisted of variation in liver colour, with light or pale coloured livers observed for seven females and 18 males. Liver colour, however, is closely tied to perfusion (i.e., fresh circulating blood) and time elapsed between sacrifice and observation and is subject to observer bias. Liver colour is, therefore, considered a less reliable indicator of changes in fish health relative to other observations and is therefore not considered further herein. Internal parasites observed in Fourhorn Sculpin consisted of cysts embedded within the body cavity, including on the heart, stomach, and intestines, and were present in one female and nine males.

Table 7-7: Number and Description of External and Internal Abnormalities Observed in Fourhorn Sculpin Sampled from the Milne Port Area, 2021

Parameter	Female	Male	Description
External			
Body Deformity	0	0	-
Eyes	0	0	-
Skin	0	0	-
Thymus	0	0	-
Opercula	0	0	-
Gills	0	0	-
Pseudobranchs	0	0	-
Fins	0	0	-
Vent	0	0	-
Parasitization	0	0	-
Internal			
Liver	7	18	Pale colouration[(a)]
Spleen	0	0	-
Gall bladder	0	0	-
Gonad	0	0	-
Kidney	0	0	-
Parasitization	1	9	Cysts on organs or within body cavity

(a) Pale liver colouration is typically associated with a lack of perfusion following sacrifice and cessation of the heart beating; pale livers were noted and documented but are not considered further.

- = not applicable.

7.4.1.2 *Hiatella arctica*

Hiatella arctica were collected from the Milne Port area in 2018, 2019, 2020, and 2021. In 2018 and 2019, samples were submitted for tissue chemistry analysis, but supporting biological data were not recorded for individuals (with the exception of age in 2019). In 2020 and 2021, *H. arctica* were processed for fish health endpoints, including length, weight, and age, with a subset of samples submitted for tissue analysis (Section 7.4.2.3). While gonad weights were not recorded in 2020, these data were recorded in 2021. Biological data for *H. arctica* are summarized in Table 7-8.

In 2021, a total of 36 *H. arctica* were processed for fish health endpoints. The collected individuals ranged in length from 17.5 mm to 35.1 mm and ranged in total weight from 0.480 g to 8.12 g. Length data were approximately bimodal and left skewed (Figure 7-8) and exhibited a strong relationship with total weight ($p < 0.001$; $R^2 = 0.90$). Gonad weights ranged from 0.00230 g to 0.0798 g, with a median value of 0.0360 g; MSI ranged from 0.90 to 6.13 with a median value of 1.97. *Hiatella arctica* sampled from the Milne Port area ranged in age from 1 to 39 years, with a median age of 19. Median condition factor in 2021 was 1.41.

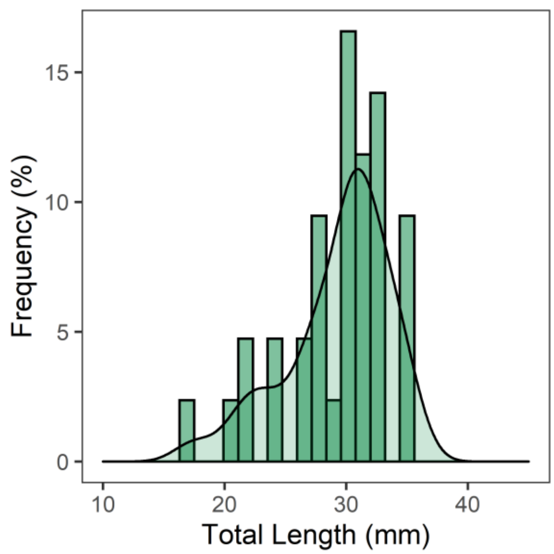


Figure 7-8: Length-Frequency Distributions of *Hiatella arctica* Sampled from the Milne Port Area, 2021

Table 7-8: Descriptive Statistics for *Hiatella arctica* Fish Health Endpoints Processed from the Milne Port Area, 2020 – 2021

Parameter	2020							2021						
	n	Min	Max	Median	Mean	SD	SE	n	Min	Max	Median	Mean	SD	SE
Shell Length (mm)	50	25.36	34.54	29.09	29.20	2.30	0.32	35	17.47	35.07	30.45	29.33	4.25	0.72
Total Weight (g)	50	2.75	6.39	4.06	4.32	1.07	0.151	35	0.480	8.12	3.98	4.02	1.75	0.297
Shell ww (g)	50	0.799	3.30	1.52	1.65	0.533	0.0750	35	0.218	5.13	2.06	2.21	1.16	0.197
Shell dw (g)	50	0.747	3.18	1.43	1.56	0.516	0.0730	35	0.114	4.72	1.79	1.90	1.03	0.174
Tissue ww (g)	5	1.21	4.01	2.56	2.67	0.680	0.0960	35	0.235	2.87	1.90	1.78	0.703	0.118
Tissue dw (g)	5	0.243	0.782	0.471	0.497	0.122	0.0170	35	0.0868	1.06	0.703	0.658	0.259	0.0439
Condition factor	50	1.13	2.54	1.70	1.73	0.34	0.05	35	0.90	2.25	1.41	1.48	0.30	0.05
Gonad ww (g)	-	-	-	-	-	-	-	35	0.00230	0.0798	0.0360	0.0365	0.0181	0.0031
GSI	-	-	-	-	-	-	-	35	0.90	6.13	1.97	2.23	1.20	0.20
Age (y)	50	10	49	23	25	12	1.6	35	1	39	17	19.2	8.1	1.4

ww = wet weight; dw = dry weight; n = sample size; min = minimum; max = maximum; SD = standard deviation; SE = standard error - = not collected/not measured.

Table 7-9: Statistical Comparisons Between 2020 and 2021 for Hiatella arctica, Milne Port

Species	Effect Indicator	Endpoint	Statistical Test	*n* Outliers	*n*		LSM		MSE	Interaction *P*-value	Levene's Test	Shapiro-Wilk	*P*-value	RPD (%)	Power Analysis	
					2020	2021	2020	2021							Minimum Detectable Difference	Sensitivity
Hiatella arctica	Survival	Length Frequency	K-S Test	0	50	36	n/a	n/a	n/a	n/a	n/a	n/a	1.000	nc	n/a	n/a
	Growth	Whole Animal Wet Weight	K-W Test	0	50	36	45	42	n/a	n/a	n/a	n/a	0.443	nc	1.16	29%
	Condition (Energy Storage)	Condition	$ANCOVA_{log10}$(b)	0	50	29	0.645	0.605	0.006	0.220	0.862	0.701	**0.047**	9%	0.55	13%

Notes:
Statistically significant values are indicated in **bold**. Power analysis was completed assuming normality. For K-W Test, LSM are mean ranks.
(a) For model components, please see Table 7-4.
(b) ANCOVA completed only in range of overlapping total length between years (25 – 36 mm) following Section A1.7 in Environment Canada (2012). See Appendix 7B Table 7B-7 for full model details, and Figure 7-9 for *H. arctica* length-frequency distributions in 2020 and 2021.
n = sample size; LSM = least-squares means; MSE = mean square error; RPD = Relative Percent Difference; log_{10} = log_{10}-transformed data; K-S Test = Kolmogorov-Smirnov test; K-W Test = Kruskal-Wallis test; ANOVA = analysis of variance; ANCOVA = analysis of covariance; n/a = not applicable; nc = not calculated.

Survival – Age

Length frequencies of *H. arctica* were compared between 2020 and 2021 (Figure 7-9). Results of the Kolmogorov-Smirnov test indicate there was no significant difference between years for *H. arctica* (Table 7-9); however, the range of lengths was greater in 2021 than in 2020 (Table 7-8), with more individuals less than 25 mm being collected.

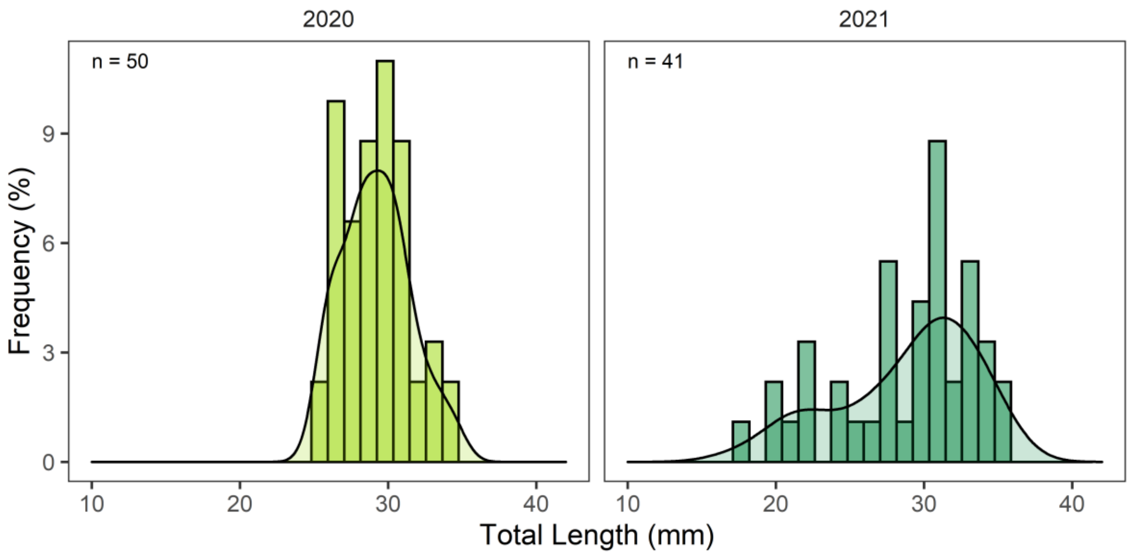


Figure 7-9: Length-Frequency Distribution for Hiatella arctica Captured from the Milne Port Area, 2020 – 2021.

Growth

Total weight was compared between 2020 and 2021 for *H. arctica* (Figure 7-10). While the range of weights was greater in 2021 compared with 2020 (Table 7-8), there was no significant difference between years (Table 7-9)

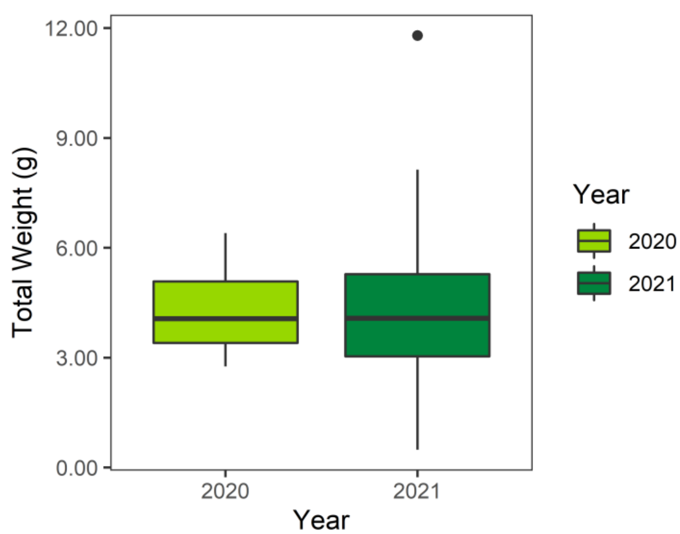
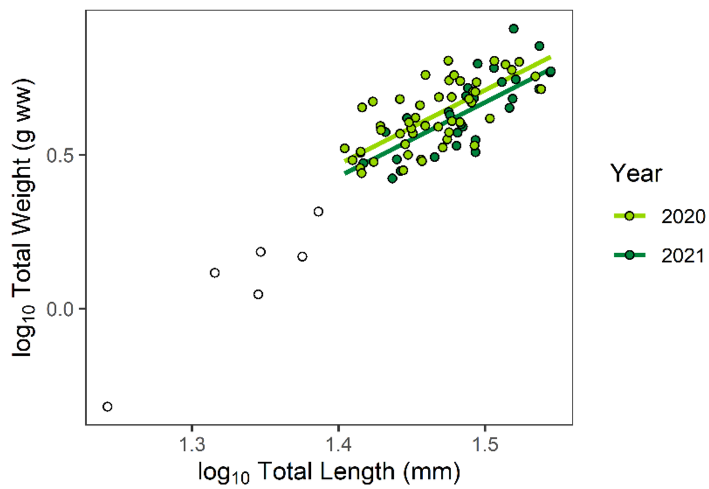


Figure 7-10: Boxplot of Total Weight of Hiatella arctica Captured from the Milne Port Area, 2020 – 2021.

Condition

Condition of *H. arctica* was compared between 2020 and 2021 using relative weight (total weight-at-length). Given the differences in the range of total length of *H. arctica* between years (Figure 7-9), differences in relative weight were evaluated over the shared range of lengths (Environment Canada 2012; Figure 7-11). Relative weight was significantly lower in 2021 relative to 2020 (Table 7-9), with an RPD of 9%.



○ = omitted from ANCOVA (2021 data).

Figure 7-11: Relationships between Total Weight and Total Length of Hiatella arctica Captured from the Milne Port Area, 2020 – 2021.

7.4.2 Fish Tissue Chemistry

A total of 357 fish tissue samples have been submitted for metals analysis and 63 fish tissue samples have been submitted for PAH analysis from the Mile Port Area from 2010 to 2021. A summary of sample sizes by species and year are provided in Appendix 7C; Table 7C-1.

In 2021, a total of 24 samples from three species were submitted for tissue chemistry analysis, supplementing data from recent years (i.e., 2018 [n = 50], 2019 [n = 187]), and 2020 [n = 24]). These 285 samples (i.e., total samples collected from 2018 to 2021) were analyzed for metals and were from Arctic Char (n = 89), Fourhorn Sculpin (n = 46), indeterminate sculpin (n = 30), and *H. arctica* (n = 120). An additional 24 samples were analyzed for PAHs in 2021 and were from Arctic Char (n = 8), Fourhorn Sculpin (n = 8), and *H. arctica* (n = 8). Results for individual species are described in the following sections.

7.4.2.1 Arctic Char

From 2010 to 2021, a total of 346 Arctic Char were analyzed for metals from the Milne Port area. Summary statistics for metals concentrations from Arctic Char collected from 2018 to 2021 are provided in Table 7-10 and data from all years are presented visually in Appendix 7D (Figures 7D-1 to 7D-36). Statistical comparisons for COPCs (i.e., aluminum, iron, magnesium, mercury, and selenium) among years (i.e., 2018 to 2021) are provided in Table 7-11, and outliers removed from the analyses are provided in Table 7-12.

From 2018 to 2021, concentrations of metals were mostly similar among years with some exceptions. Some metals demonstrated inter-annual variability (e.g., copper, iron, selenium, and zinc; Appendix 7D, Figures 7D-1 to 7D-36). Among COPCs, significant differences were observed among years for aluminum, magnesium, and selenium (Table 7-11):

- Aluminum concentrations were lowest in 2018, then increased by 108% to 2019, before declining 126% from 2019 to 2021.
- Magnesium concentrations were significantly lower in 2018 when compared to 2019 (7%) and 2021 (10%) but did not differ among other years. The RPDs for magnesium concentration among years were comparatively small and concentrations were similar to those observed from 2010 and 2017 (Figure 7D-17).
- Concentrations of selenium decreased with fish length and were significantly greater in 2019 when compared to 2018 (19%) and 2020 (21%) and significantly greater in 2021 when compared to 2018 (24%) and 2020 (26%) but did not differ among other years (Figure 7-12; Figure 7C-25).

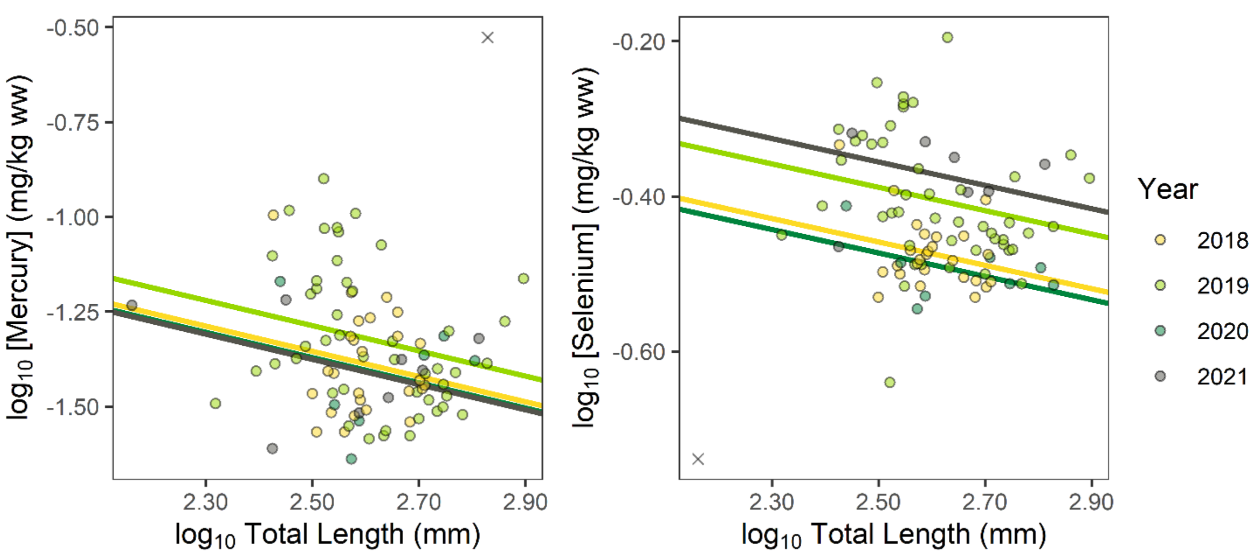
No significant differences were observed among years for iron or mercury, with mercury concentrations decreasing with fish length (Figure 7-12). While this relationship between mercury and fish length was inconsistent when compared to many other piscivorous species, where mercury generally increases with fish size, this inverse relationship has been previously documented for anadromous Arctic Char, whose mercury concentrations are related to freshwater residency time (i.e., mercury concentrations decrease once fish migrate into the marine environment; Riget and Aastrup 2000). A power analysis for COPCs indicated that target sample sizes of eight fish of mixed sex per sampling area would be sufficient to detect differences in effect sizes ranging from 13% for magnesium to 134% for aluminum.

Polycyclic aromatic hydrocarbons were below DL for all parameters analyzed in Arctic Char (Appendix 7C, Table 7C-5).

One Arctic Char sampled in 2021 had tissue concentrations of several metals which were notably different than other Arctic Char sampled in the same year. This Arctic Char had elevated COPC concentrations of aluminum, iron, and magnesium, as well as numerous other metals including chromium, lead, and nickel (Appendix 7C, Table 7C-2). Compared to the other Arctic Char sampled in 2021, this individual was the youngest (age = 4 years) and smallest (total length = 145 mm, total weight = 24.5 g) from the sampled population in 2021 (Appendix 7B, Table 7B-1). Stomach contents for this individual fish were also notably different from other Arctic Char, being composed entirely of freshwater insect taxa, including larval/juvenile chironomids (genus *Hydrobaenus*), blackflies (Family Simuliidae), craneflies (Family Tipulidae), and mayflies (Order Ephemeroptera; Appendix 7B, Table 7B-4 and 7B-5), indicating this individual had been feeding in freshwater prior to being captured in Milne Port. Given the small size and young age of this Arctic Char, it is possible that it was a smolt that had just undertaken its first migration to the marine environment. The diet of smolt and freshwater resident Arctic Char have been shown to be similar, comprised mainly of zooplankton, surface insects, and chironomid pupae (Rikardsen et al. 2003; Rikardsen et al. 2005). Characteristic differences in water chemistry, including metals concentrations, between freshwater and marine environments may explain the abnormal metals concentrations in this individual Arctic Char. A recent study of tissue metals burdens in Arctic Char from the Nunavik region of western Canada found that concentrations of chromium, lead, and nickel were significantly higher in muscle tissue samples from Arctic Char in the post-winter period before they returned to the ocean when compared with Arctic Char caught in the ocean in the summer (Martyniuk et al. 2020). Given this individual Arctic Char had elevated concentrations of chromium, lead, and nickel, and its stomach contents were comprised entirely of freshwater insects, it is likely that this individual was a first-year smolt that had migrated from a lake upstream of Milne Port. The elevated concentrations of metals, including some COPCs, may be attributable to differences in water chemistry between its originating lake and Milne Inlet.

Mercury concentrations for all Arctic Char sampled from 2018 to 2021 were below Health Canada's Maximum Levels for Chemical Contaminants in Foods mercury consumption guideline of 0.5 mg/kg ww (Health Canada 2015). Selenium concentrations for Arctic Char were also below the BC MOE fish tissue guidelines of 4 mg/kg dw (BC MOE 2014), with tissue concentrations in Arctic Char from the Milne Port area ranging from 0.730 to 2.2 mg/kg dw from 2018 to 2021.

Tissue chemistry results were within FEIS predictions, which indicated the potential for non-significant, low magnitude effects on Arctic Char fish health and condition.



x = outlier; g = grams; mg = milligram; kg = kilogram; ww = wet weight.

Figure 7-12: Concentrations of Mercury and Selenium in Relation to Total Length for Arctic Char Sampled from the Milne Port Area, 2018 – 2021.

Table 7-10: Descriptive Statistics for Arctic Char Tissue Chemistry Data Analyzed from 2018 to 2021.

Parameter	2018 (*n* = 26)							2019 (*n* = 47)						
	>DL (%)	Min	Max	Median	Mean	SD	SE	>DL (%)	Min	Max	Median	Mean	SD	SE
Aluminum	31	<0.20	0.81	<0.20	0.20	0.18	0.04	96	<0.20	9.48	0.41	0.66	1.36	0.20
Antimony	0	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Arsenic	100	0.305	1.150	0.461	0.527	0.218	0.043	100	0.329	2.850	0.811	0.799	0.374	0.055
Barium	4	<0.010	0.013	<0.010	<0.010	<0.010	<0.010	34	<0.010	0.036	<0.010	<0.010	<0.010	<0.010
Beryllium	0	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Bismuth	0	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Boron	4	<0.20	0.21	<0.20	<0.20	<0.20	<0.20	0	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Cadmium	96	<0.0010	0.0207	0.0030	0.0062	0.0059	0.0012	96	<0.0010	0.0235	0.0052	0.0062	0.0052	<0.0010
Calcium	100	43	248	76	87	45	9	100	57	791	147	164	118	17
Chromium	50	<0.010	0.050	<0.010	0.014	0.013	<0.010	75	<0.010	0.043	0.012	0.014	<0.010	<0.010
Cobalt	100	0.0030	0.0111	0.0047	0.0049	0.0015	0.0003	100	0.0024	0.0130	0.0043	0.0049	0.0022	0.0003
Copper	100	0.347	0.688	0.500	0.508	0.088	0.017	100	0.285	0.739	0.394	0.414	0.090	0.013
Iron	100	3.02	5.77	4.36	4.36	0.74	0.14	100	2.30	20.60	3.95	4.49	2.74	0.40
Lead	38	<0.0010	0.0026	<0.0010	<0.0010	<0.0010	<0.0010	85	<0.0010	0.0054	0.0016	0.0018	<0.0010	<0.0010
Magnesium	100	263	310	285	282	12	2	100	257	366	301	303	22	3
Manganese	100	0.067	0.134	0.090	0.093	0.015	0.003	100	0.060	0.316	0.092	0.101	0.038	0.006
Mercury	100	0.0271	0.1010	0.0379	0.0431	0.0159	0.0031	100	0.0260	0.1260	0.0423	0.0522	0.0246	0.0036
Molybdenum	0	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	0	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
Nickel	81	<0.010	0.037	0.014	0.015	<0.010	<0.010	79	<0.010	0.024	0.013	0.013	<0.010	<0.010
Phosphorus	100	2820	3210	3000	2992	105	21	100	2490	3300	2900	2877	187	27
Potassium	100	4030	4660	4390	4411	159	31	100	2960	4920	4060	3978	438	64
Selenium	100	0.295	0.464	0.330	0.338	0.037	0.007	100	0.229	0.638	0.375	0.401	0.080	0.012
Silver	8	<0.0010	0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Sodium	100	360	796	489	501	96	19	100	313	1240	700	711	233	34
Strontium	100	0.079	0.637	0.176	0.196	0.114	0.022	100	0.139	1.720	0.433	0.480	0.264	0.039
Thallium	100	0.00211	0.00644	0.00294	0.00311	0.00082	0.00016	100	0.00124	0.00600	0.00216	0.00246	0.00102	0.00015
Tin	4	<0.020	0.036	<0.020	<0.020	<0.020	<0.020	9	<0.020	0.032	<0.020	<0.020	<0.020	<0.020
Titanium	100	0.085	0.154	0.125	0.125	0.016	0.003	100	0.416	0.574	0.486	0.489	0.034	0.005
Uranium	4	<0.00040	0.00058	<0.00040	<0.00040	<0.00040	<0.00040	13	<0.00040	0.00091	<0.00040	<0.00040	<0.00040	<0.00040
Vanadium	0	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Zinc	100	4.50	7.74	5.48	5.66	0.91	0.18	100	4.43	15.10	6.95	7.63	2.84	0.41

mg/kg = milligram per kilogram wet weight; > = greater than; DL = detection limit; SD = Standard deviation; SE = standard error.

Table 7-10 (continued): Descriptive Statistics for Arctic Char Tissue Chemistry Data Analyzed from 2018 to 2021.

Parameter	2020 (n = 8)							2021 (n = 8)						
	>DL (%)	Min	Max	Median	Mean	SD	SE	>DL (%)	Min	Max	Median	Mean	SD	SE
Aluminum	100	0.28	0.62	0.43	0.42	0.11	0.04	38	<0.20	8.11	<0.20	1.14	2.81	<0.20
Antimony	13	<0.0010	0.0094	<0.0010	0.0016	0.0032	0.0011	50	<0.0010	0.0045	<0.0010	0.0013	0.0014	<0.0010
Arsenic	100	0.389	33.200	0.830	4.875	11.449	4.048	100	0.101	5.540	2.765	2.556	1.975	0.698
Barium	63	<0.010	0.068	0.017	0.024	0.024	<0.010	13	<0.010	0.123	<0.010	0.020	0.042	0.015
Beryllium	0	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0	<0.0010	<0.0020	<0.0010	<0.0010	<0.0010	<0.0010
Bismuth	0	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0	<0.0010	<0.0013	<0.0010	<0.0010	<0.0010	<0.0010
Boron	0	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	13	<0.20	0.27	<0.20	0.12	0.06	0.02
Cadmium	100	0.0012	0.0171	0.0032	0.0062	0.0061	0.0021	63	<0.0010	0.0020	0.0015	0.0013	<0.0010	<0.0010
Calcium	100	39	506	113	219	193	68	100	60	425	145	197	137	49
Chromium	75	<0.010	1.520	0.030	0.217	0.527	0.186	38	<0.010	0.111	<0.010	0.020	0.037	0.013
Cobalt	100	0.0029	0.0057	0.0035	0.0038	0.0010	0.0004	100	0.0030	0.0171	0.0039	0.0059	0.0048	0.0017
Copper	100	0.165	0.347	0.326	0.305	0.059	0.021	100	0.299	0.607	0.397	0.425	0.097	0.034
Iron	100	2.39	16.80	4.71	5.92	4.50	1.59	100	3.11	87.15	3.97	14.50	29.37	10.38
Lead	100	0.0012	0.0052	0.0023	0.0024	0.0013	0.0005	75	<0.0010	0.0624	0.0029	0.0107	0.0211	0.0074
Magnesium	100	219	348	303	300	37	13	100	270	377	309	314	32	11
Manganese	100	0.056	0.180	0.125	0.115	0.045	0.016	100	0.060	0.579	0.084	0.148	0.175	0.062
Mercury	100	0.0230	0.2970	0.0425	0.0728	0.0916	0.0324	100	0.0245	0.0604	0.0408	0.0421	0.0129	0.0046
Molybdenum	13	<0.0040	0.0105	<0.0040	<0.0040	<0.0040	<0.0040	13	<0.0040	0.0122	<0.0040	0.0033	0.0036	<0.0040
Nickel	63	<0.010	0.029	0.014	0.015	0.010	<0.010	25	<0.010	0.052	<0.010	0.013	0.017	<0.010
Phosphorus	100	2350	3950	3125	3206	471	167	100	2980	3370	3140	3141	153	54
Potassium	100	4190	5360	4655	4696	433	153	100	4030	5010	4535	4551	286	101
Selenium	100	0.285	0.387	0.315	0.320	0.031	0.011	100	0.183	0.480	0.421	0.396	0.096	0.034
Silver	0	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0	<0.0010	<0.0013	<0.0010	<0.0010	<0.0010	<0.0010
Sodium	100	242	633	332	367	119	42	100	235	422	282	296	59	21
Strontium	100	0.088	1.590	0.344	0.585	0.553	0.196	100	0.103	1.120	0.259	0.348	0.328	0.116
Thallium	100	0.00071	0.00324	0.00203	0.00203	0.00071	0.00025	100	0.00149	0.00868	0.00238	0.00323	0.00231	0.00082
Tin	75	<0.020	0.038	0.028	0.026	<0.020	<0.020	13	<0.020	0.069	<0.020	<0.020	0.021	<0.020
Titanium	100	0.119	0.167	0.143	0.144	0.018	0.007	100	0.423	1.050	0.442	0.517	0.216	0.076
Uranium	25	<0.00040	0.00112	<0.00040	<0.00040	<0.00040	<0.00040	13	<0.00040	0.00774	<0.00040	0.00114	0.00266	0.00094
Vanadium	0	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Zinc	100	3.78	5.54	4.62	4.57	0.70	0.25	100	4.39	9.82	4.83	5.56	1.83	0.65

mg/kg = milligram per kilogram wet weight; > = greater than; DL = detection limit; SD = Standard deviation; SE = standard error.

Table 7-11: Inter-annual Comparison of Chemicals of Potential Concern in Arctic Char, Fourhorn Sculpin and *Hiatella arctica* Tissue Samples Collected from the Milne Port Area from 2018 to 2021.

Species	Parameter	Test	Sample Size				*n* Outliers	*P*-value	Error (MSE)	LS Mean				Post-hoc *P*-value						RPD (%)						Power Analysis	
			2018	2019	2020	2021				2018	2019	2020	2021	2018* 2019	2018* 2020	2018* 2021	2019* 2020	2019* 2021	2020* 2021	2018* 2019	2018* 2020	2018* 2021	2019* 2020	2019* 2021	2020* 2021	Min Detectable Difference	Sensitivity(b)
Arctic Char	Aluminum	$ANOVA_{rank}$	26	47	8	7	1	**0.000**	633.439	0.20	0.66	0.42	0.15	**<0.001**	**0.008**	1.000	0.977	**0.001**	**0.013**	-108%	72%	nc	nc	-126%	-95%	0.48	134%
	Iron	$ANOVA_{rank}$	26	47	8	7	1	0.461	1036.028	4.36	4.49	5.92	4.12	-	-	-	-	-	-	-	-	-	-	-	-	3.78	83%
	Magnesium	$ANOVA_{log}$	26	47	7	8	1	**0.000**	0.001	282	302	311	313	**0.002**	0.286	**0.006**	0.956	0.647	0.573	-7%	nc	10%	nc	nc	nc	38	13%
	Mercury	$ANCOVA_{log}$(a)	26	47	7	8	1	0.199	0.026	0.0408	0.0477	0.0393	0.0389	-	-	-	-	-	-	-	-	-	-	-	-	0.0324	68%
	Selenium	$ANCOVA_{rank}$(a,b)	26	45	8	7	1	**0.000**	758.095	0.334	0.403	0.327	0.426	**<0.001**	0.938	**<0.001**	**0.001**	0.556	**0.001**	-19%	nc	24%	-21%	nc	26%	0.1080	29%
Fourhorn Sculpin	Aluminum	$ANOVA_{log}$	-	30	8	8	0	**0.000**	0.092	-	2.16	0.31	0.50	-	-	-	**<0.001**	**<0.001**	0.385	-	-	-	-149%	-125%	nc	2.73	150%
	Iron	$ANOVA_{log}$	-	30	8	8	0	**0.044**	0.030	-	8.99	6.31	6.82	-	-	-	**0.076**	0.198	0.920	-	-	-	-35%	nc	nc	5.29	62%
	Magnesium	ANOVA	-	29	8	8	1	0.594	1120.699	-	276	290	277	-	-	-	-	-	-	-	-	-	-	-	-	51	18%
	Mercury	$ANCOVA_{log}$(a)	-	30	8	8	0	**0.094**	0.014	-	0.1329	0.1264	0.1680	-	-	-	0.893	0.104	0.133	-	-	-	nc	nc	nc	0.0937	64%
	Selenium	ANCOVA(a)	-	30	8	8	0	**0.014**	0.004	-	0.510	0.444	0.465	-	-	-	**0.026**	0.167	0.792	-	-	-	-14%	nc	nc	0.1197	24%
Hiatella arctica	Aluminum	$ANOVA_{log}$	24	79	8	8	1	**0.000**	0.030	476	860	668	769	**<0.001**	0.246	**0.044**	0.513	0.954	0.920	-57%	nc	47%	nc	nc	nc	528.17	66%
	Iron	$ANOVA_{log}$	24	79	8	8	1	**0.000**	0.035	1233	2169	1909	2176	**<0.001**	**0.098**	**0.016**	0.925	0.999	0.941	-55%	43%	55%	nc	nc	nc	1467.80	70%
	Magnesium	$ANOVA_{log}$	24	80	8	8	0	**0.000**	0.026	2444	3855	3089	3312	**<0.001**	0.421	0.198	0.384	0.693	0.982	-45%	nc	nc	nc	nc	nc	2187	60%
	Mercury	$ANOVA_{rank}$	24	80	8	8	0	0.132	3171.174	0.0272	0.0317	0.0321	0.0305	-	-	-	-	-	-	-15%	17%	11%	1%	-4%	-5%	0.0184	60%
	Selenium	$ANOVA_{rank}$	24	80	8	8	0	**0.001**	1081.851	1.172	1.394	1.261	1.396	**0.001**	0.865	0.599	**0.081**	0.731	0.558	-17%	nc	nc	-10%	nc	nc	0.3877	29%

Note: Significant differences indicated in **bold**.
(a) Length was included as a covariate for ANCOVA.
(b) One data point was removed due to high leverage (Figure 7-12; Appendix 7D, Figure 7D-37). See Appendix 7C, Table 7C-8 for model results including this point.
(c) Sensitivity is the minimum detectable difference expressed as a percent change in the least squares mean.
P-value = probability value; LS = Least Squares; RPD = relative percent difference; Min = minimum; ANOVA = analysis of variance; ANCOVA = analysis of covariance; log = log_{10}-transformed data; rank = rank-transformed data; nc = not calculated.

Table 7-12: Outliers Omitted from Statistical Comparisons of Tissue Chemistry

Species	Parameter	Year	Age (y)	Length (mm)	Weight (g)	Concentration (mg/kg ww)	Studentized Residuals
Arctic Char	Aluminum	2021	4	145	24.5	8.11	4.2
	Iron	2021	4	145	24.5	87.15	31.6
	Magnesium	2020	9	674	3910	219	-4.9
	Mercury	2020	9	674	3910	0.297	4.4
	Selenium	2021	4	145	24.5	0.1825	-[(a)]
Fourhorn Sculpin	Magnesium	2019	4	156	2.36	414	4.1
Hiatella arctica	Aluminum	2019	21	-	-	109	-5.1
	Iron	2019	21	-	-	374	-4.0

(a) Value removed due to high leverage (Appendix 7D, Figure 7D-37 for leverage plot).

7.4.2.2 Fourhorn Sculpin

A total of 46 Fourhorn Sculpin samples were analyzed for metals from the Milne Port area from 2019 to 2021, including 30 samples in 2019, eight in 2020, and eight in 2021. Summary statistics for metals concentrations are provided in Table 7-13 and presented visually in Appendix 7D, Figures 7D-1 to 7D-36. Statistical comparisons for COPCs among years are provided in Table 7-11, and outliers removed from the analyses are provided in Table 7-12.

Concentrations of metals in Fourhorn Sculpin were generally more variable when compared to Arctic Char. For COPCs, significant differences were observed among years for aluminum, iron, mercury, and selenium (Table 7-11). Aluminum and iron concentrations decreased significantly from 2019 to 2020 by 149% and 35%, respectively, and aluminum concentrations decreased significantly from 2019 to 2021 by 125%. Concentrations of mercury and selenium increased with fish length (Figure 7-13). Selenium concentrations were significantly lower in 2020 when compared to 2019 (14%; Figure 7-13) but did not differ significantly among other years. No post hoc significant differences were found among years in mercury concentration (Table 7-11). No significant differences were observed among years for magnesium concentrations in Fourhorn Sculpin. A power analysis for COPCs indicated that target sample sizes of eight fish per sampling area would be sufficient to detect differences in effect sizes ranging from 18% for magnesium to 150% for aluminum.

Polycyclic aromatic hydrocarbons were below DL for all parameters analyzed in Fourhorn Sculpin (Appendix 7C, Table 7C-6).

Mercury concentrations for all Fourhorn Sculpin sampled from 2019 to 2021 were below Health Canada's Maximum Levels for Chemical Contaminants in Foods mercury consumption guideline of 0.5 mg/kg ww (Health Canada 2015). Selenium concentrations for Fourhorn Sculpin were also below BC MOE fish tissue guidelines of 4 mg/kg dw (BC MOE 2014), with tissue concentrations in Fourhorn Sculpin from the Milne Port area ranging from 0.345 to 2.487 mg/kg dw from 2019 to 2021.

Tissue chemistry results were within FEIS predictions, which indicated the potential for non-significant, low magnitude effects on fish health and condition.

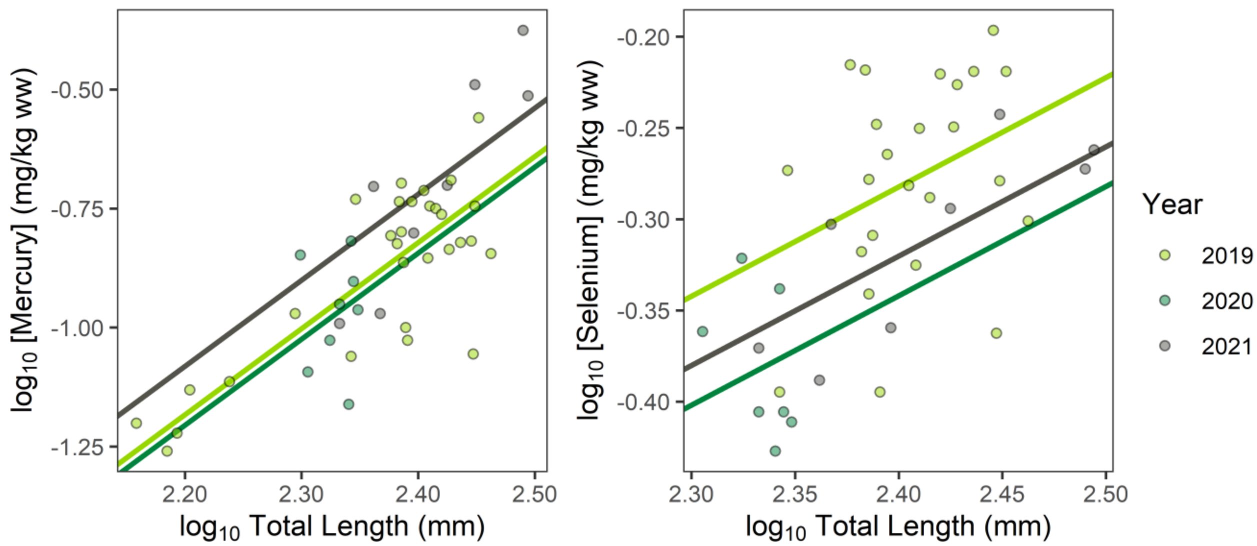


Figure 7-13: Concentrations of Mercury and Selenium in Relation to Total Length for Fourhorn Sculpin Sampled from the Milne Port Area, 2019 to 2021.

Table 7-13: Descriptive Statistics for Fourhorn Sculpin Tissue Chemistry Data Analyzed from 2019 to 2021

Parameter	2019 (*n* = 30)							2020 (*n* = 8)							2021 (*n* = 8)						
	>DL (%)	Min	Max	Median	Mean	SD	SE	>DL (%)	Min	Max	Median	Mean	SD	SE	>DL (%)	Min	Max	Median	Mean	SD	SE
Aluminum	100	0.75	11.40	1.92	2.85	2.41	0.44	88	<0.20	1.23	0.29	0.40	0.35	<0.20	100	0.28	1.25	0.53	0.56	0.31	0.11
Antimony	50	<0.0020	0.0030	<0.0020	<0.0020	<0.0020	<0.0020	0	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	88	<0.0010	0.0028	0.0013	0.0014	<0.0010	<0.0010
Arsenic	100	0.510	6.630	1.780	1.800	1.080	0.200	100	1.700	3.310	2.190	2.370	0.620	0.220	100	2.070	4.890	3.635	3.400	1.029	0.364
Barium	100	0.030	0.400	0.145	0.146	0.087	0.016	100	0.027	0.086	0.057	0.054	0.021	0.007	88	<0.010	0.060	0.031	0.031	0.021	<0.010
Beryllium	0	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0	<0.0010	<0.0020	<0.0010	<0.0010	<0.0010	<0.0010
Bismuth	87	<0.0013	0.0052	0.0029	0.0027	<0.0013	<0.0013	63	<0.0010	0.0052	0.0014	0.0018	0.0016	<0.0010	88	<0.0010	0.0031	0.0019	0.0019	<0.0010	<0.0010
Boron	77	<0.20	0.60	0.24	0.23	<0.20	<0.20	0	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	25	<0.20	0.54	<0.20	<0.20	<0.20	<0.20
Cadmium	100	0.0055	0.1300	0.0246	0.0367	0.0338	0.0062	88	<0.0010	0.0088	0.0023	0.0028	0.0026	<0.0010	100	0.0041	0.0095	0.0055	0.0058	0.0017	0.0006
Calcium	100	472	4290	2245	2234	1205	220	100	612	907	708	757	114	40	100	188	1190	485	540	370	131
Chromium	70	<0.025	0.163	0.031	0.040	0.035	<0.025	100	0.023	0.496	0.158	0.202	0.170	0.060	88	<0.010	0.038	0.020	0.021	0.011	<0.010
Cobalt	100	0.0045	0.0239	0.0123	0.0122	0.0041	0.0007	100	0.0048	0.0080	0.0062	0.0061	0.0010	0.0004	100	0.0065	0.0119	0.0078	0.0083	0.0019	0.0007
Copper	100	0.278	1.030	0.557	0.590	0.207	0.038	100	0.315	1.010	0.427	0.496	0.227	0.080	100	0.445	0.708	0.467	0.509	0.089	0.031
Iron	100	3.56	24.40	8.97	9.91	4.63	0.84	100	3.74	10.20	6.31	6.59	2.05	0.73	100	5.37	9.16	6.66	6.93	1.36	0.48
Lead	100	0.0055	0.0544	0.0148	0.0185	0.0115	0.0021	100	0.0013	0.0047	0.0018	0.0022	0.0011	0.0004	100	0.0037	0.0134	0.0054	0.0063	0.0031	0.0011
Magnesium	100	189	414	273	281	45	8	100	263	304	295	290	14	5	100	236	308	284	277	28	10
Manganese	100	0.149	0.870	0.337	0.365	0.157	0.027	100	0.255	0.409	0.302	0.315	0.049	0.017	100	0.182	0.347	0.263	0.265	0.053	0.019
Mercury	100	0.0550	0.2760	0.1510	0.1430	0.0530	0.0100	100	0.0690	0.1520	0.1110	0.1100	0.0290	0.0100	100	0.1020	0.4210	0.1985	0.2270	0.1133	0.0401
Molybdenum	13	<0.0080	0.0124	<0.0080	<0.0080	<0.0080	<0.0080	63	<0.0040	0.0104	0.0053	0.0049	<0.0040	<0.0040	0	<0.0040	<0.0080	<0.0040	<0.0040	<0.0040	<0.0040
Nickel	100	0.014	0.054	0.030	0.031	0.010	0.002	75	<0.010	0.020	0.015	0.013	<0.010	<0.010	100	0.015	0.079	0.023	0.028	0.021	0.007
Phosphorus	100	1750	4280	2645	2784	698	127	100	2560	2930	2780	2741	130	46	100	2030	2690	2450	2408	215	76
Potassium	100	2210	3640	2900	2860	344	63	100	3860	4260	4055	4034	123	44	100	3420	3870	3680	3639	162	57
Selenium	100	0.344	0.636	0.525	0.510	0.080	0.015	100	0.374	0.477	0.412	0.419	0.037	0.013	100	0.409	0.572	0.503	0.491	0.061	0.021
Silver	10	<0.0013	0.0023	<0.0013	<0.0013	<0.0013	<0.0013	0	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	13	<0.0010	0.0015	<0.0010	<0.0010	<0.0010	<0.0010
Sodium	100	885	1680	1280	1262	197	36	100	481	736	546	567	89	32	100	546	1010	748	755	157	56
Strontium	100	2.390	30.200	13.800	13.990	8.210	1.500	100	2.400	5.020	3.500	3.650	0.880	0.310	100	0.905	7.340	2.400	2.881	2.255	0.797
Thallium	97	<0.00040	0.00227	0.00087	0.00095	0.00043	<0.00040	100	0.00063	0.00143	0.00083	0.00090	0.00024	0.00009	100	0.00050	0.00104	0.00076	0.00075	0.00015	0.00005
Tin	63	<0.020	1.410	0.027	0.101	0.256	0.047	0	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	50	<0.020	0.190	0.025	0.042	0.061	0.021
Titanium	100	0.270	1.000	0.450	0.480	0.160	0.029	100	0.168	0.223	0.211	0.205	0.018	0.007	100	0.300	0.516	0.369	0.371	0.065	0.023
Uranium	100	0.00045	0.02010	0.00352	0.00446	0.00405	0.00074	75	<0.00040	0.00142	0.00072	0.00067	<0.00040	<0.00040	63	<0.00040	0.00141	0.00077	0.00067	0.00044	<0.00040
Vanadium	0	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0	0.010	0.010	0.010	0.010	0.000	0.000	13	<0.020	0.056	<0.020	<0.020	<0.020	<0.020
Zinc	100	12.20	26.70	16.80	17.99	3.92	0.72	100	9.62	18.40	11.75	12.80	3.27	1.15	100	9.59	26.10	17.80	16.91	5.86	2.07

Notes: Fourhorn Sculpin were not collected in 2018.

mg/kg = milligram per kilogram wet weight; > = greater than; < = less than; DL = detection limit; n = sample size; min = minimum; max = maximum; SD = standard deviation; SE = standard error.

7.4.2.3 *Hiatella arctica*

A total of 120 *H. arctica* samples were analyzed for metals from the Milne Port area from 2018 to 2021, including 24 samples in 2018, 80 in 2019, eight in 2020, and eight in 2021. Summary statistics for *H. arctica* metals concentrations are provided in Table 7-14 and presented visually in Appendix 7D, Figures 7D-1 to 7D-36. Statistical comparisons for COPCs among years are provided in Table 7-11, and outliers removed from analysis are provided in Table 7-12.

Concentrations of metals in *H. arctica* tissue were generally similar among years with a few exceptions, such as chromium, nickel and tin which exhibited more variability. Greater concentrations of most metals were observed for *H. arctica* when compared to Arctic Char and Fourhorn Sculpin (Appendix 7D, Figures 7D-1 to 7D-36). Differences in species-specific bioaccumulation processes (e.g., filter feeder versus non-filter feeder) and tissue type (i.e., whole body versus muscle) likely contributed to the interspecies differences in tissue concentrations observed, with molluscs typically accumulating greater concentrations of some metals compared to fish (Bonsignore et al. 2018). For COPCs, significant differences were observed among years for aluminum, iron, magnesium, and selenium (Table 7-11). Concentrations of these metals were significantly greater in 2019, when compared to 2018. Differences were only observed between 2018 and 2020 for iron, which was significantly greater in 2020 when compared to 2018. Concentrations of aluminum and iron were also significantly greater in 2021 when compared with 2020 but did not differ significantly among other years. Selenium concentrations were also significantly lower in 2020 compared with 2019 but did not differ significantly among other years. A power analysis for COPCs indicated that target sample sizes of eight specimens per sampling area would be sufficient to detect differences in effect sizes ranging from 29% for selenium to 70% for iron.

Polycyclic aromatic hydrocarbons were below DL for all parameters analyzed in *H. arctica* (Appendix 7C, Table 7C-7).

Concentrations of mercury and selenium in *H. arctica* were compared with fish tissue guidelines. While these guidelines are not intended for bivalves, comparisons with guidelines can provide relevant context for tissue chemistry results. Mercury concentrations for all *H. arctica* sampled from 2018 to 2021 were below Health Canada's Maximum Levels for Chemical Contaminants in Foods mercury consumption guideline of 0.5 mg/kg ww (Health Canada 2015). Selenium concentrations for *H. arctica* exceeded BC MOE fish tissue guidelines of 4 mg/kg dw (BC MOE 2014) in 94% of samples, with tissue concentrations in *H. arctica* from the Milne Port area ranging from 2.236 to 11.235 mg/kg dw from 2018 to 2021.

Tissue chemistry results were within FEIS predictions, which indicated the potential for non-significant, low magnitude effects on fish health and condition.

Table 7-14: Descriptive Statistics for *Hiatella arctica* Tissue Chemistry Data Analyzed from 2018 to 2021.

Parameter	2018 (*n* = 30)							2019 (*n* = 8)							2020 (*n* = 8)							2021 (n = 8)						
	>DL (%)	Min	Max	Median	Mean	SD	SE	>DL (%)	Min	Max	Median	Mean	SD	SE	>DL (%)	Min	Max	Median	Mean	SD	SE	>DL (%)	Min	Max	Median	Mean	SD	SE
Aluminum	100	166.00	920.00	521.00	516.00	196.00	40.00	100	109.00	2370.00	894.00	909.00	355.00	40.00	100	333.00	1750.00	685.50	757.00	444.00	157.00	100	390.00	1500.00	825.50	854.25	411.12	145.35
Antimony	100	0.0039	0.0094	0.0066	0.0064	0.0016	0.0003	100	0.0043	0.0424	0.0175	0.0180	0.0060	0.0007	100	0.0085	0.0354	0.0198	0.0189	0.0082	0.0029	100	0.0105	0.0323	0.0165	0.0184	0.0077	0.0027
Arsenic	100	1.420	4.120	2.410	2.440	0.680	0.140	100	1.560	6.310	2.780	2.930	1.030	0.120	100	2.400	3.360	2.560	2.680	0.330	0.120	100	2.190	6.240	3.085	3.620	1.485	0.525
Barium	100	2.120	20.500	7.870	9.200	5.230	1.070	100	3.320	32.700	8.540	10.710	6.330	0.710	100	5.310	20.100	8.820	10.680	4.970	1.760	100	5.200	13.900	9.220	9.844	3.126	1.105
Beryllium	100	0.0120	0.0531	0.0328	0.0330	0.0112	0.0023	100	0.0072	0.1460	0.0498	0.0509	0.0199	0.0022	100	0.0213	0.0966	0.0407	0.0442	0.0236	0.0083	100	0.0209	0.0808	0.0433	0.0449	0.0217	0.0077
Bismuth	100	0.0029	0.0119	0.0068	0.0069	0.0022	0.0004	100	0.0032	0.0248	0.0115	0.0117	0.0035	0.0004	100	0.0050	0.0236	0.0088	0.0099	0.0059	0.0021	100	0.0055	0.0167	0.0095	0.0099	0.0040	0.0014
Boron	100	3.28	8.95	6.05	5.96	1.44	0.29	100	3.06	16.70	8.45	8.86	2.67	0.30	100	4.36	13.20	6.63	6.97	2.76	0.98	100	4.75	11.80	7.47	7.74	2.84	1.00
Cadmium	100	0.2690	2.4900	0.5600	0.6840	0.4740	0.0970	100	0.1560	1.2700	0.4480	0.5020	0.2170	0.0240	100	0.4320	0.7550	0.6060	0.6170	0.1030	0.0360	100	0.5240	1.0000	0.8975	0.7920	0.1986	0.0702
Calcium	100	2010	11800	5065	5570	2544	519	100	1390	27000	6985	7905	4261	476	100	4020	10600	5445	6031	2293	811	100	4050	12300	6590	7591	3418	1208
Cesium	100	0.0270	0.1650	0.0906	0.0915	0.0355	0.0072	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chromium	100	0.610	2.580	1.490	1.530	0.550	0.110	100	0.410	7.340	2.530	2.660	1.030	0.120	100	5.900	64.000	30.550	27.950	18.030	6.380	100	1.150	4.500	2.265	2.451	1.268	0.448
Cobalt	100	0.2210	1.7200	0.7080	0.7850	0.3910	0.0800	100	0.2910	3.9600	0.9970	1.2220	0.7470	0.0830	100	0.7570	2.4600	1.4450	1.4560	0.5360	0.1900	100	0.5670	3.2500	1.1630	1.3550	0.8967	0.3170
Copper	100	1.480	3.290	2.020	2.110	0.400	0.080	100	1.420	4.490	2.230	2.320	0.550	0.060	100	1.760	4.020	2.810	2.890	0.820	0.290	100	1.610	3.910	2.350	2.523	0.788	0.279
Iron	100	511.00	2310.00	1280.00	1330.00	512.00	104.00	100	374.00	7000.00	2210.00	2338.00	1034.00	116.00	100	904.00	3910.00	1985.00	2101.00	961.00	340.00	100	969.00	5170.00	2030.00	2499.88	1421.39	502.54
Lead	100	0.2030	1.8400	0.6920	0.7390	0.3490	0.0710	100	0.1500	3.4200	1.2200	1.2640	0.4920	0.0550	100	0.4290	4.3300	0.9930	1.3610	1.2700	0.4490	100	0.5570	2.0600	1.1885	1.2105	0.5726	0.2024
Lithium	100	0.71	3.88	2.27	2.25	0.83	0.17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Magnesium	100	1190	5500	2565	2640	1073	219	100	1190	11600	3870	4126	1625	182	100	2370	5030	2980	3198	951	336	100	2010	5720	3380	3574	1489	526
Manganese	100	4.800	327.000	71.300	89.600	74.800	15.300	100	14.300	634.000	87.800	136.900	136.100	15.200	100	73.900	271.000	141.500	155.600	72.300	25.500	100	54.900	611.000	163.000	193.588	178.284	63.033
Mercury	100	0.0110	0.0697	0.0227	0.0272	0.0145	0.0030	100	0.0150	0.0780	0.0300	0.0329	0.0138	0.0015	100	0.0220	0.0470	0.0305	0.0321	0.0087	0.0031	100	0.0230	0.0360	0.0305	0.0305	0.0039	0.0014
Molybdenum	100	0.1340	0.5180	0.2580	0.2630	0.1040	0.0210	100	0.1340	1.2700	0.2930	0.3720	0.1910	0.0210	100	0.2820	1.3000	0.7190	0.7080	0.3060	0.1080	100	0.2160	0.6810	0.3100	0.3575	0.1588	0.0561
Nickel	100	0.790	2.720	1.450	1.540	0.500	0.100	100	0.740	4.260	2.040	2.130	0.650	0.070	100	3.460	29.900	14.350	13.350	8.170	2.890	100	1.150	2.930	1.885	2.035	0.809	0.286
Phosphorus	100	726	2020	1190	1195	257	53	100	705	3160	1225	1395	546	61	100	1020	1570	1270	1289	205	72	100	1100	1700	1460	1453	198	70
Potassium	100	799	2120	1415	1432	268	55	100	871	1950	1200	1247	240	27	100	1260	1700	1445	1450	126	45	100	1250	2090	1580	1628	250	88
Rubidium	100	0.95	3.18	2.01	1.97	0.57	0.12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Selenium	100	0.650	1.430	1.210	1.170	0.170	0.030	100	0.740	2.010	1.400	1.390	0.270	0.030	100	1.050	1.560	1.240	1.260	0.170	0.060	100	1.200	1.680	1.370	1.396	0.156	0.055
Silver	-	-	-	-	-	-	-	100	0.0019	0.0219	0.0049	0.0058	0.0036	0.0004	100	0.0035	0.0083	0.0047	0.0048	0.0016	0.0006	100	0.0039	0.0413	0.0075	0.0113	0.0123	0.0044
Sodium	100	1890	6480	3955	4110	1246	254	100	1680	5660	4205	4159	869	97	100	3250	4490	3785	3771	456	161	100	2790	3860	3345	3328	410	145
Strontium	100	9.230	46.200	19.750	21.540	9.230	1.880	100	7.440	89.900	15.950	19.940	13.360	1.490	100	10.300	30.200	14.850	16.190	6.230	2.200	100	11.000	44.700	24.700	26.425	11.506	4.068
Tellurium	25	<0.0040	0.0052	<0.0040	<0.0040	<0.0040	<0.0040	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thallium	100	0.00470	0.03770	0.01290	0.01360	0.00750	0.00150	100	0.00370	0.06360	0.02100	0.02280	0.01070	0.00120	100	0.01070	0.04220	0.01900	0.01980	0.01010	0.00360	100	0.01020	0.05470	0.01975	0.02444	0.01589	0.00562
Tin	83	<0.020	0.352	0.033	0.046	0.067	<0.020	100	0.010	0.529	0.060	0.071	0.059	0.007	100	0.086	0.360	0.160	0.184	0.086	0.030	100	0.053	0.123	0.074	0.079	0.026	0.009
Titanium	-	-	-	-	-	-	-	100	4.600	109.000	33.700	34.400	14.800	1.600	100	13.800	63.200	25.200	27.600	15.700	5.500	100	13.700	67.800	30.250	33.138	18.872	6.672
Uranium	100	0.08200	0.18500	0.12000	0.12500	0.03000	0.00600	100	0.09000	0.43500	0.19700	0.20300	0.07200	0.00800	100	0.08700	0.27700	0.14200	0.15300	0.05600	0.02000	100	0.10700	0.28100	0.15250	0.18000	0.06800	0.02404
Vanadium	100	0.800	3.960	2.420	2.410	0.900	0.180	100	0.830	7.540	3.760	3.910	1.320	0.150	100	1.880	6.940	3.380	3.430	1.570	0.550	100	1.760	5.420	3.345	3.549	1.548	0.547
Zinc	100	7.06	14.40	11.55	11.26	1.83	0.37	100	8.61	20.90	13.65	13.65	2.30	0.56	100	11.50	17.90	12.70	13.30	2.07	0.73	100	11.60	17.30	13.85	13.81	1.86	0.66
Zirconium	100	0.222	1.190	0.707	0.718	0.271	0.055	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

mg/kg = milligram per kilogram wet weight; > = greater than; DL = detection limit; n = sample size; min = minimum; max = maximum; SD = Standard deviation; SE = standard error.

7.5 Discussion

Detailed fish health data were collected for Fourhorn Sculpin and *H. arctica* in 2020 and 2021 align the MEEMP with future monitoring programs with the MDMER EEM program. Based on internal and external examinations, Fourhorn Sculpin from the Milne Port area appeared to be healthy at the time of sampling with few abnormalities observed. Comparisons of fish health endpoints for Fourhorn Sculpin between 2020 and 2021 indicated that Fourhorn Sculpin were significantly larger in 2021 than in 2020, relative to their age. Additionally, female Fourhorn Sculpin had greater relative gonad size at the upper range of weights collected, while males had significantly lower relative liver size at the upper range of weights collected. Sample timing appeared to be appropriate for future assessments of reproductive endpoints for Fourhorn Sculpin, with all individuals assessed observed to be in the late stages of gonadal recrudescence.

Comparisons of health endpoints for *H. arctica* between 2020 and 2021 indicated that condition, as total weight relative to total length, was significantly lower in 2021 compared to 2020, differing by 9%. This indicates that *H. arctica* collected in 2021 had lower mass at length compared with those specimens collected in 2020, although the difference between years was comparatively small. Given the data currently available for *H. arctica* in Milne Inlet, it is unknown whether this difference represents typical variability within the species or indicates potential effects of localized stressors. Sample timing of *H. arctica* appears to be appropriate for assessing reproductive endpoints, as gonads were retrieved from collected samples in 2021. Timing of spawning for *H. arctica* may be associated with phytoplankton biomass and varies with geographical location (Brandner et al. 2017). Gonad development for this species may also be asynchronous, with multiple overlapping spawning events occurring throughout the year, potentially leading to a high degree of variability in gonad size regardless of sample timing. While MSI data from 2021 do not exhibit high variability, this is the only year from which these data are available. Additional data collected in future years will improve understanding of the variability in gonadal development and condition for *H. arctica*, thus improving the ability to draw conclusions regarding the optimal sampling time for *H. arctica*.

A total of 24 samples were submitted for tissue chemistry analysis of metals and PAHs in 2021, which included eight samples each for Arctic Char, Fourhorn Sculpin and *H. arctica*. Tissue concentrations of PAHs were below DL for all species analyzed in 2021, while metal concentrations were generally above DLs and more variable among species and years. Generally, concentrations of most COPCs were significantly different among years but with relatively small magnitudes of differences. Measured concentrations in 2021 remained within the range of historical variability for all species.

- Arctic Char: Significant differences were observed for aluminum, magnesium, and selenium. Aluminum concentrations have decreased from 2018 to 2021 by 27% while magnesium and selenium have increased by 10% and 24%, respectively. No differences were observed for iron or mercury.
- Fourhorn Sculpin: Significant differences were observed for aluminum, iron, mercury, and selenium. Aluminum concentrations in Fourhorn Sculpin decreased significantly from 2019 to 2021, while iron and selenium concentrations decreased significantly from 2019 to 2020 but did not differ between 2020 and 2021. Mercury concentrations did not differ significantly between years.
- *H. arctica*: Significant increases observed for aluminum, iron, magnesium, and selenium between 2018 and 2021. The RPDs for these metals were small, ranging from relative increases of 10% to 57%.

For all species, to confirm that differences in concentrations of metals between years were real and less likely to be attributed to low concentrations of target contaminants, analytical variability, or spatial and temporal variation, an effect size of 100% was used to differentiate stochastic differences from those of potential biological importance (Environment Canada 2012). Given this effect size, significant differences in concentrations of COPCs for Arctic Char, Fourhorn Sculpin and *H. arctica* between 2018 and 2021 appear to reflect natural variability and were not considered to be Project-related.

Tissue metals concentrations in *H. arctica* were consistently greater than those measured in Arctic Char and Fourhorn Sculpin, occasionally by orders of magnitude. This likely reflects species-specific differences in bioaccumulation processes and the tissue types analyzed (i.e., whole body versus muscle). *Hiatella arctica* is a long-lived, sedentary, filter feeding mollusc closely associated with the sediment. These life-history characteristics increase the potential of *H. arctica* for exposure and accumulation of metals, from both natural and anthropogenic sources, relative to fish; molluscs tend to accumulate some metals to greater degree compared to fish (Bonsignore et al. 2018).

All tissue samples for Arctic Char, Fourhorn Sculpin and *H. arctica* collected from 2018 to 2021 were below Health Canada's Maximum Levels for Chemical Contaminants in Foods mercury consumption guideline of 0.5 mg/kg ww (Health Canada 2015). All tissue samples for Arctic Char and Fourhorn Sculpin were also below BC MOE fish tissue guidelines of 4 mg/kg dw for selenium (BC MOE 2014). *Hiatella arctica* tissues were also compared with fish tissue guidelines to provide additional context, despite these guidelines not being intended for use with bivalve tissues. Nearly all (94%) of *H. arctica* tissue samples exceeded the BC MOE fish tissue selenium guideline.

Tissue chemistry results were within FEIS predictions, which indicated the potential for non-significant, low magnitude effects on marine fish health and condition.

7.6 Conclusions and Recommendations

The MEEMP has been designed to meet the objectives of the various conditions associated with PC 005 (Chapter 1.0, Table 1-2), as well as to provide results to help evaluate whether the marine environment has changed or will change over time. Original FEIS predictions indicated the potential for low magnitude changes in some ecological parameters, such as water quality and Arctic Char tissue chemistry, but characterised these changes as not significant. Monitoring data align with these predictions overall, as observed changes have been small and within established guidelines or consistent with baseline levels. Monitoring to date suggests that Project mitigation is functioning as intended and that Project activities are being managed in a way that has not adversely affected the marine ecosystem. Moving forward, continued monitoring of proposed MEEMP components is recommended to maintain continuity in established time series data for Arctic Char, and the collection of additional fish health and tissue chemistry for Fourhorn Sculpin and *H. arctica,* to provide a benchmark for comparisons in the future.

7.7 Closure

We trust this information is sufficient for your needs at this time. Should you have any questions or concerns, please do not hesitate to contact Rainie Sharpe, on behalf of the undersigned, at 587-879-8424.

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APPENDIX 7A

Reference Area Reconnaissance Memo

TECHNICAL MEMORANDUM

DATE 21 October 2022 **Reference No.** 1663724-44000

TO Megan Lord-Hoyle, Vice-President, Sustainable Development
Baffinland Iron Mines Corp.

CC

FROM Rainie Sharpe **EMAIL rainie.sharpe@wsp.com**

PHASE 2 FISH HEALTH PROGRAM – 2021 REFERENCE AREA RECONNAISSANCE

1.0 INTRODUCTION

One of the monitoring objectives for the 2021 MEEMP included a reconnaissance survey to support selection of an appropriate reference area for the fish sampling program in the case it is determined a fishing reference would be beneficial in future years. To meet this objective, fish sampling as well as supporting water and sediment quality sampling was conducted in the area surrounding the Tugaat River Estuary, to evaluate whether this candidate area is suitable for use as a reference area for Milne Port. This stand-alone sampling program was completed concurrently with the 2021 MEEMP field program but does not represent an addition to the MEEMP study design at this time. Results are summarized in the sections below.

2.0 WATER QUALITY

Exploratory water quality sampling was completed on 15 August 2021 alongside the 2021 MEEMP field program. Field water quality measurements and water samples were collected at two locations: south of the mouth of the Tugaat River at TR-Ref1-21 and north of the mouth of the Tugaat River at TR-Ref2-21 (Figure 7A-1).

Sampling methods, quality assurance/quality control (QA/QC) measures, and results are summarized in the sections below.

2.1 Sampling Methods

A depth sounder was used to measure depth at each reference location prior to sampling. Field water quality measurements (i.e., pH, dissolved oxygen, salinity, conductivity, temperature, and turbidity) were taken just below the surface, mid-depth, and 1 metre from the bottom using a calibrated water quality meter. Water samples were collected just below the surface from a zodiac boat using a 2.0 L vertically oriented Kemmerer bottle sampler. The sampler was washed with laboratory-grade detergent and then rinsed with site-water prior to sample collection at each station, samples were preserved in the field according to laboratory instructions and samples for dissolved analyses were filtered in the field using 0.45 µm filters. All samples were kept refrigerated until they were shipped on ice in coolers to ALS Canada Ltd. (ALS), a Canadian Association for Laboratory Accreditation Inc. (CALA) accredited analytical laboratory. Water samples were submitted for analysis of conventional parameters, major ions, nutrients, total and dissolved organic carbon, and total and dissolved metals. Samples were shipped within 48 hours of sample collection.

2.2 Data Analysis

Water quality data collected at TR-Ref1-21 and TR-Ref2-21 were screened against the applicable Canadian Council of Ministers of the Environment (CCME) water quality guidelines for the protection of marine aquatic life (AW-M) (CCME 1999, CCME 2002). A comparison was also made to water quality data collected at Milne Port in 2021.

2.3 Quality Assurance/Quality Control

Laboratory QA/QC reports were reviewed upon receipt to confirm adherence to sample hold times and laboratory data quality objectives (DQOs), and that the appropriate QA/QC information had been reported. Laboratory QA/QC included verification of recommended sample holding times and the analysis of laboratory control samples, laboratory duplicates, and spiked samples to assess precision and accuracy of analytical methods.

A duplicate water sample was collected from the Tugaat River Estuary (TR-Ref1-21) to assess potential variability introduced during sample collection and sample handling. The analysis of field QC samples involved review of field duplicates. Notable results were defined as those greater than five times the respective DL detected in the field blanks, in accordance with the BC Field Sampling Manual (BC MWLAP 2003). To assess variability between field duplicates, the Relative Percent Difference (RPD) was calculated as follows:

$$RPD = \left(\frac{sample - duplicate}{(sample + duplicate)/2}\right) \times 100$$

An RPD value of >20% was used to identify notable differences between original and duplicate samples. Values less than five times the DL were not included in the RPD calculations because analytical variability near the MDL is higher and does not provide a good measure of variability associated with the collection of field samples.

2.3.1 QA/QC Results

The 2021 water quality data for the exploratory reference sites samples were considered valid and of acceptable quality to address the reconnaissance study objective, according to the following rationale:

- Chemical analysis of water quality samples was completed within sample hold time requirements. The only exception was anions and nutrients (5 days vs. 3 days) which is commonplace for remote sampling locations. The assessment relied on field pH measurements.
- Data reported by the laboratory were considered reliable according to the accredited laboratory QA/QC assessment.
- There was low variability and high precision between duplicate samples (Table 7A-1).

2.4 Results and Discussion

Parameter concentrations measured in water quality samples collected near the Tugaat River Estuary were below CCME AW-F guidelines and within the concentration ranges documented for Milne Port in 2021 (see Table 1 in Appendix 2E). Similarly, dissolved oxygen, salinity, and temperature measurements at all depths at the Tugaat River Estuary stations were within ranges measured at MP05 and MP06 in Milne Port in 2021. Water quality near the Tugaat River Estuary can therefore be considered comparable to Milne Port water quality based on this evaluation of data collected during the 2021 open-water season.

LEGEND

- 2021 ANGLING (JIGGING) SAMPLING LOCATION
- 2021 WATER QUALITY AND SEDIMENT QUALITY STATION
- 2021 ANGLING (TROLLING) SAMPLING LOCATION
- 2021 GILLNET SAMPLING LOCATION
- BATHYMETRIC CONTOUR (25 m INTERVAL)
- WATERCOURSE
- WATERBODY

0 250 500

1:7,500 METRES

REFERENCE(S)

BATHYMETRY CREATED BY GOLDER FROM MULTIPLE DATA SOURCES. HYDROGRAPHY DATA OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED. IMAGERY COPYRIGHT © 20190802 ESRI AND ITS LICENSORS. SOURCE: MAXAR VIVID. USED UNDER LICENSE, ALL RIGHTS RESERVED.
PROJECTION: UTM ZONE 17 DATUM: NAD 83

CLIENT
BAFFINLAND IRON MINES CORPORATION

PROJECT
MARY RIVER PROJECT

CONSULTANT
GOLDER
MEMBER OF WSP

YYYY-MM-DD	2022-02-02
DESIGNED	CA
PREPARED	AJA
REVIEWED	
APPROVED	

TITLE
EXPLORATORY SAMPLING LOCATIONS AT TUGAAT RIVER; MEEMP 2021

PROJECT NO.	CONTROL	REV.	FIGURE
1663724	44000-04	0	7A-1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B
25mm

3.0 SEDIMENT QUALITY

Exploratory sediment quality sampling was completed on 15 August 2021 alongside the 2021 MEEMP field program. Sediment samples were collected at two locations: south of the mouth of the Tugaat River at TR-Ref1-21 and north of the mouth of the Tugaat River at TR-Ref2-21 (Figure 7A-1).

Sampling methods, QA/QC measures, and sediment quality results are summarized in the sections below.

3.1 Sampling Methods

Bottom sediment samples were collected using a Van Veen (0.1 m^2) grab sampler. At each sampling location, grab samples were collected to obtain a sufficient volume of surficial sediment for the laboratory analysis. Each grab sample was examined for acceptability based on the following criteria:

- The sampler was fully closed.
- There was adequate penetration depth (i.e., sediment volume greater than 25% full).
- The sample did not appear overfilled or disturbed, and the sample did not appear to have been collected on an angle.
- The sampler did not appear to be leaking sediment at a substantial rate (i.e., the top of the sediment profile did not appear to be sloping inwards).

Upon acceptance, the top 5 cm of sediment from each acceptable grab sample was removed from the center of the grab using a stainless-steel spoon and transferred to a stainless-steel bowl. Sediment samples from composite grabs were homogenized and aliquots of homogenized sediments from each station were transferred to clean, laboratory supplied containers. All samples were kept refrigerated until they were shipped on ice in coolers to ALS for analysis of particle size, moisture, total organic carbon [TOC]), total metals, volatile organic compounds (VOCs), hydrocarbons (F1-F4), and total polycyclic aromatic hydrocarbons (PAHs).

3.2 Data Analysis

Sediment quality data collected at TR-Ref1-21 and TR-Ref2-21 in the Tugaat River Estuary were screened against applicable CCME sediment quality guidelines (SQG) for the protection of marine aquatic life (CCME 1999, CCME 2002). Specifically, data were screened against Probable Effect Levels (PELs) and Interim Sediment Quality Guidelines (ISQGs). PELS were intended to represent concentrations above which adverse effects were predicted to occur frequently, based on a concurrence dataset with effects and concentrations from other sites. By comparison, the ISQG was intended to represent a concentration above which adverse biological effects may or may not occur (CCME 2002). Sediment samples from the Tugaat River Estuary were also qualitatively compared against sediment samples from similar depths (15 to 20 m) for the 2020 MEEMP sampling program.

3.3 Quality Assurance/Quality Control

Laboratory QA/QC reports were reviewed upon receipt to confirm adherence to sample hold times and laboratory DQOs, and that the appropriate QA/QC information had been reported. A duplicate sediment sample was collected from the Tugaat River Estuary (TR-Ref2-21) to assess potential variability introduced during sample collection and sample handling. To assess variability between field duplicates, the RPD was calculated as follows:

$$RPD = \left(\frac{sample - duplicate}{(sample + duplicate)/2}\right) \times 100$$

An RPD value of >35% was used to identify notable differences between original and duplicate samples. Values less than five times the DL were not included in the RPD calculations because analytical variability near the MDL is higher and does not provide a good measure of variability associated with the collection of field samples.

3.3.1 QA/QC Results

The 2021 sediment quality data for the exploratory reference sites samples were considered valid and of acceptable quality to address the objectives stated in Section 1.0, based on the following:

- Chemical analyses on sediment samples were completed within the sample hold time requirements.
- Data reported by the laboratory were considered reliable according to the accredited laboratory QA/QC assessment[1].
- Several metals had RPD DQO exceedances which were likely the result of sample heterogeneity, but all results were below applicable guidelines (Table 7A-2).

3.4 Results and Discussion

Tugaat River Estuary sediments were primarily composed of sand with some silt and low TOC, which was generally consistent with sediment samples most recently collected from the Milne Port area (Figure 3-3, Golder 2021a). Parameter concentrations measured in Tugaat River Estuary sediments were below the CCME PEL and ISQG with one exception (i.e., ISQG exceedance for copper at TR Ref 1). Exceedance of generic CCME ISQGs for sediment metals in Northern Canada is not uncommon under naturally occurring background conditions. Organic parameters (i.e., VOCs and PAHs) were not detected in the Tugaat River Estuary sediment samples.

There were a number of metals[2] in one or both 2021 Tugaat River Estuary samples (Table 7A-2) that had concentrations higher than maximum concentrations documented at Milne Port in 2020 (Appendix D, Golder 2021a). Iron was higher at TR Ref 1 (28,000 mg/kg) compared to the maximum (~16,400 mg/kg) reported from Milne Port in 2020 for samples collected at a similar depth (Appendix D, Golder 2021a). The iron concentration at TR Ref 2 (13,000 mg/kg) was, however, within the range documented at Milne Port in 2020. There appeared to be some variability in sediment metal concentrations within candidate reference area but, overall, the sediment quality at the Tugaat estuary is comparable to Milne Port and reflects the natural minerology of the area.

[1] Laboratory qualifiers did exist but were regarding laboratory duplicates not associated with the Tugaat River Estuary samples and several surrogate recoveries were outside of the laboratory data quality objectives but results were deemed to be unaffected by the accredited laboratory.

[2] Metals include aluminum, antimony, barium, chromium, cobalt, copper, iron, manganese, nickel, phosphorus, titanium, tungsten, uranium, vanadium, zinc and zirconium.

4.0 FISH HEALTH

Fishing was completed on 15 August 2021 in the area surrounding the Tugaat River Estuary (17W 522269m E 7996536m N; Figure 7A-1) in order to identify potential reference areas, should they be required or determined useful in the future. Target species for collection were Fourhorn Sculpin (*Myoxocephalus quadricornis*) and wrinkled rock-borer (*Hiatella arctica)*, a bivalve. This work was completed concurrently with the 2021 MEEMP field program. Methods, quality assurance/quality control measures and results are summarized in the sections below.

4.1 Sampling Methods

Fishing effort included both active (i.e., angling) and passive (i.e., gill netting) capture methods. Captured fish were enumerated and measured for length and weight. Fourhorn Sculpin were retained for fish health sampling. All other fish were released alive back into the Tugaat River Estuary. Fish processing methodology is described in Section 7.3.2 in Chapter 7.0 – Fish Health and Tissue Chemistry. Due to equipment malfunction in the field, no weights were recorded from fish collected from the Tugaat River Estuary. Tissue chemistry samples for Fourhorn Sculpin captured and processed from the Tugaat River Estuary were collected and archived for potential future analysis. No tissue samples were processed for metals concentrations in 2021.

The *H. arctica* specimens were collected from benthic infauna samples collected from Tugaat River Estuary. Collection methods for benthic infauna included a standard Van Veen sampler, as described in Section 4.3.1 of Chapter 4.0—Benthic Infauna. Each benthic sample was checked for the presence of *H. arctica.* Specimens were selected for processing if the shell was greater than 1.5 cm in length, was intact, and had no indications of damage to the umbo or hinge area. Processing methodology for *H. arctica* is described in Section 7.3.2 of Chapter 7.0.

4.2 Data Analysis

Fish health data analysis was completed following the methods described in Section 7.3.4 of Chapter 7.0 – Fish Health and Tissue Chemistry. Briefly, descriptive statistics (i.e., sample size, mean, median, standard deviation [SD], standard error [SE], minimum, and maximum values) were calculated for Fourhorn Sculpin and *H. arctica* biometrics (e.g., length, weight) as well as fish health endpoints for *H. arctica*. These indices included condition factor, shell condition factor, and gonadosomatic index for *H. arctica.* Note that no fish health endpoints for Fourhorn Sculpin were calculated due to missing weight data. Formulas for these indices are provided in Section 7.3.4 of Chapter 7.0.

4.3 Quality Assurance/Quality Control

The same field practices and operations used for the 2021 MEEMP field program were implemented for the fishing effort at the Tugaat River Estuary, detailed in Section 7.3.6 of Chapter 7.0. Field and laboratory QA/QC procedures were implemented at each stage of the fish survey, including sampling, data entry, sample shipment, data analyses, laboratory analyses, and report preparation, to produce technically sound and scientifically defensible results.

4.4 Results

4.4.1 Fish Capture Data

A total of 68 fish were captured and processed from the Tugaat River Estuary area, including 63 Arctic Char (*Salvelinus alpinus*), 3 Arctic Sculpin (*Myoxocephalus scorpioides*), and 2 Fourhorn Sculpin. In the Tugaat River Estuary, gill netting was the most successful method for capturing Fourhorn Sculpin, but CPUE was notably lower than in Milne Port (Table 7A-3). Angling was unsuccessful at capturing Fourhorn Sculpin at the Tugaat River Estuary.

Table 7A-3: Total Catch Per Unit Effort for Fish Captured from the Tugaat River Estuary Reference Area Reconnaissance Survey, 2021.

Site	Angling				Gill Nets			
	Effort (h/rod)	Species	# of Fish Captured	CPUE (# fish/h/rod)	Effort (h)	Species	# of Fish Captured	CPUE (# fish/h)
Tugaat River Estuary	3.07	ARCH	1	0.33	5.75	ARCH	62	10.78
		ARSC	3	0.98		ARSC	0	0.00
		FHSC	0	0.00		FHSC	2	0.35
Milne Port[(a)]	44.73	FHSC	150	3.35	60.85	FHSC	127	2.10

ARCH = Arctic Char; ARSC = Arctic Sculpin; FHSC = Fourhorn Sculpin; h = hour.

(a) Fish capture data for Milne Port shown for comparison. CPUE calculated as an index of total abundance.

4.4.1.1 Fourhorn Sculpin

Only two Fourhorn Sculpin were captured in the Tugaat River Estuary; both were processed for fish health endpoints and were identified as female (Table 7A-4). The two fish were below the mean total length of female Fourhorn Sculpin but within the range of total lengths from Milne Port. Similarly, with respect to age, the two fish were younger than the mean age of female Fourhorn Sculpin but within the range of ages reported from Milne Port.

4.4.1.2 Hiatella arctica

A total of six *H. arctica* were collected from the Tugaat River Estuary. Summary statistics are provided in Table 7A-5. The *H. arctica* collected in the Tugaat River Estuary were similar to those collected in Milne Port (Chapter 7.0 Table 7-7); all means for health endpoints were within one standard deviation of the mean of Milne Port health endpoints. All collected measurements and health endpoints determined for *H. arctica* from the Tugaat River Estuary were within the range of those determined for Milne Port.

Table 7A-4: Descriptive Statistics for Fourhorn Sculpin Fish Health Endpoints Processed from the Tugaat River Estuary and Milne Port, 2021.

Parameter	Reference Area							Milne Port						
	n	Min	Max	Median	Mean	SD	SE	n	Min	Max	Median	Mean	SD	SE
Female														
Total Length (mm)	2	224	234	229	229	7.1	5.0	20	205	344	249	255	40.3	9.0
Age (y)	2	4	6	5	5.0	1.4	1.0	20	3	10	6	6.2	2.0	0.5
Male														
Total Length (mm)	0	-	-	-	-	-	-	20	209	281	229	237	24.4	5.5
Age (y)	0	-	-	-	-	-	-	20	3	12	6	6.6	2.1	0.5

n = sample size; min = minimum; max = maximum; SD = standard deviation; SE = standard error; mm = millimeters; y = years - = not applicable.

Table 7A-5: Descriptive Statistics for *Hiatella arctica* Fish Health Endpoints Processed from the Tugaat River Estuary and Milne Port, 2021.

Parameter	Tugaat River Estuary							Milne Port						
	n	Min	Max	Median	Mean	SD	SE	n	Min	Max	Median	Mean	SD	SE
Shell Length (mm)	6	20.4	33.84	23.81	25.87	6.16	2.51	35	17.47	35.07	30.45	29.331429	4.25	0.72
Total Weight (g)	6	1.0499	5.6753	1.6434	2.7262	2.0521	0.8378	35	0.4805	8.1284	3.9825	4.0210	1.7575	0.2971
Shell ww (g)	6	0.3396	3.6655	0.6310	1.5594	1.5921	0.6500	35	0.2187	5.1394	2.0614	2.2152	1.1666	0.1972
Shell dw (g)	6	0.2600	3.3998	0.4867	1.3273	1.4421	0.5887	35	0.1145	4.7250	1.7991	1.9047	1.0324	0.1745
Tissue ww (g)	6	0.5619	2.0938	0.9937	1.1051	0.5464	0.2231	35	0.2351	2.8741	1.9059	1.7853	0.7031	0.1188
Tissue dw (g)	6	0.2073	0.7726	0.3667	0.4078	0.2016	0.0823	35	0.0868	1.0605	0.7033	0.6588	0.2595	0.0439
Condition factor	6	1.07	1.57	1.40	1.36	0.18	0.07	35	0.90	2.25	1.41	1.48	0.30	0.05
Gonad ww (g)	6	0.0046	0.0635	0.0119	0.0249	0.0256	0.0104	35	0.0023	0.0798	0.0360	0.0365	0.0181	0.0031
MSI	6	0.83	4.19	1.29	1.93	1.42	0.58	35	0.90	6.13	1.97	2.23	1.20	0.20
Age (y)	6	3	33	6	12.8	13.2	5.4	35	1	39	17	19.2	8.1	1.4

n = sample size; min = minimum; max = maximum; SD = standard deviation; SD = standard error; mm = millimeters; g = grams; ww = wet weight; dw = dry weight; MSI = Mantle somatic index; y = years.

4.5 Discussion

The Tugaat River Estuary does not appear to support an adequately large population of Fourhorn Sculpin to support target sample sizes for the MEEMP fish health program. Fourhorn Sculpin CPUE in the Tugaat River Estuary was notably lower than in Milne Port (Table 7A-3): angling in the Tugaat River Estuary was unsuccessful (CPUE: 0 fish/h/rod) while angling successfully captured Fourhorn Sculpin in Milne Port (CPUE: 76 fish/h/rod). Gillnetting in the Tugaat River Estuary was also less successful in capturing Fourhorn Sculpin than in Milne Port (CPUE: 0.04 and 16.04 fish/100m/h, respectively).

During the reconnaissance survey, it was observed that fish habitat also differed between Milne Port and the Tugaat River Estuary. Milne Port is in a relatively sheltered area in the southernmost portion of Milne Inlet, where habitats are relatively deep (ranging from 0 to more than 10 m) and have a relatively steep slope prior to dropping off to deeper waters. Substrates around the Milne Port are nearly entirely boulders with some cobbles. In contrast, the Tugaat River Estuary is located in the main body of Milne Inlet, approximately 28 km north of Milne Port.. Littoral habitats at the Tugaat River Estuary were generally shallow (0 to 1.5 m in most areas), with a long, gradual slope prior to dropping off to deeper waters. Substrates in the Tugaat River Estuary were composed of finer substrates, primarily cobbles and sand. Given the abundance of Fourhorn Sculpin in the Milne Port area and the observed differences in habitat composition and structure between the Milne Port and Tugaat River Estuary, it is likely that the Tugaat River Estuary does not include sufficient habitat for Fourhorn Sculpin to serve as a reference area of the MEEMP Fish Health program.

The bivalve *H. arctica* appears to be relatively abundant in the Milne Port area (see Chapter 4.0 – Benthic Infauna), and *H. arctica* were collected from the Tugaat River Estuary. Individuals were of similar size and condition to those collected from the Milne Port area (Table 7A-5; Chapter 7.0 Table 7-7). Therefore, while the Tugaat River Estuary likely supports a population of *H. arctica* large enough to support target sample sizes, *H. arctica* is also likely present throughout Milne Inlet in other areas where populations of Fourhorn Sculpin are also present and in sufficient numbers to support the MEEMP Fish Health program.

5.0 CONCLUSIONS

Population densities of Fourhorn Sculpin in the Tugaat River Estuary candidate reference area do not appear to be adequate to support sample size requirements for the MEEMP fish health and tissue chemistry programs, which suggests that this area may not be an appropriate reference area. Supporting water and sediment quality data suggest that the candidate reference area is broadly comparable to Milne Port, however, concentrations of some sediment metals within the candidate area were variable, despite comparable substrates at the locations sampled. Therefore, the 2021 sampling locations near Tugaat River are not recommended for use as a fish health reference area based on data collected during the 2021 reconnaissance survey.

6.0 CLOSURE

We trust this information is sufficient for your needs at this time. Should you have any questions or concerns, please do not hesitate to contact Marina Winterbottom, on behalf of the undersigned, at 604-296-7312.

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https://golderassociates.sharepoint.com/sites/11206g/deliverables (do not use)/issued to client_for wp/300-399/1663724-349g-r-rev0/app/appendix 7a/appendix 7a - reference area reconnaissance survey1_mw-nz_pr.docx

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Table 7A-1: Milne Port Fish Health Reference Area
Water Quality Screening
North Baffin Island, Nunavut, 2021

Sample ID / Date Sampled / Lab Sample ID / QAQC / Parent Sample ID	CCME AW-M[1]	Lowest Detection Limit	Unit	TR Ref1 / 2021-08-15 / VA21B7536 / FDA	TR Ref2 / 2021-08-15 / VA21B7536	DUP-D / 2021-08-15 / VA21B7536 / FD / TR Ref1	RPD %
Parameter							
Anions + Nutrients							
Alkalinity, Total as CaCO3		1000	µg/L	93400	93700	92400	1%
Bromide (Br)		5000	µg/L	44500	44600	42600	4%
Chloride (Cl)		50000	µg/L	13000000	13100000	12600000	3%
Fluoride (F)		200	µg/L	560	610	600	-
Nitrate (as N)		10	µg/L	< 10	< 10	18.0	-
Nitrite (as N)		10	µg/L	< 10	< 10	< 10	-
Ammonia (as N)		5	µg/L	< 5.0	< 5.0	< 5.0	-
Total Kjeldahl Nitrogen		50	µg/L	68.0	65.0	73.0	-
Sulfate (SO4)		3000	µg/L	1790000	1840000	1790000	-
Phosphorus, Total		2	µg/L	13.0	13.5	11.8	10%
Phosphorus, Dissolved			µg/L	< 50	< 50	< 50	-
Carbons							
Dissolved Organic Carbon		500	µg/L	1130.0	1100.0	950.0	-
Total Organic Carbon		500	µg/L	810.0	810.0	790.0	-
Field + Physical							
pH	7.0 - 8.7	0.1	pH units	7.9	7.9	7.9	-
Conductivity		2.0	µS/cm	36900	38100	37300	1%
Total Dissolved Solids		10000	µg/L	27600000	28000000	25600000	8%
Total Suspended Solids		2000	µg/L	< 2000	< 2000	< 2000	-
Turbidity		0.10	NTU	1.45	0.68	0.67	**74%**
Salinity		1.0	PSU	22.8	23.6	23.1	1%
Hardness, Calcium Carbonate		500	µg/L	4300000	4460000	4250000	1%
Metals, Dissolved							
Aluminum		5	µg/L	< 5.0	< 5.0	< 5.0	-
Antimony		1	µg/L	< 1.0	< 1.0	< 1.0	-
Arsenic	12.5	0.4	µg/L	1.07	1.11	1.00	-
Barium		1	µg/L	7.10	7.40	7.10	-
Beryllium		0.5	µg/L	< 0.50	< 0.50	< 0.50	-
Bismuth		0.5	µg/L	< 0.50	< 0.50	< 0.50	-
Boron		300	µg/L	2860	2980	2890	1%
Cadmium	0.12	0.01	µg/L	0.028	0.029	0.022	-
Calcium		1000	µg/L	279000	288000	284000	2%
Cesium		0.5	µg/L	< 0.50	< 0.50	< 0.50	-
Chromium	1.50	0.5	µg/L	< 0.50	< 0.50	< 0.50	-
Cobalt		0.05	µg/L	< 0.050	< 0.050	< 0.050	-
Copper		0.2	µg/L	0.36	0.44	0.23	-
Gallium		0.5	µg/L	< 0.50	< 0.50	< 0.50	-
Iron		10	µg/L	< 10	< 10	< 10	-
Lead		0.05	µg/L	< 0.050	< 0.050	< 0.050	-
Lithium		20	µg/L	122	125	120	2%
Magnesium		1000	µg/L	876000	908000	860000	2%
Manganese		0.1	µg/L	0.82	0.77	0.76	8%
Mercury	0.016	0.005	µg/L	< 0.0050	< 0.0050	< 0.0050	-
Molybdenum		0.1	µg/L	7.50	7.65	7.63	2%
Nickel		0.5	µg/L	< 0.50	< 0.50	< 0.50	-
Phosphorus		50	µg/L	< 50	< 50	< 50	-
Potassium		1000	µg/L	291000	304000	285000	2%
Rhenium		0.5	µg/L	< 0.50	< 0.50	< 0.50	-
Rubidium		5	µg/L	79.0	82.7	77.4	2%
Selenium		0.5	µg/L	< 0.50	< 0.50	< 0.50	-
Silicon		1000	µg/L	< 1000	< 1000	< 1000	-
Silver	7.5*	0.1	µg/L	< 0.10	< 0.10	< 0.10	-
Sodium		2500	µg/L	6720000	7010000	6670000	1%
Strontium		10	µg/L	5300	5330	5270	1%
Sulphur (Colloidal)		5000	µg/L	702000	737000	726000	3%
Tellurium		0.5	µg/L	< 0.50	< 0.50	< 0.50	-
Thallium		0.05	µg/L	< 0.050	< 0.050	< 0.050	-
Thorium-232		0.5	µg/L	< 0.50	< 0.50	< 0.50	-
Tin		1	µg/L	< 1.0	< 1.0	< 1.0	-
Titanium		5	µg/L	< 5.0	< 5.0	< 5.0	-
Tungsten		1	µg/L	< 1.0	< 1.0	< 1.0	-
Uranium		0.05	µg/L	2.15	2.19	2.16	-
Vanadium		0.5	µg/L	1.08	1.05	0.97	-
Yttrium		0.5	µg/L	< 0.50	< 0.50	< 0.50	-
Zinc		1	µg/L	< 1.0	< 1.0	< 1.0	-
Zirconium		0.5	µg/L	< 0.50	< 0.50	< 0.50	-
Metals, Total							
Aluminum		5	µg/L	16.10	35.30	17.10	-
Antimony		1	µg/L	< 1.0	< 1.0	< 1.0	-
Arsenic	12.5	0.4	µg/L	1.08	1.06	1.06	-
Barium		1	µg/L	7.80	7.80	7.90	1%
Beryllium		0.5	µg/L	< 0.50	< 0.50	< 0.50	-
Bismuth		0.5	µg/L	< 0.50	< 0.50	< 0.50	-
Boron		300	µg/L	2950	3020	3020	2%
Cadmium	0.12	0.01	µg/L	0.031	0.030	0.030	-
Calcium		1000	µg/L	309000	324000	311000	1%
Cesium		0.5	µg/L	< 0.50	< 0.50	< 0.50	-
Chromium		0.5	µg/L	< 0.50	< 0.50	< 0.50	-
Cobalt		0.05	µg/L	< 0.050	< 0.050	< 0.050	-
Copper		0.5	µg/L	1.31	0.59	1.31	-
Gallium		0.5	µg/L	< 0.50	< 0.50	< 0.50	-
Iron		10	µg/L	13.00	16.00	14.00	-
Lead		0.05	µg/L	< 0.050	< 0.050	< 0.050	-
Lithium		20	µg/L	138	142	137	1%
Magnesium		1000	µg/L	928000	942000	951000	2%
Manganese		0.2	µg/L	1.10	1.15	1.13	3%
Mercury	0.016	0.005	µg/L	< 0.0050	< 0.0050	< 0.0050	-
Molybdenum		0.1	µg/L	7.70	7.82	7.65	1%
Nickel		0.5	µg/L	< 0.50	< 0.50	< 0.50	-
Phosphorus		50	µg/L	< 50	< 50	< 50	-
Potassium		1000	µg/L	332000	349000	352000	6%
Rubidium		0.5	µg/L	85.40	86.30	89.90	5%
Rhenium		5	µg/L	< 0.50	< 0.50	< 0.50	-
Selenium		0.5	µg/L	< 0.50	< 0.50	< 0.50	-
Silicon		1000	µg/L	< 1000	< 1000	< 1000	-
Silver	7.5*	0.1	µg/L	< 0.10	< 0.10	< 0.10	-
Sodium		2500	µg/L	6820000	6970000	6710000	2%
Strontium		10	µg/L	5120	5440	5330	4%
Sulphur (Colloidal)		5000	µg/L	875000	896000	863000	1%
Tellurium		0.5	µg/L	< 0.50	< 0.50	< 0.50	-
Thallium		0.05	µg/L	< 0.050	< 0.050	< 0.050	-
Thorium-232		0.5	µg/L	< 0.50	< 0.50	< 0.50	-
Tin		1	µg/L	< 1.0	< 1.0	< 1.0	-
Titanium		5	µg/L	< 5.0	< 5.0	< 5.0	-
Tungsten		1	µg/L	< 1.0	< 1.0	< 1.0	-
Uranium		0.05	µg/L	2.13	2.15	2.12	-
Vanadium		0.5	µg/L	1.12	1.16	1.17	-
Yttrium		0.5	µg/L	< 0.50	< 0.50	< 0.50	-
Zinc		3	µg/L	< 3.0	< 3.0	< 3.0	-
Zirconium		0.5	µg/L	< 0.50	< 0.50	< 0.50	-

CCME = Canadian Council of Ministers for the Environment; FD = field duplicate; FDA = field duplicate available; QA/QC = quality assurance / quality control; RPD = relative percent difference; ug/L = micrograms per litre; % = percent, < = below detection limit; - = no data; > = greater than;
* = short-term exposure guideline for silver

Bold, outline and blue shaded Exceeds CCME AW-F guidelines for protection of marine aquatic life
Bold values indicate an exceedance of the acceptable RPD of 20%.
1. Canadian Council of Ministers of the Environment (CCME 1999, updated to 2019) water quality guidelines for the protection of marine aquatic life.

Table 7A-2: Milne Port Fish Health Reference Area
Sediment Quality Screening
North Baffin Island, Nunavut, 2021

Sample ID	Lowest Detection Limit	Units	CCME ISQG Marine/Estuarine [1]	CCME PEL Marine/Estuarine [1]	TR Ref1	TR Ref2	DUP-B	RPD%
Date Sampled					15-Aug-2021	15-Aug-2021	15-Aug-2021	
Time Sampled					15:45	16:30	00:00	
Lab Sample ID					VA21B7543-001	VA21B7543-002	VA21B7543-003	
QA/QC						FDA	FD	
Parent Sample ID							TR Ref2	
Physical Tests								
moisture	0.25	%			24.6	39.7	39.6	0%
pH (1:2 soil:water)	0.10	pH units			8.37	8.22	8.21	0%
Particle Size								
clay (<0.004mm)	1.0	%			5.7	4.4	4.2	-
silt (0.063mm - 0.004mm)	1.0	%			26.7	21.9	22.4	2%
sand (2.0mm - 0.063mm)	1.0	%			57.4	68.3	71.1	4%
gravel (>2mm)	1.0	%			10.2	5.4	2.3	**81%**
Organic / Inorganic Carbon								
carbon, inorganic	0.050	%			0.524	0.355	0.378	6%
carbon, total	0.050	%			1.16	1.39	1.45	4%
carbon, total organic	0.050	%			0.636	1.04	1.07	3%
carbon, inorganic (CaCO3 equivalent)	0.40	%			4.37	2.96	3.15	6%
organic matter	0.10	%			1.10	1.79	1.84	3%
Metals								
aluminum	50	mg/kg			18400	6770	8260	20%
antimony	0.10	mg/kg			0.16	<0.10	<0.10	-
arsenic	0.10	mg/kg	7.24	41.6	2.63	2.60	2.66	2%
barium	0.50	mg/kg			48.6	32.7	32.0	2%
beryllium	0.10	mg/kg			0.22	0.51	0.52	2%
bismuth	0.20	mg/kg			<0.20	<0.20	<0.20	-
boron	5.0	mg/kg			<5.0	19.1	36.5	**63%**
cadmium	0.020	mg/kg	0.7	4.2	0.054	0.049	0.113	**79%**
calcium	50	mg/kg			11900	16100	9110	**55%**
chromium	0.50	mg/kg	52.3	160	51.6	15.6	14.6	7%
cobalt	0.10	mg/kg			10.3	3.59	3.97	10%
copper	0.50	mg/kg	18.7	108	39.5	5.03	9.10	**58%**
iron	50	mg/kg			28300	13000	12900	1%
lead	0.50	mg/kg	30.2	112	1.52	5.18	6.96	29%
lithium	2.0	mg/kg			4.9	16.1	17.7	9%
magnesium	20	mg/kg			6020	11400	8870	25%
manganese	1.0	mg/kg			414	109	91.2	18%
mercury	0.0050	mg/kg	0.13	0.70	<0.0050	0.0063	0.0064	-
molybdenum	0.10	mg/kg			2.11	0.80	1.70	**72%**
nickel	0.50	mg/kg			22.8	8.86	10.0	12%
phosphorus	50	mg/kg			365	662	410	47%
potassium	100	mg/kg			580	1730	2480	36%
selenium	0.20	mg/kg			<0.20	<0.20	<0.20	-
silver	0.10	mg/kg			<0.10	<0.10	<0.10	-
sodium	50	mg/kg			774	3190	5800	**58%**
strontium	0.50	mg/kg			42.8	21.9	26.0	17%
sulfur	1000	mg/kg			<1000	<1000	2400	-
thallium	0.050	mg/kg			<0.050	0.100	0.115	-
tin	2.0	mg/kg			<2.0	<2.0	<2.0	-
titanium	1.0	mg/kg			2260	340	257	28%
tungsten	0.50	mg/kg			11.9	<0.50	<0.50	-
uranium	0.050	mg/kg			0.253	2.13	1.82	16%
vanadium	0.20	mg/kg			95.3	22.4	21.2	6%
zinc	2.0	mg/kg	124	271	30.3	22.1	24.7	11%
zirconium	1.0	mg/kg			11.0	10.3	7.3	34%
Volatile Organic Compounds								
benzene	0.0050	mg/kg			<0.0050	<0.0050	<0.0050	-
ethylbenzene	0.015	mg/kg			<0.015	<0.015	<0.015	-
toluene	0.050	mg/kg			<0.050	<0.050	<0.050	-
xylene, m+p-	0.050	mg/kg			<0.050	<0.050	<0.050	-
xylene, o-	0.050	mg/kg			<0.050	<0.050	<0.050	-
xylenes, total	0.075	mg/kg			<0.075	<0.075	<0.075	-
Hydrocarbons								
F1 (C6-C10)	5.0	mg/kg			<5.0	<5.0	<5.0	-
F1-BTEX	5.0	mg/kg			<5.0	<5.0	<5.0	-
F2 (C10-C16)	30	mg/kg			<30	<30	<30	-
F3 (C16-C34)	50	mg/kg			<50	56	51	-
F4 (C34-C50)	50	mg/kg			<50	<50	<50	-
Polycyclic Aromatic Hydrocarbons								
acenaphthene	0.0050	mg/kg	0.00671	0.0889	<0.0050	<0.0050	<0.0050	-
acenaphthylene	0.0050	mg/kg	0.01	0.13	<0.0050	<0.0050	<0.0050	-
acridine	0.010	mg/kg			<0.010	<0.010	<0.010	-
anthracene	0.0040	mg/kg	0.05	0.25	<0.0040	<0.0040	<0.0040	-
benz(a)anthracene	0.010	mg/kg	0.0748	0.693	<0.010	<0.010	<0.010	-
benzo(a)pyrene	0.010	mg/kg	0.09	0.76	<0.010	<0.010	<0.010	-
benzo(b+j)fluoranthene	0.010	mg/kg			<0.010	<0.010	<0.010	-
benzo(b+j+k)fluoranthene	0.015	mg/kg			<0.015	<0.015	<0.015	-
benzo(g,h,i)perylene	0.010	mg/kg			<0.010	<0.010	<0.010	-
benzo(k)fluoranthene	0.010	mg/kg			<0.010	<0.010	<0.010	-
chrysene	0.010	mg/kg	0.108	0.846	<0.010	<0.010	<0.010	-
dibenz(a,h)anthracene	0.0050	mg/kg	0.01	0.14	<0.0050	<0.0050	<0.0050	-
fluoranthene	0.010	mg/kg	0.113	1.494	<0.010	<0.010	<0.010	-
fluorene	0.010	mg/kg	0.02	0.14	<0.010	<0.010	<0.010	-
indeno(1,2,3-c,d)pyrene	0.010	mg/kg			<0.010	<0.010	<0.010	-
methylnaphthalene, 1+2-	0.015	mg/kg			<0.015	<0.015	<0.015	-
methylnaphthalene, 1-	0.010	mg/kg			<0.010	<0.010	<0.010	-
methylnaphthalene, 2-	0.010	mg/kg	0.02	0.20	<0.010	<0.010	<0.010	-
naphthalene	0.010	mg/kg	0.0346	0.391	<0.010	<0.010	<0.010	-
phenanthrene	0.010	mg/kg	0.09	0.54	<0.010	<0.010	<0.010	-
pyrene	0.010	mg/kg	0.153	1.398	<0.010	<0.010	<0.010	-
quinoline	0.010	mg/kg			<0.010	<0.010	<0.010	-
B(a)P total potency equivalents [B(a)P	0.020	mg/kg			<0.020	<0.020	<0.020	-
PAHs, total (BC Sched 3.4)	0.040	mg/kg			<0.040	<0.040	<0.040	-
PAHs, total (EPA 16 - DAS)	0.140	mg/kg			-	-	<0.140	-
PAHs, total (EPA 16)	0.040	mg/kg			<0.040	<0.040	<0.040	-

CCME = Canadian Council of Ministers for the Environment; FD = field duplicate; FDA = field duplicate available; mg/kg = miligram per kilogram; PEL = probable effect level; QA/QC = quality assurance / quality control; % = percent, < = below detection limit; - = no data; > = greater than

1) Canadian Council of Ministers of the Environment (CCME). 1999. Canadian Sediment Quality Guidelines for the Protection of Aquatic Life. In: Canadian Environmental Quality Guidleines, 1999, Canadian Council of Ministers of the Environment, Winnipeg, MB.

Blue Text — Exceeds CCME ISQG sediment quality guideline
Blue shading — Exceeds CCME PEL sediment quality guideline
Bold values indicate an exceedance of the acceptable RPD of 50%.

Table 7A-3: Catch Per Unit Effort for Fish Captured during the Reference Area Reconnaissance Survey, Tugaat River Estuary, and in Milne Port, MEEMP Survey, 2021.

Site	Angling				Gill Nets			
	Effort (h/rod)	Species	# of Fish Captured	CPUE (# fish/h/rod)	Effort (h/100 m)	Species	# of Fish Captured	CPUE (# fish/h/100 m)
Tugaat River Estuary	1.53	ARCH	1	1.36	52.49	ARCH	60	1.14
		ARSC	3	4.09		ARSC	0	0.00
		FHSC	0	0.00		FHSC	2	0.04
Milne Port	9.05	FHSC	150	76.44	170.22	FHSC	128	16.04

Table 7A-4: Descriptive Statistics for Fourhorn Sculpin Fish Health Endpoints Processed from the Milne Port Area, 2021.

Parameter	Reference Area							Milne Port						
	n	Min	Max	Median	Mean	SD	SE	n	Min	Max	Median	Mean	SD	SE
Female														
Total Length (mm)	2	224	234	229	229	7.1	5.0	20	205	344	249	255	40.3	9.0
Age (y)	2	4	6	5	5.0	1.4	1.0	20	3	10	6	6.2	2.0	0.5
Male														
Total Length (mm)	0	-	-	-	-	-	-	20	209	281	229	237	24.4	5.5
Age (y)	0	-	-	-	-	-	-	20	3	12	6	6.6	2.1	0.5

n = sample size; min = minimum; max = maximum; SD = standard deviation; SE = standard error.

Table 7A-5: Descriptive Statistics for *Hiatella arctica* Fish Health Endpoints Processed from the Tugaat River Estuary and Milne Port, 2021.

Parameter	Tugaat River Estuary							Milne Port						
	n	Min	Max	Median	Mean	SD	SE	n	Min	Max	Median	Mean	SD	SE
Shell Length (mm)	6	20.4	33.84	23.81	25.87	6.16	2.51	35	17.47	35.07	30.45	29.331429	4.25	0.72
Total Weight (g)	6	1.0499	5.6753	1.6434	2.7262	2.0521	0.8378	35	0.4805	8.1284	3.9825	4.0210	1.7575	0.2971
Shell ww (g)	6	0.3396	3.6655	0.6310	1.5594	1.5921	0.6500	35	0.2187	5.1394	2.0614	2.2152	1.1666	0.1972
Shell dw (g)	6	0.2600	3.3998	0.4867	1.3273	1.4421	0.5887	35	0.1145	4.7250	1.7991	1.9047	1.0324	0.1745
Tissue ww (g)	6	0.5619	2.0938	0.9937	1.1051	0.5464	0.2231	35	0.2351	2.8741	1.9059	1.7853	0.7031	0.1188
Tissue dw (g)	6	0.2073	0.7726	0.3667	0.4078	0.2016	0.0823	35	0.0868	1.0605	0.7033	0.6588	0.2595	0.0439
Condition factor	6	1.07	1.57	1.40	1.36	0.18	0.07	35	0.90	2.25	1.41	1.48	0.30	0.05
Gonad ww (g)	6	0.0046	0.0635	0.0119	0.0249	0.0256	0.0104	35	0.0023	0.0798	0.0360	0.0365	0.0181	0.0031
MSI	6	0.83	4.19	1.29	1.93	1.42	0.58	35	0.90	6.13	1.97	2.23	1.20	0.20
Age (y)	6	3	33	6	12.8	13.2	5.4	35	1	39	17	19.2	8.1	1.4

ww = wet weight; dw = dry weight; n = sample size; min = minimum; max = maximum; SD = standard devision; SE = standard error.

APPENDIX 7B

Fish Health Data

Table 7B-1: Fish Health Data for Fourhorn Sculpin Lethally Sampled from the Milne Port Area, 2021

Date (d-m-y)	Effort Number	Fish Identification Number	Total Length (mm)	Total Weight (g)	Condition Factor	Sex	Life Stage	Maturity[(a)]	Age (y)	Liver Weight (g)	Gonad Weight (g)
08-08-21	BAFF21FHMLNAN0004	BAFF21UMLNFRSC1001	265	185.34	1.00	F	Adult	12.00	7	6.14	4.73
08-08-21	BAFF21FHMLNAN0004	BAFF21UMLNFRSC1002	256	155.28	0.93	F	Adult	12.00	6	7.33	7.40
08-08-21	BAFF21FHMLNAN0004	BAFF21UMLNFRSC1003	281	190.31	0.86	M	Adult	23.00	9	3.72	5.64
08-08-21	BAFF21FHMLNAN0004	BAFF21UMLNFRSC1004	273	186.74	0.92	M	Adult	23.00	12	3.78	10.15
08-08-21	BAFF21FHMLNAN0004	BAFF21UMLNFRSC1005	228	103.20	0.87	M	Adult	23.00	4	2.07	6.60
08-08-21	BAFF21FHMLNAN0004	BAFF21UMLNFRSC1006	266	198.63	1.06	F	Adult	12.00	6	8.38	8.37
08-08-21	BAFF21FHMLNAN0004	BAFF21UMLNFRSC1007	205	78.87	0.92	F	Adult	12.00	3	1.96	1.40
08-08-21	BAFF21FHMLNAN0004	BAFF21UMLNFRSC1008	267	182.93	0.96	F	Adult	12.00	6	5.66	5.49
08-08-21	BAFF21FHMLNAN0004	BAFF21UMLNFRSC1009	211	82.77	0.88	M	Adult	23.00	3	1.72	2.07
08-08-21	BAFF21FHMLNAN0004	BAFF21UMLNFRSC1010	259	160.78	0.93	F	Adult	12.00	6	6.42	6.08
08-08-21	BAFF21FHMLNAN0004	BAFF21UMLNFRSC1011	214	86.52	0.88	F	Adult	12.00	4	3.42	2.01
08-08-21	BAFF21FHMLNAN0004	BAFF21UMLNFRSC1012	245	126.51	0.86	F	Adult	12.00	5	5.99	4.63
08-08-21	BAFF21FHMLNAN0004	BAFF21UMLNFRSC1013	216	99.54	0.99	M	Adult	23.00	8	1.73	2.82
08-08-21	BAFF21FHMLNAN0004	BAFF21UMLNFRSC1014	256	119.85	0.71	M	Adult	23.00	8	2.90	4.39
08-08-21	BAFF21FHMLNGN1007	BAFF21UMLNFRSC1015	344	351.86	0.86	F	Adult	12.00	9	14.71	16.30
09-08-21	BAFF21FHMLNGN1008	BAFF21UMLNFRSC1016	228	124.17	1.05	F	Adult	12.00	5	4.21	2.76
09-08-21	BAFF21FHMLNAN1005	BAFF21UMLNFRSC1017	250	158.27	1.01	M	Adult	23.00	7	8.75	5.41
09-08-21	BAFF21FHMLNAN1005	BAFF21UMLNFRSC1018	228	106.42	0.90	F	Adult	12.00	5	3.04	2.73
09-08-21	BAFF21FHMLNAN1005	BAFF21UMLNFRSC1019	309	335.65	1.14	F	Adult	12.00	10	10.72	81.83
09-08-21	BAFF21FHMLNAN1005	BAFF21UMLNFRSC1020	206	84.32	0.96	F	Adult	12.00	4	2.40	2.83
09-08-21	BAFF21FHMLNAN1005	BAFF21UMLNFRSC1021	253	149.80	0.92	F	Adult	12.00	5	6.75	7.57
09-08-21	BAFF21FHMLNAN1005	BAFF21UMLNFRSC1022	211	90.87	0.97	F	Adult	12.00	5	2.95	2.39
09-08-21	BAFF21FHMLNAN1005	BAFF21UMLNFRSC1023	257	145.39	0.86	M	Adult	23.00	9	3.57	7.21
09-08-21	BAFF21FHMLNAN1005	BAFF21UMLNFRSC1024	211	90.79	0.97	M	Adult	23.00	5	1.55	4.84
09-08-21	BAFF21FHMLNAN1005	BAFF21UMLNFRSC1025	209	82.28	0.90	M	Adult	23.00	6	1.59	3.10
09-08-21	BAFF21FHMLNAN1005	BAFF21UMLNFRSC1026	228	115.22	0.97	F	Adult	12.00	6	4.52	4.25
09-08-21	BAFF21FHMLNAN1005	BAFF21UMLNFRSC1027	214	74.09	0.76	M	Adult	23.00	6	1.11	3.84
09-08-21	BAFF21FHMLNAN1005	BAFF21UMLNFRSC1028	251	128.60	0.81	M	Adult	23.00	6	2.37	6.57
09-08-21	BAFF21FHMLNAN1005	BAFF21UMLNFRSC1029	233	115.48	0.91	F	Adult	12.00	6	4.44	4.70
10-08-21	BAFF21FHMLNAN1007	BAFF21UMLNFRSC1030	230	113.62	0.93	M	Adult	23.00	6	1.69	3.25
10-08-21	BAFF21FHMLNAN1007	BAFF21UMLNFRSC1031	312	249.52	0.82	F	Adult	12.00	10	9.00	15.78
10-08-21	BAFF21FHMLNAN1007	BAFF21UMLNFRSC1032	280	196.87	0.90	M	Adult	23.00	9	5.88	7.40
10-08-21	BAFF21FHMLNAN1007	BAFF21UMLNFRSC1033	215	82.22	0.83	M	Adult	23.00	5	1.75	3.46
10-08-21	BAFF21FHMLNAN1007	BAFF21UMLNFRSC1034	325	320.90	0.93	F	Adult	12.00	10	23.91	21.57
10-08-21	BAFF21FHMLNAN1007	BAFF21UMLNFRSC1035	216	94.84	0.94	M	Adult	23.00	4	2.18	2.68
10-08-21	BAFF21FHMLNAN1007	BAFF21UMLNFRSC1036	249	143.05	0.93	M	Adult	23.00	7	2.29	6.85
10-08-21	BAFF21FHMLNAN1007	BAFF21UMLNFRSC1037	248	147.91	0.97	M	Adult	23.00	6	3.27	8.77
10-08-21	BAFF21FHMLNAN1007	BAFF21UMLNFRSC1038	225	108.99	0.96	M	Adult	23.00	6	1.98	4.69
10-08-21	BAFF21FHMLNAN1007	BAFF21UMLNFRSC1039	239	115.70	0.85	F	Adult	12.00	6	4.83	4.11
10-08-21	BAFF21FHMLNAN1007	BAFF21UMLNFRSC1040	214	85.75	0.87	M	Adult	23.00	5	3.23	3.67

Notes:

(a) Refer to Table 7-1 in Report for descriptions of maturity codes.

d = day; m = month; y = year; F = female; M = male.

Table 7B-2: Internal and External Assessments of Fourhorn Sculpin Lethally Sampled from the Milne Port Area, 2021

Fish Identification Number	External Assessment										Internal Assessment						
	Body Deformity	Eyes	Skin	Thymus	Opercula	Gills	Pseudo-branchs	Fins	Vent	Parasites	Liver[(a)]	Spleen	Gall Bladder	Gonads	Mesenteric Fat (%)	Parasites[(b)]	Kidney
BAFF21UMLNFRSC1001	N	N	0	0	0	N	N	0	0	N	A	B	0	N	<50	0	N
BAFF21UMLNFRSC1002	N	N	0	0	0	N	N	0	0	N	C	B	0	N	<50	0	N
BAFF21UMLNFRSC1003	N	N	0	0	0	N	N	0	0	N	C	B	0	N	<50	0	N
BAFF21UMLNFRSC1004	N	N	0	0	0	N	N	0	0	N	C	B	0	N	<50	0	N
BAFF21UMLNFRSC1005	N	N	0	0	0	N	N	0	0	N	C	B	-	N	<50	0	N
BAFF21UMLNFRSC1006	N	N	0	0	0	N	N	0	0	N	A	B	0	N	<50	0	N
BAFF21UMLNFRSC1007	N	N	0	0	0	N	N	0	0	N	C	B	0	N	<50	0	N
BAFF21UMLNFRSC1008	N	N	0	0	0	N	N	0	0	N	C	B	0	N	<50	0	N
BAFF21UMLNFRSC1009	N	N	0	0	0	N	N	0	0	N	C	B	0	N	<50	1	N
BAFF21UMLNFRSC1010	N	N	0	0	0	N	N	0	0	N	A	B	0	N	<50	0	N
BAFF21UMLNFRSC1011	N	N	0	0	0	N	N	0	0	N	A	B	0	N	<50	0	N
BAFF21UMLNFRSC1012	N	N	0	0	0	N	N	0	0	N	A	B	0	N	<50	0	N
BAFF21UMLNFRSC1013	N	N	0	0	0	N	N	0	0	N	C	B	0	N	<50	0	N
BAFF21UMLNFRSC1014	N	N	0	0	0	N	N	0	0	N	C	B	-	N	<50	0	N
BAFF21UMLNFRSC1015	N	N	0	0	0	N	N	0	0	N	A	B	0	N	<50	0	N
BAFF21UMLNFRSC1016	N	N	0	0	0	N	N	0	0	N	C	B	-	N	<50	0	N
BAFF21UMLNFRSC1017	N	N	0	0	0	N	N	0	0	N	A	B	0	N	<50	0	N
BAFF21UMLNFRSC1018	N	N	0	0	0	N	N	0	0	N	A	B	0	N	<50	0	N
BAFF21UMLNFRSC1019	N	N	0	0	0	N	N	0	0	N	A	B	0	-	<50	0	N
BAFF21UMLNFRSC1020	N	N	0	0	0	N	N	0	0	N	A	B	0	N	<50	0	N
BAFF21UMLNFRSC1021	N	N	0	0	0	N	N	0	0	N	A	B	0	-	<50	0	N
BAFF21UMLNFRSC1022	N	N	0	0	0	N	N	0	0	N	C	B	0	N	<50	0	N
BAFF21UMLNFRSC1023	N	N	0	0	0	N	N	0	0	N	A	B	0	N	<50	0	N
BAFF21UMLNFRSC1024	N	N	0	0	0	N	N	0	0	N	C	B	0	N	<50	0	N
BAFF21UMLNFRSC1025	N	N	0	0	0	N	N	0	0	N	C	B	0	N	<50	0	N
BAFF21UMLNFRSC1026	N	N	0	0	0	N	N	0	0	N	A	B	0	N	<50	0	N
BAFF21UMLNFRSC1027	N	N	0	0	0	N	N	0	0	N	C	B	0	-	<50	1	N
BAFF21UMLNFRSC1028	N	N	0	0	0	N	N	0	0	N	C	B	0	N	<50	1	N
BAFF21UMLNFRSC1029	N	N	0	0	0	N	N	0	0	N	C	B	0	N	<50	0	N
BAFF21UMLNFRSC1030	N	N	0	0	0	N	N	0	0	N	C	B	0	N	<50	1	N
BAFF21UMLNFRSC1031	N	N	0	0	0	N	N	0	0	N	A	B	0	N	<50	0	N
BAFF21UMLNFRSC1032	N	N	0	0	0	N	N	0	0	N	C	B	0	N	<50	0	N
BAFF21UMLNFRSC1033	N	N	0	0	0	N	N	0	0	N	C	B	0	N	<50	1	N
BAFF21UMLNFRSC1034	N	N	0	0	0	N	N	0	0	N	A	B	0	N	<50	1	N
BAFF21UMLNFRSC1035	N	N	0	0	0	N	N	0	0	N	C	B	0	N	<50	1	N
BAFF21UMLNFRSC1036	N	N	0	0	0	N	N	0	0	N	C	B	0	N	<50	1	N
BAFF21UMLNFRSC1037	N	N	0	0	0	N	N	0	0	N	C	B	0	N	<50	1	N
BAFF21UMLNFRSC1038	N	N	0	0	0	N	N	0	0	N	C	B	0	N	<50	1	N
BAFF21UMLNFRSC1039	N	N	0	0	0	N	N	0	0	N	C	B	0	N	<50	0	N
BAFF21UMLNFRSC1040	N	N	0	0	0	N	N	0	0	N	C	B	0	N	<50	0	N

Notes:

(a) A = Normal, solid red or light red colour; C = "Fatty" liver, "coffee with cream" colour.

(b) 0 = No observed parasites; 1 = Few observed parasites.

% = percent; N, 0, or B = normal; - = not collected; < = less than

Table 7B-3: Fish Health Data for Hiatella arctica Lethally Sampled from the Milne Port Area, 2021

Date	Effort Number	Fish Identification Number	Composite	Field Measurements		Laboratory Measurements[a]							
(d-m-y)				Total Length (mm)	Whole Animal Wet Weight (g)	Total Length (mm)	Whole Animal Wet Weight (g)	Shell Wet Weight (g)	Tissue Wet Weight (g)	Gonad Wet Weight (g)	Shell Dry Weight (g)	Tissue Dry Weight (g)[b]	Age (y)
09-08-21	BAFF21FHMLNSW51001	BAFF21UMLNHTAR1501	BAFF21UMLNHTARCOMP9	33.25	6.7180	35.03	5.8641	2.2213	2.8698	2.5575	0.0287	1.0590	16
09-08-21	BAFF21FHMLNSW51001	BAFF21UMLNHTAR1502	BAFF21UMLNHTARCOMP7	30.23	6.9270	31.26	6.2588	3.9720	2.2348	3.4560	0.0332	0.8246	25
09-08-21	BAFF21FHMLNSW51001	BAFF21UMLNHTAR1503	-	32.72	6.7680	34.43	5.1816	3.8153	1.5662	3.1908	0.0263	0.5779	28
09-08-21	BAFF21FHMLNSW51001	BAFF21UMLNHTAR1504	-	29.33	5.5600	31.07	4.8301	2.1991	2.6814	2.1667	0.0240	0.9894	16
09-08-21	BAFF21FHMLNSW51001	BAFF21UMLNHTAR1505	-	29.87	3.7820	31.15	3.2244	1.8862	1.3443	1.5481	0.0215	0.4960	15
10-08-21	BAFF21FHMLNSW31001	BAFF21UMLNHTAR1506	BAFF21UMLNHTARCOMP6	34.83	8.2910	34.45	7.1473	4.7795	2.3313	4.0434	0.0798	0.8602	32
10-08-21	BAFF21FHMLNSW31001	BAFF21UMLNHTAR1507	-	33.13	4.7320	32.86	4.4982	2.0614	2.4215	1.6290	0.0408	0.8935	17
10-08-21	BAFF21FHMLNSW31001	BAFF21UMLNHTAR1508	BAFF21UMLNHTARCOMP1	29.76	4.2180	30.54	3.9026	1.9483	1.9488	1.6618	0.0541	0.7191	24
10-08-21	BAFF21FHMLNSW31001	BAFF21UMLNHTAR1509	-	35.18	6.6890	35.07	5.9138	3.6123	2.4640	2.8669	0.0779	0.9092	26
10-08-21	BAFF21FHMLNSW31001	BAFF21UMLNHTAR1510	BAFF21UMLNHTARCOMP3	32.88	6.9510	33.18	5.5623	3.0104	2.5989	2.5999	0.0289	0.9590	29
14-08-21	BAFF21FHMLNSW21001	BAFF21UMLNHTAR1511	BAFF21UMLNHTARCOMP13	30.22	5.7670	30.79	5.2173	2.6218	2.4102	2.3206	0.0540	0.8894	28
14-08-21	BAFF21FHMLNSW21001	BAFF21UMLNHTAR1512	BAFF21UMLNHTARCOMP5	30.99	5.1530	30.70	4.9101	2.4252	2.4367	1.9997	0.0459	0.8991	29
14-08-21	BAFF21FHMLNSW21001	BAFF21UMLNHTAR1513	BAFF21UMLNHTARCOMP10	30.40	4.0200	30.24	3.3855	1.7313	1.6745	1.5225	0.0606	0.6179	15
14-08-21	BAFF21FHMLNSW21001	BAFF21UMLNHTAR1514	BAFF21UMLNHTARCOMP7	30.07	4.4200	30.45	3.9825	1.9972	1.9059	1.7991	0.0461	0.7033	16
14-08-21	BAFF21FHMLNSW21001	BAFF21UMLNHTAR1515	BAFF21UMLNHTARCOMP10	33.15	6.4390	32.47	5.4600	2.9823	2.5207	2.5210	0.0501	0.9301	24
14-08-21	BAFF21FHMLNSE11001	BAFF21UMLNHTAR1516	BAFF21UMLNHTARCOMP4	31.46	7.1290	32.07	6.0603	3.5941	2.4629	3.1784	0.0497	0.9088	23
14-08-21	BAFF21FHMLNSE11001	BAFF21UMLNHTAR1517	BAFF21UMLNHTARCOMP16	30.58	4.9040	29.87	4.3641	2.7957	1.8289	2.2823	0.0360	0.6749	25
14-08-21	BAFF21FHMLNSE11001	BAFF21UMLNHTAR1518	BAFF21UMLNHTARCOMP1	32.89	8.3070	33.08	8.1284	5.1394	2.8741	4.7250	0.0394	1.0605	39
14-08-21	BAFF21FHMLNSE11001	BAFF21UMLNHTAR1519	BAFF21UMLNHTARCOMP9	22.54	1.2860	22.14	1.1127	0.4978	0.6059	0.4163	0.0350	0.2236	8
14-08-21	BAFF21FHMLNSE11001	BAFF21UMLNHTAR1520	BAFF21UMLNHTARCOMP2	20.69	1.4670	20.68	1.3078	0.6033	0.6786	0.4872	0.0189	0.2504	6
16-08-21	BAFF21FHMLNSE61001	BAFF21UMLNHTAR1521	BAFF21UMLNHTARCOMP14	29.46	-	29.21	3.1109	1.7368	1.3578	1.5106	0.0450	0.5010	15
16-08-21	BAFF21FHMLNSE61001	BAFF21UMLNHTAR1522	BAFF21UMLNHTARCOMP8	26.23	-	27.04	3.7495	1.8192	1.9707	1.5705	0.0352	0.7272	19
16-08-21	BAFF21FHMLNSE61001	BAFF21UMLNHTAR1523	BAFF21UMLNHTARCOMP16	27.82	-	27.97	4.1702	2.4920	1.6154	2.1154	0.0450	0.5961	26
16-08-21	BAFF21FHMLNSE61001	BAFF21UMLNHTAR1524	BAFF21UMLNHTARCOMP8	30.99	-	31.15	3.5326	1.6087	1.9339	1.1794	0.0373	0.7136	14
16-08-21	BAFF21FHMLNSE61001	BAFF21UMLNHTAR1525	BAFF21UMLNHTARCOMP15	27.23	-	27.34	2.6501	1.1712	1.4850	1.2270	0.0487	0.5480	12
17-08-21	BAFF21FHMLNSNW11001	BAFF21UMLNHTAR1526	BAFF21UMLNHTARCOMP4	21.73	-	22.23	1.5293	0.7319	0.7970	0.6321	0.0214	0.2941	12
17-08-21	BAFF21FHMLNSNW11001	BAFF21UMLNHTAR1527	BAFF21UMLNHTARCOMP12	27.77	-	27.70	2.8062	1.3218	1.1615	1.1422	0.0122	0.4286	17
17-08-21	BAFF21FHMLNSNW11001	BAFF21UMLNHTAR1528	BAFF21UMLNHTARCOMP3	24.21	-	23.73	1.4782	0.7129	0.7611	0.6208	0.8200	0.2808	10
17-08-21	BAFF21FHMLNSNW11001	BAFF21UMLNHTAR1529	BAFF21UMLNHTARCOMP11	24.19	-	24.34	2.0688	1.0240	1.0513	0.8306	0.0121	0.3879	14
17-08-21	BAFF21FHMLNSNW11001	BAFF21UMLNHTAR1530	BAFF21UMLNHTARCOMP1	17.48	-	17.47	0.4805	0.2187	0.2351	0.1145	0.0023	0.0868	1
18-08-21	BAFF21FHMLNSNE11001	BAFF21UMLNHTAR1531	BAFF21UMLNHTARCOMP14	32.66	-	33.03	4.8160	2.4915	2.2798	2.0586	0.0530	0.8412	17
18-08-21	BAFF21FHMLNSNE11001	BAFF21UMLNHTAR1532	BAFF21UMLNHTARCOMP5	25.60	-	26.12	2.9710	1.5115	1.4719	1.1618	0.0249	0.5431	14
18-08-21	BAFF21FHMLNSNE11001	BAFF21UMLNHTAR1533	BAFF21UMLNHTARCOMP15	29.53	-	29.92	4.2666	2.4380	2.0326	1.8601	0.0198	0.7500	25
18-08-21	BAFF21FHMLNSNE11001	BAFF21UMLNHTAR1534	BAFF21UMLNHTARCOMP6	28.18	-	27.53	3.0586	1.6118	1.5239	1.2499	0.0164	0.5623	13
18-08-21	BAFF21FHMLNSNE11001	BAFF21UMLNHTAR1535	-	30.41	-	30.29	3.7359	2.7469	0.9481	2.4174	0.0462	0.3498	23

Notes:

(a) Measurements collected by Biological Environmental Services Ltd.

(b) Estimated using conversion factor from Brey et al. (2001).

d = day; m = month; y = year.

Table 7B-4: Relative Weight of Stomach Contents Observed in Fishes Sampled form the Milne Port Area, 2021

Phyllum	Subphyllum	Class	Subclass	Order	Family	Taxon	Fish Species: Arctic Char (*n* = 18)	Fish Species: Fourhorn Sculpin (*n* = 15)
Acanthocephala	-	-	-	-	-	Acanthocephala indet.	<1%	-
Annelida	-	Polychaeta	-	-	-	Polychaeta indet.	<1%	-
Arthropoda	Crustacea	-	-	-	-	Crustacea indet.	10%	<1%
Arthropoda	Crustacea	Hexanauplii	Copepoda	Calanoida	Calanidae	*Calanus glacialis*	<1%	-
Arthropoda	Crustacea	Hexanauplii	Copepoda	Calanoida	Calanidae	*Calanus* sp.	<1%	<1%
Arthropoda	Crustacea	Hexanauplii	Copepoda	Calanoida	-	Calanoida indet.	<1%	-
Arthropoda	Crustacea	Hexanauplii	Copepoda	Harpacticoida	-	Harpacticoida indet.	-	<1%
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Atylidae	*Atylus carinatus*	<1%	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Atylidae	*Atylus* sp.	<1%	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Gammaridae	*Gammarus* sp.	<1%	5%
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Gammaridae	Gammaridae indet.	-	3%
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Hyperiidae	*Themisto libellula*	26%	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Hyperiidae	*Themisto* sp.	<1%	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Hyperiidae	Hyperiidea indet.	8%	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Oedicerotidae	Monoporeia affinis	-	<1%
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Uristidae	*Anonyx* sp.	-	2%
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Uristidae	*Onisimus* sp.	2%	<1%
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	-	Amphipoda indet.	1%	16%
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Mysida	Mysidae	*Mysis* sp.	<1%	<1%
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Mysida	-	Mysida indet.	<1%	<1%
Arthropoda	Crustacea	Thecostraca	Cirripedia	Balanomorpha	-	Balanomorpha indet.	-	<1%
Arthropoda	Crustacea	Thecostraca	Cirripedia	-	-	Cirripedia indet.	-	<1%
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	*Hydrobaenus* sp.	<1%	-
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Simuliidae	Simuliidae indet.	<1%	-
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Tipulidae	Tipulidae indet.	<1%	34%
Arthropoda	Hexapoda	Insecta	Pterygota	Ephemeroptera	-	Ephemeroptera indet.	<1%	-
Arthropoda	Hexapoda	Insecta	-	-	-	Insecta indet.	<1%	-
Chordata	Tunicata	Ascidiacea	-	-	-	Ascidiacea indet.	-	<1%
Chordata	Vertebrata	Actinopteri	Teleostei	Perciformes	Cottidae	*Myoxocephalus* sp.	4%	-
Chordata	Vertebrata	Actinopteri	Teleostei	Perciformes	Cottidae	Cottidae indet.	9%	-
Chordata	Vertebrata	-	-	-	-	Pisces indet.	34%	36%
Mollusca	-	Bivalvia	-	-	-	Bivalvia indet.	-	<1%
Mollusca	-	Gastropoda	Heterobranchia	Pteropoda	Limacinidae	*Limacina* sp.	<1%	<1%
Nemertea	-	-	-	-	-	Nemertea indet.	<1%	-
Non-food						Unidentified tissue	5%	2%

n = sample size; sp. = species; indet. = indeterminate; - = not identified.

Table 7B-5: Stomach Contents of All Fish Captured from the Milne Port Area, 2021

Species	Fish Identification Number	Fullness (%)	Digested (%)	Full Stomach Weight (g)	Phylum	Subphylum	Class	Subclass	Order	Family	Taxon	Total Abundance	Total Wet Weight (g)	Wet Weight / Individual (g)
Fourhorn Sculpin	BAFF21UMLNFHSC1005	0	0	5.0580	-	-	-	-	-	-	Empty Stomach	-	-	-
	BAFF21UMLNFHSC1011	100	75	5.6676	-	-	-	-	-	-	Sand	-	-	-
					-	-	-	-	-	-	Unidentified tissue	-	-	-
					Arthropoda	Crustacea	-	-	-	-	Crustacea indet.	-	0.0661	0.0661
					Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	-	Amphipoda indet.	-	0.1407	0.1407
					Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Gammaridae	Gammaridae indet.	6	0.0408	0.0068
					Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Uristidae	Onisimus sp.	3	0.0858	0.0286
	BAFF21UMLNFHSC1015	5	0	16.0053	-	-	-	-	-	-	Sand	-	-	-
					Mollusca	-	Gastropoda	Heterobranchia	Pteropoda	Limacinidae	Limacina sp.	1	0.0080	0.0080
	BAFF21UMLNFHSC1016	25	75	5.4192	-	-	-	-	-	-	Sand	-	-	-
					-	-	-	-	-	-	Unidentified tissue	-	-	-
					Mollusca	-	Gastropoda	Heterobranchia	Pteropoda	Limacinidae	Limacina sp.	-	0.0300	0.0300
					Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	-	Amphipoda indet.	-	0.0165	0.0165
					Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Gammaridae	Gammaridae indet.	1	0.0107	0.0107
					Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Oedicerotidae	Monoporeia affinis	1	0.0113	0.0113
					Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Uristidae	Anonyx sp.	1	0.0916	0.0916
					Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Uristidae	Onisimus sp.	5	0.0387	0.0077
					Arthropoda	Crustacea	Thecostraca	Cirripedia	Balanomorpha	-	Balanomorpha indet.	1	0.0000	0.0000
	BAFF21UMLNFHSC1018	75	100	5.3940	-	-	-	-	-	-	Plant material	-	-	-
					-	-	-	-	-	-	Sand	-	-	-
					-	-	-	-	-	-	Unidentified tissue	-	-	-
					Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Gammaridae	Gammaridae indet.	2	0.0159	0.0080
					Arthropoda	Crustacea	Thecostraca	Cirripedia	Balanomorpha	-	Balanomorpha indet.	15	0.0003	0.0000
					Chordata	Vertebrata	-	-	-	-	Pisces indet.	-	1.1241	1.1241
	BAFF21UMLNFHSC1019	50	75	12.7315	-	-	-	-	-	-	Sand	-	-	-
					-	-	-	-	-	-	Unidentified tissue	-	-	-
					Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Gammaridae	Gammaridae indet.	4	0.0748	0.0187
	BAFF21UMLNFHSC1020	100	100	5.1767	-	-	-	-	-	-	Sand	-	-	-
					-	-	-	-	-	-	Unidentified tissue	-	-	-
					Mollusca	-	Bivalvia	-	-	-	Bivalvia indet.	-	0.0233	0.0233
					Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	-	Amphipoda indet.	-	2.5146	2.5146
					Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Gammaridae	Gammaridae indet.	-	0.3049	0.3049
	BAFF21UMLNFHSC1026	75	100	6.1231	-	-	-	-	-	-	Plant material	-	-	-
					-	-	-	-	-	-	Sand	-	-	-
					-	-	-	-	-	-	Unidentified tissue	-	-	-
					Arthropoda	Crustacea	-	-	-	-	Crustacea indet.	-	0.0156	0.0156
					Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	-	Amphipoda indet.	-	0.0242	0.0242
					Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Mysida	-	Mysida indet.	-	0.0198	0.0198
					Arthropoda	Crustacea	Thecostraca	Cirripedia	-	-	Cirripedia indet.	7	0.0007	0.0001
					Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Tipulidae	Tipulidae indet.	3	5.9843	1.9948
	BAFF21UMLNFHSC1027	10	75	3.4292	-	-	-	-	-	-	Unidentified tissue	-	-	-
					Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Gammaridae	Gammarus sp.	1	0.0018	0.0018
	BAFF21UMLNFHSC1028	10	100	3.7038	-	-	-	-	-	-	Unidentified tissue	-	-	-
	BAFF21UMLNFHSC1029	100	50	7.5666	-	-	-	-	-	-	Plant material	-	-	-
					-	-	-	-	-	-	Sand	-	-	-
					-	-	-	-	-	-	Unidentified tissue	-	-	-
					Arthropoda	Crustacea	Hexanauplii	Copepoda	Calanoida	Calanidae	Calanus sp.	105	0.1306	0.0012
					Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	-	Amphipoda indet.	-	0.0031	0.0031
					Arthropoda	Crustacea	Thecostraca	Cirripedia	Balanomorpha	-	Balanomorpha indet.	11	0.0010	0.0001
					Chordata	Vertebrata	-	-	-	-	Pisces indet.	1	2.7013	2.7013
	BAFF21UMLNFHSC1035	25	50	2.2578	-	-	-	-	-	-	Unidentified tissue	-	-	-
					Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Gammaridae	Gammarus sp.	1	0.0083	0.0083
					Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Oedicerotidae	Monoporeia affinis	1	0.0113	0.0113
					Arthropoda	Crustacea	Thecostraca	Cirripedia	Balanomorpha	-	Balanomorpha indet.	11	0.0006	0.0001
	BAFF21UMLNFHSC1036	100	75	6.6209	-	-	-	-	-	-	Sand	-	-	-
					-	-	-	-	-	-	Unidentified tissue	-	0.2307	0.2307
					Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	-	Amphipoda indet.	-	0.0277	0.0277
					Arthropoda	Crustacea	Thecostraca	Cirripedia	Balanomorpha	-	Balanomorpha indet.	7	0.0003	0.0000
					Chordata	Vertebrata	-	-	-	-	Pisces indet.	1	2.4316	2.4316
	BAFF21UMLNFHSC1038	50	25	3.1214	-	-	-	-	-	-	Unidentified tissue	-	0.1599	0.1599
					Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Gammaridae	Gammarus sp.	1	0.7934	0.7934
					Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Oedicerotidae	Monoporeia affinis	1	0.0046	0.0046
					Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Uristidae	Anonyx sp.	1	0.2541	0.2541
					Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Mysida	Mysidae	Mysis sp.	2	0.0509	0.0255
					Chordata	Tunicata	Ascidiacea	-	-	-	Ascidiacea indet.	1	0.0970	0.0970
	BAFF21UMLNFHSC1040	5	75	1.8706	-	-	-	-	-	-	Unidentified tissue	-	0.0226	0.0226
					Arthropoda	Crustacea	-	-	-	-	Crustacea indet.	-	0.0006	0.0006
					Arthropoda	Crustacea	Hexanauplii	Copepoda	Harpacticoida	-	Harpacticoida indet.	1	0.0000	0.0000
					Arthropoda	Crustacea	Thecostraca	Cirripedia	Balanomorpha	-	Balanomorpha indet.	5	0.0002	0.0000

Table 7B-5: Stomach Contents of All Fish Captured from the Milne Port Area, 2021

Species	Fish Identification Number	Fullness (%)	Digested (%)	Full Stomach Weight (g)	Phyllum	Subphyllum	Class	Subclass	Order	Family	Taxon	Total Abundance	Total Wet Weight (g)	Wet Weight / Individual (g)
Arctic Char	BAFF21UMLNGN03ARCH03	25	100	26.2445	-	-	-	-	-	-	Unidentified tissue	-	1.5732	1.5732
					Chordata	Vertebrata	-	-	-	-	Pisces indet.	-	1.5804	1.5804
	BAFF21UMLNGN03ARCH04	75	75	13.1581	Arthropoda	Crustacea	Hexanauplii	Copepoda	Calanoida	Calanidae	Calanus sp.	2	0.0074	0.0037
					Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Mysida	Mysidae	Mysis sp.	1	0.0306	0.0306
					Chordata	Vertebrata	-	-	-	-	Pisces indet.	1	1.3989	1.3989
					Chordata	Vertebrata	-	-	-	-	Pisces indet.	3	3.1729	1.0576
					Chordata	Vertebrata	-	-	-	-	Pisces indet.	-	4.7610	4.7610
	BAFF21UMLNGN04ARCH46	75	25	11.5345	-	-	-	-	-	-	Unidentified tissue	-	1.0825	1.0825
					Mollusca	-	Gastropoda	Heterobranchia	Pteropoda	Limacinidae	Limacina sp.	1	0.0019	0.0019
					Arthropoda	Crustacea	Hexanauplii	Copepoda	Calanoida	Calanidae	Calanus sp.	8	0.0356	0.0045
					Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	-	Hyperiidea indet.	1	0.0274	0.0274
					Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Hyperiidae	Themisto libellula	7	0.2638	0.0377
					Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Uristidae	Onisimus sp.	48	1.4461	0.0301
					Chordata	Vertebrata	-	-	-	-	Pisces indet.	1	0.4437	0.4437
	BAFF21UMLNGN05ARCH03	25	25	18.4049	-	-	-	-	-	-	Unidentified tissue	-	0.0334	0.0334
					Arthropoda	Crustacea	Hexanauplii	Copepoda	Calanoida	-	Calanoida indet.	2	0.0021	0.0011
					Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	-	Hyperiidea indet.	1	0.0285	0.0285
					Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Atylidae	Atylus carinatus	1	0.0937	0.0937
					Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Atylidae	Atylus carinatus	1	0.0088	0.0088
					Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Gammaridae	Gammarus sp.	5	0.0737	0.0147
					Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Hyperiidae	Themisto sp.	1	0.0306	0.0306
					Chordata	Vertebrata	-	-	-	-	Pisces indet.	1	0.6523	0.6523
	BAFF21UMLNGN05ARCH04	25	100	7.1648	-	-	-	-	-	-	Unidentified tissue	-	0.0855	0.0855
					Arthropoda	Crustacea	Hexanauplii	Copepoda	Calanoida	-	Calanoida indet.	2	0.0140	0.0070
					Chordata	Vertebrata	-	-	-	-	Pisces indet.	-	0.6483	0.6483
	BAFF21UMLNGN05ARCH05	75	50	13.6432	Acanthocephala	-	-	-	-	-	Acanthocephala indet.	4	0.0087	0.0022
					Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Gammaridae	Gammarus sp.	1	0.0010	0.0010
					Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Hyperiidae	Themisto libellula	2	0.0454	0.0227
					Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Mysida	Mysidae	Mysis sp.	1	0.1051	0.1051
					Chordata	Vertebrata	-	-	-	-	Pisces indet.	2	1.7665	0.8832
					Chordata	Vertebrata	Actinopteri	Teleostei	Perciformes	Cottidae	Cottidae indet.	1	2.1222	2.1222
	BAFF21UMLNGN06ARCH09[a]	75	100	0.2796	-	-	-	-	-	-	Unidentified tissue	-	0.0223	0.0223
					Arthropoda	Hexapoda	Insecta	-	-	-	Insecta indet.	-	0.0164	0.0164
					Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	Hydrobaenus sp.	25	0.0052	0.0002
					Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Simuliidae	Simuliidae indet.	1	0.0012	0.0012
					Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Tipulidae	Tipulidae indet.	1	0.0107	0.0107
					Arthropoda	Hexapoda	Insecta	Pterygota	Ephemeroptera	-	Ephemeroptera indet.	4	0.0001	0.0000
	BAFF21UMLNGN08ARCH03	5	100	2.9449	-	-	-	-	-	-	Unidentified tissue	-	0.0758	0.0758
					Mollusca	-	Gastropoda	Heterobranchia	Pteropoda	Limacinidae	Limacina sp.	-	0.0223	0.0223
					Chordata	Vertebrata	-	-	-	-	Pisces indet.	1	8.7152	8.7152
	BAFF21UMLNGN10ARCH10	50	75	7.2455	Nemertea	-	-	-	-	-	Nemertea indet.	1	0.0354	0.0354
					Arthropoda	Crustacea	-	-	-	-	Crustacea indet.	-	0.7356	0.7356
					Arthropoda	Crustacea	Hexanauplii	Copepoda	Calanoida	Calanidae	Calanus sp.	1	0.0011	0.0011
					Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Hyperiidae	Themisto libellula	4	0.2652	0.0663
	BAFF21UMLNGN20ARCH02	75	50	10.2863	-	-	-	-	-	-	Unidentified tissue	-	0.0101	0.0101
					Arthropoda	Crustacea	-	-	-	-	Crustacea indet.	-	0.4548	0.4548
					Arthropoda	Crustacea	Hexanauplii	Copepoda	Calanoida	Calanidae	Calanus sp.	2	0.0106	0.0053
					Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	-	Hyperiidea indet.	-	0.0241	0.0241
					Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Hyperiidae	Themisto libellula	19	1.9035	0.1002
					Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Mysida	-	Mysida indet.	2	0.0127	0.0063
	BAFF21UMLNGN21ARCH04	25	75	4.6684	-	-	-	-	-	-	Unidentified tissue	-	0.0043	0.0043
					Annelida	-	Polychaeta	-	-	-	Polychaeta indet.	-	0.0029	0.0029
					Arthropoda	Crustacea	Hexanauplii	Copepoda	Calanoida	-	Calanoida indet.	10	0.0001	0.0000
					Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Atylidae	Atylus sp.	1	0.0019	0.0019
					Chordata	Vertebrata	Actinopteri	Teleostei	Perciformes	Cottidae	Cottidae indet.	3	0.1998	0.0666
	BAFF21UMLNGN23ARCH01	100	50	39.0314	-	-	-	-	-	-	Unidentified tissue	-	0.3748	0.3748
					Arthropoda	Crustacea	-	-	-	-	Crustacea indet.	-	5.8112	5.8112
					Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Hyperiidae	Themisto libellula	148	8.4544	0.0571
					Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Uristidae	Onisimus sp.	4	0.0997	0.0249
					Chordata	Vertebrata	-	-	-	-	Pisces indet.	-	0.2637	0.2637
	BAFF21UMLNGN25ARCH03	75	50	6.4741	Arthropoda	Crustacea	-	-	-	-	Crustacea indet.	-	1.3261	1.3261
					Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Hyperiidae	Themisto libellula	46	1.9817	0.0431
	BAFF21UMLNGN25ARCH04	75	50	5.3719	-	-	-	-	-	-	Unidentified tissue	-	0.0356	0.0356
					Arthropoda	Crustacea	Hexanauplii	Copepoda	Calanoida	Calanidae	Calanus glacialis	3	0.0348	0.0116
					Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Mysida	-	Mysida indet.	2	0.0125	0.0062
					Chordata	Vertebrata	-	-	-	-	Pisces indet.	-	1.2360	1.2360
					Chordata	Vertebrata	Actinopteri	Teleostei	Perciformes	Cottidae	Cottidae indet.	1	1.1486	1.1486
					Chordata	Vertebrata	Actinopteri	Teleostei	Perciformes	Cottidae	Cottidae indet.	9	1.1331	0.1259
	BAFF21UMLNGN25ARCH05	100	75	11.8608	Chordata	Vertebrata	-	-	-	-	Pisces indet.	1	0.0922	0.0922
					Chordata	Vertebrata	-	-	-	-	Pisces indet.	-	1.7193	1.7193
					Chordata	Vertebrata	Actinopteri	Teleostei	Perciformes	Cottidae	Cottidae indet.	19	2.5301	0.1332
					Chordata	Vertebrata	Actinopteri	Teleostei	Perciformes	Cottidae	Myoxocephalus sp.	3	3.1375	1.0458
	BAFF21UMLNGN25ARCH06	100	50	30.3276	-	-	-	-	-	-	Unidentified tissue	-	0.0296	0.0296
					Acanthocephala	-	-	-	-	-	Acanthocephala indet.	1	0.0025	0.0025
					Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	-	Hyperiidea indet.	-	6.1572	6.1572
					Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Hyperiidae	Themisto libellula	150	6.9122	0.0461
	BAFF21UMLNGN25ARCH13	75	50	13.0553	-	-	-	-	-	-	Unidentified tissue	-	0.8804	0.8804
					Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	-	Amphipoda indet.	-	0.8284	0.8284
					Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Gammaridae	Gammarus sp.	1	0.0500	0.0500
					Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Hyperiidae	Themisto libellula	29	1.0941	0.0377
					Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Uristidae	Onisimus sp.	1	0.0027	0.0027
					Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Uristidae	Onisimus sp.	2	0.0448	0.0224
					Chordata	Vertebrata	-	-	-	-	Pisces indet.	1	0.9961	0.9961

(a) Potentially feeding in freshwater prior to capture.

indet. = indeterminable; sp. = species; - = not available.

Table 7B-6: Outliers Omitted from Statistical Comparisons of Fourhorn Sculpin Health Endpoints, 2020 – 2021

Sex	Parameter	Year	FIN	Total Length (mm)	Total Weight (g)	SR
Female	Relative Liver Weight	2021	BAFF21UMLNFRSC1034	325	320	10.34
	Relative Gonad Weight	2021	BAFF21UMLNFRSC1019	309	335	35.89
Male	Relative Liver Weight	2021	BAFF21UMLNFRSC1017	250	158	7.08

Table 7B-7: Statistical Comparisons Between 2020 and 2021 for Fish Health Endpoints for Hiatella arctica, Milne Port

Species	Effect Indicator	Endpoint	Dependent Variable	Covariate	Statistical Test	Data Subset?	*n* Outliers	*n*		LSM		MSE	Interaction *P*-value	Levene's Test	Shapiro-Wilk	*P*-value	RPD (%)	Power Analysis	
								2020	2021	2020	2021							Minimum Detectable Difference	Sensitivity
Hiatella arctica	Condition	Condition	Total Weight	Total Length	$ANCOVA_{log10}$	Yes > 25 mm	0	50	29	0.645	0.605	0.006	0.220	0.862	0.701	**0.047**	9%	1.16	29%
						No	0	50	35	0.622	0.551	0.006	**0.001**	0.555	0.210	**0.001**	nc[(a)]	nc	nc

n = samples size; LSM = least-squares means; RPD = relative percent difference; log_{10} = log_{10}-transformed data; nc = not calculated.

(a) Not calculated due to significant interaction term.

APPENDIX 7C

Fish Tissue Data

Table 7C-1: Sample Counts for Fish Tissue Chemistry Analyses from the Milne Port Area, 2010 to 2021

Species	Year	Number of Samples	
		Metals	Polycyclic Aromatic Hydrocarbons
Arctic Char	2010	22[(a)]	0
	2013	17	14
	2015	5	0
	2016	13	0
	2017	2	0
	2018	26	0
	2019	47	0
	2020	8	8
	2021	8	8
Arctic Staghorn Sculpin	2013	1	0
Fourhorn Sculpin	2013	2	1
	2019	30	0
	2020	8	8
	2021	8	8
Hiatella arctica	2018	24	0
	2019	80	0
	2020	8	8
	2021	8	8
Unknown Sculpin	2019	30	0
Unknown Fish	2015	10	0
Total	**-**	**357**	**63**

(a) Includes 11 muscle samples and 11 liver samples.

Table 7C-2 Concentrations of Metals in Arctic Char Muscle Tissue Collected from the Milne Port Area, 2021

Parameter	DL	Fish Identification Number								
		BAFF21UMLNGN03ARCH03	BAFF21UMLNGN05ARCH03	BAFF21UMLNGN06ARCH09	BAFF21UMLNGN09ARCH03	BAFF21UMLNGN10ARCH10	BAFF21UMLNGN20ARCH02	BAFF21UMLNGN25ARCH03	BAFF21UMLNGN25ARCH05	Duplicate[(a)]
Moisture (%)	0.30	73.00	74.00	75.00	69.00	75.00	74.00	74.00	73.00	-
Total Metals (mg/kg ww)										
Aluminum	0.20 - 0.50	0.25	0.29	6.43	<0.20	<0.20	<0.20	<0.20	<0.20	9.78
Antimony	0.0010 - 0.0020	0.0012	0.0012	0.0038	<0.0010	<0.0010	0.0013	<0.0010	<0.0010	0.0052
Arsenic	0.0040 - 0.0050	5.5400	2.8800	0.0974	4.2500	2.6500	3.8400	0.4960	0.6870	0.1050
Barium	0.010	<0.010	<0.010	0.112	<0.010	<0.010	<0.010	<0.010	<0.010	0.134
Beryllium	0.0010 - 0.0020	<0.0010	<0.0010	<0.0020	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0020
Bismuth	0.001 - 0.0013	<0.0010	<0.0010	<0.0013	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0013
Boron	0.20	<0.20	<0.20	0.22	<0.20	<0.20	<0.20	<0.20	<0.20	0.32
Cadmium	0.0010 - 0.0013	0.0017	0.0012	<0.0013	<0.0010	0.0018	0.0019	0.0020	<0.0010	<0.0013
Calcium	2.0 - 4.0	60.1	73.0	439.0	425.0	136.0	154.0	227.0	122.0	323.0
Chromium	0.010 - 0.025	<0.010	0.013	0.115	<0.010	<0.010	<0.010	0.012	<0.010	0.106
Cobalt	0.0013	0.0041	0.0031	0.0135	0.0036	0.0031	0.0030	0.0084	0.0047	0.0206
Copper	0.010 - 0.013	0.487	0.607	0.475	0.358	0.386	0.299	0.370	0.484	0.342
Iron	0.25	4.68	6.23	89.90	3.11	3.49	3.41	3.79	4.15	84.40
Lead	0.0010 - 0.0013	0.0016	0.0088	0.0379	<0.0010	<0.0010	0.0041	0.0061	0.0017	0.0868
Magnesium	0.40	307.00	289.00	378.00	270.00	324.00	332.00	311.00	304.00	376.00
Manganese	0.010	0.060	0.084	0.576	0.133	0.083	0.079	0.075	0.092	0.582
Mercury	0.0020 - 0.0130	0.0478	0.0394	0.0630	0.0421	0.0334	0.0304	0.0604	0.0245	0.0540
Molybdenum	0.0040 - 0.0080	<0.0040	<0.0040	0.0122	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	0.0121
Nickel	0.010	<0.010	0.022	0.049	<0.010	<0.010	<0.010	<0.010	<0.010	0.055
Phosphorous	2.0	3050.0	2980.0	3120.0	2980.0	3240.0	3270.0	3370.0	3230.0	2900.0
Potassium	2.0 - 2.5	4520.0	4550.0	4810.0	4030.0	5010.0	4740.0	4370.0	4500.0	4560.0
Selenium	0.010	0.438	0.404	0.186	0.403	0.447	0.468	0.480	0.343	0.179
Silver	0.0010 - 0.0013	<0.0010	<0.0010	<0.0013	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0013
Sodium	2.0 - 2.5	274.0	292.0	428.0	289.0	235.0	268.0	334.0	250.0	416.0
Strontium	0.010 - 0.013	0.103	0.127	0.181	1.120	0.397	0.287	0.340	0.231	0.171
Thallium	0.00040	0.00199	0.00270	0.00854	0.00236	0.00228	0.00149	0.00396	0.00239	0.00882
Tin	0.020	<0.020	<0.020	0.045	<0.020	<0.020	<0.020	<0.020	<0.020	0.093
Titanium	0.020 - 0.130	0.431	0.424	0.550	0.423	0.434	0.450	0.473	0.449	1.550
Uranium	0.00040	<0.00040	<0.00040	0.00817	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	0.00730
Vanadium	0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Zinc	0.040 - 0.200	4.570	4.440	9.340	5.090	4.480	4.390	5.580	6.090	10.300

% = percent; mg/kg ww = milligram per killigram wet weight; DL = Detection Limit; < = less than.

(a) Duplicate sample FIN: BAFF21UMLNGN06ARCH09

Table 7C-3 Concentrations of Metals in Fourhorn Sculpin Muscle Tissue Collected from the Milne Port Area, 2021

Parameter	DL	Fish Identification Number							
		BAFF21UMLNFRSC1003	BAFF21UMLNFRSC1006	BAFF21UMLNFRSC1019	BAFF21UMLNFRSC1029	BAFF21UMLNFRSC1030	BAFF21UMLNFRSC1031	BAFF21UMLNFRSC1033	BAFF21UMLNFRSC1036
Moisture (%)	0.30	77	78	78	78	79	78	76	80
Total Metals (mg/kg ww)									
Aluminum	0.20 - 0.50	0.31	0.49	0.56	0.61	0.62	0.28	1.25	0.34
Antimony	0.0010 - 0.0020	0.0012	0.0013	0.0013	<0.0010	0.0028	0.0021	0.0010	0.0012
Arsenic	0.0040 - 0.0050	4.2600	3.3900	4.8900	2.3300	3.8800	3.9700	2.0700	2.4100
Barium	0.010	0.015	0.034	0.060	0.028	<0.010	0.011	0.034	0.060
Beryllium	0.0010 - 0.0020	<0.0010	<0.0010	<0.0010	<0.0010	<0.0020	<0.0010	<0.0010	<0.0010
Bismuth	0.0010 - 0.0013	0.0021	0.0014	0.0019	<0.0010	0.0026	0.0031	0.0018	0.0015
Boron	0.20	<0.20	<0.20	0.32	0.54	<0.20	<0.20	<0.20	<0.20
Cadmium	0.0010 - 0.0013	0.0051	0.0042	0.0095	0.0057	0.0041	0.0053	0.0056	0.0070
Calcium	2.0 - 4.0	200.0	515.0	1190.0	628.0	199.0	188.0	455.0	945.0
Chromium	0.010 - 0.025	0.020	0.018	0.019	0.030	0.028	<0.010	0.038	0.010
Cobalt	0.0013	0.0070	0.0076	0.0069	0.0065	0.0102	0.0119	0.0079	0.0087
Copper	0.010 - 0.013	0.516	0.445	0.470	0.453	0.708	0.554	0.458	0.464
Iron	0.25	6.39	6.25	6.92	5.38	9.16	8.14	7.86	5.37
Lead	0.0010 - 0.0013	0.0037	0.0037	0.0061	0.0055	0.0052	0.0134	0.0076	0.0053
Magnesium	0.40	245.00	304.00	261.00	297.00	272.00	236.00	308.00	295.00
Manganese	0.010	0.215	0.270	0.246	0.255	0.315	0.182	0.347	0.292
Mercury	0.0020 - 0.013	0.3240	0.1990	0.4210	0.1070	0.1980	0.3070	0.1020	0.1580
Molybdenum	0.0040 - 0.008	<0.0040	<0.0040	<0.0040	<0.0040	<0.0080	<0.0040	<0.0040	<0.0040
Nickel	0.010	0.015	0.025	0.020	0.027	0.079	0.019	0.026	0.016
Phosphorous	2.0	2270.0	2500.0	2620.0	2440.0	2030.0	2250.0	2460.0	2690.0
Potassium	2.0 - 2.5	3700.0	3870.0	3520.0	3420.0	3440.0	3770.0	3730.0	3660.0
Selenium	0.010	0.572	0.508	0.534	0.498	0.409	0.547	0.426	0.437
Silver	0.0010 - 0.0013	<0.0010	<0.0010	<0.0010	0.0015	<0.0013	<0.0010	<0.0010	<0.0010
Sodium	2.0 - 2.5	622.0	649.0	775.0	1010.0	941.0	727.0	546.0	769.0
Strontium	0.010 - 0.013	0.905	2.350	7.340	2.570	1.040	1.240	2.450	5.150
Thallium	0.00040	0.00078	0.00076	0.00074	0.00050	0.00104	0.00076	0.00081	0.00063
Tin	0.020	0.025	0.024	<0.020	0.042	0.025	0.190	<0.020	<0.020
Titanium	0.020 - 0.130	0.343	0.370	0.377	0.367	0.300	0.317	0.516	0.380
Uranium	0.00040	<0.00040	0.00101	0.00141	0.00075	0.00079	<0.00040	<0.00040	0.00078
Vanadium	0.020	<0.020	<0.020	0.056	<0.020	<0.020	<0.020	<0.020	<0.020
Zinc	0.040 - 0.200	22.400	12.500	19.000	9.590	17.400	26.100	10.100	18.200

% = percent; mg/kg ww = milligram per killigram wet weight; DL = Detection Limit; < = less than.

Table 7C-4 Concentrations of Metals in Hiatella arctica Tissue Collected from the Milne Port Area, 2021

Parameter	DL	Fish Identification Number							
		BAFF21UMLNHTARCOMP1	BAFF21UMLNHTARCOMP2	BAFF21UMLNHTARCOMP3	BAFF21UMLNHTARCOMP4	BAFF21UMLNHTARCOMP5	BAFF21UMLNHTARCOMP6	BAFF21UMLNHTARCOMP7	BAFF21UMLNHTARCOMP8
Moisture (%)	0.30	66	77	78	70	75	76	68	76
Total Metals (mg/kg ww)									
Aluminum	0.50	1380	923	439	1500	390	784	867	551
Antimony	0.0020	0.0244	0.0161	0.0121	0.0237	0.0105	0.0169	0.0323	0.0111
Arsenic	0.0050	5.61	2.98	3.19	2.91	2.19	3.41	6.24	2.43
Barium	0.010	13.9	6.72	8.79	9.38	12.3	9.06	13.4	5.20
Beryllium	0.0020	0.0718	0.0466	0.0250	0.0808	0.0209	0.0400	0.0465	0.0279
Bismuth	0.0013	0.0133	0.0119	0.0059	0.0167	0.0055	0.0085	0.0105	0.0065
Boron	0.20	11.8	8.04	5.17	11.6	4.75	6.90	8.73	4.95
Cadmium	0.0013	0.524	0.937	0.540	0.918	1.00	0.608	0.877	0.932
Calcium	4.0	12200	6790	4790	12300	4330	6390	9880	4050
Chromium	0.025	4.50	2.72	1.20	4.04	1.15	1.98	2.55	1.47
Cobalt	0.0013	1.62	1.54	0.708	1.69	0.679	0.786	3.25	0.567
Copper	0.013	2.49	3.16	1.66	3.91	2.16	2.21	2.98	1.61
Iron	0.25	5170	2050	1570	3560	1290	2010	3380	969
Lead	0.0013	1.51	1.83	0.668	2.06	0.557	0.967	1.41	0.682
Magnesium	0.40	5660	3760	2010	5720	2010	3000	3940	2490
Manganese	0.010	194	192	84.3	201	77.5	134	611	54.9
Mercury	0.013	0.033	0.031	0.033	0.023	0.029	0.030	0.036	0.029
Molybdenum	0.0080	0.402	0.356	0.222	0.466	0.264	0.216	0.681	0.253
Nickel	0.010	2.93	2.21	1.15	2.93	1.36	1.56	2.93	1.21
Phosphorous	2.0	1350	1510	1100	1340	1430	1700	1700	1490
Potassium	2.5	1780	1740	1250	2090	1440	1560	1600	1560
Selenium	0.010	1.44	1.36	1.38	1.20	1.54	1.32	1.68	1.25
Silver	0.0013	0.0078	0.0107	0.0039	0.0413	0.0062	0.0071	0.0094	0.0042
Sodium	2.5	3540	3860	2950	3420	2950	3840	2790	3270
Strontium	0.013	44.7	19.8	25.4	28.0	17.3	24.0	41.2	11.0
Thallium	0.00040	0.0358	0.0242	0.0109	0.0332	0.0102	0.0153	0.0547	0.0112
Tin	0.020	0.123	0.083	0.054	0.105	0.055	0.092	0.064	0.053
Titanium	0.13	67.8	32.9	16.7	53.8	13.7	27.6	33.1	19.5
Uranium	0.00040	0.279	0.164	0.138	0.281	0.126	0.141	0.204	0.107
Vanadium	0.020	5.38	3.79	2.09	5.42	1.76	2.90	4.96	2.09
Zinc	0.20	13.6	15.1	11.9	14.3	17.3	11.6	14.1	12.6

% = percent; mg/kg ww = milligram per killigram wet weight; DL = Detection Limit; < = less than.

Table 7C-5 Concentrations of Polycyclic Aromatic Hydrocarbons in Arctic Char Muscle Tissue Collected from the Milne Port Area, 2021

Parameter	DL	Fish Identification Number							
		BAFF21UMLNGN03ARCH03	BAFF21UMLNGN05ARCH03	BAFF21UMLNGN06ARCH09	BAFF21UMLNGN09ARCH03	BAFF21UMLNGN10ARCH10	BAFF21UMLNGN20ARCH02	BAFF21UMLNGN25ARCH03	BAFF21UMLNGN25ARCH05
Polycyclic Aromatic Hydrocarbons (mg/kg ww)									
1-Methylnaphthalene	0.050 - 0.070	<0.050	<0.050	<0.070	<0.050	<0.050	<0.050	<0.050	<0.050
2-Methylnaphthalene	0.050 - 0.070	<0.050	<0.050	<0.070	<0.050	<0.050	<0.050	<0.050	<0.050
Benzo(j)fluoranthene	0.050 - 0.070	<0.050	<0.050	<0.070	<0.050	<0.050	<0.050	<0.050	<0.050
Perylene	0.050 - 0.070	<0.050	<0.050	<0.070	<0.050	<0.050	<0.050	<0.050	<0.050
Naphthalene	0.050 - 0.070	<0.050	<0.050	<0.070	<0.050	<0.050	<0.050	<0.050	<0.050
Acenaphthylene	0.050 - 0.070	<0.050	<0.050	<0.070	<0.050	<0.050	<0.050	<0.050	<0.050
Acenaphthene	0.050 - 0.070	<0.050	<0.050	<0.070	<0.050	<0.050	<0.050	<0.050	<0.050
Fluorene	0.050 - 0.070	<0.050	<0.050	<0.070	<0.050	<0.050	<0.050	<0.050	<0.050
Phenanthrene	0.050 - 0.070	<0.050	<0.050	<0.070	<0.050	<0.050	<0.050	<0.050	<0.050
Anthracene	0.050 - 0.070	<0.050	<0.050	<0.070	<0.050	<0.050	<0.050	<0.050	<0.050
Fluoranthene	0.050 - 0.070	<0.050	<0.050	<0.070	<0.050	<0.050	<0.050	<0.050	<0.050
Pyrene	0.050 - 0.070	<0.050	<0.050	<0.070	<0.050	<0.050	<0.050	<0.050	<0.050
Benzo(a)anthracene	0.050 - 0.070	<0.050	<0.050	<0.070	<0.050	<0.050	<0.050	<0.050	<0.050
Chrysene	0.050 - 0.070	<0.050	<0.050	<0.070	<0.050	<0.050	<0.050	<0.050	<0.050
Benzo(b)fluoranthene	0.050 - 0.070	<0.050	<0.050	<0.070	<0.050	<0.050	<0.050	<0.050	<0.050
Benzo(k)fluoranthene	0.050 - 0.070	<0.050	<0.050	<0.070	<0.050	<0.050	<0.050	<0.050	<0.050
Benzo(a)pyrene	0.050 - 0.070	<0.050	<0.050	<0.070	<0.050	<0.050	<0.050	<0.050	<0.050
Indeno(1,2,3-cd)pyrene	0.050 - 0.070	<0.050	<0.050	<0.070	<0.050	<0.050	<0.050	<0.050	<0.050
Dibenz(a,h)anthracene	0.050 - 0.070	<0.050	<0.050	<0.070	<0.050	<0.050	<0.050	<0.050	<0.050
Benzo(g,h,i)perylene	0.050 - 0.070	<0.050	<0.050	<0.070	<0.050	<0.050	<0.050	<0.050	<0.050
Surrogate Recovery (%)									
D10-Anthracene	-	83	89	94	96	93	81	90	88
D8-Acenaphthylene	-	88	91	94	98	96	82	93	89
Terphenyl-D14	-	83	87	91	95	93	76	87	86

% = percent; mg/kg ww = milligram per killigram wet weight; DL = Detection Limit; < = less than.

Table 7C-6 Concentrations of Polycyclic Aromatic Hydrocarbons in Fourhorn Sculpin Muscle Tissue Collected from the Milne Port Area, 2021

Parameter	DL	Fish Identification Number							
		BAFF21UMLNFRSC1003	BAFF21UMLNFRSC1006	BAFF21UMLNFRSC1019	BAFF21UMLNFRSC1029	BAFF21UMLNFRSC1030	BAFF21UMLNFRSC1031	BAFF21UMLNFRSC1033	BAFF21UMLNFRSC1036
Polycyclic Aromatic Hydrocarbons (mg/kg ww)									
1-Methylnaphthalene	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
2-Methylnaphthalene	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Benzo(j)fluoranthene	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Perylene	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Naphthalene	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Acenaphthylene	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Acenaphthene	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Fluorene	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Phenanthrene	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Anthracene	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Fluoranthene	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Pyrene	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Benzo(a)anthracene	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Chrysene	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Benzo(b)fluoranthene	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Benzo(k)fluoranthene	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Benzo(a)pyrene	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Indeno(1,2,3-cd)pyrene	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Dibenz(a,h)anthracene	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Benzo(g,h,i)perylene	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Surrogate Recovery (%)									
D10-Anthracene	-	90	91	85	88	80	92	94	101
D8-Acenaphthylene	-	90	94	86	90	79	97	96	102
Terphenyl-D14	-	89	90	83	86	78	92	93	99

% = percent; mg/kg ww = milligram per killigram wet weight; DL = Detection Limit; < = less than.

Table 7C-7 Concentrations of Polycyclic Aromatic Hydrocarbons in Hiatella arctica Tissues Collected from the Milne Port Area, 2021

Parameter	DL	Fish Identification Number							
		BAFF21UMLNHTARCOMP10	BAFF21UMLNHTARCOMP11	BAFF21UMLNHTARCOMP12	BAFF21UMLNHTARCOMP13	BAFF21UMLNHTARCOMP14	BAFF21UMLNHTARCOMP15	BAFF21UMLNHTARCOMP16	BAFF21UMLNHTARCOMP9
Polycyclic Aromatic Hydrocarbons (mg/kg ww)									
1-Methylnaphthalene	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
2-Methylnaphthalene	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Benzo(j)fluoranthene	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Perylene	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Naphthalene	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Acenaphthylene	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Acenaphthene	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Fluorene	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Phenanthrene	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Anthracene	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Fluoranthene	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Pyrene	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Benzo(a)anthracene	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Chrysene	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Benzo(b)fluoranthene	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Benzo(k)fluoranthene	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Benzo(a)pyrene	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Indeno(1,2,3-cd)pyrene	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Dibenz(a,h)anthracene	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Benzo(g,h,i)perylene	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Surrogate Recovery (%)									
D10-Anthracene	-	101	104	102	107	98	101	102	100
D8-Acenaphthylene	-	98	99	97	104	95	99	98	99
Terphenyl-D14	-	98	103	99	105	96	99	99	99

% = percent; mg/kg ww = milligram per killigram wet weight; DL = Detection Limit; < = less than.

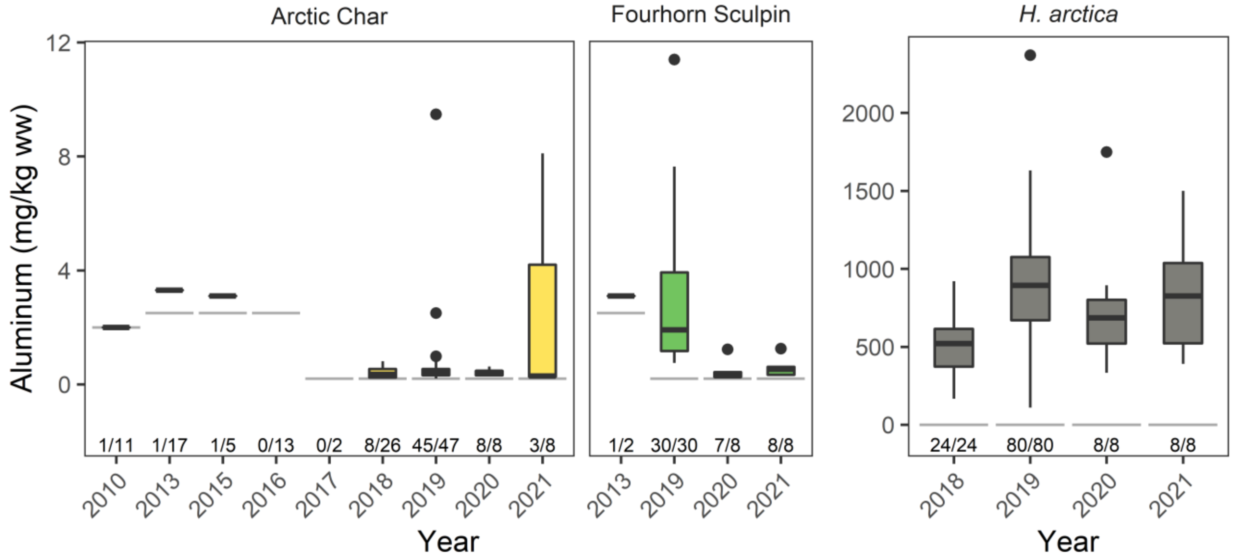
Table 7C-8: Statistical Comparisons including High Leverage Points Between 2020 and 2021 for Arctic Char Tissue Chemistry, Milne Port

Species	Parameter	Test	Sample Size				*n* Outliers	High Leverage Point Included?	*P* -value	Error (MSE)	LS Mean				Post-hoc *P* -value						RPD (%)						Power Analysis	
			2018	2019	2020	2021					2018	2019	2020	2021	2018* 2019	2018* 2020	2018* 2021	2019* 2020	2019* 2021	2020* 2021	2018* 2019	2018* 2020	2018* 2021	2019* 2020	2019* 2021	2020* 2021	Min Detectable Difference	Sensitivity
Arctic Char	Selenium	ANCOVA$_{rank}$	26	45	8	7	1	No	**<0.001**	758.095	0.334	0.403	0.327	0.426	**<0.001**	0.938	**<0.001**	**0.001**	0.556	**0.001**	-19%	nc	24%	nc	nc	26%	0.116	31%
			26	45	8	7	0	Yes	**<0.001**	784.268	0.336	0.401	0.324	0.393	**<0.001**	0.937	**0.002**	**0.004**	0.753	**0.005**	-18%	nc	16%	nc	nc	19%	0.131	37%

n = samples size; LSM = least-squares means; RPD = relative percent difference; rank = rank-transformed data.

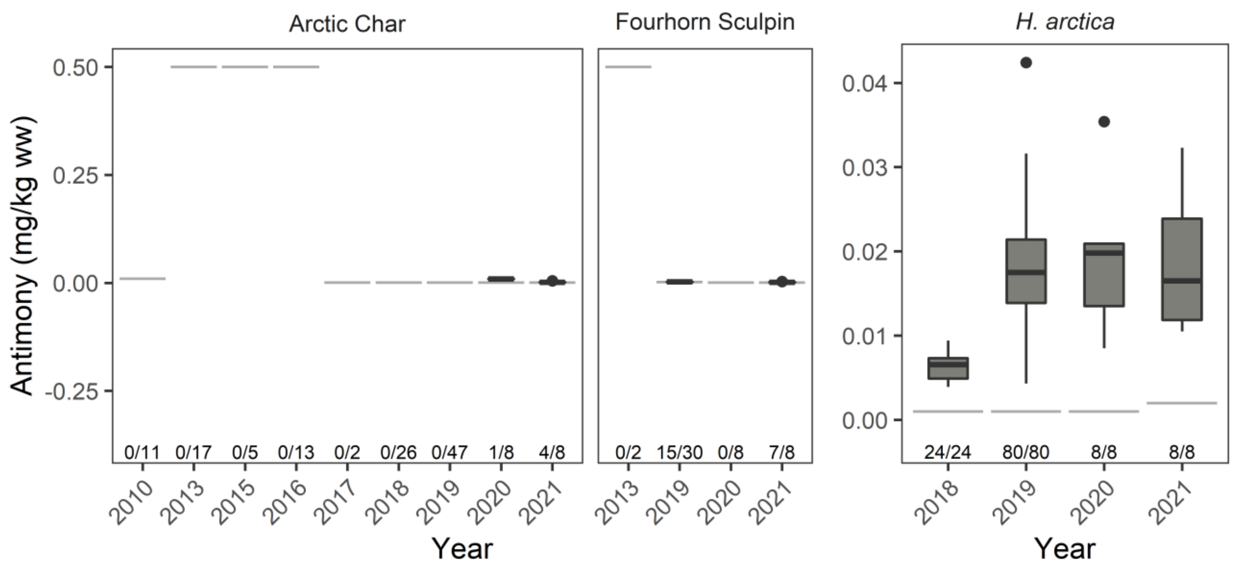
APPENDIX 7D

Fish Tissue Boxplots



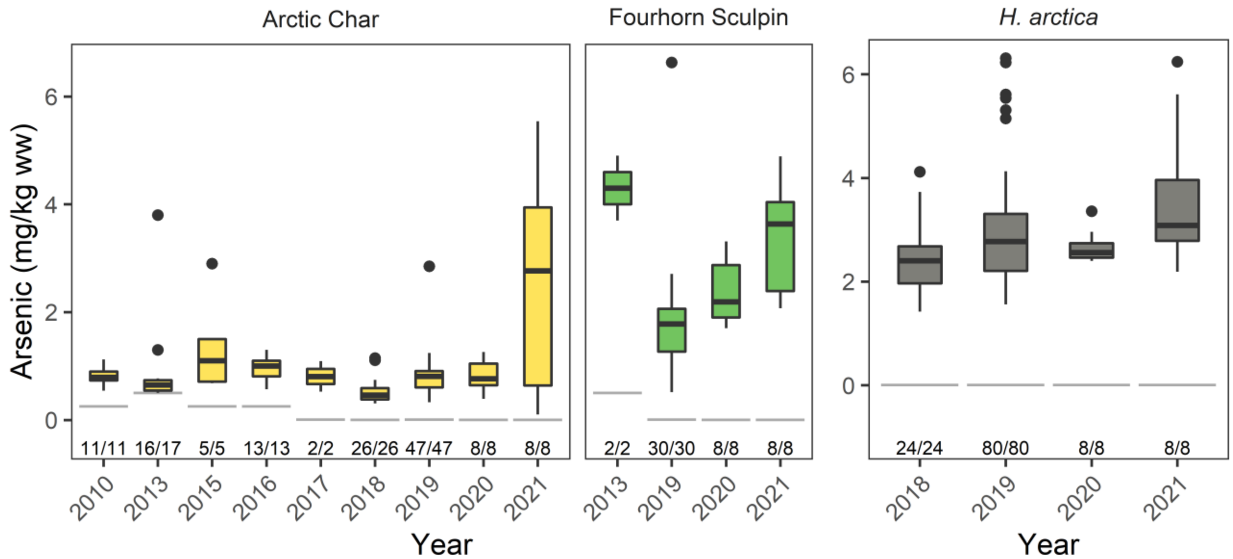
Total sample size (n) and number of samples above detection limits (n>DL) are shown below each bar as “n>DL/n”. Values below DL are not shown. Grey lines indicate detection limits.

Figure 7D-1: Concentrations of Aluminum for Arctic Char, Fourhorn Sculpin and *Hiatella arctica* Tissue Sampled from the Milne Port Area, 2010 to 2021



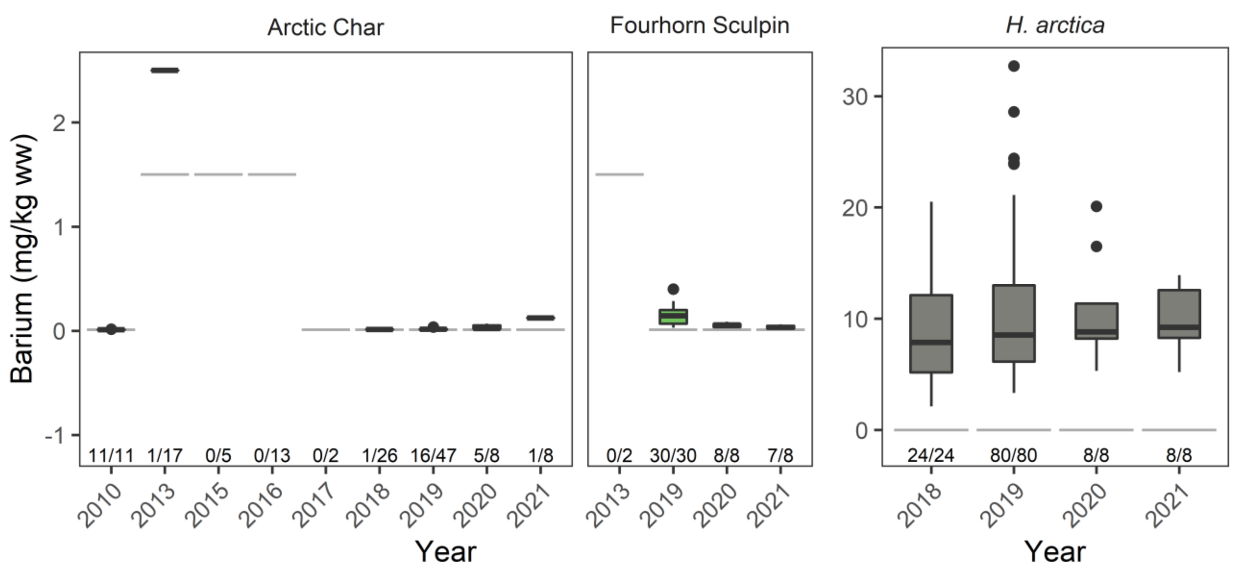
Total sample size (n) and number of samples above detection limits (n>DL) are shown below each bar as “n>DL/n”. Values below DL are not shown. Grey lines indicate detection limits.

Figure 7D-2: Concentrations of Antimony for Arctic Char, Fourhorn Sculpin and *Hiatella arctica* Tissue Sampled from the Milne Port Area, 2010 to 2021



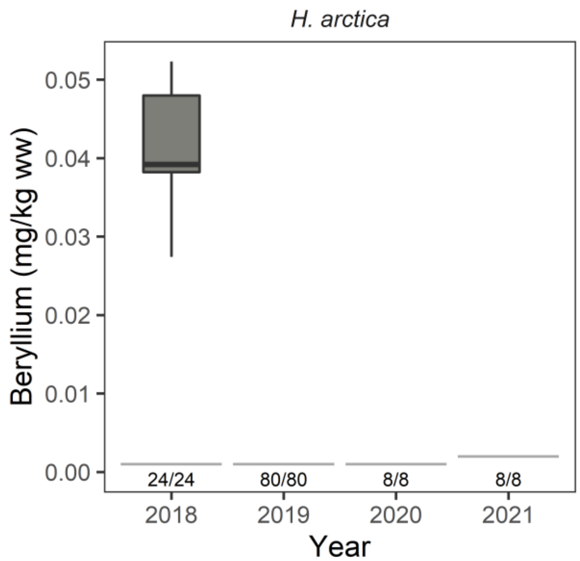
Total sample size (n) and number of samples above detection limits (n>DL) are shown below each bar as "n>DL/n". Values below DL are not shown. Grey lines indicate detection limits. One Arctic Char sample removed from 2020 (BAFF20UMLNGN18ARCH003, 33.2 mg/kg ww) to improve plotting.

Figure 7D-3: Concentrations of Arsenic for Arctic Char, Fourhorn Sculpin and *Hiatella arctica* Tissue Sampled from the Milne Port Area, 2010 to 2021



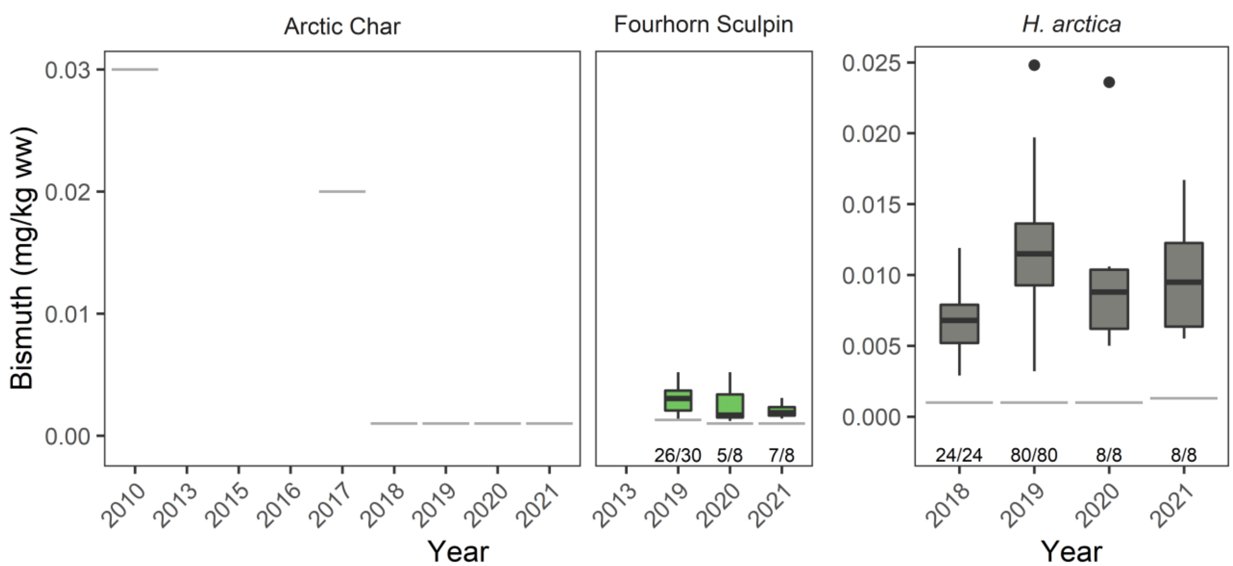
Total sample size (n) and number of samples above detection limits (n>DL) are shown below each bar as "n>DL/n". Values below DL are not shown. Grey lines indicate detection limits.

Figure 7D-4: Concentrations of Barium for Arctic Char, Fourhorn Sculpin and *Hiatella arctica* Tissue Sampled from the Milne Port Area, 2010 to 2021



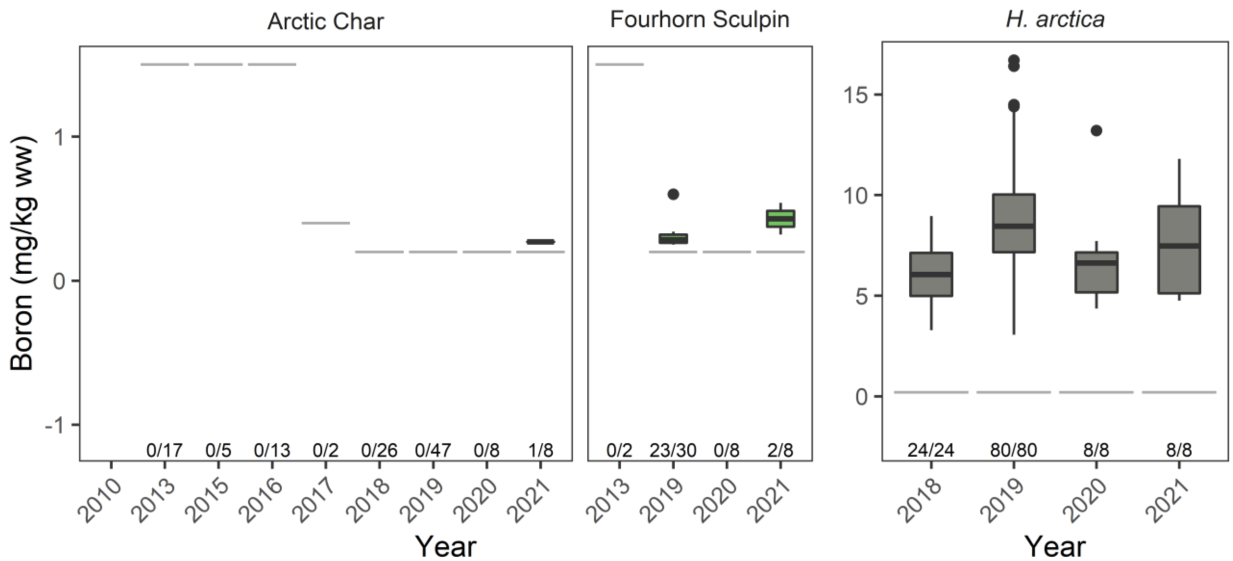
Total sample size (n) and number of samples above detection limits (n>DL) are shown below each bar as "n>DL/n". Values below DL are not shown. Grey lines indicate detection limits.

Figure 7D-5: Concentrations of Beryllium for *Hiatella arctica* Tissue Sampled from the Milne Port Area, 2010 to 2021



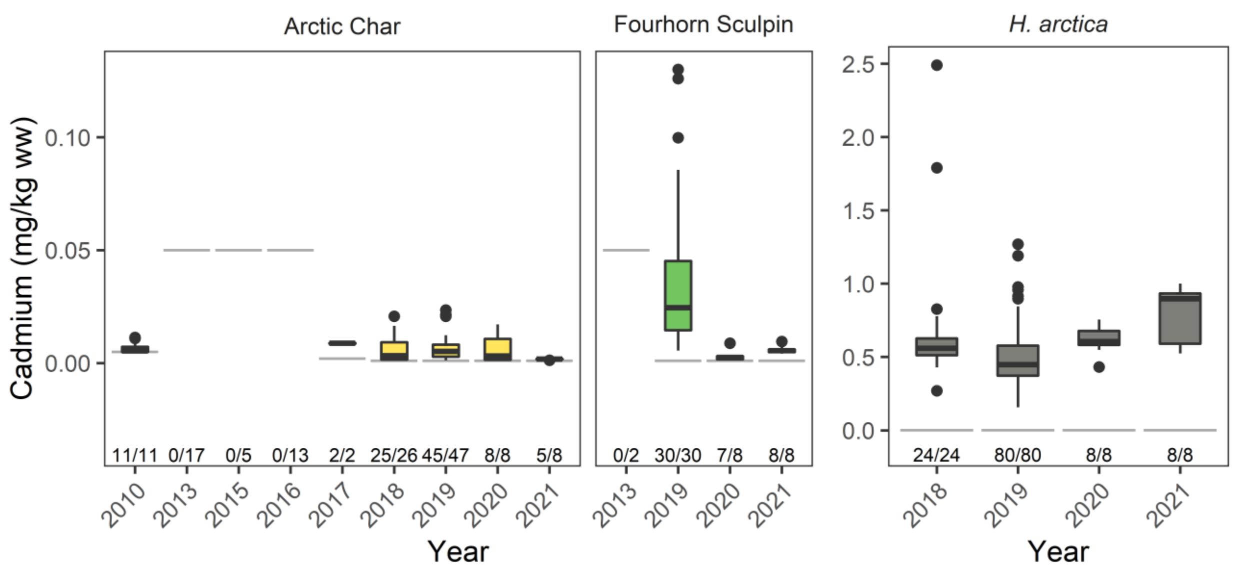
Total sample size (n) and number of samples above detection limits (n>DL) are shown below each bar as "n>DL/n". Values below DL are not shown. Grey lines indicate detection limits.

Figure 7D-6: Concentrations of Bismuth for Fourhorn Sculpin and *Hiatella arctica* Tissue Sampled from the Milne Port Area, 2010 to 2021



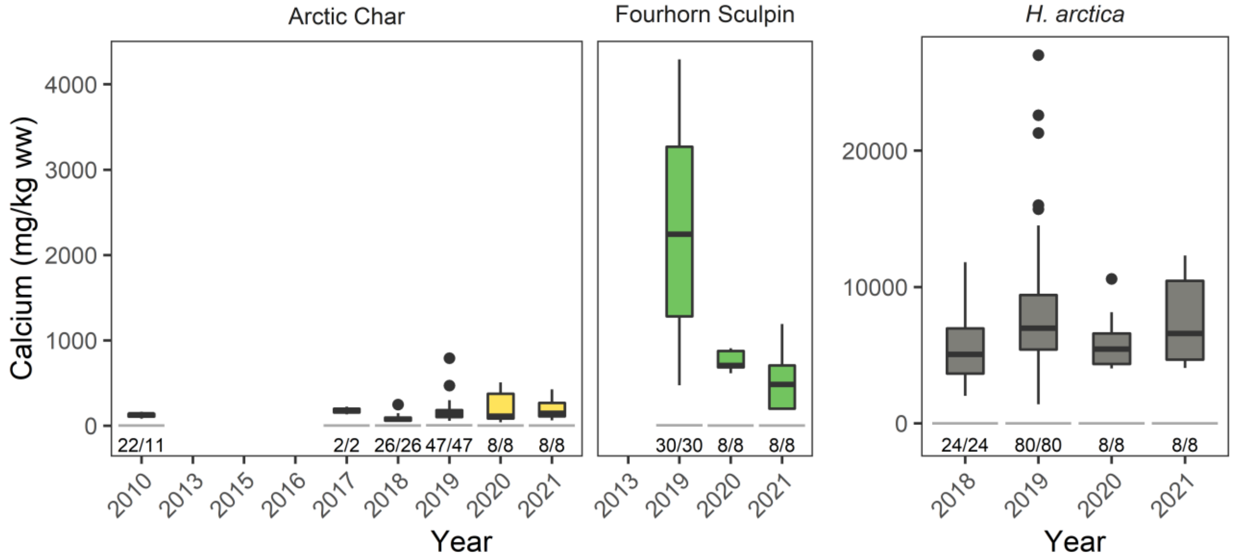
Total sample size (n) and number of samples above detection limits (n>DL) are shown below each bar as "n>DL/n". Values below DL are not shown. Grey lines indicate detection limits.

Figure 7D-7: Concentrations of Boron for Arctic Char, Fourhorn Sculpin and *Hiatella arctica* Tissue Sampled from the Milne Port Area, 2010 to 2021



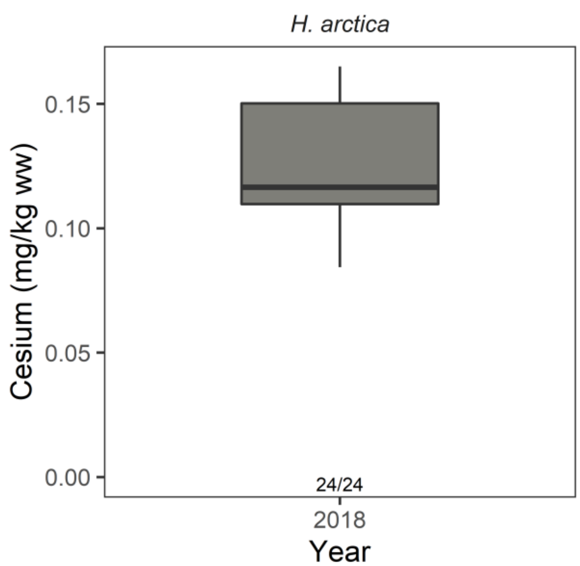
Total sample size (n) and number of samples above detection limits (n>DL) are shown below each bar as "n>DL/n". Values below DL are not shown. Grey lines indicate detection limits.

Figure 7D-8: Concentrations of Cadmium for Arctic Char, Fourhorn Sculpin and *Hiatella arctica* Tissue Sampled from the Milne Port Area, 2010 to 2021



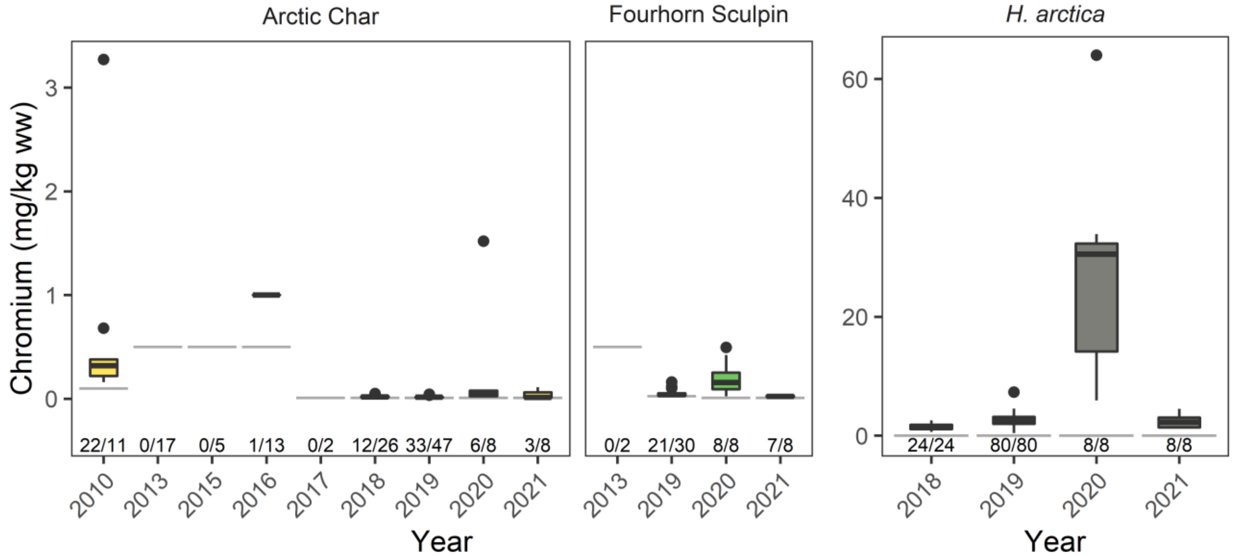
Total sample size (n) and number of samples above detection limits (n>DL) are shown below each bar as "n>DL/n". Values below DL are not shown. Grey lines indicate detection limits.

Figure 7D-9: Concentrations of Calcium for Arctic Char, Fourhorn Sculpin and *Hiatella arctica* Tissue Sampled from the Milne Port Area, 2010 to 2021



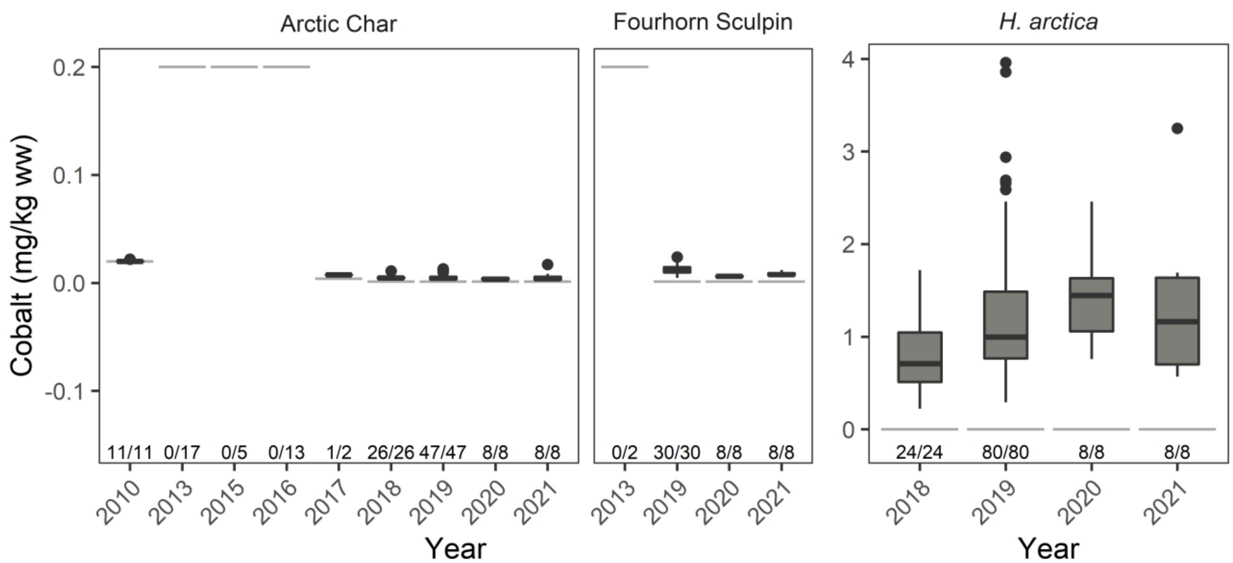
Total sample size (n) and number of samples above detection limits (n>DL) are shown below each bar as "n>DL/n". Values below DL are not shown. Grey lines indicate detection limits.

Figure 7D-10: Concentrations of Cesium for *Hiatella arctica* Tissue Sampled from the Milne Port Area, 2010 to 2021



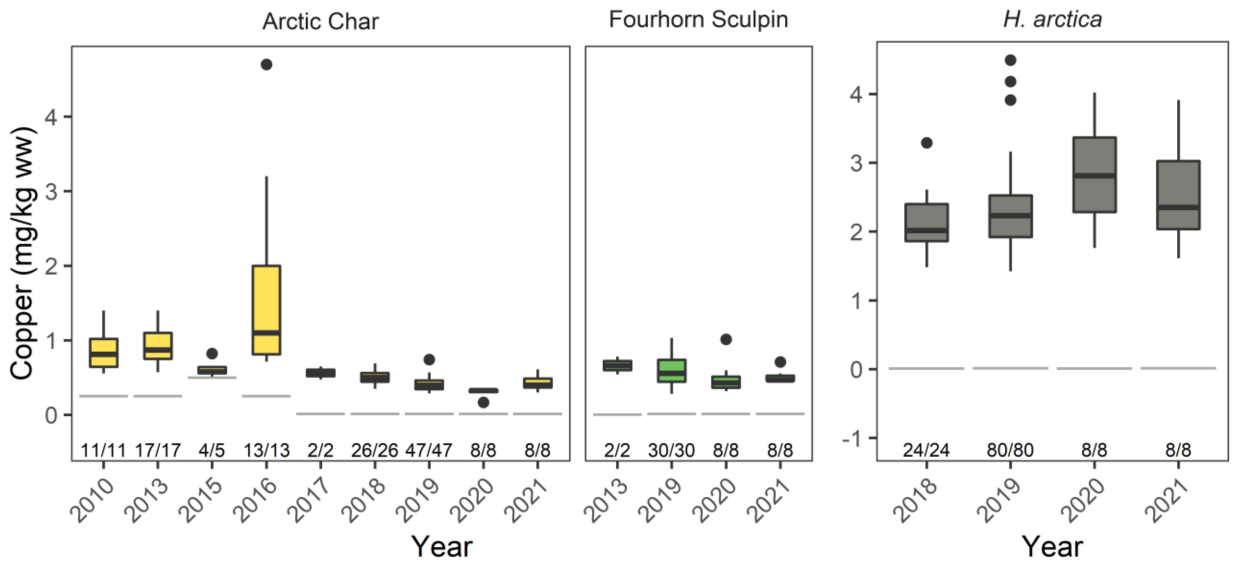
Total sample size (n) and number of samples above detection limits (n>DL) are shown below each bar as "n>DL/n". Values below DL are not shown. Grey lines indicate detection limits.

Figure 7D-11: Concentrations of Chromium for Arctic Char, Fourhorn Sculpin and *Hiatella arctica* Tissue Sampled from the Milne Port Area, 2010 to 2021



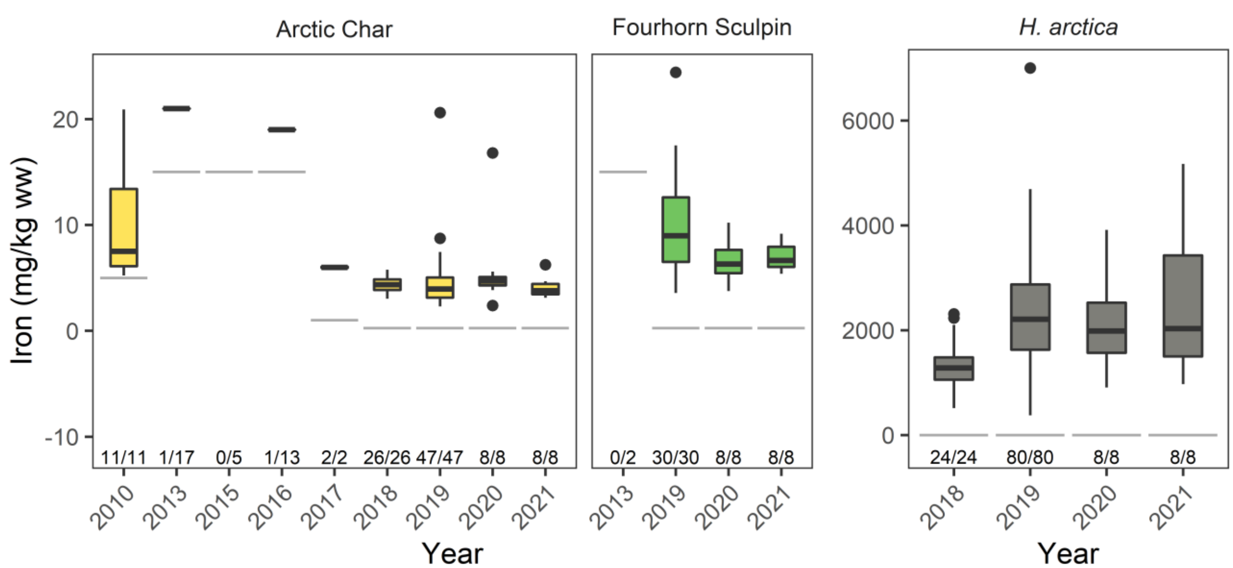
Total sample size (n) and number of samples above detection limits (n>DL) are shown below each bar as "n>DL/n". Values below DL are not shown. Grey lines indicate detection limits.

Figure 7D-12: Concentrations of Cobalt for Arctic Char, Fourhorn Sculpin and *Hiatella arctica* Tissue Sampled from the Milne Port Area, 2010 to 2021



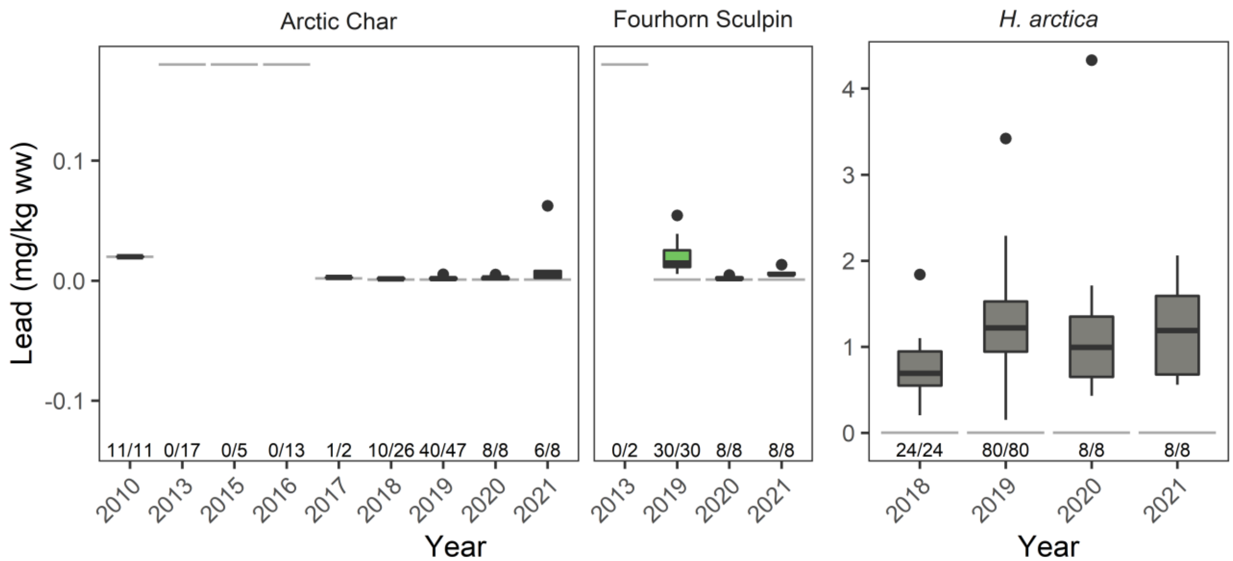
Total sample size (n) and number of samples above detection limits (n>DL) are shown below each bar as “n>DL/n”. Values below DL are not shown. Grey lines indicate detection limits.

Figure 7D-13: Concentrations of Copper for Arctic Char, Fourhorn Sculpin and *Hiatella arctica* Tissue Sampled from the Milne Port Area, 2010 to 2021



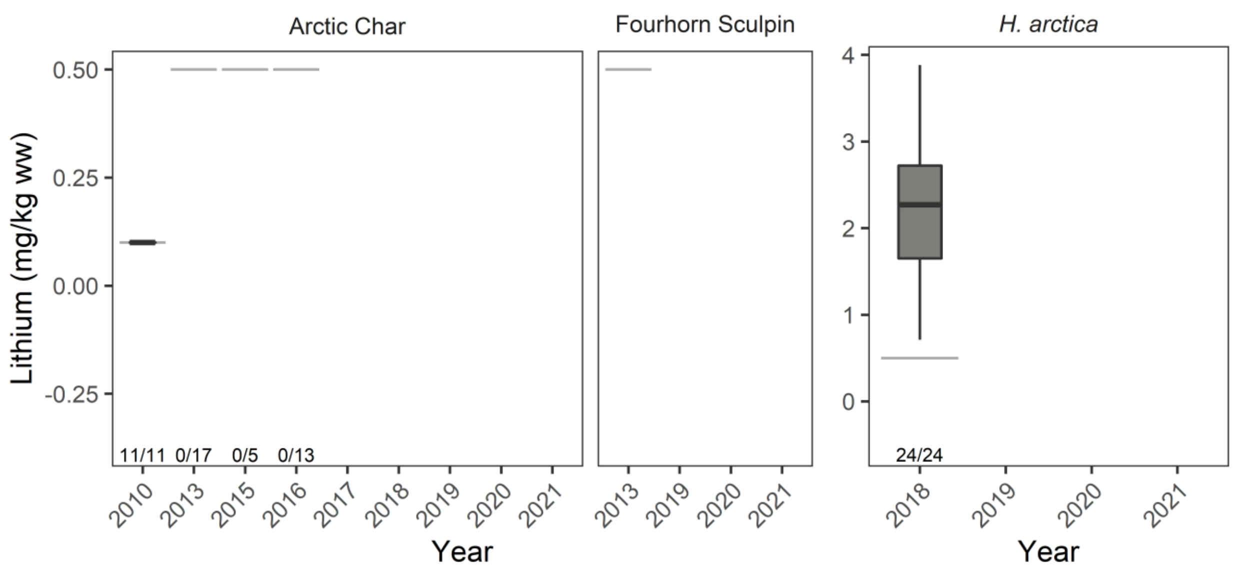
Total sample size (n) and number of samples above detection limits (n>DL) are shown below each bar as “n>DL/n”. Values below DL are not shown. Grey lines indicate detection limits. One Arctic Char sample removed from 2021 (BAFF21UMLNGN06ARCH09, 87.15 mg/kg ww) to improve plotting.

Figure 7D-14: Concentrations of Iron for Arctic Char, Fourhorn Sculpin and *Hiatella arctica* Tissue Sampled from the Milne Port Area, 2010 to 2021



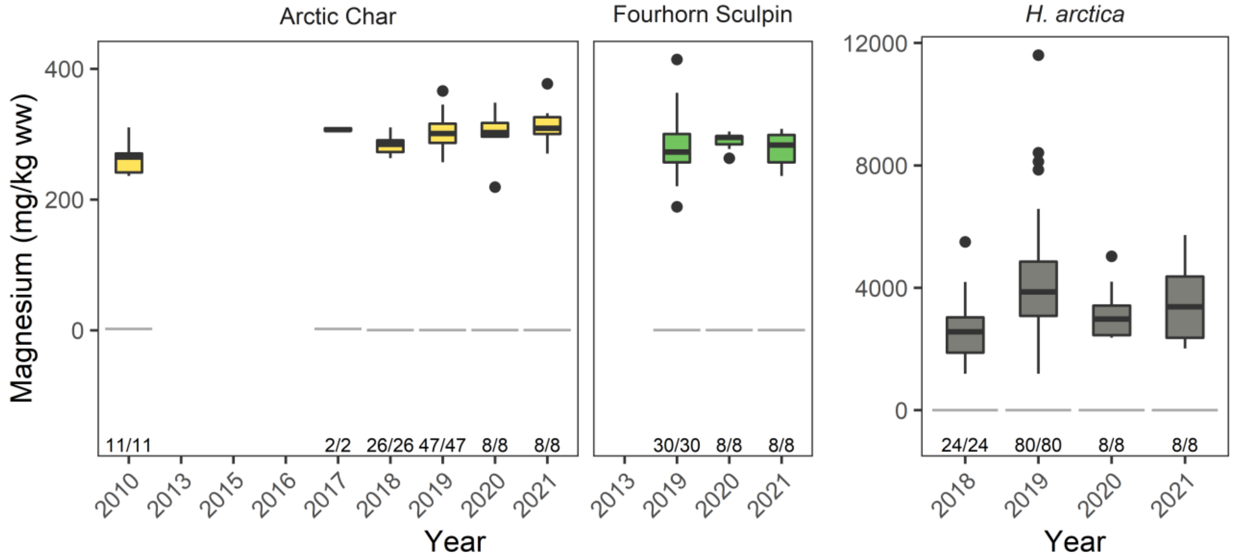
Total sample size (n) and number of samples above detection limits (n>DL) are shown below each bar as “n>DL/n”. Values below DL are not shown. Grey lines indicate detection limits.

Figure 7D-15: Concentrations of Lead for Arctic Char, Fourhorn Sculpin and *Hiatella arctica* Tissue Sampled from the Milne Port Area, 2010 to 2021



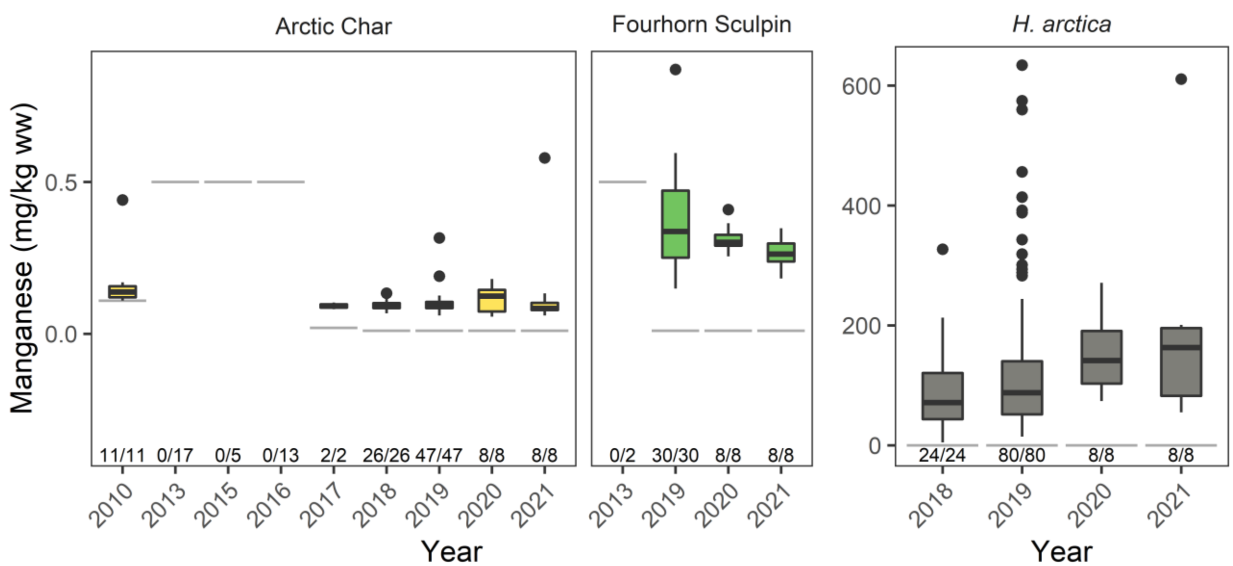
Total sample size (n) and number of samples above detection limits (n>DL) are shown below each bar as “n>DL/n”. Values below DL are not shown. Grey lines indicate detection limits.

Figure 7D-16: Concentrations of Lithium for *Hiatella arctica* Tissue Sampled from the Milne Port Area, 2010 to 2021



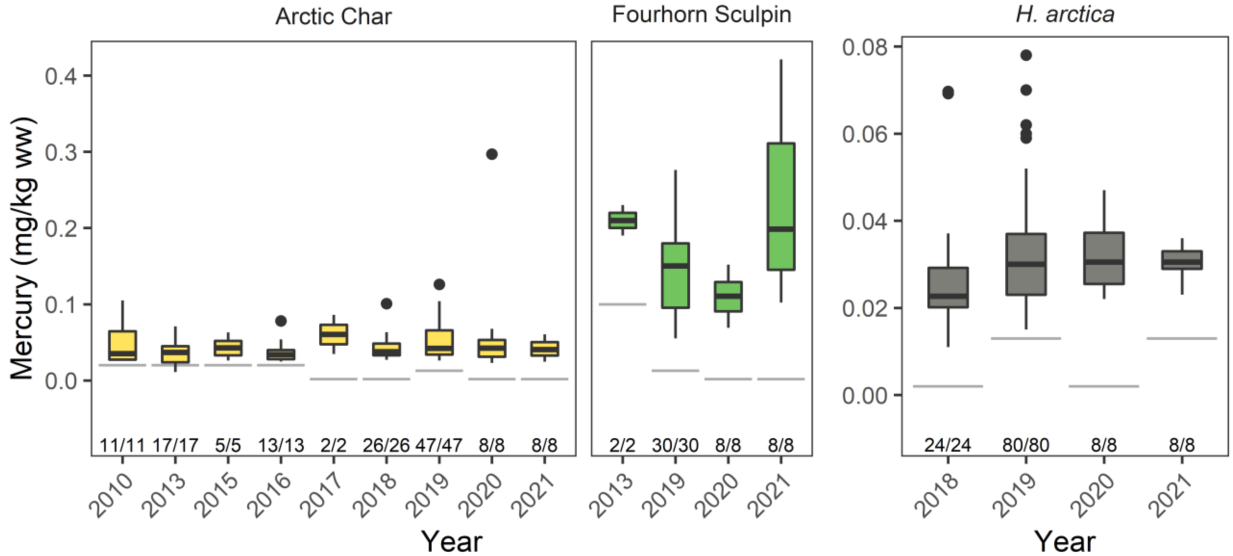
Total sample size (n) and number of samples above detection limits (n>DL) are shown below each bar as “n>DL/n”. Values below DL are not shown. Grey lines indicate detection limits.

Figure 7D-17: Concentrations of Magnesium for Arctic Char, Fourhorn Sculpin and *Hiatella arctica* Tissue Sampled from the Milne Port Area, 2010 to 2021



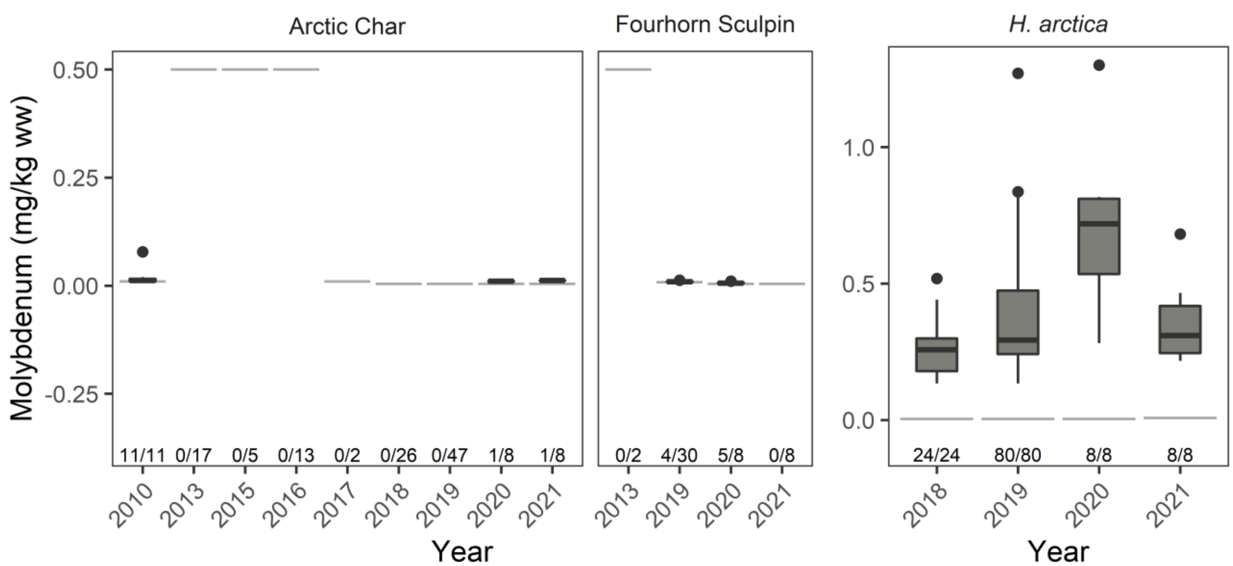
Total sample size (n) and number of samples above detection limits (n>DL) are shown below each bar as “n>DL/n”. Values below DL are not shown. Grey lines indicate detection limits.

Figure 7D-18: Concentrations of Manganese for Arctic Char, Fourhorn Sculpin and *Hiatella arctica* Tissue Sampled from the Milne Port Area, 2010 to 2021



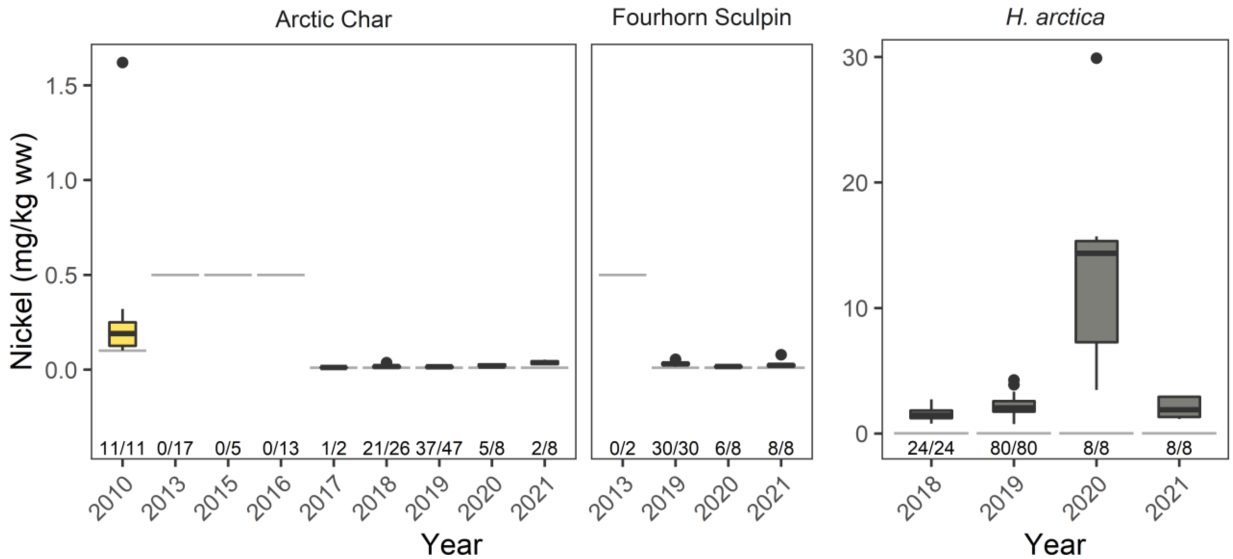
Total sample size (n) and number of samples above detection limits (n>DL) are shown below each bar as “n>DL/n”. Values below DL are not shown. Grey lines indicate detection limits.

Figure 7D-19: Concentrations of Mercury for Arctic Char, Fourhorn Sculpin and *Hiatella arctica* Tissue Sampled from the Milne Port Area, 2010 to 2021



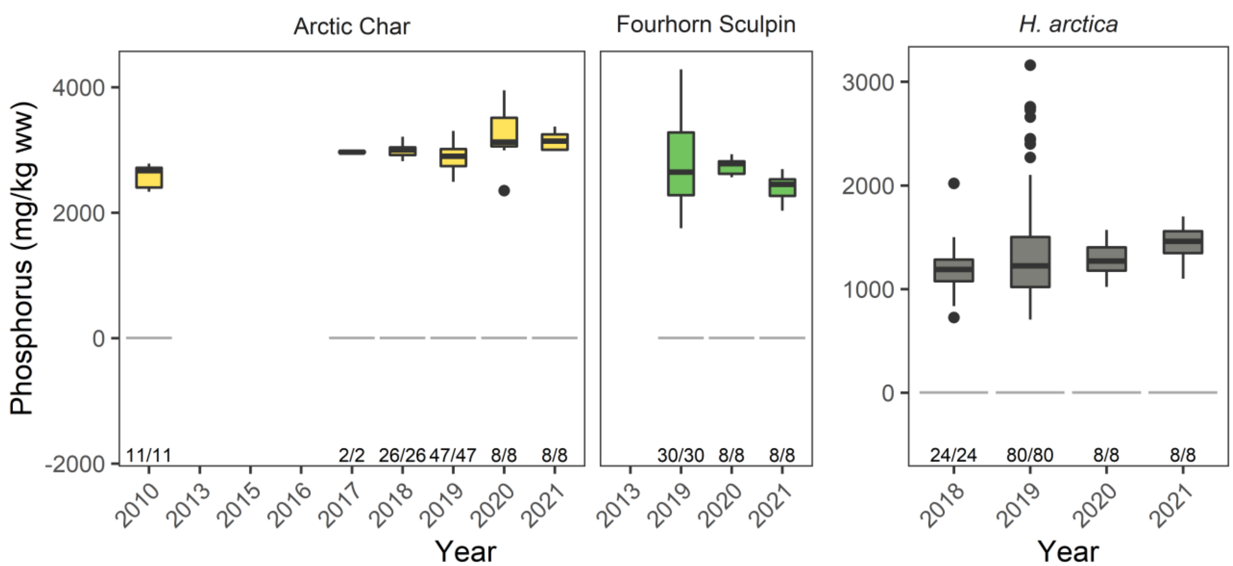
Total sample size (n) and number of samples above detection limits (n>DL) are shown below each bar as “n>DL/n”. Values below DL are not shown. Grey lines indicate detection limits.

Figure 7D-20: Concentrations of Molybdenum for Arctic Char, Fourhorn Sculpin and *Hiatella arctica* Tissue Sampled from the Milne Port Area, 2010 to 2021



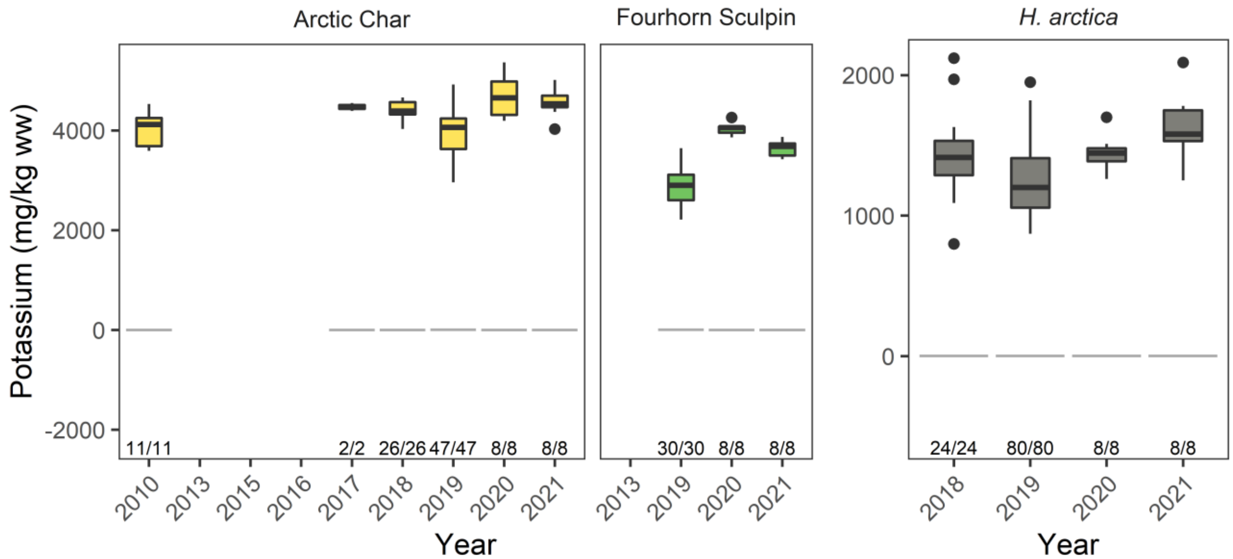
Total sample size (n) and number of samples above detection limits (n>DL) are shown below each bar as "n>DL/n". Values below DL are not shown. Grey lines indicate detection limits.

Figure 7D-21: Concentrations of Nickel for Arctic Char, Fourhorn Sculpin and *Hiatella arctica* Tissue Sampled from the Milne Port Area, 2010 to 2021



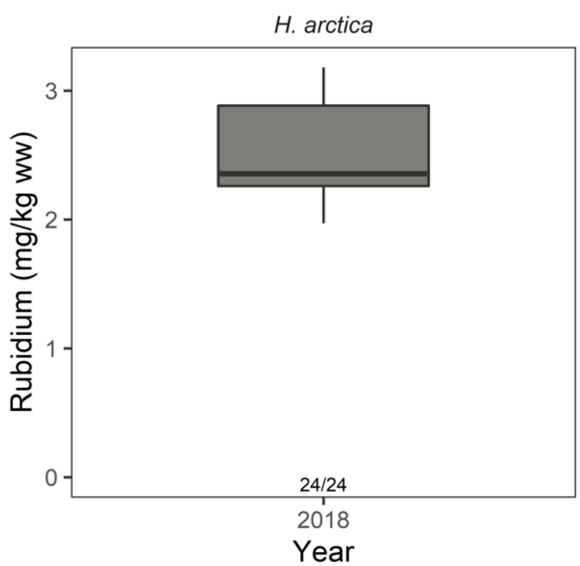
Total sample size (n) and number of samples above detection limits (n>DL) are shown below each bar as "n>DL/n". Values below DL are not shown. Grey lines indicate detection limits.

Figure 7D-22: Concentrations of Phosphorus for Arctic Char, Fourhorn Sculpin and *Hiatella arctica* Tissue Sampled from the Milne Port Area, 2010 to 2021



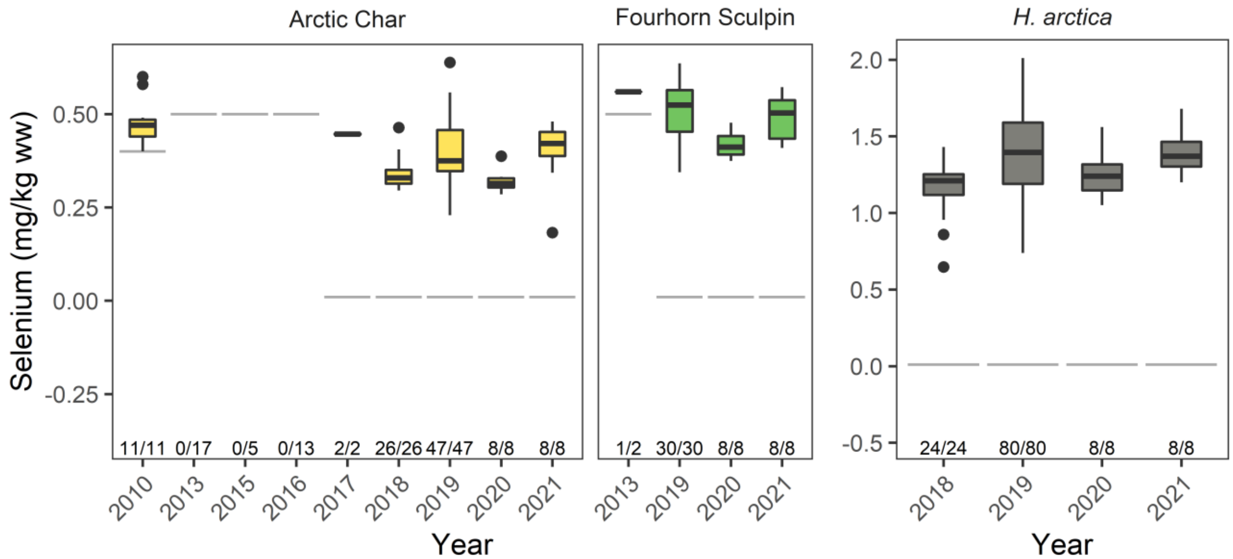
Total sample size (n) and number of samples above detection limits (n>DL) are shown below each bar as “n>DL/n”. Values below DL are not shown. Grey lines indicate detection limits.

Figure 7D-23: Concentrations of Potassium for Arctic Char, Fourhorn Sculpin and *Hiatella arctica* Tissue Sampled from the Milne Port Area, 2010 to 2021



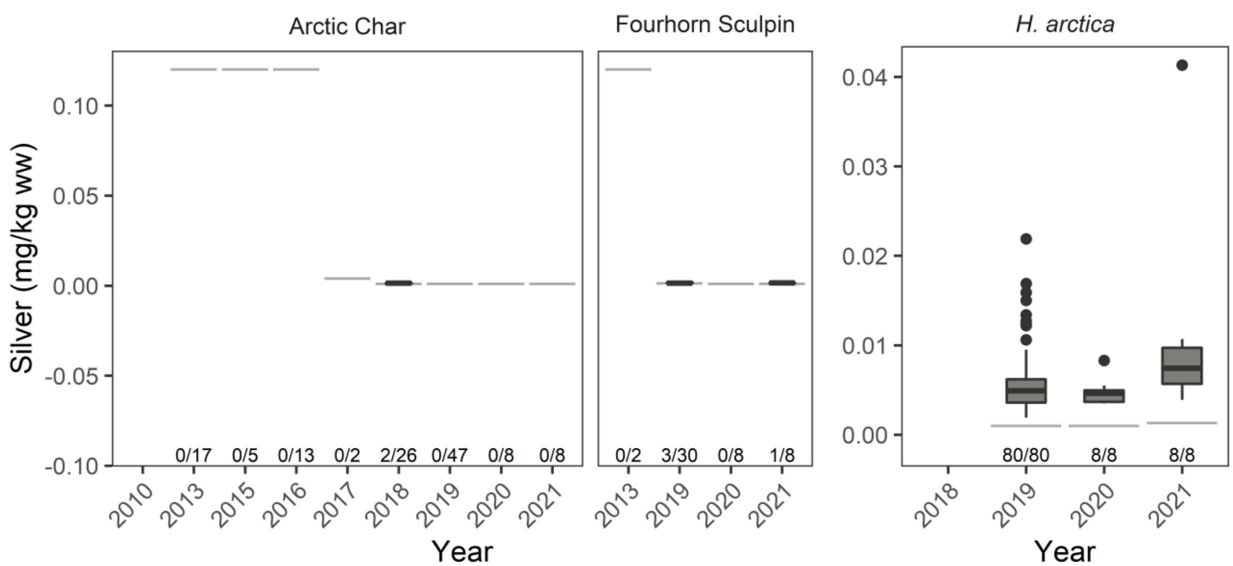
Total sample size (n) and number of samples above detection limits (n>DL) are shown below each bar as “n>DL/n”. Values below DL are not shown. Grey lines indicate detection limits.

Figure 7D-24: Concentrations of Rubidium for *Hiatella arctica* Tissue Sampled from the Milne Port Area, 2010 to 2021



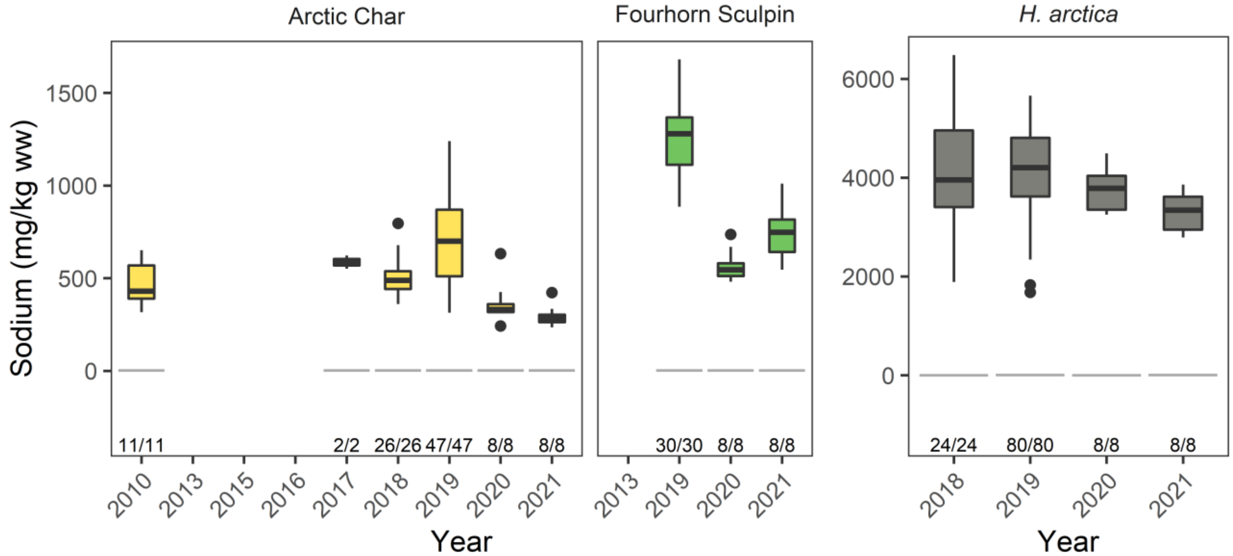
Total sample size (n) and number of samples above detection limits (n>DL) are shown below each bar as "n>DL/n". Values below DL are not shown. Grey lines indicate detection limits.

Figure 7D-25: Concentrations of Selenium for Arctic Char, Fourhorn Sculpin and *Hiatella arctica* Tissue Sampled from the Milne Port Area, 2010 to 2021



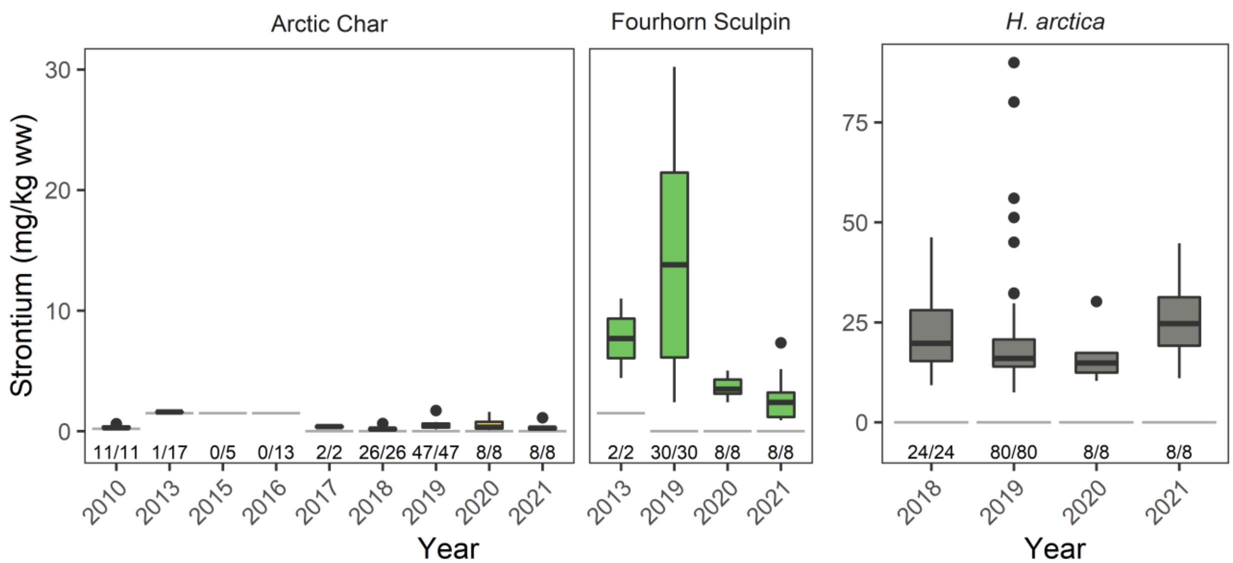
Total sample size (n) and number of samples above detection limits (n>DL) are shown below each bar as "n>DL/n". Values below DL are not shown. Grey lines indicate detection limits.

Figure 7D-26: Concentrations of Silver for Arctic Char, Fourhorn Sculpin and *Hiatella arctica* Tissue Sampled from the Milne Port Area, 2010 to 2021



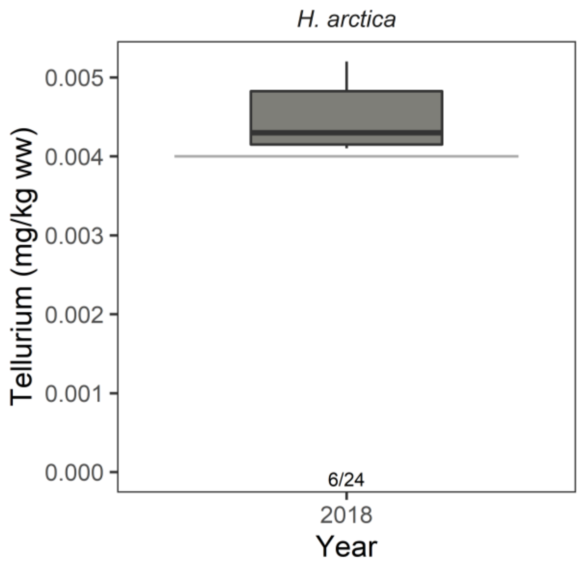
Total sample size (n) and number of samples above detection limits (n>DL) are shown below each bar as “n>DL/n”. Values below DL are not shown. Grey lines indicate detection limits.

Figure 7D-27: Concentrations of Sodium for Arctic Char, Fourhorn Sculpin and *Hiatella arctica* Tissue Sampled from the Milne Port Area, 2010 to 2021



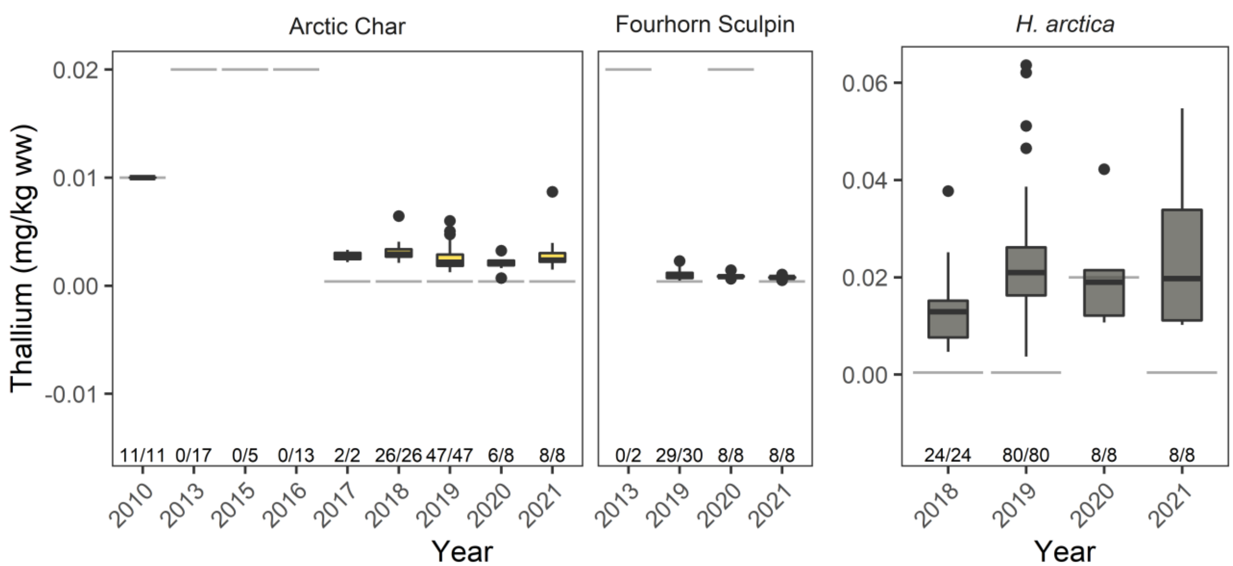
Total sample size (n) and number of samples above detection limits (n>DL) are shown below each bar as “n>DL/n”. Values below DL are not shown. Grey lines indicate detection limits.

Figure 7D-28: Concentrations of Strontium for Arctic Char, Fourhorn Sculpin and *Hiatella arctica* Tissue Sampled from the Milne Port Area, 2010 to 2021



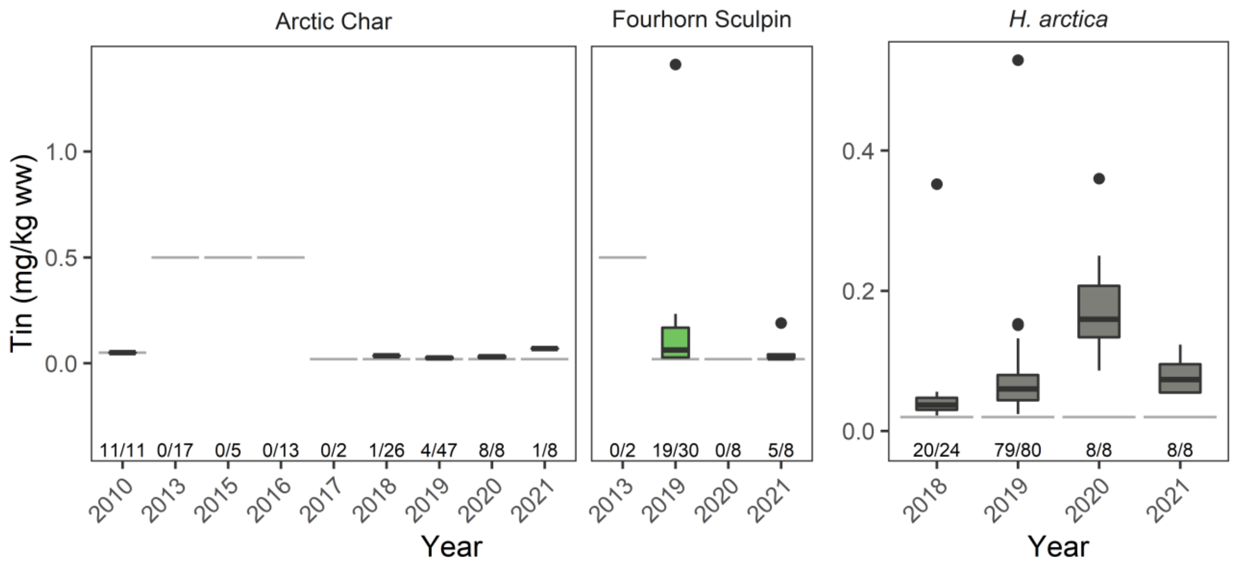
Total sample size (n) and number of samples above detection limits (n>DL) are shown below each bar as “n>DL/n”. Values below DL are not shown. Grey lines indicate detection limits.

Figure 7D-29: Concentrations of Tellurium for *Hiatella arctica* Tissue Sampled from the Milne Port Area, 2010 to 2021



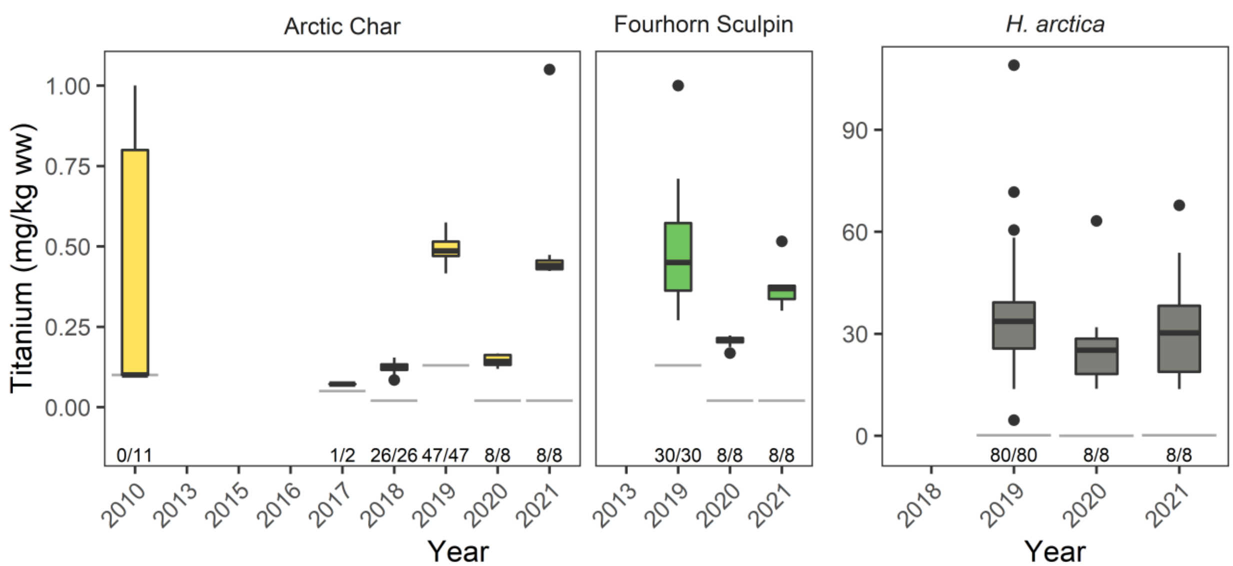
Total sample size (n) and number of samples above detection limits (n>DL) are shown below each bar as “n>DL/n”. Values below DL are not shown. Grey lines indicate detection limits.

Figure 7D-30: Concentrations of Thallium for Arctic Char, Fourhorn Sculpin and *Hiatella arctica* Tissue Sampled from the Milne Port Area, 2010 to 2021



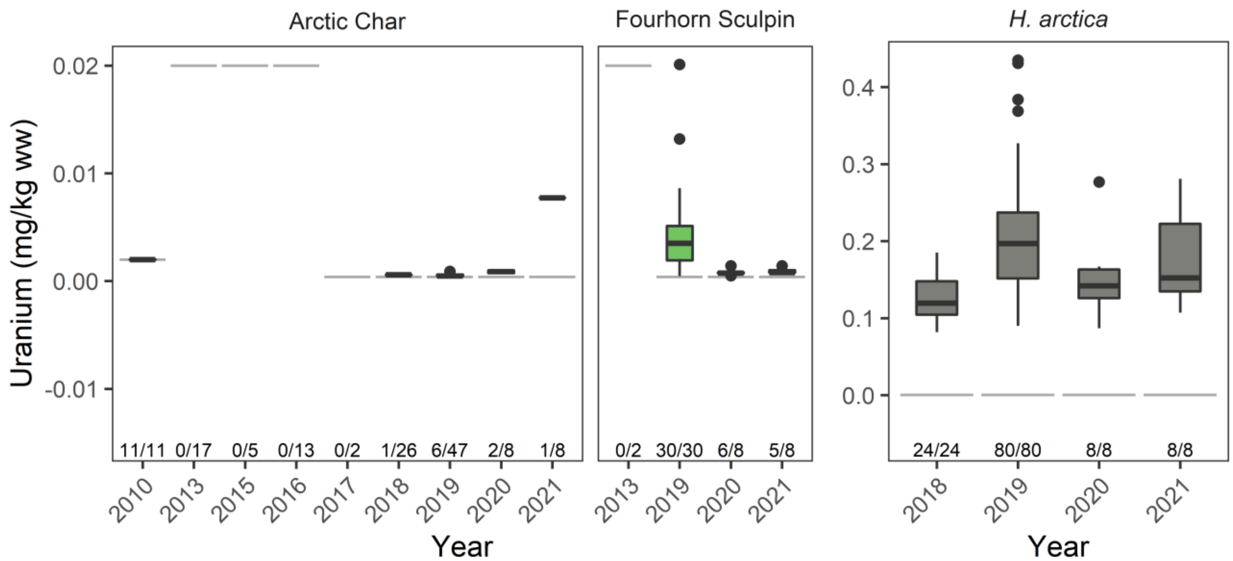
Total sample size (n) and number of samples above detection limits (n>DL) are shown below each bar as "n>DL/n". Values below DL are not shown. Grey lines indicate detection limits.

Figure 7D-31: Concentrations of Tin for Arctic Char, Fourhorn Sculpin and *Hiatella arctica* Tissue Sampled from the Milne Port Area, 2010 to 2021



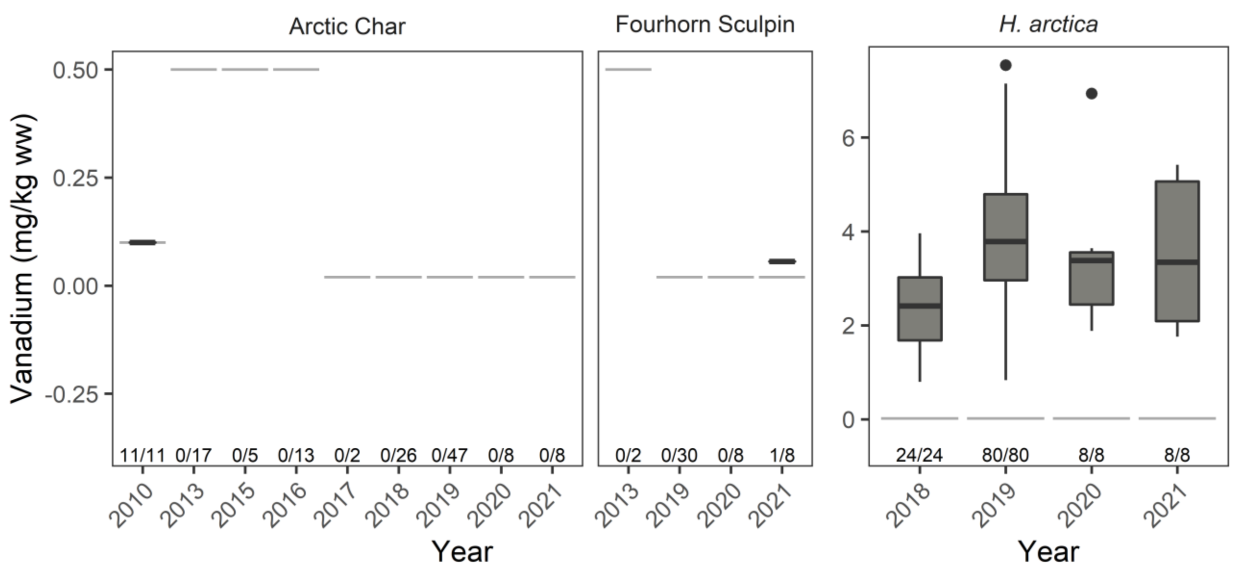
Total sample size (n) and number of samples above detection limits (n>DL) are shown below each bar as "n>DL/n". Values below DL are not shown. Grey lines indicate detection limits.

Figure 7D-32: Concentrations of Titanium for Arctic Char, Fourhorn Sculpin and *Hiatella arctica* Tissue Sampled from the Milne Port Area, 2010 to 2021



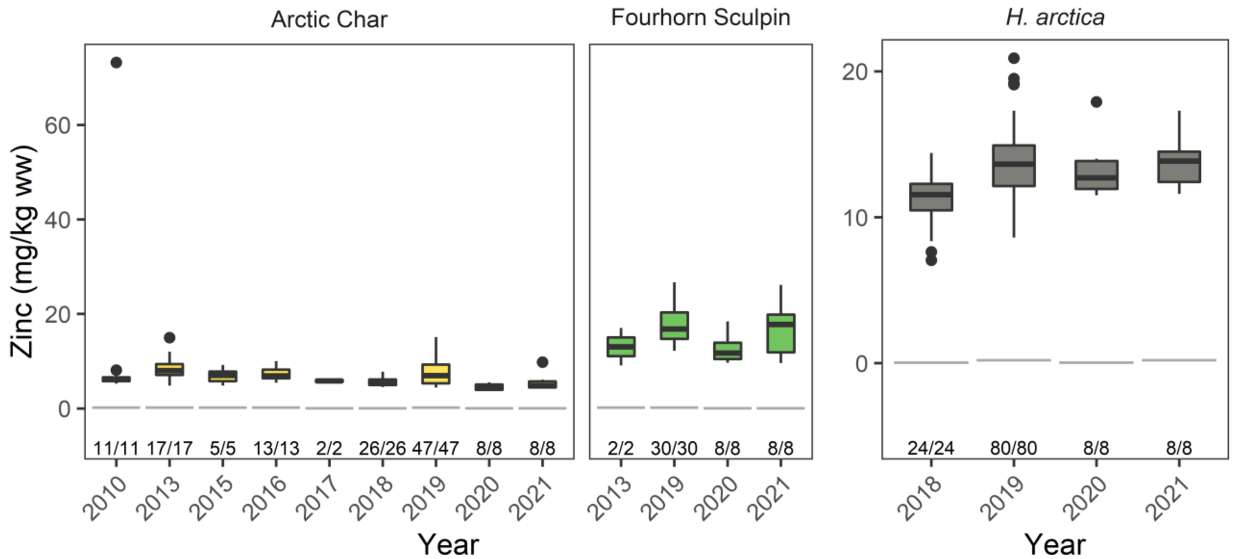
Total sample size (n) and number of samples above detection limits (n>DL) are shown below each bar as “n>DL/n”. Values below DL are not shown. Grey lines indicate detection limits.

Figure 7D-33: Concentrations of Uranium for Arctic Char, Fourhorn Sculpin and *Hiatella arctica* Tissue Sampled from the Milne Port Area, 2010 to 2021



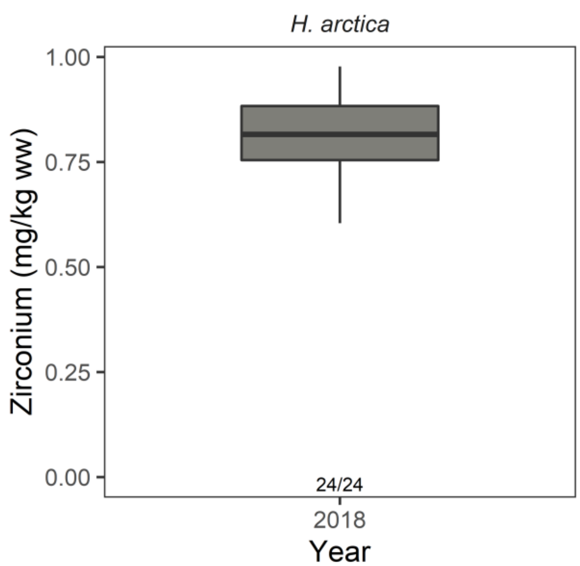
Total sample size (n) and number of samples above detection limits (n>DL) are shown below each bar as “n>DL/n”. Values below DL are not shown. Grey lines indicate detection limits.

Figure 7D-34: Concentrations of Vanadium for *Hiatella arctica* Tissue Sampled from the Milne Port Area, 2010 to 2021



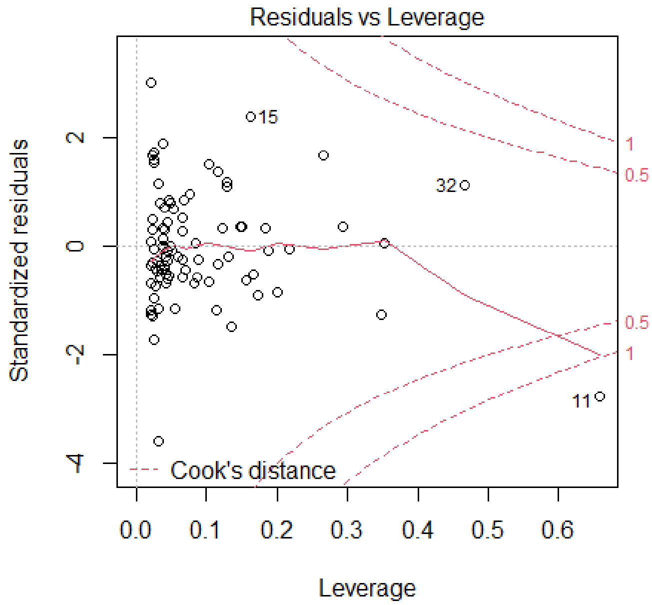
Total sample size (n) and number of samples above detection limits (n>DL) are shown below each bar as “n>DL/n”. Values below DL are not shown. Grey lines indicate detection limits.

Figure 7D-35: Concentrations of Zinc for Arctic Char, Fourhorn Sculpin and *Hiatella arctica* Tissue Sampled from the Milne Port Area, 2010 to 2021



Total sample size (n) and number of samples above detection limits (n>DL) are shown below each bar as “n>DL/n”. Values below DL are not shown. Grey lines indicate detection limits.

Figure 7D-36: Concentrations of Zirconium for *Hiatella arctica* Tissue Sampled from the Milne Port Area, 2010 to 2021



Point 11 = FIN BAFF21UMLNGN06ARCH09.

Figure 7D-37: Leverage Plot for Arctic Char Selenium ANCOVA, Indicating Point 11 as Having Excessive Leverage.

APPENDIX 7E

Certificate of Analysis

Your Project #: 1663724
Site#: MINE PORT REFERENCE SITE
Site Location: 44000/03 BAFFINLAND IRON MINE
Your C.O.C. #: 08497711

Attention: Collin Arens

GOLDER ASSOCIATES LTD
16820-107 AVE
EDMONTON, AB
CANADA T5P 4C3

Report Date: 2022/01/05
Report #: R3118203
Version: 4 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

BV LABS JOB #: C171211
Received: 2021/09/23, 08:00

Sample Matrix: Tissue
Samples Received: 16

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Elements by ICPMS - Tissue Plug Wet Wt	2	2021/10/15	2021/10/16	BBY WI-00033	Auto Calc
Elements by CRC ICPMS - Tissue Wet Wt	14	2021/10/13	2021/10/21	BBY7SOP-00021 / BBY7SOP-00002	EPA 6020b R2 m
Moisture in Tissue - Freeze Drying	2	2021/10/15	2021/10/16	BBY7SOP-00021	BCMOE BCLM Aug 2014
Moisture in Tissue	14	2021/10/10	2021/10/13	BBY8SOP-00017	BCMOE BCLM Dec2000 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, MELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Bureau Veritas 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.

Bureau Veritas Laboratories Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Your Project #: 1663724
Site#: MINE PORT REFERENCE SITE
Site Location: 44000/03 BAFFINLAND IRON MINE
Your C.O.C. #: 08497711

Attention: Collin Arens

GOLDER ASSOCIATES LTD
16820-107 AVE
EDMONTON, AB
CANADA T5P 4C3

Report Date: 2022/01/05
Report #: R3118203
Version: 4 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

BV LABS JOB #: C171211
Received: 2021/09/23, 08:00

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Cynny Hagen, Key Account Specialist
Email: Cynny.HAGEN@bureauveritas.com
Phone# (403)735-2273
==
BV Labs 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 Signature Page.

Bureau Veritas Job #: C171211
Report Date: 2022/01/05

GOLDER ASSOCIATES LTD
Client Project #: 1663724
Site Location: 44000/03 BAFFINLAND IRON MINE
Sampler Initials: BC

ELEMENTS BY ATOMIC SPECTROSCOPY - WET WT (TISSUE)

Bureau Veritas ID		AGP039	AGP040	AGU164		
Sampling Date		2021/08/08 13:40	2021/08/08 14:33	2021/08/09 11:22		
COC Number		08497711	08497711	08497711		
	UNITS	**BAFF21UMLNFRSC1003**	**BAFF21UMLNFRSC1006**	**BAFF21UMLNFRSC1019**	**RDL**	**QC Batch**
Total Metals by ICPMS						
Total (Wet Wt) Aluminum (Al)	mg/kg	0.31	0.49	0.56	0.20	A385672
Total (Wet Wt) Antimony (Sb)	mg/kg	0.0012	0.0013	0.0013	0.0010	A385672
Total (Wet Wt) Arsenic (As)	mg/kg	4.26	3.39	4.89	0.0040	A385672
Total (Wet Wt) Barium (Ba)	mg/kg	0.015	0.034	0.060	0.010	A385672
Total (Wet Wt) Beryllium (Be)	mg/kg	<0.0010	<0.0010	<0.0010	0.0010	A385672
Total (Wet Wt) Bismuth (Bi)	mg/kg	0.0021	0.0014	0.0019	0.0010	A385672
Total (Wet Wt) Boron (B)	mg/kg	<0.20	<0.20	0.32	0.20	A385672
Total (Wet Wt) Cadmium (Cd)	mg/kg	0.0051	0.0042	0.0095	0.0010	A385672
Total (Wet Wt) Calcium (Ca)	mg/kg	200	515	1190	2.0	A385672
Total (Wet Wt) Chromium (Cr)	mg/kg	0.020	0.018	0.019	0.010	A385672
Total (Wet Wt) Cobalt (Co)	mg/kg	0.0070	0.0076	0.0069	0.0013	A385672
Total (Wet Wt) Copper (Cu)	mg/kg	0.516	0.445	0.470	0.010	A385672
Total (Wet Wt) Iron (Fe)	mg/kg	6.39	6.25	6.92	0.25	A385672
Total (Wet Wt) Lead (Pb)	mg/kg	0.0037	0.0037	0.0061	0.0010	A385672
Total (Wet Wt) Magnesium (Mg)	mg/kg	245	304	261	0.40	A385672
Total (Wet Wt) Manganese (Mn)	mg/kg	0.215	0.270	0.246	0.010	A385672
Total (Wet Wt) Mercury (Hg)	mg/kg	0.324	0.199	0.421	0.0020	A385672
Total (Wet Wt) Molybdenum (Mo)	mg/kg	<0.0040	<0.0040	<0.0040	0.0040	A385672
Total (Wet Wt) Nickel (Ni)	mg/kg	0.015	0.025	0.020	0.010	A385672
Total (Wet Wt) Phosphorus (P)	mg/kg	2270	2500	2620	2.0	A385672
Total (Wet Wt) Potassium (K)	mg/kg	3700	3870	3520	2.0	A385672
Total (Wet Wt) Selenium (Se)	mg/kg	0.572	0.508	0.534	0.010	A385672
Total (Wet Wt) Silver (Ag)	mg/kg	<0.0010	<0.0010	<0.0010	0.0010	A385672
Total (Wet Wt) Sodium (Na)	mg/kg	622	649	775	2.0	A385672
Total (Wet Wt) Strontium (Sr)	mg/kg	0.905	2.35	7.34	0.010	A385672
Total (Wet Wt) Thallium (Tl)	mg/kg	0.00078	0.00076	0.00074	0.00040	A385672
Total (Wet Wt) Tin (Sn)	mg/kg	0.025	0.024	<0.020	0.020	A385672
Total (Wet Wt) Titanium (Ti)	mg/kg	0.343	0.370	0.377	0.020	A385672
Total (Wet Wt) Uranium (U)	mg/kg	<0.00040	0.00101	0.00141	0.00040	A385672
Total (Wet Wt) Vanadium (V)	mg/kg	<0.020	<0.020	0.056	0.020	A385672
Total (Wet Wt) Zinc (Zn)	mg/kg	22.4	12.5	19.0	0.040	A385672
RDL = Reportable Detection Limit						

Bureau Veritas Laboratories Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas Job #: C171211
Report Date: 2022/01/05

GOLDER ASSOCIATES LTD
Client Project #: 1663724
Site Location: 44000/03 BAFFINLAND IRON MINE
Sampler Initials: BC

ELEMENTS BY ATOMIC SPECTROSCOPY - WET WT (TISSUE)

Bureau Veritas ID		AGU165			AGU166		
Sampling Date		2021/08/09 14:53			2021/08/10 12:32		
COC Number		08497711			08497711		
	UNITS	BAFF21UMLNFRSC1029	RDL	QC Batch	BAFF21UMLNFRSC1030	RDL	QC Batch
Total Metals by ICPMS							
Total (Wet Wt) Aluminum (Al)	mg/kg	0.61	0.20	A385672	0.62	0.50	A372381
Total (Wet Wt) Antimony (Sb)	mg/kg	<0.0010	0.0010	A385672	0.0028	0.0020	A372381
Total (Wet Wt) Arsenic (As)	mg/kg	2.33	0.0040	A385672	3.88	0.0050	A372381
Total (Wet Wt) Barium (Ba)	mg/kg	0.028	0.010	A385672	<0.010	0.010	A372381
Total (Wet Wt) Beryllium (Be)	mg/kg	<0.0010	0.0010	A385672	<0.0020	0.0020	A372381
Total (Wet Wt) Bismuth (Bi)	mg/kg	<0.0010	0.0010	A385672	0.0026	0.0013	A372381
Total (Wet Wt) Boron (B)	mg/kg	0.54	0.20	A385672	<0.20	0.20	A372381
Total (Wet Wt) Cadmium (Cd)	mg/kg	0.0057	0.0010	A385672	0.0041	0.0013	A372381
Total (Wet Wt) Calcium (Ca)	mg/kg	628	2.0	A385672	199	4.0	A372381
Total (Wet Wt) Chromium (Cr)	mg/kg	0.030	0.010	A385672	0.028	0.025	A372381
Total (Wet Wt) Cobalt (Co)	mg/kg	0.0065	0.0013	A385672	0.0102	0.0013	A372381
Total (Wet Wt) Copper (Cu)	mg/kg	0.453	0.010	A385672	0.708	0.013	A372381
Total (Wet Wt) Iron (Fe)	mg/kg	5.38	0.25	A385672	9.16	0.25	A372381
Total (Wet Wt) Lead (Pb)	mg/kg	0.0055	0.0010	A385672	0.0052	0.0013	A372381
Total (Wet Wt) Magnesium (Mg)	mg/kg	297	0.40	A385672	272	0.40	A372381
Total (Wet Wt) Manganese (Mn)	mg/kg	0.255	0.010	A385672	0.315	0.010	A372381
Total (Wet Wt) Mercury (Hg)	mg/kg	0.107	0.0020	A385672	0.198	0.013	A372381
Total (Wet Wt) Molybdenum (Mo)	mg/kg	<0.0040	0.0040	A385672	<0.0080	0.0080	A372381
Total (Wet Wt) Nickel (Ni)	mg/kg	0.027	0.010	A385672	0.079	0.010	A372381
Total (Wet Wt) Phosphorus (P)	mg/kg	2440	2.0	A385672	2030	2.0	A372381
Total (Wet Wt) Potassium (K)	mg/kg	3420	2.0	A385672	3440	2.5	A372381
Total (Wet Wt) Selenium (Se)	mg/kg	0.498	0.010	A385672	0.409	0.010	A372381
Total (Wet Wt) Silver (Ag)	mg/kg	0.0015	0.0010	A385672	<0.0013	0.0013	A372381
Total (Wet Wt) Sodium (Na)	mg/kg	1010	2.0	A385672	941	2.5	A372381
Total (Wet Wt) Strontium (Sr)	mg/kg	2.57	0.010	A385672	1.04	0.013	A372381
Total (Wet Wt) Thallium (Tl)	mg/kg	0.00050	0.00040	A385672	0.00104	0.00040	A372381
Total (Wet Wt) Tin (Sn)	mg/kg	0.042	0.020	A385672	0.025	0.020	A372381
Total (Wet Wt) Titanium (Ti)	mg/kg	0.367	0.020	A385672	0.30	0.13	A372381
Total (Wet Wt) Uranium (U)	mg/kg	0.00075	0.00040	A385672	0.00079	0.00040	A372381
Total (Wet Wt) Vanadium (V)	mg/kg	<0.020	0.020	A385672	<0.020	0.020	A372381
Total (Wet Wt) Zinc (Zn)	mg/kg	9.59	0.040	A385672	17.4	0.20	A372381
RDL = Reportable Detection Limit							

Bureau Veritas Laboratories Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas Job #: C171211
Report Date: 2022/01/05

GOLDER ASSOCIATES LTD
Client Project #: 1663724
Site Location: 44000/03 BAFFINLAND IRON MINE
Sampler Initials: BC

ELEMENTS BY ATOMIC SPECTROSCOPY - WET WT (TISSUE)

Bureau Veritas ID		AGU167	AGU168	AGU169		
Sampling Date		2021/08/10 12:50	2021/08/10 13:22	2021/08/10 14:24		
COC Number		08497711	08497711	08497711		
	UNITS	BAFF21UMLNFRSC1031	BAFF21UMLNFRSC1033	BAFF21UMLNFRSC1036	RDL	QC Batch
Total Metals by ICPMS						
Total (Wet Wt) Aluminum (Al)	mg/kg	0.28	1.25	0.34	0.20	A385672
Total (Wet Wt) Antimony (Sb)	mg/kg	0.0021	0.0010	0.0012	0.0010	A385672
Total (Wet Wt) Arsenic (As)	mg/kg	3.97	2.07	2.41	0.0040	A385672
Total (Wet Wt) Barium (Ba)	mg/kg	0.011	0.034	0.060	0.010	A385672
Total (Wet Wt) Beryllium (Be)	mg/kg	<0.0010	<0.0010	<0.0010	0.0010	A385672
Total (Wet Wt) Bismuth (Bi)	mg/kg	0.0031	0.0018	0.0015	0.0010	A385672
Total (Wet Wt) Boron (B)	mg/kg	<0.20	<0.20	<0.20	0.20	A385672
Total (Wet Wt) Cadmium (Cd)	mg/kg	0.0053	0.0056	0.0070	0.0010	A385672
Total (Wet Wt) Calcium (Ca)	mg/kg	188	455	945	2.0	A385672
Total (Wet Wt) Chromium (Cr)	mg/kg	<0.010	0.038	0.010	0.010	A385672
Total (Wet Wt) Cobalt (Co)	mg/kg	0.0119	0.0079	0.0087	0.0013	A385672
Total (Wet Wt) Copper (Cu)	mg/kg	0.554	0.458	0.464	0.010	A385672
Total (Wet Wt) Iron (Fe)	mg/kg	8.14	7.86	5.37	0.25	A385672
Total (Wet Wt) Lead (Pb)	mg/kg	0.0134	0.0076	0.0053	0.0010	A385672
Total (Wet Wt) Magnesium (Mg)	mg/kg	236	308	295	0.40	A385672
Total (Wet Wt) Manganese (Mn)	mg/kg	0.182	0.347	0.292	0.010	A385672
Total (Wet Wt) Mercury (Hg)	mg/kg	0.307	0.102	0.158	0.0020	A385672
Total (Wet Wt) Molybdenum (Mo)	mg/kg	<0.0040	<0.0040	<0.0040	0.0040	A385672
Total (Wet Wt) Nickel (Ni)	mg/kg	0.019	0.026	0.016	0.010	A385672
Total (Wet Wt) Phosphorus (P)	mg/kg	2250	2460	2690	2.0	A385672
Total (Wet Wt) Potassium (K)	mg/kg	3770	3730	3660	2.0	A385672
Total (Wet Wt) Selenium (Se)	mg/kg	0.547	0.426	0.437	0.010	A385672
Total (Wet Wt) Silver (Ag)	mg/kg	<0.0010	<0.0010	<0.0010	0.0010	A385672
Total (Wet Wt) Sodium (Na)	mg/kg	727	546	769	2.0	A385672
Total (Wet Wt) Strontium (Sr)	mg/kg	1.24	2.45	5.15	0.010	A385672
Total (Wet Wt) Thallium (Tl)	mg/kg	0.00076	0.00081	0.00063	0.00040	A385672
Total (Wet Wt) Tin (Sn)	mg/kg	0.190	<0.020	<0.020	0.020	A385672
Total (Wet Wt) Titanium (Ti)	mg/kg	0.317	0.516	0.380	0.020	A385672
Total (Wet Wt) Uranium (U)	mg/kg	<0.00040	<0.00040	0.00078	0.00040	A385672
Total (Wet Wt) Vanadium (V)	mg/kg	<0.020	<0.020	<0.020	0.020	A385672
Total (Wet Wt) Zinc (Zn)	mg/kg	26.1	10.1	18.2	0.040	A385672
RDL = Reportable Detection Limit						

Bureau Veritas Laboratories Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas Job #: C171211
Report Date: 2022/01/05

GOLDER ASSOCIATES LTD
Client Project #: 1663724
Site Location: 44000/03 BAFFINLAND IRON MINE
Sampler Initials: BC

ELEMENTS BY ATOMIC SPECTROSCOPY - WET WT (TISSUE)

Bureau Veritas ID		AGU170	AGU171		
Sampling Date		2021/08/06 13:28	2021/08/06 14:58		
COC Number		08497711	08497711		
	UNITS	**BAFF21UMLNGN03ARCH03**	**BAFF21UMLNGN05ARCH03**	**RDL**	**QC Batch**
Total Metals by ICPMS					
Total (Wet Wt) Aluminum (Al)	mg/kg	0.25	0.29	0.20	A385672
Total (Wet Wt) Antimony (Sb)	mg/kg	0.0012	0.0012	0.0010	A385672
Total (Wet Wt) Arsenic (As)	mg/kg	5.54	2.88	0.0040	A385672
Total (Wet Wt) Barium (Ba)	mg/kg	<0.010	<0.010	0.010	A385672
Total (Wet Wt) Beryllium (Be)	mg/kg	<0.0010	<0.0010	0.0010	A385672
Total (Wet Wt) Bismuth (Bi)	mg/kg	<0.0010	<0.0010	0.0010	A385672
Total (Wet Wt) Boron (B)	mg/kg	<0.20	<0.20	0.20	A385672
Total (Wet Wt) Cadmium (Cd)	mg/kg	0.0017	0.0012	0.0010	A385672
Total (Wet Wt) Calcium (Ca)	mg/kg	60.1	73.0	2.0	A385672
Total (Wet Wt) Chromium (Cr)	mg/kg	<0.010	0.013	0.010	A385672
Total (Wet Wt) Cobalt (Co)	mg/kg	0.0041	0.0031	0.0013	A385672
Total (Wet Wt) Copper (Cu)	mg/kg	0.487	0.607	0.010	A385672
Total (Wet Wt) Iron (Fe)	mg/kg	4.68	6.23	0.25	A385672
Total (Wet Wt) Lead (Pb)	mg/kg	0.0016	0.0088	0.0010	A385672
Total (Wet Wt) Magnesium (Mg)	mg/kg	307	289	0.40	A385672
Total (Wet Wt) Manganese (Mn)	mg/kg	0.060	0.084	0.010	A385672
Total (Wet Wt) Mercury (Hg)	mg/kg	0.0478	0.0394	0.0020	A385672
Total (Wet Wt) Molybdenum (Mo)	mg/kg	<0.0040	<0.0040	0.0040	A385672
Total (Wet Wt) Nickel (Ni)	mg/kg	<0.010	0.022	0.010	A385672
Total (Wet Wt) Phosphorus (P)	mg/kg	3050	2980	2.0	A385672
Total (Wet Wt) Potassium (K)	mg/kg	4520	4550	2.0	A385672
Total (Wet Wt) Selenium (Se)	mg/kg	0.438	0.404	0.010	A385672
Total (Wet Wt) Silver (Ag)	mg/kg	<0.0010	<0.0010	0.0010	A385672
Total (Wet Wt) Sodium (Na)	mg/kg	274	292	2.0	A385672
Total (Wet Wt) Strontium (Sr)	mg/kg	0.103	0.127	0.010	A385672
Total (Wet Wt) Thallium (Tl)	mg/kg	0.00199	0.00270	0.00040	A385672
Total (Wet Wt) Tin (Sn)	mg/kg	<0.020	<0.020	0.020	A385672
Total (Wet Wt) Titanium (Ti)	mg/kg	0.431	0.424	0.020	A385672
Total (Wet Wt) Uranium (U)	mg/kg	<0.00040	<0.00040	0.00040	A385672
Total (Wet Wt) Vanadium (V)	mg/kg	<0.020	<0.020	0.020	A385672
Total (Wet Wt) Zinc (Zn)	mg/kg	4.57	4.44	0.040	A385672
RDL = Reportable Detection Limit					

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Bureau Veritas Job #: C171211
Report Date: 2022/01/05

GOLDER ASSOCIATES LTD
Client Project #: 1663724
Site Location: 44000/03 BAFFINLAND IRON MINE
Sampler Initials: BC

ELEMENTS BY ATOMIC SPECTROSCOPY - WET WT (TISSUE)

Bureau Veritas ID		AGU172		AGU172		
Sampling Date		2021/08/07 15:12		2021/08/07 15:12		
COC Number		08497711		08497711		
	UNITS	**BAFF21UMLNGN06ARCH09**	**QC Batch**	**BAFF21UMLNGN06ARCH09 REPEAT**	**RDL**	**QC Batch**
Total Metals by ICPMS						
Total (Wet Wt) Aluminum (Al)	mg/kg	6.43	A372381	9.78	0.50	A415877
Total (Wet Wt) Antimony (Sb)	mg/kg	0.0038	A372381	0.0052	0.0020	A415877
Total (Wet Wt) Arsenic (As)	mg/kg	0.0974	A372381	0.105	0.0050	A415877
Total (Wet Wt) Barium (Ba)	mg/kg	0.112	A372381	0.134	0.010	A415877
Total (Wet Wt) Beryllium (Be)	mg/kg	<0.0020	A372381	<0.0020	0.0020	A415877
Total (Wet Wt) Bismuth (Bi)	mg/kg	<0.0013	A372381	<0.0013	0.0013	A415877
Total (Wet Wt) Boron (B)	mg/kg	0.22	A372381	0.32	0.20	A415877
Total (Wet Wt) Cadmium (Cd)	mg/kg	<0.0013	A372381	<0.0013	0.0013	A415877
Total (Wet Wt) Calcium (Ca)	mg/kg	439	A372381	323	4.0	A415877
Total (Wet Wt) Chromium (Cr)	mg/kg	0.115	A372381	0.106	0.025	A415877
Total (Wet Wt) Cobalt (Co)	mg/kg	0.0135	A372381	0.0206	0.0013	A415877
Total (Wet Wt) Copper (Cu)	mg/kg	0.475	A372381	0.342	0.013	A415877
Total (Wet Wt) Iron (Fe)	mg/kg	89.9	A372381	84.4	0.25	A415877
Total (Wet Wt) Lead (Pb)	mg/kg	0.0379	A372381	0.0868	0.0013	A415877
Total (Wet Wt) Magnesium (Mg)	mg/kg	378	A372381	376	0.40	A415877
Total (Wet Wt) Manganese (Mn)	mg/kg	0.576	A372381	0.582	0.010	A415877
Total (Wet Wt) Mercury (Hg)	mg/kg	0.063	A372381	0.054	0.013	A415877
Total (Wet Wt) Molybdenum (Mo)	mg/kg	0.0122	A372381	0.0121	0.0080	A415877
Total (Wet Wt) Nickel (Ni)	mg/kg	0.049	A372381	0.055	0.010	A415877
Total (Wet Wt) Phosphorus (P)	mg/kg	3120	A372381	2900	2.0	A415877
Total (Wet Wt) Potassium (K)	mg/kg	4810	A372381	4560	2.5	A415877
Total (Wet Wt) Selenium (Se)	mg/kg	0.186	A372381	0.179	0.010	A415877
Total (Wet Wt) Silver (Ag)	mg/kg	<0.0013	A372381	<0.0013	0.0013	A415877
Total (Wet Wt) Sodium (Na)	mg/kg	428	A372381	416	2.5	A415877
Total (Wet Wt) Strontium (Sr)	mg/kg	0.181	A372381	0.171	0.013	A415877
Total (Wet Wt) Thallium (Tl)	mg/kg	0.00854	A372381	0.00882	0.00040	A415877
Total (Wet Wt) Tin (Sn)	mg/kg	0.045	A372381	0.093	0.020	A415877
Total (Wet Wt) Titanium (Ti)	mg/kg	0.55	A372381	1.55	0.13	A415877
Total (Wet Wt) Uranium (U)	mg/kg	0.00817	A372381	0.00730	0.00040	A415877
Total (Wet Wt) Vanadium (V)	mg/kg	<0.020	A372381	<0.020	0.020	A415877
Total (Wet Wt) Zinc (Zn)	mg/kg	9.34	A372381	10.3	0.20	A415877
RDL = Reportable Detection Limit						

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Bureau Veritas Job #: C171211
Report Date: 2022/01/05

GOLDER ASSOCIATES LTD
Client Project #: 1663724
Site Location: 44000/03 BAFFINLAND IRON MINE
Sampler Initials: BC

ELEMENTS BY ATOMIC SPECTROSCOPY - WET WT (TISSUE)

Bureau Veritas ID		AGU173	AGU174	AGU175		
Sampling Date		2021/08/10 09:00	2021/08/11 16:09	2021/08/17 12:50		
COC Number		08497711	08497711	08497711		
	UNITS	**BAFF21UMLNGN09ARCH03**	**BAFF21UMLNGN10ARCH10**	**BAFF21UMLNGN20ARCH02**	**RDL**	**QC Batch**
Total Metals by ICPMS						
Total (Wet Wt) Aluminum (Al)	mg/kg	<0.20	<0.20	<0.20	0.20	A385672
Total (Wet Wt) Antimony (Sb)	mg/kg	<0.0010	<0.0010	0.0013	0.0010	A385672
Total (Wet Wt) Arsenic (As)	mg/kg	4.25	2.65	3.84	0.0040	A385672
Total (Wet Wt) Barium (Ba)	mg/kg	<0.010	<0.010	<0.010	0.010	A385672
Total (Wet Wt) Beryllium (Be)	mg/kg	<0.0010	<0.0010	<0.0010	0.0010	A385672
Total (Wet Wt) Bismuth (Bi)	mg/kg	<0.0010	<0.0010	<0.0010	0.0010	A385672
Total (Wet Wt) Boron (B)	mg/kg	<0.20	<0.20	<0.20	0.20	A385672
Total (Wet Wt) Cadmium (Cd)	mg/kg	<0.0010	0.0018	0.0019	0.0010	A385672
Total (Wet Wt) Calcium (Ca)	mg/kg	425	136	154	2.0	A385672
Total (Wet Wt) Chromium (Cr)	mg/kg	<0.010	<0.010	<0.010	0.010	A385672
Total (Wet Wt) Cobalt (Co)	mg/kg	0.0036	0.0031	0.0030	0.0013	A385672
Total (Wet Wt) Copper (Cu)	mg/kg	0.358	0.386	0.299	0.010	A385672
Total (Wet Wt) Iron (Fe)	mg/kg	3.11	3.49	3.41	0.25	A385672
Total (Wet Wt) Lead (Pb)	mg/kg	<0.0010	<0.0010	0.0041	0.0010	A385672
Total (Wet Wt) Magnesium (Mg)	mg/kg	270	324	332	0.40	A385672
Total (Wet Wt) Manganese (Mn)	mg/kg	0.133	0.083	0.079	0.010	A385672
Total (Wet Wt) Mercury (Hg)	mg/kg	0.0421	0.0334	0.0304	0.0020	A385672
Total (Wet Wt) Molybdenum (Mo)	mg/kg	<0.0040	<0.0040	<0.0040	0.0040	A385672
Total (Wet Wt) Nickel (Ni)	mg/kg	<0.010	<0.010	<0.010	0.010	A385672
Total (Wet Wt) Phosphorus (P)	mg/kg	2980	3240	3270	2.0	A385672
Total (Wet Wt) Potassium (K)	mg/kg	4030	5010	4740	2.0	A385672
Total (Wet Wt) Selenium (Se)	mg/kg	0.403	0.447	0.468	0.010	A385672
Total (Wet Wt) Silver (Ag)	mg/kg	<0.0010	<0.0010	<0.0010	0.0010	A385672
Total (Wet Wt) Sodium (Na)	mg/kg	289	235	268	2.0	A385672
Total (Wet Wt) Strontium (Sr)	mg/kg	1.12	0.397	0.287	0.010	A385672
Total (Wet Wt) Thallium (Tl)	mg/kg	0.00236	0.00228	0.00149	0.00040	A385672
Total (Wet Wt) Tin (Sn)	mg/kg	<0.020	<0.020	<0.020	0.020	A385672
Total (Wet Wt) Titanium (Ti)	mg/kg	0.423	0.434	0.450	0.020	A385672
Total (Wet Wt) Uranium (U)	mg/kg	<0.00040	<0.00040	<0.00040	0.00040	A385672
Total (Wet Wt) Vanadium (V)	mg/kg	<0.020	<0.020	<0.020	0.020	A385672
Total (Wet Wt) Zinc (Zn)	mg/kg	5.09	4.48	4.39	0.040	A385672

RDL = Reportable Detection Limit

Bureau Veritas Laboratories Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

ELEMENTS BY ATOMIC SPECTROSCOPY - WET WT (TISSUE)

Bureau Veritas ID		AGU176	AGU177		
Sampling Date		2021/08/18 16:15	2021/08/18 16:15		
COC Number		08497711	08497711		
	UNITS	**BAFF21UMLNGN25ARCH03**	**BAFF21UMLNGN25ARCH05**	**RDL**	**QC Batch**
Total Metals by ICPMS					
Total (Wet Wt) Aluminum (Al)	mg/kg	<0.20	<0.20	0.20	A385672
Total (Wet Wt) Antimony (Sb)	mg/kg	<0.0010	<0.0010	0.0010	A385672
Total (Wet Wt) Arsenic (As)	mg/kg	0.496	0.687	0.0040	A385672
Total (Wet Wt) Barium (Ba)	mg/kg	<0.010	<0.010	0.010	A385672
Total (Wet Wt) Beryllium (Be)	mg/kg	<0.0010	<0.0010	0.0010	A385672
Total (Wet Wt) Bismuth (Bi)	mg/kg	<0.0010	<0.0010	0.0010	A385672
Total (Wet Wt) Boron (B)	mg/kg	<0.20	<0.20	0.20	A385672
Total (Wet Wt) Cadmium (Cd)	mg/kg	0.0020	<0.0010	0.0010	A385672
Total (Wet Wt) Calcium (Ca)	mg/kg	227	122	2.0	A385672
Total (Wet Wt) Chromium (Cr)	mg/kg	0.012	<0.010	0.010	A385672
Total (Wet Wt) Cobalt (Co)	mg/kg	0.0084	0.0047	0.0013	A385672
Total (Wet Wt) Copper (Cu)	mg/kg	0.370	0.484	0.010	A385672
Total (Wet Wt) Iron (Fe)	mg/kg	3.79	4.15	0.25	A385672
Total (Wet Wt) Lead (Pb)	mg/kg	0.0061	0.0017	0.0010	A385672
Total (Wet Wt) Magnesium (Mg)	mg/kg	311	304	0.40	A385672
Total (Wet Wt) Manganese (Mn)	mg/kg	0.075	0.092	0.010	A385672
Total (Wet Wt) Mercury (Hg)	mg/kg	0.0604	0.0245	0.0020	A385672
Total (Wet Wt) Molybdenum (Mo)	mg/kg	<0.0040	<0.0040	0.0040	A385672
Total (Wet Wt) Nickel (Ni)	mg/kg	<0.010	<0.010	0.010	A385672
Total (Wet Wt) Phosphorus (P)	mg/kg	3370	3230	2.0	A385672
Total (Wet Wt) Potassium (K)	mg/kg	4370	4500	2.0	A385672
Total (Wet Wt) Selenium (Se)	mg/kg	0.480	0.343	0.010	A385672
Total (Wet Wt) Silver (Ag)	mg/kg	<0.0010	<0.0010	0.0010	A385672
Total (Wet Wt) Sodium (Na)	mg/kg	334	250	2.0	A385672
Total (Wet Wt) Strontium (Sr)	mg/kg	0.340	0.231	0.010	A385672
Total (Wet Wt) Thallium (Tl)	mg/kg	0.00396	0.00239	0.00040	A385672
Total (Wet Wt) Tin (Sn)	mg/kg	<0.020	<0.020	0.020	A385672
Total (Wet Wt) Titanium (Ti)	mg/kg	0.473	0.449	0.020	A385672
Total (Wet Wt) Uranium (U)	mg/kg	<0.00040	<0.00040	0.00040	A385672
Total (Wet Wt) Vanadium (V)	mg/kg	<0.020	<0.020	0.020	A385672
Total (Wet Wt) Zinc (Zn)	mg/kg	5.58	6.09	0.040	A385672
RDL = Reportable Detection Limit					

PHYSICAL TESTING (TISSUE)

Bureau Veritas ID		AGP039	AGP040	AGU164		
Sampling Date		2021/08/08 13:40	2021/08/08 14:33	2021/08/09 11:22		
COC Number		08497711	08497711	08497711		
	UNITS	BAFF21UMLNFRSC1003	BAFF21UMLNFRSC1006	BAFF21UMLNFRSC1019	RDL	QC Batch
Physical Properties						
Moisture	%	77	78	78	0.30	A382831
RDL = Reportable Detection Limit						

Bureau Veritas ID		AGU165		AGU166		AGU167		
Sampling Date		2021/08/09 14:53		2021/08/10 12:32		2021/08/10 12:50		
COC Number		08497711		08497711		08497711		
	UNITS	BAFF21UMLNFRSC1029	QC Batch	BAFF21UMLNFRSC1030	QC Batch	BAFF21UMLNFRSC1031	RDL	QC Batch
Physical Properties								
Moisture	%	78	A382831	79	A371604	78	0.30	A382831
RDL = Reportable Detection Limit								

Bureau Veritas ID		AGU168	AGU169	AGU170	AGU171		
Sampling Date		2021/08/10 13:22	2021/08/10 14:24	2021/08/06 13:28	2021/08/06 14:58		
COC Number		08497711	08497711	08497711	08497711		
	UNITS	BAFF21UMLNFRSC1033	BAFF21UMLNFRSC1036	BAFF21UMLNGN03AR CH03	BAFF21UMLNGN05AR CH03	RDL	QC Batch
Physical Properties							
Moisture	%	76	80	73	74	0.30	A382831
RDL = Reportable Detection Limit							

Bureau Veritas ID		AGU172		AGU173	AGU174		
Sampling Date		2021/08/07 15:12		2021/08/10 09:00	2021/08/11 16:09		
COC Number		08497711		08497711	08497711		
	UNITS	BAFF21UMLNGN06AR CH09	QC Batch	BAFF21UMLNGN09AR CH03	BAFF21UMLNGN10AR CH10	RDL	QC Batch
Physical Properties							
Moisture	%	75	A371604	69	75	0.30	A382831
RDL = Reportable Detection Limit							

Bureau Veritas ID		AGU175	AGU176	AGU177		
Sampling Date		2021/08/17 12:50	2021/08/18 16:15	2021/08/18 16:15		
COC Number		08497711	08497711	08497711		
	UNITS	BAFF21UMLNGN20AR CH02	BAFF21UMLNGN25AR CH03	BAFF21UMLNGN25AR CH05	RDL	QC Batch
Physical Properties						
Moisture	%	74	74	73	0.30	A382831
RDL = Reportable Detection Limit						

GENERAL COMMENTS

Sample AGP039 [BAFF21UMLNFRSC1003] : Version #4: Report reissued to include additional results for metals on sample AGU172 (BAFF21UMLNGN06ARCH09) due to request for re-analysis by client. Both sets of data are reported.

Results relate only to the items tested.

Bureau Veritas Laboratories Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas Job #: C171211
Report Date: 2022/01/05

GOLDER ASSOCIATES LTD
Client Project #: 1663724
Site Location: 44000/03 BAFFINLAND IRON MINE
Sampler Initials: BC

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
A371604	CG5	RPD	Moisture	2021/10/09	0.13		%	20
A372381	SOM	QC Standard	Total (Wet Wt) Aluminum (Al)	2021/10/12		102	%	N/A
			Total (Wet Wt) Arsenic (As)	2021/10/12		93	%	N/A
			Total (Wet Wt) Cadmium (Cd)	2021/10/12		91	%	N/A
			Total (Wet Wt) Chromium (Cr)	2021/10/12		84	%	N/A
			Total (Wet Wt) Cobalt (Co)	2021/10/12		92	%	N/A
			Total (Wet Wt) Copper (Cu)	2021/10/12		90	%	N/A
			Total (Wet Wt) Iron (Fe)	2021/10/12		94	%	N/A
			Total (Wet Wt) Lead (Pb)	2021/10/12		56 (1)	%	N/A
			Total (Wet Wt) Mercury (Hg)	2021/10/12		90	%	N/A
			Total (Wet Wt) Molybdenum (Mo)	2021/10/12		93	%	N/A
			Total (Wet Wt) Nickel (Ni)	2021/10/12		83	%	N/A
			Total (Wet Wt) Phosphorus (P)	2021/10/12		91	%	N/A
			Total (Wet Wt) Selenium (Se)	2021/10/12		97	%	N/A
			Total (Wet Wt) Sodium (Na)	2021/10/12		98	%	N/A
			Total (Wet Wt) Uranium (U)	2021/10/12		105	%	N/A
			Total (Wet Wt) Zinc (Zn)	2021/10/12		90	%	N/A
A372381	SOM	Spiked Blank	Total (Wet Wt) Aluminum (Al)	2021/10/16		101	%	80 - 120
			Total (Wet Wt) Antimony (Sb)	2021/10/16		102	%	80 - 120
			Total (Wet Wt) Arsenic (As)	2021/10/16		100	%	80 - 120
			Total (Wet Wt) Barium (Ba)	2021/10/16		100	%	80 - 120
			Total (Wet Wt) Beryllium (Be)	2021/10/16		96	%	80 - 120
			Total (Wet Wt) Bismuth (Bi)	2021/10/16		101	%	80 - 120
			Total (Wet Wt) Boron (B)	2021/10/16		99	%	80 - 120
			Total (Wet Wt) Cadmium (Cd)	2021/10/16		98	%	80 - 120
			Total (Wet Wt) Calcium (Ca)	2021/10/16		102	%	80 - 120
			Total (Wet Wt) Chromium (Cr)	2021/10/16		99	%	80 - 120
			Total (Wet Wt) Cobalt (Co)	2021/10/16		102	%	80 - 120
			Total (Wet Wt) Copper (Cu)	2021/10/16		102	%	80 - 120
			Total (Wet Wt) Iron (Fe)	2021/10/16		108	%	80 - 120
			Total (Wet Wt) Lead (Pb)	2021/10/16		101	%	80 - 120
			Total (Wet Wt) Magnesium (Mg)	2021/10/16		106	%	80 - 120
			Total (Wet Wt) Manganese (Mn)	2021/10/16		99	%	80 - 120
			Total (Wet Wt) Mercury (Hg)	2021/10/16		107	%	80 - 120
			Total (Wet Wt) Molybdenum (Mo)	2021/10/16		103	%	80 - 120
			Total (Wet Wt) Nickel (Ni)	2021/10/16		100	%	80 - 120
			Total (Wet Wt) Phosphorus (P)	2021/10/16		99	%	80 - 120
			Total (Wet Wt) Potassium (K)	2021/10/16		106	%	80 - 120
			Total (Wet Wt) Selenium (Se)	2021/10/16		101	%	80 - 120
			Total (Wet Wt) Silver (Ag)	2021/10/16		100	%	80 - 120
			Total (Wet Wt) Sodium (Na)	2021/10/16		106	%	80 - 120
			Total (Wet Wt) Strontium (Sr)	2021/10/16		101	%	80 - 120
			Total (Wet Wt) Thallium (Tl)	2021/10/16		103	%	80 - 120
			Total (Wet Wt) Tin (Sn)	2021/10/16		102	%	80 - 120
			Total (Wet Wt) Titanium (Ti)	2021/10/16		101	%	80 - 120
			Total (Wet Wt) Uranium (U)	2021/10/16		106	%	80 - 120
			Total (Wet Wt) Vanadium (V)	2021/10/16		97	%	80 - 120
			Total (Wet Wt) Zinc (Zn)	2021/10/16		95	%	80 - 120
A372381	SOM	Method Blank	Total (Wet Wt) Aluminum (Al)	2021/10/16	<0.50		mg/kg	
			Total (Wet Wt) Antimony (Sb)	2021/10/16	<0.0020		mg/kg	
			Total (Wet Wt) Arsenic (As)	2021/10/16	<0.0050		mg/kg	
			Total (Wet Wt) Barium (Ba)	2021/10/16	<0.010		mg/kg	
			Total (Wet Wt) Beryllium (Be)	2021/10/16	<0.0020		mg/kg	

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GOLDER ASSOCIATES LTD
Client Project #: 1663724
Site Location: 44000/03 BAFFINLAND IRON MINE
Sampler Initials: BC

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total (Wet Wt) Bismuth (Bi)	2021/10/16	<0.0013		mg/kg	
			Total (Wet Wt) Boron (B)	2021/10/16	<0.20		mg/kg	
			Total (Wet Wt) Cadmium (Cd)	2021/10/16	<0.0013		mg/kg	
			Total (Wet Wt) Calcium (Ca)	2021/10/16	<4.0		mg/kg	
			Total (Wet Wt) Chromium (Cr)	2021/10/16	<0.025		mg/kg	
			Total (Wet Wt) Cobalt (Co)	2021/10/16	<0.0013		mg/kg	
			Total (Wet Wt) Copper (Cu)	2021/10/16	<0.013		mg/kg	
			Total (Wet Wt) Iron (Fe)	2021/10/16	<0.25		mg/kg	
			Total (Wet Wt) Lead (Pb)	2021/10/16	<0.0013		mg/kg	
			Total (Wet Wt) Magnesium (Mg)	2021/10/16	<0.40		mg/kg	
			Total (Wet Wt) Manganese (Mn)	2021/10/16	<0.010		mg/kg	
			Total (Wet Wt) Mercury (Hg)	2021/10/16	<0.013		mg/kg	
			Total (Wet Wt) Molybdenum (Mo)	2021/10/16	<0.0080		mg/kg	
			Total (Wet Wt) Nickel (Ni)	2021/10/16	<0.010		mg/kg	
			Total (Wet Wt) Phosphorus (P)	2021/10/16	<2.0		mg/kg	
			Total (Wet Wt) Potassium (K)	2021/10/16	<2.5		mg/kg	
			Total (Wet Wt) Selenium (Se)	2021/10/16	<0.010		mg/kg	
			Total (Wet Wt) Silver (Ag)	2021/10/16	<0.0013		mg/kg	
			Total (Wet Wt) Sodium (Na)	2021/10/16	<2.5		mg/kg	
			Total (Wet Wt) Strontium (Sr)	2021/10/16	<0.013		mg/kg	
			Total (Wet Wt) Thallium (Tl)	2021/10/16	<0.00040		mg/kg	
			Total (Wet Wt) Tin (Sn)	2021/10/16	<0.020		mg/kg	
			Total (Wet Wt) Titanium (Ti)	2021/10/16	<0.13		mg/kg	
			Total (Wet Wt) Uranium (U)	2021/10/16	<0.00040		mg/kg	
			Total (Wet Wt) Vanadium (V)	2021/10/16	<0.020		mg/kg	
			Total (Wet Wt) Zinc (Zn)	2021/10/16	<0.20		mg/kg	
A372381	SOM	RPD	Total (Wet Wt) Aluminum (Al)	2021/10/16	14		%	40
			Total (Wet Wt) Antimony (Sb)	2021/10/16	5.8		%	40
			Total (Wet Wt) Arsenic (As)	2021/10/16	6.1		%	40
			Total (Wet Wt) Barium (Ba)	2021/10/16	4.7		%	40
			Total (Wet Wt) Beryllium (Be)	2021/10/16	12		%	40
			Total (Wet Wt) Bismuth (Bi)	2021/10/16	32		%	40
			Total (Wet Wt) Boron (B)	2021/10/16	NC		%	40
			Total (Wet Wt) Cadmium (Cd)	2021/10/16	4.8		%	40
			Total (Wet Wt) Calcium (Ca)	2021/10/16	29		%	60
			Total (Wet Wt) Chromium (Cr)	2021/10/16	40		%	40
			Total (Wet Wt) Cobalt (Co)	2021/10/16	5.6		%	40
			Total (Wet Wt) Copper (Cu)	2021/10/16	3.0		%	40
			Total (Wet Wt) Iron (Fe)	2021/10/16	1.6		%	40
			Total (Wet Wt) Lead (Pb)	2021/10/16	24		%	40
			Total (Wet Wt) Magnesium (Mg)	2021/10/16	13		%	40
			Total (Wet Wt) Manganese (Mn)	2021/10/16	4.5		%	40
			Total (Wet Wt) Mercury (Hg)	2021/10/16	NC		%	40
			Total (Wet Wt) Molybdenum (Mo)	2021/10/16	4.5		%	40
			Total (Wet Wt) Nickel (Ni)	2021/10/16	18		%	40
			Total (Wet Wt) Phosphorus (P)	2021/10/16	1.1		%	40
			Total (Wet Wt) Potassium (K)	2021/10/16	1.1		%	40
			Total (Wet Wt) Selenium (Se)	2021/10/16	0.066		%	40
			Total (Wet Wt) Silver (Ag)	2021/10/16	5.9		%	40
			Total (Wet Wt) Sodium (Na)	2021/10/16	1.2		%	40
			Total (Wet Wt) Strontium (Sr)	2021/10/16	23		%	60
			Total (Wet Wt) Thallium (Tl)	2021/10/16	4.3		%	40
			Total (Wet Wt) Tin (Sn)	2021/10/16	6.0		%	40

Bureau Veritas Job #: C171211
Report Date: 2022/01/05

GOLDER ASSOCIATES LTD
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Site Location: 44000/03 BAFFINLAND IRON MINE
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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total (Wet Wt) Titanium (Ti)	2021/10/16	3.4		%	40
			Total (Wet Wt) Uranium (U)	2021/10/16	3.5		%	40
			Total (Wet Wt) Vanadium (V)	2021/10/16	1.5		%	40
			Total (Wet Wt) Zinc (Zn)	2021/10/16	11		%	40
A382831	CG5	RPD	Moisture	2021/10/13	1.8		%	20
A385672	JLP	Matrix Spike [AGU170-01]	Total (Wet Wt) Aluminum (Al)	2021/10/21		97	%	75 - 125
			Total (Wet Wt) Antimony (Sb)	2021/10/21		96	%	75 - 125
			Total (Wet Wt) Arsenic (As)	2021/10/21		119	%	75 - 125
			Total (Wet Wt) Barium (Ba)	2021/10/21		94	%	75 - 125
			Total (Wet Wt) Beryllium (Be)	2021/10/21		93	%	75 - 125
			Total (Wet Wt) Bismuth (Bi)	2021/10/21		92	%	75 - 125
			Total (Wet Wt) Boron (B)	2021/10/21		96	%	75 - 125
			Total (Wet Wt) Cadmium (Cd)	2021/10/21		95	%	75 - 125
			Total (Wet Wt) Calcium (Ca)	2021/10/21		83	%	75 - 125
			Total (Wet Wt) Chromium (Cr)	2021/10/21		90	%	75 - 125
			Total (Wet Wt) Cobalt (Co)	2021/10/21		88	%	75 - 125
			Total (Wet Wt) Copper (Cu)	2021/10/21		94	%	75 - 125
			Total (Wet Wt) Iron (Fe)	2021/10/21		104	%	75 - 125
			Total (Wet Wt) Lead (Pb)	2021/10/21		93	%	75 - 125
			Total (Wet Wt) Magnesium (Mg)	2021/10/21		110	%	75 - 125
			Total (Wet Wt) Manganese (Mn)	2021/10/21		92	%	75 - 125
			Total (Wet Wt) Mercury (Hg)	2021/10/21		113	%	75 - 125
			Total (Wet Wt) Molybdenum (Mo)	2021/10/21		102	%	75 - 125
			Total (Wet Wt) Nickel (Ni)	2021/10/21		87	%	75 - 125
			Total (Wet Wt) Phosphorus (P)	2021/10/21		109	%	75 - 125
			Total (Wet Wt) Potassium (K)	2021/10/21		NC	%	75 - 125
			Total (Wet Wt) Selenium (Se)	2021/10/21		107	%	75 - 125
			Total (Wet Wt) Silver (Ag)	2021/10/21		91	%	75 - 125
			Total (Wet Wt) Sodium (Na)	2021/10/21		97	%	75 - 125
			Total (Wet Wt) Strontium (Sr)	2021/10/21		97	%	75 - 125
			Total (Wet Wt) Thallium (Tl)	2021/10/21		94	%	75 - 125
			Total (Wet Wt) Tin (Sn)	2021/10/21		101	%	75 - 125
			Total (Wet Wt) Titanium (Ti)	2021/10/21		89	%	75 - 125
			Total (Wet Wt) Uranium (U)	2021/10/21		100	%	75 - 125
			Total (Wet Wt) Vanadium (V)	2021/10/21		91	%	75 - 125
			Total (Wet Wt) Zinc (Zn)	2021/10/21		111	%	75 - 125
A385672	JLP	QC Standard	Total (Wet Wt) Aluminum (Al)	2021/10/21		107	%	75 - 125
			Total (Wet Wt) Arsenic (As)	2021/10/21		104	%	75 - 125
			Total (Wet Wt) Cadmium (Cd)	2021/10/21		101	%	75 - 125
			Total (Wet Wt) Chromium (Cr)	2021/10/21		81	%	75 - 125
			Total (Wet Wt) Cobalt (Co)	2021/10/21		96	%	75 - 125
			Total (Wet Wt) Copper (Cu)	2021/10/21		92	%	75 - 125
			Total (Wet Wt) Iron (Fe)	2021/10/21		102	%	75 - 125
			Total (Wet Wt) Lead (Pb)	2021/10/21		66 (2)	%	75 - 125
			Total (Wet Wt) Mercury (Hg)	2021/10/21		96	%	75 - 125
			Total (Wet Wt) Molybdenum (Mo)	2021/10/21		103	%	75 - 125
			Total (Wet Wt) Nickel (Ni)	2021/10/21		90	%	75 - 125
			Total (Wet Wt) Phosphorus (P)	2021/10/21		98	%	75 - 125
			Total (Wet Wt) Selenium (Se)	2021/10/21		102	%	75 - 125
			Total (Wet Wt) Sodium (Na)	2021/10/21		102	%	75 - 125
			Total (Wet Wt) Uranium (U)	2021/10/21		104	%	75 - 125
			Total (Wet Wt) Zinc (Zn)	2021/10/21		94	%	75 - 125

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
A385672	JLP	Spiked Blank	Total (Wet Wt) Aluminum (Al)	2021/10/21		106	%	75 - 125
			Total (Wet Wt) Antimony (Sb)	2021/10/21		101	%	75 - 125
			Total (Wet Wt) Arsenic (As)	2021/10/21		100	%	75 - 125
			Total (Wet Wt) Barium (Ba)	2021/10/21		98	%	75 - 125
			Total (Wet Wt) Beryllium (Be)	2021/10/21		100	%	75 - 125
			Total (Wet Wt) Bismuth (Bi)	2021/10/21		99	%	75 - 125
			Total (Wet Wt) Boron (B)	2021/10/21		101	%	75 - 125
			Total (Wet Wt) Cadmium (Cd)	2021/10/21		97	%	75 - 125
			Total (Wet Wt) Calcium (Ca)	2021/10/21		103	%	75 - 125
			Total (Wet Wt) Chromium (Cr)	2021/10/21		99	%	75 - 125
			Total (Wet Wt) Cobalt (Co)	2021/10/21		98	%	75 - 125
			Total (Wet Wt) Copper (Cu)	2021/10/21		97	%	75 - 125
			Total (Wet Wt) Iron (Fe)	2021/10/21		106	%	75 - 125
			Total (Wet Wt) Lead (Pb)	2021/10/21		101	%	75 - 125
			Total (Wet Wt) Magnesium (Mg)	2021/10/21		108	%	75 - 125
			Total (Wet Wt) Manganese (Mn)	2021/10/21		100	%	75 - 125
			Total (Wet Wt) Mercury (Hg)	2021/10/21		96	%	75 - 125
			Total (Wet Wt) Molybdenum (Mo)	2021/10/21		106	%	75 - 125
			Total (Wet Wt) Nickel (Ni)	2021/10/21		99	%	75 - 125
			Total (Wet Wt) Phosphorus (P)	2021/10/21		101	%	75 - 125
			Total (Wet Wt) Potassium (K)	2021/10/21		103	%	75 - 125
			Total (Wet Wt) Selenium (Se)	2021/10/21		99	%	75 - 125
			Total (Wet Wt) Silver (Ag)	2021/10/21		96	%	75 - 125
			Total (Wet Wt) Sodium (Na)	2021/10/21		105	%	75 - 125
			Total (Wet Wt) Strontium (Sr)	2021/10/21		100	%	75 - 125
			Total (Wet Wt) Thallium (Tl)	2021/10/21		98	%	75 - 125
			Total (Wet Wt) Tin (Sn)	2021/10/21		102	%	75 - 125
			Total (Wet Wt) Titanium (Ti)	2021/10/21		102	%	75 - 125
			Total (Wet Wt) Uranium (U)	2021/10/21		106	%	75 - 125
			Total (Wet Wt) Vanadium (V)	2021/10/21		99	%	75 - 125
			Total (Wet Wt) Zinc (Zn)	2021/10/21		99	%	75 - 125
A385672	JLP	Method Blank	Total (Wet Wt) Aluminum (Al)	2021/10/21	<0.20		mg/kg	
			Total (Wet Wt) Antimony (Sb)	2021/10/21	<0.0010		mg/kg	
			Total (Wet Wt) Arsenic (As)	2021/10/21	<0.0040		mg/kg	
			Total (Wet Wt) Barium (Ba)	2021/10/21	<0.010		mg/kg	
			Total (Wet Wt) Beryllium (Be)	2021/10/21	<0.0010		mg/kg	
			Total (Wet Wt) Bismuth (Bi)	2021/10/21	<0.0010		mg/kg	
			Total (Wet Wt) Boron (B)	2021/10/21	<0.20		mg/kg	
			Total (Wet Wt) Cadmium (Cd)	2021/10/21	<0.0010		mg/kg	
			Total (Wet Wt) Calcium (Ca)	2021/10/21	<2.0		mg/kg	
			Total (Wet Wt) Chromium (Cr)	2021/10/21	<0.010		mg/kg	
			Total (Wet Wt) Cobalt (Co)	2021/10/21	<0.0013		mg/kg	
			Total (Wet Wt) Copper (Cu)	2021/10/21	<0.010		mg/kg	
			Total (Wet Wt) Iron (Fe)	2021/10/21	<0.25		mg/kg	
			Total (Wet Wt) Lead (Pb)	2021/10/21	<0.0010		mg/kg	
			Total (Wet Wt) Magnesium (Mg)	2021/10/21	<0.40		mg/kg	
			Total (Wet Wt) Manganese (Mn)	2021/10/21	<0.010		mg/kg	
			Total (Wet Wt) Mercury (Hg)	2021/10/21	<0.0020		mg/kg	
			Total (Wet Wt) Molybdenum (Mo)	2021/10/21	<0.0040		mg/kg	
			Total (Wet Wt) Nickel (Ni)	2021/10/21	<0.010		mg/kg	
			Total (Wet Wt) Phosphorus (P)	2021/10/21	<2.0		mg/kg	
			Total (Wet Wt) Potassium (K)	2021/10/21	<2.0		mg/kg	
			Total (Wet Wt) Selenium (Se)	2021/10/21	<0.010		mg/kg	

Bureau Veritas Job #: C171211
Report Date: 2022/01/05

GOLDER ASSOCIATES LTD
Client Project #: 1663724
Site Location: 44000/03 BAFFINLAND IRON MINE
Sampler Initials: BC

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total (Wet Wt) Silver (Ag)	2021/10/21	<0.0010		mg/kg	
			Total (Wet Wt) Sodium (Na)	2021/10/21	<2.0		mg/kg	
			Total (Wet Wt) Strontium (Sr)	2021/10/21	<0.010		mg/kg	
			Total (Wet Wt) Thallium (Tl)	2021/10/21	<0.00040		mg/kg	
			Total (Wet Wt) Tin (Sn)	2021/10/21	<0.020		mg/kg	
			Total (Wet Wt) Titanium (Ti)	2021/10/21	<0.020		mg/kg	
			Total (Wet Wt) Uranium (U)	2021/10/21	<0.00040		mg/kg	
			Total (Wet Wt) Vanadium (V)	2021/10/21	<0.020		mg/kg	
			Total (Wet Wt) Zinc (Zn)	2021/10/21	<0.040		mg/kg	
A385672	JLP	RPD [AGU170-01]	Total (Wet Wt) Aluminum (Al)	2021/10/21	1.7		%	40
			Total (Wet Wt) Antimony (Sb)	2021/10/21	21		%	40
			Total (Wet Wt) Arsenic (As)	2021/10/21	2.7		%	40
			Total (Wet Wt) Barium (Ba)	2021/10/21	NC		%	40
			Total (Wet Wt) Beryllium (Be)	2021/10/21	NC		%	40
			Total (Wet Wt) Bismuth (Bi)	2021/10/21	NC		%	40
			Total (Wet Wt) Boron (B)	2021/10/21	NC		%	40
			Total (Wet Wt) Cadmium (Cd)	2021/10/21	4.2		%	40
			Total (Wet Wt) Calcium (Ca)	2021/10/21	16		%	60
			Total (Wet Wt) Cesium (Cs)	2021/10/21	0.48		%	40
			Total (Wet Wt) Chromium (Cr)	2021/10/21	NC		%	40
			Total (Wet Wt) Cobalt (Co)	2021/10/21	11		%	40
			Total (Wet Wt) Copper (Cu)	2021/10/21	16		%	40
			Total (Wet Wt) Iron (Fe)	2021/10/21	16		%	40
			Total (Wet Wt) Lanthanum (La)	2021/10/21	NC		%	40
			Total (Wet Wt) Lead (Pb)	2021/10/21	32		%	40
			Total (Wet Wt) Lithium (Li)	2021/10/21	NC		%	40
			Total (Wet Wt) Magnesium (Mg)	2021/10/21	3.2		%	40
			Total (Wet Wt) Manganese (Mn)	2021/10/21	4.7		%	40
			Total (Wet Wt) Mercury (Hg)	2021/10/21	1.2		%	40
			Total (Wet Wt) Molybdenum (Mo)	2021/10/21	NC		%	40
			Total (Wet Wt) Nickel (Ni)	2021/10/21	NC		%	40
			Total (Wet Wt) Phosphorus (P)	2021/10/21	4.1		%	40
			Total (Wet Wt) Potassium (K)	2021/10/21	4.0		%	40
			Total (Wet Wt) Rubidium (Rb)	2021/10/21	0.93		%	40
			Total (Wet Wt) Selenium (Se)	2021/10/21	3.3		%	40
			Total (Wet Wt) Silicon (Si)	2021/10/21	NC		%	40
			Total (Wet Wt) Silver (Ag)	2021/10/21	NC		%	40
			Total (Wet Wt) Sodium (Na)	2021/10/21	2.6		%	40
			Total (Wet Wt) Strontium (Sr)	2021/10/21	20		%	60
			Total (Wet Wt) Sulphur (S)	2021/10/21	2.9		%	40
			Total (Wet Wt) Tellurium (Te)	2021/10/21	NC		%	40
			Total (Wet Wt) Thallium (Tl)	2021/10/21	3.5		%	40
			Total (Wet Wt) Thorium (Th)	2021/10/21	NC		%	40
			Total (Wet Wt) Tin (Sn)	2021/10/21	NC		%	40
			Total (Wet Wt) Titanium (Ti)	2021/10/21	7.0		%	40
			Total (Wet Wt) Tungsten (W)	2021/10/21	NC		%	40
			Total (Wet Wt) Uranium (U)	2021/10/21	NC		%	40
			Total (Wet Wt) Vanadium (V)	2021/10/21	NC		%	40
			Total (Wet Wt) Zinc (Zn)	2021/10/21	2.1		%	40
			Total (Wet Wt) Zirconium (Zr)	2021/10/21	NC		%	40
A415877	JLP	QC Standard	Total (Wet Wt) Aluminum (Al)	2021/11/17		108	%	N/A
			Total (Wet Wt) Arsenic (As)	2021/11/17		92	%	N/A
			Total (Wet Wt) Cadmium (Cd)	2021/11/17		96	%	N/A

Bureau Veritas Laboratories Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas Job #: C171211
Report Date: 2022/01/05

GOLDER ASSOCIATES LTD
Client Project #: 1663724
Site Location: 44000/03 BAFFINLAND IRON MINE
Sampler Initials: BC

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total (Wet Wt) Chromium (Cr)	2021/11/17		82	%	N/A
			Total (Wet Wt) Cobalt (Co)	2021/11/17		96	%	N/A
			Total (Wet Wt) Copper (Cu)	2021/11/17		89	%	N/A
			Total (Wet Wt) Iron (Fe)	2021/11/17		91	%	N/A
			Total (Wet Wt) Lead (Pb)	2021/11/17		61 (2)	%	N/A
			Total (Wet Wt) Mercury (Hg)	2021/11/17		85	%	N/A
			Total (Wet Wt) Molybdenum (Mo)	2021/11/17		98	%	N/A
			Total (Wet Wt) Nickel (Ni)	2021/11/17		85	%	N/A
			Total (Wet Wt) Phosphorus (P)	2021/11/17		87	%	N/A
			Total (Wet Wt) Selenium (Se)	2021/11/17		97	%	N/A
			Total (Wet Wt) Sodium (Na)	2021/11/17		97	%	N/A
			Total (Wet Wt) Uranium (U)	2021/11/17		125	%	N/A
			Total (Wet Wt) Zinc (Zn)	2021/11/17		89	%	N/A
A415877	JLP	Spiked Blank	Total (Wet Wt) Aluminum (Al)	2021/11/17		101	%	80 - 120
			Total (Wet Wt) Antimony (Sb)	2021/11/17		96	%	80 - 120
			Total (Wet Wt) Arsenic (As)	2021/11/17		97	%	80 - 120
			Total (Wet Wt) Barium (Ba)	2021/11/17		97	%	80 - 120
			Total (Wet Wt) Beryllium (Be)	2021/11/17		95	%	80 - 120
			Total (Wet Wt) Bismuth (Bi)	2021/11/17		96	%	80 - 120
			Total (Wet Wt) Boron (B)	2021/11/17		103	%	80 - 120
			Total (Wet Wt) Cadmium (Cd)	2021/11/17		94	%	80 - 120
			Total (Wet Wt) Calcium (Ca)	2021/11/17		100	%	80 - 120
			Total (Wet Wt) Chromium (Cr)	2021/11/17		98	%	80 - 120
			Total (Wet Wt) Cobalt (Co)	2021/11/17		100	%	80 - 120
			Total (Wet Wt) Copper (Cu)	2021/11/17		98	%	80 - 120
			Total (Wet Wt) Iron (Fe)	2021/11/17		101	%	80 - 120
			Total (Wet Wt) Lead (Pb)	2021/11/17		96	%	80 - 120
			Total (Wet Wt) Magnesium (Mg)	2021/11/17		106	%	80 - 120
			Total (Wet Wt) Manganese (Mn)	2021/11/17		100	%	80 - 120
			Total (Wet Wt) Mercury (Hg)	2021/11/17		99	%	80 - 120
			Total (Wet Wt) Molybdenum (Mo)	2021/11/17		103	%	80 - 120
			Total (Wet Wt) Nickel (Ni)	2021/11/17		101	%	80 - 120
			Total (Wet Wt) Phosphorus (P)	2021/11/17		94	%	80 - 120
			Total (Wet Wt) Potassium (K)	2021/11/17		99	%	80 - 120
			Total (Wet Wt) Selenium (Se)	2021/11/17		99	%	80 - 120
			Total (Wet Wt) Silver (Ag)	2021/11/17		95	%	80 - 120
			Total (Wet Wt) Sodium (Na)	2021/11/17		102	%	80 - 120
			Total (Wet Wt) Strontium (Sr)	2021/11/17		97	%	80 - 120
			Total (Wet Wt) Thallium (Tl)	2021/11/17		98	%	80 - 120
			Total (Wet Wt) Tin (Sn)	2021/11/17		102	%	80 - 120
			Total (Wet Wt) Titanium (Ti)	2021/11/17		103	%	80 - 120
			Total (Wet Wt) Uranium (U)	2021/11/17		98	%	80 - 120
			Total (Wet Wt) Vanadium (V)	2021/11/17		96	%	80 - 120
			Total (Wet Wt) Zinc (Zn)	2021/11/17		111	%	80 - 120
A415877	JLP	Method Blank	Total (Wet Wt) Aluminum (Al)	2021/11/17	<0.50		mg/kg	
			Total (Wet Wt) Antimony (Sb)	2021/11/17	<0.0020		mg/kg	
			Total (Wet Wt) Arsenic (As)	2021/11/17	<0.0050		mg/kg	
			Total (Wet Wt) Barium (Ba)	2021/11/17	<0.010		mg/kg	
			Total (Wet Wt) Beryllium (Be)	2021/11/17	<0.0020		mg/kg	
			Total (Wet Wt) Bismuth (Bi)	2021/11/17	<0.0013		mg/kg	
			Total (Wet Wt) Boron (B)	2021/11/17	<0.20		mg/kg	
			Total (Wet Wt) Cadmium (Cd)	2021/11/17	<0.0013		mg/kg	
			Total (Wet Wt) Calcium (Ca)	2021/11/17	<4.0		mg/kg	

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total (Wet Wt) Chromium (Cr)	2021/11/17	<0.025		mg/kg	
			Total (Wet Wt) Cobalt (Co)	2021/11/17	<0.0013		mg/kg	
			Total (Wet Wt) Copper (Cu)	2021/11/17	<0.013		mg/kg	
			Total (Wet Wt) Iron (Fe)	2021/11/17	<0.25		mg/kg	
			Total (Wet Wt) Lead (Pb)	2021/11/17	<0.0013		mg/kg	
			Total (Wet Wt) Magnesium (Mg)	2021/11/17	<0.40		mg/kg	
			Total (Wet Wt) Manganese (Mn)	2021/11/17	<0.010		mg/kg	
			Total (Wet Wt) Mercury (Hg)	2021/11/17	<0.013		mg/kg	
			Total (Wet Wt) Molybdenum (Mo)	2021/11/17	<0.0080		mg/kg	
			Total (Wet Wt) Nickel (Ni)	2021/11/17	<0.010		mg/kg	
			Total (Wet Wt) Phosphorus (P)	2021/11/17	<2.0		mg/kg	
			Total (Wet Wt) Potassium (K)	2021/11/17	<2.5		mg/kg	
			Total (Wet Wt) Selenium (Se)	2021/11/17	<0.010		mg/kg	
			Total (Wet Wt) Silver (Ag)	2021/11/17	<0.0013		mg/kg	
			Total (Wet Wt) Sodium (Na)	2021/11/17	<2.5		mg/kg	
			Total (Wet Wt) Strontium (Sr)	2021/11/17	<0.013		mg/kg	
			Total (Wet Wt) Thallium (Tl)	2021/11/17	<0.00040		mg/kg	
			Total (Wet Wt) Tin (Sn)	2021/11/17	<0.020		mg/kg	
			Total (Wet Wt) Titanium (Ti)	2021/11/17	<0.13		mg/kg	
			Total (Wet Wt) Uranium (U)	2021/11/17	<0.00040		mg/kg	
			Total (Wet Wt) Vanadium (V)	2021/11/17	<0.020		mg/kg	
			Total (Wet Wt) Zinc (Zn)	2021/11/17	<0.20		mg/kg	

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.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

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) Reference outside acceptance criteria due to digestion limitations. Re-analysis yields similar results.

(2) Reference material outside acceptance criteria due to digestion limitations.

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:

David Huang, M.Sc., P.Chem., QP, Scientific Services Manager

BV Labs 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 Signature Page.

Burnaby: 4606 Canada Way, Burnaby, BC V5G 1K5 Toll Free (800) 665 8566
Victoria: 460 Tennyson Place, Unit 1, Victoria, BC V8Z 6S8 Toll Free (866) 385-6112
bvlabs.com

CHAIN OF CUSTODY RECORD

Page 1 of 2

Invoice Information		Report Information (if differs from invoice)		Project Information	
Company:	Golder Associates Ltd.	Company:		Quotation	C00599
Contact Name:	Collin Arens	Contact Name:		P.O. #/AFE#:	
Address:	16820 107 Ave.	Address:			
	Edmonton, AB PC: T5P 4C3		PC:	Project #:	1663724/44000/03
Phone/Fax:	(780) 237-9638	Phone/Fax:		Site Location:	Baffinland Iron Mine
Email:	carens@golder.com	Email:		Site #:	Milne Port/Reference Site
Copies:	rsharpe@golder.com	Copies:		Sampled By:	Bradley Cox, Daniel Vicente

Turnaround Time (TAT) Required

☑ 5 - 7 Days Regular (Most analyses)

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

Rush TAT (Surcharges will be applied)

☐ Same Day ☐ 2 Days
☐ 1 Day ☐ 3-4 Days

Date Required:

Rush Confirmation #:

Laboratory Use Only

	YES	NO	Cooler ID			
Seal Present						
Seal Intact			Temp			
Cooling Media						
	YES	NO	Cooler ID			
Seal Present						
Seal Intact			Temp			
Cooling Media						
	YES	NO	Cooler ID			
Seal Present						
Seal Intact			Temp			
Cooling Media						

Depot Reception

Analysis Requested: ☐ BTEXS / VPH ☐ VOC / BTEXS / VPH ☐ MTBE; ☐ BTEX F1 ☐ VOC / BTEX / F1; ☐ PAH ☐ LEPH / HEPH / PAH; ☐ EPH ☐ TEH ☐ F2 - F4; ☐ Dissolved Metals ☐ Filtered? ☐ Preserved?; ☐ Dissolved Mercury ☐ Filtered? ☐ Preserved?; ☑ Total Metals ☐ Field Preserved?; ☐ Total Mercury ☐ Field Preserved?; ☐ Chloride ☐ Fluoride ☐ Sulphate; ☐ TSS ☐ TDS ☐ BOD ☐ COD; ☐ pH ☐ Conductivity ☐ Alkalinity; ☐ Nitrite ☐ Nitrate ☐ Ammonia; ☐ Alkylated PAHs; HOLD - DO NOT ANALYZE

Regulatory Criteria: ☐ BC CSR ☐ YK CSR ☐ CCME ☐ Drinking Water ☐ BC Water Quality ☐ Other

#	Sample Identification	Date Sampled (yyyy/mm/dd)	Time Sampled (hh:mm)	Matrix	# of Containers	Total Metals	Special Instructions
1	BAFF21UMLNFRSC1003	2021-08-08	13:40	Tissue	1	X	
2	BAFF21UMLNFRSC1006	2021-08-08	14:33	Tissue	1	X	
3	BAFF21UMLNFRSC1019	2021-08-09	11:22	Tissue	1	X	
4	BAFF21UMLNFRSC1029	2021-08-09	14:53	Tissue	1	X	
5	BAFF21UMLNFRSC1030	2021-08-10	12:32	Tissue	1	X	
6	BAFF21UMLNFRSC1031	2021-08-10	12:50	Tissue	1	X	
7	BAFF21UMLNFRSC1033	2021-08-10	13:22	Tissue	1	X	
8	BAFF21UMLNFRSC1036	2021-08-10	14:24	Tissue	1	X	
9							
10							

Relinquished by: (Signature/ Print)	Date (yyyy/mm/dd):	Time (hh:mm):	Received by: (Signature/ Print)	Date (yyyy/mm/dd):	Time (hh:mm):	BV Job #
Collin Arens (signature). Collin Arens	2021/09/22	13:15				C171211_COC

COC-1020

08497711

Burnaby: 4606 Canada Way, Burnaby, BC V5G 1K5 Toll Free (800) 665 8566
Victoria: 460 Tennyson Place, Unit 1, Victoria, BC V8Z 6S8 Toll Free (866) 385-6112
bvlabs.com

CHAIN OF CUSTODY RECORD

Page 2 of 2

Invoice Information

Company:	Golder Associates Ltd.
Contact Name:	Collin Arens
Address:	16820 107 Ave.
	Edmonton, AB PC: T5P 4C3
Phone/Fax:	(780) 237-9638
Email:	carens@golder.com
Copies:	rsharpe@golder.com

Report Information (if differs from invoice)

Company:
Contact Name:
Address:
PC:
Phone/Fax:
Email:
Copies:

Project Information

Quotation	C00599
P.O. #/AFE#:	
Project #:	1663724/44000/03
Site Location:	Baffinland Iron Mine
Site #:	Milne Port/Reference Site
Sampled By:	Bradley Cox, Daniel Vicente

Turnaround Time (TAT) Required

☑ 5 - 7 Days Regular (Most analyses)

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

Rush TAT (Surcharges will be applied)

☐ Same Day ☐ 2 Days
☐ 1 Day ☐ 3-4 Days

Date Required:
Rush Confirmation #:

Laboratory Use Only

	YES	NO	Cooler ID	1		
Seal Present	✓					
Seal Intact	✓		Temp	4	3	3
Cooling Media	✓					
	YES	NO	Cooler ID			
Seal Present						
Seal Intact			Temp			
Cooling Media						
	YES	NO	Cooler ID			
Seal Present						
Seal Intact			Temp			
Cooling Media						

Depot Reception

Analysis Requested: ☐ BTEXS / VPH (☐ VOC / BTEXS / VPH, ☐ MTBE); ☐ BTEX F1 (☐ VOC / BTEX / F1); ☐ PAH (☐ LEPH / HEPH / PAH); ☐ EPH (☐ TEH, ☐ F2 - F4); ☐ Dissolved Metals (☐ Filtered?, ☐ Preserved?); ☐ Dissolved Mercury (☐ Filtered?, ☐ Preserved?); ☑ Total Metals (☐ Field Preserved?); ☐ Total Mercury (☐ Field Preserved?); ☐ Chloride (☐ Fluoride, ☐ Sulphate); ☐ TSS (☐ TDS, ☐ BOD, ☐ COD); ☐ pH (☐ Conductivity, ☐ Alkalinity); ☐ Nitrite (☐ Nitrate, ☐ Ammonia); ☐ Alkylated PAHs; ☐; HOLD - DO NOT ANALYZE

Regulatory Criteria

☐ BC CSR
☐ YK CSR
☐ CCME
☐ Drinking Water
☐ BC Water Quality
☐ Other

#	Sample Identification	Date Sampled (yyyy/mm/dd)	Time Sampled (hh:mm)	Matrix	# of Containers	Total Metals	Special Instructions
1	BAFF21UMLNGN03ARCH03	2021-08-06	13:28	Tissue	1	X	
2	BAFF21UMLNGN05ARCH03	2021-08-07	14:58	Tissue	1	X	
3	BAFF21UMLNGN06ARCH09	2021-08-07	15:12	Tissue	1	X	
4	BAFF21UMLNGN09ARCH03	2021-08-10	9:00	Tissue	1	X	
5	BAFF21UMLNGN10ARCH10	2021-08-11	16:09	Tissue	1	X	
6	BAFF21UMLNGN20ARCH02	2021-08-17	12:50	Tissue	1	X	
7	BAFF21UMLNGN25ARCH03	2021-08-18	16:15	Tissue	1	X	
8	BAFF21UMLNGN25ARCH05	2021-08-18	16:15	Tissue	1	X	
9							
10							

Relinquished by: (Signature/ Print)	Date (yyyy/mm/dd):	Time (hh:mm):	Received by: (Signature/ Print)	Date (yyyy/mm/dd):	Time (hh:mm):	BV Job #
Colh Arens. Collin Arens	2021/09/22	13:15	Renzie Langoy	2021/09/23	08:00	

COC-1020

C171211_COC

Your Project #: 1663724/44000/03
Site Location: BAFFINLAND IRON MINE MILNE PORT/REFERENCE SITE
Your C.O.C. #: 08497715

Attention: Collin Arens

GOLDER ASSOCIATES LTD
16820-107 AVE
EDMONTON, AB
CANADA T5P 4C3

Report Date: 2021/10/27
Report #: R3091169
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: C171217
Received: 2021/09/23, 08:00

Sample Matrix: Tissue
Samples Received: 16

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
PAH in Tissue by GC/MS (SIM) (1, 2)	16	2021/10/19	2021/10/20	ATL SOP 00104	EPA 8270E R6 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, MELCC, EPA, APHA.

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.

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Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.
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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 Bedford, Bureau Veritas Bedford, 200 Bluewater Rd. Suite 105, Bedford, NS, Canada, B4B 1G9
(2) Results are reported on an as received basis unless otherwise indicated.

Bureau Veritas Laboratories Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Your Project #: 1663724/44000/03
Site Location: BAFFINLAND IRON MINE MILNE PORT/REFERENCE SITE
Your C.O.C. #: 08497715

Attention: Collin Arens

GOLDER ASSOCIATES LTD
16820-107 AVE
EDMONTON, AB
CANADA T5P 4C3

Report Date: 2021/10/27
Report #: R3091169
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: C171217
Received: 2021/09/23, 08:00

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Cynny Hagen, Key Account Specialist
Email: Cynny.HAGEN@bureauveritas.com
Phone# (403)735-2273
==
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Bureau Veritas Job #: C171217
Report Date: 2021/10/27

GOLDER ASSOCIATES LTD
Client Project #: 1663724/44000/03
Site Location: BAFFINLAND IRON MINE MILNE PORT/REFERENCE SITE
Sampler Initials: CA

RESULTS OF CHEMICAL ANALYSES OF TISSUE

Bureau Veritas ID		AGP071	AGP072	AGY779		
Sampling Date		2021/08/06 13:28	2021/08/08 13:40	2021/08/07 14:58		
COC Number		08497715	08497715	08497715		
	UNITS	**BAFF21UMLNGN03ARCH03**	**BAFF21UMLNFRSC1003**	**BAFF21UMLNGN05ARCH03**	**RDL**	**QC Batch**
Polycyclic Aromatics						
1-Methylnaphthalene	mg/kg	<0.050	<0.050	<0.050	0.050	A396942
2-Methylnaphthalene	mg/kg	<0.050	<0.050	<0.050	0.050	A396942
Benzo(j)fluoranthene	mg/kg	<0.050	<0.050	<0.050	0.050	A396942
Perylene	mg/kg	<0.050	<0.050	<0.050	0.050	A396942
Naphthalene	mg/kg	<0.050	<0.050	<0.050	0.050	A396942
Acenaphthylene	mg/kg	<0.050	<0.050	<0.050	0.050	A396942
Acenaphthene	mg/kg	<0.050	<0.050	<0.050	0.050	A396942
Fluorene	mg/kg	<0.050	<0.050	<0.050	0.050	A396942
Phenanthrene	mg/kg	<0.050	<0.050	<0.050	0.050	A396942
Anthracene	mg/kg	<0.050	<0.050	<0.050	0.050	A396942
Fluoranthene	mg/kg	<0.050	<0.050	<0.050	0.050	A396942
Pyrene	mg/kg	<0.050	<0.050	<0.050	0.050	A396942
Benzo(a)anthracene	mg/kg	<0.050	<0.050	<0.050	0.050	A396942
Chrysene	mg/kg	<0.050	<0.050	<0.050	0.050	A396942
Benzo(b)fluoranthene	mg/kg	<0.050	<0.050	<0.050	0.050	A396942
Benzo(k)fluoranthene	mg/kg	<0.050	<0.050	<0.050	0.050	A396942
Benzo(a)pyrene	mg/kg	<0.050	<0.050	<0.050	0.050	A396942
Indeno(1,2,3-cd)pyrene	mg/kg	<0.050	<0.050	<0.050	0.050	A396942
Dibenz(a,h)anthracene	mg/kg	<0.050	<0.050	<0.050	0.050	A396942
Benzo(g,h,i)perylene	mg/kg	<0.050	<0.050	<0.050	0.050	A396942
Surrogate Recovery (%)						
D10-ANTHRACENE (sur.)	%	83	90	89	N/A	A396942
D8-ACENAPHTHYLENE (sur.)	%	88	90	91	N/A	A396942
TERPHENYL-D14 (sur.)	%	83	89	87	N/A	A396942

RDL = Reportable Detection Limit
N/A = Not Applicable

Bureau Veritas Job #: C171217
Report Date: 2021/10/27

GOLDER ASSOCIATES LTD
Client Project #: 1663724/44000/03
Site Location: BAFFINLAND IRON MINE MILNE PORT/REFERENCE SITE
Sampler Initials: CA

RESULTS OF CHEMICAL ANALYSES OF TISSUE

Bureau Veritas ID		AGY781		AGY809	AGY826		
Sampling Date		2021/08/07 15:12		2021/08/10 09:00	2021/08/11 16:09		
COC Number		08497715		08497715	08497715		
	UNITS	**BAFF21UMLNGN06ARCH09**	**RDL**	**BAFF21UMLNGN09ARCH03**	**BAFF21UMLNGN10ARCH10**	**RDL**	**QC Batch**
Polycyclic Aromatics							
1-Methylnaphthalene	mg/kg	<0.070	0.070	<0.050	<0.050	0.050	A396942
2-Methylnaphthalene	mg/kg	<0.070	0.070	<0.050	<0.050	0.050	A396942
Benzo(j)fluoranthene	mg/kg	<0.070	0.070	<0.050	<0.050	0.050	A396942
Perylene	mg/kg	<0.070	0.070	<0.050	<0.050	0.050	A396942
Naphthalene	mg/kg	<0.070	0.070	<0.050	<0.050	0.050	A396942
Acenaphthylene	mg/kg	<0.070	0.070	<0.050	<0.050	0.050	A396942
Acenaphthene	mg/kg	<0.070	0.070	<0.050	<0.050	0.050	A396942
Fluorene	mg/kg	<0.070	0.070	<0.050	<0.050	0.050	A396942
Phenanthrene	mg/kg	<0.070	0.070	<0.050	<0.050	0.050	A396942
Anthracene	mg/kg	<0.070	0.070	<0.050	<0.050	0.050	A396942
Fluoranthene	mg/kg	<0.070	0.070	<0.050	<0.050	0.050	A396942
Pyrene	mg/kg	<0.070	0.070	<0.050	<0.050	0.050	A396942
Benzo(a)anthracene	mg/kg	<0.070	0.070	<0.050	<0.050	0.050	A396942
Chrysene	mg/kg	<0.070	0.070	<0.050	<0.050	0.050	A396942
Benzo(b)fluoranthene	mg/kg	<0.070	0.070	<0.050	<0.050	0.050	A396942
Benzo(k)fluoranthene	mg/kg	<0.070	0.070	<0.050	<0.050	0.050	A396942
Benzo(a)pyrene	mg/kg	<0.070	0.070	<0.050	<0.050	0.050	A396942
Indeno(1,2,3-cd)pyrene	mg/kg	<0.070	0.070	<0.050	<0.050	0.050	A396942
Dibenz(a,h)anthracene	mg/kg	<0.070	0.070	<0.050	<0.050	0.050	A396942
Benzo(g,h,i)perylene	mg/kg	<0.070	0.070	<0.050	<0.050	0.050	A396942
Surrogate Recovery (%)							
D10-ANTHRACENE (sur.)	%	94	N/A	96	93	N/A	A396942
D8-ACENAPHTHYLENE (sur.)	%	94	N/A	98	96	N/A	A396942
TERPHENYL-D14 (sur.)	%	91 (1)	N/A	95	93	N/A	A396942

RDL = Reportable Detection Limit
N/A = Not Applicable
(1) Elevated PAH RDL(s) due to limited sample.

Bureau Veritas Job #: C171217
Report Date: 2021/10/27

GOLDER ASSOCIATES LTD
Client Project #: 1663724/44000/03
Site Location: BAFFINLAND IRON MINE MILNE PORT/REFERENCE SITE
Sampler Initials: CA

RESULTS OF CHEMICAL ANALYSES OF TISSUE

Bureau Veritas ID		AGY827	AGY828	AGY829	AGY840		
Sampling Date		2021/08/17 12:50	2021/08/18 16:15	2021/08/18 16:15	2021/08/08 14:33		
COC Number		08497715	08497715	08497715	08497715		
	UNITS	**BAFF21UMLNGN20ARCH02**	**BAFF21UMLNGN25ARCH03**	**BAFF21UMLNGN25ARCH05**	**BAFF21UMLNFRSC1006**	**RDL**	**QC Batch**
Polycyclic Aromatics							
1-Methylnaphthalene	mg/kg	<0.050	<0.050	<0.050	<0.050	0.050	A396942
2-Methylnaphthalene	mg/kg	<0.050	<0.050	<0.050	<0.050	0.050	A396942
Benzo(j)fluoranthene	mg/kg	<0.050	<0.050	<0.050	<0.050	0.050	A396942
Perylene	mg/kg	<0.050	<0.050	<0.050	<0.050	0.050	A396942
Naphthalene	mg/kg	<0.050	<0.050	<0.050	<0.050	0.050	A396942
Acenaphthylene	mg/kg	<0.050	<0.050	<0.050	<0.050	0.050	A396942
Acenaphthene	mg/kg	<0.050	<0.050	<0.050	<0.050	0.050	A396942
Fluorene	mg/kg	<0.050	<0.050	<0.050	<0.050	0.050	A396942
Phenanthrene	mg/kg	<0.050	<0.050	<0.050	<0.050	0.050	A396942
Anthracene	mg/kg	<0.050	<0.050	<0.050	<0.050	0.050	A396942
Fluoranthene	mg/kg	<0.050	<0.050	<0.050	<0.050	0.050	A396942
Pyrene	mg/kg	<0.050	<0.050	<0.050	<0.050	0.050	A396942
Benzo(a)anthracene	mg/kg	<0.050	<0.050	<0.050	<0.050	0.050	A396942
Chrysene	mg/kg	<0.050	<0.050	<0.050	<0.050	0.050	A396942
Benzo(b)fluoranthene	mg/kg	<0.050	<0.050	<0.050	<0.050	0.050	A396942
Benzo(k)fluoranthene	mg/kg	<0.050	<0.050	<0.050	<0.050	0.050	A396942
Benzo(a)pyrene	mg/kg	<0.050	<0.050	<0.050	<0.050	0.050	A396942
Indeno(1,2,3-cd)pyrene	mg/kg	<0.050	<0.050	<0.050	<0.050	0.050	A396942
Dibenz(a,h)anthracene	mg/kg	<0.050	<0.050	<0.050	<0.050	0.050	A396942
Benzo(g,h,i)perylene	mg/kg	<0.050	<0.050	<0.050	<0.050	0.050	A396942
Surrogate Recovery (%)							
D10-ANTHRACENE (sur.)	%	81	90	88	91	N/A	A396942
D8-ACENAPHTHYLENE (sur.)	%	82	93	89	94	N/A	A396942
TERPHENYL-D14 (sur.)	%	76	87	86	90	N/A	A396942

RDL = Reportable Detection Limit
N/A = Not Applicable

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Bureau Veritas Job #: C171217
Report Date: 2021/10/27

GOLDER ASSOCIATES LTD
Client Project #: 1663724/44000/03
Site Location: BAFFINLAND IRON MINE MILNE PORT/REFERENCE SITE
Sampler Initials: CA

RESULTS OF CHEMICAL ANALYSES OF TISSUE

Bureau Veritas ID		AGY841	AGY842	AGY843		
Sampling Date		2021/08/09 11:22	2021/08/09 14:53	2021/08/10 12:32		
COC Number		08497715	08497715	08497715		
	UNITS	BAFF21UMLNFRSC1019	BAFF21UMLNFRSC1029	BAFF21UMLNFRSC1030	RDL	QC Batch
Polycyclic Aromatics						
1-Methylnaphthalene	mg/kg	<0.050	<0.050	<0.050	0.050	A396942
2-Methylnaphthalene	mg/kg	<0.050	<0.050	<0.050	0.050	A396942
Benzo(j)fluoranthene	mg/kg	<0.050	<0.050	<0.050	0.050	A396942
Perylene	mg/kg	<0.050	<0.050	<0.050	0.050	A396942
Naphthalene	mg/kg	<0.050	<0.050	<0.050	0.050	A396942
Acenaphthylene	mg/kg	<0.050	<0.050	<0.050	0.050	A396942
Acenaphthene	mg/kg	<0.050	<0.050	<0.050	0.050	A396942
Fluorene	mg/kg	<0.050	<0.050	<0.050	0.050	A396942
Phenanthrene	mg/kg	<0.050	<0.050	<0.050	0.050	A396942
Anthracene	mg/kg	<0.050	<0.050	<0.050	0.050	A396942
Fluoranthene	mg/kg	<0.050	<0.050	<0.050	0.050	A396942
Pyrene	mg/kg	<0.050	<0.050	<0.050	0.050	A396942
Benzo(a)anthracene	mg/kg	<0.050	<0.050	<0.050	0.050	A396942
Chrysene	mg/kg	<0.050	<0.050	<0.050	0.050	A396942
Benzo(b)fluoranthene	mg/kg	<0.050	<0.050	<0.050	0.050	A396942
Benzo(k)fluoranthene	mg/kg	<0.050	<0.050	<0.050	0.050	A396942
Benzo(a)pyrene	mg/kg	<0.050	<0.050	<0.050	0.050	A396942
Indeno(1,2,3-cd)pyrene	mg/kg	<0.050	<0.050	<0.050	0.050	A396942
Dibenz(a,h)anthracene	mg/kg	<0.050	<0.050	<0.050	0.050	A396942
Benzo(g,h,i)perylene	mg/kg	<0.050	<0.050	<0.050	0.050	A396942
Surrogate Recovery (%)						
D10-ANTHRACENE (sur.)	%	85	88	80	N/A	A396942
D8-ACENAPHTHYLENE (sur.)	%	86	90	79	N/A	A396942
TERPHENYL-D14 (sur.)	%	83	86	78	N/A	A396942

RDL = Reportable Detection Limit
N/A = Not Applicable

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Bureau Veritas Job #: C171217
Report Date: 2021/10/27

GOLDER ASSOCIATES LTD
Client Project #: 1663724/44000/03
Site Location: BAFFINLAND IRON MINE MILNE PORT/REFERENCE SITE
Sampler Initials: CA

RESULTS OF CHEMICAL ANALYSES OF TISSUE

Bureau Veritas ID		AGY854	AGY855	AGY856		
Sampling Date		2021/08/10 12:50	2021/08/10 13:22	2021/08/10 14:24		
COC Number		08497715	08497715	08497715		
	UNITS	**BAFF21UMLNFRSC1031**	**BAFF21UMLNFRSC1033**	**BAFF21UMLNFRSC1036**	**RDL**	**QC Batch**
Polycyclic Aromatics						
1-Methylnaphthalene	mg/kg	<0.050	<0.050	<0.050	0.050	A396942
2-Methylnaphthalene	mg/kg	<0.050	<0.050	<0.050	0.050	A396942
Benzo(j)fluoranthene	mg/kg	<0.050	<0.050	<0.050	0.050	A396942
Perylene	mg/kg	<0.050	<0.050	<0.050	0.050	A396942
Naphthalene	mg/kg	<0.050	<0.050	<0.050	0.050	A396942
Acenaphthylene	mg/kg	<0.050	<0.050	<0.050	0.050	A396942
Acenaphthene	mg/kg	<0.050	<0.050	<0.050	0.050	A396942
Fluorene	mg/kg	<0.050	<0.050	<0.050	0.050	A396942
Phenanthrene	mg/kg	<0.050	<0.050	<0.050	0.050	A396942
Anthracene	mg/kg	<0.050	<0.050	<0.050	0.050	A396942
Fluoranthene	mg/kg	<0.050	<0.050	<0.050	0.050	A396942
Pyrene	mg/kg	<0.050	<0.050	<0.050	0.050	A396942
Benzo(a)anthracene	mg/kg	<0.050	<0.050	<0.050	0.050	A396942
Chrysene	mg/kg	<0.050	<0.050	<0.050	0.050	A396942
Benzo(b)fluoranthene	mg/kg	<0.050	<0.050	<0.050	0.050	A396942
Benzo(k)fluoranthene	mg/kg	<0.050	<0.050	<0.050	0.050	A396942
Benzo(a)pyrene	mg/kg	<0.050	<0.050	<0.050	0.050	A396942
Indeno(1,2,3-cd)pyrene	mg/kg	<0.050	<0.050	<0.050	0.050	A396942
Dibenz(a,h)anthracene	mg/kg	<0.050	<0.050	<0.050	0.050	A396942
Benzo(g,h,i)perylene	mg/kg	<0.050	<0.050	<0.050	0.050	A396942
Surrogate Recovery (%)						
D10-ANTHRACENE (sur.)	%	92	94	101	N/A	A396942
D8-ACENAPHTHYLENE (sur.)	%	97	96	102	N/A	A396942
TERPHENYL-D14 (sur.)	%	92	93	99	N/A	A396942

RDL = Reportable Detection Limit
N/A = Not Applicable

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GENERAL COMMENTS

Results relate only to the items tested.

Bureau Veritas Laboratories Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas Job #: C171217
Report Date: 2021/10/27

GOLDER ASSOCIATES LTD
Client Project #: 1663724/44000/03
Site Location: BAFFINLAND IRON MINE MILNE PORT/REFERENCE SITE
Sampler Initials: CA

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
A396942	LGE	Reagent Blank	1-Methylnaphthalene	2021/10/20	<0.050		mg/kg	
			2-Methylnaphthalene	2021/10/20	<0.050		mg/kg	
			Benzo(j)fluoranthene	2021/10/20	<0.050		mg/kg	
			D10-ANTHRACENE (sur.)	2021/10/20		89	%	50 - 130
			D8-ACENAPHTHYLENE (sur.)	2021/10/20		84	%	50 - 130
			Perylene	2021/10/20	<0.050		mg/kg	
			TERPHENYL-D14 (sur.)	2021/10/20		91	%	50 - 130
			Naphthalene	2021/10/20	<0.050		mg/kg	
			Acenaphthylene	2021/10/20	<0.050		mg/kg	
			Acenaphthene	2021/10/20	<0.050		mg/kg	
			Fluorene	2021/10/20	<0.050		mg/kg	
			Phenanthrene	2021/10/20	<0.050		mg/kg	
			Anthracene	2021/10/20	<0.050		mg/kg	
			Fluoranthene	2021/10/20	<0.050		mg/kg	
			Pyrene	2021/10/20	<0.050		mg/kg	
			Benzo(a)anthracene	2021/10/20	<0.050		mg/kg	
			Chrysene	2021/10/20	<0.050		mg/kg	
			Benzo(b)fluoranthene	2021/10/20	<0.050		mg/kg	
			Benzo(k)fluoranthene	2021/10/20	<0.050		mg/kg	
			Benzo(a)pyrene	2021/10/20	<0.050		mg/kg	
			Indeno(1,2,3-cd)pyrene	2021/10/20	<0.050		mg/kg	
			Dibenz(a,h)anthracene	2021/10/20	<0.050		mg/kg	
			Benzo(g,h,i)perylene	2021/10/20	<0.050		mg/kg	
A396942	LGE	Matrix Spike [AGP071-01]	1-Methylnaphthalene	2021/10/20		82	%	50 - 130
			2-Methylnaphthalene	2021/10/20		85	%	50 - 130
			Benzo(j)fluoranthene	2021/10/20		73	%	50 - 130
			D10-ANTHRACENE (sur.)	2021/10/20		84	%	50 - 130
			D8-ACENAPHTHYLENE (sur.)	2021/10/20		89	%	50 - 130
			Perylene	2021/10/20		72	%	50 - 130
			TERPHENYL-D14 (sur.)	2021/10/20		84	%	50 - 130
			Naphthalene	2021/10/20		85	%	50 - 130
			Acenaphthylene	2021/10/20		86	%	50 - 130
			Acenaphthene	2021/10/20		91	%	50 - 130
			Fluorene	2021/10/20		92	%	50 - 130
			Phenanthrene	2021/10/20		92	%	50 - 130
			Anthracene	2021/10/20		88	%	50 - 130
			Fluoranthene	2021/10/20		89	%	50 - 130
			Pyrene	2021/10/20		89	%	50 - 130
			Benzo(a)anthracene	2021/10/20		91	%	50 - 130
			Chrysene	2021/10/20		94	%	50 - 130
			Benzo(b)fluoranthene	2021/10/20		75	%	50 - 130
			Benzo(k)fluoranthene	2021/10/20		77	%	50 - 130
			Benzo(a)pyrene	2021/10/20		71	%	50 - 130
			Indeno(1,2,3-cd)pyrene	2021/10/20		76	%	50 - 130
			Dibenz(a,h)anthracene	2021/10/20		75	%	50 - 130
			Benzo(g,h,i)perylene	2021/10/20		73	%	50 - 130
A396942	LGE	Spiked Blank	1-Methylnaphthalene	2021/10/20		82	%	50 - 130
			2-Methylnaphthalene	2021/10/20		85	%	50 - 130
			Benzo(j)fluoranthene	2021/10/20		74	%	50 - 130
			D10-ANTHRACENE (sur.)	2021/10/20		84	%	50 - 130
			D8-ACENAPHTHYLENE (sur.)	2021/10/20		87	%	50 - 130
			Perylene	2021/10/20		74	%	50 - 130

Bureau Veritas Laboratories Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			TERPHENYL-D14 (sur.)	2021/10/20		82	%	50 - 130
			Naphthalene	2021/10/20		86	%	50 - 130
			Acenaphthylene	2021/10/20		85	%	50 - 130
			Acenaphthene	2021/10/20		90	%	50 - 130
			Fluorene	2021/10/20		91	%	50 - 130
			Phenanthrene	2021/10/20		93	%	50 - 130
			Anthracene	2021/10/20		87	%	50 - 130
			Fluoranthene	2021/10/20		87	%	50 - 130
			Pyrene	2021/10/20		87	%	50 - 130
			Benzo(a)anthracene	2021/10/20		85	%	50 - 130
			Chrysene	2021/10/20		90	%	50 - 130
			Benzo(b)fluoranthene	2021/10/20		81	%	50 - 130
			Benzo(k)fluoranthene	2021/10/20		75	%	50 - 130
			Benzo(a)pyrene	2021/10/20		72	%	50 - 130
			Indeno(1,2,3-cd)pyrene	2021/10/20		76	%	50 - 130
			Dibenz(a,h)anthracene	2021/10/20		73	%	50 - 130
			Benzo(g,h,i)perylene	2021/10/20		75	%	50 - 130
A396942	LGE	Method Blank	1-Methylnaphthalene	2021/10/20	<0.050		mg/kg	
			2-Methylnaphthalene	2021/10/20	<0.050		mg/kg	
			Benzo(j)fluoranthene	2021/10/20	<0.050		mg/kg	
			D10-ANTHRACENE (sur.)	2021/10/20		95	%	50 - 130
			D8-ACENAPHTHYLENE (sur.)	2021/10/20		97	%	50 - 130
			Perylene	2021/10/20	<0.050		mg/kg	
			TERPHENYL-D14 (sur.)	2021/10/20		95	%	50 - 130
			Naphthalene	2021/10/20	<0.050		mg/kg	
			Acenaphthylene	2021/10/20	<0.050		mg/kg	
			Acenaphthene	2021/10/20	<0.050		mg/kg	
			Fluorene	2021/10/20	<0.050		mg/kg	
			Phenanthrene	2021/10/20	<0.050		mg/kg	
			Anthracene	2021/10/20	<0.050		mg/kg	
			Fluoranthene	2021/10/20	<0.050		mg/kg	
			Pyrene	2021/10/20	<0.050		mg/kg	
			Benzo(a)anthracene	2021/10/20	<0.050		mg/kg	
			Chrysene	2021/10/20	<0.050		mg/kg	
			Benzo(b)fluoranthene	2021/10/20	<0.050		mg/kg	
			Benzo(k)fluoranthene	2021/10/20	<0.050		mg/kg	
			Benzo(a)pyrene	2021/10/20	<0.050		mg/kg	
			Indeno(1,2,3-cd)pyrene	2021/10/20	<0.050		mg/kg	
			Dibenz(a,h)anthracene	2021/10/20	<0.050		mg/kg	
			Benzo(g,h,i)perylene	2021/10/20	<0.050		mg/kg	
A396942	LGE	RPD [AGP071-01]	1-Methylnaphthalene	2021/10/20	NC		%	50
			2-Methylnaphthalene	2021/10/20	NC		%	50
			Benzo(j)fluoranthene	2021/10/20	NC		%	50
			Perylene	2021/10/20	NC		%	50
			Naphthalene	2021/10/20	NC		%	50
			Acenaphthylene	2021/10/20	NC		%	50
			Acenaphthene	2021/10/20	NC		%	50
			Fluorene	2021/10/20	NC		%	50
			Phenanthrene	2021/10/20	NC		%	50
			Anthracene	2021/10/20	NC		%	50
			Fluoranthene	2021/10/20	NC		%	50
			Pyrene	2021/10/20	NC		%	50

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Benzo(a)anthracene	2021/10/20	NC		%	50
			Chrysene	2021/10/20	NC		%	50
			Benzo(b)fluoranthene	2021/10/20	NC		%	50
			Benzo(k)fluoranthene	2021/10/20	NC		%	50
			Benzo(a)pyrene	2021/10/20	NC		%	50
			Indeno(1,2,3-cd)pyrene	2021/10/20	NC		%	50
			Dibenz(a,h)anthracene	2021/10/20	NC		%	50
			Benzo(g,h,i)perylene	2021/10/20	NC		%	50

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.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

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

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:

Phil Deveau, Scientific Specialist (Organics)

BV Labs 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 Signature Page.

Burnaby: 4606 Canada Way, Burnaby, BC V5G 1K5 Toll Free (800) 665 8566
Victoria: 460 Tennyson Place, Unit 1, Victoria, BC V8Z 6S8 Toll Free (866) 385-6112
bvlabs.com

CHAIN OF CUSTODY RECORD

Invoice Information		Report Information (if differs from invoice)		Project Information	
Company:	Golder Associates Ltd.	Company:		Quotation	C00599
Contact Name:	Collin Arens	Contact Name:		P.O. #/AFE#:	
Address:	16820 107 Ave.	Address:			
	Edmonton, AB PC: T5P 4C3		PC:	Project #:	1663724/44000/03
Phone/Fax:	(780) 237-9638	Phone/Fax:		Site Location:	Baffinland Iron Mine
Email:	carens@golder.com	Email:		Site #:	Milne Port/Reference Site
Copies:	rsharpe@golder.com	Copies:		Sampled By:	Bradley Cox, Daniel Vicente

Turnaround Time (TAT) Required

☑ 5 - 7 Days Regular (Most analyses)

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

Rush TAT (Surcharges will be applied)

☐ Same Day ☐ 2 Days
☐ 1 Day ☐ 3-4 Days

Date Required:

Rush Confirmation #:

Laboratory Use Only

	YES	NO	Cooler ID
Seal Present			
Seal Intact			Temp
Cooling Media			
	YES	NO	Cooler ID
Seal Present			
Seal Intact			Temp
Cooling Media			
	YES	NO	Cooler ID
Seal Present			
Seal Intact			Temp
Cooling Media			

Depot Reception

Analysis Requested

☐ BTEXS / VPH; ☐ VOC / BTEXS / VPH; ☐ MTBE; ☐ BTEX F1; ☐ VOC / BTEX / F1; ☑ PAH; ☐ LEPH / HEPH / PAH; ☐ EPH; ☐ TEH; ☐ F2 - F4; ☐ Dissolved Metals; ☐ Filtered?; ☐ Preserved?; ☐ Dissolved Mercury; ☐ Filtered?; ☐ Preserved?; ☐ Total Metals; ☐ Field Preserved?; ☐ Total Mercury; ☐ Field Preserved?; ☐ Chloride; ☐ Fluoride; ☐ Sulphate; ☐ TSS; ☐ TDS; ☐ BOD; ☐ COD; ☐ pH; ☐ Conductivity; ☐ Alkalinity; ☐ Nitrite; ☐ Nitrate; ☐ Ammonia; ☑ Alkylated PAHs; ☐; HOLD - DO NOT ANALYZE

Regulatory Criteria

☐ BC CSR
☐ YK CSR
☐ CCME
☐ Drinking Water
☐ BC Water Quality
☐ Other

	Sample Identification	Date Sampled (yyyy/mm/dd)	Time Sampled (hh:mm)	Matrix	# of Containers	PAH	Alkylated PAHs	HOLD - DO NOT ANALYZE	Special Instructions
1	BAFF21UMLNFRSC1003	2021-08-08	13:40	Tissue	1	X	X		
2	BAFF21UMLNFRSC1006	2021-08-08	14:33	Tissue	1	X	X		
3	BAFF21UMLNFRSC1019	2021-08-09	11:22	Tissue	1	X	X		
4	BAFF21UMLNFRSC1029	2021-08-09	14:53	Tissue	1	X	X		
5	BAFF21UMLNFRSC1030	2021-08-10	12:32	Tissue	1	X	X		
6	BAFF21UMLNFRSC1031	2021-08-10	12:50	Tissue	1	X	X		
7	BAFF21UMLNFRSC1033	2021-08-10	13:22	Tissue	1	X	X		
8	BAFF21UMLNFRSC1036	2021-08-10	14:24	Tissue	1	X	X		
9									
10									

Relinquished by: (Signature/ Print)	Date (yyyy/mm/dd):	Time (hh:mm):	Received by: (Signature/ Print)	Date (yyyy/mm/dd):	Time (hh:mm):	BV Job #
Collin Arens / Collin Arens	2021/09/22	13:15				

COC-1020

C171217_COC

Burnaby: 4606 Canada Way, Burnaby, BC V5G 1K5 Toll Free (800) 665 8566
Victoria: 460 Tennyson Place, Unit 1, Victoria, BC V8Z 6S8 Toll Free (866) 385-6112
bvlabs.com

CHAIN OF CUSTODY RECORD

08497715

2

Invoice Information		Report Information (if differs from invoice)		Project Information	
Company:	Golder Associates Ltd.	Company:		Quotation	C00599
Contact Name:	Collin Arens	Contact Name:		P.O. #/AFE#:	
Address:	16820 107 Ave.	Address:			
	Edmonton, AB PC: T5P 4C3		PC:	Project #:	1663724/44000/03
Phone/Fax:	(780) 237-9638	Phone/Fax:		Site Location:	Baffinland Iron Mine
Email:	carens@golder.com	Email:		Site #:	Milne Port/Reference Site
Copies:	rsharpe@golder.com	Copies:		Sampled By:	Bradley Cox, Daniel Vicente

Turnaround
☑ 5 - 7 Days Regular (Most analyses)

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

Rush TAT (Surcharges will be applied)
☐ Same Day ☐ 2 Days
☐ 1 Day ☐ 3-4 Days

Date Required:
Rush Confirmation #:

Laboratory Use Only

	YES	NO	Cooler ID			
Seal Present		✓				
Seal Intact		✓	Temp	6	3	3
Cooling Media	✓					
	YES	NO	Cooler ID			
Seal Present						
Seal Intact			Temp			
Cooling Media						
	YES	NO	Cooler ID			
Seal Present						
Seal Intact			Temp			
Cooling Media						

Depot Reception

Analysis Requested

☐ BTEXS / VPH ☐ VOC / BTEXS / VPH ☐ MTBE; ☐ BTEX F1 ☐ VOC / BTEX / F1; ☑ PAH ☐ LEPH / HEPH / PAH; ☐ EPH ☐ TEH ☐ F2 - F4; ☐ Dissolved Metals ☐ Filtered? ☐ Preserved?; ☐ Dissolved Mercury ☐ Filtered? ☐ Preserved?; ☐ Total Metals ☐ Field Preserved?; ☐ Total Mercury ☐ Field Preserved?; ☐ Chloride ☐ Fluoride ☐ Sulphate; ☐ TSS ☐ TDS ☐ BOD ☐ COD; ☐ pH ☐ Conductivity ☐ Alkalinity; ☐ Nitrite ☐ Nitrate ☐ Ammonia; ☑ Alkylated PAHs; ☐; HOLD - DO NOT ANALYZE

Regulatory Criteria

☐ BC CSR
☐ YK CSR
☐ CCME
☐ Drinking Water
☐ BC Water Quality
☐ Other

#	Sample Identification	Date Sampled (yyyy/mm/dd)	Time Sampled (hh:mm)	Matrix	# of Containers	BTEXS/VPH	BTEX F1	PAH / LEPH / HEPH / PAH	EPH	Dissolved Metals	Dissolved Mercury	Total Metals	Total Mercury	Chloride	TSS	pH	Nitrite	Alkylated PAHs		HOLD - DO NOT ANALYZE	Special Instructions
1	BAFF21UMLNGN03ARCH03	2021-08-06	13:28	Tissue	1			X										X			
2	BAFF21UMLNGN05ARCH03	2021-08-07	14:58	Tissue	1			X										X			
3	BAFF21UMLNGN06ARCH09	2021-08-07	15:12	Tissue	1			X										X			
4	BAFF21UMLNGN09ARCH03	2021-08-10	9:00	Tissue	1			X										X			
5	BAFF21UMLNGN10ARCH10	2021-08-11	16:09	Tissue	1			X										X			
6	BAFF21UMLNGN20ARCH02	2021-08-17	12:50	Tissue	1			X										X			
7	BAFF21UMLNGN25ARCH03	2021-08-18	16:15	Tissue	1			X										X			
8	BAFF21UMLNGN25ARCH05	2021-08-18	16:15	Tissue	1			X										X			
9																					
10																					

Unless otherwise agreed to in writing, work submitted on this Chain of Custody is subject to Bureau Veritas Laboratories' standard Terms and Conditions. Signing of this Chain of Custody document is acknowledgment and acceptance of our terms available at http://www.bvlabs.com/terms-and-conditions

Relinquished by: (Signature/ Print)	Date (yyyy/mm/dd):	Time (hh:mm):	Received by: (Signature/ Print)	Date (yyyy/mm/dd):	Time (hh:mm):	BV Job #
Collin Arens	2021/09/22	13:15	Renay Laping	2021/09/23	~~08:00~~ 08:00	

COC-1020

C171217_COC

Your Project #: 1663724/44000/03
Site#: MILNE PART/REFERENCE SITE
Site Location: BAFFLINLAND IRON MINE
Your C.O.C. #: 08502167

Attention: Collin Arens

GOLDER ASSOCIATES LTD
16820-107 AVE
EDMONTON, AB
CANADA T5P 4C3

Report Date: 2022/01/25
Report #: R3125981
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: C191378
Received: 2021/12/08, 08:25

Sample Matrix: Tissue
Samples Received: 16

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Elements by ICPMS - Tissue Plug Wet Wt	8	2022/01/18	2022/01/22	BBY WI-00033	Auto Calc
Moisture in Tissue - Freeze Drying	8	2022/01/18	2022/01/20	BBY7SOP-00021	BCMOE BCLM Aug 2014
PAH in Tissue by GC/MS (SIM) (1, 2)	8	2022/01/21	2022/01/21	ATL SOP 00104	EPA 8270E R6 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, MELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Bureau Veritas 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 Bedford, Bureau Veritas Bedford, 200 Bluewater Rd. Suite 105, Bedford, NS, Canada, B4B 1G9
(2) Results are reported on an as received basis unless otherwise indicated.

Your Project #: 1663724/44000/03
Site#: MILNE PART/REFERENCE SITE
Site Location: BAFFLINLAND IRON MINE
Your C.O.C. #: 08502167

Attention: Collin Arens

GOLDER ASSOCIATES LTD
16820-107 AVE
EDMONTON, AB
CANADA T5P 4C3

Report Date: 2022/01/25
Report #: R3125981
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: C191378
Received: 2021/12/08, 08:25

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Cynny Hagen, Key Account Specialist
Email: Cynny.HAGEN@bureauveritas.com
Phone# (403)735-2273
==
This report has been generated and distributed using a secure automated process.
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Bureau Veritas Laboratories Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas Job #: C191378
Report Date: 2022/01/25

GOLDER ASSOCIATES LTD
Client Project #: 1663724/44000/03
Site Location: BAFFLINLAND IRON MINE
Sampler Initials: BL

RESULTS OF CHEMICAL ANALYSES OF TISSUE

Bureau Veritas ID		ALJ041	ALJ042	ALJ043	ALJ044		
Sampling Date							
COC Number		08502167	08502167	08502167	08502167		
	UNITS	**BAFF21UMLNHTARCOMP9_PAHS**	**BAFF21UMLNHTARCOMP10_PAHS**	**BAFF21UMLNHTARCOMP11_PAHS**	**BAFF21UMLNHTARCOMP12_PAHS**	**RDL**	**QC Batch**
Polycyclic Aromatics							
1-Methylnaphthalene	mg/kg	<0.050	<0.050	<0.050	<0.050	0.050	A479138
2-Methylnaphthalene	mg/kg	<0.050	<0.050	<0.050	<0.050	0.050	A479138
Benzo(j)fluoranthene	mg/kg	<0.050	<0.050	<0.050	<0.050	0.050	A479138
Perylene	mg/kg	<0.050	<0.050	<0.050	<0.050	0.050	A479138
Naphthalene	mg/kg	<0.050	<0.050	<0.050	<0.050	0.050	A479138
Acenaphthylene	mg/kg	<0.050	<0.050	<0.050	<0.050	0.050	A479138
Acenaphthene	mg/kg	<0.050	<0.050	<0.050	<0.050	0.050	A479138
Fluorene	mg/kg	<0.050	<0.050	<0.050	<0.050	0.050	A479138
Phenanthrene	mg/kg	<0.050	<0.050	<0.050	<0.050	0.050	A479138
Anthracene	mg/kg	<0.050	<0.050	<0.050	<0.050	0.050	A479138
Fluoranthene	mg/kg	<0.050	<0.050	<0.050	<0.050	0.050	A479138
Pyrene	mg/kg	<0.050	<0.050	<0.050	<0.050	0.050	A479138
Benzo(a)anthracene	mg/kg	<0.050	<0.050	<0.050	<0.050	0.050	A479138
Chrysene	mg/kg	<0.050	<0.050	<0.050	<0.050	0.050	A479138
Benzo(b)fluoranthene	mg/kg	<0.050	<0.050	<0.050	<0.050	0.050	A479138
Benzo(k)fluoranthene	mg/kg	<0.050	<0.050	<0.050	<0.050	0.050	A479138
Benzo(a)pyrene	mg/kg	<0.050	<0.050	<0.050	<0.050	0.050	A479138
Indeno(1,2,3-cd)pyrene	mg/kg	<0.050	<0.050	<0.050	<0.050	0.050	A479138
Dibenz(a,h)anthracene	mg/kg	<0.050	<0.050	<0.050	<0.050	0.050	A479138
Benzo(g,h,i)perylene	mg/kg	<0.050	<0.050	<0.050	<0.050	0.050	A479138
Surrogate Recovery (%)							
D10-ANTHRACENE (sur.)	%	101	104	102	107	N/A	A479138
D8-ACENAPHTHYLENE (sur.)	%	98	99	97	104	N/A	A479138
TERPHENYL-D14 (sur.)	%	98	103	99	105	N/A	A479138

RDL = Reportable Detection Limit
N/A = Not Applicable

Bureau Veritas Laboratories Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas Job #: C191378
Report Date: 2022/01/25

GOLDER ASSOCIATES LTD
Client Project #: 1663724/44000/03
Site Location: BAFFLINLAND IRON MINE
Sampler Initials: BL

RESULTS OF CHEMICAL ANALYSES OF TISSUE

Bureau Veritas ID		ALJ045	ALJ046	ALJ047	ALJ048		
Sampling Date							
COC Number		08502167	08502167	08502167	08502167		
	UNITS	BAFF21UMLNHTARCO MP13_PAHS	BAFF21UMLNHTARCO MP14_PAHS	BAFF21UMLNHTARCO MP15_PAHS	BAFF21UMLNHTARCO MP16_PAHS	RDL	QC Batch
Polycyclic Aromatics							
1-Methylnaphthalene	mg/kg	<0.050	<0.050	<0.050	<0.050	0.050	A479138
2-Methylnaphthalene	mg/kg	<0.050	<0.050	<0.050	<0.050	0.050	A479138
Benzo(j)fluoranthene	mg/kg	<0.050	<0.050	<0.050	<0.050	0.050	A479138
Perylene	mg/kg	<0.050	<0.050	<0.050	<0.050	0.050	A479138
Naphthalene	mg/kg	<0.050	<0.050	<0.050	<0.050	0.050	A479138
Acenaphthylene	mg/kg	<0.050	<0.050	<0.050	<0.050	0.050	A479138
Acenaphthene	mg/kg	<0.050	<0.050	<0.050	<0.050	0.050	A479138
Fluorene	mg/kg	<0.050	<0.050	<0.050	<0.050	0.050	A479138
Phenanthrene	mg/kg	<0.050	<0.050	<0.050	<0.050	0.050	A479138
Anthracene	mg/kg	<0.050	<0.050	<0.050	<0.050	0.050	A479138
Fluoranthene	mg/kg	<0.050	<0.050	<0.050	<0.050	0.050	A479138
Pyrene	mg/kg	<0.050	<0.050	<0.050	<0.050	0.050	A479138
Benzo(a)anthracene	mg/kg	<0.050	<0.050	<0.050	<0.050	0.050	A479138
Chrysene	mg/kg	<0.050	<0.050	<0.050	<0.050	0.050	A479138
Benzo(b)fluoranthene	mg/kg	<0.050	<0.050	<0.050	<0.050	0.050	A479138
Benzo(k)fluoranthene	mg/kg	<0.050	<0.050	<0.050	<0.050	0.050	A479138
Benzo(a)pyrene	mg/kg	<0.050	<0.050	<0.050	<0.050	0.050	A479138
Indeno(1,2,3-cd)pyrene	mg/kg	<0.050	<0.050	<0.050	<0.050	0.050	A479138
Dibenz(a,h)anthracene	mg/kg	<0.050	<0.050	<0.050	<0.050	0.050	A479138
Benzo(g,h,i)perylene	mg/kg	<0.050	<0.050	<0.050	<0.050	0.050	A479138
Surrogate Recovery (%)							
D10-ANTHRACENE (sur.)	%	98	101	102	100	N/A	A479138
D8-ACENAPHTHYLENE (sur.)	%	95	99	98	99	N/A	A479138
TERPHENYL-D14 (sur.)	%	96	99	99	99	N/A	A479138

RDL = Reportable Detection Limit
N/A = Not Applicable

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ELEMENTS BY ATOMIC SPECTROSCOPY - WET WT (TISSUE)

Bureau Veritas ID		ALJ033	ALJ034	ALJ035		
Sampling Date						
COC Number		08502167	08502167	08502167		
	UNITS	**BAFF21UMLNHTARCO MP1_METALS**	**BAFF21UMLNHTARCO MP2_METALS**	**BAFF21UMLNHTARCO MP3_METALS**	**RDL**	**QC Batch**
Total Metals by ICPMS						
Total (Wet Wt) Aluminum (Al)	mg/kg	1380	923	439	0.50	A475543
Total (Wet Wt) Antimony (Sb)	mg/kg	0.0244	0.0161	0.0121	0.0020	A475543
Total (Wet Wt) Arsenic (As)	mg/kg	5.61	2.98	3.19	0.0050	A475543
Total (Wet Wt) Barium (Ba)	mg/kg	13.9	6.72	8.79	0.010	A475543
Total (Wet Wt) Beryllium (Be)	mg/kg	0.0718	0.0466	0.0250	0.0020	A475543
Total (Wet Wt) Bismuth (Bi)	mg/kg	0.0133	0.0119	0.0059	0.0013	A475543
Total (Wet Wt) Boron (B)	mg/kg	11.8	8.04	5.17	0.20	A475543
Total (Wet Wt) Cadmium (Cd)	mg/kg	0.524	0.937	0.540	0.0013	A475543
Total (Wet Wt) Calcium (Ca)	mg/kg	12200	6790	4790	4.0	A475543
Total (Wet Wt) Chromium (Cr)	mg/kg	4.50	2.72	1.20	0.025	A475543
Total (Wet Wt) Cobalt (Co)	mg/kg	1.62	1.54	0.708	0.0013	A475543
Total (Wet Wt) Copper (Cu)	mg/kg	2.49	3.16	1.66	0.013	A475543
Total (Wet Wt) Iron (Fe)	mg/kg	5170	2050	1570	0.25	A475543
Total (Wet Wt) Lead (Pb)	mg/kg	1.51	1.83	0.668	0.0013	A475543
Total (Wet Wt) Magnesium (Mg)	mg/kg	5660	3760	2010	0.40	A475543
Total (Wet Wt) Manganese (Mn)	mg/kg	194	192	84.3	0.010	A475543
Total (Wet Wt) Mercury (Hg)	mg/kg	0.033	0.031	0.033	0.013	A475543
Total (Wet Wt) Molybdenum (Mo)	mg/kg	0.402	0.356	0.222	0.0080	A475543
Total (Wet Wt) Nickel (Ni)	mg/kg	2.93	2.21	1.15	0.010	A475543
Total (Wet Wt) Phosphorus (P)	mg/kg	1350	1510	1100	2.0	A475543
Total (Wet Wt) Potassium (K)	mg/kg	1780	1740	1250	2.5	A475543
Total (Wet Wt) Selenium (Se)	mg/kg	1.44	1.36	1.38	0.010	A475543
Total (Wet Wt) Silver (Ag)	mg/kg	0.0078	0.0107	0.0039	0.0013	A475543
Total (Wet Wt) Sodium (Na)	mg/kg	3540	3860	2950	2.5	A475543
Total (Wet Wt) Strontium (Sr)	mg/kg	44.7	19.8	25.4	0.013	A475543
Total (Wet Wt) Thallium (Tl)	mg/kg	0.0358	0.0242	0.0109	0.00040	A475543
Total (Wet Wt) Tin (Sn)	mg/kg	0.123	0.083	0.054	0.020	A475543
Total (Wet Wt) Titanium (Ti)	mg/kg	67.8	32.9	16.7	0.13	A475543
Total (Wet Wt) Uranium (U)	mg/kg	0.279	0.164	0.138	0.00040	A475543
Total (Wet Wt) Vanadium (V)	mg/kg	5.38	3.79	2.09	0.020	A475543
Total (Wet Wt) Zinc (Zn)	mg/kg	13.6	15.1	11.9	0.20	A475543
RDL = Reportable Detection Limit						

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Bureau Veritas Job #: C191378
Report Date: 2022/01/25

GOLDER ASSOCIATES LTD
Client Project #: 1663724/44000/03
Site Location: BAFFLINLAND IRON MINE
Sampler Initials: BL

ELEMENTS BY ATOMIC SPECTROSCOPY - WET WT (TISSUE)

Bureau Veritas ID		ALJ036	ALJ037	ALJ038		
Sampling Date						
COC Number		08502167	08502167	08502167		
	UNITS	**BAFF21UMLNHTARCO MP4_METALS**	**BAFF21UMLNHTARCO MP5_METALS**	**BAFF21UMLNHTARCO MP6_METALS**	**RDL**	**QC Batch**
Total Metals by ICPMS						
Total (Wet Wt) Aluminum (Al)	mg/kg	1500	390	784	0.50	A475543
Total (Wet Wt) Antimony (Sb)	mg/kg	0.0237	0.0105	0.0169	0.0020	A475543
Total (Wet Wt) Arsenic (As)	mg/kg	2.91	2.19	3.41	0.0050	A475543
Total (Wet Wt) Barium (Ba)	mg/kg	9.38	12.3	9.06	0.010	A475543
Total (Wet Wt) Beryllium (Be)	mg/kg	0.0808	0.0209	0.0400	0.0020	A475543
Total (Wet Wt) Bismuth (Bi)	mg/kg	0.0167	0.0055	0.0085	0.0013	A475543
Total (Wet Wt) Boron (B)	mg/kg	11.6	4.75	6.90	0.20	A475543
Total (Wet Wt) Cadmium (Cd)	mg/kg	0.918	1.00	0.608	0.0013	A475543
Total (Wet Wt) Calcium (Ca)	mg/kg	12300	4330	6390	4.0	A475543
Total (Wet Wt) Chromium (Cr)	mg/kg	4.04	1.15	1.98	0.025	A475543
Total (Wet Wt) Cobalt (Co)	mg/kg	1.69	0.679	0.786	0.0013	A475543
Total (Wet Wt) Copper (Cu)	mg/kg	3.91	2.16	2.21	0.013	A475543
Total (Wet Wt) Iron (Fe)	mg/kg	3560	1290	2010	0.25	A475543
Total (Wet Wt) Lead (Pb)	mg/kg	2.06	0.557	0.967	0.0013	A475543
Total (Wet Wt) Magnesium (Mg)	mg/kg	5720	2010	3000	0.40	A475543
Total (Wet Wt) Manganese (Mn)	mg/kg	201	77.5	134	0.010	A475543
Total (Wet Wt) Mercury (Hg)	mg/kg	0.023	0.029	0.030	0.013	A475543
Total (Wet Wt) Molybdenum (Mo)	mg/kg	0.466	0.264	0.216	0.0080	A475543
Total (Wet Wt) Nickel (Ni)	mg/kg	2.93	1.36	1.56	0.010	A475543
Total (Wet Wt) Phosphorus (P)	mg/kg	1340	1430	1700	2.0	A475543
Total (Wet Wt) Potassium (K)	mg/kg	2090	1440	1560	2.5	A475543
Total (Wet Wt) Selenium (Se)	mg/kg	1.20	1.54	1.32	0.010	A475543
Total (Wet Wt) Silver (Ag)	mg/kg	0.0413	0.0062	0.0071	0.0013	A475543
Total (Wet Wt) Sodium (Na)	mg/kg	3420	2950	3840	2.5	A475543
Total (Wet Wt) Strontium (Sr)	mg/kg	28.0	17.3	24.0	0.013	A475543
Total (Wet Wt) Thallium (Tl)	mg/kg	0.0332	0.0102	0.0153	0.00040	A475543
Total (Wet Wt) Tin (Sn)	mg/kg	0.105	0.055	0.092	0.020	A475543
Total (Wet Wt) Titanium (Ti)	mg/kg	53.8	13.7	27.6	0.13	A475543
Total (Wet Wt) Uranium (U)	mg/kg	0.281	0.126	0.141	0.00040	A475543
Total (Wet Wt) Vanadium (V)	mg/kg	5.42	1.76	2.90	0.020	A475543
Total (Wet Wt) Zinc (Zn)	mg/kg	14.3	17.3	11.6	0.20	A475543
RDL = Reportable Detection Limit						

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Bureau Veritas Job #: C191378
Report Date: 2022/01/25

GOLDER ASSOCIATES LTD
Client Project #: 1663724/44000/03
Site Location: BAFFLINLAND IRON MINE
Sampler Initials: BL

ELEMENTS BY ATOMIC SPECTROSCOPY - WET WT (TISSUE)

Bureau Veritas ID		ALJ039	ALJ040		
Sampling Date					
COC Number		08502167	08502167		
	UNITS	**BAFF21UMLNHTARCOMP7_METALS**	**BAFF21UMLNHTARCOMP8_METALS**	**RDL**	**QC Batch**
Total Metals by ICPMS					
Total (Wet Wt) Aluminum (Al)	mg/kg	867	551	0.50	A475543
Total (Wet Wt) Antimony (Sb)	mg/kg	0.0323	0.0111	0.0020	A475543
Total (Wet Wt) Arsenic (As)	mg/kg	6.24	2.43	0.0050	A475543
Total (Wet Wt) Barium (Ba)	mg/kg	13.4	5.20	0.010	A475543
Total (Wet Wt) Beryllium (Be)	mg/kg	0.0465	0.0279	0.0020	A475543
Total (Wet Wt) Bismuth (Bi)	mg/kg	0.0105	0.0065	0.0013	A475543
Total (Wet Wt) Boron (B)	mg/kg	8.73	4.95	0.20	A475543
Total (Wet Wt) Cadmium (Cd)	mg/kg	0.877	0.932	0.0013	A475543
Total (Wet Wt) Calcium (Ca)	mg/kg	9880	4050	4.0	A475543
Total (Wet Wt) Chromium (Cr)	mg/kg	2.55	1.47	0.025	A475543
Total (Wet Wt) Cobalt (Co)	mg/kg	3.25	0.567	0.0013	A475543
Total (Wet Wt) Copper (Cu)	mg/kg	2.98	1.61	0.013	A475543
Total (Wet Wt) Iron (Fe)	mg/kg	3380	969	0.25	A475543
Total (Wet Wt) Lead (Pb)	mg/kg	1.41	0.682	0.0013	A475543
Total (Wet Wt) Magnesium (Mg)	mg/kg	3940	2490	0.40	A475543
Total (Wet Wt) Manganese (Mn)	mg/kg	611	54.9	0.010	A475543
Total (Wet Wt) Mercury (Hg)	mg/kg	0.036	0.029	0.013	A475543
Total (Wet Wt) Molybdenum (Mo)	mg/kg	0.681	0.253	0.0080	A475543
Total (Wet Wt) Nickel (Ni)	mg/kg	2.93	1.21	0.010	A475543
Total (Wet Wt) Phosphorus (P)	mg/kg	1700	1490	2.0	A475543
Total (Wet Wt) Potassium (K)	mg/kg	1600	1560	2.5	A475543
Total (Wet Wt) Selenium (Se)	mg/kg	1.68	1.25	0.010	A475543
Total (Wet Wt) Silver (Ag)	mg/kg	0.0094	0.0042	0.0013	A475543
Total (Wet Wt) Sodium (Na)	mg/kg	2790	3270	2.5	A475543
Total (Wet Wt) Strontium (Sr)	mg/kg	41.2	11.0	0.013	A475543
Total (Wet Wt) Thallium (Tl)	mg/kg	0.0547	0.0112	0.00040	A475543
Total (Wet Wt) Tin (Sn)	mg/kg	0.064	0.053	0.020	A475543
Total (Wet Wt) Titanium (Ti)	mg/kg	33.1	19.5	0.13	A475543
Total (Wet Wt) Uranium (U)	mg/kg	0.204	0.107	0.00040	A475543
Total (Wet Wt) Vanadium (V)	mg/kg	4.96	2.09	0.020	A475543
Total (Wet Wt) Zinc (Zn)	mg/kg	14.1	12.6	0.20	A475543
RDL = Reportable Detection Limit					

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PHYSICAL TESTING (TISSUE)

Bureau Veritas ID		ALJ033	ALJ034	ALJ035	ALJ036		
Sampling Date							
COC Number		08502167	08502167	08502167	08502167		
	UNITS	**BAFF21UMLNHTARCO MP1_METALS**	**BAFF21UMLNHTARCO MP2_METALS**	**BAFF21UMLNHTARCO MP3_METALS**	**BAFF21UMLNHTARCO MP4_METALS**	**RDL**	**QC Batch**
Physical Properties							
Moisture	%	66	77	78	70	0.30	A474979
RDL = Reportable Detection Limit							

Bureau Veritas ID		ALJ037	ALJ038	ALJ039	ALJ040		
Sampling Date							
COC Number		08502167	08502167	08502167	08502167		
	UNITS	**BAFF21UMLNHTARCO MP5_METALS**	**BAFF21UMLNHTARCO MP6_METALS**	**BAFF21UMLNHTARCO MP7_METALS**	**BAFF21UMLNHTARCO MP8_METALS**	**RDL**	**QC Batch**
Physical Properties							
Moisture	%	75	76	68	76	0.30	A474979
RDL = Reportable Detection Limit							

GENERAL COMMENTS

Results relate only to the items tested.

Bureau Veritas Job #: C191378
Report Date: 2022/01/25

GOLDER ASSOCIATES LTD
Client Project #: 1663724/44000/03
Site Location: BAFFLINLAND IRON MINE
Sampler Initials: BL

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
A474979	CG5	RPD	Moisture	2022/01/20	0.60		%	20
A475543	SOM	QC Standard	Total (Wet Wt) Aluminum (Al)	2022/01/22		100	%	N/A
			Total (Wet Wt) Arsenic (As)	2022/01/22		92	%	N/A
			Total (Wet Wt) Cadmium (Cd)	2022/01/22		90	%	N/A
			Total (Wet Wt) Chromium (Cr)	2022/01/22		84	%	N/A
			Total (Wet Wt) Cobalt (Co)	2022/01/22		88	%	N/A
			Total (Wet Wt) Copper (Cu)	2022/01/22		85	%	N/A
			Total (Wet Wt) Iron (Fe)	2022/01/22		92	%	N/A
			Total (Wet Wt) Lead (Pb)	2022/01/22		71	%	N/A
			Total (Wet Wt) Mercury (Hg)	2022/01/22		86	%	N/A
			Total (Wet Wt) Molybdenum (Mo)	2022/01/22		100	%	N/A
			Total (Wet Wt) Nickel (Ni)	2022/01/22		148	%	N/A
			Total (Wet Wt) Phosphorus (P)	2022/01/22		89	%	N/A
			Total (Wet Wt) Selenium (Se)	2022/01/22		93	%	N/A
			Total (Wet Wt) Sodium (Na)	2022/01/22		89	%	N/A
			Total (Wet Wt) Uranium (U)	2022/01/22		147	%	N/A
			Total (Wet Wt) Zinc (Zn)	2022/01/22		87	%	N/A
A475543	SOM	Spiked Blank	Total (Wet Wt) Aluminum (Al)	2022/01/22		100	%	80 - 120
			Total (Wet Wt) Antimony (Sb)	2022/01/22		101	%	80 - 120
			Total (Wet Wt) Arsenic (As)	2022/01/22		102	%	80 - 120
			Total (Wet Wt) Barium (Ba)	2022/01/22		103	%	80 - 120
			Total (Wet Wt) Beryllium (Be)	2022/01/22		94	%	80 - 120
			Total (Wet Wt) Bismuth (Bi)	2022/01/22		98	%	80 - 120
			Total (Wet Wt) Boron (B)	2022/01/22		99	%	80 - 120
			Total (Wet Wt) Cadmium (Cd)	2022/01/22		99	%	80 - 120
			Total (Wet Wt) Calcium (Ca)	2022/01/22		104	%	80 - 120
			Total (Wet Wt) Chromium (Cr)	2022/01/22		98	%	80 - 120
			Total (Wet Wt) Cobalt (Co)	2022/01/22		100	%	80 - 120
			Total (Wet Wt) Copper (Cu)	2022/01/22		96	%	80 - 120
			Total (Wet Wt) Iron (Fe)	2022/01/22		105	%	80 - 120
			Total (Wet Wt) Lead (Pb)	2022/01/22		100	%	80 - 120
			Total (Wet Wt) Magnesium (Mg)	2022/01/22		101	%	80 - 120
			Total (Wet Wt) Manganese (Mn)	2022/01/22		99	%	80 - 120
			Total (Wet Wt) Mercury (Hg)	2022/01/22		101	%	80 - 120
			Total (Wet Wt) Molybdenum (Mo)	2022/01/22		105	%	80 - 120
			Total (Wet Wt) Nickel (Ni)	2022/01/22		98	%	80 - 120
			Total (Wet Wt) Phosphorus (P)	2022/01/22		97	%	80 - 120
			Total (Wet Wt) Potassium (K)	2022/01/22		104	%	80 - 120
			Total (Wet Wt) Selenium (Se)	2022/01/22		101	%	80 - 120
			Total (Wet Wt) Silver (Ag)	2022/01/22		99	%	80 - 120
			Total (Wet Wt) Sodium (Na)	2022/01/22		100	%	80 - 120
			Total (Wet Wt) Strontium (Sr)	2022/01/22		102	%	80 - 120
			Total (Wet Wt) Thallium (Tl)	2022/01/22		99	%	80 - 120
			Total (Wet Wt) Tin (Sn)	2022/01/22		100	%	80 - 120
			Total (Wet Wt) Titanium (Ti)	2022/01/22		103	%	80 - 120
			Total (Wet Wt) Uranium (U)	2022/01/22		104	%	80 - 120
			Total (Wet Wt) Vanadium (V)	2022/01/22		99	%	80 - 120
			Total (Wet Wt) Zinc (Zn)	2022/01/22		97	%	80 - 120
A475543	SOM	Method Blank	Total (Wet Wt) Aluminum (Al)	2022/01/22	<0.50		mg/kg	
			Total (Wet Wt) Antimony (Sb)	2022/01/22	<0.0020		mg/kg	
			Total (Wet Wt) Arsenic (As)	2022/01/22	<0.0050		mg/kg	
			Total (Wet Wt) Barium (Ba)	2022/01/22	<0.010		mg/kg	
			Total (Wet Wt) Beryllium (Be)	2022/01/22	<0.0020		mg/kg	

Bureau Veritas Job #: C191378
Report Date: 2022/01/25

GOLDER ASSOCIATES LTD
Client Project #: 1663724/44000/03
Site Location: BAFFLINLAND IRON MINE
Sampler Initials: BL

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total (Wet Wt) Bismuth (Bi)	2022/01/22	<0.0013		mg/kg	
			Total (Wet Wt) Boron (B)	2022/01/22	<0.20		mg/kg	
			Total (Wet Wt) Cadmium (Cd)	2022/01/22	<0.0013		mg/kg	
			Total (Wet Wt) Calcium (Ca)	2022/01/22	<4.0		mg/kg	
			Total (Wet Wt) Chromium (Cr)	2022/01/22	<0.025		mg/kg	
			Total (Wet Wt) Cobalt (Co)	2022/01/22	<0.0013		mg/kg	
			Total (Wet Wt) Copper (Cu)	2022/01/22	<0.013		mg/kg	
			Total (Wet Wt) Iron (Fe)	2022/01/22	<0.25		mg/kg	
			Total (Wet Wt) Lead (Pb)	2022/01/22	<0.0013		mg/kg	
			Total (Wet Wt) Magnesium (Mg)	2022/01/22	<0.40		mg/kg	
			Total (Wet Wt) Manganese (Mn)	2022/01/22	<0.010		mg/kg	
			Total (Wet Wt) Mercury (Hg)	2022/01/22	<0.013		mg/kg	
			Total (Wet Wt) Molybdenum (Mo)	2022/01/22	<0.0080		mg/kg	
			Total (Wet Wt) Nickel (Ni)	2022/01/22	<0.010		mg/kg	
			Total (Wet Wt) Phosphorus (P)	2022/01/22	<2.0		mg/kg	
			Total (Wet Wt) Potassium (K)	2022/01/22	<2.5		mg/kg	
			Total (Wet Wt) Selenium (Se)	2022/01/22	<0.010		mg/kg	
			Total (Wet Wt) Silver (Ag)	2022/01/22	<0.0013		mg/kg	
			Total (Wet Wt) Sodium (Na)	2022/01/22	<2.5		mg/kg	
			Total (Wet Wt) Strontium (Sr)	2022/01/22	<0.013		mg/kg	
			Total (Wet Wt) Thallium (Tl)	2022/01/22	<0.00040		mg/kg	
			Total (Wet Wt) Tin (Sn)	2022/01/22	<0.020		mg/kg	
			Total (Wet Wt) Titanium (Ti)	2022/01/22	<0.13		mg/kg	
			Total (Wet Wt) Uranium (U)	2022/01/22	<0.00040		mg/kg	
			Total (Wet Wt) Vanadium (V)	2022/01/22	<0.020		mg/kg	
			Total (Wet Wt) Zinc (Zn)	2022/01/22	<0.20		mg/kg	
A475543	SOM	RPD	Total (Wet Wt) Aluminum (Al)	2022/01/22	NC		%	40
			Total (Wet Wt) Antimony (Sb)	2022/01/22	30		%	40
			Total (Wet Wt) Arsenic (As)	2022/01/22	12		%	40
			Total (Wet Wt) Barium (Ba)	2022/01/22	55 (1)		%	40
			Total (Wet Wt) Beryllium (Be)	2022/01/22	NC		%	40
			Total (Wet Wt) Bismuth (Bi)	2022/01/22	NC		%	40
			Total (Wet Wt) Boron (B)	2022/01/22	NC		%	40
			Total (Wet Wt) Cadmium (Cd)	2022/01/22	2.1		%	40
			Total (Wet Wt) Calcium (Ca)	2022/01/22	41		%	60
			Total (Wet Wt) Chromium (Cr)	2022/01/22	16		%	40
			Total (Wet Wt) Cobalt (Co)	2022/01/22	6.5		%	40
			Total (Wet Wt) Copper (Cu)	2022/01/22	0.71		%	40
			Total (Wet Wt) Iron (Fe)	2022/01/22	11		%	40
			Total (Wet Wt) Lead (Pb)	2022/01/22	21		%	40
			Total (Wet Wt) Magnesium (Mg)	2022/01/22	8.1		%	40
			Total (Wet Wt) Manganese (Mn)	2022/01/22	26		%	40
			Total (Wet Wt) Mercury (Hg)	2022/01/22	NC		%	40
			Total (Wet Wt) Molybdenum (Mo)	2022/01/22	7.1		%	40
			Total (Wet Wt) Nickel (Ni)	2022/01/22	NC		%	40
			Total (Wet Wt) Phosphorus (P)	2022/01/22	7.8		%	40
			Total (Wet Wt) Potassium (K)	2022/01/22	2.6		%	40
			Total (Wet Wt) Selenium (Se)	2022/01/22	5.8		%	40
			Total (Wet Wt) Silver (Ag)	2022/01/22	NC		%	40
			Total (Wet Wt) Sodium (Na)	2022/01/22	5.0		%	40
			Total (Wet Wt) Strontium (Sr)	2022/01/22	41		%	60
			Total (Wet Wt) Thallium (Tl)	2022/01/22	4.4		%	40
			Total (Wet Wt) Tin (Sn)	2022/01/22	NC		%	40

Bureau Veritas Laboratories Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total (Wet Wt) Titanium (Ti)	2022/01/22	16		%	40
			Total (Wet Wt) Uranium (U)	2022/01/22	2.3		%	40
			Total (Wet Wt) Vanadium (V)	2022/01/22	NC		%	40
			Total (Wet Wt) Zinc (Zn)	2022/01/22	15		%	40
A479138	KKE	Reagent Blank	1-Methylnaphthalene	2022/01/21	<0.050		mg/kg	
			2-Methylnaphthalene	2022/01/21	<0.050		mg/kg	
			Benzo(j)fluoranthene	2022/01/21	<0.050		mg/kg	
			D10-ANTHRACENE (sur.)	2022/01/21		97	%	50 - 130
			D8-ACENAPHTHYLENE (sur.)	2022/01/21		92	%	50 - 130
			Perylene	2022/01/21	<0.050		mg/kg	
			TERPHENYL-D14 (sur.)	2022/01/21		95	%	50 - 130
			Naphthalene	2022/01/21	<0.050		mg/kg	
			Acenaphthylene	2022/01/21	<0.050		mg/kg	
			Acenaphthene	2022/01/21	<0.050		mg/kg	
			Fluorene	2022/01/21	<0.050		mg/kg	
			Phenanthrene	2022/01/21	<0.050		mg/kg	
			Anthracene	2022/01/21	<0.050		mg/kg	
			Fluoranthene	2022/01/21	<0.050		mg/kg	
			Pyrene	2022/01/21	<0.050		mg/kg	
			Benzo(a)anthracene	2022/01/21	<0.050		mg/kg	
			Chrysene	2022/01/21	<0.050		mg/kg	
			Benzo(b)fluoranthene	2022/01/21	<0.050		mg/kg	
			Benzo(k)fluoranthene	2022/01/21	<0.050		mg/kg	
			Benzo(a)pyrene	2022/01/21	<0.050		mg/kg	
			Indeno(1,2,3-cd)pyrene	2022/01/21	<0.050		mg/kg	
			Dibenz(a,h)anthracene	2022/01/21	<0.050		mg/kg	
			Benzo(g,h,i)perylene	2022/01/21	<0.050		mg/kg	
A479138	KKE	Spiked Blank	1-Methylnaphthalene	2022/01/21		99	%	50 - 130
			2-Methylnaphthalene	2022/01/21		94	%	50 - 130
			Benzo(j)fluoranthene	2022/01/21		92	%	50 - 130
			D10-ANTHRACENE (sur.)	2022/01/21		95	%	50 - 130
			D8-ACENAPHTHYLENE (sur.)	2022/01/21		93	%	50 - 130
			Perylene	2022/01/21		96	%	50 - 130
			TERPHENYL-D14 (sur.)	2022/01/21		92	%	50 - 130
			Naphthalene	2022/01/21		98	%	50 - 130
			Acenaphthylene	2022/01/21		100	%	50 - 130
			Acenaphthene	2022/01/21		98	%	50 - 130
			Fluorene	2022/01/21		100	%	50 - 130
			Phenanthrene	2022/01/21		99	%	50 - 130
			Anthracene	2022/01/21		99	%	50 - 130
			Fluoranthene	2022/01/21		98	%	50 - 130
			Pyrene	2022/01/21		96	%	50 - 130
			Benzo(a)anthracene	2022/01/21		101	%	50 - 130
			Chrysene	2022/01/21		98	%	50 - 130
			Benzo(b)fluoranthene	2022/01/21		96	%	50 - 130
			Benzo(k)fluoranthene	2022/01/21		90	%	50 - 130
			Benzo(a)pyrene	2022/01/21		90	%	50 - 130
			Indeno(1,2,3-cd)pyrene	2022/01/21		91	%	50 - 130
			Dibenz(a,h)anthracene	2022/01/21		92	%	50 - 130
			Benzo(g,h,i)perylene	2022/01/21		88	%	50 - 130
A479138	KKE	Method Blank	1-Methylnaphthalene	2022/01/21	<0.050		mg/kg	
			2-Methylnaphthalene	2022/01/21	<0.050		mg/kg	
			Benzo(j)fluoranthene	2022/01/21	<0.050		mg/kg	

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			D10-ANTHRACENE (sur.)	2022/01/21		111	%	50 - 130
			D8-ACENAPHTHYLENE (sur.)	2022/01/21		108	%	50 - 130
			Perylene	2022/01/21	<0.050		mg/kg	
			TERPHENYL-D14 (sur.)	2022/01/21		111	%	50 - 130
			Naphthalene	2022/01/21	<0.050		mg/kg	
			Acenaphthylene	2022/01/21	<0.050		mg/kg	
			Acenaphthene	2022/01/21	<0.050		mg/kg	
			Fluorene	2022/01/21	<0.050		mg/kg	
			Phenanthrene	2022/01/21	<0.050		mg/kg	
			Anthracene	2022/01/21	<0.050		mg/kg	
			Fluoranthene	2022/01/21	<0.050		mg/kg	
			Pyrene	2022/01/21	<0.050		mg/kg	
			Benzo(a)anthracene	2022/01/21	<0.050		mg/kg	
			Chrysene	2022/01/21	<0.050		mg/kg	
			Benzo(b)fluoranthene	2022/01/21	<0.050		mg/kg	
			Benzo(k)fluoranthene	2022/01/21	<0.050		mg/kg	
			Benzo(a)pyrene	2022/01/21	<0.050		mg/kg	
			Indeno(1,2,3-cd)pyrene	2022/01/21	<0.050		mg/kg	
			Dibenz(a,h)anthracene	2022/01/21	<0.050		mg/kg	
			Benzo(g,h,i)perylene	2022/01/21	<0.050		mg/kg	

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.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

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.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

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.

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:

David Huang, M.Sc., P.Chem., QP, Scientific Services Manager

Phil Deveau, Scientific Specialist (Organics)

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BV Labs 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 Signature Page.

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08502167

CHAIN OF CUSTODY RECORD

Page 1 of 2

Invoice Information		Report Information (if differs from invoice)		Project Information		Turnaround Time (TAT) Required
Company:	Golder Associates Ltd.	Company:		Quotation	C00599	☑ 5 - 7 Days Regular (Most analyses)
Contact Name:	Collin Arens	Contact Name:		P.O. #/AFE#:		PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address:	16820 107 Ave.	Address:				Rush TAT (Surcharges will be applied)
	Edmonton, AB PC: T5P 4C3		PC:	Project #:	1663724/44000/03	☐ Same Day ☐ 2 Days
Phone/Fax:	(780) 237-9638	Phone/Fax:		Site Location:	Baffinland Iron Mine	☐ 1 Day ☐ 3-4 Days
Email:	carens@golder.com	Email:		Site #:	Milne Port/Reference Site	Date Required:
Copies:	rsharpe@golder.com	Copies:		Sampled By:	Bradley Cox, Daniel Vicente	Rush Confirmation #:

Laboratory Use Only

	YES	NO	Cooler ID	1		
Seal Present		/	Temp	6	7	8
Seal Intact		/				
Cooling Media	/					
	YES	NO	Cooler ID			
Seal Present			Temp			
Seal Intact						
Cooling Media						
	YES	NO	Cooler ID			
Seal Present			Temp			
Seal Intact						
Cooling Media						

Depot Reception

Analysis Requested

Analysis options: ☐ BTEXS / VPH; ☐ VOC / BTEXS / VPH; ☐ MTBE; ☐ BTEX F1; ☐ VOC / BTEX / F1; ☑ PAH; ☐ LEPH / HEPH / PAH; ☐ EPH; ☐ TEH; ☐ F2 - F4; ☐ Dissolved Metals; ☐ Filtered?; ☐ Preserved?; ☐ Dissolved Mercury; ☐ Filtered?; ☐ Preserved?; ☐ Total Metals; ☐ Field Preserved?; ☐ Total Mercury; ☐ Field Preserved?; ☐ Chloride; ☐ Fluoride; ☐ Sulphate; ☐ TSS; ☐ TDS; ☐ BOD; ☐ COD; ☐ pH; ☐ Conductivity; ☐ Alkalinity; ☐ Nitrite; ☐ Nitrate; ☐ Ammonia; ☑ Alkylated PAHs; ☐; HOLD - DO NOT ANALYZE

Regulatory Criteria

☐ BC CSR
☐ YK CSR
☐ CCME
☐ Drinking Water
☐ BC Water Quality
☐ Other

	Sample Identification	Date Sampled (yyyy/mm/dd)	Time Sampled (hh:mm)	Matrix	# of Containers	PAH	Alkylated PAHs	HOLD - DO NOT ANALYZE
1	BAFF21UMLNHTAR1501 ✓	8/9/2021	12:00	Tissue	1	X	X	
2	BAFF21UMLNHTAR1503 ✓	8/9/2021	12:00	Tissue	1	X	X	
3	BAFF21UMLNHTAR1505 ✓	8/9/2021	12:00	Tissue	1	X	X	
4	BAFF21UMLNHTAR1507 ✓	8/9/2021	12:00	Tissue	1	X	X	
5	BAFF21UMLNHTAR1509 ✓	8/9/2021	12:00	Tissue	1	X	X	
6	BAFF21UMLNHTAR1511 ✓	8/14/2021	12:00	Tissue	1	X	X	
7	BAFF21UMLNHTAR1513 ✓	8/14/2021	12:00	Tissue	1	X	X	
8	BAFF21UMLNHTAR1515 ✓	8/14/2021	12:00	Tissue	1	X	X	
9	BAFF21UMLNHTAR1517 ✓	8/14/2021	12:00	Tissue	1	X	X	
10	BAFF21UMLNHTAR1519 ✓	8/14/2021	12:00	Tissue	1	X	X	

Special Instructions

Form a total of eight composite samples for PAH analysis from those included on this COC.

Relinquished by: (Signature/ Print)	Date (yyyy/mm/dd):	Time (hh:mm):	Received by: (Signature/ Print)	Date (yyyy/mm/dd):	Time (hh:mm):
Maddie Bearge	2021/12/07	12:00	Renee Lanzon	2021/12/08	08:25

COC-1020

C191378_COC

BUREAU VERITAS

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Victoria: 460 Tennyson Place, Unit 1, Victoria, BC V8Z 6S8 Toll Free (866) 385-6112
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08502163

CHAIN OF CUSTODY RECORD

Invoice Information		Report Information (if differs from invoice)		Project Information	
Company:	Golder Associates Ltd.	Company:		Quotation	C00599
Contact Name:	Collin Arens	Contact Name:		P.O. #/AFE#:	
Address:	16820 107 Ave. Edmonton, AB PC: T5P 4C3	Address:	PC:	Project #:	1663724/44000/03
				Site Location:	Baffinland Iron Mine
Phone/Fax:	(780) 237-9638	Phone/Fax:		Site #:	Milne Port/Reference Site
Email:	carens@golder.com	Email:		Sampled By:	Bradley Cox, Daniel Vicente
Copies:	rsharpe@golder.com	Copies:			

Turnaround Time (TAT) Required

☑ 5 - 7 Days Regular (Most analyses)

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

Rush TAT (Surcharges will be applied)

☐ Same Day ☐ 2 Days
☐ 1 Day ☐ 3-4 Days

Date Required:

Rush Confirmation #:

Laboratory Use Only

	YES	NO	Cooler ID
Seal Present			
Seal Intact			Temp
Cooling Media			
	YES	NO	Cooler ID
Seal Present			
Seal Intact			Temp
Cooling Media			
	YES	NO	Cooler ID
Seal Present			
Seal Intact			Temp
Cooling Media			

Depot Reception

Regulatory Criteria

☐ BC CSR
☐ YK CSR
☐ CCME
☐ Drinking Water
☐ BC Water Quality
☐ Other

Analysis Requested

#	Sample Identification	Date Sampled (yyyy/mm/dd)	Time Sampled (hh:mm)	Matrix	# of Containers	☐ MTBE / ☐ VOC / BTEXS / VPH / ☐ BTEXS / VPH	☐ VOC / BTEX / F1 / ☐ BTEX F1	☐ LEPH / HEPH / PAH / ☑ PAH	☐ F2 - F4 / ☐ TEH / ☐ EPH	☐ Preserved? / ☐ Filtered? / Dissolved Metals	☐ Preserved? / ☐ Filtered? / Dissolved Mercury	☐ Field Preserved? / Total Metals	☐ Field Preserved? / Total Mercury	☐ Sulphate / ☐ Fluoride / ☐ Chloride	☐ COD / ☐ BOD / ☐ TDS / ☐ TSS	☐ Alkalinity / ☐ Conductivity / ☐ pH	☐ Ammonia / ☐ Nitrate / ☐ Nitrite	☑ Alkylated PAHs	☐				HOLD - DO NOT ANALYZE
1	BAFF21UMLNHTAR1521	8/16/2021	12:00	Tissue	1			X										X					
2	BAFF21UMLNHTAR1523	8/16/2021	12:00	Tissue	1			X										X					
3	BAFF21UMLNHTAR1525	8/16/2021	12:00	Tissue	1			X										X					
4	BAFF21UMLNHTAR1527	8/17/2021	12:00	Tissue	1			X										X					
5	BAFF21UMLNHTAR1529	8/17/2021	12:00	Tissue	1			X										X					
6	BAFF21UMLNHTAR1531	8/18/2021	12:00	Tissue	1			X										X					
7	BAFF21UMLNHTAR1533	8/18/2021	12:00	Tissue	1			X										X					
8	BAFF21UMLNHTAR1535	8/18/2021	12:00	Tissue	1			X										X					
9								X										X					
10								X										X					

Special Instructions

Form a total of eight composite samples for PAH analysis from those included on this COC.

Relinquished by: (Signature/ Print)	Date (yyyy/mm/dd):	Time (hh:mm):	Received by: (Signature/ Print)	Date (yyyy/mm/dd):	Time (hh:mm):
Maddie Bearge	2021/12/07	12:00			

COC-1020

C191378_COC

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Victoria: 460 Tennyson Place, Unit 1, Victoria, BC V8Z 6S8 Toll Free (866) 385-6112
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CHAIN OF CUSTODY RECORD 08502082

Invoice Information		Report Information (if differs from invoice)		Project Information	
Company:	Golder Associates Ltd.	Company:		Quotation	C00599
Contact Name:	Collin Arens	Contact Name:		P.O. #/AFE#:	
Address:	16820 107 Ave. Edmonton, AB PC: T5P 4C3	Address: PC:		Project #:	1663724/44000/03
Phone/Fax:	(780) 237-9638	Phone/Fax:		Site Location:	Baffinland Iron Mine
Email:	carens@golder.com	Email:		Site #:	Milne Port
Copies:	rsharpe@golder.com	Copies:		Sampled By:	Bradley Cox, Daniel Vicente

Turnaround Time (TAT) Required

- [x] 5 - 7 Days Regular (Most analyses)

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

Rush TAT (Surcharges will be applied)

- [ ] Same Day
- [ ] 2 Days
- [ ] 1 Day
- [ ] 3-4 Days

Date Required:

Rush Confirmation #:

Laboratory Use Only

	YES	NO	Cooler ID	1		
Seal Present		/				
Seal Intact		/	Temp	6	7	8
Cooling Media	/					
	YES	NO	Cooler ID			
Seal Present						
Seal Intact			Temp			
Cooling Media						
	YES	NO	Cooler ID			
Seal Present						
Seal Intact			Temp			
Cooling Media						

Depot Reception

Analysis Requested

- [ ] BTEXS / VPH
- [ ] VOC / BTEXS / VPH
- [ ] MTBE
- [ ] BTEX F1
- [ ] VOC / BTEX / F1
- [ ] PAH
- [ ] LEPH / HEPH / PAH
- [ ] EPH
- [ ] TEH
- [ ] F2 - F4
- [x] Dissolved Metals
- [ ] Filtered?
- [ ] Preserved?
- [ ] Dissolved Mercury
- [ ] Filtered?
- [ ] Preserved?
- [x] Total Metals
- [ ] Field Preserved?
- [ ] Total Mercury
- [ ] Field Preserved?
- [ ] Chloride
- [ ] Fluoride
- [ ] Sulphate
- [ ] TSS
- [ ] TDS
- [ ] BOD
- [ ] COD
- [ ] pH
- [ ] Conductivity
- [ ] Alkalinity
- [ ] Nitrite
- [ ] Nitrate
- [ ] Ammonia
- [ ] Alkylated PAHs
- [ ]

HOLD - DO NOT ANALYZE

Regulatory Criteria

- [ ] BC CSR
- [ ] YK CSR
- [ ] CCME
- [ ] Drinking Water
- [ ] BC Water Quality
- [ ] Other

	Sample Identification	Date Sampled (yyyy/mm/dd)	Time Sampled (hh:mm)	Matrix	# of Containers	BTEXS / VPH	BTEX F1	PAH	EPH	Dissolved Metals	Dissolved Mercury	Total Metals	Total Mercury	Chloride	TSS	pH	Nitrite	Alkylated PAHs		HOLD - DO NOT ANALYZE
1	BAFF21UMLNHTAR1502	8/9/2021	12:00	Tissue	1							X								
2	BAFF21UMLNHTAR1504	8/9/2021	12:00	Tissue	1							X								
3	BAFF21UMLNHTAR1506	8/10/2021	12:00	Tissue	1							X								
4	BAFF21UMLNHTAR1508	8/10/2021	12:00	Tissue	1							X								
5	BAFF21UMLNHTAR1510	8/10/2021	12:00	Tissue	1							X								
6	BAFF21UMLNHTAR1512	8/14/2021	12:00	Tissue	1							X								
7	BAFF21UMLNHTAR1514	8/14/2021	12:00	Tissue	1							X								
8	BAFF21UMLNHTAR1516	8/14/2021	12:00	Tissue	1							X								
9	BAFF21UMLNHTAR1518	8/14/2021	12:00	Tissue	1							X								
10	BAFF21UMLNHTAR1520	8/14/2021	12:00	Tissue	1							X								

Special Instructions

Form a total of eight composite samples from those included in this COC for metals analysis.

Relinquished by: (Signature/ Print)	Date (yyyy/mm/dd):	Time (hh:mm):	Received by: (Signature/ Print)	Date (yyyy/mm/dd):	Time (hh:mm):
Maddie Beang	2021/12/07	12:00	[illegible]	2021/12/08	08:25

C191378_COC

COC-1020

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Victoria: 460 Tennyson Place, Unit 1, Victoria, BC V8Z 6S8 Toll Free (866) 385-6112
bvlabs.com

08502086

CHAIN OF CUSTODY RECORD

Invoice Information

Company: Golder Associates Ltd.
Contact Name: Collin Arens
Address: 16820 107 Ave.
Edmonton, AB PC: T5P 4C3
Phone/Fax: (780) 237-9638
Email: carens@golder.com
Copies: rsharpe@golder.com

Report Information (if differs from invoice)

Company:
Contact Name:
Address:
PC:
Phone/Fax:
Email:
Copies:

Project Information

Quotation: C00599
P.O. #/AFE#:
Project #: 1663724/44000/03
Site Location: Baffinland Iron Mine
Site #: Milne Port
Sampled By: Bradley Cox, Daniel Vicente

Turnaround Time (TAT) Required

☑ 5 - 7 Days Regular (Most analyses)

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

Rush TAT (Surcharges will be applied)

☐ Same Day ☐ 2 Days
☐ 1 Day ☐ 3-4 Days

Date Required:
Rush Confirmation #:

Laboratory Use Only

	YES	NO	Cooler ID		
Seal Present			Temp		
Seal Intact					
Cooling Media					
	YES	NO	Cooler ID		
Seal Present			Temp		
Seal Intact					
Cooling Media					
	YES	NO	Cooler ID		
Seal Present			Temp		
Seal Intact					
Cooling Media					

Depot Reception

Analysis Requested

Columns: # of Containers; ☐ BTEXS / VPH / ☐ VOC / BTEXS / VPH / ☐ MTBE; ☐ BTEX F1 / ☐ VOC / BTEX / F1; ☐ PAH / ☐ LEPH / HEPH / PAH; ☐ EPH / ☐ TEH / ☐ F2 - F4; ☐ Dissolved Metals / ☐ Filtered? / ☐ Preserved?; ☐ Dissolved Mercury / ☐ Filtered? / ☐ Preserved?; ☑ Total Metals / ☐ Field Preserved?; ☐ Total Mercury / ☐ Field Preserved?; ☐ Chloride / ☐ Fluoride / ☐ Sulphate; ☐ TSS / ☐ TDS / ☐ BOD / ☐ COD; ☐ pH / ☐ Conductivity / ☐ Alkalinity; ☐ Nitrite / ☐ Nitrate / ☐ Ammonia; ☐ Alkylated PAHs; ☐; HOLD - DO NOT ANALYZE

Regulatory Criteria

☐ BC CSR
☐ YK CSR
☐ CCME
☐ Drinking Water
☐ BC Water Quality
☐ Other

#	Sample Identification	Date Sampled (yyyy/mm/dd)	Time Sampled (hh:mm)	Matrix	# of Containers	Total Metals	HOLD - DO NOT ANALYZE
1	BAFF21UMLNHTAR1522	8/16/2021	12:00	Tissue	1	X	
2	BAFF21UMLNHTAR1524	8/16/2021	12:00	Tissue	1	X	
3	BAFF21UMLNHTAR1526	8/17/2021	12:00	Tissue	1	X	
4	BAFF21UMLNHTAR1528	8/17/2021	12:00	Tissue	1	X	
5	BAFF21UMLNHTAR1530	8/17/2021	12:00	Tissue	1	X	
6	BAFF21UMLNHTAR1532	8/18/2021	12:00	Tissue	1	X	
7	BAFF21UMLNHTAR1534	8/18/2021	12:00	Tissue	1	X	
8							
9							
10							

Special Instructions

Form a total of eight composite samples from those included in this COC for metals analysis.

Relinquished by: (Signature/ Print)	Date (yyyy/mm/dd):	Time (hh:mm):	Received by: (Signature/ Print)	Date (yyyy/mm/dd):	Time (hh:mm):
Maddie Bearge	2021/12/07	12:00			

COC-1020

C191378_COC

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FINAL REPORT

Chapter 8.0 Non-Indigenous and Aquatic Invasive Species (NIS/AIS) Monitoring

2021 Marine Environmental Effects Monitoring Program (MEEMP) and Non-Indigenous Species / Aquatic Invasive Species (AIS) Monitoring Program

Submitted to:

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1663724-349h-R-Rev0-44000

21 October 2022

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ACRONYMS AND ABBREVIATIONS

Acronym or Abbreviation	Definition
AIS	Aquatic Invasive Species
ArcOD	Arctic Ocean Diversity
ARMS	Arctic Register of Marine Species
Biologica	Biological Environmental Services Ltd.
cf.	Compare with (taxonomy)
DFO	Fisheries and Oceans Canada
EOL	Encyclopedia of Life
FEIS	2012 Final Environmental Impact Statement
GBIF	Global Biodiversity Information Facility
GISD	Global Invasive Species Database
Indet.	Indeterminate (taxonomy)
ISSG	Invasive Species Specialist Group
IUCN	International Union for Conservation of Nature
Laval	Benthic Ecology Lab at Université Laval
MEEMP	Marine Environmental Effects Monitoring Program
MEWG	Marine Environmental Working Group
µm	micrometer
NCCOS	National Centers for Coastal Ocean Science
NEMESIS	National Exotic Marine and Estuarine Species Information System
NIS	Non-Indigenous Species
OBIS	Ocean Biogeographic Information System
PC	Project Certificate
QA/QC	Quality assurance and quality control
sp.	Species (taxonomy)
sp. nr.	Species near (taxonomy)
WoRMS	World Register of Marine Species
WRIMS	World Register of Introduced Marine Species

8.0 NON-INDIGENOUS SPECIES/AQUATIC INVASIVE SPECIES (NIS/AIS)

8.1 Introduction

This chapter presents the results of the Non-Indigenous Species (NIS) and Aquatic Invasive Species (AIS) monitoring program as a part of the larger Marine Environmental Effects Monitoring Program (MEEMP) conducted at Milne Port and in Milne Inlet during the 2021 open-water season. This component was developed in consideration of the monitoring requirements outlined in the PC Conditions described in Chapter 1.0, Table 1-2. Project Certificate (PC) Conditions related to the monitoring of NIS and AIS included PC Conditions No. 76, 87, 89, 91, 99 (a), and 99 (c).

8.1.1 Objectives

Objectives for the overall MEEMP program are outlined in Section 1.3 of Chapter 1.0 (Program Overview). Objectives specific to the NIS/AIS monitoring program are as follows:

- Sample marine environment to screen for potential Project-related introductions of taxa that are invasive or non-indigenous.
- Update taxonomic inventory of marine biota (i.e., list of organisms observed) for Milne Inlet.
- Communicate outcomes for specimens sent for independent verification.

8.1.2 Definitions

Definitions are provided below for technical terms used throughout this chapter:

Non-indigenous species (NIS): a species that exists outside the particular region or body of water where it originated naturally with the potential to become harmful.

Aquatic invasive species (AIS): a species that exists outside the particular region or body of water where it originated naturally and that can harm the environment, the economy, or society.

Cryptogenic: a species that is not demonstrably native or introduced, a species with an obscure or unknown natural range.

forma (f.): or form, indicating a secondary rank classification that designates a group with a noticeable morphological deviation.

sp.: “Species”, used to indicate the species name is indeterminate. This is typically used for samples that were damaged, juvenile, or missing features preventing a conclusive identification to species level.

indet.: “indeterminate”, used to indicate the specimen can be identified only to the listed taxonomic level, used for indeterminate taxonomic designations above genus. This is typically used for samples that were damaged, juvenile, or missing features preventing a conclusive identification beyond the indicated taxonomic level

cf.: “compare with”, in taxonomy refers to a taxonomic designation that indicates an inexact match to the indicated taxon. The specimen may represent a similar related species, an undescribed morph, or the specimen may be lacking characteristics (due to damage, lack of development of the features, or immaturity) that allow for a positive identification.

sp. nr.: “species near”, similar to “cf.”, but representing a species that is similar to the described species, however there are indications that the species is not a correct match. This may occur in poorly or newly described taxonomic groups where a specimen clearly matches the genus description but does not necessarily match the described species within it. May indicate a new to science species without a description on record.

Other terms used throughout the report include:

Flagged taxa: Taxa are flagged where there is low confidence in their identifications, uncertainties in the range on record, or presence on any of the AIS databases.

No Risk: A species is considered “No Risk” if it has a probable range that includes the Canadian Arctic, or the north Atlantic in the vicinity of the Project (i.e., Labrador Sea), and is not present in any AIS databases. For higher taxonomic levels, a taxon is considered “No Risk” if at least one representative species within the taxon has a confirmed range that includes the Canadian Arctic.

Low Risk: Taxa is considered “Low Risk” if the species (or any representative species for higher taxonomic levels) does not have a probable range that includes the Canadian Arctic, but it is not considered invasive in any AIS databases.

High Risk: Taxa is considered “High Risk” if the species (or any representative species for higher taxonomic levels) does not have a probable range that includes the Canadian Arctic, and it is considered invasive in any AIS databases.

Watchlist: a list of taxa identified in Milne Inlet that are considered to be “Low Risk” or “High Risk” but not directly attributable to the Project, or requiring more data. Taxa on this list are subjected to a heightened level of monitoring.

Trigger List: a list that contains species confirmed as Project-related introductions of High-Risk taxa. Responsive actions will be species specific and proportional to the risk.

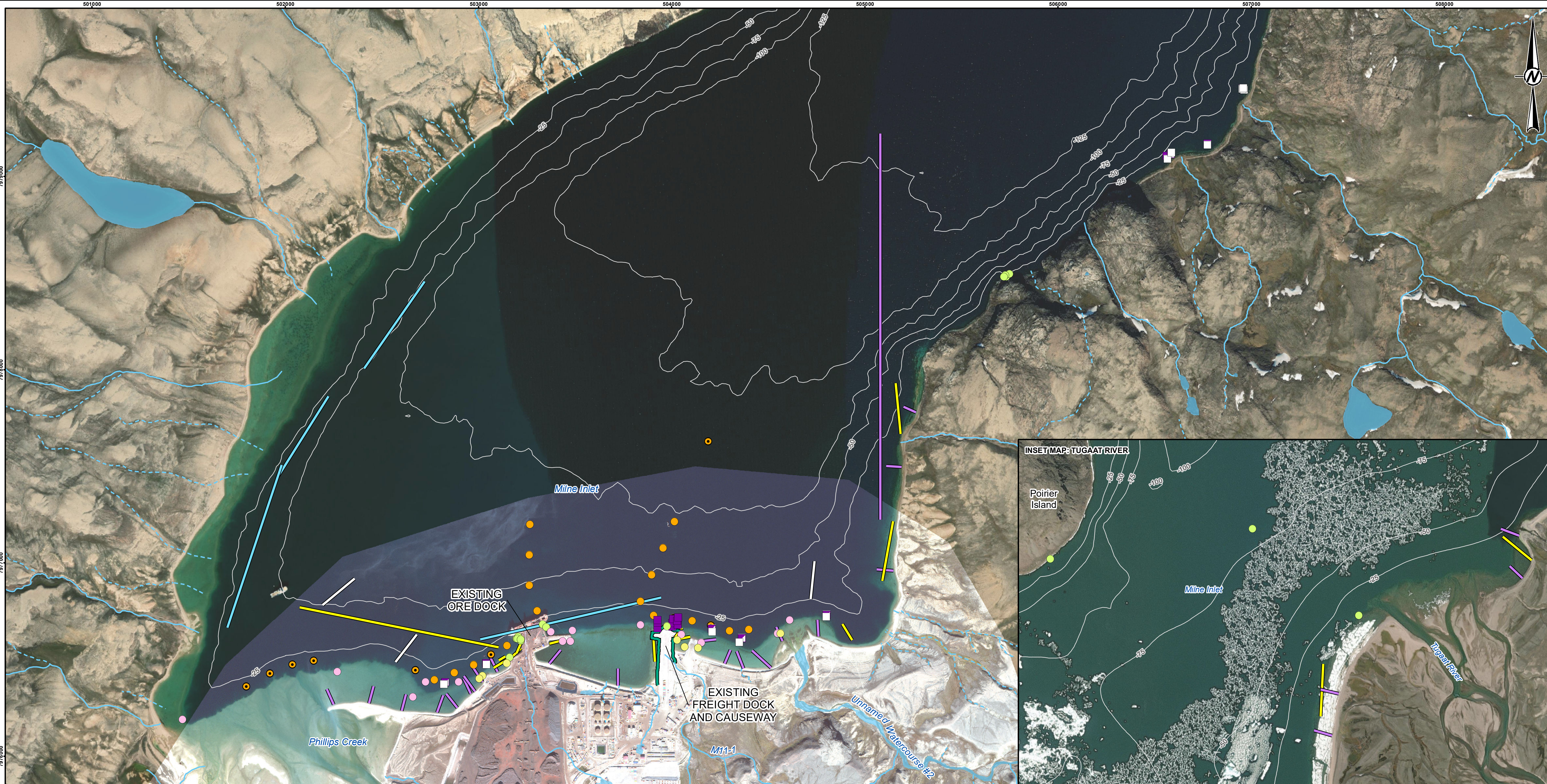
8.2 Study Design

The NIS/AIS monitoring program is designed to detect potential introductions of non-indigenous and/or invasive species from Project-related vectors such as ballast water discharges or ship hull biofouling. Since ballast water releases only occur at the anchorages and the Ore Dock in Milne Port, sampling conducted to date has largely focused on southern Milne Inlet as the area with highest likelihood of marine invasion.

NIS/AIS monitoring involves a combination of dedicated surveys as well as screening all specimens caught during surveys for all the various MEEMP components; thus, NIS/AIS monitoring involves data collection across multiple trophic levels – marine vegetation, invertebrates and fish – to establish a comprehensive inventory of existing marine biota in the Project area that serves as a point of reference for any new species/taxa identified (herein referred to as the “Milne Inlet Taxonomic Inventory”). The Milne Inlet Taxonomic Inventory was initially populated with organisms identified during baseline studies in 2008, 2010 and 2013 and has been updated annually with new records collected during MEEMP surveys; 2021 sampling locations are shown in Figure 8-1.

Dedicated surveys involve:

i) NIS/AIS sampling of benthic invertebrates at Milne Port, including collection of targeted samples for DNA barcoding (Benthic Samples for DNA Barcoding on Figure 8-2).
ii) Recruitment surveys using settlement substrates deployed in 2020 around Milne Port (Settlement Plate Only and Settlement Basket and Plate on Figure 8-2).



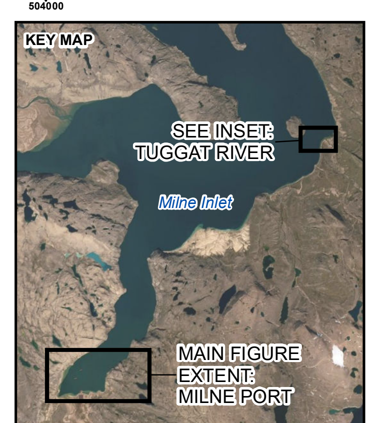
LEGEND

SAMPLING LOCATION
- ANGLING
- BENTHIC COMMUNITY
- BENTHIC SAMPLE FOR DNA BARCODING
- FUKUI TRAP
- HOOP NET
- QUADRAT
- QUADRAT/SETTLEMENT PLATE
- SETTLEMENT BASKET AND PLATE

SAMPLING TRANSECT
- ANGLING
- FREIGHT DOCK SURVEY
- GILL NET
- LONG LINE
- OTTER TRAWL

- BATHYMETRIC CONTOUR (25 m INTERVAL)
- INTERMITTENT WATERCOURSE
- WATERCOURSE
- WATERBODY

KEY MAP



0 500 1,000
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REFERENCE(S)
BATHYMETRY CREATED BY GOLDER FROM MULTIPLE DATA SOURCES. FREIGHT DOCK DATA PROVIDED BY HATCH, MARCH 4, 2020. ADDITIONAL MILNE PORT INFRASTRUCTURE DATA OBTAINED FROM CLIENT, MAY 2, 2020 AND MAY 28, 2018. HYDROGRAPHY DATA OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED. MILNE PORT IMAGERY CAPTURED AUGUST 2020 © 2020 DIGITAL GLOBE, INC. ADDITIONAL IMAGERY COPYRIGHT © 20190802 ESRI AND ITS LICENSORS. SOURCE: MAXAR VIVID. USED UNDER LICENSE, ALL RIGHTS RESERVED.
PROJECTION: UTM ZONE 17 DATUM: NAD 83

CLIENT
BAFFINLAND IRON MINES CORPORATION

PROJECT
MARY RIVER PROJECT

CONSULTANT
GOLDER
MEMBER OF WSP

YYYY-MM-DD	2022-06-30
DESIGNED	CB
PREPARED	AJA
REVIEWED	CB
APPROVED	PR

TITLE
MEEMP SAMPLING LOCATIONS IN MILNE PORT USED TO INFORM NIS/AIS PROGRAM SPECIES INVENTORIES, 2021

PROJECT NO.	CONTROL	REV.	FIGURE
1663724	44000-04	0	8-1

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25mm

NIS/AIS monitoring is recommended to be conducted annually until results of ballast water treatment and compliance monitoring, and Project vessel biofouling monitoring, are better understood. Additionally, annual monitoring not only increases the data available for Milne Port, but is also important from a regional perspective, as this program currently represents the most intensive sampling for NIS/AIS in the Canadian Arctic and has contributed to filling data gaps and advancing the science on benthic invertebrates in particular.

8.2.1 Modifications to the Program (2021)

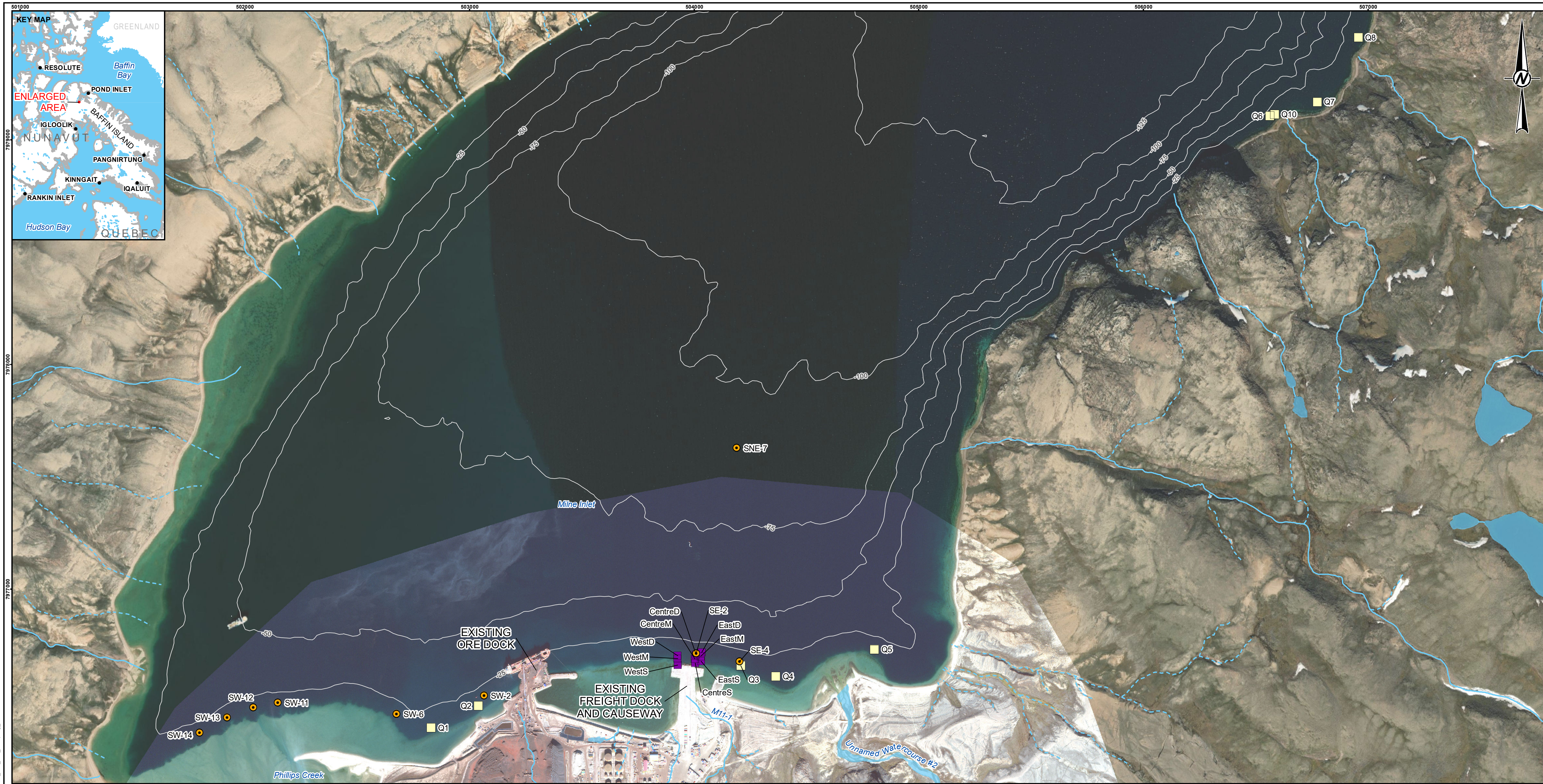
Due to multiple years of monitoring data revealing no adverse trends in benthic community indicators related to Project construction and operations, the monitoring frequency of the benthic infauna invertebrates sampling program was adjusted to every 3 years, which is more consistent with routine biological sampling for other mining effects monitoring programs (e.g., the federal Environmental Effects Monitoring Program [EEM]). As a result, benthic sampling collection in 2021 was dedicated to support the NIS/AIS program and, accordingly, focussed on areas surrounding Project infrastructure with the greatest potential for NIS/AIS detection. Sampling effort consisted of 17 stations, comparable to efforts in 2018. Additionally, 2021 was the second year that targeted sampling was conducted to obtain specimens for genetic analysis, with additional sampling locations added to the 2020 program. Nine locations were sampled where species of concern were previously observed as part of the response program (Benthic Samples for DNA Barcoding on Figure 8-2).

Zooplankton sampling was removed from the program in 2021 and replaced with monitoring for recruitment. Zooplankton samples were found to be ineffective at indicating risk of recruitment of NIS/AIS taxa due to the large variation in taxa present and given that the samples generally only represent a limited fraction of the annual planktonic community both due to physical (i.e., weather patterns) and biological (i.e., spawning timing) factors. Further, presence of juvenile NIS/AIS taxa in zooplankton may not represent an invasion as there is no indication of the viability of the organism; for example, a juvenile taxon found in zooplankton may reflect an introduction, however it is not possible to assess whether the specimen was alive at collection, and thus with the potential to establish. Recruitment was instead monitored through settlement substrates deployed at various locations throughout Milne Port (Settlement Plate Only and Settlement Basket and Plate on Figure 8-2). Taxa on settlement substrates are more likely to reflect recruitment capability as the specimen was able to establish on the substrate. Settlement baskets and plates also represent the first targeted sampling of hard substrates in Milne Port. Species associated with hard substrates are generally underrepresented in Canadian Arctic surveys due to a focus on substrates that are more readily collected with standard sampling equipment such as Ponar and Van Veen grabs.

In 2018, 2019, and 2020, underwater video of ship hulls was collected to monitor for risk of NIS/AIS introductions through biofouling. Taxonomic resolution was consistently poor due to the inability to confidently identify encrusting organisms without specimen collections and therefore ship hulls were not surveyed in 2021. The settlement substrates deployed through Milne Port are intended to monitor for recruitment of encrusting species, similar to what may be present on ship hull biofouling. Baffinland is continuing to work with Fisheries and Oceans Canada (DFO) to explore options to improve taxonomic resolution in ship hull surveys.

8.2.2 Indicators & Thresholds

The NIS/AIS monitoring program is designed as a surveillance survey and therefore does not use traditional indicators and thresholds. Detection of a single NIS/AIS will initiate a response protocol aimed to assess the risk and determine the appropriate course of action. Ultimately, species are either determined to be “No Risk” or are determined to be “High Risk” or “Low Risk” and placed on a “Watchlist” and subject to heightened monitoring efforts, or placed on a “Trigger List”, where rapid response plans and an evaluation of potential intervention measures would be developed and implemented. The taxa review process framework is depicted in Figure 8-3.



LEGEND

- BENTHIC SAMPLE FOR DNA BARCODING
- SETTLEMENT BASKET AND PLATE
- SETTLEMENT PLATE ONLY
- BATHYMETRIC CONTOUR (25 m INTERVAL)
- INTERMITTENT WATERCOURSE
- WATERCOURSE
- WATERBODY

0 500 1,000

1:17,000 METRES

REFERENCE(S)

BATHYMETRY CREATED BY GOLDER FROM MULTIPLE DATA SOURCES. FREIGHT DOCK DATA PROVIDED BY HATCH, MARCH 4, 2020. ADDITIONAL MILNE PORT INFRASTRUCTURE DATA OBTAINED FROM CLIENT, MAY 2, 2020 AND MAY 28, 2018. HYDROGRAPHY DATA OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED. MILNE PORT IMAGERY CAPTURED AUGUST 2020 © 2020 DIGITAL GLOBE, INC. ADDITIONAL IMAGERY COPYRIGHT © 20190802 ESRI AND ITS LICENSORS. SOURCE: MAXAR VIVID. USED UNDER LICENSE, ALL RIGHTS RESERVED.
PROJECTION: UTM ZONE 17 DATUM: NAD 83

CLIENT
BAFFINLAND IRON MINES CORPORATION

PROJECT
MARY RIVER PROJECT

CONSULTANT
GOLDER
MEMBER OF WSP

YYYY-MM-DD	2022-06-30
DESIGNED	CB
PREPARED	AJA
REVIEWED	CB
APPROVED	PR

TITLE
SPECIFIC NIS/AIS SAMPLING LOCATIONS IN MILNE PORT, 2021

PROJECT NO.	CONTROL	REV.	FIGURE
1663724	44000-04	0	8-2

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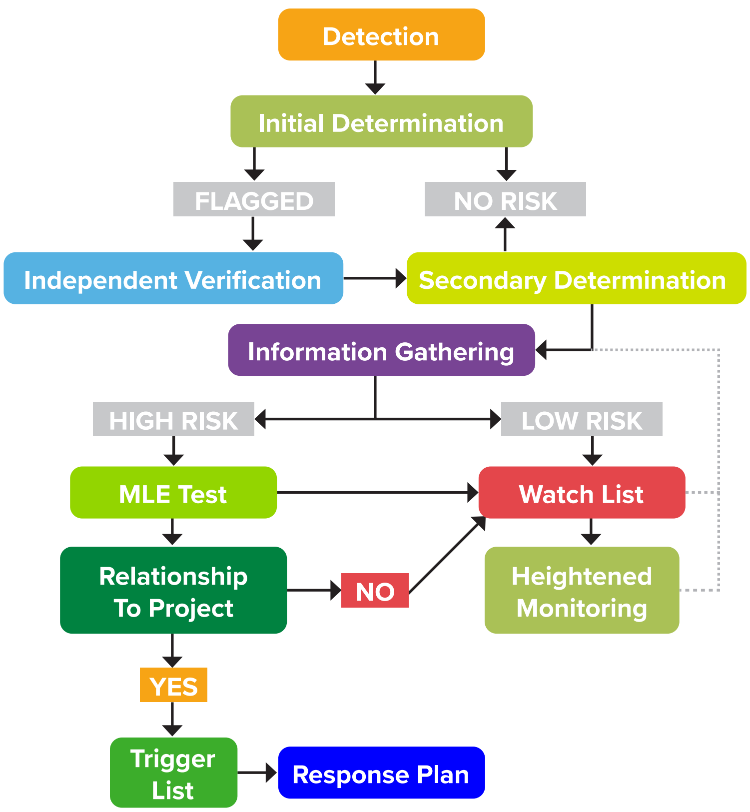
Figure 8-3: Flow Chart Describing Taxa Review Process for Flagging Species as Low or High Risk



Detection

Detection involves screening the taxonomic list received from annual survey efforts against the taxonomic inventory developed for Milne Inlet (which includes all taxa observed across all baseline and monitoring surveys) to identify taxa that have not been observed previously.

Initial Determination

Taxa identified in the detection stage are compared to existing taxonomic resources and available regional species records of occurrence. Resources include, but are not limited to, the World Register of Marine Species (WoRMS), the Global Biodiversity Information Facility (GBIF), and Arctic species inventories published or accessed through the Ocean Biogeographic Information System (OBIS). Taxa are also screened against available global and domestic AIS databases including, but not limited to, the Global invasive species database (Molnar et al. 2008), the National Exotic Marine and Estuarine Species Information System (NEMESIS), the Global Invasive Species Database (GISD) published by the IUCN Invasive Species Specialist Group (ISSG) and the invasive species list within the National Risk Assessment for Introduction of Aquatic Nonindigenous Species to Canada by Ballast Water (Casas-Monroy et al. 2014). Species, or taxa of higher levels with at least one representative species that are found to have a range that includes the Canadian Arctic and do not appear on the AIS databases are considered "No Risk" and added to the inventory. Taxa are **flagged** for independent verification where there is low confidence in their identifications, uncertainties in the range on record, or presence on any of the AIS databases.

Independent Verification

Specimens of flagged taxa are sent for an independent identification or verification of the initial identification. Currently, taxa are verified by the Benthic Ecology Lab at Université Laval. Additional specialists in particular taxonomic groups or species are also being sought to provide clarity on identifications unable to be resolved by Laval. Specimens preserved in ethanol are alternatively sent for DNA verification by the Canadian Centre for DNA Barcoding at the University of Guelph.

Secondary Determination

Results and rationale for the independent verifications are reviewed by Biologica Environmental Services Ltd. for accuracy and confidence in the identification. Results from the independent verifications are compared to the same taxonomic resources and AIS databases as described in the Initial Determination step. Species, or taxa of higher levels with at least one representative species that are found to have a range that includes the Canadian Arctic and do not appear on the AIS databases are considered "No Risk" and added to the Milne Inlet taxonomic inventory. Specimens where the initial identification was confirmed or updated identifications with uncertainties in the range on record, or a presence on any of the AIS databases are flagged for a more detailed review stage.

Information Gathering

All taxa not determined to be "No Risk" following Secondary Determination are subjected to a detailed and focussed literature review. Information Gathering includes examining documented occurrences relative to the range on record, as well as genetic and phylogenetic studies that may help resolve a taxon's origin. Following the review, taxa will either be classified as "Low Risk" and added to the Watchlist, or classified as "High Risk" and subjected to the MLE Test.

MLE Test

The Multiple Lines of Evidence (MLE) test is applied to all "High Risk" taxa determined through the Information Gathering step. Recognizing the limitations of existing AIS databases, the MLE test informs whether site-specific biogeographic, ecological, and genetic evidence supports the categorization of a particular species/taxon as invasive. Biogeographic evidence may include information from the historical taxonomic record or historical documented occurrences. Ecological evidence considers vectors of introduction as well as whether the species/taxon of concern is displaying invasive behaviour at Milne Port (i.e., increase in relative abundance, geographic spread, change in benthic community indices). Genetic evidence may help resolve trickier taxonomic identifications and may also identify related or source populations of the same species in linked Ports and nearby areas.

Relationship To Project

Following the MLE test, a determination will be made as to whether a potential introduction is Project-related. An introduction is considered Project-related if a species/taxon was not documented in baseline surveys or if there are no documented occurrences in the Canadian Arctic prior to the commencement of shipping operations. Introductions attributable to the Project will be added to the Trigger List while those that are not will be added to the Watchlist.

Watch List

The Watchlist is a list of taxa identified in Milne Port that are considered to be "Low Risk" or "High Risk" but not attributable to the Project. Taxa on this list are subjected to a heightened level of monitoring, which may include increased surveillance through targeted sampling events, and the involvement of taxonomic specialists. Additionally, each year the taxa is reidentified in samples, the Information Gathering step will be performed again to review any updates to the literature and NIS/AIS status of the taxa. The taxa will be reassessed as "No Risk", "Low Risk" or "High Risk" accordingly.

Heighted monitoring includes annual sampling at the locations where taxa have been previously observed to monitor for changes in metrics such as relative abundance, species diversity and richness, and other indications that the taxa is displaying invasive behaviours. Should invasive behaviours be identified, the taxa will be considered "High Risk" and the MLE Test performed again.

Trigger List

The Trigger List contains species confirmed as Project-related introductions of High-Risk taxa. Responsive actions will be species specific and proportional to the risk.

Response Plan

Species specific response plans will be developed in collaboration with DFO and may include possible interventions such as control or eradication efforts, balancing the environmental impacts of the response.

8.3 Materials and Methods

The 2021 MEEMP and NIS/AIS monitoring programs were conducted over eight weeks between 30 July and 19 August by a field team composed of Golder biologists and SCUBA divers, a subcontracted SCUBA diver, a Golder vessel operator, and a local Inuit field technician from Pond Inlet, NU. Sampling was conducted from a 30-foot aluminum vessel (research vessel) in addition to a 20-foot and a 16-foot zodiac tender vessels based at the Milne Port facility.

8.3.1 Sample Collection for Taxonomic Identification

8.3.1.1 Benthic Infauna, Macroflora and Benthic Epifauna, Fish and Incidentals

All specimens caught during surveys for all the various MEEMP components were screened for NIS/AIS status, including benthic infaunal and epifaunal invertebrates (Chapter 4.0 and Chapter 5.0, respectively), macroflora (Chapter 5.0), fish species (Chapter 6.0), and taxa found in fish stomachs (Chapter 7.0). Methodology for these collections are described in the respective chapters of this Report. Additional observations of species presence were made as part of monitoring of offset habitat in Milne Port along the Freight Dock, reported in Golder (2022).

Collection of benthic infaunal invertebrate samples followed the same methodology as used in previous years, as described in Chapter 4.0. Incidental samples were also collected opportunistically during SCUBA surveys for macroflora and epifauna as well as during fishing efforts; the specimens have been sent for taxonomic and/or genetic analysis due to the difficulty of field identification. All samples were preserved in 10% formalin and submitted to Biologica Environmental Services Ltd. (henceforth referred to as “Biologica”; a Canadian marine and freshwater taxonomy laboratory) for taxonomic identification.

8.3.1.2 Settlement Substrates

In 2020, settlement substrates were deployed in various locations throughout Milne Port to monitor for recruitment of encrusting taxa. Each station was configured as three to five settlement baskets filled with locally sourced cobble and five settlement plates (comprised of a 5-gallon bucket lid stacked horizontally) attached to a line with a subtidal buoy (Figure 8-4). Stations were located at -3 m, -8 m, and -15 m water depth, along the east, north and west faces of the Freight Dock as well as various depths co-located with the quadrats (Table 8-1, Chapter 5.0).

One settlement basket and plate will be collected during each monitoring year to represent immediate to short term colonization, and then redeployed for retrieval in future monitoring programs. In subsequent years, the next settlement basket and plate in the series will be collected, which will have been deployed for two or more years to represent short to medium term colonization.

Due to supply chain limitations associated with COVID-19 in 2020, baskets could not be obtained for all stations, and baskets were therefore not deployed at the quadrats until 2021. At these stations, divers collected a single plate. Baskets were brought to the surface and placed in clean 4-gallon buckets with in-situ water. Plates were cut underwater to unwrap from the center line and placed within a collection bag and brought to the surface where they were placed in a clean plastic tote with in-situ water. The cobbles were removed from the basket and photographed prior to being placed into an 8-gallon sample bucket. The plates were photographed prior to being cut into quarters using a knife and then placed in a 4-gallon sample bucket. Samples were preserved with 10% formalin. The buckets were sealed and inverted several times to promote homogenization with the formalin. The buckets were labeled internally and externally with water-resistant labels and sent to Biologica for taxonomic analysis of attached and motile invertebrates, and marine vegetation.

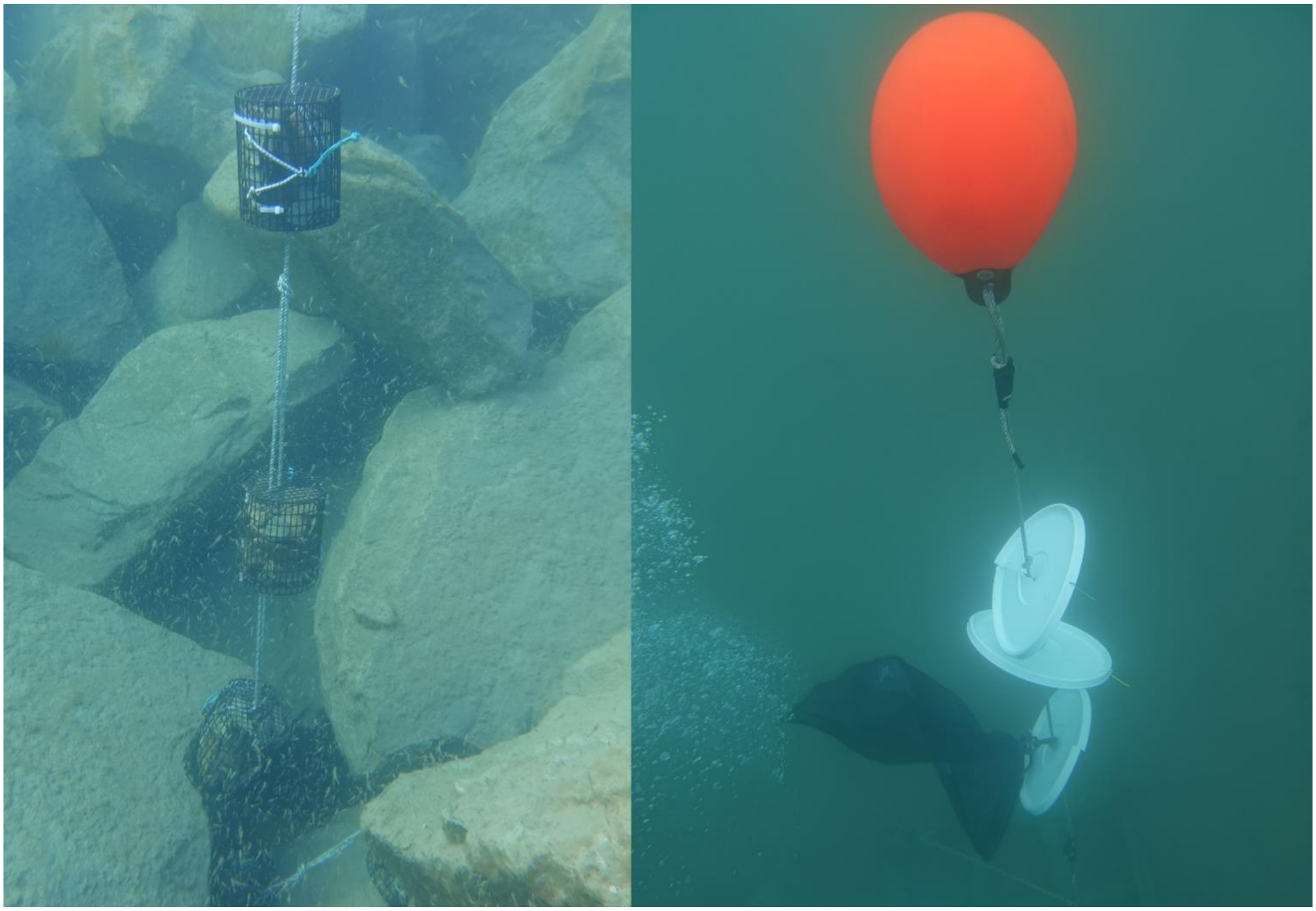


Figure 8-4: Settlement baskets deployed along the face of the freight dock and settlement plates from the quadrats.

Table 8-1: Summary of Settlement Basket and Plate Stations

Station	Location (NAD 83 UTM 17W)		Depth (m below CD)	Substrate	Date Recovered
	Easting (m)	Northing (m)			
West S	503927	7976662	-4.4	Basket and Plate	10 August
West M	503926	7976690	-7.8	Basket and Plate	15 August
West D	503926	7976703	-10.0	Basket and Plate	15 August
Centre S	504005	7976670	-9.1[1]	Basket and Plate	14 August
Centre M	504003	7976689	-8.7	Basket and Plate	10 August
Centre D	504008	7976708	-15.2	Basket and Plate	14 August
East S	504031	7976679	-8.7	Basket and Plate	10 August
East M	504029	7976700	-12.3	Basket and Plate	15 August

Station	Location (NAD 83 UTM 17W)		Depth (m below CD)	Substrate	Date Recovered
	Easting (m)	Northing (m)			
East D	504033	7976717	-16.8	Basket and Plate	14 August
Q1	502828	7976382	-9.1	Plate only	14 August
Q2	503039	7976480	-9.8	Plate only	Not recovered[2]
Q3	504208	7976659	-10.9	Plate only	15 August
Q4	504363	7976611	-12.2	Plate only	6 August
Q5	504802	7976731	-12.4	Plate only	6 August
Q6	506563	7979107	-15.9	Plate only	8 August
Q7	506774	7979170	-10.2	Plate only	16 August
Q8	506957	7979457	-10.7	Plate only	16 August
Q9	506997	7979599	-10	Plate only	11 August[3]
Q10	506584	7979115	-6.5	Plate only	8 August

[1]Depth for Centre S station is inferred from bathymetry data as field measurement was not recorded at the time of survey.

[2]Q2 was not able to be located by divers. A new quadrat and settlement substrates were deployed at the target location.

[3]Q9 was relocated in 2021. These coordinates represent the location where the plate was originally deployed and differ from the coordinates presented for this deployment in Chapter 5.0.

8.3.2 Sample Collection for Genetic Analysis

In 2021, targeted sampling occurred at nine stations in Milne Port where potential high risk taxa that were placed on the program Watchlist were collected in previous years (Table 8-2 and Benthic Samples for DNA Barcoding, Figure 8-2).

Table 8-2: Benthic Stations Sampled for DNA Barcoding and Target Taxa (Putative Identifications)

Station	Location (NAD 83 UTM 17W)		Target Taxa
	Easting	Northing	
SW-2	503064	7976526	*Marenzelleria* sp. and *Monocorophium* sp.
SW-6	502674	7976444	*Monocorophium* sp.
SW-11	502146	7976494	*Marenzelleria* sp.
SW-12	502037	7976473	*Marenzelleria* sp.
SW-13	501920	7976428	*Marenzelleria* sp.
SW-14	501797	7976360	*Marenzelleria* sp.
SE-2	504009	7976714	*Marenzelleria* sp. and *Monocorophium* sp.
SE-4	504202	7976677	*Monocorophium* sp.
SNE-7	504189	7977629	*Monocorophium* sp.

These samples were collected and processed in a similar manner to the other benthic infauna samples, however, the samples were preserved in 90% ethanol, rather than formalin, to allow for DNA analysis should the flagged taxa be identified again in 2021.

All samples collected for DNA analysis were sent to Biologica for identification, sorted following the same procedures for benthic infauna samples (Section 8.3.1.1) and were further sorted for target taxa, which would be sent for barcoding. Targeted taxa included potential NIS/AIS species that were placed on the Watchlist after being flagged in previous surveys and also included other potential invasive taxa for Nunavut compiled from a high-risk species brochure (Appendix 8F-3; Government of Nunavut 2016). Whole specimen or tissue samples of taxa sent for DNA verification were sent to the Canadian Centre for DNA Barcoding (CCDB) at the University of Guelph for barcoding. Laboratory methodologies are detailed in Appendix 8D-3.

In order to improve taxonomic resolution of macroflora data, macroflora specimens were opportunistically collected during dive surveys in Milne Port and sent to Biologica for identification. Collection methodology is detailed in Chapter 5.0. Macroalgae are particularly challenging to identify due to their relatively simple anatomy, convergence, rampant phenotypic plasticity, and alternation of heteromorphic generations (Saunders, 2005). While systematists currently rely on genetic tools for identification, the transition from traditional taxonomy to DNA barcoding is a slow process due to unreliable or unavailable reference sequences in publicly accessible databases. Therefore, the macroalgae specimens collected from permanent quadrats in Chapter 5.0 were analysed using a two-tiered approach: specimens were first morphologically analysed by an algal taxonomist (Dr. Sandra Lindstrom, UBC) and then sent to the CCDB for barcoding. QA/QC of the DNA barcoding results is ongoing at the time of finalizing this report. Laboratory methodologies and results are detailed in Appendix 8D-4.

8.3.3 Data Analysis

8.3.3.1 Taxonomic Identification and Literature Review

Data presented in this chapter includes presence only, rather than enumeration, since relative abundance and other species metrics were not of interest for the NIS/AIS monitoring program. Abundance and diversity metrics for quadrats are presented in Chapter 5.0.

Benthic infauna, fish stomachs, and other samples collected incidentally were sent to Biologica for taxonomic identification, with specimens identified to the lowest possible taxonomic level. The process for reviewing and assessing the status of the identified taxa is described in Figure 8-3. All specimens were compared to the Milne Inlet Taxonomic Inventory, and those not on the Inventory (i.e., not found in previous surveys) were assessed further through literature review to determine if their known distributions and ranges included north Atlantic, Arctic and/or Canadian Arctic waters. The inventory was also updated to include any new or updated accepted species names for any previously identified species.

Information on general species biology and distributions for the literature review was sourced from:

- World Register of Marine Species (WoRMS 2022)
- Global Biodiversity Information Facility (GBIF 2022)
- Encyclopedia of Life (EOL 2020)
- SeaLifeBase (Palomares and Pauly 2021)

- Marine Species Identification Portal (ETI 2022)
- National Centers for Coastal Ocean Science (NCCOS 2017)
- Arctic Register of Marine Species (ARMS) compiled by the Arctic Ocean Diversity (ArcOD 2022, Sirenko et al. 2022)
- Arctic species inventories published or accessed through the Ocean Biogeographic Information System (OBIS 2022)

In addition, specimens were also compared against the following global and domestic AIS databases:

- Global invasive species database (Molnar et al. 2008)
- National Exotic Marine and Estuarine Species Information System (NEMESIS; Fofonoff et al. 2022)
- Global Invasive Species Database (GISD) published by the IUCN Invasive Species Specialist Group (ISSG 2022)
- Known invasive species list within the National Risk Assessment for Introduction of Aquatic Nonindigenous Species to Canada by Ballast Water (Casas-Monroy et al. 2014)
- World Register of Introduced Marine Species (WRIMS; Rius et al. 2022)

Specimens were not always identified to the species level due to a variety of limitations such as incomplete or disputed morphological descriptions available for some taxonomic groups, missing or undeveloped (juvenile) features, or damage to specimens. These specimens were recorded to the lowest practical taxonomic level as indet. (indeterminate) or sp. (species) when identifiable to the genus level. When an inexact match to a species was made, the designations cf. (compare with) and sp. nr. (species near) were used to indicate the specimen was similar to or represented an unknown species near to the indicated taxon, respectively (see Section 8.1.2 Definitions). For literature review, where taxa were not identifiable to the species level, an attempt was made to confirm the higher taxon includes members that have a distribution or range that included north Atlantic, Arctic and/or Canadian Arctic waters. The higher taxonomic levels were also compared to the invasive species databases; for example, if a specimen from Milne Inlet could only be identified to genus, and the database revealed that no species within that genus have ranges that include the Canadian Arctic, the specimen was flagged for further review.

The Canadian Arctic is understudied, particularly in comparison to other Arctic regions (Sirenko et al. 2022, Figure 8-5). Surveys and species inventories in the Canadian Arctic are not exhaustive, and species descriptions may not include a comprehensive description of range. Rarer and more recently described taxa may not have a report of occurrence or range on record within Canadian Arctic waters despite having the potential to be present. Species where the native range is unknown, disputed, or uncertain are considered cryptogenic, being unable to be classified as native or introduced where they are found to be present.

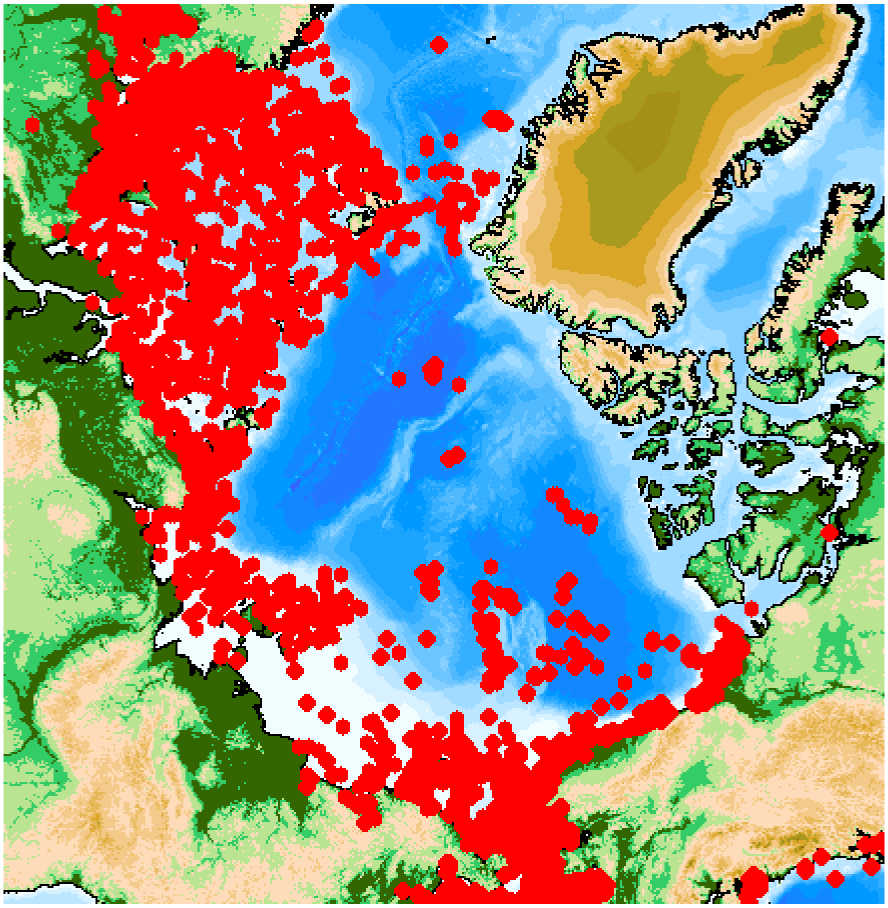


Figure 8-5: Datasets on Arctic species available through ArcOD, indicating the discrepancy between studies in Canadian waters (right side) compared to other areas of the Arctic Ocean (left side). Image from arcodiv.org/Database/Data_overview.html; ArcOD 2022.

8.3.3.2 Independent Verification

Following literature review, specimens that were flagged as requiring closer examination underwent secondary taxonomic review by Biologica and were sent for independent verification to the Benthic Ecology Lab at Université Laval (Laval) and specialists in specific taxonomic groups at the National Scientific Center of Marine Biology at the Far Eastern Branch of the Russian Academy of Sciences, EcoAnalysts Inc. and Columbia Science. Laboratory methods are provided in Appendices 8A-3 and 8D-3. Samples were sent for independent verification for a number of reasons, including possible NIS/AIS status, existence of a new species description, limited information on the distribution, or uncertainty on the identification; in other words, not all species sent for independent verification were flagged as being of concern as potential non-indigenous or invasive species.

8.3.4 Quality Management

8.3.4.1 Field QA/QC

The same field QA/QC procedures were used during benthic infauna collection (Chapter 4.0), macroflora and benthic epifauna monitoring (Chapter 5.0), and fish population monitoring (Chapter 6.0) for the NIS/AIS Program as those used for the MEEMP. These methods are discussed in their respective chapters. QA/QC procedure for samples collected for DNA analysis followed the procedure for benthic infauna collection (Chapter 4.0).

8.3.4.2 Laboratory and Data Analysis QA/QC

- The same lab QA/QC procedures were used during analysis for benthic infauna (Chapter 4.0), macroflora and benthic epifauna (Chapter 5.0), fish population (Chapter 6.0), and fish health (Chapter 7.0) for the NIS/AIS Program as those used for the MEEMP. These methods are discussed in their respective Chapters.
- Lab QA/QC for independent verifications was dependent on the methodology. Results of DNA barcoding were internally reviewed at the Canadian Centre for DNA Barcoding (Appendix 8D-3).
- Macroflora samples were identified using a combination of morphological and DNA barcoding methods and results were reviewed against each other for consistency.

8.4 Results

8.4.1 Taxonomic Identification

8.4.1.1 Benthic Infauna

Benthic infaunal sampling in 2021 was conducted at 17 stations in Milne Port, yielding a total abundance of 72,441 infaunal organisms representing 266 taxa (Appendix 8A-1, 8A-2). Of these, 16 taxa are considered "new records", meaning they were not found in previous surveys in Milne Inlet; a list of the new records is presented in Table 8-3, along with a description of the distribution on record. Approximately 19% of the newly recorded taxa were identified to species level, 56% to genus level, and 25% represented the first observations of higher taxonomic levels in Milne Inlet. Incidental taxa were occasionally observed in the benthic samples including parasitic and planktonic specimens; while these were considered for NIS/AIS status in this chapter, they are not included in the taxa counts for the benthic infauna study.

The majority of newly recorded taxa were confirmed to have ranges that included the Canadian Arctic or the Northern Atlantic extending past Greenland and Southern Baffin Island (Table 8-3) while others had very limited descriptions or no description of natural ranges with few georeferenced specimens on record. Ranges were considered to have a high probability of including the Project area if the limited collections on record were georeferenced to Arctic waters or were spread across a wide geographic range that could reasonably include Canadian Arctic waters. To address some of the uncertainty surrounding limited taxonomic descriptions, relevant specimens were sent for independent verification, as described in greater detail in Section 8.4.2 below.

Bryozoans represented the majority of newly recorded taxa in Milne Inlet in 2021. Bryozoan taxa are generally poorly described in the taxonomic literature and may be difficult to resolve taxonomically from collected specimens due to being fragmented during collection. Furthermore, bryozoans are generally associated with hard substrates, and are more abundant and diverse on larger substrates (Centurión and López-Gappa 2011). These substrate types are usually absent or in low abundance in benthic grab samples as cobbles may prevent grab samplers from fully closing causing a loss of sample or reduced sample volume, leading to an underrepresentation of bryozoan and other encrusting taxa in benthic surveys. Notably, the samples where most bryozoans were identified in 2021 generally were those that retained larger volumes of gravel and cobble compared to samples from other stations in Milne Port. The identification of *Stomacrustula pachystega* represents the first bryozoan identified to the species level during surveys in Milne Inlet. New records of taxa in 2021 also included the first taxonomic observations from the Phylum Brachiopoda.

Seven taxa from benthic infauna samples were sent for verification. This included five taxa from the Program Watchlist (*Ampharete petersenae*, *Marenzelleria* sp., *Crassicorophium* sp., *Paramphitrite birulai*, *Pseudofabricia* sp. nr. *aberrans*), one taxon flagged for review (*Tricellaria* sp.), and one taxon (*Diastyloides biplicatus*) flagged for review as part of QA/QC procedures following a transcription error in the lab data. Independent verification procedures are detailed in Section 8.4.2.

Table 8-3: List of Newly Recorded Benthic Infauna Taxa Identified at Milne Inlet in 2021 with Description of Distribution on Record

Phylum Class/Order	Family	Taxon	Description	Distribution Reference
Annelida				
Polychaeta/ Eunicida	Lumbrineridae	*Lumbrineris fauchaldi*	Very poorly described worm species, but the species description is derived from specimens collected in the Canadian Arctic in Davis Strait	1, 11
Clitellata/ Haplotaxida	Naididae	Naididae indet.	Broad family of annelid worms that contains representative species with ranges that include the Canadian Arctic.	1, 2, 3, 4
Arthropoda				
Malacostraca/ Amphipoda	Tryphosidae	*Hippomedon propinqvus*	Amphipod species with broad range on record, including collections from the Canadian Arctic and Baffin Island.	1, 2, 3, 5, 6
Brachiopoda				
-	-	-	Phylum with representative species in the Canadian Arctic.	1, 2, 3, 6, 7, 8, 9, 10
Bryozoa				
Gymnolaemata/ Cheilostomatida	Bitectiporidae	*Schizomavella* sp.	A broadly distributed bryozoan genus with at least one described species that has a distribution that includes the Canadian Arctic, including Baffin Island.	1, 2
Gymnolaemata/ Cheilostomatida	Calloporidae	*Callopora* sp.	A broadly distributed bryozoan genus with at least one described species that has a distribution that includes the Canadian Arctic, including Baffin Island.	1, 2, 8,
Gymnolaemata/ Cheilostomatida	Calloporidae	*Cauloramphus* sp.	A bryozoan genus with limited species descriptions, includes representative specimen collections in the Canadian Arctic.	1, 2, 8,
Gymnolaemata/ Cheilostomatida	Candidae	*Tricellaria* sp.	A bryozoan genus with multiple described species that have distributions that includes the Canadian Arctic. Flagged for review due to representative species on NIS/AIS databases.	2
Gymnolaemata/ Cheilostomatida	Cribrilinidae	*Cribrilina* sp.	A broadly distributed bryozoan genus with at least one described species that has a distribution that includes the Canadian Arctic, including Baffin Island.	1, 2, 6, 8
Gymnolaemata/ Cheilostomatida	Exochellidae	*Escharoides* sp.	A bryozoan genus with at least one described species that has a distribution that includes the Canadian Arctic.	1, 2, 8
Gymnolaemata/ Cheilostomatida	Fatkullinidae	*Stomacrustula pachystega*	A poorly described bryozoan species with a probable distribution that includes Arctic and North Atlantic waters.	1
Gymnolaemata/ Cheilostomatida	Smittinidae	*Pseudoflustra* sp.	A bryozoan genus with at least one described species that has a distribution that includes the Canadian Arctic.	1, 2, 6, 8

Phylum Class/Order	Family	Taxon	Description	Distribution Reference
Gymnolaemata/ Cheilostomatida	Smittinidae	*Smittina* sp.	A bryozoan genus with at least one described species that has a distribution that includes the Canadian Arctic.	1, 2, 6
Gymnolaemata/ Cheilostomatida	-	Schizoporelloidea indet.	A bryozoan superfamily with a global distribution with at least one described species that has a distribution that includes the Canadian Arctic.	1, 8, 10
Cnidaria				
Hydrozoa/Leptothecata	Campanulinidae	*Calycella* sp.	Hydrozoan genus with species largely limited to the northern hemisphere. Includes representative species in the Canadian Arctic, including Baffin Island.	1, 2
Mollusca				
Bivalvia/Galeommatida	Lasaeidae	Lasaeidae indet.	Bivalve family with a global distribution. Includes representative species in the Canadian Arctic, including Baffin Island.	1, 2, 3

Notes: Taxa identified to the lowest practical taxonomic level; *indicates non-unique taxa; indet.= indeterminate (taxa which could not be identified beyond the taxonomic level listed); sp.=species.
Taxa distribution references: 1: WoRMS 2022, 2: GBIF 2022, 3: Cusson 2018, 4: Gagnon and Torgersen 2021, 5: Hopcroft 2019, 6: Miller et al. 2014, 7: Sejr 2009, 8. Goldsmit 2016, 9: DFO 2019, 10: Stewart 2013, 11: Blake 1972.
All taxa cross-referenced with NIS/AIS resources: Fofonoff et al. 2022, ISSG 2022, Rius et al. 2022, Molnar et al. 2008, Casas-Monroy et al. 2014.

8.4.1.2 Macroflora and Benthic Epifauna

A total of 16 distinct macroflora taxa were newly recorded during quadrat surveys in Milne Inlet in 2021, nine of which were identifiable to the species level (Table 8-4). The remaining seven taxa were found to be inexact matches to described taxa. These specimens were given the designation “cf.”, indicating the specimen potentially represented a similar related undescribed genus or species, an undescribed morph or subspecies, or the specimen may be a close match but was lacking the characteristics that would allow for a positive identification. Four of these specimens were further resolved to species level via DNA barcoding.

A literature review was performed for all newly recorded taxa identified in quadrat surveys and all were determined to have ranges that included the Canadian Arctic or the representative taxa had a reasonable probability of having a natural distribution that includes Canadian Arctic waters. Each newly observed taxon was also cross-checked against available databases of marine invasive species and none of the taxa were identified as a globally-recognized invasive species to Arctic waters.

All epifauna and fish taxa observed in quadrat surveys had been observed previously in Milne Inlet and had natural distributions that included the Canadian Arctic. Each taxon was also cross-checked against available global databases of marine invasive species and none of the taxa documented at Milne Port were listed.

No taxa from the Program Watchlist were detected during permanent quadrat surveys and no taxa were flagged for review.

Table 8-4: List of Newly Recorded Macroflora Taxa Identified in Permanent Quadrat Surveys in Milne Inlet, 2021

Phylum Class/Order	Family	Taxa Common Name	Description	Distribution Reference
Chlorophyta				
Ulvophyceae/ Acrosiphoniales	Acrosiphoniaceae	cf. *Spongomorpha aeruginosa*	The comparative species has a broad distribution that includes the Canadian Arctic, with collections from Northern Baffin Island.	1, 2, 3, 4
Ulvophyceae/ Cladophorales	Cladophoraceae	*Rhizoclonium* cf. *riparium*	The comparative species has a broad distribution that includes the Canadian Arctic, with collections from Northern Baffin Island.	1, 2, 3, 4
Ulvophyceae/Cladophorales	Cladophoraceae	*Chaetomorpha melagonium*	Mossy green algae species with a broad distribution, including collections from Baffin Island. DNA analysis was unable to resolve the identification (see Section 8.4.2.1).	1, 2, 4, 5
Ochrophyta				
Phaeophyceae/ Desmarestiales	Desmarestiaceae	*Desmarestia viridis*	Filamentous brown algae species with a broad distribution that includes the Canadian Arctic, with collections from Northern Baffin Island.	1, 2, 3, 4
Phaeophyceae/Desmarestiales	Desmarestiaceae	*Desmarestia aculeata*	Brown algae species with a broad global distribution, including observations from Baffin Island.	1, 2, 4, 5
Phaeophyceae/ Ectocarpales	Acinetosporaceae	*Pylaiella* cf. *varia*	The comparative species has an Arctic distribution. *P. washingtoniensis, P. littoralis,* and an unidentified third species collected from Baffin Island. DNA analysis was unable to resolve the identification (see Section 8.4.2.1).	1, 2, 3, 4
Phaeophyceae/Ectocarpales	Chordariaceae	cf. *Coelocladia arctica*	Poorly described species of brown algae. Collection records indicate non-georeferenced Canadian specimens were collected from Ragged Island. DNA analysis was unable to resolve the identification (see Section 8.4.2.1).	2, 4
Phaeophyceae/Ectocarpales	Chordariaceae	*cf. Dictyosiphon foeniculaceus*	Brown algae species with a broad global distribution, including collections from Baffin Island.	2, 4, 5
Phaeophyceae/ Ectocarpales	Chordariaceae	*Dictyosiphon ekmanii*	Arctic and north Atlantic distributed species. At least one distinct undescribed species of *Dictyosiphon* has been collected from Baffin Island.	1, 2, 3
Phaeophyceae/ Ectocarpales	Chordariaceae	cf. *Trachynema groenlandicum*	Comparative genus is very poorly described. Limited records from Greenland indicate a probable range that would include the Canadian Arctic	1, 2, 3
Phaeophyceae/Ectocarpales	Scytosiphonaceae	cf. *Petalonia*	Brown algae genus with a broad global distribution, including species observations from Baffin Island. DNA analysis was unable to resolve the identification (see Section 8.4.2.1).	1, 2, 4

Phylum Class/Order	Family	Taxa Common Name	Description	Distribution Reference
Rhodophyta				
Florideophyceae Ceramiales	Delesseriaceae	*Phycodrys fimbriata*	Foliose red algae with a distribution record that includes the Canadian Arctic. Sequence data is available from a specimen collected from Baffin Island.	1, 2, 3
Florideophyceae Gigartinales	Phyllophoraceae	*Coccotylus truncatus*	Foliose red algae species with a global distribution including records from the Canadian Arctic and northern Baffin Island. Species confirmed through DNA analysis (see Section 8.4.2.1).	1, 2, 3, 4
Florideophyceae/Ceramiales	Rhodomelaceae	*Savoiea arctica*	Recently proposed taxonomic designation, considered an Arctic and North Atlantic species, with collections from Western Greenland and Baffin Island. DNA analysis was unable to resolve the identification (see Section 8.4.2.1).	2, 7
Florideophyceae/Ceramiales	Rhodomelaceae	cf. *Rhodomela*	Broadly distributed genus of red algae with representative taxa with natural ranges that include the Canadian Arctic. DNA analysis confirmed species as *Rhodomela virgata* (see Section 8.4.2.1)	1, 2, 4, 5, 6
Florideophyceae/Gigartinales	Dumontiaceae	*Dilsea socialis*	Red algae with a broad distribution, including collections from Baffin Island.	1, 2, 4

Notes: Taxa identified to the lowest practical taxonomic level; indet.= indeterminate (taxa could not be identified beyond the taxonomic level listed); sp.=species; cf.=compare with (taxa is an inexact match to the designated taxa.

Taxa distribution references: 1: WoRMS 2022, 2: GBIF 2022, 3: AlgaeBase 2022, 4: Küpper et al. 2016, 5. Ellis and Wilce 1961, 6: Brown et al. 2011, 7: Wynne 2018.

All taxa cross-referenced with NIS/AIS resources: Fofonoff et al. 2022, ISSG 2022, Rius et al. 2022, Molnar et al. 2008, Casas-Monroy et al. 2014.

8.4.1.3 Settlement Substrates

Nine settlement baskets and eighteen plates were recovered from stations throughout Milne Port. During recovery of the substrates, the station at quadrat 2 was unable to be located and therefore a settlement plate was not recovered from this station. Taxonomic data of encrusting taxa collected from settlement and recruitment monitoring stations in Milne Port are presented in Appendix 8C-1 and 8C-2. Recruitment on the settlement substrates was low, which was expected following one year of deployment based on previous surveys in Milne Inlet (Golder 2020b).

Figure 8-6: a) Settlement Plate Collected from the Centre-D Station on the Freight Dock and b) Rocks from Settlement Basket collected from the West-M Station on the Freight Dock, following One Year Deployment (14 and 15 August 2021)

A list of newly recorded (i.e., not encountered in previous surveys, thus not listed in Milne Inlet Taxonomic Inventory) encrusting taxa is provided in Table 8-5 along with a brief description of the known geographic distribution of each taxon. Of the 98 taxa identified in samples collected in 2021, fifteen had not been previously observed (Table 8-5). Three taxa were identified to species level and seven were only identifiable to genus level. Each newly observed taxon was cross-checked against a global database of marine invasive species and none of the taxa were identified as a globally-recognized invasive species (Molnar et al. 2008) or a potential invasive species in Canada according to the National Risk Assessment for Introduction of Aquatic Nonindigenous Species to Canada by Ballast Water (Casas-Monroy et al. 2014). In addition to these databases, each new taxon was researched independently in the literature for their known habitats and distributions for signs of taxa that may be considered non-native to the Arctic region.

Three taxa from the Program Watchlist were identified on settlement substrates (*Marenzelleria* sp., *Crassicorophium* sp., *Monocorophium insidiosum*), these are detailed in Section 8.4.2 Independent Verifications. No newly recorded taxa on the settlement substrates were flagged for independent review.

Table 8-5: Newly Observed Taxa from Settlement Substrate Deployments in Milne Inlet, 2021

Phylum Class/Order	Family	Taxa	Description	Distribution Reference
Bryozoa				
Stenolaemata/ Cyclostomatida	Lichenoporidae	*Lichenopora* sp.	Bryozoan genus with a limited collection record that includes the Canadian Arctic	1, 2, 3, 4
Chlorophyta				
Ulvophyceae/ Acrosiphoniales	Acrosiphoniaceae	*Spongomorpha aeruginosa*	Broadly distributed algae species, including collections from the Canadian Arctic and Baffin Island	1, 2
Ulvophyceae/ Cladophorales	Cladophoraceae	*Rhizoclonium* sp.	Green algae species with a limited collection record. Records include Canadian Arctic specimens.	2
Ulvophyceae/ Ulotrichales	Ulotrichaceae	*Ulothrix* sp.	Green algae species with a broad range that includes the Canadian Arctic and Baffin Island	2
Ulvophyceae/ Ulotrichales	Ulotrichaceae	Ulotrichaceae indet.	Globally distributed green algae family with representative species with ranges that include the Canadian Arctic	1, 2
Ulvophyceae/ Ulvales	Ulvaceae	*Ulva* cf. *prolifera*	Comparative taxon is a globally distributed species, including subspecies with ranges that include the Canadian Arctic and Baffin Island.	1, 2
Ciliophora				
-/-	-	Ciliophora indet.	Phylum with a broad, global distribution	1, 2, 5
Cnidaria				
Hydrozoa/ Anthoathecata	Corynidae	*Sarsia* sp.	Globally distributed genus with representative species with ranges that include the Canadian Arctic	1, 2, 3, 5
Echinodermata				
Asteroidea/ Forcipulatida	Asteriidae	*Leptasterias* (*Leptasterias*) *muelleri*	Seastar species with a broad distribution that includes the Canadian Arctic and Davis Strait	1, 2
Foraminifera				
-/-	-	Foraminifera indet.	Phylum with a broad, global distribution	1, 2, 4, 5, 6
Mollusca				
Bivalvia/ Mytilida	Mytilidae	*Arvella faba*	Updated name for *Crenella faba*, which has a range that includes the Canadian Arctic	1, 2, 3, 7

Phylum Class/Order	Family	Taxa	Description	Distribution Reference
Gastropoda/ Nudibranchia	Dendronotidae	*Dendronotus* sp.	Broadly distributed genus with at least one species with a range that includes the Canadian Arctic	1, 2, 3, 5
Ochrophyta				
Phaeophyceae/ Ectocarpales	Acinetosporaceae	*Pylaiella* cf. *varia*	The comparative species has an Arctic distribution. *P. washingtoniensis, P. littoralis,* and an unidentified third species collected from Baffin Island.	1, 2, 8, 9
Phaeophyceae/ Ectocarpales	Chordariaceae	cf. *Trachynema groenlandicum*	Comparative genus is very poorly described. Limited records from Greenland indicate a probable range that would include the Canadian Arctic	1, 2, 9
Phaeophyceae/ Ectocarpales	Chordariaceae	Chordariaceae indet.	Broadly distributed brown algae family, including records in the Canadian Arctic and Baffin Island	2, 9

Notes: Taxa identified to the lowest practical taxonomic level; indet.= indeterminate (taxa could not be identified beyond the taxonomic level listed); sp.=species; cf.=compare with (taxa is an inexact match to the designated taxa.

Taxa distribution references: 1: WoRMS 2022, 2: GBIF 2022, 3: Miller et al. 2014, 4: Goldsmit 2016, 5: Stewart 2013, 6: Stewart et al. 1985, 7: Cusson 2018, 8: Küpper et al. 2016, 9: AlgaeBase 2022.

All taxa cross-referenced with NIS/AIS resources: Fofonoff et al. 2022, ISSG 2022, Rius et al. 2022, Molnar et al. 2008, Casas-Monroy et al. 2014.

8.4.1.4 Fish and Incidentals

Throughout surveys at Milne Inlet, some species are targeted and caught intentionally (such as fish as part of fish health and population chapters; collected for and reported in Chapters 6.0 and 7.0) while others are collected or observed incidentally. In 2021 MEEMP and offset habitat monitoring surveys, 96 taxa were collected or observed incidentally and of these, ten taxa were newly recorded in MEEMP surveys (Table 8-6). The full list of incidental taxa is available in Appendix 8B-1, laboratory results are in Appendices 8B-2, 8B-3, and 8B-4.

All taxa observed or caught incidentally in MEEMP and NIS/AIS surveys were cross-checked against a global database of marine invasive species and none of the taxa were identified as a globally-recognized invasive species (Molnar et al. 2008) or an invasive species in Canada according to the National Risk Assessment for Introduction of Aquatic Nonindigenous Species to Canada by Ballast Water (Casas-Monroy et al. 2014). In addition to these databases, each taxon was researched independently in the literature for their known habitats and distributions for signs of taxa that may be considered non-native to the Arctic region. For taxa that were not identified to the species level, it was confirmed that the identified higher-level taxa had at least one representative species with a distribution that included Arctic waters.

No taxa from the Program watchlist were identified during permanent quadrat surveys and no taxa were flagged for review.

Table 8-6: Newly Recorded Incidental Macroflora and Fauna Taxa Identified in Milne Inlet in 2021

Phylum Class/Order	Family	Taxa	Description	Distribution Reference
Arthropoda				
Insecta/Diptera	Chironomidae	*Hydrobaenus* sp.	Freshwater chironomid taxa with a global distribution, including records from the Canadian Arctic	2
Insecta/Diptera	Simuliidae	Simuliidae indet.	Freshwater dipteran taxa with a global distribution, including records from the Canadian Arctic	2, 3
Insecta/Diptera	Tipulidae	Tipulidae indet.	Freshwater dipteran taxa with a global distribution, including records from the Canadian Arctic	2, 3
Insecta/Ephemeroptera	-	Ephemeroptera indet.	Freshwater taxa with a global distribution, including records from the Canadian Arctic	2, 3
Brachiopoda				
-/-	-	-	Phylum with representative species in the Canadian Arctic. Also observed in benthic samples for the first time.	1, 2, 3, 4, 5, 6, 7, 8
Chlorophyta				
Ulvophyceae/Ulotrichales	Ulotrichaceae	cf. *Urospora neglecta*	The comparative species is poorly described. The limited specimen collections are from a broad geographical range, including North Atlantic and Arctic waters.	1, 2, 9, 10
Chordata				
Actinopterygii/Perciformes	Agonidae	*Aspidophoroides olrikii*	Arctic Alligatorfish, a fish species with a broad circumarctic and North American distribution, including collections around Baffin Island.	1, 2, 3, 5, 7
Actinopterygii/Perciformes	Agonidae	*Leptagonus decagonus*	Atlantic Poacher, a fish species with a broad circumarctic and North American distribution.	1, 2, 3, 5, 7
Actinopterygii/Perciformes	Cottidae	*Triglops pingelii*	Ribbed Sculpin, a fish species with a broad circumarctic and North American distribution, including collections from Baffin Island.	1, 2, 3, 5, 7
Actinopterygii/Perciformes	Cyclopteridae	*Eumicrotremus spinosus*	Atlantic Spiny Lumpsucker, an eastern Canadian Arctic fish species with multiple records of occurrence around Baffin Island	1, 2, 5, 7

Notes: Taxa identified to the lowest practical taxonomic level; indet.= indeterminate (taxa which could not be identified beyond the taxonomic level listed); sp.=species.

Taxa distribution references: 1: WoRMS 2022, 2: GBIF 2022, 3: Stewart 2013, 4: Sejr 2009, 5: Miller et al. 2014, 6: Goldsmit 2016, 7: DFO 2019, 8: Cusson 2018, 9: Saunders 2022, 10: Brown et al. 2011

All taxa cross-referenced with NIS/AIS resources: Fofonoff et al. 2022, ISSG 2022, Rius et al. 2022, Molnar et al. 2008, Casas-Monroy et al. 2014.

8.4.2 Independent Verification and Identifications

The majority of observed taxa in 2021 surveys are known to occur in Arctic habitats or have representative species with Arctic distributions; however, during the 2021 NIS/AIS survey program, a number of taxa were flagged as potentially non-indigenous to the region or to Arctic waters, or as present on the program Watchlist for potential NIS/AIS taxa. It is important to note that fauna and flora of the Canadian Arctic are not thoroughly described, as marine surveys have not been exhaustive, particularly in comparison to other Arctic regions. Distribution records for many species are incomplete or not documented. Therefore, it is possible that a species with a range on record that does not include a Canadian Arctic distribution may represent a first observation within a native range and not the introduction of a non-native species. It is also possible that new or poorly described species have been detected.

Nineteen (19) taxa were flagged for review in 2021, due to concerns regarding possible NIS/AIS status, presence on the program Watchlist, limited descriptions of geographic range, to gain clarity or confirmation of uncertain identifications, or as part of QA/QC procedures (Table 8-7). Table 8-9. Flagged taxa underwent secondary taxonomic review by Biologica prior to being forwarded to specialists for a secondary morphological assessment as part of independent verification procedures. Independent verifications of the samples were made by Philippe Archambault's Benthic Ecology Lab at Université Laval (Laval; Quebec). Samples were also sent for verification where new species descriptions[1] existed or there was uncertainty on the identification, whether or not the species are of concern as potential NIS or AIS. A record of specimens sent for verification is included in Appendix 8E-1. A complete record of flagged taxa observations in 2021 and their risk statuses is available in Appendix 8F-1. Results of independent review are summarized in Table 8-9, however, the results of some of the morphological assessments have not been received as of October 2022. Results of the remaining morphological assessments will be provided in the 2022 MEEMP report.

Table 8-7: Record of Taxa sent for Independent Morphological Assessment, 2021

Phylum Class/Order	Family	Putative Taxa	Reason for Review
Annelida			
Polychaeta/ Sabellida	Fabriciidae	*Pseudofabricia* sp. nr. *aberrans*	On the Watchlist. Limited records indicate species may be endemic to Mediterranean. Independent identification by Laval as *Manayunkia aesturiana* in 2018 and as *Fabricia stellaris* in 2019 and 2020 were not accepted by Biologica and other specialists due to morphological and ecological differences.
Polychaeta/ Spionida	Spionidae	*Marenzelleria* sp.	On the Watchlist. Genus contains species of concern due to being listed as AIS taxa in northern European waters. Review of Milne Port specimens by a specialist indicated multiple species with Arctic ranges may be present in Milne Inlet. Morphological similarities between species confound identifications, requiring the input of specialists in the genus.

[1] New species descriptions occur when an update to the taxonomic record is accepted, this may be due to a variety of reasons including acceptance of a more senior description, DNA analysis combining or separating species descriptions, or the identification of features that match a different taxonomic group.

Phylum Class/Order	Family	Putative Taxa	Reason for Review
Polychaeta/ Terebellida	Ampharetidae	*Ampharete petersenae*	On the Watchlist. Recently described, data poor species described from Arctic waters near western Greenland and Iceland, although no range is described. Flagged for review against any new or updated species descriptions.
Polychaeta/ Terebellida	Terebellidae	*Paramphitrite birulai*	On the Watchlist. Limited taxonomic record with no described range. Indications the range could include the Canadian Arctic. Record of NIS status in the Mediterranean. Flagged for review against any new or updated species descriptions.
Arthropoda			
Malacostraca/ Cumacea	Diastylidae	*Diastyloides biplicatus*	Cumacean species from the Canadian Arctic, previously observed in MEEMP surveys, incorrectly transcribed as a Pacific species. Sent for verification as part of QA/QC procedures.
Malacostraca/ Amphipoda	Corophiidae	*Crassicorophium* sp.	On the Watchlist. Observed during baseline studies in Milne Port in 2013. On program Watchlist due to presence on AIS species databases.
Bryozoa			
Gymnolaemata/ Cheilostomatida	Candidae	*Tricellaria* sp.	Genus of bryozoans that includes more than one species with a natural range that includes the Eastern Canadian Arctic. Flagged for review due to *T. inopinata*, being listed on the National Risk Assessment as a potential invader to Canadian waters, including the Arctic region.
Chlorophyta			
Ulvophyceae/Cladophorales	Cladophoraceae	*Chaetomorpha melagonium*	Macroflora systematics and identifications are difficult to confirm in the field, therefore macroflora samples were both morphologically and DNA sequenced to verify results.
Ulvophyceae/Ulotrichales	Ulotrichaceae	cf. *Urospora neglecta*	Macroflora systematics and identifications are difficult to confirm in the field, therefore macroflora samples were both morphologically and DNA sequenced to verify results.
Ochrophyta			
Phaeophyceae/ Desmarestiales	Desmarestiaceae	*Desmarestia viridis*	Macroflora systematics and identifications are difficult to confirm in the field, therefore macroflora samples were both morphologically and DNA sequenced to verify results.
Phaeophyceae/Desmarestiales	Desmarestiaceae	*Desmarestia aculeata*	Macroflora systematics and identifications are difficult to confirm in the field, therefore macroflora samples were both morphologically and DNA sequenced to verify results.
Phaeophyceae/ Ectocarpales	Acinetosporaceae	*Pylaiella* cf. *varia*	Macroflora systematics and identifications are difficult to confirm in the field, therefore macroflora samples were both morphologically and DNA sequenced to verify results.

Phylum Class/Order	Family	Putative Taxa	Reason for Review
Phaeophyceae/Ectocarpales	Chordariaceae	cf. *Coelocladia arctica*	Macroflora systematics and identifications are difficult to confirm in the field, therefore macroflora samples were both morphologically and DNA sequenced to verify results.
Phaeophyceae/Ectocarpales	Chordariaceae	*cf. Dictyosiphon foeniculaceus*	Macroflora systematics and identifications are difficult to confirm in the field, therefore macroflora samples were both morphologically and DNA sequenced to verify results.
Phaeophyceae/Ectocarpales	Scytosiphonaceae	cf. *Petalonia*	Macroflora systematics and identifications are difficult to confirm in the field, therefore macroflora samples were both morphologically and DNA sequenced to verify results.
Rhodophyta			
Florideophyceae Gigartinales	Phyllophoraceae	*Coccotylus truncatus*	Macroflora systematics and identifications are difficult to confirm in the field, therefore macroflora samples were both morphologically and DNA sequenced to verify results.
Florideophyceae/Ceramiales	Rhodomelaceae	*Savoiea arctica*	Macroflora systematics and identifications are difficult to confirm in the field, therefore macroflora samples were both morphologically and DNA sequenced to verify results.
Florideophyceae/Ceramiales	Rhodomelaceae	cf. *Rhodomela*	Macroflora systematics and identifications are difficult to confirm in the field, therefore macroflora samples were both morphologically and DNA sequenced to verify results.
Florideophyceae/Gigartinales	Dumontiaceae	*Dilsea socialis*	Macroflora systematics and identifications are difficult to confirm in the field, therefore macroflora samples were both morphologically and DNA sequenced to verify results.

8.4.2.1 DNA Analysis

As part of independent verification and identification of taxa, additional specimens were collected for genetic analysis at the Canadian Centre for DNA Barcoding. Benthic infauna samples for DNA analysis were collected from nine stations where flagged taxa were observed in previous surveys (e.g., *Marenzelleria viridis, Monocorophium insidiosum*). A total of 168 taxa were identified in benthic samples collected for DNA. All taxa had been observed previously in Milne Inlet surveys. A complete list of taxa identified in DNA samples is presented in Appendix 8D-1

The samples contained three taxa from the Watchlist (*M. viridis*, *C. bonelli*, and *P.* sp. nr. *aberrans*, Table 8-8). Four stations targeted for sampling did not have any flagged taxa. No specimens of *Monocorophium* sp. were documented, despite targeted efforts at stations where this taxon has been previously observed.

One adult specimen was tentatively identified as *Pseudofabricia aberrans*, a taxon that has a limited range on record. Independent verifications in previous years were largely inconclusive or were not agreed upon under review. While no sequencing is known to have been performed for the genus *Pseudofabricia,* records do exist for at least one of the potential alternative identifications (*Fabricia stellaris*) in addition to other species in the family Fabriciidae. The specimen was therefore sent for DNA barcoding along with samples from 2020, to gain clarity on the identification. Results were inconclusive (Table 8-9). The specimens did not match available sequences for *Fabricia stellaris*, excluding this species as a potential identification for the specimens; however, there were no close matches to any sequences on record. DNA results placed the unidentified specimens within the Family Fabriciidae.

Fifteen specimens identified as *Marenzelleria* sp. were collected at three of the five stations where it has been observed previously (Table 8-8). Specimens represented a mix of adult and intermediate life stages. Four specimens were damaged and only the anterior portion was present. All specimens, including the damaged ones, were sent for DNA barcoding. DNA results based on molecular analysis of four genes conclusively identified the specimens as *Marenzelleria wireni* (Table 8-9, Radashevsky 2022, pers. comm.). A formalized laboratory report on the molecular identification is pending.

Five specimens identified as *Crassicorophium bonelli* were collected at two stations. *C. bonelli* is not a taxon of concern, in terms of being introduced by Project shipping, as it was found at Milne Port during baseline surveys. However, this genus is on the Watchlist due to concerns about the range on record for other *Crassicorophium* species and similarities to the flagged genus *Monocorophium* (also found in baseline surveys at Milne Port). There were no exact matches to existing barcodes on record for the sequenced *Crassicorophium* specimens (Table 8-9): they were not grouped with known specimens of *Monocorophium* or *Crassicorophium*, and were closer matches to specimens from the genus *Corophium.* The closest match to existing sequences were to unidentified amphipod specimens collected from the Canadian Arctic in Nunavut, which have been suggested to be *Crassicorophium clarencense* (MacDonald 2022c, Pers.Comm.).

DNA barcoding was successful in confirming six macroflora species that had previously been identified with a “cf.” designation, while two specimens were only identified to genus or family. Four specimens failed to generate readable sequences (see Table 8-9 for a comparison of morphological and DNA identification results).

Table 8-8: Target or Flagged Taxa Collected at Benthic Stations Sampled for DNA Barcoding

Station	Target or Flagged Taxa Collected (Putative Identifications)	Number of Specimens
SW-2	*Marenzelleria* sp.	2
SW-6	-	-
SW-11	*Crassicorophium bonelli*	3
SW-12	*Marenzelleria* sp.	10*
SW-13	*Crassicorophium bonelli*	2
	Marenzelleria sp.	3
SW-14	-	-
SE-2	-	-
SE-4	-	-
SNE-7	*Pseudofabricia* sp. nr. *aberrans*	1

* Four specimens were damaged and incomplete, but were suitable for DNA analysis

Table 8-9: Record of Results of Independent Review and DNA Barcoding of Taxa Collected in Milne Port, 2021.

Biologica's Identification	Verification Method	Result of Verification	Description	Reference
Annelida				
Pseudofabricia sp. nr. *aberrans*	DNA	No match, Family Fabriciidae	DNA results indicate the specimens are not *Fabricia stellaris* and do not match any sequences on record. Based on available information, there is a reasonable probability these specimens are from a currently undescribed species in the family Fabriciidae.	1, 2, 3
Marenzelleria sp.	DNA	*Marenzelleria wireni*	Species confirmed through DNA analysis; a formal report is being prepared by the analytical laboratory. *M. wireni* is understudied compared to other members of the genus; however, it is established to be a native Arctic species and the limited georeferenced collection records indicate range is extremely broad, and likely is circumpolar, including the North American arctic.	1, 2, 4
Ampharete petersenae	Morphological Assessment	TBD	TBD	
Paramphitrite birulai	Morphological Assessment	TBD	TBD	
Arthropoda				
Diastyloides biplicatus	Morphological Assessment	*Diastylis* sp.	Morphologically similar taxa, *Diastylis* and *Diastyloides* are not well differentiated in the available taxonomic literature. Multiple *Diastylis* species have ranges that include the Canadian Arctic, and have previously been observed in Milne Port surveys.	1, 2, 12
Crassicorophium sp.	DNA and Morphological Assessment	DNA: No match, Corophiidae indet. Morphological Assessment: *Crassicorophium clarencense*	DNA results indicate the specimens do not match sequences available for *Monocorophium* nor *Crassicorophium*. The specimens most closely matched the genus *Corophium*; however, the match was only 83.76% similar where a minimum 95% similarity is required to confirm an identification. This means the specimens are also unlikely to be from *Corophium*. The closest sequence match was to unidentified Amphipoda specimens collected from the Canadian Arctic in Nunavut (Victoria Island) that are presumed to be *Crassicorophium clarencense*, which is a Canadian Arctic species. Independent morphological assessment confirmed the identification as *C. clarencense.*	1, 2, 3, 12
Bryozoa				
Tricellaria sp.	Morphological Assessment	Candidae indet.	Unable to be differentiated from *Scrupocellaria* sp. due to the size of the specimen. Recommended the identification be brought to the Family level. Bryozoans of the family Candidae, including *Scrupocellaria* sp., have ranges that include the Canadian Arctic and have previously been observed in Milne Port surveys	1, 2, 12

Biologica's Identification	Verification Method	Result of Verification	Description	Reference
Chlorophyta				
Chaetomorpha melagonium	DNA	Failed	Failed to generate readable sequences. Mossy green algae species with a broad distribution, including collections from Baffin Island.	1, 2, 5, 6, 7
cf. *Urospora neglecta*	DNA	*Urospora neglecta*	99.86% match to multiple records representing the species. The comparative species is poorly described. The limited specimen collections are from a broad geographical range, including Arctic and North Atlantic waters.	5, 8
Ochrophyta				
Desmarestia aculeata or *Dictyosiphon foeniculaceus*	DNA	*Desmarestia aculeata*	100% match to multiple records representing the species. Brown algae species with a broad global distribution, including observations from Baffin Island.	5, 6, 7
cf. *Desmarestia viridis*	DNA	Genus *Desmarestia*	94.09% match to multiple records representing the species *Desmarestia viridis* from Alaska, USA, and New Brunswick and British Columbia, Canada, however only genus level can be established. Brown algae species with a broad global distribution, including observations from Baffin Island.	5, 6, 7, 9
cf. *Dictyosiphon foeniculaceus*	DNA	*Dictyosiphon foeniculaceus*	100% match to multiple records representing the species. Brown algae species with a broad global distribution, including collections from Baffin Island.	2, 5, 6, 7
Pylaiella cf. *varia*	DNA	Family Acinetosporacea	99.69% match to a record that had only been identified to Family. The comparative species has an Arctic distribution. *P. washingtoniensis, P. littoralis,* and an unidentified third species collected from Baffin Island.	2, 4, 5, 9
cf. *Coelocladia arctica*	DNA	Failed	Failed to generate readable sequences. Poorly described species of brown algae. Collection records indicate non-georeferenced Canadian specimens were collected from Ragged Island.	2, 5, 6
cf. *Petalonia* or other Brown algae	DNA	Failed	Failed to generate readable sequences. Brown algae genus with a broad global distribution, including species observations from Baffin Island.	1, 2, 5, 6
Rhodophyta				
Coccotylus truncatus	DNA	*Coccotylus truncatus*	100% match to a record representing the species. Foliose red algae species with a global distribution including records from the Canadian Arctic and northern Baffin Island.	1, 2, 5, 6, 9
Savoiea arctica	DNA	Failed	Failed to generate readable sequences. Recently proposed taxonomic designation, considered an Arctic and North Atlantic species, with collections from Western Greenland and Baffin Island.	2, 5. 10
cf. *Rhodomela*	DNA	*Rhodomela virgata*	100% match to multiple records spanning the Canadian Arctic representing the species. Broadly distributed genus of red algae with representative taxa with natural ranges that include the Canadian Arctic.	1, 2, 5, 6, 7, 11

Biologica's Identification	Verification Method	Result of Verification	Description	Reference
Dilsea socialis	DNA	*Dilsea socialis*	100% match to a record representing the species. Red algae with a broad distribution, including collections from Baffin Island.	1, 2, 5, 6

Taxa distribution references: 1: WoRMS 2022, 2: GBIF 2022, 3:,MacDonald 2022c, pers. comm. 4: Radashevsky 2022, pers. comm, 5: BOLD, 6: Küpper et al. 2016, 7: Ellis and Wilce 1961, 8: Saunders 2022, 9: AlgaeBase 2022, 10: Wynne 2018, 11: Brown et al. 2011, 12: MacDonald 2022d, pers. comm.

8.5 Discussion

8.5.1 Limitations

It is important to note that it is not always possible to identify specimens to the species level due to a variety of limitations. Species descriptions are often based on adult samples, and immature specimens may lack the features present in the adult that are required for specific identification (Steinerstauch 2019, pers. comm.). Fragmented samples, or samples damaged during collection, may also be missing identifying features that would be used to determine species. Incomplete species records and descriptions also lead to limitations in species identification (Steinerstauch 2019, pers. comm.). Where taxa were not identifiable to the species level, it was confirmed that the higher taxonomic designation included at least one species with a probable native range that included the Project area.

Identification resolution may be dependent also on the number of individual specimens of the same type that are collected. This is for two general reasons: first, higher incidence of a type of specimen often translates to a higher incidence of specimens with diagnostic characters, and thus higher identification resolution; and second, the increase in incidence of identifiable taxa allows for more distinctions to be made about like and unlike taxa. For example, with bryozoans, a single incidence of a small colony or fragment observed in a sample is less likely to be identified to genus than it would be in a sample with a high incidence, in which opportunities to compare and contrast morphologies are greater (MacDonald 2022a, pers. comm.)

Ranges on record are not complete for all taxa; recently described or uncommon taxa may have a limited range description based on where specimens have been found, with a broader range inferred based on biological characteristics and tolerances. However, with some taxa it can be difficult to determine if a species is originally from the area in which it is found, or if it was introduced from another location. In cases where the original native range cannot be conclusively determined a species is considered cryptogenic.

Flora and fauna of the Canadian Arctic are not thoroughly described and surveys of species in the Canadian Arctic are severely lacking relative to surveys in other Arctic and sub-Arctic regions, particularly in comparison to surveys in Northern Europe. Surveys in the Canadian Arctic are also frequently limited by methodology, focussing on methods such as benthic grabs and zooplankton tows that do not sample the biota of larger hard substrates. Encrusting taxa such as bryozoans and some tunicate species may therefore be underrepresented in the datasets. Both of these factors reduce confidence in the ranges on record, particularly for less common or recently described species that may be distributed within a broader area, but due to their rarity and the relative survey effort, have not yet been described from that broader range.

Difficulties in determining the historic range of a species may also be related to changes or inconsistencies in a species description. The range on record may be linked to a previous name or description and databases are not always updated as new descriptions are accepted. Alternatively, multiple conflicting descriptions or names for the same taxa may further confound records. New species descriptions occur when an update to the taxonomic record is accepted. This may be due to a variety of reasons including acceptance of a more senior description, DNA analysis combining (two species merging under one species name) or separating species descriptions (one species being divided into two distinct species or subspecies), or reclassification due to the identification of features that match a different taxonomic group (such as reclassification to a new genus or being considered a subspecies). These limitations may be more pronounced in certain taxonomic groups such as bryozoans and marine algae (i.e. macroflora) where there are fewer experts focussed on refining the taxonomy or more variation in reporting relative to other more well-defined groups.

The accurate identification of macroalgae by genetic means requires reliable, accurate reference sequences in a publicly accessible database. Currently, there are some barriers slowing the process of populating reference databases such as the Barcode of Life Database (BOLD). First, obtaining quality DNA sequences reliably can be difficult. Macroalgae are a diverse taxonomic group, and many taxa require specialized extraction protocols and primer design. Thus, an industrial-scale approach to DNA sequencing (e.g., DNA barcoding as per the Canadian Centre for DNA Barcoding) may not always be successful. The second barrier to progress is that once the sequences are obtained, like with any other taxonomic group, the rigour of the original identification for reference specimens must be considered, as can often be misleading due to the limitations of morphological identifications, as discussed earlier. Therefore, improvement is an iterative process, with understanding of algal molecular and morphological diversity developing hand in hand (MacDonald 2022a, pers. comm.).

Availability of publications may further impact descriptions, more recently published works may not be readily available or accepted by the larger taxonomic community, and updates may not be reflected in the identification keys used by the taxonomy labs.

8.5.2 Taxonomic Identification

8.5.2.1 Benthic Infauna

In 2021, benthic community analysis was not required as part of MEEMP surveys. A subset of the benthic infauna stations was sampled in support of NIS/AIS monitoring, focusing on stations surrounding Project infrastructure or where flagged taxa had previously been detected. A total of 266 taxa were identified in 17 benthic samples in Milne Inlet, including 16 taxa which had not been recorded in the Project area. An analysis of the available literature indicated all but one of the new records had clearly described ranges or collection records that included Arctic waters or were north Atlantic species with unknown northern limits that presumably could extend into the Canadian Arctic. Results for the taxon sent for independent verification are discussed in Section 8.5.3 and the others are listed below:

- *Lumbrineris fauchaldi* is a very poorly described species of polychaete worm. However, the original species description is derived from specimens collected in Davis Strait near Baffin Island, indicating the natural range likely includes the Project Area (WoRMS 2022).
  - ***Lumbrineris fauchaldi* is not considered a taxon of concern in Milne Port**
- Naididae is a broad family of Clitellatan worms that contains species that have distributions that include the Canadian Arctic (WoRMS 2022). Twelve species (from six separate genera and four subfamilies) are listed as potentially alien or cryptogenic, although none to Arctic waters (Rius et al. 2022).
  - **Naididae indet. is not considered a taxon of concern in Milne Port**

- *Hippomedon propinqvus* is an amphipod species with a broad range on record (WoRMS 2022, GBIF 2022). Specimen collections in the Canadian Arctic in the vicinity of the project are recorded under a misspelling of the species name (*propinquus*; Miller et al. 2014, Hopcroft 2019, Cusson 2018).
  - ***Hippomedon propinqvus* is not considered a taxon of concern in Milne Port**
- Brachiopoda is a broad phylum with a global distribution (WoRMS 2022, GBIF 2022). While there is at least one recorded alien species within this Phylum (Rius et al. 2022), there are many species with natural ranges that include the Project Area.
  - **Brachiopoda indet. is not considered a taxon of concern in Milne Port**
- *Schizomavella* is a bryozoan genus that includes at least one representative species with a natural range that include the Canadian Arctic around Baffin Island (GBIF 2022).
  - ***Schizomavella* sp. is not considered a taxon of concern in Milne Port**
- *Callopora* is a bryozoan genus that includes at least one representative species with a natural range that include the Canadian Arctic around Baffin Island (WoRMS 2022, GBIF 2022, Goldsmit 2016). At least two species are listed as potentially alien (to Hawai'i and the South China Sea, Rius et al. 2022).
  - ***Callopora* sp. is not considered a taxon of concern in Milne Port**
- *Cauloramphus* is a relatively poorly described bryozoan genus. However, collections include specimens from the eastern Canadian Arctic (WoRMS 2022, GBIF 2022, Goldsmit 2016). At least one species within the genus is listed as a potentially alien taxon to the north Pacific (Rius et al. 2022).
  - ***Cauloramphus* sp. is not considered a taxon of concern in Milne Port**
- *Tricellaria* is a genus of bryozoans that includes more than one species with a natural range that includes the Eastern Canadian Arctic. The genus also includes species listed on databases as alien, including *T. inopinata*, listed on the National Risk Assessment as a potential invader to Canadian waters, including the Arctic region (Casas-Monroy et al. 2014).
  - ***Tricellaria* sp. was flagged for independent review (see Section 8.5.3.3.1).**
- *Cribrilina* is a genus of bryozoans with representative species from the Eastern Canadian Arctic, including Baffin Island (WoRMS 2022, GBIF 2022, Miller et al. 2014, Goldsmit 2016).
  - ***Cribrilina* sp. is not considered a taxon of concern in Milne Port**
- *Escharoides* is a genus of bryozoans with representative collections in the Eastern Canadian Arctic (WoRMS 2022, GBIF 2022, Goldsmit 2016).
  - ***Escharoides* sp. is not considered a taxon of concern in Milne Port.**
- *Stomacrustula pachystega* is a poorly described species of bryozoan with few georeferenced collections. It is considered to have a probable range that includes the Arctic Ocean and the Northwestern Atlantic (WoRMS 2022).
  - ***Stomacrustula pachystega* is not considered a taxon of concern in Milne Port.**
- *Pseudoflustra* is a bryozoan genus largely limited to Arctic waters. Collection records indicate at least one species has a range that includes the eastern Canadian Arctic (WoRMS 2022, GBIF 2022).

  - ***Pseudoflustra* sp. is not considered a taxon of concern in Milne Port**.
- *Smittina* is a genus of bryozoans with a broad global distribution that includes the Canadian Arctic (WoRMS 2022, GBIF 2022). Representative collections have been made in the Eastern Canadian Arctic around Baffin Island (Miller et al. 2014).
  - ***Smittina* sp. is not considered a taxon of concern for Milne Port.**
- Schizoporelloidea is a superfamily of bryozoans with a global distribution. Representative taxa are present in the Canadian Arctic (WoRMS 2022, Goldsmit 2016, Stewart 2013). Some taxa are included on lists of potentially alien taxa, although this includes species with natural ranges that include the Canadian Arctic (Rius et al. 2022).
  - **Schizoporelloidea indet. is not considered a taxon of concern in Milne Port**
- *Calycella* is a genus of hydrozoans that is largely limited to the northern hemisphere. At least one representative species has a natural range that includes the Canadian Arctic and Baffin Island (WoRMS 2022, GBIF 2022, Calder 2015).
  - ***Calycella* sp. is not considered a taxon of concern in Milne Port.**
- Lasaeidae is a bivalve family with a broad distribution, including representative taxa in the Canadian Arctic and Baffin Island (WoRMS 2022, GBIF 2022, Cusson 2018).
  - **Lasaeidae indet. is not considered a taxon of concern in Milne Port.**

Taxa collected during the MEEMP and NIS/AIS monitoring surveys should continue to be compared to the best available literature (e.g., check for additions to the Canadian and global invasive species databases on an annual basis) to confirm the geographic ranges of known or suspected NIS/AIS taxa.

In addition to the new taxa described above, five taxa currently on the Program Watchlist were identified in benthic samples (*Ampharete petersenae*, *Marenzelleria* sp., *Crassicorophium* sp., *Paramphitrite birulai*, *Pseudofabricia* sp. nr. *aberrans*). These specimens were sent to specialists in the relative taxonomic groups for further review. The results of the independent reviews are presented in Section 8.5.3.

8.5.2.2 Macroflora and Benthic Epifauna

Dive surveys of the permanent quadrats were performed to assess for presence of macroflora and epifauna species. Dive surveys included collection of algae and invertebrate specimens for taxonomic assessment. 16 macroflora were identified in the 2021 survey that had not been identified previously in surveys at Milne Port; each taxon is described in further detail below. The majority of the new algae taxa were inexact matches to described taxa, designated by “cf.”. In these cases, the indicated taxon was researched in addition to the next highest taxonomic level to identify potential related species or unidentified taxa within the taxonomic group with Arctic distributions.

- An algae taxon was identified as an inexact match to *Spongomorpha aeruginosa*, which has a broad distribution that includes the Eastern Canadian Arctic, with collections from Cape Hatt and Ragged Island, north of the Project Area (WoRMS 2022, GBIF 2022, Küpper et al. 2016).
  - **cf. *Spongomorpha aeruginosa* is not considered a taxon of concern in Milne Port.**

- An algae taxon from the genus *Rhizoclonium* was identified as an inexact match to *R. riparium*, which has a broad distribution that includes the Eastern Canadian Arctic, with collections from Cape Hatt and Ragged Island, north of the Project Area (WoRMS 2022, GBIF 2022, Küpper et al. 2016). *R. riparium* is considered introduced to Japan and the Mediterranean (Rius et al.2022).
  - ***Rhizoclonium* cf. *riparium* is not considered a taxon of concern in Milne Port.**
- *Chaetomorpha melagonium* is a species of cladophoran green algae with a broad global distribution, including the Canadian Arctic, with collections from Cape Hatt and Ragged Island, north of the Project Area (WoRMS 2022, GBIF 2022, Ellis and Wilce 1961, Küpper et al. 2016).
  - ***Chaetomorpha melagonium* is not considered a taxon of concern in Milne Port.**
- *Desmarestia aculeata* is a species of brown algae with a broad global distribution that includes the Canadian Arctic (WoRMS 2022, GBIF 2022). Records include observations from Baffin Island (Ellis and Wilce 1961, Küpper et al. 2016).
  - ***Desmarestia aculeata* is not considered a taxon of concern in Milne Port**
- *Desmarestia viridis* is a common species of filamentous brown algae with a broad distribution and a natural range that includes the Eastern Canadian Arctic, with collections from Cape Hatt and Ragged Island, north of the Project Area (WoRMS 2022, GBIF 2022, Küpper et al. 2016). *D. viridis* may be alien to the Mediterranean and Adriatic Seas (Rius et al. 2022, Molnar et al. 2008).
  - ***Desmarestia viridis* is not considered a taxon of concern in Milne Port.**
- An algae taxon from the genus *Pylaiella* was identified as an inexact match to *P. varia*, an Arctic species with a limited collection record. Unidentified *Pylaiella* sp. were identified previously in Milne Port (Golder 2021a). During surveys at Cape Hatt, *Pylaiella* species were common and found in many habitat types (Küpper et al. 2016). Molecular studies indicated the presence of a Pacific species (*P. washingtoniensis*) and a European species (*P. littoralis*) in addition to a third species, potentially undescribed (Küpper et al. 2016) indicating the ranges on record for this genus are likely poorly understood.
  - ***Pylaiella* cf. *varia* is not considered a taxon of concern in Milne Port.**
- *Coelocladia arctica* is a poorly described species of brown algae, however records indicate that collections have been made from Baffin Island and northern Milne Inlet (GBIF 2022, Küpper et al. 2016).
  - **cf. *Coelocladia arctica* is not considered a taxon of concern in Milne Port.**
- *Dictyosiphon foeniculaceus* is a brown algae species that has a broad natural distribution (GBIF 2022). Observations of this species have been made on Baffin Island (Ellis and Wilce 1961, Küpper et al. 2016).
  - ***Dictyosiphon foeniculaceus* and cf. *D. foeniculaceus* are not considered taxa of concern in Milne Port.**
- An algae taxon was identified as an inexact match to the brown algae *Dictyosiphon ekmanii*, which has a broad distribution that includes the Arctic and North Atlantic (AlgaeBase 2022). Collections from Cape Hatt and Ragged Island, north of the Project Area indicate the presence of a species of *Dictyosiphon* that does not match any currently described species (Küpper et al. 2016).

  - **cf. *Dictyosiphon ekmanii* is not considered a taxon of concern in Milne Port.**

- An algae taxon was identified as an inexact match to *Trachynema groenlandicum*, a rare epiphytic species from a poorly described genus, containing only two described species, both considered to be Arctic taxa (WoRMS 2022, AlgaeBase 2022). Specimens collected in South America indicate a wider range within the genus (Peters 1992).

  - **cf. *Trachynema groenlandicum* is not considered a taxon of concern in Milne Port.**

- *Petalonia* is a genus of brown algae with a collectively broad global distribution (WoRMS 2022, GBIF 2022). *P. fascia* and *P. zosterifolia* have been identified among algae species in Northern Milne Inlet (Küpper et al. 2016). *P. binghamiae* is reported as alien to the Atlantic (Rius et al. 2022).

  - **cf. *Petalonia* is not considered a taxon of concern in Milne Port.**

- *Phycodrys fimbriata* is a foliose red algae with a broad distribution and a natural range that includes the Eastern Canadian Arctic. Sequence data is available for this species from specimens collected at Baffin Island (GBIF 2022).

  - ***Phycodrys fimbriata* is not considered a taxon of concern in Milne Port.**

- *Coccotylus truncatus* is a foliose red algae with a broad distribution and a natural range that includes the Eastern Canadian Arctic. which has a broad distribution that includes the Eastern Canadian Arctic, with collections from Cape Hatt and Ragged Island, north of the Project Area (WoRMS 2022, GBIF 2022, Küpper et al. 2016).

  - ***Coccotylus truncatus* is not considered a taxon of concern in Milne Port.**

- *Savoiea arctica* is a red algae species from a poorly described genus. The species name is a recent redescription of *Polysiphonia arctica*. This species has been observed on Baffin Island under both taxonomic designations (Ellis and Wilce 1961, Küpper et al. 2016, GBIF 2022).

  - ***Savoiea arctica* is not considered a taxon of concern in Milne Port.**

- *Rhodomela* is a genus of red algae with a broad genus that includes representative species with ranges that include the Canadian Arctic (WoRMS 2022, GBIF 2022). Representative species observed on Baffin Island include *R. confervoides*, and *R. lycopodioides* (Küpper et al. 2016, Brown et al. 2011, Ellis and Wilce 1961).

  - **cf. *Rhodomela* is not considered a taxon of concern in Milne Port.**

- *Dilsea socialis* is a red algae species with a broad distribution that includes the Canadian Arctic and Baffin Island (WoRMS 2022, GBIF 2022, Küpper et al. 2016).

  - ***Dilsea socialis* is not considered a taxon of concern in Milne Port.**

Taxa collected during the MEEMP and NIS/AIS monitoring surveys should continue to be compared to the best available literature (e.g., check for additions to the Canadian and global invasive species databases on an annual basis) to confirm the geographic ranges of known or suspected NIS/AIS taxa.

8.5.2.3 Settlement Substrates

Settlement substrates had been deployed previously in four locations in Milne Inlet with limited success. Loss of all but one of the deployments and limited colonization led to analysis of recruitment only being performed on a subset of the original deployments in 2017, 2018, and 2019 (Golder 2020a). In 2021, settlement substrates were deployed in nineteen locations and will be recovered in subsequent survey years to promote longer soak times to improve colonization and taxonomic resolution. As 2021 is the first survey year to recover the new substrates, the deployment time is one year, comparable to soak times in 2018 and 2019.

As anticipated based on previous efforts, colonization was low on all substrates, with higher colonisation on the rocks in the settlement baskets compared to plates deployed at the same locations. The majority of invertebrate taxa were present only in juvenile or intermediate life stages. In general, juvenile and intermediate life stages are poorly described and most taxa in these stages were not identifiable to species level.

A total of 98 taxa were identified in eighteen settlement substrate samples, 18 of which had not been observed in previous surveys in the Project area. An analysis of the available literature indicated all had clearly described ranges or collection records that included Arctic waters or were North Atlantic species with unknown northern limits that presumably could extend into the Canadian Arctic.

- *Lichenopora* is a bryozoan genus with a limited collection record. However, collections include specimens from the Eastern Canadian Arctic (WoRMS 2022, GBIF 2022, Miller et al. 2014, Goldsmit 2016).
  - ***Lichenopora* sp. is not considered a taxon of concern in Milne Port.**
- *Spongomorpha aeruginosa* is a filamentous and epiphytic green algae with a broad distribution that includes the Eastern Canadian Arctic. Records include collections from Cape Hatt and Ragged Island, north of the Project Area (WoRMS 2022, GBIF 2022, Küpper et al. 2016). An inexact match to this species was also observed in quadrat samples.
  - ***Spongomorpha aeruginosa* is not considered a taxon of concern in Milne Port.**
- *Rhizoclonium* is a genus of green algae with species that have documented distributions that include the Eastern Canadian Arctic, with collections from Cape Hatt and Ragged Island, north of the Project Area (WoRMS 2022, GBIF 2022, Küpper et al. 2016). *R.* cf. *riparium* was identified in quadrat samples.
  - ***Rhizoclonium* sp. is not considered a taxon of concern in Milne Port.**
- *Ulothrix* is a genus of green algae with species that have documented distributions that include the Eastern Canadian Arctic, with collections from Cape Hatt and Ragged Island, north of the Project Area (WoRMS 2022, GBIF 2022, Küpper et al. 2016). The genus contains species may be alien to the Mediterranean Sea (Rius et al. 2022). Indeterminate taxa from the Family Ulotrichaceae, which contains *Ulothrix* were also observed on settlement substrates.
  - ***Ulothrix* sp. and Ulotrichaceae are not considered a taxon of concern in Milne Port.**
- An algae taxon from the genus *Ulva* was identified as an inexact match to *U. prolifera*, a broadly distributed species with an Arctic presence. During surveys at Cape Hatt, *U. prolifera* was identified among macroscopic species in the supralittoral zone (Küpper et al. 2016). *U. prolifera* is considered alien in the Great Lakes (Rius et al. 2022).
  - ***Ulva* cf. *prolifera* is not considered a taxon of concern in Milne Port.**

- Ciliophora is a phylum with a global distribution. Representative species have been collected in Eastern Canadian Arctic waters (WoRMS 2022, GBIF 2022, Stewart 2013). At least eight species are known to be non-indigenous in various locations, none within Arctic waters (Rius et al. 2022).
  - **Ciliophora indet. is not considered a taxon of concern in Milne Port.**
- *Sarsia* is a genus of hydrozoan cnidarians with a global distribution, including taxa with natural ranges that include the Eastern Canadian Arctic and the waters around Baffin Island (WoRMS 2022, GBIF 2022, Miller et al. 2014, Stewart 2013).
  - ***Sarsia* sp. is not considered a taxon of concern in Milne Port.**
- *Leptasterias* (*Leptasterias*) *muelleri* is a species of seastar with a broad distribution which includes the Canadian Arctic, with records from Davis Strait (WoRMS 2022, GBIF2022).
  - ***Leptasterias* (*Leptasterias*) *muelleri* is not considered a taxon of concern in Milne Port.**
- *Arvella faba* is an updated name for *Crenella faba*, which has a natural distribution in the North Atlantic and Eastern Canadian Arctic (WoRMS 2022, GBIF 2022). Records included collections and observations of *Crenella faba* from the Canadian Arctic near Baffin Island (Miller et al. 2014, Cusson 2018, Ellis and Wilce 1961).
  - ***Arvella faba* is not considered a taxon of concern in Milne Port.**
- *Dendronotus* is a nudibranch genus with at least one species that has a natural range within the Eastern Canadian Arctic (WoRMS 2022, GBIF 2022). Records from the Canadian Arctic include specimen collections of *D. robustus* and *D. frondosus* (Stewart 2013, Miller et al. 2014).
  - ***Dendronotus* sp. is not considered a taxon of concern in Milne Port.**
- Chordariaceae is a family of brown algae with a broad distribution that includes species with ranges in the eastern Canadian Arctic (WoRMS 2022, GBIF 2022). During surveys at Cape Hatt, multiple indeterminate Chordariaceae were identified (Küpper et al. 2016). Representative species include *Trachynema groenlandicum*, *Dictyosiphon ekmanii, D. foeniculaceus* and *Coelolcadia arctica*, taxa provisionally identified in quadrat surveys and incidental collections (discussed in Sections 8.5.2.2 and 8.5.2.4).
  - **Chordariaceae indet. is not considered a taxon of concern in Milne Port.**

New taxa observations on settlement substrates also included two algae taxa observed in the quadrats for the first time (*Pylaiella* cf. *varia* and cf. *Trachynema groenlandicum*), these are discussed in Section 8.5.2.2.

In addition to the new taxa described above, three taxa currently on the Program Watchlist were identified on settlement substrates (*Marenzelleria* sp., *Crassicorophium* sp., and *Monocorophium insidiosum*). These specimens were sent to specialists in the relative taxonomic groups for further review. The results of the independent reviews are presented in Section 8.5.3.

8.5.2.4 Fish and Incidentals

All taxa observed during marine surveys at Milne Port are considered as part of the NIS/AIS program. This includes observations during habitat offset monitoring, or non-targeted captures such as invertebrate species during fishing efforts. During survey efforts for the MEEMP program, 85 taxa were caught or observed incidentally; of these, ten were new records (i.e., not on the Milne Inlet Taxonomic Inventory), including duplicate observations through other methodologies. Notably, new observations included four freshwater taxa, all collected from the stomach of a single Arctic Char incidental mortality. As Arctic Char are often observed near sources of freshwater in Milne Port, these taxa likely originated from a freshwater source such as Phillips Creek.

All taxa observed incidentally in MEEMP and NIS/AIS surveys were cross-checked against marine invasive species databases. None of the taxa observed were identified as globally recognized invasive species (Molnar et al. 2008) or as domestically recognized invasive species according to the National Risk Assessment for Introduction of Aquatic Nonindigenous Species to Canada by Ballast Water (Casas-Monroy et al. 2014). In addition to these databases, the distribution and habitat preferences of each taxa was researched independently in the literature for signs of NIS status in the Arctic region. For specimens that could not be resolved to species, review efforts focussed on confirming that the higher-level classification (e.g., genus) had at least one species with a distribution that included Arctic waters.

- *Hydrobaenus* is a genus of freshwater chironomids with a global distribution, including collection records from the Canadian Arctic (GBIF 2022).
  - ***Hydrobaenus* sp. is not considered a taxon of concern in Milne Port.**
- Simuliidae is a family of freshwater dipterans with a global distribution, including collection records from the Canadian Arctic (GBIF 2022, Stewart 2013).
  - **Simuliidae indet. is not considered a taxon of concern in Milne Port.**
- Tipulidae is a family of freshwater dipterans with a global distribution, including collection records from the Canadian Arctic (GBIF 2022, Stewart 2013).
  - **Tipulidae indet. is not considered a taxon of concern in Milne Port.**
- Ephemeroptera is an order of freshwater arthropods with a global distribution, including collection records from the Canadian Arctic (GBIF 2022, Stewart 2013).
  - **Ephemeroptera indet. is not considered a taxon of concern in Milne Port.**
- *Urospora neglecta* is a poorly described species of green algae, however collections records indicate it has a broad range that includes North Atlantic and Arctic waters (GBIF 2022). Unidentified species from this genus have been observed in the Eastern Canadian Arctic (Brown et al. 2011). Genetic work is required to better describe this genus in Canadian waters (Saunders 2022).
  - **cf. *Urospora neglecta* is not considered a taxon of concern in Milne Port.**
- *Aspidophoroides olrikii*, or the Arctic Alligatorfish is a common benthic fish species with a broad range across North America and the Arctic Ocean. Collection records include specimens from the Eastern Canadian Arctic and Baffin Island under the former name, *Ulcina olrikii* (Miller et al. 2014, DFO 2019, Stewart 2013).
  - ***Aspidophoroides olrikii* is not considered a taxon of concern in Milne Port.**

- *Leptagonus decagonus*, the Atlantic Poacher or Kanajordlak in Inuktitut has a broad circumpolar and North American distribution with a natural range that includes the Project Area (WoRMS 2022, GBIF 2022, Miller et al. 2014, DFO 2019).
  - ***Leptagonus decagonus* is not considered a taxon of concern in Milne Port**
- *Triglops pingelii*, the Ribbed Sculpin is a fish species with a broad circumarctic distribution (WoRMS 2022, GBIF 2022). Collection records confirm presence of the species around Baffin Island (Miller et al. 2014, DFO 2019, Stewart 2013).
  - ***Triglops pingelii* is not considered a taxon of concern in Milne Port.**
- *Eumicrotremus spinosus*, the Atlantic Spiny Lumpsucker (Man-iktoe, Nepisardluarsuk, or Nepisardluk in Inuktitut) is species with a natural range to the Eastern Canadian Arctic (WoRMS 2022, GBIF 2022, Miller et al. 2014, DFO 2019).
  - ***Eumicrotremus spinosus* is not considered a taxon of concern in Milne Port.**
- Brachiopoda is a broad phylum with a global distribution (WoRMS 2022, GBIF 2022). While there is at least one recorded alien species within this Phylum (Rius et al. 2022), there are many species with natural ranges that include the Project Area.
  - **Brachiopoda indet. is not considered a taxon of concern in Milne Port**

New taxonomic records in incidental samples also included taxa observed in other methods for the first time (Brachiopoda [Benthic Infauna], *Desmarestia viridis* [Quadrats], *Pylaiella* cf. *varia* [Quadrats and Settlement Substrates], and *Coccotylus truncatus* [Quadrats]), these are discussed in Section 8.5.2.2.

Additionally, in trawl samples, fish specimens were identified as *Liparis* sp. and *Myoxocephalus* sp. Biologica indicated the specimens were potentially *L. tunicatus* (Kelp Snailfish) or *L. gibbus* (Variegated Snailfish), and *M. aenaeus* (Grubby), although identifying features were not clear (Appendix 8B-3). Unidentified species from these genera have been observed in previous surveys, and therefore these identifications were not added to the list of new taxonomic observations. However, the potential taxa were checked against the available resources to confirm that they have natural distributions that include the Eastern Canadian Arctic (WoRMS 2022, GBIF 2022, Coad and Reist 2018).

8.5.3 Independent Verifications and Program Watchlist

Results of independent verification through morphological assessment are pending and will be updated as reviews become available.

The NIS/AIS program is conducted at a surveillance level and designed to flag potential invasive or non-indigenous species; the independent verification process is a crucial element of the program, ensuring third party review by global specialists in particular taxa. A summary of specimens flagged for review is provided in Table 8-10 and results of verifications will be provided once available. A summary of all newly recorded taxa in 2021 and the results of verifications will be available in Appendix 8E-1. A complete list of the Project Watchlist for taxa of concern in Milne Port is included in Appendix 8F-2.

Table 8-10: Summary of Taxa Verifications 2021

Initial ID	Year(s) Present	Verification Method	Independent ID	Risk[1]	Action	Rationale
Annelida						
Pseudofabricia sp. nr. *aberrans*	2019 – 2021	DNA	No match, Family Fabriciidae	No Risk	Remove from Watchlist	No match to existing sequences on record, confirmed not to be the previous alternative identification, *Fabricia stellaris*. It is considered probable these specimens are of a currently undescribed species with a range that would include the Project area.
Marenzelleria sp.	2016 – 2021	DNA	*Marenzelleria wireni*	No Risk	None	*M. wireni* is a native Arctic species with a probable natural range that includes the project area. Other *Marenzelleria* sp., aside from *M. arctia* and including *M. viridis* remain on the Watchlist as High Risk taxa.
Ampharete petersenae	2020 – 2021	Morphological assessment	TBD	No Risk	Remove from Watchlist	Independent morphological assessment results are pending. However, limited records indicate natural range extends into Arctic waters, including potentially Western Greenland. It is considered likely that the natural range would include the Eastern Canadian Arctic.
Paramphitrite birulai	2020 – 2021	Morphological assessment	TBD	Low Risk	Watchlist	Independent morphological assessment results are pending. Taxon risk status remains “Low” due to records of potential introductions in the Adriatic Sea. The designated risk status may be updated based on the results of review.
Arthropoda						
Diastyloides biplicatus	2021	Morphological assessment	*Diastylis* sp.	No Risk	None	Taxon was not considered flagged. Sent for verification as part of internal QA/QC procedures due to a transcription error being captured by the review process. Morphologically similar genera, *Diastyloides* and *Diastylis* both include Canadian Arctic species, which have previously been observed in Milne Port.
Crassicorophium sp.	2013, 2017, 2018,	DNA	No match, Corophiidae indet.	Low Risk	Watchlist	Species was not able to be confirmed. Species remains unidentified and on the Watchlist as a precaution.

Initial ID	Year(s) Present	Verification Method	Independent ID	Risk[1]	Action	Rationale
	2020, 2021*	Morphological assessment	*Crassicorophium clarencense*	No Risk	None	*Crassicorophium clarencense* is a Canadian Arctic species and has been previously observed in Milne Port surveys.
Bryozoa						
Tricellaria sp.	2021	Morphological assessment	Candidae indet.	No Risk	None	Bryozoans of the family Candidae include multiple species with natural ranges that include the Canadian Arctic and have previously been observed in Milne Port surveys. It is considered probable that the Candidae indet. specimens represent a Canadian Arctic species.
Chlorophyta						
Chaetomorpha melagonium	2021	DNA	Inconclusive due to failed sequencing.	No Risk	None	Taxon was not considered flagged. Sent for verification as part of internal QA/QC procedures. Morphological assessment identified this to be a mossy green algae species with a broad distribution, including collections from Baffin Island.
cf. *Urospora neglecta*	2021	DNA	*Urospora neglecta*	No Risk	None	Taxon was not considered flagged. Sent for verification as part of internal QA/QC procedures. The comparative species is poorly described. The limited specimen collections are from a broad geographical range, including North Atlantic and Arctic waters.
Ochrophyta						
Desmarestia aculeata or *Dictyosiphon foeniculaceus*	2021	DNA	*Desmarestia aculeata*	No Risk	None	Taxon was not considered flagged. Sent for verification as part of internal QA/QC procedures. Brown algae species with a broad global distribution, including observations from Baffin Island.
cf. *Desmarestia viridis*	2021	DNA	Genus *Desmarestia*	No Risk	None	Taxon was not considered flagged. Sent for verification as part of internal QA/QC procedures. Brown algae genus with a broad global distribution, including observations from Baffin Island and Canadian Artic.
cf. *Dictyosiphon foeniculaceus*	2021	DNA	*Dictyosiphon foeniculaceus*	No Risk	None	Taxon was not considered flagged. Sent for verification as part of internal QA/QC procedures. Brown algae species with a broad global distribution, including collections from Baffin Island.

Initial ID	Year(s) Present	Verification Method	Independent ID	Risk[1]	Action	Rationale
Pylaiella cf. *varia*	2021	DNA	Family Acinetosporacea	No Risk	None	Taxon was not considered flagged. Sent for verification as part of internal QA/QC procedures. At least two species and one unidentified species collected from the Arctic.
cf. *Coelocladia arctica*	2021	DNA	Inconclusive due to failed sequencing.	No Risk	None	Taxon was not considered flagged. Sent for verification as part of internal QA/QC procedures. Poorly described species of brown algae. Collection records indicate non-georeferenced Canadian specimens were collected from Ragged Island.
cf. *Petalonia* or other Brown algae	2021	DNA	Inconclusive due to failed sequencing.	No Risk	None	Taxon was not considered flagged. Sent for verification as part of internal QA/QC procedures. Brown algae genus with a broad global distribution, including species observations from Baffin Island.
Rhodophyta						
Coccotylus truncatus	2021	DNA	*Coccotylus truncatus*	No Risk	None	Taxon was not considered flagged. Sent for verification as part of internal QA/QC procedures. Foliose red algae species with a global distribution including records from the Canadian Arctic and northern Baffin Island.
Savoiea arctica	2021	DNA	Inconclusive due to failed sequencing.	No Risk	None	Taxon was not considered flagged. Sent for verification as part of internal QA/QC procedures. Recently proposed taxonomic designation, considered an Arctic and North Atlantic species, with collections from Western Greenland and Baffin Island.
cf. *Rhodomela*	2021	DNA	*Rhodomela virgata*	No Risk	None	Taxon was not considered flagged. Sent for verification as part of internal QA/QC procedures
Dilsea socialis	2021	DNA	*Dilsea socialis*	No Risk	None	Taxon was not considered flagged. Sent for verification as part of internal QA/QC procedures. Red alga with a broad distribution, including collections from Baffin Island.

**Crassicorophium bonelli* in 2013, 2017, 2018, *C. clarencense* in 2020.

[1]Risk category refers to the taxonomic description following independent verification.

8.5.3.1 Polychaetes

8.5.3.1.1 Pseudofabricia aberrans

A sabellid polychaete worm was found in benthic infaunal samples in 2018 and tentatively classified to the *Pseudofabricia* genus. *P. aberrans* is currently the only described species in this genus and this species range has only been defined in the Mediterranean Sea and, therefore, is assumed to be endemic to that region (Giangrande and Cantone 1990, WoRMS 2022). However, specimens of *P. aberrans*, as well as unidentified specimens from the *Pseudofabricia* genus, have been identified in waters around the United Kingdom and the Black Sea indicating the range may extend further, or the genus is present as NIS outside of the Mediterranean Sea (OBIS 2021). Due to the limited distribution record for *P. aberrans* not including Arctic waters, *P. aberrans* was added to the Program watchlist as a "Low Risk" taxon.

Only a limited description exists for *P. aberrans*, and polychaete surveys in the Canadian Arctic are not exhaustive. It is likely these specimens are either a cryptic species related to *P. aberrans*, or that the range on record is incomplete. *P. aberrans* is not listed as an invasive species or a species of concern in Canadian or Arctic waters (Molnar et al. 2008, Casas-Monroy et al. 2014). As the samples collected from Milne Port were morphologically similar to the species description of *P. aberrans*, a temporary identification of *Pseudofabricia* sp. nr. *aberrans* was assigned to those specimens, indicating an inconclusive identification near to *P. aberrans*. The 2018 specimens were flagged and sent for independent verification at Laval where they were tentatively identified as *Manayunkia aesturiana*, which has a documented Arctic range (Miller et al. 2014).

Pseudofabricia sp. nr. *aberrans* was again flagged in benthic samples in 2019 and 2020 because of ongoing uncertainty in its identification. The specimens were collected from sample sites ranging between approximately 65 m to 90 m water depth, which precluded the identification of *M. aesturiana*, which is limited to shallow, estuarine waters (MacDonald 2020, pers. comm.). Laval identified the specimens as *Fabricia stellaris*. *F. stellaris* and *P. aberrans* are both members of Fabriciidae, a family of sabellid worms. *F. stellaris* has a fairly broad distribution that includes Pacific, Atlantic, Arctic and Southern Oceans; specimen collections have been made from Southern Baffin Island and Western Greenland (WoRMS 2022, GBIF 2022).

However, Biologica disagreed with the identification based on the fact that specimens lacked a distinguishing feature (i.e., pseudospatulate chaetae) that would indicate the genus *Fabricia.* Rather, in Biologica's professional opinion, the lack of the feature in question is characteristic of *Pseudofabricia* (MacDonald 2021, pers. comm.). Additional experts from Columbia Science and EcoAnalysts Inc. were consulted for their review of the 2018 and 2019 specimens. Columbia Science agreed that the specimens did not match *F. stellaris* and the keys indicated *P. aberrans* as the identification of the specimens, but recommended the identification remain as Fabriciidae indet. until further information was available on this group (Lipovsky 2021, pers. comm.). EcoAnalysts agreed with the identification of *Pseudofabricia* sp. nr. *aberrans*, as the specimens contained short ventral filamentous appendages on the branchial crown, a characteristic of *Pseudofabricia* that is absent in *Fabricia* (McGraw 2021, pers. comm.). Both *F. stellaris* and *M. aesturiana* have documented Canadian Arctic ranges and are not listed in AIS databases and are therefore considered no risk.

Three specimens tentatively identified as *Pseudofabricia* in 2020 and 2021 were sent for DNA analysis, however the results were largely inconclusive. The three specimens were considered genetically identical (i.e., from the same species), however there were no matches to existing specimens on record. The specimens were 79.23% similar to sequences for *Fabricia stellaris,* which is too dissimilar to be of the same species. This result does not exclude *Pseudofabricia aberrans* as a potential identification, as there are no sequences available for the genus, and only five records for the Family Fabriciidae. Due to the limited information available for Fabriciidae, it is unlikely this identification will be resolved further. However, considering there are no matches to described species on record, the poor taxonomic record for the Family Fabriciidae, and the incomplete taxonomic records for the Canadian Arctic region, it is probable that these specimens are of a currently undescribed species with a range that would include the Project area (MacDonald 2022b,c, pers. comm.) and would not represent a Project related introduction to Milne Port. Based on these results, it is recommended the risk status of *P.* sp. nr. *aberrans* be revised to "No Risk" and the taxon removed from the Program Watchlist.

- **The status of *P.* sp. nr. *aberrans* is revised to No Risk and will be removed from the Watchlist.**
- ***F. stellaris and M. aesturiana* are designated as No Risk and are not considered species of concern in Milne Inlet.**

8.5.3.1.2 Marenzelleria sp.

In 2019 and 2020, specimens from the worm family Spionidae were identified as *Marenzelleria viridis.* Unidentified species from this genus had been identified in benthic samples prior to 2019 (2016, 2017 and 2018). *M. viridis* was designated a High Risk species for Milne Inlet due to it being listed in the Global Database as invasive to areas outside of East Coast North America (Molnar et al. 2008). It is also listed in the National Risk Assessment as a potential invader to Canadian waters, including the Arctic region (Casas-Monroy et al. 2014). The primary invasion vector is considered to be transport through ballast water and sediments and once established, locally by currents (Molnar et al. 2008). Introduced to California, Scotland, the North Sea, and the Baltic Sea, *M. viridis* reaches high densities, in some locations replacing native infauna and altering sediment characteristics (Molnar et al. 2008, Fofonoff et al. 2021). Once established, management is considered highly difficult (Molnar et al. 2008).

Specimens from 2017, 2018, 2019, and 2020 were sent to Dr. Vasily Radashevsky of the Russian National Scientific Center of Marine Biology in Vladivostok. Biologica recommended Dr. Radashevsky review the identification due to his expertise on Spionidae, the order of marine worms that contains *Marenzelleria*, as well as his familiarity with Canadian spionids through collaborative research with the Canadian Museum of Nature in Ottawa. Based on morphological examination, Dr. Radashevsky concluded that none of the specimens matched descriptions for *Marenzelleria viridis* (Radashevsky 2021a, b, pers. comm). Rather, specimens from 2020, collected from stations near Phillips Creek, matched features described for *M. arctia*. Further, while not a conclusive distinguishing trait, pigmentation in the head of the specimens closely matched specimens of *M. arctia* from the White Sea (Radashevsky 2021a, pers. comm.). One specimen collected in 2019 from the near the Ore Dock was identified as likely being *M. wireni*. The remaining specimens from 2017, 2018, and 2019 were less conclusive due to a combination of juvenile life stages and specimen condition but were considered likely either *M. neglecta* or *M. wireni*, or a mix of the two (Radashevsky 2021b, pers. comm). Fifteen specimens collected from three stations in Milne Port were sent to Dr. Radashevsky for DNA. The specimens were conclusively identified as *Marenzelleria wireni* (Radashevsky 2022, pers. comm.). A formalized laboratory report on the molecular identification is pending

The genus *Marenzelleria* contains five recognized species, of which *M. bastropi* and *M. neglecta* are the most recently described (Bick 2005; Sikorski and Bick 2004). The genus is presumed to have evolved in the Arctic, with *M. arctia* considered the most basal of the extant species (Blank and Bastrop 2008, Radashevsky et al. 2022). *Marenzelleria* sp. can be difficult to distinguish based simply on morphology due to a combination of limited descriptions, overlapping morphological traits (particularly in smaller specimens), lack of differentiating features in immature specimens, and hybridization between species (Sikorski and Bick 2004; Bick 2005; Blank et al. 2004, Radashevsky et al. 2021). *M. viridis*, *M. neglecta*, and *M. arctia,* in particular, are morphologically similar, resulting in the three species being part of a cryptic sibling species complex (Sikorski and Bick 2004; Bick 2005; Green 2015). The recent redescriptions of the genus, descriptions of new species based on historical collections (*M. bastropi* and *M. neglecta*), incorrect species denomination in reporting, and synonymization of the former description of *M. jonesi* with *M. viridis* lead to uncertainty in the historical specimen records, particularly where distributions overlap (Blank et al. 2008; Sikorski and Bick 2004). As many historically collected specimens are no longer available, there is an inherent uncertainty in the actual species that may be represented by these original collections. Despite morphological similarities between species, there are notable behavioral and ecological differences that may aid in species differentiation (Renz and Forster 2013; Sikorski and Bick 2004).

At present, recognized species in the genus include:

- ***M. arctia*** – an Arctic Basin species, first described in the Beaufort Sea, Alaska, USA (Chamberlin 1920). Generally found at depths from 0 to 30 m, with an apparent preference of depths between 20-30 m (Sikorski and Bick 2004; Green 2015). Tolerant of large fluctuations in temperature and salinity, with salinities of 3-16‰ being the most favourable range (5-7‰ for reproduction) (Sikorski and Bick 2004). Phylogenetic analysis of *Marenzelleria* suggests *M. arctia* is the most basal taxon in the genus and may represent the ancestral species (Blank and Bastrop 2008).
- ***M. bastropi* (*M.* sp. A, *M.* Type III[2])** – Most recently described species in genus. Current known distribution is limited to Currituck Sound, North Carolina, where it occurs sympatrically with *M. neglecta*. Closely related (morphologically) to *M. neglecta* and *M. viridis*.
- ***M. neglecta* (*M.* Type II)** – Indications of a broad range, including the Atlantic Ocean, the Baltic Sea, and the Arctic Ocean, including in Canada (Bastrop et al. 1997; Sikorski and Bick 2004, CABI 2022). Morphologically similar to *M. viridis*, and having overlapping habitats, differentiation between *M. viridis* and *M. neglecta* may be made based on *M. neglecta* generally preferring lower salinities (0.5-10‰ compared to 16‰ for *M. viridis*) (Sikorski and Bick 2004).
- ***M. viridis* (*M.* Type I)** – natural range presumed to be the western coast of the north Atlantic – described as native to east coast North America from Nova Scotia to Delaware, with a probable native range that includes waters around Newfoundland to Chesapeake Bay (Fofonoff et al. 2022). *M. viridis* is apparently more sensitive to low salinities compared to other species of *Marenzelleria*, typically found in eulittoral habitats with brackish waters where salinities do not fall below 16‰ (Sikorski and Bick 2004; Bastrop and Blank 2006).
- ***M. wireni*** – Poorly described with a limited collection record, however records indicate the species is broadly distributed in Arctic waters with collections in the North American, European and Russian Arctic zones (GBIF 2022). Salinity tolerances are not well understood, the species being described as found in a range of depths between 1 m and 55 m, where salinities are not below 30‰ (Sikorski and Bick 2004), but also associated with brackish and freshwater habitats (Bick 2005, EOL 2022, WoRMS 2022).

M. viridis and *M. neglecta* are listed in the Database of Global Marine Invasive Species Threats as 'invasive to areas outside of East Coast North America' (Molnar et al. 2008). They are also listed in the National Risk

[2] Type I, II, and II, and sp. A were names assigned to specimens with features that differentiated them from currently described species. While descriptions now exist, these names are still used in some literature, or were used in literature relevant to this report.

Assessment as a potential invader to Canadian waters, including the Arctic region (Casas-Monroy et al. 2014). However, collections of *Marenzelleria* in Canadian waters, including the Canadian Arctic, may indicate the currently listed range or taxonomic record is incomplete for this genus in Canada (Stewart et al. 1985; Cusson 2018; Brown et al. 2011; GBIF 2022; Miller et al. 2014). A review of the literature indicates that while the known documented ranges of these species do not include the Eastern Canadian Arctic, available evidence via historical collections suggested the genus was present in the area prior to Project operations and that multiple *Marenzelleria* species may be cryptogenic, if not indigenous to the Canadian Arctic (Stewart et al. 1985; Cusson 2018; Brown et al. 2011; GBIF 2022; Miller et al. 2014; Golder 2021a). However, due to the morphological similarities between species and the lack of available specimens for review, these may represent instances of *M. viridis, M. arctia*, *M. wireni* or *M. neglecta* (Radashevsky 2021a, pers. comm.)

The corrected species identifications are further supported by the environmental conditions at Milne Port. Oceanographic data collected at Milne Port indicates that the nearshore environment is subject to a wide range of salinity (from near zero to 30 PSU - approximately equivalent to 0-30‰),) and water temperature (0°C to 12°C) due to distinct water masses moving with tides, presumed to be influenced by freshwater input from Phillips Creek and melting sea ice in Milne Port (Golder 2021b). *Marenzelleria* specimens identified between 2016-2020 were collected in similar locations to the Ore Dock tide gauge and the mouth of Phillips Creek. The range of temperatures and salinities observed in the area support the identifications of *M. arctia* and *M. neglecta*, which are more tolerant of large fluctuations in temperature and salinity, and generally found in lower salinities compared to *M. viridis*, which is not typically found in areas where salinity falls below 16‰ (Sikorski and Bick 2004; Green 2015; Quintana et al. 2018).

Additionally, and more relevant to Baffinland operations, monitoring of benthic communities at Milne Port reveals no warning signs of invasion, even after sampling intensity was substantially increased in 2020. *Marenzelleria* sp. are among 264 annelid taxa documented at Milne Port, and there is no indication that any of the other taxa are experiencing a loss of abundance or diversity that would be associated with impacts from an invasion. Notably, the abundance and diversity of polychaetes in Milne Port is in direct contrast to locations where *Marenzelleria* has successfully invaded. Native species and functional diversity are generally naturally low in areas where *Marenzelleria* spp. have successful invaded (Kauppi et al. 2015; Maximov et al. 2014). In particular, these areas are characterized by very low abundances of marine polychaete worms, especially larger burrowing forms functionally similar to *Marenzelleria* (Maximov 2015; Quintana et al. 2018). These ecosystems are generally adapted to an absence of bioturbators and, due to a lack of competition, *Marenzelleria* spp. were able to fill that void, disrupting the existing environment by changing sediment characteristics through burrowing behaviour. In addition to low diversity, increasing eutrophication has also caused these areas to be vulnerable to successful invasion by *Marenzelleria* and other invasive species (Kauppi et al. 2015; Maximov et al. 2014).

The local receiving environment at Milne Port is not subject to the degree of disturbance from eutrophication as observed in other areas such as the Baltic Sea. *Marenzelleria* spp. are not expected to have a competitive advantage in Milne Port as was observed during invasions in Europe. Should a non-indigenous species of the genus *Marenzelleria* be introduced to Milne Port, the risks of an invasion similar in scale to what has been observed in European waters is therefore not expected.

Benthic sampling in 2021 included targeted collections where *Marenzelleria* was previously observed. Three out of six targeted stations had no *Marenzelleria* present, reinforcing the lack of invasive behaviour observed in 2020. One station had *Marenzelleria* sp. in low abundance present where it had not been observed previously, however the station was located between stations where *Marenzelleria* sp. has been observed in 2018, 2019 and 2020, and this cannot be considered a geographic spread within Port.

Marenzelleria species are known successful invaders to European waters, mediated by ballast water, and thus this genus is listed in AIS databases. Accordingly, this genus is designated as High Risk. However, biogeographic evidence suggests multiple species are indigenous to the Canadian Arctic or may be cryptogenic, while ecological evidence indicates it is not showing invasive behaviour in Milne Port. Further, documented occurrences of the genus in waters around Baffin Island prior to the commencement of shipping operations confirm this is not a Project-related introduction (if it is to be considered an introduction at all). For these reasons, *Marenzelleria wireni* and *Marenzelleria arctia* are designated “No Risk” and will not be placed on the Program Watchlist, however, other members of the genus *Marenzelleria*, and *M. viridis* in particular will remain on the Watchlist where it is subject to heightened monitoring efforts.

- ***Marenzelleria wireni*** **and** ***Marenzelleria arctia*** **are designated “No Risk” and are not considered a taxon of concern in Milne Port.**
- ***Marenzelleria*** **spp. aside from** ***M. wireni*** **and** ***M. arctia*** **are designated “High Risk” species of concern in the Project area. Their occurrence in Milne Inlet is not considered attributable to the Project. As ‘High Risk’ species, they have been placed on the Project Watchlist.**

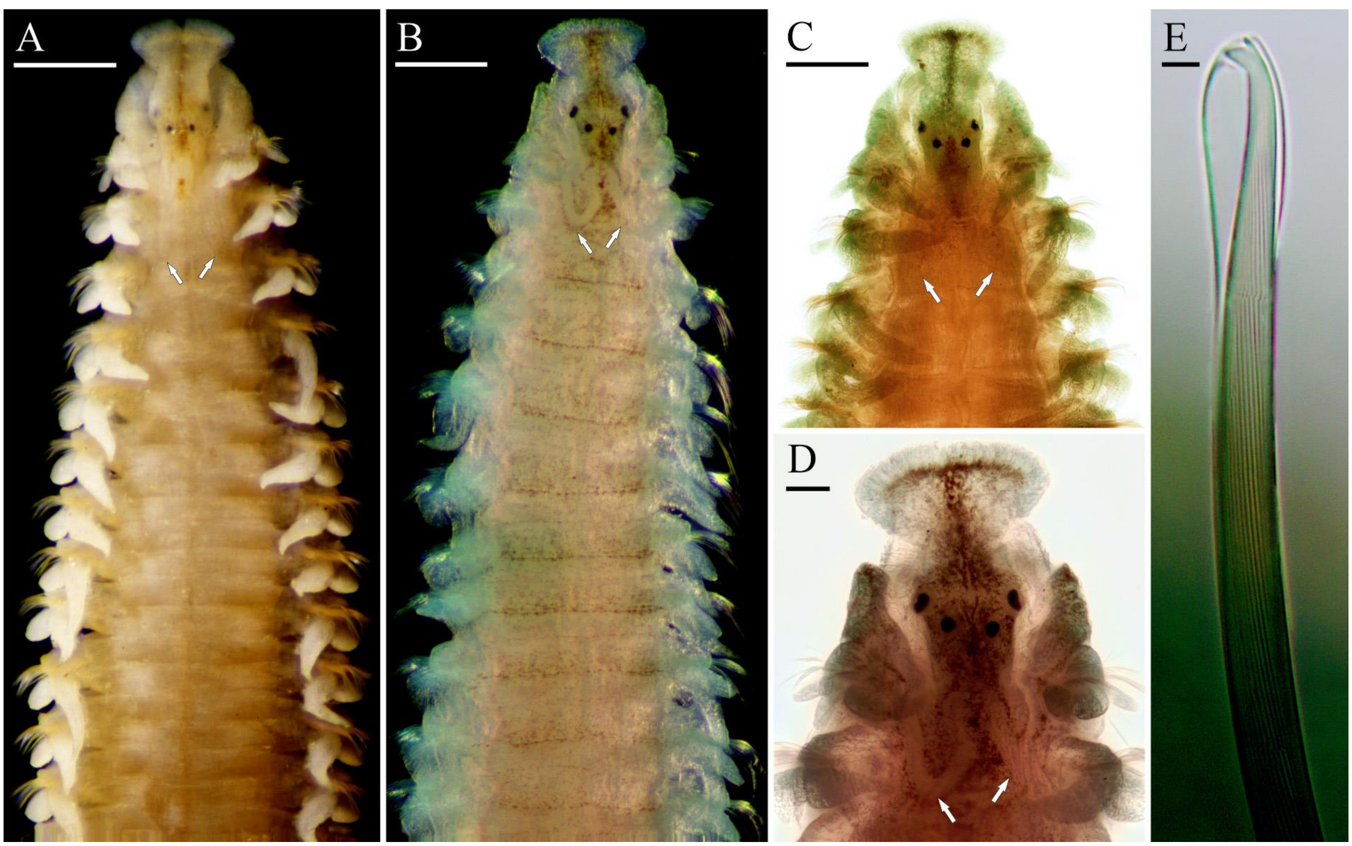


Figure 8-7: Features of *Marenzelleria* sp. identified in 2020 benthic infaunal samples at Milne Port. A-D) anterior ends, dorsal view, E) Bidentate hooded hook from a neuropodium of a middle chaetiger. Arrows showing the posterior ends of U-shaped nuchal organs. Scale Bars A) 300 µm, B) and C) 200 µm, D) 50 µm, E) 5 µm. Formalin fixed specimens. Figure credit Radashevsky et al. 2021, Figure 4.

8.5.3.1.3 *Ampharete petersenae*

The terebellid polychaete worm, *Ampharete petersenae* is a relatively recently described species. Specimens were first identified in Milne Port in 2020. No description of its range is available, though specimen collection records indicate the range may include the North Atlantic as well as Arctic waters around Iceland, where the species was first described (Jirkov 1997; WoRMS 2022; Parapar et al. 2012). An anecdotal report indicates that this species may have been present in western Greenland (Parapar et al. 2012). *Ampharete petersenae* is not listed in AIS databases; the specimen was sent for independent verification in 2020 and 2021 as a precaution due to uncertainty in the described range on record. Laval confirmed the identification of *A. petersenae* in 2020. The taxon was considered No Risk, but flagged for review in 2021 in case more information defining the range was available. No new range information was available in 2021 but considering the reports of specimens in the North Atlantic and Arctic waters, including potentially western Greenland, it is considered unlikely that it represents an introduction in Canadian Arctic waters. *A. petersenae* is designated no risk and will be removed from the program watchlist.

- ***A. petersenae* is designated as No Risk and is not considered species of concern in Milne Inlet.**

8.5.3.1.4 *Paramphitrite birulai*

The terebellid polychaete *Paramphitrite birulai* is poorly described with a limited taxonomic record. No range description exists for this species, but collection records indicate the range may be wide and include the European North Atlantic and high Arctic oceans (WoRMS 2022; Jirkov 2020). There are also indications of introductions in the Adriatic Sea, where it is described as non-indigenous, but not invasive (Rius et al. 2021, Loia 2017). Uncertainty in the range of this taxa is compounded by disagreement in the accepted name, with some sources indicating the species is *Amphitrite birulai*, which has a narrower range on record, with type localities in Scandinavian waters (WoRMS 2022). Collection records for this species in North America are limited to a single specimen collected off the coast of Labrador in 1987 (Gagnon and Torgersen 2021) and Yukon/Alaska under the junior synonym *P. tetrabranchiata* (GBIF 2022).

The specimen was flagged for independent verification as a precaution due to uncertainty in the described range on record; however, the wide high Arctic range derived from a few collection events indicates this is unlikely to be a species of concern. In 2020, Laval confirmed the identification under the alternative name *Amphitrite birulai*. *Amphitrite birulai* is considered Low Risk because, although it is not listed in AIS databases, it has potentially been flagged as alien in the Adriatic and does not have a documented distribution in the Canadian Arctic; therefore, it has been placed on the Watchlist.

- ***Paramphitrite/Amphitrite birulai* is designated Low Risk and will be placed on the Watchlist.**

8.5.3.2 Arthropods

8.5.3.2.1 *Diastyloides biplicatus*

In benthic samples, a specimen was initially recorded as *Diastylis bidentata*, an Arctic Cumacean species that has a natural range that includes the Canadian Arctic. However, collection records are limited to the Pacific region of the Arctic and the Pacific Ocean (WoRMS 2022, GBIF 2022), although there are few georeferenced collections on record and the range description is likely incomplete. Due to the primarily Pacific distribution, the taxon was flagged for further review. Biologica re-examined the specimen and determined a transcription error had occurred, and the specimen should have been recorded as *Diastyloides biplicatus*, which has a Canadian Arctic range and has been previously observed in Milne Port and in other samples from 2021. The specimen was not considered a taxon of concern but was flagged for independent verification as part of QA/QC procedures.

Independent review by Laval was inconclusive, although they suggested the specimens were *Diastylis* sp. The specimen was not able to be resolved further due to it lacking distinguishing features in the juvenile stage. Biologica did not agree with the Laval identification due to the use of an outdated taxonomic resource, however they indicated that there is existing confusion in the literature in differentiating the genera (MacDonald 2022d, pers. comm.). *Diastylis* is a large genus that includes several species with documented natural ranges that include the Eastern Canadian Arctic. At least nine species of *Diastylis* have been observed in previous surveys in Milne Port (Appendix 8A-1).

The initial flagging of *D. bidentata* demonstrates how the NIS/AIS monitoring program is effective at identifying taxa for further review, and that QA/QC procedures are working as intended.

- ***Diastyloides biplicatus* and *Diastylis* sp. are not considered taxa of concern in Milne Port.**

8.5.3.2.2 *Crassicorophium* sp. / *Monocorophium* sp.

An amphipod crustacean was identified in 2013 and 2017 samples as *Monocorophium insidiosum*. In 2018, individuals from the same genus were found with their identifying features missing and therefore only identified to the genus level. No species within this genus have confirmed distributions that include Arctic waters. *M. insidiosum* is a tube-building gammarid amphipod and a well-known fouling invasive species with a wide global distribution that is possibly non-indigenous to the Canadian Arctic (Molnar et al. 2008). Vectors for introduction and spread are through biofouling of ship hulls and hard substrates in harbours and ports and possibly also through accidental transplant (Fofonoff et al. 2021, Molnar et al. 2008). In addition to *M. insidiosum*, two other species in this genus (*M. acherusicum* and *M. sextonae*) are also considered invasive (Molnar et al. 2008).

In 2019 and 2020, specimens tentatively identified as *M. insidiosum* and *Monocorophium* sp. from samples in the 2017 through 2020 NIS/AIS programs at Milne Port were flagged and sent for independent taxonomic verification by Laval (the 2013 specimens were not available for re-review). Results suggested that the specimens identified in those years may have been *Crassicorophium bonelli* or *Crassicorophium* sp., although the identification was considered uncertain by Biologica (MacDonald 2020, pers. comm.).

C. bonelli has a known range similar to *M. insidiosum*, covering eastern North America and the northeastern Atlantic Ocean, but is not considered invasive in these locations (GBIF 2022, ETI 2021, Sirenko et al. 2020). No taxonomic record was found of this species in Arctic waters during review; however, similar to *M. insidiosum*, *C. bonelli* was also identified in Milne Port during baseline surveys in 2013. The genus *Crassicorophium* contains at least two species (*C. clarencense* and *C. crassicorne*) with a native range that includes Arctic Canada (GBIF 2022, WoRMS 2022). *C. clarencense* were observed in Milne Port surveys in 2020 (Appendix 8A-1). *C. bonelli* is not listed in AIS databases but is considered alien to the South Atlantic and Australia.

No *Monocorophium* specimens were identified in 2021 samples, however both *Crassicorophium* sp. and *C. bonelli* were found. Due to morphological similarities between the genera, uncertainties with the ranges and the potential for invasive behaviours in some species within the genera, these specimens were flagged for further review. While uncertainty remains in the Arctic range, taxonomic identification, and NIS/AIS status of both *M. insidiosum* and *C. bonelli*, there is confidence that these do not represent Project-related introductions because of their presence in Milne Port prior to the commencement of shipping operations. Specimens tentatively identified as *Crassicorophium bonelli* were found in samples collected for molecular analysis. Results were inconclusive, but indicated the specimens were not *Monocorophium* species or *Crassicorophium bonelli*. The closest match was to unidentified specimens collected from Victoria Island in Nunavut, which were thought to be *C. clarencense* (MacDonald 2022c, pers. comm.).

Specimens were also sent to Dr. Craig Straude at Friday Harbor Laboratories at the University of Washington for morphological assessment. Dr. Straude confirmed the identification for *C. clarencense* for specimens analysed based on several validating features (MacDonald 2022d, pers. comm.).

- **While the presence of *Monocorophium* sp. in the Project area remains unconfirmed due to tentative/ uncertain identification, the genus is designated 'High Risk' for the Project area as a precaution, and it has been placed on the Project Watchlist.**
- ***Crassicorophium bonelli* and *Crassicorophium* sp. are designated 'Low Risk' taxa of concern in the Project area. Their occurrence in Milne Inlet is not considered attributable to the Project. These taxa have been placed on the Project Watchlist.**
- ***Crassicorophium clarencense* is not considered a taxon of concern in Milne Port.**

8.5.3.3 Bryozoans

8.5.3.3.1 *Tricellaria* sp.

Among bryozoan species in 2021 benthic infauna samples was an unidentified species from the genus *Tricelleria.* This genus includes species with ranges that extend into the Eastern Canadian Arctic, including *T. gracilis*, *T. arctica, T. ternata*, and *T. elongata* (GBIF 2022). However, the genus also includes species listed on databases as alien (Rius et al. 2022, Fofonoff et al. 2022, Molnar et al. 2008), of particular note is *T. inopinata*, listed on the National Risk Assessment as a potential invader to Canadian waters, including the Arctic region (Casas-Monroy et al. 2014). Due the presence of the species on the National Risk Assessment, the specimen was flagged for independent verification at Laval as a precaution, results are pending.

Laval was unable to differentiate the specimen from *Scrupocellaria* sp. due to the size of the specimen and recommended the identification be brought to the Family level (Candidae indet.). Bryozoans of the family Candidae, including *Scrupocellaria* and *Tricellaria* species, have ranges that include the Canadian Arctic and have previously been observed in Milne Port surveys (WoRMS 2022, GBIF 2022, Appendix 8A-1).

Detecting invasive species of bryozoans, like any other faunal group, requires reliable and comprehensive information about species identities and ranges (MacDonald 2022a, pers. comm.). This is particularly pronounced for bryozoan taxa in the Arctic, as the baseline communities have not been well-studied in the region. The majority of Canadian Arctic bryozoan community information heavily relies on a single survey performed by Powell (1968) for taxonomic and ecological information in which records representing 93 species were compiled from previous sampling missions that took place throughout Hudson Bay, the Labrador Sea, the Northwestern Passages, Queen Elizabeth Islands, and Beaufort Sea. A recent review of European Arctic bryozoan fauna (Denisenko, 2020) compiled 518 European records, which represented a 26.4% increase in registered taxa. Using rarefaction (as described by Clarke and Warwick, 1994), Denisenko demonstrated that bryozoan fauna are still underexplored, estimating species richness would increase by 10–30% with additional sampling effort, depending on the region, and that the Canadian Archipelago stood out as being particularly under-studied. Additionally, this author indicated that bryozoans are possibly one of the most species-rich groups in the Arctic.

- **Based on the presence of at least four *Tricellaria* species in the eastern Canadian arctic and poor range descriptions for bryozoans in general, it is considered highly probable *Tricellaria* sp. would be one of the Canadian Arctic species rather than represent an introduction.**
- ***Tricellaria* sp. is designated No Risk and is not considered to be a taxon of concern for Milne Inlet. However, as a precaution, if *Tricellaria* sp. are identified in future studies, they will be treated with the same caution and sent for independent review. Should *Tricellaria inopinata* be identified in samples from Milne Port, the risk determination would be revised, and the taxon would be placed on the Watchlist and flagged for further review.**
- **Candidae indet. is designated No Risk, and is not considered a taxon of concern in Milne Port.**

8.5.3.4 Macroalgae

8.5.3.4.1 Rhodomela virgata

The red algae genus *Rhodomela* collected from permanent quadrats (as part of Chapter 5.0) was further identified to species level with DNA barcoding as *Rhodomela virgata*. Several species of the genus are considered to have a Canadian Artic distribution and found at Ragged Island on Baffin Island (*R. confervoides* and *R. lycopodiodes*) (based on morphological analysis presented in Küpper et al. 2016, Brown et al. 2011, Ellis and Wilce 1961), while DNA barcoding indicates that *R. virgata* records originate from Alaska (USA), Manitoba, Quebec, Nunavut and Prince Edward Island in Canada. In addition, several occurrence records exist from western Hudson Bay, the Baltic Sea, and the western Arctic Russia (GBIF 2022). While the aforementioned species all appear to be of Arctic distribution, the systematics of *R. confervoides* and *R*. *lycopodioides* is unclear with several WoRMS database (2022) designations as “forma (f.)”, or form, indicating a secondary rank classification that designates a group with a noticeable morphological deviation (for example, *Rhodomela confervoides* f. *lycopodioides*). It is thus apparent that the morphological assessment is questionable given the challenge of phenotypic plasticity and alternation of heteromorphic generations. Future specimens should be collected and sent to morphological assessment and DNA barcoding to resolve this taxon to species level.

- ***Rhodomela virgata* is designated as No Risk and is not considered a species of concern in Milne Inlet.**

8.6 Conclusions and Recommendations

The NIS/AIS program satisfies PC Nos. 87, 89, and 91. Detection is conducted at a surveillance level and designed to flag potential invasive or non-indigenous species introduced through Project-related vectors. Approximately 870 taxa (including 390 identifiable to species) have been observed in Milne Inlet through monitoring surveys to date. The vast majority of these taxa have been designated as “No Risk” and are not considered to be of concern.

Directed literature review of flagged taxa in 2021 has resulted in no taxa being added to the Project Watchlist for increased monitoring effort, such as review by specialists or DNA analysis. However, some independent taxonomic verifications remain pending. Molecular results confirmed the identification of *Marenzelleria wireni*, an Arctic species with a probable range that includes the Canadian Arctic. Molecular results for *Crassicorophium* sp. were largely inconclusive although they suggested that the specimens are most likely to be the Canadian Arctic species *Crassicorophium clarencense,* which was in agreement with morphological assessments.

Morphological assessment of *Tricellaria* sp. resulted in the designation being brought up to Family Candidae, a large bryozoan family with multiple species with natural ranges that include the Eastern Canadian Arctic.

Based on molecular results indicating *Pseudofabricia* sp. nr. *aberrans* are likely an undescribed species native to the Project area, this taxon has been removed from the Program Watchlist. Additionally, following extensive review of collection data, *Ampharete petersenae* was also removed from the Program Watchlist. The complete program watchlist is presented in Appendix 8F-2. As yet, there has not been confirmation of Project-related introduction of an NIS/AIS species documented at Milne Port and no species have been placed on the Trigger List to initiate rapid response. Based on the number of specimens flagged and sent for independent verification, monitoring is considered to be effective and functioning as intended.

It is recommended that sampling across multiple trophic levels continues in 2022, that the Milne Inlet Taxonomic Inventory continue to be expanded upon, and that all flagged specimens continue to be screened for known geographic ranges and AIS/NIS status. It is further recommended that efforts are continued to collect and review genetic evidence for *Marenzelleria* sp. and *Monocorophium* sp. (both, apart from *Marenzelleria wireni and Marenzelleria arctia*, flagged as High Risk but not Project-related), including targeted sampling to obtain specimens for DNA barcoding to further resolve these taxonomic groups in Milne Port.

8.7 Closure

We trust this information is sufficient for your needs at this time. Should you have any questions or concerns, please do not hesitate to contact Phil Rouget, on behalf of the undersigned, at 250-888-1100.

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APPENDIX 8A-1

Benthic Infauna Presence/Absence (2010 through 2021)

Appendix 8A-1

Benthic Infauna Taxa Presence/Absence from Survey Years 2010-2021

Phylum	Subphylum	Class	Subclass	Order	Family	Subfamily	Taxa	2010	2013	2015	2016	2017	2018	2019	2020	2021
Annelida	-	Clitellata	Hirudinea	-	-	-	Hirudinea indet.	-	-	-	-	-	-	Y	-	-
Annelida	-	Clitellata	Hirudinea	Rhynchobdellida	Piscicolidae	Platybdellinae	*Mysidobdella* sp.	-	-	-	-	X	-	-	X	-
Annelida	-	Clitellata	Oligochaeta	-	-	-	Oligochaete indet.	-	X	-	-	-	-	-	-	-
Annelida	-	Clitellata	Oligochaeta	Enchytraeida	Enchytraeidae	-	Enchytraeidae indet.	X	-	-	-	X	X	X	X	X
Annelida	-	Polychaeta	-	-	-	-	Polychaeta indet.	-	X	X	X	Y	-	-	-	-
Annelida	-	Polychaeta	Echiura	Echiuroidea	Echiuridae	-	*Echiurus echiurus*	-	X	X	-	X	X	-	X	-
Annelida	-	Polychaeta	Errantia	-	-	-	Errantia indet.	-	-	-	-	Y	-	-	-	-
Annelida	-	Polychaeta	Errantia	Eunicida	Dorvilleidae	-	*Ophryotrocha* sp.	-	-	-	-	-	-	-	X	-
Annelida	-	Polychaeta	Errantia	Eunicida	Dorvilleidae	-	*Parougia caeca*	-	-	-	-	-	X	X	X	-
Annelida	-	Polychaeta	Errantia	Eunicida	Lumbrineridae	-	Lumbrineridae indet.	-	-	-	-	-	-	Y	X	Y
Annelida	-	Polychaeta	Errantia	Eunicida	Lumbrineridae	-	*Lumbrineris fauchaldi*	-	-	-	-	-	-	-	-	X
Annelida	-	Polychaeta	Errantia	Eunicida	Lumbrineridae	-	*App 8A*	X	X	X	X	-	X	-	-	-
Annelida	-	Polychaeta	Errantia	Eunicida	Lumbrineridae	-	*Scoletoma fragilis*	X	-	X	X	X	X	X	X	X
Annelida	-	Polychaeta	Errantia	Eunicida	Lumbrineridae	-	*Scoletoma impatiens*	-	-	-	X	X	X	X	X	X
Annelida	-	Polychaeta	Errantia	Eunicida	Lumbrineridae	-	*Scoletoma* sp.	-	-	-	-	-	X	Y	Y	Y
Annelida	-	Polychaeta	Errantia	Eunicida	Lumbrineridae	-	*Scoletoma tenuis*	-	X	-	X	-	-	-	-	-
Annelida	-	Polychaeta	Errantia	Eunicida	Onuphidae	Hyalinoeciinae	*Nothria conchylega*	X	-	-	-	-	X	X	X	X
Annelida	-	Polychaeta	Errantia	Phyllodocida	Aphroditidae	-	Aphroditidae indet.	-	X	-	-	-	-	-	-	-
Annelida	-	Polychaeta	Errantia	Phyllodocida	Glyceridae	-	*Glycera capitata*	-	-	-	-	X	X	X	-	-
Annelida	-	Polychaeta	Errantia	Phyllodocida	Glyceridae	-	*Glycera* sp.	-	-	-	-	Y	X	Y	X	Y
Annelida	-	Polychaeta	Errantia	Phyllodocida	Hesionidae	-	Hesionidae indet.	-	-	-	-	Y	-	Y	-	Y
Annelida	-	Polychaeta	Errantia	Phyllodocida	Hesionidae	Ophiodrominae	*Gyptis* sp.	-	-	-	-	-	X	-	-	-
Annelida	-	Polychaeta	Errantia	Phyllodocida	Hesionidae	Psamathinae	Nereimyra aphroditoides	-	-	-	X	X	X	X	X	X
Annelida	-	Polychaeta	Errantia	Phyllodocida	Microphthalmidae	-	*Microphthalmus* sp.	-	-	-	-	-	X	-	X	-
Annelida	-	Polychaeta	Errantia	Phyllodocida	Nephtyidae	-	*Aglaophamus malmgreni*	-	-	-	-	-	-	X	X	-
Annelida	-	Polychaeta	Errantia	Phyllodocida	Nephtyidae	-	*Aglaophamus* sp.	-	-	-	-	-	X	-	-	-
Annelida	-	Polychaeta	Errantia	Phyllodocida	Nephtyidae	-	*Micronephthys cornuta*	-	-	-	-	X	X	X	X	X
Annelida	-	Polychaeta	Errantia	Phyllodocida	Nephtyidae	-	*Nephtys bucera*	-	-	-	-	-	X	-	-	-
Annelida	-	Polychaeta	Errantia	Phyllodocida	Nephtyidae	-	*Nephtys ciliata*	X	-	X	X	X	X	X	X	X
Annelida	-	Polychaeta	Errantia	Phyllodocida	Nephtyidae	-	*Nephtys paradoxa*	-	-	-	-	-	-	X	X	-
Annelida	-	Polychaeta	Errantia	Phyllodocida	Nephtyidae	-	*Nephtys* sp.	X	X	X	X	-	X	Y	Y	Y
Annelida	-	Polychaeta	Errantia	Phyllodocida	Nereididae	-	Nereididae indet.	X	-	-	-	Y	X	Y	X	-
Annelida	-	Polychaeta	Errantia	Phyllodocida	Nereididae	Nereidinae	*Nereis* sp.	-	-	-	X	Y	-	Y	-	-
Annelida	-	Polychaeta	Errantia	Phyllodocida	Nereididae	Nereidinae	*Nereis zonata*	-	X	X	X	X	X	X	X	X
Annelida	-	Polychaeta	Errantia	Phyllodocida	Pholoidae	-	*Pholoe longa*	X	X	-	-	-	-	X	X	X
Annelida	-	Polychaeta	Errantia	Phyllodocida	Pholoidae	-	*Pholoe minuta*	-	-	X	X	X	X	X	X	X
Annelida	-	Polychaeta	Errantia	Phyllodocida	Pholoidae	-	*Pholoe* sp.	X	X	X	X	Y	X	Y	Y	Y
Annelida	-	Polychaeta	Errantia	Phyllodocida	Pholoidae	-	*Pholoe tecta*	X	X	X	X	X	X	X	-	-
Annelida	-	Polychaeta	Errantia	Phyllodocida	Phyllodocidae	-	Phyllodocidae indet.	-	-	X	X	Y	-	-	-	Y
Annelida	-	Polychaeta	Errantia	Phyllodocida	Phyllodocidae	Eteoninae	*Eteone barbata*	X	-	-	-	X	X	X	-	-
Annelida	-	Polychaeta	Errantia	Phyllodocida	Phyllodocidae	Eteoninae	*Eteone flava*	-	-	-	-	X	X	X	X	-
Annelida	-	Polychaeta	Errantia	Phyllodocida	Phyllodocidae	Eteoninae	*Eteone longa* complex	-	X	X	X	X	X	X	X	X
Annelida	-	Polychaeta	Errantia	Phyllodocida	Phyllodocidae	Eteoninae	*Eteone* sp.	X	X	X	X	Y	X	Y	X	Y
Annelida	-	Polychaeta	Errantia	Phyllodocida	Phyllodocidae	Eteoninae	*Eteone spilotus*	-	-	-	-	-	X		-	-
Annelida	-	Polychaeta	Errantia	Phyllodocida	Phyllodocidae	Eteoninae	*Eulalia bilineata*	-	-	-	-	-	-	-	X	-
Annelida	-	Polychaeta	Errantia	Phyllodocida	Phyllodocidae	Eteoninae	*Eulalia* sp.	-	-	-	-	-	X	-	-	-
Annelida	-	Polychaeta	Errantia	Phyllodocida	Phyllodocidae	Eteoninae	*Eumida* sp.	-	-	-	-	-	-	X	-	-
Annelida	-	Polychaeta	Errantia	Phyllodocida	Phyllodocidae	Eteoninae	*Hypereteone* sp.	-	-	-	-	X	X	-	-	-
Annelida	-	Polychaeta	Errantia	Phyllodocida	Phyllodocidae	Phyllodocinae	*Phyllodoce groenlandica*	X	-	X	X	X	X	X	X	X
Annelida	-	Polychaeta	Errantia	Phyllodocida	Phyllodocidae	Phyllodocinae	*Phyllodoce mucosa*	-	-	X	X	X	-	-	-	-
Annelida	-	Polychaeta	Errantia	Phyllodocida	Phyllodocidae	Phyllodocinae	*Phyllodoce* sp.	-	-	-	-	Y	X	Y	-	Y
Annelida	-	Polychaeta	Errantia	Phyllodocida	Polynoidae	-	Polynoidae indet.	X	X	X	X	Y	X	-	X	-
Annelida	-	Polychaeta	Errantia	Phyllodocida	Polynoidae	Polynoinae	*Bylgides groenlandicus*	X	-	-	-	-	-	-	-	-
Annelida	-	Polychaeta	Errantia	Phyllodocida	Polynoidae	Polynoinae	*Bylgides promamme*	-	-	-	-	-	-	-	X	-
Annelida	-	Polychaeta	Errantia	Phyllodocida	Polynoidae	Polynoinae	*Bylgides sarsi*	-	X	X	X	X	X	-	X	X
Annelida	-	Polychaeta	Errantia	Phyllodocida	Polynoidae	Polynoinae	*Bylgides* sp.	-	-	-	-	-	Y	-	-	-
Annelida	-	Polychaeta	Errantia	Phyllodocida	Polynoidae	Polynoinae	*Bylgides* sp. A	-	-	-	X	-	-	-	-	-
Annelida	-	Polychaeta	Errantia	Phyllodocida	Polynoidae	Polynoinae	*Gattyana cirrhosa*	X	X	X	-	X	X	X	X	X
Annelida	-	Polychaeta	Errantia	Phyllodocida	Polynoidae	Polynoinae	*Harmothoe extenuata*	-	X	X	X	X	X	-	-	-
Annelida	-	Polychaeta	Errantia	Phyllodocida	Polynoidae	Polynoinae	*Harmothoe fragilis*	-	X	-	-	-	-	-	-	-
Annelida	-	Polychaeta	Errantia	Phyllodocida	Polynoidae	Polynoinae	*Harmothoe imbricata*	X	X	X	X	X	X	X	X	X
Annelida	-	Polychaeta	Errantia	Phyllodocida	Polynoidae	Polynoinae	*Harmothoe propinqua*	-	-	-	-	-	-	-	X	-
Annelida	-	Polychaeta	Errantia	Phyllodocida	Polynoidae	Polynoinae	*Harmothoe rarispina*	-	-	-	-	-	-	X	X	X
Annelida	-	Polychaeta	Errantia	Phyllodocida	Polynoidae	Polynoinae	*Harmothoe* sp.	X	X	X	X	Y	X	Y	X	Y

Appendix 8A-1

Benthic Infauna Taxa Presence/Absence from Survey Years 2010-2021

Phylum	Subphylum	Class	Subclass	Order	Family	Subfamily	Taxa	2010	2013	2015	2016	2017	2018	2019	2020	2021
Annelida	-	Polychaeta	Errantia	Phyllodocida	Polynoidae	Polynoinae	*Hartmania moorei*	-	-	-	-	X	X	-	-	-
Annelida	-	Polychaeta	Errantia	Phyllodocida	Polynoidae	Polynoinae	*Hartmania* sp.	-	X	-	-	-	-	-	-	-
Annelida	-	Polychaeta	Errantia	Phyllodocida	Polynoidae	Polynoinae	*Hesperonoe* sp.	-	-	-	-	-	-	-	X	-
Annelida	-	Polychaeta	Errantia	Phyllodocida	Polynoidae	Polynoinae	*Melaenis loveni*	-	-	-	-	-	X	-	X	-
Annelida	-	Polychaeta	Errantia	Phyllodocida	Polynoidae	Polynoinae	*Neobylgides* sp.	-	-	-	X	-	-	-	-	-
Annelida	-	Polychaeta	Errantia	Phyllodocida	Polynoidae	Polynoinae	Polynoinae indet.	-	-	-	-	Y	-	Y	Y	Y
Annelida	-	Polychaeta	Errantia	Phyllodocida	Sphaerodoridae	-	*Ephesiella* sp.	-	-	-	-	-	-	-	X	-
Annelida	-	Polychaeta	Errantia	Phyllodocida	Sphaerodoridae	-	*Sphaerodoropsis biserialis*	-	-	-	-	-	-	X	X	X
Annelida	-	Polychaeta	Errantia	Phyllodocida	Sphaerodoridae	-	*Sphaerodoropsis minuta*	X	-	-	-	X	X	-	X	X
Annelida	-	Polychaeta	Errantia	Phyllodocida	Sphaerodoridae	-	*Sphaerodoropsis minutum*	-	-	-	-	-	-	X	-	-
Annelida	-	Polychaeta	Errantia	Phyllodocida	Syllidae	-	Syllidae indet.	X	X	X	X	Y	-	-	-	-
Annelida	-	Polychaeta	Errantia	Phyllodocida	Syllidae	Anoplosyllinae	*Streptospinigera niuqtuut*	-	-	-	-	-	X	X	X	-
Annelida	-	Polychaeta	Errantia	Phyllodocida	Syllidae	Anoplosyllinae	*Syllides* sp.	-	-	-	-	X	X	-	X	-
Annelida	-	Polychaeta	Errantia	Phyllodocida	Syllidae	Eusyllinae	*Eusyllis* sp.	-	-	-	-	-	X	-	-	-
Annelida	-	Polychaeta	Errantia	Phyllodocida	Syllidae	Eusyllinae	*Pionosyllis compacta*	-	-	-	-	-	-	X	X	-
Annelida	-	Polychaeta	Errantia	Phyllodocida	Syllidae	Eusyllinae	*Pionosyllis* sp.	-	-	-	-	-	X	-	Y	Y
Annelida	-	Polychaeta	Errantia	Phyllodocida	Syllidae	Exogoninae	*Exogone naidina*	-	-	-	-	-	-	X	X	X
Annelida	-	Polychaeta	Errantia	Phyllodocida	Syllidae	Exogoninae	*Exogone* sp.	-	X	-	-	X	X	-	-	-
Annelida	-	Polychaeta	Errantia	Phyllodocida	Syllidae	Exogoninae	*Exogone verugera*	X	X	-	-	-	-	-	-	-
Annelida	-	Polychaeta	Errantia	Phyllodocida	Syllidae	Exogoninae	*Parexogone hebes*	-	X	-	-	-	X	X	-	-
Annelida	-	Polychaeta	Polychaeta incertae sedis	-	Oweniidae	-	*Galathowenia oculata*	-	-	X	-	X	X	X	X	X
Annelida	-	Polychaeta	Polychaeta incertae sedis	-	Oweniidae	-	*Myriochele danielsseni*	-	-	-	-	X	-	-	-	-
Annelida	-	Polychaeta	Polychaeta incertae sedis	-	Oweniidae	-	*Myriochele heeri*	-	-	-	-	X	X	X	X	X
Annelida	-	Polychaeta	Polychaeta incertae sedis	-	Oweniidae	-	*Myriochele* sp.	-	-	-	-	Y	-	-	-	Y
Annelida	-	Polychaeta	Polychaeta incertae sedis	-	Oweniidae	-	*Owenia fusiformis*	X	X	X	X	X	X	X	X	X
Annelida	-	Polychaeta	Polychaeta incertae sedis	-	Oweniidae	-	Oweniidae indet.	-	-	X	X	-	X	Y	-	Y
Annelida	-	Polychaeta	Polychaeta incertae sedis	-	Protodrilidae	-	*Protodrilus* sp.	-	-	-	-	-	X	-	-	-
Annelida	-	Polychaeta	Sedentaria	-	Capitellidae	-	*Capitella capitata* complex	X	X	-	-	X	X	X	X	X
Annelida	-	Polychaeta	Sedentaria	-	Capitellidae	-	Capitellidae indet.	-	-	-	X	Y	-	Y	X	-
Annelida	-	Polychaeta	Sedentaria	-	Capitellidae	-	*Mediomastus ambiseta*	-	X	-	X	X	-	-	-	-
Annelida	-	Polychaeta	Sedentaria	-	Capitellidae	-	*Mediomastus* sp.	X	-	-	-	Y	X	Y	X	Y
Annelida	-	Polychaeta	Sedentaria	-	Capitellidae	-	*Notomastus latericeus*	-	-	-	-	X	X	X	-	-
Annelida	-	Polychaeta	Sedentaria	-	Capitellidae	-	*Notomastus* sp.	-	-	-	-	-	-	-	Y	Y
Annelida	-	Polychaeta	Sedentaria	-	Cossuridae	-	*Cossura longocirrata*	-	X	-	-	-	-	X	X	X
Annelida	-	Polychaeta	Sedentaria	-	Cossuridae	-	*Cossura* sp.	X	-	X	X	X	X	-	-	-
Annelida	-	Polychaeta	Sedentaria	-	Maldanidae	-	Maldanidae indet.	X	X	X	X	Y	X	Y	Y	Y
Annelida	-	Polychaeta	Sedentaria	-	Maldanidae	-	Maldanidae sp. A	-	-	-	X	-	-	-	-	-
Annelida	-	Polychaeta	Sedentaria	-	Maldanidae	-	Maldanidae sp. B	-	-	-	X	-	-	-	-	-
Annelida	-	Polychaeta	Sedentaria	-	Maldanidae	-	Maldanidae sp. C	-	-	-	X	-	-	-	-	-
Annelida	-	Polychaeta	Sedentaria	-	Maldanidae	Euclymeninae	*Axiothella* sp.	-	-	-	-	-	-	-	X	-
Annelida	-	Polychaeta	Sedentaria	-	Maldanidae	Euclymeninae	*Clymenura polaris*	-	-	-	-	-	-	X	X	-
Annelida	-	Polychaeta	Sedentaria	-	Maldanidae	Euclymeninae	*Clymenura* sp.	-	-	-	-	X	X	Y	X	Y
Annelida	-	Polychaeta	Sedentaria	-	Maldanidae	Euclymeninae	*Euclymene* sp.	-	-	-	-	X	X	-	-	-
Annelida	-	Polychaeta	Sedentaria	-	Maldanidae	Euclymeninae	Euclymeninae indet.	-	-	-	-	Y	X	Y	X	Y
Annelida	-	Polychaeta	Sedentaria	-	Maldanidae	Euclymeninae	*Heteroclymene robusta*	-	-	X	-	-	-	-	-	-
Annelida	-	Polychaeta	Sedentaria	-	Maldanidae	Euclymeninae	*Microclymene* sp.	-	-	-	-	X	X	X	X	X
Annelida	-	Polychaeta	Sedentaria	-	Maldanidae	Euclymeninae	*Praxillella gracilis*	-	-	-	-	-	X	X	X	X
Annelida	-	Polychaeta	Sedentaria	-	Maldanidae	Euclymeninae	*Praxillella praetermissa*	-	-	-	-	X	X	X	X	-
Annelida	-	Polychaeta	Sedentaria	-	Maldanidae	Euclymeninae	*Praxillella* sp.	-	-	-	X	Y	-	-	-	-
Annelida	-	Polychaeta	Sedentaria	-	Maldanidae	Maldaninae	*Maldane sarsi*	X	X	X	X	X	X	X	X	X
Annelida	-	Polychaeta	Sedentaria	-	Maldanidae	Nicomachinae	*Nicomache lumbricalis*	-	-	X	X	X	-	-	-	-
Annelida	-	Polychaeta	Sedentaria	-	Maldanidae	Nicomachinae	*Nicomache* sp.	-	-	-	-	-	X	Y	-	-
Annelida	-	Polychaeta	Sedentaria	-	Maldanidae	Nicomachinae	Nicomachinae indet.	-	-	-	-	-	-	Y	X	-
Annelida	-	Polychaeta	Sedentaria	-	Maldanidae	Nicomachinae	*Petaloproctus* sp.	-	-	-	-	-	-	Y	-	-
Annelida	-	Polychaeta	Sedentaria	-	Maldanidae	Nicomachinae	*Petaloproctus tenuis*	-	-	-	-	-	-	X	X	-
Annelida	-	Polychaeta	Sedentaria	-	Maldanidae	Rhodininae	*Rhodine bitorquata*	-	-	-	-	-	X	-	-	-
Annelida	-	Polychaeta	Sedentaria	-	Maldanidae	Rhodininae	*Rhodine gracilior*	-	-	-	-	-	X	-	-	-
Annelida	-	Polychaeta	Sedentaria	-	Maldanidae	Rhodininae	*Rhodine loveni*	-	-	-	-	X	-	X	X	-
Annelida	-	Polychaeta	Sedentaria	-	Opheliidae	-	Opheliidae indet.	X	-	-	-	-	-	-	-	-
Annelida	-	Polychaeta	Sedentaria	-	Opheliidae	Opheliinae	*Ophelia limacina*	X	X	X	X	X	-	X	-	-
Annelida	-	Polychaeta	Sedentaria	-	Opheliidae	Opheliinae	*Ophelia* sp.	-	-	-	-	-	-	-	-	Y
Annelida	-	Polychaeta	Sedentaria	-	Opheliidae	Ophelininae	*Ophelina acuminata*	X	-	X	X	X	X	X	X	-
Annelida	-	Polychaeta	Sedentaria	-	Opheliidae	Ophelininae	*Ophelina cylindricaudata*	-	-	-	-	-	X	X	X	-
Annelida	-	Polychaeta	Sedentaria	-	Opheliidae	Ophelininae	*Ophelina* sp.	-	-	-	-	Y	X	Y	Y	Y

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Phylum	Subphylum	Class	Subclass	Order	Family	Subfamily	Taxa	2010	2013	2015	2016	2017	2018	2019	2020	2021
Annelida	-	Polychaeta	Sedentaria	-	Orbiniidae	-	Orbiniidae indet.	-	-	-	-	Y	X	Y	X	-
Annelida	-	Polychaeta	Sedentaria	-	Orbiniidae	Orbiniinae	*Leitoscoloplos acutus*	-	X	X	X	X	X	X	-	-
Annelida	-	Polychaeta	Sedentaria	-	Orbiniidae	Orbiniinae	*Leitoscoloplos* sp.	X	-	-	-	X	X	-	X	Y
Annelida	-	Polychaeta	Sedentaria	-	Orbiniidae	Orbiniinae	*Scoloplos armiger*	X	-	-	-	X	X	X	X	X
Annelida	-	Polychaeta	Sedentaria	-	Orbiniidae	Orbiniinae	*Scoloplos* sp.	-	X	X	-	Y	X	Y	Y	Y
Annelida	-	Polychaeta	Sedentaria	-	Paraonidae	-	*Aricidea (Acmira) catherinae*	-	-	-	-	-	-	X	-	-
Annelida	-	Polychaeta	Sedentaria	-	Paraonidae	-	*Aricidea (Strelzovia) antennata*	-	-	-	-	-	-	X	X	-
Annelida	-	Polychaeta	Sedentaria	-	Paraonidae	-	*Aricidea catherinae*	-	X	-	-	X	-	-	X	-
Annelida	-	Polychaeta	Sedentaria	-	Paraonidae	-	*Aricidea hartmanae*	-	-	-	-	X	X	X	X	X
Annelida	-	Polychaeta	Sedentaria	-	Paraonidae	-	*Aricidea minuta*	-	-	-	-	X	X	X	X	X
Annelida	-	Polychaeta	Sedentaria	-	Paraonidae	-	*Aricidea nolani*	-	X	-	-	X	X	X	X	X
Annelida	-	Polychaeta	Sedentaria	-	Paraonidae	-	*Aricidea* sp.	X	X	-	X	Y	X	Y	X	Y
Annelida	-	Polychaeta	Sedentaria	-	Paraonidae	-	*Aricidea* sp. A	-	-	-	X	-	-	-	-	-
Annelida	-	Polychaeta	Sedentaria	-	Paraonidae	-	Paraonidae indet.	-	X	X	X	Y	X	Y	Y	-
Annelida	-	Polychaeta	Sedentaria	-	Paraonidae	-	*Paraonides* sp.	-	-	-	-	-	-	-	X	-
Annelida	-	Polychaeta	Sedentaria	-	Paraonidae	-	*Paraonis* sp.	X	-	-	-	-	-	-	-	-
Annelida	-	Polychaeta	Sedentaria	-	Scalibregmatidae	-	*Polyphysia baffinensis*	X	-	-	-	-	-	-	X	X
Annelida	-	Polychaeta	Sedentaria	-	Scalibregmatidae	-	*Polyphysia crassa*	-	-	-	-	X	X	-	X	-
Annelida	-	Polychaeta	Sedentaria	-	Scalibregmatidae	-	*Polyphysia* sp.	-	-	-	-	-	-	Y	-	-
Annelida	-	Polychaeta	Sedentaria	-	Scalibregmatidae	-	*Scalibregma inflatum*	X	X	X	X	X	X	X	X	X
Annelida	-	Polychaeta	Sedentaria	-	Scalibregmatidae	-	Scalibregmatidae indet.	-	-	-	-	Y	-	-	-	-
Annelida	-	Polychaeta	Sedentaria	Sabellida	Fabriciidae	-	Fabriciidae indet.	-	-	-	-	X	-	Y	X	Y
Annelida	-	Polychaeta	Sedentaria	Sabellida	Fabriciidae	-	*Manayunkia aesturiana*	-	-	-	-	-	X	-	-	-
Annelida	-	Polychaeta	Sedentaria	Sabellida	Fabriciidae	-	*Pseudofabricia* sp. nr. *aberrans*	-	-	-	-	-	-	X	X	X
Annelida	-	Polychaeta	Sedentaria	Sabellida	Sabellidae	-	Sabellid sp. A	-	-	-	X	-	-	-	-	-
Annelida	-	Polychaeta	Sedentaria	Sabellida	Sabellidae	-	Sabellid sp. B	-	-	-	X	-	-	-	-	-
Annelida	-	Polychaeta	Sedentaria	Sabellida	Sabellidae	-	Sabellid sp. F	-	-	-	X	-	-	-	-	-
Annelida	-	Polychaeta	Sedentaria	Sabellida	Sabellidae	-	Sabellid sp. G	-	-	-	X	-	-	-	-	-
Annelida	-	Polychaeta	Sedentaria	Sabellida	Sabellidae	-	Sabellidae indet.	-	X	X	X	Y	X	Y	Y	Y
Annelida	-	Polychaeta	Sedentaria	Sabellida	Sabellidae	-	Sabellidae sp. 3	-	-	-	-	-	-	Y	Y	X
Annelida	-	Polychaeta	Sedentaria	Sabellida	Sabellidae	-	Sabellidae sp. 4	-	-	-	-	-	-	Y	Y	-
Annelida	-	Polychaeta	Sedentaria	Sabellida	Sabellidae	-	Sabellidae sp. H	-	-	-	-	X	X	-	-	-
Annelida	-	Polychaeta	Sedentaria	Sabellida	Sabellidae	-	Sabellidae sp. I	-	-	-	-	X	X	-	-	-
Annelida	-	Polychaeta	Sedentaria	Sabellida	Sabellidae	-	Sabellidae sp. J	-	-	-	-	X	X	-	-	-
Annelida	-	Polychaeta	Sedentaria	Sabellida	Sabellidae	Myxicolinae	*Chone duneri*	-	-	-	-	X	X	-	X	-
Annelida	-	Polychaeta	Sedentaria	Sabellida	Sabellidae	Myxicolinae	*Chone* sp.	X	-	-	-	-	-	-	-	X
Annelida	-	Polychaeta	Sedentaria	Sabellida	Sabellidae	Sabellinae	*Bispira* sp.	-	-	-	-	-	X	-	-	-
Annelida	-	Polychaeta	Sedentaria	Sabellida	Sabellidae	Sabellinae	*Branchiomma* sp.	-	-	-	-	X	X	-	X	-
Annelida	-	Polychaeta	Sedentaria	Sabellida	Sabellidae	Sabellinae	*Dialychone* sp.	-	-	-	-	X	X	X	X	-
Annelida	-	Polychaeta	Sedentaria	Sabellida	Sabellidae	Sabellinae	*Dialychone* sp. 1	-	-	-	-	-	-	X	X	X
Annelida	-	Polychaeta	Sedentaria	Sabellida	Sabellidae	Sabellinae	*Dialychone* sp. 3	-	-	-	-	-	-	-	Y	-
Annelida	-	Polychaeta	Sedentaria	Sabellida	Sabellidae	Sabellinae	*Dialychone* sp. A	-	-	-	-	Y	X	-	-	-
Annelida	-	Polychaeta	Sedentaria	Sabellida	Sabellidae	Sabellinae	*Dialychone* sp. B	-	-	-	-	X	X	-	-	-
Annelida	-	Polychaeta	Sedentaria	Sabellida	Sabellidae	Sabellinae	*Euchone analis*	-	-	-	-	-	-	X	X	-
Annelida	-	Polychaeta	Sedentaria	Sabellida	Sabellidae	Sabellinae	*Euchone incolor*	-	X	-	-	X	X	X	X	X
Annelida	-	Polychaeta	Sedentaria	Sabellida	Sabellidae	Sabellinae	*Euchone papillosa*	X	-	-	-	-	-	-	-	-
Annelida	-	Polychaeta	Sedentaria	Sabellida	Sabellidae	Sabellinae	*Euchone rubrocincta*	-	-	-	-	X	X	X	-	-
Annelida	-	Polychaeta	Sedentaria	Sabellida	Sabellidae	Sabellinae	*Euchone* sp.	-	-	X	X	-	X	Y	X	Y
Annelida	-	Polychaeta	Sedentaria	Sabellida	Sabellidae	Sabellinae	*Euchone* sp. 1	-	-	-	-	-	-	-	Y	-
Annelida	-	Polychaeta	Sedentaria	Sabellida	Sabellidae	Sabellinae	*Hypsicomus* sp.	-	-	-	-	X	-	-	-	-
Annelida	-	Polychaeta	Sedentaria	Sabellida	Sabellidae	Sabellinae	*Paradialychone harrisae*	-	-	-	-	X	-	-	-	-
Annelida	-	Polychaeta	Sedentaria	Sabellida	Sabellidae	Sabellinae	*Potamilla neglecta*	-	-	X	X	-	-	-	-	-
Annelida	-	Polychaeta	Sedentaria	Sabellida	Sabellidae	Sabellinae	*Pseudopotamilla reniformis*	-	-	-	X	-	-	-	-	-
Annelida	-	Polychaeta	Sedentaria	Sabellida	Serpulidae	-	Serpulidae indet.	X	X	X	X	-	-	Y	-	-
Annelida	-	Polychaeta	Sedentaria	Sabellida	Serpulidae	Spirorbinae	*Bushiella (Jugaria) quadrangularis*	-	-	-	-	X	-	-	X	-
Annelida	-	Polychaeta	Sedentaria	Sabellida	Serpulidae	Spirorbinae	*Bushiella* sp.	-	-	-	-	-	-	-	-	Y
Annelida	-	Polychaeta	Sedentaria	Sabellida	Serpulidae	Spirorbinae	*Pileolaria* sp.	-	-	-	-	X	X	-	-	X
Annelida	-	Polychaeta	Sedentaria	Sabellida	Serpulidae	Spirorbinae	Spirorbinae indet.	-	-	-	-	X	X	-	X	-
Annelida	-	Polychaeta	Sedentaria	Spionida	Apistobranchidae	-	*Apistobranchus* sp.	-	-	-	-	X	X	X	X	X
Annelida	-	Polychaeta	Sedentaria	Spionida	Spionidae	-	*Dipolydora caulleryi*	-	-	-	-	X	X	X	X	-
Annelida	-	Polychaeta	Sedentaria	Spionida	Spionidae	-	*Dipolydora concharum*	-	-	-	-	-	X	-	-	-
Annelida	-	Polychaeta	Sedentaria	Spionida	Spionidae	-	*Dipolydora quadrilobata*	-	-	-	-	X	X	X	X	X
Annelida	-	Polychaeta	Sedentaria	Spionida	Spionidae	-	*Dipolydora socialis*	-	-	-	-	-	X	X	-	-
Annelida	-	Polychaeta	Sedentaria	Spionida	Spionidae	-	*Dipolydora* sp.	-	-	-	-	Y	X	-	X	-

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Phylum	Subphylum	Class	Subclass	Order	Family	Subfamily	Taxa	2010	2013	2015	2016	2017	2018	2019	2020	2021
Annelida	-	Polychaeta	Sedentaria	Spionida	Spionidae	-	*Laonice cirrata*	-	-	-	-	-	X	X	X	-
Annelida	-	Polychaeta	Sedentaria	Spionida	Spionidae	-	*Marenzelleria* sp.	-	-	-	X	X	X	-	-	Y
Annelida	-	Polychaeta	Sedentaria	Spionida	Spionidae	-	*Marenzelleria viridis*	-	-	-	-	-	-	X	X	-
Annelida	-	Polychaeta	Sedentaria	Spionida	Spionidae	-	*Polydora* sp. complex	X	X	-	-	X	X	-	-	-
Annelida	-	Polychaeta	Sedentaria	Spionida	Spionidae	-	*Prionospio (Prionospio)* sp.	-	-	-	-	-	-	-	Y	-
Annelida	-	Polychaeta	Sedentaria	Spionida	Spionidae	-	*Prionospio cirrifera*	-	-	-	-	X	X	-	X	-
Annelida	-	Polychaeta	Sedentaria	Spionida	Spionidae	-	*Prionospio* sp.	-	-	-	-	Y	X	Y	Y	Y
Annelida	-	Polychaeta	Sedentaria	Spionida	Spionidae	-	*Prionospio steenstrupi*	-	X	X	X	X	X	X	-	-
Annelida	-	Polychaeta	Sedentaria	Spionida	Spionidae	-	*Pygospio elegans*	-	-	-	-	-	-	X	X	X
Annelida	-	Polychaeta	Sedentaria	Spionida	Spionidae	-	*Pygospio* sp.	-	X	-	-	X	X	-	-	-
Annelida	-	Polychaeta	Sedentaria	Spionida	Spionidae	-	*Scolelepis* sp.	-	-	-	-	-	X	-	X	X
Annelida	-	Polychaeta	Sedentaria	Spionida	Spionidae	-	*Spio filicornis*	X	X	X	X	X	X	X	X	X
Annelida	-	Polychaeta	Sedentaria	Spionida	Spionidae	-	*Spio* sp.	-	-	-	-	-	-	-	Y	Y
Annelida	-	Polychaeta	Sedentaria	Spionida	Spionidae	-	Spionidae indet.	X	X	X	X	Y	X	Y	Y	Y
Annelida	-	Polychaeta	Sedentaria	Spionida	Trochochaetidae	-	*Trochochaeta watsoni*	-	-	-	-	X	-	-	-	-
Annelida	-	Polychaeta	Sedentaria	Terebellida	Ampharetidae	-	Ampharetidae indet.	X	X	X	X	Y	-	Y	X	Y
Annelida	-	Polychaeta	Sedentaria	Terebellida	Ampharetidae	Ampharetinae	*Ampharete borealis*	-	-	-	-	-	-	X	X	-
Annelida	-	Polychaeta	Sedentaria	Terebellida	Ampharetidae	Ampharetinae	*Ampharete finmarchica*	-	-	-	-	-	-	-	X	-
Annelida	-	Polychaeta	Sedentaria	Terebellida	Ampharetidae	Ampharetinae	*Ampharete oculata*	-	-	X	-	-	-	-	-	-
Annelida	-	Polychaeta	Sedentaria	Terebellida	Ampharetidae	Ampharetinae	*Ampharete petersenae*	-	-	-	-	-	-	-	X	X
Annelida	-	Polychaeta	Sedentaria	Terebellida	Ampharetidae	Ampharetinae	*Ampharete* sp.	-	X	-	X	Y	X	Y	X	Y
Annelida	-	Polychaeta	Sedentaria	Terebellida	Ampharetidae	Ampharetinae	*Ampharete vega*	-	-	-	-	X	X	-	-	-
Annelida	-	Polychaeta	Sedentaria	Terebellida	Ampharetidae	Ampharetinae	Ampharetid sp. B	-	-	-	X	-	-	-	-	-
Annelida	-	Polychaeta	Sedentaria	Terebellida	Ampharetidae	Ampharetinae	Ampharetid sp. E	-	-	-	X	-	-	-	-	-
Annelida	-	Polychaeta	Sedentaria	Terebellida	Ampharetidae	Ampharetinae	*Amphicteis gunneri*	-	X	X	X	-	-	-	-	-
Annelida	-	Polychaeta	Sedentaria	Terebellida	Ampharetidae	Ampharetinae	*Amphicteis sundevalli*	X	-	-	-	X	X	X	X	X
Annelida	-	Polychaeta	Sedentaria	Terebellida	Ampharetidae	Ampharetinae	*Anobothrus gracilis*	-	-	-	X	-	-	-	X	-
Annelida	-	Polychaeta	Sedentaria	Terebellida	Ampharetidae	Ampharetinae	*Lysippe labiata*	-	-	X	X	X	X	X	X	-
Annelida	-	Polychaeta	Sedentaria	Terebellida	Ampharetidae	Ampharetinae	*Samytha* sp.	-	-	-	X	-	-	-	-	-
Annelida	-	Polychaeta	Sedentaria	Terebellida	Ampharetidae	Ampharetinae	*Sosane* sp. nr. *wireni*	-	-	-	-	-	-	X	X	-
Annelida	-	Polychaeta	Sedentaria	Terebellida	Cirratulidae	-	*Aphelochaeta marioni*	-	X	-	-	-	-	-	-	-
Annelida	-	Polychaeta	Sedentaria	Terebellida	Cirratulidae	-	*Aphelochaeta* sp.	-	-	-	-	X	X	Y	X	Y
Annelida	-	Polychaeta	Sedentaria	Terebellida	Cirratulidae	-	*Chaetozone bathyala*	-	-	-	-	X	X	X	X	X
Annelida	-	Polychaeta	Sedentaria	Terebellida	Cirratulidae	-	*Chaetozone careyi*	-	-	-	-	X	X	-	X	X
Annelida	-	Polychaeta	Sedentaria	Terebellida	Cirratulidae	-	*Chaetozone pigmentata*	-	-	-	-	X	X	X	X	X
Annelida	-	Polychaeta	Sedentaria	Terebellida	Cirratulidae	-	*Chaetozone setosa* complex	-	X	X	X	X	X	X	X	X
Annelida	-	Polychaeta	Sedentaria	Terebellida	Cirratulidae	-	*Chaetozone* sp.	-	-	-	-	Y	X	Y	X	Y
Annelida	-	Polychaeta	Sedentaria	Terebellida	Cirratulidae	-	Cirratulidae indet.	X	X	X	X	Y	X	Y	X	Y
Annelida	-	Polychaeta	Sedentaria	Terebellida	Cirratulidae	-	Cirratulidae sp. A	-	-	-	X	-	-	-	-	-
Annelida	-	Polychaeta	Sedentaria	Terebellida	Cirratulidae	-	*Kirkegaardia* sp.	-	-	-	-	-	X	-	X	X
Annelida	-	Polychaeta	Sedentaria	Terebellida	Cirratulidae	-	*Tharyx* sp.	-	-	-	-	X	X	X	X	-
Annelida	-	Polychaeta	Sedentaria	Terebellida	Flabelligeridae	-	*Brada villosa*	-	X	-	-	-	-	-	-	-
Annelida	-	Polychaeta	Sedentaria	Terebellida	Flabelligeridae	-	*Diplocirrus hirsutus*	-	-	X	X	-	X	X	X	X
Annelida	-	Polychaeta	Sedentaria	Terebellida	Flabelligeridae	-	*Flabelligera affinis*	-	-	-	X	-	-	X	-	-
Annelida	-	Polychaeta	Sedentaria	Terebellida	Flabelligeridae	-	Flabelligeridae indet.	-	-	X	-	-	-	-	-	-
Annelida	-	Polychaeta	Sedentaria	Terebellida	Melinnidae	-	*Melinna elisabethae*	X	X	X	X	X	X	X	X	X
Annelida	-	Polychaeta	Sedentaria	Terebellida	Melinnidae	-	*Melinna* sp.	X	-	-	-	-	X	-	-	-
Annelida	-	Polychaeta	Sedentaria	Terebellida	Pectinariidae	-	*Cistenides granulata*	X	X	X	X	X	X	X	X	X
Annelida	-	Polychaeta	Sedentaria	Terebellida	Pectinariidae	-	*Cistenides hyperborea*	X	-	-	-	-	-	-	-	-
Annelida	-	Polychaeta	Sedentaria	Terebellida	Pectinariidae	-	*Pectinaria* sp.	X	X	-	-	-	-	-	-	-
Annelida	-	Polychaeta	Sedentaria	Terebellida	Terebellidae	-	Terebellidae indet.	-	X	X	X	Y	X	Y	Y	Y
Annelida	-	Polychaeta	Sedentaria	Terebellida	Terebellidae	Terebellinae	*Amaeana* sp.	-	-	-	-	-	X	-	-	-
Annelida	-	Polychaeta	Sedentaria	Terebellida	Terebellidae	Terebellinae	*Lanassa* sp.	-	-	-	-	-	-	Y	-	-
Annelida	-	Polychaeta	Sedentaria	Terebellida	Terebellidae	Terebellinae	*Lanassa venusta venusta*	-	-	-	-	X	X	X	X	X
Annelida	-	Polychaeta	Sedentaria	Terebellida	Terebellidae	Terebellinae	*Laphania boecki*	-	-	-	X	X	X	X	X	X
Annelida	-	Polychaeta	Sedentaria	Terebellida	Terebellidae	Terebellinae	*Leaena ebranchiata*	-	-	-	-	X	X	X	X	X
Annelida	-	Polychaeta	Sedentaria	Terebellida	Terebellidae	Terebellinae	*Neoamphitrite affinis*	-	-	-	-	X	X	X	-	-
Annelida	-	Polychaeta	Sedentaria	Terebellida	Terebellidae	Terebellinae	*Nicolea venustula*	-	X	-	-	-	-	-	-	-
Annelida	-	Polychaeta	Sedentaria	Terebellida	Terebellidae	Terebellinae	*Paramphitrite birulai*	-	-	-	-	-	-	-	X	X
Annelida	-	Polychaeta	Sedentaria	Terebellida	Terebellidae	Terebellinae	*Pista cristata*	-	-	-	X	-	-	-	-	-
Annelida	-	Polychaeta	Sedentaria	Terebellida	Terebellidae	Terebellinae	*Pista maculata*	X	X	X	X	X	X	X	X	X
Annelida	-	Polychaeta	Sedentaria	Terebellida	Terebellidae	Terebellinae	*Polycirrus medusa*	-	-	-	-	-	-	X	-	-
Annelida	-	Polychaeta	Sedentaria	Terebellida	Terebellidae	Terebellinae	*Polycirrus* sp. complex	X	X	-	X	X	X	Y	Y	X
Annelida	-	Polychaeta	Sedentaria	Terebellida	Terebellidae	Terebellinae	*Proclea graffii*	-	-	-	-	-	X	-	-	-

Appendix 8A-1

Benthic Infauna Taxa Presence/Absence from Survey Years 2010-2021

Phylum	Subphylum	Class	Subclass	Order	Family	Subfamily	Taxa	2010	2013	2015	2016	2017	2018	2019	2020	2021
Annelida	-	Polychaeta	Sedentaria	Terebellida	Terebellidae	Terebellinae	*Amphitrite cirrata*	-	-	-	-	-	-	-	X	X
Annelida	-	Polychaeta	Sedentaria	Terebellida	Trichobranchidae	-	*Terebellides reishi*	-	-	-	-	X	-	-	-	-
Annelida	-	Polychaeta	Sedentaria	Terebellida	Trichobranchidae	-	*Terebellides* sp.	-	-	-	-	Y	X	Y	Y	Y
Annelida	-	Polychaeta	Sedentaria	Terebellida	Trichobranchidae	-	*Terebellides stroemii*	X	X	X	X	X	-	X	-	-
Annelida	-	Polychaeta	Sedentaria	Terebellida	Trichobranchidae	-	Trichobranchidae indet.	X	-	-	-	-	-	-	Y	-
Annelida	-	Polychaeta	Sedentaria	Terebellida	Trichobranchidae	-	*Trichobranchus glacialis*	X	-	-	-	X	X	X	X	-
Annelida	-	Polychaeta/Archiannelida	Polychaeta incertae sedis	Archiannelida	-	-	Archiannelid indet.	-	X	-	-	-	-	-	-	-
Annelida		Clitellata	Oligochaeta	Tubificida	Naididae	-	Naididae indet.	-	-	-	-	-	-	-	-	X
Arthropoda	Chelicerata	Arachnida	Acari	-	-	-	Acari indet.	X	X	-	-	-	-	X	X	-
Arthropoda	Chelicerata	Arachnida	Acari	Trombidiformes	Halacaridae	-	Halacaridae indet.	-	-	-	-	X	X	X	X	-
Arthropoda	Chelicerata	Pycnogonida	-	-	-	-	Pycnogonida indet.	X	-	X	-	X	-	-	-	-
Arthropoda	Chelicerata	Pycnogonida	-	Pantopoda	Ammotheidae	-	*Achelia spinosa*	-	-	-	X	-	-	-	-	-
Arthropoda	Chelicerata	Pycnogonida	-	Pantopoda	Ammotheidae	-	*Achelia* sp.	-	-	-	-	X	-	-	-	-
Arthropoda	Chelicerata	Pycnogonida	-	Pantopoda	Nymphonidae	-	*Nymphon hirtipes*	-	-	-	-	-	-	X	X	-
Arthropoda	Chelicerata	Pycnogonida	-	Pantopoda	Nymphonidae	-	*Nymphon* sp.	-	-	-	-	X	X	-	X	Y
Arthropoda	Crustacea	Hexanauplia	-	-	-	-	Cirripedia indet.	-	-	X	X	-	-	-	-	-
Arthropoda	Crustacea	Hexanauplia	Copepoda	-	-	-	Copepoda indet.	-	-	-	-	-	-	-	Y	-
Arthropoda	Crustacea	Hexanauplia	Copepoda	Calanoida	-	-	Calanoida indet.	-	-	-	-	-	-	-	-	Y
Arthropoda	Crustacea	Hexanauplia	Copepoda	Cyclopoida	-	-	Cyclopoida indet.	-	-	-	-	X	X	X	X	X
Arthropoda	Crustacea	Hexanauplia	Copepoda	Harpacticoida	-	-	Harpacticoida indet.	X	X	-	X	X	X	X	X	X
Arthropoda	Crustacea	Hexanauplia	Thecostraca	Sessilia	-	-	Balanomorpha indet.	-	-	-	-	X	X	X	X	X
Arthropoda	Crustacea	Hexanauplia	Thecostraca	Sessilia	Archaeobalanidae	Semibalabinae	*Semibalanus balanoides*	X	-	-	-	-	-	-	-	-
Arthropoda	Crustacea	Hexanauplia	Thecostraca	Sessilia	Balanidae	Balaninae	*Balanus* sp.	X	-	-	X	-	-	-	-	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	-	-	Amphipoda indet.	X	X	X	X	Y	X	X	X	Y
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Acanthonotozomatidae	-	Acanthonotozoma inflatum	-	-	-	-	-	-	X	-	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Ampeliscidae	-	*Ampelisca eschrichtii*	-	-	X	X	X	X	X	X	X
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Ampeliscidae	-	*Ampelisca* sp.	-	-	X	X	-	-	Y	-	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Ampeliscidae	-	Ampeliscidae indet.	-	-	-	X	-	X	-	X	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Ampeliscidae	-	*Byblis gaimardii*	X	-	-	-	-	-	-	-	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Ampeliscidae	-	*Byblis* sp.	-	-	X	X	X	X	Y	X	Y
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Ampeliscidae	-	*Haploops* sp.	-	-	X	X	-	-	-	X	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Ampeliscidae	-	*Haploops tubicola*	X	X	-	X	X	X	X	X	X
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Amphilochidae	-	Amphilochidae indet.	-	-	-	-	Y	-	-	X	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Amphilochidae	-	*Amphilochus hamatus*	-	-	-	-	X	-	-	-	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Amphilochidae	-	*Amphilochus* sp.	-	-	-	-	-	X	-	-	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Aoridae	-	Aoridae indet.	-	-	-	-	-	-	-	X	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Atylidae	Atylinae	*Atylus carinatus*	X	X	X	X	X	X	X	X	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Atylidae	Atylinae	*Atylus* sp.	-	-	-	-	-	-	-	Y	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Atylidae	Nototropiinae	*Nototropis* sp.	-	-	X	-	-	-	-	-	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Calliopiidae	-	*Apherusa jurinei*	-	X	-	-	-	-	-	-	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Calliopiidae	-	*Apherusa megalops*	-	X	-	-	-	-	-	-	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Calliopiidae	-	Calliopiidae indet.	-	-	-	-	X	X	-	-	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Corophiidae	-	Corophiidae indet.	-	-	-	X	-	X	Y	X	Y
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Corophiidae	Corophiinae	*Corophium* sp.	X	X	-	-	-	-	-	-	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Corophiidae	Corophiinae	*Crassicorophium bonellii*	-	X	-	-	X	X	-	-	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Corophiidae	Corophiinae	*Crassicorophium clarencense*	-	-	-	-	-	-	-	X	X
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Corophiidae	Corophiinae	*Crassicorophium* sp.	-	-	-	-	-	-	-	-	Y
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Corophiidae	Corophiinae	*Monocorophium insidiosum*	-	X	-	-	X	-	-	-	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Corophiidae	Corophiinae	*Monocorophium* sp.	-	-	-	-	Y	X	Y	-	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Corophiidae	Protomedeiinae	*Protomedeia fasciata*	-	X	-	X	-	-	-	-	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Corophiidae	Protomedeiinae	*Protomedeia* sp.	-	-	-	-	X	-	-	X	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Dexaminidae	Dexamininae	*Dexamine* sp.	-	-	-	-	X	-	-	-	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Dexaminidae	Prophliantinae	*Guernea nordenskioldi*	X	X	X	X	X	X	X	X	X
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Dulichiidae	-	*Dulichia* sp.	-	-	-	-	-	-	-	X	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Dulichiidae	-	Dulichiidae indet.	-	-	-	-	-	-	-	-	Y
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Dulichiidae	-	*Dyopedos* sp.	-	-	-	-	X	X	-	X	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Eusiridae	-	*Rhachotropis aculeata*	X	-	-	-	-	-	-	-	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Eusiridae	-	*Rhachotropis helleri*	-	-	-	-	X	X	-	-	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Eusiridae	-	*Rhachotropis oculata*	-	X	-	-	-	-	-	-	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Eusiridae	-	*Rhachotropis* sp.	-	-	-	-	Y	-	-	-	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Gammaridae	-	*Gammarus oceanicus*	-	X	-	-	X	-	-	-	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Gammaridae	-	*Gammarus setosus*	-	-	-	X	-	-	-	-	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Gammaridae	-	*Gammarus* sp.	-	X	X	X	-	X	-	-	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Hyperiidae	-	*Themisto libellula**	-	-	-	-	-	-	-	X	-

Appendix 8A-1

Benthic Infauna Taxa Presence/Absence from Survey Years 2010-2021

Phylum	Subphylum	Class	Subclass	Order	Family	Subfamily	Taxa	2010	2013	2015	2016	2017	2018	2019	2020	2021
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Hyperiidae	-	*Themisto* sp.	-	-	-	X	-	-	-	-	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Ischyroceridae	-	Ischyroceridae indet.	X	-	-	-	-	-	-	X	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Ischyroceridae	Ischyrocerinae	*Ischyrocerus anguipes*	-	X	X	-	-	-	-	-	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Ischyroceridae	Ischyrocerinae	*Ischyrocerus* sp.	-	-	X	-	-	-	-	-	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Lysianassidae	-	Lysianassidae indet.	X	-	X	-	Y	-	Y	-	Y
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Lysianassidae	-	Lysianassoidea indet.	-	-	-	-	Y	X	Y	X	X
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Melphidippidae	-	*Melphidippa* sp.	-	-	-	-	-	-	-	X	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Munnopsidae	Eurycopinae	*Eurycope* sp.	-	-	-	-	-	X	-	-	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Oedicerotidae	-	*Aceroides latipes*	-	-	-	-	-	-	X	X	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Oedicerotidae	-	*Aceroides* sp.	-	-	-	-	-	X	-	-	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Oedicerotidae	-	*Arrhis* sp.	-	-	-	-	-	X	X	-	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Oedicerotidae	-	*Bathymedon obtusifrons*	-	-	-	X	X	-	-	X	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Oedicerotidae	-	*Bathymedon* sp.	-	-	-	-	-	-	-	Y	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Oedicerotidae	-	*Deflexilodes* sp.	-	-	-	-	-	-	-	Y	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Oedicerotidae	-	*Deflexilodes tesselatus*	-	X	-	-	-	-	-	-	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Oedicerotidae	-	*Monoculodes latimanus*	-	X	-	-	X	-	-	-	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Oedicerotidae	-	*Monoculodes* sp.	X	X	X	X	Y	X	Y	X	Y
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Oedicerotidae	-	*Monoculopsis longicornis*	-	X	-	X	X	-	X	-	X
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Oedicerotidae	-	*Monoculopsis* sp.	-	-	-	-	-	-	Y	X	Y
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Oedicerotidae	-	*Oediceros borealis*	-	X	X	X	-	-	-	-	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Oedicerotidae	-	Oedicerotidae indet.	X	X	X	X	Y	X	Y	X	Y
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Oedicerotidae	-	*Paroediceros lynceus*	X	X	X	X	X	X	X	X	X
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Oedicerotidae	-	*Paroediceros* sp.	-	X	-	-	-	-	-	Y	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Oedicerotidae	-	*Rostroculodes borealis*	-	-	X	-	X	-	-	-	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Oedicerotidae	-	*Rostroculodes kroyeri*	-	-	X	X	-	-	-	-	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Oedicerotidae	-	*Rostroculodes longirostris*	-	-	-	-	X	-	-	-	X
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Oedicerotidae	-	*Rostroculodes* sp.	-	-	-	-	Y	X	Y	Y	Y
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Oedicerotidae	-	*Westwoodilla caecula*	-	-	X	-	-	-	-	-	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Oedicerotidae	-	*Westwoodilla* sp.	-	X	-	X	X	X	-	X	Y
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Opisidae	-	*Opisa eschrichti*	-	-	-	X	-	-	-	-	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Opisidae	-	*Opisa* sp.	-	-	-	-	-	-	-	-	Y
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Phoxocephalidae	Harpiniinae	*Harpinia serrata*	X	-	X	X	X	X	-	X	X
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Phoxocephalidae	Harpiniinae	*Harpinia* sp.	-	-	X	X	Y	X	X	-	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Phoxocephalidae	Phoxocephalinae	*Phoxocephalus holbolli*	-	-	-	X	-	-	-	-	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Podoceridae	-	Podoceridae indet.	-	-	-	-	-	-	-	X	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Pontoporeiidae	-	*Monoporeia affinis*	X	X	X	X	X	X	X	-	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Pontoporeiidae	-	*Pontoporeia femorata*	X	X	X	X	X	X	X	X	X
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Pontoporeiidae	-	Pontoporeiidae indet.	-	-	-	-	Y	-	-	-	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Scopelocheiridae	Scopelocheirinae	*Scopelocheirus hopei*	-	-	-	X	-	-	-	-	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Stenothoidae	-	*Hardametopa nasuta*	-	-	-	-	X	-	-	-	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Stenothoidae	-	*Metopa* sp.	-	X	-	-	-	-	X	-	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Stenothoidae	-	Stenothoidae indet.	X	-	-	X	Y	X	X	X	Y
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Synopiidae	-	*Tiron spiniferus*	-	-	-	-	-	-	-	X	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Tryphosidae	-	*Gronella groenlandica*	-	X	-	X	X	X	-	X	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Tryphosidae	-	*Hippomedon denticulatus*	-	-	X	-	-	-	-	-	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Tryphosidae	-	*Hippomedon propinqvus*	-	-	-	-	-	-	-	-	X
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Tryphosidae	-	*Hippomedon serratus*	-	-	-	X	-	-	-	-	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Tryphosidae	-	*Hippomedon* sp.	-	-	-	-	-	-	Y	X	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Tryphosidae	-	*Orchomene macroserratus*	X	-	-	-	-	-	-	-	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Tryphosidae	-	*Orchomene* sp.	-	-	-	-	X	X	Y	Y	Y
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Tryphosidae	-	*Orchomenella minuta*	-	X	-	X	-	X	X	X	X
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Tryphosidae	-	*Orchomenella pinguis*	-	-	-	X	X	X	-	X	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Tryphosidae	-	*Orchomenella* sp.	-	X	-	X	-	-	Y	Y	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Tryphosidae	-	Tryphosidae indet.	-	-	-	-	-	-	Y	Y	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Uristidae	-	*Anonyx laticoxae*	-	-	-	-	-	-	X	-	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Uristidae	-	*Anonyx lilljeborgi*	-	-	-	-	-	-	-	X	X
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Uristidae	-	*Anonyx nugax*	X	X	X	X	X	-	X	X	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Uristidae	-	*Anonyx ochoticus*	-	-	-	X	-	-	-	X	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Uristidae	-	*Anonyx pacificus*	-	-	-	X	-	-	-	-	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Uristidae	-	*Anonyx sarsi*	-	-	X	X	X	X	-	X	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Uristidae	-	*Anonyx* sp.	-	X	X	X	Y	X	Y	X	Y
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Uristidae	-	*Menigrates obtusifrons*	-	-	-	-	X	-	-	-	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Uristidae	-	*Onisimus barentsi Group*	-	-	-	-	X	X	-	-	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Uristidae	-	*Onisimus brevicaudatus*	-	-	-	-	-	X	-	-	-

Appendix 8A-1

Benthic Infauna Taxa Presence/Absence from Survey Years 2010-2021

Phylum	Subphylum	Class	Subclass	Order	Family	Subfamily	Taxa	2010	2013	2015	2016	2017	2018	2019	2020	2021
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Uristidae	-	*Onisimus litoralis*	-	-	X	-	-	-	-	-	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Uristidae	-	*Onisimus normani*	-	-	X	-	-	-	-	-	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Uristidae	-	*Onisimus plautus*	-	-	-	X	-	-	-	-	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Uristidae	-	*Onisimus* sp.	X	-	-	-	Y	X	Y	Y	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Uristidae	-	Uristidae indet.	-	-	-	-	Y	-	-	X	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Cumacea	-	-	Cumacea indet.	-	X	X	X	Y	X	-	X	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Cumacea	Bodotriidae	Bodotriinae	*Cyclaspis longicaudata*	X	-	-	-	-	-	-	-	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Cumacea	Diastylidae	-	*Brachydiastylis resima*	X	X	X	X	X	X	X	X	X
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Cumacea	Diastylidae	-	Diastylidae indet.	-	-	-	-	Y	X	Y	-	Y
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Cumacea	Diastylidae	-	*Diastylis alaskensis*	-	-	-	-	X	-	-	-	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Cumacea	Diastylidae	-	*Diastylis bradyi*	-	-	-	-	X	X	-	X	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Cumacea	Diastylidae	-	*Diastylis echinata*	-	-	X	X	-	-	-	-	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Cumacea	Diastylidae	-	*Diastylis goodsiri*	X	-	X	-	X	X	X	X	X
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Cumacea	Diastylidae	-	*Diastylis lucifera*	-	-	X	-	X	X	-	X	X
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Cumacea	Diastylidae	-	*Diastylis rathkei*	X	X	X	-	X	X	X	X	X
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Cumacea	Diastylidae	-	*Diastylis scorpiodes*	X	-	X	X	X	X	X	X	X
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Cumacea	Diastylidae	-	*Diastylis sculpta*	-	X	-	-	-	-	-	-	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Cumacea	Diastylidae	-	*Diastylis* sp.	-	X	-	X	Y	X	Y	X	X
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Cumacea	Diastylidae	-	*Diastylis spinulosa*	X	-	X	-	X	X	X	X	X
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Cumacea	Diastylidae	-	*Diastyloides biplicatus*	-	-	-	-	X	X	-	-	X
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Cumacea	Lampropidae	-	*Hemilamprops cristatus*	-	-	-	-	X	-	-	-	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Cumacea	Lampropidae	-	Lampropidae indet.	-	-	X	-	Y	X	-	-	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Cumacea	Lampropidae	-	*Lamprops fuscatus*	X	X	X	X	X	X	X	X	X
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Cumacea	Lampropidae	-	*Lamprops* sp.	-	-	X	X	-	-	-	X	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Cumacea	Leuconidae	-	*Eudorella emarginata*	-	-	X	X	-	-	X	X	X
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Cumacea	Leuconidae	-	*Eudorella* sp.	X	-	X	X	Y	-	Y	X	Y
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Cumacea	Leuconidae	-	*Eudorella truncatula*	-	-	X	X	X	X	X	X	X
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Cumacea	Leuconidae	-	*Eudorellopsis* sp.	X	-	-	-	-	-	-	-	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Cumacea	Leuconidae	-	*Leucon nasica*	-	-	-	-	-	-	X	X	X
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Cumacea	Leuconidae	-	*Leucon nasicoides*	X	X	X	X	X	-	X	X	X
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Cumacea	Leuconidae	-	*Leucon* sp.	-	-	X	-	Y	X	Y	X	Y
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Cumacea	Leuconidae	-	Leuconidae indet.	-	-	-	-	Y	X	Y	-	Y
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Cumacea	Nannastacidae	-	*Campylaspis rubicunda*	-	-	-	-	X	X	X	X	X
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Cumacea	Nannastacidae	-	*Campylaspis* sp.	-	-	-	-	Y	-	-	-	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Cumacea	Nannastacidae	-	Nannastacidae indet.	-	-	-	-	-	-	-	Y	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Decapoda	Crangonidae	-	Crangonidae indet.	-	-	-	-	-	-	-	Y	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Decapoda	Crangonidae	-	*Sabinea septemcarinata*	X	-	X	-	X	X	X	X	X
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Decapoda	Crangonidae	-	*Sabinea* sp.	-	-	-	-	-	-	-	-	Y
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Decapoda	Crangonidae	-	*Sclerocrangon boreas**	-	-	-	X	X	X	-	-	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Decapoda	Crangonidae	-	*Sclerocrangon* sp.	-	-	-	-	-	-	-	Y	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Decapoda	Thoridae	-	*Lebbeus polaris*	X	-	-	-	-	X	X	X	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Decapoda	Thoridae	-	*Lebbeus* sp.	-	-	-	-	-	-	Y	-	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Isopoda	-	-	Asellota indet.	-	-	-	-	Y	-	-	-	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Isopoda	-	-	Isopoda indet.	-	-	-	-	-	-	-	Y	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Isopoda	-	-	Isopoda sp. A	-	-	-	X	-	-	-	-	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Isopoda	Desmosomatidae	-	Desmosomatidae indet.	-	-	-	-	X	-	-	X	Y
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Isopoda	Desmosomatidae	Desmosomatinae	*Desmosoma* sp.	-	X	-	-	-	-	-	-	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Isopoda	Desmosomatidae	Desmosomatinae	*Eugerda* sp.	X	-	-	-	-	-	-	-	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Isopoda	Gnathiidae	-	*Gnathia maxillaris*	-	-	-	X	-	-	-	-	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Isopoda	Gnathiidae	-	*Gnathia* sp.	X	X	-	-	X	-	Y	X	Y
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Isopoda	Gnathiidae	-	Gnathiidae indet.	-	-	-	-	Y	X	Y	X	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Isopoda	Paramunnidae	-	*Pleurogonium rubicundum*	-	-	-	-	X	-	-	-	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Isopoda	Paramunnidae	-	*Pleurogonium* sp.	-	-	-	-	Y	-	-	-	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Isopoda	Paramunnidae	-	*Pleurogonium spinosissimum*	X	-	-	-	X	X	-	-	X
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Mysida	Mysidae	-	Mysida indet.	-	-	-	-	Y	-	-	-	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Mysida	Mysidae	Mysinae	*Mysis mixta*	-	X	-	X	X	-	-	-	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Mysida	Mysidae	Mysinae	*Mysis* sp.	-	X	-	-	-	X	-	-	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Tanaidacea	-	-	Tanaidacea indet.	X	X	X	X	Y	X	Y	Y	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Tanaidacea	Akanthophoreidae	-	*Akanthophoreus gracilis*	-	-	-	-	X	-	-	-	-
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Tanaidacea	Akanthophoreidae	-	*Akanthophoreus* sp.	-	-	-	-	Y	X	Y	X	Y
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Tanaidacea	Pseudotanaidae	Pseudotanainae	*Pseudotanais* sp.	-	-	-	-	X	X	Y	Y	X
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Tanaidacea	Sphyrapodidae	Pseudosphyrapodinae	*Pseudosphyrapus anomalus*	X	-	-	X	X	X	X	X	X
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Tanaidacea	Typhlotanaidae	-	*Typhlotanais* sp.	-	-	-	-	X	X	X	X	-
Arthropoda	Crustacea	Ostracoda	-	-	-	-	Ostracoda indet.	-	-	-	-	Y	-	-	Y	-

Appendix 8A-1

Benthic Infauna Taxa Presence/Absence from Survey Years 2010-2021

Phylum	Subphylum	Class	Subclass	Order	Family	Subfamily	Taxa	2010	2013	2015	2016	2017	2018	2019	2020	2021
Arthropoda	Crustacea	Ostracoda	Myodocopa	-	-	-	Myodocopa indet.	X	X	X	X	-	-	-	-	-
Arthropoda	Crustacea	Ostracoda	Myodocopa	Myodocopida	Philomedidae	Philomedinae	*Philomedes* sp.	-	-	-	-	X	X	X	X	X
Arthropoda	Crustacea	Ostracoda	Podocopa	Podocopida	Cytheridae	-	Cytheridae indet.	-	-	-	-	-	-	X	-	X
Arthropoda	Crustacea	Ostracoda	Podocopa	Podocopida	Trachyleberididae	-	*Robertsonites tuberculatus*	-	-	-	-	X	-	-	-	-
Arthropoda	Hexapoda	Insecta	Pterygota	Coleoptera	Curculionidae	-	Curculionidae indet.	-	-	-	-	-	X	-	-	-
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	-	-	Diptera indet.	-	-	-	-	Y	-	-	-	-
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	-	Chironomidae indet.	X	-	-	-	-	X	-	-	-
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	Chironominae	Chironominae indet.	X	-	-	-	-	-	-	-	-
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	Diamesinae	*Diamesa* sp.	-	-	-	-	-	-	-	X	-
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	Orthocladiinae	*Cricotopus/Orthocladius* sp. Complex	-	-	-	-	-	-	-	X	-
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	Orthocladiinae	*Eukiefferiella* sp.	-	-	-	-	-	-	-	X	-
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	Orthocladiinae	Orthocladiinae indet.	X	-	-	-	X	X	-	X	-
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Empididae	Clinocerinae	*Clinocera* sp.	-	-	-	-	-	-	-	X	-
Brachiopoda	-	-	-	-	-	-	Brachiopoda indet.	-	-	-	-	-	-	-	-	X
Bryozoa	-	-	-	-	-	-	Bryozoa indet.	-	-	-	-	Y	X	-	X	Y
Bryozoa	-	Gymnolaemata	-	-	-	-	Gymnolaemata indet.	-	-	-	-	-	-	Y	-	-
Bryozoa	-	Gymnolaemata	-	Cheilostomatida	-	-	Cheilostomatida indet.	-	-	-	-	-	-	Y	X	Y
Bryozoa	-	Gymnolaemata	-	Cheilostomatida	-	-	Schizoporelloidea indet.	-	-	-	-	-	-	-	-	X
Bryozoa	-	Gymnolaemata	-	Cheilostomatida	Bitectiporidae	-	*Schizomavella* sp.	-	-	-	-	-	-	-	-	X
Bryozoa	-	Gymnolaemata	-	Cheilostomatida	Calloporidae	-	*Callopora* sp.	-	-	-	-	-	-	-	-	X
Bryozoa	-	Gymnolaemata	-	Cheilostomatida	Calloporidae	-	Calloporidae indet.	-	-	-	-	-	X	X	X	Y
Bryozoa	-	Gymnolaemata	-	Cheilostomatida	Calloporidae	-	*Cauloramphus* sp.	-	-	-	-	-	-	-	-	X
Bryozoa	-	Gymnolaemata	-	Cheilostomatida	Candidae	-	Candidae indet.	-	-	-	-	-	-	-	-	Y
Bryozoa	-	Gymnolaemata	-	Cheilostomatida	Candidae	-	*Scrupocellaria* sp.	-	-	-	-	-	X	-	-	-
Bryozoa	-	Gymnolaemata	-	Cheilostomatida	Candidae	-	*Tricellaria* sp.	-	-	-	-	-	-	-	-	X
Bryozoa	-	Gymnolaemata	-	Cheilostomatida	Cribrilinidae	-	*Cribrilina* sp.	-	-	-	-	-	-	-	-	X
Bryozoa	-	Gymnolaemata	-	Cheilostomatida	Epistomiidae	-	*Synnotum* sp.	-	-	-	-	X	-	-	-	-
Bryozoa	-	Gymnolaemata	-	Cheilostomatida	Escharellidae	-	*Escharella* sp.	-	-	-	-	-	-	X	X	X
Bryozoa	-	Gymnolaemata	-	Cheilostomatida	Eucrateidae	-	*Eucratea* sp.	-	-	-	-	-	-	-	X	-
Bryozoa	-	Gymnolaemata	-	Cheilostomatida	Exochellidae	-	*Escharoides* sp.	-	-	-	-	-	-	-	-	X
Bryozoa	-	Gymnolaemata	-	Cheilostomatida	Fatkullinidae	-	*Stomacrustula pachystega*	-	-	-	-	-	-	-	-	X
Bryozoa	-	Gymnolaemata	-	Cheilostomatida	Hippothoidae	-	*Celleporella hyalina*	-	-	-	-	X	-	-	-	-
Bryozoa	-	Gymnolaemata	-	Cheilostomatida	Myriaporidae	-	*Leieschara* sp.	-	-	-	-	-	X	-	X	-
Bryozoa	-	Gymnolaemata	-	Cheilostomatida	Smittinidae	-	*Pseudoflustra* sp.	-	-	-	-	-	-	-	-	X
Bryozoa	-	Gymnolaemata	-	Cheilostomatida	Smittinidae	-	*Smittina* sp.	-	-	-	-	-	-	-	-	X
Bryozoa	-	Gymnolaemata	-	Ctenostomatida	-	-	Ctenostomatida indet.	-	-	-	-	X	X	-	-	-
Bryozoa	-	Gymnolaemata	-	Ctenostomatida	Alcyonidiidae	-	*Alcyonidium* sp.	-	-	-	-	-	X	X	X	X
Bryozoa	-	Gymnolaemata	-	Ctenostomatida	Triticellidae	-	*Triticella* sp.	-	-	-	-	-	X	-	-	-
Bryozoa	-	Gymnolaemata	-	Ctenostomatida	Vesiculariidae	-	*Amathia* sp.	-	-	-	-	X	-	X	-	-
Bryozoa	-	Stenolaemata	-	-	-	-	Stenolaemata indet.	-	-	-	-	-	-	Y	-	-
Bryozoa	-	Stenolaemata	-	Cyclostomatida	Crisiidae	-	*Crisia* sp.	-	-	-	-	X	X	X	X	X
Bryozoa	-	Stenolaemata	-	Cyclostomatida	Oncousoeciidae	-	*Oncousoecia* sp.	-	-	-	-	-	-	X	-	-
Bryozoa	-	Stenolaemata	-	Cyclostomatida	Tubuliporidae	-	*Tubulipora* sp.	-	-	-	-	-	-	X	X	X
Chordata	Tunicata	-	-	-	-	-	Tunicata indet.	-	-	-	X	-	-	-	-	-
Chordata	Tunicata	Ascidiacea	-	-	-	-	Ascidiacea indet.	-	-	-	-	Y	-	X	X	Y
Chordata	Tunicata	Ascidiacea	-	Aplousobranchia	-	-	Aplousobranchia indet.	-	-	-	-	-	X	X	X	-
Chordata	Tunicata	Ascidiacea	-	Phlebobranchia	Ascidiidae	-	*Ascidia callosa*	-	X	-	-	-	-	-	-	-
Chordata	Tunicata	Ascidiacea	-	Phlebobranchia	Ascidiidae	-	*Ascidia* sp.	-	X	X	-	X	X	Y	X	Y
Chordata	Tunicata	Ascidiacea	-	Stolidobranchia	-	-	Stolidobranchia indet.	-	-	-	-	-	-	-	Y	-
Chordata	Tunicata	Ascidiacea	-	Stolidobranchia	Molgulidae	-	*Molgula* sp.	-	X	-	-	-	X	X	-	-
Chordata	Tunicata	Ascidiacea	-	Stolidobranchia	Pyuridae	-	*Boltenia echinata*	-	-	X	-	X	X	X	X	-
Chordata	Tunicata	Ascidiacea	-	Stolidobranchia	Pyuridae	-	*Boltenia* sp.	-	-	-	-	-	-	-	Y	-
Chordata	Tunicata	Ascidiacea	-	Stolidobranchia	Styelidae	-	*Polycarpa fibrosa*	-	-	-	-	X	X	-	X	-
Chordata	Tunicata	Ascidiacea	-	Stolidobranchia	Styelidae	-	*Polycarpa* sp.	-	-	-	-	-	-	Y	Y	Y
Chordata	Tunicata	Ascidiacea	-	Stolidobranchia	Styelidae	-	Styelidae indet.	-	-	-	-	-	-	Y	-	-
Chordata	Vertebrata	-	-	-	-	-	Pisces indet.	-	-	-	-	X	-	-	-	-
Chordata	Vertebrata	Actinopterygii	-	Perciformes	Zoarcidae	-	Zoarcidae indet.	-	-	-	-	-	-	X	-	-
Chordata	Vertebrata	Actinopterygii	-	Scorpaeniformes	Cottidae	-	Cottidae indet.	-	-	-	-	-	-	X	X	-
Cnidaria	-	Anthozoa	-	-	-	-	Anthozoa indet.	-	-	-	-	-	-	-	Y	-
Cnidaria	-	Anthozoa	Ceriantharia	Spirularia	Cerianthidae	-	*Cerianthus lloydii*	-	-	-	-	-	-	-	X	-
Cnidaria	-	Anthozoa	Hexacorallia	Actiniaria	-	-	Actiniaria indet.	-	-	-	-	-	-	-	Y	-
Cnidaria	-	Anthozoa	Hexacorallia	Actiniaria	Actiniidae	-	*Urticina* sp.	-	-	-	-	X	-	-	-	-
Cnidaria	-	Anthozoa	Hexacorallia	Actiniaria	Edwardsiidae	-	Edwardsiidae indet.	-	-	-	-	-	-	X	X	-
Cnidaria	-	Anthozoa	Hexacorallia	Actiniaria	Halcampidae	-	*Halcampa* sp.	-	-	-	-	-	-	-	X	-

Appendix 8A-1

Benthic Infauna Taxa Presence/Absence from Survey Years 2010-2021

Phylum	Subphylum	Class	Subclass	Order	Family	Subfamily	Taxa	2010	2013	2015	2016	2017	2018	2019	2020	2021
Cnidaria	-	Anthozoa	Hexacorallia	Actiniaria	Hormathiidae	-	*Hormathia digitata*	-	-	-	-	X	-	-	-	-
Cnidaria	-	Anthozoa	Hexacorallia	Zoantharia	Parazoanthidae	-	*Parazoanthus* sp.	-	-	-	-	X	-	-	-	-
Cnidaria	-	Hydrozoa	-	-	-	-	Hydrozoa indet.	-	-	-	-	Y	-	Y	X	-
Cnidaria	-	Hydrozoa	-	Leptothecata	Campanulariidae	-	Campanulariidae indet.	-	-	-	-	-	-	-	-	Y
Cnidaria	-	Hydrozoa	-	Leptothecata	Campanulinidae	-	*Calycella* sp.	-	-	-	-	-	-	-	-	X
Cnidaria	-	Hydrozoa	Hydroidolina	Anthoathecata	-	-	Anthoathecata indet.	-	-	-	-	-	-	Y	X	-
Cnidaria	-	Hydrozoa	Hydroidolina	Anthoathecata	Bougainvilliidae	-	Bougainvilliidae indet.	-	-	-	-	X	X	-	X	-
Cnidaria	-	Hydrozoa	Hydroidolina	Anthoathecata	Corynidae	-	Corynidae indet.	-	-	-	-	-	-	X	-	-
Cnidaria	-	Hydrozoa	Hydroidolina	Leptothecata	-	-	Leptothecata indet.	-	-	-	-	-	-	-	Y	Y
Cnidaria	-	Hydrozoa	Hydroidolina	Leptothecata	Lafoeidae	-	*Lafoea* sp.	-	-	-	-	-	-	X	-	-
Cnidaria	-	Hydrozoa	Trachylinae	Limnomedusae	Monobrachiidae	-	*Monobrachium parasitum*	-	-	-	-	X	X	X	X	X
Echinodermata	Asterozoa	Asteroidea	-	Forcipulatida	Asteriidae	-	Asteriidae indet.	-	-	X	-	-	-	-	-	-
Echinodermata	Asterozoa	Ophiuroidea	-	-	-	-	Ophiuroidea indet.	-	-	X	-	-	-	Y	Y	Y
Echinodermata	Asterozoa	Ophiuroidea	Myophiuroidea	Amphilepidida	-	-	Amphilepidida indet.	-	-	-	-	-	-	-	X	-
Echinodermata	Asterozoa	Ophiuroidea	Myophiuroidea	Ophiurida	Ophiopyrgidae	-	*Ophiopleura borealis*	-	-	-	-	-	-	X	X	-
Echinodermata	Asterozoa	Ophiuroidea	Myophiuroidea	Ophiurida	Ophiuridae	-	Ophiuridae indet.	-	-	-	-	-	-	Y	Y	Y
Echinodermata	Asterozoa	Ophiuroidea	Myophiuroidea	Ophiurida	Ophiuridae	Ophiurinae	*Ophiocten affinis*	-	-	-	-	-	X	X	X	X
Echinodermata	Asterozoa	Ophiuroidea	Myophiuroidea	Ophiurida	Ophiuridae	Ophiurinae	*Ophiocten sericeum*	X	X	-	-	-	-	-	-	-
Echinodermata	Asterozoa	Ophiuroidea	Myophiuroidea	Ophiurida	Ophiuridae	Ophiurinae	*Ophiura robusta*	X	-	X	X	X	X	X	X	X
Echinodermata	Asterozoa	Ophiuroidea	Myophiuroidea	Ophiurida	Ophiuridae	Ophiurinae	*Ophiura sarsii*	X	X	X	X	X	X	X	X	X
Echinodermata	Asterozoa	Ophiuroidea	Myophiuroidea	Ophiurida	Ophiuridae	Ophiurinae	*Ophiura* sp.*	-	-	X	-	Y	-	Y	Y	Y
Echinodermata	Echinozoa	Echinoidea	Euechinoidea	Camarodonta	Strongylocentrotidae	-	*Strongylocentrotus droebachiensis*	X	-	X	X	X	X	X	X	X
Echinodermata	Echinozoa	Echinoidea	Euechinoidea	Camarodonta	Strongylocentrotidae	-	*Strongylocentrotus pallidus*	-	-	-	-	-	-	-	X	-
Echinodermata	Echinozoa	Echinoidea	Euechinoidea	Camarodonta	Strongylocentrotidae	-	*Strongylocentrotus* sp.	-	X	-	-	Y	X	Y	Y	Y
Echinodermata	Echinozoa	Holothuroidea	-	-	-	-	Holothuroidea sp. A	-	-	-	-	X	X	-	-	-
Echinodermata	Echinozoa	Holothuroidea	Actinopoda	Dendrochirotida	Psolidae	-	*Psolus phantapus*	-	-	-	-	X	X	-	-	-
Echinodermata	Echinozoa	Holothuroidea	Actinopoda	Dendrochirotida	Psolidae	-	*Psolus* sp.	-	-	-	-	-	-	Y	-	-
Echinodermata	Echinozoa	Holothuroidea	Actinopoda	Molpadida	-	-	Molpadida indet.	-	-	-	-	X	X	-	-	-
Echinodermata	Echinozoa	Holothuroidea	Actinopoda	Molpadida	Eupyrgidae	-	*Eupyrgus scaber*	-	-	-	-	-	-	X	X	-
Echinodermata	Echinozoa	Holothuroidea	Paractinopoda	Apodida	-	-	Apodida indet.	-	-	-	-	-	-	Y	Y	-
Echinodermata	Echinozoa	Holothuroidea	Paractinopoda	Apodida	Myriotrochidae	-	*Myriotrochus rinkii*	-	-	-	X	-	-	X	X	X
Entoprocta	-	-	-	-	-	-	Entoprocta indet.	-	-	-	-	-	-	-	X	-
Entoprocta	-	-	-	Coloniales	Barentsiidae	-	*Barentsia* sp.	-	-	-	-	-	-	-	X	-
Hemichordata	-	Enteropneusta	-	-	-	-	Enteropneusta indet.	-	-	-	-	-	-	-	X	-
Mollusca	-	Bivalvia	-	-	-	-	Bivalvia indet.	-	X	X	X	Y	-	X	X	X
Mollusca	-	Bivalvia	-	-	-	-	Bivalvia sp. A	-	-	-	X	-	-	-	-	-
Mollusca	-	Bivalvia	-	Galeommatida	Lasaeidae	-	Lasaeidae indet.	-	-	-	-	-	-	-	-	X
Mollusca	-	Bivalvia	Autobranchia	-	Cuspidariidae	-	*Cuspidaria arctica*	-	-	X	-	-	-	-	-	-
Mollusca	-	Bivalvia	Autobranchia	-	Cuspidariidae	-	*Cuspidaria* sp.	X	-	-	-	-	X	-	X	Y
Mollusca	-	Bivalvia	Autobranchia	-	Lyonsiidae	-	*Lyonsia arenosa*	-	-	-	-	X	X	X	-	X
Mollusca	-	Bivalvia	Autobranchia	-	Periplomatidae	-	*Periploma aleuticum*	X	-	-	-	X	X	X	X	X
Mollusca	-	Bivalvia	Autobranchia	-	Thraciidae	-	*Thracia myopsis*	-	-	X	X	X	X	X	X	X
Mollusca	-	Bivalvia	Autobranchia	-	Thraciidae	-	*Thracia* sp.	-	-	-	-	Y	X	Y	-	Y
Mollusca	-	Bivalvia	Autobranchia	Adapedonta	Hiatellidae	-	*Hiatella arctica*	X	X	X	X	X	X	X	X	X
Mollusca	-	Bivalvia	Autobranchia	Arcida	Arcidae	-	*Bathyarca glacialis*	-	-	-	-	-	X	X	X	X
Mollusca	-	Bivalvia	Autobranchia	Cardiida	Cardiidae	Clinocardiinae	*Ciliatocardium ciliatum*	X	-	X	X	X	X	X	X	X
Mollusca	-	Bivalvia	Autobranchia	Cardiida	Cardiidae	Clinocardiinae	Clinocardiinae indet.	-	-	-	-	-	-	Y	-	-
Mollusca	-	Bivalvia	Autobranchia	Cardiida	Cardiidae	Clinocardiinae	*Serripes groenlandicus*	-	X	X	X	X	X	X	X	X
Mollusca	-	Bivalvia	Autobranchia	Cardiida	Cardiidae	Clinocardiinae	*Serripes* sp.	-	X	-	-	-	-	-	-	-
Mollusca	-	Bivalvia	Autobranchia	Cardiida	Cardiidae	-	Cardiidae indet.	-	-	-	-	Y	-	-	X	Y
Mollusca	-	Bivalvia	Autobranchia	Cardiida	Tellinidae	Macominae	*Limecola balthica*	-	-	X	X	X	X	X	-	-
Mollusca	-	Bivalvia	Autobranchia	Cardiida	Tellinidae	Macominae	*Macoma calcarea*	X	X	X	X	X	X	X	X	X
Mollusca	-	Bivalvia	Autobranchia	Cardiida	Tellinidae	Macominae	*Macoma moesta*	-	-	-	-	X	X	X	X	X
Mollusca	-	Bivalvia	Autobranchia	Cardiida	Tellinidae	Macominae	*Macoma* sp.	-	-	-	-	Y	X	-	-	Y
Mollusca	-	Bivalvia	Autobranchia	Cardiida	Tellinidae	Macominae	Macominae indet.	-	-	-	-	-	-	Y	Y	Y
Mollusca	-	Bivalvia	Autobranchia	Carditida	Astartidae	-	*Astarte borealis*	X	X	X	X	X	X	X	X	X
Mollusca	-	Bivalvia	Autobranchia	Carditida	Astartidae	-	*Astarte montagui*	X	-	X	X	X	X	X	X	X
Mollusca	-	Bivalvia	Autobranchia	Carditida	Astartidae	-	*Astarte* sp.	X	X	X	X	Y	X	Y	X	Y
Mollusca	-	Bivalvia	Autobranchia	Lucinida	Thyasiridae	-	*Axinopsida serricata**	-	-	-	-	X	-	X	-	-
Mollusca	-	Bivalvia	Autobranchia	Lucinida	Thyasiridae	-	*Axinopsida* sp.	-	-	-	-	-	-	Y	X	Y
Mollusca	-	Bivalvia	Autobranchia	Lucinida	Thyasiridae	-	*Thyasira flexuosa*	-	X	X	X	-	-	-	-	-
Mollusca	-	Bivalvia	Autobranchia	Lucinida	Thyasiridae	-	*Thyasira gouldi*	X	-	-	-	-	-	-	-	-
Mollusca	-	Bivalvia	Autobranchia	Lucinida	Thyasiridae	-	*Thyasira* sp.	-	-	-	-	X	X	Y	Y	Y
Mollusca	-	Bivalvia	Autobranchia	Lucinida	Thyasiridae	-	Thyasiridae indet.*	-	-	-	-	Y	X	Y	Y	Y

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Phylum	Subphylum	Class	Subclass	Order	Family	Subfamily	Taxa	2010	2013	2015	2016	2017	2018	2019	2020	2021
Mollusca	-	Bivalvia	Autobranchia	Myida	Myidae	-	*Mya arenaria*	-	-	X	X	-	-	-	-	-
Mollusca	-	Bivalvia	Autobranchia	Myida	Myidae	-	*Mya* sp.	-	-	-	-	Y	X	Y	Y	Y
Mollusca	-	Bivalvia	Autobranchia	Myida	Myidae	-	*Mya truncata*	X	X	X	X	X	X	X	X	X
Mollusca	-	Bivalvia	Autobranchia	Mytilida	Mytilidae	-	Mytilidae indet.	X	-	-	-	Y	X	Y	Y	Y
Mollusca	-	Bivalvia	Autobranchia	Mytilida	Mytilidae	Crenellinae	*Crenella faba*	X	X	X	X	X	X	-	-	-
Mollusca	-	Bivalvia	Autobranchia	Mytilida	Mytilidae	Crenellinae	*Crenella* sp.	-	X	-	-	-	-	-	-	-
Mollusca	-	Bivalvia	Autobranchia	Mytilida	Mytilidae	Dacrydiinae	*Dacrydium vitreum*	X	-	-	-	-	X	-	X	-
Mollusca	-	Bivalvia	Autobranchia	Mytilida	Mytilidae	Musculinae	*Musculus discors*	X	X	X	X	X	X	X	X	X
Mollusca	-	Bivalvia	Autobranchia	Mytilida	Mytilidae	Musculinae	*Musculus niger*	-	X	-	-	X	-	X	X	-
Mollusca	-	Bivalvia	Autobranchia	Mytilida	Mytilidae	Musculinae	*Musculus* sp.	X	-	-	-	Y	-	Y	X	Y
Mollusca	-	Bivalvia	Autobranchia	Mytilida	Mytilidae	Mytilinae	*Mytilus edulis*	-	X	-	-	-	-	-	-	-
Mollusca	-	Bivalvia	Autobranchia	Mytilida	Mytilidae	Mytilinae	*Mytilus* sp.	-	-	-	-	X	-	-	-	-
Mollusca	-	Bivalvia	Autobranchia	Pectinida	-	-	Pectinoidea indet.	-	-	-	-	Y	-	-	-	Y
Mollusca	-	Bivalvia	Autobranchia	Pectinida	Pectinidae	-	Pectinidae indet.	-	-	-	-	Y	X	-	X	-
Mollusca	-	Bivalvia	Autobranchia	Pectinida	Pectinidae	Pedinae	*Chlamys islandica*	-	-	X	X	X	X	X	X	X
Mollusca	-	Bivalvia	Autobranchia	Pectinida	Propeamussiidae	-	Propeamussiidae indet.	-	-	-	-	Y	X	Y	Y	Y
Mollusca	-	Bivalvia	Autobranchia	Pectinida	Propeamussiidae	-	*Similipecten greenlandicus*	X	-	X	X	X	X	X	X	X
Mollusca	-	Bivalvia	Protobranchia	Nuculanida	-	-	Nuculanida indet.	-	-	-	-	-	-	Y	-	-
Mollusca	-	Bivalvia	Protobranchia	Nuculanida	-	-	Nuculanoidea indet.	-	-	-	-	Y	X	-	X	Y
Mollusca	-	Bivalvia	Protobranchia	Nuculanida	Nuculanidae	Nuculaninae	*Nuculana minuta*	-	X	X	X	X	X	X	X	X
Mollusca	-	Bivalvia	Protobranchia	Nuculanida	Nuculanidae	Nuculaninae	*Nuculana pernula*	X	X	X	X	X	X	X	X	X
Mollusca	-	Bivalvia	Protobranchia	Nuculanida	Nuculanidae	Nuculaninae	*Nuculana* sp.	-	-	X	-	Y	X	Y	Y	Y
Mollusca	-	Bivalvia	Protobranchia	Nuculanida	Yoldiidae	-	*Portlandia arctica*	X	X	X	X	X	-	X	X	-
Mollusca	-	Bivalvia	Protobranchia	Nuculanida	Yoldiidae	-	*Yoldiella frigida*	-	-	-	-	-	X	X	X	X
Mollusca	-	Bivalvia	Protobranchia	Nuculanida	Yoldiidae	-	*Yoldiella intermedia*	-	-	-	-	-	X	X	-	X
Mollusca	-	Bivalvia	Protobranchia	Nuculanida	Yoldiidae	-	*Yoldiella lenticula*	X	-	-	-	-	X	-	-	-
Mollusca	-	Bivalvia	Protobranchia	Nuculanida	Yoldiidae	-	*Yoldiella nana*	X	-	-	-	-	-	-	-	-
Mollusca	-	Bivalvia	Protobranchia	Nuculanida	Yoldiidae	-	*Yoldiella* sp.	-	-	-	-	-	-	-	Y	Y
Mollusca	-	Bivalvia	Protobranchia	Nuculanida	Yoldiidae	-	Yoldiidae indet.	-	-	-	-	Y	X	Y	Y	Y
Mollusca	-	Bivalvia	Protobranchia	Nuculida	Nuculidae	-	*Ennucula tenuis*	X	-	-	-	X	X	X	X	X
Mollusca	-	Bivalvia	Protobranchia	Nuculida	Nuculidae	-	*Nucula* sp.	-	-	X	-	-	-	-	-	-
Mollusca	-	Bivalvia	Protobranchia	Nuculida	Nuculidae	-	*Pronucula tenuis*	-	X	X	X	-	-	-	-	-
Mollusca	-	Caudofoveata	-	-	-	-	Caudofoveata indet.	-	-	-	-	-	-	-	Y	Y
Mollusca	-	Caudofoveata	-	Chaetodermatida	Chaetodermatidae	-	*Chaetoderma* sp.	-	-	X	X	X	X	X	X	X
Mollusca	-	Gastropoda	-	-	-	-	Gastropoda indet.	-	-	X	-	Y	X	Y	X	Y
Mollusca	-	Gastropoda	-	-	-	-	Gastropoda sp. A	-	-	-	X	-	-	-	-	-
Mollusca	-	Gastropoda	Caenogastropoda	Littorinimorpha	Capulidae	-	*Ariadnaria borealis*	-	-	X	X	X	X	X	X	X
Mollusca	-	Gastropoda	Caenogastropoda	Littorinimorpha	Naticidae	-	*Naticidae (juvenile)*	-	-	X	-	-	-	-	-	-
Mollusca	-	Gastropoda	Caenogastropoda	Littorinimorpha	Naticidae	-	Naticidae indet.	-	-	-	-	-	-	Y	X	Y
Mollusca	-	Gastropoda	Caenogastropoda	Littorinimorpha	Naticidae	Naticinae	*Cryptonatica affinis*	-	-	X	X	X	X	-	-	X
Mollusca	-	Gastropoda	Caenogastropoda	Littorinimorpha	Naticidae	Naticinae	*Euspira pallida*	X	-	-	-	X	X	X	X	X
Mollusca	-	Gastropoda	Caenogastropoda	Littorinimorpha	Naticidae	Polinicinae	*Bulbus* sp.	-	X	-	-	-	-	-	-	-
Mollusca	-	Gastropoda	Caenogastropoda	Littorinimorpha	Rissoidae	-	*Boreocingula castanea*	-	X	-	X	-	X	X	X	X
Mollusca	-	Gastropoda	Caenogastropoda	Littorinimorpha	Rissoidae	-	Rissoidae indet.	-	-	-	-	X	X	Y	Y	Y
Mollusca	-	Gastropoda	Caenogastropoda	Littorinimorpha	Skeneopsidae	-	*Skeneopsis planorbis*	-	X	-	-	-	-	-	-	-
Mollusca	-	Gastropoda	Caenogastropoda	Littorinimorpha	Velutinidae	-	Velutinidae indet.	-	-	-	-	X	X	-	-	-
Mollusca	-	Gastropoda	Caenogastropoda	Neogastropoda	Buccinidae	-	Buccinidae indet.	-	-	-	-	Y	X	Y	-	Y
Mollusca	-	Gastropoda	Caenogastropoda	Neogastropoda	Buccinidae	-	*Buccinum ciliatum*	-	-	-	-	-	-	X	-	-
Mollusca	-	Gastropoda	Caenogastropoda	Neogastropoda	Buccinidae	-	*Buccinum hydrophanum*	-	-	-	-	-	X	X	X	-
Mollusca	-	Gastropoda	Caenogastropoda	Neogastropoda	Buccinidae	-	Colus sp.	-	-	-	-	X	X	-	-	-
Mollusca	-	Gastropoda	Caenogastropoda	Neogastropoda	Buccinidae	-	*Volutopsius norwegicus*	-	-	-	-	X	X	-	-	-
Mollusca	-	Gastropoda	Caenogastropoda	Neogastropoda	Cancellariidae	Admetinae	*Admete viridula*	-	-	-	X	-	X	X	X	-
Mollusca	-	Gastropoda	Caenogastropoda	Neogastropoda	Columbellidae	-	Columbellidae indet.	-	-	-	-	-	X	-	-	-
Mollusca	-	Gastropoda	Caenogastropoda	Neogastropoda	Mangeliidae	-	Mangeliidae indet.	-	-	-	-	-	-	Y	X	Y
Mollusca	-	Gastropoda	Caenogastropoda	Neogastropoda	Mangeliidae	-	*Oenopota* sp.	-	-	-	X	-	X	-	-	-
Mollusca	-	Gastropoda	Caenogastropoda	Neogastropoda	Mangeliidae	-	*Oenopota violacea*	-	X	X	X	-	-	-	-	-
Mollusca	-	Gastropoda	Caenogastropoda	Neogastropoda	Mangeliidae	-	*Propebela* sp.	-	-	-	-	X	-	-	-	-
Mollusca	-	Gastropoda	Caenogastropoda	Neogastropoda	Mangeliidae	-	*Propepela nobilis*	-	-	-	X	-	-	-	-	-
Mollusca	-	Gastropoda	Caenogastropoda	Neogastropoda	Turridae	-	Turridae indet.	X	-	-	-	X	-	-	-	-
Mollusca	-	Gastropoda	Heterobranchia	Cephalaspidea	-	-	Cephalaspidea indet.	-	-	-	-	Y	X	Y	X	Y
Mollusca	-	Gastropoda	Heterobranchia	Cephalaspidea	Cylichnidae	-	*Cylichna alba*	X	-	X	X	-	X	X	X	X
Mollusca	-	Gastropoda	Heterobranchia	Cephalaspidea	Cylichnidae	-	*Cylichna gouldi*	-	-	X	X	-	-	-	-	-
Mollusca	-	Gastropoda	Heterobranchia	Cephalaspidea	Cylichnidae	-	*Cylichna* sp.	-	-	-	-	X	X	Y	X	Y
Mollusca	-	Gastropoda	Heterobranchia	Cephalaspidea	Cylichnidae	-	Cylichnidae indet.	-	-	-	-	Y	X	Y	X	Y

Appendix 8A-1

Benthic Infauna Taxa Presence/Absence from Survey Years 2010-2021

Phylum	Subphylum	Class	Subclass	Order	Family	Subfamily	Taxa	2010	2013	2015	2016	2017	2018	2019	2020	2021
Mollusca	-	Gastropoda	Heterobranchia	Cephalaspidea	Cylichnidae	-	*Cylichnoides occultus*	X	-	-	-	X	X	X	X	-
Mollusca	-	Gastropoda	Heterobranchia	Cephalaspidea	Philinidae	Philininae	Philininae indet.	-	-	-	-	-	-	X	X	-
Mollusca	-	Gastropoda	Heterobranchia	Cephalaspidea	Retusidae	-	*Retusa obtusa*	-	X	-	-	-	-	-	-	-
Mollusca	-	Gastropoda	Heterobranchia	Cephalaspidea	Retusidae	-	*Retusa* sp.	-	-	-	-	-	-	-	Y	-
Mollusca	-	Gastropoda	Heterobranchia	Cephalaspidea	Retusidae	-	Retusidae indet.	-	X	-	-	-	-	-	-	-
Mollusca	-	Gastropoda	Heterobranchia	Cephalaspidea	Tornatinidae	-	*Acteocina canaliculata*	X	-	-	-	-	-	-	-	-
Mollusca	-	Gastropoda	Heterobranchia	Cephalaspidea	Tornatinidae	-	*Acteocina* sp.	-	-	-	-	X	-	X	X	-
Mollusca	-	Gastropoda	Patellogastropoda	-	-	-	Patellogastropoda indet.	-	X	X	-	Y	-	-	X	Y
Mollusca	-	Gastropoda	Patellogastropoda	-	Lepetidae	-	*Lepeta caeca*	X	X	X	X	X	X	X	X	X
Mollusca	-	Gastropoda	Patellogastropoda	-	Lottiidae	-	*Erginus rubellus*	-	-	-	-	-	-	X	-	-
Mollusca	-	Gastropoda	Patellogastropoda	-	Lottiidae	-	Lottiidae indet.	-	-	-	-	X	X	-	-	-
Mollusca	-	Gastropoda	Patellogastropoda	-	Lottiidae	-	*Testudinalia testudinalis*	X	X	X	-	-	X	-	-	-
Mollusca	-	Gastropoda	Vetigastropoda	Trochida	Colloniidae	Moelleriinae	*Moelleria costulata*	-	-	-	-	X	X	-	X	-
Mollusca	-	Gastropoda	Vetigastropoda	Trochida	Margaritidae	-	*Margarites groenlandicus*	-	X	X	X	X	X	X	-	X
Mollusca	-	Gastropoda	Vetigastropoda	Trochida	Margaritidae	-	*Margarites helicinus*	-	-	-	-	X	X	X	X	-
Mollusca	-	Gastropoda	Vetigastropoda	Trochida	Margaritidae	-	*Margarites olivaceus*	X	-	-	-	-	X	-	X	-
Mollusca	-	Gastropoda	Vetigastropoda	Trochida	Margaritidae	-	*Margarites* sp.	-	-	-	-	Y	X	Y	Y	-
Mollusca	-	Gastropoda	Vetigastropoda	Trochida	Trochidae	-	Trochidae indet.	X	-	-	-	X	X	-	-	-
Mollusca	-	Polyplacophora	-	-	-	-	Polyplacophora indet.	-	-	-	-	Y	-	-	-	-
Mollusca	-	Polyplacophora	Neoloricata	Chitonida	Tonicellidae	Tonicellinae	*Tonicella marmorea*	X	-	X	X	X	X	X	X	X
Mollusca	-	Scaphopoda	-	Gadilida	Gadilidae	-	Gadilidae indet.							Y	X	-
Mollusca	-	Scaphopoda	-	Gadilida	Gadilidae	-	*Siphonodentalium lobatum*	-	-	-	-	-	-	X	X	X
Mollusca	Aculifera	Aplacophora	-	-	-	-	Aplacophora indet.	-	-	-	-	X	X	-	-	-
Nematoda	-	-	-	-	-	-	Nematoda indet.	-	-	-	-	-	-	-	X	-
Nemertea	-	-	-	-	-	-	Nemertea indet.	-	X	X	X	Y	X	Y	X	Y
Nemertea	-	Hoplonemertea	-	-	-	-	Hoplonemertea indet.	-	-	-	-	-	-	Y	X	Y
Nemertea	-	Hoplonemertea	-	Monostilifera	Amphiporidae	-	Amphiporus sp.	-	-	-	-	-	-	-	X	-
Nemertea	-	Hoplonemertea	-	Monostilifera	Tetrastemmatidae	-	*Tetrastemma* sp.	-	-	-	-	X	-	X	-	-
Nemertea	-	Hoplonemertea	-	Monostilifera	Tetrastemmatidae	-	Tetrastemmatidae indet.	-	-	-	-	-	-	-	Y	-
Nemertea	-	Nemertea incertae sedis	-	-	-	-	Nermertea incertae sedis indet. (Anopla)	-	-	-	-	Y	X	-	-	-
Nemertea	-	Nemertea incertae sedis	-	-	-	-	Nermertea incertae sedis indet. (Enopla)	-	-	-	-	Y	X	-	-	-
Nemertea	-	Palaeonemertea	-	Archinemertea	Cephalotrichidae	-	*Cephalothrix* sp.	-	-	-	-	X	X	X	X	X
Nemertea	-	Palaeonemertea	-	Carinomiformes	Carinomidae	-	*Carinoma* sp.	-	-	-	-	-	X	-	X	-
Nemertea	-	Palaeonemertea	-	Tubulaniformes	Tubulanidae	-	*Tubulanus* sp.	-	-	-	-	-	X	X	X	-
Nemertea	-	Pilidiophora	-	Heteronemertea	-	-	Heteronemertea indet.	-	-	-	-	-	-	Y	-	Y
Nemertea	-	Pilidiophora	-	Heteronemertea	Lineidae	-	*Cerebratulus* sp.	-	X	X	-	X	X	X	X	-
Nemertea	-	Pilidiophora	-	Heteronemertea	Lineidae	-	Lineidae indet.	-	-	-	-	-	-	Y	X	Y
Nemertea	-	Pilidiophora	-	Heteronemertea	Lineidae	-	*Lineus* sp.	-	-	-	-	-	-	X	X	-
Platyhelminthes	-	-	-	-	-	-	Platyhelminthes indet.	-	-	-	-	X	X	-	-	-
Porifera	-	Calcarea	-	-	-	-	Calcarea indet.*	-	-	-	-	X	X	X	X	-
Porifera	-	Demospongiae	-	-	-	-	Demospongiae indet.	-	-	-	-	-	-	-	X	X
Priapulida	-	-	-	-	-	-	Priapulida indet.	-	X	-	-	-	-	Y	Y	Y
Priapulida	-	-	-	Prapulomorpha	Priapulidae	-	*Priapulus caudatus*	X	-	X	X	X	X	-	X	-
Priapulida	-	-	-	Prapulomorpha	Priapulidae	-	*Priapulus* sp.	-	-	-	-	Y	X	Y	Y	Y
Sipuncula	-	-	-	-	-	-	Sipuncula indet.	-	-	X	X	-	-	-	-	-
Sipuncula	-	Sipunculidea	-	Golfingiida	Golfingiidae	-	*Golfingia* sp.	-	-	-	-	X	X	X	X	X
Sipuncula	-	Sipunculidea	-	Golfingiida	Golfingiidae	-	Golfingiidae indet.	-	-	-	-	-	-	Y	X	Y
Sipuncula	-	Sipunculidea	-	Golfingiida	Golfingiidae	-	*Nephasoma* sp.	-	-	-	-	X	-	X	X	-
XXXX	-	-	-	-	-	-	Cyclostomatida indet.	-	-	-	-	-	-	Y	-	-
							# New Unique Taxa each year	135	84	53	50	113	47	41	34	16
							TOTAL # Taxa (COUNT)	135	147	156	188	237	320	318	370	266

APPENDIX 8A-2

Benthic Infauna Lab Data

biologica

Total abundance data in matrix format, including total taxa (species richness) count per sample, total abundance per sample and total density (organsisms/m^2) for Golder Baffinland Iron Mine MEEMP, 2021.

Biologica Sample ID										mb21-042-001	mb21-042-002	mb21-042-003	mb21-042-004	mb21-042-005	mb21-042-006	mb21-042-007	mb21-042-008	mb21-042-009	mb21-042-010	mb21-042-011	mb21-042-012	mb21-042-013	mb21-042-014	mb21-042-015	mb21-042-016	mb21-042-017
Client Sample ID										SE-1	SE-3	SE-5	SE-6	SW-1	SW-2	SW-3	SW-4	SW-5	SNE-1	SNE-2	SNE-3	SNE-4	SNW-1	SNW-2	SNW-3	SNW-4
Date Sampled										14-Aug-21	18-Aug-21	18-Aug-21	16-Aug-21	16-Aug-21	14-Aug-21	10-Aug-21	9-Aug-21	9-Aug-21	18-Aug-21	18-Aug-21	18-Aug-21	16-Aug-21	17-Aug-21	17-Aug-21	10-Aug-21	10-Aug-21
								Grand Total		Total	Total	Total	Total	Total	Total	Total	Total	Total	Total	Total	Total	Total	Total	Total	Total	Total
taxcode	grpcode	Phylum	Class	Order	Family	Subfamily	Taxon Name	Unique Taxa	Abundance	Abundance	Abundance	Abundance	Abundance	Abundance	Abundance	Abundance	Abundance	Abundance	Abundance	Abundance	Abundance	Abundance	Abundance	Abundance	Abundance	Abundance
ARTH	CRTA	Arthropoda	Malacostraca	Tanaidacea	Akanthophoreidae		Akanthophoreus sp.	1	752	16	48	112	224				160	32	16			16	16		16	96
MISC	BRYO	Bryozoa	Gymnolaemata	Ctenostomatida	Alcyonidiidae		Alcyonidium sp.	1	18											1		17				
ARTH	CRAM	Arthropoda	Malacostraca	Amphipoda	Ampeliscidae		Ampelisca eschrichtii	1	2	1		1														
ANNE	POSE	Annelida	Polychaeta	Terebellida	Ampharetidae	Ampharetinae	Ampharete petersenae	1	48	16	16						16									
ANNE	POSE	Annelida	Polychaeta	Terebellida	Ampharetidae	Ampharetinae	Ampharete sp.		160			112			32	16										
ANNE	POSE	Annelida	Polychaeta	Terebellida	Ampharetidae		Ampharetidae indet.		128						16				32			16			16	48
ANNE	POSE	Annelida	Polychaeta	Terebellida	Ampharetidae		Amphicteis sundevalli	1	2									1					1			
ARTH	CRAM	Arthropoda	Malacostraca	Amphipoda			Amphipoda indet.		64									16		16		16				16
ANNE	POSE	Annelida	Polychaeta	Terebellida	Terebellidae	Terebellinae	Amphitrite cirrata	1	3		1							1	1							
ARTH	CRAM	Arthropoda	Malacostraca	Amphipoda	Uristidae		Anonyx lilljeborgi	1	4						2	2										
ARTH	CRAM	Arthropoda	Malacostraca	Amphipoda	Uristidae		Anonyx sp.		64				16	16		16										16
ANNE	POSE	Annelida	Polychaeta	Terebellida	Cirratulidae		Aphelochaeta sp.	1	352						80		176								96	
ANNE	POSE	Annelida	Polychaeta	Spionida	Apistobranchidae		Apistobranchus sp.	1	16								16									
MOLL	MOGA	Mollusca	Gastropoda	Littorinimorpha	Capulidae		Ariadnaria borealis	1	16				16													
ANNE	POSE	Annelida	Polychaeta		Paraonidae		Aricidea hartmanae	1	528	16				32		32	128		48	48	16		48	80	64	16
ANNE	POSE	Annelida	Polychaeta		Paraonidae		Aricidea minuta	1	752	80	64	80				80	240	160	16				32			
ANNE	POSE	Annelida	Polychaeta		Paraonidae		Aricidea nolani	1	176	16	16	16		16			16	48					16	16		16
ANNE	POSE	Annelida	Polychaeta		Paraonidae		Aricidea sp.		128		16									16	32	16	32	16		
MISC	URAS	Chordata	Ascidiacea	Phlebobranchia	Ascidiidae		Ascidia sp.	1	1									1								
MISC	URAS	Chordata	Ascidiacea				Ascidiacea indet.		32													16				16
MOLL	MOBI	Mollusca	Bivalvia	Carditida	Astartidae		Astarte borealis	1	542	70	117	44	96	36		9	68	51	31				19	1		
MOLL	MOBI	Mollusca	Bivalvia	Carditida	Astartidae		Astarte montagui	1	1,504	171	413	269	185	32		7	118	137	24	37	10	13	68	8	9	3
MOLL	MOBI	Mollusca	Bivalvia	Carditida	Astartidae		Astarte sp.		544	32	80	64	32			16	80	48	112	16	16		32		16	
MOLL	MOBI	Mollusca	Bivalvia	Lucinida	Thyasiridae		Axinopsida sp.	1	16											16						
ARTH	CRCI	Arthropoda	Thecostraca	Balanomorpha			Balanomorpha indet.	1	825	115				582	112					16						
MOLL	MOBI	Mollusca	Bivalvia	Venerida	Arcidae		Bathyarca glacialis	1	28											3	9	10		5	1	
MOLL	MOBI	Mollusca	Bivalvia				Bivalvia indet.		320	16	32	48	48	16		32		32	32		16		48			
MOLL	MOGA	Mollusca	Gastropoda	Littorinimorpha	Rissoidae		Boreocingula castanea	1	64		32	16						16								
MISC	BRAC	Brachiopoda					Brachiopoda indet.	1	1													1				
ARTH	CRCU	Arthropoda	Malacostraca	Cumacea	Diastylidae		Brachydiastylis resima	1	1,600		16	64	1,216				256					48				
MISC	BRYO	Bryozoa					Bryozoa indet.		2													2				
MOLL	MOGA	Mollusca	Gastropoda	Neogastropoda	Buccinidae		Buccinidae indet.	1	48		16		16					16								
ANNE	POSE	Annelida	Polychaeta	Sabellida	Serpulidae	Spirorbinae	Bushiella sp.	1	3											2		1				
ARTH	CRAM	Arthropoda	Malacostraca	Amphipoda	Ampeliscidae		Byblis sp.	1	16															16		
ANNE	POER	Annelida	Polychaeta	Phyllodocida	Polynoidae	Polynoinae	Bylgides sarsi	1	32										32							
ARTH	CRCO	Arthropoda	Hexanauplia	Calanoida			Calanoida indet.	1	16						16											
MISC	BRYO	Bryozoa	Gymnolaemata	Cheilostomatida	Calloporidae		Callopora sp.	1	1													1				
MISC	BRYO	Bryozoa	Gymnolaemata	Gymnolaemata	Calloporidae		Calloporidae indet.	1	16													16				
MISC	CNHY	Cnidaria	Hydrozoa	Leptothecata	Campanulinidae		Calycella sp.	1	16													16				
MISC	CNHY	Cnidaria	Hydrozoa	Leptothecata	Campanulariidae		Campanulariidae indet.	1	16										16							
ARTH	CRCU	Arthropoda	Malacostraca	Cumacea	Nannastacidae		Campylaspis rubicunda	1	16																	16
MISC	BRYO	Bryozoa	Gymnolaemata	Cheilostomatida	Candidae		Candidae indet.		16											16						
ANNE	POSE	Annelida	Polychaeta		Capitellidae		Capitella capitata complex	1	144					80	48			16								
MOLL	MOBI	Mollusca	Bivalvia	Cardiida	Cardiidae		Cardiidae indet.		48				16			16		16								
MOLL	MOAP	Mollusca	Caudofoveata				Caudofoveata indet.		16												16					
MISC	BRYO	Bryozoa	Gymnolaemata	Cheilostomatida	Calloporidae		Cauloramphus sp.	1	4				3									1				
MOLL	MOGA	Mollusca	Gastropoda	Cephalaspidea			Cephalaspidea indet.		16											16						
MISC	NTEA	Nemertea	Palaeonemertea	Archinemertea	Cephalothricidae		Cephalothrix sp.	1	64	32								16								16
MOLL	MOAP	Mollusca	Caudofoveata	Chaetodermatida	Chaetodermatidae		Chaetoderma sp.	1	64												32				16	16
ANNE	POSE	Annelida	Polychaeta	Terebellida	Cirratulidae		Chaetozone bathyala	1	2,000	288	352	160		80		128	512	208	176					16	16	64
ANNE	POSE	Annelida	Polychaeta	Terebellida	Cirratulidae		Chaetozone careyi	1	416						80	336										
ANNE	POSE	Annelida	Polychaeta	Terebellida	Cirratulidae		Chaetozone pigmentata	1	306	32	16		2				160	48							16	32
ANNE	POSE	Annelida	Polychaeta	Terebellida	Cirratulidae		Chaetozone setosa complex	1	64								32	32								
ANNE	POSE	Annelida	Polychaeta	Terebellida	Cirratulidae		Chaetozone sp.		1,552	96	96	48		80	32	288	320	128	80	16		16		48	160	144
MISC	BRYO	Bryozoa	Gymnolaemata	Cheilostomatida			Cheilostomatida indet.		34		16									9	2	4		3		
MOLL	MOBI	Mollusca	Bivalvia	Pectinida	Pectinidae	Pedinae	Chlamys islandica	1	1	1																
ANNE	POSE	Annelida	Polychaeta	Sabellida	Sabellidae	Sabellinae	Chone sp.	1	16				16													
MOLL	MOBI	Mollusca	Bivalvia	Cardiida	Cardiidae	Clinocardiinae	Ciliatocardium ciliatum	1	29	1	17	4	2				3	2								
ANNE	POSE	Annelida	Polychaeta	Terebellida	Cirratulidae		Cirratulidae indet.		1,600	16	128	112	80	64	128	160	320		48	16	48		176	80	112	112
ANNE	POSE	Annelida	Polychaeta	Terebellida	Pectinariidae		Cistenides granulata	1	442	81	35	114	48			48	77	39								
ANNE	POSE	Annelida	Polychaeta		Maldanidae	Euclymeninae	Clymenura sp.	1	128			16									32	16			16	48
ARTH	CRAM	Arthropoda	Malacostraca	Amphipoda	Corophiidae		Corophiidae indet.		16							16										
ANNE	POSE	Annelida	Polychaeta		Cossuridae		Cossura longocirrata	1	1,232	48	128	48		16		80	416	176	48	48	16			16	160	32
ARTH	CRAM	Arthropoda	Malacostraca	Amphipoda	Corophiidae	Corophiinae	Crassicorophium sp.	1	16		16															
MISC	BRYO	Bryozoa	Gymnolaemata	Cheilostomatida	Cribrilinidae		Cribrilina sp.	1	1													1				
MISC	BRYO	Bryozoa	Stenolaemata	Cyclostomatida	Crisiidae		Crisia sp.	1	16													16				
MOLL	MOGA	Mollusca	Gastropoda	Littorinimorpha	Naticidae	Naticinae	Cryptonatica affinis	1	3		1		1						1							
MOLL	MOBI	Mollusca	Bivalvia	Anomalodesmata	Cuspidariidae		Cuspidaria sp.	1	16											16						
ARTH	CRCO	Arthropoda	Hexanauplia	Cyclopoida			Cyclopoida indet.	1	288					32		16	128	48	16			32		16		
MOLL	MOGA	Mollusca	Gastropoda	Cephalaspidea	Cylichnidae		Cylichna alba	1	16													16				
MOLL	MOGA	Mollusca	Gastropoda	Cephalaspidea	Cylichnidae		Cylichna sp.		48		16						16								16	
MOLL	MOGA	Mollusca	Gastropoda	Cephalaspidea	Cylichnidae		Cylichnidae indet.		304		80		48				32	96			16		16	16		
ARTH	CROS	Arthropoda	Ostracoda	Podocopida	Cytheridae		Cytheridae indet.	1	48			48														
MISC	PORI	Porifera	Demospongiae				Demospongiae indet.	1	2													2				
ARTH	CRIS	Arthropoda	Malacostraca	Isopoda	Desmosomatidae		Desmosomatidae indet.	1	32											16	16					
ANNE	POSE	Annelida	Polychaeta	Sabellida	Sabellidae		Dialychone sp. 1	1	160	16			16				96	32								
ARTH	CRCU	Arthropoda	Malacostraca	Cumacea	Diastylidae		Diastylidae indet.		32									16	16							
ARTH	CRCU	Arthropoda	Malacostraca	Cumacea	Diastylidae		Diastylis goodsiri	1	145				80							32	1	16			16	
ARTH	CRCU	Arthropoda	Malacostraca	Cumacea	Diastylidae		Diastylis lucifera	1	32			32														
ARTH	CRCU	Arthropoda	Malacostraca	Cumacea	Diastylidae		Diastylis rathkei	1	128				16				16	48	32				16			
ARTH	CRCU	Arthropoda	Malacostraca	Cumacea	Diastylidae		Diastylis scorpioides	1	160		48	16			16				32				32		16	
ARTH	CRCU	Arthropoda	Malacostraca	Cumacea	Diastylidae		Diastylis spinulosa	1	16										16							
ARTH	CRCU	Arthropoda	Malacostraca	Cumacea	Diastylidae		Diastyloides biplicatus	1	304	32	32						16	32	192							
ANNE	POSE	Annelida	Polychaeta	Terebellida	Flabelligeridae		Diplocirrus hirsutus	1	48				16								16			16		
ANNE	POSE	Annelida	Polychaeta	Spionida	Spionidae		Dipolydora quadrilobata	1	112				16		96											
ARTH	CRAM	Arthropoda	Malacostraca	Amphipoda	Dulichiidae		Dulichiidae indet.	1	16								16									
ANNE	ANOL	Annelida	Clitellata	Enchytraeida	Enchytraeidae		Enchytraeidae indet.	1	96		16			32	32				16							
MOLL	MOBI	Mollusca	Bivalvia	Nuculida	Nuculidae		Ennucula tenuis	1	1,218	16	2		32				16	48	16	160	144	64	144	192	160	224

MISC	BRYO	Bryozoa	Gymnolaemata	Cheilostomatida	Escharellidae		Escharella sp.	1	2													1		1		
MISC	BRYO	Bryozoa	Gymnolaemata	Cheilostomatida	Exochellidae		Escharoides sp.	1	16													16				
ANNE	POER	Annelida	Polychaeta	Phyllodocida	Phyllodocidae	Eteoninae	Eteone longa complex	1	48												16	16			16	
ANNE	POER	Annelida	Polychaeta	Phyllodocida	Phyllodocidae	Eteoninae	Eteone sp.		48			16		16									16			
ANNE	POSE	Annelida	Polychaeta	Sabellida	Sabellidae	Sabellinae	Euchone incolor	1	864	96	64	64		16		64	416	144								
ANNE	POSE	Annelida	Polychaeta	Sabellida	Sabellidae	Sabellinae	Euchone sp.		17				1													16
ANNE	POSE	Annelida	Polychaeta		Maldanidae	Euclymeninae	Euclymeninae indet.		160															32	32	96
ARTH	CRCU	Arthropoda	Malacostraca	Cumacea	Leuconidae		Eudorella emarginata	1	16															16		
ARTH	CRCU	Arthropoda	Malacostraca	Cumacea	Leuconidae		Eudorella sp.		80		16		32											32		
ARTH	CRCU	Arthropoda	Malacostraca	Cumacea	Leuconidae		Eudorella truncatula	1	64			32													32	
MOLL	MOGA	Mollusca	Gastropoda	Littorinimorpha	Naticidae	Polinicinae	Euspira pallida	1	1																	1
ANNE	POER	Annelida	Polychaeta	Phyllodocida	Syllidae	Exogoninae	Exogone naidina	1	208	32		48	64												16	48
ANNE	POSE	Annelida	Polychaeta	Sabellida	Fabriciidae		Fabriciidae indet.		16													16				
ANNE	POSE	Annelida	Polychaeta	Sabellida	Oweniidae		Galathowenia oculata	1	324											96		33	32	1	81	81
MOLL	MOGA	Mollusca	Gastropoda				Gastropoda indet.		32		16							16								
ANNE	POER	Annelida	Polychaeta	Phyllodocida	Polynoidae	Polynoinae	Gattyana cirrhosa	1	19		3	3	2		1		6	3			1					
ANNE	POER	Annelida	Polychaeta	Phyllodocida	Glyceridae		Glycera sp.	1	16																16	
ARTH	CRIS	Arthropoda	Malacostraca	Isopoda	Gnathiidae		Gnathia sp.	1	80											32		32				16
MISC	SIPN	Sipuncula	Sipunculidea	Golfingiida	Golfingiidae		Golfingia sp.	1	32										16						16	
MISC	SIPN	Sipuncula	Sipunculidea	Golfingiida	Golfingiidae		Golfingiidae indet.		80												16				16	48
ARTH	CRAM	Arthropoda	Malacostraca	Amphipoda	Dexaminoidae	Prophliantinae	Guernea nordenskioldi	1	3,312	336	576	480	480		32	16	448	752	160		16	32				
ARTH	CRAM	Arthropoda	Malacostraca	Amphipoda	Ampeliscidae		Haploops tubicola	1	49	16	16								16	1						
ANNE	POER	Annelida	Polychaeta	Phyllodocida	Polynoidae	Polynoinae	Harmothoe imbricata	1	18	1								17								
ANNE	POER	Annelida	Polychaeta	Phyllodocida	Polynoidae	Polynoinae	Harmothoe rarispina	1	16									16								
ANNE	POER	Annelida	Polychaeta	Phyllodocida	Polynoidae	Polynoinae	Harmothoe sp.		128		16	16	16				32		32					16		
ARTH	CRCO	Arthropoda	Hexanauplia	Harpacticoida			Harpacticoida indet.	1	32						32											
ARTH	CRAM	Arthropoda	Malacostraca	Amphipoda	Phoxocephalidae	Harpiniinae	Harpinia serrata	1	48														16	32		
ANNE	POER	Annelida	Polychaeta	Phyllodocida	Hesionidae		Hesionidae indet.		32										32							
MISC	NTEA	Nemertea	Pilidiophora	Heteronemertea			Heteronemertea indet.		32		32															
MOLL	MOBI	Mollusca	Bivalvia	Adapedonta	Hiatellidae		Hiatella arctica	1	662	10	72	50	45	44	102	67	185	61	23		1	1				1
ARTH	CRAM	Arthropoda	Malacostraca	Amphipoda	Tryphosidae		Hippomedon propinqvus	1	2					2												
MISC	NTEA	Nemertea	Hoplonemertea				Hoplonemertea indet.	1	64	64																
ANNE	POSE	Annelida	Polychaeta	Terebellida	Cirratulidae		Kirkegaardia sp.	1	32								32									
ARTH	CRCU	Arthropoda	Malacostraca	Cumacea	Lampropidae		Lamprops fuscatus	1	1,872	160	272	144	208	32	112	96	432	400					16			
ANNE	POSE	Annelida	Polychaeta	Terebellida	Terebellidae	Terebellinae	Lanassa venusta venusta	1	16			16														
ANNE	POSE	Annelida	Polychaeta	Terebellida	Terebellidae	Terebellinae	Laphania boecki	1	16							16										
MOLL	MOBI	Mollusca	Bivalvia	Galeommatida	Lasaeidae		Lasaeidae indet.	1	16													16				
ANNE	POSE	Annelida	Polychaeta	Terebellida	Terebellidae	Terebellinae	Leaena ebranchiata	1	17				1					16								
ANNE	POSE	Annelida	Polychaeta		Orbiniidae	Orbiniinae	Leitoscoloplos sp.	1	336										64	16	32		32	80	48	64
MOLL	MOGA	Mollusca	Gastropoda		Lepetidae		Lepeta caeca	1	47										4	24			1	1	1	16
MISC	CNHY	Cnidaria	Hydrozoa	Leptothecata			Leptothecata indet.		16		16															
ARTH	CRCU	Arthropoda	Malacostraca	Cumacea	Leuconidae		Leucon nasica	1	128	128																
ARTH	CRCU	Arthropoda	Malacostraca	Cumacea	Leuconidae		Leucon nasicoides	1	1,200		80	48				16	464	368	144			16		32	16	16
ARTH	CRCU	Arthropoda	Malacostraca	Cumacea	Leuconidae		Leucon sp.		80		80															
ARTH	CRCU	Arthropoda	Malacostraca	Cumacea	Leuconidae		Leuconidae indet.		16																16	
MISC	NTEA	Nemertea	Pilidiophora	Heteronemertea	Lineidae		Lineidae indet.	1	144	32				16	16	16		32							16	16
ANNE	POER	Annelida	Polychaeta	Eunicida	Lumbrineridae		Lumbrineridae indet.		48									16			32					
ANNE	POER	Annelida	Polychaeta	Eunicida	Lumbrineridae		Lumbrineris fauchaldi	1	128	112						16										
MOLL	MOBI	Mollusca	Bivalvia	Anomalodesmata	Lyonsiidae		Lyonsia arenosa	1	1				1													
ARTH	CRAM	Arthropoda	Malacostraca	Amphipoda	Lysianassidae		Lysianassidae indet.		32	32																
ARTH	CRAM	Arthropoda	Malacostraca	Amphipoda	Lysianassoidea		Lysianassoidea indet.		272		48	16	16	16	32	32		112								
MOLL	MOBI	Mollusca	Bivalvia	Cardiida	Tellinidae	Macominae	Macoma calcarea	1	273	1	20		38	18		5	7	22	19	29	13	10	7	58	13	13
MOLL	MOBI	Mollusca	Bivalvia	Cardiida	Tellinidae	Macominae	Macoma moesta	1	71	1	8	19	6	2		3	8	8		1	4	2	2	2	2	3
MOLL	MOBI	Mollusca	Bivalvia	Cardiida	Tellinidae	Macominae	Macoma sp.		32		32															
MOLL	MOBI	Mollusca	Bivalvia	Cardiida	Tellinidae	Macominae	Macominae indet.		435	16		48	16					80	64	113		1		16	49	32
ANNE	POSE	Annelida	Polychaeta		Maldanidae	Maldaninae	Maldane sarsi	1	1,243		208		82			65	274	96	16	48	48	97		49	99	161
ANNE	POSE	Annelida	Polychaeta		Maldanidae		Maldanidae indet.		48								16				32					
MOLL	MOGA	Mollusca	Gastropoda	Neogastropoda	Mangeliidae		Mangeliidae indet.	1	16														16			
ANNE	POSE	Annelida	Polychaeta	Spionida	Spionidae		Marenzelleria sp.	1	64						48	16										
MOLL	MOGA	Mollusca	Gastropoda	Trochida	Margaritidae		Margarites groenlandicus	1	3	1			1						1							
ANNE	POSE	Annelida	Polychaeta		Capitellidae		Mediomastus sp.	1	880	16	64	80	16	32	48	160	192	128	48		16	16			48	16
ANNE	POSE	Annelida	Polychaeta	Terebellida	Ampharetidae	Melinninae	Melinna elisabethae	1	133												18	32	17	2	16	48
ANNE	POSE	Annelida	Polychaeta		Maldanidae	Euclymeninae	Microclymene sp.	1	32	16														16		
ANNE	POER	Annelida	Polychaeta	Phyllodocida	Nephtyidae		Micronephthys cornuta	1	1,553	128	97	48	48			16	176	224	112	32	48	48	160	144	240	32
MISC	CNHY	Cnidaria	Hydrozoa	Limnomedusae	Monobrachiidae		Monobrachium parasitum	1	73	1			2			1	21	2	17	6	4	2	2	5	4	6
ARTH	CRAM	Arthropoda	Malacostraca	Amphipoda	Oedicerotidae		Monoculodes sp.	1	240	16			16		32		80	64	16					16		
ARTH	CRAM	Arthropoda	Malacostraca	Amphipoda	Oedicerotidae		Monoculopsis longicornis	1	96							96										
ARTH	CRAM	Arthropoda	Malacostraca	Amphipoda	Oedicerotidae		Monoculopsis sp.		48					16			16						16			
MOLL	MOBI	Mollusca	Bivalvia	Mytilida	Mytilidae	Musculinae	Musculus discors	1	1	1																
MOLL	MOBI	Mollusca	Bivalvia	Mytilida	Mytilidae		Musculus sp.		32									32								
MOLL	MOBI	Mollusca	Bivalvia	Myida	Myidae		Mya sp.		97		32					16	1	16	16				16			
MOLL	MOBI	Mollusca	Bivalvia	Myida	Myidae		Mya truncata	1	183	4	57	41	22	3	5	7	10	7	25				2			
ANNE	POSE	Annelida	Polychaeta	Sabellida	Oweniidae		Myriochele heeri	1	19															1		18
ANNE	POSE	Annelida	Polychaeta	Sabellida	Oweniidae		Myriochele sp.		144											16		64	32	32		
ECHI	ECHO	Echinodermata	Holothuroidea	Apodida	Myriotrochidae		Myriotrochus rinkii	1	17																	17
MOLL	MOBI	Mollusca	Bivalvia	Mytilida	Mytilidae		Mytilidae indet.		16													16				
ANNE	ANOL	Annelida	Clitellata	Haplotaxida	Naididae		Naididae indet.	1	48		32				16											
MOLL	MOGA	Mollusca	Gastropoda	Littorinimorpha	Naticidae		Naticidae indet.		16								16									
MISC	NTEA	Nemertea					Nemertea indet.		32									32								
ANNE	POER	Annelida	Polychaeta	Phyllodocida	Nephtyidae		Nephtys ciliata	1	5					1			1						1	2		
ANNE	POER	Annelida	Polychaeta	Phyllodocida	Nephtyidae		Nephtys sp.		16												16					
ANNE	POER	Annelida	Polychaeta	Phyllodocida	Hesionidae		Nereimyra aphroditoides	1	736	96	240	32	16	16	32		112	32	160							
ANNE	POER	Annelida	Polychaeta	Phyllodocida	Nereididae	Nereidinae	Nereis zonata	1	134	1	36	1	4				26	65	1							
ANNE	POER	Annelida	Polychaeta	Eunicida	Onuphidae	Onuphinae	Nothria conchylega	1	194											4	5	33		4	37	111
ANNE	POSE	Annelida	Polychaeta		Capitellidae		Notomastus sp.	1	83						16							35			32	
MOLL	MOBI	Mollusca	Bivalvia	Nuculanida	Nuculanidae	Nuculaninae	Nuculana minuta	1	293	32	129	48	32				50	2								
MOLL	MOBI	Mollusca	Bivalvia	Nuculanida	Nuculanidae	Nuculaninae	Nuculana pernula	1	53		1							2		16	1		17			16
MOLL	MOBI	Mollusca	Bivalvia	Nuculanida	Nuculanidae		Nuculana sp.		432	32	48	64					48	80	32	48	16		32		16	16
MOLL	MOBI	Mollusca	Bivalvia	Nuculanida			Nuculanoidea indet.		112								16	16		32		16		32		
ARTH	CHPY	Arthropoda	Pycnogonida	Pantopoda	Nymphonidae		Nymphon sp.	1	2													1			1	
ARTH	CRAM	Arthropoda	Malacostraca	Amphipoda	Oedicerotidae		Oedicerotidae indet.		96	16			32										48			
ANNE	POSE	Annelida	Polychaeta		Opheliidae		Ophelia sp.	1	16						16											
ANNE	POSE	Annelida	Polychaeta		Opheliidae	Ophelininae	Ophelina sp.	1	48	16		16														16
ECHI	ECOP	Echinodermata	Ophiuroidea	Ophiurida	Ophiuridae	Ophiurinae	Ophiocten affinis	1	19	1														7	6	5
ECHI	ECOP	Echinodermata	Ophiuroidea	Ophiurida	Ophiuridae	Ophiurinae	Ophiura robusta	1	36	2	2							6	2	18			1	5		
ECHI	ECOP	Echinodermata	Ophiuroidea	Ophiurida	Ophiuridae	Ophiurinae	Ophiura sarsii	1	30		1			1			5	2		3	10	1		2	5	
ECHI	ECOP	Echinodermata	Ophiuroidea	Ophiurida	Ophiuridae	Ophiurinae	Ophiura sp.		28									16		2	4	3		2	1	
ECHI	ECOP	Echinodermata	Ophiuroidea	Ophiurida	Ophiuridae	Ophiurinae	Ophiuridae indet.		80		16											48			16	

ECHI	ECOP	Echinodermata	Ophiuroidea				Ophiuroidea indet.		96										16		32	32			16	
ARTH	CRAM	Arthropoda	Malacostraca	Amphipoda	Opisidae		Opisa sp.	1	16										16							
ARTH	CRAM	Arthropoda	Malacostraca	Amphipoda	Tryphosidae		Orchomene sp.	1	16									16								
ARTH	CRAM	Arthropoda	Malacostraca	Amphipoda	Tryphosidae		Orchomenella minuta	1	32								32									
ANNE	POSE	Annelida	Polychaeta	Sabellida	Oweniidae		Owenia fusiformis	1	117				18						16	32	48	1	1			1
ANNE	POSE	Annelida	Polychaeta	Sabellida	Oweniidae		Oweniidae indet.		48												32				16	
ANNE	POSE	Annelida	Polychaeta	Terebellida	Terebellidae		Paramphitrite birulai	1	16	16																
ARTH	CRAM	Arthropoda	Malacostraca	Amphipoda	Oedicerotidae		Paroediceros lynceus	1	32					16											16	
MOLL	MOGA	Mollusca	Gastropoda				Patellogastropoda indet.	1	16													16				
MOLL	MOBI	Mollusca	Bivalvia	Pectinida			Pectinoidea indet.		48										16		32					
MOLL	MOBI	Mollusca	Bivalvia		Periplomatidae		Periploma aleuticum	1	6		1	1						1	1	1				1		
ARTH	CROS	Arthropoda	Ostracoda	Myodocopida	Philomedidae		Philomedes sp.	1	8,048	528	704	784	160		16	48	1,040	1,584	192	432	240	96	320	720	848	336
ANNE	POER	Annelida	Polychaeta	Phyllodocida	Pholoidae		Pholoe longa	1	2,659	289	112	192	64	16	129	304	976	497	64				16			
ANNE	POER	Annelida	Polychaeta	Phyllodocida	Pholoidae		Pholoe minuta	1	8,908	1,660	1,488	976	256	32	16	64	2,352	992	448	32		64	64		224	240
ANNE	POER	Annelida	Polychaeta	Phyllodocida	Pholoidae		Pholoe sp.		2,944	16	144	176	144				96	624	544	128	192	320	176	176	160	48
ANNE	POER	Annelida	Polychaeta	Phyllodocida	Phyllodocidae	Phyllodocinae	Phyllodoce groenlandica	1	16						16											
ANNE	POER	Annelida	Polychaeta	Phyllodocida	Phyllodocidae	Phyllodocinae	Phyllodoce sp.		16					16												
ANNE	POER	Annelida	Polychaeta	Phyllodocida	Phyllodocidae		Phyllodocidae indet.		32						32											
ANNE	POSE	Annelida	Polychaeta	Sabellida	Serpulidae	Spirorbinae	Pileolaria sp.	1	1											1						
ANNE	POER	Annelida	Polychaeta	Phyllodocida	Syllidae	Eusyllinae	Pionosyllis sp.	1	48								48									
ANNE	POSE	Annelida	Polychaeta	Terebellida	Terebellidae	Terebellinae	Pista maculata	1	81	21	9	6	6				16	19	4							
ARTH	CRIS	Arthropoda	Malacostraca	Isopoda	Paramunnidae		Pleurogonium spinosissimum	1	32														32			
MISC	URAS	Chordata	Ascidiacea	Stolidobranchia	Styelidae		Polycarpa sp.	1	4		1		1					2								
ANNE	POSE	Annelida	Polychaeta	Terebellida	Terebellidae	Polycirrinae	Polycirrus sp. complex	1	176	16							16	80		16					16	32
ANNE	POER	Annelida	Polychaeta	Phyllodocida	Polynoidae	Polynoinae	Polynoinae indet.		128	16					16	32		16						32	16	
ANNE	POSE	Annelida	Polychaeta		Scalibregmatidae		Polyphysia baffinensis	1	1								1									
ARTH	CRAM	Arthropoda	Malacostraca	Amphipoda	Pontogeneiidae		Pontoporeia femorata	1	64	16	16	32														
ANNE	POSE	Annelida	Polychaeta		Maldanidae	Euclymeninae	Praxillella gracilis	1	16																16	
MISC	PRIA	Cephalorhyncha	Priapulida				Priapulida indet.		64		16	16					16			16						
MISC	PRIA	Cephalorhyncha	Priapulida	Priapulomorpha	Priapulidae		Priapulus sp.	1	1										1							
ANNE	POSE	Annelida	Polychaeta	Spionida	Spionidae		Prionospio sp.	1	352								16		16						240	80
MOLL	MOBI	Mollusca	Bivalvia	Pectinida	Propeamussiidae		Propeamussiidae indet.		1								1									
ANNE	POSE	Annelida	Polychaeta	Sabellida	Fabriciidae		Pseudofabricia sp. nr. aberrans	1	32																32	
MISC	BRYO	Bryozoa	Gymnolaemata	Cheilostomatida	Smittinidae		Pseudoflustra sp.	1	1													1				
ARTH	CRTA	Arthropoda	Malacostraca	Tanaidacea	Sphyrapodidae	Pseudosphyrapodinae	Pseudosphyrapus anomalus	1	640										240				272	128		
ARTH	CRTA	Arthropoda	Malacostraca	Tanaidacea	Pseudotanaidae		Pseudotanais sp.	1	224	16		48	16				64				32	16		32		
ANNE	POSE	Annelida	Polychaeta	Spionida	Spionidae		Pygospio elegans	1	208	80	32					48	48									
MOLL	MOGA	Mollusca	Gastropoda	Littorinimorpha	Rissoidae		Rissoidae indet.		48	16		32														
ARTH	CRAM	Arthropoda	Malacostraca	Amphipoda	Oedicerotidae		Rostroculodes longirostris	1	32									32								
ARTH	CRAM	Arthropoda	Malacostraca	Amphipoda	Oedicerotidae		Rostroculodes sp.		224	16	32	16	32			32	16	48				16	16			
ANNE	POSE	Annelida	Polychaeta	Sabellida	Sabellidae		Sabellidae indet.		176			96	16							16	16		16		16	
ANNE	POSE	Annelida	Polychaeta	Sabellida	Sabellidae		Sabellidae sp. 3	1	32						16											16
ARTH	CRDE	Arthropoda	Malacostraca	Decapoda	Crangonidae		Sabinea septemcarinata	1	1															1		
ARTH	CRDE	Arthropoda	Malacostraca	Decapoda	Crangonidae		Sabinea sp.		1									1								
ANNE	POSE	Annelida	Polychaeta		Scalibregmatidae		Scalibregma inflatum	1	1,329	208	48	96				16	401	416	96	16	16			16		
MISC	BRYO	Bryozoa	Gymnolaemata	Cheilostomatida	Bitectiporidae		Schizomavella sp.	1	1																1	
MISC	BRYO	Bryozoa	Gymnolaemata	Cheilostomatida			Schizoporelloidea indet.		2															1	1	
ANNE	POSE	Annelida	Polychaeta	Spionida	Spionidae		Scolelepis sp.	1	144					32	96	16										
ANNE	POER	Annelida	Polychaeta	Eunicida	Lumbrineridae		Scoletoma fragilis	1	720	16		16			16		32	16	16		96		64	112	256	80
ANNE	POER	Annelida	Polychaeta	Eunicida	Lumbrineridae		Scoletoma impatiens	1	768		128	256		16			224	128	16							
ANNE	POER	Annelida	Polychaeta	Eunicida	Lumbrineridae		Scoletoma sp.		720	96	16		16			48				48		288	32	32	112	32
ANNE	POSE	Annelida	Polychaeta		Orbiniidae	Orbiniinae	Scoloplos armiger	1	144						32	32	32	48								
ANNE	POSE	Annelida	Polychaeta		Orbiniidae	Orbiniinae	Scoloplos sp.		240	32	16	32	48			32	16	48	16							
MOLL	MOBI	Mollusca	Bivalvia	Cardiida	Cardiidae	Clinocardiinae	Serripes groenlandicus	1	87	7	2	6	21		48		3									
MOLL	MOBI	Mollusca	Bivalvia	Pectinida	Propeamussiidae		Similipecten greenlandicus	1	327	1	1			5	4		16	3	6	100			62	65		64
MOLL	MOSC	Mollusca	Scaphopoda	Gadilida	Gadilidae		Siphonodentalium lobatum	1	32											16						16
MISC	BRYO	Bryozoa	Gymnolaemata	Cheilostomatida	Smittinidae		Smittina sp.	1	1													1				
ANNE	POER	Annelida	Polychaeta	Phyllodocida	Sphaerodoridae		Sphaerodoropsis biserialis	1	48												16	16				16
ANNE	POER	Annelida	Polychaeta	Phyllodocida	Sphaerodoridae		Sphaerodoropsis minuta	1	32											16			16			
ANNE	POSE	Annelida	Polychaeta	Spionida	Spionidae		Spio filicornis	1	64	16	16	16						16								
ANNE	POSE	Annelida	Polychaeta	Spionida	Spionidae		Spio sp.		400	16					256	112		16								
ANNE	POSE	Annelida	Polychaeta	Spionida	Spionidae		Spionidae indet.		288		16		16	144	64	32		16								
ARTH	CRAM	Arthropoda	Malacostraca	Amphipoda	Stenothoidae	Stenothoinae	Stenothoidae indet.	1	32				32													
MISC	BRYO	Bryozoa	Gymnolaemata	Cheilostomatida	Fatkullinidae		Stomacrustula pachystega	1	1											1						
ECHI	ECEC	Echinodermata	Echinoidea	Camarodonta	Strongylocentrotidae		Strongylocentrotus droebachiensis	1	8	3	1	1	1				1	1								
ECHI	ECEC	Echinodermata	Echinoidea	Camarodonta	Strongylocentrotidae		Strongylocentrotus sp.		1										1							
ANNE	POSE	Annelida	Polychaeta	Terebellida	Terebellidae		Terebellidae indet.		32											16					16	
ANNE	POSE	Annelida	Polychaeta	Terebellida	Trichobranchidae	Trichobranchinae	Terebellides sp.	1	629	48	39	67	66				102	275			16			16		
MOLL	MOBI	Mollusca	Bivalvia	Anomalodesmata	Thraciidae		Thracia myopsis	1	3											2			1			
MOLL	MOBI	Mollusca	Bivalvia	Anomalodesmata	Thraciidae		Thracia sp.		16												16					
MOLL	MOBI	Mollusca	Bivalvia	Lucinida	Thyasiridae		Thyasira sp.	1	448		80					64	64	48	32		32	32	48	48		
MOLL	MOBI	Mollusca	Bivalvia	Lucinida	Thyasiridae		Thyasiridae indet.		336	16	32			32		16	16	48	80	16		16	32			32
MOLL	MOPO	Mollusca	Polyplacophora	Chitonida	Tonicellidae	Tonicellinae	Tonicella marmorea	1	2	1			1													
MISC	BRYO	Bryozoa	Gymnolaemata	Cheilostomatida	Candidae		Tricellaria sp.	1	1											1						
MISC	BRYO	Bryozoa	Stenolaemata	Cyclostomatida	Tubuliporidae		Tubulipora sp.	1	17											1		16				
ARTH	CRAM	Arthropoda	Malacostraca	Amphipoda	Oedicerotidae		Westwoodilla sp.	1	112		80						32									
MOLL	MOBI	Mollusca	Bivalvia	Nuculanida	Yoldiidae		Yoldiella frigida	1	128											16	32				16	64
MOLL	MOBI	Mollusca	Bivalvia	Nuculanida	Yoldiidae		Yoldiella intermedia	1	64											16						48
MOLL	MOBI	Mollusca	Bivalvia	Nuculanida	Yoldiidae		Yoldiella sp.		64											16						48
MOLL	MOBI	Mollusca	Bivalvia	Nuculanida	Yoldiidae		Yoldiidae indet.		16													16				
							Total Abundance		**72,441**	**5,790**	**7,226**	**5,619**	**4,352**	**1,654**	**1,987**	**2,918**	**12,217**	**9,436**	**3,906**	**2,008**	**1,619**	**1,940**	**2,346**	**2,563**	**3,847**	**3,013**
							Total Unique Taxa (Species Richness)	**190**																		
							Grab Sampler		**Van veen**	**Van veen**	**Van veen**	**Van veen**	**Van veen**	**Van veen**	**Van veen**	**Van veen**	**Van veen**	**Van veen**	**Van veen**	**Van veen**	**Van veen**	**Van veen**	**Van veen**	**Van veen**	**Van veen**	**Van veen**
							# of Composite Grabs		**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
							Total Density (Organisms/m^2)		**241,470**	**19,300**	**24,087**	**18,730**	**14,507**	**5,513**	**6,623**	**9,727**	**40,723**	**31,453**	**13,020**	**6,693**	**5,397**	**6,467**	**7,820**	**8,543**	**12,823**	**10,043**
Fish:																										
MISC	PIXX	Chordata	Actinopterygii (Pisces)				Pisces indet.	1	16													16				
Incidental Taxa:																										
MEMO	MEMO	Annelida	Polychaeta	Sabellida	Oweniidae		Owenia sp. (fragment)		16															16		
MEMO	MEMO	Arthropoda	Hexanauplia				Copepoda indet. (parasitic)		35	3	16		16													
MEMO	MEMO	Arthropoda	Malacostraca	Decapoda	Crangonidae		Crangonidae indet. (fragment)		1								1									
MEMO	MEMO	Arthropoda	Ostracoda				Ostracoda indet. (planktonic)		9,632	752	960	688	624	352	80		2,176	1,664	464	160	224	176	512	80	192	528
MEMO	MEMO	Arthropoda	Thecostraca	Balanomorpha			Balanomorpha indet. (planktonic)		16					16												
MEMO	MEMO	Nematoda					Nematoda indet.		19,152	1,504	1,136	2,928	1,200	336	176	352	2,688	1,760	416	448	1,264	736	528	464	2,448	768
MEMO	MEMO	Nemertea					Nemertea indet. (fragment)		1				1													
MEMO	MEMO						Egg/egg mass		352		48	80					48	16			16			144		

APPENDIX 8A-3

Laboratory Methods

Marine Benthic Enumeration and Identification Methods
Client: Golder
Project: Baffinland Iron Mine MEEMP, 2021
Protocol: EEM

Sample Inventory

Sample arrival: 15-Sept-21
Number of samples: 17
Number of jars: 34
Screen size: 500 µm and 1.0 cm
Biologica project number: 21-042

The chain of custody documents were checked and approved with the client. Samples were transferred from formalin into 70% ethanol and stained with Rose Bengal to aid in sorting. Each sample was provided a unique identification number and placed in the queue for analysis.

Table 1. Summary of benthic samples processed for Golder Baffinland Iron Mine MEEMP, 2021

Client Sample ID	Date Sampled	Biologica Sample ID	# of Jars	Field Screen	Field Split	Final Split	Organisms Counted
SE-1	14-Aug-21	mb21-042-001	1	500 µm	1/4	1/16	343
			2	1.0 cm	Whole	Whole	302
SE-3	18-Aug-21	mb21-042-002	1	500 µm	1/4	1/16	441
			2	1.0 cm	Whole	Whole	170
SE-5	18-Aug-21	mb21-042-003	1	500 µm	1/4	1/16	339
			1	1.0 cm	Whole	Whole	195
SE-6	16-Aug-21	mb21-042-004	1	500 µm	1/4	1/16	260
			2	1.0 cm	Whole	Whole	192
SW-1	16-Aug-21	mb21-042-005	2	500 µm	1/4	1/16	92
			2	1.0 cm	Whole	Whole	182
SW-2	14-Aug-21	mb21-042-006	1	500 µm	1/4	1/16	122
			1	1.0 cm	Whole	Whole	35
SW-3	10-Aug-21	mb21-042-007	1	500 µm	1/4	1/16	178
			1	1.0 cm	Whole	Whole	70
SW-4	9-Aug-21	mb21-042-008	1	500 µm	1/4	1/16	745
			2	1.0 cm	Whole	Whole	297
SW-5	9-Aug-21	mb21-042-009	1	500 µm	1/4	1/16	577
			2	1.0 cm	Whole	Whole	204
SNE-1	18-Aug-21	mb21-042-010	2	500 µm	1/4	1/16	240
			2	1.0 cm	Whole	Whole	66
SNE-2	18-Aug-21	mb21-042-011	1	500 µm	1/4	1/16	120
			2	1.0 cm	Whole	Whole	88
SNE-3	18-Aug-21	mb21-042-012	1	500 µm	1/4	1/16	97
			2	1.0 cm	Whole	Whole	67

Client Sample ID	Date Sampled	Biologica Sample ID	# of Jars	Field Screen	Field Split	Final Split	Organisms Counted
SNE-4	16-Aug-21	mb21-042-013	1	500 µm	1/4	1/16	117
			2	1.0 cm	Whole	Whole	84
SNW-1	17-Aug-21	mb21-042-014	1	500 µm	1/4	1/16	143
			1	1.0 cm	Whole	Whole	58
SNW-2	17-Aug-21	mb21-042-015	1	500 µm	1/4	1/16	156
			1	1.0 cm	Whole	Whole	67
SNW-3	10-Aug-21	mb21-042-016	2	500 µm	1/4	1/16	237
			2	1.0 cm	Whole	Whole	55
SNW-4	10-Aug-21	mb21-042-017	2	500 µm	1/4	1/16	185
			1	1.0 cm	Whole	Whole	53

Sample Processing

Sorting and Subsampling:

All samples were sorted using dissecting microscopes at 10–40x magnification by trained personnel. Microscopic sorting is the only way to ensure >90% of organisms are removed from the debris, which is required by EEM (Environment Canada; Environmental Effects Monitoring) guidelines for marine benthic analyses. To minimize potential sorter bias, samples were distributed among technicians such that no one person sorted all the replicates of a given sample.

Due to historically the large volumes and high abundances in the samples, samples were fractioned in the field into a 1.0 cm macro fraction and 500 µm fine fraction. This strategy was developed to maximize the detection of large and rare individuals in the macro fraction while accurately enumerating smaller organisms in the fine fraction. The macro 1.0 cm fraction was analyzed whole, with all large organisms (>1.0 cm) removed from the sample, as was done in 2020. The abundances of these large organisms should be comparable to historical estimates (SEM Ltd., 2016; Biologica, 2017–2019). In addition, all large debris in this fraction were checked microscopically, including rocks and other large debris to ensure encrusting organisms were accurately enumerated.

Biologica subsampled the fine 500 µm fraction. The 500 µm fraction was split in the field to 1/4. Biologica subsequently split this fraction by a second 1/4, for a final 1/16 split. Subsampling was done with a Caton tray (Caton, 1991). The sample was spread evenly over a Caton grid, and sequential random quadrats were selected and sorted until the minimum 1/4 split was reached.

Sorting QA/QC:

To ensure sorting efficiency was >95%, whole and/or partial sub-samples were re-sorted. Sorting efficiency was calculated using the following equation (where total count = final total number of organisms in sample):

Sorting efficiency = [1−(# of organisms in spotcheck or re-sort / total organisms)] x 100

*Total organisms includes the original count and the number found from the re-sort

Sorting efficiency QA/QC was performed on 18% of samples. 25–100% of the debris was re-sorted for the selected samples. All samples checked must meet or exceed 95% sorting efficiency. Any samples falling below 95% sorting efficiency were re-sorted in their entirety, and additional checks were undertaken as necessary. For quality assurance, QA re-sorts were performed on 10% of samples. Two samples were randomly selected and re-sorted in their entirety. Refer to Table 2 for sorting efficiency results.

Table 2. Summary of sorting QA/QC results for Golder Baffinland Iron Mine MEEMP, 2021.

Client Sample ID	Biologica Sample ID	Sorting Efficiency QA Whole Re-sorts
SE-1	mb21-042-001	
SE-3	mb21-042-002	
SE-5	mb21-042-003	
SE-6	mb21-042-004	
SW-1	mb21-042-005	
SW-2	mb21-042-006	
SW-3	mb21-042-007	
SW-4	mb21-042-008	
SW-5	mb21-042-009	
SNE-1	mb21-042-010	
SNE-2	mb21-042-011	
SNE-3	mb21-042-012	98.23%
SNE-4	mb21-042-013	
SNW-1	mb21-042-014	
SNW-2	mb21-042-015	98.81%
SNW-3	mb21-042-016	
SNW-4	mb21-042-017	
	Average:	**98.52%**

Identification and Invasive Species Detection:

All organisms were identified using a combination of dissecting (10–40x) and compound microscopes (100–1000x) and standard taxonomic keys (see methodological and taxonomic references) to the lowest practicable level (species whenever possible). All specimens were archived in air-tight glass vials with glycerin and 70% ethanol for long-term storage. Taxonomic data were recorded in Biologica's custom database.

During the identification process, taxonomists recorded if any identified taxa were beyond their recorded range and/or potentially introduced (originating from another location) or invasive (both introduced and appearing to proliferate with possible detrimental effects to the ecosystem and/or industry). One genus of interest, *Marenzelleria,* is currently under review and awaiting verification by DNA analysis. Taxa previously identified as *Marenzelleria sp.* (identified as *M. viridis* by an unnamed taxonomist from the laboratory of Phillipe Archembault, Laval University) from 2019 and 2020 were sent for external verification to Vasily Radashevsky from the National Scientific Center of Marine Biology. Dr. Radashevsky hypothesized that there are 2 possible species present, *M. neglecta* and *M. wireni*. Until these identifications are confirmed the specimens have been left at the confirmed genus level. No other taxa observed were identified as putative invasive taxa.

Data Management and Analysis

All data were recorded in Biologica's custom database. Total abundances were extrapolated for samples split in the field to represent the abundance from the whole sample. Organism densities were calculated by dividing the total organism abundance (extrapolated if the sample was split) using the area of a Van Veen grab (0.1 m^2), with three composite Van Veen grabs (3 x 0.1m^2) for each sample.

Results were provided to the Golder project manager in Excel spreadsheets via email.

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APPENDIX 8B-1

Incidental Taxa Identifications

Appendix 8B-1

Incidental Taxa Identifications

Phylum Class/Order	Family	Taxa	Method
Acanthocephala			
-/-	-	Acanthocephala indet.	Stomach Contents
Annelida			
Polychaeta/-	-	Polychaeta indet.	Stomach Contents, Freight Dock Offset Monitoring
Polychaeta/Sabellida	Oweniidae	*Owenia* sp.	Incidentals
Polychaeta/Terebellida	Pectinariidae	*Cistenides granulata*	Freight Dock Offset Monitoring
Arthropoda			
-/-	-	Crustacea indet.	Stomach Contents
Hexanauplia/-	-	Copepoda indet.	Incidentals
Hexanauplia/Calanoida	-	Calanoida indet.	Stomach Contents
Hexanauplia/Calanoida	Calanidae	*Calanus glacialis*	Stomach Contents
Hexanauplia/Calanoida	Calanidae	*Calanus* sp.	Stomach Contents
Hexanauplia/Harpacticoida	-	Harpacticoida indet.	Stomach Contents
Insecta/-	-	Insecta indet.	Stomach Contents
Insecta/Diptera	Chironomidae	***Hydrobaenus* sp.**	Stomach Contents
Insecta/Diptera	Simuliidae	**Simuliidae indet.**	Stomach Contents
Insecta/Diptera	Tipulidae	**Tipulidae indet.**	Stomach Contents
Insecta/Ephemeroptera	-	**Ephemeroptera indet.**	Stomach Contents
Malacostraca/Amphipoda	-	Amphipoda indet.	Stomach Contents
Malacostraca/Amphipoda	-	Hyperiidea indet.	Stomach Contents
Malacostraca/Amphipoda	Atylidae	Atylus carinatus	Stomach Contents
Malacostraca/Amphipoda	Atylidae	*Atylus* sp.	Stomach Contents
Malacostraca/Amphipoda	Eusiridae	*Rhachotropis aculeata*	Incidentals
Malacostraca/Amphipoda	Gammaridae	Gammaridae indet.	Stomach Contents
Malacostraca/Amphipoda	Gammaridae	*Gammarus sp.*	Stomach Contents
Malacostraca/Amphipoda	Hyperiidae	*Themisto libellula*	Stomach Contents
Malacostraca/Amphipoda	Hyperiidae	*Themisto sp.*	Stomach Contents
Malacostraca/Amphipoda	Oedcerotidae	Monoporeia affinis	Stomach Contents
Malacostraca/Amphipoda	Uristidae	*Anonyx sp.*	Stomach Contents
Malacostraca/Amphipoda	Uristidae	*Onisimus sp.*	Stomach Contents
Malacostraca/Decapoda	Crangonidae	Crangonidae indet.	Incidentals
Malacostraca/Mysida	Mysidae	*Mysis* sp.	Stomach Contents
Malacostraca/Mysida	-	Mysida indet.	Stomach Contents, Freight Dock Offset Monitoring
Pycnogonida/-	-	Pycnogonida indet.	Freight Dock Offset Monitoring
Ostracoda/-	-	Ostracoda indet.	Incidentals
Thecostraca/-	-	Cirripedia indet.	Stomach Contents
Thecostraca/Balanomorpha	-	Balanomorpha indet.	Incidentals, Stomach Contents, Freight Dock Offset Monitoring
Brachiopoda			
-/-	-	**Brachiopoda indet.**	Freight Dock Offset Monitoring
Bryozoa			
-/-	-	Bryozoa indet.	Freight Dock Offset Monitoring
Chlorophyta			
-/-	-	Chlorophyta indet.	Freight Dock Offset Monitoring
Ulvophyceae/Ulotrichales	Ulotrichaceae	***Urospora neglecta***	Algae Collections, Freight Dock Offset Monitoring
Ulvophyceae/Cladophorales	Cladophoraceae	***Chaetomorpha melagonium***	Algae Collections
Chordata			
-/-	-	Tunicata indet.	Freight Dock Offset Monitoring
Ascidiacea/-	-	Ascidiacea indet.	Stomach Contents
Ascidiacea/Phlebobranchia	Ascidiidae	*Ascidia* sp.	Incidentals
Ascidiacea/Stolidobranchia	Pyuridae	*Boltenia echinata*	Incidentals
Ascidiacea/Stolidobranchia	Styelidae	*Polycarpa* sp.	Incidentals
-/-	-	Pisces indet.	Stomach Contents, Incidentals
Actinopterygii/Gadiformes	Gadidae	Gadidae indet.	Fishing Efforts
Actinopterygii/Gadiformes	Gadidae	*Gadus ogac*	Fishing Efforts
Actinopterygii/Perciformes	Agonidae	***Aspidophoroides olrikii***	Fishing Efforts
Actinopterygii/Perciformes	Agonidae	***Leptagonus decagonus***	Fishing Efforts
Actinopterygii/Perciformes	Cottidae	Cottidae indet.	Fishing Efforts, Freight Dock Offset Monitoring
Actinopterygii/Perciformes	Cottidae	*Gymnocanthus tricuspis*	Fishing Efforts
Actinopterygii/Perciformes	Cottidae	*Myoxocephalus quadricornis*	Fishing Efforts
Actinopterygii/Perciformes	Cottidae	Myoxocephalus scorpioides	Fishing Efforts
Actinopterygii/Perciformes	Cottidae	*Myoxocephalus scorpius*	Fishing Efforts, Freight Dock Offset Monitoring
Actinopterygii/Perciformes	Cottidae	*Myoxocephalus* sp.	Fishing Efforts, Stomach Contents
Actinopterygii/Perciformes	Cottidae	***Triglops pingelii***	Fishing Efforts
Actinopterygii/Perciformes	Cyclopteridae	***Eumicrotremus spinosus***	Freight Dock Offset Monitoring
Actinopterygii/Perciformes	Liparidae	*Liparis* sp.	Fishing Efforts
Actinopterygii/Perciformes	Liparidae	*Liparidae indet.*	Fishing Efforts
Actinopterygii/Perciformes	Salmonidae	*Salvelinus alpinus*	Fishing Efforts
Actinopterygii/Perciformes	Zoarcidae	*Lycodes mucosus*	Fishing Efforts
Cnidaria			
Anthozoa/Actiniaria	-	Actiniaria indet.	Freight Dock Offset Monitoring
Ctenophora			
Tentaculata/Cydippida	Mertensiidae	*Mertensia ovum*	Freight Dock Offset Monitoring

Appendix 8B-1

Incidental Taxa Identifications

Echinodermata			
Echinoidea/Camarodonta	Strongylocentrotidae	*Strongylocentrotus droebachiens*	Incidentals, Freight Dock Offset Monitoring
Holothuroidea/Dendrochirotida	Psolidae	Psolidae indet.	Freight Dock Offset Monitoring
Ophiuroidea/Ophiurida	Ophiuridae	Ophiuridae indet.	Freight Dock Offset Monitoring
Mollusca			
Bivalvia/-	-	Bivalvia indet.	Stomach Contents
Bivalvia/Adapedonta	Hiatellidae	*Hiatella arctica*	Freight Dock Offset Monitoring
Bivalvia/Myida	Myidae	*Mya truncata*	Freight Dock Offset Monitoring
Bivalvia/Mytilida	-	Mytilida indet.	Freight Dock Offset Monitoring
Bivalvia/Pectinida	Pectinidae	*Chlamys islandica*	Freight Dock Offset Monitoring
Gastropoda/-	Lottiidae	Lottiidae indet.	Freight Dock Offset Monitoring
Gastropoda/Pteropoda	Limacinidae	*Limacina* sp.	Stomach Contents
Polyplacophora/Chitonida	Tonicellidae	*Tonicella* sp.	Freight Dock Offset Monitoring
Nematoda			
-/-	-	Nematoda indet.	Incidentals
Nemertea			
-/-	-	Nemertea indet.	Incidentals
Ochrophyta			
Phaeophyceae/-	-	Phaeophyceae indet.	Freight Dock Offset Monitoring
Phaeophyceae/Desmarestiales	Desmarestiaceae	***Desmarestia aculeata***	Algae Collections
Phaeophyceae/Desmarestiales	Desmarestiaceae	***Desmarestia viridis****	Algae Collections
Phaeophyceae/Ectocarpales	Acinetosporaceae	*Pylaiella* sp.	Freight Dock Offset Monitoring
Phaeophyceae/Ectocarpales	Acinetosporaceae	***Pylaiella* cf. *varia***	Algae Collections
Phaeophyceae/Ectocarpales	Chordariaceae	**cf. *Coelocladia arctica***	Algae Collections
Phaeophyceae/Ectocarpales	Chordariaceae	***Dictyosiphon foeniculaceus****	Algae Collections
Phaeophyceae/Ectocarpales	Scytosiphonaceae	**cf. *Petalonia***	Algae Collections
Phaeophyceae/Fucales	Fucaceae	*Fucus distichus*	Freight Dock Offset Monitoring/Algae Collections
Phaeophyceae/Laminariales	Agaraceae	*Agarum clathratum*	Freight Dock Offset Monitoring
Phaeophyceae/Laminariales	Laminariaceae	*Saccharina latissima*	Freight Dock Offset Monitoring
Phaeophyceae/Sphacelariales	Sphacelariaceae	*Battersia* sp.	Freight Dock Offset Monitoring
Phaeophyceae/Tilopteridales	Halosiphonaceae	*Halosiphon tomentosus**	Freight Dock Offset Monitoring/Algae Collections
Rhodophyta			
-/-	-	Rhodophyta indet.	Freight Dock Offset Monitoring
Florideophyceae/Ceramiales	Rhodomelaceae	***Rhodomela virgata***	Algae Collections
Florideophyceae/Ceramiales	Rhodomelaceae	***Savoiea arctica***	Algae Collections
Florideophyceae/Corallinales	-	Corallinales indet.	Freight Dock Offset Monitoring
Florideophyceae/Gigartinales	Dumontiaceae	***Dilsea socialis***	Algae Collections
Florideophyceae/Gigartinales	Phyllophoraceae	***Coccotylus truncatus***	Algae Collections
Florideophyceae/Palmariales	Palmariaceae	*Palmaria palmata*	Freight Dock Offset Monitoring

*In algae collections, additional samples were identified as cf. *Desmarestia viridis* cf. *Dictyosiphon foeniculaceus* and cf. *Halosiphon tomentosus*

Notes: taxa identified to the lowest practical taxonomic level; indet.= indeterminate (taxa which could not be identified beyond the taxonomic level listed); sp.=species; cf.=compare with (taxa is an inexact match to the designated taxa).

Taxa in bold indicate new observations in MEEMP and NIS/AIS programs

All taxa cross-referenced with NIS/AIS resources: Fofonoff et al. 2022, ISSG 2022, Rius et al. 2022, Molnar et al. 2008, Casas-Monroy et al. 2014

APPENDIX 8B-2

Quadrat Samples

biologica

Raw abundance data in long format for Golder Baffinlands, 2021 Quadrat Taxonomy.

Client	Project	Year	Sample Type	Split	Biologica Sample ID	Client Sample ID	Date Sampled	taxcode	grpcode	Phylum	Class	Order	Family	Subfamily	Taxon Name	A	Int	J	Total Abundance	Unique Taxa Count	Comments
Golder	Baffinlands	2021	Quadrat Taxonomy	Whole	mb21-042-036	Q3	15-Aug-21	ALGAE	ALGAE	Ochrophyta	Phaeophyceae	Ectocarpales	Chordariaceae		cf. Trachynema groenlandicum				Present	1	
Golder	Baffinlands	2021	Quadrat Taxonomy	Whole	mb21-042-036	Q3	15-Aug-21	ECHI	ECOP	Echinodermata	Ophiuroidea	Ophiurida	Ophiuridae	Ophiurinae	Ophiura robusta	3			3	1	
Golder	Baffinlands	2021	Quadrat Taxonomy	Whole	mb21-042-036	Q3	15-Aug-21	MISC	URAS	Chordata	Ascidiacea	Stolidobranchia	Pyuridae		Boltenia echinata	1			1	1	
Golder	Baffinlands	2021	Quadrat Taxonomy	Whole	mb21-042-037	Q4	6-Aug-21	ANNE	ANHI	Annelida	Clitellata				Hirudinea indet.	2			2	1	1.0 cm. Attached to shrimp, Sclerocrangon boreas
Golder	Baffinlands	2021	Quadrat Taxonomy	Whole	mb21-042-037	Q4	6-Aug-21	ARTH	CRDE	Arthropoda	Malacostraca	Decapoda	Crangonidae		Sclerocrangon boreas	1			1	1	Leech attached to leg. Possibly eggs from another organism attached to abdominal appendages, eggs are not from Sclerocrangon
Golder	Baffinlands	2021	Quadrat Taxonomy	Whole	mb21-042-037	Q4	6-Aug-21	MOLL	MOGA	Mollusca	Gastropoda	Neogastropoda	Buccinidae		Buccinum hydrophanum	1			1	1	
Golder	Baffinlands	2021	Quadrat Taxonomy	Whole	mb21-042-038	Q11	14-Aug-21	ALGAE	ALGAE	Ochrophyta	Phaeophyceae	Ectocarpales	Acinetosporaceae		Pylaiella cf. varia				Present	1	
Golder	Baffinlands	2021	Quadrat Taxonomy	Whole	mb21-042-038	Q11	14-Aug-21	ALGAE	ALGAE	Rhodophyta	Florideophyceae	Gigartinales	Phyllophoraceae		Coccotylus truncatus				Present	1	
Golder	Baffinlands	2021	Quadrat Taxonomy	Whole	mb21-042-038	Q11	14-Aug-21	ECHI	ECOP	Echinodermata	Ophiuroidea	Ophiurida	Ophiuridae	Ophiurinae	Ophiura sarsii	1			1	1	
Golder	Baffinlands	2021	Quadrat Taxonomy	Whole	mb21-042-038	Q11	14-Aug-21	MISC	URAS	Chordata	Ascidiacea	Stolidobranchia	Styelidae		Polycarpa sp.	1			1	1	
Golder	Baffinlands	2021	Quadrat Taxonomy	Whole	mb21-042-039	Q13	15-Aug-21	ALGAE	ALGAE	Chlorophyta	Ulvophyceae	Cladophorales	Cladophoraceae		Rhizoclonium cf. riparium				Present	1	
Golder	Baffinlands	2021	Quadrat Taxonomy	Whole	mb21-042-039	Q13	15-Aug-21	ALGAE	ALGAE	Ochrophyta	Phaeophyceae	Ectocarpales	Acinetosporaceae		Pylaiella cf. varia				Present	1	
Golder	Baffinlands	2021	Quadrat Taxonomy	Whole	mb21-042-039	Q13	15-Aug-21	ALGAE	ALGAE	Ochrophyta	Phaeophyceae	Ectocarpales	Chordariaceae		cf. Dictyosiphon ekmanii				Present	1	
Golder	Baffinlands	2021	Quadrat Taxonomy	Whole	mb21-042-039	Q13	15-Aug-21	ALGAE	ALGAE	Ochrophyta	Phaeophyceae	Ectocarpales	Chordariaceae		cf. Trachynema groenlandicum				Present	1	
Golder	Baffinlands	2021	Quadrat Taxonomy	Whole	mb21-042-039	Q13	15-Aug-21	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Hesionidae		Nereimyra aphroditoides	1	3		4	1	1.0 cm
Golder	Baffinlands	2021	Quadrat Taxonomy	Whole	mb21-042-039	Q13	15-Aug-21	Incidental	POER	Annelida	Polychaeta	Phyllodocida	Pholoidae		Pholoe minuta	3			3	1	Small ~5.0 mm
Golder	Baffinlands	2021	Quadrat Taxonomy	Whole	mb21-042-039	Q13	15-Aug-21	ANNE	POSE	Annelida	Polychaeta	Sabellida	Sabellidae	Sabellinae	Euchone sp.	2			2	1	~2.0 cm
Golder	Baffinlands	2021	Quadrat Taxonomy	Whole	mb21-042-039	Q13	15-Aug-21	ANNE	POSE	Annelida	Polychaeta		Capitellidae		Mediomastus sp.	1			1	1	1.0 cm
Golder	Baffinlands	2021	Quadrat Taxonomy	Whole	mb21-042-039	Q13	15-Aug-21	Encrusting	CRCI	Arthropoda	Thecostraca	Balanomorpha			Balanomorpha indet.			3	3	1	Small <5mm. Attached to bivalve
Golder	Baffinlands	2021	Quadrat Taxonomy	Whole	mb21-042-039	Q13	15-Aug-21	Encrusting	CRCI	Arthropoda	Thecostraca	Balanomorpha			Balanomorpha indet.			29	29		Small <5mm. Attached to Mytilus
Golder	Baffinlands	2021	Quadrat Taxonomy	Whole	mb21-042-039	Q13	15-Aug-21	Incidental	CRIS	Arthropoda	Malacostraca	Isopoda	Gnathiidae		Gnathia sp.		1		1	1	Small <5mm
Golder	Baffinlands	2021	Quadrat Taxonomy	Whole	mb21-042-039	Q13	15-Aug-21	Incidental	MOBI	Mollusca	Bivalvia	Mytilida	Mytilidae		Mytilidae indet.			1	1		Small <5mm
Golder	Baffinlands	2021	Quadrat Taxonomy	Whole	mb21-042-039	Q13	15-Aug-21	Incidental	POER	Annelida	Polychaeta	Phyllodocida	Hesionidae		Hesionidae indet.			13	13	1	Small <5mm. Possibly Nereimyra
Golder	Baffinlands	2021	Quadrat Taxonomy	Whole	mb21-042-039	Q13	15-Aug-21	Incidental	POSE	Annelida	Polychaeta	Spionida	Spionidae		Pygospio elegans	4			4	1	Small <5mm
Golder	Baffinlands	2021	Quadrat Taxonomy	Whole	mb21-042-039	Q13	15-Aug-21	MISC	NTEA	Nemertea	Pilidiophora	Heteronemertea	Lineidae		Lineidae indet.		1		1	1	1.0 cm
Golder	Baffinlands	2021	Quadrat Taxonomy	Whole	mb21-042-039	Q13	15-Aug-21	MOLL	MOBI	Mollusca	Bivalvia	Mytilida	Mytilidae		Mytilus edulis complex	1			1	1	
Golder	Baffinlands	2021	Quadrat Taxonomy	Whole	mb21-042-039	Q13	15-Aug-21	MOLL	MOGA	Mollusca	Gastropoda		Lottiidae		Testudinalia testudinalis		1		1	1	
Golder	Baffinlands	2021	Quadrat Taxonomy	Whole	mb21-042-040	Q14	16-Aug-21	ALGAE	ALGAE	Chlorophyta	Ulvophyceae	Acrosiphoniales	Acrosiphoniaceae		cf. Spongomorpha aeruginosa				Present	1	
Golder	Baffinlands	2021	Quadrat Taxonomy	Whole	mb21-042-040	Q14	16-Aug-21	ALGAE	ALGAE	Ochrophyta	Phaeophyceae	Ectocarpales	Acinetosporaceae		Pylaiella cf. varia				Present	1	
Golder	Baffinlands	2021	Quadrat Taxonomy	Whole	mb21-042-040	Q14	16-Aug-21	ALGAE	ALGAE	Ochrophyta	Phaeophyceae	Sphacelariales			Sphacelariales indet.				Present	1	Possibly Battersia cf. arctica, Protohalopteris radicans, or Sphaceloderma caespitulum
Golder	Baffinlands	2021	Quadrat Taxonomy	Whole	mb21-042-040	Q14	16-Aug-21	Incidental	POER	Annelida	Polychaeta	Phyllodocida	Hesionidae		Nereimyra aphroditoides	1			1	1	Small ~8.0 mm
Golder	Baffinlands	2021	Quadrat Taxonomy	Whole	mb21-042-040	Q14	16-Aug-21	Incidental	POER	Annelida	Polychaeta	Phyllodocida	Pholoidae		Pholoe minuta	1			1	1	Small ~4.5 mm
Golder	Baffinlands	2021	Quadrat Taxonomy	Whole	mb21-042-040	Q14	16-Aug-21	ANNE	POSE	Annelida	Polychaeta	Sabellida	Sabellidae	Sabellinae	Euchone sp.	2			2	1	~2.5-5.0 cm
Golder	Baffinlands	2021	Quadrat Taxonomy	Whole	mb21-042-040	Q14	16-Aug-21	Incidental	MOBI	Mollusca	Bivalvia	Mytilida	Mytilidae		Musculus sp.			1	1	1	Small <5mm
Golder	Baffinlands	2021	Quadrat Taxonomy	Whole	mb21-042-040	Q14	16-Aug-21	Incidental	MOBI	Mollusca	Bivalvia	Mytilida	Mytilidae		Mytilidae indet.			10	10		Small <5mm
Golder	Baffinlands	2021	Quadrat Taxonomy	Whole	mb21-042-040	Q14	16-Aug-21	Incidental	POER	Annelida	Polychaeta	Phyllodocida	Hesionidae		Hesionidae indet.			16	16	1	Small <5mm. Possibly Nereimyra
Golder	Baffinlands	2021	Quadrat Taxonomy	Whole	mb21-042-040	Q14	16-Aug-21	Incidental	POER	Annelida	Polychaeta	Phyllodocida	Phyllodocidae	Eteoninae	Eteoninae indet.			1	1	1	Small <5mm. Possibly Eteone
Golder	Baffinlands	2021	Quadrat Taxonomy	Whole	mb21-042-040	Q14	16-Aug-21	Incidental	POER	Annelida	Polychaeta	Phyllodocida	Polynoidae	Polynoinae	Harmothoe imbricata	1			1	1	Small <5mm
Golder	Baffinlands	2021	Quadrat Taxonomy	Whole	mb21-042-040	Q14	16-Aug-21	Incidental	POER	Annelida	Polychaeta	Phyllodocida	Polynoidae	Polynoinae	Polynoinae indet.			1	1		Small <5mm
Golder	Baffinlands	2021	Quadrat Taxonomy	Whole	mb21-042-040	Q14	16-Aug-21	Incidental	POSE	Annelida	Polychaeta	Spionida	Spionidae		Spionidae indet.			1	1	1	Small <5mm
Golder	Baffinlands	2021	Quadrat Taxonomy	Whole	mb21-042-040	Q14	16-Aug-21	MOLL	MOBI	Mollusca	Bivalvia	Cardiida	Cardiidae	Clinocardiinae	Serripes groenlandicus		1		1	1	Damaged/crushed
Golder	Baffinlands	2021	Quadrat Taxonomy	Whole	mb21-042-041	Q16	8-Aug-21	ALGAE	ALGAE	Rhodophyta	Florideophyceae	Ceramiales	Delesseriaceae	Phycodryoideae	Phycodrys fimbriata				Present	1	
Golder	Baffinlands	2021	Quadrat Taxonomy	Whole	mb21-042-041	Q16	8-Aug-21	Encrusting	BRYO	Bryozoa	Gymnolaemata	Cheilostomatida	Eucrateidae		Eucratea sp.	1			1	1	Encrusting small colony
Golder	Baffinlands	2021	Quadrat Taxonomy	Whole	mb21-042-041	Q16	8-Aug-21	Incidental	MOBI	Mollusca	Bivalvia				Bivalvia indet.			5	5		Small <5mm, probably Mytilidae
Golder	Baffinlands	2021	Quadrat Taxonomy	Whole	mb21-042-041	Q16	8-Aug-21	MOLL	MOBI	Mollusca	Bivalvia	Mytilida	Mytilidae	Musculinae	Musculus discors	1			1	1	Shell opened and appeared to have died prior to preservation
Golder	Baffinlands	2021	Quadrat Taxonomy	Whole	mb21-042-041	Q16	8-Aug-21	MOLL	MOBI	Mollusca	Bivalvia	Mytilida	Mytilidae		Crenella faba		2		2	1	Shell opened and appeared to have died prior to preservation
Golder	Baffinlands	2021	Quadrat Taxonomy	Whole	mb21-042-041	Q16	8-Aug-21	MOLL	MOGA	Mollusca	Gastropoda	Trochida	Margaritidae		Margarites groenlandicus	1			1	1	
Golder	Baffinlands	2021	Quadrat Taxonomy	Whole	mb21-042-042	Q1	14-Aug-21	ALGAE	ALGAE	Ochrophyta	Phaeophyceae	Ectocarpales	Chordariaceae		cf. Trachynema groenlandicum				Present	1	
Golder	Baffinlands	2021	Quadrat Taxonomy	Whole	mb21-042-042	Q1	14-Aug-21	Incidental	CHAR	Arthropoda	Arachnida				Acari indet.	1			1	1	Small <5mm
Golder	Baffinlands	2021	Quadrat Taxonomy	Whole	mb21-042-042	Q1	14-Aug-21	Incidental	POER	Annelida	Polychaeta	Phyllodocida	Polynoidae	Polynoinae	Polynoinae indet.			1	1	1	Small <5mm
Golder	Baffinlands	2021	Quadrat Taxonomy	Whole	mb21-042-042	Q1	14-Aug-21	MISC	URAS	Chordata	Ascidiacea	Stolidobranchia	Styelidae		Polycarpa sp.	2			2	1	
Golder	Baffinlands	2021	Quadrat Taxonomy	Whole	mb21-042-042	Q1	14-Aug-21	MOLL	MOBI	Mollusca	Bivalvia	Mytilida	Mytilidae	Musculinae	Musculus discors	1			1	1	
Golder	Baffinlands	2021	Quadrat Taxonomy	Whole	mb21-042-043	Q20	8-Aug-21	ALGAE	ALGAE	Ochrophyta	Phaeophyceae	Desmarestiales	Desmarestiaceae		Desmarestia viridis				Present	1	
Golder	Baffinlands	2021	Quadrat Taxonomy	Whole	mb21-042-043	Q20	8-Aug-21	ALGAE	ALGAE	Ochrophyta	Phaeophyceae	Sphacelariales			Sphacelariales indet.				Present	1	Possibly Battersia cf. arctica, Protohalopteris radicans, or Sphaceloderma caespitulum
Golder	Baffinlands	2021	Quadrat Taxonomy	Whole	mb21-042-043	Q20	8-Aug-21	ANNE	POSE	Annelida	Polychaeta	Terebellida	Terebellidae	Terebellinae	Pista maculata	1			1	1	~6.0 cm
Golder	Baffinlands	2021	Quadrat Taxonomy	Whole	mb21-042-043	Q20	8-Aug-21	ECHI	ECOP	Echinodermata	Ophiuroidea	Ophiurida	Ophiuridae	Ophiurinae	Ophiura sp.	1			1	1	
Golder	Baffinlands	2021	Quadrat Taxonomy	Whole	mb21-042-043	Q20	8-Aug-21	Encrusting	CRCI	Arthropoda	Thecostraca	Balanomorpha	Balanidae	Balaninae	Balanus sp.	1			1	1	1.0 cm
Golder	Baffinlands	2021	Quadrat Taxonomy	Whole	mb21-042-043	Q20	8-Aug-21	Incidental	CRAM	Arthropoda	Malacostraca	Amphipoda	Stenothoidae	Stenothoinae	Stenothoidae indet.	1			1	1	Small <5mm
Golder	Baffinlands	2021	Quadrat Taxonomy	Whole	mb21-042-043	Q20	8-Aug-21	Incidental	MOBI	Mollusca	Bivalvia	Myida	Myidae		Mya sp.			1	1	1	Small <5mm
Golder	Baffinlands	2021	Quadrat Taxonomy	Whole	mb21-042-043	Q20	8-Aug-21	Incidental	MOBI	Mollusca	Bivalvia	Mytilida	Mytilidae		Mytilidae indet.			1	1	1	Small <5mm
Golder	Baffinlands	2021	Quadrat Taxonomy	Whole	mb21-042-043	Q20	8-Aug-21	Incidental	MOBI	Mollusca	Bivalvia				Bivalvia indet.			1	1		Small <5mm
Golder	Baffinlands	2021	Quadrat Taxonomy	Whole	mb21-042-043	Q20	8-Aug-21	Incidental	POER	Annelida	Polychaeta	Phyllodocida	Hesionidae		Nereimyra aphroditoides		1		1	1	Small <5mm
Golder	Baffinlands	2021	Quadrat Taxonomy	Whole	mb21-042-043	Q20	8-Aug-21	Incidental	POER	Annelida	Polychaeta	Phyllodocida	Pholoidae		Pholoe sp.	1	4		5	1	Small <5mm
Golder	Baffinlands	2021	Quadrat Taxonomy	Whole	mb21-042-043	Q20	8-Aug-21	MOLL	MOBI	Mollusca	Bivalvia	Carditida	Astartidae		Astarte borealis	2			2	1	One shell opened and appeared to have died prior to preservation
Golder	Baffinlands	2021	Quadrat Taxonomy	Whole	mb21-042-043	Q20	8-Aug-21	MOLL	MOBI	Mollusca	Bivalvia	Mytilida	Mytilidae	Musculinae	Musculus discors		1		1	1	Shell opened and appeared to have died prior to preservation
Golder	Baffinlands	2021	Quadrat Taxonomy	Whole	mb21-042-043	Q20	8-Aug-21	MOLL	MOGA	Mollusca	Gastropoda	Trochida	Margaritidae		Margarites helicinus	1			1	1	
Golder	Baffinlands	2021	Quadrat Taxonomy	Whole	mb21-042-044	AN3D	18-Aug-21	Encrusting	BRYO	Bryozoa	Gymnolaemata	Ctenostomatida	Alcyonidiidae		Alcyonidium sp.	1			1	1	Encrusting large colony

APPENDIX 8B-3

Trawl Specimens

biologica

Raw abundance data in long format for Golder Baffinlands, 2021 Trawl Samples.

Client	Project	Year	Sample Type	Split	Biologica Sample ID	Client Sample ID	Sample Description	Date Sampled	taxcode	grpcode	Phylum	Class	Order	Family	Subfamily	Taxon Name	A	Int	J	Total Abundance	Unique Taxa Count	Comments
Golder	Baffinlands	2021	Trawl	Whole	mb21-042-078	TR02	Snailfish sp. 1	19-Aug-21	MISC	PIXX	Chordata	Actinopterygii (Pisces)	Scorpaeniformes	Liparidae		Liparis sp.		1		1	1	Possibly L. tunicatus or L. gibbus, pectoral ray count is unclear
Golder	Baffinlands	2021	Trawl	Whole	mb21-042-079	TR04	UNPO	19-Aug-21	MISC	PIXX	Chordata	Actinopterygii (Pisces)	Perciformes	Cottidae		Triglops pingelii		2		2	1	
Golder	Baffinlands	2021	Trawl	Whole	mb21-042-080	TR04	UNPO 2	19-Aug-21	MISC	PIXX	Chordata	Actinopterygii (Pisces)	Perciformes	Agonidae	Anoplagoninae	Aspidophoroides olrikii	2			2	1	
Golder	Baffinlands	2021	Trawl	Whole	mb21-042-081	TR04	Amphipod sp.	19-Aug-21	ARTH	CRAM	Arthropoda	Malacostraca	Amphipoda	Eusiridae		Rhachotropis aculeata	1			1	1	
Golder	Baffinlands	2021	Trawl	Whole	mb21-042-082	TR02	Urchin sp.	19-Aug-21	ECHI	ECEC	Echinodermata	Echinoidea	Camarodonta	Strongylocentrotidae		Strongylocentrotus droebachiensis	1			1	1	
Golder	Baffinlands	2021	Trawl	Whole	mb21-042-083	TR02	Poacher sp.	19-Aug-21	MISC	PIXX	Chordata	Actinopterygii (Pisces)	Perciformes	Agonidae	Agoninae	Leptagonus decagonus			1	1	1	
Golder	Baffinlands	2021	Trawl	Whole	mb21-042-084	TR04	UNSC	19-Aug-21	MISC	PIXX	Chordata	Actinopterygii (Pisces)	Perciformes	Cottidae		Myoxocephalus sp.		1		1	1	Possibly M. aenaeus; small ~6 cm
Golder	Baffinlands	2021	Trawl	Whole	mb21-042-085	TR04	Tunicate spp.	19-Aug-21	MISC	URAS	Chordata	Ascidiacea	Stolidobranchia	Pyuridae		Boltenia echinata	1			1	1	
Golder	Baffinlands	2021	Trawl	Whole	mb21-042-085	TR04	Tunicate spp.	19-Aug-21	MISC	URAS	Chordata	Ascidiacea	Phlebobranchia	Ascidiidae		Ascidia sp.	2	1		3	1	
Golder	Baffinlands	2021	Trawl	Whole	mb21-042-085	TR04	Tunicate spp.	19-Aug-21	MISC	URAS	Chordata	Ascidiacea	Stolidobranchia	Styelidae		Polycarpa sp.	1			1	1	

APPENDIX 8B-4

Fish Stomach Lab Data

biologica

Abundance and biomass data for fish stomach contents for Golder Baffinland Iron Mine MEEMP, 2021.

Client	Project	Year	Sample Type	Fish	Biologica Sample ID	Client Sample ID	Date Sampled	% Fullness	%Material Digested	Full Stomach Weight (g)	Source	Group Code	Phylum	Subphylum	Class	Subclass	Order	Family	Taxon	Stage	Total Abundance	Total WW (g)	WW/ Individual (g)	Total Unique Taxa	Comments	Processing Note
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-086	BAFF21UMLNFHSC1001	8-Aug-21	n/a	n/a	n/a	n/a								Not Analyzed	n/a	n/a	n/a			Archived_Not Processed	
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-087	BAFF21UMLNFHSC1002	8-Aug-21	n/a	n/a	n/a	n/a								Not Analyzed	n/a	n/a	n/a			Archived_Not Processed	
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-088	BAFF21UMLNFHSC1003	8-Aug-21	n/a	n/a	n/a	n/a								Not Analyzed	n/a	n/a	n/a			Archived_Not Processed	
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-089	BAFF21UMLNFHSC1004	8-Aug-21	n/a	n/a	n/a	n/a								Not Analyzed	n/a	n/a	n/a			Archived_Not Processed	
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-090	BAFF21UMLNFHSC1005	8-Aug-21	0	0	5.05803	n/a	n/a							Empty Stomach	n/a	n/a	n/a				
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-091	BAFF21UMLNFHSC1006	8-Aug-21	n/a	n/a	n/a	n/a								Not Analyzed	n/a	n/a	n/a			Archived_Not Processed	
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-092	BAFF21UMLNFHSC1007	8-Aug-21	n/a	n/a	n/a	n/a								Not Analyzed	n/a	n/a	n/a			Archived_Not Processed	
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-093	BAFF21UMLNFHSC1008	8-Aug-21	n/a	n/a	n/a	n/a								Not Analyzed	n/a	n/a	n/a			Archived_Not Processed	
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-094	BAFF21UMLNFHSC1009	8-Aug-21	n/a	n/a	n/a	n/a								Not Analyzed	n/a	n/a	n/a			Archived_Not Processed	
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-095	BAFF21UMLNFHSC1010	8-Aug-21	n/a	n/a	n/a	n/a								Not Analyzed	n/a	n/a	n/a			Archived_Not Processed	
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-096	BAFF21UMLNFHSC1011	8-Aug-21	100	75	5.66762	Benthic	CRAM	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Gammaridae	Gammaridae indet.	Int/parts	6	0.04082	0.00680	1		Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-096	BAFF21UMLNFHSC1011	8-Aug-21	100	75	5.66762	Planktonic	CRAM	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Uristidae	Onisimus sp.	A	3	0.08576	0.02859	1		Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-096	BAFF21UMLNFHSC1011	8-Aug-21	100	75	5.66762	Undetermined	CRAM	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda		Amphipoda indet.	Parts		0.14070	0.14070			Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-096	BAFF21UMLNFHSC1011	8-Aug-21	100	75	5.66762	Undetermined	CRXX	Arthropoda	Crustacea					Crustacea indet.	Parts		0.06614	0.06614			Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-096	BAFF21UMLNFHSC1011	8-Aug-21	100	75	5.66762	Non-food	Non-food							Sand	n/a	n/a	n/a				Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-096	BAFF21UMLNFHSC1011	8-Aug-21	100	75	5.66762	Undetermined	XXXX							Unidentified tissue	Parts		2.38459	2.38459			Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-097	BAFF21UMLNFHSC1012	8-Aug-21	n/a	n/a	n/a	n/a								Not Analyzed	n/a	n/a	n/a			Archived_Not Processed	
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-098	BAFF21UMLNFHSC1013	8-Aug-21	n/a	n/a	n/a	n/a								Not Analyzed	n/a	n/a	n/a			Archived_Not Processed	
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-099	BAFF21UMLNFHSC1014	8-Aug-21	n/a	n/a	n/a	n/a								Not Analyzed	n/a	n/a	n/a			Archived_Not Processed	
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-100	BAFF21UMLNFHSC1015	8-Aug-21	5	0	16.00525	Planktonic	MOGA	Mollusca		Gastropoda	Heterobranchia	Pteropoda	Limacinidae	Limacina sp.	A	1	0.00798	0.00798	1		
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-100	BAFF21UMLNFHSC1015	8-Aug-21	5	0	16.00525	Non-food	Non-food							Sand	n/a	n/a	n/a				
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-101	BAFF21UMLNFHSC1016	9-Aug-21	25	75	5.41915	Benthic	CRAM	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Gammaridae	Gammaridae indet.	Int/parts	1	0.01073	0.01073	1		Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-101	BAFF21UMLNFHSC1016	9-Aug-21	25	75	5.41915	Benthic	CRAM	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Oedicerotidae	Monoporeia affinis	A/parts	1	0.01126	0.01126	1		Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-101	BAFF21UMLNFHSC1016	9-Aug-21	25	75	5.41915	Epibenthic	CRAM	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Uristidae	Anonyx sp.	A/parts	1	0.09163	0.09163	1		Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-101	BAFF21UMLNFHSC1016	9-Aug-21	25	75	5.41915	Planktonic	CRAM	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Uristidae	Onisimus sp.	A/parts	5	0.03867	0.00773	1		Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-101	BAFF21UMLNFHSC1016	9-Aug-21	25	75	5.41915	Undetermined	CRAM	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda		Amphipoda indet.	Parts		0.01647	0.01647			Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-101	BAFF21UMLNFHSC1016	9-Aug-21	25	75	5.41915	Planktonic	CRCI	Arthropoda	Crustacea	Thecostraca	Cirripedia	Balanomorpha		Balanomorpha indet.	Cypris	1	0.00001	0.00001	1		Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-101	BAFF21UMLNFHSC1016	9-Aug-21	25	75	5.41915	Planktonic	MOGA	Mollusca		Gastropoda	Heterobranchia	Pteropoda	Limacinidae	Limacina sp.	Parts		0.02997	0.02997	1		Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-101	BAFF21UMLNFHSC1016	9-Aug-21	25	75	5.41915	Non-food	Non-food							Sand	n/a	n/a	n/a				Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-101	BAFF21UMLNFHSC1016	9-Aug-21	25	75	5.41915	Undetermined	XXXX							Unidentified tissue	Parts		0.67493	0.67493			Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-102	BAFF21UMLNFHSC1017	9-Aug-21	n/a	n/a	n/a	n/a								Not Analyzed	n/a	n/a	n/a			Archived_Not Processed	
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-103	BAFF21UMLNFHSC1018	9-Aug-21	75	100	5.39398	Benthic	CRAM	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Gammaridae	Gammaridae indet.	A/parts	2	0.01594	0.00797	1		Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-103	BAFF21UMLNFHSC1018	9-Aug-21	75	100	5.39398	Planktonic	CRCI	Arthropoda	Crustacea	Thecostraca	Cirripedia	Balanomorpha		Balanomorpha indet.	Cypris	15	0.00026	0.00002	1		Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-103	BAFF21UMLNFHSC1018	9-Aug-21	75	100	5.39398	Non-food	Non-food							Plant material	n/a	n/a	n/a				Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-103	BAFF21UMLNFHSC1018	9-Aug-21	75	100	5.39398	Non-food	Non-food							Sand	n/a	n/a	n/a				Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-103	BAFF21UMLNFHSC1018	9-Aug-21	75	100	5.39398	Undetermined	PIXX	Chordata	Vertebrata					Pisces indet.	Parts		1.12408	1.12408	1		Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-103	BAFF21UMLNFHSC1018	9-Aug-21	75	100	5.39398	Undetermined	XXXX							Unidentified tissue	Parts		0.47076	0.47076			Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-104	BAFF21UMLNFHSC1019	9-Aug-21	50	75	12.73151	Benthic	CRAM	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Gammaridae	Gammaridae indet.	A/parts	4	0.07482	0.01871	1		Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-104	BAFF21UMLNFHSC1019	9-Aug-21	50	75	12.73151	Non-food	Non-food							Sand	n/a	n/a	n/a				Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-104	BAFF21UMLNFHSC1019	9-Aug-21	50	75	12.73151	Undetermined	XXXX							Unidentified tissue	Parts		0.68245	0.68245			Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-105	BAFF21UMLNFHSC1020	9-Aug-21	100	100	5.17669	Benthic	CRAM	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Gammaridae	Gammaridae indet.	Parts		0.30492	0.30492	1		Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-105	BAFF21UMLNFHSC1020	9-Aug-21	100	100	5.17669	Undetermined	CRAM	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda		Amphipoda indet.	Parts		2.51457	2.51457		Likely Gammaridae indet.	Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-105	BAFF21UMLNFHSC1020	9-Aug-21	100	100	5.17669	Benthic	MOBI	Mollusca		Bivalvia				Bivalvia indet.	Parts		0.02327	0.02327	1		Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-105	BAFF21UMLNFHSC1020	9-Aug-21	100	100	5.17669	Non-food	Non-food							Sand	n/a	n/a	n/a				Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-105	BAFF21UMLNFHSC1020	9-Aug-21	100	100	5.17669	Undetermined	XXXX							Unidentified tissue	Parts		0.05302	0.05302			Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-106	BAFF21UMLNFHSC1021	9-Aug-21	n/a	n/a	n/a	n/a								Not Analyzed	n/a	n/a	n/a			Archived_Not Processed	
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-107	BAFF21UMLNFHSC1022	9-Aug-21	n/a	n/a	n/a	n/a								Not Analyzed	n/a	n/a	n/a			Archived_Not Processed	
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-108	BAFF21UMLNFHSC1023	9-Aug-21	n/a	n/a	n/a	n/a								Not Analyzed	n/a	n/a	n/a			Archived_Not Processed	
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-109	BAFF21UMLNFHSC1024	9-Aug-21	n/a	n/a	n/a	n/a								Not Analyzed	n/a	n/a	n/a			Archived_Not Processed	
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-110	BAFF21UMLNFHSC1025	9-Aug-21	n/a	n/a	n/a	n/a								Not Analyzed	n/a	n/a	n/a			Archived_Not Processed	
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-111	BAFF21UMLNFHSC1026	9-Aug-21	75	100	6.12311	Undetermined	CRAM	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda		Amphipoda indet.	Parts		0.02419	0.02419	1		Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-111	BAFF21UMLNFHSC1026	9-Aug-21	75	100	6.12311	Planktonic	CRCI	Arthropoda	Crustacea	Thecostraca	Cirripedia			Cirripedia indet.	Cypris	7	0.00069	0.00010	1		Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-111	BAFF21UMLNFHSC1026	9-Aug-21	75	100	6.12311	Planktonic	CRMY	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Mysida		Mysida indet.	Parts		0.01977	0.01977	1		Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-111	BAFF21UMLNFHSC1026	9-Aug-21	75	100	6.12311	Undetermined	CRXX	Arthropoda	Crustacea					Crustacea indet.	Parts		0.01564	0.01564			Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-111	BAFF21UMLNFHSC1026	9-Aug-21	75	100	6.12311	Benthic	INDI	Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Tipulidae	Tipulidae indet.	L/parts	3	5.98426	1.99475	1	Freshwater	Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-111	BAFF21UMLNFHSC1026	9-Aug-21	75	100	6.12311	Non-food	Non-food							Plant material	n/a	n/a	n/a				Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-111	BAFF21UMLNFHSC1026	9-Aug-21	75	100	6.12311	Non-food	Non-food							Sand	n/a	n/a	n/a				Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-111	BAFF21UMLNFHSC1026	9-Aug-21	75	100	6.12311	Undetermined	XXXX							Unidentified tissue	Parts		2.26001	2.26001			Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-112	BAFF21UMLNFHSC1027	9-Aug-21	10	75	3.42921	Benthic	CRAM	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Gammaridae	Gammarus sp.	Int	1	0.00181	0.00181	1		Organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-112	BAFF21UMLNFHSC1027	9-Aug-21	10	75	3.42921	Undetermined	XXXX							Unidentified tissue	Parts		0.11773	0.11773			Organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-113	BAFF21UMLNFHSC1028	9-Aug-21	10	100	3.70381	Undetermined	XXXX							Unidentified tissue	Parts		0.12687	0.12687	1		Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-114	BAFF21UMLNFHSC1029	9-Aug-21	100	50	7.56655	Undetermined	CRAM	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda		Amphipoda indet.	Parts		0.00311	0.00311	1		Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-114	BAFF21UMLNFHSC1029	9-Aug-21	100	50	7.56655	Planktonic	CRCI	Arthropoda	Crustacea	Thecostraca	Cirripedia	Balanomorpha		Balanomorpha indet.	Cypris	11	0.00102	0.00009	1		Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-114	BAFF21UMLNFHSC1029	9-Aug-21	100	50	7.56655	Planktonic	CRCO	Arthropoda	Crustacea	Hexanauplii	Copepoda	Calanoida	Calanidae	Calanus sp.	A/parts	105	0.13062	0.00124	1		Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-114	BAFF21UMLNFHSC1029	9-Aug-21	100	50	7.56655	Non-food	Non-food							Plant material	n/a	n/a	n/a				Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-114	BAFF21UMLNFHSC1029	9-Aug-21	100	50	7.56655	Non-food	Non-food							Sand	n/a	n/a	n/a				Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-114	BAFF21UMLNFHSC1029	9-Aug-21	100	50	7.56655	Planktonic	PIXX	Chordata	Vertebrata					Pisces indet.	Int/parts	1	2.70125	2.70125	1	Possibly Ammodytes sp.	Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-114	BAFF21UMLNFHSC1029	9-Aug-21	100	50	7.56655	Undetermined	XXXX							Unidentified tissue	Parts		0.84541	0.84541			Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-115	BAFF21UMLNFHSC1030	10-Aug-21	n/a	n/a	n/a	n/a								Not Analyzed	n/a	n/a	n/a			Archived_Not Processed	
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-116	BAFF21UMLNFHSC1031	10-Aug-21	n/a	n/a	n/a	n/a								Not Analyzed	n/a	n/a	n/a			Archived_Not Processed	
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-117	BAFF21UMLNFHSC1032	10-Aug-21	n/a	n/a	n/a	n/a								Not Analyzed	n/a	n/a	n/a			Archived_Not Processed	
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-118	BAFF21UMLNFHSC1033	10-Aug-21	n/a	n/a	n/a	n/a								Not Analyzed	n/a	n/a	n/a			Archived_Not Processed	
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-119	BAFF21UMLNFHSC1034	10-Aug-21	n/a	n/a	n/a	n/a								Not Analyzed	n/a	n/a	n/a			Archived_Not Processed	
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-120	BAFF21UMLNFHSC1035	10-Aug-21	25	50	2.25778	Benthic	CRAM	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Gammaridae	Gammarus sp.	A/parts	1	0.00834	0.00834	1		Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-120	BAFF21UMLNFHSC1035	10-Aug-21	25	50	2.25778	Benthic	CRAM	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Oedicerotidae	Monoporeia affinis	A/parts	1	0.01127	0.01127	1		Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-120	BAFF21UMLNFHSC1035	10-Aug-21	25	50	2.25778	Planktonic	CRCI	Arthropoda	Crustacea	Thecostraca	Cirripedia	Balanomorpha		Balanomorpha indet.	Cypris	11	0.00060	0.00005	1		Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-120	BAFF21UMLNFHSC1035	10-Aug-21	25	50	2.25778	Undetermined	XXXX							Unidentified tissue	Parts		0.16073	0.16073			Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-121	BAFF21UMLNFHSC1036	10-Aug-21	100	75	6.62087	Undetermined	CRAM	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda		Amphipoda indet.	Parts		0.02768	0.02768	1		Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-121	BAFF21UMLNFHSC1036	10-Aug-21	100	75	6.62087	Planktonic	CRCI	Arthropoda	Crustacea	Thecostraca	Cirripedia	Balanomorpha		Balanomorpha indet.	Cypris	7	0.00026	0.00004	1		Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-121	BAFF21UMLNFHSC1036	10-Aug-21	100	75	6.62087	Non-food	Non-food							Sand	n/a	n/a	n/a				Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-121	BAFF21UMLNFHSC1036	10-Aug-21	100	75	6.62087	Planktonic	PIXX	Chordata	Vertebrata					Pisces indet.	Parts	1	2.43161	2.43161	1		Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-121	BAFF21UMLNFHSC1036	10-Aug-21	100	75	6.62087	Undetermined	XXXX							Unidentified tissue	Parts		0.23069	0.23069			Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-122	BAFF21UMLNFHSC1037	10-Aug-21	n/a	n/a	n/a	n/a								Not Analyzed	n/a	n/a	n/a			Archived_Not Processed	
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-123	BAFF21UMLNFHSC1038	10-Aug-21	50	25	3.12137	Benthic	CRAM	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Gammaridae	Gammarus sp.	A	1	0.79340	0.79340	1		Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-123	BAFF21UMLNFHSC1038	10-Aug-21	50	25	3.12137	Benthic	CRAM	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Oedicerotidae	Monoporeia affinis	A	1	0.00462	0.00462	1		Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-123	BAFF21UMLNFHSC1038	10-Aug-21	50	25	3.12137	Epibenthic	CRAM	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Uristidae	Anonyx sp.	A	1	0.25409	0.25409	1		Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-123	BAFF21UMLNFHSC1038	10-Aug-21	50	25	3.12137	Planktonic	CRMY	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Mysida	Mysidae	Mysis sp.	Int/parts	2	0.05091	0.02546	1		Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-123	BAFF21UMLNFHSC1038	10-Aug-21	50	25	3.12137	Benthic	URAS	Chordata	Tunicata	Ascidiacea				Ascidiacea indet.	A	1	0.09702	0.09702	1		Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-123	BAFF21UMLNFHSC1038	10-Aug-21	50	25	3.12137	Undetermined	XXXX							Unidentified tissue	Parts		0.15991	0.15991			Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-124	BAFF21UMLNFHSC1039	10-Aug-21	n/a	n/a	n/a	n/a								Not Analyzed	n/a	n/a	n/a			Archived_Not Processed	
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-125	BAFF21UMLNFHSC1040	10-Aug-21	5	75	1.87063	Planktonic	CRCI	Arthropoda	Crustacea	Thecostraca	Cirripedia	Balanomorpha		Balanomorpha indet.	Cypris	5	0.00018	0.00004	1		Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-125	BAFF21UMLNFHSC1040	10-Aug-21	5	75	1.87063	Epibenthic	CRCO	Arthropoda	Crustacea	Hexanauplii	Copepoda	Harpacticoida		Harpacticoida indet.	A/parts	1	0.00002	0.00002	1		Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-125	BAFF21UMLNFHSC1040	10-Aug-21	5	75	1.87063	Undetermined	CRXX	Arthropoda	Crustacea					Crustacea indet.	Parts		0.00059	0.00059	1		Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-125	BAFF21UMLNFHSC1040	10-Aug-21	5	75	1.87063	Undetermined	XXXX							Unidentified tissue	Parts		0.02260	0.02260			Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-126	BAFF21UMLNGN03ARCH03	6-Aug-21	25	100	26.24445	Undetermined	PIXX	Chordata	Vertebrata					Pisces indet.	Parts		1.58043	1.58043	1	Whirl pack label matched COC (BAFF21UMLNGN03ARCH03). Bottle labeled as GN03ARCH04.	Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-126	BAFF21UMLNGN03ARCH03	6-Aug-21	25	100	26.24445	Undetermined	XXXX							Unidentified tissue	Parts		1.57317	1.57317		Whirl pack label matched COC (BAFF21UMLNGN03ARCH03). Bottle labeled as GN03ARCH04.	Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-127	BAFF21UMLNGN03ARCH04	6-Aug-21	75	75	13.15805	Planktonic	CRCO	Arthropoda	Crustacea	Hexanauplii	Copepoda	Calanoida	Calanidae	Calanus sp.	A	2	0.00744	0.00372	1		Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-127	BAFF21UMLNGN03ARCH04	6-Aug-21	75	75	13.15805	Planktonic	CRMY	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Mysida	Mysidae	Mysis sp.	A	1	0.03057	0.03057	1		Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-127	BAFF21UMLNGN03ARCH04	6-Aug-21	75	75	13.15805	Planktonic	PIXX	Chordata	Vertebrata					Pisces indet.	A/parts	1	1.39892	1.39892	1	Possibly Ammodytes sp.	Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-127	BAFF21UMLNGN03ARCH04	6-Aug-21	75	75	13.15805	Planktonic	PIXX	Chordata	Vertebrata					Pisces indet.	Int/parts	3	3.17285	1.05762		Possibly Ammodytes sp.	Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-127	BAFF21UMLNGN03ARCH04	6-Aug-21	75	75	13.15805	Planktonic	PIXX	Chordata	Vertebrata					Pisces indet.	Parts		4.76096	4.76096		Possibly Ammodytes sp.	Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-128	BAFF21UMLNGN04ARCH46	6-Aug-21	75	25	11.53445	Planktonic	CRAM	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Hyperiidae	Themisto libellula	A/parts	7	0.26383	0.03769	1		Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-128	BAFF21UMLNGN04ARCH46	6-Aug-21	75	25	11.53445	Planktonic	CRAM	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Uristidae	Onisimus sp.	A/parts	48	1.44605	0.03013	1		Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-128	BAFF21UMLNGN04ARCH46	6-Aug-21	75	25	11.53445	Planktonic	CRAM	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda		Hyperiidea indet.	A/parts	1	0.02735	0.02735		Possibly Themisto sp.	Some organisms found outside stomach.

Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-128	BAFF21UMLNGN04ARCH46	6-Aug-21	75	25	11.53445	Planktonic	CRCO	Arthropoda	Crustacea	Hexanauplii	Copepoda	Calanoida	Calanidae	Calanus sp.	A/parts	8	0.03562	0.00445	1		Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-128	BAFF21UMLNGN04ARCH46	6-Aug-21	75	25	11.53445	Planktonic	MOGA	Mollusca		Gastropoda	Heterobranchia	Pteropoda	Limacinidae	Limacina sp.	A/parts	1	0.00185	0.00185	1		Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-128	BAFF21UMLNGN04ARCH46	6-Aug-21	75	25	11.53445	Planktonic	PIXX	Chordata	Vertebrata					Pisces indet.	Int/parts	1	0.44372	0.44372	1		Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-128	BAFF21UMLNGN04ARCH46	6-Aug-21	75	25	11.53445	Undetermined	XXXX							Unidentified tissue	Parts		1.08253	1.08253			Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-129	BAFF21UMLNGN05ARCH03	7-Aug-21	25	25	18.40492	Benthic	CRAM	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Atylidae	Atylus carinatus	A	1	0.09370	0.09370	1		Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-129	BAFF21UMLNGN05ARCH03	7-Aug-21	25	25	18.40492	Benthic	CRAM	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Atylidae	Atylus carinatus	Int/parts	1	0.00878	0.00878			Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-129	BAFF21UMLNGN05ARCH03	7-Aug-21	25	25	18.40492	Benthic	CRAM	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Gammaridae	Gammarus sp.	A/parts	5	0.07372	0.01474	1		Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-129	BAFF21UMLNGN05ARCH03	7-Aug-21	25	25	18.40492	Planktonic	CRAM	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Hyperiidae	Themisto sp.	A/parts	1	0.03055	0.03055	1		Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-129	BAFF21UMLNGN05ARCH03	7-Aug-21	25	25	18.40492	Planktonic	CRAM	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda		Hyperiidea indet.	A/parts	1	0.02851	0.02851			Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-129	BAFF21UMLNGN05ARCH03	7-Aug-21	25	25	18.40492	Planktonic	CRCO	Arthropoda	Crustacea	Hexanauplii	Copepoda	Calanoida		Calanoida indet.	A/parts	2	0.00213	0.00107	1		Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-129	BAFF21UMLNGN05ARCH03	7-Aug-21	25	25	18.40492	Planktonic	PIXX	Chordata	Vertebrata					Pisces indet.	Int/parts	1	0.65231	0.65231	1		Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-129	BAFF21UMLNGN05ARCH03	7-Aug-21	25	25	18.40492	Undetermined	XXXX							Unidentified tissue	Parts		0.03339	0.03339			Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-130	BAFF21UMLNGN05ARCH04	7-Aug-21	25	100	7.16478	Planktonic	CRCO	Arthropoda	Crustacea	Hexanauplii	Copepoda	Calanoida		Calanoida indet.	A/parts	2	0.01396	0.00698	1		Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-130	BAFF21UMLNGN05ARCH04	7-Aug-21	25	100	7.16478	Undetermined	PIXX	Chordata	Vertebrata					Pisces indet.	Parts		0.64832	0.64832	1		Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-130	BAFF21UMLNGN05ARCH04	7-Aug-21	25	100	7.16478	Undetermined	XXXX							Unidentified tissue	Parts		0.08545	0.08545			Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-131	BAFF21UMLNGN05ARCH05	7-Aug-21	75	50	13.64315	Parasite	ACAN	Acanthocephala						Acanthocephala indet.	A	4	0.00872	0.00218	1		Cycsts in stomach external lining. Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-131	BAFF21UMLNGN05ARCH05	7-Aug-21	75	50	13.64315	Benthic	CRAM	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Gammaridae	Gammarus sp.	Int	1	0.00095	0.00095	1		Cycsts in stomach external lining. Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-131	BAFF21UMLNGN05ARCH05	7-Aug-21	75	50	13.64315	Planktonic	CRAM	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Hyperiidae	Themisto libellula	A	2	0.04537	0.02269	1		Cycsts in stomach external lining. Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-131	BAFF21UMLNGN05ARCH05	7-Aug-21	75	50	13.64315	Planktonic	CRMY	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Mysida	Mysidae	Mysis sp.	A	1	0.10505	0.10505	1		Cycsts in stomach external lining. Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-131	BAFF21UMLNGN05ARCH05	7-Aug-21	75	50	13.64315	Epibenthic	PIXX	Chordata	Vertebrata	Actinopteri	Teleostei	Perciformes	Cottidae	Cottidae indet.	Int	1	2.12219	2.12219	1	Possibly Myoxocepalus sp.	Cycsts in stomach external lining. Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-131	BAFF21UMLNGN05ARCH05	7-Aug-21	75	50	13.64315	Planktonic	PIXX	Chordata	Vertebrata					Pisces indet.	Int/parts	2	1.76647	0.88324			Cycsts in stomach external lining. Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-132	BAFF21UMLNGN06ARCH09	7-Aug-21	75	100	0.27957	Benthic	INDI	Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	Hydrobaenus sp.	L/parts	25	0.00524	0.00021	1	Freshwater	
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-132	BAFF21UMLNGN06ARCH09	7-Aug-21	75	100	0.27957	Benthic	INDI	Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Simuliidae	Simuliidae indet.	L/parts	1	0.00119	0.00119	1	Freshwater	
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-132	BAFF21UMLNGN06ARCH09	7-Aug-21	75	100	0.27957	Benthic	INDI	Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Tipulidae	Tipulidae indet.	L/parts	1	0.01069	0.01069	1	Freshwater	
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-132	BAFF21UMLNGN06ARCH09	7-Aug-21	75	100	0.27957	Benthic	INEP	Arthropoda	Hexapoda	Insecta	Pterygota	Ephemeroptera		Ephemeroptera indet.	N/parts	4	0.00013	0.00003	1	Freshwater	
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-132	BAFF21UMLNGN06ARCH09	7-Aug-21	75	100	0.27957	Benthic	INXX	Arthropoda	Hexapoda	Insecta				Insecta indet.	Parts		0.01641	0.01641		Freshwater	
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-132	BAFF21UMLNGN06ARCH09	7-Aug-21	75	100	0.27957	Undetermined	XXXX							Unidentified tissue	Parts		0.02225	0.02225			
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-133	BAFF21UMLNGN08ARCH03	9-Aug-21	5	100	2.94489	Planktonic	MOGA	Mollusca		Gastropoda	Heterobranchia	Pteropoda	Limacinidae	Limacina sp.	Parts		0.02234	0.02234	1		Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-133	BAFF21UMLNGN08ARCH03	9-Aug-21	5	100	2.94489	Undetermined	XXXX							Unidentified tissue	Parts		0.07583	0.07583			Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-134	BAFF21UMLNGN09ARCH03	10-Aug-21	75	100	22.73025	Planktonic	PIXX	Chordata	Vertebrata					Pisces indet.	Int/parts	1	8.71524	8.71524	1	Possibly Clupea sp.	
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-135	BAFF21UMLNGN10ARCH10	11-Aug-21	50	75	7.24553	Planktonic	CRAM	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Hyperiidae	Themisto libellula	A/parts	4	0.26524	0.06631	1		Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-135	BAFF21UMLNGN10ARCH10	11-Aug-21	50	75	7.24553	Planktonic	CRCO	Arthropoda	Crustacea	Hexanauplii	Copepoda	Calanoida	Calanidae	Calanus sp.	A/parts	1	0.00109	0.00109	1		Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-135	BAFF21UMLNGN10ARCH10	11-Aug-21	50	75	7.24553	Undetermined	CRXX	Arthropoda	Crustacea					Crustacea indet.	Parts		0.73561	0.73561			Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-135	BAFF21UMLNGN10ARCH10	11-Aug-21	50	75	7.24553	Benthic	NTEA	Nemertea						Nemertea indet.	Parts	1	0.03543	0.03543	1		Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-136	BAFF21UREFFHSC1101	15-Aug-21	n/a	n/a	n/a	n/a								Not Analyzed	n/a	n/a	n/a			Archived_Not Processed	
Golder	Baffinlands	2021	Fish Stomach	Fourhorn Sculpin	ms21-042-137	BAFF21UREFFHSC1102	15-Aug-21	n/a	n/a	n/a	n/a								Not Analyzed	n/a	n/a	n/a			Archived_Not Processed	
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-138	BAFF21UREFGN12ARCH07	15-Aug-21	n/a	n/a	n/a	n/a								Not Analyzed	n/a	n/a	n/a			Archived_Not Processed	
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-139	BAFF21UREFGN12ARCH20	15-Aug-21	n/a	n/a	n/a	n/a								Not Analyzed	n/a	n/a	n/a			Archived_Not Processed	
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-140	BAFF21UREFGN12ARCH21	15-Aug-21	n/a	n/a	n/a	n/a								Not Analyzed	n/a	n/a	n/a			Archived_Not Processed	
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-141	BAFF21UREFGN12ARCH22	15-Aug-21	n/a	n/a	n/a	n/a								Not Analyzed	n/a	n/a	n/a			Archived_Not Processed	
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-142	BAFF21UREFGN15ARCH19	15-Aug-21	n/a	n/a	n/a	n/a								Not Analyzed	n/a	n/a	n/a			Archived_Not Processed	
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-143	BAFF21UREFGN15ARCH20	15-Aug-21	n/a	n/a	n/a	n/a								Not Analyzed	n/a	n/a	n/a			Archived_Not Processed	
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-144	BAFF21UREFGN15ARCH21	15-Aug-21	n/a	n/a	n/a	n/a								Not Analyzed	n/a	n/a	n/a			Archived_Not Processed	
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-145	BAFF21UREFGN15ARCH22	15-Aug-21	n/a	n/a	n/a	n/a								Not Analyzed	n/a	n/a	n/a			Archived_Not Processed	
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-146	BAFF21UMLNGN20ARCH02	17-Aug-21	75	50	10.28625	Planktonic	CRAM	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Hyperiidae	Themisto libellula	A/parts	19	1.90348	0.10018	1		Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-146	BAFF21UMLNGN20ARCH02	17-Aug-21	75	50	10.28625	Planktonic	CRAM	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda		Hyperiidea indet.	Parts		0.02412	0.02412			Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-146	BAFF21UMLNGN20ARCH02	17-Aug-21	75	50	10.28625	Planktonic	CRCO	Arthropoda	Crustacea	Hexanauplii	Copepoda	Calanoida	Calanidae	Calanus sp.	A/parts	2	0.01055	0.00528	1		Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-146	BAFF21UMLNGN20ARCH02	17-Aug-21	75	50	10.28625	Planktonic	CRMY	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Mysida		Mysida indet.	Int/parts	2	0.01266	0.00633	1		Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-146	BAFF21UMLNGN20ARCH02	17-Aug-21	75	50	10.28625	Undetermined	CRXX	Arthropoda	Crustacea					Crustacea indet.	Parts		0.45475	0.45475			Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-146	BAFF21UMLNGN20ARCH02	17-Aug-21	75	50	10.28625	Undetermined	XXXX							Unidentified tissue	Parts		0.01013	0.01013			Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-147	BAFF21UMLNGN21ARCH04	17-Aug-21	25	75	4.66835	Benthic	CRAM	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Atylidae	Atylus sp.	J	1	0.00187	0.00187	1		Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-147	BAFF21UMLNGN21ARCH04	17-Aug-21	25	75	4.66835	Planktonic	CRCO	Arthropoda	Crustacea	Hexanauplii	Copepoda	Calanoida		Calanoida indet.	A/parts	10	0.00009	0.00001	1		Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-147	BAFF21UMLNGN21ARCH04	17-Aug-21	25	75	4.66835	Epibenthic	PIXX	Chordata	Vertebrata	Actinopteri	Teleostei	Perciformes	Cottidae	Cottidae indet.	J/parts	3	0.19984	0.06661	1		Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-147	BAFF21UMLNGN21ARCH04	17-Aug-21	25	75	4.66835	Undetermined	POXX	Annelida		Polychaeta				Polychaeta indet.	Parts		0.00290	0.00290	1		Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-147	BAFF21UMLNGN21ARCH04	17-Aug-21	25	75	4.66835	Undetermined	XXXX							Unidentified tissue	Parts		0.00427	0.00427			Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-148	BAFF21UMLNGN23ARCH01	18-Aug-21	100	50	39.03136	Planktonic	CRAM	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Hyperiidae	Themisto libellula	A/parts	148	8.45439	0.05712	1		Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-148	BAFF21UMLNGN23ARCH01	18-Aug-21	100	50	39.03136	Planktonic	CRAM	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Uristidae	Onisimus sp.	A	4	0.09974	0.02494	1		Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-148	BAFF21UMLNGN23ARCH01	18-Aug-21	100	50	39.03136	Undetermined	CRXX	Arthropoda	Crustacea					Crustacea indet.	Parts		5.81122	5.81122			Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-148	BAFF21UMLNGN23ARCH01	18-Aug-21	100	50	39.03136	Undetermined	PIXX	Chordata	Vertebrata					Pisces indet.	Parts		0.26373	0.26373	1		Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-148	BAFF21UMLNGN23ARCH01	18-Aug-21	100	50	39.03136	Undetermined	XXXX							Unidentified tissue	Parts		0.37478	0.37478			Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-149	BAFF21UMLNGN25ARCH03	18-Aug-21	75	50	6.47409	Planktonic	CRAM	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Hyperiidae	Themisto libellula	A/parts	46	1.98169	0.04308	1		
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-149	BAFF21UMLNGN25ARCH03	18-Aug-21	75	50	6.47409	Undetermined	CRXX	Arthropoda	Crustacea					Crustacea indet.	Parts		1.32605	1.32605			
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-150	BAFF21UMLNGN25ARCH04	18-Aug-21	75	50	5.37191	Planktonic	CRCO	Arthropoda	Crustacea	Hexanauplii	Copepoda	Calanoida	Calanidae	Calanus glacialis	A	3	0.03482	0.01161	1		Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-150	BAFF21UMLNGN25ARCH04	18-Aug-21	75	50	5.37191	Planktonic	CRMY	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Mysida		Mysida indet.	J	2	0.01246	0.00623	1		Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-150	BAFF21UMLNGN25ARCH04	18-Aug-21	75	50	5.37191	Epibenthic	PIXX	Chordata	Vertebrata	Actinopteri	Teleostei	Perciformes	Cottidae	Cottidae indet.	Int	1	1.14862	1.14862	1		Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-150	BAFF21UMLNGN25ARCH04	18-Aug-21	75	50	5.37191	Epibenthic	PIXX	Chordata	Vertebrata	Actinopteri	Teleostei	Perciformes	Cottidae	Cottidae indet.	J/parts	9	1.13309	0.12590			Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-150	BAFF21UMLNGN25ARCH04	18-Aug-21	75	50	5.37191	Undetermined	PIXX	Chordata	Vertebrata					Pisces indet.	Parts		1.23603	1.23603			Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-150	BAFF21UMLNGN25ARCH04	18-Aug-21	75	50	5.37191	Undetermined	XXXX							Unidentified tissue	Parts		0.03561	0.03561			Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-151	BAFF21UMLNGN25ARCH05	18-Aug-21	100	75	11.86079	Epibenthic	PIXX	Chordata	Vertebrata	Actinopteri	Teleostei	Perciformes	Cottidae	Cottidae indet.	J/parts	19	2.53012	0.13316	1		Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-151	BAFF21UMLNGN25ARCH05	18-Aug-21	100	75	11.86079	Epibenthic	PIXX	Chordata	Vertebrata	Actinopteri	Teleostei	Perciformes	Cottidae	Myoxocephalus sp.	Int	3	3.13754	1.04585	1		Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-151	BAFF21UMLNGN25ARCH05	18-Aug-21	100	75	11.86079	Undetermined	PIXX	Chordata	Vertebrata					Pisces indet.	J/parts	1	0.09218	0.09218			Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-151	BAFF21UMLNGN25ARCH05	18-Aug-21	100	75	11.86079	Undetermined	PIXX	Chordata	Vertebrata					Pisces indet.	Parts		1.71934	1.71934			Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-152	BAFF21UMLNGN25ARCH06	18-Aug-21	100	50	30.32764	Parasite	ACAN	Acanthocephala						Acanthocephala indet.	A	1	0.00249	0.00249	1		Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-152	BAFF21UMLNGN25ARCH06	18-Aug-21	100	50	30.32764	Planktonic	CRAM	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Hyperiidae	Themisto libellula	A/parts	150	6.91222	0.04608	1		Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-152	BAFF21UMLNGN25ARCH06	18-Aug-21	100	50	30.32764	Planktonic	CRAM	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda		Hyperiidea indet.	Parts		6.15721	6.15721			Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-152	BAFF21UMLNGN25ARCH06	18-Aug-21	100	50	30.32764	Undetermined	XXXX							Unidentified tissue	Parts		0.02963	0.02963			Some organisms found outside stomach.
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-153	BAFF21UMLNGN25ARCH13	18-Aug-21	75	50	13.05528	Benthic	CRAM	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Gammaridae	Gammarus sp.	A	1	0.04998	0.04998	1		
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-153	BAFF21UMLNGN25ARCH13	18-Aug-21	75	50	13.05528	Planktonic	CRAM	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Hyperiidae	Themisto libellula	A/parts	29	1.09408	0.03773	1		
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-153	BAFF21UMLNGN25ARCH13	18-Aug-21	75	50	13.05528	Planktonic	CRAM	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Uristidae	Onisimus sp.	Int	1	0.00271	0.00271	1		
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-153	BAFF21UMLNGN25ARCH13	18-Aug-21	75	50	13.05528	Planktonic	CRAM	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Uristidae	Onisimus sp.	A	2	0.04482	0.02241			
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-153	BAFF21UMLNGN25ARCH13	18-Aug-21	75	50	13.05528	Undetermined	CRAM	Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda		Amphipoda indet.	Parts		0.82836	0.82836			
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-153	BAFF21UMLNGN25ARCH13	18-Aug-21	75	50	13.05528	Undetermined	PIXX	Chordata	Vertebrata					Pisces indet.	Int/parts	1	0.99605	0.99605	1		
Golder	Baffinlands	2021	Fish Stomach	Arctic Char	ms21-042-153	BAFF21UMLNGN25ARCH13	18-Aug-21	75	50	13.05528	Undetermined	XXXX							Unidentified tissue	Parts		0.88038	0.88038			

APPENDIX 8C-1

Settlement Basket and Plate Taxa Identifications

Appendix 8C-1

Settlement Basket and Plate Taxa Identifications

Phylum Class/Order	Family	Taxa	Settlement Substrate Baskets	Plates
Annelida				
Clitellata/-	-	Hirudinea indet.	X	X
Polychaeta/Phyllodocida	Hesionidae	Hesionidae indet.	X	X
Polychaeta/Phyllodocida	Hesionidae	*Nereimyra aphroditoides*	X	X
Polychaeta/Phyllodocida	Nephtyidae	*Micronephthys cornuta*	X	
Polychaeta/Phyllodocida	Nereididae	*Nereis zonata*	X	
Polychaeta/Phyllodocida	Nereididae	Nereididae indet.	X	
Polychaeta/Phyllodocida	Pholoidae	*Pholoe longa*	X	
Polychaeta/Phyllodocida	Pholoidae	*Pholoe minuta*	X	X
Polychaeta/Phyllodocida	Pholoidae	*Pholoe* sp.	X	
Polychaeta/Phyllodocida	Phyllodocidae	*Eteone* sp.	X	X
Polychaeta/Phyllodocida	Phyllodocidae	*Phyllodoce* sp.	X	
Polychaeta/Phyllodocida	Phyllodocidae	Phyllodocidae indet.		X
Polychaeta/Phyllodocida	Polynoidae	*Gattyana cirrhosa*	X	
Polychaeta/Phyllodocida	Polynoidae	*Harmothoe imbricata*	X	X
Polychaeta/Phyllodocida	Polynoidae	*Harmothoe rarispina*	X	
Polychaeta/Phyllodocida	Polynoidae	Polynoinae indet.	X	X
Polychaeta/Phyllodocida	Polynoidae	*Harmothoe* sp.	X	
Polychaeta/Phyllodocida	Syllidae	*Pionosyllis* sp.	X	X
Polychaeta/Phyllodocida	Syllidae	Syllidae indet.		X
Polychaeta/Sabellida	Sabellidae	Dialychone sp. 3	X	
Polychaeta/Sabellida	Sabellidae	*Euchone incolor*	X	
Polychaeta/Sabellida	Sabellidae	*Euchone* sp.	X	
Polychaeta/Sabellida	Sabellidae	Sabellidae indet.	X	
Polychaeta/Sabellida	Serpulidae	*Circeis* sp.	X	
Polychaeta/Sabellida	Serpulidae	Serpulidae indet.	X	
Polychaeta/Spionida	Spionidae	*Marenzelleria* sp.	X	
Polychaeta/Spionida	Spionidae	*Scolelepis* sp.	X	
Polychaeta/Spionida	Spionidae	Spionidae indet.	X	X
Polychaeta/Terebellida	Ampharetidae	*Ampharete* sp.	X	
Polychaeta/Terebellida	Ampharetidae	Ampharetidae indet.	X	
Polychaeta/Terebellida	Cirratulidae	*Chaetozone bathyala*	X	
Polychaeta/Terebellida	Cirratulidae	*Chaetozone* sp.	X	
Polychaeta/Terebellida	Pectinariidae	*Cistenides granulata*	X	
Polychaeta/Terebellida	Terebellidae	Terebellidae indet.	X	X
Polychaeta/Terebellida	Trichobranchidae	*Terebellides* sp.	X	
Polychaeta/-	Capitellidae	Mediomastus sp.	X	
Polychaeta/-	Cossuridae	Cossura longocirrata	X	
Polychaeta/-	Scalibregmatidae	Scalibregma inflatum	X	
Polychaeta/-	Scalibregmatidae	Scalibregmatidae indet.		X
Arthropoda				
Arachnida/-	-	Acari indet.	X	X
Malacostraca/Amphipoda	Atylidae	*Atylus carinatus*	X	
Malacostraca/Amphipoda	Calliopiidae	Calliopiidae indet.	X	X
Malacostraca/Amphipoda	Calliopiidae	*Apherusa* sp.	X	
Malacostraca/Amphipoda	Corophiidae	*Crassicorophium* sp.	X	
Malacostraca/Amphipoda	Corophiidae	Corophiidae indet.	X	
Malacostraca/Amphipoda	Dexaminidae	*Guernea nordenskioldi*	X	
Malacostraca/Amphipoda	Gammaridae	*Gammarus oceanicus*		X
Malacostraca/Amphipoda	Gammaridae	*Gammarus* sp.	X	X
Malacostraca/Amphipoda	Ischyroceridae	*Ischyrocerus anguipes*		X
Malacostraca/Amphipoda	Oedicerotidae	*Monoculopsis* sp.	X	
Malacostraca/Amphipoda	Oedicerotidae	*Paroediceros lynceus*	X	
Malacostraca/Amphipoda		Lysianassoidea indet.	X	
Malacostraca/Decapoda	Thoridae	*Lebbeus polaris*	X	
Ostracoda/Myodocopida	Philomedidae	*Philomedes* sp.	X	
Thecostraca/Balanomorpha	-	Balanomorpha indet.	X	X

Appendix 8C-1

Settlement Basket and Plate Taxa Identifications

Bryozoa				
-/-	-	Bryozoa indet.	X	
Stenolaemata/Cyclostomatida	Lichenoporidae	Lichenoporidae indet.		X
Stenolaemata/Cyclostomatida	Lichenoporidae	***Lichenopora* sp.**	X	
Stenolaemata/Cyclostomatida	Tubuliporidae	Tubuliporidae indet.	X	
Chlorophyta				
Ulvophyceae/Acrosiphoniales	Acrosiphoniaceae	***Spongomorpha aeruginosa***	X	X
Ulvophyceae/Cladophorales	Cladophoraceae	***Rhizoclonium* sp.**		X
Ulvophyceae/Ulotrichales	Ulotrichaceae	***Ulothrix* sp.**		X
Ulvophyceae/Ulotrichales	Ulotrichaceae	**Ulotrichaceae indet.**		X
Ulvophyceae/Ulvales	Ulvaceae	***Ulva* cf. *prolifera***	X	
Chordata				
Ascidiacea/Stolidobranchia	Molgulidae	*Molgula* sp.	X	X
Ciliophora				
-/-	-	**Ciliophora indet.**	X	
Cnidaria				
Anthozoa/Actiniaria	-	Actiniaria indet.	X	X
Hydrozoa/Anthoathecata	Corynidae	***Sarsia* sp.**	X	X
Hydrozoa/Anthoathecata	-	Anthoathecata indet.	X	
Hydrozoa/Leptothecata	Campanulariidae	Campanulariidae indet.	X	X
Echinodermata				
Asteroidea/Forcipulatida	Asteriidae	***Leptasterias* (*Leptasterias*) *m***	X	
Echinoidea/Camarodonta	Strongylocentrotidae	*Strongylocentrotus droebachiens*	X	
Ophiuroidea/Ophiurida	Ophiuridae	*Ophiura sarsii*	X	
Foraminifera				
-/-	-	**Foraminifera indet.**	X	
Mollusca				
Bivalvia/-	-	Bivalvia indet.	X	X
Bivalvia/Adapedonta	Hiatellidae	*Hiatella arctica*	X	X
Bivalvia/Carditida	Astartidae	*Astarte* sp.	X	
Bivalvia/Carditida	Astartidae	*Astarte borealis*	X	
Bivalvia/Carditida	Astartidae	*Astarte montagui*	X	
Bivalvia/Myida	Myidae	*Mya* sp.	X	X
Bivalvia/Mytilida	Mytilidae	***Arvella faba***	X	
Bivalvia/Mytilida	Mytilidae	*Musculus discors*	X	X
Bivalvia/Mytilida	Mytilidae	*Musculus* sp.	X	X
Bivalvia/Mytilida	Mytilidae	Mytilidae indet.	X	X
Bivalvia/Nuculanida	Nuculanidae	*Nuculana minuta*	X	
Bivalvia/Nuculida	Nuculidae	*Ennucula tenuis*	X	
Gastropoda/-	-	Gastropoda indet.		X
Gastropoda/-	-	Patellogastropoda indet.	X	
Gastropoda/-	Lottiidae	*Testudinalia testudinalis*	X	
Gastropoda/Nudibranchia	Dendronotidae	***Dendronotus* sp.**	X	
Gastropoda/Trochida	Margaritidae	*Margarites groenlandicus*	X	
Gastropoda/Trochida	Margaritidae	*Margarites helicinus*	X	
Ochrophyta				
Phaeophyceae/Ectocarpales	Acinetosporaceae	***Pylaiella* cf. *varia***	X	X
Phaeophyceae/Ectocarpales	Chordariaceae	**cf. *Trachynema groenlandicum***	X	X
Phaeophyceae/Ectocarpales	Chordariaceae	**Chordariaceae indet.**	X	
Phaeophyceae/Fucales	Fucaceae	cf. *Fucus distichus*	X	
Phaeophyceae/Sphacelariales	-	Sphacelariales indet.	X	X

Notes: taxa identified to the lowest practical taxonomic level; indet.= indeterminate (taxa which could not be identified beyond the taxonomic level listed); sp.=species; cf.=compare with (taxa is an inexact match to the designated taxa.
Taxa in bold indicate new observations in MEEMP and NIS/AIS programs
All taxa cross-referenced with NIS/AIS resources: Fofonoff et al. 2022, ISSG 2022, Rius et al. 2022, Molnar et al. 2008, Casas-Monroy et al. 2014

APPENDIX 8C-2

Settlement Substrate Lab Data

biologica

Raw abundance data in long format for Golder Baffinland Iron Mine MEEMP, 2021 Quadrat Plates and Freight Dock Y2 Settlement Plates and Baskets.

Client	Project	Year	Sample Type	Biologica Sample ID	Client Sample ID	Date Sampled	Organism Type	taxcode	grpcode	Phylum	Class	Order	Family	Subfamily	Taxon Name	A	Int	J	Total Abundance	Unique Taxa Count	Percent Cover	Comment
Golder	Baffinlands	2021	Settlement Basket	mb21-042-069	East S Basket 1	10-Aug-21	Mobile	ARTH	CHAR	Arthropoda	Arachnida				Acari indet.	5			5	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-077	West D Basket 1	15-Aug-21	Mobile	ARTH	CHAR	Arthropoda	Arachnida				Acari indet.	4			4	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-074	West M Basket 1	15-Aug-21	Mobile	ARTH	CHAR	Arthropoda	Arachnida				Acari indet.	1			1	1	1	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-065	West M Plate 1	15-Aug-21	Mobile	ARTH	CHAR	Arthropoda	Arachnida				Acari indet.	1			1	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-076	Centre D Basket 1	14-Aug-21	Attached	MISC	CNAN	Cnidaria	Anthozoa	Actiniaria			Actiniaria indet.			1	1	1	2	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-070	Centre S Basket 1	14-Aug-21	Attached	MISC	CNAN	Cnidaria	Anthozoa	Actiniaria			Actiniaria indet.			2	2	1	2	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-066	East D Plate 1	14-Aug-21	Attached	MISC	CNAN	Cnidaria	Anthozoa	Actiniaria			Actiniaria indet.			1	1	1	2	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-072	East M Basket 1	15-Aug-21	Attached	MISC	CNAN	Cnidaria	Anthozoa	Actiniaria			Actiniaria indet.		1		1	1	2	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-070	Centre S Basket 1	14-Aug-21	Mobile	ANNE	POSE	Annelida	Polychaeta	Terebellida	Ampharetidae	Ampharetinae	Ampharete sp.			1	1	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-072	East M Basket 1	15-Aug-21	Mobile	ANNE	POSE	Annelida	Polychaeta	Terebellida	Ampharetidae		Ampharetidae indet.			1	1	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-076	Centre D Basket 1	14-Aug-21	Attached	MISC	CNHY	Cnidaria	Hydrozoa	Anthoathecata			Anthoathecata indet.				Present		2	On one bivalve
Golder	Baffinlands	2021	Settlement Basket	mb21-042-077	West D Basket 1	15-Aug-21	Mobile	ARTH	CRAM	Arthropoda	Malacostraca	Amphipoda	Calliopiidae		Apherusa sp.	2			2	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-074	West M Basket 1	15-Aug-21	Attached	MOLL	MOBI	Mollusca	Bivalvia	Mytilida	Mytilidae	Crenellinae	Arvella faba	1			1	1	2	Name updated. Previously Crenella faba
Golder	Baffinlands	2021	Settlement Basket	mb21-042-076	Centre D Basket 1	14-Aug-21	Mobile	MOLL	MOBI	Mollusca	Bivalvia	Carditida	Astartidae		Astarte borealis		1		1	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-076	Centre D Basket 1	14-Aug-21	Mobile	MOLL	MOBI	Mollusca	Bivalvia	Carditida	Astartidae		Astarte montagui		1		1	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-072	East M Basket 1	15-Aug-21	Mobile	MOLL	MOBI	Mollusca	Bivalvia	Carditida	Astartidae		Astarte montagui		2	1	3	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-076	Centre D Basket 1	14-Aug-21	Mobile	MOLL	MOBI	Mollusca	Bivalvia	Carditida	Astartidae		Astarte sp.			1	1		1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-075	East D Basket 1	14-Aug-21	Mobile	MOLL	MOBI	Mollusca	Bivalvia	Carditida	Astartidae	Musculinae	Astarte sp.		1		1	1	1	Damaged
Golder	Baffinlands	2021	Settlement Basket	mb21-042-071	West S Basket 1	10-Aug-21	Mobile	ARTH	CRAM	Arthropoda	Malacostraca	Amphipoda	Atylidae	Atylinae	Atylus carinatus	1			1	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-076	Centre D Basket 1	14-Aug-21	Attached	ARTH	CRCI	Arthropoda	Thecostraca	Balanomorpha			Balanomorpha indet.				Present	1	2	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-067	Centre D Plate 1	14-Aug-21	Attached	ARTH	CRCI	Arthropoda	Thecostraca	Balanomorpha			Balanomorpha indet.				Present	1	2	Primarily cypris
Golder	Baffinlands	2021	Settlement Basket	mb21-042-073	Centre M Basket 1	10-Aug-21	Attached	ARTH	CRCI	Arthropoda	Thecostraca	Balanomorpha			Balanomorpha indet.				Present	1	2	Juvenile and cypris
Golder	Baffinlands	2021	Settlement Plate	mb21-042-064	Centre M Plate 1	10-Aug-21	Attached	ARTH	CRCI	Arthropoda	Thecostraca	Balanomorpha			Balanomorpha indet.				Present	1	2	Primarily cypris
Golder	Baffinlands	2021	Settlement Basket	mb21-042-070	Centre S Basket 1	14-Aug-21	Attached	ARTH	CRCI	Arthropoda	Thecostraca	Balanomorpha			Balanomorpha indet.				Present	1	2	Juvenile and cypris, newly settled
Golder	Baffinlands	2021	Settlement Plate	mb21-042-061	Centre S Plate 1	14-Aug-21	Attached	ARTH	CRCI	Arthropoda	Thecostraca	Balanomorpha			Balanomorpha indet.				Present	1	2	Sparse
Golder	Baffinlands	2021	Settlement Basket	mb21-042-075	East D Basket 1	14-Aug-21	Attached	ARTH	CRCI	Arthropoda	Thecostraca	Balanomorpha			Balanomorpha indet.				Present	1	2	Juvenile and cypris
Golder	Baffinlands	2021	Settlement Plate	mb21-042-066	East D Plate 1	14-Aug-21	Attached	ARTH	CRCI	Arthropoda	Thecostraca	Balanomorpha			Balanomorpha indet.				Present	1	2	Primarily cypris
Golder	Baffinlands	2021	Settlement Basket	mb21-042-072	East M Basket 1	15-Aug-21	Attached	ARTH	CRCI	Arthropoda	Thecostraca	Balanomorpha			Balanomorpha indet.				Present	1	2	Juvenile and cypris
Golder	Baffinlands	2021	Settlement Plate	mb21-042-063	East M Plate 1	15-Aug-21	Attached	ARTH	CRCI	Arthropoda	Thecostraca	Balanomorpha			Balanomorpha indet.				Present	1	2	Found along the ridge
Golder	Baffinlands	2021	Settlement Basket	mb21-042-069	East S Basket 1	10-Aug-21	Attached	ARTH	CRCI	Arthropoda	Thecostraca	Balanomorpha			Balanomorpha indet.				Present	1	2	Juvenile and cypris
Golder	Baffinlands	2021	Settlement Plate	mb21-042-060	East S Plate 1	10-Aug-21	Attached	ARTH	CRCI	Arthropoda	Thecostraca	Balanomorpha			Balanomorpha indet.				Present	1	2	Sparse, <5%, juvenile and cypris
Golder	Baffinlands	2021	Quadrat Plate	mb21-042-035	Q10-Plate 1	8-Aug-21	Attached	ARTH	CRCI	Arthropoda	Thecostraca	Balanomorpha			Balanomorpha indet.				Present	1	2	Sparse, <5%, juvenile and cypris
Golder	Baffinlands	2021	Quadrat Plate	mb21-042-027	Q1-Plate 1	14-Aug-21	Attached	ARTH	CRCI	Arthropoda	Thecostraca	Balanomorpha			Balanomorpha indet.				Present	1	2	Cypris newly settled
Golder	Baffinlands	2021	Quadrat Plate	mb21-042-028	Q3-Plate 1	15-Aug-21	Attached	ARTH	CRCI	Arthropoda	Thecostraca	Balanomorpha			Balanomorpha indet.				Present	1	2	Primarily juvenile, some cypris
Golder	Baffinlands	2021	Quadrat Plate	mb21-042-029	Q4-Plate 1	6-Aug-21	Attached	ARTH	CRCI	Arthropoda	Thecostraca	Balanomorpha			Balanomorpha indet.				Present	1	2	Cypris newly settled
Golder	Baffinlands	2021	Quadrat Plate	mb21-042-031	Q6-Plate 1	8-Aug-21	Attached	ARTH	CRCI	Arthropoda	Thecostraca	Balanomorpha			Balanomorpha indet.				Present	1	2	Cypris newly settled
Golder	Baffinlands	2021	Quadrat Plate	mb21-042-032	Q7-Plate 1	16-Aug-21	Attached	ARTH	CRCI	Arthropoda	Thecostraca	Balanomorpha			Balanomorpha indet.				Present	1	2	
Golder	Baffinlands	2021	Quadrat Plate	mb21-042-033	Q8-Plate 1	16-Aug-21	Attached	ARTH	CRCI	Arthropoda	Thecostraca	Balanomorpha			Balanomorpha indet.				Present	1	2	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-077	West D Basket 1	15-Aug-21	Attached	ARTH	CRCI	Arthropoda	Thecostraca	Balanomorpha			Balanomorpha indet.				Present	1	2	Juvenile and cypris
Golder	Baffinlands	2021	Settlement Plate	mb21-042-068	West D Plate 1	15-Aug-21	Attached	ARTH	CRCI	Arthropoda	Thecostraca	Balanomorpha			Balanomorpha indet.				Present		2	Primarily cypris, newly settled
Golder	Baffinlands	2021	Settlement Basket	mb21-042-074	West M Basket 1	15-Aug-21	Attached	ARTH	CRCI	Arthropoda	Thecostraca	Balanomorpha			Balanomorpha indet.				Present	1	2	Primarily juvenile, Newly settled
Golder	Baffinlands	2021	Settlement Plate	mb21-042-065	West M Plate 1	15-Aug-21	Attached	ARTH	CRCI	Arthropoda	Thecostraca	Balanomorpha			Balanomorpha indet.				Present	1	2	Primarily cypris
Golder	Baffinlands	2021	Settlement Basket	mb21-042-071	West S Basket 1	10-Aug-21	Attached	ARTH	CRCI	Arthropoda	Thecostraca	Balanomorpha			Balanomorpha indet.				Present	1	2	Juvenile and cypris. 1 damaged adult
Golder	Baffinlands	2021	Settlement Plate	mb21-042-062	West S Plate 1	10-Aug-21	Attached	ARTH	CRCI	Arthropoda	Thecostraca	Balanomorpha			Balanomorpha indet.				Present	1	2	Sparse, along the ridge
Golder	Baffinlands	2021	Settlement Basket	mb21-042-076	Centre D Basket 1	14-Aug-21	Mobile	MOLL	MOBI	Mollusca	Bivalvia				Bivalvia indet.		1		1		1	Damaged
Golder	Baffinlands	2021	Settlement Plate	mb21-042-067	Centre D Plate 1	14-Aug-21	Mobile	MOLL	MOBI	Mollusca	Bivalvia				Bivalvia indet.			1	1		1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-073	Centre M Basket 1	10-Aug-21	Mobile	MOLL	MOBI	Mollusca	Bivalvia				Bivalvia indet.			3	3		1	Damaged/very small
Golder	Baffinlands	2021	Settlement Basket	mb21-042-070	Centre S Basket 1	14-Aug-21	Mobile	MOLL	MOBI	Mollusca	Bivalvia				Bivalvia indet.			1	1		1	Damaged
Golder	Baffinlands	2021	Settlement Basket	mb21-042-072	East M Basket 1	15-Aug-21	Mobile	MOLL	MOBI	Mollusca	Bivalvia				Bivalvia indet.			2	2		1	Damaged x1
Golder	Baffinlands	2021	Settlement Plate	mb21-042-063	East M Plate 1	15-Aug-21	Mobile	MOLL	MOBI	Mollusca	Bivalvia				Bivalvia indet.			1	1		1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-069	East S Basket 1	10-Aug-21	Mobile	MOLL	MOBI	Mollusca	Bivalvia				Bivalvia indet.			2	Present		1	Damaged
Golder	Baffinlands	2021	Quadrat Plate	mb21-042-031	Q6-Plate 1	8-Aug-21	Mobile	MOLL	MOBI	Mollusca	Bivalvia				Bivalvia indet.			10	10		1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-074	West M Basket 1	15-Aug-21	Mobile	MOLL	MOBI	Mollusca	Bivalvia				Bivalvia indet.			1	1		1	Damaged/very small
Golder	Baffinlands	2021	Settlement Basket	mb21-042-071	West S Basket 1	10-Aug-21	Mobile	MOLL	MOBI	Mollusca	Bivalvia				Bivalvia indet.			3	3		1	Damaged/very small
Golder	Baffinlands	2021	Settlement Basket	mb21-042-071	West S Basket 1	10-Aug-21	Attached	MISC	BRYO	Bryozoa					Bryozoa indet.			1	1	1	2	Small colony
Golder	Baffinlands	2021	Settlement Basket	mb21-042-076	Centre D Basket 1	14-Aug-21	Mobile	ARTH	CRAM	Arthropoda	Malacostraca	Amphipoda	Calliopiidae	Musculinae	Calliopiidae indet.		2		2	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-073	Centre M Basket 1	10-Aug-21	Mobile	ARTH	CRAM	Arthropoda	Malacostraca	Amphipoda	Calliopiidae		Calliopiidae indet.		34	1	35	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-070	Centre S Basket 1	14-Aug-21	Mobile	ARTH	CRAM	Arthropoda	Malacostraca	Amphipoda	Calliopiidae		Calliopiidae indet.			1	1	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-075	East D Basket 1	14-Aug-21	Mobile	ARTH	CRAM	Arthropoda	Malacostraca	Amphipoda	Calliopiidae		Calliopiidae indet.			1	1	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-072	East M Basket 1	15-Aug-21	Mobile	ARTH	CRAM	Arthropoda	Malacostraca	Amphipoda	Calliopiidae		Calliopiidae indet.		1		1	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-069	East S Basket 1	10-Aug-21	Mobile	ARTH	CRAM	Arthropoda	Malacostraca	Amphipoda	Calliopiidae		Calliopiidae indet.		3		3	1	1	
Golder	Baffinlands	2021	Quadrat Plate	mb21-042-035	Q10-Plate 1	8-Aug-21	Mobile	ARTH	CRAM	Arthropoda	Malacostraca	Amphipoda	Calliopiidae		Calliopiidae indet.			1	1	1	1	
Golder	Baffinlands	2021	Quadrat Plate	mb21-042-034	Q9-Plate 1	11-Aug-21	Mobile	ARTH	CRAM	Arthropoda	Malacostraca	Amphipoda	Calliopiidae		Calliopiidae indet.			1	1	1	1	Damaged
Golder	Baffinlands	2021	Settlement Basket	mb21-042-077	West D Basket 1	15-Aug-21	Mobile	ARTH	CRAM	Arthropoda	Malacostraca	Amphipoda	Calliopiidae		Calliopiidae indet.		18	1	19		1	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-068	West D Plate 1	15-Aug-21	Mobile	ARTH	CRAM	Arthropoda	Malacostraca	Amphipoda	Calliopiidae		Calliopiidae indet.			3	3	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-071	West S Basket 1	10-Aug-21	Mobile	ARTH	CRAM	Arthropoda	Malacostraca	Amphipoda	Calliopiidae		Calliopiidae indet.			1	1	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-076	Centre D Basket 1	14-Aug-21	Attached	MISC	CNHY	Cnidaria	Hydrozoa	Leptothecata	Campanulariidae		Campanulariidae indet.				Present	1	2	On 1 rock
Golder	Baffinlands	2021	Settlement Plate	mb21-042-067	Centre D Plate 1	14-Aug-21	Attached	MISC	CNHY	Cnidaria	Hydrozoa	Leptothecata	Campanulariidae		Campanulariidae indet.				Present	1	2	Sparse
Golder	Baffinlands	2021	Settlement Basket	mb21-042-073	Centre M Basket 1	10-Aug-21	Attached	MISC	CNHY	Cnidaria	Hydrozoa	Leptothecata	Campanulariidae		Campanulariidae indet.				Present	1	2	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-070	Centre S Basket 1	14-Aug-21	Attached	MISC	CNHY	Cnidaria	Hydrozoa	Leptothecata	Campanulariidae		Campanulariidae indet.				Present	1	2	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-061	Centre S Plate 1	14-Aug-21	Attached	MISC	CNHY	Cnidaria	Hydrozoa	Leptothecata	Campanulariidae		Campanulariidae indet.				Present	1	2	1 colony
Golder	Baffinlands	2021	Settlement Basket	mb21-042-075	East D Basket 1	14-Aug-21	Attached	MISC	CNHY	Cnidaria	Hydrozoa	Leptothecata	Campanulariidae		Campanulariidae indet.				Present	1	2	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-066	East D Plate 1	14-Aug-21	Attached	MISC	CNHY	Cnidaria	Hydrozoa	Leptothecata	Campanulariidae		Campanulariidae indet.				Present	1	2	Sparse
Golder	Baffinlands	2021	Settlement Basket	mb21-042-072	East M Basket 1	15-Aug-21	Attached	MISC	CNHY	Cnidaria	Hydrozoa	Leptothecata	Campanulariidae		Campanulariidae indet.				Present	1	2	Sparse

Golder	Baffinlands	2021	Settlement Basket	mb21-042-069	East S Basket 1	10-Aug-21	Attached	MISC	CNHY	Cnidaria	Hydrozoa	Leptothecata	Campanulariidae		Campanulariidae indet.				Present	1	2	
Golder	Baffinlands	2021	Quadrat Plate	mb21-042-035	Q10-Plate 1	8-Aug-21	Attached	MISC	CNHY	Cnidaria	Hydrozoa	Leptothecata	Campanulariidae		Campanulariidae indet.				Present	1	2	
Golder	Baffinlands	2021	Quadrat Plate	mb21-042-027	Q1-Plate 1	14-Aug-21	Attached	MISC	CNHY	Cnidaria	Hydrozoa	Leptothecata	Campanulariidae		Campanulariidae indet.				Present	1	2	
Golder	Baffinlands	2021	Quadrat Plate	mb21-042-029	Q4-Plate 1	6-Aug-21	Attached	MISC	CNHY	Cnidaria	Hydrozoa	Leptothecata	Campanulariidae		Campanulariidae indet.				Present	1	2	
Golder	Baffinlands	2021	Quadrat Plate	mb21-042-030	Q5-Plate 1	6-Aug-21	Attached	MISC	CNHY	Cnidaria	Hydrozoa	Leptothecata	Campanulariidae		Campanulariidae indet.				Present	1	2	
Golder	Baffinlands	2021	Quadrat Plate	mb21-042-031	Q6-Plate 1	8-Aug-21	Attached	MISC	CNHY	Cnidaria	Hydrozoa	Leptothecata	Campanulariidae		Campanulariidae indet.				Present	1	2	<3% coverage, no gonangium present to identify further
Golder	Baffinlands	2021	Quadrat Plate	mb21-042-034	Q9-Plate 1	11-Aug-21	Attached	MISC	CNHY	Cnidaria	Hydrozoa	Leptothecata	Campanulariidae		Campanulariidae indet.				Present	1	2	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-065	West M Plate 1	15-Aug-21	Attached	MISC	CNHY	Cnidaria	Hydrozoa	Leptothecata	Campanulariidae		Campanulariidae indet.				Present	1	2	Sparse
Golder	Baffinlands	2021	Settlement Basket	mb21-042-071	West S Basket 1	10-Aug-21	Attached	MISC	CNHY	Cnidaria	Hydrozoa	Leptothecata	Campanulariidae		Campanulariidae indet.				Present	1	2	Sparse
Golder	Baffinlands	2021	Settlement Basket	mb21-042-071	West S Basket 1	10-Aug-21	Attached	ALGAE	ALGAE	Ochrophyta	Phaeophyceae	Fucales	Fucaceae		cf. Fucus distichus				Present	1	2	Degraded
Golder	Baffinlands	2021	Settlement Basket	mb21-042-073	Centre M Basket 1	10-Aug-21	Attached	ALGAE	ALGAE	Ochrophyta	Phaeophyceae	Ectocarpales	Chordariaceae		cf. Trachynema groenlandicum				Present	1	2	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-064	Centre M Plate 1	10-Aug-21	Attached	ALGAE	ALGAE	Ochrophyta	Phaeophyceae	Ectocarpales	Chordariaceae		cf. Trachynema groenlandicum				Present	1	2	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-070	Centre S Basket 1	14-Aug-21	Attached	ALGAE	ALGAE	Ochrophyta	Phaeophyceae	Ectocarpales	Chordariaceae		cf. Trachynema groenlandicum				Present	1	2	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-072	East M Basket 1	15-Aug-21	Attached	ALGAE	ALGAE	Ochrophyta	Phaeophyceae	Ectocarpales	Chordariaceae		cf. Trachynema groenlandicum				Present	1	2	
Golder	Baffinlands	2021	Quadrat Plate	mb21-042-035	Q10-Plate 1	8-Aug-21	Attached	ALGAE	ALGAE	Ochrophyta	Phaeophyceae	Ectocarpales	Chordariaceae		cf. Trachynema groenlandicum				Present	1	2	
Golder	Baffinlands	2021	Quadrat Plate	mb21-042-029	Q4-Plate 1	6-Aug-21	Attached	ALGAE	ALGAE	Ochrophyta	Phaeophyceae	Ectocarpales	Chordariaceae		cf. Trachynema groenlandicum				Present	1	2	
Golder	Baffinlands	2021	Quadrat Plate	mb21-042-034	Q9-Plate 1	11-Aug-21	Attached	ALGAE	ALGAE	Ochrophyta	Phaeophyceae	Ectocarpales	Chordariaceae		cf. Trachynema groenlandicum				Present	1	2	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-077	West D Basket 1	15-Aug-21	Attached	ALGAE	ALGAE	Ochrophyta	Phaeophyceae	Ectocarpales	Chordariaceae		cf. Trachynema groenlandicum				Present	1	2	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-068	West D Plate 1	15-Aug-21	Attached	ALGAE	ALGAE	Ochrophyta	Phaeophyceae	Ectocarpales	Chordariaceae		cf. Trachynema groenlandicum				Present	1	2	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-074	West M Basket 1	15-Aug-21	Attached	ALGAE	ALGAE	Ochrophyta	Phaeophyceae	Ectocarpales	Chordariaceae		cf. Trachynema groenlandicum				Present	1	2	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-071	West S Basket 1	10-Aug-21	Attached	ALGAE	ALGAE	Ochrophyta	Phaeophyceae	Ectocarpales	Chordariaceae		cf. Trachynema groenlandicum				Present	1	2	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-062	West S Plate 1	10-Aug-21	Attached	ALGAE	ALGAE	Ochrophyta	Phaeophyceae	Ectocarpales	Chordariaceae		cf. Trachynema groenlandicum				Present	1	2	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-076	Centre D Basket 1	14-Aug-21	Mobile	ANNE	POSE	Annelida	Polychaeta	Terebellida	Cirratulidae	Musculinae	Chaetozone bathyala	3			3	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-076	Centre D Basket 1	14-Aug-21	Mobile	ANNE	POSE	Annelida	Polychaeta	Terebellida	Cirratulidae	Musculinae	Chaetozone sp.		1	1	2		1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-072	East M Basket 1	15-Aug-21	Mobile	ANNE	POSE	Annelida	Polychaeta	Terebellida	Cirratulidae		Chaetozone sp.		1	1	2	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-072	East M Basket 1	15-Aug-21	Attached	ALGAE	ALGAE	Ochrophyta	Phaeophyceae	Ectocarpales	Chordariaceae		Chordariaceae indet.				Present		2	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-076	Centre D Basket 1	14-Aug-21	Attached	MEMO	MEMO	Ciliophora					Ciliophora indet.				Present		2	Over a few rocks, possibly Metafolliculina
Golder	Baffinlands	2021	Settlement Basket	mb21-042-075	East D Basket 1	14-Aug-21	Attached	ANNE	POSE	Annelida	Polychaeta	Sabellida	Serpulidae	Spirorbinae	Circeis sp.		1		1	1	2	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-076	Centre D Basket 1	14-Aug-21	Mobile	ANNE	POSE	Annelida	Polychaeta	Terebellida	Pectinariidae	Musculinae	Cistenides granulata	1			1	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-074	West M Basket 1	15-Aug-21	Mobile	ARTH	CRAM	Arthropoda	Malacostraca	Amphipoda	Corophiidae		Corophiidae indet.			1	1	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-076	Centre D Basket 1	14-Aug-21	Mobile	ANNE	POSE	Annelida	Polychaeta		Cossuridae	Musculinae	Cossura longocirrata	1	1		2	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-072	East M Basket 1	15-Aug-21	Mobile	ANNE	POSE	Annelida	Polychaeta		Cossuridae		Cossura longocirrata	1			1	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-073	Centre M Basket 1	10-Aug-21	Mobile	ARTH	CRAM	Arthropoda	Malacostraca	Amphipoda	Corophiidae	Corophiinae	Crassicorophium sp.		1		1	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-070	Centre S Basket 1	14-Aug-21	Mobile	ARTH	CRAM	Arthropoda	Malacostraca	Amphipoda	Corophiidae	Corophiinae	Crassicorophium sp.	2			2	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-073	Centre M Basket 1	10-Aug-21	Mobile	MOLL	MOGA	Mollusca	Gastropoda	Nudibranchia	Dendronotidae		Dendronotus sp.		1		1	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-077	West D Basket 1	15-Aug-21	Mobile	MOLL	MOGA	Mollusca	Gastropoda	Nudibranchia	Dendronotidae		Dendronotus sp.			1	1	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-071	West S Basket 1	10-Aug-21	Mobile	ANNE	POSE	Annelida	Polychaeta	Sabellida	Sabellidae	Sabellinae	Dialychone sp. 3		1	2	3	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-075	East D Basket 1	14-Aug-21	Mobile	MEMO	MEMO					Musculinae	Egg/egg mass				Present		1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-072	East M Basket 1	15-Aug-21	Mobile	MEMO	MEMO						Egg/egg mass				Present		1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-077	West D Basket 1	15-Aug-21	Mobile	MEMO	MEMO						Egg/egg mass				Present		1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-074	West M Basket 1	15-Aug-21	Mobile	MEMO	MEMO						Egg/egg mass				Present		1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-075	East D Basket 1	14-Aug-21	Attached	MEMO	MEMO						Empty Polychaeta tube	1			1		2	Tube similar to Nothria
Golder	Baffinlands	2021	Settlement Basket	mb21-042-076	Centre D Basket 1	14-Aug-21	Mobile	MOLL	MOBI	Mollusca	Bivalvia	Nuculida	Nuculidae		Ennucula tenuis		1		1	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-073	Centre M Basket 1	10-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Phyllodocidae	Eteoninae	Eteone sp.			1	1	1	1	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-064	Centre M Plate 1	10-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Phyllodocidae	Eteoninae	Eteone sp.			1	1	1	1	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-066	East D Plate 1	14-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Phyllodocidae	Eteoninae	Eteone sp.			1	1	1	1	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-060	East S Plate 1	10-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Phyllodocidae	Eteoninae	Eteone sp.			1	1	1	1	
Golder	Baffinlands	2021	Quadrat Plate	mb21-042-035	Q10-Plate 1	8-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Phyllodocidae	Eteoninae	Eteone sp.			1	1	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-077	West D Basket 1	15-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Phyllodocidae	Eteoninae	Eteone sp.			2	2	1	1	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-065	West M Plate 1	15-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Phyllodocidae	Eteoninae	Eteone sp.			1	1	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-071	West S Basket 1	10-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Phyllodocidae	Eteoninae	Eteone sp.			9	9	1	1	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-062	West S Plate 1	10-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Phyllodocidae	Eteoninae	Eteone sp.			4	4	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-071	West S Basket 1	10-Aug-21	Mobile	ANNE	POSE	Annelida	Polychaeta	Sabellida	Sabellidae	Sabellinae	Euchone incolor	1			1	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-071	West S Basket 1	10-Aug-21	Mobile	ANNE	POSE	Annelida	Polychaeta	Sabellida	Sabellidae	Sabellinae	Euchone sp.		4		4		1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-075	East D Basket 1	14-Aug-21	Attached	MISC	FORA						Foraminifera indet.	10			10	1	2	On one rock
Golder	Baffinlands	2021	Settlement Basket	mb21-042-071	West S Basket 1	10-Aug-21	Attached	MISC	FORA						Foraminifera indet.	1			1	1	2	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-068	West D Plate 1	15-Aug-21	Mobile	ARTH	CRAM	Arthropoda	Malacostraca	Amphipoda	Gammaridae		Gammarus oceanicus	1			1	1	1	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-060	East S Plate 1	10-Aug-21	Mobile	ARTH	CRAM	Arthropoda	Malacostraca	Amphipoda	Gammaridae		Gammarus sp.		1		1	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-071	West S Basket 1	10-Aug-21	Mobile	ARTH	CRAM	Arthropoda	Malacostraca	Amphipoda	Gammaridae		Gammarus sp.		1		1	1	1	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-063	East M Plate 1	15-Aug-21	Mobile	MOLL	MOGA	Mollusca	Gastropoda				Gastropoda indet.			1	1	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-076	Centre D Basket 1	14-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Polynoidae	Musculinae	Gattyana cirrhosa	1			1	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-072	East M Basket 1	15-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Polynoidae	Polynoinae	Gattyana cirrhosa	1			1	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-072	East M Basket 1	15-Aug-21	Mobile	ARTH	CRAM	Arthropoda	Malacostraca	Amphipoda	Dexaminidae	Prophliantinae	Guernea nordenskioldi	2			2	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-076	Centre D Basket 1	14-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Polynoidae	Musculinae	Harmothoe imbricata	4			4	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-075	East D Basket 1	14-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Polynoidae	Polynoinae	Harmothoe imbricata	3			3	1	1	
Golder	Baffinlands	2021	Quadrat Plate	mb21-042-027	Q1-Plate 1	14-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Polynoidae	Polynoinae	Harmothoe imbricata	1			1	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-077	West D Basket 1	15-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Polynoidae	Polynoinae	Harmothoe imbricata	3			3	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-076	Centre D Basket 1	14-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Polynoidae	Musculinae	Harmothoe rarispina	1			1	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-069	East S Basket 1	10-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Polynoidae	Polynoinae	Harmothoe sp.		1		1	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-076	Centre D Basket 1	14-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Hesionidae	Musculinae	Hesionidae indet.			5	5		1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-073	Centre M Basket 1	10-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Hesionidae		Hesionidae indet.			1	1	1	1	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-064	Centre M Plate 1	10-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Hesionidae		Hesionidae indet.			2	2	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-075	East D Basket 1	14-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Hesionidae		Hesionidae indet.			1	1		1	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-066	East D Plate 1	14-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Hesionidae		Hesionidae indet.			6	6	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-072	East M Basket 1	15-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Hesionidae		Hesionidae indet.			1	1		1	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-063	East M Plate 1	15-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Hesionidae		Hesionidae indet.			2	2	1	1	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-060	East S Plate 1	10-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Hesionidae		Hesionidae indet.			28	28	1	1	
Golder	Baffinlands	2021	Quadrat Plate	mb21-042-035	Q10-Plate 1	8-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Hesionidae		Hesionidae indet.			62	62	1	1	
Golder	Baffinlands	2021	Quadrat Plate	mb21-042-027	Q1-Plate 1	14-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Hesionidae		Hesionidae indet.			1	1	1	1	
Golder	Baffinlands	2021	Quadrat Plate	mb21-042-029	Q4-Plate 1	6-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Hesionidae		Hesionidae indet.			2	2	1	1	
Golder	Baffinlands	2021	Quadrat Plate	mb21-042-030	Q5-Plate 1	6-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Hesionidae		Hesionidae indet.			9	9		1	

Golder	Baffinlands	2021	Quadrat Plate	mb21-042-033	Q8-Plate 1	16-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Hesionidae		Hesionidae indet.			7	7	1	1	
Golder	Baffinlands	2021	Quadrat Plate	mb21-042-034	Q9-Plate 1	11-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Hesionidae		Hesionidae indet.			250	250		1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-077	West D Basket 1	15-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Hesionidae		Hesionidae indet.			90	90		1	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-068	West D Plate 1	15-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Hesionidae		Hesionidae indet.			14	14		1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-074	West M Basket 1	15-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Hesionidae		Hesionidae indet.			10	10		1	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-065	West M Plate 1	15-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Hesionidae		Hesionidae indet.			312	312	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-071	West S Basket 1	10-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Hesionidae		Hesionidae indet.	1		2	3	1	1	Damaged
Golder	Baffinlands	2021	Settlement Plate	mb21-042-062	West S Plate 1	10-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Hesionidae		Hesionidae indet.			7	7		1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-076	Centre D Basket 1	14-Aug-21	Attached	MOLL	MOBI	Mollusca	Bivalvia	Adapedonta	Hiatellidae		Hiatella arctica			4	4	1	2	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-067	Centre D Plate 1	14-Aug-21	Attached	MOLL	MOBI	Mollusca	Bivalvia	Adapedonta	Hiatellidae		Hiatella arctica			25	25	1	2	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-073	Centre M Basket 1	10-Aug-21	Attached	MOLL	MOBI	Mollusca	Bivalvia	Adapedonta	Hiatellidae		Hiatella arctica			27	27	1	2	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-064	Centre M Plate 1	10-Aug-21	Attached	MOLL	MOBI	Mollusca	Bivalvia	Adapedonta	Hiatellidae		Hiatella arctica			8	8	1	2	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-070	Centre S Basket 1	14-Aug-21	Attached	MOLL	MOBI	Mollusca	Bivalvia	Adapedonta	Hiatellidae		Hiatella arctica		1	6	7	1	2	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-075	East D Basket 1	14-Aug-21	Attached	MOLL	MOBI	Mollusca	Bivalvia	Adapedonta	Hiatellidae		Hiatella arctica			6	6	1	2	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-066	East D Plate 1	14-Aug-21	Attached	MOLL	MOBI	Mollusca	Bivalvia	Adapedonta	Hiatellidae		Hiatella arctica			36	36	1	2	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-072	East M Basket 1	15-Aug-21	Attached	MOLL	MOBI	Mollusca	Bivalvia	Adapedonta	Hiatellidae		Hiatella arctica			14	14	1	2	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-063	East M Plate 1	15-Aug-21	Attached	MOLL	MOBI	Mollusca	Bivalvia	Adapedonta	Hiatellidae		Hiatella arctica			23	23	1	2	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-069	East S Basket 1	10-Aug-21	Attached	MOLL	MOBI	Mollusca	Bivalvia	Adapedonta	Hiatellidae		Hiatella arctica			28	28	1	2	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-060	East S Plate 1	10-Aug-21	Attached	MOLL	MOBI	Mollusca	Bivalvia	Adapedonta	Hiatellidae		Hiatella arctica			1	1	1	2	
Golder	Baffinlands	2021	Quadrat Plate	mb21-042-035	Q10-Plate 1	8-Aug-21	Attached	MOLL	MOBI	Mollusca	Bivalvia	Adapedonta	Hiatellidae		Hiatella arctica			28	28	1	2	
Golder	Baffinlands	2021	Quadrat Plate	mb21-042-027	Q1-Plate 1	14-Aug-21	Attached	MOLL	MOBI	Mollusca	Bivalvia	Adapedonta	Hiatellidae		Hiatella arctica			1	1	1	2	
Golder	Baffinlands	2021	Quadrat Plate	mb21-042-028	Q3-Plate 1	15-Aug-21	Attached	MOLL	MOBI	Mollusca	Bivalvia	Adapedonta	Hiatellidae		Hiatella arctica			4	4	1	2	
Golder	Baffinlands	2021	Quadrat Plate	mb21-042-029	Q4-Plate 1	6-Aug-21	Attached	MOLL	MOBI	Mollusca	Bivalvia	Adapedonta	Hiatellidae		Hiatella arctica			18	18	1	2	
Golder	Baffinlands	2021	Quadrat Plate	mb21-042-030	Q5-Plate 1	6-Aug-21	Attached	MOLL	MOBI	Mollusca	Bivalvia	Adapedonta	Hiatellidae		Hiatella arctica			43	43	1	2	
Golder	Baffinlands	2021	Quadrat Plate	mb21-042-031	Q6-Plate 1	8-Aug-21	Attached	MOLL	MOBI	Mollusca	Bivalvia	Adapedonta	Hiatellidae		Hiatella arctica			77	77	1	2	
Golder	Baffinlands	2021	Quadrat Plate	mb21-042-032	Q7-Plate 1	16-Aug-21	Attached	MOLL	MOBI	Mollusca	Bivalvia	Adapedonta	Hiatellidae		Hiatella arctica			17	17	1	2	
Golder	Baffinlands	2021	Quadrat Plate	mb21-042-033	Q8-Plate 1	16-Aug-21	Attached	MOLL	MOBI	Mollusca	Bivalvia	Adapedonta	Hiatellidae		Hiatella arctica			6	6	1	2	
Golder	Baffinlands	2021	Quadrat Plate	mb21-042-034	Q9-Plate 1	11-Aug-21	Attached	MOLL	MOBI	Mollusca	Bivalvia	Adapedonta	Hiatellidae		Hiatella arctica			23	23	1	2	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-077	West D Basket 1	15-Aug-21	Attached	MOLL	MOBI	Mollusca	Bivalvia	Adapedonta	Hiatellidae		Hiatella arctica			32	32	1	2	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-068	West D Plate 1	15-Aug-21	Attached	MOLL	MOBI	Mollusca	Bivalvia	Adapedonta	Hiatellidae		Hiatella arctica			21	21	1	2	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-074	West M Basket 1	15-Aug-21	Attached	MOLL	MOBI	Mollusca	Bivalvia	Adapedonta	Hiatellidae		Hiatella arctica			13	13	1	2	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-065	West M Plate 1	15-Aug-21	Attached	MOLL	MOBI	Mollusca	Bivalvia	Adapedonta	Hiatellidae		Hiatella arctica			19	19	1	2	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-071	West S Basket 1	10-Aug-21	Attached	MOLL	MOBI	Mollusca	Bivalvia	Adapedonta	Hiatellidae		Hiatella arctica			13	13	1	2	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-062	West S Plate 1	10-Aug-21	Attached	MOLL	MOBI	Mollusca	Bivalvia	Adapedonta	Hiatellidae		Hiatella arctica			8	8	1	2	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-072	East M Basket 1	15-Aug-21	Mobile	ANNE	ANHI	Annelida	Clitellata				Hirudinea indet.			1	1	1	1	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-063	East M Plate 1	15-Aug-21	Mobile	ANNE	ANHI	Annelida	Clitellata				Hirudinea indet.			1	1	1	1	
Golder	Baffinlands	2021	Quadrat Plate	mb21-042-034	Q9-Plate 1	11-Aug-21	Mobile	ARTH	CRAM	Arthropoda	Malacostraca	Amphipoda	Ischyroceridae	Ischyrocerinae	Ischyrocerus anguipes			1	1	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-075	East D Basket 1	14-Aug-21	Mobile	ARTH	CRDE	Arthropoda	Malacostraca	Decapoda	Thoridae		Lebbeus polaris	1			1	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-075	East D Basket 1	14-Aug-21	Mobile	ECHI	ECAS	Echinodermata	Asteroidea	Forcipulatida	Asteriidae		Leptasterias (Leptasterias) muelleri			2	2	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-076	Centre D Basket 1	14-Aug-21	Attached	MISC	BRYO	Bryozoa	Stenolaemata	Cyclostomatida	Lichenoporidae		Lichenopora sp.	1			1	1	2	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-075	East D Basket 1	14-Aug-21	Attached	MISC	BRYO	Bryozoa	Stenolaemata	Cyclostomatida	Lichenoporidae		Lichenopora sp.	1			1	1	2	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-072	East M Basket 1	15-Aug-21	Attached	MISC	BRYO	Bryozoa	Stenolaemata	Cyclostomatida	Lichenoporidae		Lichenopora sp.	2			2	1	2	1cm in diameter
Golder	Baffinlands	2021	Quadrat Plate	mb21-042-031	Q6-Plate 1	8-Aug-21	Attached	MISC	BRYO	Bryozoa	Stenolaemata	Cyclostomatida	Lichenoporidae		Lichenoporidae indet.	1			1	1	2	
Golder	Baffinlands	2021	Quadrat Plate	mb21-042-033	Q8-Plate 1	16-Aug-21	Attached	MISC	BRYO	Bryozoa	Stenolaemata	Cyclostomatida	Lichenoporidae		Lichenoporidae indet.	1			1	1	2	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-077	West D Basket 1	15-Aug-21	Mobile	ARTH	CRAM	Arthropoda	Malacostraca	Amphipoda			Lysianassoidea indet.			2	2	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-073	Centre M Basket 1	10-Aug-21	Mobile	ANNE	POSE	Annelida	Polychaeta	Spionida	Spionidae		Marenzelleria sp.		1		1	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-075	East D Basket 1	14-Aug-21	Mobile	MOLL	MOGA	Mollusca	Gastropoda	Trochida	Margaritidae	Musculinae	Margarites groenlandicus		1		1	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-075	East D Basket 1	14-Aug-21	Mobile	MOLL	MOGA	Mollusca	Gastropoda	Trochida	Margaritidae	Musculinae	Margarites helicinus	2			2	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-072	East M Basket 1	15-Aug-21	Mobile	MOLL	MOGA	Mollusca	Gastropoda	Trochida	Margaritidae		Margarites helicinus	1			1	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-071	West S Basket 1	10-Aug-21	Mobile	ANNE	POSE	Annelida	Polychaeta		Capitellidae		Mediomastus sp.			1	1	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-076	Centre D Basket 1	14-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Nephtyidae	Musculinae	Micronephthys cornuta	1			1	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-072	East M Basket 1	15-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Nephtyidae		Micronephthys cornuta	1			1	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-073	Centre M Basket 1	10-Aug-21	Attached	MISC	URAS	Chordata	Ascidiacea	Stolidobranchia	Molgulidae		Molgula sp.			1	1	1	2	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-070	Centre S Basket 1	14-Aug-21	Attached	MISC	URAS	Chordata	Ascidiacea	Stolidobranchia	Molgulidae		Molgula sp.		2	1	3	1	2	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-069	East S Basket 1	10-Aug-21	Attached	MISC	URAS	Chordata	Ascidiacea	Stolidobranchia	Molgulidae		Molgula sp.		1		1	1	2	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-060	East S Plate 1	10-Aug-21	Attached	MISC	URAS	Chordata	Ascidiacea	Stolidobranchia	Molgulidae		Molgula sp.	1			1	1	2	
Golder	Baffinlands	2021	Quadrat Plate	mb21-042-035	Q10-Plate 1	8-Aug-21	Attached	MISC	URAS	Chordata	Ascidiacea	Stolidobranchia	Molgulidae		Molgula sp.		2		2	1	2	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-065	West M Plate 1	15-Aug-21	Attached	MISC	URAS	Chordata	Ascidiacea	Stolidobranchia	Molgulidae		Molgula sp.	3		2	5	1	2	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-071	West S Basket 1	10-Aug-21	Attached	MISC	URAS	Chordata	Ascidiacea	Stolidobranchia	Molgulidae		Molgula sp.		1		1	1	2	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-062	West S Plate 1	10-Aug-21	Attached	MISC	URAS	Chordata	Ascidiacea	Stolidobranchia	Molgulidae		Molgula sp.		2		2	1	2	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-071	West S Basket 1	10-Aug-21	Mobile	ARTH	CRAM	Arthropoda	Malacostraca	Amphipoda	Oedicerotidae		Monoculopsis sp.			1	1	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-077	West D Basket 1	15-Aug-21	Attached	MOLL	MOBI	Mollusca	Bivalvia	Mytilida	Mytilidae	Musculinae	Musculus discors		1		1	1	2	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-068	West D Plate 1	15-Aug-21	Attached	MOLL	MOBI	Mollusca	Bivalvia	Mytilida	Mytilidae	Musculinae	Musculus discors	1			1	1	2	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-074	West M Basket 1	15-Aug-21	Attached	MOLL	MOBI	Mollusca	Bivalvia	Mytilida	Mytilidae	Musculinae	Musculus discors	1	5		6	1	2	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-070	Centre S Basket 1	14-Aug-21	Attached	MOLL	MOBI	Mollusca	Bivalvia	Mytilida	Mytilidae	Musculinae	Musculus sp.			1	1	1	2	
Golder	Baffinlands	2021	Quadrat Plate	mb21-042-032	Q7-Plate 1	16-Aug-21	Attached	MOLL	MOBI	Mollusca	Bivalvia	Mytilida	Mytilidae	Musculinae	Musculus sp.			1	1	1	2	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-068	West D Plate 1	15-Aug-21	Attached	MOLL	MOBI	Mollusca	Bivalvia	Mytilida	Mytilidae	Musculinae	Musculus sp.			23	23		2	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-074	West M Basket 1	15-Aug-21	Attached	MOLL	MOBI	Mollusca	Bivalvia	Mytilida	Mytilidae	Musculinae	Musculus sp.		2	8	10		2	Damaged/very small
Golder	Baffinlands	2021	Settlement Plate	mb21-042-065	West M Plate 1	15-Aug-21	Attached	MOLL	MOBI	Mollusca	Bivalvia	Mytilida	Mytilidae	Musculinae	Musculus sp.			3	3	1	2	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-062	West S Plate 1	10-Aug-21	Attached	MOLL	MOBI	Mollusca	Bivalvia	Mytilida	Mytilidae	Musculinae	Musculus sp.			1	1	1	2	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-076	Centre D Basket 1	14-Aug-21	Mobile	MOLL	MOBI	Mollusca	Bivalvia	Myida	Myidae		Mya sp.			1	1	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-073	Centre M Basket 1	10-Aug-21	Mobile	MOLL	MOBI	Mollusca	Bivalvia	Myida	Myidae		Mya sp.			8	8	1	1	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-064	Centre M Plate 1	10-Aug-21	Mobile	MOLL	MOBI	Mollusca	Bivalvia	Myida	Myidae		Mya sp.			1	1	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-070	Centre S Basket 1	14-Aug-21	Mobile	MOLL	MOBI	Mollusca	Bivalvia	Myida	Myidae		Mya sp.			6	6	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-072	East M Basket 1	15-Aug-21	Mobile	MOLL	MOBI	Mollusca	Bivalvia	Myida	Myidae		Mya sp.			1	1	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-069	East S Basket 1	10-Aug-21	Mobile	MOLL	MOBI	Mollusca	Bivalvia	Myida	Myidae		Mya sp.			5	Present	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-077	West D Basket 1	15-Aug-21	Mobile	MOLL	MOBI	Mollusca	Bivalvia	Myida	Myidae		Mya sp.			1	1	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-071	West S Basket 1	10-Aug-21	Mobile	MOLL	MOBI	Mollusca	Bivalvia	Myida	Myidae		Mya sp.			9	9	1	1	Damaged/very small
Golder	Baffinlands	2021	Settlement Basket	mb21-042-073	Centre M Basket 1	10-Aug-21	Attached	MOLL	MOBI	Mollusca	Bivalvia	Mytilida	Mytilidae		Mytilidae indet.			8	8	1	2	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-070	Centre S Basket 1	14-Aug-21	Attached	MOLL	MOBI	Mollusca	Bivalvia	Mytilida	Mytilidae		Mytilidae indet.			3	3		2	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-072	East M Basket 1	15-Aug-21	Attached	MOLL	MOBI	Mollusca	Bivalvia	Mytilida	Mytilidae		Mytilidae indet.			2	2	1	2	

Golder	Baffinlands	2021	Settlement Basket	mb21-042-069	East S Basket 1	10-Aug-21	Attached	MOLL	MOBI	Mollusca	Bivalvia	Mytilida	Mytilidae		Mytilidae indet.			6	6	1	2	
Golder	Baffinlands	2021	Quadrat Plate	mb21-042-035	Q10-Plate 1	8-Aug-21	Attached	MOLL	MOBI	Mollusca	Bivalvia	Mytilida	Mytilidae		Mytilidae indet.			2	2	1	2	
Golder	Baffinlands	2021	Quadrat Plate	mb21-042-030	Q5-Plate 1	6-Aug-21	Attached	MOLL	MOBI	Mollusca	Bivalvia	Mytilida	Mytilidae		Mytilidae indet.			1	1	1	2	
Golder	Baffinlands	2021	Quadrat Plate	mb21-042-031	Q6-Plate 1	8-Aug-21	Attached	MOLL	MOBI	Mollusca	Bivalvia	Mytilida	Mytilidae		Mytilidae indet.			1	1	1	2	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-077	West D Basket 1	15-Aug-21	Attached	MOLL	MOBI	Mollusca	Bivalvia	Mytilida	Mytilidae		Mytilidae indet.			150	150		2	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-068	West D Plate 1	15-Aug-21	Attached	MOLL	MOBI	Mollusca	Bivalvia	Mytilida	Mytilidae		Mytilidae indet.			42	42		2	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-074	West M Basket 1	15-Aug-21	Attached	MOLL	MOBI	Mollusca	Bivalvia	Mytilida	Mytilidae		Mytilidae indet.			341	341		2	Damaged/very small
Golder	Baffinlands	2021	Settlement Plate	mb21-042-065	West M Plate 1	15-Aug-21	Attached	MOLL	MOBI	Mollusca	Bivalvia	Mytilida	Mytilidae		Mytilidae indet.			13	13		2	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-071	West S Basket 1	10-Aug-21	Attached	MOLL	MOBI	Mollusca	Bivalvia	Mytilida	Mytilidae		Mytilidae indet.			3	3	1	2	Damaged/very small
Golder	Baffinlands	2021	Settlement Basket	mb21-042-075	East D Basket 1	14-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Nereididae		Nereididae indet.			1	1		1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-076	Centre D Basket 1	14-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Hesionidae	Musculinae	Nereimyra aphroditoides	2			2	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-075	East D Basket 1	14-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Hesionidae		Nereimyra aphroditoides	1			1	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-072	East M Basket 1	15-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Hesionidae		Nereimyra aphroditoides	1			1	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-069	East S Basket 1	10-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Hesionidae		Nereimyra aphroditoides			1	1	1	1	
Golder	Baffinlands	2021	Quadrat Plate	mb21-042-030	Q5-Plate 1	6-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Hesionidae		Nereimyra aphroditoides	1			1	1	1	
Golder	Baffinlands	2021	Quadrat Plate	mb21-042-034	Q9-Plate 1	11-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Hesionidae		Nereimyra aphroditoides	1			1	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-077	West D Basket 1	15-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Hesionidae		Nereimyra aphroditoides	2	3		5	1	1	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-068	West D Plate 1	15-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Hesionidae		Nereimyra aphroditoides	1		1	2	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-074	West M Basket 1	15-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Hesionidae		Nereimyra aphroditoides	2	2		4	1	1	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-062	West S Plate 1	10-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Hesionidae		Nereimyra aphroditoides	1			1	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-073	Centre M Basket 1	10-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Nereididae	Nereidinae	Nereis zonata	1			1	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-075	East D Basket 1	14-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Nereididae	Nereidinae	Nereis zonata	1			1	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-076	Centre D Basket 1	14-Aug-21	Mobile	MOLL	MOBI	Mollusca	Bivalvia	Nuculanida	Nuculanidae	Nuculaninae	Nuculana minuta	2			2	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-072	East M Basket 1	15-Aug-21	Mobile	ECHI	ECOP	Echinodermata	Ophiuroidea	Ophiurida	Ophiuridae	Ophiurinae	Ophiura sarsii		1		1	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-073	Centre M Basket 1	10-Aug-21	Mobile	ARTH	CRAM	Arthropoda	Malacostraca	Amphipoda	Oedicerotidae		Paroediceros lynceus	1			1	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-070	Centre S Basket 1	14-Aug-21	Attached	MOLL	MOGA	Mollusca	Gastropoda				Patellogastropoda indet.			3	3	1	2	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-076	Centre D Basket 1	14-Aug-21	Mobile	ARTH	CROS	Arthropoda	Ostracoda	Myodocopida	Philomedidae	Musculinae	Philomedes sp.			1	1	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-076	Centre D Basket 1	14-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Pholoidae	Musculinae	Pholoe longa	1			1	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-072	East M Basket 1	15-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Pholoidae		Pholoe longa	1			1	1	1	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-066	East D Plate 1	14-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Pholoidae		Pholoe minuta	1			1	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-072	East M Basket 1	15-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Pholoidae		Pholoe minuta	2			2	1	1	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-063	East M Plate 1	15-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Pholoidae		Pholoe minuta	2			2	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-069	East S Basket 1	10-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Pholoidae		Pholoe minuta	1			1	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-077	West D Basket 1	15-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Pholoidae		Pholoe minuta	5			5	1	1	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-068	West D Plate 1	15-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Pholoidae		Pholoe minuta	3			3	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-074	West M Basket 1	15-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Pholoidae		Pholoe minuta	4			4	1	1	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-065	West M Plate 1	15-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Pholoidae		Pholoe minuta	2			2	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-071	West S Basket 1	10-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Pholoidae		Pholoe minuta	1			1	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-073	Centre M Basket 1	10-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Pholoidae		Pholoe sp.			1	1	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-071	West S Basket 1	10-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Phyllodocidae	Phyllodocinae	Phyllodoce sp.			1	1	1	1	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-063	East M Plate 1	15-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Phyllodocidae		Phyllodocidae indet.			1	1	1	1	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-065	West M Plate 1	15-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Phyllodocidae		Phyllodocidae indet.			1	1		1	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-062	West S Plate 1	10-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Phyllodocidae		Phyllodocidae indet.			3	3		1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-070	Centre S Basket 1	14-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Syllidae	Eusyllinae	Pionosyllis sp.	1			1	1	1	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-066	East D Plate 1	14-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Syllidae	Eusyllinae	Pionosyllis sp.	2			2	1	1	
Golder	Baffinlands	2021	Quadrat Plate	mb21-042-030	Q5-Plate 1	6-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Syllidae	Eusyllinae	Pionosyllis sp.	1			1	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-076	Centre D Basket 1	14-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Polynoidae	Musculinae	Polynoinae indet.			7	7		1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-073	Centre M Basket 1	10-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Polynoidae	Polynoinae	Polynoinae indet.			40	40	1	1	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-064	Centre M Plate 1	10-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Polynoidae	Polynoinae	Polynoinae indet.			2	2	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-070	Centre S Basket 1	14-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Polynoidae	Polynoinae	Polynoinae indet.			11	11	1	1	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-061	Centre S Plate 1	14-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Polynoidae	Polynoinae	Polynoinae indet.			1	1	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-075	East D Basket 1	14-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Polynoidae	Polynoinae	Polynoinae indet.			2	2		1	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-066	East D Plate 1	14-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Polynoidae	Polynoinae	Polynoinae indet.			2	2	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-072	East M Basket 1	15-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Polynoidae	Polynoinae	Polynoinae indet.			4	4		1	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-063	East M Plate 1	15-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Polynoidae	Polynoinae	Polynoinae indet.			6	6	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-069	East S Basket 1	10-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Polynoidae	Polynoinae	Polynoinae indet.			31	31		1	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-060	East S Plate 1	10-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Polynoidae	Polynoinae	Polynoinae indet.			4	4	1	1	
Golder	Baffinlands	2021	Quadrat Plate	mb21-042-035	Q10-Plate 1	8-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Polynoidae	Polynoinae	Polynoinae indet.			7	7	1	1	
Golder	Baffinlands	2021	Quadrat Plate	mb21-042-032	Q7-Plate 1	16-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Polynoidae	Polynoinae	Polynoinae indet.			2	2	1	1	
Golder	Baffinlands	2021	Quadrat Plate	mb21-042-034	Q9-Plate 1	11-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Polynoidae	Polynoinae	Polynoinae indet.			3	3	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-077	West D Basket 1	15-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Polynoidae	Polynoinae	Polynoinae indet.		2	57	59		1	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-068	West D Plate 1	15-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Polynoidae	Polynoinae	Polynoinae indet.		1	7	8	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-074	West M Basket 1	15-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Polynoidae	Polynoinae	Polynoinae indet.			16	16	1	1	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-065	West M Plate 1	15-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Polynoidae	Polynoinae	Polynoinae indet.			34	34	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-071	West S Basket 1	10-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Polynoidae	Polynoinae	Polynoinae indet.			43	43	1	1	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-062	West S Plate 1	10-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Polynoidae	Polynoinae	Polynoinae indet.			1	1	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-073	Centre M Basket 1	10-Aug-21	Attached	ALGAE	ALGAE	Ochrophyta	Phaeophyceae	Ectocarpales	Acinetosporaceae		Pylaiella cf. varia				Present	1	2	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-064	Centre M Plate 1	10-Aug-21	Attached	ALGAE	ALGAE	Ochrophyta	Phaeophyceae	Ectocarpales	Acinetosporaceae		Pylaiella cf. varia				Present	1	2	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-072	East M Basket 1	15-Aug-21	Attached	ALGAE	ALGAE	Ochrophyta	Phaeophyceae	Ectocarpales	Acinetosporaceae		Pylaiella cf. varia				Present	1	2	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-063	East M Plate 1	15-Aug-21	Attached	ALGAE	ALGAE	Ochrophyta	Phaeophyceae	Ectocarpales	Acinetosporaceae		Pylaiella cf. varia				Present	1	2	
Golder	Baffinlands	2021	Quadrat Plate	mb21-042-027	Q1-Plate 1	14-Aug-21	Attached	ALGAE	ALGAE	Ochrophyta	Phaeophyceae	Ectocarpales	Acinetosporaceae		Pylaiella cf. varia				Present	1	2	
Golder	Baffinlands	2021	Quadrat Plate	mb21-042-033	Q8-Plate 1	16-Aug-21	Attached	ALGAE	ALGAE	Ochrophyta	Phaeophyceae	Ectocarpales	Acinetosporaceae		Pylaiella cf. varia				Present	1	2	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-077	West D Basket 1	15-Aug-21	Attached	ALGAE	ALGAE	Ochrophyta	Phaeophyceae	Ectocarpales	Acinetosporaceae		Pylaiella cf. varia				Present	1	2	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-068	West D Plate 1	15-Aug-21	Attached	ALGAE	ALGAE	Ochrophyta	Phaeophyceae	Ectocarpales	Acinetosporaceae		Pylaiella cf. varia				Present	1	2	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-074	West M Basket 1	15-Aug-21	Attached	ALGAE	ALGAE	Ochrophyta	Phaeophyceae	Ectocarpales	Acinetosporaceae		Pylaiella cf. varia				Present	1	2	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-071	West S Basket 1	10-Aug-21	Attached	ALGAE	ALGAE	Ochrophyta	Phaeophyceae	Ectocarpales	Acinetosporaceae		Pylaiella cf. varia				Present	1	2	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-068	West D Plate 1	15-Aug-21	Attached	ALGAE	ALGAE	Chlorophyta	Ulvophyceae	Cladophorales	Cladophoraceae		Rhizoclonium sp.				Present	1	2	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-073	Centre M Basket 1	10-Aug-21	Mobile	ANNE	POSE	Annelida	Polychaeta	Sabellida	Sabellidae		Sabellidae indet.			2	2	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-075	East D Basket 1	14-Aug-21	Mobile	ANNE	POSE	Annelida	Polychaeta	Sabellida	Sabellidae		Sabellidae indet.			1	1	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-072	East M Basket 1	15-Aug-21	Mobile	ANNE	POSE	Annelida	Polychaeta	Sabellida	Sabellidae		Sabellidae indet.			1	1	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-069	East S Basket 1	10-Aug-21	Mobile	ANNE	POSE	Annelida	Polychaeta	Sabellida	Sabellidae		Sabellidae indet.			1	1	1	1	

Golder	Baffinlands	2021	Settlement Basket	mb21-042-077	West D Basket 1	15-Aug-21	Mobile	ANNE	POSE	Annelida	Polychaeta	Sabellida	Sabellidae		Sabellidae indet.			2	2	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-076	Centre D Basket 1	14-Aug-21	Attached	MISC	CNHY	Cnidaria	Hydrozoa	Anthoathecata	Corynidae		Sarsia sp.				Present	1	2	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-073	Centre M Basket 1	10-Aug-21	Attached	MISC	CNHY	Cnidaria	Hydrozoa	Anthoathecata	Corynidae		Sarsia sp.				Present	1	2	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-066	East D Plate 1	14-Aug-21	Attached	MISC	CNHY	Cnidaria	Hydrozoa	Anthoathecata	Corynidae		Sarsia sp.				Present	1	2	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-074	West M Basket 1	15-Aug-21	Attached	MISC	CNHY	Cnidaria	Hydrozoa	Anthoathecata	Corynidae		Sarsia sp.				Present	1	2	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-071	West S Basket 1	10-Aug-21	Attached	MISC	CNHY	Cnidaria	Hydrozoa	Anthoathecata	Corynidae		Sarsia sp.				Present	1	2	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-076	Centre D Basket 1	14-Aug-21	Mobile	ANNE	POSE	Annelida	Polychaeta		Scalibregmatidae	Musculinae	Scalibregma inflatum			1	1	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-071	West S Basket 1	10-Aug-21	Mobile	ANNE	POSE	Annelida	Polychaeta		Scalibregmatidae		Scalibregma inflatum		1	1	2	1	1	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-065	West M Plate 1	15-Aug-21	Mobile	ANNE	POSE	Annelida	Polychaeta		Scalibregmatidae		Scalibregmatidae indet.			1	1	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-071	West S Basket 1	10-Aug-21	Mobile	ANNE	POSE	Annelida	Polychaeta	Spionida	Spionidae		Scolelepis sp.		1		1	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-076	Centre D Basket 1	14-Aug-21	Attached	ANNE	POSE	Annelida	Polychaeta	Sabellida	Serpulidae		Serpulidae indet.		4	2	6	1	2	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-072	East M Basket 1	15-Aug-21	Attached	ANNE	POSE	Annelida	Polychaeta	Sabellida	Serpulidae		Serpulidae indet.		1	4	5	1	2	
Golder	Baffinlands	2021	Quadrat Plate	mb21-042-033	Q8-Plate 1	16-Aug-21	Attached	ALGAE	ALGAE	Ochrophyta	Phaeophyceae	Sphacelariales			Sphacelariales indet.				Present	1	2	Possibly Battersia cf. arctica, Protohalopteris radicans, or Sphaceloderma caespitulum
Golder	Baffinlands	2021	Settlement Basket	mb21-042-077	West D Basket 1	15-Aug-21	Attached	ALGAE	ALGAE	Ochrophyta	Phaeophyceae	Sphacelariales			Sphacelariales indet.				Present	1	2	Possibly Battersia cf. arctica, Protohalopteris radicans, or Sphaceloderma caespitulum
Golder	Baffinlands	2021	Settlement Basket	mb21-042-073	Centre M Basket 1	10-Aug-21	Mobile	ANNE	POSE	Annelida	Polychaeta	Spionida	Spionidae		Spionidae indet.			11	11		1	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-064	Centre M Plate 1	10-Aug-21	Mobile	ANNE	POSE	Annelida	Polychaeta	Spionida	Spionidae		Spionidae indet.			19	19	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-070	Centre S Basket 1	14-Aug-21	Mobile	ANNE	POSE	Annelida	Polychaeta	Spionida	Spionidae		Spionidae indet.			9	9	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-075	East D Basket 1	14-Aug-21	Mobile	ANNE	POSE	Annelida	Polychaeta	Spionida	Spionidae		Spionidae indet.			1	1	1	1	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-066	East D Plate 1	14-Aug-21	Mobile	ANNE	POSE	Annelida	Polychaeta	Spionida	Spionidae		Spionidae indet.			2	2	1	1	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-063	East M Plate 1	15-Aug-21	Mobile	ANNE	POSE	Annelida	Polychaeta	Spionida	Spionidae		Spionidae indet.			2	2	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-069	East S Basket 1	10-Aug-21	Mobile	ANNE	POSE	Annelida	Polychaeta	Spionida	Spionidae		Spionidae indet.			12	12	1	1	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-060	East S Plate 1	10-Aug-21	Mobile	ANNE	POSE	Annelida	Polychaeta	Spionida	Spionidae		Spionidae indet.			39	39	1	1	
Golder	Baffinlands	2021	Quadrat Plate	mb21-042-035	Q10-Plate 1	8-Aug-21	Mobile	ANNE	POSE	Annelida	Polychaeta	Spionida	Spionidae		Spionidae indet.			30	30	1	1	
Golder	Baffinlands	2021	Quadrat Plate	mb21-042-029	Q4-Plate 1	6-Aug-21	Mobile	ANNE	POSE	Annelida	Polychaeta	Spionida	Spionidae		Spionidae indet.			2	2	1	1	
Golder	Baffinlands	2021	Quadrat Plate	mb21-042-030	Q5-Plate 1	6-Aug-21	Mobile	ANNE	POSE	Annelida	Polychaeta	Spionida	Spionidae		Spionidae indet.			2	2	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-077	West D Basket 1	15-Aug-21	Mobile	ANNE	POSE	Annelida	Polychaeta	Spionida	Spionidae		Spionidae indet.			19	19	1	1	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-068	West D Plate 1	15-Aug-21	Mobile	ANNE	POSE	Annelida	Polychaeta	Spionida	Spionidae		Spionidae indet.			15	15	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-074	West M Basket 1	15-Aug-21	Mobile	ANNE	POSE	Annelida	Polychaeta	Spionida	Spionidae		Spionidae indet.			12	12	1	1	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-065	West M Plate 1	15-Aug-21	Mobile	ANNE	POSE	Annelida	Polychaeta	Spionida	Spionidae		Spionidae indet.			37	37	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-071	West S Basket 1	10-Aug-21	Mobile	ANNE	POSE	Annelida	Polychaeta	Spionida	Spionidae		Spionidae indet.			132	132		1	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-062	West S Plate 1	10-Aug-21	Mobile	ANNE	POSE	Annelida	Polychaeta	Spionida	Spionidae		Spionidae indet.			37	37	1	1	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-064	Centre M Plate 1	10-Aug-21	Attached	ALGAE	ALGAE	Chlorophyta	Ulvophyceae	Acrosiphoniales	Acrosiphoniaceae		Spongomorpha aeruginosa				Present	1	2	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-070	Centre S Basket 1	14-Aug-21	Attached	ALGAE	ALGAE	Chlorophyta	Ulvophyceae	Acrosiphoniales	Acrosiphoniaceae		Spongomorpha aeruginosa				Present	1	2	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-061	Centre S Plate 1	14-Aug-21	Attached	ALGAE	ALGAE	Chlorophyta	Ulvophyceae	Acrosiphoniales	Acrosiphoniaceae		Spongomorpha aeruginosa				Present	1	2	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-063	East M Plate 1	15-Aug-21	Attached	ALGAE	ALGAE	Chlorophyta	Ulvophyceae	Acrosiphoniales	Acrosiphoniaceae		Spongomorpha aeruginosa				Present	1	2	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-069	East S Basket 1	10-Aug-21	Attached	ALGAE	ALGAE	Chlorophyta	Ulvophyceae	Acrosiphoniales	Acrosiphoniaceae		Spongomorpha aeruginosa				Present	1	2	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-060	East S Plate 1	10-Aug-21	Attached	ALGAE	ALGAE	Chlorophyta	Ulvophyceae	Acrosiphoniales	Acrosiphoniaceae		Spongomorpha aeruginosa				Present	1	2	
Golder	Baffinlands	2021	Quadrat Plate	mb21-042-031	Q6-Plate 1	8-Aug-21	Attached	ALGAE	ALGAE	Chlorophyta	Ulvophyceae	Acrosiphoniales	Acrosiphoniaceae		Spongomorpha aeruginosa				Present	1	2	
Golder	Baffinlands	2021	Quadrat Plate	mb21-042-034	Q9-Plate 1	11-Aug-21	Attached	ALGAE	ALGAE	Chlorophyta	Ulvophyceae	Acrosiphoniales	Acrosiphoniaceae		Spongomorpha aeruginosa				Present	1	2	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-068	West D Plate 1	15-Aug-21	Attached	ALGAE	ALGAE	Chlorophyta	Ulvophyceae	Acrosiphoniales	Acrosiphoniaceae		Spongomorpha aeruginosa				Present	1	2	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-074	West M Basket 1	15-Aug-21	Attached	ALGAE	ALGAE	Chlorophyta	Ulvophyceae	Acrosiphoniales	Acrosiphoniaceae		Spongomorpha aeruginosa				Present	1	2	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-065	West M Plate 1	15-Aug-21	Attached	ALGAE	ALGAE	Chlorophyta	Ulvophyceae	Acrosiphoniales	Acrosiphoniaceae		Spongomorpha aeruginosa				Present	1	3	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-071	West S Basket 1	10-Aug-21	Attached	ALGAE	ALGAE	Chlorophyta	Ulvophyceae	Acrosiphoniales	Acrosiphoniaceae		Spongomorpha aeruginosa				Present	1	2	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-062	West S Plate 1	10-Aug-21	Attached	ALGAE	ALGAE	Chlorophyta	Ulvophyceae	Acrosiphoniales	Acrosiphoniaceae		Spongomorpha aeruginosa				Present	1	2	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-075	East D Basket 1	14-Aug-21	Mobile	ECHI	ECEC	Echinodermata	Echinoidea	Camarodonta	Strongylocentrotidae		Strongylocentrotus droebachiensis		1	1	2	1	1	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-062	West S Plate 1	10-Aug-21	Mobile	ANNE	POER	Annelida	Polychaeta	Phyllodocida	Syllidae		Syllidae indet.			1	1	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-070	Centre S Basket 1	14-Aug-21	Mobile	ANNE	POSE	Annelida	Polychaeta	Terebellida	Terebellidae		Terebellidae indet.			2	2	1	1	In tube
Golder	Baffinlands	2021	Settlement Basket	mb21-042-075	East D Basket 1	14-Aug-21	Mobile	ANNE	POSE	Annelida	Polychaeta	Terebellida	Terebellidae		Terebellidae indet.		1		1	1	1	Damaged
Golder	Baffinlands	2021	Quadrat Plate	mb21-042-027	Q1-Plate 1	14-Aug-21	Mobile	ANNE	POSE	Annelida	Polychaeta	Terebellida	Terebellidae		Terebellidae indet.			1	1	1	1	In a tube on the lid
Golder	Baffinlands	2021	Quadrat Plate	mb21-042-028	Q3-Plate 1	15-Aug-21	Mobile	ANNE	POSE	Annelida	Polychaeta	Terebellida	Terebellidae		Terebellidae indet.			1	1	1	1	
Golder	Baffinlands	2021	Quadrat Plate	mb21-042-031	Q6-Plate 1	8-Aug-21	Mobile	ANNE	POSE	Annelida	Polychaeta	Terebellida	Terebellidae		Terebellidae indet.			2	2	1	1	
Golder	Baffinlands	2021	Quadrat Plate	mb21-042-033	Q8-Plate 1	16-Aug-21	Mobile	ANNE	POSE	Annelida	Polychaeta	Terebellida	Terebellidae		Terebellidae indet.			1	1	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-071	West S Basket 1	10-Aug-21	Mobile	ANNE	POSE	Annelida	Polychaeta	Terebellida	Terebellidae		Terebellidae indet.			3	3	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-076	Centre D Basket 1	14-Aug-21	Mobile	ANNE	POSE	Annelida	Polychaeta	Terebellida	Trichobranchidae	Musculinae	Terebellides sp.		1		1	1	1	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-069	East S Basket 1	10-Aug-21	Attached	MOLL	MOGA	Mollusca	Gastropoda		Lottiidae		Testudinalia testudinalis		1		1	1	2	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-077	West D Basket 1	15-Aug-21	Attached	MOLL	MOGA	Mollusca	Gastropoda		Lottiidae		Testudinalia testudinalis		1		1	1	2	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-074	West M Basket 1	15-Aug-21	Attached	MOLL	MOGA	Mollusca	Gastropoda		Lottiidae		Testudinalia testudinalis		1		1	1	2	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-076	Centre D Basket 1	14-Aug-21	Attached	MISC	BRYO	Bryozoa	Stenolaemata	Cyclostomatida	Tubuliporidae		Tubuliporidae indet.			1	1	1	2	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-072	East M Basket 1	15-Aug-21	Attached	MISC	BRYO	Bryozoa	Stenolaemata	Cyclostomatida	Tubuliporidae		Tubuliporidae indet.			4	4	1	2	Just settling
Golder	Baffinlands	2021	Settlement Plate	mb21-042-063	East M Plate 1	15-Aug-21	Attached	ALGAE	ALGAE	Chlorophyta	Ulvophyceae	Ulotrichales	Ulotrichaceae		Ulothrix sp.				Present	1	2	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-062	West S Plate 1	10-Aug-21	Attached	ALGAE	ALGAE	Chlorophyta	Ulvophyceae	Ulotrichales	Ulotrichaceae		Ulothrix sp.				Present	1	2	
Golder	Baffinlands	2021	Settlement Plate	mb21-042-060	East S Plate 1	10-Aug-21	Attached	ALGAE	ALGAE	Chlorophyta	Ulvophyceae	Ulotrichales	Ulotrichaceae		Ulotrichaceae indet.				Present	1	2	Ulothrix and/or Urospora neglecta
Golder	Baffinlands	2021	Settlement Plate	mb21-042-068	West D Plate 1	15-Aug-21	Attached	ALGAE	ALGAE	Chlorophyta	Ulvophyceae	Ulotrichales	Ulotrichaceae		Ulotrichaceae indet.				Present	1	2	Ulothrix and/or Urospora neglecta
Golder	Baffinlands	2021	Settlement Basket	mb21-042-072	East M Basket 1	15-Aug-21	Attached	ALGAE	ALGAE	Chlorophyta	Ulvophyceae	Ulvales	Ulvaceae		Ulva cf. prolifera				Present	1	2	
Golder	Baffinlands	2021	Settlement Basket	mb21-042-077	West D Basket 1	15-Aug-21	Attached	ALGAE	ALGAE	Chlorophyta	Ulvophyceae	Ulvales	Ulvaceae		Ulva cf. prolifera				Present	1	2	
																67	49	189				
																116	121	2746				

APPENDIX 8D-1

Taxa Identifications from Samples Collected for DNA Analysis

Appendix 8D-1

Taxa Identifications from Samples Collected for DNA Analysis

Phylum Class/Order	Family	Subfamily	Taxa
Annelida			
Polychaeta/Echiuroidea	Echiuridae	-	*Echiurus echiurus*
Polychaeta/Echiuroidea	-	-	Echiuroidea indet.
Polychaeta/Eunicida	Dorvilleidae	-	*Ophryotrocha* sp.
Polychaeta/Eunicida	Lumbrineridae	-	Lumbrineridae indet.
Polychaeta/Eunicida	Lumbrineridae	-	*Scoletoma fragilis*
Polychaeta/Eunicida	Lumbrineridae	-	*Scoletoma* sp.
Polychaeta/Eunicida	Onuphidae	Onuphinae	*Nothria conchylega*
Polychaeta/Phyllodocida	Hesionidae	-	Hesionidae indet.
Polychaeta/Phyllodocida	Hesionidae	-	*Nereimyra aphroditoides*
Polychaeta/Phyllodocida	Nephtyidae	-	*Aglaophamus malmgreni*
Polychaeta/Phyllodocida	Nephtyidae	-	*Micronephthys cornuta*
Polychaeta/Phyllodocida	Nephtyidae	-	Nephtyidae indet.
Polychaeta/Phyllodocida	Nephtyidae	-	*Nephtys ciliata*
Polychaeta/Phyllodocida	Nereididae	Nereidinae	*Nereis zonata*
Polychaeta/Phyllodocida	Nereididae	-	Nereididae indet.
Polychaeta/Phyllodocida	Pholoidae	-	*Pholoe longa*
Polychaeta/Phyllodocida	Pholoidae	-	*Pholoe minuta*
Polychaeta/Phyllodocida	Pholoidae	-	*Pholoe* sp.
Polychaeta/Phyllodocida	Phyllodocidae	Eteoninae	*Eteone longa* complex
Polychaeta/Phyllodocida	Phyllodocidae	Eteoninae	*Eteone* sp.
Polychaeta/Phyllodocida	Phyllodocidae	Phyllodocinae	*Phyllodoce groenlandica*
Polychaeta/Phyllodocida	Phyllodocidae	Phyllodocinae	*Phyllodoce* sp.
Polychaeta/Phyllodocida	Phyllodocidae	-	Phyllodocidae indet.
Polychaeta/Phyllodocida	Polynoidae	Polynoinae	*Gattyana cirrhosa*
Polychaeta/Phyllodocida	Polynoidae	Polynoinae	*Harmothoe imbricata*
Polychaeta/Phyllodocida	Polynoidae	Polynoinae	*Harmothoe rarispina*
Polychaeta/Phyllodocida	Polynoidae	Polynoinae	*Harmothoe* sp.
Polychaeta/Phyllodocida	Polynoidae	Polynoinae	Polynoinae indet.
Polychaeta/Phyllodocida	Sphaerodoridae	-	*Sphaerodoropsis biserialis*
Polychaeta/Phyllodocida	Sphaerodoridae	-	*Sphaerodoropsis minuta*
Polychaeta/Phyllodocida	Syllidae	Anoplosyllinae	*Streptospinigera niuqtuut*
Polychaeta/Phyllodocida	Syllidae	Exogoninae	*Exogone* sp.
Polychaeta/Sabellida	Fabriciidae	-	Fabriciidae indet.
Polychaeta/Sabellida	Fabriciidae	-	***Pseudofabricia* sp. nr. *aberrans***
Polychaeta/Sabellida	Oweniidae	-	*Galathowenia oculata*
Polychaeta/Sabellida	Oweniidae	-	*Myriochele* sp.
Polychaeta/Sabellida	Sabellidae	Sabellinae	*Chone* sp.
Polychaeta/Sabellida	Sabellidae	Sabellinae	*Euchone incolor*
Polychaeta/Sabellida	Sabellidae	Sabellinae	*Euchone* sp.
Polychaeta/Sabellida	Sabellidae	-	Sabellidae indet.
Polychaeta/Sabellida	Serpulidae	Spirorbinae	*Bushiella* (*Jugaria*) *quadrangularis*
Polychaeta/Spionida	Spionidae	-	*Dipolydora quadrilobata*
Polychaeta/Spionida	Spionidae	-	*Dipolydora socialis*
Polychaeta/Spionida	Spionidae	-	***Marenzelleria* sp.**
Polychaeta/Spionida	Spionidae	-	*Prionospio* sp.
Polychaeta/Spionida	Spionidae	-	*Pygospio elegans*
Polychaeta/Spionida	Spionidae	-	*Scolelepis* sp.
Polychaeta/Spionida	Spionidae	-	*Spio* sp.
Polychaeta/Spionida	Spionidae	-	Spionidae indet.
Polychaeta/Terebellida	Ampharetidae	Ampharetinae	*Ampharete* sp.
Polychaeta/Terebellida	Ampharetidae	Ampharetinae	*Lysippe labiata*
Polychaeta/Terebellida	Ampharetidae	-	Ampharetidae indet.
Polychaeta/Terebellida	Ampharetidae	-	*Amphicteis* sp.
Polychaeta/Terebellida	Cirratulidae	-	*Aphelochaeta* sp.
Polychaeta/Terebellida	Cirratulidae	-	*Chaetozone pigmentata*
Polychaeta/Terebellida	Cirratulidae	-	*Chaetozone* sp.
Polychaeta/Terebellida	Cirratulidae	-	Cirratulidae indet.
Polychaeta/Terebellida	Pectinariidae	-	*Cistenides granulata*
Polychaeta/Terebellida	Pectinariidae	-	*Cistenides hyperborea*
Polychaeta/Terebellida	Pectinariidae	-	*Cistenides* sp.
Polychaeta/Terebellida	Terebellidae	Polycirrinae	*Polycirrus* sp. complex
Polychaeta/Terebellida	Terebellidae	Terebellinae	*Pista maculata*
Polychaeta/Terebellida	Terebellidae	Terebellinae	*Amphitrite cirrata*

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Taxa Identifications from Samples Collected for DNA Analysis

Polychaeta/Terebellida	Terebellidae	-	Terebellidae indet.
Polychaeta/Terebellida	Trichobranchidae	Trichobranchinae	*Terebellides* sp.
Polychaeta/Terebellida	Trichobranchidae	Trichobranchinae	*Terebellides stroemii*
Polychaeta/-	Capitellidae	-	*Capitella capitata* complex
Polychaeta/-	Capitellidae	-	Capitellidae indet.
Polychaeta/-	Capitellidae	-	*Mediomastus* sp.
Polychaeta/-	Capitellidae	-	*Notomastus* sp.
Polychaeta/-	Cossuridae	-	*Cossura longocirrata*
Polychaeta/-	Maldanidae	Euclymeninae	*Axiothella* sp.
Polychaeta/-	Maldanidae	Euclymeninae	Euclymeninae indet.
Polychaeta/-	Maldanidae	Maldaninae	*Maldane sarsi*
Polychaeta/-	Maldanidae	-	Maldanidae indet.
Polychaeta/-	Opheliidae	Ophelininae	*Ophelina* sp.
Polychaeta/-	Orbiniidae	Orbiniinae	*Leitoscoloplos* sp.
Polychaeta/-	Orbiniidae	Orbiniinae	*Scoloplos armiger*
Polychaeta/-	Orbiniidae	Orbiniinae	*Scoloplos* sp.
Polychaeta/-	Orbiniidae	-	Orbiniidae indet.
Polychaeta/-	Paraonidae	-	*Aricidea hartmanae*
Polychaeta/-	Paraonidae	-	*Aricidea minuta*
Polychaeta/-	Paraonidae	-	*Aricidea* sp.
Polychaeta/-	Scalibregmatidae	-	*Polyphysia baffinensis*
Polychaeta/-	Scalibregmatidae	-	*Scalibregma inflatum*
Polychaeta/-	-	-	Polychaete indet.
Arthropoda			
Insecta/Diptera	Chironomidae	-	Chironomidae indet.
Malacostraca/Amphipoda	Ampeliscidae	-	*Haploops* sp.
Malacostraca/Amphipoda	Atylidae	Atylinae	*Atylus* sp.
Malacostraca/Amphipoda	Corophiidae	-	Corophiidae indet.
Malacostraca/Amphipoda	Corophiidae	-	***Crassicorophium bonellii***
Malacostraca/Amphipoda	Dexaminoidae	Prophliantinae	*Guernea nordenskioldi*
Malacostraca/Amphipoda	Dulichiidae	-	Dulichiidae indet.
Malacostraca/Amphipoda	Oedicerotidae	-	*Arrhis* sp.
Malacostraca/Amphipoda	Oedicerotidae	-	*Monoculopsis* sp.
Malacostraca/Amphipoda	Oedicerotidae	-	Oedicerotidae indet.
Malacostraca/Amphipoda	Oedicerotidae	-	*Paroediceros* sp.
Malacostraca/Amphipoda	Oedicerotidae	-	*Rostroculodes* sp.
Malacostraca/Amphipoda	Oedicerotidae	-	*Westwoodilla* sp.
Malacostraca/Amphipoda	Pontogeneiidae	-	*Pontoporeia femorata*
Malacostraca/Amphipoda	Tryphosidae	-	*Orchomenella* sp.
Malacostraca/Amphipoda	Tryphosidae	-	Tryphosidae indet.
Malacostraca/Amphipoda	-	-	Amphipoda indet.
Malacostraca/Amphipoda	-	-	Lysianassoidea indet.
Malacostraca/Cumacea	Diastylidae	-	*Brachydiastylis resima*
Malacostraca/Cumacea	Diastylidae	-	Diastylidae indet.
Malacostraca/Cumacea	Diastylidae	-	*Diastylis lucifera*
Malacostraca/Cumacea	Diastylidae	-	*Diastylis scorpioides*
Malacostraca/Cumacea	Diastylidae	-	*Diastylis* sp.
Malacostraca/Cumacea	Lampropidae	-	*Lamprops* sp.
Malacostraca/Cumacea	Leuconidae	-	*Leucon nasica*
Malacostraca/Cumacea	Leuconidae	-	*Leucon nasicoides*
Malacostraca/Cumacea	Leuconidae	-	*Leucon* sp.
Malacostraca/Cumacea	-	-	Cumacea indet.
Malacostraca/Decapoda	Crangonidae	-	Crangonidae indet.
Malacostraca/Isopoda	Gnathiidae	-	*Gnathia* sp.
Malacostraca/Tanaidacea	Akanthophoreidae	-	*Akanthophoreus* sp.
Malacostraca/Tanaidacea	Pseudotanaidae	-	*Pseudotanais* sp.
Ostracoda/Myodocopida	Philomedidae	-	*Philomedes* sp.
Pycnogonida /Pantopoda	Nymphonidae	-	*Nymphon* sp.
Pycnogonida /-	-	-	Pycnogonida indet.
Thecostraca/Balanomorpha	-	-	Balanomorpha indet.

Appendix 8D-1

Taxa Identifications from Samples Collected for DNA Analysis

Bryozoa			
Gymnolaemata/Cheilostomatida	Calloporidae	-	Calloporidae indet.
Gymnolaemata/Cheilostomatida	-	-	Cheilostomatida indet.
Stenolaemata/Cyclostomatida	Crisiidae	-	*Crisia* sp.
Stenolaemata/Cyclostomatida	-	-	Cyclostomatida indet.
-/-	-	-	Bryozoa indet.
Chordata			
Ascidiacea/Stolidobranchia	-	-	Stolidobranchiata indet.
Cnidaria			
Hydrozoa/Anthoathecata	Bougainvilliidae	-	Bougainvilliidae indet.
Hydrozoa/Anthoathecata	-	-	Anthoathecata indet.
Hydrozoa/Leptothecata	-	-	Leptothecata indet.
Hydrozoa/Limnomedusae	Monobrachiidae	-	*Monobrachium parasitum*
Hydrozoa/-	-	-	Hydrozoa indet.
Echinodermata			
Echinoidea/Camarodonta	Strongylocentrotidae	-	*Strongylocentrotus* sp.
Holothuroidea/Apodida	Myriotrochidae	-	*Myriotrochus rinkii*
Holothuroidea/-	-	-	Holothuroidea indet.
Ophiuroidea/Ophiurida	Ophiuridae	Ophiurinae	*Ophiura* sp.
Ophiuroidea/-	-	-	Ophiuroidea indet.
Mollusca			
Bivalvia/Adapedonta	Hiatellidae	-	*Hiatella arctica*
Bivalvia/Cardiida	Cardiidae	Clinocardiinae	*Ciliatocardium ciliatum*
Bivalvia/Cardiida	Cardiidae	Clinocardiinae	*Serripes groenlandicus*
Bivalvia/Cardiida	Tellinidae	Macominae	*Macoma calcarea*
Bivalvia/Cardiida	Tellinidae	Macominae	*Macoma moesta*
Bivalvia/Cardiida	Tellinidae	Macominae	Macominae indet.
Bivalvia/Carditida	Astartidae	-	*Astarte borealis*
Bivalvia/Carditida	Astartidae	-	*Astarte montagui*
Bivalvia/Carditida	Astartidae	-	*Astarte* sp.
Bivalvia/Lucinida	Thyasiridae	-	*Axinopsida* sp.
Bivalvia/Lucinida	Thyasiridae	-	*Thyasira* sp.
Bivalvia/Myida	Myidae	-	*Mya* sp.
Bivalvia/Myida	Myidae	-	*Mya truncata*
Bivalvia/Mytilida	Mytilidae	-	Mytilidae indet.
Bivalvia/Nuculanida	Nuculanidae	Nuculaninae	*Nuculana minuta*
Bivalvia/Nuculanida	Nuculanidae	Nuculaninae	*Nuculana pernula*
Bivalvia/Nuculanida	Nuculanidae	Nuculaninae	*Nuculana* sp.
Bivalvia/Nuculida	Nuculidae	-	*Ennucula tenuis*
Bivalvia/Pectinida	Propeamussiidae	-	*Similipecten greenlandicus*
Bivalvia/-	-	-	Bivalvia indet.
Caudofoveata/Chaetodermatida	Chaetodermatidae	-	*Chaetoderma* sp.
Gastropoda/Cephalaspidea	Cylichnidae	-	Cylichnidae indet.
Gastropoda/Cephalaspidea	Philinidae	-	Philininae indet.
Gastropoda/Littorinimorpha	Capulidae	-	*Ariadnaria borealis*
Gastropoda/Littorinimorpha	Rissoidae	-	*Boreocingula castanea*
Gastropoda/Neogastropoda	Mangeliidae	-	Mangeliidae indet.
Gastropoda/Trochida	Margaritidae	-	*Margarites* sp.
Gastropoda/-	-	-	Gastropoda indet.
Nemertea			
Palaeonemertea/Archinemertea	Cephalothricidae	-	*Cephalothrix* sp.
Pilidiophora/Heteronemertea	Lineidae	-	Lineidae indet.

Notes: taxa identified to the lowest practical taxonomic level; indet.= indeterminate (taxa which could not be identified beyond the taxonomic level listed); sp.=species; cf.=compare with (taxa is an inexact match to the designated taxa.
Taxa in bold indicate taxa flagged or on Program watchlist, to be sent for DNA Barcoding
All taxa cross-referenced with NIS/AIS resources: Fofonoff et al. 2022, ISSG 2022, Rius et al. 2022, Molnar et al. 2008, Casas-Monroy et al. 2014

APPENDIX 8D-2

DNA Sort Lab Data

biologica

Total abundance data in matrix format, including total taxa (species richness) count per sample, total abundance per sample and total density (organsisms/m^2) for Golder Baffinland Iron Mine MEEMP DNA Samples, 2021.

taxcode	grpcode	Phylum	Class	Order		Family	Subfamily	Taxon Name	Grand Total Unique Taxa	Grand Total Abundance	mb21-042-018 SE-2 14-Aug-21 Total Abundance	mb21-042-019 SE-4 17-Aug-21 Total Abundance	mb21-042-020 SW-2 14-Aug-21 Total Abundance	mb21-042-021 SW-6 12-Aug-21 Total Abundance	mb21-042-022 SW-11 12-Aug-21 Total Abundance	mb21-042-023 SW-12 12-Aug-21 Total Abundance	mb21-042-024 SW-13 12-Aug-21 Total Abundance	mb21-042-025 SW-14 12-Aug-21 Total Abundance	mb21-042-026 SNE-7 17-Aug-21 Total Abundance
Biologica Sample ID											mb21-042-018	mb21-042-019	mb21-042-020	mb21-042-021	mb21-042-022	mb21-042-023	mb21-042-024	mb21-042-025	mb21-042-026
Site											SE-2	SE-4	SW-2	SW-6	SW-11	SW-12	SW-13	SW-14	SNE-7
Date Sampled											14-Aug-21	17-Aug-21	14-Aug-21	12-Aug-21	12-Aug-21	12-Aug-21	12-Aug-21	12-Aug-21	17-Aug-21
ANNE	EURA	Annelida	Polychaeta	Echiuroidea	Polychaeta/Echiuroi	Echiuridae	-	Echiurus echiurus	1	11						11			
ANNE	EURA	Annelida	Polychaeta	Echiuroidea	Polychaeta/Echiuroi	-	-	Echiuroidea indet.		16						16			
ANNE	POER	Annelida	Polychaeta	Eunicida	Polychaeta/Eunicida	Dorvilleidae	-	Ophryotrocha sp.	1	48							48		
ANNE	POER	Annelida	Polychaeta	Eunicida	Polychaeta/Eunicida	Lumbrineridae	-	Lumbrineridae indet.		32									32
ANNE	POER	Annelida	Polychaeta	Eunicida	Polychaeta/Eunicida	Lumbrineridae	-	Scoletoma fragilis	1	356	18	2							336
ANNE	POER	Annelida	Polychaeta	Eunicida	Polychaeta/Eunicida	Lumbrineridae	-	Scoletoma sp.		272	112	128		32					
ANNE	POER	Annelida	Polychaeta	Eunicida	Polychaeta/Eunicida	Onuphidae	Onuphinae	Nothria conchylega	1	69									69
ANNE	POER	Annelida	Polychaeta	Phyllodocida	Polychaeta/Phyllodc	Hesionidae	-	Hesionidae indet.		65					1		64		
ANNE	POER	Annelida	Polychaeta	Phyllodocida	Polychaeta/Phyllodc	Hesionidae	-	Nereimyra aphroditoides	1	1,656	161	82	17	17	416	115	592	256	
ANNE	POER	Annelida	Polychaeta	Phyllodocida	Polychaeta/Phyllodc	Nephtyidae	-	Aglaophamus malmgreni	1	1									1
ANNE	POER	Annelida	Polychaeta	Phyllodocida	Polychaeta/Phyllodc	Nephtyidae	-	Micronephthys cornuta	1	449	64	48		145	16			16	160
ANNE	POER	Annelida	Polychaeta	Phyllodocida	Polychaeta/Phyllodc	Nephtyidae	-	Nephtyidae indet.		1				1					
ANNE	POER	Annelida	Polychaeta	Phyllodocida	Polychaeta/Phyllodc	Nephtyidae	-	Nephtys ciliata	1	1				1					
ANNE	POER	Annelida	Polychaeta	Phyllodocida	Polychaeta/Phyllodc	Nereididae	Nereidinae	Nereis zonata	1	58	18	21		19					
ANNE	POER	Annelida	Polychaeta	Phyllodocida	Polychaeta/Phyllodc	Nereididae	-	Nereididae indet.		18	17			1					
ANNE	POER	Annelida	Polychaeta	Phyllodocida	Polychaeta/Phyllodc	Pholoidae	-	Pholoe longa	1	780	144	86		240	273	21		16	
ANNE	POER	Annelida	Polychaeta	Phyllodocida	Polychaeta/Phyllodc	Pholoidae	-	Pholoe minuta	1	2,465	1,073	336		640	384			32	
ANNE	POER	Annelida	Polychaeta	Phyllodocida	Polychaeta/Phyllodc	Pholoidae	-	Pholoe sp.		1,253	48	464	16	84	176		16	209	240
ANNE	POER	Annelida	Polychaeta	Phyllodocida	Polychaeta/Phyllodc	Phyllodocidae	Eteoninae	Eteone longa complex	1	33						1			32
ANNE	POER	Annelida	Polychaeta	Phyllodocida	Polychaeta/Phyllodc	Phyllodocidae	Eteoninae	Eteone sp.		163		16		16	16	2	65		48
ANNE	POER	Annelida	Polychaeta	Phyllodocida	Polychaeta/Phyllodc	Phyllodocidae	Phyllodocinae	Phyllodoce groenlandica	1	18					1	1	16		
ANNE	POER	Annelida	Polychaeta	Phyllodocida	Polychaeta/Phyllodc	Phyllodocidae	Phyllodocinae	Phyllodoce sp.		1							1		
ANNE	POER	Annelida	Polychaeta	Phyllodocida	Polychaeta/Phyllodc	Phyllodocidae	-	Phyllodocidae indet.		48			16				32		
ANNE	POER	Annelida	Polychaeta	Phyllodocida	Polychaeta/Phyllodc	Polynoidae	Polynoinae	Gattyana cirrhosa	1	27	3	24							
ANNE	POER	Annelida	Polychaeta	Phyllodocida	Polychaeta/Phyllodc	Polynoidae	Polynoinae	Harmothoe imbricata	1	67	1				32	2	16	16	
ANNE	POER	Annelida	Polychaeta	Phyllodocida	Polychaeta/Phyllodc	Polynoidae	Polynoinae	Harmothoe rarispina	1	1				1					
ANNE	POER	Annelida	Polychaeta	Phyllodocida	Polychaeta/Phyllodc	Polynoidae	Polynoinae	Harmothoe sp.		97	16	16	16		16	16	1	16	
ANNE	POER	Annelida	Polychaeta	Phyllodocida	Polychaeta/Phyllodc	Polynoidae	Polynoinae	Polynoinae indet.		33		16					17		
ANNE	POER	Annelida	Polychaeta	Phyllodocida	Polychaeta/Phyllodc	Sphaerodoridae	-	Sphaerodoropsis biserialis	1	16									16
ANNE	POER	Annelida	Polychaeta	Phyllodocida	Polychaeta/Phyllodc	Sphaerodoridae	-	Sphaerodoropsis minuta	1	32				32					
ANNE	POER	Annelida	Polychaeta	Phyllodocida	Polychaeta/Phyllodc	Syllidae	Anoplosyllinae	Streptospinigera niuqtuut	1	16				16					
ANNE	POER	Annelida	Polychaeta	Phyllodocida	Polychaeta/Phyllodc	Syllidae	Exogoninae	Exogone sp.	1	128	96	32							
ANNE	POSE	Annelida	Polychaeta	Sabellida	Polychaeta/Sabellid	Fabriciidae	-	Fabriciidae indet.		16									16
ANNE	POSE	Annelida	Polychaeta	Sabellida	Polychaeta/Sabellid	Fabriciidae	-	Pseudofabricia sp. nr. aberrans	1	16									16
ANNE	POSE	Annelida	Polychaeta	Sabellida	Polychaeta/Sabellid	Oweniidae	-	Galathowenia oculata	1	48									48
ANNE	POSE	Annelida	Polychaeta	Sabellida	Polychaeta/Sabellid	Oweniidae	-	Myriochele sp.	1	32									32
ANNE	POSE	Annelida	Polychaeta	Sabellida	Polychaeta/Sabellid	Sabellidae	Sabellinae	Chone sp.	1	22						6	16		
ANNE	POSE	Annelida	Polychaeta	Sabellida	Polychaeta/Sabellid	Sabellidae	Sabellinae	Euchone incolor	1	144	128						16		
ANNE	POSE	Annelida	Polychaeta	Sabellida	Polychaeta/Sabellid	Sabellidae	Sabellinae	Euchone sp.		12					12				
ANNE	POSE	Annelida	Polychaeta	Sabellida	Polychaeta/Sabellid	Sabellidae	-	Sabellidae indet.		507	1			16	130	45	263	52	
ANNE	POSE	Annelida	Polychaeta	Sabellida	Polychaeta/Sabellid	Serpulidae	Spirorbinae	Bushiella (Jugaria) quadrangularis	1	1				1					
ANNE	POSE	Annelida	Polychaeta	Spionida	Polychaeta/Spionida	Spionidae	-	Dipolydora quadrilobata	1	32	32								
ANNE	POSE	Annelida	Polychaeta	Spionida	Polychaeta/Spionida	Spionidae	-	Dipolydora socialis	1	16	16								
ANNE	POSE	Annelida	Polychaeta	Spionida	Polychaeta/Spionida	Spionidae	-	Marenzelleria sp.	1	150			2			100	48		
ANNE	POSE	Annelida	Polychaeta	Spionida	Polychaeta/Spionida	Spionidae	-	Prionospio sp.	1	64				64					
ANNE	POSE	Annelida	Polychaeta	Spionida	Polychaeta/Spionida	Spionidae	-	Pygospio elegans	1	16	16								
ANNE	POSE	Annelida	Polychaeta	Spionida	Polychaeta/Spionida	Spionidae	-	Scolelepis sp.	1	16							16		
ANNE	POSE	Annelida	Polychaeta	Spionida	Polychaeta/Spionida	Spionidae	-	Spio sp.	1	17		16	1						
ANNE	POSE	Annelida	Polychaeta	Spionida	Polychaeta/Spionida	Spionidae	-	Spionidae indet.		1,361		64	160	32	64	49	896	96	
ANNE	POSE	Annelida	Polychaeta	Terebellida	Polychaeta/Terebell	Ampharetidae	Ampharetinae	Ampharete sp.	1	16	16								
ANNE	POSE	Annelida	Polychaeta	Terebellida	Polychaeta/Terebell	Ampharetidae	Ampharetinae	Lysippe labiata	1	49	16		1						32
ANNE	POSE	Annelida	Polychaeta	Terebellida	Polychaeta/Terebell	Ampharetidae	-	Ampharetidae indet.		85		16			36		16	16	1
ANNE	POSE	Annelida	Polychaeta	Terebellida	Polychaeta/Terebell	Ampharetidae	-	Amphicteis sp.	1	1		1							
ANNE	POSE	Annelida	Polychaeta	Terebellida	Polychaeta/Terebell	Cirratulidae	-	Aphelochaeta sp.	1	48	48								
ANNE	POSE	Annelida	Polychaeta	Terebellida	Polychaeta/Terebell	Cirratulidae	-	Chaetozone pigmentata	1	74	58			16					
ANNE	POSE	Annelida	Polychaeta	Terebellida	Polychaeta/Terebell	Cirratulidae	-	Chaetozone sp.		806	338	160	66	162	16	16	48		
ANNE	POSE	Annelida	Polychaeta	Terebellida	Polychaeta/Terebell	Cirratulidae	-	Cirratulidae indet.		756	240	144	208	19	33		48	48	16
ANNE	POSE	Annelida	Polychaeta	Terebellida	Polychaeta/Terebell	Pectinariidae	-	Cistenides granulata	1	235	19	44		2	51	73	1	45	
ANNE	POSE	Annelida	Polychaeta	Terebellida	Polychaeta/Terebell	Pectinariidae	-	Cistenides hyperborea	1	36					17	3		16	
ANNE	POSE	Annelida	Polychaeta	Terebellida	Polychaeta/Terebell	Pectinariidae	-	Cistenides sp.		49			16		1			32	
ANNE	POSE	Annelida	Polychaeta	Terebellida	Polychaeta/Terebell	Terebellidae	Polycirrinae	Polycirrus sp. complex	1	17					1		16		
ANNE	POSE	Annelida	Polychaeta	Terebellida	Polychaeta/Terebell	Terebellidae	Terebellinae	Pista maculata	1	65	13	16		16	4		16		

ANNE	POSE	Annelida	Polychaeta	Terebellida	Polychaeta/Terebelli	Terebellidae	Terebellinae	Amphitrite cirrata	1	1	1								
ANNE	POSE	Annelida	Polychaeta	Terebellida	Polychaeta/Terebelli	Terebellidae	-	Terebellidae indet.		20				1	17		2		
ANNE	POSE	Annelida	Polychaeta	Terebellida	Polychaeta/Terebelli	Trichobranchidae	Trichobranchinae	Terebellides sp.		297	132	35		82	16			16	16
ANNE	POSE	Annelida	Polychaeta	Terebellida	Polychaeta/Terebelli	Trichobranchidae	Trichobranchinae	Terebellides stroemii	1	1								1	
ANNE	POSE	Annelida	Polychaeta	-	Polychaeta/-	Capitellidae	-	Capitella capitata complex	1	112	16			16			80		
ANNE	POSE	Annelida	Polychaeta	-	Polychaeta/-	Capitellidae	-	Capitellidae indet.		33						16	16	1	
ANNE	POSE	Annelida	Polychaeta	-	Polychaeta/-	Capitellidae	-	Mediomastus sp.	1	272	64	48		16	48	16	64		16
ANNE	POSE	Annelida	Polychaeta	-	Polychaeta/-	Capitellidae	-	Notomastus sp.	1	6									6
ANNE	POSE	Annelida	Polychaeta	-	Polychaeta/-	Cossuridae	-	Cossura longocirrata	1	448	240			208					
ANNE	POSE	Annelida	Polychaeta	-	Polychaeta/-	Maldanidae	Euclymeninae	Axiothella sp.	1	1	1								
ANNE	POSE	Annelida	Polychaeta	-	Polychaeta/-	Maldanidae	Euclymeninae	Euclymeninae indet.		16					16				
ANNE	POSE	Annelida	Polychaeta	-	Polychaeta/-	Maldanidae	Maldaninae	Maldane sarsi	1	124	59	16							49
ANNE	POSE	Annelida	Polychaeta	-	Polychaeta/-	Maldanidae	-	Maldanidae indet.		2									2
ANNE	POSE	Annelida	Polychaeta	-	Polychaeta/-	Opheliidae	Ophelininae	Ophelina sp.	1	64		16		48					
ANNE	POSE	Annelida	Polychaeta	-	Polychaeta/-	Orbiniidae	Orbiniinae	Leitoscoloplos sp.	1	48				16					32
ANNE	POSE	Annelida	Polychaeta	-	Polychaeta/-	Orbiniidae	Orbiniinae	Scoloplos armiger	1	2			1		1				
ANNE	POSE	Annelida	Polychaeta	-	Polychaeta/-	Orbiniidae	Orbiniinae	Scoloplos sp.		128	80	16		16				16	
ANNE	POSE	Annelida	Polychaeta	-	Polychaeta/-	Orbiniidae	-	Orbiniidae indet.		49	32			16			1		
ANNE	POSE	Annelida	Polychaeta	-	Polychaeta/-	Paraonidae	-	Aricidea hartmanae	1	48	16		16						16
ANNE	POSE	Annelida	Polychaeta	-	Polychaeta/-	Paraonidae	-	Aricidea minuta	1	96	32	32		32					
ANNE	POSE	Annelida	Polychaeta	-	Polychaeta/-	Paraonidae	-	Aricidea sp.		48	32	16							
ANNE	POSE	Annelida	Polychaeta	-	Polychaeta/-	Scalibregmatidae	-	Polyphysia baffinensis	1	1				1					
ANNE	POSE	Annelida	Polychaeta	-	Polychaeta/-	Scalibregmatidae	-	Scalibregma inflatum	1	608	208			112	80		96	112	
ANNE	POSE	Annelida	Polychaeta	-	Polychaeta/-	-	-	Polychaete indet.		80			80						
ARTH	CHAR	Arthropoda	Arachnida	-	Arachnida/-	-	-	Acari indet.	1	48						32		16	
ARTH	CRCO	Arthropoda	Hexanauplia	-	Hexanauplia/-	-	-	Copepoda indet.	1	32							16	16	
ARTH	INDI	Arthropoda	Insecta	Diptera	Insecta/Diptera	Chironomidae	-	Chironomidae indet.	1	64					16		48		
ARTH	CRAM	Arthropoda	Malacostraca	Amphipoda	Malacostraca/Amph	Ampeliscidae	-	Haploops sp.	1	48		48							
ARTH	CRAM	Arthropoda	Malacostraca	Amphipoda	Malacostraca/Amph	Atylidae	Atylinae	Atylus sp.	1	66	1						65		
ARTH	CRAM	Arthropoda	Malacostraca	Amphipoda	Malacostraca/Amph	Corophiidae	-	Corophiidae indet.		496		16	16		320		144		
ARTH	CRAM	Arthropoda	Malacostraca	Amphipoda	Malacostraca/Amph	Corophiidae	-	Crassicorophium bonellii	1	80					48		32		
ARTH	CRAM	Arthropoda	Malacostraca	Amphipoda	Malacostraca/Amph	Dexaminoidae	Prophliantinae	Guernea nordenskioldi	1	656	304	208		128				16	
ARTH	CRAM	Arthropoda	Malacostraca	Amphipoda	Malacostraca/Amph	Dulichiidae	-	Dulichiidae indet.	1	48					16		32		
ARTH	CRAM	Arthropoda	Malacostraca	Amphipoda	Malacostraca/Amph	Oedicerotidae	-	Arrhis sp.	1	32					32				
ARTH	CRAM	Arthropoda	Malacostraca	Amphipoda	Malacostraca/Amph	Oedicerotidae	-	Monoculopsis sp.	1	160							160		
ARTH	CRAM	Arthropoda	Malacostraca	Amphipoda	Malacostraca/Amph	Oedicerotidae	-	Oedicerotidae indet.		80	16						16	48	
ARTH	CRAM	Arthropoda	Malacostraca	Amphipoda	Malacostraca/Amph	Oedicerotidae	-	Paroediceros sp.	1	16							16		
ARTH	CRAM	Arthropoda	Malacostraca	Amphipoda	Malacostraca/Amph	Oedicerotidae	-	Rostroculodes sp.	1	176	16	32	64	16			48		
ARTH	CRAM	Arthropoda	Malacostraca	Amphipoda	Malacostraca/Amph	Oedicerotidae	-	Westwoodilla sp.	1	48				48					
ARTH	CRAM	Arthropoda	Malacostraca	Amphipoda	Malacostraca/Amph	Pontogeneiidae	-	Pontoporeia femorata	1	192	96	96							
ARTH	CRAM	Arthropoda	Malacostraca	Amphipoda	Malacostraca/Amph	Tryphosidae	-	Orchomenella sp.	1	96				16	16		16	48	
ARTH	CRAM	Arthropoda	Malacostraca	Amphipoda	Malacostraca/Amph	Tryphosidae	-	Tryphosidae indet.		48					16	16	16		
ARTH	CRAM	Arthropoda	Malacostraca	Amphipoda	Malacostraca/Amph	-	-	Amphipoda indet.		80			32		16		16	16	
ARTH	CRAM	Arthropoda	Malacostraca	Amphipoda	Malacostraca/Amph	-	-	Lysianassoidea indet.		310		50	1		18	80	16	144	1
ARTH	CRCU	Arthropoda	Malacostraca	Cumacea	Malacostraca/Cuma	Diastylidae	-	Brachydiastylis resima	1	80		48		16					16
ARTH	CRCU	Arthropoda	Malacostraca	Cumacea	Malacostraca/Cuma	Diastylidae	-	Diastylidae indet.		32		16							16
ARTH	CRCU	Arthropoda	Malacostraca	Cumacea	Malacostraca/Cuma	Diastylidae	-	Diastylis lucifera	1	32	16	16							
ARTH	CRCU	Arthropoda	Malacostraca	Cumacea	Malacostraca/Cuma	Diastylidae	-	Diastylis scorpioides	1	48				32	16				
ARTH	CRCU	Arthropoda	Malacostraca	Cumacea	Malacostraca/Cuma	Diastylidae	-	Diastylis sp.		48		48							
ARTH	CRCU	Arthropoda	Malacostraca	Cumacea	Malacostraca/Cuma	Lampropidae	-	Lamprops sp.	1	1,040	112	192	48	176	144		288	80	
ARTH	CRCU	Arthropoda	Malacostraca	Cumacea	Malacostraca/Cuma	Leuconidae	-	Leucon nasica	1	32				32					
ARTH	CRCU	Arthropoda	Malacostraca	Cumacea	Malacostraca/Cuma	Leuconidae	-	Leucon nasicoides	1	112	16			96					
ARTH	CRCU	Arthropoda	Malacostraca	Cumacea	Malacostraca/Cuma	Leuconidae	-	Leucon sp.		96				48				32	16
ARTH	CRCU	Arthropoda	Malacostraca	Cumacea	Malacostraca/Cuma	-	-	Cumacea indet.		32							16	16	
ARTH	CRDE	Arthropoda	Malacostraca	Decapoda	Malacostraca/Decap	Crangonidae	-	Crangonidae indet.	1	1					1				
ARTH	CRIS	Arthropoda	Malacostraca	Isopoda	Malacostraca/Isopo	Gnathiidae	-	Gnathia sp.	1	16									16
ARTH	CRTA	Arthropoda	Malacostraca	Tanaidacea	Malacostraca/Tanaid	Akanthophoreidae	-	Akanthophoreus sp.	1	336	32	96			48	16	48	64	32
ARTH	CRTA	Arthropoda	Malacostraca	Tanaidacea	Malacostraca/Tanaid	Pseudotanaidae	-	Pseudotanais sp.	1	32	32								
ARTH	CROS	Arthropoda	Ostracoda	Myodocopida	Ostracoda/Myodoco	Philomedidae	-	Philomedes sp.	1	1,280	224	624	16	400				16	
ARTH	CHPY	Arthropoda	Pycnogonida	Pantopoda	Pycnogonida /Panto	Nymphonidae	-	Nymphon sp.	1	18		1						16	1
ARTH	CHPY	Arthropoda	Pycnogonida	-	Pycnogonida /-	-	-	Pycnogonida indet.		16				16					
ARTH	CRCI	Arthropoda	Thecostraca	Balanomorpha	Thecostraca/Balanor	-	-	Balanomorpha indet.	1	88		16	56					16	
MISC	BRYO	Bryozoa	Gymnolaemata	Cheilostomatida	Gymnolaemata/Chei	Calloporidae	-	Calloporidae indet.	1	3									3
MISC	BRYO	Bryozoa	Gymnolaemata	Cheilostomatida	Gymnolaemata/Chei	-	-	Cheilostomatida indet.		32									32
MISC	BRYO	Bryozoa	Stenolaemata	Cyclostomatida	Stenolaemata/Cyclo	Crisiidae	-	Crisia sp.	1	16									16
MISC	BRYO	Bryozoa	Stenolaemata	Cyclostomatida	Stenolaemata/Cyclo	-	-	Cyclostomatida indet.		16									16
MISC	BRYO	Bryozoa	-	-	-/-	-	-	Bryozoa indet.		1									1
MISC	URAS	Chordata	Ascidiacea	Stolidobranchia	Ascidiacea/Stolidobr	-	-	Stolidobranchia indet.	1	32		16	16						
MISC	CNHY	Cnidaria	Hydrozoa	Anthoathecata	Hydrozoa/Anthoath	Bougainvilliidae	-	Bougainvilliidae indet.	1	38	16				16	6			
MISC	CNHY	Cnidaria	Hydrozoa	Anthoathecata	Hydrozoa/Anthoath	-	-	Anthoathecata indet.		3					3				
MISC	CNHY	Cnidaria	Hydrozoa	Leptothecata	Hydrozoa/Leptothec	-	-	Leptothecata indet.	1	16			16						
MISC	CNHY	Cnidaria	Hydrozoa	Limnomedusae	Hydrozoa/Limnomed	Monobrachiidae	-	Monobrachium parasitum	1	17	1			8		2		5	1
MISC	CNHY	Cnidaria	Hydrozoa	-	Hydrozoa/-	-	-	Hydrozoa indet.		13					2		1	7	3

ECHI	ECEC	Echinodermata	Echinoidea	Camarodonta	Echinoidea/Camaroc	Strongylocentrotidae	-	Strongylocentrotus sp.	1	2	1			1					
ECHI	ECHO	Echinodermata	Holothuroidea	Apodida	Holothuroidea/Apoc	Myriotrochidae	-	Myriotrochus rinkii	1	54					33	1		20	
ECHI	ECHO	Echinodermata	Holothuroidea	-	Holothuroidea/-	-	-	Holothuroidea indet.		32								32	
ECHI	ECOP	Echinodermata	Ophiuroidea	Ophiurida	Ophiuroidea/Ophiur	Ophiuridae	Ophiurinae	Ophiura sp.	1	14	2	1		2		1	1	1	6
ECHI	ECOP	Echinodermata	Ophiuroidea	-	Ophiuroidea/-	-	-	Ophiuroidea indet.		18		16							2
MOLL	MOBI	Mollusca	Bivalvia	Adapedonta	Bivalvia/Adapedonta	Hiatellidae	-	Hiatella arctica	1	183	49	38	33	43	18			1	1
MOLL	MOBI	Mollusca	Bivalvia	Cardiida	Bivalvia/Cardiida	Cardiidae	Clinocardiinae	Ciliatocardium ciliatum	1	6		4		2					
MOLL	MOBI	Mollusca	Bivalvia	Cardiida	Bivalvia/Cardiida	Cardiidae	Clinocardiinae	Serripes groenlandicus	1	50		4	32	2	8	1	3		
MOLL	MOBI	Mollusca	Bivalvia	Cardiida	Bivalvia/Cardiida	Tellinidae	Macominae	Macoma calcarea	1	172	2			14	26	7	49	61	13
MOLL	MOBI	Mollusca	Bivalvia	Cardiida	Bivalvia/Cardiida	Tellinidae	Macominae	Macoma moesta	1	3		1						1	
MOLL	MOBI	Mollusca	Bivalvia	Cardiida	Bivalvia/Cardiida	Tellinidae	Macominae	Macominae indet.		69	1	2				1		18	48
MOLL	MOBI	Mollusca	Bivalvia	Carditida	Bivalvia/Carditida	Astartidae	-	Astarte borealis	1	113	53	35		25					
MOLL	MOBI	Mollusca	Bivalvia	Carditida	Bivalvia/Carditida	Astartidae	-	Astarte montagui	1	291	160	127		3					1
MOLL	MOBI	Mollusca	Bivalvia	Carditida	Bivalvia/Carditida	Astartidae	-	Astarte sp.		204	86	102							16
MOLL	MOBI	Mollusca	Bivalvia	Lucinida	Bivalvia/Lucinida	Thyasiridae	-	Axinopsida sp.	1	112								112	
MOLL	MOBI	Mollusca	Bivalvia	Lucinida	Bivalvia/Lucinida	Thyasiridae	-	Thyasira sp.	1	48	32			16					
MOLL	MOBI	Mollusca	Bivalvia	Myida	Bivalvia/Myida	Myidae	-	Mya sp.		128	32	32		16	48				
MOLL	MOBI	Mollusca	Bivalvia	Myida	Bivalvia/Myida	Myidae	-	Mya truncata	1	62	12	42	1	5	2				
MOLL	MOBI	Mollusca	Bivalvia	Mytilida	Bivalvia/Mytilida	Mytilidae	-	Mytilidae indet.	1	16				16					
MOLL	MOBI	Mollusca	Bivalvia	Nuculanida	Bivalvia/Nuculanida	Nuculanidae	Nuculaninae	Nuculana minuta	1	22	16	3		2				1	
MOLL	MOBI	Mollusca	Bivalvia	Nuculanida	Bivalvia/Nuculanida	Nuculanidae	Nuculaninae	Nuculana pernula	1	34		16		17					1
MOLL	MOBI	Mollusca	Bivalvia	Nuculanida	Bivalvia/Nuculanida	Nuculanidae	Nuculaninae	Nuculana sp.		112	48	32		32					
MOLL	MOBI	Mollusca	Bivalvia	Nuculida	Bivalvia/Nuculida	Nuculidae	-	Ennucula tenuis	1	102		48		18				2	34
MOLL	MOBI	Mollusca	Bivalvia	Pectinida	Bivalvia/Pectinida	Propeamussiidae	-	Similipecten greenlandicus	1	14	5	5	2	2					
MOLL	MOBI	Mollusca	Bivalvia	-	Bivalvia/-	-	-	Bivalvia indet.		240	64	32		32	16	16		80	
MOLL	MOAP	Mollusca	Caudofoveata	Chaetodermatida	Caudofoveata/Chaet	Chaetodermatidae	-	Chaetoderma sp.	1	17									17
MOLL	MOGA	Mollusca	Gastropoda	Cephalaspidea	Gastropoda/Cephala	Cylichnidae	-	Cylichnidae indet.	1	80	16	16		32				16	
MOLL	MOGA	Mollusca	Gastropoda	Cephalaspidea	Gastropoda/Cephala	Philinidae	-	Philininae indet.	1	16	16								
MOLL	MOGA	Mollusca	Gastropoda	Littorinimorpha	Gastropoda/Littorini	Capulidae	-	Ariadnaria borealis	1	3	1							2	
MOLL	MOGA	Mollusca	Gastropoda	Littorinimorpha	Gastropoda/Littorini	Rissoidae	-	Boreocingula castanea	1	16	16								
MOLL	MOGA	Mollusca	Gastropoda	Neogastropoda	Gastropoda/Neogast	Mangeliidae	-	Mangeliidae indet.	1	50		1		16			17	16	
MOLL	MOGA	Mollusca	Gastropoda	Trochida	Gastropoda/Trochid	Margaritidae	-	Margarites sp.	1	16				16					
MOLL	MOGA	Mollusca	Gastropoda	-	Gastropoda/-	-	-	Gastropoda indet.		16		16							
MISC	NTEA	Nemertea	Palaeonemertea	Archinemertea	Palaeonemertea/Arc	Cephalothricidae	-	Cephalothrix sp.	1	48	16			32					
MISC	NTEA	Nemertea	Pilidiophora	Heteronemertea	Pilidiophora/Heteroi	Lineidae	-	Lineidae indet.	1	49	32			16					1
								Total Abundance		**24,157**	**5,167**	**4,007**	**949**	**3,529**	**2,753**	**688**	**3,591**	**1,931**	**1,542**
								Total Unique Taxa (Species Richness)	**118**		**58**	**49**	**23**	**59**	**35**	**22**	**35**	**37**	**34**
								Grab Sampler		**Van Veen**	**Van Veen**	**Van Veen**	**Van Veen**	**Van Veen**	**Van Veen**	**Van Veen**	**Van Veen**	**Van Veen**	**Van Veen**
								# of Composite Grabs		**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
								Total Density (Organisms/m^2)		**80,523**	**17,223**	**13,357**	**3,163**	**11,763**	**9,177**	**2,293**	**11,970**	**6,437**	**5,140**
Incidental Taxa:																			
MEMO	MEMO	Arthropoda	Hexanauplia					Copepoda indet. (parasitic)		32					32				

APPENDIX 8D-3

DNA Sort Lab Methods

Marine Benthic Enumeration and Identification Methods
Client: Golder
Project: Baffinland Iron Mine MEEMP, 2021
Sample Type: DNA
Protocol: EEM

Sample Inventory

Sample arrival: 15-Sept-21
Number of samples: 9
Number of jars: 25
Screen size: 500 µm and 1.0 cm
Biologica project number: mb21-042

The chain of custody documents were checked and approved with the client. Samples arrived preserved in DNA grade Ethanol (95%). Samples were stored in a freezer at Biologica. Each sample was provided a unique identification number and placed in the queue for analysis.

Table 1. Summary of benthic samples processed for Golder Baffinland Iron Mine MEEMP DNA Samples, 2021.

Site	Date Sampled	Biologica Sample ID	# of Jars	Field Screen	Field Split	Final Split	Organisms Counted
SE-2	14-Aug-21	mb21-042-018	1	500 µm	1/4	1/16	311
			2	1.0 cm	Whole	Whole	191
SE-4	17-Aug-21	mb21-042-019	1	500 µm	1/4	1/16	239
			2	1.0 cm	Whole	Whole	183
SW-2	14-Aug-21	mb21-042-020	2	500 µm	1/4	1/16	58
			1	1.0 cm	Whole	Whole	21
SW-6	12-Aug-21	mb21-042-021	1	500 µm	1/4	1/16	212
			2	1.0 cm	Whole	Whole	137
SW-11	12-Aug-21	mb21-042-022	1	500 µm	1/4	1/16	137
			1	1.0 cm	Whole	1/16	31
				1.0 cm	Whole	Whole	65
SW-12	12-Aug-21	mb21-042-023	2	500 µm	1/4	1/16	26
			2	1.0 cm	Whole	1/16	7
				1.0 cm	Whole	Whole	160
SW-13	12-Aug-21	mb21-042-024	1	500 µm	1/4	1/16	125
			2	1.0 cm	Whole	1/16	97
				1.0 cm	Whole	Whole	39
SW-14	12-Aug-21	mb21-042-025	1	500 µm	1/4	1/16	88
			1	1.0 cm	Whole	1/16	29
				1.0 cm	Whole	Whole	59
SNE-7	17-Aug-21	mb21-042-026	1	500 µm	1/4	1/16	91
			1	1.0 cm	Whole	Whole	86

Sample Processing

Sorting and Subsampling:

All samples were sorted using dissecting microscopes at 10–40x magnification by trained personnel. Microscopic sorting is the only way to ensure >90% of organisms are removed from the debris, which is required by EEM (Environment Canada; Environmental Effects Monitoring) guidelines for marine benthic analyses. To minimize potential sorter bias, samples were distributed among technicians such that no one person sorted all the replicates of a given sample.

Due to historically large volumes and high abundances in the samples, samples were fractioned in the field into a 1.0 cm macro fraction and 500 µm fine fraction. This strategy was developed to maximize the detection of large and rare individuals in the macro fraction while accurately enumerating smaller organisms in the fine fraction. The macro 1.0 cm fraction was analyzed whole, with all large organisms (>1.0 cm) removed from the sample, as was done for the formalin preserved benthic samples. In addition, all large debris in this fraction were checked microscopically, including rocks and other large debris to ensure encrusting organisms were accurately enumerated. For four samples, SW-11, -12, -13, and -14 the 1.0 cm fraction contained a large volume of dense organic material. To be accurately enumerate and capture the diversity of the smaller taxa the dense organic material from the 1.0 cm fraction was subsampled. The organic material was first thoroughly checked for large organisms >1.0 cm and then the material was spread on a Caton tray (Caton, 1991) and subsampled to a 1/16 split.

The 500 µm fraction was split in the field to 1/4. Biologica subsequently split this fraction by a second 1/4, for a final 1/16 split. Subsampling was done with a Caton tray (Caton, 1991). The sample was spread evenly over a Caton grid, and sequential random quadrats were selected and sorted until the minimum 1/4 split was reached.

Sub-sampling accuracy was assessed by sorting the remaining 500 µm fraction sample for 10% of all sub-sampled samples (one sample) and comparing the fractions to one another. Refer to Table 2 for sub-sampling accuracy results.

Table 2. Results of subsampling accuracy for Golder Baffinland Iron Mine MEEMP DNA Samples, 2021.

Site	Biologica Sample ID	Sub-sampling Accuracy
SE-2	mb21-042-018	
SE-4	mb21-042-019	
SW-2	mb21-042-020	
SW-6	mb21-042-021	
SW-11	mb21-042-022	
SW-12	mb21-042-023	
SW-13	mb21-042-024	74.40%
SW-14	mb21-042-025	
SNE-7	mb21-042-026	

Identification and Invasive Species Detection:

All organisms were identified using a combination of dissecting (10–40x) and compound microscopes (100–1000x) and standard taxonomic keys (see methodological and taxonomic references) to the lowest practicable level (as preservation in ethanol allows). All specimens were archived in air-tight glass vials with 95% ethanol and stored in the freezer. Taxonomic data were recorded in Biologica's custom database. One new taxa was recorded that had not been previously identified in the historical benthic data, *Cistenides hyperborea.* All specimens were referenced for DNA analysis and/or verification.

Data Management and Analysis

All data were recorded in Biologica's custom database. Total abundances were extrapolated for samples split in the field to represent the abundance from the whole sample. Organism densities were calculated by dividing the total organism abundance (extrapolated if the sample was split) using the area of a Van Veen grab (0.1 m^2), with three composite Van Veen grabs (3 x 0.1m^2) for each sample.

Results were provided to the Golder project manager in Excel spreadsheets via email.

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APPENDIX 8D-4

DNA Macroflora Methods and Results

CANADIAN CENTRE FOR DNA BARCODING
DNA Testing Laboratory Report

FORENSIC CASE INFORMATION

File Number: BIO-22-040_Biologica Environmental Services_Tara Macdonald_2022-03-09
Accession Number: BIO-22-040

Client Name: Tara Macdonald; President/CEO
Client Address: Biologica Environmental Services, Ltd.
488-F Bay Street, Victoria BC, V8T 5H2
T: 250-479-3868 | C: 250-516-2906
Contact Name: Tara Macdonald (tara@biologica.ca)

ITEMS

Description: Eight specimens of invertebrate organisms with putative taxonomy were submitted for species verification with DNA barcoding using Sanger sequencing

Sample ID provided	Sample ID	Process ID	Putative taxon
21-042-026	CCBDFR0734	ABCBF758-22	*Pseudofabricia* sp. nr. *aberrans*
20-045-250-A	CCBDFR0735	ABCBF759-22	*Pseudofabricia* sp. nr. *aberrans*
20-045-250-B	CCBDFR0736	ABCBF760-22	*Pseudofabricia* sp. nr. *aberrans*
21-042-024-A	CCBDFR0737	ABCBF761-22	*Crassicorophium bonelli*
21-042-024-B	CCBDFR0738	ABCBF762-22	*Crassicorophium bonelli*
21-042-022-A	CCBDFR0739	ABCBF763-22	*Crassicorophium bonelli*
21-042-022-B	CCBDFR0740	ABCBF764-22	*Crassicorophium bonelli*
21-042-022-C	CCBDFR0741	ABCBF765-22	*Crassicorophium bonelli*

Dates Received: March-09, 2022
Received From: Maria Kuzmina

Dates of Analysis: March 16 – 25, 2022
Collector/Collection Site: Nguyen NguyenTX./ Canadian Centre for DNA Barcoding, Biodiversity of Ontario, University of Guelph, 50 Stone Road East, Guelph

METHODS

To ascertain the identity of the species from the submitted samples, the whole specimens CCDBFR0721 - CCDBFR0733 were lysed. Total genomic DNA was extracted using validated spin columns. The target genetic marker (DNA barcode region of the mitochondrial cytochrome *c* oxidase subunit I gene) was amplified using polymerase chain reaction (PCR) employing the primers suitable for Arthropoda (*C-LepFoIF/C-LepFoIR*) for putative taxon *Crassicorophium bonelli* and primers suitable for Annelida (*polyLCO/polyHCO*) for putative taxon *Pseudofabricia* sp. nr. *Aberrans* samples. Cycle sequencing was performed using a standardized commercially available BigDye Terminator v3.1 kit. Sequencing reactions were analyzed by high-voltage capillary electrophoresis on an automated ABI 3730xL DNA Analyzer. Recovered DNA sequences were compared against the Barcode of Life Data System (BOLD) database accessible at http://www.boldsystems.org/.

IMAGING

All items were photographed in the Photography Lab Area by Nguyen NguyenT.X., using a Canon ELPH 300 HS, 12.1 megapixels. Pictures were uploaded to the BOLD website into the secure project called “[ABCBF] – Forensic sampling”.

INTERPRETATION

Bidirectional forward and reverse sequences were generated from all samples. Resulting trace files were assembled into contigs, and their consensus sequences were manually edited in CodonCode Aligner (version 4.1.1.) software. The resulting COI barcode sequences were compared against the publicly available records in Barcode of Life Database (BOLD) and National Centre for Biotechnology Information (NCBI). Based on the percentage of nucleotide sequence divergence (number of nucleotide substitutions) between sequence from test sample and reference DNA barcode, the closest match was used to infer species identity of the DNA contributor in the corresponding test sample (BLAST algorithm). Images, primers, sequences, and their associated trace files with quality scores were uploaded to the secure BOLD project called “[ABCBF] – Forensic sampling”.

SUMMARY OF RESULTS

The sequences for the samples 21-042-026, 20-045-250-A, and 20-045-250-B showed no variation within the amplified COI region (~580 base pairs). The closest match with 79.23% similarity to *Fabricia stellaris* (class Polychaeta, phylum Annelida) was found in BOLD (Figure 1). The closest match with 76.96% similarity to *Polychaeta sp.* (class Polychaeta, phylum Annelida) was found in NCBI (accession numbers MN684125, MN684053).
The sequences for the samples 21-042-024-A, 21-042-024-B, 21-042-022-A, 21-042-022-B, 21-042-022-C showed closest match with 100% similarity to order Amphipoda (class Malacostraca, phylum Arthropoda) was found in BOLD (http://www.barcodinglife.org/index.php/Public_BarcodeCluster?clusteruri=BOLD:AEB7517) (Figure 2). The closest match with 83.76% similarity to *Corophium sp.* (class Malacostraca, phylum Arthropoda) was found in NCBI (accession number MG313289).

CONCLUSIONS

The tested samples (CCBDFR0734- CCBDFR0741) showed no significant similarity on species level with the records in the publicly available sequencing databases (BOLD and NCBI). The closest match for the samples CCBDFR0734, CCBDFR0735, and CCBDFR0736 is class Polychaeta, which corresponds with the putative identification of these samples. The closest match for the samples CCBDFR0737, CCBDFR0738, CCBDFR0739, CCBDFR0740, and CCBDFR0741 is order Amphipoda, which corresponds with the putative identification of these samples.

RESULTS REPORTED BY:

Nguyen NguyenTX., MSc; Wildlife Forensic Technician

RESULTS REVIEWED BY:

Maria Kuzmina, PhD; Plant Lead

Evgeny V. Zakharov, PhD; Director, CCDB

All inquiries pertaining to this report should be directed to Nguyen NguyenTX (n.nguyen@uoguelph.ca) and Evgeny V. Zakharov (zakharov@uoguelph.ca).

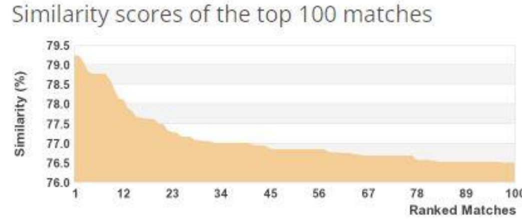
FIGURES

Query: 21-042-026_stock_
Top Hit: No match

Search Result:

Request Type: COI FULL DATABASE (includes records without species designation)

TREE BASED IDENTIFICATION



Top 20 Matches

Display option: Top 20

Phylum	Class	Order	Family	Genus	Species	Subspecies	Similarity (%)	Status
Annelida	Polychaeta	Sabellida	Fabriciidae	*Fabricia*	*stellaris*		79.23	Private
Annelida	Polychaeta	Sabellida	Fabriciidae	*Fabricia*	*stellaris*		79.23	Early-Release
Annelida	Polychaeta	Sabellida	Fabriciidae	*Fabricia*			79.07	Private
Annelida	Polychaeta	Sabellida	Fabriciidae	*Fabricia*	*stellaris*		78.83	Private
Annelida	Polychaeta	Canalipalpata	Protodriloididae				78.75	Published
Annelida	Polychaeta	Canalipalpata	Protodriloididae				78.75	Published
Annelida	Polychaeta	Canalipalpata	Protodriloididae				78.75	Published
Annelida	Polychaeta	Canalipalpata	Protodriloididae				78.75	Published
Annelida	Polychaeta	Sabellida	Fabriciidae	*Fabricia*	*stellaris*		78.59	Private
Annelida	Clitellata	Haplotaxida	Rhinodrilidae	*Pontoscolex*	*corethrurus*		78.32	Published
Annelida	Polychaeta	Sabellida	Fabriciidae	*Fabricia*	*sp.*		78.12	Private
Annelida	Clitellata	Haplotaxida	Rhinodrilidae	*Pontoscolex*	*corethrurus*		78.1	Published
Annelida	Clitellata	Haplotaxida	Rhinodrilidae	*Pontoscolex*	*corethrurus*		77.88	Published
Annelida	Polychaeta						77.8	Published
Annelida	Clitellata	Haplotaxida	Lumbricidae				77.66	Early-Release
Annelida	Polychaeta	Spionida	Spionidae				77.64	Private
Annelida	Clitellata	Haplotaxida	Lumbricidae	*Aporrectodea*	*caliginosa*		77.63	Private

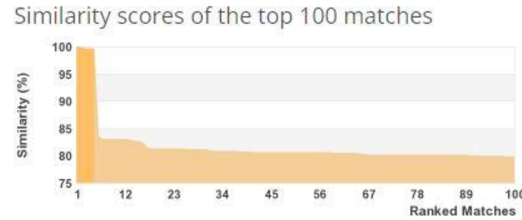
Figure 1 – Species identification match percentage on BOLD for sample 21-042-026 (CCDBFR0734).

Query: 21-042-022A_1in10_
Top Hit: Arthropoda Malacostraca - Amphipoda (100%)

Search Result:

Request Type: COI FULL DATABASE (includes records without species designation)

TREE BASED IDENTIFICATION



Top 20 Matches

Display option: Top 20

Phylum	Class	Order	Family	Genus	Species	Subspecies	Similarity (%)	Status
Arthropoda	Malacostraca	Amphipoda					100	Published
Arthropoda	Malacostraca	Amphipoda					99.83	Published
Arthropoda	Malacostraca	Amphipoda					99.65	Published
Arthropoda	Malacostraca	Amphipoda					99.65	Published
Arthropoda	Malacostraca	Amphipoda					99.65	Published
Arthropoda	Malacostraca	Amphipoda	Corophiidae	*Corophium*			83.59	Published
Arthropoda	Malacostraca	Amphipoda	Corophiidae				83.07	Published
Arthropoda	Malacostraca	Amphipoda	Corophiidae	*Monocorophium*	*sextonae*		83.07	Published
Arthropoda	Malacostraca	Amphipoda	Corophiidae	*Monocorophium*	*sextonae*		83.07	Published
Arthropoda	Malacostraca	Amphipoda	Corophiidae	*Monocorophium*	*sextonae*		83.07	Published
Arthropoda	Malacostraca	Amphipoda	Corophiidae	*Monocorophium*	*sextonae*		83.07	Published
Arthropoda	Malacostraca	Amphipoda	Corophiidae	*Monocorophium*	*sextonae*		83.07	Published
Arthropoda	Malacostraca	Amphipoda	Corophiidae	*Corophium*			82.88	Published
Arthropoda	Malacostraca	Amphipoda	Corophiidae	*Corophium*			82.73	Published
Arthropoda	Malacostraca	Amphipoda	Corophiidae	*Corophium*			82.7	Published

Figure 2 – Species identification match percentage on BOLD for sample 21-042-022A (CCDBFR0739)

BOLD TaxonID Tree

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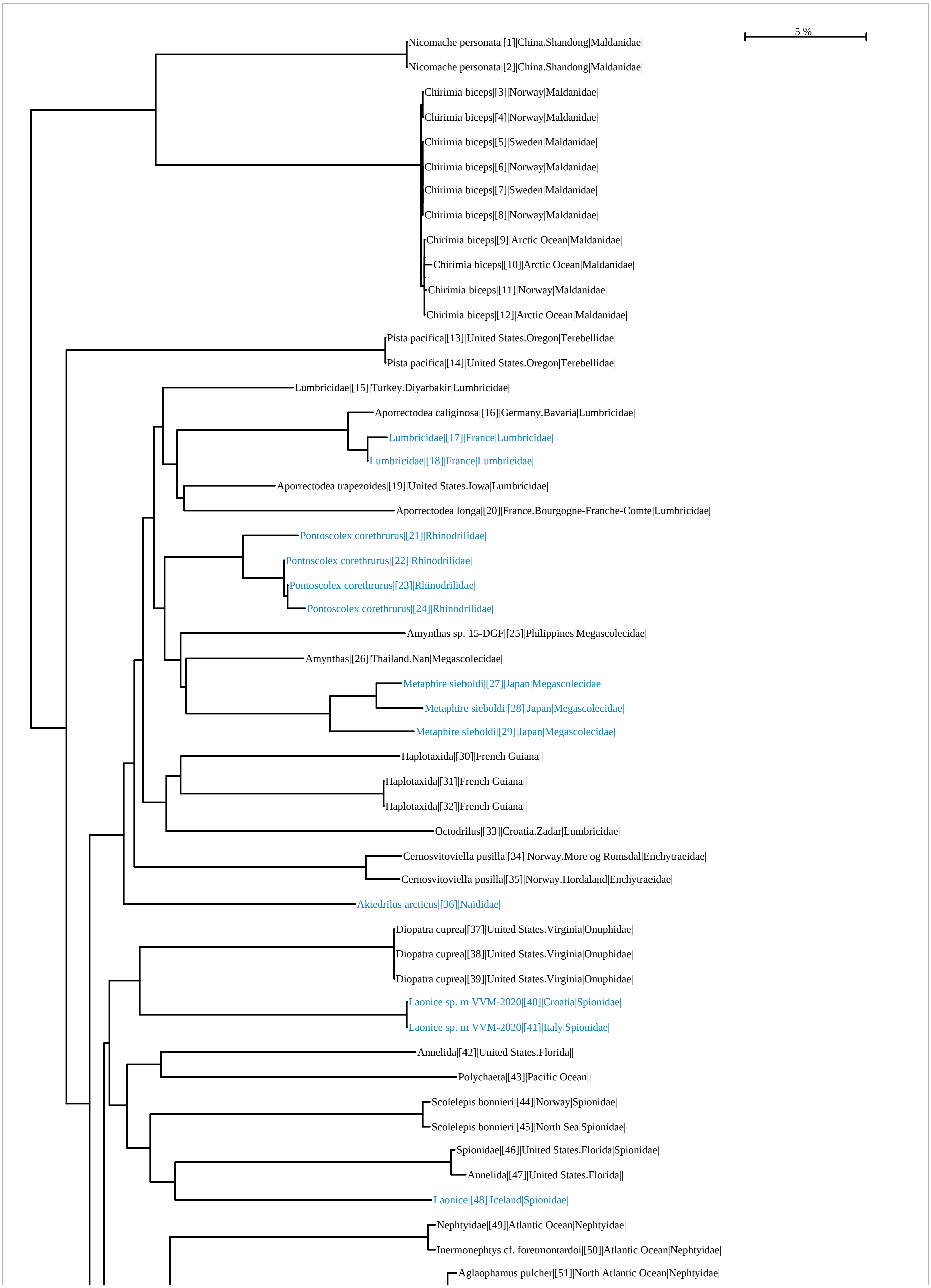
Data Type	:	Nucleotide
Distance Model	:	Kimura 2 Parameter
Marker	:	COI-5P
Codon Positions	:	1st, 2nd, 3rd
Labels	:	Extra Info, Country & Province, Family
Filters	:	Length > 200
Attachment	:	Photographs & Spreadsheet

Sequence Count	:	101
Species count	:	24
Genus count	:	20
Family count	:	14
Unidentified	:	38


5 %
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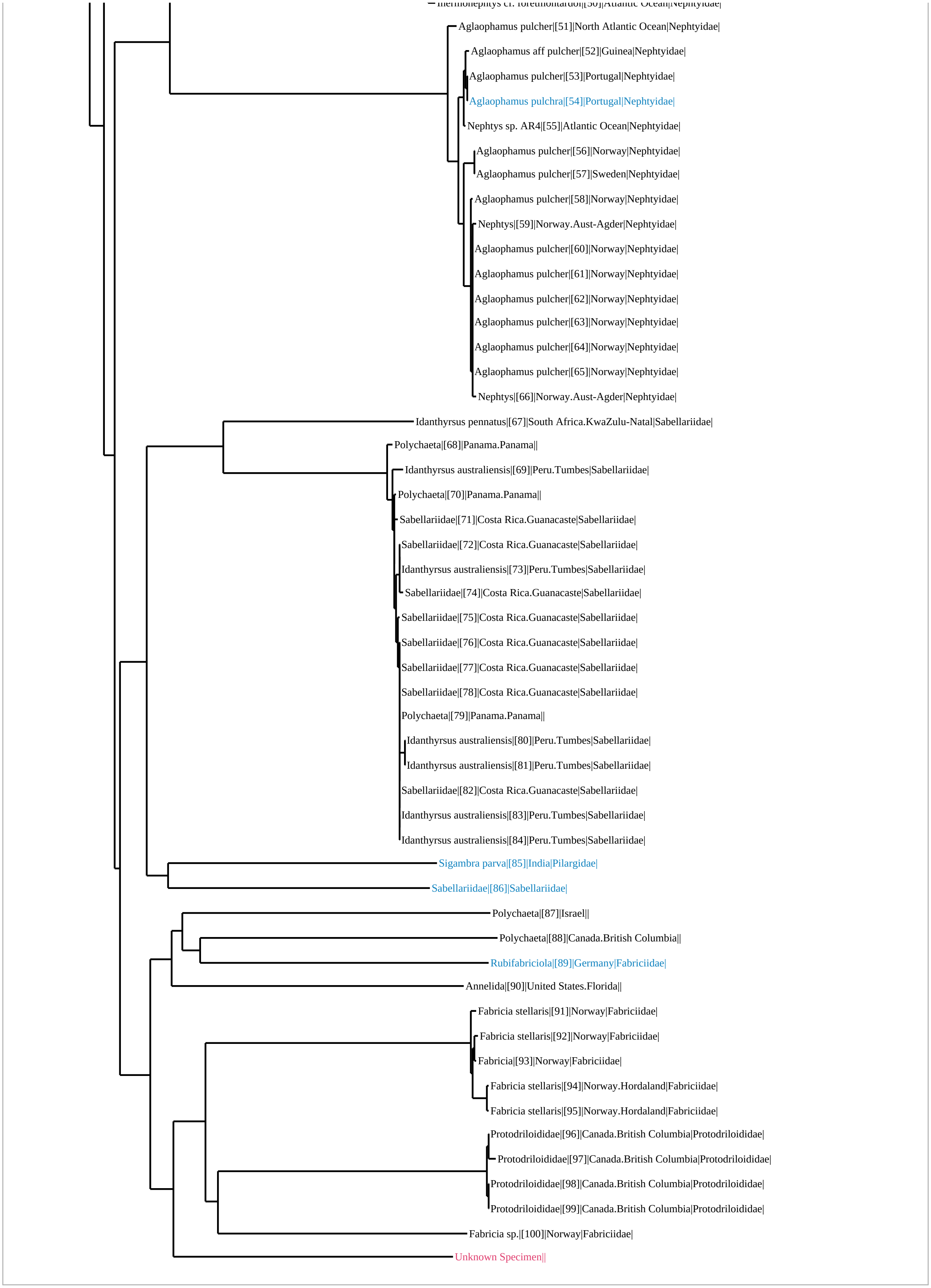
Nicomache personata|[2]|China.Shandong|Maldanidae|
Chirimia biceps|[3]|Norway|Maldanidae|
Chirimia biceps|[4]|Norway|Maldanidae|
Chirimia biceps|[5]|Sweden|Maldanidae|
Chirimia biceps|[6]|Norway|Maldanidae|
Chirimia biceps|[7]|Sweden|Maldanidae|
Chirimia biceps|[8]|Norway|Maldanidae|
Chirimia biceps|[9]|Arctic Ocean|Maldanidae|
Chirimia biceps|[10]|Arctic Ocean|Maldanidae|
Chirimia biceps|[11]|Norway|Maldanidae|
Chirimia biceps|[12]|Arctic Ocean|Maldanidae|
Pista pacifica|[13]|United States.Oregon|Terebellidae|
Pista pacifica|[14]|United States.Oregon|Terebellidae|
Lumbricidae|[15]|Turkey.Diyarbakir|Lumbricidae|
Aporrectodea caliginosa|[16]|Germany.Bavaria|Lumbricidae|
Lumbricidae|[17]|France|Lumbricidae|
Lumbricidae|[18]|France|Lumbricidae|
Aporrectodea trapezoides|[19]|United States.Iowa|Lumbricidae|
Aporrectodea longa|[20]|France.Bourgogne-Franche-Comte|Lumbricidae|
Pontoscolex corethrurus|[21]|Rhinodrilidae|
Pontoscolex corethrurus|[22]|Rhinodrilidae|
Pontoscolex corethrurus|[23]|Rhinodrilidae|
Pontoscolex corethrurus|[24]|Rhinodrilidae|
Amynthas sp. 15-DGF|[25]|Philippines|Megascolecidae|
Amynthas|[26]|Thailand.Nan|Megascolecidae|
Metaphire sieboldi|[27]|Japan|Megascolecidae|
Metaphire sieboldi|[28]|Japan|Megascolecidae|
Metaphire sieboldi|[29]|Japan|Megascolecidae|
Haplotaxida|[30]|French Guiana||
Haplotaxida|[31]|French Guiana||
Haplotaxida|[32]|French Guiana||
Octodrilus|[33]|Croatia.Zadar|Lumbricidae|
Cernosvitoviella pusilla|[34]|Norway.More og Romsdal|Enchytraeidae|
Cernosvitoviella pusilla|[35]|Norway.Hordaland|Enchytraeidae|
Aktedrilus arcticus|[36]|Naididae|
Diopatra cuprea|[37]|United States.Virginia|Onuphidae|
Diopatra cuprea|[38]|United States.Virginia|Onuphidae|
Diopatra cuprea|[39]|United States.Virginia|Onuphidae|
Laonice sp. m VVM-2020|[40]|Croatia|Spionidae|
Laonice sp. m VVM-2020|[41]|Italy|Spionidae|
Annelida|[42]|United States.Florida||
Polychaeta|[43]|Pacific Ocean||
Scolelepis bonnieri|[44]|Norway|Spionidae|
Scolelepis bonnieri|[45]|North Sea|Spionidae|
Spionidae|[46]|United States.Florida|Spionidae|
Annelida|[47]|United States.Florida||
Laonice|[48]|Iceland|Spionidae|
Nephtyidae|[49]|Atlantic Ocean|Nephtyidae|
Inermonephtys cf. foretmontardoi|[50]|Atlantic Ocean|Nephtyidae|
Aglaophamus pulcher|[51]|North Atlantic Ocean|Nephtyidae|


Aglaophamus pulcher|[51]|North Atlantic Ocean|Nephtyidae|
Aglaophamus aff pulcher|[52]|Guinea|Nephtyidae|
Aglaophamus pulcher|[53]|Portugal|Nephtyidae|
Aglaophamus pulchra|[54]|Portugal|Nephtyidae|
Nephtys sp. AR4|[55]|Atlantic Ocean|Nephtyidae|
Aglaophamus pulcher|[56]|Norway|Nephtyidae|
Aglaophamus pulcher|[57]|Sweden|Nephtyidae|
Aglaophamus pulcher|[58]|Norway|Nephtyidae|
Nephtys|[59]|Norway.Aust-Agder|Nephtyidae|
Aglaophamus pulcher|[60]|Norway|Nephtyidae|
Aglaophamus pulcher|[61]|Norway|Nephtyidae|
Aglaophamus pulcher|[62]|Norway|Nephtyidae|
Aglaophamus pulcher|[63]|Norway|Nephtyidae|
Aglaophamus pulcher|[64]|Norway|Nephtyidae|
Aglaophamus pulcher|[65]|Norway|Nephtyidae|
Nephtys|[66]|Norway.Aust-Agder|Nephtyidae|
Idanthyrsus pennatus|[67]|South Africa.KwaZulu-Natal|Sabellariidae|
Polychaeta|[68]|Panama.Panama||
Idanthyrsus australiensis|[69]|Peru.Tumbes|Sabellariidae|
Polychaeta|[70]|Panama.Panama||
Sabellariidae|[71]|Costa Rica.Guanacaste|Sabellariidae|
Sabellariidae|[72]|Costa Rica.Guanacaste|Sabellariidae|
Idanthyrsus australiensis|[73]|Peru.Tumbes|Sabellariidae|
Sabellariidae|[74]|Costa Rica.Guanacaste|Sabellariidae|
Sabellariidae|[75]|Costa Rica.Guanacaste|Sabellariidae|
Sabellariidae|[76]|Costa Rica.Guanacaste|Sabellariidae|
Sabellariidae|[77]|Costa Rica.Guanacaste|Sabellariidae|
Sabellariidae|[78]|Costa Rica.Guanacaste|Sabellariidae|
Polychaeta|[79]|Panama.Panama||
Idanthyrsus australiensis|[80]|Peru.Tumbes|Sabellariidae|
Idanthyrsus australiensis|[81]|Peru.Tumbes|Sabellariidae|
Sabellariidae|[82]|Costa Rica.Guanacaste|Sabellariidae|
Idanthyrsus australiensis|[83]|Peru.Tumbes|Sabellariidae|
Idanthyrsus australiensis|[84]|Peru.Tumbes|Sabellariidae|
Sigambra parva|[85]|India|Pilargidae|
Sabellariidae|[86]|Sabellariidae|
Polychaeta|[87]|Israel||
Polychaeta|[88]|Canada.British Columbia||
Rubifabriciola|[89]|Germany|Fabriciidae|
Annelida|[90]|United States.Florida||
Fabricia stellaris|[91]|Norway|Fabriciidae|
Fabricia stellaris|[92]|Norway|Fabriciidae|
Fabricia|[93]|Norway|Fabriciidae|
Fabricia stellaris|[94]|Norway.Hordaland|Fabriciidae|
Fabricia stellaris|[95]|Norway.Hordaland|Fabriciidae|
Protodriloididae|[96]|Canada.British Columbia|Protodriloididae|
Protodriloididae|[97]|Canada.British Columbia|Protodriloididae|
Protodriloididae|[98]|Canada.British Columbia|Protodriloididae|
Protodriloididae|[99]|Canada.British Columbia|Protodriloididae|
Fabricia sp.|[100]|Norway|Fabriciidae|
Unknown Specimen||

BOLD TaxonID Tree

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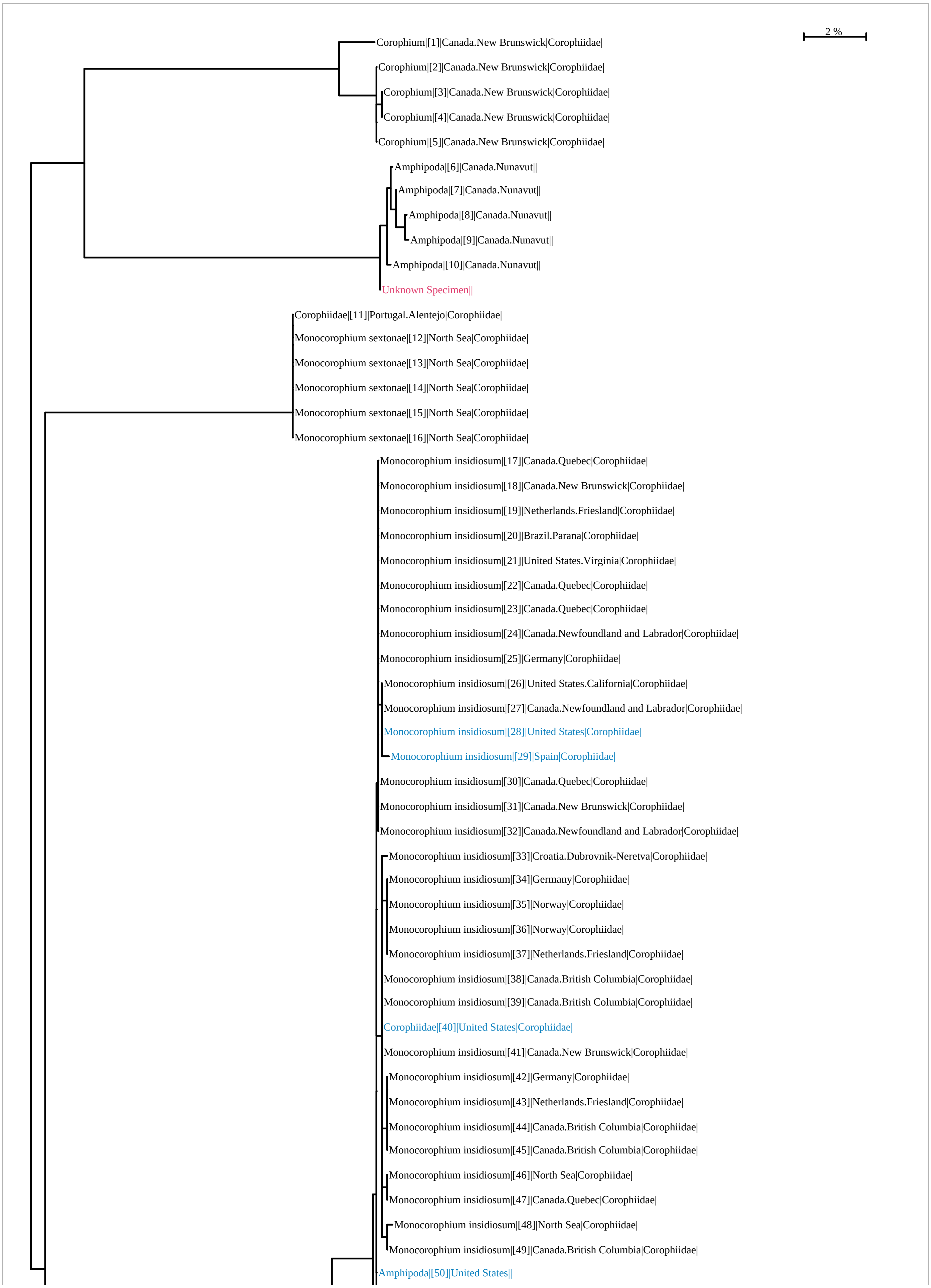
Marker	:	COI-5P
Codon Positions	:	1st, 2nd, 3rd
Labels	:	Extra Info, Country & Province, Family
Filters	:	Length > 200
Attachment	:	Photographs & Spreadsheet

Sequence Count	:	101
Species count	:	7
Genus count	:	5
Family count	:	2
Unidentified	:	16


2 %
Corophium|[1]|Canada.New Brunswick|Corophiidae|
Corophium|[2]|Canada.New Brunswick|Corophiidae|
Corophium|[3]|Canada.New Brunswick|Corophiidae|
Corophium|[4]|Canada.New Brunswick|Corophiidae|
Corophium|[5]|Canada.New Brunswick|Corophiidae|
Amphipoda|[6]|Canada.Nunavut||
Amphipoda|[7]|Canada.Nunavut||
Amphipoda|[8]|Canada.Nunavut||
Amphipoda|[9]|Canada.Nunavut||
Amphipoda|[10]|Canada.Nunavut||
Unknown Specimen||
Corophiidae|[11]|Portugal.Alentejo|Corophiidae|
Monocorophium sextonae|[12]|North Sea|Corophiidae|
Monocorophium sextonae|[13]|North Sea|Corophiidae|
Monocorophium sextonae|[14]|North Sea|Corophiidae|
Monocorophium sextonae|[15]|North Sea|Corophiidae|
Monocorophium sextonae|[16]|North Sea|Corophiidae|
Monocorophium insidiosum|[17]|Canada.Quebec|Corophiidae|
Monocorophium insidiosum|[18]|Canada.New Brunswick|Corophiidae|
Monocorophium insidiosum|[19]|Netherlands.Friesland|Corophiidae|
Monocorophium insidiosum|[20]|Brazil.Parana|Corophiidae|
Monocorophium insidiosum|[21]|United States.Virginia|Corophiidae|
Monocorophium insidiosum|[22]|Canada.Quebec|Corophiidae|
Monocorophium insidiosum|[23]|Canada.Quebec|Corophiidae|
Monocorophium insidiosum|[24]|Canada.Newfoundland and Labrador|Corophiidae|
Monocorophium insidiosum|[25]|Germany|Corophiidae|
Monocorophium insidiosum|[26]|United States.California|Corophiidae|
Monocorophium insidiosum|[27]|Canada.Newfoundland and Labrador|Corophiidae|
Monocorophium insidiosum|[28]|United States|Corophiidae|
Monocorophium insidiosum|[29]|Spain|Corophiidae|
Monocorophium insidiosum|[30]|Canada.Quebec|Corophiidae|
Monocorophium insidiosum|[31]|Canada.New Brunswick|Corophiidae|
Monocorophium insidiosum|[32]|Canada.Newfoundland and Labrador|Corophiidae|
Monocorophium insidiosum|[33]|Croatia.Dubrovnik-Neretva|Corophiidae|
Monocorophium insidiosum|[34]|Germany|Corophiidae|
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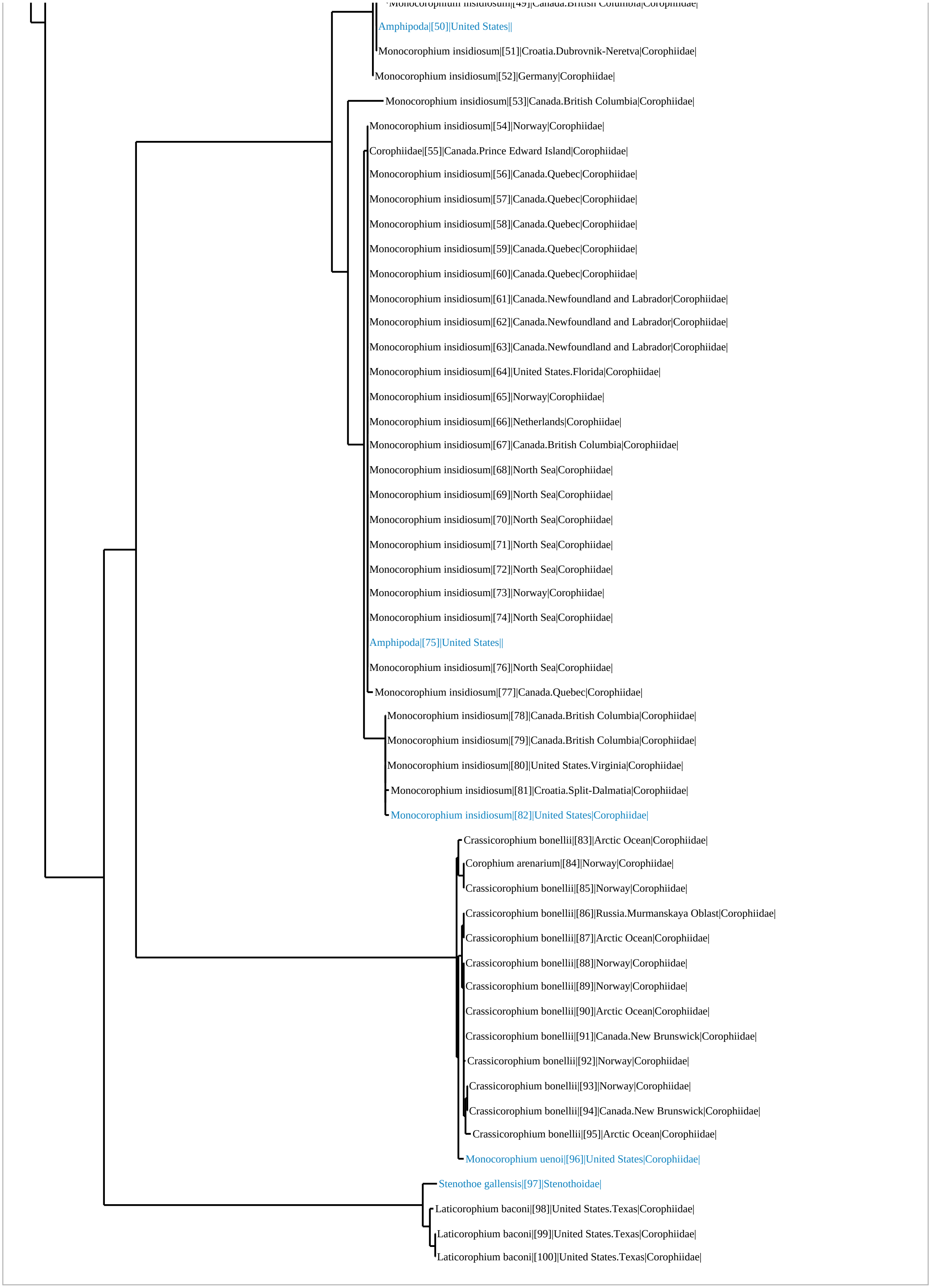
Monocorophium insidiosum|[45]|Canada.British Columbia|Corophiidae|
Monocorophium insidiosum|[46]|North Sea|Corophiidae|
Monocorophium insidiosum|[47]|Canada.Quebec|Corophiidae|
Monocorophium insidiosum|[48]|North Sea|Corophiidae|
Monocorophium insidiosum|[49]|Canada.British Columbia|Corophiidae|
Amphipoda|[50]|United States||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Monocorophium insidiosum|[52]|Germany|Corophiidae|
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Monocorophium insidiosum|[54]|Norway|Corophiidae|
Corophiidae|[55]|Canada.Prince Edward Island|Corophiidae|
Monocorophium insidiosum|[56]|Canada.Quebec|Corophiidae|
Monocorophium insidiosum|[57]|Canada.Quebec|Corophiidae|
Monocorophium insidiosum|[58]|Canada.Quebec|Corophiidae|
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Monocorophium insidiosum|[60]|Canada.Quebec|Corophiidae|
Monocorophium insidiosum|[61]|Canada.Newfoundland and Labrador|Corophiidae|
Monocorophium insidiosum|[62]|Canada.Newfoundland and Labrador|Corophiidae|
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Monocorophium insidiosum|[70]|North Sea|Corophiidae|
Monocorophium insidiosum|[71]|North Sea|Corophiidae|
Monocorophium insidiosum|[72]|North Sea|Corophiidae|
Monocorophium insidiosum|[73]|Norway|Corophiidae|
Monocorophium insidiosum|[74]|North Sea|Corophiidae|
Amphipoda|[75]|United States||
Monocorophium insidiosum|[76]|North Sea|Corophiidae|
Monocorophium insidiosum|[77]|Canada.Quebec|Corophiidae|
Monocorophium insidiosum|[78]|Canada.British Columbia|Corophiidae|
Monocorophium insidiosum|[79]|Canada.British Columbia|Corophiidae|
Monocorophium insidiosum|[80]|United States.Virginia|Corophiidae|
Monocorophium insidiosum|[81]|Croatia.Split-Dalmatia|Corophiidae|
Monocorophium insidiosum|[82]|United States|Corophiidae|
Crassicorophium bonellii|[83]|Arctic Ocean|Corophiidae|
Corophium arenarium|[84]|Norway|Corophiidae|
Crassicorophium bonellii|[85]|Norway|Corophiidae|
Crassicorophium bonellii|[86]|Russia.Murmanskaya Oblast|Corophiidae|
Crassicorophium bonellii|[87]|Arctic Ocean|Corophiidae|
Crassicorophium bonellii|[88]|Norway|Corophiidae|
Crassicorophium bonellii|[89]|Norway|Corophiidae|
Crassicorophium bonellii|[90]|Arctic Ocean|Corophiidae|
Crassicorophium bonellii|[91]|Canada.New Brunswick|Corophiidae|
Crassicorophium bonellii|[92]|Norway|Corophiidae|
Crassicorophium bonellii|[93]|Norway|Corophiidae|
Crassicorophium bonellii|[94]|Canada.New Brunswick|Corophiidae|
Crassicorophium bonellii|[95]|Arctic Ocean|Corophiidae|
Monocorophium uenoi|[96]|United States|Corophiidae|
Stenothoe gallensis|[97]|Stenothoidae|
Laticorophium baconi|[98]|United States.Texas|Corophiidae|
Laticorophium baconi|[99]|United States.Texas|Corophiidae|
Laticorophium baconi|[100]|United States.Texas|Corophiidae|

Ethanol specimens for sequencing

Q1 *Desmarestia aculeata* or *Dictyosiphon foeniculaceus* (BROWN)

Q3 cf. *Coelocladia arctica* (formerly ID'd as cf. *Trachynema groenlandicum*) (BROWN)

Q4 cf. *Dictyosiphon foeniculaceus* (BROWN)

Q5 cf. *Coelocladia arctica* (see above; BROWN)

Q7 cf. *Desmarestia viridis* (BROWN)

Q8 cf. *Halosiphon tomentosum* (BROWN)

Q11 *Pylaiella* cf. *varia* (BROWN)

[Q12 Colonial diatoms (related to browns)—did not sample]

Q13A cf. *Coelocladia arctica* (BROWN)

Q13B *Chaetomorpha melagonium** (GREEN)

Q15A *Chaetomorpha melagonium** (GREEN)

Q15B *Coccotylus truncatus* (RED)

Q15C cf. *Fucus distichus* (BROWN)—it's possible this is a red but it looks more like *Fucus* than anything else

Q16A *Dilsea socialis* (RED)

Q16B cf. *Petalonia* or other BROWN

Q16C cf. *Rhodomela* (RED)

Q16D cf. *Coelocladia arctica* (BROWN)

Q18 *Savoiea arctica* (RED)

Q20 *Desmarestia viridis* (BROWN)

AN3D Sponge?

FDGS cf. *Urospora neglecta* (GREEN)

*This genus is notoriously difficult to sequence. Expect failure with TufA.

Morphological taxonomy results presented above were provided by Dr. Sandra Lindstrom, Adjunct Professor, University of British Columbia.

sandra.lindstrom@botany.ubc.ca
(604) 822-2340

CANADIAN CENTRE FOR DNA BARCODING
DNA Testing Laboratory Report

FORENSIC CASE INFORMATION

File Number: BIO-22-028_Biologica Environmental Services_Tara Macdonald_2022-02-25
Accession Number: BIO-22-028

Client Name: Tara Macdonald; President/CEO
Client Address: Biologica Environmental Services, Ltd.
488-F Bay Street, Victoria BC, V8T 5H2
T: 250-479-3868 | C: 250-516-2906
Contact Name: Tara Macdonald (tara@biologica.ca)

ITEMS

Description: 13 putative Algae (8 brown; 4 red; and 2 green) samples were submitted for Sanger species verification.

Sample ID provided	Sample ID	Process ID	Putative taxon
Q1	CCDBFR0721	ABCBF730-22	*Desmarestia aculeata/ Dictyosiphon foeniculaceus*
Q3	CCDBFR0722	ABCBF731-22	cf. *Coelocladia arctica*
Q4	CCDBFR0723	ABCBF732-22	cf. *Dictyosiphon foeniculaceus*
Q8	CCDBFR0724	ABCBF733-22	cf. *Halosiphon tomentosum*
Q11	CCDBFR0725	ABCBF734-22	*Pylaiella* cf. *varia*
Q16B	CCDBFR0726	ABCBF735-22	cf. *Petalonia*
Q7	CCDBFR0727	ABCBF736-22	cf. *Desmarestia viridis*
Q15B	CCDBFR0728	ABCBF737-22	*Coccotylus truncatus*
Q16A	CCDBFR0729	ABCBF738-22	*Dilsea socialis*
Q16C	CCDBFR0730	ABCBF739-22	cf. *Rhodomela*
Q18	CCDBFR0731	ABCBF740-22	*Savoiea arctica*
Q13B	CCDBFR0732	ABCBF741-22	*Chaetomorpha melagonium*
FDGS	CCDBFR0733	ABCBF742-22	cf. *Urospora neglecta*

Dates Received: February 25, 2022
Received From: Maria Kuzmina

Dates of Analysis: March 14 – 25, 2022
Collector/Collection Site: Nguyen NguyenTX./ Canadian Centre for DNA Barcoding, Biodiversity of Ontario, University of Guelph, 50 Stone Road East, Guelph

METHODS

To ascertain the identity of the species from the submitted samples, a 2 mm by 2 mm piece of tissue from samples CCDBFR0721 - CCDBFR0733 was subsampled using sterile techniques. The samples were ground to a fine powder and then lysed. Total genomic DNA was extracted using a validated spin column and the DNA extraction protocols for brown and red algae (1), and for green algae (2). The target genetic marker (barcode region of the mitochondrial cytochrome *c* oxidase subunit I gene, COI) was amplified using polymerase chain reaction (PCR) employing the primers *GazF2-GazR2* for the samples of brown algae, and primers *GHaIF-GazR1* for samples of red algae. The plastid elongation factor Tu gene (*tufA*) was amplified using the full-length primers *TufGF4-TufAR* for the samples of green algae. Cycle sequencing was performed using a standardized commercially available BigDye Terminator v3.1 kit. Sequencing reactions were analyzed by high-voltage capillary electrophoresis on an automated ABI 3730xL DNA Analyzer. The recovered COI and *tufA* DNA sequences were compared against the references available at the public sequencing databases in order to obtain the best identification result: Barcode of Life Data management system, BOLD, (http://www.boldsystems.org/); and NCBI BLAST (https://blast.ncbi.nlm.nih.gov). The incorporated in BOLD identification tool was used for the analysis of the COI marker. Since a similar tool is not available for the *tufA* marker, it was analyzed using BLAST algorithm available at NCBI. In order to compare the query sequences with the closely related taxa, the internal references were used to build a Neighbor Joining (NJ) tree using MEGA (3).

IMAGING

All items were photographed in the Photography Lab Area by Nguyen NguyenT.X., using a Canon ELPH 300 HS, 12.1 megapixels. Pictures were uploaded to the BOLD website into the secure project called "[ABCBF] – Forensic sampling".

INTERPRETATION

Bidirectional forward and reverse sequences were generated from all samples. Resulting trace files were assembled into contigs, and their consensus sequences were manually edited in CodonCode Aligner (version 4.1.1.) software. The resulting COI barcode sequences were compared against the Public Record Barcode Database available in BOLD. Based on a percentage of nucleotide sequence divergence (number of nucleotide substitutions) between a sequence from test sample and a reference DNA barcode, the closest match was used to infer species identity of the DNA contributor in the corresponding test sample. Images, primers, sequences, and their associated trace files with quality scores were uploaded to the secure BOLD project called "[ABCBF] – Forensic sampling".

SUMMARY OF RESULTS

Sample ID provided	Sample ID	Process ID	Marker/Primers used	Lab Identification
Q1	CCDBFR0721	ABCBF730-22	COI / GazF2-GazR2	*Desmarestia aculeata*
Q3	CCDBFR0722	ABCBF731-22	COI / GazF2-GazR2	N/A
Q4	CCDBFR0723	ABCBF732-22	COI / GazF2-GazR2	*Dictyosiphon foeniculaceus*
Q8	CCDBFR0724	ABCBF733-22	COI / GazF2-GazR2	N/A
Q11	CCDBFR0725	ABCBF734-22	COI / GazF2-GazR2	*Acinetosporaceae*
Q16B	CCDBFR0726	ABCBF735-22	COI / GazF2-GazR2	N/A
Q7	CCDBFR0727	ABCBF736-22	COI / GazF2-GazR2	*Desmarestia*
Q15B	CCDBFR0728	ABCBF737-22	COI / GHalF-GazR1	*Coccotylus truncatus*
Q16A	CCDBFR0729	ABCBF738-22	COI / GHalF-GazR1	*Dilsea socialis*
Q16C	CCDBFR0730	ABCBF739-22	COI / GHalF-GazR1	*Rhodomela virgata*
Q18	CCDBFR0731	ABCBF740-22	COI / GHalF-GazR1	N/A
Q13B	CCDBFR0732	ABCBF741-22	tufA / TufGF4-TufAR	N/A
FDGS	CCDBFR0733	ABCBF742-22	tufA / TufGF4-TufAR	*Urospora neglecta*

Q1 (CCDBFR0721): A 620 base-pair (bp) COI DNA barcode was a 100% match to multiple BOLD reference records representing *Desmarestia aculeata*. Based on the inferred identity of the sequence recovered from **Q1**, we can establish a species level match to ***Desmarestia aculeata*** (Fig. 1).

Q4 (CCDBFR0723): A 453 bp COI DNA barcode was a 100% match to multiple BOLD reference records representing *Dictyosiphon foeniculaceus*. Based on the inferred identity of the sequence recovered from **Q4**, we can establish a species level match to ***Dictyosiphon foeniculaceus*** (Fig. 2)***.***

Q11 (CCDBFR0725): A 610 bp COI DNA barcode was a 99.69% match to BOLD reference record, which was identified to the family (*Acinetosporaceae sp. 3AP-2016*). Based on the inferred identity of the sequence recovered from **Q11**, we can establish a family level match to ***Acinetosporaceae*** (Fig. 4).

Q7 (CCDBFR0727): A 618 bp COI DNA barcode was a 94.09% match to BOLD reference record representing *Desmarestia viridis*. Based on the inferred identity of the sequence recovered from **Q7**, we can establish a genus level match to ***Desmarestia*** (Fig. 3).

Q15B (CCDBFR0728): A 563 bp COI DNA barcode was a 100% match to BOLD reference record representing *Coccotylus truncatus*. Based on the inferred identity of the sequence recovered from **Q15B**, we can establish a species level match to ***Coccotylus truncatus*** (Fig. 5)***.***

Q16A (CCDBFR0729): A 570 bp COI DNA barcode was a 100% match to BOLD reference record representing *Dilsea socialis*. Based on the inferred identity of the sequence recovered from **Q16A**, we can establish a species level match to ***Dilsea socialis*** (Fig. 6).

Q16C (CCDBFR0730): A 620 bp COI DNA barcode was a 100% match to multiple BOLD reference records representing *Rhodomela virgata*. Based on the inferred identity of the sequence recovered from **Q16C**, we can establish a species level match to ***Rhodomela virgata*** (Fig. 7).

FDGS (CCDBFR733): A 776 bp *tufA* sequences were a 99.86% match to *Urospora neglecta* (NCBI, accession numbers MZ401487.1). The comparison of FDGS sequences with the available references of six other species of *Urospora* using the NJ tree indicated that the query sequences form a monophyletic clade with the other references for *Urospora neglecta* (Fig. 8). Based on the information available in the public sequencing databases we concluded that the sample **FDGS** belongs to ***Urospora neglecta***.

The samples **Q3, Q8, Q16B, Q18**, and **Q13B** (**CCDBFR0722, CCDBFR0724, CCDBFR0726, CCDBFR0731**, and **CCDBFR0732**) failed to generate readable sequences.

References

1. Gary W Saunders (2005). Applying DNA barcoding to red macroalgae: a preliminary appraisal holds promise for future applications. *Philosophical Transactions of the Royal Society B: Biological Sciences* 360, 1879-1888.
2. Ivanova et al. (2008). Semi-automated, Membrane-Based Protocol for DNA Isolation from Plants. *Plant Molecular Biology Reports*.
3. Sudhir Kumar, Koichiro Tamura, and Masatoshi Nei. 1993. MEGA: Molecular Evolutionary Genetics Analysis, version 1.01. The Pennsylvania State University, University Park, PA 16802.

RESULTS REPORTED BY:

Nguyen NguyenTX., MSc; Wildlife Forensic Technician

RESULTS REVIEWED BY:

Maria Kuzmina, PhD; Plant Lead

Evgeny V. Zakharov, PhD; Director, CCDB

All inquiries pertaining to this report should be directed to Nguyen NguyenTX (n.nguyen@uoguelph.ca) and Evgeny V. Zakharov (zakharov@uoguelph.ca).

FIGURES

Query: Q1_stock_
Top Hit: Ochrophyta Phaeophyceae - Desmarestiales - *Desmarestia sp. 1aculeata* (100%)

Search Result:

The submitted sequence has been matched to *Desmarestia sp. 1aculeata*. This identification is solid unless there is a very closely allied congeneric species that has not yet been analyzed. Such cases are rare.

A species page is available for this taxon: SPECIES PAGE

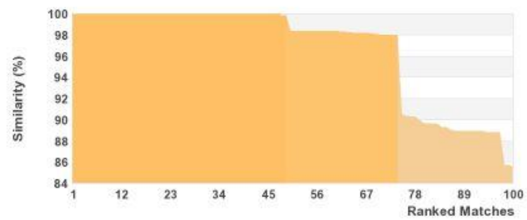
Closest matching BIN (within 3%): BIN PAGE

For a hierarchical placement - a neighbor-joining tree is provided: TREE BASED IDENTIFICATION

Identification Summary

Taxonomic Level	Taxon Assignment	Probability of Placement (%)
Phylum	Ochrophyta	100
Class	Phaeophyceae	100
Order	Desmarestiales	100
Family	Desmarestiaceae	100
Genus	*Desmarestia*	100
Species	*Desmarestia sp. 1aculeata*	100

Similarity Scores of Top 100 Matches



Top 20 Matches

Display: Top 20

Phylum	Class	Order	Family	Genus	Species	Subspecies	Similarity (%)	Status
Ochrophyta	Phaeophyceae	Desmarestiales	Desmarestiaceae	*Desmarestia*	*sp. 1aculeata*		100	Published
Ochrophyta	Phaeophyceae	Desmarestiales	Desmarestiaceae	*Desmarestia*	*sp. 1aculeata*		100	Published
Ochrophyta	Phaeophyceae	Desmarestiales	Desmarestiaceae	*Desmarestia*	*sp. 1aculeata*		100	Published

Figure 1 – Sequence trace files and species identification match percentage on BOLD for sample Q1 (CCDBFR0721).

Query: Q4_stock_
Top Hit: Ochrophyta Phaeophyceae - Ectocarpales - *Dictyosiphon foeniculaceus* (100%)

Search Result:

The submitted sequence has been matched to *Dictyosiphon foeniculaceus*. This identification is solid unless there is a very closely allied congeneric species that has not yet been analyzed. Such cases are rare.

A species page is available for this taxon: SPECIES PAGE

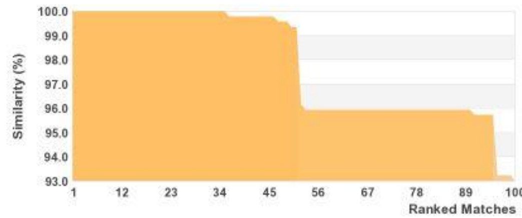
Closest matching BIN (within 3%): BIN PAGE

For a hierarchical placement - a neighbor-joining tree is provided: TREE BASED IDENTIFICATION

Identification Summary

Taxonomic Level	Taxon Assignment	Probability of Placement (%)
Phylum	Ochrophyta	100
Class	Phaeophyceae	100
Order	Ectocarpales	100
Family	Chordariaceae	100
Genus	*Dictyosiphon*	100
Species	*Dictyosiphon foeniculaceus*	100

Similarity Scores of Top 100 Matches



Display: Top 20

Top 20 Matches

Phylum	Class	Order	Family	Genus	Species	Subspecies	Similarity (%)	Status
Ochrophyta	Phaeophyceae	Ectocarpales	Chordariaceae	*Dictyosiphon*	*foeniculaceus*		100	Published
Ochrophyta	Phaeophyceae	Ectocarpales	Chordariaceae	*Dictyosiphon*	*foeniculaceus*		100	Published
Ochrophyta	Phaeophyceae	Ectocarpales	Chordariaceae	*Dictyosiphon*	*foeniculaceus*		100	Published

Figure 2 – Sequence trace files and species identification match percentage on BOLD for sample Q4 (CCDBFR0723)

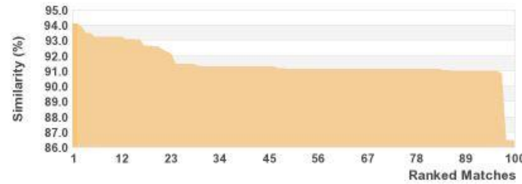
Query: Q7_1in10_
Top Hit: No match

Search Result:

Request Type: COI FULL DATABASE (includes records without species designation)

TREE BASED IDENTIFICATION

Similarity scores of the top 100 matches



Top 20 Matches

Display option: Top 20

Phylum	Class	Order	Family	Genus	Species	Subspecies	Similarity (%)	Status
Ochrophyta	Phaeophyceae	Desmarestiales	Desmarestiaceae	*Desmarestia*	*viridis*		94.09	Published
Ochrophyta	Phaeophyceae	Desmarestiales	Desmarestiaceae	*Desmarestia*	*viridis*		94.09	Published
Ochrophyta	Phaeophyceae	Desmarestiales	Desmarestiaceae	*Desmarestia*	*viridis*		93.89	Published
Ochrophyta	Phaeophyceae	Desmarestiales	Desmarestiaceae	*Desmarestia*	*viridis*		93.46	Published
Ochrophyta	Phaeophyceae	Desmarestiales	Desmarestiaceae	*Desmarestia*	*viridis*		93.46	Published
Ochrophyta	Phaeophyceae	Desmarestiales	Desmarestiaceae	*Desmarestia*	*viridis*		93.23	Early-Release
Ochrophyta	Phaeophyceae	Desmarestiales	Desmarestiaceae	*Desmarestia*	*viridis*		93.23	Published
Ochrophyta	Phaeophyceae	Desmarestiales	Desmarestiaceae	*Desmarestia*	*viridis*		93.23	Published

Figure 3 – Sequence trace files and species identification match percentage on BOLD for sample Q7 (CCDBFR0727)

Query: Q11_stock_
Top Hit: Ochrophyta Phaeophyceae - Ectocarpales - *Acinetosporaceae_gen sp. 3AP-2016* (99.69%)

Search Result:

The submitted sequence has been matched to *Acinetosporaceae_gen sp. 3AP-2016*. This identification is solid unless there is a very closely allied congeneric species that has not yet been analyzed. Such cases are rare.

A species page is available for this taxon: SPECIES PAGE

Closest matching BIN (within 3%): BIN PAGE

For a hierarchical placement - a neighbor-joining tree is provided: TREE BASED IDENTIFICATION

Identification Summary

Taxonomic Level	Taxon Assignment	Probability of Placement (%)
Phylum	Ochrophyta	100
Class	Phaeophyceae	100
Order	Ectocarpales	100
Family	Acinetosporaceae	100
Genus	*Acinetosporaceae_gen*	100
Species	*Acinetosporaceae_gen sp. 3AP-2016*	99.7

Similarity Scores of Top 100 Matches

Display: Top 20

Top 20 Matches

Phylum	Class	Order	Family	Genus	Species	Subspecies	Similarity (%)	Status
Ochrophyta	Phaeophyceae	Ectocarpales	Acinetosporaceae	*Acinetosporaceae_gen*	*sp. 3AP-2016*		99.69	Published
Ochrophyta	Phaeophyceae	Ectocarpales	Acinetosporaceae	*Acinetosporaceae_gen*	*sp. 1AP2016*		93.58	Published
Ochrophyta	Phaeophyceae	Ectocarpales	Acinetosporaceae	*Hincksia*	*hincksiae*		88.15	Published

Figure 4 – Sequence trace files and species identification match percentage on BOLD for sample Q11 (CCDBFR0725)

Query: Q15B_stock_
Top Hit: Rhodophyta Florideophyceae - Gigartinales - *Coccotylus truncatus* (100%)

Search Result:

A species level match could not be made, the queried specimen is likely to be one of the following:

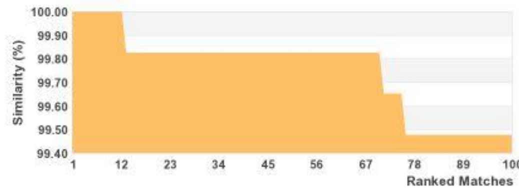
Coccotylus truncatus
Coccotylus hartzii

For a hierarchical placement - a neighbor-joining tree is provided: TREE BASED IDENTIFICATION

Identification Summary

Taxonomic Level	Taxon Assignment	Probability of Placement (%)
Phylum	Rhodophyta	100
Class	Florideophyceae	100
Order	Gigartinales	100
Family	Phyllophoraceae	100
Genus	*Coccotylus*	100

Similarity Scores of Top 100 Matches



Top 100 Matches

Display: Top 100

Phylum	Class	Order	Family	Genus	Species	Subspecies	Similarity (%)	Status
Rhodophyta	Florideophyceae	Gigartinales	Phyllophoraceae	*Coccotylus*	*truncatus*		100	Published
Rhodophyta	Florideophyceae	Gigartinales	Phyllophoraceae	*Coccotylus*	*truncatus*		100	Published
Rhodophyta	Florideophyceae	Gigartinales	Phyllophoraceae	*Coccotylus*	*truncatus*		100	Published
Rhodophyta	Florideophyceae	Gigartinales	Phyllophoraceae	*Coccotylus*	*truncatus*		100	Published
Rhodophyta	Florideophyceae	Gigartinales	Phyllophoraceae	*Coccotylus*	*truncatus*		100	Published
Rhodophyta	Florideophyceae	Gigartinales	Phyllophoraceae	*Coccotylus*	*truncatus*		100	Published

Figure 5 – Sequence trace files and species identification match percentage on BOLD for sample Q15B (CCDBFR0728)

Query: Q16A_stock_
Top Hit: Rhodophyta Florideophyceae - Gigartinales - *Dilsea socialis* (100%)

Search Result:

The submitted sequence has been matched to *Dilsea socialis*. This identification is solid unless there is a very closely allied congeneric species that has not yet been analyzed. Such cases are rare.

A species page is available for this taxon: SPECIES PAGE

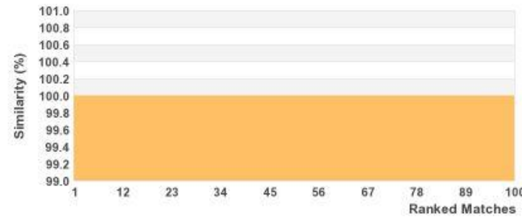
Closest matching BIN (within 3%): BIN PAGE

For a hierarchical placement - a neighbor-joining tree is provided: TREE BASED IDENTIFICATION

Identification Summary

Taxonomic Level	Taxon Assignment	Probability of Placement (%)
Phylum	Rhodophyta	100
Class	Florideophyceae	100
Order	Gigartinales	100
Family	Dumontiaceae	100
Genus	*Dilsea*	100
Species	*Dilsea socialis*	100

Similarity Scores of Top 100 Matches



Top 20 Matches

Display: Top 20

Phylum	Class	Order	Family	Genus	Species	Subspecies	Similarity (%)	Status
Rhodophyta	Florideophyceae	Gigartinales	Dumontiaceae	*Dilsea*	*socialis*		100	Published
Rhodophyta	Florideophyceae	Gigartinales	Dumontiaceae	*Dilsea*	*socialis*		100	Published
Rhodophyta	Florideophyceae	Gigartinales	Dumontiaceae	*Dilsea*	*socialis*		100	Published

Figure 6 – Sequence trace files and species identification match percentage on BOLD for sample Q16A (CCDBFR0729)

Query: Q16C_1in5_
Top Hit: Rhodophyta Florideophyceae - Ceramiales - *Rhodomela virgata* (100%)

Search Result:

The submitted sequence has been matched to *Rhodomela virgata*. This identification is solid unless there is a very closely allied congeneric species that has not yet been analyzed. Such cases are rare.

A species page is available for this taxon: SPECIES PAGE

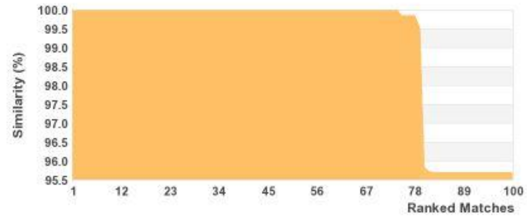
Closest matching BIN (within 3%): BIN PAGE

For a hierarchical placement - a neighbor-joining tree is provided: TREE BASED IDENTIFICATION

Identification Summary

Taxonomic Level	Taxon Assignment	Probability of Placement (%)
Phylum	Rhodophyta	100
Class	Florideophyceae	100
Order	Ceramiales	100
Family	Rhodomelaceae	100
Genus	*Rhodomela*	100
Species	*Rhodomela virgata*	100

Similarity Scores of Top 100 Matches



Top 20 Matches

Display: Top 20

Phylum	Class	Order	Family	Genus	Species	Subspecies	Similarity (%)	Status
Rhodophyta	Florideophyceae	Ceramiales	Rhodomelaceae	*Rhodomela*	*virgata*		100	Published
Rhodophyta	Florideophyceae	Ceramiales	Rhodomelaceae	*Rhodomela*	*virgata*		100	Published
Rhodophyta	Florideophyceae	Ceramiales	Rhodomelaceae	*Rhodomela*	*virgata*		100	Published

Figure 7 – Sequence trace files and species identification match percentage on BOLD for sample Q16C (CCDBFR0730)

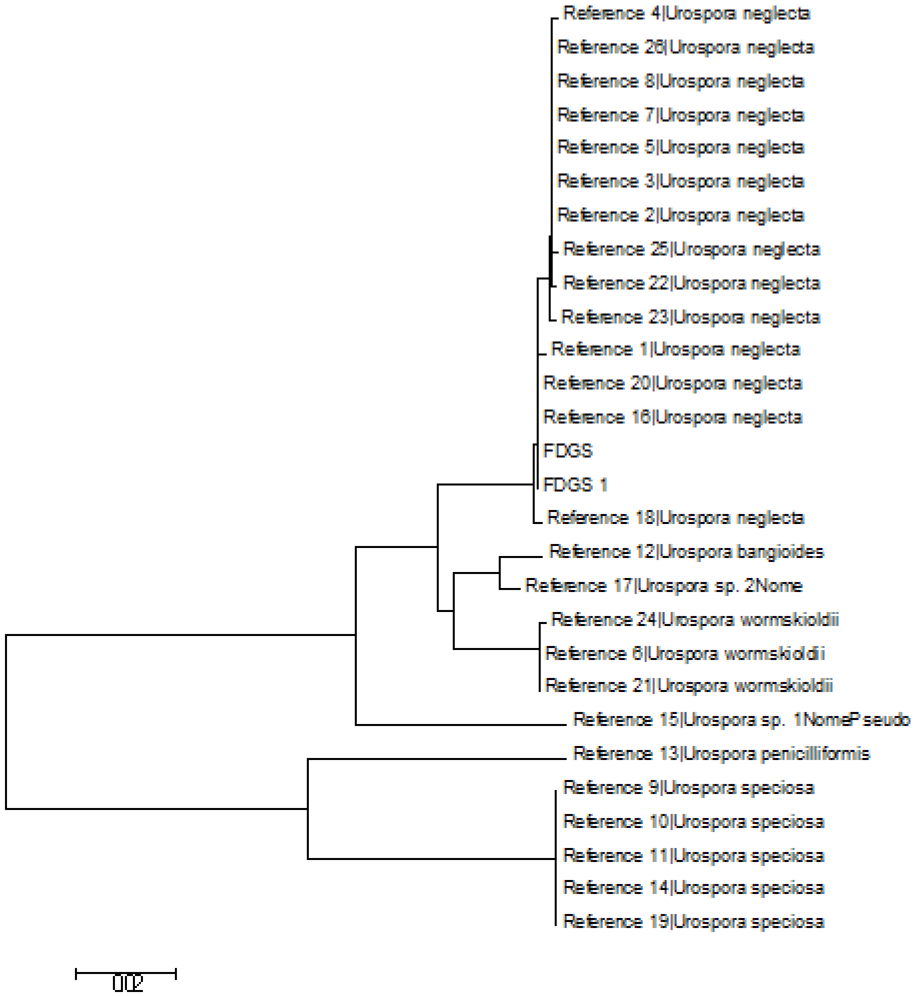
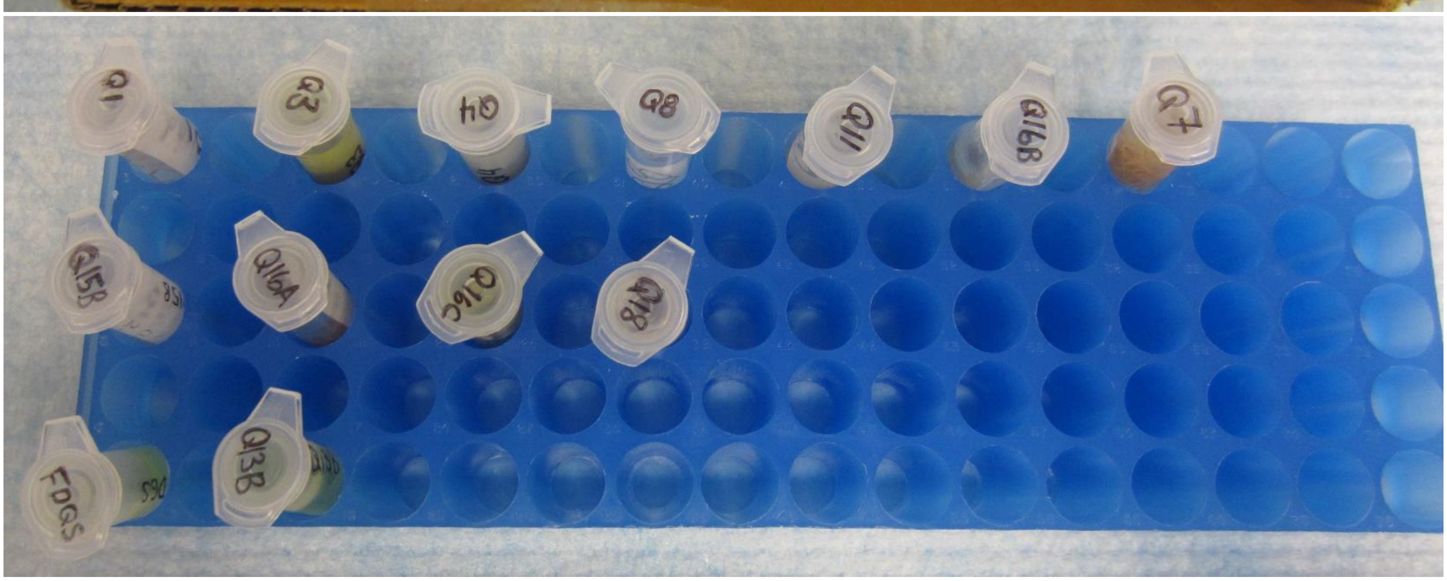


Figure 8 – Sequence trace files and the aligned sequences compared for sample FDGS (CCDBFR0733)

Appendix I. Image Inventory



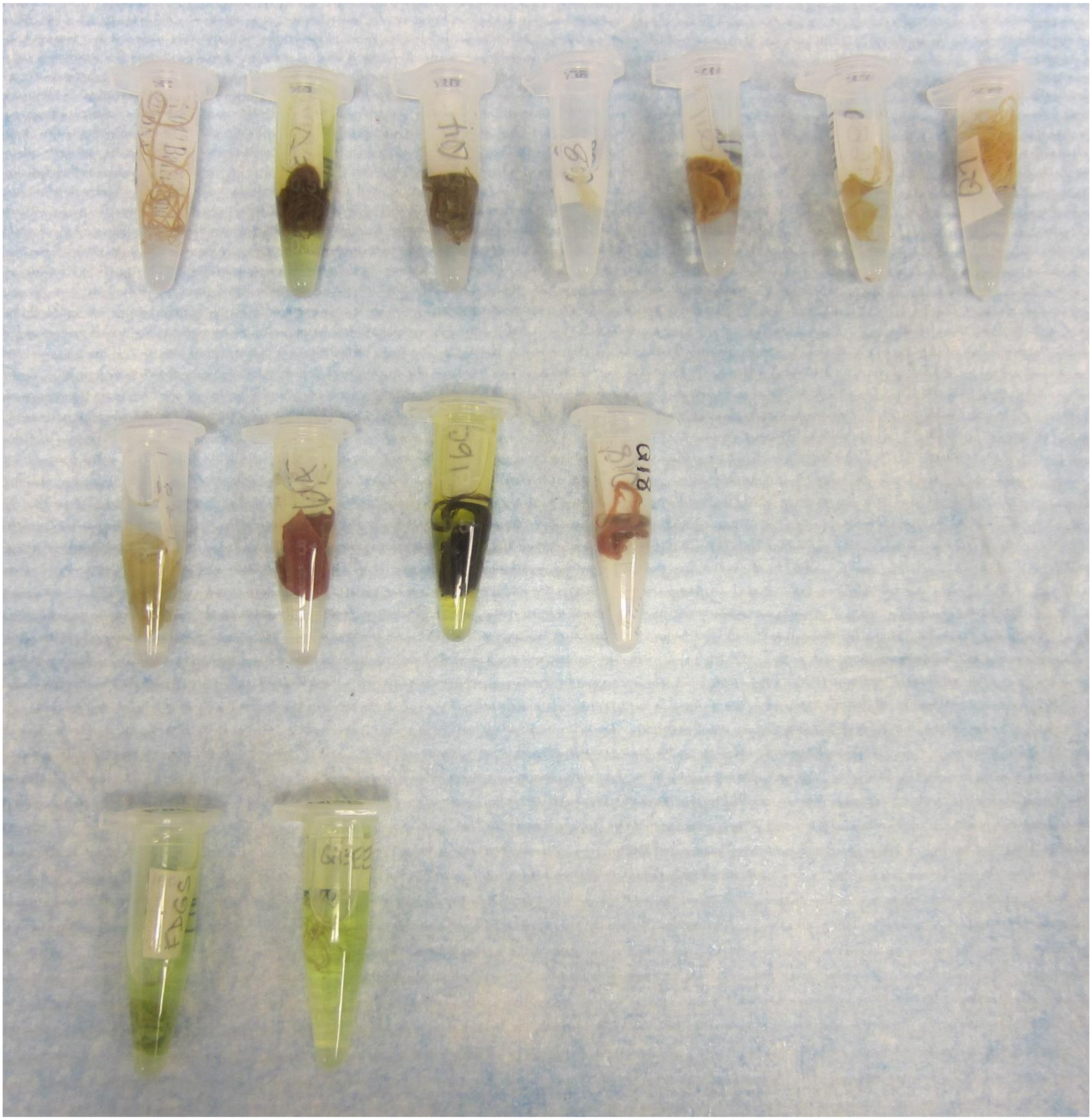
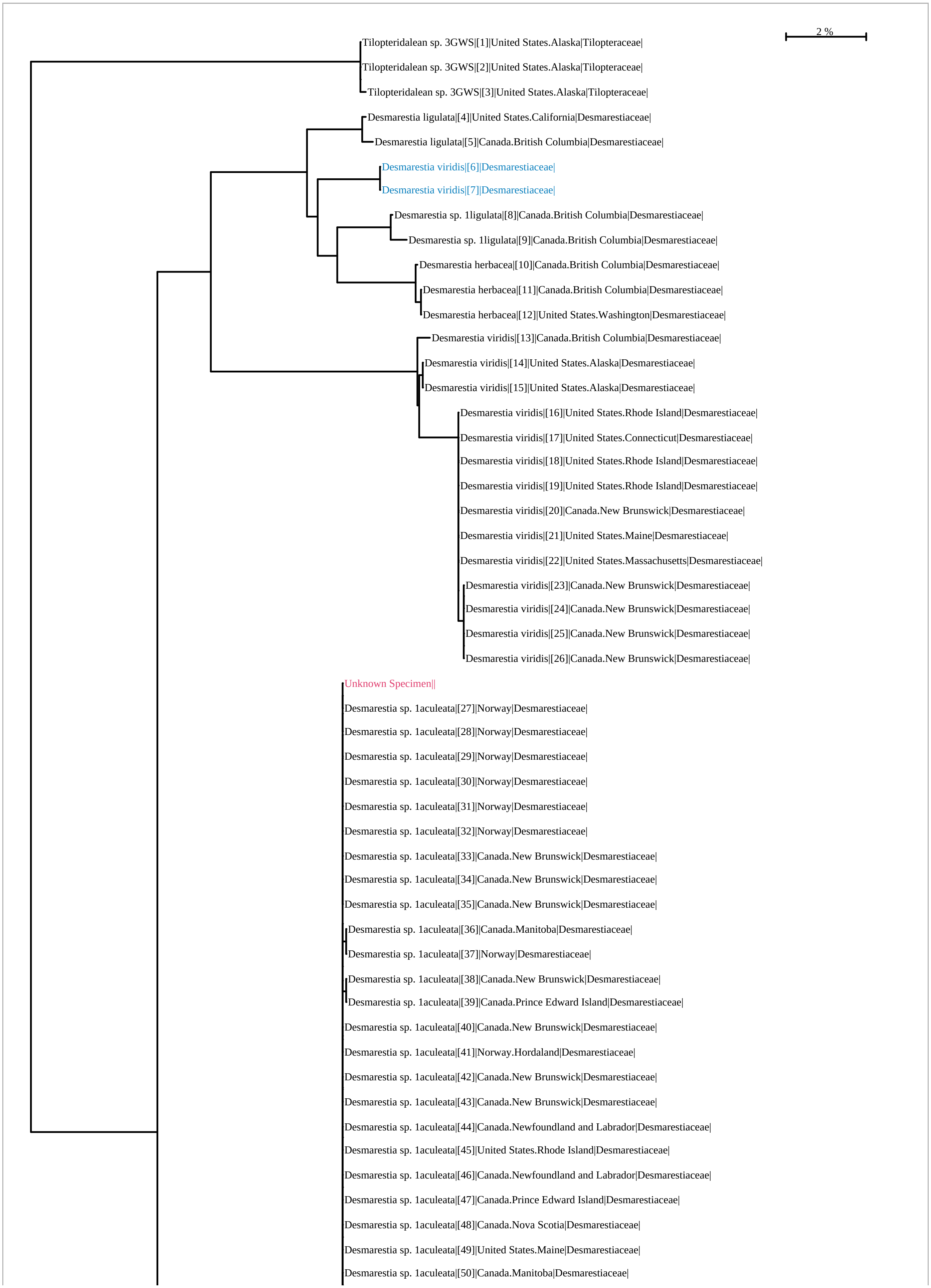


Image 1-2-3: Sample CCDBFR0721-CCDBFF0733 submitted

BOLD TaxonID Tree

Title : COI SPECIES DATABASE Tree
Date : 22-April-2022
Data Type : Nucleotide
Distance Model : Kimura 2 Parameter
Marker : COI-5P
Codon Positions : 1st, 2nd, 3rd
Labels : Extra Info, Country & Province, Family
Filters : Length > 200
Attachment : Photographs & Spreadsheet

Sequence Count : 101
Species count : 8
Genus count : 2
Family count : 2
Unidentified : 1


2 %
Tilopteridalean sp. 3GWS|[1]|United States.Alaska|Tilopteraceae|
Tilopteridalean sp. 3GWS|[2]|United States.Alaska|Tilopteraceae|
Tilopteridalean sp. 3GWS|[3]|United States.Alaska|Tilopteraceae|
Desmarestia ligulata|[4]|United States.California|Desmarestiaceae|
Desmarestia ligulata|[5]|Canada.British Columbia|Desmarestiaceae|
Desmarestia viridis|[6]|Desmarestiaceae|
Desmarestia viridis|[7]|Desmarestiaceae|
Desmarestia sp. 1ligulata|[8]|Canada.British Columbia|Desmarestiaceae|
Desmarestia sp. 1ligulata|[9]|Canada.British Columbia|Desmarestiaceae|
Desmarestia herbacea|[10]|Canada.British Columbia|Desmarestiaceae|
Desmarestia herbacea|[11]|Canada.British Columbia|Desmarestiaceae|
Desmarestia herbacea|[12]|United States.Washington|Desmarestiaceae|
Desmarestia viridis|[13]|Canada.British Columbia|Desmarestiaceae|
Desmarestia viridis|[14]|United States.Alaska|Desmarestiaceae|
Desmarestia viridis|[15]|United States.Alaska|Desmarestiaceae|
Desmarestia viridis|[16]|United States.Rhode Island|Desmarestiaceae|
Desmarestia viridis|[17]|United States.Connecticut|Desmarestiaceae|
Desmarestia viridis|[18]|United States.Rhode Island|Desmarestiaceae|
Desmarestia viridis|[19]|United States.Rhode Island|Desmarestiaceae|
Desmarestia viridis|[20]|Canada.New Brunswick|Desmarestiaceae|
Desmarestia viridis|[21]|United States.Maine|Desmarestiaceae|
Desmarestia viridis|[22]|United States.Massachusetts|Desmarestiaceae|
Desmarestia viridis|[23]|Canada.New Brunswick|Desmarestiaceae|
Desmarestia viridis|[24]|Canada.New Brunswick|Desmarestiaceae|
Desmarestia viridis|[25]|Canada.New Brunswick|Desmarestiaceae|
Desmarestia viridis|[26]|Canada.New Brunswick|Desmarestiaceae|
Unknown Specimen||
Desmarestia sp. 1aculeata|[27]|Norway|Desmarestiaceae|
Desmarestia sp. 1aculeata|[28]|Norway|Desmarestiaceae|
Desmarestia sp. 1aculeata|[29]|Norway|Desmarestiaceae|
Desmarestia sp. 1aculeata|[30]|Norway|Desmarestiaceae|
Desmarestia sp. 1aculeata|[31]|Norway|Desmarestiaceae|
Desmarestia sp. 1aculeata|[32]|Norway|Desmarestiaceae|
Desmarestia sp. 1aculeata|[33]|Canada.New Brunswick|Desmarestiaceae|
Desmarestia sp. 1aculeata|[34]|Canada.New Brunswick|Desmarestiaceae|
Desmarestia sp. 1aculeata|[35]|Canada.New Brunswick|Desmarestiaceae|
Desmarestia sp. 1aculeata|[36]|Canada.Manitoba|Desmarestiaceae|
Desmarestia sp. 1aculeata|[37]|Norway|Desmarestiaceae|
Desmarestia sp. 1aculeata|[38]|Canada.New Brunswick|Desmarestiaceae|
Desmarestia sp. 1aculeata|[39]|Canada.Prince Edward Island|Desmarestiaceae|
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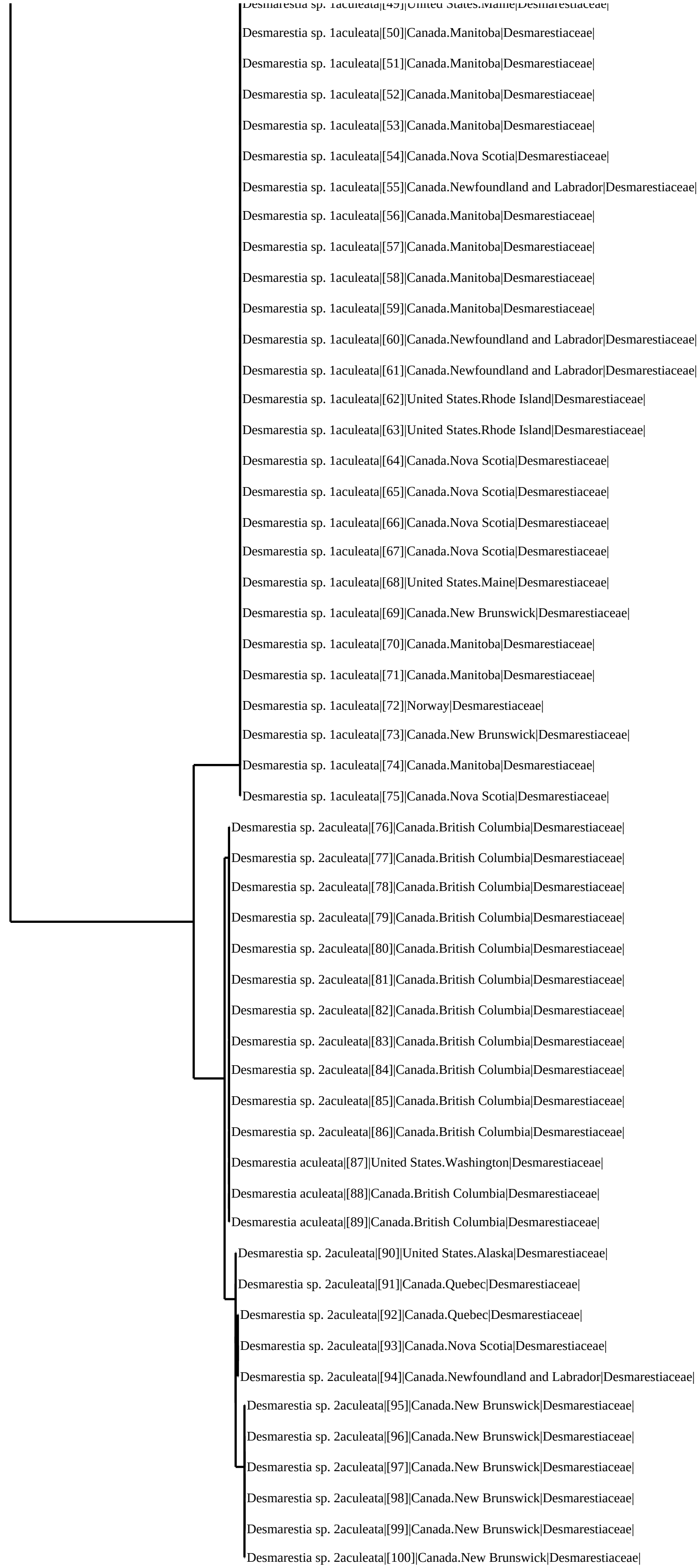
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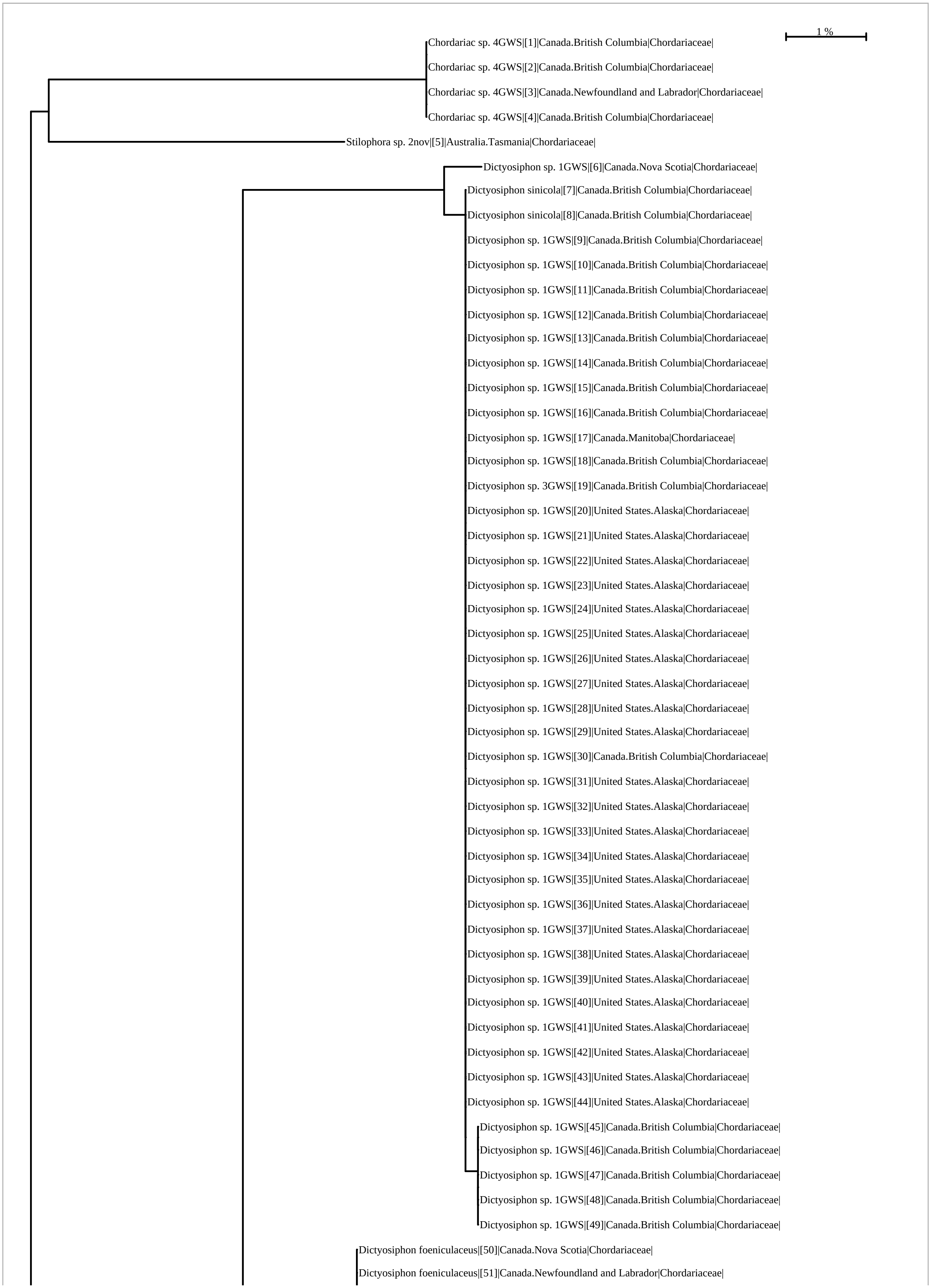
Data Type	:	Nucleotide
Distance Model	:	Kimura 2 Parameter
Marker	:	COI-5P
Codon Positions	:	1st, 2nd, 3rd
Labels	:	Extra Info, Country & Province, Family
Filters	:	Length > 200
Attachment	:	Photographs & Spreadsheet

Sequence Count	:	101
Species count	:	6
Genus count	:	3
Family count	:	1
Unidentified	:	1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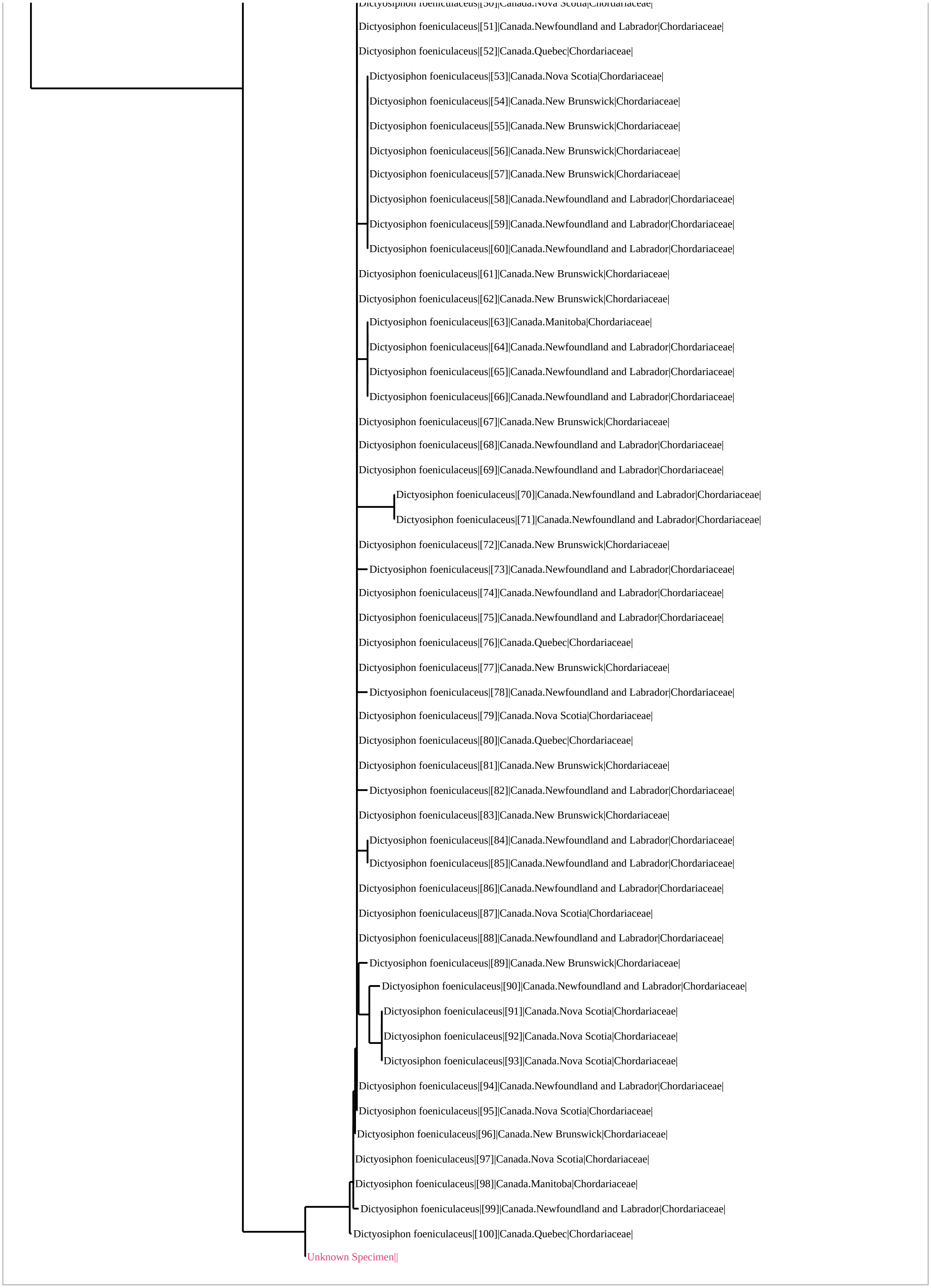
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Distance Model	:	Kimura 2 Parameter
Marker	:	COI-5P
Codon Positions	:	1st, 2nd, 3rd
Labels	:	Extra Info, Country & Province, Family
Filters	:	Length > 200
Attachment	:	Photographs & Spreadsheet

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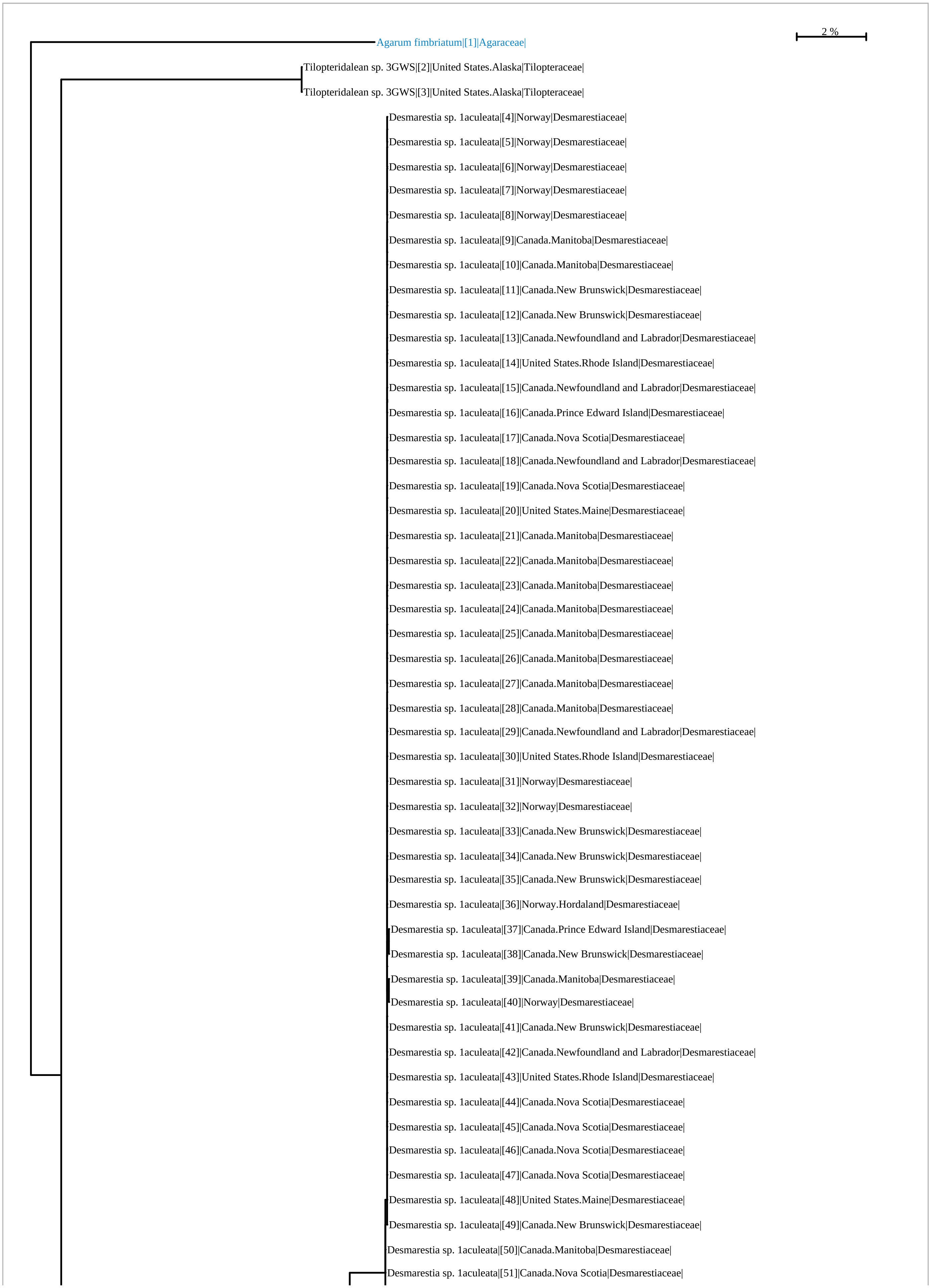
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Desmarestia viridis|[91]|Canada.New Brunswick|Desmarestiaceae|
Unknown Specimen||
Desmarestia ligulata|[92]|United States.California|Desmarestiaceae|
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Desmarestia viridis|[94]|Desmarestiaceae|
Desmarestia viridis|[95]|Desmarestiaceae|
Desmarestia herbacea|[96]|Canada.British Columbia|Desmarestiaceae|
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BOLD TaxonID Tree

Title	: COI SPECIES DATABASE Tree
Date	: 22-April-2022
Data Type	: Nucleotide
Distance Model	: Kimura 2 Parameter
Marker	: COI-5P
Codon Positions	: 1st, 2nd, 3rd
Labels	: Extra Info, Country & Province, Family
Filters	: Length > 200
Attachment	: Photographs & Spreadsheet

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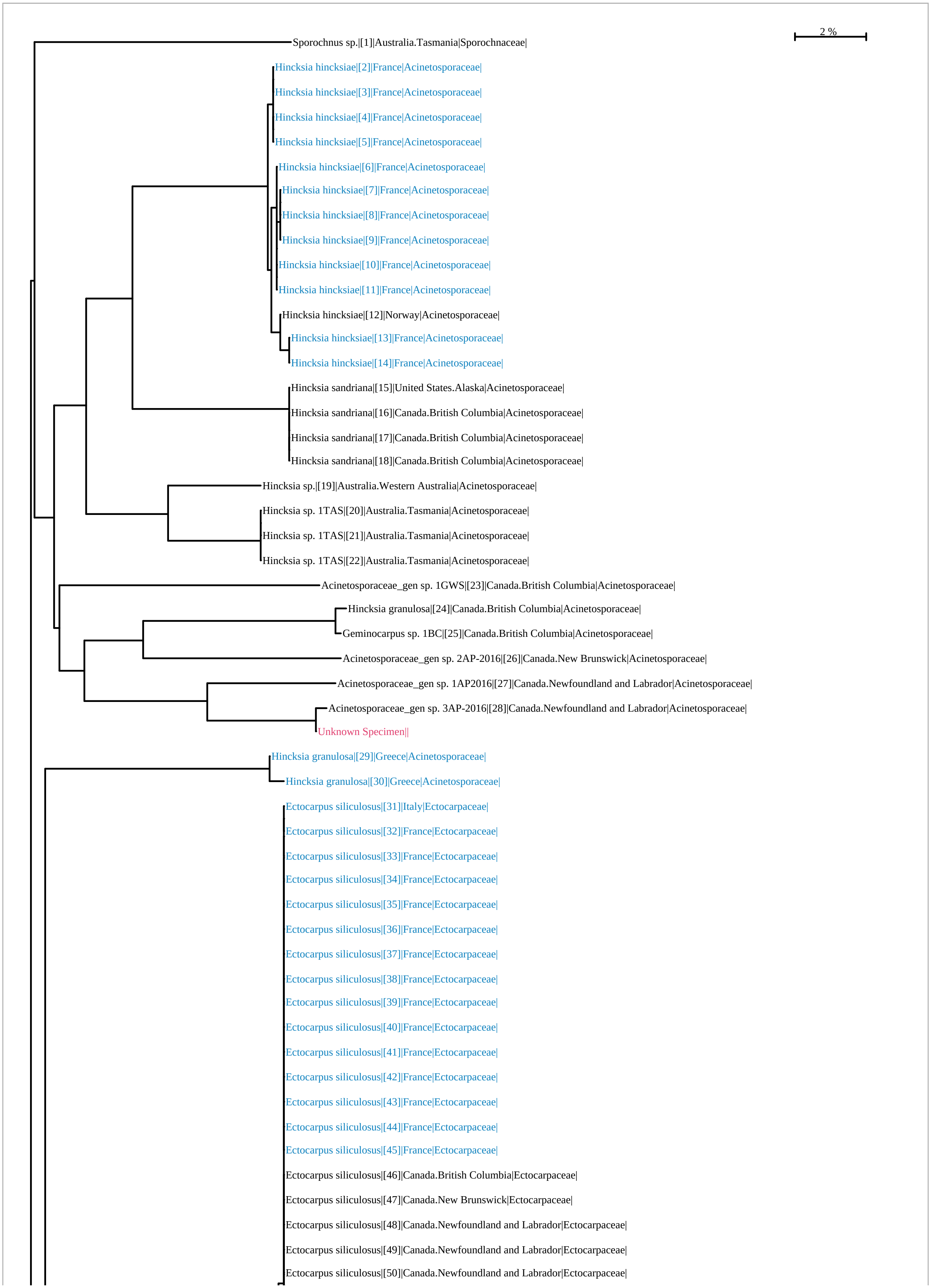
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Hincksia hincksiae|[12]|Norway|Acinetosporaceae|
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Ectocarpus siliculosus|[47]|Canada.New Brunswick|Ectocarpaceae|
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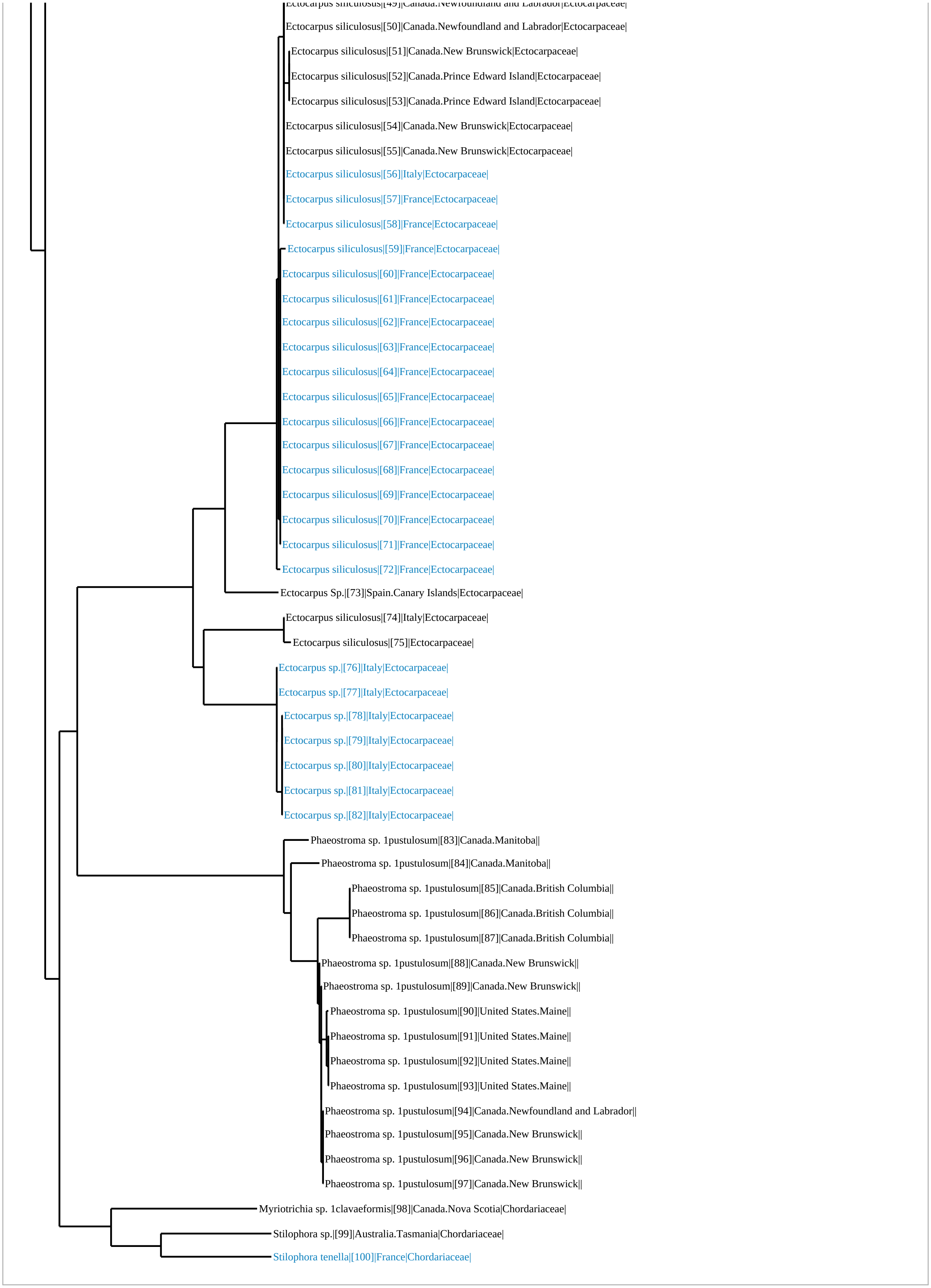
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Ectocarpus sp.|[82]|Italy|Ectocarpaceae|
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Phaeostroma sp. 1pustulosum|[84]|Canada.Manitoba||
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Phaeostroma sp. 1pustulosum|[89]|Canada.New Brunswick||
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Phaeostroma sp. 1pustulosum|[91]|United States.Maine||
Phaeostroma sp. 1pustulosum|[92]|United States.Maine||
Phaeostroma sp. 1pustulosum|[93]|United States.Maine||
Phaeostroma sp. 1pustulosum|[94]|Canada.Newfoundland and Labrador||
Phaeostroma sp. 1pustulosum|[95]|Canada.New Brunswick||
Phaeostroma sp. 1pustulosum|[96]|Canada.New Brunswick||
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BOLD TaxonID Tree

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Title           : COI SPECIES DATABASE Tree
Date            : 22-April-2022
Data Type       : Nucleotide
Distance Model  : Kimura 2 Parameter
Marker          : COI-5P
Codon Positions : 1st, 2nd, 3rd
Labels          : Extra Info, Country & Province, Family
Filters         : Length > 200
Attachment      : Photographs & Spreadsheet

Sequence Count  : 101
Species count   : 2
Genus count     : 1
Family count    : 1
Unidentified    : 1
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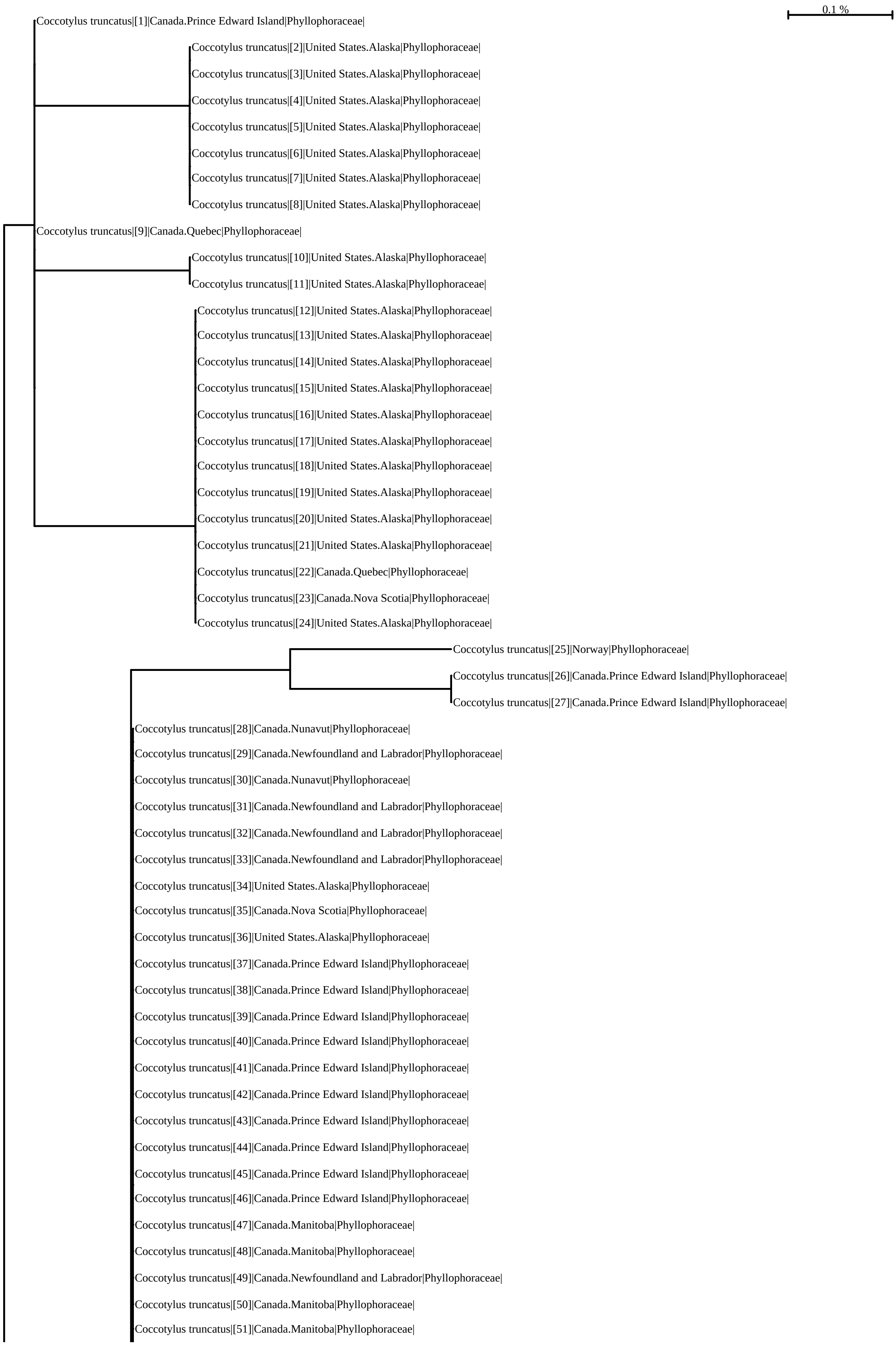
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Coccotylus truncatus|[26]|Canada.Prince Edward Island|Phyllophoraceae|
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BOLD TaxonID Tree

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Date	:	22-April-2022
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Marker	:	COI-5P
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Dilsea socialis|[92]|United States.Alaska|Dumontiaceae|
Dilsea socialis|[93]|United States.Alaska|Dumontiaceae|
Dilsea socialis|[94]|United States.Alaska|Dumontiaceae|
Dilsea socialis|[95]|United States.Alaska|Dumontiaceae|
Dilsea socialis|[96]|United States.Alaska|Dumontiaceae|
Dilsea socialis|[97]|United States.Alaska|Dumontiaceae|
Dilsea socialis|[98]|United States.Alaska|Dumontiaceae|
Dilsea socialis|[99]|United States.Alaska|Dumontiaceae|
Dilsea socialis|[100]|United States.Alaska|Dumontiaceae|

BOLD TaxonID Tree

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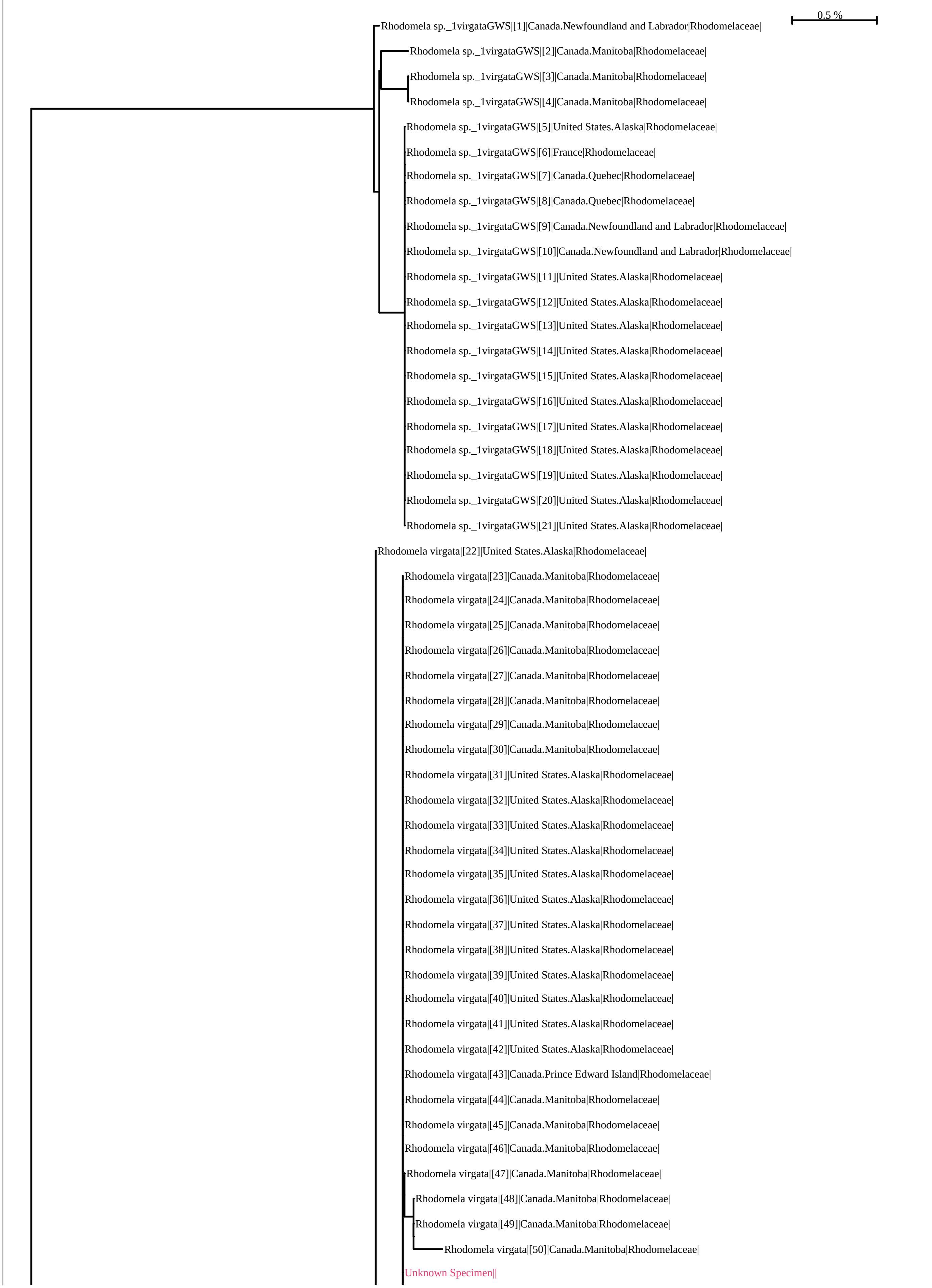
Date	:	22-April-2022
Data Type	:	Nucleotide
Distance Model	:	Kimura 2 Parameter
Marker	:	COI-5P
Codon Positions	:	1st, 2nd, 3rd
Labels	:	Extra Info, Country & Province, Family
Filters	:	Length > 200
Attachment	:	Photographs & Spreadsheet

Sequence Count	:	101
Species count	:	2
Genus count	:	1
Family count	:	1
Unidentified	:	1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Rhodomela sp._1virgataGWS|[8]|Canada.Quebec|Rhodomelaceae|
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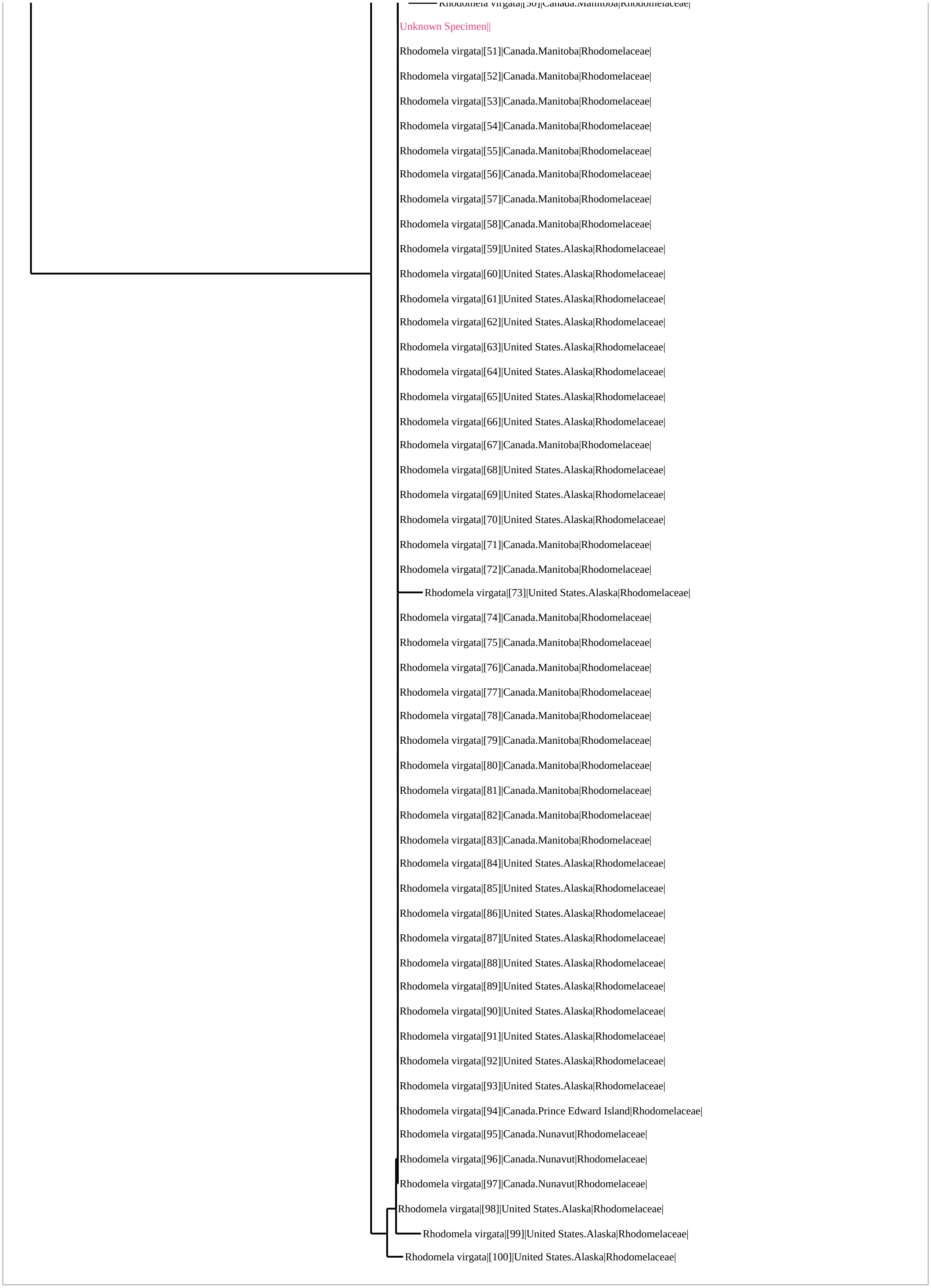
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Rhodomela virgata|[83]|Canada.Manitoba|Rhodomelaceae|
Rhodomela virgata|[84]|United States.Alaska|Rhodomelaceae|
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Rhodomela virgata|[98]|United States.Alaska|Rhodomelaceae|
Rhodomela virgata|[99]|United States.Alaska|Rhodomelaceae|
Rhodomela virgata|[100]|United States.Alaska|Rhodomelaceae|

APPENDIX 8E-1

Record of Independent Verifications

Original ID	2018 Samples	2018 ID Verification (Lab/Inst. Name)*	2019 Samples	2019 Sample Locations	Sent for Verification (in 2020)	2019 ID Verification (Lab/Inst. Name)	2020 Samples	2020 Sample Locations	Sent for Verification (in 2021)?	2020 ID Verification (Lab/Inst. Name)	2021 Samples	2021 Sample Locations	Sent for Verification (in 2022)	2021 ID Verification (Lab/Inst. Name)
Polydora cornuta	Yes	*Polydora* sp. (Laval)	none				None				None			
Pseudofabricia aberrans	Yes	*Pseudofabricia* sp. nr. *aberrans* (Biologica) *Manayunkia aestruania* (Laval)	yes	SNW-4, SNE-3 through SNE-5, SNE-8	Yes	*Pseudofabricia* sp. nr. *aberrans* (Biologica) *Fabricia stellaris* (Laval)	Yes	SNW-4, SNE-2, SNE-5, SNE-8 through SNE-11, SNE-13 through SNE-15	Yes	*Pseudofabricia* sp. nr. *aberrans* (Biologica) *Fabricia stellaris* (Laval)	Yes	SNW-3	Yes	Family Fabriciidae (CCDB, Columbia Science) *Pseudofabricia* sp. nr. *aberrans* (EcoAnalysts Inc.)**
Rhodine bitorquata	Yes	*Rhodine loveni* (Biologica) *Rhodine gracilior* (Laval)	yes				None				None			
Rhodine sp.	Yes		yes	BNE-8	Yes	*Rhodine* sp.	None				None			
Styelidae indet.	Yes	*Polycarpa fibrosa* (Biologica)	none				Yes		No		Yes		No	
Ammodytes sp.	Yes	*Ammodytes* sp.	none				Yes	Incidental	Yes	*Ammodytes hexapterus* (CCDB)	None			
Eteone spilotus	Yes	*Eteone* sp. (Biologica and Laval) *Eteone longa* (Potential ID from Laval)	multiple *Eteone* species		No		None				None			
Monocorophium insidosium	Yes	*Monocorophium insidosium* (Biologica) *Crassicorophium bonelli* (Laval)	none				None				None			
Monocorophium sp.	Yes	*Monocorophium sp.* (Biologica) *Crassicorophium bonelli* (Laval)	yes	SE-2, SE-4, SW-2, SW-6, SNE-7	Yes	*Crassicorophium* sp. (Laval)	None				None			
Mya arenaria *Mya truncata* *Mya* sp.	Yes	*Mya truncata* (Biologica) *Mya* sp. (Biologica) Imparientia (superorder) (Biologica)	none				None				None			
Polycarpa pomaria	Yes	*Polycarpa fibrosa* (Biologica)	none				None				None			
Marenzelleria viridis *Marenzelleria* sp.	No		yes	SE-2, SW-2,	Yes	*Marenzelleria viridis* (Laval)	Yes	SW-11 through SW-14	Yes	*Marenzelleria viridis* (Laval) *Marenzelleria wireni* , *Marenzelleria arctia,* *Marenzelleria neglecta* (Radashevsky)***	Yes (*Marenzelleria* sp.)	SW-2, SW-3, Centre M Basket	Yes	*Marenzelleria wireni* (Radashevsky)
Sosane sp. nr. *Wireni*	No		yes	SNE-6,	Yes	*Sosane wireni* (Laval)	Yes	SNW-9, SNE-10, SNE-12	Yes	*Sosane wireni* (Laval)	None			
Oncousoecia sp.	No		yes	SNE-5	Yes	Tubuliporina (Laval)	None				None			
Euphilomedes sp.	No		yes	Fish Stomachs	No	*Philomedes* sp. (Biologica)	None				None			
Nereimyra aphroditoides	Former name		yes	Archive	Yes	*Nereimyra* sp. (Biologica)	Yes		No		Yes		No	
Streptospinigera niuqtuut	Former name		yes	Archive	Yes	*Streptospinigera niuqtuut* (Biologica)	Yes		No		None			
Harmothoe propinqua	No		none				Yes	SW-6	Yes	*Harmothoe extenuata* (Laval)	None			
Harmothoe viridis	No		none				Yes	SE-11	Yes	*Harmothoe imbricata* (Biologica and Laval)	None			
Hesperonoe sp.	No		none				Yes	SNE-7	Yes	*Hesperonoe* sp. (Biologica) *Bylgides* sp. (Laval)	None			
Ampharete petersenae	No		none				Yes	SW-3, SW-7, SW-10, SW-11, SW-13 through SW-15, SE-5 through SE-13, SE-15, SNW-7	Yes	*Ampharete petersenae* (Laval)	Yes	SE-1, SE-3, SW-4	Yes	Pending
Paramphitrite birulai	No		none				Yes	SW-8, SW-10	Yes	*Amphitrite birulai* (Laval)	Yes	SE-1	Yes	Pending
Crassicorophium sp.	No		none				None				Yes	SE-3, Centre S Basket 1, Centre M Basket 1	Yes	Inconclusive/ Corophiidae indet. (CCDB) *Crassicorophium clarencense* (Friday Harbor)
Diastyloides biplicatus	No		none				None				Yes	SW-4	Yes	*Diastylis* sp. (Laval)
Tricellaria sp.	No		none				None				Yes	SNE-2	Yes	Candidae indet. (Laval)

Note: Grey cells indicate no action (i.e., no specimen in samples, therefore none sent for verification)
* Biologica: Biologica Environmental Services; Laval: The Benthic Ecology Lab at Université Laval; CCDB: Canadian Centre for DNA Barcoding at the University of Guelph, Radashevsky: Dr. Vasily Radashevsky of the Russian National Scientific Center of Marine Biology; Friday Harbor: Dr. Craig Staude at Friday Harbour Laboratories at the University of Washington
**EcoAnalysts and Columbia Science examined specimens from 2018 and 2019 collections
*** Radashevsky examined specimens from 2017-2020, no specimens matched *M. viridis* , at least one specimen was conclusively identified as *M. wireni* , a high probability of *M. arctia* was given for specimens from Phillips Creek, other specimens were a high probability of *M. wireni* and/or *M. neglecta*

APPENDIX 8F-1

Record of New and Flagged Taxa Risk Status

Appendix 8F-1

Record of New and Flagged Taxa Risk Status

Phylum Class/Order	Family	Subfamily	Taxa	Project Component	Flagged for Verification	Results of Independent Verification	Risk Category	Watchlist or Trigger List?	Distribution References
Annelida									
Clitellata/Haplotaxida	Naididae	-	Naididae indet.	Benthic Infauna	No	N/A	No Risk	N/A	1, 2, 3, 4
Polychaeta/Eunicida	Lumbrineridae	-	*Lumbrineris fauchaldi*	Benthic Infauna	No	N/A	No Risk	N/A	1, 11
Polychaeta/Sabellida	Fabriciidae	-	*Pseudofabricia* sp. nr. *aberrans*	Benthic Infauna, DNA Samples	Flagged (on Watchlist)	Inconclusive	No Risk	N/A	18
Polychaeta/Spionida	Spionidae	-	*Marenzelleria* sp.	Benthic Infauna, Settlement Substrates, DNA Samples	Flagged (on Watchlist)	*Marenzelleria wireni*	No Risk**	N/A**	1, 2, 19
Polychaeta/Terebellida	Ampharetidae	Ampharetinae	*Amphارete petersenae*	Benthic Infauna	Flagged (on Watchlist)	TBD	No Risk	N/A	1, 20, 21
Polychaeta/Terebellida	Terebellidae		*Paramphitrite birulai*	Benthic Infauna	Flagged (on Watchlist)	TBD	Low Risk	Watchlist	-
Arthropoda									
Insecta/Diptera	Chironomidae	-	*Hydrobaenus* sp.	Fish Stomachs	No	N/A	No Risk	N/A	2
Insecta/Diptera	Simuliidae	-	Simuliidae indet.	Fish Stomachs	No	N/A	No Risk	N/A	2, 10
Insecta/Diptera	Tipulidae	-	Tipulidae indet.	Fish Stomachs	No	N/A	No Risk	N/A	2, 10
Insecta/Ephemeroptera	-	-	Ephemeroptera indet.	Fish Stomachs	No	N/A	No Risk	N/A	2, 10
Malacostraca/Amphipoda	Corophiidae	Corophiinae	*Crassicorophium bonelli*	DNA Samples	Flagged (on Watchlist)	Inconclusive	Low Risk	Watchlist	-
Malacostraca/Amphipoda	Corophiidae	Corophiinae	*Crassicorophium* sp.	Benthic Infauna, Settlement Substrates	Flagged (on Watchlist)	TBD	Low Risk	Watchlist	1, 2, 6, 8
Malacostraca/Amphipoda	Tryphosidae	-	*Hippomedon propinqvus*	Benthic Infauna	No	N/A	No Risk	N/A	1, 2, 3, 5, 6
Malacostraca/Cumacea	Diastylidae	-	*Diastyloides biplicatus*	Benthic Infauna	QA/QC	*Diastylis* sp.*	No Risk	N/A	1, 2
Brachiopoda									
-/-	-	-	Brachiopoda indet.	Benthic Infauna, Freight Dock Offset Habitat	No	N/A	No Risk	N/A	1, 2, 6, 7, 8, 9, 10
Bryozoa									
Gymnolaemata/Cheilostomatida	-	-	Schizoporelloidea indet.	Benthic Infauna	No	N/A	No Risk	N/A	1, 8, 10
Gymnolaemata/Cheilostomatida	Bitectiporidae	-	*Schizomavella* sp.	Benthic Infauna	No	N/A	No Risk	N/A	2
Gymnolaemata/Cheilostomatida	Calloporidae	-	*Callopora* sp.	Benthic Infauna	No	N/A	No Risk	N/A	1, 2, 8
Gymnolaemata/Cheilostomatida	Calloporidae	-	*Cauloramphus* sp.	Benthic Infauna	No	N/A	No Risk	N/A	1, 2, 8
Gymnolaemata/Cheilostomatida	Candidae	-	*Tricellaria* sp.	Benthic Infauna	Yes	Candidae indet.	No Risk	N/A	2
Gymnolaemata/Cheilostomatida	Cribrilinidae	-	*Cribrilina* sp.	Benthic Infauna	No	N/A	No Risk	N/A	1, 2, 6, 8
Gymnolaemata/Cheilostomatida	Exochellidae	-	*Escharoides* sp.	Benthic Infauna	No	N/A	No Risk	N/A	1, 2, 8
Gymnolaemata/Cheilostomatida	Fatkullinidae	-	*Stomacrustula pachystega*	Benthic Infauna	No	N/A	No Risk	N/A	1
Gymnolaemata/Cheilostomatida	Smittinidae	-	*Pseudoflustra* sp.	Benthic Infauna	No	N/A	No Risk	N/A	1, 2
Gymnolaemata/Cheilostomatida	Smittinidae	-	*Smittina* sp.	Benthic Infauna	No	N/A	No Risk	N/A	1, 2, 6
Stenolaemata/Cyclostomatida	Lichenoporidae	-	*Lichenopora* sp.	Settlement Substrates	No	N/A	No Risk	N/A	1, 2, 6, 8
Chlorophyta									
Ulvophyceae/Acrosiphoniales	Acrosiphoniaceae	-	*Spongomorpha aeruginosa*	Settlement Substrates	No	N/A	No Risk	N/A	1, 2, 12, 13
Ulvophyceae/Cladophorales	Cladophoraceae	-	*Chaetomorpha melagonium*	Quadrat Surveys	No	N/A	No Risk	N/A	1, 2, 12, 14
Ulvophyceae/Cladophorales	Cladophoraceae	-	*Rhizoclonium* cf. *riparium*	Quadrat Surveys	No	N/A	No Risk	N/A	1, 2, 12, 13
Ulvophyceae/Cladophorales	Cladophoraceae	-	*Rhizoclonium* sp.	Settlement Substrates	No	N/A	No Risk	N/A	2, 12, 13
Ulvophyceae/Ulotrichales	Ulotrichaceae	-	*Urospora neglecta*	Freight Dock Habitat Offset Monitoring	No	N/A	No Risk	N/A	12, 15
Ulvophyceae/Ulotrichales	Ulotrichaceae	-	*Ulothrix* sp.	Settlement Substrates	No	N/A	No Risk	N/A	2, 12, 13
Ulvophyceae/Ulotrichales	Ulotrichaceae	-	Ulotrichaceae indet.	Settlement Substrates	No	N/A	No Risk	N/A	1, 2, 12, 13
Ulvophyceae/Ulvales	Ulvaceae	-	*Ulva* cf. *prolifera*	Settlement Substrates	No	N/A	No Risk	N/A	1, 2, 12, 13
Chordata									
Actinopterygii/Perciformes	Agonidae	Agoninae	*Leptagonus decagonus*	Incidentals	No	N/A	No Risk	N/A	1, 2, 6, 9, 10, 16
Actinopterygii/Perciformes	Agonidae	Anoplagoninae	*Aspidophoroides olrikii*	Incidentals	No	N/A	No Risk	N/A	1, 2, 6, 9, 10, 16
Actinopterygii/Perciformes	Cottidae	-	*Triglops pingelii*	Incidentals	No	N/A	No Risk	N/A	1, 2, 6, 9, 10, 16
Actinopterygii/Perciformes	Cyclopteridae	-	*Eumicrotremus spinosus*	Freight Dock Habitat Offset Monitoring	No	N/A	No Risk	N/A	1, 2, 6, 9, 16
Ciliophora									
-/-	-	-	Ciliophora indet.	Settlement Substrates	No	N/A	No Risk	N/A	1, 2, 10
Cnidaria									
Hydrozoa/Anthoathecata	Corynidae	-	*Sarsia* sp.	Settlement Substrates	No	N/A	No Risk	N/A	1, 2, 6, 10
Hydrozoa/Leptothecata	Campanulinidae	-	*Calycella* sp.	Benthic Infauna	No	N/A	No Risk	N/A	1, 2
Echinodermata									
Asteroidea/Forcipulatida	Asteriidae	-	*Leptasterias* (*Leptasterias*) *muelleri*	Settlement Substrates	No	N/A	No Risk	N/A	1, 2
Foraminifera									
-/-	-	-	Foraminifera indet.	Settlement Substrates	No	N/A	No Risk	N/A	1, 2, 8, 10, 17
Mollusca									
Bivalvia/Galeommatida	Lasaeidae	-	Lasaeidae indet.	Benthic Infauna	No	N/A	No Risk	N/A	1, 2, 3
Bivalvia/Mytilida	Mytilidae	Crenellinae	*Arvella faba*	Settlement Substrates	No	N/A	No Risk	N/A	1, 2, 3, 6
Gastropoda/Nudibranchia	Dendronotidae	-	*Dendronotus* sp.	Settlement Substrates	No	N/A	No Risk	N/A	1, 2, 6, 10
Ochrophyta									
Phaeophyceae/Desmarestiales	Desmarestiaceae	-	*Desmarestia aculeata*	Quadrat Surveys	No	N/A	No Risk	N/A	1, 2, 12, 14
Phaeophyceae/Desmarestiales	Desmarestiaceae	-	*Desmarestia viridis*	Quadrat Surveys	No	N/A	No Risk	N/A	1, 2, 12, 13
Phaeophyceae/Ectocarpales	Acinetosporaceae	-	*Pylaiella* cf. *varia*	Quadrat Surveys, Settlement Substrates	No	N/A	No Risk	N/A	13
Phaeophyceae/Ectocarpales	Chordariaceae	-	cf. *Coelocladia arctica*	Quadrat Surveys	No	N/A	No Risk	N/A	2, 12
Phaeophyceae/Ectocarpales	Chordariaceae	-	cf. *Dictyosiphon ekmanii*	Quadrat Surveys	No	N/A	No Risk	N/A	13
Phaeophyceae/Ectocarpales	Chordariaceae	-	cf. *Trachynema groenlandicum*	Quadrat Surveys, Settlement Substrates	No	N/A	No Risk	N/A	13
Phaeophyceae/Ectocarpales	Chordariaceae	-	Chordariaceae indet.	Settlement Substrates	No	N/A	No Risk	N/A	2, 12, 13
Phaeophyceae/Ectocarpales	Chordariaceae	-	*Dictyosiphon foeniculaceus*	Quadrat Surveys	No	N/A	No Risk	N/A	2, 12, 14
Phaeophyceae/Ectocarpales	Scytosiphonaceae	-	cf. *Petalonia* sp.	Quadrat Surveys	No	N/A	No Risk	N/A	1, 2, 12, 15
Rhodophyta									
Florideophyceae/Ceramiales	Delesseriaceae	Phycodryoideae	*Phycodrys fimbriata*	Quadrat Surveys	No	N/A	No Risk	N/A	1, 2, 24
Florideophyceae/Ceramiales	Rhodomelaceae	-	*Rhodomela virgata*	Quadrat Surveys	No	N/A	No Risk	N/A	1, 2, 24
Florideophyceae/Ceramiales	Rhodomelaceae	-	*Savoiea arctica*	Quadrat Surveys	No	N/A	No Risk	N/A	1, 2, 24
Florideophyceae/Gigartinales	Dumontiaceae	-	*Dilsea socialis*	Quadrat Surveys	No	N/A	No Risk	N/A	1, 2, 24
Florideophyceae/Gigartinales	Phyllophoraceae	-	*Coccotylus truncatus*	Quadrat Surveys	No	N/A	No Risk	N/A	1, 2, 24

Notes: Taxa identified to the lowest practical taxonomic level; indet.= indeterminate (taxa which could not be identified beyond the taxonomic level listed); sp.=species.

Taxa distribution references: 1: WoRMS 2022, 2: GBIF 2022, 3: Cusson 2018, 4: Gagnon and Torgersen 2021, 5: Hopcroft 2019, 6: Miller et al. 2014, 7: Sejr 2009, 8. Goldsmit 2016, 9: DFO 2019, 10: Stewart 2013, 11: Blake 1972, 12: Kupper et al. 2016, 13: Algaebase 2022, 14: Ellis and Wilce 1961, 15: Brown et al. 2011, 16: Coad and Reist 2018, 17: Stewart et al. 1985, 18: MacDonald 2022b, Pers. Comm., 19: Radashevsky 2022, Pers. Comm., 20: Jirkov 1997, 21: Parapar et al. 2021.

All taxa cross-referenced with NIS/AIS resources: Fofonoff et al. 2022, ISSG 2022, Rius et al. 2022, Molnar et al. 2008, Casas-Monroy et al. 2014.

**Diastylis* and *Diastyloides* are morphologically similar and indentification results may vary depending on the specific key used.

**Note that this risk status is for *Marenzelleria wireni* specifically, *Marenzelleria* sp. other than *M. wireni* and *M. arctia* remain on the program watchlist as High Risk taxa

APPENDIX 8F-2

Program Watchlist

Appendix 8F-2

Program Watchlist

Phylum Class/Order	Family	Subfamily	Taxa	Risk Category	Year Added	Year Removed
Polychaeta/Phyllodocida	Polynoidae	Polynoinae	*Hesperonoe* sp.	Low Risk	2020	N/A
Polychaeta/Sabellida	Fabriciidae		*Pseudofabricia* sp. nr. *aberrans*	Low Risk	2018	2021
Polychaeta/Spionida	Spionidae		*Marenzelleria viridis* (*Marenzelleria* sp.)*	High Risk	2019	N/A
Polychaeta/Terebellida	Ampharetidae	Ampharetinae	*Ampharete petersenae*	Low Risk	2020	2021
Polychaeta/Terebellida	Ampharetidae	Ampharetinae	*Sosane wireni*	Low Risk	2019	N/A
Polychaeta/Terebellida	Terebellidae		*Amphitrite birulai/Paramphitrite birulai*	Low Risk	2020	N/A
Malacostraca/Amphipoda	Corophiidae	Corophiinae	*Crassicorophium* sp.	Low Risk	2018**	N/A
Malacostraca/Amphipoda	Corophiidae	Corophiinae	*Monocorophium* sp.	High Risk	2018**	N/A
Actinopterygii/Perciformes	Ammodytidae		*Ammodytes hexapterus*	Low Risk	2020	N/A

**Marenzelleria viridis* and *Marenzelleria* species, other than *M. wireni* and *M. arctia*

** *Monocorophium* and *Crassicorophium* sp. were previously identified during baseline surveys, but flagged for review in 2018

APPENDIX 8F-3

Nunavut High Risk AIS

Non-Native & Invasive species *In Nunavut*

In 2010 the Canadian Endangered Species Conservation Council (CESCC) identified 17 species not normally found in Nunavut.

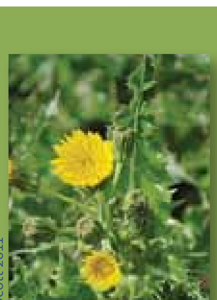
These are called "non-native species". Some of these plants and animals can become an "invasive species", which represents a potential major concern for the future health of the Arctic.

What is a non-native species?

A non-native species is defined as an organism that is not normally found in a region. They are introduced by human activities, which can be intentional (e.g. species introduced to control a pest species), accidental (e.g. shipping and ballast water exchange), or environmental (e.g. changes in climate leading to wildlife movements). An example of a non-native species in Nunavut is the European Starling *(Sturnus vulgaris)*, which was introduced to North America from Europe intentionally by humans.

What is an invasive species?

Not all non-native species are considered invasive. This term is reserved for species that do so well in their new habitat that they end up causing harm to the environment, other species, human health, or economic activity (ISAC, 2006). An example of an invasive species in southern Canada is the Zebra Mussel *(Dreissena polymorpha)*, which was introduced to North America by ships releasing their ballast water. The Zebra mussel reproduces quickly and establishes large colonies on any hard surface. In this way they take over habitat occupied by native species, reducing the availability of food for other species, and also attaching themselves in great numbers to boats and other infrastructure in the water. (Benson and Raikow, 2010).



Scott 2011

Species: Field Sow Thistle *(Sonchus arvensis)*

Impact: The Field Sow Thistle grows quickly, easily and when there are many of them they can reduce the water resources available to other plants. They have the potential to decrease native plant diversity by competing for space and water.

Introduction pathway: Accidently introduced from Europe into North America in a containment of agricultural crop seed. This plant has been able to spread long distances across Canada because the seeds can travel far in the wind.

Sohl 2005

Species: The European Starling *(Sturnus vulgaris)*

Impact: The European Starling can displace native bird species by taking over nesting sites and competing for food.

Introduction pathway: Introduced intentionally to North America from Europe. These birds then dispersed naturally into Canada through migration.

Why should you be concerned about invasive species?

When invasive species are introduced and survive, their populations can increase rapidly because there are no natural predators. Invasive species may feed on native species, compete for food and space, as well as expose native species to new parasites and disease. Invasive species are now widely recognized as a leading cause of endangerment and/or extinction of native species (Lassuy and Lewis, 2010).

**** There are currently no known species in Nunavut that can be classified as aquatic or terrestrial invasive species.***

How can you help?

Report

Have you seen a different plant, animal or insect in Nunavut?

Everything you can do to help us identify these species is important. Report the **location** where you observed the species (GPS Coordinates are very helpful) and provide a **detailed description** of the plant, animal, or insect. If possible **take a photo**.

Remember that not all non-native species are considered invasive. If you see an unknown plant or animal, it is very important to report it.

Do not take any extreme actions; the first step is reporting the species so that territorial and federal agencies can respond appropriately. We will report our findings back to you and information about the species you have observed.

Share

Keep yourself informed and educate others about non-native and invasive species. Let them know what to do if they see an unknown or uncommon species.

Nunavut

This project was undertaken with the financial support of:

Environment Canada Environnement Canada

Report a species to your local Conservation Officer.

For More Information or if your CO is not available please contact:

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Please call 867-975-7706 to request a French copy of this brochure.

How might invasive species get into Nunavut?

Species are transported throughout the world by human activities, like shipping, which allows species to move further distances and over barriers that they could not do on their own. Nunavut remains very remote compared to the rest of Canada and so the lack of major road systems, infrequent shipping and cold climate has limited their introduction and survival.

However, as climate change alters Arctic ecosystems, it creates conditions that are more favorable to the survival and reproduction of non-native species. It also enables greater human activity and development, which gives potential invasive species more opportunities to establish themselves. (Lassuy and Lewis, 2010).

Pathways of introduction for invasive species into Nunavut

* Ballast water exchange and hull fouling have the greatest potential for introducing invasive species into the aquatic ecosystems of Nunavut. Ballast water is used to stabilize ships. It is pumped aboard ships from different ports around the world and often exchanged far from the region it was obtained. This water can contain species that are not native, and may establish themselves locally.

Hull fouling occurs when organisms attach themselves to the outside of a ship's hull where they can then be transported around the world.

MacGregor, 2009

* Seeds, insects and even small mammals can be transported around the world through the shipping of grocery produce, lumber, construction supplies, and packing materials, even dirt from someone's footwear can contain plant seeds (IASC, 2010).

* As climate continues to change in the Arctic, many terrestrial and aquatic plants and animals will move further north looking for the food and habitat they desire. These wildlife movements are not a threat when it comes to invasive species, but it is important to note that some species, (especially rare or threatened ones) may not survive the transition. Others may do well, like flying insects, which are already increasing in number in some areas of Nunavut. (IASC, 2010).

Wildlife movements are often referred to as "range extensions" where a species expands the area they can live in when the habitat and climate is favorable for them.

The Migratory Grasshopper (Melanoplus sanguinipes) is a winged insect that is widely distributed across Canada and is one example of a species that may expand its range into Nunavut.

Non-Native Species in Nunavut

As of 2011, there are 17 species known to be non-native in Nunavut, these are listed below and are all terrestrial species. Please note that it is not currently known what the potential is for any of these species to become invasive and to what extent. Two species, the starling and the sow thistle are described in more detail below.

SCIENTIFIC NAME	COMMON NAME	ORGANISM TYPE
Carum carvi	Wild Caraway	Flowering Plant
Taraxacum officinale	Common Dandelion	Flowering Plant
Sonchus arvensis	Field Sow Thistle	Flowering Plant
Leucanthemum vulgare	Oxeye Daisy	Flowering Plant
Thlaspi arvense	Field Pennycress	Flowering Plant
Capsella bursa-pastoris	Shepherd's Purse	Flowering Plant
Barbarea vulgaris	Yellow Rocket	Flowering Plant
Amaranthus retroflexus	Green Amaranth	Flowering Plant
Hordeum vulgare	Common Barley	Flowering Plant
Puccinellia distans	Spreading Alkali Grass	Flowering Plant
Vicia cracca	Tufted Vetch	Flowering Plant
Papaver somniferum	Opium Poppy	Flowering Plant
Plantago major	Common Plantain	Flowering Plant
Polygonum aviculare	Prostrate Knotweed	Flowering Plant
Pieris rapae	Cabbage White	Butterfly
Sturnus vulgaris	European Starling	Passerine Bird
Passer domesticus	House Sparrow	Passerine Bird

*Species photo references available upon request. Images are not to scale.

This project was undertaken with the financial support of:

Environment Canada / Environnement Canada

Nunavut

Potential Invasive Species in Nunavut

As trade and shipping continues to increase, some aquatic invasive species known to commonly foul ship hulls and ballast waters, like the Chinese Mitten Crab, are more likely to arrive at ports around Nunavut.

A recent report commissioned by Fisheries and Oceans Canada identified a number of potential aquatic invasive species, mainly for the Hudson Bay region. The table below lists only those species considered as "High Risk" to Nunavut and they are found in freshwater & marine environments.

SCIENTIFIC NAME	COMMON NAME	ORGANISM TYPE
Osmerus mordax	Rainbow Smelt	Fish
Gymnocephalus cernuus	Ruffe	Fish
Caprella mutica	Skeleton Shrimp	Crustacean
Chelicorophium curvispinum	Data unavailable	Crustacean
Dikerogammarus villosus	Killer Shrimp	Crustacean
Gmelinoides fasciatus	Data unavailable	Crustacean
Pontogammarus robustoides	Data unavailable	Crustacean
Eriocheir sinensis	Chinese Mitten Crab	Crustacean
Hemimysis anomala	Data unavailable	Crustacean
Balanus improvisus	Acorn Barnacle	Crustacean
Corbicula fluminea	Asian Clam	Mollusc
Dreissena bugensi	Quagga Mussel	Mollusc
Bythotrephes longimanus	Spiny Water Flea	Zooplankton
Cercopagis pengo	Fishhook Water Flea	Zooplankton
Eubosmina maritima	Data unavailable	Zooplankton
Marenzelleria cf. viridis	Data unavailable	Worm
Marenzelleria cf. wireni	Data unavailable	Worm
Cordylophora caspia	Freshwater Hydroid	Hydrozoa
Coscinodiscus wailesii	Data unavailable	Phytoplankton
Odontella sinensi	Data unavailable	Phytoplankton
Prorocentrum minimum	Data unavailable	Phytoplankton
Codium fragile ssp. tomentosoides	Oyster Thief	Algae
Glugea hertwigi	Data unavailable	Protozoa
Amphilina foliacea	Data unavailable	Parasite

*Species photo references available upon request. Images are not to scale.

GOLDER
MEMBER OF WSP

REPORT

Chapter 9.0 Tide Gauge Results

2021 Marine Environmental Effects Monitoring Program (MEEMP) and Non-Indigenous Species / Aquatic Invasive Species (AIS) Monitoring Program

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21 October 2022

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9.0 TIDE GAUGE RESULTS

9.1 Introduction

In 2021, Baffinland Iron Mines Corporation (Baffinland) undertook water level measurements with a tide gauge stationed at the Milne Port Ore Dock. The tide gauge monitoring program is intended to satisfy requirements of the Mary River Project's (the Project) Ecological Effects Monitoring (EEM) programs and address Terms and Conditions No. 1, 76 and 83 of Project Certificate (PC) No. 005. This is the fifth year this program has been running. This report presents the results of the tide gauge monitoring program during the 2021 season. A brief summary of results across all years is also provided below. Please see Appendix A for the tide gauge installation instructions, Appendix B for the tide gauge calibration documents, and Appendix C for the tide gauge data deliverable.

9.2 Methodology

9.2.1 Unit Conventions

All dates and times are reported in Coordinated Universal Time (UTC), four hours ahead of the local time zone, Eastern Daylight Time (EDT). All horizontal positions are reported in Universal Transverse Mercator (UTM) coordinates referenced to the North American Datum of 1983 (NAD83). Elevations are referenced to the Canadian Geodetic Vertical Datum (CGVD).

9.2.2 Design

The approach to installing the tide gauge on the Milne Port Ore Dock ladder was identical to that of 2020 (Golder, 2021). This was necessary to keep a repeatable installation location and elevation from season to season, which is essential to support inter-annual comparison of water level data.

An RBRconcerto CTD sensor was used to measure conductivity, temperature, and water levels at the Milne Port Ore Dock. To circumvent similar issues that occurred in previous years, an RBRsolo D logger was deployed as a redundancy to measure water levels in case of the RBRconcerto failing. The RBR sensors are both designed to be simple, but accurate and self-contained instruments capable of working in cold (rated to -5 ˚C) and corrosive (i.e., saline) environments. The RBR sensors were mounted in an aluminum housing unit which was secured to the Milne Port ore dock ladder through two welded L-brackets. The ladder is typically installed during the open water period (approximately July to October). The Ore Dock ladder was chosen as the sampling location as it provides a stable mounting point that can be reinstalled each year as part of standard port operations. The RBR sensors and the sampling specifications are summarized in Table 1. Additional details on the tide gauge design, installation and recovery, and mounting hardware are provided in the Milne Port Tide Gauge Installation and Recovery Instructions (Attachment 1).

Table 1: Tide Gauge Instrumentation and Sampling Strategy

Instrumentation	Sampling Strategy	Instrument Accuracy
Sensor: RBRconcerto CTD	**Measurement Interval:** 300 s **Sampling Rate:** 1 Hz **Averaging Duration:** 60 s	**Temperature accuracy:** ±0.002˚C **Conductivity accuracy:** ±0.005 mS/cm **Pressure accuracy:** ±0.05% of full-scale range (0.025 dbar)
Sensor: RBRsolo D	**Sampling Rate:** 1 Hz	**Pressure accuracy:** ±0.05% of full-scale range

9.2.3 Deployment and Recovery

Prior to deployment the RBR sensors were calibrated at the factory. Calibration results are well within the nominal instrument accuracy in Table 1. The standard deviation of calibration errors over the full-scale range of calibration (0 – 60 dbar) is approximately -0.000758 dbar or less than 1 mm. The calibration certificates are included in Attachment 2. Additionally, the RBR sensors were visually inspected, programmed, and synchronized to UTC time. The deployment and recovery of the RBR sensors, attached to the Milne Port Ore Dock ladder, was conducted by Baffinland personnel with remote support provided by Golder personnel on 12 July 2021 and 31 October 2021, respectively. Post-deployment, a GPS RTK (real-time kinematic) survey was conducted to determine the elevation and position of the ladder top plate (Table 2). This involved surveying three points on the ladder top plate and calculating an average elevation. The standard deviation of the elevation measurements is approximately 3.3 cm. Following recovery of the RBR sensors, the data was downloaded by Baffinland personnel and sent to Golder.

Table 2: RTK GPS Survey 2021

Survey Point	Easting (m)	Northing (m)	UTM Zone	Ladder Top Plate Elevation (m, CGVD)	Tide Gauge Elevation (m, CGVD)[1]	Tide Gauge Elevation (m, Chart Datum)
Point 01	503251.208	7976647.873	17W	3.754	-2.661	-1.461
Point 02	503251.316	7976647.975	17W	3.699	-2.716	-1.516
Point 03	503251.412	7976648.066	17W	3.695	-2.720	-1.520
Average Elevation, m				**3.716**	**-2.699**	**-1.499**
Standard Deviation, m				**0.03297**		

Notes: CGVD=Canadian Geodetic Vertical Datum; Horizontal datum is UTM NAD 83, Zone 17W; Elevations assume Chart Datum is 1.2 m below CGVD; [1]Distance from the tide gauge pressure sensor to the surveyed steel ladder top plate is 6.415 m based on an email communication with Baffinland personnel (Ritgen, 2020)

Table 3 shows the elevation of the ladder top plate and tide gauge measured in the Milne Port tide gauge programs from 2017 to 2021. It is noted that both the ladder top plate and the tide gauge have been deployed in the same location and configuration each year, however, the results of the RTK GPS survey show the elevation of the ladder top plate and tide gauge increasing year-on-year, with a total elevation difference of 0.24 m (standard deviation of 0.0943m and trend of 0.0569 m/year).

Table 3: Elevation of Ladder Top Plate and Tide Gauge from 2017 to 2021

Year	Ladder Top Plate Elevation (m CGVD)	Tide Gauge Elevation (m CGVD)
2017	3.474	-2.941
2018	3.501	-2.914
2019	3.568	-2.847
2020	3.586	-2.829
2021	3.716	-2.699
Standard Deviation, m	**0.0943**	
Trend, m/year	**0.0569**	

Figure 1: Left: RTK Survey of the ore dock ladder top plate. Right: Ore dock ladder following removal, with the tide gauge housing shown on the bottom right of the ladder. (Ritgen, 2020)

9.2.4 Data Processing

A preliminary review of the data recorded by the RBR sensors was performed following the recovery. Quality checks included the following:

- Reviewing time series measured by the instruments, including various diagnostic parameters.
- Checking internal recorder and file status.
- Plotting and viewing the time series data.

The data from the RBR sensors was extracted from raw instrument format to ASCII using the instrument specific software Ruskin®. The RBRconcerto successfully recorded for the entire duration of the deployment, so full data processing was carried out for the RBRconcerto (which measures conductivity, temperature, and pressure) but not the backup RBRsolo (which only measures pressure). Plots of measured water quality parameters were generated, and post-processing and quality-checking of data was completed using the MATLAB® (Mathworks, 2019) scientific computing software and included:

- Measurements made by the instrument while it was out of water, as determined from either the pressure or salinity gauge, were replaced with a -999 value.
- Data were filtered for values above a maximum water temperature and salinity. The maximum water temperature was defined as 15 ˚C and salinity as 36 PSU. Filtered values were replaced with a -999 value.
- Where applicable, data were filtered for periods when the change in pressure between consecutive samples exceeded 0.5 dbar (approximately 0.5 m of water). Filtered values were replaced with a -999 value.
- Flagged and missing data values, identified onboard the instrument, were replaced with a -999 value. Additional manual editing to remove or flag spurious data was performed as necessary.
- The instrument deployment and recovery dates and percentage of valid data from the deployment period is provided in Table 4. Quality Controlled (QC) data are provided in Attachment 3.

Table 4: Recorded Data Statistics for the RBRconcerto CTD Sensor

Instrument	Date/Time Deployed (UTC)	Date/Time Recovered (UTC)	Total Records Recorded (#)	Total Records Expected (#)	Flagged and Missing Data (#)	Percent Valid Data (%)
RBRconcerto CTD	12 July 2021, 18:05:00	31 October 2021, 19:55:00	31991	31991	0	100

9.3 Data Summary

9.3.1 Tide Gauge

Time series of temperature, conductivity, salinity, and water level referenced to CGVD as measured by the RBRconcerto at the Milne Port Ore Dock over the length of the deployment are shown in Figure 2. The tide gauge shows a distinct seasonal pattern for near-surface water in Milne Inlet. This pattern was observed in previous years and is discussed in more detail below (Golder, 2018; 2019; 2020; 2021).

The processes observed in the dataset fall into two general time periods which have been identified every year since the tide gauge monitoring began. The first time period is from the tide gauge's deployment on 12 July 2021 to early September. During this time, the RBRconcerto measured large fluctuations in temperature and salinity. The temperature fluctuated between approximately 0 and 8 degrees C and the salinity fluctuated between approximately 4 and 32 PSU. This range is most likely the result of freshwater runoff from Phillips Creek during the spring freshet and the melting of sea ice in Milne Inlet near Milne Port. These processes cause the surface layer to be warmer and less saline than the water column beneath the pycnocline. As the water level varies with the tidal cycle, the tide gauge switches between being positioned in the warmer, fresher water of the surface layer and the colder, more saline water at greater depth.

The second time period is from early September to the tide gauge's retrieval on 31 October 2021. This time period begins after the spring freshet ends and sees the temperature and salinity time series stabilize. A small diurnal fluctuation is observed in the temperature and salinity data in September but mostly ceases beginning in October. It is likely that these diurnal fluctuations are driven by tidal forcing, upwelling/downwelling during wind events, and continued freshwater runoff. As the water level varies with the tidal cycle, the tide gauge switches between being positioned in the warmer, fresher water of the surface layer and in the colder, more saline water at greater depth. Overall, temperature was generally lower and salinity was generally higher in the second time period than in the first time period. In the second time period, temperature ranged from -1 to 3 degrees C, with a mean of 1 degree C; and salinity ranged from 20 to 32 PSU, with a mean of 29 PSU. This likely occurs in response to the autumn weather conditions. Air temperature in Milne Port decreases and fall storms with high winds cause the surface layer of the water column to become well mixed with the layers below. This results in generally colder and more saline surface waters, as observed in the temperature and salinity measurements from early September to the end of the deployment.

The water level data shows that tides in Milne Port follow a mixed semidiurnal tidal cycle. 8 neap tides and 8 spring tides occurred during the tide gauge deployment. The mean water level observed was -0.04 m CGVD. The maximum water level observed was 1.16 m CGVD and the minimum water level observed was -1.14 m CGVD. This range is very consistent with the data from the previous four years.

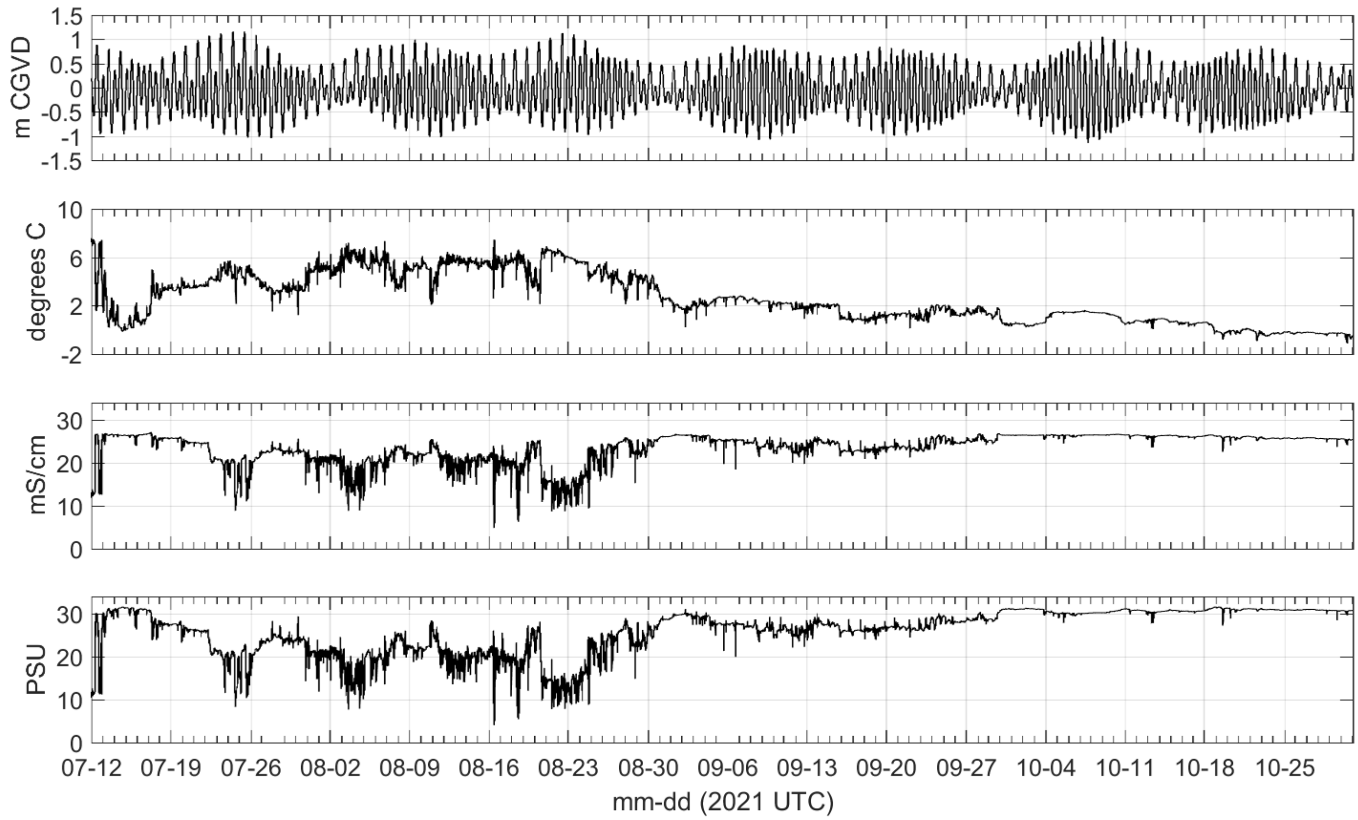


Figure 2: Time series of water level, temperature, conductivity, and salinity measured at Milne Port Tide Gauge by the RBRconcerto CTD Sensor from 12 July 2021 to 31 October 2021 in UTC.

9.3.2 Monitoring Effects of Climate Change Induced Sea Level Change

As noted in the introductory statements, the tide gauge monitoring program is intended to satisfy requirements of the Mary River Project's (the Project) Ecological Effects Monitoring (EEM) programs and address Terms and Conditions No. 1, 76 and 83 of Project Certificate (PC) No. 005.

The objective of Condition No. 1 is to provide feedback on the impacts that climate change might be having on the port facilities. The condition states that the Proponent shall use GPS monitoring or a similar means of monitoring at both Steensby Port and Milne Port, with tidal gauges to monitor the relative sea levels and storm surges at these sites. It should be noted that quantitative measurements of relative sea level change are generally considered beyond the scope of project environmental effects monitoring.

The results of GPS surveys of the tide gauge position show the elevation of the tide gauge to be increasing year-on-year at a mean rate of 0.0569 m/year. This elevation trend is approximately a factor of 10 larger than the estimated isostatic uplift in the region (James et al., 2014; James et al., 2021). The NAD83V70VG model of vertical land motion for Canada (Robin et al., 2020 cited in James et al., 2021) indicates uplift rates of approximately 5 mm/year for northern Baffin Island.

There is currently substantial uncertainty regarding the contribution of both global sea level rise and land uplift rates on year-to-year differences in water level elevation measured by the Milne Port tide gauge. A significant proportion of the uncertainty derives from measurement error in the elevation of the ladder top plate position (see Table 1 and Table 2).

Nonetheless significant trends in relative sea level are likely too small to be measurable in the short term given that relative sea-level projections indicate that relative sea level will either fall or be near neutral for northern Baffin Island (James et al, 2021). Sea level projections are made relative to the solid surface of the Earth, and land uplift from regional isostatic adjustments for Northern Baffin Island is projected to offset projected global and regional sea-level rise for the short to medium term future. In other words, relative changes in sea level are likely to be very small differences between two small quantities both with high uncertainty. Within the next 30 to 50 years relative sea-level projections indicate either falling or near neutral relative sea-level (James et al, 2021). Global sea level change is therefore unlikely to result in any significant climate change-induced sea level impact on the project in the foreseeable future.

Significantly more accurate local elevation control as well as high precision atmospheric pressure correction of the water surface elevation measurements would be required to quantify long term relative sea level change using the Milne Port tide data as changes in relative sea level are expected to be on the scale of fractions of a millimeter per year. The elevation and position of the ladder top plate would need to be precisely surveyed relative to an elevation control monument in the Port. Should Baffinland determine that this is required, Golder recommends that in 2022, the elevation of the ladder top plate be surveyed relative to a local geodetic survey control monument using a precision survey instrument such as a theodolite or total station which employs optical levelling. Golder recommends that the geodetic data regarding the survey control monument also be monitored and retained over time so that changes in ground position (uplift/subsidence) can be evaluated in relation to tide levels monitored using the tide gauge. If records are available, the geodetic history of the Port survey control point could be analysed together with past water level records to evaluate past trends in ground elevation to establish local rates of uplift/subsidence.

Another factor which impacts sea level measurements by pressure sensor are atmospheric pressure variations. The Milne Port gauge is not vented to the atmosphere therefore atmospheric pressure variations influence the levels measured by the instrument. Baffinland could consider analysis of the historical atmospheric pressure record (2017 – present) for processing the water level record with greater precision. For additional data, Baffinland could also consider developing site specific tidal constituents to develop time series of the predicted tide. The latter would allow calculation of anomalies between measured and predicted tides, which would allow quantification of storm surge effects at Milne Port.

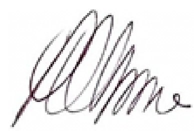
9.4 Raw Data

In addition to this report, Golder has provided the tide gauge data that was processed and quality checked following the methods described in Section 9.2.4. The data is provided as a text file in Attachment 3. All dates and times are reported in UTC time.

9.5 Closure

This report presents the results of the 2021 Tide Gauge Monitoring Program for Milne Port. We trust the information contained in this report is sufficient for your present needs. Should you have any additional questions regarding the project, please do not hesitate to contact the undersigned.

Golder Associates Ltd.



Alex MacMillan, EIT
Geo-Coastal Engineer-In-Training

Phil Osborne, PhD, PGeo
Principal, Senior Coastal Geomorphologist

AM/PO/lih

https://golderassociates.sharepoint.com/sites/11206g/deliverables (do not use)/issued to client_for wp/300-399/1663724-349i-r-rev0/1663724-349i-r-rev0-44000-2021 meemp 9.0 tide gauge results 21oct_22.docx

9.6 References

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Mathworks. 2019. MATLAB R2019a Update 3 (9.6.0.1135713) [software]. Natick, Massachusetts.

Ritgen, D. 2020. Environmental Coordinator, Baffinland Iron Mine Corporation. Ore Dock Ladder Photos. Email to Hurley D, Field Lead Physical Oceanography, Golder Associates Ltd. 18 October 2020.

Robin, C.M.I., Craymer, M., Ferland, R., James, T.S., Lapelle, E., Piraszewski, M., and Zhao, Y., 2020. NAD83v70VG: A new national crustal velocity model for Canada; Geomatics Canada, Open File 0062, 1. zip file. https://doi.org/10.4095/327592.

APPENDIX 9A

Tide Gauge Installation Instructions

TECHNICAL MEMORANDUM

DATE June 21, 2021 **Project No.** 1663724

TO Justin Dee
Baffinland

CC Benjamin Widdowson

FROM Evan Elder **EMAIL evan_elder@golder.com**

MILNE PORT TIDE GAUGE INSTALLATION AND RECOVERY INSTRUCTIONS

Golder Associates Ltd. (Golder) was retained by Baffinland in 2021 to re-install the tide gauge, an RBRconcerto CTD first deployed in 2017 at Milne Port to provide water level monitoring on-site during the open-water season (typically July to October). In 2021, an RBRsolo D logger will be added for redundancy. The objective of this technical memorandum is to provide installation instructions for the tide gauge at Milne Port and itemize the necessary consumables for installation.

1.0 ALUMINUM MOUNTING SYSTEM OVERVIEW

The tide gauge is housed inside a 26-inch long aluminum square tube (4-inch diameter) to provide protection from vessels and reduce wind and wave effects. The aluminum square tube is mounted to the ladder with two steel L brackets that will be welded to the side of the bottom of the steel ladder located on the ore dock (Figure 1).

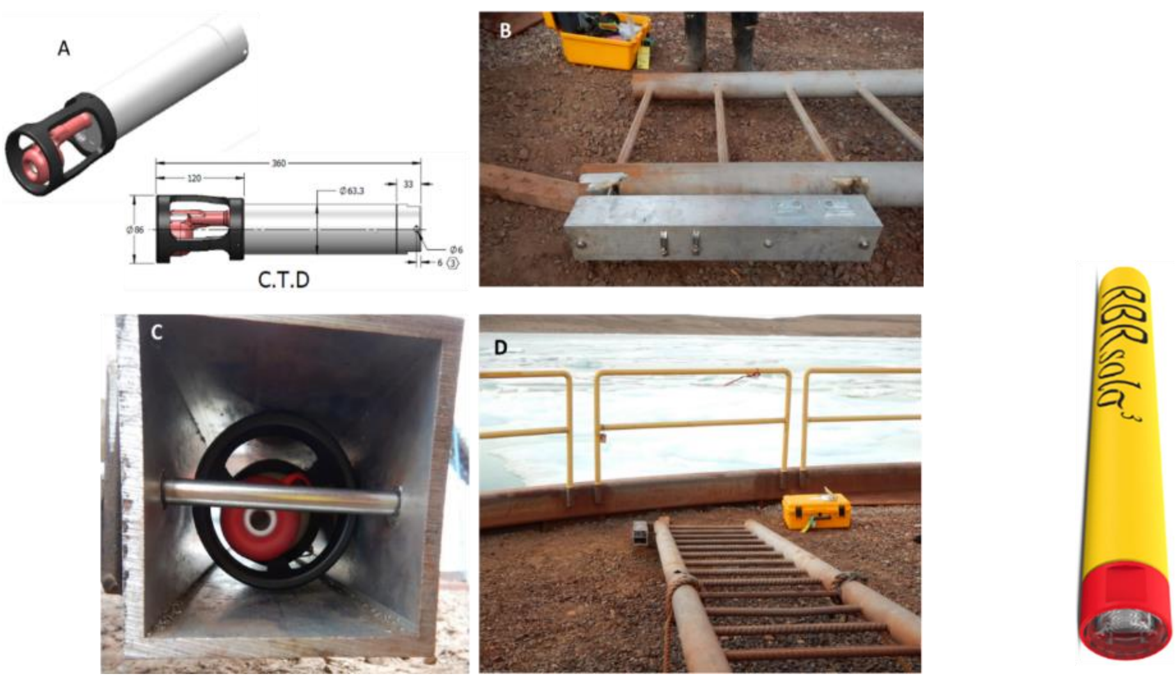


Figure 1: Overview of tide gauge installation. In 2021, an RBRsolo (right) will be included for redundancy.

2.0 TIDE GAUGE INSTALLATION

Step 1) Two 1/4" diameter holes need to be drilled in the aluminum tube. These holes will be used to add a length of 3mm 316 stainless steel wire rope as redundant security against a hardware failure (Figure 2). On the outside of the aluminum tube two zinc anodes should be replaced with new anodes and secured with one stainless steel bolt (316 stainless 1/2" x 1") per anode (Figure 5).

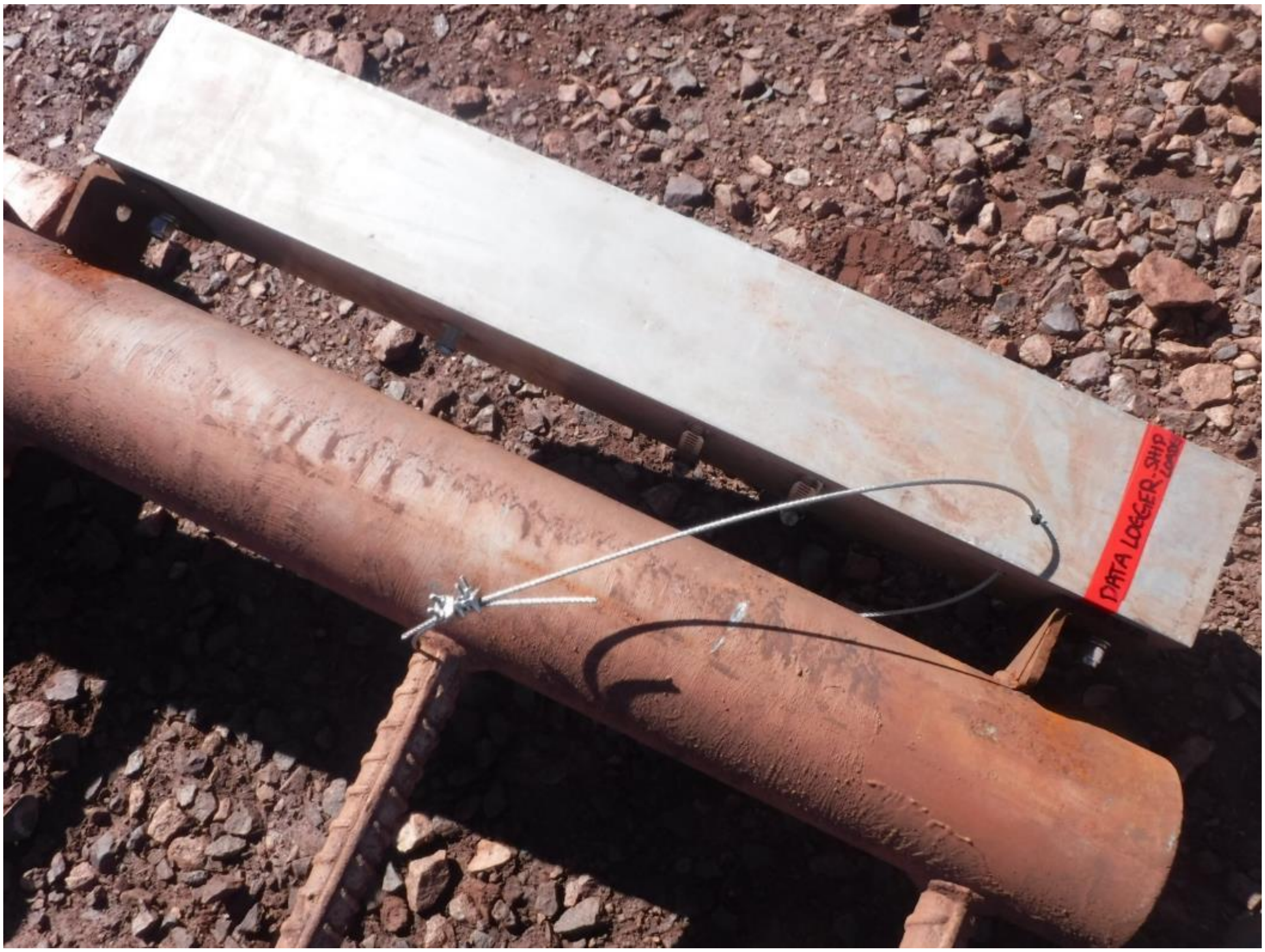


Figure 2: Hardware attaching aluminum tube to steel L brackets and wire rope for redundancy of the L bracket attachments.

Step 2) The redundant tide gauge (RBRsolo – small yellow cylinder) should be hose clamped to the primary tide gauge (RBRconcerto – white cylinder). The sensor on the RBRsolo (red end) should be facing the same direction as the sensor end of the RBRconcerto (red/black end). This configuration is shown in Figure 3. Measure and record the distance between the sensor on the primary tide gauge and the sensor on the redundant tide gauge.

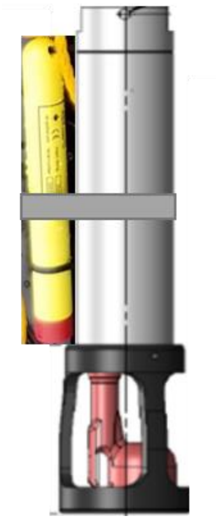


Figure 3: Configuration of an RBRsolo hose clamped to an RBRconcerto.

Step 3) The primary tide gauge (RBRconcerto – white Delrin cylinder) should be mounted inside the aluminum square tube with one stainless steel bolt (316 stainless 1/4" x 4 1/2"), washer, nylon shoulder washer, lock nut (Figure 4) and two stainless steel hose clamps wrapping around the body of both RBR loggers, using caution to not overtighten against the plastic housing. The bolt should be passed through the hole on the end cap of the primary tide gauge, making sure not to twist the end cap in the process, and secured to the square tube with nylon shoulder washers inserted in the drilled holes on the aluminium square tube (Figure 5). The white RBRconcerto (not the yellow RBRsolo) should rest against the aluminum tube.

Figure 4: Hardware attaching aluminum tube to L brackets and view of the primary tide gauge mounted in the tube. Arrow shows location of the ¼" bolt that should pass through the end cap of the primary tide gauge. Note that the redundant tide gauge is not shown in this photo, but would be sitting to the right of the primary tide gauge in this photo.

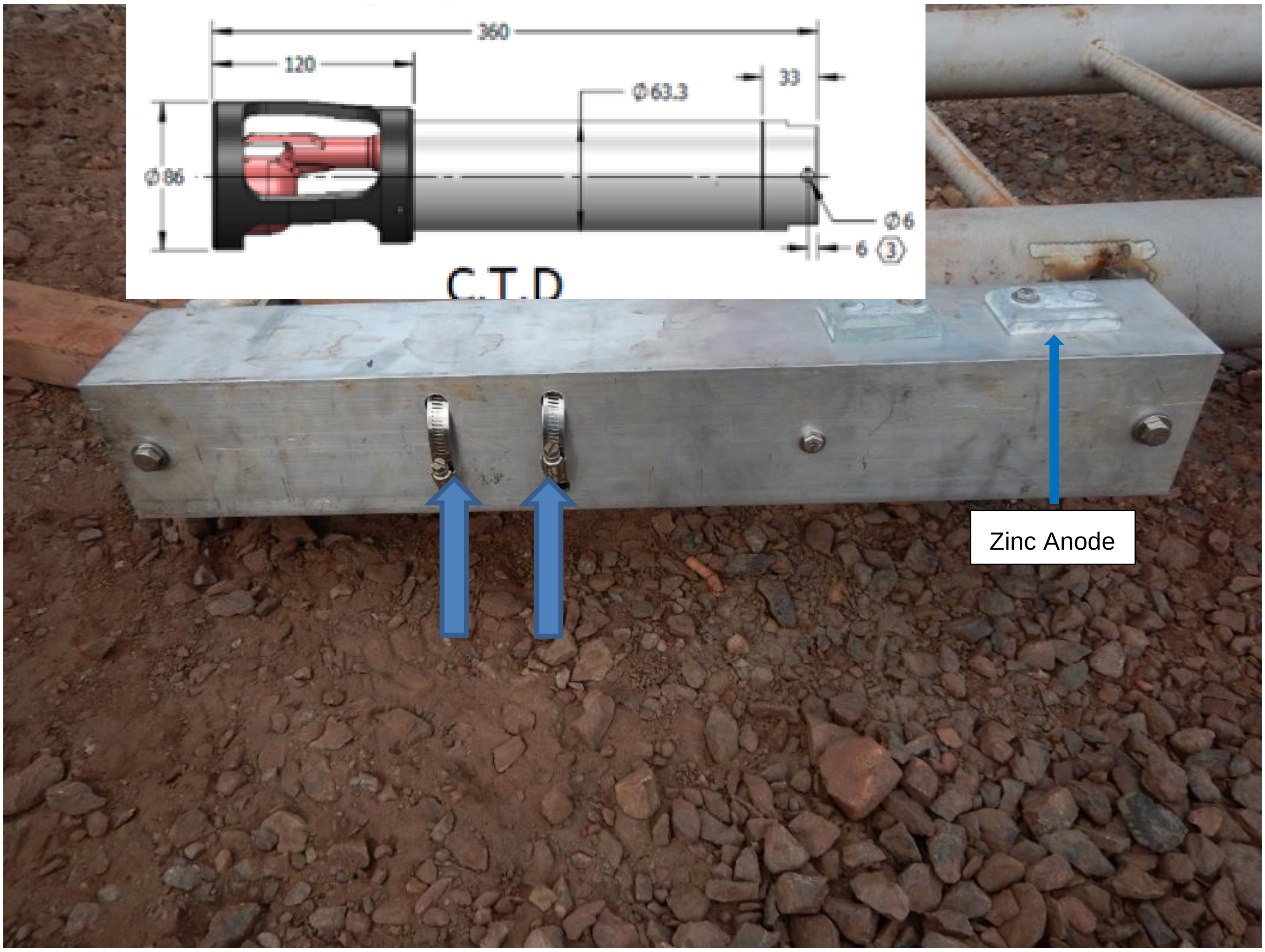


Figure 5: Hardware attaching primary and redundant tide gauge to tube. Arrows show the location of the hose clamps which mount the tide gauges to the square tube and the zinc anodes. In 2021, the two hose clamps should go around both the primary tide gauge and redundant tide gauge.

Step 4) The aluminum square tube is mounted to the ladder at two steel L brackets that are welded to the side of the bottom of the steel ladder located on the ore dock. The primary tide gauge should be mounted such that the red and black end cap is pointing downwards towards the seabed. The integrity of the welds on the ladder should be inspected before mounting the square tube. Mount the aluminum tube to the L brackets with stainless steel bolts (316 stainless 3/8" x 5"), washers, nylon shoulder washers, lock washers and lock nuts (Figure 6).

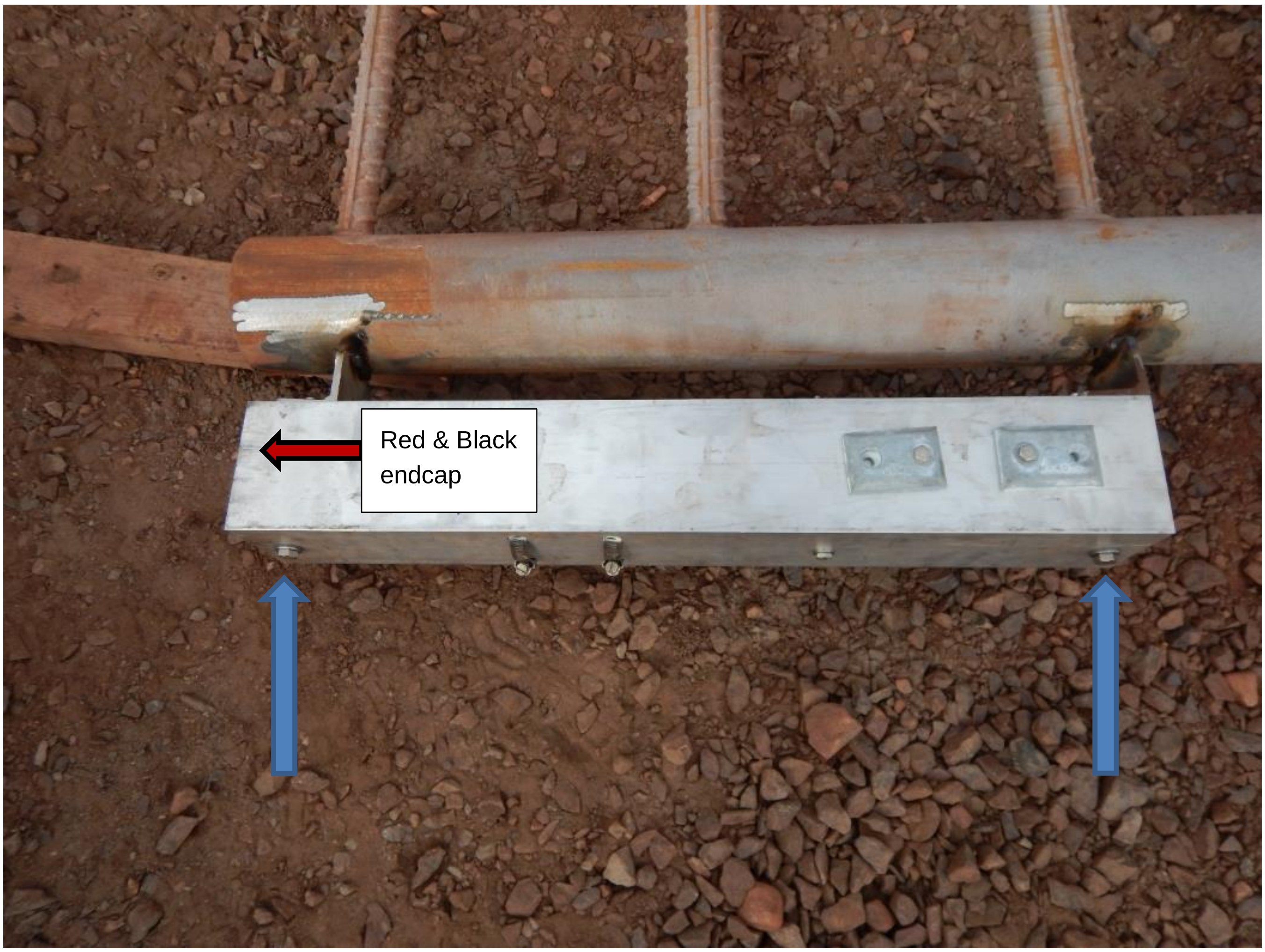


Figure 6: Aluminum square tube mounted to the bottom of the steel ladder located at the ore dock. Arrows show location of mounting bolts which attach the square tube to the welding tabs on the steel ladder.

Step 5) Add a length of 3 mm 316 stainless steel wire rope passed through the two holes on the square tube, and around the bottom ladder rung, and join wire rope together with 2 wire rope clips (1/8" stainless steel). This is to provide a redundant mounting system (Figure 2).

Step 6) Take photos during each step of the installation process for documentation purposes and provide a record of hardware used and any changes to the above steps.

Step 7) In 2018 the elevation and position of the ladder was surveyed using five survey points measured from an RTK GPS system. The following table provides the survey position and elevation of the primary tide gauge pressure sensor in 2018. The pressure sensor is located behind the plastic sensor cover on the downward facing end of the primary tide gauge (Figure 7). The distance from the bottom of the aluminum tube to a point at the top plate of the ladder and from the pressure sensor to a point at the top plate of the ladder was measured as 6.57 m and 6.42 m in 2018, respectively.

An RTK GPS survey will need to be conducted in 2021 to reference the steel ladder top plate and provide a reference for instrument to chart datum. Additionally, the distance from the primary tide gauge pressure sensor to the ladder top plate and from the bottom of the aluminum tube to the ladder top plate should be measured.

Table 1: RTK GPS survey 2018

Survey Point	Easting (m)	Northing (m)	UTM Zone	Elevation (m, CGVD)	Tide Gauge Elevation (m, CGVD)[1]
Point 01	503227.211	7976633.252	17W	3.505	-2.915
Point 02	503227.205	7976633.246	17W	3.516	-2.904
Point 03	503227.205	7976633.242	17W	3.491	-2.93
Point 04	503227.197	7976633.241	17W	3.495	-2.925
Point 05	503227.215	7976633.268	17W	3.496	-2.924
Average Elevation				3.501	-2.920

Notes: CGVD=Canadian Geodetic Vertical Datum; [1]Distance from the tide gauge pressure sensor to the surveyed steel ladder top plate is 6.42 m

Figure 7: Pressure sensor location, shown by the arrow, on the downward facing end of the primary tide gauge

Figure 8: RTK GPS survey conducted in 2018

3.0 HARDWARE LIST

The following is a list of necessary hardware to complete the tide gauge installation:

Item Description	Quantity
26” aluminum square tube	1
Stainless steel L-brackets	2
316 stainless steel hex bolt 5”- 3/8”	2
316 stainless steel lock nut 3/8”	2
316 stainless steel lock washer 3/8”	2
316 stainless steel washer 3/8”	4
Nylon shoulder washer 3/8”	4
316 stainless steel hex bolt 4 1/2”- 1/4”	2
316 stainless steel lock nut 1/4”	2
316 stainless steel washer 1/4”	4

Item Description	Quantity
Nylon shoulder washer 1/4"	2
Zinc anode	2
316 stainless steel hex bolt 1” – 1/2"	2
316 stainless steel washer 1/2"	2
316 stainless steel lock nut 1/2"	2
316 stainless steel ½” band width hose clamps 2 9/16”-3 1/2” diameter	2
3mm 316 stainless steel wire rope	1 roll
1/8” stainless steel wire rope clip	2

4.0 TIDE GAUGE RECOVERY

Upon recovery of the tide gauge from the ore dock ladder the following steps should be done.

Step 1) The distance from the primary tide gauge pressure sensor (Figure 7) and the bottom of the aluminum tube to the steel ladder top plate (Figure 8) should be recorded and accompanied by a photo of the measurements (i.e. a photo of the tape measure). The distance from the secondary tide gauge sensor to the primary tide gauge sensor should also be recorded.

Step 2) If determined applicable, data from both of the two tide gauges should be downloaded using the computer software program Ruskin before shipping. The software program Ruskin can be obtained from https://rbr-global.com/products/software. The following steps should be followed when using Ruskin:

- Unscrew the tide gauge end cap to expose the USB port and battery compartment.
- Plug one end of the data cable (found in the RBR logger box) into the RBR logger and the other end of the cable into the computer. The cable for both loggers should be a USB-C cable.
- Open the software program Ruskin. The instrument should appear in the Navigator tab under the subheading Instruments.
- Click on the Download tab and select “download”. Save the .RSK file to a location on the local machine.
- Disconnect the USB cable from the logger and computer.
- Screw the tide gauge end cap back on.
- DO NOT select stop logging or enable logging.
- DO NOT remove the batteries from the instrument.

APPENDIX 9B

Tide Gauge Calibration Documents

RBR Conductivity Calibration Certificate

RBRconcerto³ C.T.D|fast8 s/n: 207642

References: Autosal8400B#66289, MS-315#15506, SSW P163, RC#002

Reference Resistance (ohm)	Reference Conductivity (mS/cm)	Voltage Ratio, V	Measured Conductivity (mS/cm)	Calibration Error (mS/cm)
open	0.0000	-0.000104	-0.0003	-0.0003
694.023	6.1094	0.039142	6.1089	-0.0005
331.918	12.7744	0.081960	12.7742	-0.0002
150.011	28.2649	0.181483	28.2663	0.0014
100.007	42.3974	0.272263	42.3974	0.0000
75.013	56.5240	0.363012	56.5238	-0.0002
55.511	76.3819	0.490584	76.3821	0.0001
47.018	90.1790	0.579215	90.1787	-0.0003

Coefficients

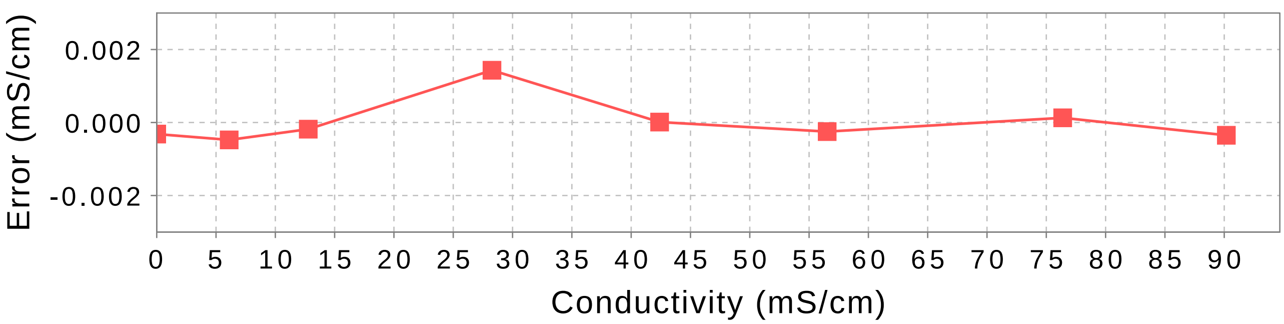
C0:	15.885748E-3
C1:	155.6639
X0:	435.98202E-6
X1:	-8.058266E-6
X2:	600E-9
X3:	14.90292
X4:	10

Bath	Voltage Ratio	Temperature (ITS-90)	Salinity (PSS-78)	Conductivity (mS/cm)
T15S35	0.2749927	14.90292	35.0002	42.8223
T25S35	0.3428941	25.30215	35.0038	53.3921

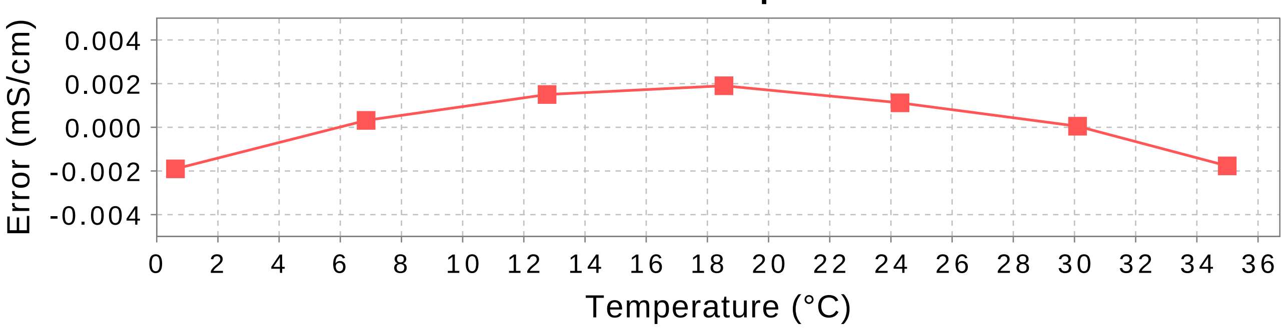
Cell Constant @T15S35 = 4.24004 1/cm

$$C_{cor} = \frac{C_0 + C_1 * V - X_0 * (T - X_3)}{1 + X_1 * (T - X_3) + X_2 * (P - X_4))}$$

Calibration error vs. Conductivity



Calibration error vs. Temperature



Calibration Date: 2021-06-09
Issue Date: 2021-06-09
File Name: 207642_20210609_1636C.rsk

Operator: Jeff Walker
jwalker

Approver:
kmalorny

RBR

Pressure Calibration Certificate

RBRconcerto³ C.T.D|fast8 s/n: 207642

Instrument rating: 50 dbar s/n: K296591

Nominal accuracy: 0.05%FS (0.025 dbar)

Reference instrument: Mensor CPC6050 s/n: 41000CAM

Applied pressure, P_{app} (dbar)	Voltage ratio, V	Measured pressure, P_c (dbar)	Calibration error (dbar)
10.058	0.048683	10.0568	-0.0009
15.000	0.069505	15.0016	0.0019
19.999	0.090546	19.9997	0.0003
25.000	0.111586	24.9991	-0.0004
30.000	0.132625	29.9992	-0.0006
34.999	0.153661	34.9994	-0.0000
40.000	0.174695	39.9992	-0.0003
45.000	0.195735	45.0005	0.0006
50.000	0.216768	50.0000	0.0002
55.000	0.237808	55.0002	0.0003
60.000	0.258848	59.9998	-0.0004

Coefficients

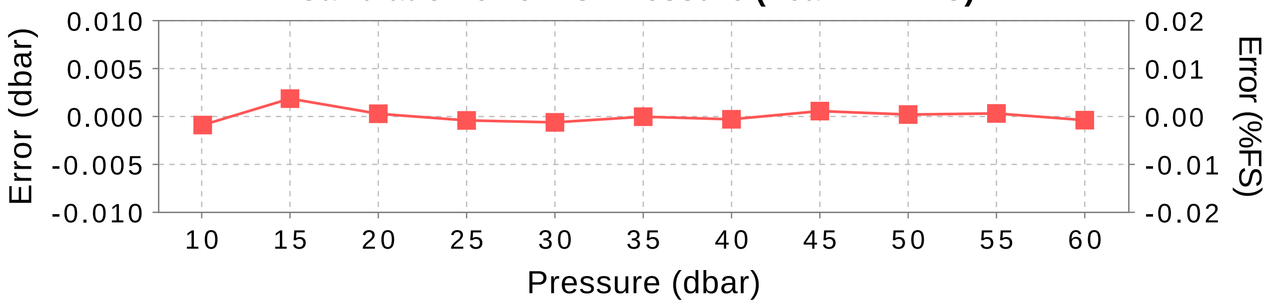
C0:	-914.03097E-3
C1:	237.17517
C2:	3.0330358
C3:	-5.737307
X0:	10.0577
X1:	7.842538E-3
X2:	48.955848E-6
X3:	214.32402E-9
X4:	-93.56487E-6
X5:	21.411144

$$P_c = X_0 + \frac{P_m - X_0 - X_1(T - X_5) - X_2(T - X_5)^2 - X_3(T - X_5)^3}{1 + X_4(T - X_5)}$$

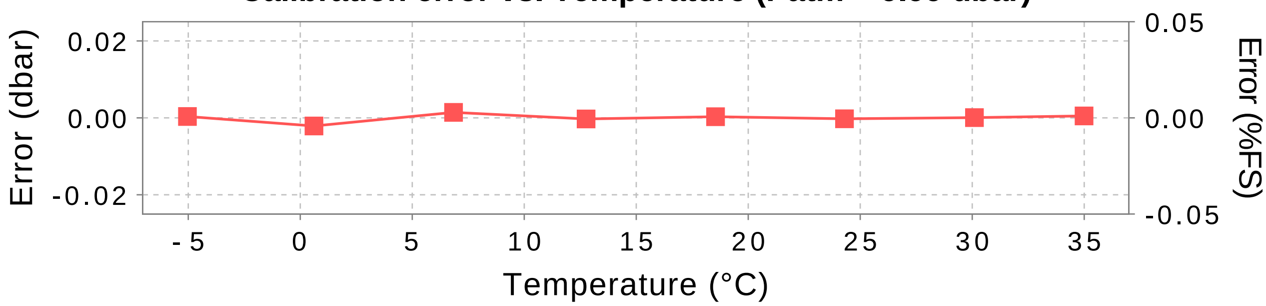
Head (mm) = 582

$$P_m = C_0 + C_1 V + C_2 V^2 + C_3 V^3$$

Calibration error vs. Pressure (Tcal = 21.4°C)



Calibration error vs. Temperature (Patm = 9.99 dbar)



Calibration Date: 2021-06-08

Issue Date: 2021-06-08

File Name: 207642_20210608_1308P.rsk

Operator: afalicki

Approver: kmalorny

Temperature Calibration Certificate

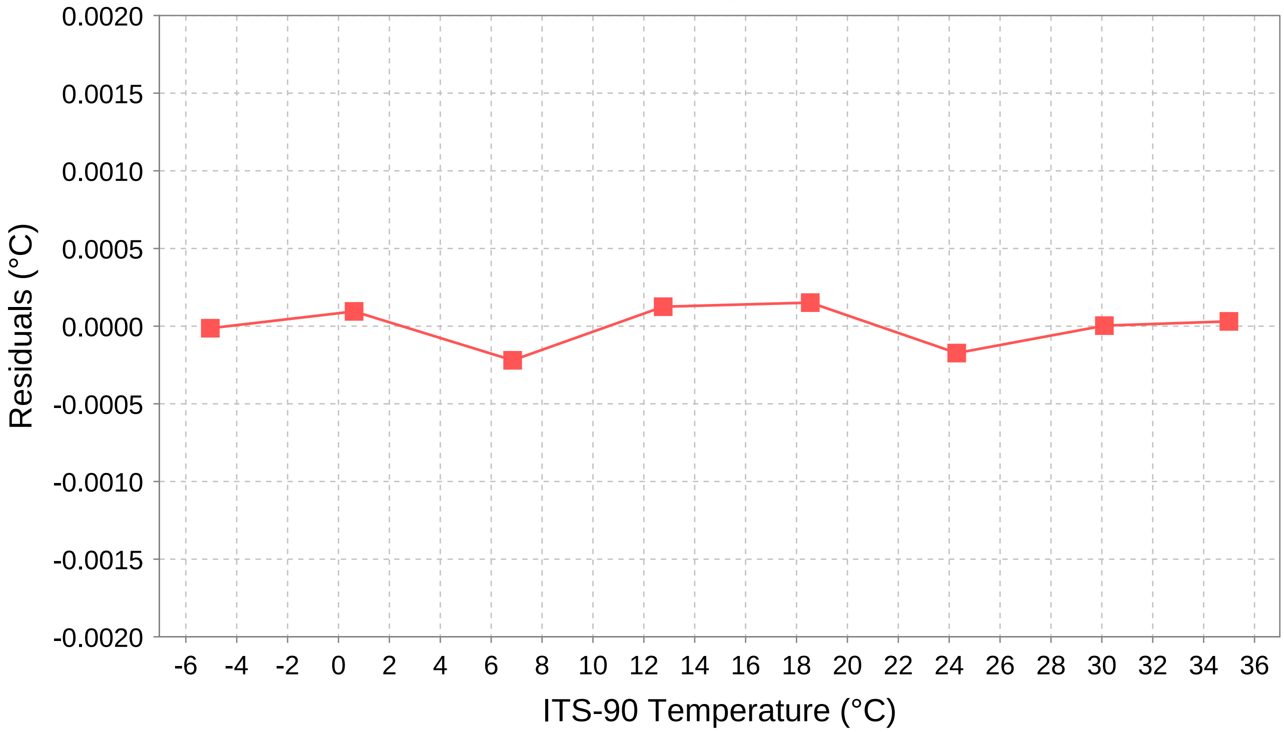
Logger ID: RBRconcerto³ Serial No: 207642 Channel No: 2

Reference Temperature, ITS-90	Voltage ratio, V	Measured Temperature, ITS-90	Calibration error
-5.03738	0.809066	-5.03740	-0.00001
0.61233	0.759575	0.61242	0.00010
6.84396	0.698114	6.84374	-0.00022
12.76012	0.634821	12.76024	0.00013
18.54150	0.570482	18.54165	0.00015
24.29690	0.506246	24.29672	-0.00017
30.09958	0.443430	30.09958	0.00000
34.99299	0.393305	34.99302	0.00003

Coefficients

C0:	3.3555604E-3
C1:	-255.52773E-6
C2:	2.389719E-6
C3:	-87.325716E-9

Residuals vs. Temperature



Calibration Date: 2021-06-04
Issue Date: 2021-06-07
Calibration ID: 47061

Operator: kmalorny

Approver: kmalorny

RBR

Pressure Calibration Certificate

RBRsolo³ D s/n: 207643

Instrument rating: 20 dbar s/n: M135739

Nominal accuracy: 0.05%FS (0.01 dbar)

Reference instrument: Mensor CPC6000 s/n: 612676

Applied pressure, P_{app} (dbar)	Voltage ratio, V	Measured pressure, P_c (dbar)	Calibration error (dbar)
10.096	0.139343	10.0955	-0.0008
12.000	0.162607	12.0018	0.0017
13.999	0.186948	13.9998	0.0004
16.001	0.211277	16.0002	-0.0003
18.000	0.235554	17.9994	-0.0005
20.000	0.259806	19.9997	-0.0004
22.000	0.284019	22.0000	-0.0001
24.000	0.308199	24.0003	0.0002
26.000	0.332342	26.0005	0.0005
28.000	0.356448	28.0004	0.0003
30.000	0.380514	29.9997	-0.0004

Coefficients

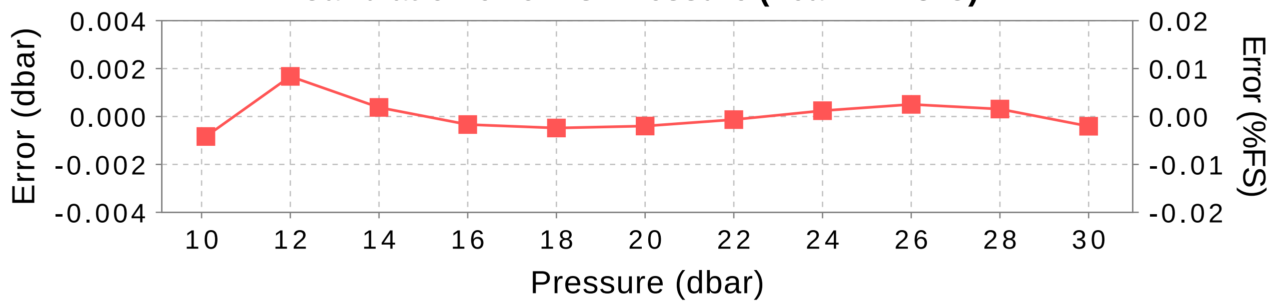
C0:	-665.38525E-3
C1:	81.00648
C2:	3.3388352
C3:	-965.59364E-3
X0:	10.0963
X1:	7.7618468E-3
X2:	78.86402E-6
X3:	572.53436E-9
X4:	293.02313E-6
X5:	21.342314

$$P_c = X_0 + \frac{P_m - X_0 - X_1(T - X_5) - X_2(T - X_5)^2 - X_3(T - X_5)^3}{1 + X_4(T - X_5)}$$

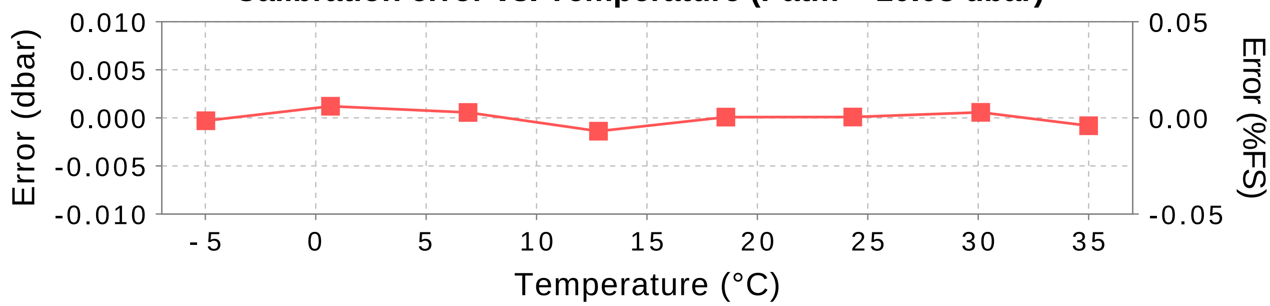
Head (mm) = 589

$$P_m = C_0 + C_1 V + C_2 V^2 + C_3 V^3$$

Calibration error vs. Pressure (Tcal = 21.3°C)



Calibration error vs. Temperature (Patm = 10.03 dbar)



Calibration Date: 2021-06-09
Issue Date: 2021-06-10
File Name: 207643_20210610_1033P.rsk

Operator: afalicki

Approver: kmalorny

APPENDIX 9C

Tide Gauge Data Deliverable (delivered electronically)