Appendix 46

2021 Wildlife and Country Foods Screening Level Assessment

AGNICO EAGLE

MEADOWBANK GOLD PROJECT

2021 Wildlife and Country Foods Screening Level Risk Assessment

In Accordance with NIRB Project Certificate No.004

Prepared by:

Agnico Eagle Mines Limited – Meadowbank Complex

March, 2022

EXECUTIVE SUMMARY

In 2006 and 2016/2019, pre-construction effects assessments were conducted to predict changes in risk to wildlife and human receptors from chemical contaminants associated with the Meadowbank and Whale Tail Pit projects. According to Condition 67 of NIRB Project Certification No.004, this report presents results of the updated assessment conducted using field data collected in 2021, to evaluate risk under current operational conditions. The general approach and methodology of this assessment are based on those presented in the pre-construction risk assessments for the Meadowbank and Whale Tail sites (Azimuth, 2006; Golder, 2019a,b).

Wildlife Assessment

For the wildlife assessment, risk to receptors of concern (ungulates, small mammals, songbirds, waterfowl, and shorebirds) obtaining food and water from onsite, near-site, AWAR, Whale Tail Haul Road, Whale Tail site, and Tailings Storage Facility (TSF) locations in 2021 was evaluated. Contaminants of potential concern (COPCs) were identified by screening measured concentrations in soil, water, tailings sediment and tailings water against regulatory guideline values that are protective of wildlife health (primarily CCME's Soil Quality Guidelines for the Protection of Environmental Health, and Water Quality Guidelines the Protection of Agriculture, where available) and maximum measured baseline +10% (Appendix A). For onsite, near-site, AWAR, Whale Tail Haul Road, and Whale Tail Site locations no COPCs were retained through this screening process[1], so these exposure pathways were not required to be evaluated further. Concentrations for several parameters in tailings sediment and water exceeded screening values, so the TSF pathway was carried forward to the quantitative risk characterization.

Exposure to TSF contaminants (estimated daily intake; EDI) was calculated from maximum measured concentrations in TSF media, and toxicity reference values (TRVs) were identified from lowest-observed adverse effect levels (LOAELs) from the literature, as used in previous assessments. Hazard quotient (HQ) values were calculated as: HQ = EDI / TRV. Risk was characterized as negligible when HQ ≤ 1.

Risks associated with the TSF pathway were found to be negligible (HQ≤1) for all ROCs under previously used (Golder, 2019b) assumptions for exposure factors, with the exception of three COPCs for shorebirds (arsenic, chromium, cyanide) (Appendix B). When assumptions for exposure concentration and time-in-area were refined using more site-specific but still conservative values (average instead of maximum concentration; eight days of exposure instead of 4 weeks), risk was found to be negligible for all COPCs.

Human Health - Country Foods Assessment

In addition to the wildlife assessment, an evaluation of risks to human receptors from contaminant exposure through consumption of country foods was conducted. For the established exposure pathways (consumption of animals selecting territories at onsite, near-site, AWAR, Whale Tail Haul Road, and Whale Tail Site locations), COPCs were identified by comparing measured concentrations in soil and water to regulatory guideline values that are protective of human health (primarily CCME's Soil Quality Guidelines for the Protection of Human Health, and Health Canada's Guidelines for

[1]Concentrations of barium and strontium exceeded screening values in one soil sample, but they were not retained as COPCs based on further analysis, as described in the report.

Canadian Drinking Water Quality, where available). All measured concentrations in soil and water met screening values so no COPCs were identified and quantitative risk characterization was not required.

Overall, this 2021 assessment supports FEIS-stage predictions (Azimuth, 2006; Wilson Scientific, 2006; Golder, 2019a,b) that operation of the Meadowbank and Whale Tail sites would not increase risks to wildlife and human consumers of country foods from ingestion of chemical contaminants.

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1 INTRODUCTION

1.1 BACKGROUND

In accordance with Condition 67 of NIRB Project Certificate No.004, a human health (country foods) and wildlife screening level risk assessment ($HHRA_{country\ foods}$ and WSLRA) has been completed for the Meadowbank site every 3 – 4 years since 2011, following the pre-construction HHRA and WSLRA completed in 2006 as part of the original Meadowbank Project FEIS (Azimuth, 2006; Wilson Scientific, 2006).

In 2016 and 2019, pre-construction human health and ecological risk assessments (HHERAs) were also completed for the Whale Tail Pit and Whale Tail Pit Expansion Project FEIS.

While the goal of the pre-construction risk assessments was to determine potential risks to wildlife and human receptors from the identified contaminants of potential concern (COPCs) under projected future site conditions, the aim of this and previous follow-up assessments (2011, 2014, 2017) is to characterize risk under current operational conditions.

According to the Wildlife Screening Level Risk Assessment Plan (a component of the Terrestrial Ecosystem Monitoring Plan), this assessment follows a hazard quotient (HQ) approach based on food-chain modeling developed by Azimuth Consulting Group Inc. for the pre-construction WSLRA (Azimuth, 2006), with updates based on the 2019 HHERA for the Whale Tail Pit Expansion Project (Golder, 2019a) and Ecological Risk Assessment for the Tailings Storage Facility (Golder, 2019b). The risk assessment framework follows various standard Canadian and American sources (e.g. CCME, 1996; USEPA, 1992, 1998; Health Canada, 2012).

Briefly, for this 2021 assessment, measured concentrations of contaminants in soil and water samples collected from the six study locations (onsite, near-site, All-Weather Access Road, Whale Tail Haul Road, Whale Tail Site, and TSF) were screened against regulatory guideline values and measured baseline concentrations to identify current-year COPCs for inclusion in the quantitative risk characterization. Exposure of the receptors of concern (ROCs) to COPCs was calculated as an estimated daily intake value (EDI) according to literature-based or site-specific ingestion rates, dietary preferences, and time spent in the area. Calculated EDIs were compared to toxicity reference values (TRVs) from the literature to determine HQs (wildlife target HQ ≤ 1.0; human health target HQ ≤ 0.2).

1.2 FEIS PREDICTIONS

In the initial 2006 WSLRA, negligible risks were found under baseline conditions for all identified contaminants of potential concern (COPCs) except chromium, which was determined to pose an improbable but potential risk for songbirds at naturally occurring concentrations. Exposure concentrations were not expected to increase significantly during operations, so potential risks were not expected to change from baseline conditions for wildlife and human receptors (country foods consumption). Results of post-construction assessments in 2011, 2014, and 2017 supported those predictions.

In 2016, Agnico completed a human health and ecological risk assessment for the Whale Tail Pit Project FEIS, with updates in 2019 as part of the Whale Tail Pit Expansion Project FEIS Addendum process. Predicted concentrations for soil and water at Whale Tail Site and Haul Road locations met screening values, so no residual impacts to wildlife and human health through country foods consumption were predicted as a result of this Project phase (Golder, 2019a). The associated August

2019 assessment for exposure of wildlife receptors to contaminants in the Tailings Storage Facility (TSF) indicated that risks were acceptable (HQ <1 for all receptors) (Golder, 2019b).

1.3 2021 FIELD SAMPLING

In 2021, soil, water, and vegetation samples were collected in support of both the wildlife and human health risk assessment programs.

The complete SOP for sample collection is provided in the WSLRA Plan (V5, August 2021 or most recent version), and photos of 2021 samples are shown in Appendix C.

According to the Plan, monitoring locations include four Meadowbank minesite (onsite) locations, three near-site locations, one AWAR location, two Whale Tail Pit locations, one Whale Tail Haul Road (WTHR) location and three external reference locations (Figures 1 and 2). For each location, samples of each media type (surface soil, sedge, lichen, berry) were collected in August from three previously determined sites. Sites were approximately 150 – 300 m apart. Samples were analyzed by an accredited laboratory for concentrations of the chemical parameters selected for screening (primarily metals – see Sections 2.1.4 and 3.1.3)

Water chemistry results used in this assessment were from the Core Receiving Environment Monitoring Program (2021 CREMP Report, an appendix of the 2021 Meadowbank Complex Annual Report) in Second Portage Lake (SP), the east and north basins of Third Portage Lake (TPE, TPN), Tehek Lake (TE), Whale Tail Lake South, and Mammoth Lake (Figures 1 and 2). External reference samples are from Inuggugayualik Lake and Pipedream Lake. Water sample collection procedures are described in the CREMP Plan (Azimuth, 2015), and results for all 2021 samples (March, May, June, July, August and September) were used in the evaluation.

For the TSF effects assessment, tailings material (“sediment”) samples from mill effluent were collected approximately monthly by mine site technicians. Results for May through August were considered in this evaluation, since they coincide with shorebird presence in the area (the only receptor assessed for tailings sediment ingestion – see Section 2.1.1). While these samples are appropriate for comparison to Golder (2019b) which used the same source, it is noted that they likely represent conservatively high exposure concentrations, since some parameters (e.g. cyanide) are expected to degrade over time in the TSF. In subsequent assessment, direct analysis of TSF sediment material will be considered. In addition, samples of ponded water in the North and South Cell were collected throughout the open water season (June – October) by mine site technicians, and results for all months were included in the evaluation. It is noted is that this water source is seasonal ponded snowmelt, since these tailings storage cells are pumped dry prior to freeze-up in the fall.

In 2021, tailings sediment samples were also collected from the TSF to evaluate the presence of aquatic benthic invertebrates in this area for use in the shorebird exposure assessment. Samples were collected on August 19 from two locations in the South Cell and three locations in the North Cell (complete methods in Appendix D).

1

Wally 4

Wally Lake

Vault Waste Rock Storage Facility

Vault Lake

Vault and Phaser Pits

Phaser Lake

Turn Lake

T7

Drilltrail Lake

Tailings Storage Facility

Portage Waste Rock Storage Facility

Dogleg North

T1

Dogleg Pond

North Basin

Third Portage Lake

Portage and Goose Pits

T2

Second Portage Lake

Bay Goose Basin

T6

T3

T5

East Basin

T4

0 0.75 1.5 3

Kilometres

2

Wally 3

T8

0 0.75 1.5 3

Kilometres

3

Pipedream Lake

C3

C2

Inuggugayualik Lake

C1

0 2.5 5 10

Kilometres

Legend

Soil/Veg Sampling Location

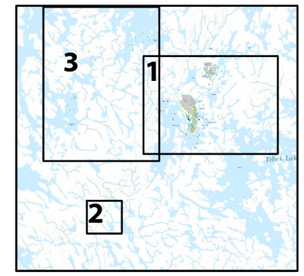
- Onsite
- Near Site
- External Reference
- AWAR

Water Sampling Location

- Onsite
- Near Site
- External Reference

Mine Plan

- Dewatered Lake
- Roads
- Pits
- Airstrip
- Dikes
- Facilities
- Waste Rock & Tailing Storage Facility
- Stormwater Management Pond



Meadowbank HHERA Sampling Locations

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PROJECT: DA11-062-06

CLIENT: Agnico-Eagle Mines Ltd., Meadowbank Div.

N W E S
UTM Zone 14 NAD83

DATE: FEBRUARY 2022

SCALE: 1:50,000

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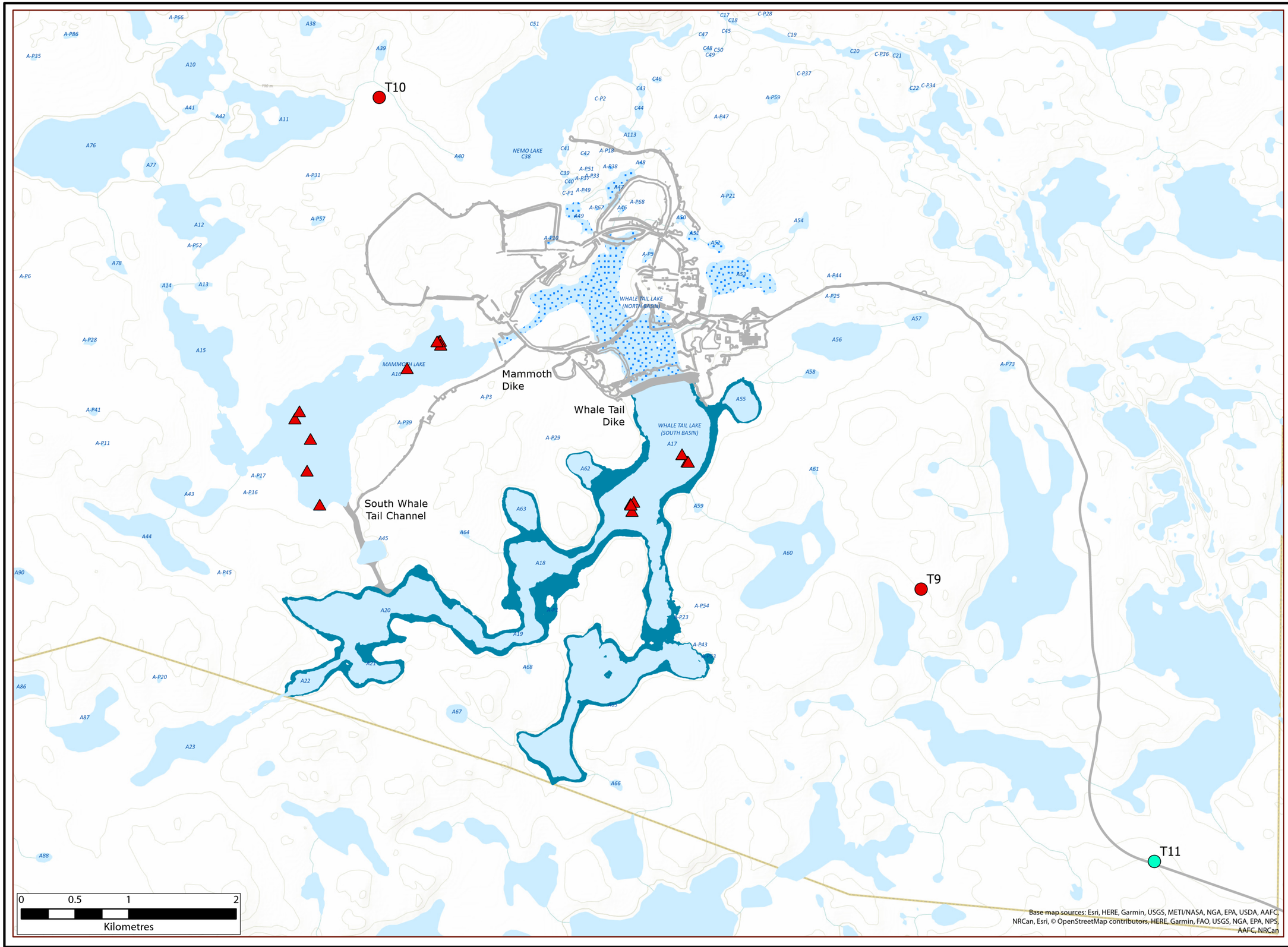
CHECKED BY:

FIGURE:

1



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Legend

- Water Sampling Location
- Soil/Veg Sampling Location
- Soil/Veg Sampling Location - WTHR
- Dewatered Lake
- Infrastructure

South Whale Tail Lake Elevations

- Baseline Water Level
- Flood Zone

Whale Tail HHERA Sampling Locations

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PROJECT: DA11-062-06

CLIENT: Agnico-Eagle Mines Ltd., Meadowbank Div.

N W E S
UTM Zone 14 NAD83

DATE: JANUARY 2022

SCALE:

DRAWN BY: LC, JS, NW

CHECKED BY:

FIGURE:

2

2 WILDLIFE ASSESSMENT

2.1 PROBLEM FORMULATION

This assessment evaluates risks to wildlife receptors of concern (ROCs) from contaminants of potential concern (COPCs) measured in 2021 for exposure pathways as identified in the WSLRA Plan (Version 5; August 2021). Receptors, protection goals, exposure pathways, and COPCs are summarized below, and the conceptual model is shown in Figure 3.

2.1.1 Receptors of Concern

For regular tundra exposure pathways (onsite, near-site, AWAR, WTHR, Whale Tail site locations) the WSLRA considers four groups of receptors of concern (ROCs): ungulates, small mammals, waterfowl and songbirds. These receptors were determined from the project's initial environmental impact assessment, which included discussions with stakeholders, public meetings, traditional knowledge and experience from other mines. Specifically, the WSLRA focusses on Caribou, Canada Goose, Lapland Longspur and Northern Red-Backed Vole as representative species.

This updated assessment also includes an evaluation of risks to all original receptors, plus shorebirds (as represented by Semi-Palmated Sandpiper) from contaminants within the TSF, based on a commitment made during the Whale Tail Pit project Final Hearing, following discussions with Environment and Climate Change Canada (ECCC).

Receptor-specific values such as dietary preferences that are used in this assessment are further discussed in Section 3.1.

2.1.2 Protection Goals and Endpoints

The assessment endpoint is no adverse effect of COPCs on populations of the ROCs. The ecotoxicological benchmarks used in this risk assessment are lowest observable adverse effect levels (LOAELs), which are generally considered to be appropriate for determining risk at the population level (as in Azimuth, 2006).

2.1.3 Exposure Pathways

In this assessment, risk is characterized separately for TSF, main Meadowbank minesite (onsite), near-site, AWAR, Whale Tail Pit, and Whale Tail Haul Road locations, in order to determine whether those animals choosing territories at any mine-related location are at increased risk compared to those choosing territories at nearby reference locations. Risk for shorebirds as represented by Semi-palmated Sandpiper is determined for the TSF location only, based on recommendations from ECCC and commitments made during the 2018 Whale Tail Final Hearings.

As shown in Figure 3, the following exposure pathways were investigated for each location and ROC combination, according to the WSLRA Plan (tundra locations = onsite, near-site, AWAR, Whale Tail Site and WTHR locations):

Small mammals –

- TSF location: ingestion of tailings water
- Tundra locations: ingestion of insects, plants, water; incidental ingestion of soil

Ungulates –

- TSF location: ingestion of tailings water
- Tundra locations: ingestion of plants, water; incidental ingestion of soil

Songbirds –

- TSF location: ingestion of tailings water
- Tundra locations: ingestion of insects, plants, water; incidental ingestion of soil

Waterfowl –

- TSF location: ingestion of tailings water
- Tundra locations: ingestion of insects, plants, water; incidental ingestion of soil

Shorebirds –

- TSF location: ingestion of tailings water and tailings benthic invertebrates; incidental ingestion of tailings sediment
- Tundra locations: not evaluated[2]

Inhalation and dermal absorption of metals are generally considered to be insignificant in comparison to exposures through ingestion (USEPA, 2005), so they are not considered in Meadowbank WLSRA.

[2] Based on discussions with ECCC during the permitting process for the Whale Tail Pit Expansion Project, assessment of risk to shorebirds was required to be added for the TSF pathway only (as in Golder, 2019b).

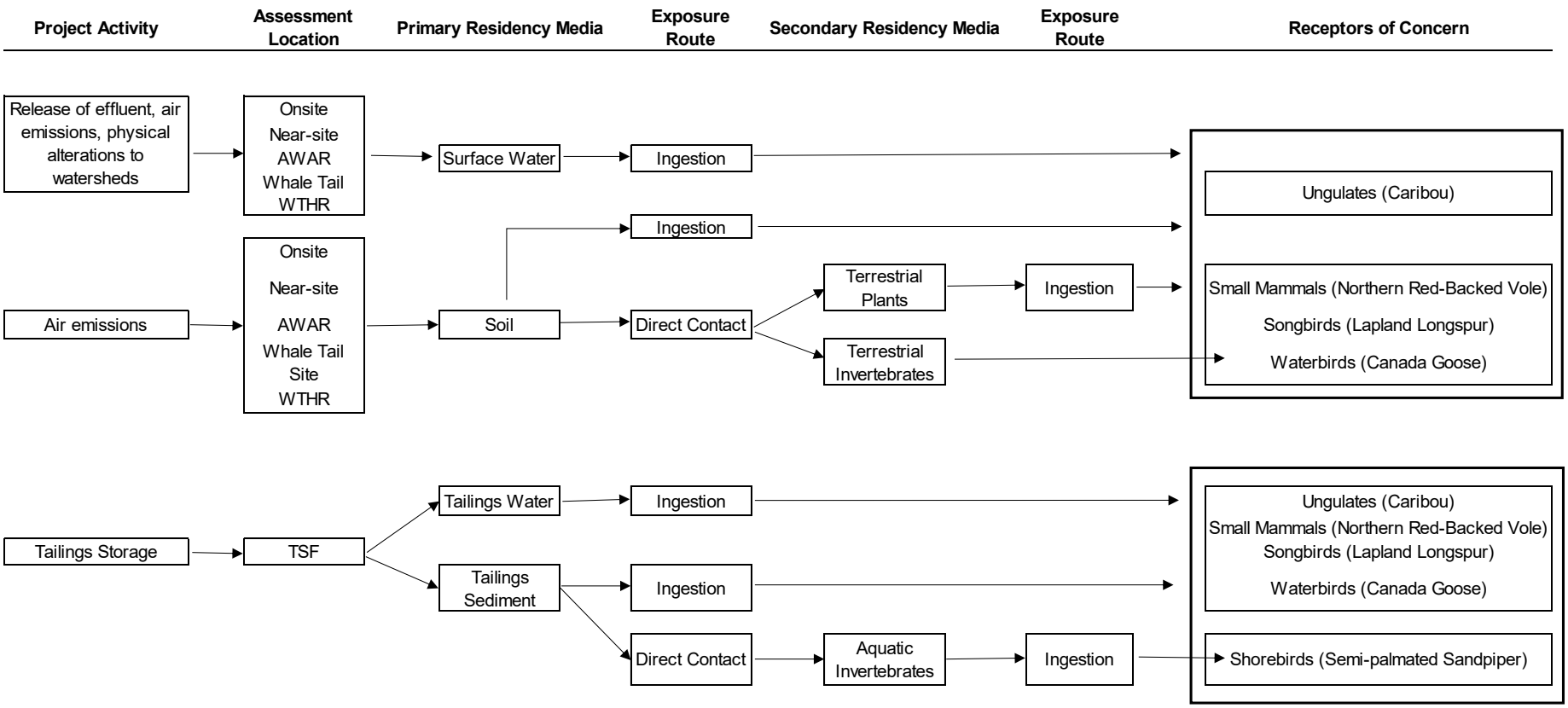

Figure 3. Wildlife risk assessment conceptual model.

2.1.4 Contaminants of Potential Concern (COPCs)

To identify COPCs, measured concentrations in primary residency media (Figure 3 -soil, lake water, tailings sediment, and tailings water) were screened against established regulatory guideline values that are protective of wildlife health or maximum measured baseline +10% (where baseline is greater than guideline values), as in Golder (2019a,b).

If measured concentrations in these primary residency media exceeded screening values, the parameter was retained as a COPC for quantitative risk characterization. The quantitative risk characterization makes use of measured concentrations in soil, water, and vegetation tissue samples collected in 2021 to calculate daily exposure, according to the established food chain model (as described in the WSLRA Plan, March 2022)[3].

If measured concentrations in primary residency media were less than screening values, then the parameter was not considered to be of potential toxicological concern (i.e. was not a COPC), and no further assessment was required (i.e. if soil and drinking water are not "contaminated", it is assumed that vegetation and insects consumed by wildlife would not be "contaminated"). These pathways are represented visually in Figure 3.

Parameters selected for screening included all metals with CCME Soil Quality Guidelines for the Protection of Environmental and Human Health (CCME, 2022b) or CCME Canadian Water Quality Guidelines for the Protection of Agriculture (CCME, 2022c), plus COPCs identified in previous Meadowbank WSLRAs (manganese and strontium were identified as COPCs in 2006 because predicted concentrations in mine rock dust sources exceeded baseline soil concentrations; cyanide was identified as a COPC for the TSF pathway in 2019).

All screening parameters, guideline values, baseline concentrations (where required), and measured concentrations in primary residency media are presented in Appendix A and screening results are discussed below for each medium.

Soil *(Appendix A)* – Maximum measured concentrations in soil were screened against CCME's Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health (CCME 2022b - SQG_E) for residential land use (primary source), British Columbia's Contaminated Sites Regulation guidelines for environmental protection (BC CSR, 2021a) (secondary source, where CCME guidelines were unavailable), and maximum measured baseline concentrations +10% (from Azimuth, 2006; Golder, 2019a,b) where required (no guideline available, or baseline exceeded guidelines). All concentrations in soil met screening values (Appendix A, Tables A1 – A4), with the exception of a single sample (T10-2), which exceeded screening values for barium and strontium (Figure 4). In the absence of a regulatory guideline value, results for strontium were compared only to baseline concentrations, and the guideline value for barium is the CCME general guideline for all receptors (no SQG_E is available). Additional review of all analytical results for this sample identified it as an apparent outlier, as justified further below. Firstly, concentrations of many non-mine related parameters (e.g. calcium, potassium, magnesium) at T10-2 were also ~10x greater than adjacent T10 samples, which are collected within ~150 m (Figure 2, Figure 4). Secondly, the T10 location is 1 km upwind of the Whale Tail site, well outside the deposition zone for fugitive dust (generally less than

[3] Following screening, risk characterization was only required for the TSF pathway in 2021, which does not include ingestion of vegetation (Figure 3). Therefore the vegetation samples collected in 2021 were analyzed, but results were not required in this assessment.

500 m; FEIS Expansion Project App 4-C – Air Quality Modelling), which is the only identified project source for potential impacts to contaminants in soil. Further, no increase in barium and strontium concentrations was recorded at locations downwind of the Whale Tail site (T9, T11) or adjacent T10 stations (T10-1, T10-3, located within 150 m of T10-2). These factors strongly indicate T10-2 sample contamination or a localized mineral deposit leading to natural variation in soil concentrations, rather than atmospheric deposition patterns, suggesting that the elevated result is not mine-related. As a result, and since both barium and strontium concentrations in soil met better-established human health screening values (see Section 3.1.3), they were not retained as wildlife COPCs in this evaluation. To help confirm these assumptions, all five soil sampling sites at T10-2 will be assessed in the next WSLRA field program, rather than a random three sites (see Recommendations, Section 4.3).

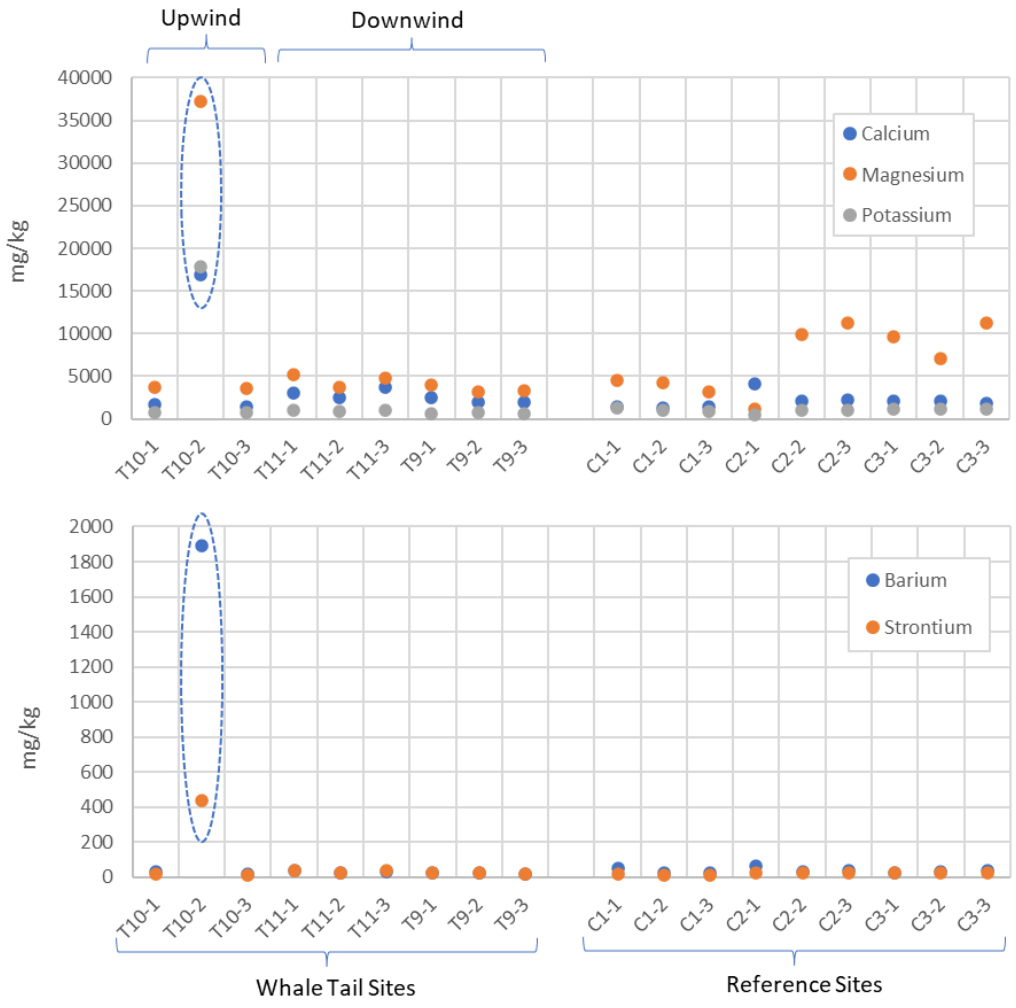

Figure 4. Measured concentrations of select parameters for Whale Tail Site and Reference Sites in 2021 showing the apparent outlier sample T10-2. Location T10 is upwind of the mine site, while T9 and T11 are downwind, suggesting results at T10-2 are not mine-related.

Lake Water *(Appendix A)* – Maximum measured concentrations of COPCs in lake water were screened against CCME and BC MOE Livestock Watering Guidelines (CCME, 2022c;; BC MOE, 2021) and baseline concentrations +10%. Where livestock watering guidelines were not available, results were screened against Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life (CCME, 2022a). All concentrations in water met their respective screening values (Appendix A, Tables A9 – A15), and therefore none were carried forward as COPCs in this evaluation.

TSF Water and Sediment (*Appendix A*) – As described in Golder (2019b), for the incidental ingestion pathway considered in this assessment, tailings sediment was considered as soil and maximum measured concentrations of COPCs were screened against CCME Soil Quality Guidelines for the Protection of Environmental and Human Health (CCME, 2022b) for residential land use (primary source) and British Columbia Contaminated Sites Regulation guidelines for environmental protection (BC CSR, 2021a) (secondary source). Water chemistry results for ponded reclaim water were screened against CCME and BC MOE Livestock Watering Guidelines (CCME, 2022c; BC MOE, 2021). Results of this screening are provided in Appendix A for informational purposes only. Measured 2021 concentrations for a number of contaminants exceeded screening values, as well as measured concentrations used in the Golder (2019b) assessment, so the complete suite of previously identified COPCs was retained here.

Summary - Since no COPCs were identified in soil and lake water, only the TSF pathway was carried forward to the quantitative risk characterization.

2.2 EXPOSURE ASSESSMENT

Exposure assessment is used to calculate the dose of each COPC received by each ROC for each complete exposure pathway. For this assessment, only the TSF pathway of exposure was evaluated, because all soil and lake water results met screening criteria, so no COPCs were retained (Section 2.1.4).

This exposure assessment uses the food chain model developed by Azimuth (2006), and updated based on methods from the Whale Tail site assessments (Golder (2019a,b) as described below. The model was developed to calculate daily exposure based on COPC concentrations in food items and drinking water, dietary preferences, ingestion rates and dose-adjustment factors.

As in the previous TSF assessment (Golder (2019b), estimated daily intake of each COPC was calculated for the TSF exposure pathway as:

$$EDI = I_{w,s,f} \times C_{w,s,f} \times T \times BF$$

Where:

EDI = estimated daily intake (mg/kg body weight/day)

$I_{w,s,f}$ = intake of water, soil/sediment and food items (L/kg ww/d; kg dw/kg ww/d; kg dw/kg ww/d)

$C_{w,s,f}$ = concentration of COPC in water, soil and food items (L/kg ww/d; kg dw/kg ww/d; kg dw/kg ww/d)

T = proportion of time in area (%)

BF = biotransfer factor (absorption factor) – assumed to be 100%

2.2.1 Exposure Factors

For the TSF pathway, exposure factors are provided in Table 1, from the WSLRA Plan (complete references provided in that document). Factors are the same as those used in the previous TSF assessment (Golder, 2019b), except proportion of benthic invertebrates obtained from the TSF, as described below.

In Golder (2019b), Semi-Palmated Sandpiper were assumed to ingest of benthic invertebrates residing in the TSF sediment. Concentrations in invertebrate tissue were calculated from measured sediment concentrations. However, it was noted that presence of invertebrates in the TSF sediment is unknown, and that a follow-up assessment would be conducted. In 2021, TSF sediment samples were collected for evaluation of invertebrate abundance, as describe in Section 1.3 (complete methods and results in Appendix D). The evaluation of abundance indicated extremely limited presence of invertebrates in this area. Average abundance among the five samples collected was 147 organisms/m^2, which is significantly less than historical average abundance in area reference systems (1172 organisms/m^2 – as reported in the 2020 CREMP Report, Table 4-10, historical average for Inuggugayualik and Pipedream Lakes). Among the five TSF samples collected (4L or approximately 0.08 m^2 each), four had fewer than 3 organisms in total, and one had 55 organisms. Based on these results, the contribution of benthic invertebrates from the TSF to the diet of shorebirds was reduced from 100% (assumed in the Golder, 2019b assessment) to 13% (147/1172 organisms/m^2) in this assessment, to reflect the limited availability of this food item in the TSF.

Table 1. Exposure factors for the TSF pathway.

ROC		Northern Red-backed Vole	Caribou	Lapland Longspur	Canada Goose	Semi-palmated Sandpiper
Body Weight (kg ww)		0.02	75	0.023	2.0	0.0235
Intake Factors	I_{water} (L/kg ww/d)	0.253	0.064	0.205	0.044	0.188
	$I_{sediment}$ (kg dw/kg ww/d)	-	-	-	-	0.059
	$I_{food\text{-}ww}$ (kg ww/kg ww/d)	-	-	-	-	1
	$I_{food\text{-}dw}$ (kg dw/kg ww/d)	-	-	-	-	0.197
Food Preferences	Benthic Invertebrates	-	-	-	-	13%[2]
Time in Area[1]		25%	8%	8%	8%	8%

I = intake; ww = wet weight; dw = dry weight; "-" = not applicable
(1) 1 month exposure scenario (8%) for all receptors except vole (25%) based on ice-free season and that voles are not actively deterred.
(2) Adjustment from 100% based on measured average abundance of benthic invertebrates in tailings sediment in 2021 compared to reference systems.

2.2.2 Dietary Concentrations of COPCs

Concentrations of COPCs were measured in tailings sediment and water as described in Section 1.3. Complete results are provided with screening tables in Appendix A.

Maximum measured concentrations in tailings sediment and ponded reclaim water were used in exposure assessment calculations rather than an estimate of central tendency (e.g. 95% UCLM concentrations), because the sample size was relatively small, particularly for sediment (three sediment samples and 12 water samples).

For benthic invertebrates in TSF sediment, BAFs from USEPA (1999) were used to estimate whole-body tissue concentrations based on measured sediment concentrations as:

[benthic invertebrate] = BAF x [sediment]; concentrations are expressed in mg/kg dry weight.

Available BAFs are shown in Table 2. For all other COPCs, a BAF of 1 was assumed.

Table 2. Bioaccumulation factors (BAFs) from USEPA (1999) used for estimating whole-body concentrations of COPCs in benthic invertebrates.

Parameter	BAF
Arsenic	0.90
Barium	0.90
Chromium	0.39
Copper	0.30
Lead	0.63
Mercury	0.068
Nickel	0.90
Selenium	0.90
Thallium	0.90
Zinc	0.57
Cyanide	0.90

2.3 TOXICITY ASSESSMENT

Toxicity reference values (TRVs) (Appendix B) were collated from a review of the literature; mainly from Sample et al. (1996), with other sources as indicated in Appendix B. Sample et al. (1996) represents one of the most comprehensive and commonly used sources available for wildlife toxicity reference values and has been used in other similar assessments for this region (e.g. Senes, 2008). In order to ensure the selected TRVs were relevant to the Meadowbank site several criteria were applied in screening toxicity studies. These included selecting values from studies conducted on species of similar phylogeny (i.e. bird or mammal), and selecting LOAEL-based TRVs over NOAEL-based TRVs.

Mammalian TRVs were updated here to remove the allometric scaling factors formerly applied, to align with Golder (2019a,b) methods, as recommended in Allard et al. (2010).

Details of the TRV selection are provided in the WSLRA Plan (Version 5, August 2021).

2.4 RISK CHARACTERIZATION

2.4.1 Hazard Quotients

The risk characterization compares predicted exposure concentrations with the toxicity reference values from the literature, using the hazard quotient approach. For this 2021 assessment, hazard quotients for the TSF study area pathways were calculated as:

$$HQ = EDI / TRV$$

Where:

EDI = estimated daily intake (mg/kg body weight/day)

TRV = toxicity reference value (mg/kg body weight/day)

See Appendix B for all calculated EDIs and TRVs. As discussed above, the TRV used in this assessment corresponds to the LOAEL, unless only a NOAEL was available (indicated).

Because of the conservative assumptions included at this level of assessment, there is generally considered to be a high degree of certainty associated with results indicating negligible risk. A hazard quotient > 1 in an SLRA indicates the possible need for more in-depth assessment, including analysis of assumptions used.

Calculated HQ values for the TSF pathway are shown in Table 3, and the risk characterization is summarized below.

2.4.1.1 Northern Red-backed Vole

For the Northern Red-backed Vole, HQs were less than 1 for all COPCs. Risk for this ROC under the conditions of this assessment is therefore classified as negligible.

2.4.1.2 Caribou

For Caribou, HQs were less than 1 for all COPCs. Risk for this ROC under the conditions of this assessment is therefore classified as negligible.

2.4.1.3 Lapland Longspur

For Lapland Longspur, HQs were less than 1 for all COPCs. Risk for this ROC under the conditions of this assessment is therefore classified as negligible.

2.4.1.4 Canada Goose

For the Canada Goose, HQs were less than 1 for all COPCs. Risk for this ROC under the conditions of this assessment is therefore classified as negligible.

2.4.1.5 Semi-Palmated Sandpiper

For Semi-Palmated Sandpiper, HQs were less than 1 for all COPCs except arsenic, chromium, and cyanide.

As indicated above, various conservative assumptions were used throughout this assessment which are considered to contribute to over-estimation of HQs. While further discussed in Section 2.5 (e.g. sediment concentrations are measured in mill effluent rather than aged tailing beach sediment, likely over-estimating cyanide exposure concentrations), the impacts of two of these assumptions on risk estimates were evaluated:

- *Exposure concentrations*: Maximum measured concentrations of COPCs in tailings sediment and ponded water were used in exposure calculations, whereas in reality ROCs would more likely be exposed to an average of measured concentrations.
- *Time in area*: Agnico actively discourages wildlife, including birds, from the TSF area, using personnel presence, and decoys, noise cannons, and flares as needed. Wildlife surveys are

completed daily during the in-migration season, from mid-May through the end of June, annually. At the beginning of the season, TSF ponds are open prior to natural lakes, which may attract birds, resulting in more intensive monitoring and deterrent use during this time. Daily to weekly surveys are conducted the rest of the year, and incidental observations are also recorded. Results are reported in the 2021 Meadowbank Complex Wildlife Monitoring Summary Report. Over the last six years (2016 – 2021), birds have only been observed in the TSF on eight days in 2016, and one day in 2018. No birds were observed in 2017, 2019, 2020, and 2021, despite daily surveys (Appendix A or E of the 2016 – 2021 Wildlife Monitoring Summary Reports for the Meadowbank Project). As a result, the assumed one-month exposure period is considered conservatively high.

When risk calculations are adjusted with more realistic but still conservative exposure concentrations (average measured concentration instead of maximum) and time-in-area assumptions based on historical observations (8 days in area instead of 1 month), HQs are less than 1 for arsenic, chromium, and cyanide (Table 3).

Table 3. Hazard quotients for the TSF pathway at the Meadowbank site. All values are LOAEL-based HQs, except where underline indicates NOAEL-based HQ (which is more conservative).

TSF Pathway					
COPC	**Northern Red-backed Vole**	**Caribou**	**Lapland Longspur**	**Canada Goose**	**Semi-Palmated Sandpiper**
Antimony	0.0	0.0	0.0	0.0	0.0
Arsenic	0.0	0.0	0.0	0.0	1.3 *(0.3)*[a]
Barium	0.0	0.0	0.0	0.0	0.0
Beryllium	0.0	0.0	0.0	0.0	0.1
Cadmium	0.0	0.0	0.0	0.0	0.0
Chromium	0.0	0.0	0.0	0.0	1.8 *(0.3)*[a]
Cobalt	0.0	0.0	0.0	0.0	0.1
Copper	0.0	0.0	0.0	0.0	0.0
Lead	0.0	0.0	0.0	0.0	0.1
Manganese	0.0	0.0	0.0	0.0	0.0
Inorganic Mercury[b]	0.0	0.0	0.0	0.0	0.0
Methylmercury	0.0	0.0	0.0	0.0	0.0
Molybdenum	0.0	0.0	0.0	0.0	0.0
Nickel	0.0	0.0	0.0	0.0	0.1
Selenium	0.0	0.0	0.0	0.0	0.0
Strontium	0.0	0.0	0.0	0.0	0.0
Thallium	0.0	0.0	0.0	0.0	0.0
Tin	0.0	0.0	0.0	0.0	0.0
Uranium	0.0	0.0	0.0	0.0	0.0
Vanadium	0.0	0.0	0.0	0.0	0.1
Zinc	0.0	0.0	0.0	0.0	0.0
Cyanide	0.0	0.0	0.0	0.2	5.9 *(0.6)*[a]

(a) Value in italics represents HQ under refined exposure assumptions as described in Section 2.4.
(b) Mercury was measured in water only.

2.5 UNCERTAINTY ASSESSMENT

The assumptions included in each section of the assessment are discussed here, along with implications for over- or under-estimating risk.

2.5.1 Uncertainty in Exposure Assessment

ROCs used in the assessment are assumed to represent categories of species (ungulates, small mammals, waterfowl, songbirds, and shorebirds) that are found around the Meadowbank site. Exposure is assumed to be similar for other species in these categories. Compared to other Arctic animals, the exposure for the species chosen is expected to be realistic to conservative, because they all are assumed to forage in or on the soil.

Exposure concentrations in TSF media were assumed to be represented by the maximum measured concentration. Since animals would be more likely to ingest food sources with a range of COPC concentrations, this is a conservative assumption.

Further, concentrations for TSF solids were measured directly in mill effluent, rather than aged tailings beach sediment. This likely represents an overestimate of true exposure concentrations for some parameters (especially cyanide) since degradation over time in the TSF would be anticipated.

Ingestion rates were applied using published values for similar but not identical species. Based on biological factors, these rates were chosen to be conservative.

Dietary preferences are from studies on the same or similar species, but are not from populations specifically inhabiting the study region.

Methyl mercury proportions of total mercury concentrations were estimated from the available literature using the UCLM from two studies (Azimuth, 2006). While there is an unknown degree of uncertainty in the extrapolation of this data for use at the Meadowbank site, the fractions chosen were at the highest end of the published range, and are therefore designed to be conservative. Furthermore, mercury was included as a COPC because it was found to be of concern to the general public in the Arctic, and no source of elevated mercury was identified at the mine.

Ingestion of COPCs was the only route of exposure considered in this assessment. While this assumption may slightly under-estimate actual exposure, inhalation and dermal absorption of metals are generally considered to be insignificant in comparison to exposures through ingestion (USEPA, 2005).

2.5.2 Uncertainty in Toxicity Assessment

TRVs were not available for the ROCs and species-to-species extrapolations were necessary. This included 1:1 scaling for birds and mammals (as in Golder, 2019a,b), and the application of uncertainty factors in mammal-to-avian extrapolation. Food intake-to-body weight ratios are well studied and uncertainty factors are designed to be protective, so these extrapolations are likely to be realistic or conservative.

As is common in screening level risk assessments, the estimation of risk is for each COPC in isolation, and does not consider potential additive, synergistic or antagonistic reactions. Models for determining mixture toxicity of a large suite of metals are not yet available, and guideline values are for single compounds only. This factor may lead to under-estimation of actual risk from metals overall, but the otherwise conservative nature of an SLRA is assumed to compensate for this issue.

2.6 HISTORICAL COMPARISON

2.6.1 Meadowbank Site – Tundra Pathways

As described in Section 1.2, the 2006 pre-construction WSLRA assessment for the Meadowbank site predicted negligible risk under operational conditions for all ROCs, except songbirds (as represented by Lapland Longspur), which were assessed has having potential but improbable risk from chromium ingestion under both baseline and operational conditions (i.e. no change in risk was predicted due to mine operations).

Results of post-construction assessments in 2011, 2014, and 2017 supported those predictions. Negligible risks were found for all ROCs except songbirds, which had HQs>1 for both onsite and reference locations.

The 2021 assessment methods introduced a screening stage for COPCs according to the updated WSLRA Plan, and all soil concentrations (including chromium) met screening values that are considered protective of wildlife health so HQs were not required to be calculated. These results

therefore continue to support 2006 predictions that operations at the Meadowbank site (tundra locations) have not increased risk to wildlife receptors from ingestion of chemical contaminants.

As a representative screening parameter, measured concentrations of chromium in soil since 2011 are shown in Figure 5. These results demonstrate that concentrations remain well below maximum measured area baseline (measured at the Whale Tail site in 2015 – Agnico Eagle, 2018, App 5-B), and have not been increasing over time.

2.6.2 Meadowbank Site – TSF Pathway

Risks to wildlife receptors from ingestion of chemical contaminants in the TSF were first assessed in 2019 as part of the Whale Tail Pit Expansion Project permitting process (Golder, 2019b). Using TSF sediment (mill effluent) and ponded water samples collected in 2015 – 2018, and predicted pit water quality post-deposition (2028+), the assessment identified negligible risk to ROCs under 2015-2018 conditions, and predicted negligible risk under post-deposition conditions.

Using TSF sediment and ponded water samples collected in 2021, this updated assessment similarly indicated negligible risk for all ROCs, except shorebirds. Under the same exposure assumptions as Golder (2019b), potential risks to shorebirds (as represented by Semi-Palmated Sandpiper) from ingestion of arsenic, chromium, and cyanide were identified (i.e. HQ>1). This difference from the Golder (2019b) assessment is due to an increased concentrations of arsenic, chromium, and cyanide in mill effluent (tailings sediment) compared to samples collected in 2015 – 2016. However, under refined but still conservative exposure assumptions (average instead of maximum concentrations, 8 days exposure instead of 1 month), risk was found to be negligible for all ROCs including shorebirds.

2.6.3 Whale Tail Site

Risks to wildlife receptors from ingestion of chemical contaminants were predicted for the Whale Tail Pit Expansion Project in Golder (2019a). In that assessment, predicted concentrations of all assessed parameters in soil and water met screening values, so no quantitative risk characterization was required (no residual impacts to wildlife were predicted).

Results of this 2021 assessment support those predictions. All measured concentrations met screening values with the exception of barium and strontium in one sample. These results were further examined and determined not to be mine-related, so ultimately no COPCs were identified and quantitative risk characterization was not required.

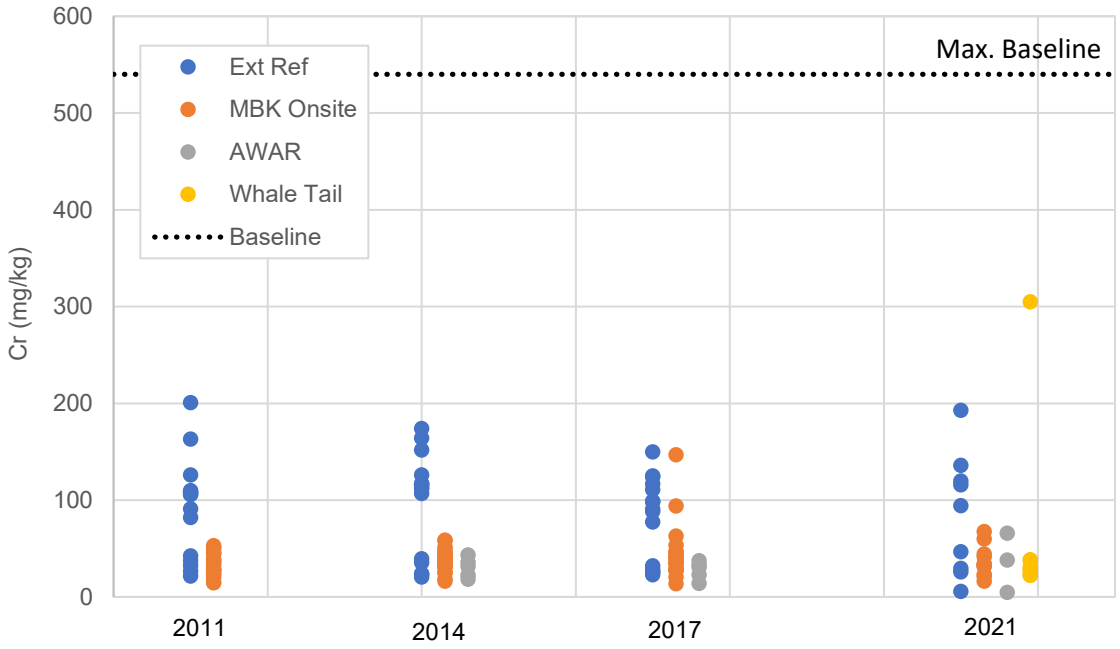

Figure 5. Historical concentrations of soil in chromium at external reference locations (C1 – C3), Meadowbank onsite (T1, T3, T6, T7) locations, AWAR locations (T8), and Whale Tail locations (T9, T10, T11) along with maximum measured baseline concentrations (Agnico Eagle, 2018 (App. 5-B)).

3 HUMAN HEALTH – COUNTRY FOODS ASSESSMENT

3.1 PROBLEM FORMULATION

Further in accordance with NIRB Project Certificate No. 004 Condition 67, an assessment of risks to human receptors from contaminant exposure through consumption of country foods during operation of the Meadowbank mine was conducted. This assessment re-evaluates risks to receptors for exposure pathways identified in the pre-construction HHRA (Wilson, 2006) and follow-up assessments (2011, 2014, and 2017), making use of environmental samples collected in 2021, as described in Section 1.3. The conceptual model for country foods consumption is shown in Figure 6.

3.1.1 Potential Receptors

Potential receptors for which risk is evaluated are a young child or toddler (age 7 months – 4 years) and an adult consumer of country foods. These receptors are considered to be representative and protective of the general population.

3.1.2 Exposure Pathways

According to previous assessments (Agnico Eagle 2012, 2015, 2018) the evaluation focuses on potential risks to the above receptors from contaminant exposure through consumption of caribou muscle, caribou liver, caribou kidney, and Canada goose meat from animals spending time in various minesite locations (onsite, near site, AWAR, Whale Tail Haul Road, Whale Tail Site, and external reference locations – Figure 1 and 2).

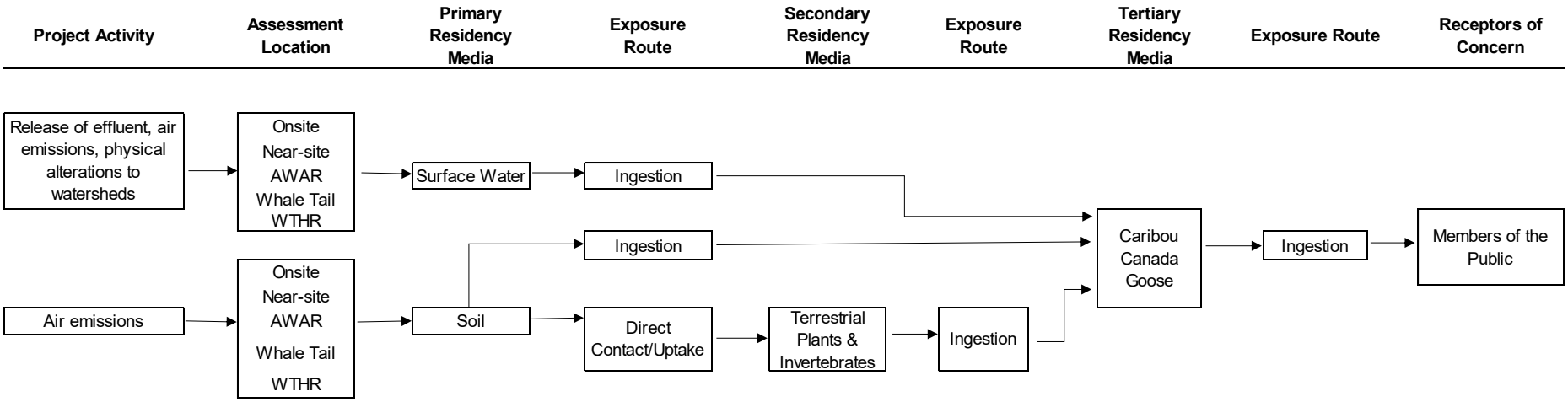

Figure 6. Human health (country foods) risk assessment conceptual model.

3.1.3 Contaminants of Potential Concern (COPCs)

The same process to identify COPCs used in the wildlife assessment (Section 2.1.4) was applied to the human health assessment. Maximum measured concentrations in primary residency media (soil and lake water) were screened against regulatory guideline values that are protective of human health, and maximum measured baseline +10%, as in Golder (2019a).

If measured concentrations were greater than screening values, the parameter was retained as a COPC for quantitative risk characterization. The quantitative risk characterization would make use of measured concentrations in soil, drinking water, and vegetation samples to estimate concentrations in country foods (Caribou and Canada Goose tissue), according to the established food chain model, as described in the WSLRA Plan.

If measured concentrations in primary residency media were less than screening values, then the parameter was not considered to be of potential toxicological concern (i.e. was not a COPC), and no further assessment was required (i.e. if soil and lake water are not “contaminated”, it may be assumed that vegetation, and subsequently, Caribou and Canada Goose tissue, would not be “contaminated”). This pathway is represented visually in Figure 6.

Parameters selected for screening include all metals with CCME Soil Quality Guidelines for the Protection of Environmental and Human Health (CCME, 2022b) or Health Canada Canadian Water Quality Guidelines for Drinking Water (Health Canada, 2020), plus any COPCs identified in previous assessments (manganese and strontium were identified as COPCs in 2006 because concentrations in onsite dust sources were predicted to exceed baseline soil concentrations).

All screening parameters, guideline values, baseline concentrations (where required), and measured concentrations in primary residency media are presented in Appendix A and screening results are discussed below for each medium.

Soil (*Appendix A*): Measured maximum concentrations of COPCs in soil were screened against CCME Canadian Soil Quality Guidelines for the Protection of Environment and Human Health (CCME, 2022b) for residential land use (primary source), British Columbia Contaminated Sites Regulation guidelines for human health protection (BC CSR, 2021a) (secondary source), and maximum measured baseline concentrations +10% (Azimuth, 2006; Golder, 2019a). All concentrations in soil met screening values and/or baseline +10% (Appendix A, Tables A5 – A8). No COPCs were therefore retained for soil.

Lake Water (*Appendix A*): Measured maximum concentration of COPCs in lake water were screened against the Canadian Drinking Water Quality Guidelines from Health Canada (Health Canada, 2021) (primary source), British Columbia Contaminated Sites Regulation Generic Numerical Water Standards for drinking water (BC CSR, 2021b) (secondary source), and maximum measured baseline concentrations +10%. All concentrations in water met screening values so no COPCs are retained for water (Appendix A, Tables A16 – 21).

Summary: Since no COPCs were identified in the primary residency media (soil and water), these sources continue to meet screening values protective of human health or have not changed from baseline conditions, so no changes to risk from consumption of country foods under the current operational scenario are predicted and this pathway is not assessed further.

3.2 HISTORICAL COMPARISON

3.2.1 Meadowbank Site

Risks to human receptors from consumption of country foods were first assessed for Meadowbank site locations in 2006. No incremental risks (changes in risk characterizations) were predicted as a result of mine operations.

Results for assessments in 2011, 2014, and 2017 supported these predictions overall. While 2011 results indicated some potential for incremental risk associated with chromium onsite compared to reference sites, this trend did not continue in subsequent years (and as shown in Figure 5, concentrations of chromium in soil have remained below area baseline and are not increasing over time). Because the target hazard quotient was reduced to 0.2 in 2011 – 2017 (from 1 in Wilson, 2006), some potentially unacceptable risks were identified throughout the assessments, but not as a result of mine operations (there were no major differences between minesite and reference locations).

Since a screening approach was introduced to identify COPCs in this updated 2021 assessment (according to the WSLRA Plan), HQs were not required to be calculated because all soil and water concentrations (including chromium) met screening values that are protective of human health. These results therefore continue to support 2006 predictions that operations at the Meadowbank site have not resulted in increased risk from consumption of country foods.

3.2.2 Whale Tail Site

The human health (country foods) risk assessment for the Whale Tail Pit Expansion Project (Golder, 2019a) compared maximum predicted concentrations in soil and water to screening values to identify COPCs. All parameters met screening values so no COPCs were identified and no residual impacts to human receptors were predicted.

Results of this initial 2021 update support those predictions. All measured concentrations in 2021 soil and water samples met screening values that are protective of human health, so no COPCs were identified and further quantitative risk characterization was not required.

4 SUMMARY

4.1 WILDLIFE ASSESSMENT

This assessment evaluated risks to wildlife from dietary exposure to chemical contaminants in and around the Meadowbank site during operations (2021). Because of the conservative assumptions included at this level of assessment, there is generally considered to be a high degree of certainty associated with results indicating negligible risk.

Key findings are as follows:

- Through the soil and water sample screening process, no COPCs were identified for tundra locations (onsite, near-site, AWAR, Whale Tail site, and WTHR locations), so quantitative risk characterization was not required for these pathways. Risk for these pathways is assumed to be negligible, or not to have changed from baseline conditions.

- Concentrations of several parameters in tailings sediment and water did not meet screening values, so risks for this pathway were quantitatively assessed. For all receptors, risks were found to be negligible (HQ≤1) under previous exposure assumptions with the exception of three COPCs for shorebirds (arsenic, chromium,

cyanide). However, when the previously selected assumptions for exposure concentration and time-in-area were refined using more realistic but still conservative values (average instead of maximum concentration, eight day exposure time instead of four weeks), risk was found to be negligible for all COPCs.

Overall, the operation of the Meadowbank Complex does not appear to be contributing excess risk from dietary exposure to chemical contaminants for wildlife residing in the area.

Based on the results of this assessment, management recommendations include continuing to focus on deterring birds and wildlife from the TSF to ensure no animals are obtaining food and water from TSF sources for more than eight days of the year. Subsequent assessments (2024) will consider analysis of tailings beach sediment rather than mill effluent to better characterize actual exposure concentrations, which are likely to be overestimated for some parameters in mill effluent.

4.2 HUMAN HEALTH – COUNTRY FOODS ASSESSMENT

This assessment also evaluated risks to human receptors from consumption of select country foods (Caribou meat and organs, Canada Goose meat) from tundra locations around the mine site (onsite, near-site, AWAR, Whale Tail Site, WTHR locations). For these assessment locations, all soil and water concentrations met screening values that are protective of human health, so no COPCs were identified and quantitative risk characterization was not required. Risk is assumed to be negligible, or not to have changed from baseline conditions.

4.3 RECOMMENDATIONS

According to Condition 67 of NIRB Project Certificate No.004, the next WSLRA and $HHRA_{country\ foods}$ will be conducted in 2024 (3 years). Based on results of this 2021 assessment, the following actions are recommended for the 2024 evaluation:

- For the T10 location, all five sites will be sampled (rather than a random three sites) to better delineate potential mineralization in this area and facilitate confirmation of conclusions made here that elevated concentrations of some parameters at T10-2 are not caused by atmospheric deposition (i.e. are not mine-related).
- The feasibility of storing vegetation samples for analysis as needed after screening soil and water samples will be explored.
- Analysis of tailings beach sediment rather than mill effluent will be considered, to better characterize actual exposure concentrations, which are likely to be overestimated for some parameters in mill effluent

In addition, the following annual actions are planned:

- A continued focus on deterrence of birds from the TSF area, particularly during early spring, to ensure birds are not obtaining food and water from TSF sources for more than eight days of the year. Records of bird sightings within the TSF will continue to be maintained and these assumptions verified during the next assessment.

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Appendix A

COPC SCREENING TABLES

Table A-1: Soil screening for wildlife - Whale Tail locations

Chemical	CCME SQG-E[a]	BC CSR-E[b]	Max. Baseline +10%[c]	T10-1-Soil	T10-2-Soil	T10-3-Soil	T11-1-Soil	T11-2-Soil	T11-3-Soil	T9-1-Soil	T9-2-Soil	T9-3-Soil
				22-Aug-2021	22-Aug-2021	22-Aug-2021	23-Aug-2021	23-Aug-2021	23-Aug-2021	23-Aug-2021	23-Aug-2021	23-Aug-2021
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Antimony	20			<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Arsenic	17		190.3	10.3	3.38	11.7	4.96	3.75	4.6	3.62	3.53	3.64
Barium	*500*[e]			31	**1890**	16.2	35.8	26	32.5	25.2	22.4	19.9
Beryllium	4			0.22	1.06	0.27	0.42	0.35	0.48	0.32	0.31	0.29
Cadmium	10			0.076	0.081	0.053	0.041	0.042	0.05	0.035	0.024	0.024
Chromium	64		603.9[d]	38.5	305	28.8	37.9	22.7	31.2	28.2	22.2	25
Cobalt	50			4.2	32.5	4.49	6.42	6.6	6.82	5.9	5.1	4.62
Copper	63			4.62	37.9	3.83	6.4	5.54	6.55	6.47	4.79	4.44
Lead	300			5.7	5.33	6.15	6.34	6	6.89	5.43	4.67	4.92
Manganese	NV	2000		173	1310	200	255	319	297	216	197	190
Mercury	12			<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500
Molybdenum	10			0.38	0.16	0.31	0.38	0.4	0.54	0.35	0.29	0.35
Nickel	45		184.8[d]	13.9	182	12.2	21.6	19	19.9	20.2	15.8	14.8
Selenium	1			<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Silver	20			<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Strontium	NV	NV	47	17.9	**437**	13.8	36.3	27.1	40.3	26.4	23.5	21.2
Thallium	1.4			0.06	0.847	0.05	0.074	0.063	0.071	0.054	0.054	<0.050
Tin	50			<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Uranium	500			1.12	0.538	0.967	2.15	2.11	2.88	1.87	2.03	1.72
Vanadium	130			20.1	110	13.8	16.6	11.6	14.8	12.4	10.3	10.6
Zinc	250			24.8	87.7	27.1	36.9	30.5	38.7	25.8	24.5	25.8

Table A-2: Soil screening for wildlife - AWAR location

Chemical	CCME SQG-E[a]	BC CSR-E[b]	Max. Baseline +10%[c]	T8-S1-Soil	T8-S2-Soil	T8-S4-Soil
				27-Aug-2021	27-Aug-2021	27-Aug-2021
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Antimony	20			<0.10	<0.10	<0.10
Arsenic	17		190.3	5.79	6.08	0.66
Barium	*500*[e]			87.9	123	104
Beryllium	4			0.51	0.81	0.12
Cadmium	10			0.064	0.165	0.587
Chromium	64		603.9[d]	38.2	65.8	4.65
Cobalt	50			4.57	12.3	1.8
Copper	63			23.1	21.8	4.57
Lead	300			6.15	14.5	1.76
Manganese	NV	2000		137	619	13.8
Mercury	12			<0.0500	0.0591	0.109
Molybdenum	10			1.24	2.13	0.35
Nickel	45		184.8[d]	24.5	33.3	4.97
Selenium	1			0.23	<0.20	0.31
Silver	20			<0.10	<0.10	<0.10
Strontium	NV	NV	47	30.4	30.4	30.4
Thallium	1.4			0.118	0.202	<0.050
Tin	50			<2.0	<2.0	<2.0
Uranium	500			6.13	3.32	0.617
Vanadium	130			20.8	36.3	2.32
Zinc	250			29.4	71.6	36.1

Table A-3: Soil screening for wildlife - Meadowbank locations

Chemical	CCME SQG-E[a]	BC CSR-E[b]	Max. Baseline +10%[c]	T1-S2-Soil	T1-S3-Soil	T2-S1-Soil	T2-S3-Soil	T2-S4-Soil	T3-S1-Soil	T3-S2-Soil	T3-S3-Soil	T4-S1-Soil	T4-S2-Soil	T4-S4-Soil	T5-S1-Soil	T5-S4-Soil	T5-S5-Soil	T6-S1-Soil	T6-S2-Soil	T6-S5-Soil	T7-S1-Soil	T7-S2-Soil	T7-S5-Soil
				22-Aug-2021	23-Aug-2021	26-Aug-2021	26-Aug-2021	27-Aug-2021	27-Aug-2021	27-Aug-2021	27-Aug-2021	25-Aug-2021	25-Aug-2021	25-Aug-2021	25-Aug-2021	25-Aug-2021	25-Aug-2021	20-Aug-2021	20-Aug-2021	20-Aug-2021	24-Aug-2021	24-Aug-2021	24-Aug-2021
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Antimony	20			<0.10	<0.10	<0.10	<0.10	<0.10	0.12	<0.10	<0.10	0.11	<0.10	<0.10	<0.10	<0.10	0.14	<0.10	<0.10	<0.10	0.13	<0.10	0.24
Arsenic	17		190.3	2.83	4.02	1.18	2.75	4.89	10.8	3.3	5.54	8.86	2.89	2.18	3.32	1.72	38.1	4.39	5.78	4.4	17.5	10.3	87.1
Barium	*500*[e]			20.1	46.5	20.6	34.1	86.9	73.3	64.7	64.3	146	37.2	31.2	32.7	95	27.2	50.2	41.6	33	17.2	43.2	23.3
Beryllium	4			0.39	0.39	0.23	0.4	0.48	0.66	0.26	0.34	1.39	0.43	0.39	0.22	0.17	0.25	0.37	0.36	0.3	0.2	0.16	0.36
Cadmium	10			0.04	0.058	0.03	0.034	0.16	0.224	0.304	0.308	0.088	0.039	0.077	0.116	0.319	0.106	0.054	0.04	0.039	0.253	0.239	0.556
Chromium	64		603.9[d]	16.4	32.3	10	20.9	13	60.1	21.2	31.6	60.7	24.2	22.3	38.1	12	92.1	41.4	67.6	44.4	34	23.4	33.8
Cobalt	50			4.17	5.53	1.92	4.72	5.43	9.43	3.12	4.84	11.3	5.42	4.81	4.36	1.48	5.71	7.32	8.86	6.78	4.6	3.48	6.4
Copper	63			4.15	8.04	1.92	5.82	6.44	15.4	6.44	7.53	21.2	5.98	5.16	8.28	6.2	7.35	8.86	9.07	7.02	10.4	7.35	13.4
Lead	300			4.25	6.19	4.89	6.15	7.84	11.3	4.72	6.45	14.5	6.07	5.92	4.81	3.58	8.98	6.84	7.33	5.98	8.77	7.52	14.9
Manganese	NV	2000		220	249	113	248	248	480	490	377	935	286	370	136	22.6	184	311	296	266	136	178	221
Mercury	12			<0.0500	0.0752	<0.0500	<0.0500	0.161	0.14	0.197	0.212	<0.0500	<0.0500	0.0836	0.0535	0.175	0.0737	<0.0500	<0.0500	<0.0500	0.0537	0.181	<0.0500
Molybdenum	10			0.48	0.88	0.57	0.68	0.6	2.61	0.99	1.14	3.91	1.06	0.91	0.65	0.9	0.52	0.85	1.07	0.8	1.17	0.69	1.07
Nickel	45		184.8[d]	9.09	15.7	4.37	10.9	8.81	27.3	9.97	14.8	28.6	11.8	10.5	15.6	6.98	28.6	20.4	30.6	21.5	18.2	13.2	19.8
Selenium	1			<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.35	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Silver	20			<0.10	<0.10	<0.10	<0.10	<0.10	0.1	<0.10	<0.10	0.1	<0.10	<0.10	<0.10	0.15	<0.10	<0.10	<0.10	<0.10	0.13	0.19	<0.10
Strontium	NV	NV	47	10.2	11.8	5.81	12.9	15.5	19.2	15.2	18.3	19.7	13.2	6.65	8.88	13.7	9.79	13.4	12.1	13.6	9.41	11.5	8.05
Thallium	1.4			0.06	0.108	0.08	0.117	0.078	0.171	0.097	0.116	0.342	0.127	0.121	0.081	<0.050	0.104	0.155	0.146	0.114	0.075	0.071	0.121
Tin	50			<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Uranium	500			1.26	1.6	1.36	4.6	4.78	3.77	1.62	2.14	9.2	2.12	1.5	1.29	0.926	1.19	3.13	2.17	2.36	1.35	0.933	1.67
Vanadium	130			11.6	20.4	11.6	16.1	7.86	23.6	9.17	11.9	40.7	18.2	17.1	15.7	6.95	20	22	21.8	18	19.1	14.2	20.4
Zinc	250			29	38.6	18.6	30.8	30	58	38.4	34.2	85	36.4	36.5	23.7	24.9	32.2	38.6	37.1	26.5	34.1	24.8	57.3

Table A-4: Soil screening for wildlife - External reference locations

Chemical	CCME SQG-E[a]	BC CSR-E[b]	Max. Baseline +10%[c]	C1-S1-Soil	C1-S2-Soil	C1-S3-Soil	C2-S1-Soil	C2-S2-Soil	C2-S3-Soil	C3-S1-Soil	C3-S2-Soil	C3-S3-Soil
				29-Aug-2021	29-Aug-2021	29-Aug-2021	30-Aug-2021	30-Aug-2021	30-Aug-2021	30-Aug-2021	30-Aug-2021	30-Aug-2021
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Antimony	20			<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.12	<0.10	0.12
Arsenic	17		190.3	4.56	2.9	3.21	0.65	6.94	7.98	10.8	6.97	11.3
Barium	*500*[e]			49.8	23.8	23.3	63.9	31.5	39.1	27	31.9	37.7
Beryllium	4			0.36	0.29	0.32	<0.10	0.39	0.41	0.38	0.2	0.35
Cadmium	10			0.137	0.035	0.035	0.543	0.11	0.091	0.08	0.093	0.082
Chromium	64		603.9[d]	46.6	29.6	25.9	5.66	116	193	120	94.3	136
Cobalt	50			5.02	5.9	3.72	3.36	10.8	11.2	11.8	7.57	11.7
Copper	63			6.44	3.93	3.6	3.8	10.3	8.21	10.9	5.3	10.3
Lead	300			7.7	5.58	5.91	1.33	6.51	7.95	7.8	7.43	8.33
Manganese	NV	2000		177	227	153	7.7	303	371	319	242	320
Mercury	12			0.0785	<0.0500	<0.0500	0.088	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500
Molybdenum	10			0.8	0.58	0.6	0.26	0.7	0.67	0.62	0.78	0.83
Nickel	45		184.8[d]	20.6	15.8	11.9	11.9	58.7	62.7	63.8	37.7	59.6
Selenium	1			<0.20	<0.20	<0.20	0.24	<0.20	<0.20	<0.20	<0.20	<0.20
Silver	20			<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Strontium	NV	NV	47	18.3	13	12.9	28.5	24.9	24.7	28.5	26	24.8
Thallium	1.4			0.1	0.078	0.086	<0.050	0.091	0.117	0.115	0.095	0.11
Tin	50			<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Uranium	500			2.55	1.88	2.16	0.228	1.08	0.937	1.33	0.797	0.996
Vanadium	130			19.7	15.6	14.2	2.05	27.7	33.2	27.5	27	33
Zinc	250			31.5	27.7	20.8	42.9	46.6	52.7	38.9	35.7	55.9

(a) CCME (Canadian Council of Ministers of the Environment). 2022b. Canadian Environmental Quality Guidelines – Soil Quality Guidelines for the Protection of Environmental and Human Health (residential)

(b) BC Reg. 375/96 British Columbia Contaminated Sites Regulation Schedule 3.1 Part 1 - Matrix Numerical Soil Standards (lowest value for Environmental Protection) - where CCME guideline unavailable

(c) Azimuth (2006) or Golder (2019a) - where greater than guideline value, or guideline value unavailable

(d) Whale Tail Pit Expansion Project FEIS Addendum- App 5B - Total Metal Soil Concentrations

(e) Overall residential/parkland guideline (1999); no SQG_E was derived.

(f) CCME SQG_E - agricultural

NV = no value

Table A-5: Soil screening for human health - Whale Tail locations

Chemical	CCME SQG-HH[a]	BC CSR-HH[b]	Max. Baseline +10%[c]	T10-1-Soil	T10-2-Soil	T10-3-Soil	T11-1-Soil	T11-2-Soil	T11-3-Soil	T9-1-Soil	T9-2-Soil	T9-3-Soil
				22-Aug-2021	22-Aug-2021	22-Aug-2021	23-Aug-2021	23-Aug-2021	23-Aug-2021	23-Aug-2021	23-Aug-2021	23-Aug-2021
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Aluminum	NV	40000		7080	25700	6640	9000	6560	8630	6360	5710	5940
Antimony	20			<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Arsenic	12		190.3	10.3	3.38	11.7	4.96	3.75	4.6	3.62	3.53	3.64
Barium	6800			31	1890	16.2	35.8	26	32.5	25.2	22.4	19.9
Beryllium	75			0.22	1.06	0.27	0.42	0.35	0.48	0.32	0.31	0.29
Cadmium	14			0.076	0.081	0.053	0.041	0.042	0.05	0.035	0.024	0.024
Chromium	220		603.9[d]	38.5	305	28.8	37.9	22.7	31.2	28.2	22.2	25
Cobalt	50			4.2	32.5	4.49	6.42	6.6	6.82	5.9	5.1	4.62
Copper	1100			4.62	37.9	3.83	6.4	5.54	6.55	6.47	4.79	4.44
Lead	140			5.7	5.33	6.15	6.34	6	6.89	5.43	4.67	4.92
Manganese	NV	6000		173	1310	200	255	319	297	216	197	190
Mercury	6.6			<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500
Molybdenum	10			0.38	0.16	0.31	0.38	0.4	0.54	0.35	0.29	0.35
Nickel	45		184.8[d]	13.9	182	12.2	21.6	19	19.9	20.2	15.8	14.8
Selenium	80			<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Silver	20			<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Strontium	NV	9500	47	17.9	437	13.8	36.3	27.1	40.3	26.4	23.5	21.2
Thallium	1			0.06	0.847	0.05	0.074	0.063	0.071	0.054	0.054	<0.050
Tin	50			<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Uranium	23			1.12	0.538	0.967	2.15	2.11	2.88	1.87	2.03	1.72
Vanadium	130			20.1	110	13.8	16.6	11.6	14.8	12.4	10.3	10.6
Zinc	10000			24.8	87.7	27.1	36.9	30.5	38.7	25.8	24.5	25.8

Table A-6: Soil screening for human health - AWAR locations

Chemical	CCME SQG-HH[a]	BC CSR-HH[b]	Max. Baseline +10%[c]	T8-S1-Soil	T8-S2-Soil	T8-S4-Soil
				27-Aug-2021	27-Aug-2021	27-Aug-2021
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Aluminum	NV	40000		10600	16900	2440
Antimony	20			<0.10	<0.10	<0.10
Arsenic	12		190.3	5.79	6.08	0.66
Barium	6800			87.9	123	104
Beryllium	75			0.51	0.81	0.12
Cadmium	14			0.064	0.165	0.587
Chromium	220		603.9[d]	38.2	65.8	4.65
Cobalt	50			4.57	12.3	1.8
Copper	1100			23.1	21.8	4.57
Lead	140			6.15	14.5	1.76
Manganese	NV	6000		137	619	13.8
Mercury	6.6			<0.0500	0.0591	0.109
Molybdenum	10			1.24	2.13	0.35
Nickel	45		184.8[d]	24.5	33.3	4.97
Selenium	80			0.23	<0.20	0.31
Silver	20			<0.10	<0.10	<0.10
Strontium	NV	9500	47	30.4	30.4	30.4
Thallium	1			0.118	0.202	<0.050
Tin	50			<2.0	<2.0	<2.0
Uranium	23			6.13	3.32	0.617
Vanadium	130			20.8	36.3	2.32
Zinc	10000			29.4	71.6	36.1

Table A-7: Soil screening for human health - Meadowbank site locations

Chemical	CCME SQG-HH[a]	BC CSR-HH[b]	Max. Baseline +10%[c]	T1-S2-Soil	T1-S3-Soil	T2-S1-Soil	T2-S3-Soil	T2-S4-Soil	T3-S1-Soil	T3-S2-Soil	T3-S3-Soil	T4-S1-Soil	T4-S2-Soil	T4-S4-Soil	T5-S1-Soil	T5-S4-Soil	T5-S5-Soil	T6-S1-Soil	T6-S2-Soil	T6-S5-Soil	T7-S1-Soil	T7-S2-Soil	T7-S5-Soil
				22-Aug-2021	23-Aug-2021	26-Aug-2021	26-Aug-2021	27-Aug-2021	27-Aug-2021	27-Aug-2021	27-Aug-2021	25-Aug-2021	25-Aug-2021	25-Aug-2021	25-Aug-2021	25-Aug-2021	25-Aug-2021	20-Aug-2021	20-Aug-2021	20-Aug-2021	24-Aug-2021	24-Aug-2021	24-Aug-2021
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Aluminum	NV	40000		6810	10000	4490	6810	4860	12400	4660	6140	25100	8400	8160	6290	3200	7740	9230	9180	6840	8900	6160	11800
Antimony	20			<0.10	<0.10	<0.10	<0.10	<0.10	0.12	<0.10	<0.10	0.11	<0.10	<0.10	<0.10	<0.10	0.14	<0.10	<0.10	<0.10	0.13	<0.10	0.24
Arsenic	12		190.3	2.83	4.02	1.18	2.75	4.89	10.8	3.3	5.54	8.86	2.89	2.18	3.32	1.72	38.1	4.39	5.78	4.4	17.5	10.3	87.1
Barium	6800			20.1	46.5	20.6	34.1	86.9	73.3	64.7	64.3	146	37.2	31.2	32.7	95	27.2	50.2	41.6	33	17.2	43.2	23.3
Beryllium	75			0.39	0.39	0.23	0.4	0.48	0.66	0.26	0.34	1.39	0.43	0.39	0.22	0.17	0.25	0.37	0.36	0.3	0.2	0.16	0.36
Cadmium	14			0.04	0.058	0.03	0.034	0.16	0.224	0.304	0.308	0.088	0.039	0.077	0.116	0.319	0.106	0.054	0.04	0.039	0.253	0.239	0.556
Chromium	220		603.9[d]	16.4	32.3	10	20.9	13	60.1	21.2	31.6	60.7	24.2	22.3	38.1	12	92.1	41.4	67.6	44.4	34	23.4	33.8
Cobalt	50			4.17	5.53	1.92	4.72	5.43	9.43	3.12	4.84	11.3	5.42	4.81	4.36	1.48	5.71	7.32	8.86	6.78	4.6	3.48	6.4
Copper	1100			4.15	8.04	1.92	5.82	6.44	15.4	6.44	7.53	21.2	5.98	5.16	8.28	6.2	7.35	8.86	9.07	7.02	10.4	7.35	13.4
Lead	140			4.25	6.19	4.89	6.15	7.84	11.3	4.72	6.45	14.5	6.07	5.92	4.81	3.58	8.98	6.84	7.33	5.98	8.77	7.52	14.9
Manganese	NV	6000		220	249	113	248	248	480	490	377	935	286	370	136	22.6	184	311	296	266	136	178	221
Mercury	6.6			<0.0500	0.0752	<0.0500	<0.0500	0.161	0.14	0.197	0.212	<0.0500	<0.0500	0.0836	0.0535	0.175	0.0737	<0.0500	<0.0500	<0.0500	0.0537	0.181	<0.0500
Molybdenum	10			0.48	0.88	0.57	0.68	0.6	2.61	0.99	1.14	3.91	1.06	0.91	0.65	0.9	0.52	0.85	1.07	0.8	1.17	0.69	1.07
Nickel	45		184.8[d]	9.09	15.7	4.37	10.9	8.81	27.3	9.97	14.8	28.6	11.8	10.5	15.6	6.98	28.6	20.4	30.6	21.5	18.2	13.2	19.8
Selenium	80			<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.35	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Silver	20			<0.10	<0.10	<0.10	<0.10	<0.10	0.1	<0.10	<0.10	0.1	<0.10	<0.10	<0.10	0.15	<0.10	<0.10	<0.10	<0.10	0.13	0.19	<0.10
Strontium	NV	9500	47	10.2	11.8	5.81	12.9	15.5	19.2	15.2	18.3	19.7	13.2	6.65	8.88	13.7	9.79	13.4	12.1	13.6	9.41	11.5	8.05
Thallium	1			0.06	0.108	0.08	0.117	0.078	0.171	0.097	0.116	0.342	0.127	0.121	0.081	<0.050	0.104	0.155	0.146	0.114	0.075	0.071	0.121
Tin	50			<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Uranium	23			1.26	1.6	1.36	4.6	4.78	3.77	1.62	2.14	9.2	2.12	1.5	1.29	0.926	1.19	3.13	2.17	2.36	1.35	0.933	1.67
Vanadium	130			11.6	20.4	11.6	16.1	7.86	23.6	9.17	11.9	40.7	18.2	17.1	15.7	6.95	20	22	21.8	18	19.1	14.2	20.4
Zinc	10000			29	38.6	18.6	30.8	30	58	38.4	34.2	85	36.4	36.5	23.7	24.9	32.2	38.6	37.1	26.5	34.1	24.8	57.3

Table A-8: Soil screening for human health - external reference locations

Chemical	CCME SQG-HH[a]	BC CSR-HH[b]	Max. Baseline +10%[c]	C1-S1-Soil	C1-S2-Soil	C1-S3-Soil	C2-S1-Soil	C2-S2-Soil	C2-S3-Soil	C3-S1-Soil	C3-S2-Soil	C3-S3-Soil
				29-Aug-2021	29-Aug-2021	29-Aug-2021	30-Aug-2021	30-Aug-2021	30-Aug-2021	30-Aug-2021	30-Aug-2021	30-Aug-2021
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Aluminum	NV	40000		9770	7770	7190	1300	13900	15100	13400	9330	14400
Antimony	20			<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.12	<0.10	0.12
Arsenic	12		190.3	4.56	2.9	3.21	0.65	6.94	7.98	10.8	6.97	11.3
Barium	6800			49.8	23.8	23.3	63.9	31.5	39.1	27	31.9	37.7
Beryllium	75			0.36	0.29	0.32	<0.10	0.39	0.41	0.38	0.2	0.35
Cadmium	14			0.137	0.035	0.035	0.543	0.11	0.091	0.08	0.093	0.082
Chromium	220		603.9[d]	46.6	29.6	25.9	5.66	116	193	120	94.3	136
Cobalt	50			5.02	5.9	3.72	3.36	10.8	11.2	11.8	7.57	11.7
Copper	1100			6.44	3.93	3.6	3.8	10.3	8.21	10.9	5.3	10.3
Lead	140			7.7	5.58	5.91	1.33	6.51	7.95	7.8	7.43	8.33
Manganese	NV	6000		177	227	153	7.7	303	371	319	242	320
Mercury	6.6			0.0785	<0.0500	<0.0500	0.088	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500
Molybdenum	10			0.8	0.58	0.6	0.26	0.7	0.67	0.62	0.78	0.83
Nickel	45		184.8[d]	20.6	15.8	11.9	11.9	58.7	62.7	63.8	37.7	59.6
Selenium	80			<0.20	<0.20	<0.20	0.24	<0.20	<0.20	<0.20	<0.20	<0.20
Silver	20			<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Strontium	NV	9500	47	18.3	13	12.9	28.5	24.9	24.7	28.5	26	24.8
Thallium	1			0.1	0.078	0.086	<0.050	0.091	0.117	0.115	0.095	0.11
Tin	50			<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Uranium	23			2.55	1.88	2.16	0.228	1.08	0.937	1.33	0.797	0.996
Vanadium	130			19.7	15.6	14.2	2.05	27.7	33.2	27.5	27	33
Zinc	10000			31.5	27.7	20.8	42.9	46.6	52.7	38.9	35.7	55.9

(a) CCME (Canadian Council of Ministers of the Environment). 2022b. Canadian Environmental Quality Guidelines – Soil Quality Guidelines for the Protection of Environmental and Human Health (residential)

(b) BC Reg. 375/96 British Columbia Contaminated Sites Regulation Schedule 3.1 Part 1 - Matrix Numerical Soil Standards (human health - agricultural/low density residential) - where CCME guideline unavailable

(c) Azimuth (2006) or Golder (2019a) - where greater than guideline value, or guideline value unavailable

(d) Whale Tail Pit Expansion Project FEIS Addendum- App 5B - Total Metal Soil Concentrations

NV = no value

Table A-9: Lake water screening for wildlife - Meadowbank site locations Second Portage Lake and Tehek Lake

Chemical	CCME WQG - Agriculture[a]	CCME WQG-Aquatic Life[g]	Max. Baseline +10%[h]	Second Portage Lake (SP)										Tehek Lake (TE)				
				2021-03-18	2021-03-18	2021-05-09	2021-05-09	2021-07-11	2021-07-11	2021-08-06	2021-08-06	2021-09-03	2021-09-03	2021-03-09	2021-03-09	2021-03-09	2021-03-09	2021-03-09
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Aluminum	5			<0.0030	<0.0030	<0.0030	<0.0030	0.01	0.01	0.02	0.01	0.01	0.01	<0.0030	<0.0030	<0.0030	0.00	0.00
Antimony	NV	0.009[d]		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic	0.025			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Barium	NV	1[d]		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Beryllium	0.1			<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100
Boron	5			<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium	0.08			<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Calcium	1000			5.14	4.26	4.45	4.06	3.79	3.71	3.53	3.62	3.30	3.38	3.05	3.91	2.61	2.87	2.21
Chromium	0.05[b]			<0.00010	<0.00010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Cobalt	1			<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper	0.3[c]			0.0008	0.0006	0.0006	0.0006	0.0007	0.0007	0.0008	0.0008	0.0008	0.0007	<0.00050	<0.00050	<0.00050	0.0006	<0.00050
Lead	0.1			<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.00	<0.000050
Manganese	NV	1.7[e]		0.0005	0.0006	0.0005	0.0007	0.0026	0.0027	0.0013	0.0014	0.0010	0.0010	0.0005	0.0004	0.0005	0.0005	0.0004
Mercury	0.003			<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum	0.5			0.00017	0.00016	0.00017	0.00017	0.00012	0.00012	0.00014	0.00014	0.00014	0.00012	0.00013	0.00014	0.00007	0.00015	0.00006
Nickel	1			<0.00050	<0.00050	0.00	<0.00050	0.00	0.00	0.00	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Selenium	0.05			<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Silver	NV	0.000025		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Strontium	NV	2.5[f]		0.0234	0.0215	0.0229	0.0219	0.0170	0.0173	0.0165	0.0168	0.0161	0.0170	0.0131	0.0203	0.0143	0.0165	0.0124
Thallium	NV	0.0008	0.11	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin	NV	0.003[e]		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Uranium	0.2			0.000047	0.000047	0.000063	0.000046	0.000054	0.000051	0.000054	0.000057	0.000064	0.000068	0.000029	0.000044	0.000050	0.000066	0.000045
Vanadium	0.1			<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc	50			<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030

Table A-10: Lake water screening for wildlife - Meadowbank site location Third Portage Lake - East Basin

Chemical	CCME WQG - Agriculture[a]	CCME WQG-Aquatic Life[g]	Max. Baseline +10%[h]	Third Portage Lake - East Basin (TPE)									
				2021-03-29	2021-03-29	2021-05-10	2021-05-10	2021-07-23	2021-07-23	2021-08-13	2021-08-13	2021-09-17	2021-09-17
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Aluminum	5			<0.0030	<0.0030	<0.0030	0.00	0.01	0.01	0.02	0.01	0.01	0.01
Antimony	NV	0.009[d]		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic	0.025			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Barium	NV	1[d]		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Beryllium	0.1			<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100
Boron	5			<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium	0.08			<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Calcium	1000			3.42	3.12	3.58	3.56	2.47	2.39	2.56	2.60	2.51	2.46
Chromium	0.05[b]			<0.00010	<0.00010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Cobalt	1			<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper	0.3[c]			<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Lead	0.1			<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Manganese	NV	1.7[e]		0.0005	0.0004	0.0004	0.0005	0.0019	0.0018	0.0010	0.0010	0.0012	0.0014
Mercury	0.003			<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum	0.5			0.00015	0.00012	0.00014	0.00014	0.00010	0.00010	0.00011	0.00012	0.00010	0.00012
Nickel	1			0.00	<0.00050	0.00	0.00	0.00	<0.00050	0.00	0.00	0.00	0.00
Selenium	0.05			<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Silver	NV	0.000025		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Strontium	NV	2.5[f]		0.0156	0.0143	0.0159	0.0160	0.0108	0.0106	0.0109	0.0110	0.0116	0.0116
Thallium	NV	0.0008	0.11	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin	NV	0.003[e]		<0.00010	<0.00010	<0.00010	<0.00010	0.00041	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Uranium	0.2			0.000031	0.000027	0.000040	0.000040	0.000046	0.000037	0.000046	0.000038	0.000048	0.000049
Vanadium	0.1			<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc	50			<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030

(a) CCME (Canadian Council of Ministers of the Environment). 2022c. Canadian Water Quality Guidelines for the Protection of Agriculture. Livestock Watering.
(b) Value for hexavalent chromium (applied to measured total chromium)
(c) BC MOE (British Columbia Ministry of Environment and Climate Change Strategy), 2021. British Columbia Approved Water Quality Guidelines: Aquatic Life, Wildlife, and Agriculture – Guideline Summary. Water Quality Guideline Series, WQG-20. Prov B.C., Victoria, B.C.
(d) BC MOE (British Columbia Ministry of Environment and Climate Change Strategy), 2021. British Columbia Working Water Quality Guidelines: Aquatic Life, Wildlife, and Agriculture – Guideline Summary. Water Quality Guideline Series, WQG-20. Prov B.C., Victoria, B.C. February, 2021
(e) ANZECC and ARMCANZ (Australia and New Zealand Environment and Conservation Council and the Agriculture and Resource Management Council of Australia and New Zealand), 2000. Australian and New Zealand guidelines for fresh and marine water quality. Canberra, Australia.
(f) Environment and Climate Change Canada Federal Environmental Quality Guidelines - Strontium (July, 2020)
(g) CCME (Canadian Council of Ministers of the Environment). 2022a. Canadian Water Quality Guidelines for the Protection of Aquatic Life - Freshwater (where Agriculture guideline unavailable)
(h) Azimuth (2006) or Golder (2018) - included here where baseline is greater than guideline value.

Table A-11: Lake water screening for wildlife - Meadowbank site location Third Portage Lake - North Basin

Chemical	CCME WQG - Agriculture[a]	CCME WQG-Aquatic Life[g]	Max. Baseline +10%[h]	Third Portage Lake - North Basin (TPN)												
				2021-03-29	2021-03-29	2021-05-10	2021-05-10	2021-07-29	2021-07-29	2021-07-29	2021-08-10	2021-08-10	2021-09-17	2021-09-17	2021-09-17	
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Aluminum	5			<0.0030	<0.0030	<0.0030	<0.0030	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Antimony	NV	0.009[d]		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic	0.025			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Barium	NV	1[d]		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Beryllium	0.1			<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100
Boron	5			<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium	0.08			<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Calcium	1000			3.10	2.99	3.16	3.04	2.27	2.18	2.29	2.03	2.29	2.29	2.31	2.24	
Chromium	0.05[b]			<0.00010	<0.00010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	
Cobalt	1			<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	
Copper	0.3[c]			<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	
Lead	0.1			<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	
Manganese	NV	1.7[e]		0.0005	0.0005	0.0005	0.0005	0.0017	0.0016	0.0017	0.0011	0.0016	0.0014	0.0015	0.0014	
Mercury	0.003			<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	
Molybdenum	0.5			0.00015	0.00016	0.00014	0.00014	0.00010	0.00009	0.00010	0.00011	0.00010	0.00010	0.00010	0.00011	
Nickel	1			<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00	0.00	<0.00050	0.00	<0.00050	
Selenium	0.05			<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	
Silver	NV	0.000025		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	
Strontium	NV	2.5[f]		0.0147	0.0145	0.0140	0.0141	0.0104	0.0095	0.0100	0.0089	0.0102	0.0112	0.0111	0.0109	
Thallium	NV	0.0008	0.11	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	
Tin	NV	0.003[e]		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	
Uranium	0.2			0.000030	0.000031	0.000038	0.000038	0.000037	0.000036	0.000035	0.000031	0.000038	0.000047	0.000044	0.000043	
Vanadium	0.1			<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	
Zinc	50			<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	

Table A-12: Lake water screening for wildlife - Whale Tail Lake - South Basin

Chemical	CCME WQG - Agriculture[a]	CCME WQG-Aquatic Life[g]	Max. Baseline +10%[h]	Whale Tail Lake - South Basin (WTS)												
				2021-03-25	2021-03-25	2021-05-12	2021-05-12	2021-07-08	2021-07-08	2021-08-10	2021-08-10	2021-08-10	2021-09-08	2021-09-08	2021-09-08	
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Aluminum	5			0.0064	0.0059	0.0061	0.0056	0.0239	0.0138	0.0144	0.0153	0.0141	0.0110	0.0081	0.0103	
Antimony	NV	0.009[d]		0.0002	0.0002	0.0002	0.0002	0.0003	0.0003	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	
Arsenic	0.025			0.0008	0.0008	0.0007	0.0008	0.0016	0.0017	0.0011	0.0011	0.0011	0.0011	0.0010	0.0010	
Barium	NV	1[d]		0.0220	0.0233	0.0229	0.0235	0.0198	0.0198	0.0160	0.0162	0.0164	0.0152	0.0142	0.0145	
Beryllium	0.1			<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	
Boron	5			<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	
Cadmium	0.08			<0.0000050	<0.0000050	0.0000055	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	
Calcium	1000			11.90	12.20	13.20	13.80	10.10	10.10	8.81	8.89	8.86	7.97	7.53	7.76	
Chromium	0.05[b]			0.00015	0.00015	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	
Cobalt	1			0.00	0.00	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	
Copper	0.3[c]			0.0008	0.0009	0.0008	0.0007	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	
Lead	0.1			<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	
Manganese	NV	1.7[e]		0.0481	0.0505	0.0428	0.0456	0.0390	0.0431	0.0083	0.0084	0.0094	0.0113	0.0093	0.0105	
Mercury	0.003			<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	
Molybdenum	0.5			0.00065	0.00076	0.00054	0.00063	0.00047	0.00049	0.00041	0.00041	0.00040	0.00033	0.00040	0.00034	
Nickel	1			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Selenium	0.05			<0.000050	0.00006	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	
Silver	NV	0.000025		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	
Strontium	NV	2.5[f]		0.0994	0.1050	0.1000	0.1070	0.0765	0.0788	0.0723	0.0724	0.0721	0.0683	0.0634	0.0653	
Thallium	NV	0.0008	0.11	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	
Tin	NV	0.003[e]		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	
Uranium	0.2			0.000146	0.000165	0.000132	0.000144	0.000082	0.000087	0.000076	0.000066	0.000076	0.000076	0.000072	0.000073	
Vanadium	0.1			<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	
Zinc	50			<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	

(a) CCME (Canadian Council of Ministers of the Environment). 2022c. Canadian Water Quality Guidelines for the Protection of Agriculture. Livestock Watering.
(b) Value for hexavalent chromium (applied to measured total chromium)
(c) BC MOE (British Columbia Ministry of Environment and Climate Change Strategy), 2021. British Columbia Approved Water Quality Guidelines: Aquatic Life, Wildlife, and Agriculture – Guideline Summary. Water Quality Guideline Series, WQG-20. Prov B.C., Victoria, B.C.
(d) BC MOE (British Columbia Ministry of Environment and Climate Change Strategy), 2021. British Columbia Working Water Quality Guidelines: Aquatic Life, Wildlife, and Agriculture – Guideline Summary. Water Quality Guideline Series, WQG-20. Prov B.C., Victoria, B.C. February, 2021
(e) ANZECC and ARMCANZ (Australia and New Zealand Environment and Conservation Council and the Agriculture and Resource Management Council of Australia and New Zealand), 2000. Australian and New Zealand guidelines for fresh and marine water quality. Canberra, Australia.
(f) Environment and Climate Change Canada Federal Environmental Quality Guidelines - Strontium (July, 2020)
(g) CCME (Canadian Council of Ministers of the Environment). 2022a. Canadian Water Quality Guidelines for the Protection of Aquatic Life - Freshwater (where Agriculture guideline unavailable)
(h) Azimuth (2006) or Golder (2018) - included here where baseline is greater than guideline value.

Table A-13: Lake water screening for wildlife - Mammoth Lake

Chemical	CCME WQG - Agriculture[a]	CCME WQG-Aquatic Life[g]	Max. Baseline +10%[h]	Mammoth Lake (MAM)												
				2021-03-25	2021-03-25	2021-05-12	2021-05-12	2021-05-12	2021-07-09	2021-07-09	2021-07-09	2021-08-07	2021-08-07	2021-08-07	2021-09-09	2021-09-09
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Aluminum	5			<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	0.0059	0.0095	0.0039	0.0072	0.0079	0.0078	0.0070	0.0126
Antimony	NV	0.009[d]		0.0006	0.0009	0.0007	0.0009	0.0009	0.0004	0.0007	0.0004	0.0006	0.0015	0.0006	0.0011	0.0025
Arsenic	0.025			0.0007	0.0008	0.0009	0.0009	0.0008	0.0010	0.0015	0.0009	0.0012	0.0019	0.0011	0.0014	0.0032
Barium	NV	1[d]		0.0374	0.0529	0.0439	0.0562	0.0573	0.0223	0.0244	0.0220	0.0181	0.0231	0.0185	0.0189	0.0243
Beryllium	0.1			<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100
Boron	5			<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium	0.08			<0.0000050	<0.0000050	<0.0000050	0.0000054	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.0000052
Calcium	1000			23.80	32.60	27.00	35.40	36.80	13.20	15.20	13.60	12.40	15.80	12.50	11.50	16.30
Chromium	0.05[b]			<0.00010	<0.00010	<0.00050	<0.00050	<0.00050	<0.00050	0.00076	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Cobalt	1			<0.00010	<0.00010	<0.00010	0.00	0.00	<0.00010	<0.00010	<0.00010	<0.00010	0.00	<0.00010	<0.00010	0.00
Copper	0.3[c]			0.0006	0.0008	0.0007	0.0008	0.0008	<0.00050	<0.00050	0.0005	<0.00050	0.0005	0.0005	0.0006	0.0008
Lead	0.1			<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Manganese	NV	1.7[e]		0.0035	0.0086	0.0037	0.0070	0.0071	0.0090	0.0137	0.0048	0.0053	0.0120	0.0054	0.0064	0.0224
Mercury	0.003			<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum	0.5			0.00060	0.00075	0.00058	0.00075	0.00071	0.00033	0.00055	0.00033	0.00045	0.00073	0.00045	0.00047	0.00091
Nickel	1			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Selenium	0.05			0.00008	0.00012	0.00010	0.00013	0.00015	0.00005	0.00009	0.00006	0.00007	0.00011	0.00007	0.00009	0.00014
Silver	NV	0.000025		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Strontium	NV	2.5[f]		0.1730	0.2430	0.1800	0.2420	0.2550	0.0908	0.1050	0.0917	0.0865	0.1170	0.0882	0.0890	0.1290
Thallium	NV	0.0008	0.11	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin	NV	0.003[e]		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Uranium	0.2			0.000096	0.000128	0.000093	0.000124	0.000122	0.000060	0.000096	0.000061	0.000098	0.000196	0.000094	0.000125	0.000286
Vanadium	0.1			<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc	50			<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030

Table A-14: Lake water screening for wildlife - Inuggugayualik Lake

Chemical	CCME WQG - Agriculture[a]	CCME WQG-Aquatic Life[g]	Max. Baseline +10%[h]	Inuggugayualik Lake (INUG)										
				2021-03-10	2021-03-17	2021-05-11	2021-05-11	2021-07-27	2021-07-27	2021-08-18	2021-08-18	2021-09-04	2021-09-04	2021-09-04
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Aluminum	5			0.00	0.00	0.00	0.00	0.02	0.03	0.02	0.02	0.02	0.02	0.02
Antimony	NV	0.009[d]		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic	0.025			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Barium	NV	1[d]		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Beryllium	0.1			<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100
Boron	5			<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium	0.08			<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Calcium	1000			1.48	1.57	1.65	1.56	1.12	1.11	1.12	1.12	1.11	1.11	1.15
Chromium	0.05[b]			<0.00010	<0.00010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Cobalt	1			<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper	0.3[c]			<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Lead	0.1			<0.000050	<0.000050	<0.000050	0.00	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Manganese	NV	1.7[e]		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mercury	0.003			<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum	0.5			<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Nickel	1			<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Selenium	0.05			<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Silver	NV	0.000025		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Strontium	NV	2.5[f]		0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Thallium	NV	0.0008	0.11	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin	NV	0.003[e]		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Uranium	0.2			0.000063	0.000068	0.000060	0.000055	0.000066	0.000071	0.000071	0.000069	0.000069	0.000076	0.000079
Vanadium	0.1			<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc	50			<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030

(a) CCME (Canadian Council of Ministers of the Environment). 2022c. Canadian Water Quality Guidelines for the Protection of Agriculture. Livestock Watering.
(b) Value for hexavalent chromium (applied to measured total chromium)
(c) BC MOE (British Columbia Ministry of Environment and Climate Change Strategy), 2021. British Columbia Approved Water Quality Guidelines: Aquatic Life, Wildlife, and Agriculture – Guideline Summary. Water Quality Guideline Series, WQG-20. Prov B.C., Victoria, B.C.
(d) BC MOE (British Columbia Ministry of Environment and Climate Change Strategy), 2021. British Columbia Working Water Quality Guidelines: Aquatic Life, Wildlife, and Agriculture – Guideline Summary. Water Quality Guideline Series, WQG-20. Prov B.C., Victoria, B.C. February, 2021
(e) ANZECC and ARMCANZ (Australia and New Zealand Environment and Conservation Council and the Agriculture and Resource Management Council of Australia and New Zealand), 2000. Australian and New Zealand guidelines for fresh and marine water quality. Canberra, Australia.
(f) Environment and Climate Change Canada Federal Environmental Quality Guidelines - Strontium (July, 2020)
(g) CCME (Canadian Council of Ministers of the Environment). 2022a. Canadian Water Quality Guidelines for the Protection of Aquatic Life - Freshwater (where Agriculture guideline unavailable)
(h) Azimuth (2006) or Golder (2018) - included here where baseline is greater than guideline value.

Table A-15: Lake water screening for wildlife - Pipedream Lake

Chemical	CCME WQG - Agriculture[a]	CCME WQG-Aquatic Life[g]	Max. Baseline +10%[h]	Pipedream Lake (PDL)											
				2021-03-20	2021-03-20	2021-03-20	2021-05-09	2021-05-09	2021-05-09	2021-07-27	2021-07-27	2021-08-16	2021-08-16	2021-09-04	2021-09-04
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Aluminum	5			<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	0.01	0.01	0.01	0.01	0.01	0.01
Antimony	NV	0.009[d]		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic	0.025			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Barium	NV	1[d]		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Beryllium	0.1			<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100
Boron	5			<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium	0.08			<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Calcium	1000			3.13	3.09	2.64	2.70	3.00	2.65	2.28	2.35	2.40	2.34	2.32	2.35
Chromium	0.05[b]			<0.00010	<0.00010	<0.00010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Cobalt	1			<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper	0.3[c]			<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Lead	0.1			<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Manganese	NV	1.7[e]		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mercury	0.003			<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum	0.5			0.00	0.00	<0.000050	<0.000050	0.00	0.00	0.00	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Nickel	1			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Selenium	0.05			<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Silver	NV	0.000025		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Strontium	NV	2.5[f]		0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Thallium	NV	0.0008	0.11	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin	NV	0.003[e]		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Uranium	0.2			0.000029	0.000031	0.000027	0.000020	0.000024	0.000023	0.000031	0.000026	0.000033	0.000029	0.000030	0.000031
Vanadium	0.1			<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc	50			<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030

(a) CCME (Canadian Council of Ministers of the Environment). 2022c. Canadian Water Quality Guidelines for the Protection of Agriculture. Livestock Watering.
(b) Value for hexavalent chromium (applied to measured total chromium)
(c) BC MOE (British Columbia Ministry of Environment and Climate Change Strategy), 2021. British Columbia Approved Water Quality Guidelines: Aquatic Life, Wildlife, and Agriculture – Guideline Summary. Water Quality Guideline Series, WQG-20. Prov B.C., Victoria, B.C.
(d) BC MOE (British Columbia Ministry of Environment and Climate Change Strategy), 2021. British Columbia Working Water Quality Guidelines: Aquatic Life, Wildlife, and Agriculture – Guideline Summary. Water Quality Guideline Series, WQG-20. Prov B.C., Victoria, B.C. February, 2021
(e) ANZECC and ARMCANZ (Australia and New Zealand Environment and Conservation Council and the Agriculture and Resource Management Council of Australia and New Zealand), 2000. Australian and New Zealand guidelines for fresh and marine water quality. Canberra, Australia.
(f) Environment and Climate Change Canada Federal Environmental Quality Guidelines - Strontium (July, 2020)
(g) CCME (Canadian Council of Ministers of the Environment). 2022a. Canadian Water Quality Guidelines for the Protection of Aquatic Life - Freshwater (where Agriculture guideline unavailable)
(h) Azimuth (2006) or Golder (2018) - included here where baseline is greater than guideline value.

Table A-16: Lake water screening for human health - Second Portage Lake and Tehek Lake

Chemical	HC Drinking Water[a]	BC CSR - Drinking Water[b]	Max. Baseline +10%[d]	Second Portage Lake (SP)										Tehek Lake (TE)				
				2021-03-18	2021-03-18	2021-05-09	2021-05-09	2021-07-11	2021-07-11	2021-08-06	2021-08-06	2021-09-03	2021-09-03	2021-03-09	2021-03-09	2021-03-09	2021-03-09	2021-03-09
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Aluminum	2.9			<0.0030	<0.0030	<0.0030	<0.0030	0.01	0.01	0.02	0.01	0.01	0.01	<0.0030	<0.0030	<0.0030	0.00	0.00
Antimony	0.006			<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic	0.01			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Barium	2			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Beryllium	NV	0.005[c]	0.0055	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100
Cadmium	0.007			<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Chromium	0.05			<0.00010	<0.00010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Cobalt	NV	0.001	0.0011	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper	0.2			0.0008	0.0006	0.0006	0.0006	0.0007	0.0007	0.0008	0.0008	0.0008	0.0007	<0.00050	<0.00050	<0.00050	0.0006	<0.00050
Lead	0.005			<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.00012	<0.000050
Manganese	0.12			0.0005	0.0006	0.0005	0.0007	0.0026	0.0027	0.0013	0.0014	0.0010	0.0010	0.0005	0.0004	0.0005	0.0005	0.0004
Mercury	0.001			<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum	NV	0.25		0.00017	0.00016	0.00017	0.00017	0.00012	0.00012	0.00014	0.00014	0.00014	0.00012	0.00013	0.00014	0.00007	0.00015	0.00006
Nickel	NV	0.08		<0.00050	<0.00050	0.00	<0.00050	0.00	0.00	0.00	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Selenium	0.05			<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Strontium	7			0.0234	0.0215	0.0229	0.0219	0.0170	0.0173	0.0165	0.0168	0.0161	0.0170	0.0131	0.0203	0.0143	0.0165	0.0124
Thallium	NV	0.00004[c]	0.11	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin	NV	2.5		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Uranium	0.02			0.000047	0.000047	0.000063	0.000046	0.000054	0.000051	0.000054	0.000057	0.000064	0.000068	0.000029	0.000044	0.000050	0.000066	0.000045
Vanadium	NV	0.02	0.033	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc	0.5			<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030

Table A-17: Lake water screening for human health - Third Portage Lake - East Basin

Chemical	HC Drinking Water[a]	BC CSR - Drinking Water[b]	Max. Baseline +10%[d]	Third Portage Lake - East Basin (TPE)									
				2021-03-29	2021-03-29	2021-05-10	2021-05-10	2021-07-23	2021-07-23	2021-08-13	2021-08-13	2021-09-17	2021-09-17
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Aluminum	2.9			<0.0030	<0.0030	<0.0030	0.00	0.01	0.01	0.02	0.01	0.01	0.01
Antimony	0.006			<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic	0.01			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Barium	2			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Beryllium	NV	0.005[c]	0.0055	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100
Cadmium	0.007			<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Chromium	0.05			<0.00010	<0.00010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Cobalt	NV	0.001	0.0011	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper	0.2			<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Lead	0.005			<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Manganese	0.12			0.0005	0.0004	0.0004	0.0005	0.0019	0.0018	0.0010	0.0010	0.0012	0.0014
Mercury	0.001			<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum	NV	0.25		0.00015	0.00012	0.00014	0.00014	0.00010	0.00010	0.00011	0.00012	0.00010	0.00012
Nickel	NV	0.08		0.00	<0.00050	0.00	0.00	0.00	<0.00050	0.00	0.00	0.00	0.00
Selenium	0.05			<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Strontium	7			0.0156	0.0143	0.0159	0.0160	0.0108	0.0106	0.0109	0.0110	0.0116	0.0116
Thallium	NV	0.00004[c]	0.11	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin	NV	2.5		<0.00010	<0.00010	<0.00010	<0.00010	0.00041	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Uranium	0.02			0.000031	0.000027	0.000040	0.000040	0.000046	0.000037	0.000046	0.000038	0.000048	0.000049
Vanadium	NV	0.02	0.033	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc	0.5			<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030

(a) Health Canada, 2020. Guidelines for Canadian Drinking Water Quality - Summary Table. Water and Air Quality Bureau, Healthy Environments and Consumer Safety Branch, Heath Canada. Ottawa, ON.
(b) BC CSR (British Columbia Contaminated Sites Regulation), 2021b. BC Reg. 375/96 British Columbia Contaminated Sites Regulation Schedule 3.2 Generic Numerical Water Standards - drinking water. Current to July 6, 2021.
(c) USEPA RSL for tap water adjusted for hazard quotient of 0.2 (USEPA, 2022)
(d) Azimuth (2006) or Golder (2018) - included here where baseline is greater than guideline value.

Table A-18: Lake water screening for human health - Third Portage Lake - North Basin

Chemical	HC Drinking Water[a]	BC CSR - Drinking Water[b]	Max. Baseline +10%[d]	Third Portage Lake - North Basin (TPN)												
				2021-03-29	2021-03-29	2021-05-10	2021-05-10	2021-07-29	2021-07-29	2021-07-29	2021-08-10	2021-08-10	2021-09-17	2021-09-17	2021-09-17	
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Aluminum	2.9			<0.0030	<0.0030	<0.0030	<0.0030	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Antimony	0.006			<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic	0.01			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Barium	2			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Beryllium	NV	0.005[c]	0.0055	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100
Cadmium	0.007			<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Chromium	0.05			<0.00010	<0.00010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Cobalt	NV	0.001	0.0011	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper	0.2			<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Lead	0.005			<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Manganese	0.12			0.0005	0.0005	0.0005	0.0005	0.0017	0.0016	0.0017	0.0011	0.0016	0.0014	0.0015	0.0014	
Mercury	0.001			<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum	NV	0.25		0.00015	0.00016	0.00014	0.00014	0.00010	0.00009	0.00010	0.00011	0.00010	0.00010	0.00010	0.00011	
Nickel	NV	0.08		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00	0.00	<0.00050	0.00	<0.00050	
Selenium	0.05			<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	
Strontium	7			0.0147	0.0145	0.0140	0.0141	0.0104	0.0095	0.0100	0.0089	0.0102	0.0112	0.0111	0.0109	
Thallium	NV	0.00004[c]	0.11	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	
Tin	NV	2.5		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	
Uranium	0.02			0.000030	0.000031	0.000038	0.000038	0.000037	0.000036	0.000035	0.000031	0.000038	0.000047	0.000044	0.000043	
Vanadium	NV	0.02	0.033	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	
Zinc	0.5			<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	

Table A-19: Lake water screening for human health - Whale Tail Lake - South Basin

Chemical	HC Drinking Water[a]	BC CSR - Drinking Water[b]	Max. Baseline +10%[d]	Whale Tail Lake - South Basin (WTS)												
				2021-03-25	2021-03-25	2021-05-12	2021-05-12	2021-07-08	2021-07-08	2021-08-10	2021-08-10	2021-08-10	2021-09-08	2021-09-08	2021-09-08	
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Aluminum	2.9			0.0064	0.0059	0.0061	0.0056	0.0239	0.0138	0.0144	0.0153	0.0141	0.0110	0.0081	0.0103	
Antimony	0.006			0.0002	0.0002	0.0002	0.0002	0.0003	0.0003	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	
Arsenic	0.01			0.0008	0.0008	0.0007	0.0008	0.0016	0.0017	0.0011	0.0011	0.0011	0.0011	0.0010	0.0010	
Barium	2			0.0220	0.0233	0.0229	0.0235	0.0198	0.0198	0.0160	0.0162	0.0164	0.0152	0.0142	0.0145	
Beryllium	NV	0.005[c]	0.0055	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	
Cadmium	0.007			<0.0000050	<0.0000050	0.0000055	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	
Chromium	0.05			0.00015	0.00015	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	
Cobalt	NV	0.001	0.0011	0.00012	0.00012	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	
Copper	0.2			0.0008	0.0009	0.0008	0.0007	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	
Lead	0.005			<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	
Manganese	0.12			0.0481	0.0505	0.0428	0.0456	0.0390	0.0431	0.0083	0.0084	0.0094	0.0113	0.0093	0.0105	
Mercury	0.001			<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	
Molybdenum	NV	0.25		0.00065	0.00076	0.00054	0.00063	0.00047	0.00049	0.00041	0.00041	0.00040	0.00033	0.00040	0.00034	
Nickel	NV	0.08		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Selenium	0.05			<0.000050	0.00006	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	
Strontium	7			0.0994	0.1050	0.1000	0.1070	0.0765	0.0788	0.0723	0.0724	0.0721	0.0683	0.0634	0.0653	
Thallium	NV	0.00004[c]	0.11	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	
Tin	NV	2.5		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	
Uranium	0.02			0.000146	0.000165	0.000132	0.000144	0.000082	0.000087	0.000076	0.000066	0.000076	0.000076	0.000072	0.000073	
Vanadium	NV	0.02	0.033	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	
Zinc	0.5			<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	

(a) Health Canada, 2020. Guidelines for Canadian Drinking Water Quality - Summary Table. Water and Air Quality Bureau, Healthy Environments and Consumer Safety Branch, Heath Canada. Ottawa, ON.
(b) BC CSR (British Columbia Contaminated Sites Regulation), 2021b. BC Reg. 375/96 British Columbia Contaminated Sites Regulation Schedule 3.2 Generic Numerical Water Standards - drinking water. Current to July 6, 2021.
(c) USEPA RSL for tap water adjusted for hazard quotient of 0.2 (USEPA, 2022)
(d) Azimuth (2006) or Golder (2018) - included here where baseline is greater than guideline value.

Table A-20: Lake water screening for human health - Mammoth Lake

Chemical	HC Drinking Water[a]	BC CSR - Drinking Water[b]	Max. Baseline +10%[d]	Mammoth Lake (MAM)												
				2021-03-25	2021-03-25	2021-05-12	2021-05-12	2021-05-12	2021-07-09	2021-07-09	2021-07-09	2021-08-07	2021-08-07	2021-08-07	2021-09-09	2021-09-09
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Aluminum	2.9			<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	0.0059	0.0095	0.0039	0.0072	0.0079	0.0078	0.0070	0.0126
Antimony	0.006			0.0006	0.0009	0.0007	0.0009	0.0009	0.0004	0.0007	0.0004	0.0006	0.0015	0.0006	0.0011	0.0025
Arsenic	0.01			0.0007	0.0008	0.0009	0.0009	0.0008	0.0010	0.0015	0.0009	0.0012	0.0019	0.0011	0.0014	0.0032
Barium	2			0.0374	0.0529	0.0439	0.0562	0.0573	0.0223	0.0244	0.0220	0.0181	0.0231	0.0185	0.0189	0.0243
Beryllium	NV	0.005[c]	0.0055	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100
Cadmium	0.007			<0.0000050	<0.0000050	<0.0000050	0.0000054	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.0000052
Chromium	0.05			<0.00010	<0.00010	<0.00050	<0.00050	<0.00050	<0.00050	0.00076	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Cobalt	NV	0.001	0.0011	<0.00010	<0.00010	<0.00010	0.00010	0.00012	<0.00010	<0.00010	<0.00010	<0.00010	0.00012	<0.00010	<0.00010	0.00019
Copper	0.2			0.0006	0.0008	0.0007	0.0008	0.0008	<0.00050	<0.00050	0.0005	<0.00050	0.0005	0.0005	0.0006	0.0008
Lead	0.005			<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Manganese	0.12			0.0035	0.0086	0.0037	0.0070	0.0071	0.0090	0.0137	0.0048	0.0053	0.0120	0.0054	0.0064	0.0224
Mercury	0.001			<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum	NV	0.25		0.00060	0.00075	0.00058	0.00075	0.00071	0.00033	0.00055	0.00033	0.00045	0.00073	0.00045	0.00047	0.00091
Nickel	NV	0.08		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Selenium	0.05			0.00008	0.00012	0.00010	0.00013	0.00015	0.00005	0.00009	0.00006	0.00007	0.00011	0.00007	0.00009	0.00014
Strontium	7			0.1730	0.2430	0.1800	0.2420	0.2550	0.0908	0.1050	0.0917	0.0865	0.1170	0.0882	0.0890	0.1290
Thallium	NV	0.00004[c]	0.11	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin	NV	2.5		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Uranium	0.02			0.000096	0.000128	0.000093	0.000124	0.000122	0.000060	0.000096	0.000061	0.000098	0.000196	0.000094	0.000125	0.000286
Vanadium	NV	0.02	0.033	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc	0.5			<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030

Table A-21: Lake water screening for human health - Inuggugayualik Lake

Chemical	HC Drinking Water[a]	BC CSR - Drinking Water[b]	Max. Baseline +10%[d]	Inuggugayualik Lake (INUG)										
				2021-03-10	2021-03-17	2021-05-11	2021-05-11	2021-07-27	2021-07-27	2021-08-18	2021-08-18	2021-09-04	2021-09-04	2021-09-04
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Aluminum	2.9			0.00	0.00	0.00	0.00	0.02	0.03	0.02	0.02	0.02	0.02	0.02
Antimony	0.006			<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic	0.01			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Barium	2			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Beryllium	NV	0.005[c]	0.0055	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100
Cadmium	0.007			<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Chromium	0.05			<0.00010	<0.00010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Cobalt	NV	0.001	0.0011	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper	0.2			<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Lead	0.005			<0.000050	<0.000050	<0.000050	0.00	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Manganese	0.12			0.0005	0.0005	0.0005	0.0004	0.0031	0.0033	0.0017	0.0015	0.0013	0.0013	0.0013
Mercury	0.001			<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum	NV	0.25		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Nickel	NV	0.08		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Selenium	0.05			<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Strontium	7			0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Thallium	NV	0.00004[c]	0.11	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin	NV	2.5		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Uranium	0.02			0.000063	0.000068	0.000060	0.000055	0.000066	0.000071	0.000071	0.000069	0.000069	0.000076	0.000079
Vanadium	NV	0.02	0.033	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc	0.5			<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030

(a) Health Canada, 2020. Guidelines for Canadian Drinking Water Quality - Summary Table. Water and Air Quality Bureau, Healthy Environments and Consumer Safety Branch, Heath Canada. Ottawa, ON.
(b) BC CSR (British Columbia Contaminated Sites Regulation), 2021b. BC Reg. 375/96 British Columbia Contaminated Sites Regulation Schedule 3.2 Generic Numerical Water Standards - drinking water. Current to July 6, 2021.
(c) USEPA RSL for tap water adjusted for hazard quotient of 0.2 (USEPA, 2022)
(d) Azimuth (2006) or Golder (2018) - included here where baseline is greater than guideline value.

Table A-22: Lake water screening for human health - Pipedream Lake

Chemical	HC Drinking Water[a]	BC CSR - Drinking Water[b]	Max. Baseline +10%[d]	Pipedream Lake (PDL)											
				2021-03-20	2021-03-20	2021-03-20	2021-05-09	2021-05-09	2021-05-09	2021-07-27	2021-07-27	2021-08-16	2021-08-16	2021-09-04	2021-09-04
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Aluminum	2.9			<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	0.01	0.01	0.01	0.01	0.01	0.01
Antimony	0.006			<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic	0.01			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Barium	2			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Beryllium	NV	0.005[c]	0.0055	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100
Cadmium	0.007			<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Chromium	0.05			<0.00010	<0.00010	<0.00010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Cobalt	NV	0.001	0.0011	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper	0.2			<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Lead	0.005			<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Manganese	0.12			0.0004	0.0005	0.0005	0.0004	0.0004	0.0004	0.0015	0.0015	0.0011	0.0013	0.0010	0.0008
Mercury	0.001			<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum	NV	0.25		0.00	0.00	<0.000050	<0.000050	0.00	0.00	0.00	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Nickel	NV	0.08		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Selenium	0.05			<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Strontium	7			0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Thallium	NV	0.00004[c]	0.11	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin	NV	2.5		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Uranium	0.02			0.000029	0.000031	0.000027	0.000020	0.000024	0.000023	0.000031	0.000026	0.000033	0.000029	0.000030	0.000031
Vanadium	NV	0.02	0.033	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc	0.5			<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030

(a) Health Canada, 2020. Guidelines for Canadian Drinking Water Quality - Summary Table. Water and Air Quality Bureau, Healthy Environments and Consumer Safety Branch, Heath Canada. Ottawa, ON.
(b) BC CSR (British Columbia Contaminated Sites Regulation), 2021b. BC Reg. 375/96 British Columbia Contaminated Sites Regulation Schedule 3.2 Generic Numerical Water Standards - drinking water. Current to July 6, 2021.
(c) USEPA RSL for tap water adjusted for hazard quotient of 0.2 (USEPA, 2022)
(d) Azimuth (2006) or Golder (2018) - included here where baseline is greater than guideline value.

Table A-23: Tailings sediment screening (wildlife)

Chemical	CCME SQG-E[a]	BC CSR-E[b]	Max. Measured Golder (2019b)[c]	CA15220-MAY21-5	CA15159-JUN21-5	CA14078-JUL21-5	CA14827-AUG21-5	Average (June - Aug.)[d]
				5/09/21	6/06/21	7/04/21	8/03/21	
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Antimony	20		2.8	4.5	3.6	3.7	3.5	
Arsenic	17		300	1000	1500	1100	1400	1250
Barium	500[e]		610	210	190	180	200	
Beryllium	4		1.8	0.99	0.93	0.95	0.98	
Cadmium	10		1.1	0.35	0.39	0.37	0.43	
Chromium	64		110	840	540	1300	1600	1070
Cobalt	50		15	74	52	50	63	
Copper	63		110	100	80	110	93	
Lead	300		120	140	100	59	110	
Manganese	NV	2000	820	5800	4800	4000	5400	
Mercury	12		-	-	-	-	-	
Molybdenum	10		20	1.3	1.1	3.3	1.2	
Nickel	45		75	920	660	730	820	
Selenium	1		1.4	0.9	1	< 0.7	0.8	
Silver	20		-	< 0.5	< 0.5	< 0.5	0.5	
Strontium	NV	NV	200	110	94	110	120	
Thallium	1.4		0.48	0.26	0.31	0.33	0.37	
Tin	50		<6	< 6	< 6	< 6	< 6	
Uranium	500		3.9	0.43	0.46	0.56	0.59	
Vanadium	130		89	110	90	90	110	
Zinc	250		130	87	71	73	85	
Chemical	**CCME SQG-E[a]**	**BC CSR-E[b]**	**Max. Measured Golder (2019b)[c]**	**CA14196-SEP21-5**	**CA14309-OCT21-5**	**CA13539-NOV21-5**	**CA14328-DEC21-5**	**Average (Sept. - Dec.)[d]**
				9/06/21	**10/09/21**	**11/05/21**	**12/14/21**	
	mg/kg	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**
Cyanide (WAD)[g]	NV	NV	-	<10	<10	19	<10	8.5[f]

(a) CCME (Canadian Council of Ministers of the Environment). 2022b. Canadian Environmental Quality Guidelines – Soil Quality Guidelines for the Protection of Environmental and Human Health (residential)
(b) BC Reg. 375/96 British Columbia Contaminated Sites Regulation Schedule 3.1 Part 1 - Matrix Numerical Soil Standards (lowest value for Environmental Protection) - where CCME guideline unavailable
(c) Maximum measured concentration in tailings sediment as used in the Golder (2019b) assessment. Values are from 2015 - 2017.
(d) Average concentration for June - August (arsenic and chromium) and September - December (cyanide) as used in refined exposure calculations.
(e) Overall residential/parkland guideline (1999); no SQG_E was derived.
(f) 1/2 DL used in calculation of the average
(g) Cyanide was measured in tailings sediment beginning in September, so those values are used in the assessment.
"-" Not measured
NV = no value

Table A-24: Tailings water screening (wildlife)

Chemical	CCME WQG - Agriculture[a]	CCME WQG-Aquatic Life[g]	Max. Measured Golder (2019b)[h]	South Cell						North Cell						Average[i]
				6/22/21	7/25/21	8/17/21	9/22/21	9/22/21	10/03/21	6/22/21	7/28/21	8/17/21	9/22/21	9/28/21	10/03/21	
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Aluminum	5		-	0.314	3.42	0.368	0.146	0.121	0.303	0.399	2.64	0.204	0.0797	0.0776	0.295	
Antimony	NV	0.009[d]	0.0019	0.000643	0.0092	-	-	0.00362	-	0.000811	0.00744	-	-	0.00352	-	
Arsenic	0.025		0.0204	0.0105	0.283	0.0499	0.064	0.0645	0.054	0.0107	0.149	0.0941	0.087	0.0706	0.0733	0.0842
Barium	NV	1[d]	0.053	0.0126	0.0721	0.0406	0.0374	0.0374	0.0279	0.0134	0.08	0.0605	0.0295	0.0224	0.0233	
Beryllium	0.1		<0.0005	0.00003	0.000126	-	-	< 0.000010	-	0.000032	0.00012	-	-	< 0.000010	-	
Boron	5		-	0.025	0.099	-	-	0.082	-	0.03	0.135	-	-	0.063	-	
Cadmium	0.08		0.00162	0.0000334	0.00019	0.00011	0.0000616	0.0000628	0.0000724	0.0000352	0.000137	0.000211	0.0000803	0.0000471	0.0000555	
Chromium	0.05[b]		0.0041	0.00153	0.105	0.0081	0.00205	0.00181	0.0066	0.00173	0.0888	0.0065	0.00243	0.00091	0.00853	0.0195
Cobalt	1		NM	0.00191	0.264	-	-	0.109	-	0.00178	0.438	-	-	0.0332	-	
Copper	0.3[c]		0.1097	0.0105	4.45	8.76	0.467	0.47	0.292	0.0101	9.15	11.3	0.285	0.242	0.103	
Lead	0.1		0.0096	0.00801	0.0476	0.0121	0.00252	0.00262	0.00633	0.00914	0.0238	0.00751	0.0017	0.00293	0.00673	
Manganese	NV	1.7[e]	0.4497	0.145	0.432	0.203	0.384	0.391	0.558	0.151	0.333	0.23	0.165	0.0884	0.13	
Mercury	0.003		0.00053	< 0.00001	0.00001	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00001	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	
Molybdenum	0.5		0.3588	0.0138	0.0609	0.0482	0.0412	0.0414	0.0445	0.0238	0.0802	0.0897	0.0493	0.0395	0.0295	
Nickel	1		0.0752	0.0107	1.25	3.72	0.413	0.418	0.3	0.0139	5.58	6.39	0.386	0.33	0.162	
Selenium	0.05		0.038	0.000306	0.0584	0.0933	0.0321	0.0325	0.0244	0.000399	0.102	0.176	0.0325	0.0265	0.0122	
Silver	NV	0.000025	-	0.000013	0.00183	0.0021	0.000222	0.00021	0.000206	0.00002	0.00178	0.00056	0.000338	0.000232	0.0001	
Strontium	NV	2.5[f]	1.12	0.225	0.731	-	-	0.592	-	0.246	0.87	-	-	0.408	-	
Thallium	NV	0.0008	<0.0008	0.0000169	0.000077	0.000023	0.0000398	0.0000391	0.0000365	0.0000127	0.000101	< 0.000020	0.0000295	0.0000166	0.0000156	
Tin	NV	0.003[e]	<0.001	< 0.00020	< 0.00040	-	-	< 0.00020	-	< 0.00020	< 0.0020	-	-	< 0.00020	-	
Uranium	0.2		0.013	0.00206	0.00762	-	-	0.0112	-	0.00251	0.012	-	-	0.00606	-	
Vanadium	0.1		<0.0005	0.00032	0.00869	-	-	0.0003	-	0.00045	0.0055	-	-	0.0003	-	
Zinc	50		0.015	0.0032	0.0111	0.00626	0.00265	0.00336	0.00347	0.0028	0.015	0.0068	0.00073	0.00114	0.00135	
Cyanide (WAD)	NV	0.005	0.143 (total)	0.0019	0.0015	0.0026	0.018	0.015	0.045	0.0029	1.5	0.27	0.38	0.44	0.14	0.2347

(a) CCME (Canadian Council of Ministers of the Environment). 2022c. Canadian Water Quality Guidelines for the Protection of Agriculture. Livestock Watering.
(b) Value for hexavalent chromium (applied to measured total chromium)
(c) BC MOE (British Columbia Ministry of Environment and Climate Change Strategy), 2021. British Columbia Approved Water Quality Guidelines: Aquatic Life, Wildlife, and Agriculture – Guideline Summary. Water Quality Guideline Series, WQG-20. Prov B.C., Victoria, B.C.

(d) BC MOE (British Columbia Ministry of Environment and Climate Change Strategy), 2021. British Columbia Working Water Quality Guidelines: Aquatic Life, Wildlife, and Agriculture – Guideline Summary. Water Quality Guideline Series, WQG-20. Prov B.C., Victoria, B.C. February, 2021
(e) ANZECC and ARMCANZ (Australia and New Zealand Environment and Conservation Council and the Agriculture and Resource Management Council of Australia and New Zealand), 2000. Australian and New Zealand guidelines for fresh and marine water quality. Canberra, Australia.
(f) Environment and Climate Change Canada Federal Environmental Quality Guidelines - Strontium (July, 2020)
(g) CCME (Canadian Council of Ministers of the Environment). 2022a. Canadian Water Quality Guidelines for the Protection of Aquatic Life - Freshwater (where Agriculture guideline unavailable)
(h) Maximum measured concentration in tailings water as used in the Golder (2019b) assessment. Values are from 2016 - 2018.
(i) Average across all sample dates, used in refined exposure calculations
WAD = weak acid disscociable
"-" = not measured

Appendix B

TOXICITY REFERENCE VALUES AND HAZARD QUOTIENTS – TSF STUDY AREA

Table B-1: Toxicity Reference Values and Hazard Quotients for Northern Red-Backed Vole (TSF Study Area)

Risk Assessment Parameter		% Intake from TSF	Antimony[2,3,4]	Arsenic[1]	Barium[1]	Beryllium[1,2]	Cadmium[1]	Chromium[1,5]	Cobalt[7]	Copper[1]	Lead[1]	Manganese[1]	Total Hg	Inorg-Hg[1,9]	MeHg[1,9]	Molybdenum[1]	Nickel[1]	Selenium[1]	Strontium[1,2]
% Time in Area			25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%
Dose	**Soil**	0%	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
(mg/kg wet/day)	**Water**	100%	0.0006	0.0179	0.0051	0.0000	0.0000	0.0066	0.0276	0.7133	0.0030	0.0352	0.0000	0.0000	0.0000	0.0057	0.4034	0.0111	0.0549
	Sedges	0%	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Lichens	0%	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Berries	0%	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	Insects	0%	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Total Food	0%	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	Total Dose		0.001	0.018	0.005	0.000	0.000	0.007	0.028	0.713	0.003	0.035	0.000	0.000	0.000	0.006	0.403	0.011	0.055
TRVs	**NOAEL$_{TRV}$**		98.0	0.1	5.1	0.7	1.0	3.3	0.2	11.7	8.0	88.0	na	1.0	0.0	0.3	40.0	0.2	263.0
(mg/kg wet/day)	**LOAEL$_{TRV}$**		112.9	1.3	19.8	na	10.0	13.1	2.0	15.1	80.0	284.0	na	na	0.0	2.6	80.0	0.3	na
Hazard Quotients	**HQ (NOAEL)**		0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	na	0.0	0.0	0.0	0.0	0.1	0.0
(unitless)	**HQ (LOAEL)**		0.0	0.0	0.0	na	0.0	0.0	0.0	0.0	0.0	0.0	na	na	0.0	0.0	0.0	0.0	na

Risk Assessment Parameter		% Intake from TSF	Thallium[1,6]	Tin[1]	Uranium[1]	Vanadium[1]	Zinc[1]	CN[8]
% Time in Area			25%	25%	25%	25%	25%	25%
Dose	**Sediment**	0%	0.000	0.000	0.000	0.000	0.000	0.000
(mg/kg wet/day)	**Water**	100%	0.0000	0.0001	0.0008	0.0005	0.0009	0.0947
	Sedges	0%	0.000	0.000	0.000	0.000	0.000	0.000
	Lichens	0%	0.000	0.000	0.000	0.000	0.000	0.000
	Berries	0%	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	Invertebrates	0%	0.000	0.000	0.000	0.000	0.000	0.000
	Total Food	0%	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	Total Dose		0.000	0.000	0.001	0.001	0.001	0.095
TRVs	**NOAEL$_{TRV}$**		0.0	23.4	3.1	0.2	160.0	68.7
(mg/kg wet/day)	**LOAEL$_{TRV}$**		0.1	35.0	6.1	2.1	320.0	na
Hazard Quotients	**HQ (NOAEL)**		0.0	0.0	0.0	0.0	0.0	0.0
(unitless)	**HQ (LOAEL)**		0.0	0.0	0.0	0.0	0.0	na

Notes:

na - not available

No allometric scaling for mammals (or birds) per Golder, 2019

underline corresponds to an unbounded LOAEL (10X safety factor used to derive the NOAEL) (see text for details)

na indicates that there was no TRV (NOAEL or LOAEL) available

[1] TRV from Sample et al. (1996)

[2] Bird TRVs calculated by multiplying the mammal TRVs with a safety factor of 0.1 (see WSLRA Plan for discussion)

[3] NOAEL from Dieter et al. (1991) as quoted in Lynch et al. (1999)

[4] LOAEL from Rossi et al. (1987)

[5] Mammals TRV based on chromium VI; bird TRV based on chromium III (Sample, 1996)

[6] TRV from Ueberschar et al. (1986)

[7] Chetty et al. (1979) for mammal NOAEL TRV, Szakmary et al. (2001) for mammal LOAEL TRV, Van Vleet (1982) for bird TRVs.

[8] Bird TRV from Ma and Pritsos (1997); uncertainty factor of 10 was applied to account for chronic exposure (Golder, 2004)

[9] Assumed fractions of MeHg in soil = 0.01 x total Hg; MeHg in water = 0 x total Hg ; MeHg in invertebrates = 0.17 x total Hg; InorgHg = Total - MeHg (see WSLRA Plan for details)

Table B-2: Toxicity Reference Values and Hazard Quotients for Caribou (TSF Study Area)

Risk Assessment Parameter		% Intake from TSF	Antimony[2,3,4]	Arsenic[1]	Barium[1]	Beryllium[1,2]	Cadmium[1]	Chromium[1,5]	Cobalt[7]	Copper[1]	Lead[1]	Manganese[1]	Total Hg	Inorg-Hg[1,9]	MeHg[1,9]	Molybdenum[1]	Nickel[1]	Selenium[1]	Strontium[1,2]
% Time in Area			8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%
Dose	**Sediment**	0%	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
(mg/kg wet/day)	**Water**	100%	0.00005	0.00146	0.00041	0.00000	0.00000	0.00054	0.00225	0.05812	0.00024	0.00287	0.00000	0.00000	0.00000	0.00046	0.03286	0.00091	0.00447
	Sedges	0%	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	Lichens	0%	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	Berries	0%	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	Invertebrates	0%	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Total Food	0%	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	Total Dose		0.000	0.001	0.000	0.000	0.000	0.001	0.002	0.058	0.000	0.003	0.000	0.000	0.000	0.000	0.033	0.001	0.004
TRVs	**NOAEL$_{TRV}$**		98.0	0.1	5.1	0.7	1.0	3.3	0.2	11.7	8.0	88.0	na	1.0	0.0	0.3	40.0	0.2	263.0
(mg/kg wet/day)	**LOAEL$_{TRV}$**		112.9	1.3	19.8	na	10.0	13.1	2.0	15.1	80.0	284.0	na	na	0.0	2.6	80.0	0.3	na
Hazard Quotients	**HQ (NOAEL)**		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	na	0.0	0.0	0.0	0.0	0.0	0.0
(unitless)	**HQ (LOAEL)**		0.0	0.0	0.0	na	0.0	0.0	0.0	0.0	0.0	0.0	na	na	0.0	0.0	0.0	0.0	na

Risk Assessment Parameter		% Intake from TSF	Thallium[1,6]	Tin[1]	Uranium[1]	Vanadium[1]	Zinc[1]	CN[8]
% Time in Area			8%	8%	8%	8%	8%	8%
Dose	**Sediment**	0%	0.000	0.000	0.000	0.000	0.000	0.000
(mg/kg wet/day)	**Water**	100%	0.00000	0.00001	0.00006	0.00004	0.00008	0.00771
	Sedges	0%	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	Lichens	0%	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	Berries	0%	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	Invertebrates	0%	0.000	0.000	0.000	0.000	0.000	0.000
	Total Food	0%	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	Total Dose		0.000	0.000	0.000	0.000	0.000	0.008
TRVs	**NOAEL$_{TRV}$**		0.0	23.4	3.1	0.2	160.0	68.7
(mg/kg wet/day)	**LOAEL$_{TRV}$**		0.1	35.0	6.1	2.1	320.0	na
Hazard Quotients	**HQ (NOAEL)**		0.0	0.0	0.0	0.0	0.0	0.0
(unitless)	**HQ (LOAEL)**		0.0	0.0	0.0	0.0	0.0	na

Notes:

na - not available

No allometric scaling for mammals (or birds) per Golder, 2019

underline corresponds to an unbounded LOAEL (10X safety factor used to derive the NOAEL) (see text for details)

na indicates that there was no TRV (NOAEL or LOAEL) available

[1] TRV from Sample et al. (1996)

[2] Bird TRVs calculated by multiplying the mammal TRVs with a safety factor of 0.1 (see WSLRA Plan for discussion)

[3] NOAEL from Dieter et al. (1991) as quoted in Lynch et al. (1999)

[4] LOAEL from Rossi et al. (1987)

[5] Mammals TRV based on chromium VI; bird TRV based on chromium III (Sample, 1996)

[6] TRV from Ueberschar et al. (1986)

[7] Chetty et al. (1979) for mammal NOAEL TRV, Szakmary et al. (2001) for mammal LOAEL TRV, Van Vleet (1982) for bird TRVs.

[8] Bird TRV from Ma and Pritsos (1997); uncertainty factor of 10 was applied to account for chronic exposure (Golder, 2004)

[9] Assumed fractions of MeHg in soil = 0.01 x total Hg; MeHg in water = 0 x total Hg ; MeHg in invertebrates = 0.17 x total Hg; InorgHg = Total - MeHg (see WSLRA Plan for details)

Table B-3: Toxicity Reference Values and Hazard Quotients for Lapland Longspur (TSF Study Area)

Risk Assessment Parameter		% Intake from TSF	Antimony[2,3,4]	Arsenic[1]	Barium[1]	Beryllium[1,2]	Cadmium[1]	Chromium[1,5]	Cobalt[7]	Copper[1]	Lead[1]	Manganese[1]	Total Hg	Inorg-Hg[1,9]	MeHg[1,9]	Molybdenum[1]	Nickel[1]	Selenium[1]	Strontium[1,2]
% Time in Area			8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%
Dose	**Sediment**	0%	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
(mg/kg wet/day)	**Water**	100%	0.0002	0.0046	0.0013	0.0000	0.0000	0.0017	0.0072	0.1852	0.0008	0.0091	0.0000	0.0000	0.0000	0.0015	0.1047	0.0029	0.0143
	Sedges	0%	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Lichens	0%	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Berries	0%	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	Invertebrates	0%	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Total Food	0%	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	Total Dose		0.000	0.005	0.001	0.000	0.000	0.002	0.007	0.185	0.001	0.009	0.000	0.000	0.000	0.001	0.105	0.003	0.014
TRVs	**$NOAEL_{TRV}$**		9.8	2.5	21.0	0.1	1.5	1.0	2.4	47.0	1.1	977.0	na	0.5	0.0	3.5	77.4	0.4	26.3
(mg/kg wet/day)	**$LOAEL_{TRV}$**		11.3	7.4	42.0	na	20.0	5.0	4.7	61.7	11.3	na	na	0.9	0.1	35.3	107.0	0.8	na
Hazard Quotients	**HQ (NOAEL)**		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	na	0.0	0.0	0.0	0.0	0.0	0.0
(unitless)	**HQ (LOAEL)**		0.0	0.0	0.0	na	0.0	0.0	0.0	0.0	0.0	na	na	0.0	0.0	0.0	0.0	0.0	na

Risk Assessment Parameter		% Intake from TSF	Thallium[1,6]	Tin[1]	Uranium[1]	Vanadium[1]	Zinc[1]	CN[8]
% Time in Area			8%	8%	8%	8%	8%	8%
Dose	**Sediment**	0%	0.000	0.000	0.000	0.000	0.000	0.000
(mg/kg wet/day)	**Water**	100%	0.0000	0.0000	0.0002	0.0001	0.0002	0.0246
	Sedges	0%	0.000	0.000	0.000	0.000	0.000	0.000
	Lichens	0%	0.000	0.000	0.000	0.000	0.000	0.000
	Berries	0%	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	Invertebrates	0%	0.000	0.000	0.000	0.000	0.000	0.000
	Total Food	0%	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	Total Dose		0.000	0.000	0.000	0.000	0.000	0.025
TRVs	**$NOAEL_{TRV}$**		0.2	6.8	16.0	11.4	14.5	0.0
(mg/kg wet/day)	**$LOAEL_{TRV}$**		0.8	16.9	na	na	130.9	na
Hazard Quotients	**HQ (NOAEL)**		0.0	0.0	0.0	0.0	0.0	0.0
(unitless)	**HQ (LOAEL)**		0.0	0.0	na	na	0.0	na

Notes:

na - not available

No allometric scaling for mammals (or birds) per Golder, 2019

underline corresponds to an unbounded LOAEL (10X safety factor used to derive the NOAEL) (see text for details)

na indicates that there was no TRV (NOAEL or LOAEL) available

[1] TRV from Sample et al. (1996)

[2] Bird TRVs calculated by multiplying the mammal TRVs with a safety factor of 0.1 (see WSLRA Plan for discussion)

[3] NOAEL from Dieter et al. (1991) as quoted in Lynch et al. (1999)

[4] LOAEL from Rossi et al. (1987)

[5] Mammals TRV based on chromium VI; bird TRV based on chromium III (Sample, 1996)

[6] TRV from Ueberschar et al. (1986)

[7] Chetty et al. (1979) for mammal NOAEL TRV, Szakmary et al. (2001) for mammal LOAEL TRV, Van Vleet (1982) for bird TRVs.

[8] Bird TRV from Ma and Pritsos (1997); uncertainty factor of 10 was applied to account for chronic exposure (Golder, 2004)

[9] Assumed fractions of MeHg in soil = 0.01 x total Hg; MeHg in water = 0 x total Hg ; MeHg in invertebrates = 0.17 x total Hg; InorgHg = Total - MeHg (see WSLRA Plan for details)

Table B-4: Toxicity Reference Values and Hazard Quotients for Canada Goose (TSF Study Area)

Risk Assessment Parameter		% Intake from TSF	Antimony[2,3,4]	Arsenic[1]	Barium[1]	Beryllium[1,2]	Cadmium[1]	Chromium[1,5]	Cobalt[7]	Copper[1]	Lead[1]	Manganese[1]	Total Hg	Inorg-Hg[1,9]	MeHg[1,9]	Molybdenum[1]	Nickel[1]	Selenium[1]	Strontium[1,2]
% Time in Area			8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%
Dose	**Sediment**	0%	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
(mg/kg wet/day)	**Water**	100%	0.00003	0.00100	0.00028	0.00000	0.00000	0.00037	0.00155	0.04005	0.00017	0.00198	0.00000	0.00000	0.00000	0.00032	0.02265	0.00062	0.00308
	Sedges	0%	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	Lichens	0%	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Berries	0%	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	Invertebrates	0%	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Total Food	0%	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	Total Dose		0.000	0.001	0.000	0.000	0.000	0.000	0.002	0.040	0.000	0.002	0.0000	0.0000	0.0000	0.000	0.023	0.001	0.003
TRVs	**$NOAEL_{TRV}$**		9.8	2.5	21.0	0.1	1.5	1.0	2.4	47.0	1.1	977.0	na	0.5	0.0	3.5	77.4	0.4	26.3
(mg/kg wet/day)	**$LOAEL_{TRV}$**		11.3	7.4	42.0	na	20.0	5.0	4.7	61.7	11.3	na	na	0.9	0.1	35.3	107.0	0.8	na
Hazard Quotients	**HQ (NOAEL)**		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	na	0.0	0.0	0.0	0.0	0.0	0.0
(unitless)	**HQ (LOAEL)**		0.0	0.0	0.0	na	0.0	0.0	0.0	0.0	0.0	na	na	0.0	0.0	0.0	0.0	0.0	na

Risk Assessment Parameter		% Intake from TSF	Thallium[1,6]	Tin[1]	Uranium[1]	Vanadium[1]	Zinc[1]	CN[8]
% Time in Area			8%	8%	8%	8%	8%	8%
Dose	**Sediment**	0%	0.000	0.000	0.000	0.000	0.000	0.000
(mg/kg wet/day)	**Water**	100%	0.00000	0.00001	0.00004	0.00003	0.00005	0.00532
	Sedges	0%	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	Lichens	0%	0.000	0.000	0.000	0.000	0.000	0.000
	Berries	0%	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	Invertebrates	0%	0.000	0.000	0.000	0.000	0.000	0.000
	Total Food	0%	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	Total Dose		0.000	0.000	0.000	0.000	0.000	0.005
TRVs	**$NOAEL_{TRV}$**		0.2	6.8	16.0	11.4	14.5	0.0
(mg/kg wet/day)	**$LOAEL_{TRV}$**		0.8	16.9	na	na	130.9	na
Hazard Quotients	**HQ (NOAEL)**		0.0	0.0	0.0	0.0	0.0	0.2
(unitless)	**HQ (LOAEL)**		0.0	0.0	na	na	0.0	na

Notes:

na - not available

No allometric scaling for mammals (or birds) per Golder, 2019

underline corresponds to an unbounded LOAEL (10X safety factor used to derive the NOAEL) (see text for details)

na indicates that there was no TRV (NOAEL or LOAEL) available

[1] TRV from Sample et al. (1996)

[2] Bird TRVs calculated by multiplying the mammal TRVs with a safety factor of 0.1 (see WSLRA Plan for discussion)

[3] NOAEL from Dieter et al. (1991) as quoted in Lynch et al. (1999)

[4] LOAEL from Rossi et al. (1987)

[5] Mammals TRV based on chromium VI; bird TRV based on chromium III (Sample, 1996)

[6] TRV from Ueberschar et al. (1986)

[7] Chetty et al. (1979) for mammal NOAEL TRV, Szakmary et al. (2001) for mammal LOAEL TRV, Van Vleet (1982) for bird TRVs.

[8] Bird TRV from Ma and Pritsos (1997); uncertainty factor of 10 was applied to account for chronic exposure (Golder, 2004)

[9] Assumed fractions of MeHg in soil = 0.01 x total Hg; MeHg in water = 0 x total Hg ; MeHg in invertebrates = 0.17 x total Hg; InorgHg = Total - MeHg (see WSLRA Plan for details)

Table B-5: Toxicity Reference Values and Hazard Quotients for Semi-Palmated Sandpiper (TSF Study Area) - Standard Exposure Assumptions

Risk Assessment Parameter		% Intake from TSF	Antimony[2,3,4]	Arsenic[1]	Barium[1]	Beryllium[1,2]	Cadmium[1]	Chromium[1,5]	Cobalt[7]	Copper[1]	Lead[1]	Manganese[1]	Total Hg	Inorg-Hg[1,9]	MeHg[1,9]	Molybdenum[1]	Nickel[1]	Selenium[1]	Strontium[1,2]
% Time																			
(unitless)			8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%
Dose	**Sediment**	0%	0.021	7.080	0.991	0.005	0.002	7.552	0.297	0.519	0.661	27.376	0.000	0.000	0.000	0.016	4.342	0.005	0.566
(mg/kg wet/day)	**Water**	100%	0.00014	0.00426	0.00120	0.00000	0.00000	0.00158	0.00659	0.16995	0.00072	0.00839	0.00000	0.00000	0.00000	0.00135	0.09611	0.00265	0.01308
	Sedges	0%	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	Lichens	0%	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Berries	0%	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	Invertebrates	13%	0.009	2.808	0.393	0.002	0.001	1.298	0.131	0.069	0.183	12.064	0.000	0.000	0.000	0.007	1.722	0.002	0.250
	Total Food	13%	0.0094	2.8080	0.3931	0.0021	0.0009	1.2979	0.1310	0.0686	0.1835	12.0640	0.0000	0.0000	0.0000	0.0069	1.7222	0.0019	0.2496
	Total Dose		0.031	9.892	1.386	0.007	0.003	8.851	0.435	0.758	0.845	39.448	0.0000	0.0000	0.0000	0.024	6.161	0.009	0.829
TRVs	**$NOAEL_{TRV}$**		9.8	2.5	21.0	0.1	1.5	1.0	2.4	47.0	1.1	977.0	na	0.5	0.0	3.5	77.4	0.4	26.3
(mg/kg wet/day)	**$LOAEL_{TRV}$**		11.3	7.4	42.0	na	20.0	5.0	4.7	61.7	11.3	na	na	0.9	0.1	35.3	107.0	0.8	na
Hazard Quotients	**HQ (NOAEL)**		0.0	4.0	0.1	0.1	0.0	8.9	0.2	0.0	0.7	0.0	na	0.0	0.0	0.0	0.1	0.0	0.0
(unitless)	**HQ (LOAEL)**		0.0	1.3	0.0	na	0.0	1.8	0.1	0.0	0.1	na	na	0.0	0.0	0.0	0.1	0.0	na

Risk Assessment Parameter		% Intake from TSF	Thallium[1,6]	Tin[1]	Uranium[1]	Vanadium[1]	Zinc[1]	CN[8]
% Time								
(unitless)			8%	8%	8%	8%	8%	8%
Dose	**Sediment**	0%	0.002	0.014	0.003	0.519	0.411	0.090
(mg/kg wet/day)	**Water**	100%	0.00000	0.00003	0.00018	0.00013	0.00023	0.02256
	Sedges	0%	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	Lichens	0%	0.000	0.000	0.000	0.000	0.000	0.000
	Berries	0%	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	Invertebrates	13%	0.001	0.006	0.001	0.229	0.103	0.036
	Total Food	13%	0.0007	0.0062	0.0012	0.2288	0.1031	0.0356
	Total Dose		0.002	0.020	0.004	0.748	0.514	0.148
TRVs	**$NOAEL_{TRV}$**		0.2	6.8	16.0	11.4	14.5	0.0
(mg/kg wet/day)	**$LOAEL_{TRV}$**		0.8	16.9	na	na	130.9	na
Hazard Quotients	**HQ (NOAEL)**		0.0	0.0	0.0	0.1	0.0	5.9
(unitless)	**HQ (LOAEL)**		0.0	0.0	na	na	0.0	na

Notes:

na - not available

No allometric scaling for mammals (or birds) per Golder, 2019

underline corresponds to an unbounded LOAEL (10X safety factor used to derive the NOAEL) (see text for details)

na indicates that there was no TRV (NOAEL or LOAEL) available

[1] TRV from Sample et al. (1996)

[2] Bird TRVs calculated by multiplying the mammal TRVs with a safety factor of 0.1 (see WSLRA Plan for discussion)

[3] NOAEL from Dieter et al. (1991) as quoted in Lynch et al. (1999)

[4] LOAEL from Rossi et al. (1987)

[5] Mammals TRV based on chromium VI; bird TRV based on chromium III (Sample, 1996)

[6] TRV from Ueberschar et al. (1986)

[7] Chetty et al. (1979) for mammal NOAEL TRV, Szakmary et al. (2001) for mammal LOAEL TRV, Van Vleet (1982) for bird TRVs.

[8] Bird TRV from Ma and Pritsos (1997); uncertainty factor of 10 was applied to account for chronic exposure (Golder, 2004)

[9] Assumed fractions of MeHg in soil = 0.01 x total Hg; MeHg in water = 0 x total Hg ; MeHg in invertebrates = 0.17 x total Hg; InorgHg = Total - MeHg (see WSLRA Plan for details)

Table B-6: Toxicity Reference Values and Hazard Quotients for Semi-Palmated Sandpiper (TSF Study Area) - Refined Exposure Assumptions (changes from Table B-5 in bold)

Risk Assessment Parameter		% Intake from TSF	Antimony[2,3,4]	Arsenic[1]	Barium[1]	Beryllium[1,2]	Cadmium[1]	Chromium[1,5]	Cobalt[7]	Copper[1]	Lead[1]	Manganese[1]	Total Hg	Inorg-Hg[1,9]	MeHg[1,9]	Molybdenum[1]	Nickel[1]	Selenium[1]	Strontium[1,2]
% Time																			
(unitless)			8%	**2%**	8%	8%	8%	**2%**	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%
Dose	**Sediment**	0%	0.021	1.475	0.991	0.005	0.002	1.263	0.297	0.519	0.661	27.376	0.000	0.000	0.000	0.016	4.342	0.005	0.566
(mg/kg wet/day)	**Water**	100%	0.00014	0.00032	0.00120	0.00000	0.00000	0.00007	0.00659	0.16995	0.00072	0.00839	0.00000	0.00000	0.00000	0.00135	0.09611	0.00265	0.01308
	Sedges	0%	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	Lichens	0%	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Berries	0%	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	Invertebrates	13%	0.009	0.585	0.393	0.002	0.001	0.217	0.131	0.069	0.183	12.064	0.000	0.000	0.000	0.007	1.722	0.002	0.250
	Total Food	13%	0.0094	0.5850	0.3931	0.0021	0.0009	0.2170	0.1310	0.0686	0.1835	12.0640	0.0000	0.0000	0.0000	0.0069	1.7222	0.0019	0.2496
	Total Dose		0.031	2.060	1.386	0.007	0.003	1.480	0.435	0.758	0.845	39.448	0.0000	0.0000	0.0000	0.024	6.161	0.009	0.829
TRVs	**$NOAEL_{TRV}$**		9.8	2.5	21.0	0.1	1.5	1.0	2.4	47.0	1.1	977.0	na	0.5	0.0	3.5	77.4	0.4	26.3
(mg/kg wet/day)	**$LOAEL_{TRV}$**		11.3	7.4	42.0	na	20.0	5.0	4.7	61.7	11.3	na	na	0.9	0.1	35.3	107.0	0.8	na
Hazard Quotients	**HQ (NOAEL)**		0.0	0.8	0.1	0.1	0.0	1.5	0.2	0.0	0.7	0.0	na	0.0	0.0	0.0	0.1	0.0	0.0
(unitless)	**HQ (LOAEL)**		0.0	**0.3**	0.0	na	0.0	**0.3**	0.1	0.0	0.1	na	na	0.0	0.0	0.0	0.1	0.0	na

Risk Assessment Parameter		% Intake from TSF	Thallium[1,6]	Tin[1]	Uranium[1]	Vanadium[1]	Zinc[1]	CN[8]
% Time								
(unitless)			8%	8%	8%	8%	8%	**2%**
Dose	**Sediment**	0%	0.002	0.014	0.003	0.519	0.411	0.010
(mg/kg wet/day)	**Water**	100%	0.00000	0.00003	0.00018	0.00013	0.00023	0.00088
	Sedges	0%	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	Lichens	0%	0.000	0.000	0.000	0.000	0.000	0.000
	Berries	0%	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	Invertebrates	13%	0.001	0.006	0.001	0.229	0.103	0.004
	Total Food	13%	0.0007	0.0062	0.0012	0.2288	0.1031	0.0040
	Total Dose		0.002	0.020	0.004	0.748	0.514	0.015
TRVs	**$NOAEL_{TRV}$**		0.2	6.8	16.0	11.4	14.5	0.0
(mg/kg wet/day)	**$LOAEL_{TRV}$**		0.8	16.9	na	na	130.9	na
Hazard Quotients	**HQ (NOAEL)**		0.0	0.0	0.0	0.1	0.0	**0.6**
(unitless)	**HQ (LOAEL)**		0.0	0.0	na	na	0.0	na

Notes:

na - not available

No allometric scaling for mammals (or birds) per Golder, 2019

underline corresponds to an unbounded LOAEL (10X safety factor used to derive the NOAEL) (see text for details)

na indicates that there was no TRV (NOAEL or LOAEL) available

[1] TRV from Sample et al. (1996)

[2] Bird TRVs calculated by multiplying the mammal TRVs with a safety factor of 0.1 (see WSLRA Plan for discussion)

[3] NOAEL from Dieter et al. (1991) as quoted in Lynch et al. (1999)

[4] LOAEL from Rossi et al. (1987)

[5] Mammals TRV based on chromium VI; bird TRV based on chromium III (Sample, 1996)

[6] TRV from Ueberschar et al. (1986)

[7] Chetty et al. (1979) for mammal NOAEL TRV, Szakmary et al. (2001) for mammal LOAEL TRV, Van Vleet (1982) for bird TRVs.

[8] Bird TRV from Ma and Pritsos (1997); uncertainty factor of 10 was applied to account for chronic exposure (Golder, 2004)

[9] Assumed fractions of MeHg in soil = 0.01 x total Hg; MeHg in water = 0 x total Hg ; MeHg in invertebrates = 0.17 x total Hg; InorgHg = Total - MeHg (see WSLRA Plan for details)

Appendix C

2021 SAMPLE and LOCATION PHOTOS

Photo 1: Location T1-3

Photo 2: Location T2-1

Photo 3: Location T2-1 samples.

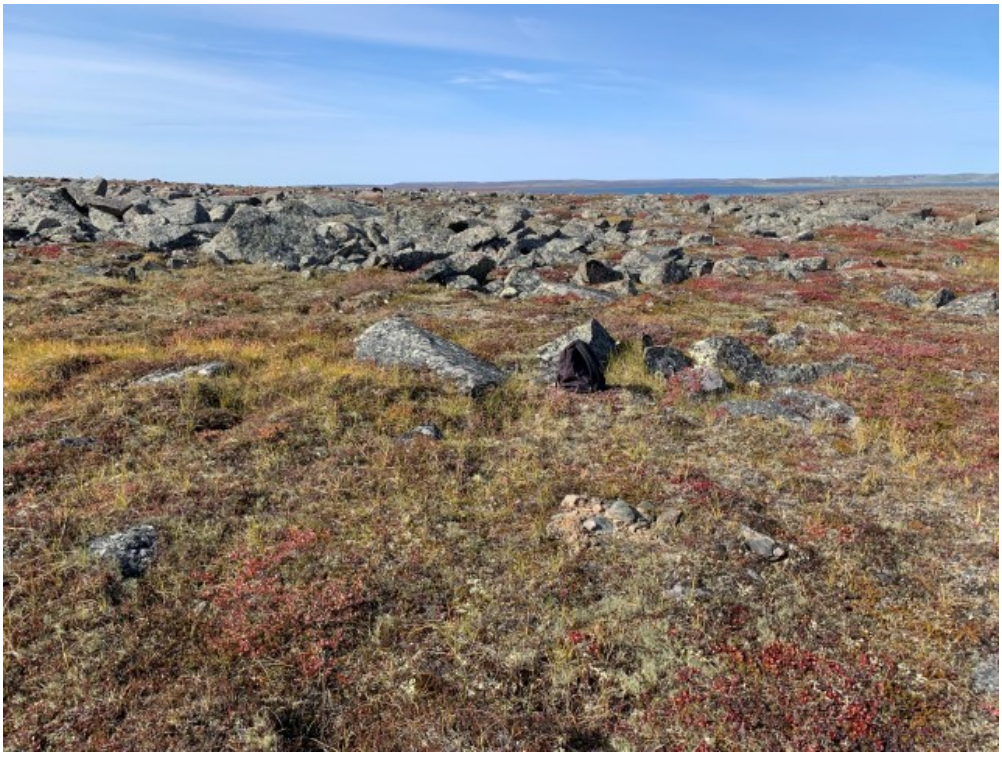

Photo 4: Location T4-1

Photo 5: Location T6-2

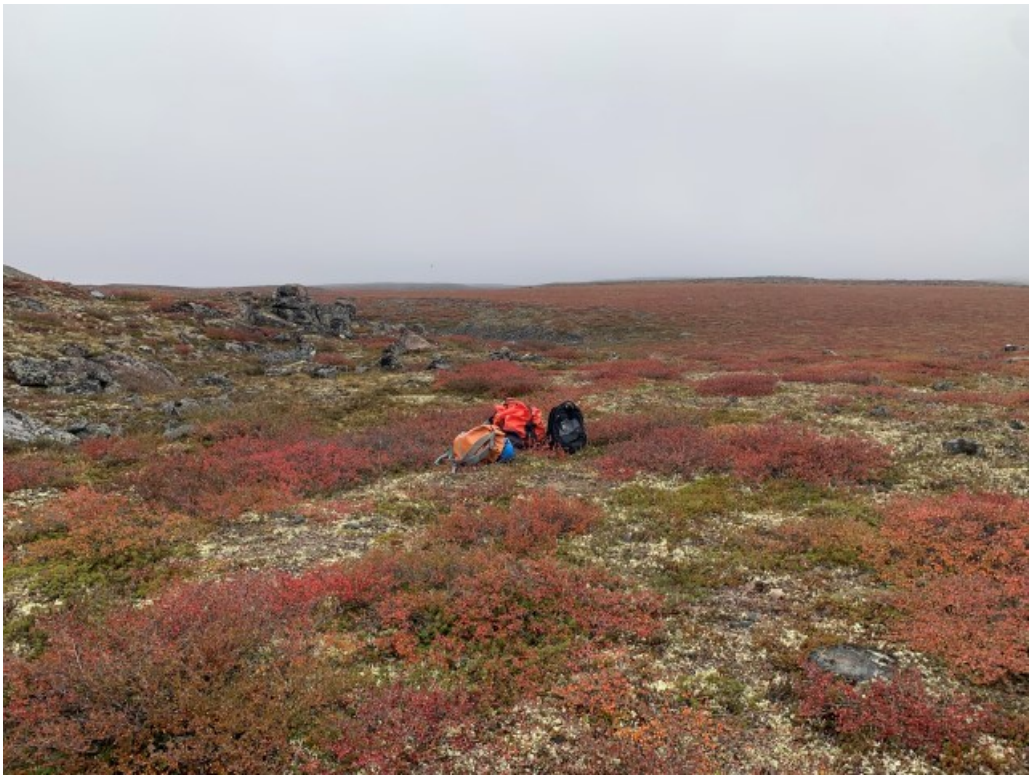

Photo 6: Location C1-1

Photo 7: Location C1-1 samples.

Photo 8: Location T9-1

Photo 9: Location T10-2 samples.

Photo 10: Location T11-1

Appendix D

TSF EXPLORATORY BENTHIC INVERTEBRATES SAMPLING

(Technical Memorandum - Azimuth, 2021; Laboratory Certificate of Analysis)

Azimuth Consulting Group Inc.
218-2902 West Broadway
Vancouver, BC
Canada V6K 2G8

Phone: 604-730-1220
www.azimuthgroup.ca

Memorandum

Sediment and Benthic Invertebrate Sampling in the Meadowbank Tailings Storage Facility

Date: **March 18, 2022**

To: **Meadowbank Environment**

From: **Marianna DiMauro, Cameron Bullen, and Morgan Finley**

RE: **Sediment and Benthic Invertebrate Sampling in the Meadowbank Tailings Storage Facility**

SUMMARY

Benthic invertebrates in the Meadowbank Tailings Storage Facility (TSF), if present, are a potential source of dietary contaminant exposure to birds. The objective of this preliminary sampling for benthic invertebrates is to provide a rough estimate of the presence and density of benthic invertebrates in the TSF. Benthic invertebrates were collected from five locations along the perimeter of the north and south cells of the TSF. Paired sediment samples were collected for archiving to assist in the interpretation of the benthic community samples, if needed. This sampling was not intended to investigate benthic invertebrate tissue chemistry or toxicity.

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TABLES & FIGURES

BENTHOS & SEDIMENT SAMPLING

1.1 Field Collection Materials

Gather the following **field collection materials**:

In the field:

- Waterproof field notebook, pencils, permanent markers, and clipboard
- GPS unit, batteries
- Liquinox detergent and dish cleaning brush
- 500-micron sieve bag
- Shovel
- Stainless steel spoon
- 5-gallon buckets – with markings at 2, 4, and 6L
- Personal protective equipment – gloves (nitrile and rubber), safety glasses, coveralls, hard hat, N95 or at least three-layer mask
- Plastic squirt bottles
- Field sample jars and preservatives (per sampling station):
    - 2 – 125 mL glass jars (sediment samples: 2 jars for each replicate)
    - 2 – 500 mL plastic jars (benthos: 1-2 jars for each replicate, depending on amount of organic material/sediment remaining in benthos sample after sieving)

In camp:

- 50% formalin (18.5% of pure formaldehyde)
- Labels for sampling containers (waterproof)
- Ice packs – for shipping sediment samples to lab
- Address labels for coolers
- Chain-of-custody (COC) forms
- Large Ziploc bags – for sending COC forms in coolers
- Electrical tape – for sealing benthos jars
- Packing tape – for affixing labels to sediment sample containers and sealing coolers

1.2 Field Methods

1.2.1 Benthic Invertebrates and Sediment Sample Collection

1. Before going into the field, labelled the lids of all the sampling containers using a permanent waterproof marker with the following information:
    - Station abbreviation (e.g., TSFS-1 for the first replicate in the TSF south cell)
    - Date of sample collection

2. Habitat areas were identified along the perimeter of the tailings where sampling would be safely accessible from the edge of the road.
3. Multiple sampling locations were selected to get some spatial coverage at areas that would likely be representative of the benthos community in the TSF (i.e., good habitat). Good habitat was assumed to be wetted areas and areas near standing water.
4. In each sampling area, the GPS location was recorded and three subsampling areas < 10 m apart were selected.
5. Using Liquinox soap, the field crew washed sampling equipment (e.g., shovel, stainless-steel spoon, and four 5-gallon buckets) by scrubbing with the dish cleaning brush and then thoroughly rinsing the equipment with water from a nearby, unimpacted lake.
6. Using the clean shovel, the field crew collected 2L of sediment from the top 5 cm of the tailings at each of the three subsampling areas. The 2L of sediment from each subsampling location was composited in one bucket to get a total of 6L sediment for a single area.
7. The composited 6L of sediment was mixed and then transferred using a stainless-steel spoon into two 120 mL glass jars to be archived.
8. Transferred 4L of the mixed sediment into a 500-micron sieve bag and sieved the sediment in buckets of water until only the benthic organisms and coarse materials remained. Gently stirred apart any clay with the stainless-steel spoon and did not forcibly push any materials through the sieve.
9. Flushed the remaining sample in the bottom of the sieve into a pre-labeled 500 mL plastic sampling jar using squirt bottles filled with water.
10. Repeated steps 5–9 at each sampling area.
11. Back at the office, the sediment samples were placed in the fridge, and each benthos sample was preserved in a well-ventilated area with 50% formalin to obtain approximately 10% formalin in each sample. Ensured there was enough liquid in each jar to cover the entire sample. Sealed the benthos sample containers securely with electrical tape and gently swirled the containers to mix the sample and formalin solution.

1.2.2 Packaging and Shipping Samples

1. Ensure all sediment samples are sealed securely. Pack sediment sampling containers upright in a cooler with ice packs, and packing material, to ensure containers do not break during transport. The ideal storage and transport temperature is 4°C.
2. Ensure the COC form is enclosed in the cooler with the sediment samples and then seal the cooler(s). Label the cooler(s) with the following ALS address:

ALS Environmental
101-8081 Lougheed Hwy.
Burnaby, BC, Canada
V5A 1W9
Tel: 604-253-4188
Attention: Brent Mack

3. Ensure benthos samples are sealed securely. Pack benthos sampling containers upright in a cooler or action packer; ensure the cooler/action packer is well packed so the jars are not able to move around.
4. Ensure the COC form is enclosed in the cooler/action packer with the benthos samples and then seal the cooler(s). Label the cooler/action packer with the ALS Burnaby address, same as the sediment samples.
5. Send completed COC forms and field data forms to Azimuth Consulting Group (mdimauro@azimuthgroup.ca, and efranz@azimuthgroup.ca)

1.3 Field Notes

Field notes from each sampling area are provided below:

TSFS-1

- Difficult to mix the sediment – thick heavy clay, very consolidated
- Chironomids were evident during sample collection.
- Collected near north end of Central Dike

TSFS-2

- Evidence of organic matter (e.g., decaying leaves) in the sediment
- Very consolidated clay
- Sieved 4L of the mixed 6L composite sample
- Collected near Saddle Dam 3 and PWA38

TSFN-1

- Very consolidated fine clay
- Some standing water nearby (less than TSFN-2)
- Collected near Saddle Dam 2

TSFN-2

- Sampling location close to edge of tundra

- Some standing water nearby
- Softer material for 2 of the three subsamples with higher moisture content
- Consolidated fine clay
- Collected near Saddle Dam 1

TSFN-3

- Appeared to be newly flooded, very soft mud. Some subsamples from the soft "new" sediment and some from drier tailings along the edge.
- Collected near West Interception Sump and PWA10

Table 1. Summary of samples collected at the Meadowbank TSF south cell (TSFS) and TSF north cell (TSFN).

Sample ID	Zone	Easting	Northing	Date and Time
TSFS-1	14W	0638630	7215139	19-08-2021, 9:53
TSFS-2	14W	0637938	7214920	19-08-2021, 10:30
TSFN-1	14W	0637198	7215654	19-08-2021, 13:00
TSFN-2	14W	0637132	7216110	19-08-2021, 14:30
TSFN-3	14W	0637407	7216182	19-08-2021, 15:06

FIGURES

Figure 1. Sample collection at TSFN-1.

Figure 2. Sample collection at TSFN-2.

Figure 3. Sample collection at TSFN-3.

Figure 4. Sample collection at TSFS-1.

Figure 5. Sample collection at TSFS-2.

AGNICO-EAGLE MINES LIMITED
ATTN: Leilan Baxter
PO Box 99
Baker Lake NU X0C 0G0

Date Received: 08-SEP-21
Report Date: 04-NOV-21 14:20 (MT)
Version: FINAL

Client Phone: 819-759-3555

Certificate of Analysis

Lab Work Order #: L2638699

Project P.O. #: 1077004
Job Reference: MEADOWBANK SLRA
C of C Numbers:
Legal Site Desc:

Judy Dalmaijer
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2638699-1 TSFS-1 Sampled By: MXD/CDB on 19-AUG-21 @ 09:53 Matrix: Sediment **Miscellaneous Parameters** Benthic Invertebrates Note: Entire sample sorted	See attached		1.0			26-OCT-21	R5628806
L2638699-2 TSFS-2 Sampled By: MXD/CDB on 19-AUG-21 @ 10:30 Matrix: Sediment **Miscellaneous Parameters** Benthic Invertebrates Note: Entire sample sorted	See attached		1.0			26-OCT-21	R5628806
L2638699-3 TSFN-1 Sampled By: MXD/CDB on 19-AUG-21 @ 13:00 Matrix: Sediment **Miscellaneous Parameters** Benthic Invertebrates Note: Entire sample sorted	See attached		1.0			26-OCT-21	R5628806
L2638699-4 TSFN-2 Sampled By: MXD/CDB on 19-AUG-21 @ 14:30 Matrix: Sediment **Miscellaneous Parameters** Benthic Invertebrates Note: Entire sample sorted	See attached		1.0			26-OCT-21	R5628806
L2638699-5 TSFN-3 Sampled By: MXD/CDB on 19-AUG-21 @ 15:06 Matrix: Sediment **Miscellaneous Parameters** Benthic Invertebrates Note: Entire sample sorted	See attached		1.0			26-OCT-21	R5628806

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
BENTHOS-WP	Soil	Benthic Invertebrates	APHA 10500

The benthic macroinvertebrates method is a procedure for identifying those organisms inhabiting the substrates of freshwater lakes and rivers. The organisms contained in large samples must be sorted to varying degrees in the laboratory before identification is performed. Samples are sorted and identified using compound and stereoscopic microscopes. Benthic organisms are identified to species where possible, enumerated and reported.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
WP	ALS ENVIRONMENTAL - WINNIPEG, MANITOBA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Client: AGNICO-EAGLE MINES LIMITED
PO Box 99
Baker Lake NU X0C 0G0
Contact: Leilan Baxter

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

ALS Laboratory Group
Manitoba Technology Centre
12-1329 Niakwa Road E
Winnipeg, Manitoba R2J 3T4
(204) 255-9720

Benthic Sample Results

Lab Number: L2638699-1 **Work Order:** L2638699

Date Sampled	August 19, 2021	**Submitter**	MXD/CDB	**Sample Type**	Sediment	**Station No**	
Source:	MEADOWBANK SLRA	**WQ Site #:**	TSFS-1	**Sample ID**			

Class	Order	Family/Suborder	Genus	Species	Larva	Adult	Pupa	Total
INSECTA	*DIPTERA*		*unidentified adult*	*terrestrial*	0	2	0	2
INSECTA	*DIPTERA*	*CHIRONOMIDAE*			46	0	0	46
INSECTA	*DIPTERA*	*EPHYDRIDAE*			7	0	0	7
INSECTA	*DIPTERA*	*TIPULIDAE*			1	0	0	1
INSECTA	*TRICHOPTERA*	*BRACHYCENTRIDAE*			1	0	0	1
NEMATODA			*unidentified*		0	0	0	1

Date Printed: October 26, 2021

ALS Laboratory Group
Manitoba Technology Centre
12-1329 Niakwa Road E
Winnipeg, Manitoba R2J 3T4
(204) 255-9720

Benthic Sample Results

Lab Number: L2638699-2 **Work Order:** L2638699

Date Sampled	August 19, 2021	**Submitter**	MXD/CDB	**Sample Type**	Sediment	**Station No**	
Source:	MEADOWBANK SLRA	**WQ Site #:**	TSFS-2	**Sample ID**			

Class	Order	Family/Suborder	Genus	Species	Larva	Adult	Pupa	Total
INSECTA	*DIPTERA*	*CHIRONOMIDAE*			1	0	0	1

Date Printed: October 26, 2021

ALS Laboratory Group
Manitoba Technology Centre
12-1329 Niakwa Road E
Winnipeg, Manitoba R2J 3T4
(204) 255-9720

Benthic Sample Results

Lab Number: L2638699-3 **Work Order:** L2638699

Date Sampled	August 19, 2021	**Submitter**	MXD/CDB	**Sample Type**	Sediment	**Station No**	
Source:	MEADOWBANK SLRA	**WQ Site #:**	TSFN-1	**Sample ID**			

Class	Order	Family/Suborder	Genus	Species	Larva	Adult	Pupa	Total
INSECTA	*DIPTERA*		*unidentified adult*	*terrestrial*	0	1	0	1
INSECTA	*DIPTERA*	*CHIRONOMIDAE*			2	0	0	2
INSECTA	*PLECOPTERA*		*unidentified nymph*	*too young to ID*	1	0	0	1

Date Printed: October 26, 2021

ALS Laboratory Group
Manitoba Technology Centre
12-1329 Niakwa Road E
Winnipeg, Manitoba R2J 3T4
(204) 255-9720

Benthic Sample Results

Lab Number: L2638699-4 **Work Order:** L2638699

Date Sampled	August 19, 2021	**Submitter**	MXD/CDB	**Sample Type**	Sediment	**Station No**	
Source:	MEADOWBANK SLRA	**WQ Site #:**	TSFN-2	**Sample ID**			

Class	Order	Family/Suborder	Genus	Species	Larva	Adult	Pupa	Total
INSECTA	*HYMENOPTERA*		*unidentified adult*	*terrestrial*	0		0	0

Date Printed: October 26, 2021

ALS Laboratory Group
Manitoba Technology Centre
12-1329 Niakwa Road E
Winnipeg, Manitoba R2J 3T4
(204) 255-9720

Benthic Sample Results

Lab Number: L2638699-5 **Work Order:** L2638699

Date Sampled	August 19, 2021	**Submitter**	MXD/CDB	**Sample Type**	Sediment	**Station No**	
Source:	MEADOWBANK SLRA	**WQ Site #:**	TSFN-3	**Sample ID**			

Class	Order	Family/Suborder	Genus	Species	Larva	Adult	Pupa	Total
INSECTA	*DIPTERA*		*unidentified adult*	*terrestrial*	0	1	0	1

Date Printed: October 26, 2021

ALS Environmental

Chain of Custody / Analytical Request Form

Canada Toll Free: 1 800 668 9878

www.alsglobal.com

COC # _____

Page 1 of _____

Report To		Report Format / Distribution				Service Requested (Rush for routine analysis subject to availability)
Company:	Agnico Eagle Mines Ltd.-Meadowbank Division	☐ Standard	☑ Other			◉ Regular (Standard Turnaround Times - Business Days)
Contact:	Leilan Baxter	☑ PDF	☑ Excel	☐ Digital	☐ Fax	○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
Address:	Baker Lake NU X0C 0A0	Email 1:				○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
	leilan.Baxter@agnicoeagle.com	Email 2:				○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT
Phone:	Fax:	Email 3:	leilan.baxter@agnicoeagle.com			Analysis Request
Invoice To	Same as Report ? ☑ Yes ☐ No	Client / Project Information				Please indicate below Filtered, Preserved or both (F, P, F/P)
Hardcopy of Invoice with Report?	☐ Yes ☑ No	Job #:	Meadowbank SLRA			
Company:		PO / AFE:	1077004			
Contact:		LSD:				
Address:						
Phone:	Fax:	Quote #:	BENTHOS-WP			
Lab Work Order # (lab use only)		ALS Contact:	Judy Dalmaijer	Sampler:	MXD, CDB	

L2638699-COFC

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Taxonomie	Number of Containers
	TSFS-1	19-Aug-21	9:53	Sediment	X	1
	TSFS-2	19-Aug-21	10:30	Sediment	X	1
	TSFN-1	19-Aug-21	13:00	Sediment	X	1
	TSFN-2	19-Aug-21	14:30	Sediment	X	1
	TSFN-3	19-Aug-21	15:06	Sediment	X	1
						1
						1
						1
						1
						1
						1
						1

Special Instructions / Regulations with water or land use (CCME Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc): Please Detail

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 provided on a separate Excel tab.

Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF
						20 °C	JG	8 Sep	11:45 AM	

GENF 20.00 Front

Winnipeg, Manitoba R2J 3T4
T: +1 204 255 9720
F: +1 204 255 9721
www.alsglobal.com

Benthic Analysis Information & Protocol

CLIENT NAME: Agnico Eagle Mines Ltd – Meadowbank Division

Note: The maximum sample size is 500 mL (unless sub-sampling is required). Additional fees may be applied for: oversize samples, for samples arriving at the lab overfilled, unpreserved, for transfer to ethanol from formalin, or other unforeseen circumstances (broken or inappropriate containers). To avoid this, please contact the lab for sampling information, supplies, and pricing prior to submission.

	(circle one)			
Number of Samples:	(1 - 20)	20 - 50	>50	
Substrate:	(Sand/Gravel)	Organic Matter (Vegetation)	Clay/Mud	*Tailings sediment
Turn Around Time:	2 Months	(4 Months)	6 months	Other:
Minimum Mesh Size:	250 µm	(500 µm)	Other:	
Sub-sampling Permitted?		(Yes)	No	
If sub-sampling is permitted, please specify the conditions (eg # organisms):	Count to 100 organisms (OBBN) but need to roughly calc density so please homogenize and provide volume of subsample counted			
Reference Library Required?		Yes	(No)	
Return of Organisms Required?		Yes	(No)	
Return of Sediment Required?		Yes	(No)	

Do you require the following groups to be enumerated (Yes) (No) If any present

Porifera			Copepoda:	
Nematoda			Cyclopoida	
Ostracoda			Calanoida	
Cladocera			Harpacticoida	

	(circle one)		
Identification of Benthic Organisms to:	(Family)	Genus/Species (if possible)	
Identification of Chironomidae to:	(Family)	Subfamily	Genus

L2638699-COFC