OSISKO DEVELOPMENT

CARIBOO GOLD PROJECT

HUMAN HEALTH MONITORING AND MANAGEMENT PLAN REV2

JUNE 2025

OSISKO DEVELOPMENT

Cariboo Gold Project

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REVISION HISTORY

Rev. No.	Date	Author	Description
0	May 2, 2024	Audrey Wagenaar, Tessa Roselli, Janet Cheung	Initial version for environmental assessment condition review
1	November 15, 2024	Audrey Wagenaar, Tessa Roselli, Janet Cheung	Revised to address environmental assessment condition review comments
2	June 16, 2025	Audrey Wagenaar, Tessa Roselli, Janet Cheung	Revised to address BC Environmental Assessment Office review comments

EXECUTIVE SUMMARY

The Cariboo Gold Project (the Project) was granted Environmental Assessment Certificate #M23-01 (EAC) on October 10, 2023 by the British Columbia (BC) Environmental Assessment Office (EAO). The Project is an underground gold mine with a maximum production capacity of 1,793,400 tonnes per year of mineralized material (ore) and an operational mine life of 12 years. The Project is located in the District of Wells and the Cariboo Regional District.

Condition #19 of the EAC requires the development of a Human Health Monitoring and Management Plan (HHMMP) for the monitoring of environmental components related to human health (soil and vegetation, air quality, groundwater, surface water, sediment, and fish tissue) and the management of adverse Project effects to human health through the implementation of a trigger response plan. The main objective of the HHMMP is to serve as an overall plan for summarizing monitoring results for the relevant environmental components and detailing the trigger levels and associated responses (actions) required to protect human health, including mitigation measures, monitoring, and adaptive management related to the Project. The related environmental component plans for the HHMMP include:

- Soil and Vegetation Monitoring Plan (SVMP) developed as part of the HHMMP;
- Air Quality Monitoring Plan (AQMP);
- Groundwater Monitoring Plan (GWMP); and
- Aquatic Effects Monitoring Plan (AEMP) for Surface Water, Sediment and Fish.

This document also describes overarching components, such as monitoring, adaptive management measures, reporting, and consultation and feedback that are applicable across the environmental component plans. The mitigation measures applicable to human health effects are addressed through these environmental components; therefore, the mitigation measures provided as part of the environmental assessment for the respective components were applicable for the HHMMP.

ABBREVIATIONS

Terminology used in his document has been defined where it is first used, while the following list has been presented to assist readers that choose to review only portions of the document.

Abbreviation	Description
AEMP	Aquatic Effects Monitoring Plan
AQMP	Air Quality Monitoring Plan
BC	British Columbia
BGM	Barkerville Gold Mines Ltd.
CAC	criteria air contaminant
COPC	constituent of potential concern
EAC	Environmental Assessment Certificate
EAO	Environmental Assessment Office (BC)
EMS	Environmental Management System
ENV	Ministry of Environment and Parks, formerly Ministry of Environment and Climate Change Strategy (BC)
GWMP	Groundwater Monitoring Plan
HHERA	Human Health and Ecological Risk Assessment
HHMMP	Human Health Monitoring and Management Plan
HHRA	Human Health Risk Assessment
km	kilometre
LSA	Local Study Area
m^2	square metre
MCM	Ministry of Mining and Critical Minerals (BC)
Mine Site	Mine Site Complex and Bonanza Ledge Site
ODV	Osisko Development Corp.
PAH	polycyclic aromatic hydrocarbon
Participating Indigenous nations	Lhtako Dené Nation, Xatśūll First Nation, and Williams Lake First Nation
$PM_{2.5}$	Particulate matter (2.5 microns [µm])
PM_{10}	Particulate matter (10 microns [µm])
Project	Cariboo Gold Project
QP	Qualified Professional
QR Mill	Quesnel River Mill
RSA	Regional Study Area
SVMP	Soil and Vegetation Monitoring Plan
VC	Valued Component
WRSF	Waste Rock Storage Facility
WTP	Water Treatment Plant
WSP	WSP Canada Inc.

1. INTRODUCTION

This Human Health Monitoring and Management Plan (HHMMP or the Plan) was prepared by WSP Canada Inc. (WSP) to satisfy Environmental Assessment Certificate (EAC) Condition #19 for Barkerville Gold Mines Ltd.'s (BGM's) Cariboo Gold Project (the Project). BGM is a wholly-owned subsidiary of Osisko Development Corp. (ODV). The HHMMP was developed based on mitigation measures outlined in the EAC Application, comments received on the EAC Application for the Project, and conditions set out in Schedule B of EAC #M23-01. The HHMMP was prepared as a consolidated report for the Project, which includes the Mine Site (Mine Site Complex and Bonanza Ledge Site) and Quesnel River Mill (QR Mill). These sites are described in Section 1.2.

The HHMMP was developed to address the requirements of Condition #19 of Schedule B of EAC #M23-01 and Table 20.1-12 in EAC Application Appendix 20.1. A Declaration of Competency form for Audrey Wagenaar, PChem, DABT, CSAP (BC), QPRA (Ontario), for preparation of the HHMMP is provided as Appendix A.

As part of the HHMMP, a Co-Located Soil and Vegetation Monitoring Plan (SVMP) was developed and is provided in Section 4.2.

Monitoring plans relevant for the HHMMP developed for other Valued Components (VCs) are as follows:

- Air Quality Monitoring Plan (AQMP) – Appendix B;
- Groundwater Monitoring Plans (GWMP) – Appendix C; and
- Aquatic Effects Monitoring Plan (AEMP) - ODV 2025; prepared to meet Condition #22 of the EAC.

The Human Health management program is described in Section 5 of the HHMMP.

1.1 Objectives and Scope

The objective of the HHMMP is to document how environmental constituents with the potential to impact human health (e.g., for work camp residents, residents of Wells, and local land users) will be monitored, and to establish triggers that would initiate alternative mitigation measures, notifications, and/or additional actions.

In addition to Condition #19, the HHMMP addresses EAC Conditions #3 (Document Development) and #4 (Trigger Response), which apply to the management plans and monitoring programs in the EAC conditions. Further, the HHMMP addresses EAC Condition #5 (Consultation), which applies to management and monitoring plans that require consultation of a party or parties to inform parts of the plan. The HHMMP functions as a comprehensive document, incorporating components, such as adaptive management, monitoring, and reporting procedures, which are applicable to the appended monitoring plans.

The HHMMP is organized according to the following sections:

- Section 2 – Document Development;
- Section 3 – Evaluation of Baseline Health Conditions;
- Section 4 – Human Health Monitoring Program;
- Section 5 – Human Health Management Program;
- Section 6 – Reporting; and
- Section 7 – Consultation and Feedback.

EAC Condition #19 is covered within the above sections, and Condition #3 (Document Development) is discussed in Section 2. Condition #4 (Trigger Response) is discussed in Section 5.1, and Condition #5 (Consultation) is discussed in Section 7.

The HHMMP applies to Project activities during the Construction, Operations, and Closure Phases. The HHMMP will be provided to the BC Environmental Assessment Office (EAO) a minimum of 60 days prior to the planned commencement of Construction, unless otherwise authorized by the EAO. The HHMMP is not a fixed document and components of the HHMMP may be revised over the life of the Project.

1.2 Project Overview

This section summarizes the Project and information from the Conceptual Site Model for the Mine Site and QR Mill (KCB 2023).

1.2.1 Proposed Project

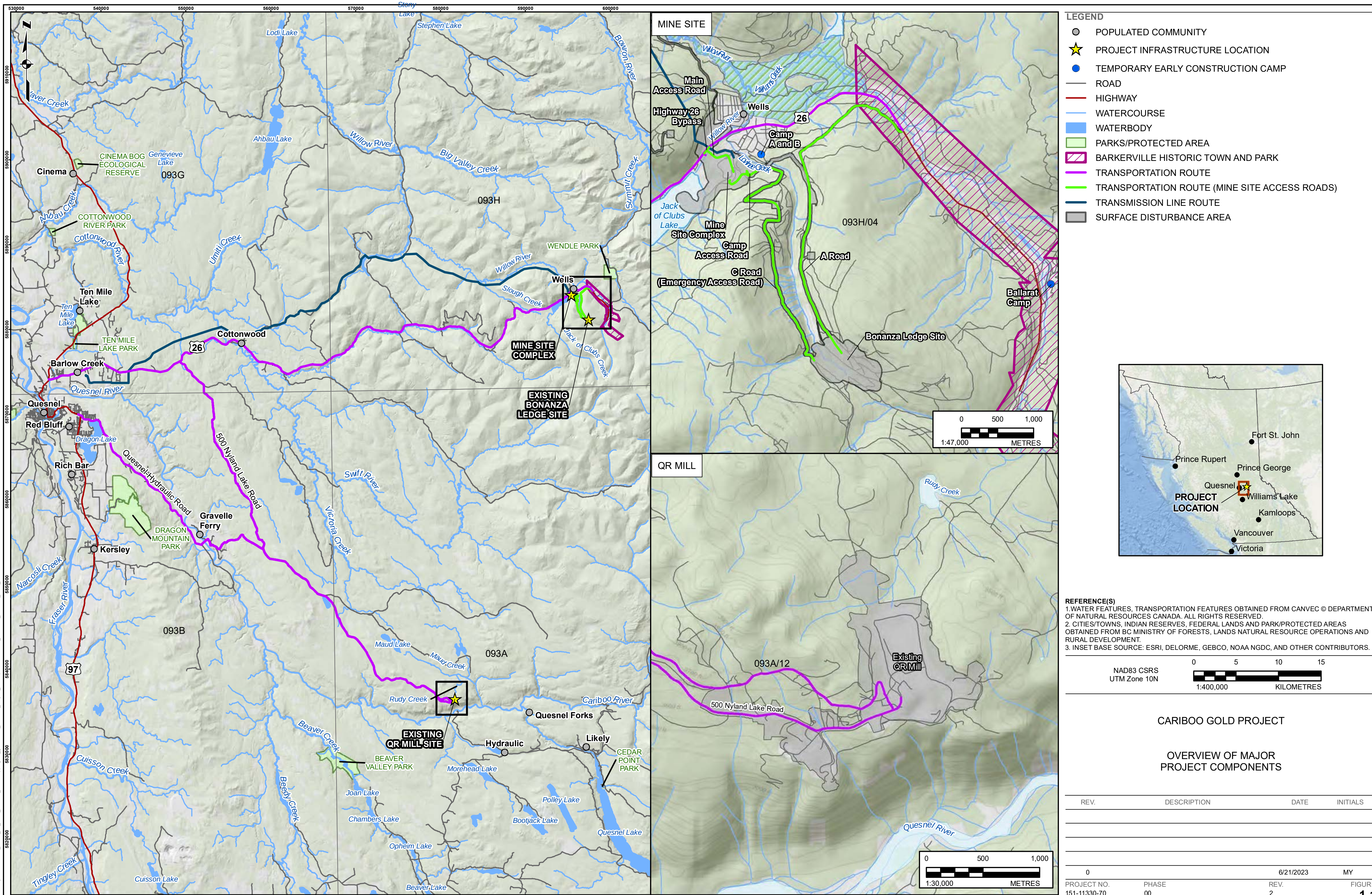
ODV is proposing to develop the Project, an underground gold mine with a maximum production capacity of 1,793,400 tonnes per year of mineralized material (ore) located in the District of Wells and Cariboo Regional District, BC. The Project includes the following sites and key components (Figure 1-1):

Mine Site:

- Mine Site Complex:
  - Waste management facilities;
  - Water supply and management structures and facilities;
  - Services Building;
  - Electrical Substation;
  - Camp (Worker Accommodation);
  - Valley Portal;
  - Water Treatment Plant (WTP); and
  - Other ancillary infrastructure.

- Bonanza Ledge Site:
  - A Waste Rock Storage Facility (WRSF) and associated water management structures;
  - Overburden Stockpiles;
  - Temporary Ore Stockpile;
  - Cow Portal;
  - Other ancillary infrastructure.
- Access roads and infrastructure.
- Quesnel River Mill (QR Mill):
  - ODV's existing and associated infrastructure within the Project Surface Footprint, including use of the Worker Accommodation and necessary upgrades to the existing infrastructure.
- Transmission Line.

The mine will have an estimated operational mine life of 12 years and will operate 24 hours per day, 365 days per year. Closure will occur over a period of 2 years after mining is completed.


MINE SITE
QR MILL
LEGEND
POPULATED COMMUNITY
PROJECT INFRASTRUCTURE LOCATION
TEMPORARY EARLY CONSTRUCTION CAMP
ROAD
HIGHWAY
WATERCOURSE
WATERBODY
PARKS/PROTECTED AREA
BARKERVILLE HISTORIC TOWN AND PARK
TRANSPORTATION ROUTE
TRANSPORTATION ROUTE (MINE SITE ACCESS ROADS)
TRANSMISSION LINE ROUTE
SURFACE DISTURBANCE AREA
Wells
Cottonwood
Barlow Creek
Quesnel
Red Bluff
Rich Bar
Kersley
Gravelle Ferry
Cinema
Ten Mile Lake
Quesnel Forks
Hydraulic
Likely
CINEMA BOG ECOLOGICAL RESERVE
COTTONWOOD RIVER PARK
TEN MILE LAKE PARK
DRAGON MOUNTAIN PARK
BEAVER VALLEY PARK
CEDAR POINT PARK
WENDLE PARK
MINE SITE COMPLEX
EXISTING BONANZA LEDGE SITE
EXISTING QR MILL SITE
500 Nyland Lake Road
Quesnel-Hydraulic Road
093G
093H
093B
093A
093H/04
093A/12
Main Access Road
Highway 26 Bypass
Camp A and B
Mine Site Complex
Camp Access Road
C Road (Emergency Access Road)
A Road
Bonanza Ledge Site
Ballarat Camp
Existing QR Mill
0 500 1,000
1:47,000 METRES
1:30,000 METRES
Fort St. John
Prince Rupert
Prince George
Quesnel
Williams Lake
Kamloops
Vancouver
Victoria
PROJECT LOCATION
REFERENCE(S)
1. WATER FEATURES, TRANSPORTATION FEATURES OBTAINED FROM CANVEC © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
2. CITIES/TOWNS, INDIAN RESERVES, FEDERAL LANDS AND PARK/PROTECTED AREAS OBTAINED FROM BC MINISTRY OF FORESTS, LANDS NATURAL RESOURCE OPERATIONS AND RURAL DEVELOPMENT.
3. INSET BASE SOURCE: ESRI, DELORME, GEBCO, NOAA NGDC, AND OTHER CONTRIBUTORS.
NAD83 CSRS
UTM Zone 10N
0 5 10 15
1:400,000 KILOMETRES
CARIBOO GOLD PROJECT
OVERVIEW OF MAJOR PROJECT COMPONENTS
REV. DESCRIPTION DATE INITIALS
0 6/21/2023 MY
PROJECT NO. 151-11330-70
PHASE 00
REV. 2
FIGURE 1-1

1.2.2 History of Mine Site Area

The Mine Site area contains several historical mines, and there has been substantial activity over the last 90 years on the overall claim holdings, with various companies that have undertaken work programs. Historical mines include Cariboo Gold Quartz, Aurum (also referred to as Island Mountain), and Mosquito Creek. The Cariboo Gold Quartz Mine in the District of Wells went into production in 1933. During Cariboo Gold Quartz Mine operation, approximately 2.65 million tonnes of flotation mill tailings were deposited into the northeastern end of Jack of Clubs Lake near its outlet into the Willow River, filling approximately 30 hectares of the original lake area (SNC 2011a). In addition to the mill tailings, hydraulic placer mining operations in Lowhee Creek also deposited an unknown quantity of placer outwash to the northeastern end of Jack of Clubs Lake. Historical waste rock associated with the 1,500 Level adit is also located on the northeast end of Jack of Clubs Lake, adjacent to the proposed Valley Portal. The Cariboo Gold Quartz Mine closed on August 31, 1959. Some remediation and reclamation have been undertaken on historical mine waste from the Cariboo Gold Quartz Mine.

Aurum Mine, located on the north side of Jack of Clubs Lake, across from the Cariboo Gold Quartz Mine, commenced milling in 1934 by Newmont Mining Corporation. The Aurum Mine closed in 1967. Various exploration, development, and mining occurred around the Aurum Mine and Mosquito Creek Mine sites throughout the 1970s and 1980s.

ODV now owns the Bonanza Ledge Mine (currently in care and maintenance) located 4 kilometres (km) southeast of the historic Cariboo Gold Quartz Mine. The mine is located on the ridge between Lowhee Creek to the north and Stouts Gulch to the south. Extensive hydraulic mining in both creek valleys from the early 1890s to the early 1920s displaced several vertical metres of streambed material to lower Lowhee Creek. Lode mining commenced in the 1930s and has continued intermittently until the present day.

1.2.3 History of QR Mill

The QR Mill is located on the Quesnel River Mine property, which has historically produced gold. The Quesnel River Mine began pre-production development and site construction under Kinross Gold in 1994, and production started from the Main Zone Pit in 1995. Barkerville Gold Mines Ltd. acquired the property in 2010 and focused on mining a small remaining deposit over a 12-month period, after which the mine was put into care and maintenance. ODV acquired the property in 2020 through its acquisition of Barkerville Gold Mines Ltd.

1.3 Roles and Responsibilities

ODV has the obligation to maintain compliance with Project commitments and to inform mine personnel and site contractors of relevant obligations during all phases of the mine's life. A clear understanding of the roles, responsibilities, and level of authority that employees and contractors have when working on the Project is essential to meet HHMMP and ODV Environmental Management System (EMS) objectives.

Table 1–1 provides an overview of general responsibilities for ODV personnel.

Table 1–1: Roles and Responsibilities Defined

Role	Responsibilities
Vice President Environment	Responsible for sign off on the Environmental Policy and has overall responsibility for verifying that Project activities are undertaken such that environmental legislation and regulatory requirements are considered and adhered to, and adverse impacts to the environment and communities in the vicinity of the Project are limited.
General Manager	Responsible for verifying that site personnel have access to and receive applicable training on the EMS and management plans and overseeing the day-to-day operations at the Project sites. Responsible for the health and safety of works and the public and verifying that Project activities comply with the Project's EMS, including integration of the EMS and management plans with other mine development plans and permit compliance.
Environmental Manager	Responsible for establishing, implementing, and maintaining the EMS, training on-site personnel on the Project's EMS and applicable management plans, overseeing responses to non-compliance, evaluating the effectiveness of mitigation measures in each management plan, and reporting outcomes to the General Manager. The Environmental Manager or their agent (i.e., Environmental Personnel) is responsible for coordinating with the General Manager to communicate with other department heads, foremen, or field-level personnel to implement or modify mitigation measures. The Environmental Manager has the authority to stop an activity or shut down the site if it is not meeting regulatory requirements. The Environmental Manager or designate is responsible for reporting non-compliances to the contractors or relevant consultants, ODV, Indigenous nations, and regulatory agencies, where required. Reports to the General Manager.
Qualified Professionals and Qualified Persons	Qualified professionals and qualified persons will be retained to review objectives and conduct various aspects of monitoring, management, and maintenance pertaining to Project facilities and other management and monitoring plans.

Notes: EMS = Environmental Management System; ODV= Osisko Development Corp.

2. DOCUMENT DEVELOPMENT

Document Development requirements per Condition #3 of EAC #M23-01 for the HHMMP are presented in Table 2–1 below. Please refer to the appended plans in Appendix B (AQMP) and Appendix C (GWMP) for their respective presentation of the Condition #3 requirements, where applicable.

Table 2–1: Document Development Requirements in Human Health Monitoring and Management Plan

Condition #3 Item	Condition #3 Requirement[1]	Section Number
3.2a	Purpose and objectives of the document	1.1
3.2b	Plain language summary of the document	Executive Summary
3.2c	Roles and responsibilities of the Holder, Project personnel and any contractors employed for the purposes of implementing the document	1.3
3.2d	Names and, if applicable, professional certifications and professional stamps, of those responsible for the preparation of the document	Appendix A
3.2e	Schedule for implementing the actions in the document throughout the relevant Project phases	4.2.1
3.2f	How the effectiveness of any mitigation measures will be evaluated including the schedule for evaluating effectiveness	5.2
3.2g	Schedules and methods for the submission of reporting required under the applicable condition, and the form and content of those reports	6
3.2h	Process and timing for updating the document, including any consultation with agencies and Participating Indigenous nations that would occur in connection with such updates	6, 7
3.3a	A description of baseline information that will be used to support monitoring of the effectiveness of mitigation	3
3.3b	Methods, objective, location, frequency, timing, and duration of monitoring	4
3.3c	Scope, content and frequency of reporting of the monitoring results	6

Note: [1] Condition set out in Schedule B Table of Conditions of EAC M23-01 (EAO 2023).

3. EVALUATION OF BASELINE HEALTH CONDITIONS

As outlined in Condition #19.3a, an evaluation of baseline health risk conditions (hereafter referred to as baseline health conditions) for the environmental parameters outlined in Condition #19.3b is required for the HHMMP. Baseline conditions represent the environmental quality prior to the commencement of Project activities and are generally based on data collected before construction, or modelled data where measured data cannot be collected.

A Human Health and Ecological Risk Assessment (HHERA) was prepared in support of the EAC Application and was submitted in 2021 and 2022 (WSP 2021; WSP 2022) for the Project sites (i.e., Mine Site, Bonanza Ledge Site, and QR Mill). Baseline chemistry data were used in the evaluation of the Existing Conditions (baseline) scenario in the HHERA to characterize exposure conditions for informational purposes. For the human health risk assessment (HHRA), these baseline data included measured chemistry data for various media including soil, vegetation (berries, leaves), groundwater, surface water, sediment, fish tissue, and air (WSP 2021; WSP 2022). Baseline data were used to identify constituents of potential concern (COPCs) for the HHRA and to provide context to changes to health risk estimates associated with the Project. A parameter was carried forward as a COPC if there was a predicted change[1] in concentration between baseline conditions (referred to as Existing Conditions in the 2021 and 2022 HHERAs) and the different Project scenarios, and concentrations also exceeded the applicable screening values. These COPCs were carried forward for further evaluation in the HHRA, and Existing Conditions (baseline) risk estimates were provided.

To satisfy Condition #19.3a, the Existing Conditions (baseline) risk estimates from the 2021 and 2022 HHERAs have been included in Appendix D, Attachments 1 and 2. As risk estimates were not previously required for some of the parameters listed in Condition #19.3b, an update to the HHRA would be required to evaluate potential risks to human health for baseline conditions. At this time, the Bonanza Ledge and QR Mill sites are currently in care and maintenance, and construction at the Mine Site Complex has not yet started. This allows for baseline conditions to be evaluated prior to the start of Project activities. Environmental data used to evaluate the Existing Conditions scenario in the 2021 and 2022 HHERAs for the EAC Application will also be used to evaluate potential human health risks associated with baseline conditions at the Project sites. In addition, environmental data that have been collected since then as part of on-going/routine monitoring, or to satisfy specific Project objectives (e.g., data collection for reclamation planning), will be considered to supplement the dataset.

[1] Defined by MOH (2022) as a predicted increase from baseline concentrations equal to or greater than the lowest analytical detection limit for that specific constituent and media type.

3.1 Recommended Human Health Risk Assessment Update

To satisfy Condition #19.3a, the Existing Conditions (baseline) risk estimates from the 2021 and 2022 HHERAs have been included in Appendix D, Attachments 1 and 2. These risk estimates represent hazard quotients and incremental lifetime cancer risks calculated for the Existing Conditions (baseline) scenario in the multimedia assessment (i.e., soil, groundwater, surface water, sediment, fish, wild game, vegetation) and air inhalation risk assessment. Constituents of potential concern were carried forward to the risk characterization if they were found to be related to the Project. The Existing Conditions (baseline) risk estimates were calculated for the environmental parameters outlined in Condition #19.3b, except for chromium, copper, lead, cyanide and sulphur dioxide.

To consider additional environmental data that has been collected since the EAC Application, an HHRA update (referred to as the Baseline Health Conditions HHRA) is recommended to re-characterize potential human health risks associated with baseline conditions for the Mine Complex, Bonanza Ledge, and QR Mill. The Baseline Health Conditions HHRA will follow the risk assessment framework, which includes a problem formulation, exposure assessment, toxicity assessment, and risk characterization. It will include the environmental parameters listed in Condition #19.3b and will apply similar methodologies and approaches used in the 2021 and 2022 HHERAs for the EAC Application (e.g., use of the same Local Study Areas [LSAs] and Regional Assessment Areas [RSAs], receptors, exposure frequencies/durations, screening approach, and risk modelling, etc.). It is noted that measured tissue concentrations from wild game species were unavailable at the time of the 2021 and 2022 HHERAs; however, a wild game donation program has been proposed to Participating Indigenous nations for the collection of wild game samples for analysis and incorporation into the Baseline Health Conditions HHRA. In addition, consideration will be given to the incorporation of comments received as part of the EAC Application review, into the Baseline Health Conditions HHRA (e.g., addition of a high-consumer Indigenous resident, use of consumer-only consumption rates, and not amortizing chronic inhalation health risks for specific air quality constituents). Data representative of background conditions (i.e., reference areas), where feasible, will be incorporated into the Baseline Health Conditions HHRA, as natural levels of metals can exceed generic environmental guidelines without representing anthropogenic contamination.

3.2 Data Requirements

Baseline data considered in the 2021 and 2022 HHERAs for the Project sites will be used in the Baseline Health Conditions HHRA. In addition, environmental data collected since the completion of the HHERA relevant for human health will also be included in the dataset for evaluation in the HHRA.

Table 3–1 below describes the additional data collected since the submission of the EAC Application (i.e., soil and vegetation, air quality, groundwater, surface water, sediment and fish) that will be reviewed to determine if they are applicable to be included in the Baseline Health Conditions HHRA.

Table 3–1: Additional Data for Evaluation of Baseline Health Conditions

Environmental Medium/ Component	Monitoring/Data Collection Since 2022 HHERA[1]	Monitoring Locations	Data Available for Parameters for HHMMP? (Y/N)	Reference Location(s) Available? (Y/N)	Next Steps/ Data to Review
Soil and Vegetation	Co-located soil and vegetation (i.e., berries and leaves) sampling conducted in 2023 for specific data collection needs associated with the Bonanza Ledge Mine reclamation plan.	Bonanza Ledge Site (within Project footprint)	Y	Y– Southeast of Project footprint (Between Barkerville and Bonanza Ledge)	Data will be reviewed for consideration in the Baseline Health Conditions HHRA[4].
	Co-located soil and vegetation sampling for a metals uptake program undertaken in 2023.	QR Mill and Mine Site Complex (within Project footprint)	Y	Y	Data will be reviewed for consideration in the Baseline Health Conditions HHRA[4].
	Co-located soil and vegetation sampling recommended in the LSA and RSA for Mine Site Complex, Bonanza Ledge, and QR Mill.	See Section 4.2 of HHMMP	Not yet – Appropriate data will be collected as part of recommended monitoring program	Y	Implement sampling program discussed in Section 4.2 of HHMMP. Data will be incorporated into the dataset for the Baseline Health Conditions HHRA[4].
Air Quality	Continuous air quality monitoring since February 2023 to satisfy conditions of EAC. Continuous monitoring includes $PM_{2.5}$, PM_{10}, sulphur dioxide, nitrogen dioxide, and carbon monoxide[2].	QR Mill near camp, AB Camp in Wells (Ski Hill Road and Hong Street) and Wells (Mooney Lane)	N – Missing metals and PAH air quality data	Y – Suitable reference stations will be identified prior to monitoring, and results will be reviewed to determine if they are appropriate to use as background levels for comparison against exposure levels. The Quesnel Johnston Avenue monitoring station may be considered as a reference location; however, other monitoring stations within the region may be more appropriate depending on the environmental parameter being considered[3]	Monitoring for metals and PAHs to be added to air quality monitoring program. Data will be reviewed for consideration in the Baseline Health Conditions HHRA[4].
	Meteorological parameters (e.g., wind speed, wind direction, relative humidity, temperature) continuously monitored.	AB Camp in Wells (Ski Hill Road and Hong Street). QR Mill	Y	N/A	N/A

Environmental Medium/ Component	Monitoring/Data Collection Since 2022 HHERA[1]	Monitoring Locations	Data Available for Parameters for HHMMP? (Y/N)	Reference Location(s) Available? (Y/N)	Next Steps/ Data to Review
Groundwater	Routine monitoring at monitoring site in mine area as per Permit PE-12601.	QR Mill Camp	Y	Y	ODV to provide data from this compliance monitoring program. Data will be reviewed for consideration in the Baseline Health Conditions HHRA[4].
	Bonanza Ledge Mine Compliance Monitoring.	Bonanza Ledge Project footprint	TBD	TBD	ODV to provide data from this compliance monitoring program. Data will be reviewed for consideration in the Baseline Health Conditions HHRA[4].
	QR Mill Compliance Monitoring	QR Mill Project footprint. Monitoring locations may overlap with those considered in the Existing Conditions Report for the EAC Application	TBD	TBD	ODV to provide data from this compliance monitoring program. Data will be reviewed for consideration in the Baseline Health Conditions HHRA[4].
	QR Mill Drinking Water Monitoring for a shallow (approximately 4 feet) well adjacent to a small stream. This well, recharged by surface water, is used as the drinking water supply for the QR Mill and camp.	Shallow well adjacent to stream serves as monitoring location	TBD	TBD	ODV to provide data from this drinking water monitoring program. Data will be reviewed for consideration in the Baseline Health Conditions HHRA[4].
	District of Wells Drinking Water Monitoring Program.	District of Wells drinking water system	TBD	TBD	ODV to provide data from this drinking water monitoring program. Data will be reviewed for consideration in the Baseline Health Conditions HHRA[4].
	On-going groundwater monitoring program to characterize existing conditions at the Project sites. Program managed by ODV since 2019.	Monitoring locations considered in the EAC Application	Y	N	ODV to provide data from this program. Data will be reviewed for consideration in the Baseline Health Conditions HHRA[4].
Surface Water	Operational/on-going surface water monitoring to satisfy Permit PE-17876 for Bonanza Ledge Mine.	Willow River, Lowhee Creek, Stouts Gulch, Williams Creek	N – PAHs not measured in surface water	Y	Add PAHs to surface water monitoring program. Include data collected after 2022 into dataset for Baseline Health Conditions HHRA[4].
	Operational/on-going surface water monitoring to satisfy Permit PE-12601 for QR Mill site.	QR Mill (Rudy Creek and Creek #3)	N – PAHs not measured in surface water	Y	Add PAHs to surface water monitoring program. Include data collected after 2022 into dataset for Baseline Health Conditions HHRA[4].

Environmental Medium/ Component	Monitoring/Data Collection Since 2022 HHERA[1]	Monitoring Locations	Data Available for Parameters for HHMMP? (Y/N)	Reference Location(s) Available? (Y/N)	Next Steps/ Data to Review
Sediment	Biological monitoring program to satisfy Permit PE-17876 for Bonanza Ledge Mine.	Lowhee Creek, Stouts Gulch, Willow River	TBD	TBD	Data will be reviewed for consideration in the Baseline Health Conditions HHRA[4].
	Biological monitoring program to satisfy Permit PE-12601 for QR Mill site.	Rudy Creek, Maud Creek	TBD	TBD	Data will be reviewed for consideration in the Baseline Health Conditions HHRA[4].
Freshwater Fish	Fish sampling as part of the Crown's Contaminated Sites Program in 2023.	Willow River	N	N/A	ODV to provide data from this program if available.

Notes: EAC= Environmental Assessment Certificate Application; HHMMP= Human Health Monitoring and Management Plan; LSA= Local Study Area; N/A= Not applicable; N= No; Y= Yes; ODV= Osisko Development Corp.; PAH= polycyclic aromatic hydrocarbon; RSA= Regional Study Area; QR Mill= Quesnel River Mill; TBD= to be determined

[1] ODV. 2022. Cariboo Gold Project Environmental Assessment Certificate (EAC) Application – Section 7.13 Human and Ecological Health. October 2022.

[2] Carbon monoxide is not a parameter included in Condition #19 of the EAC #M23-01, but it is included in routine air quality monitoring as a criteria air contaminant (CAC).

[3] Data from reference stations can provide background levels (i.e., concentrations in air not impacted by the Project) for comparison against exposure levels. The data from suitable reference stations will be evaluated to determine if they are appropriate for use as representative background levels, as several factors should be considered (e.g., differences in emission sources in the area; meteorological differences such as wind direction/speed; proximity to unpaved roads; areas of high vehicular traffic or incidences of forest fires that can result in increased concentration of air quality criteria contaminants, such as particulate matter for certain periods, etc.) . The identification of appropriate reference stations will be determined prior to air quality monitoring. Reference stations may vary depending on the environmental parameter being monitored, as certain air monitoring stations may only monitor a select list of air parameters.

[4] Data review will include, but is not limited to, consideration of the location from which monitoring results were obtained or external factors that may have influenced monitoring results (e.g., unexpected weather events, anthropogenic activities, etc.). Suitable data will be incorporated into the Baseline Health Conditions HHRA.

3.3 Data Review

The data presented in Table 3–1 will be reviewed and determined if they are applicable to be included in the Baseline Health Conditions HHRA. Should there be insufficient data to evaluate the baseline scenario, recommendations for additional data collection will be provided as part of the annual reporting.

In addition, Appendix C provides the GWMPs for the Mine Site and QR Mill. Groundwater data collected based on these monitoring plans can be incorporated into the Baseline Health Conditions HHRA. The monitoring program will be reviewed by the Groundwater Qualified Professional (QP) and Human Health QP so that reference wells are appropriately considered. Sampling frequencies set by mine permit requirements should be followed.

4. HUMAN HEALTH MONITORING PROGRAM

A program to monitor environmental constituents in soil, vegetation, air, groundwater, surface water, sediment, and fish tissue has been developed to satisfy Condition #19 of Schedule B of the EAC Application. Except for soil and vegetation, the monitoring requirements are detailed in monitoring plans appended to the HHMMP (AQMP, GWMP) or under separate cover (ODV 2025).

As previously discussed, the SVMP will be developed as part of the HHMMP. The SVMP outlines the co-located soil and vegetation monitoring (sampling) plan that will be used to monitor soil quality and potential disturbance to vegetation and ecosystems associated with Project activities. The SVMP is detailed in Section 4.2.

The remaining component monitoring plans appended to the HHMMP are further described below:

- Air Quality Monitoring Plan (AQMP): The AQMP for the Mine Site and QR Mill outlines continuous air quality and meteorological monitoring requirements and reporting requirements to satisfy Condition #15 and the air quality related requirements of Condition #19.3(b) of the EAC. The AQMP is provided in Appendix B.
- Groundwater Monitoring Plans (GWMPs): The GWMPs for the Mine Site and QR Mill outline the groundwater monitoring program for assessing groundwater quality, groundwater flow pathways, and overall changes in water levels and hydraulic gradients with mine dewatering and reflooding to satisfy the groundwater-related requirements of Condition #19.3(b) of the EAC. The GWMPs are provided in Appendix C.
- Aquatics Effects Monitoring Plan (AEMP): The AEMP for the Mine Site and QR Mill outlines the study design for the monitoring program (surface water quality, sediment quality, periphyton biomass, benthic invertebrate community structure and tissue chemistry [including fish tissue, where relevant]), reporting requirements, and the adaptive management framework to meet the requirements of Condition #22 and relevant components of Condition #19.3(b) of the EAC. The AEMP is provided under separate cover (ODV 2025).

4.1 Monitoring Requirements

4.1.1 Environmental Parameters

As specified in Condition #19.3b, the environmental parameters considered for monitoring as part of the HHMMP are presented in Table 4–1.

Table 4–1: Environmental Parameters for Monitoring

Environmental Medium	Environmental Parameters	Sample/Monitoring Method	Corresponding Plan
Soil and Vegetation	Metals[1]	Co-located soil and vegetation samples	HHMMP
	PAHs[3]		HHMMP
Air Quality	Metals[1]	Time-integrated sampling for metals bound to PM in air	AQMP
	PAHs[3]	Time-integrated sampling for PAHs bound to PM in air	AQMP
	$PM_{2.5}$ and PM_{10} Sulfur Dioxide Nitrogen Dioxide	Continuous monitoring	AQMP
	Meteorological Parameters (wind speed, wind direction, relative humidity, temperature)	Continuous monitoring	AQMP
Groundwater	Metals[1]	-	GWMP
Surface Water	Metals[1]	Co-located surface water and fish tissue samples	AEMP
	PAHs[3]	-	AEMP
Sediment	Metals[1,2]	-	AEMP
Fish	Metals[1]	Co-located surface water and fish tissue samples	AEMP

Notes: AEMP = Aquatic Effects Monitoring Plan; AQMP= Air Quality Monitoring Plan; GWMP= Groundwater Monitoring Plan; HHMMP= Human Health Monitoring and Management Plan; PAH= polycyclic aromatic hydrocarbon; $PM_{2.5}$ and PM_{10}= Particulate matter (2.5 and 10 microns [µm]); - = sampling/monitoring method not specified per Schedule B, Condition 19.

[1] Metals parameters for monitoring include antimony, aluminum, arsenic, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, nickel, selenium, and cyanide (only included for soil, surface water, and sediment).

[2] While metals analysis other than cyanide was not specified for sediment in Condition #19, for the purpose of considering potential effects from sediment for human health, the other metals parameters (i.e., antimony, aluminum, arsenic, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, nickel, selenium) were recommended to be sampled in sediment for the HHMMP.

[3] PAH suite based on the EAC Application will be monitored.

4.2 Co-Located Soil and Vegetation Monitoring Plan

Co-located samples of soil and vegetation will be collected as part of the SVMP to support the HHMMP. The objective of the sample collection is to monitor soil and vegetation quality as it relates to human health impacts from the Project. This monitoring program is intended to be adaptive as monitoring results from each monitoring cycle will be used to inform subsequent monitoring (e.g., sampling frequency and timing, environmental parameters of interest, and sampling).

4.2.1 Methods

Monitoring Locations

The first monitoring event occurred from August 22 and 31, 2024. The co-located monitoring locations for soil and vegetation (leaves and berries, if available) were based on areas where human exposure is likely to occur (i.e., through direct contact with soil or consumption of vegetation). These locations were based on available information from Indigenous Knowledge and community feedback gathered for the EAC Application. Prior to commencement of the field program, monitoring locations (as well as the types of vegetation collected) were further refined during consultation with Participating Indigenous nations (Lhtako Dené Nation, Xatśūll First Nation, and Williams Lake First Nation) on August 13 and 15, 2024.

Monitoring locations were identified within the LSA and RSA, which were based on the outermost areas of the LSAs and RSAs defined by air quality and aquatics components for the EAC Application. The selection of monitoring locations was based on consideration of those previously used for the EAC Application, additional soil and vegetation sampling programs carried out after the EAC Application submission, and feedback from Participating Indigenous nations. Locations were also reviewed to achieve sufficient spatial coverage of the respective study areas.

Co-located soil and vegetation were also collected from locations representative of reference areas (e.g., representative undisturbed sites) to provide an indication of parameters that are naturally elevated in soils and do not represent anthropogenic influence. These locations were identified as reference locations.

The monitoring locations for the Mine Site and QR Mill are presented in Figure 4–1 and Figure 4–2, respectively, and are listed in Table 4–2 below. Based on the results of operational activities of the Project and the results of monitoring, these monitoring locations may change in the future depending on accessibility, health/safety considerations, and the presence of applicable vegetation.

Sample Collection

While the first year of co-located soil and vegetation monitoring occurred in August 2024, the following section describes the plan for sample collection to be used during each field program.

The field work will be undertaken in accordance with a Project-specific Sampling and Analysis Plan. The field program will consist of collection of co-located soil and vegetation (leaves and berries) samples. The types of vegetation will be selected to represent plant types consumed by people, with consideration of species that may be used for traditional use. Types of berries targeted for collection may include, but are not limited to, black gooseberry (*Ribes lacustre*), black huckleberry (*Vaccinium membranaceum*), red huckleberry (*Vaccinium parvifolium*), velvet-leaved blueberry (*Vaccinium myrtilloides*), oval-leaved blueberry (*Vaccinium ovalifolium*), dwarf blueberry (*Vaccinium caespitosum*), bog blueberry (*Vaccinium uliginosum*), red raspberry (*Rubus idaeus*), Saskatoon (*Amelanchier alnifolia*), highbush-cranberry (*Viburnum edule*), and thimbleberry (*Rubus*

parviflorus). Types of leaves targeted for collection may include, but are not limited to, traditional plants such as cow-parsnip (*Heracleum maximum)*, Labrador tea (*Rhododendron groenlandicum*), stinging nettle (*Urtica dioica*), yarrow (*Achillea millefolium*), and common dandelion (*Taraxacum officinale*). These species were identified in the EAC Application as being potentially consumed by people.

Sampling will be dependent on accessibility, health/safety considerations, and the availability of vegetation.

For the co-located soil samples, one soil sample will be representing vegetation at that given monitoring location within a 10 square metre (m^2) area, if the soil type within that area is the same. Therefore, if both berries and leaves are found within this 10 m^2 area, no additional soil sampling is required at that given monitoring location. However, if only one of the vegetation types is identified (e.g., berries), another soil sample with co-located vegetation sample for the other type of vegetation (e.g., leaves) is required within a separate 10 m^2 area. With respect to the vegetation sampling, the edible portions of the vegetation will be targeted for sample collection. Sample collection will depend on timing of the sampling program and availability (quantity of vegetation). One duplicate sample will be collected for approximately every 10 samples. Quality assurance measures and general procedures for sample collection, consistent with the British Columbia Field Sampling Manual (ENV 2024)[2] will be followed.

[2] BC ENV. 2024. British Columbia Field Sampling Manual. Environmental Monitoring and Analysis Branch, Laboratory Standards and Quality Assurance Unit, Ministry of Environment and Climate Change Strategy, Victoria, BC, Canada.
[3] Proposed monitoring locations may change depending on accessibility, health/safety considerations, and the presence of applicable vegetation.

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MSR01-2
MSR01
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MSR03
MSR04
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MSR07
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MSR09
MSL02
MSL03
MSL04
MSL05
MSL06
MSL07
MSL08-1
MSL08-2
MSL09
MSL10-1
MSL10-2
MSL11
MSL12
MSL13
MSL14
MSL15
MSL16-1
MSL16-2
MSL17
MSL18
MSL19
MSL20-1
MSL20-2
MSL21
MSL22
MSREF01
MSREF02
Mine Site Complex
Bonanza Ledge
WENDLE PARK
Jack of Clubs Lake
Bowron Lake Rd
Reduction Rd
Cunningham Pass FSR
Barkerville Hwy
Stanley Rd
Quesnel

LEGEND

- PROPOSED PROJECT FOOTPRINT AREA
- HUMAN HEALTH AQUATICS REGIONAL STUDY AREA
- HUMAN HEALTH AQUATICS LOCAL STUDY AREA
- HUMAN HEALTH AIR QUALITY REGIONAL STUDY AREA
- HUMAN HEALTH AIR QUALITY LOCAL STUDY AREA
- LSA CO-LOCATED SOIL AND VEGETATION MONITORING LOCATION
- RSA CO-LOCATED SOIL AND VEGETATION MONITORING LOCATION
- TRANSPORTATION ROUTE
- TRANSMISSION LINE ROUTE
- ROAD
- WATERCOURSE
- WETLAND
- WATERBODY
- PARK/PROTECTED AREA

NOTE(S)

1. LOCAL STUDY AREA AND REGIONAL STUDY AREA ARE IN DRAFT AND TO BE DETERMINED EARLY IN THE EA PROCESS.

REFERENCE(S)

1. WATER FEATURES, ROADS, MUNICIPAL BOUNDARY, PARK/PROTECTED AREAS, CITIES (INSET), PROVINCIAL BORDERS (INSET) OBTAINED FROM THE B.C. MINISTRY OF FORESTS, LAND AND NATURAL RESOURCE OPERATIONS.
2. HILLSHADE SOURCE AIRBUS, SGS, NGA, NASA, CGIAR, NCEAS, NLS, OS, NMA, GEODATASTYRELSEN, GSA,GSI AND THE GIS USER COMMUNITY.
3. INSET BASE SOURCE: ESRI, DELORME, GEBCO, NOAA NGDC, AND OTHER CONTRIBUTORS.

NAD83 CSRS
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0 1,600 3,200
1:80,000 METRES

CARIBOO GOLD PROJECT

CO-LOCATED SOIL AND VEGETATION MONITORING LOCATIONS FOR HUMAN HEALTH MONITORING PROGRAM AT MINE SITE (MINE SITE COMPLEX AND BONANZA LEDGE)

OSISKO DEVELOPMENT

REV.	DESCRIPTION	DATE	INITIALS
2	FINAL APPROVED	2025-06-17	S.W.
2	FINAL REVIEWED	2025-06-17	T.R.
A	DRAFT	2024-10-31	L.H.

PROJECT NO.	PHASE	REV.	FIGURE
CA0026341.4274	34000.4003	2	4-1

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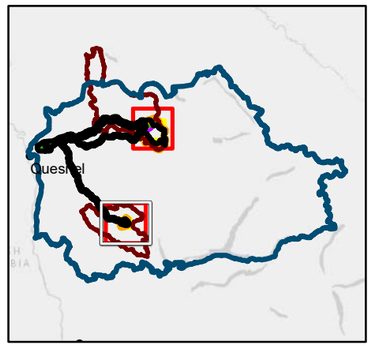
Maud Lake
Le Bourdais Lake
Kangaroo Creek
Little Creek
Duck's Creek
Birrell Creek
Fork's Creek
Slide Creek
Maud Creek
Rudy Creek
Jackpine Creek
Buxton Creek
Little Lake-Quesnel River Rd
Littlelake Creek
Dancing Bill Creek
Drop Creek
Sharpe Rd
Bouillon Rd
Likely Rd
Prior Rd
Morehead Rd
Jackpine Lake
Little Lake
Prior Lake
Morehead Lake
Sam Creek
Westenhiser Creek
Frypan Lake
Polley Lake
Joan Lake
Jacobie Creek
Warren Creek
BEAVER VALLEY PARK

QRR01
QRR02
QRR03
QRR04
QRR05
QRR06
QRR07-1
QRR07-2
QRR08
QRR09
QRR10
QRR11
QRREF01
QRREF02
QRL01
QRL02-1
QRL02-2
QRL03
QRL05
QRL06
QRL07-1
QRL09
QRL10
QRL11

LEGEND

- PROPOSED PROJECT FOOTPRINT AREA
- HUMAN HEALTH AQUATICS REGIONAL STUDY AREA
- HUMAN HEALTH AQUATICS LOCAL STUDY AREA
- HUMAN HEALTH AIR QUALITY REGIONAL STUDY AREA
- HUMAN HEALTH AIR QUALITY LOCAL STUDY AREA
- LSA CO-LOCATED SOIL AND VEGETATION MONITORING LOCATION
- RSA CO-LOCATED SOIL AND VEGETATION MONITORING LOCATION
- TRANSPORTATION ROUTE
- ROAD
- WATERCOURSE
- WETLAND
- WATERBODY
- PARK/PROTECTED AREA



NOTE(S)
1. LOCAL STUDY AREA AND REGIONAL STUDY AREA ARE IN DRAFT AND TO BE DETERMINED EARLY IN THE EA PROCESS.

REFERENCE(S)
1. WATER FEATURES, ROADS, MUNICIPAL BOUNDARY, PARK/PROTECTED AREAS, CITIES (INSET), PROVINCIAL BORDERS (INSET) OBTAINED FROM THE B.C. MINISTRY OF FORESTS, LAND AND NATURAL RESOURCE OPERATIONS.
2. HILLSHADE SOURCE AIRBUS, SGS, NGA, NASA, CGIAR, NCEAS, NLS, OS, NMA, GEODATASTYRELSEN, GSA,GSI AND THE GIS USER COMMUNITY.
3. INSET BASE SOURCE: ESRI, DELORME, GEBCO, NOAA NGDC, AND OTHER CONTRIBUTORS.

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0 1,600 3,200
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OSISKO DEVELOPMENT

CARIBOO GOLD PROJECT

CO-LOCATED SOIL AND VEGETATION LOCATIONS FOR HUMAN HEALTH MONITORING PROGRAM AT QR MILL

REV.	DESCRIPTION	DATE	INITIALS
2	FINAL APPROVED	2025-06-17	S.W.
2	FINAL REVIEWED	2025-06-17	T.R.
A	DRAFT	2024-10-31	L.H.

PROJECT NO.	PHASE	REV.	FIGURE
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Table 4–2: Vegetation and Soil Monitoring Locations

Study Area	ID	Easting	Northing
Mine Site (Mine Site Complex and Bonanza Ledge)			
RSA	MSR01-1	602145	5892531
RSA	MSR01-2	602119	5892570
RSA	MSR02	597247	5890551
RSA	MSR03	592428	5887854
RSA	MSR04	586726	5884423
RSA	MSR05	586574	5877343
RSA	MSR06	602539	5882340
RSA	MSR07	589860	5886212
RSA	MSR08	589477	5883939
RSA	MSR09	590810	5882445
LSA	MSL01	597131	587446
LSA	MSL02	593462	5886785
LSA	MSL03	595298	5884827
LSA	MSL04	597170	5885015
LSA	MSL05	592567	5884109
LSA	MSL06	594444	5883640
LSA	MSL07	594650	5883108
LSA	MSL08-1	596111	5883201
LSA	MSL08-2	596089	5883248
LSA	MSL09	597862	5881952
LSA	MSL10-1	593148	5880957
LSA	MSL10-2	593137	5880949
LSA	MSL11	599737	5880878
LSA	MSL12	596803	5879861
LSA	MSL13	601069	5884398
LSA	MSL14	594825	5885731
LSA	MSL15	599903	5883196
LSA	MSL16-1	592184	5882296
LSA	MSL16-2	592143	5882316
LSA	MSL17	599834	5888015
LSA	MSL18	593736	5879608
LSA	MSL19	599160	5879063
LSA	MSL20-1	595363	5884490
LSA	MSL20-2	595358	5884500
LSA	MSL21	595907	5884417
LSA	MSL22	595493	5885072
RSA	MSREF01 (reference)	603016	5880151
RSA	MSREF02 (reference)	598833	5877787

Study Area	ID	Easting	Northing
QR Mill			
RSA	QRR01	584971	5841587
RSA	QRR02	575593	5835714
RSA	QRR03	579221	5842296
RSA	QRR04	577991	5841270
RSA	QRR05	576303	5839835
RSA	QRR06	574968	5840787
RSA	QRR07-1	574091	5836824
RSA	QRR07-2	574070	5836816
RSA	QRR08	577528	5837452
RSA	QRR09	571610	5841208
RSA	QRR10	582529	5828840
RSA	QRR11	586930	5829728
LSA	QRL01	580041	5836647
LSA	QRL02-1	580275	5836063
LSA	QRL02-2	580292	5836159
LSA	QRL03	579930	5836105
LSA	QRL04	580475	5836364
LSA	QRL05	580851	5836452
LSA	QRL06	581046	5837244
LSA	QRL07-1	581334	5837938
LSA	QRL07-2	581267	5837931
LSA	QRL08	581952	583716
LSA	QRL09	581131	5838050
LSA	QRL10	582073	5838091
LSA	QRL11	582777	5836961
RSA	QRREF01 (reference)	581066	5840589
RSA	QRREF02 (reference)	583319	5841887

Note: ID= Identification; LSA= Local Study Area; QR Mill= Quesnel River Mill; RSA=Regional Study Area;
Universal Transverse Mercator coordinates, provided as Easting and Northing, are in 10U.

Monitoring Schedule - Frequency and Timing

The monitoring program will occur during the Project Construction, Operations, and Closure Phases, with the first round of monitoring conducted in August 2024 prior to Project construction. The data from this round of monitoring can be used to represent baseline conditions. The timing of Project Construction has not yet been confirmed for 2025, and any construction activities that are planned for 2025 will likely be short in duration or not very extensive. The main construction activities are expected to occur in 2026. It is noted that the soil and vegetation program is constrainted to the berry-fruiting months of August to early September. Given these considerations and constraints, the second monitoring program will occur in late summer of 2026. The proposed frequency and timing of the SVMP is as follows:

- Frequency: The proposed frequency is annually for the first three years after the main construction activities commence, and every three years thereafter, pending the findings of the first three years of monitoring. Increased concentrations observed within the first three years may result in the continuation of the annual monitoring event, whereas decreasing or stable concentrations may result in a reduction of the monitoring frequency to every three years. The frequency of monitoring will be determined by a trend analysis, which will provide an indication of year-over-year increases related to consistuents in soil and vegetation. The trend analysis will be conducted in collaboration with the Human Health QP; if the frequency of monitoring transitions to a three-year schedule, the Human Health QP will revise the monitoring program accordingly. The change in monitoring frequency is not expected to alter the sampling methodologies or sampling locations for the monitoring program.
- Timing: The collection of co-located soil and vegetation samples is recommended to occur in the summer season (generally late July through mid-September) to account for availability and quantity of vegetation for sample collection.

This monitoring program is intended to be adaptive based on the results of operational activities of the Project and the results of monitoring. The results of the monitoring program will be reviewed after each event and the frequency and timing of the subsequent program may be updated as required. The adaptive management proposed for this HHMMP is detailed in Section 5.2.

4.2.2 Data Compilation and Review

Soil chemistry data will be compared to trigger levels developed using relevant soil screening criteria (discussed in Section 5.1.1 below), as well as regional background and/or reference concentrations. Screening criteria are not available for vegetation; therefore, soil screening criteria will be used as a surrogate for vegetation; any parameters in soil exceeding the established trigger levels were carried forward as a potential concern for vegetation as well. While the screening criteria are health-based values developed by regulatory agencies for the protection of people, the trigger levels are developed as indicators of potential health impacts as a result of Project-related changes, allowing for adaptive management and mitigation planning to respond to these changes. Following each monitoring cycle, the results of the SVMP will be summarized in an interpretative report, which will be provided in the HHMMP report submission (See Section 5.2.1). The monitoring results will also inform the sampling frequency and timing, environmental parameters of interest, and sampling locations for the subsequent monitoring event.

The HHMMP is not a fixed document and components of the Plan may be revised over the life of the Project. It is expected that as screening criteria and regulatory guidance are periodically updated, and as the monitoring data are reviewed for effects to human health, the Plan may also

require periodic updates. Recommendations will be included for changes in the monitoring program including, but not limited to:

- Changes to monitoring and sampling frequency;
- Updating list of parameters of interest;
- Adding or relocating monitoring locations; and
- Adopting mitigation strategies and risk communication plans.

4.2.3 Implementation

QPs will implement the Human Health Monitoring Program by conducting or overseeing the monitoring efforts.

4.3 Input from Other Component Management Plans

Monitoring of soil, vegetation, air, groundwater, surface water, sediment, and fish was required in the HHMMP to monitor potential effects associated with these environmental media to human health. Monitoring locations for the environmental parameters associated with the AQMP (Appendix B), GWMPs (Appendix C), and AEMP (ODV, 2024) are specified in their respective plans. These include sampling locations for exposure sites (i.e., that could potentially be affected by the Project activities) and reference sites (i.e., representative of background/regional levels and are not affected by Project activities), where applicable. The frequency of monitoring is outlined in each of these plans. Given the AQMP and GWMP are attached to the HHMMP, the sampling locations associated with the AEMP are provided below in Figure 4–3 and Figure 4–4.

595000

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N

Red Gulch

Mosquito Creek

Willow River

Malleve Creek

Valley Creek

Lowhee Creek

Williams Creek

Eureka Gulch

Wilsons Creek

Jack of Clubs Lake

Hwy 26

Watsons Gulch

Emory Gulch

Stouts Gulch

Pinkerton Creek

Victoire Creek

Black Jack Gulch

Walker Gulch

Stoney Creek

Jack of Clubs Creek

Queen of Clubs Creek

WR-151.0

WR-151.5

Wetland

WR-152.0

LC-1.5

JCL-OUT

JCL-IDZ-1

JCL-IDZ-2

JCL-IDZ-3

JCL-MF-1

JCL-MF-3

JCL-MF-2

JCL-FF-1

JCL-FF-2

JCL-FF-3

LC-3.0

LC-3.9

WG-0.25

WC-8.0

SG-1.35

EG-0.25

SG-0.74

WC-8.9

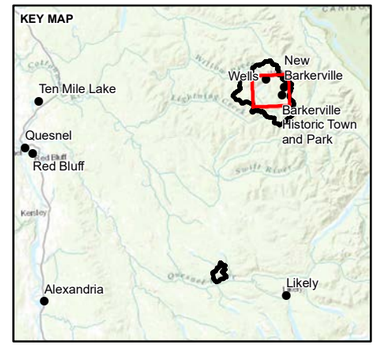
SG-0.25

WC-9.8

WC-10.55

LEGEND

- BARKERVILLE HISTORIC TOWN AND PARK
- HIGHWAY/ROAD
- CONTOUR (100 m)
- WATERCOURSE
- WETLAND
- WATERBODY
- PROPOSED INFRASTRUCTURE
- PROPOSED SURFACE SEDIMENT POND / SUMPS
- AEMP STATION
- VENTILATION RAISE
- PROPOSED MINE PORTAL LOCATION
- UPGRADED WATER TREATMENT PLANT
- WTP DISCHARGE
- PROPOSED TREATED DISCHARGE / DIFFUSER PIPELINE
- ACCESS ROAD



REFERENCE(S)

1. TRAILS, WATER FEATURES, ROADS, BARKERVILLE HISTORIC TOWN/PARK, CITIES (INSET), PROVINCIAL BORDERS (INSET) OBTAINED FROM THE B.C. MINISTRY OF FORESTS, LAND AND NATURAL RESOURCE OPERATIONS.
2. HILLSHADE DERIVED FROM LIDAR DATA FLOWN BY MCELHANNEY CONSULTANTS LTD. JUNE 27, 2016.
3. BASE DATA SOURCE: ESRI, GEOBASE, NRCAN, AND THE GIS USER COMMUNITY.
4. INSET TOPOGRAPHIC MAP © ESRI AND ITS LICENSORS. USED UNDER LICENSE, ALL RIGHTS RESERVED.
5. SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY
SOURCE: ESRI, MAXAR, EARTHSTAR GEOGRAPHICS, IGN, AND THE GIS USER COMMUNITY.

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OSISKO DEVELOPMENT

CARIBOO GOLD PROJECT

MINE SITE AQUATIC EFFECTS MONITORING PLAN – SAMPLING LOCATIONS

REV.	DESCRIPTION	DATE	INITIALS
2	FINAL APPROVED	2025-06-17	S.W.
2	FINAL REVIEWED	2025-06-17	T.R.
A	DRAFT	2024-10-31	L.H.

PROJECT NO.	PHASE	REV.	FIGURE
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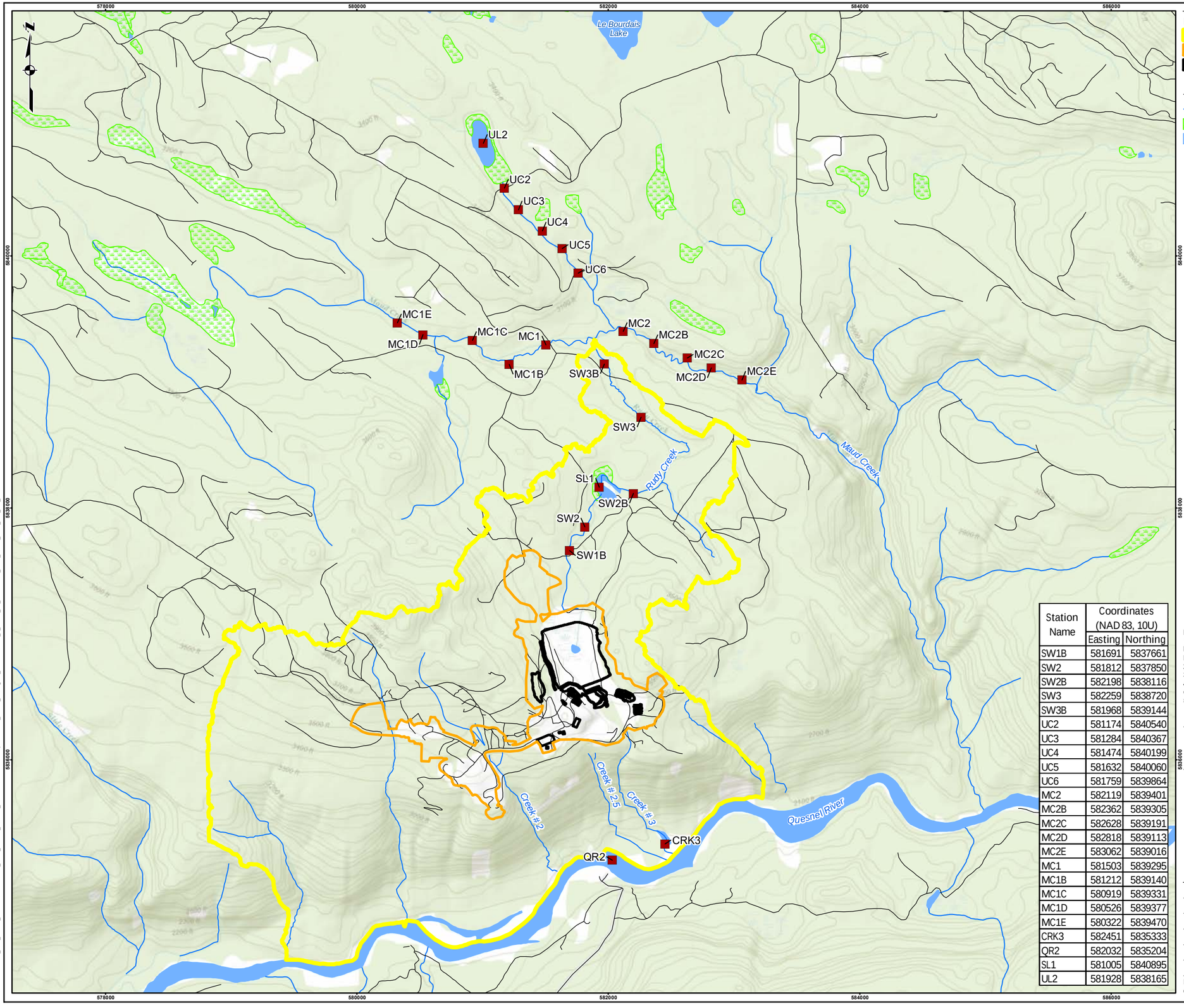

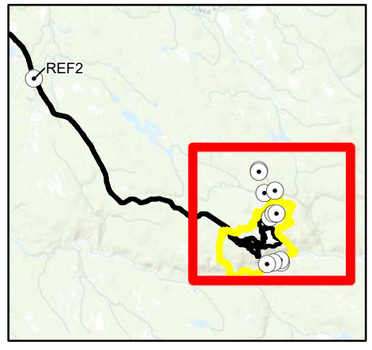

LEGEND

- AQUATICS LOCAL STUDY AREA
- QR MILL BOUNDARY
- NEW INFRASTRUCTURE
- AEMP STATION
- ROAD
- WATERCOURSE
- WETLAND
- WATERBODY

Station Name	Coordinates (NAD 83, 10U)	
	Easting	Northing
SW1B	581691	5837661
SW2	581812	5837850
SW2B	582198	5838116
SW3	582259	5838720
SW3B	581968	5839144
UC2	581174	5840540
UC3	581284	5840367
UC4	581474	5840199
UC5	581632	5840060
UC6	581759	5839864
MC2	582119	5839401
MC2B	582362	5839305
MC2C	582628	5839191
MC2D	582818	5839113
MC2E	583062	5839016
MC1	581503	5839295
MC1B	581212	5839140
MC1C	580919	5839331
MC1D	580526	5839377
MC1E	580322	5839470
CRK3	582451	5835333
QR2	582032	5835204
SL1	581005	5840895
UL2	581928	5838165

REFERENCE(S)

1. WATER FEATURES, ROADS, PARK/PROTECTED AREAS, CITIES (INSET), PROVINCIAL BORDERS (INSET) OBTAINED FROM THE B.C. MINISTRY OF FORESTS, LAND AND NATURAL RESOURCE OPERATIONS.
2. CONTOURS OBTAINED FROM THE PROVINCE OF BC TRIM DATASET.
3. PROJECT AREA PROVIDED BY BGM.
4. HILLSHADE SOURCE AIRBUS, SGS, NGA, NASA, CGIAR, NCEAS, NLS, OS, NMA, GEODATASTYRELSEN, GSA,GSI AND THE GIS USER COMMUNITY.
5. INSET BASE SOURCE: ESRI, DELORME, GEBCO, NOAA NGDC, AND OTHER CONTRIBUTORS.

NAD83 CSRS
UTM ZONE 10N

600 0 600
1:30,000 METRES

OSISKO DEVELOPMENT

CARIBOO GOLD PROJECT

QR MILL AQUATIC EFFECTS MONITORING PLAN - SAMPLING LOCATIONS

REV.	DESCRIPTION	DATE	INITIALS
2	FINAL APPROVED	2025-06-17	S.W.
2	FINAL REVIEWED	2025-06-17	T.R.
A	DRAFT	2024-10-31	L.H.

PROJECT NO.	PHASE	REV.	FIGURE
CA0026341.4274	34000.4003	2	4-4

W:\Client\BGM\BGM_Cow_Mtn\99_PROJECTS\177416\0_BGM_Cariboo_Gold\02_PRODUCTION\MXD\Report\Human_Health_Ecological_Risk\2024\Rev_2_FIG04_04_CA0026341_4274_34000_4003_WQ_QR_AEMP.mxd

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

25mm

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5. HUMAN HEALTH MANAGEMENT PROGRAM

5.1 Trigger Response

Condition #4 of EAC #M23-01 (EAO 2023) requires that the HHMMP include trigger-response actions. The objective of trigger-response is to identify circumstances that require ODV to implement alternative or supplementary mitigation measures, monitoring, or adaptive management.

5.1.1 Trigger Levels

For each of the environmental parameters outlined in Condition #19.3, trigger levels were established based on health-based screening criteria and informed by assumptions, uncertainties, and conclusions of the 2022 HHERA.

Trigger levels were established for each of the relevant environmental parameters in soil, air, groundwater, surface water, sediment, and fish tissue. There are no screening criteria available for vegetation; therefore, soil trigger levels will be used as a surrogate to assess the potential for effects to vegetation. For trigger levels for sediment, soil quality criteria will be used as a surrogate as human health-based guidelines for sediment were unavailable from provincial, federal, and other jurisdictions. The British Columbia Ministry of Environment and Parks (ENV 2021) recommends the use of soil screening criteria to identify constituents of potential concern if substances are considered to be non-bioaccumulative. For bioaccumulative substances, ENV recommends using ecological standards in BC Contaminated Site Regulation Schedule 3.4 to identify constituents of potential concern in sediment for human health in a risk assessment (ENV 2021). None of the environmental parameters considered for the development of trigger levels were considered bioaccumulative; therefore, soil quality criteria were considered applicable for screening sediment. Similarly, there are no screening criteria available for vegetation, so soil trigger levels and associated actions are used as a surrogate to assess the potential for effects to vegetation.

It should be noted that while trigger levels are meant to be applied to concentrations measured at monitoring locations described in the respective VC plans, these locations will be reviewed by the appropriate QP prior to implementing the monitoring plans tied to the HHMMP. The application of trigger levels should exclude areas of known contamination. For example, Jack of Clubs Lake should be excluded as there is known contaminated sediment and surface water monitoring plans should be limited to the areas outside of the effluent mixing zone.

Health-based screening criteria were compiled based on those considered in the 2022 HHERA in Tables D-1 to D-5c (Appendix D). The selection of these health-based screening criteria is detailed in the Screening Criteria Selection in Appendix D. A value of 80% of the selected health-based screening criteria for each environmental parameter was proposed as the respective trigger level.

The trigger levels are compiled in Table D-1 (Appendix D). It should be noted the HHMMP is not a fixed document and components of the Plan may be revised over the life of the Project. It is expected that as screening criteria and regulatory guidance are periodically updated, trigger levels may be updated accordingly.

5.1.2 Trigger Response Plan

A Trigger Response Plan was developed consisting of the established trigger level and proposed actions to implement if the trigger levels are exceeded during monitoring. These trigger response actions will be implemented when monitoring identifies variations from the anticipated Project-related effects identified in the EAC Application and the Baseline Health Conditions HHRA. Exceedances of the trigger levels may indicate that mitigation is not sufficient, and subsequent actions, alternative mitigation measures, or adaptive management measures would be required.

The Trigger Response Plan for the HHMMP is presented in Table 5–1.

Table 5–1: Trigger Response Plan for the Human Health Monitoring and Management Plan

Environmental Medium	Environmental Parameter	Action for Trigger Level Exceedance[1,2]
Soil[3]	Metals, PAHs	If the trigger level is exceeded, then: • Human Health QP to compare monitoring results to regional soil background concentrations and reference concentrations to determine if parameter should be assessed further. • Human Health QP to determine if exceedance is linked to Project activities by comparing against baseline conditions. A trend analysis will be conducted to identify environmental parameters that may be increasing in concentration or have unexpected significant spikes in concentration before approaching a trigger level. The trend analysis will provide an indication of year-over-year increases. • Human Health QP to work with the Air Quality QP to review the air quality monitoring results to determine if there is a correlation between soil/vegetation concentrations and air quality concentrations (concentrations in soil and vegetation are related to air deposition from the Project). If exceedance is not related to the Project, continued monitoring will occur at same frequency as the SVMP. • If exceedance is considered related to the Project, confirm results through verification sampling during next reasonable sampling interval. In addition, implement mitigation measures prescribed by the Air Quality QP to prevent further increases in soil concentrations. • Depending on results of the verification sampling, assessment against baseline conditions, and implementation of mitigation measures, Human Health QP to assess whether a human health risk assessment is required to determine if potential risks associated with exposure to soil and vegetation exist.

Environmental Medium	Environmental Parameter	Action for Trigger Level Exceedance[1,2]
Air Quality	Metals, PAHs, CACs	If the trigger level is exceeded, then: • Air quality QP to compare monitoring results to regional ambient air background, if available, to determine if parameter should be assessed further. If baseline conditions are not available for comparison, the regional ambient air background will be assumed to be zero for metals and PAHs. • Air quality QP to identify the potential cause of the exceedance and determine if it is related to Project activities by comparing against baseline conditions. If deemed unrelated to the Project (e.g., related to external factors such as forest fires), continued monitoring will occur at the same frequency as the AQMP. If baseline conditions are not available for comparison, an exceedance of air quality trigger levels will be assumed to be Project-related and mitigation measures prescribed by the Air Quality QP will be implemented and verification sampling will be conducted. • Human Health QP to conduct a trend analysis to identify environmental parameters that may be increasing in concentration or have unexpected significant spikes in concentration before approaching a trigger level. The trend analysis will provide an indication of year-over-year increases. • If exceedance is considered related to the Project, implement mitigation measures prescribed by the Air Quality QP and confirm results through verification sampling. • Depending on results of the verification sampling, assessment against baseline conditions, and implementation of mitigation measures, Human Health QP to assess whether a human health risk assessment is required to determine if potential risks associated with exposure to air exist.
Groundwater	Metals	If the trigger level is exceeded, then: • Groundwater QP to compare monitoring results to regional background concentrations and reference concentrations, if available, to determine if parameter should be assessed further. • Groundwater QP to identify the potential cause of the exceedance and determine if it is related to Project activities by comparing against baseline conditions. Determine if there is a consistent upward trend or increase in a number of downgradient monitoring locations. Update potential discrepancies in groundwater quality model if deemed necessary. If exceedance is not related to the Project, continued monitoring will occur at the same frequency as the GWMP. • Human Health QP to conduct a trend analysis to identify environmental parameters that may be increasing in concentration or have unexpected significant spikes in concentration before approaching a trigger level. The trend analysis will provide an indication of year-over-year increases. • If exceedance is considered related to the Project, Groundwater QP to confirm results through verification sampling. • Groundwater QP to assess results of increased monitoring. If concentrations remain above the trigger level, implement mitigation measures prescribed by the Groundwater QP mitigation measures. • Depending on results of the verification sampling, assessment against baseline conditions, and implementation of mitigation

Environmental Medium	Environmental Parameter	Action for Trigger Level Exceedance[1,2]
		measures, Human Health QP to assess whether a human health risk assessment is required to determine if potential risks associated with exposure to groundwater exist.
Surface Water	Metals, PAHs	If the trigger level is exceeded, then: • Aquatics QP to compare monitoring results to reference concentrations, if available, to determine if parameter should be assessed further. • Aquatics QP to review monitoring results to identify potential cause of increase, such as a review of construction activities or other potential disturbances in the area, similarity (or not) of the parameters indicative of mine-contact water, concentrations and flow rates, time series concentration trends to determine if levels are increasing with time or changing from baseline, and spatial extent/transport pathways of the elevated parameters. • Aquatics QP to determine if exceedance is linked to Project activities. If exceedance is not linked to the Project, continued monitoring at the same frequency as the AEMP. • Human Health QP will conduct a trend analysis to identify environmental parameters that may be increasing in concentration or have unexpected significant spikes in concentration before approaching a trigger level. The trend analysis will provide an indication of year-over-year increases. • If exceedance is considered related to the Project, Aquatics QP to confirm results through verification sampling. If exceedance is related to construction/disturbance activities, implement mitigation measures prescribed by the appropriate QP. • Aquatics QP to assess results of increased monitoring. If concentrations remain above the trigger level, implement mitigation measures prescribed by the Aquatics QP. • Depending on results of the verification sampling, assessment against baseline conditions, and implementation of mitigation measures, Human Health QP to assess whether a human health risk assessment is required to determine if potential risks associated with exposure to surface water.
Sediment[4]	Metals	If the trigger level is exceeded, then: • Aquatics QP to compare monitoring results to reference concentrations, if available, to determine if parameter should be assessed further. • Aquatics QP to review monitoring results to identify potential cause of increase. Aquatics QP to determine if exceedance is linked to Project activities. If exceedance is not linked to the Project, continued monitoring will occur at the same frequency as the AEMP. • Human Health QP to conduct a trend analysis to identify environmental parameters that may be increasing in concentration or have unexpected significant spikes in concentration before approaching a trigger level. The trend analysis will provide an indication of year-over-year increases. If exceedance is considered related to the Project, Aquatics QP to confirm results through verification sampling. If exceedance is related to construction/disturbance activities, implement appropriate mitigation measures as prescribed by the appropriate QP.

Environmental Medium	Environmental Parameter	Action for Trigger Level Exceedance[1,2]
		• Aquatics QP to assess results of verification monitoring. If concentrations remain above the trigger level, implement mitigation measures prescribed by the Aquatics QP. • Depending on results of the verification sampling, assessment against baseline conditions, and implementation of mitigation measures, Human Health QP to assess whether a human health risk assessment is required to determine if potential risks associated with exposure to sediment.
Fish Tissue	Metals	If the trigger level is exceeded, then: • Aquatics QP to compare monitoring results to reference tissue concentrations, if applicable, to determine if parameter should be assessed further. • Aquatics QP to review monitoring results to identify cause of increase, including a review of construction activities or other potential disturbances in the area, similarity (or not) of the elevated parameters in fish tissue concentrations compared to co-located surface water chemistry, and spatial extent of elevated fish tissue concentrations. • Aquatics QP to determine if exceedance is linked to Project. If exceedance is not linked to the Project, continued monitoring will occur at the same frequency as the AEMP. • Human Health QP to conduct a trend analysis to identify environmental parameters that may be increasing in concentration or have unexpected significant spikes in concentration before approaching a trigger level. The trend analysis will provide an indication of year-over-year increases. • If exceedance is considered related to the Project, Aquatics QP to confirm results through verification monitoring of co-located fish tissue[5] and surface water samples at affected receptor locations and downgradient sites. If exceedance is related to construction/disturbance activities, implement mitigation measures prescribed by the appropriate QP. • Aquatics QP to assess results of increased monitoring. If concentrations remain above the trigger level, implement mitigation measures prescribed by the Aquatics QP. • Depending on results of the verification sampling, assessment against baseline conditions, and implementation of mitigation measures, Human Health QP to assess whether a human health risk assessment is required to determine if potential risks associated with exposure from fish consumption

Notes: AEMP = Aquatics Effects Monitoring Plan; AQMP= Air Quality Monitoring Plan; CAC = Criteria Air Contaminant; GWMP = Groundwater Monitoring Plan; PAH = polycyclic aromatic hydrocarbon; QP = Qualified Professional

[1] Refer to the trigger levels provided in Table D-1(Appendix D)

[2] Review and interpretation of data should be conducted by a Qualified Professional (QP)

[3] Trigger levels could not be developed for vegetation as no screening criteria are available. The soil trigger levels and associated actions will be used as a surrogate for vegetation.

[4] Soil quality criteria was used as a surrogate to develop sediment trigger levels as human health-based guidelines for sediment were unavailable under ENV guidance. ENV (2021) recommends the use of soil screening criteria to identify constituents of potential concern if substances are considered to be non-bioaccumulative. For bioaccumulative substances, ENV recommends using ecological standards in BC Contaminated Site Regulation Schedule 3.4 to identify constituents of potential concern in sediment for human health in a risk assessment (ENV 2021). None of the parameters were considered bioaccumulative; therefore, soil quality criteria were considered applicable for screening sediment.

[5] Appropriate permits are required prior to fish sampling.

5.1.3 Risk Communication

Exceedances of trigger levels will be communicated by ODV to relevant public health authorities (i.e., the Northern Health Authority and/or Interior Health) within 2 weeks of the observed exceedance. The notification will be prepared in accordance with the requirements of the respective authorities.

The risk communication strategies will be developed in consultation with the Northern Health Authority (NHA) and applicable health agencies. If a focused study (i.e., human health risk assessment) is required based on the results of the Trigger Response Plan, the results will be provided to the relevant stakeholders and will be used to inform risk communication. If recommendations of the focused study identify a need for public risk communication, it will include public advisories (e.g. signage with drinking water advisory at impacted waterway, fish consumption advice, air quality advisories), plain language summaries, and/or community presentations. Risk communication strategies and communication materials can generally be prepared within six weeks of observed trigger level exceedances. Should a human health risk assessment be needed prior to developing the risk communication materials, the timeline may be extended.

5.2 Adaptive Management

Adaptive management will be triggered if monitoring results exceed the established trigger levels specified in Section 5 of the HHMMP. The objective of adaptive management is to address circumstances where the implementation of alternative or additional mitigation measures would be required to address the effects of the Project. This HHMMP is intended to be adaptive given the number of environmental components that can be affected by Project activities and impact human health.

The adaptive framework is shown as a cyclical process (Figure 5–1) that recognizes that monitoring can lead to new information that should be used in future monitoring. This process allows feedback from this new information for development and modification of mitigation measures or management decisions. The progressive implementation of the adaptive management framework will also include an annual review of the monitoring program to determine the potential need for revisions to planned monitoring and analysis tasks.

Figure 5–1: Adaptive Management Framework

A decision framework for adaptively managing the human health monitoring program is provided in Table 5–2. The approach, methods, and schedule (frequency and timing) of the monitoring programs as described in the respective VC monitoring plans will be carried out according to the plan. If effects to human health receptors are predicted, monitoring should be maintained or increased in frequency for a period of time, and the Human Health QP will determine if focused studies (i.e., an updated HHRA) need to be implemented to further support management decisions. Focused studies will be designed by a QP based on the findings of the monitoring program, relevant receptor locations, and Project conditions at the time.

Table 5–2: Key Elements of the Decision Framework for Changes to the Human Health Monitoring and Management Plan

Trigger	Time to Act	Action
Exceedance of trigger level for soil and vegetation, air quality, groundwater, surface water, sediment, and fish tissue	Within 1 month of observed trigger exceedance. Time to act will depend on environmental component.	Evaluate if effects are linked to Project activities
	Within next suitable field season	Conduct verification monitoring
	Within 1 month of verification monitoring	Implementation of mitigation measures prescribed by a QP
	Within 1 month of obtaining verification monitoring results	Implement focused study (i.e., conduct human health risk assessment) if concentrations remain above trigger levels after verification sampling and implementation of mitigation measures

Notes: QP = Qualified Professional

5.2.1 Implementation

The review and interpretation of monitoring results per the objectives of the Trigger Response Plan will be a collaborative effort conducted by the relevant QPs pertaining to the HHMMP (e.g., Human Health QP, Air Quality QP, Groundwater QP and Aquatics QP). These QPs may conduct various aspects of monitoring and management pertaining to this Plan.

In addition to the relevant QPs and plans listed above, the results of annual reporting for the HHMMP could also be relevant to the Drinking Water and Water Treatment Plan (Condition #18) and Community Effects Management Plan (Condition #16). For example, constituent concentrations in groundwater may exceed drinking water levels and affect residents using potable water supply wells, or constituent concentrations in various media may have an effect on community factors, such as employment levels or engagement in recreational hunting, fishing, or foraging. The QPs of the Drinking Water and Treatment Plan and Community Effects Management Plan will be notified if the triggers are exceeded to determine if additional mitigation or action is required to be implemented by these QPs.

6. REPORTING

The HHMMP will be provided to the EAO a minimum of 60 days prior to commencement of Construction at the Mine Site and QR Mill. A revised HHMMP will be provided after the incorporation of feedback from relevant stakeholder groups (see Section 7).

HHMMP reporting will be provided annually, depending on data availability and seasonal constraints (e.g., berry-fruiting season, fish migration patterns, fish population numbers affecting fish tissue monitoring, snow cover). A data appendix report associated with the co-located soil and vegetation sampling will be provided as part of the HHMMP reporting in 2025 as baseline air, surface water, sediment and fish tissue quality monitoring is currently on-going. For example, there is currently insufficient metals and PAH air quality monitoring data to include in the 2025 report submission. These data will be provided as part of the 2026 HHMMP report submission, along with updated trigger levels based on updated guidance and screening criteria.

Annual reporting will be provided to the EAO, the BC Ministry of Energy, Mines and Low Carbon Innovation, ENV, the Northern Health Authority, and Participating Indigenous nations (Condition #19.4). Reporting will summarize information gathered from the Human Health Monitoring Program (Section 4) and Human Health Management Plan (Section 5). It will provide a summary of monitoring results and screening against the established trigger levels associated with the soil and vegetation component, as well as summaries of relevant monitoring information from other VCs. Specifically, reporting will include the following:

- Summary and interpretation of collected data (including data quality and completeness, and trend analyses), and a discussion of data as it relates to the trigger levels and effects to human health.
- A comparison of results between the baseline conditions estimates of the Baseline Health Conditions HHRA and the results of the collected data to determine if Project activities are affecting human health.
- A summary of the SVMP monitoring results, including an assessment on whether Project activities are affecting human health based on comparing monitoring results to the relevant screening criteria (As described in Section 4.2.1).
- Additional mitigation measures or adaptive management implemented by ODV in response to Project-related changes as it relates to the HHMMP.

Note that the recommended Baseline Health Conditions HHRA (Section 3.1) will be provided under separate cover from the HHMMP. Further, the HHMMP is not a fixed document and components of the HHMMP may be revised over the life of the Project.

7. CONSULTATION AND FEEDBACK

A consultation period will occur after submission of the HHMMP, after which updates based on feedback will be incorporated into a revised HHMMP submission.

The HHMMP will be presented (virtually) to provincial regulators, Participating Indigenous nations, and other stakeholders by the Human Health QP. One presentation will occur prior to the commencement of the co-located soil and vegetation field program (i.e., prior to mid-August 2024) with Participating Indigenous Nations to refine the vegetation types to be collected. Another presentation is anticipated to occur after submission of the HHMMP report to provincial regulators, Participating Indigenous nations and other stakeholders as part of the consultation and feedback period. Information will be shared with these groups, including the BC Ministry of Forests' Crown Contaminated Sites Program and the District of Wells. It is noted that prior to the field program that occurred in mid-August 2024, two meetings were held (August 13 and 15, 2024) with Participating Indigenous nations to discuss the proposed vegetation types and locations to be sampled.

Specifically, consultation with the BC Ministry of Mining and Critical Minerals (MCM; [previously Energy, Mines and Low Carbon Innovation]), ENV, Northern Health Authority, and Participating Indigenous nations will be conducted so that feedback from these groups can be incorporated into the HHMMP. For example, feedback from the Participating Indigenous nations will help develop a HHMMP that is culturally appropriate and considers sampling locations and species of country foods that are representative of Participating Indigenous nations' use and consumption (Condition Item #19.3d). It is noted that feedback from these groups, during presentations or in the form of EAO review comments, have been incorporated into the sampling program or revised HHMMP.

Written notice of the HHMMP consultation and feedback period will be provided to, at a minimum, to the relevant parties identified in Condition #19 (i.e., MCM, ENV, NHA and Participating Indigenous nations), indicating the timeframe for providing feedback (i.e., within 3 weeks of obtaining the HHMMP). ODV will also provide a written explanation to the parties describing how their feedback has been considered and addressed in a revised version of the document. A copy of the consultation record will be provided to the EAO at the same time as the revised HHMMP is provided to EAO.

WSP will work with ODV to address the feedback. Under the direction of the Human Health QP, updates based on the feedback will be made to the HHMMP for submission to the EAO. As the HHMMP and updates will be implemented throughout the Project phases, consultation and feedback will be required after each revision of the HHMMP. ODV will provide rationale for feedback that was not incorporated.

Since the Baseline Conditions HHRA is a requirement for the HHMMP (see Section 3), in order to incorporate an evaluation of human health risks associated with baseline conditions for the Project, it will be included as part of the 2026 submission of the annual report (see Section 6). Results from the Baseline Health Conditions HHRA will be used when comparing monitoring results for each annual report submission. The Baseline Conditions HHRA will be shared with the relevant parties identified in Condition #19 (i.e., BC Ministry of Forest's Crown Contaminated Sites Program, MCM, ENV, NHA, and Participating Indigenous nations), and follow-up consultation will occur to discuss the findings and interpretation of measured concentrations into potential human health risks.

8. REFERENCES

EAO (BC Environmental Assessment Office). 2023. Schedule B. Table of Conditions for the Cariboo Gold Project for the Environmental Assessment Certificate #M23-01. Prepared for Osisko Development Corp. [accessed December 2023].

ENV (British Columbia Ministry of Environment and Climate Change Strategy). 2021. Protocol 1 for Contaminated Sites, Detailed Risk Assessment (Version 2.0). Available at: https://www2.gov.bc.ca/assets/gov/environment/air-land-water/site-remediation/docs/protocols/p1_jan_2021_revisions_final_signed.pdf.

ENV. 2024. British Columbia Field Sampling Manual. Environmental Monitoring and Analysis Branch, Laboratory Standards and Quality Assurance Unit, Ministry of Environment and Climate Change Strategy, Victoria, BC, Canada.

KCB (Klohn Crippen Berger). 2023. Osisko Development Corporation Cariboo Gold Project – QR Mill Conceptual Site Model.

ODV (Osisko Development Corp.). 2022. Cariboo Gold Project Environmental Assessment Certificate (EAC) Application – Section 7.13 Human and Ecological Health. October 2022.

ODV. 2021. Cariboo Gold Project EAC Application – Section 7.13 Human and Ecological Health. July 2021.

ODV. 2025. Aquatic Effects Monitoring Plan. Rev2. January 2025.

SNC Lavalin Group Inc (SNC). 2011. Risk Based Detailed Site Investigation, Wells Tailings Deposit, Wells, BC. Prepared for Ministry of Natural Resource Operations, Crown Land Opportunities and Restoration Branch. March 2011.

APPENDIX A DECLARATION OF COMPETENCY FORM

BRITISH COLUMBIA | Ministry of Environment and Climate Change Strategy

Declaration of Competency

The Ministry of Environment and Climate Change Strategy relies on the work, advice, recommendations and in some cases decision making of qualified professionals[1], under government's professional reliance regime. With this comes an assumption that professionals who undertake work in relation to ministry legislation, regulations and codes of practice have the knowledge, experience and objectivity necessary to fulfill this role.

1. Name of Qualified Professional: Audrey Wagenaar

   Title: Senior Principal, Environmental Scientist

2. Are you a registered member of a professional association in B.C.? ☑ Yes ☐ No

   Name of Association: Association of the Chemical Profession of BC Registration #: 2010214

3. Brief description of professional services:

   Human Health Monitoring and Management Plan preparation

This declaration of competency is collected under section 26(c) of the *Freedom of Information and Protection of Privacy Act* for the purposes of increasing government transparency and ensuring professional ethics and accountability. By signing and submitting this statement you consent to its publication and its disclosure outside of Canada. This consent is valid from the date submitted and cannot be revoked. If you have any questions about the collection, use or disclosure of your personal information please contact the Ministry of Environment and Climate Change Strategy Headquarters Office at 1-800-663-7867.

Declaration

I am a qualified professional with the knowledge, skills and experience to provide expert information, advice and/or recommendations in relation to the specific work described above.

Signature:

X Audrey K Wagenaar

Print Name: Audrey Wagenaar

Witnessed by:

X

Print Name: Sean Weston

Date signed: 2 May 2024

[1] *Qualified Professional, in relation to a duty or function under ministry legislation, means an individual who*

a) is registered in British Columbia with a professional association, is acting under that organization's code of ethics, and is subject to disciplinary action by that association, and

b) *through suitable education, experience, accreditation and knowledge, may reasonably be relied on to provide advice within his or her area of expertise, which area of expertise is applicable to the duty or function.*

APPENDIX B AIR QUALITY MONITORING PLAN

OSISKO DEVELOPMENT

CARIBOO GOLD PROJECT

AIR QUALITY MONITORING PLAN

REV1

NOVEMBER 2024

OSISKO DEVELOPMENT

Cariboo Gold Project

PO Box 250
3700 Ski Hill Road
Wells, BC V0K 2R0

Contents

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REVISION HISTORY

Rev. No.	Date	Author	Description
0	April 18, 2024	Chris Koscher	Initial version for environmental assessment condition review
1	November 13, 2024	Chris Koscher	Revised to address environmental assessment condition review comments

ABBREVIATIONS

Terminology used in his document has been defined where it is first used, while the following list has been presented to assist readers that choose to review only portions of the document.

Abbreviation	Description
AQMP	Air Quality Monitoring Plan
BC	British Columbia
BCFSM	British Columbia Field Sampling Manual
CRD	Cariboo Regional District
EAO	Environmental Assessment Office
EMS	Environmental Management System
ENV	Ministry of Environment and Climate Change Strategy (BC) – formerly Ministry of Environment
FDMS	Filter Dynamics Measurement System
km	kilometre
NAD 83	North American Datum of 1983
NAPS	National Air Pollution Surveillance Program
ODV	Osisko Development Corp.
PAH	Polycyclic aromatic hydrocarbons
PM	particulate matter (TSP, PM_{10}, $PM_{2.5}$)
$PM_{2.5}$	fine particulate matter (particulate matter < 2.5 microns)
PM_{10}	inhalable particulate matter (particulate matter < 10 microns)
Project	Cariboo Gold Project
QA	quality assurance
QA/QC	quality assurance / quality control
QR Mill	Quesnel River Mill
TSP	total suspended particulate
US EPA	United States Environmental Protection Agency
UTM	Universal Transverse Mercator
WRSF	Waste Rock Storage Facility
WSP	WSP Canada Inc.
WTP	Water Treatment Plant

1. PURPOSE AND SCOPE

The Air Quality Monitoring Plan (AQMP) was prepared to satisfy relevant requirements of Environmental Assessment Certificate (EAC) conditions for Osisko Development Corp.'s (ODV's) Cariboo Gold Project (the Project). Specifically, requirements in Condition #15 (Air Quality) and Condition #19 (Human Health Monitoring and Management Plan) of Schedule B of EAC #M23-01. It is understood that the AQMP will also support requirements for waste discharge (air emission) authorizations for the Project from the British Columbia (BC) Ministry of Environment and Climate Change Strategy (ENV).

Below are select excerpts from EAC #M23-01 related to air quality monitoring:

15. Air Quality

15.3 The Holder must conduct continuous air quality and meteorological monitoring for particulate matter (both 2.5 and 10 µm), carbon monoxide, sulphur dioxide, and nitrogen dioxide in the District of Wells for one full, valid year prior to Operations and prior to Construction at the Mine Site Complex and during Construction, Operations, and Closure. The monitoring must use methods defined in the B.C. Field Sampling Manual (2020, or as updated or replaced from time to time) and use locations and types of equipment developed in consultation with ENV, Participating Indigenous Nations, and the District of Wells.

15.4 The Holder must report on the monitoring in 15.3 at least twice annually for the first two years of Operations at the Mine Site Complex and at least annually following, unless otherwise authorized by the EAO, including a plain language summary, and provide publicly through condition 12 (Public Information). These reports must also include the monitoring results interpreted and compared against the current B.C. Air Quality Objectives and/or Canadian Ambient Air Quality Standards, where applicable.

15.5 All mitigation measures, monitoring, rationale, and reporting in this condition must be implemented throughout Construction, Operations, and Closure under the direction of a Qualified Professional retained by the Holder and to the satisfaction of the EAO.

19. Human Health Monitoring and Management Plan

19.3 The plan must include at least the following:

b) Identification of a sampling and monitoring plan for the Project that must include at least:

i. The following substances, media, and additional sampling parameters, as well as any other Criteria Air Contaminant, Contaminant of Potential Concern, media, or parameter identified by the Qualified Person as necessary to determine the human health effects of the Project, in consultation with EMLI, ENV, NHA, and Participating Indigenous Nations:

A) Continuous monitoring for particulate matter (both 2.5 and 10 µm), sulphur dioxide, and nitrogen dioxide in air;

B) Time-integrated sampling for polycyclic aromatic hydrocarbons in air and grab samples of soil and water;

C) Continuous monitoring for meteorological parameters (including wind speed, wind direction, relative humidity, and temperature);

D) Time-integrated sampling for metals (including but not limited to antimony, aluminum, arsenic, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, nickel, and selenium) in air (bound to particulate matter) and grab samples of soil, vegetation (including in natural environments and within the town of Wells), fish, surface water, and the community water supply or groundwater; and

iv. Sampling methods following the B.C Field Sampling Manual (2020, or as updated or replaced from time to time) including quality assurance and quality control measures and sampling frequency and the rationale for this chosen frequency.

The AQMP provides details regarding the air quality monitoring for the Project which has been organized in the following sections outlined below:

- Project Description and Setting (Section 2);
- Site Selection (Section 3);
- Roles and Responsibilities (Section 4);
- Methods and Instrumentation (Section 5);
- Quality Assurance and Quality Control (Section 6);
- Documentation and Record Keeping (Section 7);
- Reporting (Section 8); and
- References (Section 9).

This document was prepared with the support of WSP Canada Inc. The Declaration of Competency for the Qualified Professional involved is provided in Appendix A.

2. PROJECT DESCRIPTION AND SETTING

2.1 Project Overview

ODV is proposing to develop the Project, an underground gold mine with a maximum production capacity of 1,793,400 tonnes per year of mineralized material (ore) located in the District of Wells and Cariboo Regional District (CRD), BC. The Project includes the following sites and key components (Figure 2–1):

Mine Site:

- Mine Site Complex:
  - Waste management facilities;
  - Water supply and management structures and facilities;
  - Services Building;
  - Electrical Substation;
  - Camp (Worker Accommodation);
  - Valley Portal;
  - Water Treatment Plant (WTP); and
  - Other ancillary infrastructure.
- Bonanza Ledge Site:
  - A Waste Rock Storage Facility (WRSF) and associated water management structures;
  - Overburden Stockpiles;
  - Temporary Ore Stockpile;
  - Cow Portal;
  - Other ancillary infrastructure.
- Access roads and infrastructure.
- Quesnel River Mill (QR Mill):
  - ODV's existing and associated infrastructure within the Project Surface Footprint, including use of the Worker Accommodation and necessary upgrades to the existing infrastructure.
- Transmission Line

The mine will have an estimated operational mine life of 12 years and will operate 24 hours per day, 365 days per year. Closure will occur over a period of 2 years after mining is completed.

2.2 Physical Setting

2.2.1 Mine Site

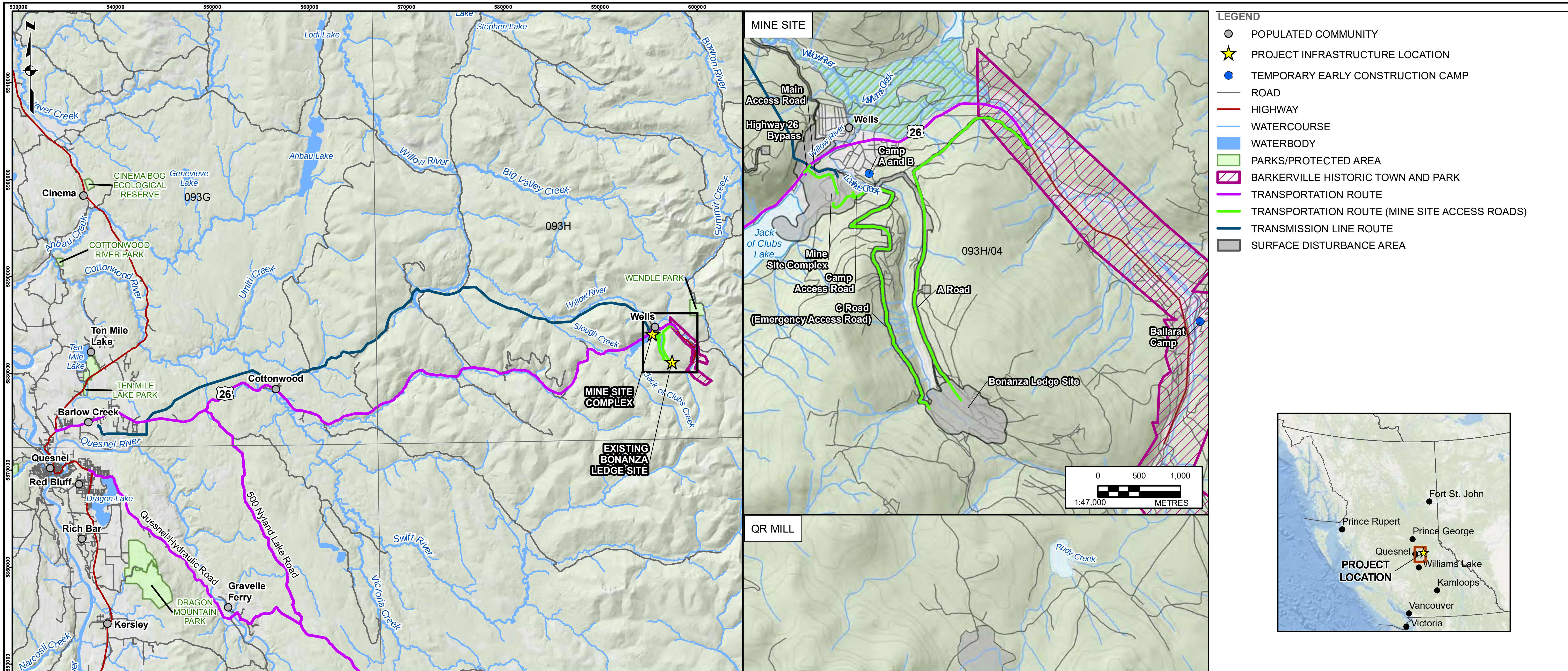
The location of the Mine Site and Project surface footprint, and its relative location to the QR Mill, is shown in Figure 2–1. The Mine Site is located in the District of Wells and CRD in BC, approximately 123 kilometres (km) southeast of the city of Prince George, BC. The city of Quesnel, BC is located approximately 65 km west of the Mine Site, and the Rocky Mountains, which extend south to north for hundreds of kilometres, are located approximately 30 km east of the Mine Site.

The Project footprint does not overlap with provincial, national, or regional parks, ecological reserves, or legally protected wildlife habitat areas. The area encompassing the Mine Site is mountainous and forested, and mostly uninhabited, except for the District of Wells.

2.2.2 QR Mill

The location of QR Mill and the Project surface footprint is shown in Figure 2–1. The QR Mill is located on the Quesnel River Mine property in the CRD, BC, approximately 55 km southeast of the city of Quesnel and 50 km south-southwest of the District of Wells. QR Mill is centred at 52°40’21.0” N and 121°47’30.2” W; the UTM coordinates are 581,700.9 E, 5,836,526.4 N (NAD 83, Zone 10N). QR Mill is accessed via Highway 26, which connects to the 500 Nyland Lake Forest Service Road.

The Project footprint does not overlap with provincial, national, or regional parks, ecological reserves, or legally protected wildlife habitat areas. The area encompassing QR Mill is mountainous and forested, and mostly uninhabited.


MINE SITE
QR MILL
LEGEND
POPULATED COMMUNITY
PROJECT INFRASTRUCTURE LOCATION
TEMPORARY EARLY CONSTRUCTION CAMP
ROAD
HIGHWAY
WATERCOURSE
WATERBODY
PARKS/PROTECTED AREA
BARKERVILLE HISTORIC TOWN AND PARK
TRANSPORTATION ROUTE
TRANSPORTATION ROUTE (MINE SITE ACCESS ROADS)
TRANSMISSION LINE ROUTE
SURFACE DISTURBANCE AREA
Wells
Cottonwood
Barlow Creek
Quesnel
Red Bluff
Rich Bar
Gravelle Ferry
Kersley
Cinema
Ten Mile Lake
Quesnel Forks
Hydraulic
Likely
MINE SITE COMPLEX
EXISTING BONANZA LEDGE SITE
EXISTING QR MILL SITE
CINEMA BOG ECOLOGICAL RESERVE
COTTONWOOD RIVER PARK
TEN MILE LAKE PARK
DRAGON MOUNTAIN PARK
BEAVER VALLEY PARK
CEDAR POINT PARK
WENDLE PARK
500 Nyland Lake Road
Quesnel-Hydraulic Road
093G
093H
093B
093A
093H/04
093A/12
Main Access Road
Highway 26 Bypass
Camp A and B
Mine Site Complex
Camp Access Road
C Road (Emergency Access Road)
A Road
Bonanza Ledge Site
Ballarat Camp
Existing QR Mill
1:47,000
1:30,000
METRES
PROJECT LOCATION
Fort St. John
Prince Rupert
Prince George
Quesnel
Williams Lake
Kamloops
Vancouver
Victoria

REFERENCE(S)
1. WATER FEATURES, TRANSPORTATION FEATURES OBTAINED FROM CANVEC © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
2. CITIES/TOWNS, INDIAN RESERVES, FEDERAL LANDS AND PARK/PROTECTED AREAS OBTAINED FROM BC MINISTRY OF FORESTS, LANDS NATURAL RESOURCE OPERATIONS AND RURAL DEVELOPMENT.
3. INSET BASE SOURCE: ESRI, DELORME, GEBCO, NOAA NGDC, AND OTHER CONTRIBUTORS.

NAD83 CSRS
UTM Zone 10N
1:400,000 KILOMETRES

CARIBOO GOLD PROJECT

OVERVIEW OF MAJOR PROJECT COMPONENTS

REV.	DESCRIPTION	DATE	INITIALS
0		6/21/2023	MY

PROJECT NO.	PHASE	REV.	FIGURE
151-11330-70	00	0	2-1

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

3. SITE SELECTION

The British Columbia Field Sampling Manual (BCFSM) Part B1 Ambient Air Monitoring (ENV 2020) was used as a key reference to guide the siting of the air quality monitoring stations for the Project. The BCFSM was developed in part with information published by the National Air Pollution Surveillance Program (NAPS), the United States Environmental Protection Agency (US EPA) 2013 QA handbook for Air Pollution Measurement Systems Volume II Ambient Air Quality Monitoring Program, and industry best practices (ENV 2020).

3.1 General Siting Considerations

A summary of general siting considerations from the BCFSM is presented below. For further details see Monitoring Station Siting and Design (Section 2) in the BCFSM.

Site location and access:

- Sites should be accessible and secure from unauthorized access;
- Access to sites should not be impeded by snow or seasonal closures;
- Sites should be accessible 24 hours a day and 7 days a week; and
- Sites and external equipment should be located to minimize the potential for vandalism.

The shelter must protect the station's instrumentation from:

- Precipitation and rodent impacts;
- Fluctuations in internal temperature, pressure, or humidity that may be caused by improperly sized air conditioning units, or intrusion of ambient air;
- Excessive dust and dirt; and
- Environmental stress, including temperature extremes, vibration, corrosive chemicals, intense light, or radiation pertinent to a manufacturer's specification.

Other general siting considerations:

- Access / availability of communications (e.g., cellular connectivity) and electrical power; and
- Long term viability of the site.

3.2 Project Siting Considerations

The monitoring location sites for the Project considered the siting considerations presented in the BCFSM as well as:

- Predicted results from the *Air Quality Effects Assessment* (WSP 2022) conducted for the EAC Application for the Project;

- Comments received on the EAC Application for the Project from stakeholders;
- Locations of nearby residential and/or sensitive receptors;
- Proximity to local emission sources (e.g. home heating, vehicular traffic, unpaved roads, etc.); and
- Specific siting criteria for the monitoring equipment.

There are two air quality monitoring stations located in Wells. One is located on Mooney Lane (see Section 3.2.1), and the other is located at AB Camp (see Section 3.2.2). There is a third air quality monitoring station located at the QR Mill (see Section 3.2.3). Meteorological parameters at the Mine Site are gathered by the air quality monitoring stations. Meteorological parameters at QR Mill are gathered by a separate meteorological monitoring station and temperature at the air quality monitoring station.

3.2.1 Wells Air Quality Monitoring Station (Mooney Lane)

A photo of the Wells Air Quality Monitoring Station (Mooney Lane) is provided in Figure 3–1, and the location of the Wells Air Quality Monitoring Station (Mooney Lane) is shown in Figure 3–5. This location was chosen based on the general siting and Project-specific siting considerations outlined in Sections 3.1 and 3.2. It is located on Mooney Lane in a residential neighbourhood at a property owned by ODV situated near the edge of the Wells community adjacent to the Project. This location serves to monitor ambient air concentrations within the community of Wells.

3.2.2 Wells Air Quality Monitoring Station (AB Camp)

A photo of the Wells Air Quality Monitoring Station (AB Camp) is provided in Figure 3–2, and the location of the Wells Air Quality Monitoring Station (AB Camp) is shown in Figure 3–5. This location was chosen based on the general siting and Project-specific siting considerations outlined in Sections 3.1 and 3.2. It is located on ODV's AB Camp which is situated near the edge of the Wells community adjacent to the Project. This location serves to monitor ambient air concentrations within the community of Wells / AB Camp.

3.2.3 QR Mill Air Quality and Meteorological Monitoring Stations

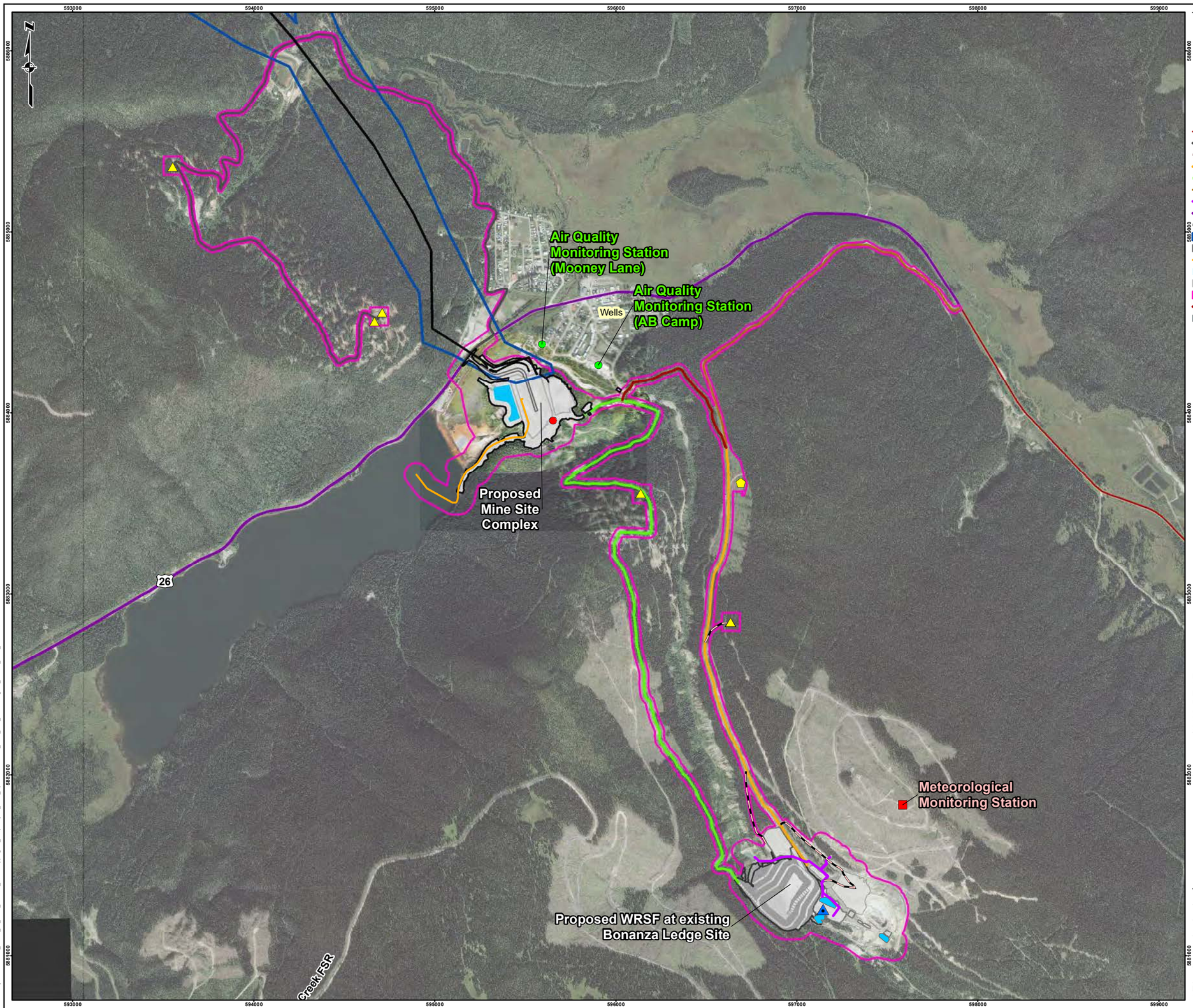
A photo of the QR Mill Air Quality Monitoring Station is provided in Figure 3–3, and a photo of the QR Mill Meteorological Station is provided as Figure 3–4. The locations of the QR Mill monitoring stations are shown in Figure 3–6. This location of the Air Quality Monitoring Station was chosen based on the general siting and Project-specific siting considerations outlined in Sections 3.1 and 3.2. It is located at the QR Mill Camp and serves to monitor ambient air concentrations for workers at the camp.

Figure 3–1: Photo of Wells Air Quality Monitoring Station (Mooney Lane)

Figure 3–2: Photo of Wells Air Quality Monitoring Station (AB Camp)

Figure 3–3: Photo of QR Mill Air Quality Monitoring Station

Figure 3–4: Photo of QR Mill Meteorological Monitoring Station



LEGEND

- AIR QUALITY MONITORING STATION
- METEOROLOGICAL MONITORING STATION
- PROPOSED MINE PORTAL LOCATION
- EXISTING COW PORTAL
- PROPOSED VENTILATION RAISE
- UPGRADED WATER TREATMENT PLANT
- WRSF DISCHARGE LOCATION TO LOWHEE CREEK
- HIGHWAY
- VENTILATION RAISE ACCESS ROAD
- ACCESS ROAD
- BONANZA LEDGE SITE WRSF ACCESS ROAD (EXISTING A ROAD, NO UPGRADE)
- EMERGENCY WRSF ACCESS ROAD (EXISTING C ROAD, NO UPGRADE)
- ACCESS ROAD (EXISTING A-ROAD, NO UPGRADE)
- BONANZA FLOOD MANAGMENT SYSTEM PIPELINE
- TRANSPORTATION ROUTE
- PROPOSED TRANSMISSION LINE ROUTE
- PROPOSED TRANSMISSION LINE CORRIDOR
- PROPOSED CAMP ACCESS ROAD
- PROPOSED TREATED DISCHARGE / DIFFUSER PIPELINE
- PROPOSED MINE SITE SURFACE SEDIMENT POND
- PROPOSED SURFACE DISTURBANCE AREA
- PROPOSED SURFACE FOOTPRINT
- FIBRE OPTIC LINE ACCESS ROAD (EXISTING B ROAD, NO UPGRADE)
- BONANZA SUMP LOCATION

REFERENCE(S)

1. TRAILS, WATER FEATURES, ROADS, MUNICIPAL BOUNDARY, PARK/PROTECTED AREAS, BARKERVILLE HISTORIC TOWN/PARK, CITIES (INSET), PROVINCIAL BORDERS (INSET) OBTAINED FROM THE B.C. MINISTRY OF FORESTS, LANDS, NATURAL RESOURCE OPERATIONS AND RURAL DEVELOPMENT.
2. HILLSHADE DERIVED FROM LIDAR DATA FLOWN BY MCELHANNAY CONSULTANTS LTD. JUNE 27, 2016.

NAD83 CSRS
UTM ZONE 10N

0 500 1,000
1:21,000 METRES

OSISKO DEVELOPMENT

CARIBOO GOLD PROJECT

METEOROLOGICAL AND AIR QUALITY MONITORING LOCATIONS

REV.	DESCRIPTION	DATE	INITIALS
A		3/29/2024	M.Y

PROJECT NO.	PHASE	REV.	FIGURE
151-11330-70	00	B	3-5

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

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0

Y:\GIS\Projects\2019\151_11330_70_BGM_Cariboo_Gold\Mapping\17_air-quality\11_2024_Update\17-10-007_Mine_Site_Meteorological_Station_2024_0329.mxd

580500 580750 581000 581250 581500 581750 582000 582250 582500

5837500 5837250 5837000 5836750 5836500 5836250 5836000

Rudy Creek

AQ Monitor

Met Station

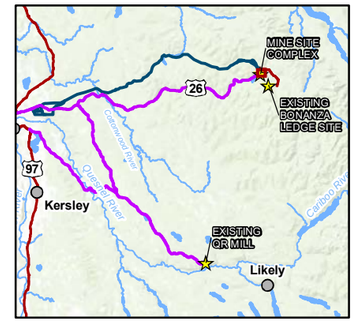
Creek #2.5

Creek #3

N

LEGEND

- AIR PARTICULATE MATTER MONITORING STATION
- METEOROLOGICAL STATION
- WATERCOURSE
- PROPOSED TRANSPORTATION ROUTE
- FENCE LINE
- INFRASTRUCTURE
- SOUTH SEEPAGE COLLECTION POND
- FILTERED STACK TAILINGS STORAGE FACILITY
- PROPOSED SURFACE FOOTPRINT



NOTES:

THE PROPOSED FILTERED STACK TAILINGS STORAGE FACILITY WILL UTILIZE THE SAME FOOTPRINT OF THE DEWATERED EXISTING TAILINGS STORAGE FACILITY

REFERENCE(S)

1. TRAILS, WATER FEATURES, ROADS, MUNICIPAL BOUNDARY, PARK/PROTECTED AREAS, BARKERVILLE HISTORIC TOWN/PARK, CITIES (INSET), PROVINCIAL BORDERS (INSET) OBTAINED FROM THE B.C. MINISTRY OF FORESTS, LANDS, NATURAL RESOURCE OPERATIONS AND RURAL DEVELOPMENT.
2. BASE DATA SOURCE: ESRI, GEOBASE, NRCAN, AND THE GIS USER COMMUNITY.
3. STOCKPILE SOURCE: BARKERVILLE GOLD MINES LTD. (BGM). 2020. QUESNEL RIVER MINE 2020 RECLAMATION AND CLOSURE PLAN. PREPARED FOR BGM. PREPARED BY GOLDER ASSOCIATES INC. NOVEMBER 5, 2020.

NAD83 CSRS
UTM ZONE 10N

0 100 200 300 400
1:7,000 METRES

OSISKO DEVELOPMENT

CARIBOO GOLD PROJECT

QR MILL MONITORING LOCATIONS

REV.	DESCRIPTION	DATE	INITIALS
B		3/29/2024	M.Y

PROJECT NO.	PHASE	REV.	FIGURE
151-11330-70	00	B	3-6

Y:\GIS\Projects\2019\151_11330_70_BGM_Cariboo_Gold\Mapping\17_air-quality\11_2024_Update\17-11-002_QR_Mill_Meteorological_Monitoring_Location_2024_0329.mxd

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

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4. ROLES AND RESPONSIBILITIES

ODV has the obligation of maintaining compliance with Project commitments and informing mine personnel and site contractors of relevant obligations during all phases of the mine life. A clear understanding of the roles, responsibilities, and level of authority that employees and contractors have when working on the Project is essential to meet AQMP and ODV Environmental Management System (EMS) objectives.

Table 4–1 provides an overview of general responsibilities for ODV personnel.

Table 4–1: Roles and Responsibilities Defined

Role	Responsibilities
Vice President Environment	Responsible for sign off on the Environmental Policy and has overall responsibility for verifying that Project activities are undertaken such that environmental legislation and regulatory requirements are considered and adhered to, and adverse impacts to the environment and communities in the vicinity of the Project are limited.
General Manager	Responsible for verifying that site personnel have access to and receive applicable training on the EMS and management plans and overseeing the day-to-day operations at the Project sites. Responsible for the health and safety of works and the public and verifying that Project activities comply with the Project's EMS, including integration of the EMS and management plans with other mine development plans and permit compliance.
Environmental Manager	Responsible for establishing, implementing, and maintaining the EMS, training of on-site personnel on the Project's EMS and applicable management plans, overseeing responses to non-compliance, evaluating the effectiveness of mitigation measures in each management plan, and reporting outcomes to the General Manager. The Environmental Manager or their agent (i.e., Environmental Personnel) is responsible for coordinating with the General Manager to communicate with other department heads, foremen, or field-level personnel to implement or modify mitigation measures, as necessary and where appropriate. The Environmental Manager has the authority to stop an activity or shut down the site if it is not meeting regulatory requirements. The Environmental Manager or designate is responsible for reporting non-compliances to the contractors or relevant consultants, ODV, Indigenous nations, and regulatory agencies, where required. Reports to the General Manager.
Qualified Professionals and Qualified Persons	Qualified professionals and qualified persons will be retained to review objectives and conduct various aspects of monitoring, management, and maintenance pertaining to Project facilities and other management and monitoring plans.

5. METHODS AND INSTRUMENTATION

5.1 Air Contaminants and Meteorological Parameters to be Monitored

The air contaminants to be monitored include:

- Particulate matter ($PM_{2.5}$);
- Particulate matter (PM_{10});
- Total suspended particulate (TSP);
- Carbon monoxide;
- Sulphur dioxide;
- Nitrogen dioxide;
- Polycyclic aromatic hydrocarbons (PAH);
- Metals (including but not limited to antimony, aluminum, arsenic, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, nickel, and selenium) in air (bound to particulate matter).
- Precipitation;
- Temperature;
- Relative humidity; and
- Wind speed and direction.

Further details regarding the speciated polycyclic aromatic hydrocarbons and metals can be found in the Human Health Monitoring and Management Plan (ODV 2024).

5.2 Sampling Frequency and Duration

The sampling frequency for the air quality and meteorological parameters is presented in Table 5–1 and follows the sampling frequency in the BCFSM, NAPS, and Metro Vancouver for passive PAH sampling.

Table 5–1: Sampling Frequency

Parameter	Sampling Frequency
Particulate matter ($PM_{2.5}$)	Continuous
Particulate matter (PM_{10})	Continuous
Total suspended particulate (TSP)	Continuous
Carbon monoxide	Continuous
Sulphur dioxide	Continuous
Nitrogen dioxide	Continuous
Polycyclic aromatic hydrocarbons	Passive Polyurethane foam (PUF) (PAH). Change PUF disk every 3 months (see notes)
Metals	One in six-day sampling (NAPS schedule)
Wind speed and direction	Continuous
Relative humidity	Continuous
Temperature	Continuous
Precipitation	Continuous

Notes: This follows Metro Vancouver's sampling frequency for passive PAH sampling (Metro Vancouver 2022).

Continuous meteorological monitoring and air quality monitoring for particulate matter (both $PM_{2.5}$ and PM_{10}), carbon monoxide, sulphur dioxide, and nitrogen dioxide will occur in the District of Wells for one full, valid year prior to operations and prior to construction at the Mine Site Complex and during construction, operations, and closure per Condition #15 of EAC #M23-01.

Following the approval of the monitoring plans, monitoring of polycyclic aromatic hydrocarbons and metals will commence as soon as practical and will continue through operations.

5.3 Continuous Monitoring Instrumentation

A description of the continuous air quality and meteorological monitoring equipment is provided in Table 5−2, Table 5−3, Table 5−4, and Table 5−5.

Table 5–2: Wells Air Quality Monitoring Station (Mooney Lane) Continuous Monitoring Instrumentation

Parameter	Continuous Monitoring Instrumentation
Particulate matter ($PM_{2.5}$)	Thermo Fisher Scientific 1405D Continuous Air Monitor (equipped with relative humidity and temperature sensor)
Particulate matter (PM_{10})	
Relative humidity	
Temperature	
Total suspended particulate (TSP)	Thermo Fisher Scientific TEOM 1405 Continuous Air Monitor
Carbon monoxide	Thermo Fisher Scientific Model 48iQ Gas Filter Correlation CO Analyzer
Sulphur dioxide	Thermo Fisher Scientific Model 43iQ Pulsed Fluorescent SO_2 Analyzer
Nitrogen dioxide	Thermo Fisher Scientific Model 42iQ Chemiluminescent NO-NO_2-NO_x

Table 5–3: Wells Air Quality Monitoring Station (AB) – Continuous Instrumentation

Parameter	Continuous Monitoring Instrumentation
Particulate matter ($PM_{2.5}$)	Thermo Fisher Scientific 1405D Continuous Air Monitor with Filter Dynamics Measurement System (FDMS) (equipped with temperature sensor)
Particulate matter (PM_{10})	
Temperature	
Total suspended particulate (TSP)	Thermo Fisher Scientific TEOM 1405 Continuous Air Monitor
Carbon monoxide	Thermo Fisher Scientific Model 48iQ Gas Filter Correlation CO Analyzer
Sulphur dioxide	Thermo Fisher Scientific Model 43iQ Pulsed Fluorescent SO_2 Analyzer
Nitrogen dioxide	Thermo Fisher Scientific Model 42iQ Chemiluminescent NO-NO_2-NO_x
Wind speed and direction	RM Young 05103

Table 5–4: QR Mill Air Quality Monitoring Station – Continuous Instrumentation

Parameter	Continuous Monitoring Instrumentation
Particulate matter ($PM_{2.5}$)	Thermo Fisher Scientific 1405D Continuous Air Monitor (equipped with temperature sensor)
Particulate matter (PM_{10})	
Temperature	
Total suspended particulate (TSP)	Thermo Fisher Scientific TEOM 1405 Continuous Air Monitor
Carbon monoxide	Thermo Fisher Scientific Model 48iQ Gas Filter Correlation CO Analyzer
Sulphur dioxide	Thermo Fisher Scientific Model 43iQ Pulsed Fluorescent SO_2 Analyzer
Nitrogen dioxide	Thermo Fisher Scientific Model 42iQ Chemiluminescent NO-NO_2-NO_x

Table 5–5: QR Mill Meteorological Monitoring Station – Continuous Instrumentation

Parameter	Continuous Monitoring Instrumentation
Wind speed and direction	RM Young 05103
Relative humidity	Rotronic HC2-S
Temperature	
Total precipitation	OTT Pluvio2
Rainfall	TE525M
Solar radiation	SPLITE2

5.4 Time-Integrated Sampling

A description of the time-integrated sampling is provided in Table 5−6 and Table 5−7.

Table 5–6: Wells Air Quality Monitoring Station (Mooney Lane) – Time-Integrated Sampling

Parameter	Time-Integrated Instrumentation
Polycyclic aromatic hydrocarbons	Passive PUF (PAH)
Metals	Tisch Environmental High Volume Air Sampler

Table 5–7: QR Mill Air Quality Monitoring Station – Time-Integrated Sampling

Parameter	Time-Integrated Instrumentation
Polycyclic aromatic hydrocarbons	Passive PUF (PAH)
Metals	Tisch Environmental High Volume Air Sampler

6. QUALITY ASSURANCE AND QUALITY CONTROL

6.1 Routine Operations and Maintenance of the Monitoring System

Routine operations and maintenance will follow the BCFSM and manufacturer recommendations. Key sections of the BCFSM pertaining to routine operations and maintenance of the monitoring system include:

- Routine Operations (Section 5);
- Forms and Checklists (Appendix 1); and
- Standard Operating Procedures (Appendix 2).

Routine operations and maintenance include:

- Scheduled and non-scheduled inspection;
- Preventative and planned maintenance;
- Scheduled calibrations; and
- Repairs and calibration.

Routine inspection/maintenance activities are grouped into short term (e.g., weekly, bi-weekly, monthly) and long term (e.g., quarterly/semi-annual). An example summary of routine inspection/maintenance activities from the BCFSM is shown in Table 6–1.

Table 6–1: Routine Inspection/Maintenance Summary

Short term – Weekly, Bi-Weekly, Monthly	Long Term – Quarterly/Semi-Annual
1. Check shelter integrity and security. 2. Check/test communications array. 3. Check/test Battery Backup system; clean filters as necessary. 4. Inspect manifold apparatus and sample lines to the analyzers, clean if needed. 5. Check all equipment fans and filters. 6. Inspect equipment specific parameters (sample tape, inlet filter, water catch jars). 7. Inspect and replace drying equipment as necessary. 8. Check for adequate supply of consumables (e.g., desiccant, filters, gloves, etc.). 9. As applicable, check station temperature is within designed operating range. 10. Review instrument alarms, instrument issues, and/or data issues identified since the last visit. 11. Verify that maintenance undertaken on the last visit is still effective. 12. Check the fire extinguisher. 13. Verify instrument standard operating procedures, manufacturer information, and routine operation plan/checklist is up-to-date. 14. Conduct routine operation checklist.	1. Review operational requirements as per Quality Assurance Plan/Agency Quality Assurance Plan. 2. Inventory of all equipment on-site, compare against previous visit, and update accordingly; this includes manufacturer's information and standard operating procedures. 3. Carry out short term checks. 4. If applicable, check zero air supply system for each analyzer and change/correct, if necessary. 5. Perform multi-point verification, if applicable. 6. Perform flow verification, if applicable. 7. Check time stamps in the local database and in equipment data loggers. 8. Conduct routine operation checklist. 9. Conduct function checks for abnormal performance (e.g., excessive signal noise, unstable baseline, positive and/or negative drift, spiking, long response time, incorrect flow/pressure readings, warning light indicators, power or pump failure, etc.).

6.2 Verification and Calibration

Verification and calibration will follow the BCFSM and manufacturer recommendations. Key sections of the BCFSM pertaining to verification and calibration of monitoring equipment include:

- Gas Analyzer Calibrations and Verifications (Section 6);
- Forms and Checklists (Appendix 1); and
- Standard Operating Procedures (Appendix 2).

6.3 Data Collection and Validation

Data collection and validation will follow the BCFSM and manufacturer recommendations. Key sections of the BCFSM pertaining to data collection and validation include:

- Collection and Validation of Continuous Monitoring Data (Section 7);
- Collection and Validation of Non-Continuous Monitoring Data (Section 8);
- Forms and Checklists (Appendix 1); and
- Standard Operating Procedures (Appendix 2).

7. DOCUMENTATION AND RECORD KEEPING

Documentation and record keeping will follow the BCFSM (Section 10). Records must be kept that are relevant to the station's operation. This includes the deployment of instrumentation, maintenance records, logging of issues and incidents, and anything else that is deemed relevant and could impact the validity of the data. Record keeping that is accurate and organized will assist in detecting potential issues early on and potential trends, and demonstrates best practice of the station's operation.

The list below is an example of the documentation and records to be maintained:

- Station Start-Up Record;
- Inspection and Maintenance Records;
- Verification and Calibration Records;
- Non-Conformance and Corrective Action Records;
- Level 0 Data Verification Log; and
- Audit Evaluations.

8. REPORTING

As required in Condition 15.4 of EAC #M23-01 (see Section 1) a report on monitoring outlined in Condition 15.3 of EAC #M23-01 (see Section 1) must be prepared at least twice annually for the first two years of operations at the Mine Site Complex and at least annually following, unless otherwise authorized by the BC Environmental Assessment Office (EAO). Reporting is to include a plain language summary and be provided publicly through Condition #12 (Public Information) of EAC #23-01. The monitoring data will be interpreted and compared to the current BC Air Quality Objectives and/or Canadian Ambient Air Quality Standards, where applicable.

Air quality data collected to satisfy the requirements of Condition #19 of EAC #M23-01 (see Section 1) will be included in the reporting requirements for the Human Health Monitoring and Management Plan (ODV 2024).

9. REFERENCES

ENV (BC Ministry of Environment and Climate Change Strategy). 2020. The British Columbia Field Sampling Manual. Part B Air and Emissions Testing. Part B1 Ambient Air Quality Monitoring. https://www2.gov.bc.ca/assets/gov/environment/research-monitoring-and-reporting/monitoring/emre/bc_field_sampling_manual_part_b.pdf. Accessed March 2024.

Metro Vancouver. 2022. Metro Vancouver. Air Quality & Climate Change Parks & Environment Department Network Quality Assurance Plan 2022.

WSP (WSP Canada Inc.). 2022. Environmental Assessment Air Quality Effects Assessment. https://projects.eao.gov.bc.ca/api/public/document/6353246902f0d40022dc80ef/download/Cariboo_Gold_Appendix7.2-1_Air_Quality_Effects_Assessment_October2022.pdf. Accessed March 2024.

ODV (Osisko Development Corp.). 2024. Human Health Monitoring and Management Plan. Prepared by WSP Canada Inc. for ODV. April 2024.

APPENDIX A QUALIFIED PROFESSIONAL DECLARATION OF COMPETENCY

BRITISH COLUMBIA | Ministry of Environment and Climate Change Strategy

Declaration of Competency

The Ministry of Environment and Climate Change Strategy relies on the work, advice, recommendations and in some cases decision making of qualified professionals[1], under government's professional reliance regime. With this comes an assumption that professionals who undertake work in relation to ministry legislation, regulations and codes of practice have the knowledge, experience and objectivity necessary to fulfill this role.

1. Name of Qualified Professional Chris Koscher

   Title Senior Principal Air Quality Scientist

2. Are you a registered member of a professional association in B.C.? ☐ Yes ☑ No

   Name of Association: Eco Canada Registration # N/A

3. Brief description of professional services:

   Air Quality Monitoring Plan

This declaration of competency is collected under section 26(c) of the *Freedom of Information and Protection of Privacy Act* for the purposes of increasing government transparency and ensuring professional ethics and accountability. By signing and submitting this statement you consent to its publication and its disclosure outside of Canada. This consent is valid from the date submitted and cannot be revoked. If you have any questions about the collection, use or disclosure of your personal information please contact the Ministry of Environment and Climate Change Strategy Headquarters Office at 1-800-663-7867.

Declaration

I am a qualified professional with the knowledge, skills and experience to provide expert information, advice and/or recommendations in relation to the specific work described above.

Signature: 

X _____

Print Name: Chris Koshcer

Witnessed by: 

X _____

Print Name: Sean Weston

Date signed: April 18, 2024

[1] *Qualified Professional, in relation to a duty or function under ministry legislation, means an individual who*

a) is registered in British Columbia with a professional association, is acting under that organization's code of ethics, and is subject to disciplinary action by that association, and

b) *through suitable education, experience, accreditation and knowledge, may reasonably be relied on to provide advice within his or her area of expertise, which area of expertise is applicable to the duty or function.*

APPENDIX C GROUNDWATER MONITORING PLANS

OSISKO DEVELOPMENT

CARIBOO GOLD PROJECT

MINE SITE GROUNDWATER MONITORING PLAN REV1

March 2025

OSISKO DEVELOPMENT

Cariboo Gold Project

PO Box 250
3700 Ski Hill Road
Wells, BC V0K 2R0

Contents

Tables

Figures

Appendices

REVISION HISTORY

Rev. No.	Date	Author	Description
0	April 19, 2024	Jennifer Levenick	Initial version for environmental assessment condition review
1	March 7, 2025	Jennifer Levenick	Revised to meet *Mines Act* permit requirements

ABBREVIATIONS

Terminology used in his document has been defined where it is first used, while the following list has been presented to assist readers that choose to review only portions of the document.

Abbreviation	Description
BGM	Barkerville Gold Mines Ltd.
CALA	Canadian Association of Laboratory Accreditation
CSR	Contaminated Sites Regulation
ENV	BC Ministry of Environment and Parks (BC)
mbgs	metres below ground surface
ODV	Osisko Development Corp.
Plan	Groundwater Monitoring Plan
Project	Cariboo Gold Project
PVC	polyvinyl chloride
QA/QC	quality assurance / quality control
SCP	Seepage Control Pond
SOP	standard operating procedure
VWP	vibrating wire piezometer
WRSF	Waste Rock Storage Facility

1. INTRODUCTION

This Groundwater Monitoring Plan (the Plan) provides the groundwater monitoring program (the Program) for the Mine Site (the Bonanza Ledge Site and the Mine Site Complex) portion of Barkerville Gold Mines Ltd.'s (BGM's) Cariboo Gold Project (the Project). BGM is a wholly owned subsidiary of Osisko Development Corp. (ODV).

This document was prepared with the support of WSP Canada Inc. The Declaration of Competency for the Qualified Professional involved is provided in Appendix A.

The Program includes:

- Groundwater quality sampling program to assess seepage water quality pathways; and
- Groundwater water level program to assess groundwater flow pathways and overall changes in water levels and hydraulic gradients with mine dewatering and reflooding.

2. GROUNDWATER MONITORING PROGRAM

2.1 Objectives

The objectives of the groundwater monitoring program for the Mine Site are to:

- Assess the potential effects of Project-related mining activities on the groundwater flow system and receiving environment.
- Collect appropriate data to verify groundwater modelling predictions and support future updates of the groundwater model, if required.
- Characterize potential seepage water quality and groundwater flow pathways.

2.1 Monitoring Locations

Figure 2.1–1, Figure 2.1–2 and Figure 2.1–3 present the groundwater monitoring network that will be used to monitor groundwater quality and groundwater levels in the Mine Site area, including the Bonanza Ledge Site. The monitoring locations are also summarized in Table 2.1–1 and Table 2.1–2, along with the rationale for the monitoring location, target hydrostratigraphic unit, and depth, where relevant.

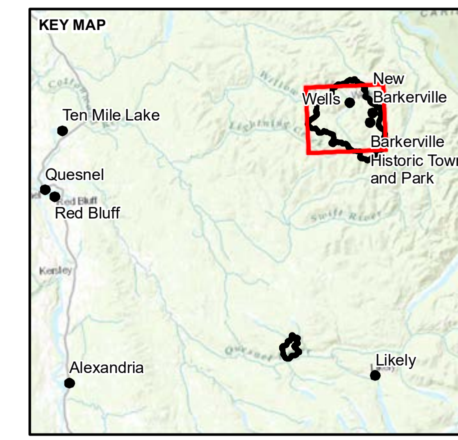
2.1.1 Bonanza Ledge Site

Table 2.1–1 summarizes the locations to be monitored at the Bonanza Ledge Site for groundwater quality and/or groundwater wells. The monitoring network includes existing wells that are monitored at the Bonanza Ledge Site. The Bonanza Ledge Site is permitted under *Mines Act* permit M-247 and *Environmental Management Act* effluent discharge authorization PE-17876.

Of the wells listed in Table 2.1–1, wells MW16-10S, MW16-10D, and MW21-09 will need to be decommissioned as part of construction of the Bonanza Ledge Waste Rock Storage Facility (WRSF). The WRSF was designed to be constructed with potentially acid generating and non-potentially acid generating materials; therefore, the WRSF foundation was designed to be lined to manage seepage and runoff. The Bonanza Ledge Sediment Control Pond will also be lined. Water within the Bonanza Ledge Sediment Control Pond will be pumped for treatment, if required. The wells will be replaced with a new well at the toe of the Project WRSF. The well is arbitrarily named New Well 1 but will be formally named after the well is installed. The new well will be installed at least 90 days prior to the decommissioning of wells MW16-10S, MW16-10D, and MW21-09.

LEGEND

- GROUNDWATER MONITORING LOCATIONS – WATER QUALITY/WATER LEVELS
- GROUNDWATER MONITORING LOCATIONS – WATER LEVELS
- LOCAL STUDY AREA
- BARKERVILLE HISTORIC TOWN AND PARK
- HIGHWAY/ROAD
- CONTOUR (100 m)
- WATERCOURSE
- WETLAND
- WATERBODY
- PROPOSED UNDERGROUND FOOTPRINT
- PROPOSED SURFACE DISTURBANCE AREA
- PROPOSED INFRASTRUCTURE
- PROPOSED SURFACE SEDIMENT POND / SUMPS
- VENTILATION RAISE
- PROPOSED MINE PORTAL LOCATION
- EXISTING COW PORTAL
- UPGRADED WATER TREATMENT PLANT
- WRSF DISCHARGE LOCATION TO LOWHEE CREEK
- PROPOSED TREATED DISCHARGE / DIFFUSER PIPELINE
- PROPOSED BURIED POTABLE WATER LINE
- BONANZA FLOOD MANAGMENT SYSTEM PIPELINE
- ACCESS ROAD
- UNDERGROUND WASTE HAULING ROUTE - PROJECTED TO SURFACE



REFERENCE(S)

1. TRAILS, WATER FEATURES, ROADS, BARKERVILLE HISTORIC TOWN/PARK, CITIES (INSET), PROVINCIAL BORDERS (INSET) OBTAINED FROM THE B.C. MINISTRY OF FORESTS, LAND AND NATURAL RESOURCE OPERATIONS.
2. HILLSHADE DERIVED FROM LIDAR DATA FLOWN BY MCELHANNEY CONSULTANTS LTD. JUNE 27, 2016.
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1:50,000 METRES

CARIBOO GOLD PROJECT

GROUNDWATER MONITORING PLAN

MINE SITE MONITORING LOCATIONS

REV.	DESCRIPTION	DATE	INITIALS
0	FINAL - APPROVED	2023-05-30	J.L.
0	FINAL - REVIEWED	2023-05-30	S.R.
0	FINAL	2023-05-30	J.P.

PROJECT NO.	PHASE	REV.	FIGURE
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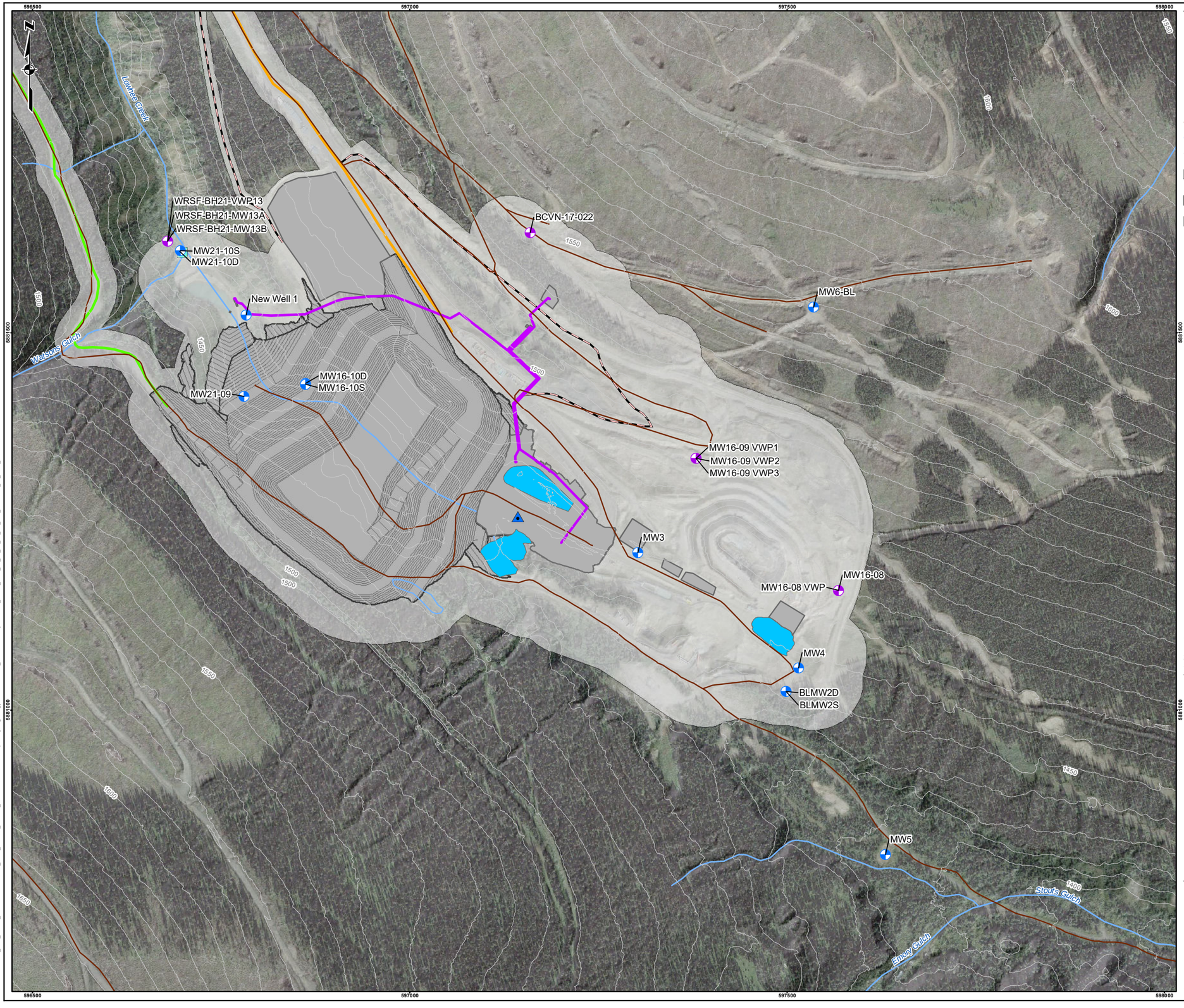
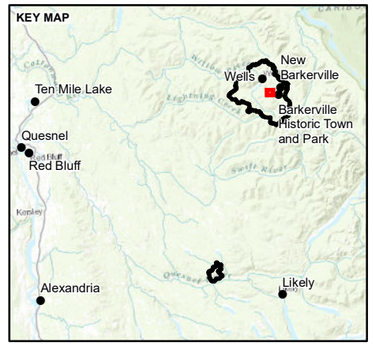


LEGEND

- GROUNDWATER MONITORING LOCATIONS – WATER QUALITY/WATER LEVELS
- GROUNDWATER MONITORING LOCATIONS – WATER LEVELS
- RESOURCE ROAD
- WATERCOURSE
- CONTOUR (10 m)
- PROPOSED SURFACE FOOTPRINT
- BONANZA LEDGE INFRASTRUCTURE (NEW)
- BONANZA SUMP LOCATION
- UPGRADED WATER TREATMENT PLANT
- WRSF DISCHARGE LOCATION TO LOWHEE CREEK
- BONANZA FLOOD MANAGMENT SYSTEM PIPELINE
- BONANZA LEDGE SITE WRSF ACCESS ROAD (EXISTING A ROAD, NO UPGRADE)
- EMERGENCY WRSF ACCESS ROAD (EXISTING C ROAD, NO UPGRADE)
- ACCESS ROAD



REFERENCE(S)

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CARIBOO GOLD PROJECT

GROUNDWATER MONITORING PLAN

BONANZA LEDGE MONITORING LOCATIONS

OSISKO DEVELOPMENT

REV.	DESCRIPTION	DATE	INITIALS
0	FINAL - APPROVED	2023-05-30	J.L.
0	FINAL - REVIEWED	2023-05-30	S.R.
0	FINAL	2023-05-30	J.P.

PROJECT NO.	PHASE	REV.	FIGURE
1774160	40000	0	**2.2-2**

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595000
595500
596000
5884800
5884400
5884000

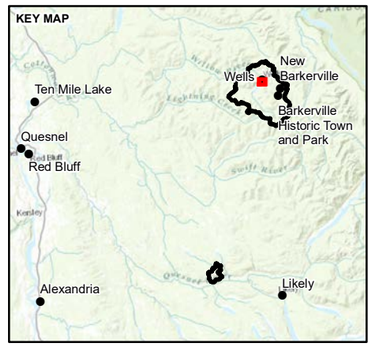
Baker St
Millred Ave
Jones Ave
Sanders Ave
Blair Ave
Blanchette St
Richardson Lane
Pooley St
Bowman Cres
Willow River
Camel Dr
Davies Rd
Margaret Ave
Burnett Ave
Barkerville Hwy
access road
Hoy St
Covey St
Coldquartz Dr
Gardner St
Mooney Lane
Legion Dr
Soilbakker Dr
Lowhee Rd
Hong St
Ski Hill Rd
forest area
Mine Site Spillway Channel
Proposed Bridge
Main Access Road
Mine Site Complex Sediment Control Pond
Electrical Substation
Sewage Treatment Plant
Main Camp
Process Plant
Groundwater Seepage Area
Propane Storage
Water Treatment Plant
Valley Portal
Potable Water Treatment Plant
MINE SEEPAGE 5

MW-19-07
New Well 3
New Well 4
District of Wells MW
New Well 6
New Well 5
MINE SEEPAGE 2
MW-09-091A
MW-09-091B
MW-09-091C
MW-19-08S
MW-19-08D
MW18-02a
MW18-02b
New Well 8
New Well 7
New Well 15
New Well 14
MW-09-063A
MW-09-063B
MINE SEEPAGE 3
New Well 9
New Well 10
MW-09-052
BFA-BH21-08 - VWP8
BFA-BH21-04 - VWP4
BFA-BH21-03 - VWP3b
BFA-BH21-03 - VWP3a
MW-09-029A
MW-09-029B
BFA-BH21-09 - VWP9a
BFA-BH21-09 - VWP9b
New Well 17
New Well 16
MW-09-026
New Well 11
MW-09-007A
MW-09-007B
MW-09-007C
MW18-03b

1200
1250
1300
1350
1400
1450
1500
1550

LEGEND

- GROUNDWATER MONITORING LOCATIONS – WATER QUALITY/WATER LEVELS
- GROUNDWATER MONITORING LOCATIONS – WATER LEVELS
- HIGHWAY/ROAD
- CONTOUR (10 m)
- GROUNDWATER SEEPAGE AREA
- LAYOUT
- 1m CONTOUR
- 5m CONTOUR
- CONTACT WATER FLOW
- CONTACT WATER FLOW (CULVERT)
- NON-CONTACT WATER FLOW
- CLEARING BOUNDARY
- PERMIT BOUNDARY
- BUILDING/STRUCTURE
- BERM
- CAMP
- DRAINAGE DISSIPATION STRUCTURE
- MSC SEDIMENT POND
- TOPSOIL
- SURFACE DISTURBANCE
- PROPOSED UNDERGROUND FOOTPRINT
- MINE RAMP UNDERGROUND



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CARIBOO GOLD PROJECT

GROUNDWATER MONITORING PLAN

MINE SITE COMPLEX MONITORING LOCATIONS

REV.	DESCRIPTION	DATE	INITIALS
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0	FINAL - REVIEWED	2023-05-30	S.R.
0	FINAL	2023-05-30	J.P.

PROJECT NO.	PHASE	REV.	FIGURE
1774160	40000	0	**2.2-3**

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Table 2.1–1: Bonanza Ledge Site Groundwater Monitoring Program

Location	Rationale	Hydrostratigraphic Unit	Monitoring Depth (mbgs)	Water Sampling Frequency	Water Level Frequency
BLMW2D	Monitor groundwater associated with Lower Stouts Gulch Catchment Area and to the east of the Bonanza Ledge Site Infrastructure.	Bedrock	34.5-39.3	Quarterly*	Quarterly Download and Manual Measurements
BLMW2S	Monitor groundwater associated with Lower Stouts Gulch Catchment Area and to the east of the Bonanza Ledge Site Infrastructure.	Overburden	15.2-16.7	Quarterly*	Quarterly Download and Manual Measurements
MW3	Monitor groundwater down-gradient of the Bonanza Ledge Site Open Pit.	Bedrock	47.2-53.3	Quarterly*	Quarterly Download and Manual Measurements
MW4	Monitor groundwater down-gradient of Pond S2.	Bedrock	37.9-44	Quarterly*	Quarterly Download and Manual Measurements
MW5	Monitor groundwater associated with Lower Stouts Gulch Catchment Area and to the east of the Bonanza Ledge Site Infrastructure.	Bedrock	32.3-38.4	Quarterly*	Quarterly Download and Manual Measurements
MW6-BL	Monitor groundwater up-gradient of the Bonanza Ledge Site Infrastructure.	Bedrock	64.0-71.6	Quarterly*	Quarterly Download and Manual Measurements
MW16-10D[2]	Monitor groundwater northwest of the existing WRSF.	Bedrock	16.2-22.2	Quarterly*	Quarterly Download and Manual Measurements
MW16-10S[2]	Monitor groundwater northwest of the existing WRSF.	Overburden	4.5-7.5	Quarterly*	Quarterly Download and Manual Measurements
MW21-09[2]	Monitor groundwater immediately down-gradient of the existing WRSF.	To be confirmed	To be confirmed	Quarterly*	Quarterly Download and Manual Measurements
MW21-10S	Monitor groundwater immediately down-gradient of the existing WRSF.	To be confirmed	To be confirmed	Quarterly*	Quarterly Download and Manual Measurements
MW21-10D	Monitor groundwater immediately down-gradient of the existing WRSF.	To be confirmed	To be confirmed	Quarterly*	Quarterly Download and Manual Measurements
New Well 1	Monitor groundwater down-gradient of the Project WRSF	Overburden or Shallow Bedrock (to be confirmed by field drilling observations and location of water table)	To be determined[1]	Quarterly*	Quarterly Download and Manual Measurements
WRSF-BH21-13-VWP	Monitor water levels near the Bonanza Ledge Site to support groundwater flow interpretation and groundwater model verification.	Bedrock	6.96	Not applicable	Quarterly Download and Manual Measurements
WRSF-BH21-13A	Monitor water levels near the Bonanza Ledge Site to support groundwater flow interpretation and groundwater model verification.	Bedrock	16.5-18.0	Not applicable	Quarterly Download and Manual Measurements
WRSF-BH21-13B	Monitor water levels near the Bonanza Ledge Site to support groundwater flow interpretation and groundwater model verification.	Overburden	7.3-8.8	Not applicable	Quarterly Download and Manual Measurements
MW16-08	Monitor water levels near the Bonanza Ledge Site to support groundwater flow interpretation and groundwater model verification.	Bedrock	67.7-73.7	Not applicable	Quarterly Download and Manual Measurements
MW16-08 VWP	Monitor water levels near the Bonanza Ledge Site to support groundwater flow interpretation and groundwater model verification.	Bedrock	28.2	Not applicable	Quarterly Download
MW16-09 VWP	Monitor water levels near the Bonanza Ledge Site to support groundwater flow interpretation and groundwater model verification.	Bedrock	16.0, 23.5 and 37.6	Not applicable	Quarterly Download
BCVN-17-022	Monitor water levels near the Bonanza Ledge Site to support groundwater flow interpretation and groundwater model verification.	Bedrock	174.6-191.8	Not applicable	Quarterly Download and Manual Measurements

Notes: mbgs = metres below ground surface; VWP = vibrating wire piezometer; * = Samples will be analyzed for dissolved and total metals, sulphate, chloride, nutrients, pH, and total suspended solids; 1- Screened interval to be determined based on subsurface conditions encountered during drilling; 2- Water level monitoring to continue until well is destroyed during construction

Table 2.1–2: Mine Site Complex Groundwater Monitoring Program

Location	Rationale	Hydrostratigraphic Unit	Monitoring Depth (mbgs)	Water Sampling Frequency	Water Level Frequency
Mine Seepage 1	Juke's Portal. Monitor seepage from existing underground development.	Not Applicable	Not Applicable	Quarterly when flowing*	Not Applicable
Mine Seepage 2	Island Mountain North Portal. Monitor seepage from existing underground development.	Not Applicable	Not Applicable	Quarterly when flowing*	Not Applicable
Mine Seepage 3	Island Mountain South Portal. Monitor seepage from existing underground development.	Not Applicable	Not Applicable	Quarterly when flowing*	Not Applicable
Mine Seepage 5	Cow Mountain 1500 Level Portal. Monitor seepage from existing underground development.	Not Applicable	Not Applicable	Quarterly when flowing*	Not Applicable
New VWP 1	Monitor groundwater near the Lowhee underground development to support model verification.	Bedrock	To be determined[1]	Not applicable	Quarterly Download
New Well 2	Monitor groundwater near the Lowhee underground development.	Bedrock	To be determined[1]	Quarterly*	Quarterly Download and Manual Measurements
MW18-02A	Monitor seepage between Mine Seepage 2 and Willow River	Glaciolacustrine	18.3-22.9	Quarterly*	Quarterly Download and Manual Measurements
MW18-02B	Monitor seepage between Mine Seepage 2, underground development, and Willow River.	Bedrock	121.3-127.4	Quarterly*	Quarterly Download and Manual Measurements
District of Wells Monitoring Well	Monitor groundwater in the Wells Aquifer.	Wells Aquifer	Unknown	Quarterly*	Quarterly Download and Manual Measurements
MW19-07	Monitor groundwater in the Wells Aquifer.	Wells Aquifer	26.2-29.2	Quarterly*	Quarterly Download and Manual Measurements
MW19-08D	Monitor groundwater in the Wells Aquifer.	Wells Aquifer	43.0-44.5	Quarterly*	Quarterly Download and Manual Measurements
MW19-08S	Monitor groundwater in Placer Outwash / Alluvial Fan.	Place Outwash / Alluvial Fan	4.6-6.1	Quarterly*	Quarterly Download and Manual Measurements
New Well 3	Monitor groundwater in Bedrock.	Bedrock	To be determined[1]	Quarterly*	Quarterly Download and Manual Measurements
New Well 4	Monitor groundwater in the Wells Aquifer.	Wells Aquifer	To be determined[1]	Quarterly*	Quarterly Download and Manual Measurements
New Well 5	Monitor groundwater in the Wells Aquifer.	Wells Aquifer	To be determined[1]	Quarterly*	Quarterly Download and Manual Measurements
New Well 6	Monitor groundwater in Placer Outwash.	Placer Outwash	To be determined[1]	Quarterly*	Quarterly Download and Manual Measurements
New Well 7	Monitor groundwater in the Wells Aquifer.	Wells Aquifer	To be determined[1]	Quarterly*	Quarterly Download and Manual Measurements
New Well 8	Monitor groundwater downgradient of the Mine Site Complex Sediment Control Pond near the Willow River.	Till / Lowlands	To be determined[1]	Quarterly*	Quarterly Download and Manual Measurements
New Well 9	Monitor groundwater in the Wells Aquifer.	Wells Aquifer	To be determined[1]	Quarterly*	Quarterly Download and Manual Measurements
New Well 10	Monitor groundwater downgradient of the Mine Site Complex Sediment Control Pond.	Mill Tailings	To be determined[1]	Quarterly*	Quarterly Download and Manual Measurements
New Well 14	Monitor groundwater downgradient of the Mine Site Complex Sediment Control Pond	Placer Deposits	To be determined[1]	Quarterly*	Quarterly Download and Manual Measurements
New Well 15	Monitor groundwater in Wells Aquifer	Wells Aquifer (if present)	To be determined[1]	Quarterly*	Quarterly Download and Manual Measurements
New Well 16	Monitor groundwater in the Wells Aquifer (if present).	Wells Aquifer (if present)	To be determined[1]	Quarterly*	Quarterly Download and Manual Measurements
New Well 17	Monitor groundwater in Placer Outwash.	Placer Deposits	To be determined[1]	Quarterly*	Quarterly Download and Manual Measurements
MW09-026[2]	Monitor groundwater downstream of the Mine Site Complex Sediment Control Pond and Groundwater Seepage Area.	Mill Tailings	2.5-4	Quarterly*	Quarterly Download and Manual Measurements
New Well 11[2]	Monitor groundwater in the Wells Aquifer (if present).	Wells Aquifer (if present)	To be determined[1]	Quarterly*	Quarterly Download and Manual Measurements
MW-LL-16-02A	Monitor groundwater downgradient of Mosquito Creek Operations.	Bedrock	50.4 - 53.5	Quarterly*	Quarterly Download and Manual Measurements
MW-LL-16-02B	Monitor groundwater downgradient of Mosquito Creek Operations.	Overburden	15.2 – 16.8	Quarterly*	Quarterly Download and Manual Measurements
New VWP 2	Monitor groundwater near Mosquito Creek Operations to support model verification.	Bedrock	To be determined[1]	Not applicable	Quarterly Download

Location	Rationale	Hydrostratigraphic Unit	Monitoring Depth (mbgs)	Water Sampling Frequency	Water Level Frequency
New Well 12	Monitor groundwater near Mosquito Creek Operations.	Bedrock	To be determined[1]	Quarterly*	Quarterly Download and Manual Measurements
New Well 13	Monitor shallow groundwater downgradient of Mine Seepage 1 and Mosquito Creek Operations.	Overburden	To be determined[1]	Quarterly*	Quarterly Download and Manual Measurements
MW18-01A	Monitor groundwater to support groundwater flow interpretation and groundwater model verification.	Overburden	4.9-6.4	Not applicable	Quarterly Download and Manual Measurements
MW18-01B	Monitor water levels to support groundwater flow interpretation and groundwater model verification.	Bedrock	224.2-230.3	Not applicable	Quarterly Download and Manual Measurements
MW18-03B	Monitor water levels to support groundwater flow interpretation and groundwater model verification.	Bedrock	143.6-149.6	Not applicable	Quarterly Download and Manual Measurements
MW18-04B	Monitor water levels to support groundwater flow interpretation and groundwater model verification.	Bedrock	308.2-314.3	Not applicable	Semi-annual Download and Manual Measurements
MW09-007A	Monitor water levels to support groundwater flow interpretation and groundwater model verification.	Mill Tailings	1.3-2.8	Not applicable	Quarterly Download and Manual Measurements
MW09-007B	Monitor water levels to support groundwater flow interpretation and groundwater model verification.	Glaciolacustrine	14.4-15.8	Not applicable	Quarterly Download and Manual Measurements
MW09-007C	Monitor water levels to support groundwater flow interpretation and groundwater model verification.	Glaciolacustrine	25.1-26.8	Not applicable	Quarterly Download and Manual Measurements
MW09-029A	Monitor water levels to support groundwater flow interpretation and groundwater model verification.	Mill Tailings	1.1-2.6	Not applicable	Quarterly Download and Manual Measurements
MW09-029B	Monitor water levels to support groundwater flow interpretation and groundwater model verification.	Glaciolacustrine	8.0-9.5	Not applicable	Quarterly Download and Manual Measurements
MW09-052	Monitor water levels to support groundwater flow interpretation and groundwater model verification.	Mill Tailings	1.2-2.6	Not applicable	Quarterly Download and Manual Measurements
MW09-063A[2]	Monitor water levels to support groundwater flow interpretation and groundwater model verification.	Placer Outwash / Alluvial Fan	2.2-3.6	Not applicable	Quarterly Download and Manual Measurements
MW09-063B[22]	Monitor water levels to support groundwater flow interpretation and groundwater model verification.	Glaciolacustrine	9.2-10.7	Not applicable	Quarterly Download and Manual Measurements
MW09-091A	Monitor water levels to support groundwater flow interpretation and groundwater model verification.	Placer Outwash / Alluvial Fan	2.2-3.6	Not applicable	Quarterly Download and Manual Measurements
MW09-091B	Monitor water levels to support groundwater flow interpretation and groundwater model verification.	Glaciolacustrine	6.8-8.3	Not applicable	Quarterly Download and Manual Measurements
MW09-091C	Monitor water levels to support groundwater flow interpretation and groundwater model verification.	Glaciolacustrine	13.7-15.2	Not applicable	Quarterly Download and Manual Measurements
BFA-BH21-03 - VWP3a [2]	Monitor water levels downstream of the Mine Site Complex Sediment Control Pond near the Groundwater Seepage Area.	Glaciolacustrine	19.81	Not applicable	Quarterly Download
BFA-BH21-03 - VWP3b [2]	Monitor water levels downstream of Mine Site Complex Sediment Control Pond near the Groundwater Seepage Area.	Mill Tailings	6.71	Not applicable	Quarterly Download
BFA-BH21-04 - VWP4[22]	Monitor water levels near the Groundwater Seepage Area.	Placer Outwash / Alluvial Fan	4.88	Not applicable	Quarterly Download
BFA-BH21-08 - VWP8 [2]	Monitor water levels downstream of the Mine Site Complex Sediment Control Pond.	Glaciolacustrine	12.19	Not applicable	Quarterly Download
BFA-BH21-09 - VWP9a	Monitor water levels downstream of the Mine Site Complex Sediment Control Pond.	Mill Tailings	6.10	Not applicable	Quarterly Download
BFA-BH21-09 - VWP9b	Monitor water levels downstream of the Mine Site Complex Sediment Control Pond.	Placer Outwash / Alluvial Fan	2.13	Not applicable	Quarterly Download

Location	Rationale	Hydrostratigraphic Unit	Monitoring Depth (mbgs)	Water Sampling Frequency	Water Level Frequency
MW-HL-16-02	Monitor water levels to support groundwater flow interpretation and groundwater model verification.	Bedrock	93.7-121.1	Not applicable	Quarterly Download and Manual Measurements
MW-HL-16-03	Monitor water levels to support groundwater flow interpretation and groundwater model verification.	Bedrock	63.1-110	Not applicable	Quarterly Download and Manual Measurements
MW-LL-16-01A	Monitor water levels to support groundwater flow interpretation and groundwater model verification.	Bedrock	39.3-42.4	Not applicable	Quarterly Download and Manual Measurements
MW-LL-16-01B	Monitor water levels to support groundwater flow interpretation and groundwater model verification.	Overburden	4.6-6.1	Not applicable	Quarterly Download and Manual Measurements
MW-LL-16-03A	Monitor groundwater near the Ballarat Camp / Regional Water.	Overburden	47.1–50.2	Semi-annually*	Semi-annual Download and Manual Measurements
MW-LL-16-03B	Monitor groundwater near the Ballarat Camp / Regional Water.	Overburden	7.32–8.8	Semi-annually*	Semi-annual Download and Manual Measurements
MW-LL-16-04A	Monitor groundwater down-gradient of the Bonanza Ledge Site at Black Jack Gulch upstream of Williams Creek.	Bedrock	13.41–16.5	Semi-annually*	Semi-annual Download and Manual Measurements
MW-LL-16-04B	Monitor groundwater down-gradient of the Bonanza Ledge Site at Black Jack Gulch upstream of Williams Creek.	Overburden	4.6-6.1	Semi-annually*	Semi-annual Download and Manual Measurements

Notes: mbgs = metres below ground surface; VWP = vibrating wire piezometer; * = Samples will be analyzed for dissolved and total metals, sulphate, chloride, nutrients, pH, and total suspended solids; 1- Screened interval to be determined based on subsurface conditions encountered during drilling; 2- Water level monitoring to continue until wells is destroyed during construction

2.1.2 Mine Site Complex

Table 2.1–2 summarizes the locations to be monitored at the Mine Site Complex for groundwater quality and/or groundwater levels. The monitoring network includes existing wells or vibrating wire piezometers (VWPs) that have been installed either as part of previous baseline characterization or as part of supplemental investigations, as well as new wells and VWPs proposed to augment the existing monitoring network.

Fourteen new wells and two new vibrating wire piezometers are identified for the Mine Site Complex to investigate the wells aquifer and/or to complement the existing monitoring network, based on where predicted changes in groundwater levels are expected and where groundwater seepage from the underground may occur at closure. The screened depth and/or sensor elevations will be optimized based on observed drilling conditions, and the monitoring location may be adjusted somewhat based on access restrictions, while still maintaining the objective of the monitoring location. Seven of the new wells are targeting the Wells Aquifer to provide supplemental characterization of the aquifer extents and vertical and hydraulic gradients within the valley. The new monitoring locations in the Wells Aquifer are paired with new and/or existing wells in the underlying and/or overlying hydrostratigraphic units to be able to monitor changes in vertical gradients/flow directions.

In addition to groundwater monitoring at monitoring wells and vibrating wire piezometers, underground seepage surveys will be conducted to monitor enhanced permeability zones that contribute to increased groundwater inflows. Enhanced permeability zones will be noted as encountered during mining and in annual underground seepage surveys.

The new wells in the Mine Site Complex (New Well 3 to New Well 15) and the new well and VWP in the Lowhee Creek underground development area (New Well 2 and VWP 1) will be installed in Year -1 during the Construction Phase, prior to the start of mining at the Lowhee underground development. The new wells and VWP near Mosquito Creek Operations (New Well 12, New Well 13, and VWP 2) will be installed at least 90 days prior to dewatering the historical underground workings in the Island Mountain area.

2.2 Monitoring Methods

2.2.1 Water Level Monitoring

Manual groundwater level readings will be collected in monitoring locations at the same frequency as the groundwater quality monitoring program. Using a water level meter, the depth to water will be recorded, and the stickup height of the monitoring well measured. The water levels will be recorded at each location prior to initiating purging or sampling of the well. If pressure is released when the cap is removed, this information will be recorded in field notes. The meter will be cleaned thoroughly before and after monitoring each well.

Each monitoring location will also be monitored with continuous data loggers, where possible. Continuous monitoring (at a minimum frequency of daily) will provide information on seasonal and temporal groundwater fluctuations.

2.2.2 Groundwater Sampling

Groundwater sampling will be conducted in alignment with methods described in the British Columbia Field Sampling Manual (MOE 2013) by trained mine personnel or contractors retained by ODV. Groundwater sampling methods will remain consistent with the methods used for baseline data collection from monitoring wells, which consisted of purging and sampling using a Waterra inertial pump. If sampling challenges are encountered due to depth of the well screen interval or static water level using a Waterra intertial pump, alternate sampling methods will be employed. For samples collected from areas of groundwater seepage, grab samples will be collected from the flowing water using a syringe. When required for the selected analysis, samples will be field filtered using Waterra in-line 25-micron filters.

In-situ measurements will be made with a field meter that has been appropriately calibrated. Field meters will be used to measure turbidity, water temperature, conductivity, pH, and dissolved oxygen.

2.2.3 Laboratory Analysis

Sample collection will be documented on Chain of Custody sheets and in field notes, as applicable. Samples will be stored and transported in coolers packed with ice packs and will be submitted to applicable laboratories in a timely manner so that the sample storage times are not exceeded. If, for any reason, samples do not reach the laboratory within the maximum sample hold time for individual parameters, the results of the specific parameters will be qualified, or the samples will not be analyzed for the specific parameters.

The samples will be submitted to Canadian Association of Laboratory Accreditation (CALA) accredited laboratories for analysis of parameters. Analytical methods for physico-chemical parameters will be consistent with the British Columbia Environmental Laboratory Manual (MOE 2020) and have detection limits appropriate for screening against Contaminated Sites Regulation (CSR) standards for drinking water and freshwater aquatic life.

Consistent with surface water quality monitoring for the Project, groundwater samples will be monitored for contaminants of concern, including dissolved and total metals, sulphate, chloride, nutrients, pH, and total suspended solids.

2.2.4 Data Management and Quality Assurance / Quality Control

When laboratory data are received, the data will be reviewed prior to entry into a database to verify the correct analyses were conducted, that method blank results were below reported detection limits, and that matrix spikes and laboratory duplicates meet the laboratory specified data quality

objectives. The data will also be reviewed for outliers or unusual results, and the analytical laboratory will be contacted to resolve identified data quality issues.

The quality assurance / quality control (QA/QC) program will further include:

- Following standard operating procedures (SOPs) for groundwater sampling and use of properly calibrated sampling equipment.
- Collection of field duplicate samples at a rate of approximately 10%.
- Collection of field blanks to assess for potential contamination of field sampling equipment and methods.
- Collection of trip blanks to assess for potential contamination from laboratory equipment and analysis, storage, and transport.
- Use of chain-of-custody forms in the transportation of samples.

Field blanks will be prepared in the field using deionized water to fill a set of sample containers, which will then be submitted to the laboratory for the same analysis as field water samples. Field blanks will be used to detect potential sampling contamination during collection, shipping, and analysis.

Travel blanks will be prepared and preserved at the analytical laboratory prior to the sampling trip using laboratory-provided deionized water. The sample will remain unopened throughout the duration of the sampling trip. Travel blanks will be used to detect potential sample contamination during transport, storage, and lab analysis.

Duplicate samples will be collected during sampling from the same well. They will be labelled, preserved individually, and submitted for identical analysis. Duplicate samples will be used to assess variability in water quality at the sampling site and lab analysis.

2.3 Reporting

Groundwater quality results from the groundwater stations outlined in this plan will be compared to the BC Contaminated Sites Regulations and Standards, Schedule 3.2 for groundwater quality. The sample analysis data and field measurement data will be submitted in an electronic format suitable for entry into the Environmental Monitoring System, the provincial repository for environmental monitoring data.

The information gathered during groundwater monitoring will be summarized annually. The annual report will provide a summary of monitoring results and identify existing or developing water quality trends or issues. Groundwater reporting will be done in alignment with BC Ministry of Environment and Parks (ENV) Technical Guidance 4, Annual Reporting Under the *Environmental Management Act* – A Guide for Mines in British Columbia (MOE 2016).

Monitoring data will be evaluated in comparison to expected Project-related changes in groundwater conditions in the study area. If negative groundwater quantity or quality is identified through interpretation of collected data, a review of the sampling frequency, parameters of interest, and sampling locations will be conducted. Recommendations will be included for changes in the monitoring network based on this comparison, including, but not limited to:

- Changes to monitoring and sampling frequency
- Adding or relocating monitoring locations
- Developing new contingency plans
- Updating conceptual and numerical models developed for the site
- Adopting mitigation strategies

The Groundwater Monitoring Plan is not a fixed document and components of the Plan may be revised over the life of the Project. It is expected that the Plan may be updated annually, if required, based on the review of collected groundwater monitoring data.

3. REFERENCES

MOE (BC Ministry of Environment). 2013. British Columbia Field Sampling Manual for Continuous Monitoring and the Collection of Air, Air-Emission, Water, Wastewater, Soil, Sediment, and Biological Samples, 2013 Edition (Permittee).

MOE. 2016. Technical Guidance 4, *Environmental Management Act* Authorizations, Annual Reporting Under the *Environmental Management Act* – A Guide for Mines in British Columbia. Version 1.1, January 2016.

MOE. 2020. British Columbia Environmental Laboratory Manual.

APPENDIX A DECLARATION OF COMPETENCY FORM

BRITISH COLUMBIA | Ministry of Environment and Climate Change Strategy

Declaration of Competency

The Ministry of Environment and Climate Change Strategy relies on the work, advice, recommendations and in some cases decision making of qualified professionals[1], under government's professional reliance regime. With this comes an assumption that professionals who undertake work in relation to ministry legislation, regulations and codes of practice have the knowledge, experience and objectivity necessary to fulfill this role.

1. Name of Qualified Professional: Jennifer Levenick

   Title: Senior Hydrogeologist

2. Are you a registered member of a professional association in B.C.? ☑ Yes ☐ No

   Name of Association: EGBC (PEng) Registration #: 35959

3. Brief description of professional services:

   Mine Site Groundwater Monitoring Plan preparation

This declaration of competency is collected under section 26(c) of the *Freedom of Information and Protection of Privacy Act* for the purposes of increasing government transparency and ensuring professional ethics and accountability. By signing and submitting this statement you consent to its publication and its disclosure outside of Canada. This consent is valid from the date submitted and cannot be revoked. If you have any questions about the collection, use or disclosure of your personal information please contact the Ministry of Environment and Climate Change Strategy Headquarters Office at 1-800-663-7867.

Declaration

I am a qualified professional with the knowledge, skills and experience to provide expert information, advice and/or recommendations in relation to the specific work described above.

Signature:

X 

Print Name: Jennifer Levenick

Witnessed by:

X 

Print Name: Sean Weston

Date signed: _____

[1] *Qualified Professional, in relation to a duty or function under ministry legislation, means an individual who*

a) is registered in British Columbia with a professional association, is acting under that organization's code of ethics, and is subject to disciplinary action by that association, and

b) *through suitable education, experience, accreditation and knowledge, may reasonably be relied on to provide advice within his or her area of expertise, which area of expertise is applicable to the duty or function.*

OSISKO DEVELOPMENT

CARIBOO GOLD PROJECT

QR MILL SURFACE AND GROUNDWATER MONITORING PLAN

April 2024

OSISKO DEVELOPMENT

Cariboo Gold Project

PO Box 250
3700 Ski Hill Road
Wells, BC V0K 2R0

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REVISION HISTORY

Rev. No.	Date	Author	Description
0	October 2023	KCB	Issued for the Revised Permit Application
1	February 2024	KCB	Removed E8 and Weir 9 from Table C-2
2	April 2024	KCB	Issued as stand-alone report for inclusion in WSP's Human Health Monitoring and Management Plan

ABBREVIATIONS

Terminology used in this document has been defined where it is first used, while the following list has been presented to assist readers that choose to review only portions of the document.

Abbreviation	Description
BCCSR	British Columbia Contaminated Sites Regulation
BCFSM	British Columbia Field Sampling Manual
BCWOG-FAL	British Columbia Water Quality Guidelines for Freshwater Aquatic Life
CGP	Cariboo Gold Project
DL	Detection Limit
FSTSF	Filtered Stack Tailings Storage Facility
JAIR	Joint Application Information Requirements
MDMER	Metal and Diamond Mining Effluent Regulations
MZP	Main Zone Pit
NLP	North Lobe Pit
ODV	Osisko Development Corp.
QA	Quality Assurance
QC	Quality Control
QR	Quesnel River
SSCP	South Seepage Collection Pond
TDS	Total Dissolved Solids
TSF	Tailings Storage Facility
TSS	Total Suspended Solids
WAD	Weak Acid Dissociable
WBWQM	Water Balance and Water Quality Model
WMP	Water Management Plan

Prepared by:

Michelle Liew, P.Eng.
Water Resources Engineer
Klohn Crippen Berger Ltd.

CLARIFICATION REGARDING THIS REPORT

This report is an instrument of service of Klohn Crippen Berger Ltd. (KCB). The QR Mill Surface and Groundwater Monitoring Plan has been prepared for the use of Osisko Development Corp. (ODV) for the specific application to the Quesnel River Mill component of the Cariboo Gold Project and may be published or disclosed by ODV as part of the Joint Permit Application for *Mines Act* and *Environmental Management Act* Permits.

KCB has prepared this report in a manner consistent with the level of care, skill and diligence ordinarily provided by members of the same profession for projects of a similar nature at the time and place the services were rendered; however, the use of this report will be at the user's sole risk absolutely and in all respects, and KCB makes no warranty, express or implied. This report may not be relied upon by any person other than ODV or the British Columbia Ministry of Environment and Climate Changes Strategy and Ministry of Energy, Mines and Low Carbon Innovation, without KCB's written consent.

Use of or reliance upon this instrument of service by ODV is subject to the following conditions:

1. The report is to be read in full, with sections or parts of the report relied upon in the context of the whole report.
2. The observations, findings and conclusions in this report are based on observed factual data and conditions that existed at the time of the work and should not be relied upon to precisely represent conditions at any other time.
3. The report is based on information provided to KCB by ODV or by other parties on behalf of ODV (ODV-supplied information). KCB has not verified the correctness or accuracy of such information and makes no representations regarding its correctness or accuracy. KCB shall not be responsible to ODV for the consequences of any error or omission contained in ODV-supplied information.
4. KCB should be consulted regarding the interpretation or application of the findings and recommendations in the report.

1. INTRODUCTION

This report presents the proposed surface and groundwater monitoring program for the Cariboo Gold Project (CGP) at the Quesnel River (QR) Mill Site. The program includes:

- discharge and surface water quantity monitoring;
- surface water quality sampling;
- discharge water quality monitoring to evaluate compliance with permit criteria;
- receiving environment water quality monitoring to assess the surface water pathway and potential for effects to aquatic receptors;
- effluent water quality sampling;
- groundwater quality sampling to assess water quality trends and potential impacts due to seepage; and
- groundwater level monitoring to understand groundwater flow.

1.1 JAIR Requirements

This plan is intended to meet the requirements of Section 9.6 of the 2019 Joint Application Information Requirements (JAIR) for *Mines Act* and *Environmental Management Act* permits (EMPR and ECCS 2019). According to the JAIR, the plan should include a detailed summary of all surface water and groundwater monitoring that will occur within the mine site boundary and in the receiving environment for each phase of mine life. The plan should include the following information for both surface water and groundwater monitoring:

- objectives;
- monitoring methods;
- monitoring locations, including a detailed map showing each location;
- rationale for the distribution of monitoring locations (including depths, where relevant), and how they relate to the maintenance and improvement of the site-wide water balance model (Section 5.3), surface water quality model (Section 5.4), and groundwater model (Section 5.5);
- for groundwater, information must be provided on the range of monitoring depths that will be included for each individual monitoring location;
- parameters of concern to be measured at each location;
- sampling frequency and period, including high, medium, and low-flow periods;

- analytical testing standard operating procedures to be used;
- Quality Assurance/Quality Control (QA/QC) protocols;
- name of the certified laboratories used to analyze samples;
- comparisons to relevant guidelines and objectives;
- methods for data analyses;
- reporting schedule; and
- any other relevant information.

1.2 Regulatory Context

There are two site-specific permits that currently govern effluent discharge, tailings deposition, and water management at the QR Mill Site:

- *Mines Act* Permit M-198, issued July 18, 1994 and last amended on October 18, 2021 (BC EMLI 2021).
- *Environmental Management Act* Permit PE-12601, issued March 3, 1994 and last amended on March 18, 2022 (BC ECCS 2022).

2. SURFACE WATER QUALITY AND QUANTITY

2.1 Objective

The objectives of the QR Mill surface water monitoring program are to:

- monitor water treatment plant performance;
- monitor impacts to the receiving environment as a result of authorized effluent discharge or accidental and emergency releases;
- determine the volume of effluent discharge;
- verify the effectiveness of the environmental protection activities and implement improvements to the WMP if targets are not achieved;
- provide information for site maintenance, such as measures to improve Total Suspended Solids (TSS);
- establish hydrologic conditions of the QR Mill Site; and
- provide information for updates to the site-wide Water Balance and Water Quality Model (WBWQM).

2.2 Regulatory Requirements

The parameters currently required by Permit PE-12601 (referred to as “Analytics” in the permit and in Table 2.2 and Table 4.1 to be monitored at all monitoring locations includes:

- Dissolved and Total Metals: Table 4.1 presents requirements to meet water quality guidelines for the protection of aquatic life;
- Nutrients: ammonia (NH_4), nitrite (NO_2), nitrate (NO_3), total nitrogen, total and dissolved phosphorus, orthophosphate;
- Organics: dissolved organic carbon (total organic carbon not specified, assume accidental omission);
- Physical parameters: laboratory measurements of pH, hardness, specific conductance, Total Suspended Solids (TSS), Total Dissolved Solids (TDS), turbidity;
- Major anions: alkalinity, acidity, chloride, fluoride, bromide, sulphate;
- Cyanide: total and Weak Acid Dissociable (WAD); and
- Field measurements: pH, temperature, dissolved oxygen, turbidity, specific conductance.

Thiosalts can cause delayed acidity in the downstream environment. Therefore, to inform the water treatment design, it is recommended to include total thiosalts (sum of thiosulfate,

trithionate, and tetrathionate) as part of the monitoring program at process water and tailings contact water monitoring stations (see Table 2.2).

For permitted effluent being discharged to the environment, Permit PE-12601 also requires:

- 96-hour LC50 rainbow trout toxicity test; and
- *48-hour LT50 Daphnia magna* bioassays (acute toxicity testing).

Monitoring requirements also address those of the Metal and Diamond Mining Effluent Regulations (MDMER) of the *Fisheries Act* (DFO 2022) (Table 2.1), and consist of the following components at the Final Discharge Point(s) for:

- effluent flow measurements (as per MDMER Division 2, Section 19);
- effluent sampling for chemical analyses (as per MDMER Division 2, Sections 12 and 13);
- effluent acute lethality testing (as per MDMER Division 2, Sections 14, 15, 16, and 17);
- effluent sublethal toxicity testing (as per MDMER Schedule 5, Part 1, Sections 5 and 6); and
- surface water quality sampling at the effluent point of entry (as per MDMER Schedule 5, Part 1, Section 7).

Table 2.1 Effluent Monitoring Required by MDMER

Sampling Location	Frequency	Required Monitoring under MDMER
At effluent final discharge point.	Weekly[1]	Effluent flow measurements for calculation of monthly loadings. Effluent grab or composite samples for pH, TSS, and MDMER Schedule 4 deleterious substances.
	Monthly[2]	Acute toxicity testing – 96-hour rainbow trout LC50, and 48-hour *Daphnia magna* LC50.
	Bi-annual[3]	Sublethal toxicity testing (i.e., developmental, reproductive, or survival effects) – fish, invertebrate, plant, and algal species.
Point of entry in receiving environment.	Quarterly[4]	Surface water quality sampling during periods of active discharge at the effluent point of entry.

Notes:

1. Weekly monitoring frequency may be reduced to quarterly sample collections if monthly mean concentrations are less than 10% of MDMER Schedule 4 limits (for the 12 months immediately preceding the most recent test). Sampling may not occur less than 24 hours apart (see MDMER Division 2, Section 12 and Section 13).
2. The required frequency of acute toxicity testing may change (i.e., increase or decrease) depending on the results of acute toxicity tests. The frequency of sampling may be increased if acute lethality is observed. The frequency of sampling may be decreased to once in a calendar quarter if the effluent is determined to be not acutely lethal for 12 consecutive months. Grab sampling may not occur less than 15 days apart (see MDMER Division 2, Sections 15 and 16).
3. After three years, the tests shall be conducted once per calendar quarter on the species referred to in subsection 5(1) or (2), as the case may be, whose results for all the tests conducted in accordance with subsections (1) and (2) — including such tests conducted in addition to the number required by those subsections — produce the lowest geometric mean, taking into account the inhibition concentration that produces a 25% effect or an effective concentration of 25% (see MDMER Schedule 5, Part 6, Section 3).
4. Sampling may not occur less than one month apart (see MDMER Schedule 5, Part 1, Section 7). Given that the site streams ice over during winter months, samples will be collected approximately monthly during ice free periods rather than quarterly. In accordance with Section 25(1) of the MDMER, if it is not possible to collect the samples at these times due to safety concerns or access problems, Osisko Development Corp. (ODV) will notify the Director and indicate an alternative sampling date.

2.3 Monitoring Program

Most surface water monitoring locations currently required under Permit PE-12601 will continue to be monitored during the CGP construction and operations phase.

The CGP construction phase includes drawdown of the existing Tailings Storage Facility (TSF) pond, enlargement of the South Seepage Collection Pond (SSCP) and construction of the Sediment Pond. The CGP operations phase includes placement of the filtered tailings in the Filtered Stack Tailings Storage Facility (FSTSF) and maintenance of the FSTSF ephemeral pond which will capture FSTSF runoff. Temporary covers will be used during FSTSF construction and are intended to reduce contact between the tailings and the runoff as well as reduce infiltration into these tailings. Discharge to the receiving environment will come from the Water Treatment Plant (WTP) and the Sediment Pond (pending approval) provided it meets criteria for discharge.

The current monitoring locations, as well as additional proposed locations, are summarized in Table 2.2 and shown on Figure 2.1.

Table 2.2 CGP Effluent Discharge and Surface Water Monitoring Program

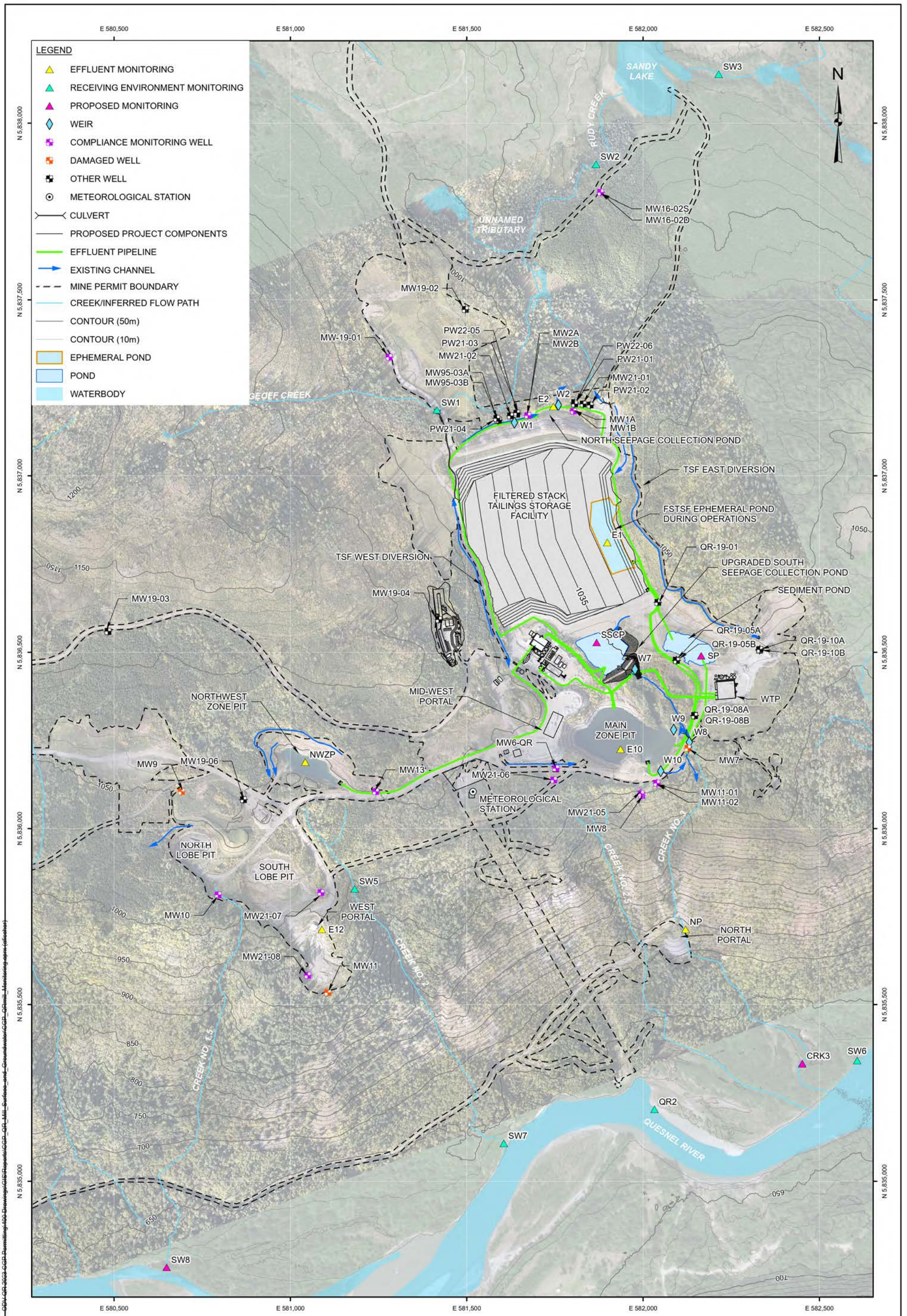
Monitoring Site ID	Stream/Site	EMS[1] Reference	Site Rationale	Frequency	Parameters
Effluent Monitoring					
E1	FSTSF Ephemeral Pond (formally TSF supernatant)	E220177	Mine contact water storage. Monitor to understand effectiveness of temporary covers and for model validation.	Monthly Quarterly Weekly	Analytics[2] Total thiosalts Water Level
E2	NSCP	E221632	Mine contact water (TSF/FSTSF seepage).	Monthly Weekly	Analytics[2] Water Level
WTP[6]	WTP effluent	E326313	Post-treatment to determine WTP is meeting discharge criteria.	Weekly Daily Continuous	Analytics[2] pH, Conductivity, Temperature Flow
WTP-R[6]	WTP retentate	E327923	Deposited in MZP. Monitor to assess treatment efficiency.	Weekly Daily Continuous	Analytics[2] pH, Conductivity Flow
E8 **(REMOVE)**	West Zone North Lobe	E221637	**ODV proposes to remove this monitoring site.** The NLP does not retain water or discharge to the environment due to breakthrough to the pit floor in 2012.	**REMOVE**	**REMOVE**
E10	MZP supernatant	E221639	Mine contact water storage. Monitor for model validation.	Monthly Quarterly Weekly	Analytics[2] Total thiosalts Water Level
E12	West Zone Portal discharge	E235980	Authorized discharge location for legacy mine contact water. Underground workings discharge from portal discharge.	Monthly Monthly Weekly	Analytics[2] Rainbow Trout 96 hr, Daphnia Magna 48 hr LC 50, Single Concentration, Total and Dissolved Metals, hardness, pH, SO4, Conductivity and TSS Flow
NP	North Zone Portal discharge	E268144	Monitoring will continue and will inform mitigation strategies (such as a pump-back system) for the North Portal discharge.	Monthly (during non-winter months) Monthly (during non-winter months) Monthly (during non-winter months)	Analytics[2] Rainbow Trout 96 hr, Daphnia Magna 48 hr LC 50, Single Concentration Total and Dissolved Metals, hardness, pH, SO4, Conductivity and TSS Flow
W2 (Weir 2)	Weir 2: Treated effluent from WTP Outlet	E327925	Authorized discharge location for WTP treated effluent. Monitor to ensure compliance with permit criteria.	Weekly Monthly Daily	Analytics[2] Rainbow Trout 96 hr, Daphnia Magna 48 hr acute lethality in full strength effluent[5] Flow
Mid-west Portal (proposed)	Mid-west Portal	-	Portal drainage is captured in the MZP. Proposed monitoring to obtain baseline information.	Monthly	Analytics[2] Flow
SSCP (proposed)	SSCP	-	Mine contact water storage. Monitor for model validation.	Monthly Weekly	Analytics[2] +Total thiosalts Water Level
Weir 7	SSCP Discharge to the MZP Diversion	E324291	SSCP Seepage Outflow. Monitor for model validation.	Monthly Weekly	Analytics[2] +Total thiosalts Flow
SP (proposed)	Sediment Pond	-	Monitor sediment pond water to ensure it meets criteria for discharge to the receiving environment via Weir 8.	Monthly Weekly	Analytics[2] Water Level
W8	Weir 8: Sediment Pond discharge	E324292	Proposed discharge location for Sediment Pond provided it meets discharge criteria.	Weekly Daily	Analytics[2] Flow
W9 **(REMOVE)**	Weir 9 : Main Zone Pit Diversion	E327926	**ODV proposes to remove this monitoring site as this is immediately downstream of Weir 7.**	**REMOVE**	**REMOVE**
NWZP	North-west Zone Pit	E327927	Legacy pit. Monitor for closure planning.	Quarterly	Analytics[2] Water Level

Monitoring Site ID	Stream/Site	EMS[1] Reference	Site Rationale	Frequency	Parameters
Receiving Environment Monitoring					
SW1	Geoff Creek	E221659	Located upstream of TSF/FSTSF and mine-impacted seepage and discharge. Reference location for monitoring background water quality (i.e., non-mine contact water).	Monthly Monthly	Analytics[2] Water Level + Flow
SW2	Rudy Creek upstream of Sandy Lake	E221660	Monitor potential impacts in the receiving environment due to E2 discharge and non-point discharge (i.e., TSF/FSTSF seepage).	Monthly Twice annually – 5 samples collected in 30 days[3] Continuous Quarterly	Analytics[2] +Total thiosalts[4] Analytics[2] Water Level + Flow Sub-lethal toxicity tests[7]
SW3	Rudy Creek downstream of Sandy Lake	E221661	Monitor potential impacts in the receiving environment due to E2 discharge and non-point discharge (i.e., TSF/FSTSF seepage).	Monthly Twice annually – 5 samples collected in 30 days[3] Continuous	Analytics[2] +Total thiosalts[4] Analytics[2] Water Level + Flow
SW5	Creek No. 2 downstream of West Zone Road	E221663	Monitor potential impacts in the receiving environment due to legacy mining activities.	Twice annually (late spring and fall)	Analytics[2]
SW6	Quesnel River u/s of QR Mine	E240061	Quesnel River upstream of mine-impacted streams and discharges. Reference location for monitoring background water quality (i.e., non-mine contact water).	Twice annually (late spring and fall)	Analytics[2]
SW7	Quesnel River d/s of QR Mine	E240063	Quesnel River downstream of mine-impacted streams and discharges (downstream of Creeks No. 3, No. 2.5, and No. 2).	Twice annually (late spring and fall)	Analytics[2]
QR2	Quesnel River downstream of Creeks No. 2.5 and 3	E240062	Quesnel River downstream of TSF/FSTSF and MZP impacted streams and discharges (downstream of Creeks No. 3 and No. 2.5).	Twice annually (late spring and fall)	Analytics[2]
SW8[8] (proposed)	Quesnel River d/s of QR Mine	-	Proposed Quesnel River monitoring to capture all potential impacted streams and discharges (downstream of Creeks No. 3, No. 2.5, No. 2, and No. 1.5).	Twice annually (late spring and fall)	Analytics[2]
CRK3 (proposed)	Creek No. 3 Wetland north of Quesnel River	-	Proposed Creek No. 3 location before it joins the Quesnel River. Monitor potential impacts in the receiving environment due to upstream CGP activities and a legacy waste rock pile located within the watershed.	Same frequency as North Portal during first year to establish baseline; twice annually (late spring and fall) thereafter.	Analytics[2]

FSTSF = Filtered Stack Tailings Storage Facility; TSF = Tailings Storage Facility; NSCP= North Seepage Collection Pond; WTP = water treatment plant; MZP = Main Zone Pit; NLP = North Lobe Pit; SSCP = South Seepage Collection Pond.

Notes:

1. The provincial reporting database system is known as EMS.
2. Analytics include all parameters listed in Table 4.1. The minimum analytical detection limits for each parameter must be suitable for comparison with the applicable standards listed in the most recent approved and working British Columbia Water Quality Guidelines for Freshwater Aquatic Life (BCWQG-FAL) (BC ECCS 2021a).
3. Five samples in 30 days will be collected during spring freshet (May-June) and late fall (Oct to Dec) periods for the purpose of comparison to the average BCWQG-FAL. Samples to be as evenly spaced as possible over the 30 days.
4. If thiosalts are detected at SSCP, E1 or E10, then add total thiosalts to SW2 and SW3 monthly testing program.
5. Acute toxicity results exceeding 50% mortality compared to control, will result in a follow-up multi-concentration acute toxicity sample and initiation of a 5 in 30 sampling program at discharge location and downstream exposure sites SW2 and SW3.
6. WTP samples/measurements are only collected during active treatment. The WTP performance monitoring plan is provided in the operating and maintenance manual. The current Permit PE-12601 uses water treatment system, instead of WTP.
7. ODV must conduct quarterly sub-lethal toxicity tests with full strength creek water from site SW2 including but not limited to a test for early life stage rainbow trout, invertebrates, and algae. Reporting requirement is presented in Section 5.
8. Add SW8 to the monitoring program if monitoring wells MW10 and MW21-08 show increasing arsenic trends and if safe access to SW8 is possible.



NOT FOR CONSTRUCTION

SCALE 0 500m

NOTES:
1. DATUM/PROJECTION: NAD83, UTM ZONE 10N
2. 2019 ORTHOPHOTO PROVIDED BY BGM, SUPPLEMENTED WITH IMAGERY FROM ESRI
3. CONTOURS(10m) DERIVED FROM 2019 LIDAR PROVIDED BY BGM

CLIENT: OSISKO DEVELOPMENT

Klohn Crippen Berger

PROJECT: CARIBOO GOLD PROJECT QR MILL
SURFACE AND GROUNDWATER MONITORING PLAN

TITLE: MONITORING LOCATIONS

SCALE	PROJECT No.	FIG No.
1:10,000	M09672A24	2.1

SAVE DATE: 2024-04-17 1:57 PM
FILE PATH: \\vt.klohn.com\Proj\Data\MV\GIS\M09672A24_QR_QR 2023 CGP Permitting\400 Drawings\GIS\Reports\CGP_QR_Mill_Surface_and_Groundwater\CGP_QRmill_MonitoringLocations.mxd

3. GROUNDWATER QUALITY AND QUANTITY

3.1 Objective

The objectives of the QR Mill groundwater monitoring program are to:

- characterize seepage water quality and identify potential flow pathways;
- provide information for use in the site hydrogeologic model and WBWQM; and
- assess the potential effects of CGP activities on the receiving environment.

3.2 Regulatory Requirements

The sample parameters required by Permit PE-12601 (referred to as “Analytics” in the permit) includes the following:

- Dissolved and Total Metals: Table 4.1 presents requirements to meet water quality guidelines for the protection of aquatic life.
- Nutrients: NH_4, NO_2, NO_3, total nitrogen, total and dissolved phosphorus, orthophosphate.
- Physical parameters: pH, hardness, specific conductance, TSS, TDS, turbidity.
- Major anions: alkalinity, acidity, chloride, fluoride, bromide, sulphate, cyanide.
- Organics: Total and dissolved organic carbon.
- Field measurements: pH, temperature, dissolved oxygen, turbidity, specific conductance.

3.3 Monitoring Programs

Most groundwater monitoring locations required under Permit PE-12601 will continue to be monitored during CGP; as well proposed new sites (summarized in Table 3.1 and shown on Figure 2.1).

Table 3.1 Groundwater Sampling Programs

Monitoring Well ID	Screened Depth (m) and Hydrostratigraphic Unit	EMS	Site Rationale	Frequency	Parameters
MW1A	6.2 - 9.2 Shallow bedrock	E221460	Monitors impacts due to seepage downgradient (to the north) of the TSF/FSTSF, just north of the Tailings Dam.	Three times annually (spring, summer, and fall/winter)	Analytics Groundwater elevation
MW1B	3.1 - 6.1 Till above bedrock contact	E221641		Three times annually	Analytics Groundwater elevation
MW2A	10.7 - 13.7 Shallow bedrock	E221642		Three times annually (spring, summer, and fall/winter)	Analytics Groundwater elevation
MW2B	4.6 - 7.6 Till above bedrock contact	E221643		Three times annually (spring, summer, and fall/winter)	Analytics Groundwater elevation
MW16-02S	3.27 - 4.27 Till above bedrock contact	E327915	Monitors impacts due to seepage downgradient (to the north) of the TSF/FSTSF, near SW2.	Semi-annual (late spring[1] and fall[2])	Analytics Groundwater elevation
MW16-02D	24 - 30 Shallow bedrock	E327914		Semi-annual (late spring[1] and fall[2])	Analytics Groundwater elevation
MW21-05 (replaces MW8)	Unknown	E327917	Monitors impacts due to seepage downgradient of MZP.	Semi-annual (late spring[1] and fall[2])	Analytics Groundwater elevation
MW21-06 (replaces MW6-QR)	Unknown	E327918		Semi-annual (late spring[1] and fall[2])	Analytics Groundwater elevation
MW11-01	39.6 - 48.8 Deep bedrock[5]	E327911		Semi-annual (late spring[1] and fall[2])	Analytics Groundwater elevation
MW10[3]	Depth not available Deep bedrock5	E221654	Monitors impacts due to seepage downgradient of North Lobe Pit.	Semi-annual (late spring[1] and fall[2])	Analytics Groundwater elevation
MW21-07	Unknown	E327919	Monitors impacts due to seepage downgradient of South Lobe Pit.	Semi-annual (late spring[1] and fall[2])	Analytics Groundwater elevation

Monitoring Well ID	Screened Depth (m) and Hydrostratigraphic Unit	EMS	Site Rationale	Frequency	Parameters
MW21-08	Unknown	E327920	Monitors impacts due to seepage downgradient of West Zone Portal.	Semi-annual (late spring[1] and fall[2])	Analytics Groundwater elevation
MW13	Depth not available Deep bedrock5	E221657	Monitors impacts due to seepage downgradient of Northwest Pit.	Semi-annual (late spring[1] and fall[2])	Analytics Groundwater elevation
MW16-01S	3.15 - 4.15 Gravelly Till	E327913	Monitors impacts due to seepage downgradient (to the south) of TSF/FSTSF. These two wells will continue to be monitored until inundated by expansion of the SSCP. No new wells proposed as replacement as seepage reports to MZP. Seepage downgradient of MZP is monitored.	Semi-annual (late spring[1] and fall[2])	Analytics Groundwater elevation
MW16-01D	18.85 - 25.05 Shallow bedrock	E327912		Semi-annual (late spring[1] and fall[2])	Analytics Groundwater elevation
MW19-01	8.4 – 10.2 Shallow bedrock	E327916	Monitors water quality upgradient of TSF/FSTSF at New Sand Borrow Area. Reference location for monitoring background water quality (i.e., non- mine contact water).	Semi-annual (late spring[1] and fall[2])	Analytics Groundwater elevation
MW19-03 (Proposed)	7.2 – 8.7 Shallow bedrock	Proposed	Proposed to be added to monitoring program as reference location to monitor background water quality upgradient of mine impact. Located next to main road north of North lobe pit and borrow areas.	Semi-annual (late spring[1] and fall[2])	Analytics Groundwater elevation
QR-19-08A	7.6 – 12.8 Shallow bedrock	E327921	Monitors impacts due to seepage downgradient of the FSTSF, East Waste Rock Pile.	Semi-annual (late spring[1] and fall[2])	Analytics Groundwater elevation
QR-19-08B	2.4 – 4.4 Gravelly Till	E327922		Semi-annual (late spring[1] and fall[2])	Analytics Groundwater elevation

Notes:

1. Late spring means the period of the years where groundwater levels are expected at their highest, following freshet.
2. Fall means the period of the year where groundwater levels are expected to be at their lowest.
3. Historical debris and blockage in well, creates sampling challenges, MW21-08 added downslope.
4. Groundwater elevation is either recorded continuously via pressure transducers with dataloggers (if installed in the well) or collected manually in the field (if pressure transducer is not installed or is not functioning).
5. From Table 13 of Hydrogeology Existing Conditions Report (Golder 2021).

4. FIELD DATA AND WATER SAMPLE COLLECTION

Surface and groundwater sampling will be conducted by trained personnel according to the procedures, protocols, and safety considerations described in the British Columbia Field Sampling Manual (BC FSM) (BC MOE 2013).

4.1 Field Observation and Measurements

Sampling event observations will be recorded and include at a minimum: water level and/or flow, water colour, any odours, and presence of sediment at the time of sampling. Additional observations may include anything unusual, such as pressure being released upon removal of a monitoring well cap, observations of damage to monitoring well casings, or obstructions upstream of downstream of surface water monitoring locations.

In-situ field measurements will be made with a handheld multiparameter water quality meter that has been calibrated according to the manufacturer's instructions. The calibration results will be logged and maintained for future reference. Water quality meters will be used to measure at a minimum: pH, specific conductance, temperature, turbidity, and dissolved oxygen. Additional parameters that can be measured in situ include TSS, Oxidation Reduction Potential.

Surface water level and flow measurements will be obtained using staff gauges, conventional flow meters, or the volumetric flow (bucket and stopwatch) method. Manual flow measurements will be used to check and calibrate the continuous flow measuring devices at least once per year. Analysis of the flow measurements will be conducted by a qualified hydrologist according to the Manual of British Columbia Hydrometric Standards Version 2.0 (BC ECCS 2018) and the Hydrological Guidelines for Waterpower Projects (LWBC 2005)

Some groundwater wells have pressure transducers installed to record continuous water levels to a datalogger. Manual groundwater level readings will be collected using a water level meter to measure the depth to water. The stickup height of the PVC casing above ground surface will also be recorded. In order to obtain representative groundwater elevations, the water level measurements will be collected before purging or sampling. The water level meter will be cleaned thoroughly before and after use in each well.

4.2 Collecting Samples

Sample collection bottles, filter syringes and filters, and sample preservatives (i.e., sulphuric acid or nitric acid) will be ordered ahead of time from the laboratory. Sample collection, filtering, and preservation of water quality samples will be conducted according to laboratory instructions.

Note that sample preservatives may already be included in the sample bottles provided by the laboratory, so the bottles should not be emptied prior to sample collection or overfilled during sampling collection.

It is important to prevent contamination of the laboratory bottles prior to sample collection. If it is not possible to fill the bottles directly, a clean receptacle triple rinsed with deionized water can be used to collect water to distribute between bottles. Note that prior to groundwater sample collection, the standing water from the well from must be purged.

Sample collection will be documented on Chain of Custody forms (one copy remains for the site and one copy travels with the samples) and in field notes as applicable. Samples will be stored and transported in coolers packed with ice packs and will be submitted to the selected laboratory or laboratories within the sample storage time.

In addition, trip blanks, field blanks, and duplicate samples will be prepared, recorded, and included with the shipment (see Section 4.4).

4.3 Laboratory Analysis

Samples will be submitted to Canadian Association of Laboratory Accreditation accredited laboratories for analysis of water quality parameters specified in Permit PE-12601. Analytical methods will be consistent with the British Columbia Environmental Laboratory Manual (BC ECCS 2020).

Table 4.1 provides a comprehensive list of the water quality parameters recommended to included in the sampling program along with the rationale for inclusion.

Toxicity testing will be conducted following applicable protocols:

- Acute lethality testing: Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout EPS1/RM/13 (Environment Canada 2016a).
- *Daphnia magna* testing: Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to '*Daphnia magna*' EPS1/RM/14 (Environment Canada 2016b).

Table 4.1 Water Quality Parameters Recommended for Sampling Programs

Parameter	Surface Water Sampling	Groundwater Sampling	Reason for Inclusion
Total Ammonia (NH3 and NH4+) as nitrogen	Y	Y	BCWQG-FAL/BCCSR
Nitrate as nitrogen	Y	Y	BCWQG-FAL/BCCSR
Nitrite as nitrogen	Y	Y	BCWQG-FAL/BCCSR
Total nitrogen	Y	Y	Modelling water chemistry
Total phosphorous	Y	Y	BCWQG-FAL

Parameter	Surface Water Sampling	Groundwater Sampling	Reason for Inclusion
Dissolved phosphorous	Y	Y	Modelling water chemistry
Orthophosphate	Y	Y	Modelling water chemistry
Dissolved organic carbon	Y	Y	BCWQG-FAL
Total organic carbon	Y	Y	BCWQG-FAL
pH	Y	Y	BCWQG-FAL
Hardness	Y	Y	Needed to calculate certain guidelines
Specific conductance	Y	Y	Modelling water chemistry
TSS	Y	Y	BCWQG-FAL/BCCSR
TDS	Y	Y	Modelling water chemistry
Turbidity	Y	Y	BCWQG-FAL
Alkalinity	Y	Y	BCWQG-FAL
Acidity	Y	Y	Modelling water chemistry
Chloride	Y	Y	BCWQG-FAL/BCCSR
Fluoride	Y	Y	BCWQG-FAL
Bromide	Y	Y	Modelling water chemistry
Sulphate	Y	Y	BCWQG-FAL/BCCSR
Total Cyanide	Y	Y	BCWQG-FAL
Free Cyanide	Y	Y	No applicable guideline, but part of cyanide speciation
WAD Cyanide	Y	Y	BCWQG-FAL
Cyanate[1]	Y	Y	Cyanide destruction product. Required for modelling water chemistry.
Thiocyanate[1]	Y	Y	
Total thiosalts[1] (thiosulfate, trithionate, and tetrathionate)	Y	Y	Included for tracking mill reagents (currently no data)
Aluminum	Y	Y	BCWQG-FAL
Antimony	Y	Y	BCWQG-FAL/BCCSR
Arsenic	Y	Y	BCWQG-FAL/BCCSR
Barium	Y	Y	BCWQG-FAL/BCCSR
Beryllium	Y	Y	BCWQG-FAL/BCCSR
Boron	Y	Y	BCWQG-FAL/BCCSR
Cadmium	Y	Y	BCWQG-FAL/BCCSR
Calcium	Y	Y	Modelling water chemistry
Chromium	Y	Y	BCWQG-FAL/BCCSR
Cobalt	Y	Y	BCWQG-FAL/BCCSR

Parameter	Surface Water Sampling	Groundwater Sampling	Reason for Inclusion
Copper	Y	Y	BCWQG-FAL/BCCSR
Iron	Y	Y	BCWQG-FAL
Lead	Y	Y	BCWQG-FAL/BCCSR
Magnesium	Y	Y	Modelling water chemistry
Manganese	Y	Y	BCWQG-FAL
Total Mercury	Y	Y	BCWQG-FAL/BCCSR
Molybdenum	Y	Y	BCWQG-FAL/BCCSR
Nickel	Y	Y	BCWQG-FAL/BCCSR
Potassium	Y	Y	Modelling water chemistry
Selenium	Y	Y	BCWQG-FAL/BCCSR
Silver	Y	Y	BCWQG-FAL/BCCSR
Sodium	Y	Y	Modelling water chemistry
Thallium	Y	Y	BCWQG-FAL/BCCSR
Uranium	Y	Y	BCWQG-FAL/BCCSR
Zinc	Y	Y	BCWQG-FAL/BCCSR

Note:

1. Parameters recommended to be added to the current monitoring program. BCWQG-FAL includes both working and approved guidelines.

4.4 Quality Assurance and Quality Control

The purpose of a QA/QC program is to verify the reliability of monitoring data through the implementation of procedures for controlling and monitoring the measurement process. The QA/QC program provides information for the evaluation of the analytical procedures, and for identifying contamination in the field or laboratory. The QA/QC program is conducted at all stages of the sampling program; sample collection, transport, filtration, and analysis. Certified laboratories will conduct analytical QA/QC which is reported in the Certificate of Analysis. Additional information is found in the BC FSM (BC MOE 2013).

Batches of samples submitted for external laboratory analysis will contain a minimum of one duplicate, one trip blank (ordered ahead of time from the laboratory) and one field blank sample (de-ionized water) per parameter analyzed. Blank and duplicate samples will be prepared, preserved, and transported in the same fashion as the other samples.

Trip Blanks and Field Blanks

Field blanks, consisting of distilled de-ionized water, will be exposed to the same conditions and treatments as the water samples collected, and are intended to monitor contamination that may

occur during the sampling event. The standard method for field blanks is as follows: blanks are carried into the field by the sampling staff, bottles are filled with de-ionized distilled water and shipped to the analytical laboratory with the remainder of the samples for analysis.

Field Duplicates

Sample duplicates are intended to evaluate the QA/QC surrounding the sampling methods. Duplicates are prepared by collecting two full sample suites from one location at the same time. When the results are reported back from the analytical laboratory all parameters from the two sample suites are reviewed to confirm likeness or potential of sampling error/ contamination. The review process also considers small-scale natural variations in water quality which may occur over the time scale of collection (~10 minutes). In particular, there is considerable potential for variations in water quality over short-time scales during periods of high sediment loads.

For concentrations less than five times the Detection Limit (DL), the difference between the two duplicate values should not exceed twice the DL value. For concentrations at or greater than five times the DL, the relative percent difference[1] should not exceed 20%.

[1] For duplicate values where A is greater than B, the relative percent difference = 2*(A-B)/(A+B)*100.

5. REPORTING REQUIREMENTS

Effluent that is discharged to the receiving environment is compared to the Permit PE-12601 discharge limits for effluent quality. Receiving surface water quality results are compared to the BCWQG-FAL. Groundwater quality results are compared to the BC Contaminated Sites Regulation (BCCSR), Schedule 3.2 (BC ECCS 2021b).

5.1 Quarterly Water Quality Reporting

Quarterly water quality reporting will be prepared in accordance with Permit PE-12601, and will report on the following:

- Collect and maintain water sample analysis, flow and water level measurements, climate data and water balance, quality assurance data and field measurement data for inspection and submit the data, suitably tabulated, to the Director, Lhtako Dene Nation, Williams Lake First Nation and Xatśūll First Nation each quarter.
- Submit results of the quarterly sub-lethal toxicity testing from site SW2 to the Director, Lhtako Dene Nation, Williams Lake First Nation and Xatśūll First Nation, with a summary of the results, within 30 days of receiving the results from the laboratory.
- Submit all reports within 30 days of the end of the quarter during which the data were collected. Submit sample analysis data and field measurement data in an electronic format suitable for entry into the provincial database system known as EMS.
- Submit all data required to be submitted in this permit by email to the Ministry's Routine Environmental Reporting Submission Mailbox at envauthorizationsreporting@gov.bc.ca or as otherwise instructed by the director.

5.2 Annual Water Quality Reporting

Quarterly water quality reporting will be prepared in accordance with Permit PE-12601, and will report on the following:

- Before March 31st submit a comprehensive Annual Report for the preceding calendar year, to the Director by email at envauthorizationsreporting@gov.bc.ca or as otherwise instructed by the Director, in a form that is suitably tabulated, graphically represented and interpreted and signed off by a Qualified Professional, to the satisfaction of the Director.
- Provide a copy of the annual report to the Lhtako Dene Nation, Williams Lake First Nation and Xatśūll First Nation, at the time the report is submitted to the Director.
- Provide a copy of the annual report to the Quesnel Public Library within 30 days of the report being submitted to the Director.

- The Annual Report must include at minimum, the following:
  a. An evaluation of the impacts of the mining and milling operation on the receiving environment from the previous year.
  b. An update on the construction and performance of the tailings impoundment and dam, including a review of the results and analysis of hydrogeological data from the previous year.
  c. A review and update of the assessment of acid rock drainage potential and water quality impacts.
  d. An update on the progress on reclamation and any updating of the reclamation plan.
  e. The results of any Aquatic Effects Monitoring that may have been done.
  f. An updated Water Balance and Site Water Management Plan.
  g. A review of the Sulphate Adaptive Management Plan implementation.
  h. A review of the groundwater and surface water monitoring program results including:
     i. a review and interpretation of the monitoring data for the preceding calendar year;
     ii. a graphical analysis of any trends in monitoring results with interpretation by a qualified professional;
     iii. an evaluation of the required quality assurance program;
     iv. an evaluation of the performance of the treatment works, identifying any changes recommended;
     v. an update on the water treatment system and associated wastes management with an implementation schedule for any alterations to the treatment and disposal works which may impact the discharge under this Authorization;
     vi. a review of the WQ modeling update in the year it was conducted; and
     vii. a review and recommendations of the surface water Trigger Response Plans, the Sulphate Adaptive Management Plan and SW and GW monitoring programs.
- Include an annual summary of the sub-lethal toxicity testing from site SW2 in the Annual Report, suitably interpreted by a Qualified Professional.
- Submit a summary of annual effluent treatment and discharge rates, treatment system wastes production and disposal rates, and evaluation of the water treatment system efficiencies, with recommendations made by a Qualified Professional for any changes to the treatment process.
- Include results of the final mill tailings slurry sampling and the analytical laboratory results.

REFERENCES

British Columbia Ministry of Energy, Mines and Low Carbon Innovation (EMLI). 2021. Permit M-198. Date issued: July 18, 1994. Date amended (most recent): October 18, 2021.

British Columbia Ministry of Energy, Mines and Petroleum Resources (EMPR) and Ministry of Environment and Climate Change Strategy (ECCS). 2019. Joint Application Information Requirements (JAIR) for Mines Act and Environmental Act Permits. September.

British Columbia Ministry of Environment (BC MOE). 2013. "British Columbia Field Sampling Manual: 2013 Edition." Victoria, British Columbia: Environmental Quality Branch.

British Columbia Ministry of Environment and Climate Change Strategy (BC ECCS). 2018. "Manual of British Columbia Hydrometric Standards Version 2.0." Prepared for the Resources Information Standards Committee. December.

British Columbia Ministry of Environment and Climate Change Strategy (BC ECCS). 2020. "British Columbia Environmental Laboratory Manual, 2020 Edition." Analysis, Reporting and Knowledge Services, Knowledge Management Branch.

British Columbia Ministry of Environment and Climate Change Strategy (BC ECCS). 2021a. "British Columbia Approved Water Quality Guidelines: Aquatic Life, Wildlife & Agriculture - Guideline Summary." Water Quality Guideline Series, WQG-20. Prov. B.C., Victoria B.C.

British Columbia Ministry of Environment and Climate Change Strategy (BC ECCS). 2021b. Environmental Management Act: CONTAMINATED SITES REGULATION. B.C. Reg. 375/96 [includes amendments up to B.C. Reg. 161/2020, February 1, 2020], Schedule 3.2. Consolidated Regulations of British Columbia.

British Columbia Ministry of Environment and Climate Change Strategy (BC ECCS). 2022. Permit 12601. Date issued: March 3, 1994. Date amended (most recent): March 18, 2022.

Environment Canada. 2016a. Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout EPS1/RM/13. Date amended (most recent): February 2016.

Environment Canada. 2016b. Reference Method for Determining Acute Lethality of Effluents to '*Daphnia magna*' EPS1/RM/14. Date amended (most recent): February 2016.

Fisheries and Oceans Canada (DFO). 2022. Metal and Diamond Mining Effluent Regulations of the *Fisheries Act*. Date amended (most recent) June 24.

Golder Associates Ltd. (Golder). 2021. Cariboo Gold Project - Hydrogeology Existing Conditions Report." June 24.

Land and Water British Columbia Inc (LWBC). 2005. "Hydrological Guidelines for Waterpower Projects." July.

APPENDIX D BASELINE RISK ESTIMATES, TRIGGER LEVELS AND SCREENING CRITERIA SELECTION

Contents

Tables

Attachments

1. INTRODUCTION

This Appendix provides the details of the health-based screening criteria selection (e.g., guidelines, standards) used in the development of trigger levels for relevant environmental parameters (soil, air, groundwater, surface water, sediment, and fish tissue) for the Human Health Monitoring and Management Plan (HHMMP). The development of trigger levels was required for the HHMMP as part of Condition #19 of Environmental Assessment Certificate (EAC) #M23-01 granted to the Cariboo Gold Project (the Project) and will be applicable for monitoring at the Mine Site (Mine Site Complex and Bonanza Ledge) and Quesnel River Mill (QR Mill) Project sites. The trigger levels will be used in the Trigger Response Plan that can identify circumstances that require Osisko Development Corp. (ODV) to implement alternative or supplementary mitigation measures, monitoring, or adaptive management. The Trigger Response Plan for the HHMMP is detailed in Section 5.0 of the main report.

As part of the Trigger Response Plan, trigger levels were established for each of the relevant environmental parameters required per Condition #19.3 including soil, groundwater, sediment, surface water, fish tissue, and air. Trigger levels were identified based on available screening criteria from various regulatory jurisdictions. Environmental quality criteria for sediment for the protection of human health are not available from regulatory jurisdictions, therefore soil quality screening criteria were used to identify triggers for sediments. Similarly, there are no screening criteria available for vegetation, therefore soil trigger levels and associated actions were used as a surrogate to assess the potential for effects to vegetation. In addition to the trigger levels, regional background or reference concentrations (from site-specific reference locations), if available, will be considered in the Trigger Response Plan. Applicable background concentrations are also discussed in this Appendix.

A description of the screening criteria considered and the selection approach to identify trigger levels for the relevant environmental media is described in the following sections. It should also be noted that it is expected that trigger levels may require periodic updates as screening criteria and regulatory guidance are updated.

1.1 Regulatory Considerations

The Project is located in British Columbia (BC), and the HHMMP is being prepared under the *BC Environmental Assessment Act* (ENV 2021a). Therefore, preference was given to provincial legislation and guidance on selecting screening criteria. Federal guidance was used to supplement where provincial guidance was not available, or if federal guidance is more current. In BC, the applicable regulation under the *Environmental Management Act* is the Contaminated Sites Regulation (CSR; BC Reg. 375/96, O.C. 1480/96, last amended March 1, 2023, by BC Reg 179/2021).

1.2 Environmental Parameters

For the development of trigger levels, health-based environmental quality criteria from federal, provincial, or international regulatory agencies, were considered for the relevant environmental parameters specified in Condition #19.3b of EAC #M23-01 for the Project. These environmental parameters are summarized in Table 1–1.

Table 1–1: Environmental Parameters Considered in the Development of Trigger Levels

Environmental Medium	Environmental Parameters	Sample/Monitoring Method	Corresponding Plan
Soil and Vegetation	Metals[1]	Co-located soil and vegetation samples	HHMMP
	PAHs[3]		HHMMP
Air Quality	Metals[1]	Time-integrated sampling for metals bound to PM in air	AQMP
	PAHs[3]	Time-integrated sampling for PAHs bound to PM in air	AQMP
	$PM_{2.5}$ and PM_{10} Sulfur Dioxide Nitrogen Dioxide	Continuous monitoring	AQMP
	Meteorological Parameters (wind speed, wind direction, relative humidity, temperature)	Continuous monitoring	AQMP
Groundwater	Metals[1]	-	GWMP
Surface Water	Metals[1]	Co-located surface water and fish tissue samples	AEMP
	PAHs[3]	-	AEMP
Sediment	Metals[1,2]	-	AEMP
Fish	Metals[1]	Co-located surface water and fish tissue samples	AEMP

Notes: AEMP – Aquatic Effects Monitoring Plan; AQMP – Air Quality Monitoring Plan; GWMP – Groundwater Monitoring Plan; HHMMP – Human Health Monitoring and Management Plan; PAH – polycyclic aromatic hydrocarbon; $PM_{2.5}$ and PM_{10} – Particulate matter (2.5 and 10 microns [µm]);- = sampling/monitoring method not specified per Schedule B, Condition 19

[1] Metals parameters for monitoring include antimony, aluminum, arsenic, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, nickel, selenium, and cyanide (only included for soil, surface water and sediment).

[2] While metals analysis other than cyanide was not specified for sediment in Condition #19, for the purpose of considering potential effects from sediment for human health, the other metals parameters (i.e., antimony, aluminum, arsenic, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, nickel, selenium) were recommended to be sampled in sediment for the HHMMP.

[3] PAH suite based on the EAC Application will be monitored.

2. SOIL

Soil screening criteria considered for the development of trigger levels are provided by land use type. Although some areas within the Project site footprints may be disturbed by existing mining operations (e.g., QR Mill) and future Project operations, which is reflective of industrial land use, residential land use was conservatively selected for the development of trigger response levels, where applicable. The following sources were considered for selecting soil screening criteria:

- British Columbia Contaminated Sites Regulation (BC CSR) Schedule 3.1 – Numerical Soil Standards (BC CSR 2023a) — The Numerical Soil Standards are typically based on an allocation of 20% of the provisional tolerable daily intake of soil (i.e., assuming 20% of a person's tolerable daily intake of a chemical comes from soil, and the remaining 80% comes from other sources such as food and water). The CSR soil standards are divided into six categories and two sub-categories based on land use: wildlands (subdivided into natural and reverted), agricultural, urban park, residential (subdivided into low density and high density), commercial, and industrial. The residential low density land use was considered applicable. The intake of contaminated soil site-specific factor from Schedule 3.1 – Part 1 Matrix Numerical Soil Standards was considered applicable for developing trigger response levels in soil. In the absence of this site-specific factor, generic human health standards from Schedule 3.1 – Part 2 Generic Numerical Soil Standards to Protect Human Health were presented.
- CCME (Canadian Council of Ministers of the Environment; current to 2024a) Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health—The CCME soil quality guidelines for protection of human health are typically based on an allocation of 20% of the provisional tolerable daily intake of soil (i.e., assuming 20% of a person's tolerable daily intake of a chemical comes from soil, and the remaining 80% comes from other sources such as food and water). The CCME soil quality guidelines are divided into categories based on land use (agricultural, residential/parkland, commercial, and industrial). The residential/parkland guidelines were considered applicable. The human health guidelines/check values for soil ingestion or direct contact were used. In the absence of these guidelines/check values, the generic guideline was presented.
- US EPA (United States Environmental Protection Agency; 2023a) Regional Screening Level (RSL) for Resident Soil—The US EPA RSLs are risk-based screening criteria that are based on an acceptable hazard quotient of 1 for non-carcinogens, and an acceptable incremental lifetime cancer risk of 1 in 1,000,000 for carcinogens. The British Columbia Ministry of the Environment and Climate Change (ENV) (2021a) and CCME (1999) apply a soil allocation factor of 20% in the derivation of soil criteria and Health Canada (2010, 2021a) considers a hazard quotient of 0.2 in order to account for background exposure. Therefore, for non-carcinogens, RSLs were adjusted by a factor of 0.2 to reflect an allocation of 20% of a

person's tolerable daily intake from soil. ENV (2022) and Health Canada (2010, 2021a) consider an incremental lifetime cancer risk of 1 in 100, 000 to be acceptable. Therefore, for carcinogens, RSLs were adjusted to an incremental lifetime cancer risk of 1 in 100,000 to be consistent with provincial and federal guidance.

The following hierarchy was used to select the soil screening criteria for the development of trigger levels:

1) The more conservative value (i.e., lower) between:
    a. BC CSR residential low density pathway-specific standard;
    b. CCME residential/parkland pathway-specific standard;
2) US EPA RSL;
3) BC CSR generic human health standard; and
4) CCME generic guideline.

The soil quality criteria from the above agencies and the selected soil screening criteria are presented in Attachment D, Table D-2. The applicable regional background soil concentrations are available for the Cariboo region (Region 5) in Protocol 4 for Contaminated Sites: Establishing Local Background Concentrations in Soil (ENV 2021b). Regional background soil concentrations were also included in Table D-2.

3. GROUNDWATER

Health-based drinking water criteria were selected over aesthetic or operational criteria (i.e., criteria that were not derived specifically for human health). The following sources were considered for selecting groundwater screening criteria:

- ENV (2020a) Source Drinking Water Guidelines—The guidelines were developed to protect water quality used for drinking water purposes and apply to ambient water (e.g., rivers, lakes, and streams) prior to treatment and distribution. The guidelines are generally based on Health Canada's Guidelines for Canadian Drinking Water Quality (see below), but some were adopted from other jurisdictions or developed by ENV. The ENV (2020a) provides guidelines based on health and aesthetic effects:
    - MAC: Guideline established to be protective of health effects.
    - AO: Guideline is based on taste, smell, or colour and is not associated with health effects. An aesthetic objective was only selected in the absence of a MAC.
- BC CSR (2023b) Schedule 3.2 Generic Numerical Water Standards—The CSR water standards are divided into aquatic life (freshwater and marine), irrigation water, livestock water, and drinking water. The drinking water standards were considered applicable for human health and selected as the BC CSR drinking water standard.
- Health Canada (2024) Guidelines for Canadian Drinking Water Quality—The guidelines apply when groundwater or surface water may be used for drinking water purposes. Health Canada provides drinking water quality guidelines based on health effects and aesthetic effects as listed below:
    - Maximum Acceptable Concentration (MAC): Health-based guidelines, which are established based on the health effects associated with each parameter and exposure levels. Where available, MAC was selected preferentially over the aesthetic objective.
    - Aesthetic Objectives (AO): Based on aesthetic effects (e.g., taste, odour, and colour). An aesthetic objective was only selected in the absence of a MAC.
- Health Canada's health-based guidelines (or MACs) were established from comprehensive review of current, published scientific research (Health Canada 2024). The guidelines (or MACs) were generally derived using an average daily intake of 1.5 L of drinking water by a 70 kg adult. However, for some constituents, regulatory agencies have developed guidelines based on intake of the most sensitive sub-population (e.g., children). For non-carcinogenic constituents, a 20% allocation of the total daily intake to drinking water was generally applied (i.e., assuming 20% of a person's tolerable daily intake from a chemical comes from water, and the remaining 80% comes from other sources such as

food), unless data on the proportion of total intake normally ingested in drinking water were available (Health Canada 1995).

- US EPA (2023a4a) RSL for Resident Tap Water—The tap water RSLs are risk-based criteria applicable to water at the point of exposure (e.g., from the tap, post-treatment). As discussed in Section 2 for soils, non-carcinogenic RSLs were adjusted to a hazard quotient of 0.2 and carcinogenic RSLs were adjusted to an incremental lifetime cancer risk of 1 in 100,000 to be consistent with provincial and federal guidance.

The following hierarchy was used to select the groundwater screening criteria for the development of trigger levels:

1) ENV Source Drinking Water Guideline (health-based);

2) ENV CSR drinking water standard;

3) Health Canada health-based guideline; and

4) US EPA RSL.

The groundwater screening criteria from the above agencies and the selected groundwater screening criteria are presented in Attachment D, Table D-3. The selected groundwater screening criteria are considered protective of both potable use and dermal contact.

4. SEDIMENT

Changes to sediment quality are not anticipated as a result of the Project as settled particles are not expected to be present in a large enough volume to be detectable. Potential changes to sediment quality will be monitored and addressed as part of the receiving environment monitoring programs.

Human health-based guidelines for sediment were unavailable from provincial, federal, and other jurisdictions; therefore, soil quality screening criteria for the protection of human health (described in Section 2) were used for sediment (BC CSR 2023a). ENV (2021c) recommends the use of soil screening criteria for identify chemicals of potential concern if substances are considered to be non-bioaccumulative. For bioaccumulative substances, ENV (2021c) recommends using ecological standards in CSR Schedule 3.4 to identify chemicals of potential concern in sediment for human health in a risk assessment. None of the environmental parameters in sediment were considered to be bioaccumulative; therefore, soil quality criteria were considered applicable for screening sediment and are presented in Attachment D, Table D-2.

5. SURFACE WATER

People who access the Site may use surface water as a drinking water source or come in contact with surface water during recreational activities (e.g., fishing, canoeing). Health-based drinking water criteria were selected over aesthetic or operational criteria (i.e., criteria that were not derived specifically for human health). The following sources were considered for selecting surface water screening criteria:

- ENV (2020) Source Drinking Water Guidelines—The guidelines were developed to protect water quality used for drinking water purposes and apply to ambient water (e.g., rivers, lakes, and streams) prior to treatment and distribution. The guidelines are generally based on Health Canada's Guidelines for Canadian Drinking Water Quality (see below), but some were adopted from other jurisdictions or developed by ENV. ENV (2020) provides guidelines based on health and aesthetic effects:
    - MAC: Guideline established to be protective of health effects. Where available, MAC was selected preferentially over the aesthetic objective.
    - AO: Guideline is based on taste, smell, or colour and is not associated with health effects. An aesthetic objective was only selected in the absence of a MAC.
- BC CSR (2023b) Schedule 3.2 Generic Numerical Water Standards—The CSR water standards are divided into aquatic life (freshwater and marine), irrigation water, livestock water, and drinking water. The drinking water standards were considered applicable for human health and selected as the BC CSR drinking water standard.
- Health Canada (2024) Guidelines for Canadian Drinking Water Quality—The guidelines apply when groundwater or surface water may be used for drinking water purposes. The drinking water quality guidelines are intended to be applied at the point of exposure (e.g., from the tap, post-treatment), but are used conservatively for the purpose of trigger level development for surface water. The Health Canada guidelines are described in more detail in Section 0.
- US EPA (2023a4a) RSL for Resident Tap Water—The tap water RSLs are risk-based criteria applicable to water at the point of exposure (e.g., from the tap, post-treatment), but are used conservatively for the purpose of trigger level development for surface water. As discussed in Section 2 for soil, non-carcinogenic RSLs were adjusted to a hazard quotient of 0.2 and carcinogenic RSLs were adjusted to an incremental lifetime cancer risk of 1 in 100,000.

The following hierarchy was used to select the surface water screening criteria for the development of trigger levels:

1) ENV Source Drinking Water Guideline (health-based);
2) ENV CSR drinking water standard;
3) Health Canada health-based guideline; and
4) US EPA RSL.

The surface water quality criteria from the above sources and the selected human health criteria are presented in Attachment D Table D-3. The selected surface water screening criteria are considered protective of both potable and recreational (e.g., dermal contact) use.

6. FISH TISSUE

Site-specific fish tissue screening criteria were derived using acceptable risk levels and fish ingestion rates appropriate for local Indigenous populations. Fish tissue criteria were calculated based on the Health Canada (2021a) equation for ingestion of foods as follows, which is similar to the approach used by ENV (2014) to calculate a fish ingestion guideline for selenium:

Equation 1

$$\text{Dose (mg/kg bw/day)} = \frac{C_{fish} \times IR_{fish} \times RAF_O \times D_2 \times D_3 \times D_4}{BW \times LE}$$

Where:

C_{fish} = concentration of constituent in fish muscle (mg/kg ww)

IR_{fish} = fish ingestion rate (kg/day)

RAF_O = oral relative absorption factor (unitless)

D_2 = days per week fish is consumed / 7 days

D_3 = weeks per year fish is consumed / 52 weeks

D_4 = total years consuming fish (for assessment of carcinogens only)

BW = body weight (kg)

LE = life expectancy (years) (for assessment of carcinogens only)

A hazard quotient is used to estimate non-carcinogenic risk as follows:

Equation 2

$$HQ = \frac{Dose}{RfD}$$

Where:

Dose = exposure dose for ingestion of fish muscle (mg/kg bw/day)

RfD = reference dose (mg/kg bw/day)

To calculate the non-cancer fish tissue screening criteria, the dose in Equation 1 is substituted for the reference dose multiplied by the hazard quotient (i.e., Equation 2 solved for the dose term). The resulting equation was then rearranged to solve for the fish tissue concentration (C_{fish}):

Equation 3

$$\mathrm{RfD} \times \mathrm{THQ} = \frac{\mathrm{C}_{fish} \times \mathrm{IR}_{fish} \times \mathrm{RAF_O} \times \mathrm{D_2} \times \mathrm{D_3}}{\mathrm{BW}}$$

Adjustments to Equation 3 include:

- The D_4 and LE terms were excluded as these are only applicable for carcinogens.
- The HQ term was changed to target hazard quotient (THQ).

The equation for calculating the non-cancer fish tissue criteria is presented below.

Equation 4

$$\mathrm{Non-cancer\ Screening\ Criteria\ (mg/kg\ ww)} = \frac{\mathrm{THQ} \times \mathrm{RfD} \times \mathrm{BW}}{\mathrm{IR_{fish}} \times \mathrm{RAF_O} \times D_2 \times D_3}$$

Where:

THQ = target hazard quotient (unitless)

RfD = reference dose (mg/kg/day)

BW = body weight (kg)

IR_{fish} = fish ingestion rate (kg/day)

RAF_O = oral relative absorption factor (unitless)

D_2 = days per week fish is consumed

D_3 = weeks per year fish is consumed

An incremental lifetime cancer risk is used to estimate carcinogenic risk as follows:

Equation 5

$$\mathrm{ILCR} = Dose \times SF$$

Where:

Dose = exposure dose for ingestion of fish muscle (mg/kg bw/day)

SF = slope factor $(\mathrm{mg/kg\ bw/day})^{-1}$

To calculate the cancer fish tissue screening criteria, the dose in Equation 1 is substituted for the incremental lifetime cancer risk divided by the slope factor (i.e., Equation 5 solved for the dose term). The resulting equation was then rearranged to solve for the fish tissue concentration (C_{fish}):

Equation 6

$$\frac{ILCR}{SF} = \frac{C_{fish} \times IR_{fish} \times RAF_O \times D_2 \times D_3 \times D_4}{BW \times LE}$$

The ILCR term in Equation 6 was changed to target incremental lifetime cancer risk (TILCR).

The equation for calculating the cancer fish tissue criteria is presented below.

Equation 7

$$\text{Cancer Screening Criteria (mg/kg ww)} = \frac{TILCR \times BW \times LE}{IR_{fish} \times SF \times RAF_O \times D_2 \times D_3 \times D_4}$$

Where:

TILCR = target incremental lifetime cancer risk (unitless)

BW = body weight (kg)

LE = life expectancy (years)

IR_{fish} = fish ingestion rate (kg/day)

SF = slope factor $(mg/kg/day)^{-1}$

RAF_O = oral relative absorption factor (unitless)

D_2 = days per week fish is consumed / 7 days

D_3 = weeks per year fish is consumed / 52 weeks

D_4 = total years consuming fish (years)

Non-cancer criteria were calculated for both a toddler and an adult. For mercury (assumed to be methylmercury), the criterion is protective of women of child-bearing age and children under 12 years of age. Cancer criteria were calculated for an adult only, as this is the life stage with the longest exposure duration (60 years) that would result in the most conservative criterion. The lowest calculated criterion (of the non-carcinogenic and carcinogenic criteria) was used to develop trigger levels for fish tissue. The inputs used to derive the fish tissue criteria are presented in Attachment D, Table D-4.

Table 6–1: Inputs for Calculating Fish Tissue Criteria

Input	Units	Toddler	Adult	Source
Body weight (BW)	kg	16.5	70.7	Health Canada (2021a)
Fish ingestion rate (IR_{fish})	kg/day	0.050[a]	0.099	Adult ingestion rate from Chan et al. (2011)
Relative absorption factor for oral exposure (RAF_O)	-	1	1	Health Canada (2021a)
Target hazard quotient (THQ)	-	0.2	0.2	Health Canada (2021a)
Target incremental lifetime cancer risk (TILCR)	-	-	0.00001	BC ENV (2022); Health Canada (2021a)
Life expectancy (LE)	years	-	80	Health Canada (2021a)
Days per week fish is consumed (D_2)	days	7	7	Assumed
Weeks per year fish is consumed (D_3)	weeks	52	52	Assumed
Total years exposed to site (life stage duration) (D_4)	years	-	60	Health Canada (2021a)
Reference dose (RfD)	mg/kg/day	Chemical-specific (Attachment D, Table D-4)		
Slope factor (SF)	$(mg/kg/day)^{-1}$			

Notes: - = not applicable; kg = kilogram; kg/day = kilogram per day; mg/kg/day = milligrams per kilogram per day.

a. Toddler ingestion rate estimated assuming 50% of adult ingestion rate (Health Canada 2007).

Additional information on the inputs used to derive the fish tissue criteria are provided below:

- Fish consumption data from Chan et al. (2011) were used to calculate fish ingestion rates representative of local Indigenous populations. The highest heavy consumer (95^{th} percentile) salmon (any type) ingestion rate was conservatively selected (0.099 kg/day, for men aged 19-50). The selected fish ingestion rate is more conservative than the Health Canada (2007) finfish consumption rate of 0.040 kg/day for the subsistence fisher. To adjust this adult consumption rate to a toddler consumption rate using data from Chan et al., the relative difference in fish consumption ingestion rates for toddlers (0.020 kg/day) and adults (0.040 kg/day) from Health Canada (2007) was considered (i.e., a 50% difference). Therefore, 50% of the adult consumption rate of 0.099 kg/day was used to derive a toddler consumption rate of 0.050 kg/day.
- Toxicity reference values were selected preferentially from the US EPA IRIS (2024a) and Health Canada (2021b) and were based on the more current TRV from these two primary sources, current scientific understanding and appropriate study methodologies. If a TRV was not available from US EPA or Health Canada, then other sources were consulted (e.g., Agency for Toxic Substances and Disease Registry, Netherlands National Institute of Public Health and the Environment, World Health Organization) to identify a TRV based on the most current information. The TRVs used to calculate the fish tissue criteria are presented in Attachment D, Table D-5.

- Default body weights, life expectancy, and total years exposed to site were obtained from (Health Canada 2021a).
- The relative absorption factor for oral exposure was assumed to be 100% (Health Canada 2021a).
- The fish tissue criteria are based on a target hazard quotient of 0.2 and a target incremental lifetime cancer risk of 1 in 100,000 consistent with ENV (2022) and Health Canada (2021a) guidance.

ENV (2001) have derived a mercury fish tissue criterion for the protection of people consuming a diet based primarily on fish. Criteria were derived based on weekly consumption rates ranging from 210 to 1,050 g wet weight (ww), which corresponds to screening criteria ranging from 0.1 to 0.5 mg/kg ww for total mercury. However, the mercury (assumed to be methylmercury) fish tissue screening value was derived using the approach and equations presented above because it results in a more conservative screening value (0.013 mg/kg ww). The derived criterion is protective of women of child-bearing age and children under 12 years of age and the TRV was obtained from Health Canada (2021b).

ENV (2014) derived human consumption screening values for selenium based on high (220 g/day), moderate (111 g/day), and low (21.5 g/day) consumers of fish. The resulting fish tissue screening values for selenium are 1.83, 3.63 and 18.7 mg/kg ww, respectively. ENV (2014) calculated selenium screening values for an adult only and based on a target hazard quotient of 1. To account for toddler fish consumption, a target HQ of 0.2, and the site-specific fish ingestion rates, the selenium fish tissue screening value for both a toddler and adult was derived using the approach and equations presented above.

The fish tissue screening criteria used to develop trigger response levels are presented in Attachment D, Tables D-4.

7. AIR

Air quality criteria were selected from the agencies described below.

British Columbia Ministry of the Environment and Climate Change

In BC, air quality objectives are developed ENV (2021e) under the authority of the *Environmental Management Act*. Air quality criteria are available for criteria air contaminants and are presented for time weighted averages of 1-hour, 24-hour, and annual (yearly) (ENV 2021e). A pollution control objective is available for reference purposes for carbon monoxide (1-hour and 8-hour) for food-processing, agriculturally oriented, and other industries. The air quality objectives were developed using air quality criteria from provincial and federal governing bodies and are non-legally binding limits to help inform decisions with respect to the management of air quality, including guiding decisions on environmental impact assessments and informing regulatory development.

Canadian Council of Ministers of the Environment

Air quality in Canada is regulated by standards set by the Canadian Council of Ministers of the Environment (CCME), an inter-governmental body of federal, provincial, and territorial ministers responsible for the environment. In 2012, a Canada-wide Air Quality Management System was implemented as one approach to try to reduce air pollution in Canada. The Canadian Ambient Air Quality Standards (CAAQS), which are established as objectives under the *Canadian Environmental Protection Act* (1999), have been developed for particulate matter with a mean aerodynamic diameter of 2.5 microns (µm) or smaller ($PM_{2.5}$), ozone, sulphur dioxide, and nitrogen dioxide. Targets for these constituents are set for 2015 ($PM_{2.5}$ and ozone only), 2020, and 2025 (ozone, sulphur dioxide, and nitrogen dioxide only) (CCME 2024b).

Agency for Toxic Substances and Disease Registry

The Agency for Toxic Substances and Disease Registry (ATSDR) is a federal public health agency of the United States Department of Health and Human Services. The ATSDR derives Minimal Risk Levels (MRLs) for non-carcinogenic health effects (ATSDR 2024). The MRLs are based on data that identify the target organ(s) of effect or the most sensitive health effect(s) for a specific duration for a given route of exposure to the substance. The ATSDR generally uses the No Observed Adverse Effect Level / Uncertainty Factor approach to derive MRLs. Physiologically-based pharmacokinetic modelling and benchmark dose modelling have also been used in deriving MRLs. Acute MRLs are derived for exposure durations of 1 to 14 days. Intermediate MRLs are derived for exposure durations of 15 to 364 days. Chronic MRLs are derived for exposure durations greater than or equal to 365 days.

The ATSDR MRLs are generally based on the most sensitive endpoint considered to be of relevance to humans. The ATSDR applies a protective approach (i.e., application of margins of safety) to address uncertainty for those people who might be most sensitive (e.g., infants, elderly and nutritionally or immunologically compromised people). Supporting documentation is available for the MRLs used in this assessment.

United States Environmental Protection Agency National Ambient Air Quality Standards

The United States Environmental Protection Agency (US EPA) has developed National Ambient Air Quality Standards (NAAQS) for widespread pollutants that are considered harmful to human health as part of the *Clean Air Act*. These six criteria pollutants include carbon monoxide, lead, nitrogen dioxide, ozone, PM_{10}, $PM_{2.5}$, and sulphur dioxide (US EPA 2024b). A primary and/or secondary standard is set for each of the criteria pollutants. Primary standards are intended to protect sensitive populations, including children, the elderly, and those with pre-disposed respiratory illnesses (e.g., asthma). Secondary standards are intended to be protective of public welfare (e.g., damage to animals, crops, vegetation, and buildings).

United States Environmental Protection Agency Regional Screening Levels

The US EPA (2023a) has developed residential air Regional Screening Levels (RSL) for the protection of human health. The RSL are risk-based concentrations derived from standardized equations combining exposure information assumptions with US EPA toxicity data. The RSL were adjusted for residential phase exposure factors based on default assumptions for an adult. The RSL are considered by the US EPA to be protective of human exposure (including sensitive groups) over a lifetime. Chemical concentrations above the RSL do not automatically constitute a health risk; however, exceeding an RSL suggests that further evaluation of the potential risks is appropriate. The US EPA RSL for non-carcinogens are based on a hazard quotient (HQ) of 1.0, and for carcinogens are based on a risk level of 1 in 1,000,000. The carcinogenic RSL were multiplied by a factor of 10 to adjust to a risk level of 1 in 100,000 to be consistent with the acceptable risk level in BC (ENV 2022).

World Health Organization

The World Health Organization (WHO) has developed air quality guidelines to provide a basis for protecting public health from adverse effects of air pollution (WHO 2010, 2021). The guidelines are intended to provide background information and guidance to governments in making risk management decisions, particularly in setting standards. These guidelines may also be used in planning processes and various management decisions at a community or regional level. Supporting documentation is available for the WHO guidelines. The air quality guidelines for non-carcinogens are based on a HQ of 1.0 and for carcinogens are provided for a cancer risk level of 1 in 100,000.

Ontario Ministry of the Environment, Conservation and Parks

The Ontario Ministry of the Environment, Conservation and Parks (MECP) has developed Ambient Air Quality Criteria (AAQC) to assess air quality (MECP 2020). The AAQC is a concentration in air that is protective against adverse effects on human health and/or the environment. The MECP have adopted the CCME CAAQS.

The AAQCs are provided for 1-hour, 24-hour, and annual averaging periods. Criteria for 1-hour averaging times are developed to be protective against acute health effects, whereas criteria for 24-hour and annual averaging times set to protect against chronic health effects. In general, the MECP AAQCs for carcinogens are based on a risk level of 1 in 1,000,000. The MECP standards were multiplied by a factor of 10 to adjust to a risk level of 1 in 100,000 to be consistent with the acceptable risk level in BC (ENV 2022). Air standards for non-carcinogens are generally derived from reference concentrations (chosen based on available peer-reviewed toxicological information and key studies with associated limiting or critical effect[s]). The air standards for non-carcinogens are generally set at a target HQ of 1.0.

The MECP has also developed Air Contaminant Benchmarks (ACB), which are standards, guidelines and screening levels for assessing point of impingement concentrations (MECP 2023). ACBs are available for 24-hour averaging periods. ACBs were selected as the air screening criteria (for 24-hour averaging time) if MECP AAQC were unavailable.

California Office of Environmental Health Hazard Assessment

The California Office of Environmental Health Hazard Assessment (Cal OEHHA 2020) Reference Exposure Levels (REL) are concentrations of a chemical at or below which adverse non-carcinogenic health effects are not anticipated to occur in a human population, including in sensitive subgroups (e.g., infants and children), for a specific exposure duration (Cal OEHHA 2008). The REL are used in risk assessments to evaluate the potential for adverse non-carcinogenic public health effects from facility emissions or similar localized sources in the Air Toxics Hot Spots Program, and from widespread exposures in the Toxic Air Contaminants program. Supporting documentation is available for most of the REL. The chronic REL for non-carcinogens are based on a HQ of 1.0.

The Cal OEHHA does not develop REL or air quality guidelines or objectives for carcinogens. Rather, the Cal OEHHA has developed inhalation unit risks (IURs) for use in cancer risk assessments (Cal OEHHA 2009, 2023). Cal OEHHA was contacted regarding the use of their IUR factors for screening purposes. Mr. Chris Halm of the California Environmental Protection Agency Air Resources Board indicated that IURs can be adjusted based on an applicable cancer risk level and used as air criteria (Halm 2010, pers. comm.). The Cal OEHHA IURs are based on a cancer risk level of 1 in 1,000,000; this level was divided by the IUR and multiplied by a factor of 10 to derive an air criterion for a risk level of 1 in 100,000 to be consistent with the acceptable risk level in BC (ENV 2022).

Texas Commission on Environmental Quality

The Texas Commission on Environmental Quality (TCEQ) has developed acute (1-hour) and chronic Effects Screening Levels (ESL) that are used in the air permitting process to evaluate emissions predicted by air dispersion modelling. The TCEQ (2015) outlines the approach and methods used to derive the ESL, and their application. The final ESL are calculated from reference values and adjusted to a HQ of 0.3. The ESLs for carcinogens are based on a risk level of 1 in 100,000. The short-term ESL are based on health effects, the potential for odours to be a nuisance, and effects on vegetation. The long-term ESL are based on data concerning chronic health and vegetation effects.

The TCEQ has also developed Air Monitoring Comparison Values (AMCVs), which are based on reference values derived from toxicological data (i.e., lowest observed adverse effect level [LOAEL] and no observed adverse effect level [NOAEL]) (TCEQ 2015). The AMCVs are based on a HQ of 1.0.

Where a final ESL is available for an environmental parameter (which is based on a HQ of 0.3), the AMCV (which is based on a HQ of 1.0), was selected as the TCEQ air criteria. For parameters where an interim ESL is available, the ESL and AMCV are the same and are selected as the TCEQ air criteria.

The TCEQ ESL and AMCVs were obtained by querying the Texas Air Monitoring Information System database (TCEQ 2023). The ESL are not ambient air standards. The ESL are used in the air permit review process, for review of air permit applications, where emissions of one constituent from one site are evaluated at a time (emissions from multiple sites or multiple chemicals are not evaluated). If predicted airborne levels of a constituent do not exceed the screening level, adverse health effects are not expected. If predicted ambient levels of constituents in air exceed the screening levels, it does not necessarily indicate a problem, but rather triggers a more detailed review.

Acute Air Criteria

The 1-hour and 24-hour health-based air criteria were obtained from the following agencies and selected based on the following hierarchy:

- Primary Sources:
    - ENV, and
    - CCME,
- Secondary Sources:
    - ATSDR,
    - US EPA NAAQS, and
    - WHO.

- Tertiary Sources:
    - MECP,
    - Cal OEHHA (available for 1-hour air criteria only), and TCEQ.

Air criteria were preferentially selected from the primary sources, followed by the secondary sources, and then the tertiary sources. The lowest health-based air criterion with supporting information was selected for use in the screening process. However, consideration was also given to relevant test species (i.e., human data versus animal data), study endpoint, study quality, relevance of results to human health, and date of the study. If an air criterion was deemed more appropriate based on those considerations (e.g., criteria is based on more current studies or human data), then this air criterion was preferentially selected over more conservative criteria.

The selected acute inhalation air criteria are provided in Attachment D, Table D-5a and D-5b. The air criteria shown in these tables are based on a HQ of 1.0. When background exposure is considered, the acceptable risk level is an HQ of 1.0 (Health Canada 2017).

Chronic Air Criteria

The annual health-based air criteria were obtained from the following agencies:

- Primary:
    - ENV, and
    - CCME.
- Secondary:
    - ATSDR,
    - US EPA NAAQS and Resident Air RSLs
    - WHO.
- Tertiary
    - MECP,
    - Cal OEHHA, and,
    - TCEQ.

Air criteria were selected preferentially from the primary sources, followed by the secondary sources, and then the tertiary sources. The lowest health-based air criterion with supporting information was selected for use in the screening process, however, consideration was also given to relevant species (i.e., human data versus animal data), study endpoint, study quality, and date of the study. If an air criterion was deemed more appropriate based on those considerations (e.g., criteria is based on more current studies or human data), then the air criterion was preferentially selected over more conservative criteria.

Carcinogenic risk levels for which the air criteria were derived were standardized to risk levels considered acceptable by Health Canada (2021a) and ENV (2022). For carcinogenic chemical parameters, this involved adjusting air criteria to a risk level of 1 in 100,000 (i.e., 1×10^{-5}). For parameters with both non-carcinogenic and carcinogenic criteria, the lowest of the two criteria was selected.

The selected annual air screening criteria are provided in Attachment D, Table D-5c. When background exposure is considered, the acceptable risk level is an HQ of 1.0 (Health Canada 2017).

8. REFERENCES

- ATSDR (Agency for Toxic Substances and Disease Registry). 2024. Minimal Risk Levels (MRLs) for Hazardous Substances. January 2024. US Department of Health and Human Services, Public Health Service. Available at: https://wwwn.cdc.gov/TSP/MRLS/mrlsListing.aspx.
- BC CSR (British Columbia Contaminated Sites Regulation). 2023a. Environmental Management Act. Contaminated Sites Regulation. BC Reg. 375/96. Schedule 3.1 – Numerical Soil Standards. Available at: https://www.bclaws.gov.bc.ca/civix/document/id/complete/statreg/375_96_07.
- BC CSR. 2023b. Environmental Management Act. Contaminated Sites Regulation. BC Reg. 375/96. Schedule 3.2 – Generic Numerical Water Standards. Available at: https://www.bclaws.gov.bc.ca/civix/document/id/complete/statreg/375_96_08.
- Cal OEHHA (California Office of Environmental Health Hazard Assessment). 2023. Appendix A: Hot Spots Unit Risk and Cancer Potency Values. Updated April 2023. Available at: Appendix A: Hot Spots Unit Risk and Cancer Potency Values.
- Cal OEHHA. 2020. OEHHA Acute, 8-hour and Chronic Reference Exposure Level (REL) Summary, as of August 2020. Air Toxicology and Epidemiology Branch, Office of Environmental Health Hazard Assessment. Oakland, CA. Available at: https://oehha.ca.gov/air/general-info/oehha-acute-8-hour-and-chronic-reference-exposure-level-rel-summary.
- Cal OEHHA. 2009. Technical Support Document for Cancer Potency Factors: Methodologies for derivation, listing of available values, and adjustments to allow for early life stage exposures. Air Toxicology and Epidemiology Branch, Office of Environmental Health Hazard Assessment. Oakland, CA. May 2009. Available at: Technical Support Document for Cancer Potency Factors.
- Cal OEHHA. 2008. Technical Support Document for the Derivation of Noncancer Reference Exposure Levels. Air Toxic Hot Spots Risk Assessment Guidelines. Air Toxicology and Epidemiology Branch, Office of Environmental Health Hazard Assessment. Oakland, CA. June 2008. Available at: Air Toxics Hot Spots Risk Assessment Guidelines: Technical Support Document for the Derivation of Noncancer Reference Exposure Levels.
- CCME (Canadian Council of Ministers of the Environment). Current to 2024a. Canadian Environmental Quality Guidelines for the Protection of Environmental and Human Health, Canadian Environmental Quality Guidelines. Available at: https://ccme.ca/en/summary-table.

- CCME. 1999. A Protocol for the Derivation for Environmental and Human Health Soil Quality Guidelines.
- CCME. 2024b. Canadian Ambient Air Quality Standards. CCME. Available at: https://ccme.ca/en/air-quality-report.
- Chan L, Receveur O, Sharp D, Schwartz H, Ing A, and Tikhonov C. 2011. First Nations Food, Nutrition and Environment Study (FNFNES): Results from British Columbia (2008/2009). Prince George: University of Northern British Columbia.
- ENV (British Columbia Ministry of Environment and Climate Change Strategy). 2022. British Columbia Guidance for Prospective Human Health Risk Assessment. Version 2.0. April 2022. Available at: bc-hhra-guidance.pdf (gov.bc.ca).
- ENV. 2021a. Environmental Assessment Act. SBC 2018, Chapter 51. [Current to March 2023]. Available at: https://www.bclaws.gov.bc.ca/civix/document/id/complete/statreg/18051.
- ENV. 2021b. Protocol 4 For Contaminated Sites, Establishing Local Background Concentrations in Soil (Version 11). Available at: https://www2.gov.bc.ca/assets/gov/environment/air-land-water/site-remediation/docs/protocols/p4__jan2021_revisions_final_signed.pdf.
- ENV. 2021c. Protocol 1 for Contaminated Sites, Detailed Risk Assessment (Version 2.0). Available at: https://www2.gov.bc.ca/assets/gov/environment/air-land-water/site-remediation/docs/protocols/p1_jan_2021_revisions_final_signed.pdf.
- BC ENV. 2021d. Protocol 28 For Contaminated Sites: 2016 Standards Derivation Methods (Version 2.0). [updated February 2021]. Available at: https://www2.gov.bc.ca/assets/gov/environment/air-land-water/site-remediation/docs/protocols/p28__jan_2021_revisions_final_signed.pdf.
- ENV. 2021e. Provincial Air Quality Information Sheet - British Columbia Ambient Air Quality Objectives. Updated November 2021. Available at: https://www2.gov.bc.ca/assets/gov/environment/air-land-water/air/reports-pub/prov_air_qual_objectives_fact_sheet.pdf.
- ENV. 2020a. B.C. Source Drinking Water Quality Guidelines: Guideline Summary. Water Quality Guideline Series, WQG-01. Prov. BC, Victoria, BC. Available at: https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/waterquality/water-quality-guidelines/approved-wqgs/drinking-water-and-recreation/source_drinking_water_quality_guidelines_bcenv.pdf.
- ENV. 2014. Ambient Water Quality Guidelines for Selenium: Technical Report Update. Water Protection and Sustainability Branch, Environmental Sustainability and Strategic Policy Division, ENV, Victoria, BC, Canada. Available at:

https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/waterquality/water-quality-guidelines/approved-wqgs/bc_moe_se_wqg.pdf.

- ENV. 2001. Ambient Water Quality Guidelines for Mercury: Overview Report — First Update. Water Protection and Sustainability Branch, Environmental Sustainability and Strategic Policy Division, ENV, Victoria, BC, Canada. [updated February 2001]. Accessed August 2022. Available at: https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/waterquality/water-quality-guidelines/approved-wqgs/mercury-or.pdf.
- Health Canada. 2024. Guidelines for Canadian Drinking Water Quality-Summary Tables. Health Canada, Ottawa, Ontario. June 2024. Available at: https://www.canada.ca/en/health-canada/services/environmental-workplace-health/reports-publications/water-quality/guidelines-canadian-drinking-water-quality-summary-table.html.
- Health Canada. 2021a. Federal Contaminated Site Risk Assessment in Canada, Part I: Guidance on Human Health Preliminary Quantitative Risk Assessment (PQRA), Version 3.0. Federal Contaminated Sites Action Plan. Available at: https://www.canada.ca/en/health-canada/services/environmental-workplace-health/reports-publications/contaminated-sites/federal-contaminated-site-risk-assessment-canada-part-guidance-human-health-preliminary-quantitative-risk-assessment-pqra-version-2-0.html.
- Health Canada. 2021b. Federal Contaminated Site Risk Assessment in Canada: Toxicological Reference Values (TRVs). Version 3.0. Contaminated Sites Division. Safe Environments Directorate. Ottawa, ON.
- Health Canada. 2017. Supplemental Guidance on Human Health Risk Assessment of Air Quality, Version 2.0. Available at: H144-40-2017-eng.pdf (publications.gc.ca).
- Health Canada. 2010. Federal Contaminated Site Risk Assessment in Canada, Part V: Guidance on Human Health Detailed Quantitative Risk Assessment for Chemicals (DQRACHEM). Federal Contaminated Sites Action Plan. Available at: https://www.canada.ca/en/health-canada/services/environmental-workplace-health/reports-publications/contaminated-sites/federal-contaminated-site-risk-assessment-canada-part-guidance-human-health-detailed-quantitative-risk-assessment-chemicals-dqrachem-health-canada.html.
- Health Canada. 2007. Human Health Risk Assessment of Mercury in Fish and Health Benefits of Fish Consumption. Bureau of Chemical Safety, Food Directorate, Health Products and Food Branch. [updated 2007]. Accessed May 2021. Available at: https://www.canada.ca/content/dam/hc-sc/migration/hc-sc/fn-an/alt_formats/hpfb-dgpsa/pdf/nutrition/merc_fish_poisson-eng.pdf.
- Health Canada. 1995. Part I: Approach to the Derivation of Drinking Water Guidelines. Health Protection Branch, Ottawa, ON, Canada.

- MECP (Ontario Ministry of Environment, Conservation and Parks). 2023. Air Contaminants Benchmarks List: standards, guidelines and screening levels for assessing point of impingement concentrations of air contaminants. Last updated November 2023. Available at: https://www.ontario.ca/document/air-contaminants-benchmarks-list-standards-guidelines-and-screening-levels-assessing-point.
- MECP. 2020. Ontario's Ambient Air Quality Criteria. Human Toxicology and Air Standards Section, Technical Assessment and Standards Development Branch, MECP. Available at: https://www.ontario.ca/page/ontarios-ambient-air-quality-criteria.
- TCEQ (Texas Commission on Environmental Quality). 2023. Texas Air Monitoring Information System (TAMIS) Web Interface V 5.2.3. Available at: https://www17.tceq.texas.gov/tamis/index.cfm?fuseaction=home.welcome.
- TCEQ. 2015. TCEQ Guidelines to Develop Toxicity Factors. Toxicology Division, Office of the Executive Director, TCEQ. Austin, TX, USA. Available at: https://www.tceq.texas.gov/assets/public/comm_exec/pubs/rg/rg-442.pdf.
- US EPA (United States Environmental Protection Agency). 2024a. Integrated Risk Information System (IRIS) Online Database. Accessed March 2024 from: www.epa.gov/iris/. The assessment date is provided for each chemical.
- US EPA. 2024b. United States National Ambient Air Quality Standards (NAAQS) Table. Last updated February 7, 2024. Available at: https://www.epa.gov/criteria-air-pollutants/naaqs-table.
- US EPA. 2023a. Regional Screening Levels (RSLs) – Generic Tables. Tables as of: November 2023. National Center for Environmental Assessment. https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables.
- WHO (World Health Organization). 2021. WHO Air Quality Guidelines for Particulate Matter (PM2.5 and PM10), Ozone, Nitrogen Dioxide, Sulfur Dioxide and Carbon Monoxide. WHO, Geneva, Switzerland. Available at: https://iris.who.int/bitstream/handle/10665/345329/9789240034228-eng.pdf.
- WHO. 2010. WHO Guidelines for Indoor Air Quality: Selected Pollutants. WHO, Geneva, Switzerland. Available at: https://iris.who.int/bitstream/handle/10665/260127/9789289002134-eng.pdf?sequence=1.

ATTACHMENT 1:

Risk Estimates (Multimedia and Inhalation)
– Human Health and Ecological Risk Assessment, 2021 Submission

Table 2A: Risk Estimates - Non-Indigenous Resident
Barkerville Gold Mine Ltd. Cariboo Gold Project
Wells, BC

COPC	Toddler Risk Estimates					Adult Risk Estimates					Woman of Childbearing Age Risk Estimates					Composite Receptor Risk Estimates				
	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure
Wells Baseball Diamond																				
Antimony	0.056	0.056	0.057	0.056	0.056	0.029	0.028	0.028	0.029	0.029	0.032	0.032	0.032	0.032	0.032					
Arsenic	0.33	0.33	0.33	0.33	0.33	0.087	0.088	0.088	0.087	0.087	0.098	0.098	0.098	0.098	0.098	2.6E-05	2.7E-05	2.7E-05	2.6E-05	2.6E-05
Cadmium	0.015	0.015	0.015	0.015	0.015	0.0077	0.0065	0.0066	0.0077	0.0077	0.0085	0.0074	0.0074	0.0085	0.0085	2.3E-08	1.5E-09	2.4E-09	2.3E-08	2.3E-08
Cobalt	0.14	0.14	0.14	0.14	0.14	0.012	0.012	0.012	0.012	0.012	0.013	0.014	0.014	0.013	0.013					
Manganese	0.15	0.18	0.17	0.15	0.15	0.017	0.027	0.023	0.017	0.017	0.02	0.03	0.026	0.02	0.02					
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.0017	0.0018	0.0018	0.0017	0.0017	0.00068	0.00068	0.00068	0.00068	0.00068	0.00076	0.00076	0.00076	0.00076	0.00076					
Nickel	0.12	0.12	0.11	0.12	0.12	0.066	0.064	0.06	0.066	0.066	0.073	0.071	0.067	0.073	0.073	5.9E-08	4.5E-08	1.0E-08	5.9E-08	5.9E-08
Selenium	0.023	0.023	0.023	0.023	0.023	0.013	0.013	0.013	0.013	0.013	0.014	0.014	0.014	0.014	0.014					
Wells Elementary School																				
Antimony	0.056	0.056	0.056	0.056	0.056	0.029	0.028	0.028	0.029	0.029	0.032	0.032	0.032	0.032	0.032					
Arsenic	0.33	0.33	0.34	0.33	0.33	0.087	0.087	0.091	0.087	0.086	0.098	0.097	0.1	0.098	0.096	2.6E-05	2.6E-05	2.8E-05	2.6E-05	2.6E-05
Cadmium	0.015	0.033	0.075	0.042	0.022	0.0077	0.016	0.038	0.022	0.011	0.0085	0.018	0.042	0.024	0.012	2.3E-08	5.7E-10	1.1E-09	2.3E-08	2.3E-08
Cobalt	0.14	0.14	0.14	0.14	0.14	0.012	0.011	0.011	0.011	0.011	0.013	0.013	0.013	0.012	0.012					
Manganese	0.15	0.17	0.17	0.15	0.15	0.017	0.023	0.022	0.017	0.017	0.02	0.026	0.025	0.02	0.02					
Methylmercury	0.019	0.029	0.031	0.028	0.029	0.0042	0.0063	0.0067	0.006	0.0063	0.011	0.017	0.018	0.016	0.017					
Molybdenum	0.0017	0.0018	0.0018	0.0017	0.0017	0.00068	0.00068	0.00068	0.00068	0.00068	0.00076	0.00076	0.00076	0.00076	0.00076					
Nickel	0.12	0.11	0.12	0.12	0.12	0.066	0.062	0.063	0.067	0.066	0.073	0.069	0.071	0.074	0.073	5.9E-08	1.7E-08	7.3E-09	5.9E-08	5.9E-08
Selenium	0.023	0.045	0.089	0.055	0.031	0.013	0.025	0.049	0.031	0.017	0.014	0.028	0.055	0.035	0.019					
Nugget Hills RV Park																				
Antimony	0.056	0.056	0.057	0.057	0.056	0.029	0.028	0.028	0.029	0.029	0.032	0.032	0.032	0.033	0.032					
Arsenic	0.33	0.33	0.33	0.32	0.33	0.087	0.087	0.088	0.084	0.087	0.098	0.098	0.098	0.094	0.098	2.6E-05	2.6E-05	2.7E-05	2.6E-05	2.6E-05
Cadmium	0.015	0.015	0.015	0.018	0.015	0.0077	0.0065	0.0066	0.0089	0.0077	0.0085	0.0073	0.0074	0.0098	0.0085	2.3E-08	5.8E-10	2.3E-09	2.3E-08	2.3E-08
Cobalt	0.14	0.14	0.14	0.14	0.14	0.012	0.012	0.012	0.011	0.012	0.013	0.014	0.014	0.012	0.013					
Manganese	0.15	0.17	0.17	0.15	0.15	0.017	0.023	0.022	0.017	0.017	0.02	0.026	0.025	0.02	0.02					
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.0017	0.0018	0.0018	0.0017	0.0017	0.00068	0.00068	0.00068	0.00068	0.00068	0.00076	0.00076	0.00076	0.00076	0.00076					
Nickel	0.12	0.11	0.11	0.12	0.12	0.066	0.061	0.06	0.066	0.066	0.073	0.068	0.067	0.073	0.073	5.9E-08	1.7E-08	7.3E-09	5.9E-08	5.9E-08
Selenium	0.023	0.023	0.023	0.027	0.023	0.013	0.013	0.013	0.015	0.013	0.014	0.014	0.014	0.017	0.014					
New Barkerville Residential																				
Antimony	0.056	0.056	0.056	0.056	0.056	0.029	0.028	0.028	0.029	0.029	0.032	0.032	0.032	0.032	0.032					
Arsenic	0.33	0.33	0.33	0.33	0.33	0.087	0.087	0.087	0.087	0.087	0.098	0.098	0.098	0.098	0.098	2.6E-05	2.6E-05	2.6E-05	2.6E-05	2.6E-05
Cadmium	0.015	0.015	0.015	0.015	0.015	0.0077	0.0065	0.0065	0.0077	0.0077	0.0085	0.0073	0.0073	0.0085	0.0085	2.3E-08	1.0E-10	1.7E-10	2.3E-08	2.3E-08
Cobalt	0.14	0.14	0.14	0.14	0.14	0.012	0.012	0.012	0.012	0.012	0.013	0.014	0.014	0.013	0.013					
Manganese	0.15	0.17	0.17	0.15	0.15	0.017	0.02	0.02	0.017	0.017	0.02	0.024	0.024	0.02	0.02					
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.0017	0.0018	0.0018	0.0017	0.0017	0.00068	0.00068	0.00068	0.00068	0.00068	0.00076	0.00076	0.00076	0.00076	0.00076					
Nickel	0.12	0.11	0.11	0.12	0.12	0.066	0.059	0.059	0.066	0.066	0.073	0.066	0.066	0.073	0.073	5.9E-08	2.5E-09	2.4E-09	5.9E-08	5.9E-08
Selenium	0.023	0.023	0.023	0.023	0.023	0.013	0.013	0.013	0.013	0.013	0.014	0.014	0.014	0.014	0.014					

Notes

Shaded value indicates hazard quotient greater than 0.2 (or 1.0 for lead) or incremental lifetime cancer risk greater than 1 in 100,000 ($1x10^{-5}$).

Table 2B: Risk Estimates - Indigenous Resident
Barkerville Gold Mine Ltd. Cariboo Gold Project
Wells, BC

COPC	Toddler Risk Estimates					Adult Risk Estimates					Woman of Childbearing Age Risk Estimates					Composite Receptor Risk Estimates				
	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure
Wells Baseball Diamond																				
Antimony	0.14	0.19	0.19	0.14	0.14	0.065	0.078	0.078	0.065	0.065	0.057	0.067	0.067	0.057	0.057					
Arsenic	0.66	0.72	0.73	0.66	0.66	0.22	0.24	0.24	0.22	0.22	0.19	0.2	0.2	0.19	0.19	6.6E-05	7.2E-05	7.4E-05	6.6E-05	6.6E-05
Cadmium	1.1	1.3	1.4	1.1	1.1	0.76	0.93	0.97	0.8	0.77	0.53	0.65	0.69	0.57	0.54	2.3E-08	1.5E-09	2.4E-09	2.3E-08	2.3E-08
Cobalt	0.82	1.1	1.1	0.82	0.82	0.48	0.68	0.68	0.48	0.48	0.32	0.46	0.46	0.32	0.32					
Manganese	1.5	2.6	2.6	1.5	1.5	0.37	0.66	0.65	0.37	0.37	0.29	0.52	0.52	0.29	0.29					
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.013	0.026	0.031	0.017	0.014	0.0047	0.0093	0.012	0.0074	0.0052	0.0038	0.0073	0.0092	0.0056	0.0041					
Nickel	0.23	0.29	0.29	0.23	0.23	0.12	0.16	0.16	0.13	0.12	0.12	0.14	0.14	0.12	0.12	5.9E-08	4.5E-08	1.0E-08	5.9E-08	5.9E-08
Selenium	0.6	0.65	0.7	0.64	0.6	0.31	0.34	0.38	0.34	0.31	0.2	0.22	0.24	0.22	0.2					
Wells Elementary School																				
Antimony	0.14	0.19	0.19	0.14	0.14	0.065	0.078	0.078	0.065	0.065	0.057	0.067	0.067	0.057	0.057					
Arsenic	0.66	0.68	0.95	0.66	0.55	0.22	0.22	0.35	0.22	0.17	0.19	0.19	0.27	0.19	0.15	6.6E-05	6.7E-05	1.0E-04	6.5E-05	5.1E-05
Cadmium	1.1	2.0	3.5	2.1	1.3	0.76	1.2	2.0	1.2	0.87	0.53	0.84	1.3	0.84	0.61	2.3E-08	5.7E-10	1.1E-09	2.3E-08	2.3E-08
Cobalt	0.82	1.1	1.1	0.76	0.76	0.48	0.65	0.65	0.45	0.45	0.32	0.44	0.44	0.3	0.3					
Manganese	1.5	2.6	2.6	1.5	1.5	0.37	0.65	0.65	0.36	0.36	0.29	0.52	0.52	0.29	0.29					
Methylmercury	0.67	1.0	1.1	0.96	1.0	0.13	0.2	0.21	0.19	0.2	0.2	0.3	0.32	0.28	0.3					
Molybdenum	0.013	0.026	0.031	0.017	0.014	0.0047	0.0093	0.012	0.0074	0.0052	0.0038	0.0073	0.0091	0.0056	0.0041					
Nickel	0.23	0.36	0.53	0.34	0.25	0.12	0.19	0.27	0.18	0.14	0.12	0.16	0.21	0.15	0.12	5.9E-08	1.7E-08	7.3E-09	5.9E-08	5.9E-08
Selenium	0.6	1.4	3.0	1.8	0.89	0.31	0.73	1.5	0.92	0.46	0.2	0.47	0.98	0.58	0.29					
Nugget Hills RV Park																				
Antimony	0.14	0.19	0.19	0.16	0.14	0.065	0.078	0.078	0.077	0.065	0.057	0.067	0.067	0.064	0.057					
Arsenic	0.66	0.72	0.73	0.46	0.66	0.22	0.24	0.24	0.13	0.22	0.19	0.2	0.2	0.13	0.19	6.6E-05	7.2E-05	7.3E-05	4.0E-05	6.6E-05
Cadmium	1.1	1.3	1.4	1.2	1.1	0.76	0.93	0.97	0.84	0.77	0.53	0.65	0.69	0.59	0.54	2.3E-08	5.8E-10	2.3E-09	2.3E-08	2.3E-08
Cobalt	0.82	1.1	1.1	0.76	0.82	0.48	0.68	0.68	0.45	0.48	0.32	0.46	0.46	0.3	0.32					
Manganese	1.5	2.6	2.6	1.5	1.5	0.37	0.65	0.65	0.36	0.37	0.29	0.52	0.52	0.29	0.29					
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.013	0.026	0.031	0.017	0.014	0.0047	0.0093	0.012	0.0074	0.0052	0.0038	0.0073	0.0092	0.0056	0.0041					
Nickel	0.23	0.29	0.29	0.24	0.23	0.12	0.15	0.16	0.13	0.12	0.12	0.14	0.14	0.12	0.12	5.9E-08	1.7E-08	7.3E-09	5.9E-08	5.9E-08
Selenium	0.6	0.65	0.7	0.79	0.6	0.31	0.34	0.38	0.42	0.31	0.2	0.22	0.24	0.27	0.2					
New Barkerville Residential																				
Antimony	0.14	0.19	0.19	0.14	0.14	0.065	0.078	0.078	0.065	0.065	0.057	0.067	0.067	0.057	0.057					
Arsenic	0.66	0.72	0.73	0.66	0.66	0.22	0.24	0.24	0.22	0.22	0.19	0.2	0.2	0.19	0.19	6.6E-05	7.2E-05	7.3E-05	6.6E-05	6.6E-05
Cadmium	1.1	1.3	1.4	1.1	1.1	0.76	0.93	0.97	0.8	0.77	0.53	0.65	0.68	0.57	0.54	2.3E-08	1.0E-10	1.7E-10	2.3E-08	2.3E-08
Cobalt	0.82	1.1	1.1	0.82	0.82	0.48	0.68	0.68	0.48	0.48	0.32	0.46	0.46	0.32	0.32					
Manganese	1.5	2.6	2.6	1.5	1.5	0.37	0.65	0.65	0.37	0.37	0.29	0.52	0.52	0.29	0.29					
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.013	0.026	0.031	0.017	0.014	0.0047	0.0093	0.012	0.0074	0.0052	0.0038	0.0073	0.0092	0.0056	0.0041					
Nickel	0.23	0.29	0.29	0.23	0.23	0.12	0.15	0.16	0.13	0.12	0.12	0.13	0.14	0.12	0.12	5.9E-08	2.5E-09	2.4E-09	5.9E-08	5.9E-08
Selenium	0.6	0.65	0.7	0.64	0.6	0.31	0.34	0.38	0.34	0.31	0.2	0.22	0.24	0.22	0.2					

Notes

Shaded value indicates hazard quotient greater than 0.2 (or 1.0 for lead) or incremental lifetime cancer risk greater than 1 in 100,000 ($1x10^{-5}$).

Appendix 7.13-9
Attachment 2
Table 2C: Risk Estimates - Indigenous Land User
Barkerville Gold Mine Ltd. Cariboo Gold Project
Wells, BC

COPC	Toddler Risk Estimates					Adult Risk Estimates					Woman of Childbearing Age Risk Estimates					Composite Receptor Risk Estimates				
	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure
Cariboo Wagon Road (Stanley to Barkerville)																				
Antimony	0.13	0.16	0.16	0.13	0.13	0.064	0.073	0.073	0.064	0.064	0.055	0.062	0.062	0.055	0.055					
Arsenic	0.75	0.8	0.8	0.75	0.75	0.3	0.31	0.31	0.3	0.3	0.27	0.28	0.28	0.27	0.27	5.1E-05	5.6E-05	5.6E-05	5.1E-05	5.1E-05
Cadmium	1.1	1.3	1.4	1.1	1.1	0.76	0.92	0.97	0.81	0.77	0.54	0.65	0.68	0.57	0.55	3.4E-08	8.9E-11	1.4E-10	3.4E-08	3.4E-08
Cobalt	0.7	0.97	0.97	0.71	0.7	0.47	0.66	0.66	0.47	0.47	0.32	0.44	0.44	0.32	0.32					
Manganese	2.3	3.4	3.4	2.3	2.3	0.66	0.87	0.87	0.66	0.66	0.59	0.71	0.71	0.59	0.59					
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.022	0.038	0.042	0.026	0.022	0.0068	0.012	0.015	0.0095	0.0073	0.0055	0.0096	0.011	0.0074	0.0059					
Nickel	0.15	0.22	0.22	0.16	0.15	0.08	0.12	0.12	0.09	0.08	0.07	0.093	0.095	0.07	0.07	8.8E-08	2.9E-09	2.8E-09	8.8E-08	8.8E-08
Selenium	0.59	0.64	0.69	0.64	0.6	0.3	0.34	0.37	0.34	0.31	0.19	0.22	0.24	0.22	0.2					
Jubilee Trail																				
Antimony	0.069	0.11	0.11	0.069	0.069	0.031	0.04	0.04	0.031	0.031	0.022	0.029	0.029	0.022	0.022					
Arsenic	0.22	0.27	0.27	0.23	0.22	0.032	0.045	0.045	0.033	0.032	0.029	0.039	0.04	0.029	0.029	9.7E-06	1.4E-05	1.4E-05	9.7E-06	9.7E-06
Cadmium	1.0	1.3	1.3	1.1	1.0	0.74	0.9	0.95	0.79	0.76	0.53	0.64	0.67	0.56	0.54	3.4E-08	9.7E-11	1.4E-10	3.4E-08	3.4E-08
Cobalt	0.58	0.84	0.84	0.58	0.58	0.41	0.6	0.6	0.42	0.41	0.28	0.4	0.4	0.28	0.28					
Manganese	2.1	3.3	3.3	2.1	2.1	0.62	0.83	0.83	0.62	0.62	0.55	0.67	0.67	0.55	0.55					
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.02	0.036	0.041	0.025	0.021	0.0062	0.011	0.014	0.0089	0.0066	0.0049	0.009	0.011	0.0068	0.0053					
Nickel	0.1	0.16	0.17	0.1	0.1	0.052	0.085	0.089	0.055	0.052	0.038	0.061	0.064	0.04	0.039	8.8E-08	3.1E-09	2.9E-09	8.8E-08	8.8E-08
Selenium	0.034	0.084	0.13	0.077	0.042	0.02	0.053	0.091	0.055	0.027	0.014	0.037	0.062	0.038	0.019					
Proserpine Trail																				
Antimony	0.069	0.11	0.11	0.069	0.069	0.031	0.04	0.04	0.031	0.031	0.022	0.029	0.029	0.022	0.022					
Arsenic	0.22	0.27	0.27	0.23	0.22	0.032	0.045	0.045	0.033	0.032	0.029	0.039	0.04	0.029	0.029	9.7E-06	1.4E-05	1.4E-05	9.7E-06	9.7E-06
Cadmium	1.0	1.3	1.3	1.1	1.0	0.74	0.9	0.95	0.79	0.76	0.53	0.64	0.67	0.56	0.54	3.4E-08	8.9E-11	1.2E-10	3.4E-08	3.4E-08
Cobalt	0.58	0.84	0.84	0.58	0.58	0.41	0.6	0.6	0.42	0.41	0.28	0.4	0.4	0.28	0.28					
Manganese	2.1	3.3	3.3	2.1	2.1	0.62	0.83	0.83	0.62	0.62	0.55	0.67	0.67	0.55	0.55					
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.02	0.036	0.041	0.025	0.021	0.0062	0.011	0.014	0.0089	0.0066	0.0049	0.009	0.011	0.0068	0.0053					
Nickel	0.1	0.16	0.17	0.1	0.1	0.052	0.085	0.089	0.055	0.052	0.038	0.061	0.064	0.04	0.039	8.8E-08	2.8E-09	2.8E-09	8.8E-08	8.8E-08
Selenium	0.034	0.084	0.13	0.077	0.042	0.02	0.053	0.091	0.055	0.027	0.014	0.037	0.062	0.038	0.019					
Sugar Creek Loop Trail																				
Antimony	0.069	0.11	0.11	0.069	0.069	0.031	0.04	0.04	0.031	0.031	0.022	0.029	0.029	0.022	0.022					
Arsenic	0.22	0.27	0.27	0.23	0.22	0.032	0.045	0.045	0.033	0.032	0.029	0.039	0.04	0.029	0.029	9.7E-06	1.4E-05	1.4E-05	9.7E-06	9.7E-06
Cadmium	1.0	1.3	1.3	1.1	1.0	0.74	0.9	0.95	0.79	0.76	0.53	0.64	0.67	0.56	0.54	3.4E-08	8.9E-11	1.3E-10	3.4E-08	3.4E-08
Cobalt	0.58	0.84	0.84	0.58	0.58	0.41	0.6	0.6	0.42	0.41	0.28	0.4	0.4	0.28	0.28					
Manganese	2.1	3.3	3.3	2.1	2.1	0.62	0.83	0.83	0.62	0.62	0.55	0.67	0.67	0.55	0.55					
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.02	0.036	0.041	0.025	0.021	0.0062	0.011	0.014	0.0089	0.0066	0.0049	0.009	0.011	0.0068	0.0053					
Nickel	0.1	0.16	0.17	0.1	0.1	0.052	0.085	0.089	0.055	0.052	0.038	0.061	0.064	0.04	0.039	8.8E-08	2.9E-09	2.8E-09	8.8E-08	8.8E-08
Selenium	0.034	0.084	0.13	0.077	0.042	0.02	0.053	0.091	0.055	0.027	0.014	0.037	0.062	0.038	0.019					
Yanks Peak Trail																				
Antimony	0.069	0.11	0.11	0.069	0.069	0.031	0.04	0.04	0.031	0.031	0.022	0.029	0.029	0.022	0.022					
Arsenic	0.22	0.27	0.27	0.23	0.22	0.032	0.045	0.045	0.033	0.032	0.029	0.039	0.04	0.029	0.029	9.7E-06	1.4E-05	1.4E-05	9.7E-06	9.7E-06
Cadmium	1.0	1.3	1.3	1.1	1.0	0.74	0.9	0.95	0.79	0.76	0.53	0.64	0.67	0.56	0.54	3.4E-08	9.0E-11	2.5E-10	3.4E-08	3.4E-08
Cobalt	0.58	0.84	0.84	0.58	0.58	0.41	0.6	0.6	0.42	0.41	0.28	0.4	0.4	0.28	0.28					
Manganese	2.1	3.3	3.3	2.1	2.1	0.62	0.83	0.83	0.62	0.62	0.55	0.67	0.68	0.55	0.55					
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.02	0.036	0.041	0.025	0.021	0.0062	0.011	0.014	0.0089	0.0066	0.0049	0.009	0.011	0.0068	0.0053					
Nickel	0.1	0.16	0.17	0.1	0.1	0.052	0.085	0.089	0.055	0.052	0.038	0.061	0.064	0.04	0.039	8.8E-08	2.9E-09	4.7E-09	8.8E-08	8.8E-08
Selenium	0.034	0.084	0.13	0.077	0.042	0.02	0.053	0.091	0.055	0.027	0.014	0.037	0.062	0.038	0.019					

Appendix 7.13-9
Attachment 2
Table 2C: Risk Estimates - Indigenous Land User
Barkerville Gold Mine Ltd. Cariboo Gold Project
Wells, BC

COPC	Toddler Risk Estimates					Adult Risk Estimates					Woman of Childbearing Age Risk Estimates					Composite Receptor Risk Estimates				
	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure
Groundhog Lake Ski Trail																				
Antimony	0.1	0.14	0.14	0.1	0.1	0.048	0.057	0.057	0.048	0.048	0.037	0.044	0.044	0.037	0.037					
Arsenic	0.7	0.75	0.75	0.71	0.7	0.27	0.29	0.29	0.27	0.27	0.24	0.25	0.25	0.24	0.24	5.0E-05	5.4E-05	5.4E-05	5.0E-05	5.0E-05
Cadmium	1.1	1.3	1.4	1.1	1.1	0.76	0.92	0.97	0.81	0.77	0.54	0.65	0.68	0.57	0.55	3.4E-08	8.9E-11	1.2E-10	3.4E-08	3.4E-08
Cobalt	0.7	0.96	0.97	0.7	0.7	0.47	0.66	0.66	0.47	0.47	0.32	0.44	0.44	0.32	0.32					
Manganese	2.3	3.4	3.4	2.3	2.3	0.66	0.87	0.87	0.66	0.66	0.59	0.71	0.71	0.59	0.59					
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.021	0.037	0.042	0.025	0.022	0.0065	0.012	0.014	0.0092	0.0069	0.0052	0.0092	0.011	0.007	0.0055					
Nickel	0.15	0.22	0.22	0.16	0.15	0.08	0.11	0.12	0.08	0.08	0.07	0.092	0.094	0.07	0.07	8.8E-08	2.8E-09	2.8E-09	8.8E-08	8.8E-08
Selenium	0.59	0.64	0.69	0.64	0.6	0.3	0.34	0.37	0.34	0.31	0.19	0.22	0.24	0.22	0.2					
Chisholm Creek Rec Site																				
Antimony	0.069	0.11	0.11	0.069	0.069	0.031	0.04	0.04	0.031	0.031	0.022	0.029	0.029	0.022	0.022					
Arsenic	0.22	0.27	0.27	0.23	0.22	0.032	0.045	0.045	0.033	0.032	0.029	0.039	0.04	0.029	0.029	9.7E-06	1.4E-05	1.4E-05	9.7E-06	9.7E-06
Cadmium	1.0	1.3	1.3	1.1	1.0	0.74	0.9	0.95	0.79	0.76	0.53	0.64	0.67	0.56	0.54	3.4E-08	8.9E-11	1.2E-09	3.4E-08	3.4E-08
Cobalt	0.58	0.84	0.84	0.58	0.58	0.41	0.6	0.6	0.42	0.41	0.28	0.4	0.4	0.28	0.28					
Manganese	2.1	3.3	3.3	2.1	2.1	0.62	0.83	0.83	0.62	0.62	0.55	0.67	0.67	0.55	0.55					
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.02	0.036	0.041	0.025	0.021	0.0062	0.011	0.014	0.0089	0.0066	0.0049	0.009	0.011	0.0068	0.0053					
Nickel	0.1	0.16	0.17	0.1	0.1	0.052	0.085	0.089	0.055	0.052	0.038	0.061	0.064	0.04	0.039	8.8E-08	2.8E-09	3.0E-09	8.8E-08	8.8E-08
Selenium	0.034	0.084	0.13	0.077	0.042	0.02	0.053	0.091	0.055	0.027	0.014	0.037	0.062	0.038	0.019					
Nine Mile Lake Rec Site																				
Antimony	0.069	0.11	0.11	0.069	0.069	0.031	0.04	0.04	0.031	0.031	0.022	0.029	0.029	0.022	0.022					
Arsenic	0.22	0.27	0.27	0.23	0.22	0.032	0.045	0.045	0.033	0.032	0.029	0.039	0.04	0.029	0.029	9.7E-06	1.4E-05	1.4E-05	9.7E-06	9.7E-06
Cadmium	1.0	1.3	1.3	1.1	1.0	0.74	0.9	0.95	0.79	0.76	0.53	0.64	0.67	0.56	0.54	3.4E-08	9.3E-11	1.8E-10	3.4E-08	3.4E-08
Cobalt	0.58	0.84	0.84	0.58	0.58	0.41	0.6	0.6	0.42	0.41	0.28	0.4	0.4	0.28	0.28					
Manganese	2.1	3.3	3.3	2.1	2.1	0.62	0.83	0.83	0.62	0.62	0.55	0.67	0.67	0.55	0.55					
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.02	0.036	0.041	0.025	0.021	0.0062	0.011	0.014	0.0089	0.0066	0.0049	0.009	0.011	0.0068	0.0053					
Nickel	0.1	0.16	0.17	0.1	0.1	0.052	0.085	0.089	0.055	0.052	0.038	0.061	0.064	0.04	0.039	8.8E-08	3.0E-09	2.9E-09	8.8E-08	8.8E-08
Selenium	0.034	0.084	0.13	0.077	0.042	0.02	0.053	0.091	0.055	0.027	0.014	0.037	0.062	0.038	0.019					
Trail Buffer 1 - Legal Objective																				
Antimony	0.069	0.11	0.11	0.069	0.069	0.031	0.04	0.04	0.031	0.031	0.022	0.029	0.029	0.022	0.022					
Arsenic	0.22	0.27	0.27	0.23	0.22	0.032	0.045	0.045	0.033	0.032	0.029	0.039	0.04	0.029	0.029	9.7E-06	1.4E-05	1.4E-05	9.7E-06	9.7E-06
Cadmium	1.0	1.3	1.3	1.1	1.0	0.74	0.9	0.95	0.79	0.76	0.53	0.64	0.67	0.56	0.54	3.4E-08	9.0E-11	2.8E-10	3.4E-08	3.4E-08
Cobalt	0.58	0.84	0.84	0.58	0.58	0.41	0.6	0.6	0.42	0.41	0.28	0.4	0.4	0.28	0.28					
Manganese	2.1	3.3	3.3	2.1	2.1	0.62	0.83	0.83	0.62	0.62	0.55	0.67	0.67	0.55	0.55					
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.02	0.036	0.041	0.025	0.021	0.0062	0.011	0.014	0.0089	0.0066	0.0049	0.009	0.011	0.0068	0.0053					
Nickel	0.1	0.16	0.17	0.1	0.1	0.052	0.085	0.089	0.055	0.052	0.038	0.061	0.064	0.04	0.039	8.8E-08	2.9E-09	2.9E-09	8.8E-08	8.8E-08
Selenium	0.034	0.084	0.13	0.077	0.042	0.02	0.053	0.091	0.055	0.027	0.014	0.037	0.062	0.038	0.019					
Viewing Point along Hwy 26																				
Antimony	0.12	0.16	0.16	0.12	0.12	0.059	0.068	0.068	0.059	0.059	0.05	0.056	0.057	0.05	0.05					
Arsenic	0.99	1.0	1.0	0.99	0.99	0.43	0.44	0.44	0.43	0.43	0.41	0.42	0.43	0.41	0.41	5.9E-05	6.4E-05	6.4E-05	5.9E-05	5.9E-05
Cadmium	1.1	1.3	1.4	1.1	1.1	0.76	0.92	0.98	0.81	0.77	0.54	0.65	0.7	0.57	0.55	3.4E-08	9.6E-11	5.4E-08	3.4E-08	3.4E-08
Cobalt	0.7	0.97	0.97	0.71	0.7	0.47	0.66	0.66	0.47	0.47	0.32	0.44	0.44	0.32	0.32					
Manganese	2.4	3.5	3.5	2.4	2.4	0.75	0.97	0.97	0.75	0.75	0.7	0.82	0.82	0.7	0.7					
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.021	0.037	0.042	0.025	0.022	0.0065	0.012	0.015	0.0092	0.007	0.0052	0.0093	0.011	0.007	0.0055					
Nickel	0.16	0.22	0.23	0.16	0.16	0.09	0.12	0.12	0.09	0.09	0.07	0.097	0.1	0.08	0.07	8.8E-08	3.0E-09	1.1E-08	8.8E-08	8.8E-08
Selenium	0.59	0.64	0.69	0.64	0.6	0.3	0.34	0.37	0.34	0.31	0.19	0.22	0.24	0.22	0.2					

Table 2C: Risk Estimates - Indigenous Land User
Barkerville Gold Mine Ltd. Cariboo Gold Project
Wells, BC

COPC	Toddler Risk Estimates					Adult Risk Estimates					Woman of Childbearing Age Risk Estimates					Composite Receptor Risk Estimates				
	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure
Trapline TR0515T017 Cabin																				
Antimony	0.069	0.11	0.11	0.069	0.069	0.031	0.04	0.04	0.031	0.031	0.022	0.029	0.029	0.022	0.022					
Arsenic	0.22	0.27	0.27	0.23	0.22	0.032	0.045	0.045	0.033	0.032	0.029	0.039	0.04	0.029	0.029	9.7E-06	1.4E-05	1.4E-05	9.7E-06	9.7E-06
Cadmium	1.0	1.3	1.3	1.1	1.0	0.74	0.9	0.95	0.79	0.76	0.53	0.64	0.67	0.56	0.54	3.4E-08	9.0E-11	8.9E-11	3.4E-08	3.4E-08
Cobalt	0.58	0.84	0.84	0.58	0.58	0.41	0.6	0.6	0.42	0.41	0.28	0.4	0.4	0.28	0.28					
Manganese	2.1	3.3	3.3	2.1	2.1	0.62	0.83	0.83	0.62	0.62	0.55	0.67	0.67	0.55	0.55					
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.02	0.036	0.041	0.025	0.021	0.0062	0.011	0.014	0.0089	0.0066	0.0049	0.009	0.011	0.0068	0.0053					
Nickel	0.1	0.16	0.17	0.1	0.1	0.052	0.085	0.089	0.055	0.052	0.038	0.061	0.064	0.04	0.039	8.8E-08	2.9E-09	2.8E-09	8.8E-08	8.8E-08
Selenium	0.034	0.084	0.13	0.077	0.042	0.02	0.053	0.091	0.055	0.027	0.014	0.037	0.062	0.038	0.019					
Highway 26 Transect 200 m																				
Antimony	0.12	0.16	0.16	0.12	0.12	0.059	0.068	0.068	0.059	0.059	0.05	0.056	0.057	0.05	0.05					
Arsenic	0.99	1.0	1.0	0.99	0.99	0.43	0.44	0.44	0.43	0.43	0.41	0.42	0.43	0.41	0.41	5.9E-05	6.4E-05	6.4E-05	5.9E-05	5.9E-05
Cadmium	1.1	1.3	1.4	1.1	1.1	0.76	0.92	0.97	0.81	0.77	0.54	0.65	0.69	0.57	0.55	3.4E-08	8.8E-11	1.5E-08	3.4E-08	3.4E-08
Cobalt	0.7	0.97	0.97	0.71	0.7	0.47	0.66	0.66	0.47	0.47	0.32	0.44	0.44	0.32	0.32					
Manganese	2.4	3.5	3.5	2.4	2.4	0.75	0.97	0.97	0.75	0.75	0.7	0.82	0.82	0.7	0.7					
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.021	0.037	0.042	0.025	0.022	0.0065	0.012	0.015	0.0092	0.007	0.0052	0.0093	0.011	0.007	0.0055					
Nickel	0.16	0.22	0.23	0.16	0.16	0.09	0.12	0.12	0.09	0.09	0.07	0.097	0.1	0.08	0.07	8.8E-08	2.8E-09	5.1E-09	8.8E-08	8.8E-08
Selenium	0.59	0.64	0.69	0.64	0.6	0.3	0.34	0.37	0.34	0.31	0.19	0.22	0.24	0.22	0.2					
Cow Mountain Trails 1																				
Antimony	0.15	0.2	0.2	0.15	0.15	0.073	0.086	0.086	0.073	0.073	0.066	0.076	0.076	0.066	0.066					
Arsenic	1.1	1.1	1.1	1.1	1.1	0.43	0.45	0.45	0.43	0.43	0.42	0.43	0.43	0.42	0.42	6.0E-05	6.6E-05	6.7E-05	6.0E-05	6.0E-05
Cadmium	1.1	1.3	1.4	1.1	1.1	0.76	0.92	0.97	0.81	0.77	0.54	0.65	0.68	0.57	0.54	3.4E-08	1.7E-10	9.3E-10	3.4E-08	3.4E-08
Cobalt	0.71	1.0	1.0	0.71	0.71	0.47	0.67	0.67	0.47	0.47	0.32	0.45	0.45	0.32	0.32					
Manganese	1.6	2.7	2.7	1.6	1.6	0.4	0.68	0.68	0.4	0.4	0.33	0.55	0.55	0.33	0.33					
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.012	0.025	0.029	0.016	0.012	0.0043	0.0088	0.012	0.007	0.0048	0.0033	0.0067	0.0085	0.0051	0.0036					
Nickel	0.18	0.24	0.25	0.18	0.18	0.09	0.12	0.13	0.1	0.09	0.08	0.1	0.11	0.08	0.08	8.8E-08	4.3E-09	3.9E-09	8.8E-08	8.8E-08
Selenium	0.59	0.64	0.69	0.64	0.6	0.3	0.34	0.37	0.34	0.31	0.19	0.22	0.24	0.22	0.2					
Cow Mountain Trails 2																				
Antimony	0.12	0.17	0.17	0.12	0.12	0.059	0.071	0.072	0.059	0.059	0.05	0.06	0.06	0.05	0.05					
Arsenic	1.1	1.1	1.1	1.1	1.1	0.44	0.46	0.46	0.44	0.44	0.43	0.44	0.45	0.43	0.43	6.1E-05	6.7E-05	6.8E-05	6.1E-05	6.1E-05
Cadmium	1.1	1.3	1.4	1.1	1.1	0.76	0.92	0.97	0.81	0.77	0.54	0.65	0.68	0.57	0.54	3.4E-08	1.5E-10	2.6E-10	3.4E-08	3.4E-08
Cobalt	0.71	1.0	1.0	0.71	0.71	0.47	0.67	0.67	0.47	0.47	0.32	0.45	0.45	0.32	0.32					
Manganese	1.5	2.6	2.6	1.5	1.5	0.39	0.67	0.67	0.39	0.39	0.32	0.54	0.54	0.32	0.32					
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.013	0.026	0.03	0.017	0.014	0.0049	0.0094	0.012	0.0076	0.0054	0.004	0.0073	0.0092	0.0058	0.0043					
Nickel	0.17	0.24	0.24	0.18	0.17	0.09	0.12	0.13	0.09	0.09	0.08	0.1	0.1	0.08	0.08	8.8E-08	3.7E-09	3.7E-09	8.8E-08	8.8E-08
Selenium	0.59	0.65	0.69	0.64	0.6	0.3	0.34	0.37	0.34	0.31	0.19	0.22	0.24	0.22	0.2					
Jubilee Trail / Wendle Park																				
Antimony	0.072	0.12	0.12	0.072	0.072	0.031	0.044	0.044	0.031	0.031	0.022	0.032	0.032	0.022	0.022					
Arsenic	0.29	0.35	0.36	0.29	0.29	0.039	0.055	0.057	0.039	0.039	0.036	0.05	0.051	0.037	0.037	1.1E-05	1.7E-05	1.8E-05	1.1E-05	1.1E-05
Cadmium	1.0	1.3	1.3	1.1	1.0	0.74	0.9	0.95	0.79	0.75	0.52	0.64	0.67	0.56	0.53	3.4E-08	1.5E-10	2.5E-10	3.4E-08	3.4E-08
Cobalt	0.59	0.89	0.89	0.59	0.59	0.41	0.61	0.61	0.42	0.41	0.28	0.41	0.41	0.28	0.28					
Manganese	1.4	2.5	2.5	1.4	1.4	0.35	0.63	0.63	0.35	0.35	0.28	0.5	0.5	0.28	0.28					
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.011	0.024	0.028	0.015	0.012	0.004	0.0085	0.011	0.0067	0.0044	0.003	0.0064	0.0083	0.0049	0.0034					
Nickel	0.12	0.18	0.18	0.12	0.12	0.058	0.091	0.094	0.062	0.059	0.045	0.067	0.069	0.047	0.045	8.8E-08	3.8E-09	3.6E-09	8.8E-08	8.8E-08
Selenium	0.033	0.086	0.13	0.076	0.041	0.019	0.053	0.091	0.054	0.026	0.014	0.037	0.062	0.037	0.018					

Table 2C: Risk Estimates - Indigenous Land User
Barkerville Gold Mine Ltd. Cariboo Gold Project
Wells, BC

COPC	Toddler Risk Estimates					Adult Risk Estimates					Woman of Childbearing Age Risk Estimates					Composite Receptor Risk Estimates				
	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure
Ned's Connector Trail																				
Antimony	0.12	0.17	0.17	0.14	0.12	0.059	0.072	0.072	0.069	0.059	0.05	0.06	0.06	0.062	0.05					
Arsenic	1.1	1.2	1.2	1.0	1.1	0.45	0.47	0.47	0.44	0.45	0.44	0.45	0.45	0.48	0.44	6.1E-05	6.7E-05	6.8E-05	3.9E-05	6.1E-05
Cadmium	1.1	1.3	1.4	2.4	1.1	0.76	0.92	0.97	1.4	0.77	0.54	0.65	0.68	0.94	0.54	3.4E-08	1.5E-10	2.6E-10	3.4E-08	3.4E-08
Cobalt	0.71	1.0	1.0	1.2	0.71	0.47	0.67	0.67	0.7	0.47	0.32	0.45	0.45	0.46	0.32					
Manganese	1.5	2.6	2.6	1.7	1.5	0.39	0.67	0.67	0.48	0.39	0.32	0.54	0.54	0.42	0.32					
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.013	0.026	0.031	0.017	0.014	0.005	0.0095	0.012	0.0077	0.0055	0.0041	0.0074	0.0093	0.0059	0.0044					
Nickel	0.17	0.24	0.24	0.35	0.17	0.09	0.12	0.13	0.18	0.09	0.08	0.1	0.1	0.14	0.08	8.8E-08	3.7E-09	4.0E-09	8.8E-08	8.8E-08
Selenium	0.59	0.65	0.69	1.4	0.6	0.3	0.34	0.37	0.71	0.31	0.19	0.22	0.24	0.45	0.2					
Williams Creek Trail																				
Antimony	0.1	0.16	0.16	0.1	0.1	0.048	0.061	0.061	0.048	0.048	0.038	0.048	0.048	0.038	0.038					
Arsenic	1.0	1.1	1.1	1.0	1.0	0.42	0.44	0.44	0.42	0.42	0.4	0.42	0.42	0.4	0.4	6.0E-05	6.6E-05	6.6E-05	6.0E-05	6.0E-05
Cadmium	1.1	1.3	1.4	1.1	1.1	0.76	0.92	0.97	0.81	0.77	0.54	0.65	0.68	0.57	0.54	3.4E-08	1.5E-10	2.1E-10	3.4E-08	3.4E-08
Cobalt	0.71	1.0	1.0	0.71	0.71	0.47	0.67	0.67	0.47	0.47	0.32	0.45	0.45	0.32	0.32					
Manganese	1.6	2.7	2.7	1.6	1.6	0.4	0.68	0.68	0.4	0.4	0.33	0.55	0.55	0.33	0.33					
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.012	0.025	0.029	0.016	0.012	0.0043	0.0088	0.012	0.007	0.0047	0.0033	0.0066	0.0085	0.0051	0.0036					
Nickel	0.17	0.23	0.23	0.17	0.17	0.09	0.12	0.12	0.09	0.09	0.07	0.096	0.098	0.08	0.07	8.8E-08	3.6E-09	3.6E-09	8.8E-08	8.8E-08
Selenium	0.59	0.64	0.69	0.64	0.6	0.3	0.34	0.37	0.34	0.31	0.19	0.22	0.24	0.22	0.2					
Cornish X-Country Ski Trail 1																				
Antimony	0.12	0.17	0.17	0.12	0.12	0.055	0.068	0.068	0.055	0.055	0.046	0.056	0.056	0.046	0.046					
Arsenic	3.0	3.1	3.1	3.0	3.0	1.5	1.5	1.5	1.5	1.5	1.6	1.6	1.6	1.6	1.6	1.3E-04	1.3E-04	1.3E-04	1.3E-04	1.3E-04
Cadmium	1.1	1.3	1.4	1.1	1.1	0.76	0.92	0.97	0.81	0.77	0.54	0.65	0.68	0.57	0.54	3.4E-08	1.8E-10	4.1E-10	3.4E-08	3.4E-08
Cobalt	0.71	1.0	1.0	0.71	0.71	0.47	0.67	0.67	0.47	0.47	0.32	0.45	0.45	0.32	0.32					
Manganese	1.6	2.8	2.8	1.6	1.6	0.45	0.73	0.73	0.45	0.45	0.38	0.61	0.61	0.38	0.38					
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.012	0.025	0.029	0.016	0.013	0.0043	0.0088	0.012	0.007	0.0048	0.0033	0.0067	0.0086	0.0051	0.0036					
Nickel	0.16	0.22	0.23	0.16	0.16	0.08	0.11	0.12	0.08	0.08	0.07	0.09	0.092	0.07	0.07	8.8E-08	4.7E-09	4.0E-09	8.8E-08	8.8E-08
Selenium	0.59	0.64	0.69	0.63	0.6	0.3	0.34	0.37	0.34	0.31	0.19	0.22	0.24	0.22	0.2					
Cornish X-Country Ski Trail 2																				
Antimony	0.11	0.16	0.16	0.11	0.11	0.051	0.064	0.064	0.051	0.051	0.041	0.051	0.051	0.041	0.041					
Arsenic	1.3	1.4	1.4	1.3	1.3	0.58	0.6	0.6	0.58	0.58	0.59	0.6	0.6	0.59	0.59	6.9E-05	7.5E-05	7.6E-05	6.9E-05	6.9E-05
Cadmium	1.1	1.3	1.4	1.1	1.1	0.76	0.92	0.97	0.8	0.77	0.54	0.65	0.68	0.57	0.54	3.4E-08	1.6E-10	3.2E-10	3.4E-08	3.4E-08
Cobalt	0.71	1.0	1.0	0.71	0.71	0.47	0.67	0.67	0.47	0.47	0.32	0.45	0.45	0.32	0.32					
Manganese	1.9	3.0	3.0	1.9	1.9	0.58	0.86	0.86	0.58	0.58	0.53	0.75	0.75	0.53	0.53					
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.012	0.025	0.029	0.016	0.013	0.0043	0.0088	0.012	0.007	0.0048	0.0033	0.0067	0.0085	0.0051	0.0036					
Nickel	0.16	0.22	0.22	0.16	0.16	0.08	0.11	0.12	0.08	0.08	0.07	0.089	0.092	0.07	0.07	8.8E-08	4.1E-09	3.8E-09	8.8E-08	8.8E-08
Selenium	0.59	0.64	0.69	0.63	0.6	0.3	0.34	0.37	0.34	0.31	0.19	0.22	0.24	0.22	0.2					
Cornish X-Country Ski Trail 3																				
Antimony	0.11	0.16	0.16	0.11	0.11	0.05	0.062	0.063	0.05	0.05	0.04	0.049	0.049	0.04	0.04					
Arsenic	1.3	1.2	1.7	1.2	1.1	0.56	0.52	0.73	0.53	0.45	0.56	0.52	0.69	0.53	0.46	6.7E-05	6.6E-05	1.1E-04	6.6E-05	5.0E-05
Cadmium	1.1	2.0	3.5	2.1	1.3	0.76	1.2	2.0	1.2	0.88	0.54	0.84	1.3	0.85	0.61	3.4E-08	3.8E-10	9.2E-10	3.4E-08	3.4E-08
Cobalt	0.71	0.95	0.96	0.65	0.65	0.47	0.64	0.65	0.45	0.44	0.32	0.43	0.44	0.3	0.3					
Manganese	1.6	2.7	2.8	1.6	1.6	0.45	0.72	0.79	0.44	0.42	0.38	0.59	0.67	0.38	0.35					
Methylmercury	0.67	1.0	1.1	0.96	1.0	0.13	0.2	0.21	0.19	0.2	0.2	0.3	0.32	0.28	0.3					
Molybdenum	0.013	0.036	0.068	0.033	0.016	0.0049	0.015	0.034	0.017	0.0068	0.0039	0.014	0.034	0.016	0.0059					
Nickel	0.16	0.3	0.49	0.28	0.18	0.08	0.15	0.24	0.14	0.09	0.07	0.12	0.18	0.11	0.08	8.8E-08	1.1E-08	5.5E-09	8.8E-08	8.8E-08
Selenium	0.59	1.4	3.0	1.8	0.88	0.3	0.73	1.5	0.91	0.45	0.19	0.46	0.98	0.58	0.29					

Table 2C: Risk Estimates - Indigenous Land User
Barkerville Gold Mine Ltd. Cariboo Gold Project
Wells, BC

COPC	Toddler Risk Estimates					Adult Risk Estimates					Woman of Childbearing Age Risk Estimates					Composite Receptor Risk Estimates				
	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure
Groundhog Lake Snowmobile Trail																				
Antimony	0.14	0.19	0.19	0.17	0.14	0.069	0.083	0.083	0.079	0.07	0.061	0.073	0.073	0.063	0.063					
Arsenic	1.5	1.5	1.5	1.2	1.5	0.69	0.67	0.68	0.53	0.66	0.71	0.68	0.69	0.57	0.67	7.6E-05	8.0E-05	8.1E-05	5.0E-05	7.4E-05
Cadmium	1.1	1.3	1.4	1.2	1.1	0.76	0.92	0.97	0.84	0.77	0.54	0.65	0.68	0.59	0.55	3.4E-08	1.5E-10	3.1E-10	3.4E-08	3.4E-08
Cobalt	0.73	1.0	1.0	0.65	0.73	0.48	0.68	0.68	0.44	0.48	0.33	0.46	0.47	0.3	0.33					
Manganese	2.0	3.1	3.1	1.6	2.0	0.63	0.93	0.93	0.42	0.65	0.59	0.83	0.83	0.35	0.6					
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.033	0.03	0.034	0.016	0.018	0.017	0.012	0.014	0.007	0.0077	0.017	0.010	0.012	0.0051	0.0069					
Nickel	0.23	0.29	0.3	0.18	0.23	0.12	0.16	0.16	0.1	0.12	0.12	0.14	0.14	0.08	0.12	8.8E-08	3.7E-09	5.4E-09	8.8E-08	8.8E-08
Selenium	0.8	0.72	0.76	0.79	0.67	0.43	0.38	0.42	0.42	0.36	0.34	0.27	0.29	0.27	0.25					
Barkerville Provincial Park Campground																				
Antimony	0.13	0.18	0.18	0.13	0.13	0.065	0.077	0.077	0.065	0.065	0.056	0.066	0.066	0.056	0.056					
Arsenic	1.5	1.6	1.6	1.5	1.5	0.68	0.69	0.69	0.68	0.68	0.69	0.71	0.71	0.69	0.69	7.5E-05	8.1E-05	8.2E-05	7.5E-05	7.5E-05
Cadmium	1.1	1.3	1.4	1.1	1.1	0.76	0.92	0.97	0.8	0.77	0.54	0.65	0.68	0.57	0.54	3.4E-08	1.5E-10	2.7E-10	3.4E-08	3.4E-08
Cobalt	0.71	1.0	1.0	0.71	0.71	0.47	0.67	0.67	0.47	0.47	0.32	0.45	0.45	0.32	0.32					
Manganese	1.6	2.7	2.7	1.6	1.6	0.42	0.7	0.7	0.42	0.42	0.35	0.57	0.57	0.35	0.35					
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.012	0.025	0.03	0.017	0.013	0.0046	0.0091	0.012	0.0073	0.0051	0.0036	0.007	0.0089	0.0055	0.0039					
Nickel	0.17	0.23	0.24	0.17	0.17	0.09	0.12	0.12	0.09	0.09	0.08	0.098	0.1	0.08	0.08	8.8E-08	3.8E-09	3.7E-09	8.8E-08	8.8E-08
Selenium	0.59	0.64	0.69	0.63	0.6	0.3	0.34	0.37	0.34	0.31	0.19	0.22	0.24	0.22	0.2					
Forest Rose Campground																				
Antimony	0.14	0.19	0.19	0.14	0.14	0.068	0.081	0.081	0.068	0.068	0.061	0.07	0.071	0.061	0.061					
Arsenic	0.68	0.74	0.75	0.68	0.68	0.25	0.27	0.27	0.25	0.25	0.26	0.27	0.27	0.26	0.26	2.9E-05	3.5E-05	3.6E-05	2.9E-05	2.9E-05
Cadmium	1.0	1.3	1.4	1.1	1.1	0.75	0.91	0.96	0.8	0.76	0.53	0.64	0.67	0.56	0.54	3.4E-08	1.5E-10	2.7E-10	3.4E-08	3.4E-08
Cobalt	0.66	0.97	0.97	0.67	0.66	0.45	0.65	0.65	0.45	0.45	0.3	0.44	0.44	0.3	0.3					
Manganese	2.2	3.3	3.3	2.2	2.2	0.8	1.1	1.1	0.8	0.8	0.78	1.0	1.0	0.78	0.78					
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.013	0.026	0.03	0.017	0.013	0.0048	0.0092	0.012	0.0075	0.0052	0.0037	0.0071	0.009	0.0056	0.004					
Nickel	0.18	0.24	0.24	0.18	0.18	0.09	0.12	0.13	0.1	0.09	0.08	0.1	0.11	0.08	0.08	8.8E-08	3.8E-09	3.7E-09	8.8E-08	8.8E-08
Selenium	0.82	0.88	0.92	0.87	0.83	0.42	0.46	0.49	0.46	0.43	0.27	0.29	0.32	0.29	0.27					
Government Hill Campground																				
Antimony	0.11	0.17	0.17	0.11	0.11	0.054	0.067	0.067	0.054	0.054	0.045	0.054	0.054	0.045	0.045					
Arsenic	1.8	1.8	1.8	1.8	1.8	0.81	0.83	0.83	0.81	0.81	0.84	0.86	0.86	0.85	0.84	8.4E-05	9.0E-05	9.1E-05	8.4E-05	8.4E-05
Cadmium	1.1	1.3	1.4	1.1	1.1	0.76	0.92	0.97	0.81	0.77	0.54	0.65	0.68	0.57	0.54	3.4E-08	1.5E-10	2.4E-10	3.4E-08	3.4E-08
Cobalt	0.71	1.0	1.0	0.71	0.71	0.47	0.67	0.67	0.47	0.47	0.32	0.45	0.45	0.32	0.32					
Manganese	1.6	2.7	2.7	1.6	1.6	0.4	0.68	0.68	0.4	0.4	0.33	0.55	0.55	0.33	0.33					
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.012	0.026	0.03	0.017	0.013	0.0047	0.0092	0.012	0.0075	0.0052	0.0038	0.0072	0.009	0.0056	0.0041					
Nickel	0.17	0.23	0.24	0.18	0.17	0.09	0.12	0.12	0.09	0.09	0.08	0.098	0.1	0.08	0.08	8.8E-08	3.7E-09	3.6E-09	8.8E-08	8.8E-08
Selenium	0.59	0.64	0.69	0.64	0.6	0.3	0.34	0.37	0.34	0.31	0.19	0.22	0.24	0.22	0.2					
Water Access – Jack of Clubs Lake																				
Antimony	0.22	0.27	0.27	0.22	0.22	0.12	0.13	0.13	0.12	0.12	0.12	0.13	0.13	0.12	0.12					
Arsenic	27	28	28	28	27	17	17	17	17	17	19	19	19	19	19	1.0E-03	1.0E-03	1.0E-03	1.0E-03	1.0E-03
Cadmium	1.0	1.6	2.1	1.6	1.2	0.75	1.0	1.3	1.0	0.81	0.53	0.72	0.89	0.7	0.57	3.4E-08	7.5E-10	2.8E-08	3.4E-08	3.4E-08
Cobalt	0.66	0.92	0.97	0.64	0.6	0.45	0.63	0.65	0.44	0.42	0.3	0.43	0.44	0.3	0.29					
Manganese	1.7	3.0	3.1	1.9	1.8	0.47	0.82	0.91	0.57	0.49	0.41	0.71	0.81	0.52	0.43					
Methylmercury	0.92	14	14	14	14	0.18	2.7	2.7	2.7	2.7	0.27	4.1	4.1	4.0	4.0					
Molybdenum	0.012	0.093	0.22	0.14	0.032	0.0045	0.039	0.098	0.06	0.014	0.0034	0.032	0.08	0.05	0.011					
Nickel	0.2	0.42	0.69	0.47	0.25	0.1	0.21	0.35	0.24	0.13	0.09	0.17	0.26	0.19	0.11	8.8E-08	2.2E-08	1.1E-08	8.8E-08	8.8E-08
Selenium	0.83	0.31	0.36	0.3	0.26	0.42	0.17	0.21	0.17	0.14	0.27	0.11	0.14	0.11	0.089					

Table 2C: Risk Estimates - Indigenous Land User
Barkerville Gold Mine Ltd. Cariboo Gold Project
Wells, BC

COPC	Toddler Risk Estimates					Adult Risk Estimates					Woman of Childbearing Age Risk Estimates					Composite Receptor Risk Estimates				
	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure
Valley Mountain Pass																				
Antimony	0.13	0.18	0.18	0.13	0.13	0.065	0.077	0.078	0.065	0.065	0.056	0.066	0.066	0.056	0.056					
Arsenic	1.5	1.6	1.6	1.5	1.5	0.67	0.69	0.69	0.67	0.67	0.69	0.7	0.71	0.69	0.69	7.5E-05	8.1E-05	8.2E-05	7.5E-05	7.5E-05
Cadmium	1.1	1.3	1.4	1.1	1.1	0.76	0.92	0.97	0.81	0.77	0.54	0.65	0.68	0.57	0.54	3.4E-08	6.8E-10	3.3E-09	3.4E-08	3.4E-08
Cobalt	0.71	1.0	1.0	0.72	0.71	0.47	0.67	0.67	0.48	0.47	0.32	0.45	0.45	0.32	0.32					
Manganese	1.9	3.0	3.0	1.9	1.9	0.58	0.87	0.87	0.58	0.58	0.53	0.76	0.76	0.53	0.53					
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.012	0.025	0.029	0.016	0.013	0.0043	0.0088	0.012	0.007	0.0048	0.0033	0.0067	0.0086	0.0051	0.0036					
Nickel	0.18	0.25	0.25	0.19	0.19	0.1	0.13	0.13	0.1	0.1	0.08	0.11	0.11	0.09	0.08	8.8E-08	2.0E-08	8.1E-09	8.8E-08	8.8E-08
Selenium	0.59	0.64	0.69	0.64	0.6	0.3	0.34	0.37	0.34	0.31	0.19	0.22	0.24	0.22	0.2					
Historic Barkerville Town and Park																				
Antimony	0.11	0.17	0.17	0.11	0.11	0.054	0.067	0.067	0.054	0.054	0.045	0.054	0.054	0.045	0.045					
Arsenic	1.8	1.8	1.8	1.8	1.8	0.81	0.83	0.83	0.81	0.81	0.84	0.86	0.86	0.85	0.84	8.4E-05	9.0E-05	9.1E-05	8.4E-05	8.4E-05
Cadmium	1.1	1.3	1.4	1.1	1.1	0.76	0.92	0.97	0.81	0.77	0.54	0.65	0.68	0.57	0.54	3.4E-08	1.5E-10	2.3E-10	3.4E-08	3.4E-08
Cobalt	0.71	1.0	1.0	0.71	0.71	0.47	0.67	0.67	0.47	0.47	0.32	0.45	0.45	0.32	0.32					
Manganese	1.6	2.7	2.7	1.6	1.6	0.4	0.68	0.68	0.4	0.4	0.33	0.55	0.55	0.33	0.33					
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.012	0.026	0.03	0.017	0.013	0.0047	0.0092	0.012	0.0075	0.0052	0.0038	0.0072	0.009	0.0056	0.0041					
Nickel	0.17	0.23	0.24	0.18	0.17	0.09	0.12	0.12	0.09	0.09	0.08	0.098	0.1	0.08	0.08	8.8E-08	3.6E-09	3.7E-09	8.8E-08	8.8E-08
Selenium	0.59	0.64	0.69	0.64	0.6	0.3	0.34	0.37	0.34	0.31	0.19	0.22	0.24	0.22	0.2					
Outfitter Area																				
Antimony	0.22	0.27	0.27	0.22	0.22	0.12	0.13	0.13	0.12	0.12	0.12	0.13	0.13	0.12	0.12					
Arsenic	33	33	33	33	33	17	18	18	18	17	20	20	20	20	20	1.1E-03	1.1E-03	1.1E-03	1.1E-03	1.1E-03
Cadmium	1.0	1.6	2.0	1.6	1.2	0.75	1.0	1.3	1.0	0.81	0.53	0.72	0.88	0.7	0.57	3.4E-08	4.1E-10	2.5E-09	3.4E-08	3.4E-08
Cobalt	0.66	0.92	0.97	0.64	0.6	0.45	0.63	0.65	0.44	0.42	0.3	0.43	0.44	0.3	0.29					
Manganese	1.7	3.0	3.1	1.9	1.8	0.47	0.81	0.91	0.57	0.49	0.41	0.7	0.81	0.52	0.43					
Methylmercury	0.92	14	14	14	14	0.18	2.7	2.7	2.7	2.7	0.27	4.1	4.1	4.0	4.0					
Molybdenum	0.012	0.093	0.22	0.14	0.032	0.0045	0.039	0.098	0.06	0.014	0.0034	0.032	0.08	0.05	0.011					
Nickel	0.2	0.42	0.69	0.47	0.25	0.1	0.21	0.35	0.24	0.13	0.09	0.17	0.26	0.19	0.11	8.8E-08	1.2E-08	5.2E-09	8.8E-08	8.8E-08
Selenium	0.83	0.31	0.36	0.3	0.26	0.42	0.17	0.21	0.17	0.14	0.27	0.11	0.14	0.11	0.089					
Le Bourdais Lake																				
Antimony	0.22	0.087	0.31	0.14	0.15	0.15	0.051	0.19	0.09	0.1	0.099	0.035	0.13	0.061	0.068					
Arsenic	0.19	0.19	0.21	0.19	0.18	0.026	0.027	0.032	0.024	0.023	0.024	0.025	0.03	0.023	0.023	6.7E-06	6.9E-06	9.0E-06	6.3E-06	6.2E-06
Cadmium	0.76	0.86	0.91	0.76	0.76	0.48	0.55	0.57	0.48	0.48	0.33	0.38	0.4	0.34	0.33	3.4E-08	3.4E-08	3.4E-10	3.4E-08	3.4E-08
Cobalt	0.58	0.82	0.84	0.58	0.58	0.41	0.58	0.59	0.41	0.41	0.27	0.39	0.39	0.27	0.27					
Manganese	1.1	1.1	2.4	1.1	1.1	0.27	0.27	0.6	0.27	0.27	0.22	0.22	0.48	0.22	0.22					
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.18	0.18	0.15	0.18	0.18	0.047	0.047	0.039	0.046	0.046	0.041	0.041	0.033	0.04	0.04					
Nickel	0.14	0.17	0.19	0.14	0.14	0.062	0.08	0.089	0.06	0.06	0.045	0.059	0.063	0.044	0.044	8.9E-08	8.9E-08	3.9E-09	8.9E-08	8.9E-08
Selenium	0.046	0.049	0.14	0.077	0.047	0.033	0.036	0.1	0.058	0.034	0.023	0.024	0.069	0.039	0.023					
Quesnel Forks																				
Antimony	0.22	0.087	0.31	0.14	0.15	0.15	0.051	0.19	0.09	0.1	0.099	0.035	0.13	0.061	0.068					
Arsenic	0.19	0.19	0.21	0.19	0.18	0.026	0.027	0.032	0.024	0.023	0.024	0.025	0.03	0.023	0.023	6.7E-06	6.9E-06	9.0E-06	6.3E-06	6.2E-06
Cadmium	0.76	0.86	0.91	0.76	0.76	0.48	0.55	0.57	0.48	0.48	0.33	0.38	0.4	0.34	0.33	3.4E-08	3.4E-08	3.4E-10	3.4E-08	3.4E-08
Cobalt	0.58	0.82	0.84	0.58	0.58	0.41	0.58	0.59	0.41	0.41	0.27	0.39	0.39	0.27	0.27					
Manganese	1.1	1.1	2.4	1.1	1.1	0.27	0.27	0.6	0.27	0.27	0.22	0.22	0.48	0.22	0.22					
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.18	0.18	0.15	0.18	0.18	0.047	0.047	0.039	0.046	0.046	0.041	0.041	0.033	0.04	0.04					
Nickel	0.14	0.17	0.19	0.14	0.14	0.062	0.08	0.089	0.06	0.06	0.045	0.059	0.063	0.044	0.044	8.9E-08	8.9E-08	3.9E-09	8.9E-08	8.9E-08
Selenium	0.046	0.049	0.14	0.077	0.047	0.033	0.036	0.1	0.058	0.034	0.023	0.024	0.069	0.039	0.023					

Table 2C: Risk Estimates - Indigenous Land User
Barkerville Gold Mine Ltd. Cariboo Gold Project
Wells, BC

COPC	Toddler Risk Estimates					Adult Risk Estimates					Woman of Childbearing Age Risk Estimates					Composite Receptor Risk Estimates				
	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure
Little Lake Rec Site																				
Antimony	0.22	0.087	0.31	0.14	0.15	0.15	0.051	0.19	0.09	0.1	0.099	0.035	0.13	0.061	0.068					
Arsenic	0.19	0.19	0.21	0.19	0.18	0.026	0.027	0.032	0.024	0.023	0.024	0.025	0.03	0.023	0.023	6.7E-06	6.9E-06	9.0E-06	6.3E-06	6.2E-06
Cadmium	0.76	0.86	0.91	0.76	0.76	0.48	0.55	0.57	0.48	0.48	0.33	0.38	0.4	0.34	0.33	3.4E-08	3.4E-08	3.4E-10	3.4E-08	3.4E-08
Cobalt	0.58	0.82	0.84	0.58	0.58	0.41	0.58	0.59	0.41	0.41	0.27	0.39	0.39	0.27	0.27					
Manganese	1.1	1.1	2.4	1.1	1.1	0.27	0.27	0.6	0.27	0.27	0.22	0.22	0.48	0.22	0.22					
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.18	0.18	0.15	0.18	0.18	0.047	0.047	0.039	0.046	0.046	0.041	0.041	0.033	0.04	0.04					
Nickel	0.14	0.17	0.19	0.14	0.14	0.062	0.08	0.089	0.06	0.06	0.045	0.059	0.063	0.044	0.044	8.9E-08	8.9E-08	3.9E-09	8.9E-08	8.9E-08
Selenium	0.046	0.049	0.14	0.077	0.047	0.033	0.036	0.1	0.058	0.034	0.023	0.024	0.069	0.039	0.023					
Maude Lake Rec Site																				
Antimony	0.22	0.087	0.31	0.14	0.15	0.15	0.051	0.19	0.09	0.1	0.099	0.035	0.13	0.061	0.068					
Arsenic	0.19	0.19	0.21	0.19	0.18	0.026	0.027	0.032	0.024	0.023	0.024	0.025	0.03	0.023	0.023	6.7E-06	6.9E-06	9.0E-06	6.3E-06	6.2E-06
Cadmium	0.76	0.86	0.91	0.76	0.76	0.48	0.55	0.57	0.48	0.48	0.33	0.38	0.4	0.34	0.33	3.4E-08	3.4E-08	3.4E-10	3.4E-08	3.4E-08
Cobalt	0.58	0.82	0.84	0.58	0.58	0.41	0.58	0.59	0.41	0.41	0.27	0.39	0.39	0.27	0.27					
Manganese	1.1	1.1	2.4	1.1	1.1	0.27	0.27	0.6	0.27	0.27	0.22	0.22	0.48	0.22	0.22					
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.18	0.18	0.15	0.18	0.18	0.047	0.047	0.039	0.046	0.046	0.041	0.041	0.033	0.04	0.04					
Nickel	0.14	0.17	0.19	0.14	0.14	0.062	0.08	0.089	0.06	0.06	0.045	0.059	0.063	0.044	0.044	8.9E-08	8.9E-08	3.9E-09	8.9E-08	8.9E-08
Selenium	0.046	0.049	0.14	0.077	0.047	0.033	0.036	0.1	0.058	0.034	0.023	0.024	0.069	0.039	0.023					
Prior Lake Rec Site																				
Antimony	0.22	0.087	0.31	0.14	0.15	0.15	0.051	0.19	0.09	0.1	0.099	0.035	0.13	0.061	0.068					
Arsenic	0.19	0.19	0.21	0.19	0.18	0.026	0.027	0.032	0.024	0.023	0.024	0.025	0.03	0.023	0.023	6.7E-06	6.9E-06	9.0E-06	6.3E-06	6.2E-06
Cadmium	0.76	0.86	0.91	0.76	0.76	0.48	0.55	0.57	0.48	0.48	0.33	0.38	0.4	0.34	0.33	3.4E-08	3.4E-08	3.4E-10	3.4E-08	3.4E-08
Cobalt	0.58	0.82	0.84	0.58	0.58	0.41	0.58	0.59	0.41	0.41	0.27	0.39	0.39	0.27	0.27					
Manganese	1.1	1.1	2.4	1.1	1.1	0.27	0.27	0.6	0.27	0.27	0.22	0.22	0.48	0.22	0.22					
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.18	0.18	0.15	0.18	0.18	0.047	0.047	0.039	0.046	0.046	0.041	0.041	0.033	0.04	0.04					
Nickel	0.14	0.17	0.19	0.14	0.14	0.062	0.08	0.089	0.06	0.06	0.045	0.059	0.063	0.044	0.044	8.9E-08	8.9E-08	3.8E-09	8.9E-08	8.9E-08
Selenium	0.046	0.049	0.14	0.077	0.047	0.033	0.036	0.1	0.058	0.034	0.023	0.024	0.069	0.039	0.023					
Trail Buffer 2																				
Antimony	0.22	0.087	0.31	0.14	0.15	0.15	0.051	0.19	0.09	0.1	0.099	0.035	0.13	0.061	0.068					
Arsenic	0.19	0.19	0.21	0.19	0.18	0.026	0.027	0.032	0.024	0.023	0.024	0.025	0.03	0.023	0.023	6.7E-06	6.9E-06	9.0E-06	6.3E-06	6.2E-06
Cadmium	0.76	0.86	0.91	0.76	0.76	0.48	0.55	0.57	0.48	0.48	0.33	0.38	0.4	0.34	0.33	3.4E-08	3.4E-08	3.5E-10	3.4E-08	3.4E-08
Cobalt	0.58	0.82	0.84	0.58	0.58	0.41	0.58	0.59	0.41	0.41	0.27	0.39	0.39	0.27	0.27					
Manganese	1.1	1.1	2.4	1.1	1.1	0.27	0.27	0.6	0.27	0.27	0.22	0.22	0.49	0.22	0.22					
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.18	0.18	0.15	0.18	0.18	0.047	0.047	0.039	0.046	0.046	0.041	0.041	0.033	0.04	0.04					
Nickel	0.14	0.17	0.19	0.14	0.14	0.062	0.08	0.089	0.06	0.06	0.045	0.059	0.064	0.044	0.044	8.9E-08	8.9E-08	4.1E-09	8.9E-08	8.9E-08
Selenium	0.046	0.049	0.14	0.077	0.047	0.033	0.036	0.1	0.058	0.034	0.023	0.024	0.069	0.039	0.023					
Trail Buffer 4																				
Antimony	0.22	0.087	0.31	0.14	0.15	0.15	0.051	0.19	0.09	0.1	0.099	0.035	0.13	0.061	0.068					
Arsenic	0.19	0.19	0.21	0.19	0.18	0.026	0.027	0.032	0.024	0.023	0.024	0.025	0.03	0.023	0.023	6.7E-06	6.9E-06	9.0E-06	6.3E-06	6.2E-06
Cadmium	0.76	0.86	0.91	0.76	0.76	0.48	0.55	0.57	0.48	0.48	0.33	0.38	0.4	0.34	0.33	3.4E-08	3.4E-08	3.4E-10	3.4E-08	3.4E-08
Cobalt	0.58	0.82	0.84	0.58	0.58	0.41	0.58	0.59	0.41	0.41	0.27	0.39	0.39	0.27	0.27					
Manganese	1.1	1.1	2.4	1.1	1.1	0.27	0.27	0.6	0.27	0.27	0.22	0.22	0.48	0.22	0.22					
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.18	0.18	0.15	0.18	0.18	0.047	0.047	0.039	0.046	0.046	0.041	0.041	0.033	0.04	0.04					
Nickel	0.14	0.17	0.19	0.14	0.14	0.062	0.08	0.089	0.06	0.06	0.045	0.059	0.063	0.044	0.044	8.9E-08	8.9E-08	3.9E-09	8.9E-08	8.9E-08
Selenium	0.046	0.049	0.14	0.077	0.047	0.033	0.036	0.1	0.058	0.034	0.023	0.024	0.069	0.039	0.023					

Table 2C: Risk Estimates - Indigenous Land User
Barkerville Gold Mine Ltd. Cariboo Gold Project
Wells, BC

COPC	Toddler Risk Estimates					Adult Risk Estimates					Woman of Childbearing Age Risk Estimates					Composite Receptor Risk Estimates				
	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure
500 Road Transect 200 m																				
Antimony	0.25	0.12	0.34	0.18	0.19	0.17	0.071	0.21	0.11	0.12	0.12	0.054	0.15	0.079	0.087					
Arsenic	0.92	0.92	0.95	0.92	0.92	0.42	0.42	0.43	0.42	0.42	0.41	0.41	0.41	0.41	0.41	5.5E-05	5.5E-05	5.7E-05	5.4E-05	5.4E-05
Cadmium	0.8	0.9	0.95	0.8	0.8	0.5	0.57	0.59	0.5	0.5	0.35	0.4	0.41	0.35	0.35	3.4E-08	3.4E-08	3.4E-10	3.4E-08	3.4E-08
Cobalt	0.71	0.95	0.97	0.71	0.71	0.47	0.64	0.65	0.47	0.47	0.31	0.43	0.44	0.31	0.31					
Manganese	1.3	1.3	2.6	1.3	1.3	0.33	0.33	0.66	0.33	0.33	0.28	0.28	0.54	0.28	0.28					
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.19	0.19	0.16	0.19	0.19	0.051	0.052	0.043	0.051	0.051	0.046	0.046	0.038	0.045	0.045					
Nickel	0.18	0.21	0.23	0.18	0.18	0.08	0.11	0.11	0.08	0.08	0.07	0.08	0.087	0.07	0.07	8.9E-08	8.9E-08	3.8E-09	8.9E-08	8.9E-08
Selenium	0.61	0.61	0.7	0.64	0.61	0.32	0.32	0.39	0.34	0.32	0.2	0.21	0.25	0.22	0.2					
Trapline TR0515T020 Cabin 1																				
Antimony	0.22	0.087	0.31	0.14	0.15	0.15	0.051	0.19	0.09	0.1	0.099	0.035	0.13	0.061	0.068					
Arsenic	0.19	0.19	0.21	0.19	0.18	0.026	0.027	0.032	0.024	0.023	0.024	0.025	0.03	0.023	0.023	6.7E-06	6.9E-06	9.0E-06	6.3E-06	6.2E-06
Cadmium	0.76	0.86	0.91	0.76	0.76	0.48	0.55	0.57	0.48	0.48	0.33	0.38	0.4	0.34	0.33	3.4E-08	3.4E-08	3.4E-10	3.4E-08	3.4E-08
Cobalt	0.58	0.82	0.84	0.58	0.58	0.41	0.58	0.59	0.41	0.41	0.27	0.39	0.39	0.27	0.27					
Manganese	1.1	1.1	2.4	1.1	1.1	0.27	0.27	0.6	0.27	0.27	0.22	0.22	0.48	0.22	0.22					
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.18	0.18	0.15	0.18	0.18	0.047	0.047	0.039	0.046	0.046	0.041	0.041	0.033	0.04	0.04					
Nickel	0.14	0.17	0.19	0.14	0.14	0.062	0.08	0.089	0.06	0.06	0.045	0.059	0.063	0.044	0.044	8.9E-08	8.9E-08	3.9E-09	8.9E-08	8.9E-08
Selenium	0.046	0.049	0.14	0.077	0.047	0.033	0.036	0.1	0.058	0.034	0.023	0.024	0.069	0.039	0.023					
Trapline TR0515T020 Cabin 2																				
Antimony	0.22	0.087	0.31	0.14	0.15	0.15	0.051	0.19	0.09	0.1	0.099	0.035	0.13	0.061	0.068					
Arsenic	0.19	0.19	0.21	0.19	0.18	0.026	0.027	0.032	0.024	0.023	0.024	0.025	0.03	0.023	0.023	6.7E-06	6.9E-06	9.0E-06	6.3E-06	6.2E-06
Cadmium	0.76	0.86	0.91	0.76	0.76	0.48	0.55	0.57	0.48	0.48	0.33	0.38	0.4	0.34	0.33	3.4E-08	3.4E-08	3.4E-10	3.4E-08	3.4E-08
Cobalt	0.58	0.82	0.84	0.58	0.58	0.41	0.58	0.59	0.41	0.41	0.27	0.39	0.39	0.27	0.27					
Manganese	1.1	1.1	2.4	1.1	1.1	0.27	0.27	0.6	0.27	0.27	0.22	0.22	0.48	0.22	0.22					
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.18	0.18	0.15	0.18	0.18	0.047	0.047	0.039	0.046	0.046	0.041	0.041	0.033	0.04	0.04					
Nickel	0.14	0.17	0.19	0.14	0.14	0.062	0.08	0.089	0.06	0.06	0.045	0.059	0.063	0.044	0.044	8.9E-08	8.9E-08	3.8E-09	8.9E-08	8.9E-08
Selenium	0.046	0.049	0.14	0.077	0.047	0.033	0.036	0.1	0.058	0.034	0.023	0.024	0.069	0.039	0.023					
Trail Buffer 3																				
Antimony	0.29	0.16	0.39	0.21	0.23	0.19	0.09	0.23	0.13	0.14	0.13	0.068	0.16	0.093	0.1					
Arsenic	0.74	0.74	0.79	0.74	0.74	0.27	0.27	0.28	0.27	0.27	0.27	0.27	0.28	0.26	0.26	3.7E-05	3.7E-05	4.2E-05	3.6E-05	3.6E-05
Cadmium	1.5	1.6	1.7	1.5	1.5	0.76	0.84	0.87	0.76	0.76	0.54	0.59	0.62	0.54	0.54	3.4E-08	3.4E-08	4.5E-10	3.4E-08	3.4E-08
Cobalt	0.69	0.93	0.88	0.69	0.69	0.45	0.62	0.61	0.45	0.45	0.3	0.42	0.41	0.3	0.3					
Manganese	1.0	1.0	2.0	1.0	1.0	0.27	0.27	0.52	0.27	0.27	0.23	0.23	0.43	0.23	0.23					
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.24	0.24	0.22	0.24	0.24	0.054	0.054	0.052	0.053	0.053	0.042	0.042	0.041	0.041	0.041					
Nickel	0.26	0.29	0.31	0.25	0.25	0.11	0.14	0.14	0.11	0.11	0.09	0.1	0.11	0.09	0.09	9.0E-08	9.0E-08	5.2E-09	9.0E-08	9.0E-08
Selenium	0.96	0.96	1.1	0.99	0.96	0.49	0.5	0.57	0.52	0.5	0.32	0.32	0.36	0.33	0.32					
SW2																				
Antimony	3.0	3.0	5.0	1.6	0.24	1.5	1.4	2.4	0.79	0.14	1.0	0.97	1.6	0.54	0.098					
Arsenic	2.0	2.0	1.8	0.76	0.45	0.9	0.9	0.8	0.27	0.12	0.77	0.77	0.68	0.24	0.11	1.7E-04	1.7E-04	1.5E-04	4.7E-05	1.8E-05
Cadmium	1.6	1.5	2.3	1.6	1.2	0.84	0.81	1.2	0.82	0.62	0.59	0.58	0.81	0.58	0.45	3.4E-08	3.4E-08	4.5E-10	3.4E-08	3.4E-08
Cobalt	0.69	0.93	0.88	0.69	0.72	0.45	0.62	0.61	0.45	0.46	0.3	0.42	0.41	0.3	0.31					
Manganese	2.3	2.0	3.4	1.6	1.0	0.99	0.86	1.3	0.62	0.26	1.0	0.87	1.3	0.61	0.22					
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.26	0.26	0.24	0.24	0.24	0.069	0.066	0.059	0.056	0.053	0.059	0.056	0.05	0.045	0.042					
Nickel	0.41	0.34	0.33	0.25	0.21	0.19	0.16	0.15	0.11	0.09	0.14	0.12	0.12	0.09	0.07	9.0E-08	9.0E-08	5.1E-09	9.0E-08	9.0E-08
Selenium	1.9	2.4	4.3	2.8	0.74	0.97	1.2	2.2	1.4	0.38	0.62	0.77	1.4	0.9	0.25					

Table 2C: Risk Estimates - Indigenous Land User
Barkerville Gold Mine Ltd. Cariboo Gold Project
Wells, BC

COPC	Toddler Risk Estimates					Adult Risk Estimates					Woman of Childbearing Age Risk Estimates					Composite Receptor Risk Estimates				
	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure
Trapline TR0502T045																				
Antimony	0.25	0.12	0.35	0.17	0.18	0.16	0.067	0.21	0.11	0.12	0.11	0.049	0.14	0.074	0.082					
Arsenic	0.66	0.66	0.71	0.66	0.66	0.22	0.22	0.23	0.21	0.21	0.18	0.18	0.19	0.18	0.18	4.5E-05	4.5E-05	5.0E-05	4.5E-05	4.5E-05
Cadmium	1.1	1.2	1.3	1.1	1.1	0.59	0.67	0.7	0.6	0.59	0.43	0.48	0.51	0.44	0.44	3.4E-08	3.4E-08	4.7E-10	3.4E-08	3.4E-08
Cobalt	0.77	1.0	0.95	0.77	0.77	0.48	0.66	0.64	0.48	0.48	0.32	0.44	0.43	0.32	0.32					
Manganese	1.0	1.0	2.0	1.0	1.0	0.26	0.26	0.51	0.26	0.26	0.22	0.22	0.42	0.22	0.22					
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.24	0.24	0.22	0.24	0.24	0.054	0.054	0.052	0.053	0.053	0.042	0.042	0.041	0.042	0.042					
Nickel	0.22	0.24	0.27	0.21	0.21	0.09	0.12	0.12	0.09	0.09	0.07	0.09	0.094	0.07	0.07	9.0E-08	9.0E-08	5.5E-09	9.0E-08	9.0E-08
Selenium	0.61	0.61	0.71	0.64	0.61	0.32	0.32	0.39	0.34	0.32	0.2	0.2	0.25	0.22	0.2					

Notes

Shaded value indicates hazard quotient greater than 0.2 (or 1.0 for lead) or incremental lifetime cancer risk greater than 1 in 100,000 ($1x10^{-5}$).

Table 2D: Risk Estimates - Hiker
Barkerville Gold Mine Ltd. Cariboo Gold Project
Wells, BC

COPC	Toddler Risk Estimates					Adult Risk Estimates					Composite Receptor Risk Estimates				
	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure
Cariboo Wagon Road (Stanley to Barkerville)															
Antimony	0.002	0.0025	0.0025	0.002	0.002	0.0004	0.00046	0.00046	0.0004	0.0004					
Arsenic	0.044	0.045	0.045	0.044	0.044	0.0039	0.0042	0.0042	0.0039	0.0039	7.3E-07	8.3E-07	8.3E-07	7.3E-07	7.3E-07
Cadmium	0.0029	0.0026	0.0026	0.0029	0.0029	0.0012	0.00054	0.00054	0.0012	0.0012	3.2E-09	8.4E-12	1.3E-11	3.2E-09	3.2E-09
Cobalt	0.0024	0.0024	0.0024	0.0024	0.0024	0.00022	0.00019	0.00019	0.00022	0.00022					
Manganese	0.088	0.13	0.13	0.088	0.088	0.015	0.024	0.024	0.015	0.015					
Methylmercury	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.0002	0.0003	0.0003	0.0002	0.0002	0.000054	0.000069	0.000069	0.000054	0.000054					
Nickel	0.0035	0.004	0.004	0.0035	0.0035	0.0008	0.00064	0.00064	0.0008	0.0008	8.2E-09	2.7E-10	2.7E-10	8.2E-09	8.2E-09
Selenium	0.00048	0.00082	0.00082	0.00048	0.00048	0.0001	0.0002	0.0002	0.0001	0.0001					
Jubilee Trail															
Antimony	0.002	0.0025	0.0025	0.002	0.002	0.0004	0.00046	0.00046	0.0004	0.0004					
Arsenic	0.044	0.045	0.045	0.044	0.044	0.0039	0.0042	0.0042	0.0039	0.0039	7.3E-07	8.3E-07	8.3E-07	7.3E-07	7.3E-07
Cadmium	0.0029	0.0026	0.0026	0.0029	0.0029	0.0012	0.00054	0.00054	0.0012	0.0012	3.2E-09	9.1E-12	1.4E-11	3.2E-09	3.2E-09
Cobalt	0.0024	0.0024	0.0024	0.0024	0.0024	0.00022	0.00019	0.00019	0.00022	0.00022					
Manganese	0.088	0.13	0.13	0.088	0.088	0.015	0.024	0.024	0.015	0.015					
Methylmercury	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.0002	0.0003	0.0003	0.0002	0.0002	0.000054	0.000069	0.000069	0.000054	0.000054					
Nickel	0.0035	0.004	0.004	0.0035	0.0035	0.0008	0.00065	0.00064	0.0008	0.0008	8.2E-09	2.9E-10	2.7E-10	8.2E-09	8.2E-09
Selenium	0.00048	0.00082	0.00082	0.00048	0.00048	0.0001	0.0002	0.0002	0.0001	0.0001					
Proserpine Trail															
Antimony	0.002	0.0025	0.0025	0.002	0.002	0.0004	0.00046	0.00046	0.0004	0.0004					
Arsenic	0.044	0.045	0.045	0.044	0.044	0.0039	0.0042	0.0042	0.0039	0.0039	7.3E-07	8.3E-07	8.3E-07	7.3E-07	7.3E-07
Cadmium	0.0029	0.0026	0.0026	0.0029	0.0029	0.0012	0.00054	0.00054	0.0012	0.0012	3.2E-09	8.3E-12	1.1E-11	3.2E-09	3.2E-09
Cobalt	0.0024	0.0024	0.0024	0.0024	0.0024	0.00022	0.00019	0.00019	0.00022	0.00022					
Manganese	0.088	0.13	0.13	0.088	0.088	0.015	0.024	0.024	0.015	0.015					
Methylmercury	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.0002	0.0003	0.0003	0.0002	0.0002	0.000054	0.000069	0.000069	0.000054	0.000054					
Nickel	0.0035	0.004	0.004	0.0035	0.0035	0.0008	0.00064	0.00064	0.0008	0.0008	8.2E-09	2.7E-10	2.7E-10	8.2E-09	8.2E-09
Selenium	0.00048	0.00082	0.00082	0.00048	0.00048	0.0001	0.0002	0.0002	0.0001	0.0001					
Sugar Creek Loop Trail															
Antimony	0.002	0.0025	0.0025	0.002	0.002	0.0004	0.00046	0.00046	0.0004	0.0004					
Arsenic	0.044	0.045	0.045	0.044	0.044	0.0039	0.0042	0.0042	0.0039	0.0039	7.3E-07	8.3E-07	8.3E-07	7.3E-07	7.3E-07
Cadmium	0.0029	0.0026	0.0026	0.0029	0.0029	0.0012	0.00054	0.00054	0.0012	0.0012	3.2E-09	8.3E-12	1.2E-11	3.2E-09	3.2E-09
Cobalt	0.0024	0.0024	0.0024	0.0024	0.0024	0.00022	0.00019	0.00019	0.00022	0.00022					
Manganese	0.088	0.13	0.13	0.088	0.088	0.015	0.024	0.024	0.015	0.015					
Methylmercury	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.0002	0.0003	0.0003	0.0002	0.0002	0.000054	0.000069	0.000069	0.000054	0.000054					
Nickel	0.0035	0.004	0.004	0.0035	0.0035	0.0008	0.00064	0.00064	0.0008	0.0008	8.2E-09	2.7E-10	2.6E-10	8.2E-09	8.2E-09
Selenium	0.00048	0.00082	0.00082	0.00048	0.00048	0.0001	0.0002	0.0002	0.0001	0.0001					

Table 2D: Risk Estimates - Hiker
Barkerville Gold Mine Ltd. Cariboo Gold Project
Wells, BC

COPC	Toddler Risk Estimates					Adult Risk Estimates					Composite Receptor Risk Estimates				
	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure
Yanks Peak Trail															
Antimony	0.002	0.0025	0.0025	0.002	0.002	0.0004	0.00046	0.00047	0.0004	0.0004					
Arsenic	0.044	0.045	0.045	0.044	0.044	0.0039	0.0042	0.0042	0.0039	0.0039	7.3E-07	8.3E-07	8.4E-07	7.3E-07	7.3E-07
Cadmium	0.0029	0.0026	0.0026	0.0029	0.0029	0.0012	0.00054	0.00054	0.0012	0.0012	3.2E-09	8.4E-12	2.3E-11	3.2E-09	3.2E-09
Cobalt	0.0024	0.0024	0.0024	0.0024	0.0024	0.00022	0.00019	0.00019	0.00022	0.00022					
Manganese	0.088	0.13	0.13	0.088	0.088	0.015	0.024	0.024	0.015	0.015					
Methylmercury	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.0002	0.0003	0.0003	0.0002	0.0002	0.000054	0.000069	0.000069	0.000054	0.000054					
Nickel	0.0035	0.004	0.004	0.0035	0.0035	0.0008	0.00064	0.00065	0.0008	0.0008	8.2E-09	2.7E-10	4.4E-10	8.2E-09	8.2E-09
Selenium	0.00048	0.00082	0.00082	0.00048	0.00048	0.0001	0.0002	0.0002	0.0001	0.0001					
Groundhog Lake Ski Trail															
Antimony	0.002	0.0025	0.0025	0.002	0.002	0.0004	0.00046	0.00046	0.0004	0.0004					
Arsenic	0.044	0.045	0.045	0.044	0.044	0.0039	0.0042	0.0042	0.0039	0.0039	7.3E-07	8.3E-07	8.3E-07	7.3E-07	7.3E-07
Cadmium	0.0029	0.0026	0.0026	0.0029	0.0029	0.0012	0.00054	0.00054	0.0012	0.0012	3.2E-09	8.4E-12	1.2E-11	3.2E-09	3.2E-09
Cobalt	0.0024	0.0024	0.0024	0.0024	0.0024	0.00022	0.00019	0.00019	0.00022	0.00022					
Manganese	0.088	0.13	0.13	0.088	0.088	0.015	0.024	0.024	0.015	0.015					
Methylmercury	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.0002	0.0003	0.0003	0.0002	0.0002	0.000054	0.000069	0.000069	0.000054	0.000054					
Nickel	0.0035	0.004	0.004	0.0035	0.0035	0.0008	0.00064	0.00064	0.0008	0.0008	8.2E-09	2.7E-10	2.7E-10	8.2E-09	8.2E-09
Selenium	0.00048	0.00082	0.00082	0.00048	0.00048	0.0001	0.0002	0.0002	0.0001	0.0001					
Viewing Point along Hwy 26															
Antimony	0.002	0.0025	0.0026	0.002	0.002	0.0004	0.00046	0.00049	0.0004	0.0004					
Arsenic	0.044	0.045	0.045	0.044	0.044	0.0039	0.0042	0.0043	0.0039	0.0039	7.3E-07	8.3E-07	8.6E-07	7.3E-07	7.3E-07
Cadmium	0.0029	0.0026	0.0039	0.0029	0.0029	0.0012	0.00054	0.0018	0.0012	0.0012	3.2E-09	9.0E-12	5.0E-09	3.2E-09	3.2E-09
Cobalt	0.0024	0.0024	0.0024	0.0024	0.0024	0.00022	0.00019	0.00019	0.00022	0.00022					
Manganese	0.088	0.13	0.13	0.088	0.088	0.015	0.024	0.025	0.015	0.015					
Methylmercury	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.0002	0.0003	0.0003	0.0002	0.0002	0.000054	0.000069	0.000069	0.000054	0.000054					
Nickel	0.0035	0.004	0.004	0.0035	0.0035	0.0008	0.00065	0.0007	0.0008	0.0008	8.2E-09	2.9E-10	1.0E-09	8.2E-09	8.2E-09
Selenium	0.00048	0.00082	0.00082	0.00048	0.00048	0.0001	0.0002	0.0002	0.0001	0.0001					
Cow Mountain Trails 1															
Antimony	0.0025	0.0034	0.0034	0.0025	0.0025	0.00046	0.00059	0.0006	0.00046	0.00046					
Arsenic	0.062	0.063	0.064	0.062	0.062	0.0053	0.0058	0.0058	0.0053	0.0053	9.4E-07	1.1E-06	1.1E-06	9.4E-07	9.4E-07
Cadmium	0.0032	0.0035	0.0035	0.0032	0.0032	0.0012	0.0007	0.00072	0.0012	0.0012	3.2E-09	1.6E-11	8.7E-11	3.2E-09	3.2E-09
Cobalt	0.0055	0.0057	0.0057	0.0055	0.0055	0.00043	0.00044	0.00044	0.00043	0.00043					
Manganese	0.075	0.11	0.11	0.075	0.075	0.012	0.02	0.02	0.012	0.012					
Methylmercury	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.00011	0.00019	0.00019	0.00011	0.00011	0.000033	0.000041	0.000041	0.000033	0.000033					
Nickel	0.0044	0.0047	0.0047	0.0044	0.0044	0.0009	0.00075	0.00075	0.0009	0.0009	8.3E-09	4.1E-10	3.6E-10	8.3E-09	8.3E-09
Selenium	0.00054	0.001	0.001	0.00054	0.00054	0.00011	0.00023	0.00023	0.00011	0.00011					

Table 2D: Risk Estimates - Hiker
Barkerville Gold Mine Ltd. Cariboo Gold Project
Wells, BC

COPC	Toddler Risk Estimates					Adult Risk Estimates					Composite Receptor Risk Estimates				
	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure
Cow Mountain Trails 2															
Antimony	0.0025	0.0034	0.0034	0.0025	0.0025	0.00046	0.00059	0.0006	0.00046	0.00046					
Arsenic	0.062	0.063	0.064	0.062	0.062	0.0053	0.0058	0.0058	0.0053	0.0053	9.4E-07	1.1E-06	1.1E-06	9.4E-07	9.4E-07
Cadmium	0.0032	0.0035	0.0035	0.0032	0.0032	0.0012	0.0007	0.00071	0.0012	0.0012	3.2E-09	1.4E-11	2.4E-11	3.2E-09	3.2E-09
Cobalt	0.0055	0.0057	0.0057	0.0055	0.0055	0.00043	0.00044	0.00044	0.00043	0.00043					
Manganese	0.075	0.11	0.11	0.075	0.075	0.012	0.02	0.02	0.012	0.012					
Methylmercury	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.00011	0.00019	0.00019	0.00011	0.00011	0.000033	0.000041	0.000041	0.000033	0.000033					
Nickel	0.0044	0.0047	0.0047	0.0044	0.0044	0.0009	0.00075	0.00075	0.0009	0.0009	8.3E-09	3.4E-10	3.4E-10	8.3E-09	8.3E-09
Selenium	0.00054	0.001	0.001	0.00054	0.00054	0.00011	0.00023	0.00023	0.00011	0.00011					
Jubilee Trail / Wendle Park															
Antimony	0.0025	0.0034	0.0034	0.0025	0.0025	0.00046	0.00059	0.0006	0.00046	0.00046					
Arsenic	0.062	0.063	0.064	0.062	0.062	0.0053	0.0058	0.0058	0.0053	0.0053	9.4E-07	1.1E-06	1.1E-06	9.4E-07	9.4E-07
Cadmium	0.0032	0.0035	0.0035	0.0032	0.0032	0.0012	0.0007	0.00071	0.0012	0.0012	3.2E-09	1.4E-11	2.3E-11	3.2E-09	3.2E-09
Cobalt	0.0055	0.0057	0.0057	0.0055	0.0055	0.00043	0.00044	0.00044	0.00043	0.00043					
Manganese	0.075	0.11	0.11	0.075	0.075	0.012	0.02	0.02	0.012	0.012					
Methylmercury	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.00011	0.00019	0.00019	0.00011	0.00011	0.000033	0.000041	0.000041	0.000033	0.000033					
Nickel	0.0044	0.0047	0.0047	0.0044	0.0044	0.0009	0.00075	0.00075	0.0009	0.0009	8.3E-09	3.5E-10	3.4E-10	8.3E-09	8.3E-09
Selenium	0.00054	0.001	0.001	0.00054	0.00054	0.00011	0.00023	0.00023	0.00011	0.00011					
Ned's Connector Trail															
Antimony	0.0025	0.0034	0.0034	0.0025	0.0025	0.00046	0.00059	0.0006	0.00046	0.00046					
Arsenic	0.062	0.063	0.064	0.062	0.062	0.0053	0.0058	0.0058	0.0053	0.0053	9.4E-07	1.1E-06	1.1E-06	9.4E-07	9.4E-07
Cadmium	0.0032	0.0035	0.0035	0.0032	0.0032	0.0012	0.0007	0.00071	0.0012	0.0012	3.2E-09	1.4E-11	2.5E-11	3.2E-09	3.2E-09
Cobalt	0.0055	0.0057	0.0057	0.0055	0.0055	0.00043	0.00044	0.00044	0.00043	0.00043					
Manganese	0.075	0.11	0.11	0.075	0.075	0.012	0.02	0.02	0.012	0.012					
Methylmercury	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.00011	0.00019	0.00019	0.00011	0.00011	0.000033	0.000041	0.000041	0.000033	0.000033					
Nickel	0.0044	0.0047	0.0047	0.0044	0.0044	0.0009	0.00075	0.00075	0.0009	0.0009	8.3E-09	3.4E-10	3.7E-10	8.3E-09	8.3E-09
Selenium	0.00054	0.001	0.001	0.00054	0.00054	0.00011	0.00023	0.00023	0.00011	0.00011					
Williams Creek Trail															
Antimony	0.0025	0.0034	0.0034	0.0025	0.0025	0.00046	0.00059	0.0006	0.00046	0.00046					
Arsenic	0.062	0.063	0.064	0.062	0.062	0.0053	0.0058	0.0058	0.0053	0.0053	9.4E-07	1.1E-06	1.1E-06	9.4E-07	9.4E-07
Cadmium	0.0032	0.0035	0.0035	0.0032	0.0032	0.0012	0.0007	0.00071	0.0012	0.0012	3.2E-09	1.4E-11	1.9E-11	3.2E-09	3.2E-09
Cobalt	0.0055	0.0057	0.0057	0.0055	0.0055	0.00043	0.00044	0.00044	0.00043	0.00043					
Manganese	0.075	0.11	0.11	0.075	0.075	0.012	0.019	0.02	0.012	0.012					
Methylmercury	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.00011	0.00019	0.00019	0.00011	0.00011	0.000033	0.000041	0.000041	0.000033	0.000033					
Nickel	0.0044	0.0047	0.0047	0.0044	0.0044	0.0009	0.00075	0.00075	0.0009	0.0009	8.3E-09	3.4E-10	3.4E-10	8.3E-09	8.3E-09
Selenium	0.00054	0.001	0.001	0.00054	0.00054	0.00011	0.00023	0.00023	0.00011	0.00011					

Table 2D: Risk Estimates - Hiker
Barkerville Gold Mine Ltd. Cariboo Gold Project
Wells, BC

COPC	Toddler Risk Estimates					Adult Risk Estimates					Composite Receptor Risk Estimates				
	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure
Cornish X-Country Ski Trail 1															
Antimony	0.0025	0.0034	0.0034	0.0025	0.0025	0.00046	0.00059	0.0006	0.00046	0.00046					
Arsenic	0.062	0.063	0.064	0.062	0.062	0.0053	0.0058	0.0058	0.0053	0.0053	9.4E-07	1.1E-06	1.1E-06	9.4E-07	9.4E-07
Cadmium	0.0032	0.0035	0.0035	0.0032	0.0032	0.0012	0.00071	0.00071	0.0012	0.0012	3.2E-09	1.7E-11	3.9E-11	3.2E-09	3.2E-09
Cobalt	0.0055	0.0057	0.0057	0.0055	0.0055	0.00043	0.00044	0.00044	0.00043	0.00043					
Manganese	0.075	0.11	0.11	0.075	0.075	0.012	0.02	0.02	0.012	0.012					
Methylmercury	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.00011	0.00019	0.00019	0.00011	0.00011	0.000033	0.000041	0.000041	0.000033	0.000033					
Nickel	0.0044	0.0047	0.0047	0.0044	0.0044	0.0009	0.00075	0.00075	0.0009	0.0009	8.3E-09	4.4E-10	3.7E-10	8.3E-09	8.3E-09
Selenium	0.00054	0.001	0.001	0.00054	0.00054	0.00011	0.00023	0.00023	0.00011	0.00011					
Cornish X-Country Ski Trail 2															
Antimony	0.0025	0.0034	0.0034	0.0025	0.0025	0.00046	0.00059	0.0006	0.00046	0.00046					
Arsenic	0.062	0.063	0.064	0.062	0.062	0.0053	0.0058	0.0058	0.0053	0.0053	9.4E-07	1.1E-06	1.1E-06	9.4E-07	9.4E-07
Cadmium	0.0032	0.0035	0.0035	0.0032	0.0032	0.0012	0.0007	0.00071	0.0012	0.0012	3.2E-09	1.5E-11	3.0E-11	3.2E-09	3.2E-09
Cobalt	0.0055	0.0057	0.0057	0.0055	0.0055	0.00043	0.00044	0.00044	0.00043	0.00043					
Manganese	0.075	0.11	0.11	0.075	0.075	0.012	0.02	0.02	0.012	0.012					
Methylmercury	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.00011	0.00019	0.00019	0.00011	0.00011	0.000033	0.000041	0.000041	0.000033	0.000033					
Nickel	0.0044	0.0047	0.0047	0.0044	0.0044	0.0009	0.00075	0.00075	0.0009	0.0009	8.3E-09	3.8E-10	3.5E-10	8.3E-09	8.3E-09
Selenium	0.00054	0.001	0.001	0.00054	0.00054	0.00011	0.00023	0.00023	0.00011	0.00011					
Cornish X-Country Ski Trail 3															
Antimony	0.0025	0.0034	0.0034	0.0025	0.0025	0.00046	0.00059	0.0006	0.00046	0.00046					
Arsenic	0.062	0.063	0.064	0.062	0.062	0.0053	0.0058	0.0058	0.0053	0.0053	9.4E-07	1.1E-06	1.1E-06	9.4E-07	9.4E-07
Cadmium	0.0032	0.0035	0.0035	0.0032	0.0032	0.0012	0.00071	0.00072	0.0012	0.0012	3.2E-09	3.5E-11	8.6E-11	3.2E-09	3.2E-09
Cobalt	0.0055	0.0057	0.0057	0.0055	0.0055	0.00043	0.00046	0.00045	0.00043	0.00043					
Manganese	0.075	0.11	0.11	0.075	0.075	0.012	0.02	0.02	0.012	0.012					
Methylmercury	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.00011	0.00019	0.00019	0.00011	0.00011	0.000033	0.000041	0.000041	0.000033	0.000033					
Nickel	0.0044	0.0048	0.0048	0.0044	0.0044	0.0009	0.0008	0.00076	0.0009	0.0009	8.3E-09	1.0E-09	5.2E-10	8.3E-09	8.3E-09
Selenium	0.00054	0.001	0.001	0.00054	0.00054	0.00011	0.00023	0.00023	0.00011	0.00011					
Groundhog Lake Snowmobile Trail															
Antimony	0.0025	0.0034	0.0034	0.0025	0.0025	0.00046	0.00059	0.0006	0.00046	0.00046					
Arsenic	0.062	0.063	0.064	0.062	0.062	0.0053	0.0058	0.0058	0.0053	0.0053	9.4E-07	1.1E-06	1.1E-06	9.4E-07	9.4E-07
Cadmium	0.0032	0.0035	0.0035	0.0032	0.0032	0.0012	0.0007	0.00071	0.0012	0.0012	3.2E-09	1.4E-11	2.9E-11	3.2E-09	3.2E-09
Manganese	0.075	0.11	0.11	0.075	0.075	0.012	0.02	0.02	0.012	0.012					
Methylmercury	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.00011	0.00019	0.00019	0.00011	0.00011	0.000033	0.000041	0.000041	0.000033	0.000033					
Nickel	0.0044	0.0047	0.0048	0.0044	0.0044	0.0009	0.00075	0.00076	0.0009	0.0009	8.3E-09	3.5E-10	5.1E-10	8.3E-09	8.3E-09
Selenium	0.00054	0.001	0.001	0.00054	0.00054	0.00011	0.00023	0.00023	0.00011	0.00011					

Table 2D: Risk Estimates - Hiker
Barkerville Gold Mine Ltd. Cariboo Gold Project
Wells, BC

COPC	Toddler Risk Estimates					Adult Risk Estimates					Composite Receptor Risk Estimates				
	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure
Water Access – Jack of Clubs Lake															
Antimony	0.0025	0.0034	0.0034	0.0025	0.0025	0.00046	0.00059	0.00062	0.00046	0.00046					
Arsenic	0.062	0.063	0.064	0.062	0.062	0.0053	0.0058	0.0059	0.0053	0.0053	9.4E-07	1.1E-06	1.2E-06	9.4E-07	9.4E-07
Cadmium	0.0032	0.0035	0.0042	0.0032	0.0032	0.0012	0.00072	0.0014	0.0012	0.0012	3.2E-09	7.0E-11	2.6E-09	3.2E-09	3.2E-09
Cobalt	0.0055	0.0058	0.0057	0.0055	0.0055	0.00043	0.00051	0.00045	0.00043	0.00043					
Manganese	0.075	0.11	0.11	0.075	0.075	0.012	0.021	0.02	0.012	0.012					
Methylmercury	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.00011	0.00019	0.00019	0.00011	0.00011	0.000033	0.000041	0.000041	0.000033	0.000033					
Nickel	0.0044	0.0048	0.0048	0.0044	0.0044	0.0009	0.0008	0.0008	0.0009	0.0009	8.3E-09	2.1E-09	9.9E-10	8.3E-09	8.3E-09
Selenium	0.00054	0.001	0.001	0.00054	0.00054	0.00011	0.00023	0.00023	0.00011	0.00011					
Valley Mountain Pass															
Antimony	0.0025	0.0034	0.0034	0.0025	0.0025	0.00046	0.00059	0.00061	0.00046	0.00046					
Arsenic	0.062	0.063	0.064	0.062	0.062	0.0053	0.0058	0.0059	0.0053	0.0053	9.4E-07	1.1E-06	1.2E-06	9.4E-07	9.4E-07
Cadmium	0.0032	0.0035	0.0036	0.0032	0.0032	0.0012	0.00072	0.00078	0.0012	0.0012	3.2E-09	6.4E-11	3.1E-10	3.2E-09	3.2E-09
Cobalt	0.0055	0.0058	0.0057	0.0055	0.0055	0.00043	0.0005	0.00046	0.00043	0.00043					
Manganese	0.075	0.11	0.11	0.075	0.075	0.012	0.02	0.02	0.012	0.012					
Methylmercury	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.00011	0.00019	0.00019	0.00011	0.00011	0.000033	0.000041	0.000041	0.000033	0.000033					
Nickel	0.0044	0.0048	0.0048	0.0044	0.0044	0.0009	0.0008	0.0008	0.0009	0.0009	8.3E-09	1.9E-09	7.6E-10	8.3E-09	8.3E-09
Selenium	0.00054	0.001	0.001	0.00054	0.00054	0.00011	0.00023	0.00023	0.00011	0.00011					
Historic Barkerville Town and Park															
Antimony	0.0025	0.0034	0.0034	0.0025	0.0025	0.00046	0.00059	0.0006	0.00046	0.00046					
Arsenic	0.062	0.063	0.064	0.062	0.062	0.0053	0.0058	0.0058	0.0053	0.0053	9.4E-07	1.1E-06	1.1E-06	9.4E-07	9.4E-07
Cadmium	0.0032	0.0035	0.0035	0.0032	0.0032	0.0012	0.0007	0.00071	0.0012	0.0012	3.2E-09	1.4E-11	2.2E-11	3.2E-09	3.2E-09
Cobalt	0.0055	0.0057	0.0057	0.0055	0.0055	0.00043	0.00044	0.00044	0.00043	0.00043					
Manganese	0.075	0.11	0.11	0.075	0.075	0.012	0.019	0.02	0.012	0.012					
Methylmercury	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.00011	0.00019	0.00019	0.00011	0.00011	0.000033	0.000041	0.000041	0.000033	0.000033					
Nickel	0.0044	0.0047	0.0047	0.0044	0.0044	0.0009	0.00075	0.00075	0.0009	0.0009	8.3E-09	3.4E-10	3.4E-10	8.3E-09	8.3E-09
Selenium	0.00054	0.001	0.001	0.00054	0.00054	0.00011	0.00023	0.00023	0.00011	0.00011					
Le Bourdais Lake															
Antimony	0.0024	0.0024	0.0031	0.0024	0.0024	0.00039	0.00039	0.0005	0.00039	0.00039					
Arsenic	0.042	0.042	0.042	0.042	0.042	0.0036	0.0036	0.0037	0.0036	0.0036	6.1E-07	6.1E-07	6.6E-07	6.1E-07	6.1E-07
Cadmium	0.0076	0.0076	0.008	0.0076	0.0076	0.0021	0.0021	0.0016	0.0021	0.0021	3.2E-09	3.2E-09	3.2E-11	3.2E-09	3.2E-09
Cobalt	0.003	0.003	0.003	0.003	0.003	0.00028	0.00028	0.00025	0.00028	0.00028					
Manganese	0.071	0.071	0.11	0.071	0.071	0.01	0.01	0.019	0.01	0.01					
Methylmercury	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.0016	0.0016	0.0014	0.0016	0.0016	0.0004	0.0004	0.00033	0.0004	0.0004					
Nickel	0.0055	0.0055	0.0056	0.0055	0.0055	0.0011	0.0011	0.0009	0.0011	0.0011	8.3E-09	8.3E-09	3.6E-10	8.3E-09	8.3E-09
Selenium	0.00038	0.00038	0.00081	0.00038	0.00038	0.000062	0.000062	0.00018	0.000062	0.000062					

Table 2D: Risk Estimates - Hiker
Barkerville Gold Mine Ltd. Cariboo Gold Project
Wells, BC

COPC	Toddler Risk Estimates					Adult Risk Estimates					Composite Receptor Risk Estimates				
	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure
Quesnel Forks															
Antimony	0.0024	0.0024	0.0031	0.0024	0.0024	0.00039	0.00039	0.0005	0.00039	0.00039					
Arsenic	0.042	0.042	0.042	0.042	0.042	0.0036	0.0036	0.0037	0.0036	0.0036	6.1E-07	6.1E-07	6.6E-07	6.1E-07	6.1E-07
Cadmium	0.0076	0.0076	0.008	0.0076	0.0076	0.0021	0.0021	0.0016	0.0021	0.0021	3.2E-09	3.2E-09	3.2E-11	3.2E-09	3.2E-09
Cobalt	0.003	0.003	0.003	0.003	0.003	0.00028	0.00028	0.00025	0.00028	0.00028					
Manganese	0.071	0.071	0.11	0.071	0.071	0.01	0.01	0.019	0.01	0.01					
Methylmercury	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.0016	0.0016	0.0014	0.0016	0.0016	0.0004	0.0004	0.00033	0.0004	0.0004					
Nickel	0.0055	0.0055	0.0056	0.0055	0.0055	0.0011	0.0011	0.0009	0.0011	0.0011	8.3E-09	8.3E-09	3.7E-10	8.3E-09	8.3E-09
Selenium	0.00038	0.00038	0.00081	0.00038	0.00038	0.000062	0.000062	0.00018	0.000062	0.000062					
SW2															
Antimony	0.0027	0.0027	0.0037	0.0027	0.0027	0.00042	0.00042	0.00058	0.00042	0.00042					
Arsenic	0.07	0.07	0.071	0.07	0.07	0.0058	0.0058	0.0061	0.0058	0.0058	9.6E-07	9.6E-07	1.1E-06	9.6E-07	9.6E-07
Cadmium	0.014	0.014	0.015	0.014	0.014	0.0036	0.0036	0.0033	0.0036	0.0036	3.2E-09	3.2E-09	4.2E-11	3.2E-09	3.2E-09
Cobalt	0.0035	0.0035	0.0032	0.0035	0.0035	0.00035	0.00035	0.00026	0.00035	0.00035					
Manganese	0.06	0.06	0.087	0.06	0.06	0.0086	0.0086	0.015	0.0086	0.0086					
Methylmercury	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.0026	0.0026	0.0024	0.0026	0.0026	0.00064	0.00064	0.00057	0.00064	0.00064					
Nickel	0.007	0.007	0.0074	0.007	0.007	0.0015	0.0015	0.0013	0.0015	0.0015	8.4E-09	8.4E-09	4.8E-10	8.4E-09	8.4E-09
Selenium	0.00049	0.00049	0.0012	0.00049	0.00049	0.000069	0.000069	0.00025	0.000069	0.000069					

Notes
Shaded value indicates hazard quotient greater than 0.2 (or 1.0 for lead) or incremental lifetime cancer risk greater than 1 in 100,000 ($1x10^{-5}$).

Table 2E: Risk Estimates - Camper
Barkerville Gold Mine Ltd. Cariboo Gold Project
Wells, BC

COPC	Toddler Risk Estimates					Adult Risk Estimates					Composite Receptor Risk Estimates				
	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure
Chisholm Creek Rec Site															
Antimony	0.0033	0.0038	0.0038	0.0033	0.0033	0.00093	0.00069	0.0007	0.00093	0.00093					
Arsenic	0.066	0.068	0.068	0.066	0.066	0.006	0.0063	0.0063	0.006	0.006	1.2E-06	1.2E-06	1.3E-06	1.2E-06	1.2E-06
Cadmium	0.0068	0.0039	0.004	0.0068	0.0068	0.0043	0.00081	0.00093	0.0043	0.0043	1.4E-08	3.8E-11	5.1E-10	1.4E-08	1.4E-08
Cobalt	0.0037	0.0036	0.0036	0.0037	0.0037	0.0005	0.00032	0.00032	0.0005	0.0005					
Manganese	0.13	0.19	0.19	0.13	0.13	0.025	0.037	0.037	0.025	0.025					
Methylmercury	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.00034	0.00045	0.00045	0.00034	0.00034	0.00012	0.0001	0.0001	0.00012	0.00012					
Nickel	0.006	0.006	0.006	0.006	0.006	0.002	0.001	0.001	0.002	0.002	3.7E-08	1.2E-09	1.3E-09	3.7E-08	3.7E-08
Selenium	0.00072	0.0012	0.0012	0.00072	0.00072	0.00016	0.00029	0.00029	0.00016	0.00016					
Nine Mile Lake Rec Site															
Antimony	0.0033	0.0038	0.0038	0.0033	0.0033	0.00093	0.00069	0.0007	0.00093	0.00093					
Arsenic	0.066	0.068	0.068	0.066	0.066	0.006	0.0063	0.0063	0.006	0.006	1.2E-06	1.2E-06	1.3E-06	1.2E-06	1.2E-06
Cadmium	0.0068	0.0039	0.0039	0.0068	0.0068	0.0043	0.00081	0.00082	0.0043	0.0043	1.4E-08	3.9E-11	7.5E-11	1.4E-08	1.4E-08
Cobalt	0.0037	0.0036	0.0036	0.0037	0.0037	0.0005	0.00032	0.00032	0.0005	0.0005					
Manganese	0.13	0.19	0.19	0.13	0.13	0.025	0.037	0.037	0.025	0.025					
Methylmercury	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.00034	0.00045	0.00045	0.00034	0.00034	0.00012	0.0001	0.0001	0.00012	0.00012					
Nickel	0.006	0.006	0.006	0.006	0.006	0.002	0.001	0.001	0.002	0.002	3.7E-08	1.3E-09	1.2E-09	3.7E-08	3.7E-08
Selenium	0.00072	0.0012	0.0012	0.00072	0.00072	0.00016	0.00029	0.00029	0.00016	0.00016					
Barkerville Provincial Park Campground															
Antimony	0.019	0.02	0.02	0.019	0.019	0.0096	0.0094	0.0094	0.0096	0.0096					
Arsenic	0.99	0.99	0.99	0.99	0.99	0.49	0.49	0.49	0.49	0.49	3.1E-05	3.2E-05	3.2E-05	3.1E-05	3.1E-05
Cadmium	0.0083	0.0063	0.0064	0.0083	0.0083	0.0047	0.0014	0.0015	0.0047	0.0047	1.4E-08	6.4E-11	1.1E-10	1.4E-08	1.4E-08
Cobalt	0.016	0.016	0.016	0.016	0.016	0.0035	0.0034	0.0034	0.0035	0.0035					
Manganese	0.22	0.26	0.26	0.22	0.22	0.056	0.065	0.065	0.056	0.056					
Methylmercury	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.00025	0.00033	0.00033	0.00025	0.00025	0.00011	0.000078	0.000078	0.00011	0.00011					
Nickel	0.049	0.048	0.048	0.049	0.049	0.026	0.025	0.025	0.026	0.026	3.7E-08	1.6E-09	1.5E-09	3.7E-08	3.7E-08
Selenium	0.001	0.0017	0.0017	0.001	0.001	0.00025	0.00044	0.00044	0.00025	0.00025					
Forest Rose Campground															
Antimony	0.026	0.027	0.027	0.026	0.026	0.014	0.013	0.013	0.014	0.014					
Arsenic	0.31	0.31	0.31	0.31	0.31	0.12	0.13	0.13	0.12	0.12	8.7E-06	8.9E-06	8.9E-06	8.7E-06	8.7E-06
Cadmium	0.0091	0.0072	0.0072	0.0091	0.0091	0.005	0.0017	0.0017	0.005	0.005	1.4E-08	6.4E-11	1.1E-10	1.4E-08	1.4E-08
Cobalt	0.016	0.016	0.016	0.016	0.016	0.0034	0.0033	0.0033	0.0034	0.0034					
Manganese	0.2	0.24	0.24	0.2	0.2	0.051	0.06	0.06	0.051	0.051					
Methylmercury	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.00029	0.00037	0.00037	0.00029	0.00029	0.00012	0.000092	0.000092	0.00012	0.00012					
Nickel	0.059	0.058	0.058	0.059	0.059	0.032	0.031	0.031	0.032	0.032	3.7E-08	1.6E-09	1.5E-09	3.7E-08	3.7E-08
Selenium	0.0011	0.0018	0.0018	0.0011	0.0011	0.00028	0.00047	0.00047	0.00028	0.00028					

Table 2E: Risk Estimates - Camper
Barkerville Gold Mine Ltd. Cariboo Gold Project
Wells, BC

COPC	Toddler Risk Estimates					Adult Risk Estimates					Composite Receptor Risk Estimates				
	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure
Government Hill Campground															
Antimony	0.028	0.029	0.029	0.028	0.028	0.015	0.015	0.015	0.015	0.015					
Arsenic	1.3	1.3	1.3	1.3	1.3	0.64	0.64	0.64	0.64	0.64	4.1E-05	4.1E-05	4.1E-05	4.1E-05	4.1E-05
Cadmium	0.0094	0.0075	0.0075	0.0094	0.0094	0.0051	0.0018	0.0018	0.0051	0.0051	1.4E-08	6.3E-11	1.0E-10	1.4E-08	1.4E-08
Cobalt	0.016	0.016	0.016	0.016	0.016	0.0035	0.0033	0.0033	0.0035	0.0035					
Manganese	0.19	0.24	0.24	0.19	0.19	0.047	0.056	0.056	0.047	0.047					
Methylmercury	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.00028	0.00035	0.00035	0.00028	0.00028	0.00012	0.000088	0.000088	0.00012	0.00012					
Nickel	0.05	0.049	0.049	0.05	0.05	0.027	0.025	0.025	0.027	0.027	3.7E-08	1.6E-09	1.5E-09	3.7E-08	3.7E-08
Selenium	0.0015	0.0022	0.0022	0.0015	0.0015	0.00041	0.0006	0.0006	0.00041	0.00041					
Little Lake Rec Site															
Antimony	0.0039	0.0039	0.0047	0.0039	0.0039	0.00091	0.00091	0.00075	0.00091	0.00091					
Arsenic	0.063	0.063	0.064	0.063	0.063	0.0054	0.0054	0.0055	0.0054	0.0054	9.8E-07	9.8E-07	9.9E-07	9.8E-07	9.8E-07
Cadmium	0.014	0.014	0.012	0.014	0.014	0.0057	0.0057	0.0024	0.0057	0.0057	1.4E-08	1.4E-08	1.4E-10	1.4E-08	1.4E-08
Cobalt	0.0047	0.0047	0.0046	0.0047	0.0047	0.0006	0.0006	0.00042	0.0006	0.0006					
Manganese	0.11	0.11	0.16	0.11	0.11	0.018	0.018	0.029	0.018	0.018					
Methylmercury	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.0025	0.0025	0.0021	0.0025	0.0025	0.00064	0.00064	0.00049	0.00064	0.00064					
Nickel	0.009	0.009	0.0084	0.009	0.009	0.003	0.003	0.0014	0.003	0.003	3.7E-08	3.7E-08	1.6E-09	3.7E-08	3.7E-08
Selenium	0.00057	0.00057	0.0012	0.00057	0.00057	0.000093	0.000093	0.00027	0.000093	0.000093					
Maude Lake Rec Site															
Antimony	0.0039	0.0039	0.0047	0.0039	0.0039	0.00091	0.00091	0.00075	0.00091	0.00091					
Arsenic	0.063	0.063	0.064	0.063	0.063	0.0054	0.0054	0.0056	0.0054	0.0054	9.8E-07	9.8E-07	9.9E-07	9.8E-07	9.8E-07
Cadmium	0.014	0.014	0.012	0.014	0.014	0.0057	0.0057	0.0024	0.0057	0.0057	1.4E-08	1.4E-08	1.4E-10	1.4E-08	1.4E-08
Cobalt	0.0047	0.0047	0.0046	0.0047	0.0047	0.0006	0.0006	0.00042	0.0006	0.0006					
Manganese	0.11	0.11	0.16	0.11	0.11	0.018	0.018	0.029	0.018	0.018					
Methylmercury	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.0025	0.0025	0.0021	0.0025	0.0025	0.00064	0.00064	0.00049	0.00064	0.00064					
Nickel	0.009	0.009	0.0084	0.009	0.009	0.003	0.003	0.0014	0.003	0.003	3.7E-08	3.7E-08	1.6E-09	3.7E-08	3.7E-08
Selenium	0.00057	0.00057	0.0012	0.00057	0.00057	0.000093	0.000093	0.00027	0.000093	0.000093					
Prior Lake Rec Site															
Antimony	0.0039	0.0039	0.0047	0.0039	0.0039	0.00091	0.00091	0.00075	0.00091	0.00091					
Arsenic	0.063	0.063	0.064	0.063	0.063	0.0054	0.0054	0.0055	0.0054	0.0054	9.8E-07	9.8E-07	9.9E-07	9.8E-07	9.8E-07
Cadmium	0.014	0.014	0.012	0.014	0.014	0.0057	0.0057	0.0024	0.0057	0.0057	1.4E-08	1.4E-08	1.4E-10	1.4E-08	1.4E-08
Cobalt	0.0047	0.0047	0.0046	0.0047	0.0047	0.0006	0.0006	0.00042	0.0006	0.0006					
Manganese	0.11	0.11	0.16	0.11	0.11	0.018	0.018	0.029	0.018	0.018					
Methylmercury	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.0025	0.0025	0.0021	0.0025	0.0025	0.00064	0.00064	0.00049	0.00064	0.00064					
Nickel	0.009	0.009	0.0084	0.009	0.009	0.003	0.003	0.0014	0.003	0.003	3.7E-08	3.7E-08	1.6E-09	3.7E-08	3.7E-08
Selenium	0.00057	0.00057	0.0012	0.00057	0.00057	0.000093	0.000093	0.00027	0.000093	0.000093					

Notes

Shaded value indicates hazard quotient greater than 0.2 (or 1.0 for lead) or incremental lifetime cancer risk greater than 1 in 100,000 ($1x10^{-5}$).

Table 2F: Risk Estimates - Sport Fisher/Hunter
Barkerville Gold Mine Ltd. Cariboo Gold Project
Wells, BC

COPC	Toddler Risk Estimates					Teen Risk Estimates					Adult Risk Estimates					Woman of Childbearing Age Risk Estimates					Composite Receptor Risk Estimates				
	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure
Cariboo Wagon Road (Stanley to Barkerville)																									
Antimony	0.011	0.011	0.011	0.011	0.011	0.0066	0.0066	0.0066	0.0066	0.0066	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0075	0.0076	0.0076	0.0076					
Arsenic	0.074	0.074	0.074	0.074	0.074	0.045	0.045	0.045	0.045	0.045	0.042	0.042	0.042	0.042	0.042	0.037	0.037	0.037	0.037	0.037	1.0E-05	1.0E-05	1.0E-05	1.0E-05	1.0E-05
Cadmium	0.016	0.017	0.017	0.016	0.016	0.0098	0.0089	0.0091	0.01	0.0099	0.01	0.0096	0.0099	0.011	0.01	0.0096	0.0089	0.0091	0.0098	0.0096	1.4E-08	3.8E-11	5.9E-11	1.4E-08	1.4E-08
Cobalt	0.15	0.2	0.2	0.15	0.15	0.085	0.12	0.12	0.085	0.085	0.1	0.14	0.14	0.1	0.1	0.11	0.15	0.15	0.11	0.11					
Manganese	0.013	0.013	0.013	0.013	0.013	0.013	0.012	0.012	0.013	0.013	0.012	0.011	0.011	0.012	0.012	0.012	0.011	0.011	0.012	0.012					
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.00079	0.0015	0.0022	0.0015	0.00092	0.00041	0.00072	0.0011	0.00077	0.00047	0.00047	0.00086	0.0013	0.00092	0.00055	0.00047	0.00089	0.0014	0.00096	0.00056					
Nickel	0.014	0.023	0.024	0.015	0.015	0.01	0.014	0.015	0.01	0.01	0.012	0.017	0.018	0.012	0.012	0.012	0.018	0.019	0.013	0.012	3.8E-08	1.2E-09	1.2E-09	3.8E-08	3.8E-08
Selenium	0.16	0.17	0.18	0.17	0.17	0.08	0.085	0.091	0.086	0.081	0.084	0.091	0.099	0.092	0.086	0.068	0.075	0.084	0.076	0.07					
Trapline TR0515T017 Cabin																									
Antimony	0.0067	0.0069	0.0069	0.0067	0.0067	0.0043	0.0042	0.0042	0.0043	0.0043	0.0054	0.0053	0.0053	0.0054	0.0054	0.0057	0.0057	0.0057	0.0057	0.0057					
Arsenic	0.00012	0.00018	0.00027	0.00021	0.00014	0.0051	0.005	0.0051	0.0051	0.0051	0.0044	0.0044	0.0044	0.0045	0.0044	0.0057	0.0057	0.0058	0.0058	0.0057	6.7E-07	5.8E-07	6.0E-07	6.8E-07	6.7E-07
Cadmium	0.0048	0.0058	0.0061	0.0051	0.0049	0.0044	0.0035	0.0036	0.0045	0.0044	0.0052	0.0044	0.0046	0.0054	0.0052	0.0054	0.0047	0.0049	0.0056	0.0054	1.4E-08	3.8E-11	3.8E-11	1.4E-08	1.4E-08
Cobalt	0.12	0.17	0.17	0.12	0.12	0.068	0.098	0.099	0.068	0.068	0.087	0.13	0.13	0.088	0.087	0.092	0.13	0.13	0.093	0.092					
Manganese	0.00031	0.00032	0.00032	0.00032	0.00031	0.0062	0.0051	0.0051	0.0062	0.0062	0.0056	0.0045	0.0045	0.0056	0.0056	0.0062	0.0052	0.0052	0.0062	0.0062					
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.00059	0.0013	0.002	0.0013	0.00072	0.00032	0.00063	0.001	0.00069	0.00038	0.00039	0.00078	0.0012	0.00085	0.00047	0.00041	0.00083	0.0013	0.00089	0.00049					
Nickel	0.012	0.02	0.021	0.013	0.012	0.008	0.012	0.013	0.008	0.008	0.01	0.015	0.016	0.01	0.01	0.01	0.016	0.017	0.011	0.01	3.8E-08	1.2E-09	1.2E-09	3.8E-08	3.8E-08
Selenium	0.0039	0.012	0.021	0.013	0.0056	0.0023	0.0068	0.013	0.0077	0.0033	0.0032	0.0094	0.017	0.011	0.0046	0.0034	0.010	0.018	0.011	0.0049					
Cow Mountain Trails 1																									
Antimony	0.011	0.011	0.011	0.011	0.011	0.007	0.0069	0.0069	0.007	0.007	0.008	0.0079	0.0079	0.008	0.008	0.008	0.008	0.008	0.008	0.008					
Arsenic	0.074	0.074	0.074	0.074	0.074	0.051	0.051	0.051	0.051	0.051	0.048	0.048	0.048	0.048	0.048	0.044	0.044	0.044	0.044	0.044	1.1E-05	1.1E-05	1.1E-05	1.1E-05	1.1E-05
Cadmium	0.016	0.017	0.017	0.016	0.016	0.0099	0.009	0.0092	0.01	0.0099	0.01	0.0097	0.0099	0.011	0.01	0.0096	0.0089	0.0092	0.0098	0.0096	1.4E-08	7.3E-11	4.0E-10	1.4E-08	1.4E-08
Cobalt	0.15	0.2	0.2	0.15	0.15	0.085	0.12	0.12	0.085	0.085	0.1	0.14	0.14	0.1	0.1	0.11	0.15	0.15	0.11	0.11					
Manganese	0.013	0.013	0.013	0.013	0.013	0.013	0.012	0.012	0.013	0.013	0.012	0.011	0.011	0.012	0.012	0.011	0.01	0.01	0.011	0.011					
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.00079	0.0015	0.0022	0.0015	0.00092	0.00041	0.00072	0.0011	0.00077	0.00047	0.00047	0.00086	0.0013	0.00092	0.00055	0.00047	0.00089	0.0014	0.00096	0.00056					
Nickel	0.014	0.023	0.024	0.015	0.015	0.01	0.014	0.015	0.011	0.01	0.012	0.018	0.018	0.013	0.012	0.012	0.018	0.019	0.013	0.012	3.8E-08	1.9E-09	1.7E-09	3.8E-08	3.8E-08
Selenium	0.16	0.17	0.18	0.17	0.17	0.08	0.085	0.091	0.086	0.081	0.084	0.091	0.099	0.092	0.086	0.068	0.075	0.084	0.076	0.07					
Williams Creek Trail																									
Antimony	0.011	0.011	0.011	0.011	0.011	0.0067	0.0066	0.0066	0.0067	0.0067	0.0077	0.0076	0.0076	0.0077	0.0077	0.0077	0.0076	0.0076	0.0077	0.0077					
Arsenic	0.074	0.074	0.074	0.074	0.074	0.051	0.051	0.051	0.051	0.051	0.048	0.048	0.048	0.048	0.048	0.044	0.044	0.044	0.044	0.044	1.1E-05	1.1E-05	1.1E-05	1.1E-05	1.1E-05
Cadmium	0.016	0.017	0.017	0.016	0.016	0.0099	0.009	0.0091	0.01	0.0099	0.01	0.0097	0.0099	0.011	0.01	0.0096	0.0089	0.0091	0.0098	0.0096	1.4E-08	6.2E-11	8.9E-11	1.4E-08	1.4E-08
Cobalt	0.15	0.2	0.2	0.15	0.15	0.085	0.12	0.12	0.085	0.085	0.1	0.14	0.14	0.1	0.1	0.11	0.15	0.15	0.11	0.11					
Manganese	0.013	0.013	0.013	0.013	0.013	0.013	0.012	0.012	0.013	0.013	0.012	0.011	0.011	0.012	0.012	0.011	0.01	0.01	0.011	0.011					
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.00079	0.0015	0.0022	0.0015	0.00092	0.0004	0.00072	0.0011	0.00077	0.00047	0.00047	0.00086	0.0013	0.00092	0.00055	0.00047	0.00089	0.0014	0.00096	0.00056					
Nickel	0.014	0.023	0.024	0.015	0.015	0.01	0.014	0.015	0.01	0.01	0.012	0.017	0.018	0.012	0.012	0.012	0.018	0.019	0.013	0.012	3.8E-08	1.5E-09	1.5E-09	3.8E-08	3.8E-08
Selenium	0.16	0.17	0.18	0.17	0.17	0.08	0.085	0.091	0.086	0.081	0.084	0.091	0.099	0.092	0.086	0.068	0.075	0.084	0.076	0.07					
Water Access – Jack of Clubs Lake																									
Antimony	0.011	0.011	0.011	0.011	0.011	0.0084	0.0083	0.0084	0.0084	0.0084	0.0093	0.0092	0.0093	0.0093	0.0093	0.0095	0.0094	0.0095	0.0095	0.0095					
Arsenic	0.016	0.016	0.031	0.022	0.0093	0.57	0.57	0.57	0.57	0.56	0.53	0.53	0.54	0.53	0.53	0.59	0.59	0.6	0.6	0.59	6.8E-05	6.8E-05	7.0E-05	6.8E-05	6.7E-05
Cadmium	0.01	0.087	0.21	0.14	0.039	0.0071	0.043	0.1	0.068	0.021	0.0078	0.042	0.10	0.066	0.021	0.0075	0.035	0.081	0.054	0.018	1.4E-08	3.2E-10	1.2E-08	1.4E-08	1.4E-08
Cobalt	0.14	0.18	0.19	0.13	0.12	0.078	0.1	0.11	0.074	0.07	0.097	0.13	0.14	0.093	0.089	0.1	0.14	0.14	0.097	0.094					
Manganese	0.0095	0.0065	0.0065	0.0065	0.0065	0.013	0.012	0.011	0.011	0.011	0.012	0.011	0.01	0.01	0.01	0.012	0.012	0.011	0.011	0.011					
Methylmercury	0.27	3.9	3.9	3.9	3.9	0.055	0.82	0.82	0.82	0.82	0.053	0.78	0.78	0.78	0.78	0.099	1.5	1.5	1.5	1.5					
Molybdenum	0.00089	0.015	0.04	0.025	0.0048	0.00045	0.0063	0.017	0.01	0.0021	0.00051	0.006	0.016	0.0099	0.002	0.0005	0.005	0.013	0.0081	0.0017					
Nickel	0.014	0.063	0.13	0.084	0.027	0.01	0.034	0.069	0.044	0.017	0.012	0.037	0.07	0.045	0.018	0.012	0.034	0.061	0.039	0.018	3.8E-08	9.4E-09	4.5E-09	3.8E-08	3.8E-08
Selenium	0.23	0.074	0.084	0.076	0.068	0.11	0.037	0.043	0.038	0.034	0.12	0.041	0.049	0.042	0.036	0.096	0.035	0.044	0.037	0.03					
Outfitter Area																									
Antimony	0.011	0.011	0.011	0.011	0.011	0.0084	0.0083	0.0084	0.0084	0.0084	0.0093	0.0092	0.0093	0.0093	0.0093	0.0095	0.0094	0.0095	0.0095	0.0095					
Arsenic	0.016	0.016	0.031	0.022	0.0093	0.57	0.57	0.57	0.57	0.56	0.53	0.53	0.54	0.53	0.53	0.59	0.59	0.6	0.6	0.59	6.8E-05	6.7E-05	7.0E-05	6.8E-05	6.7E-05
Cadmium	0.01	0.087	0.21	0.14	0.039	0.0071	0.043	0.1	0.068	0.021	0.0078	0.042	0.098	0.066	0.021	0.0075	0.035	0.08	0.054	0.018	1.4E-08	1.8E-10	1.1E-09	1.4E-08	1.4E-08
Cobalt	0.14	0.18	0.19	0.13	0.12	0.078	0.1	0.11	0.074	0.07	0.097	0.13	0.14	0.093	0.089	0.1	0.14	0.14	0.097	0.094					
Manganese	0.0095	0.0065	0.0065	0.0065	0.0065	0.013	0.011	0.011	0.011	0.011	0.012	0.01	0.0098	0.01	0.01	0.012	0.011	0.01	0.011	0.011					
Methylmercury	0.27	3.9	3.9	3.9	3.9	0.055	0.82	0.82	0.82	0.82	0.053	0.78	0.78	0.78	0.78	0.099	1.5	1.5	1.5	1.5					
Molybdenum	0.00089	0.015	0.04	0.025	0.0048	0.00045	0.0063	0.017	0.01	0.0021	0.00051	0.006	0.016	0.0099	0.002	0.0005	0.005	0.013	0.0081	0.0017					
Nickel	0.014	0.063	0.13	0.084	0.027	0.01	0.034	0.069	0.044	0.017	0.012	0.037	0.07	0.045	0.018	0.012	0.034	0.061	0.039	0.018	3.8E-08	5.0E-09	2.2E-09	3.8E-08	3.8E-08
Selenium	0.23	0.074	0.084	0.076	0.068	0.11	0.037	0.043	0.038	0.034	0.12	0.041	0.049	0.042	0.036	0.096	0.035	0.044	0.037	0.03					

Table 2F: Risk Estimates - Sport Fisher/Hunter
Barkerville Gold Mine Ltd. Cariboo Gold Project
Wells, BC

COPC	Toddler Risk Estimates					Teen Risk Estimates					Adult Risk Estimates					Woman of Childbearing Age Risk Estimates					Composite Receptor Risk Estimates				
	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure
Trapline TR0515T020 Cabin 1																									
Antimony	0.047	0.015	0.058	0.027	0.031	0.028	0.009	0.034	0.016	0.019	0.035	0.011	0.043	0.021	0.024	0.038	0.012	0.046	0.022	0.025					
Arsenic	0.00063	0.00086	0.00048	0.00019	0.00013	0.0053	0.0054	0.0051	0.005	0.005	0.0047	0.0049	0.0045	0.0044	0.0043	0.006	0.0062	0.0058	0.0057	0.0056	7.3E-07	7.7E-07	6.2E-07	6.7E-07	6.6E-07
Cadmium	0.0048	0.0057	0.0057	0.0048	0.0048	0.0046	0.0051	0.0036	0.0046	0.0046	0.0053	0.006	0.0045	0.0053	0.0053	0.0055	0.0062	0.0048	0.0056	0.0056	1.5E-08	1.5E-08	1.5E-10	1.5E-08	1.5E-08
Cobalt	0.12	0.17	0.17	0.12	0.12	0.068	0.099	0.098	0.068	0.068	0.087	0.13	0.13	0.087	0.087	0.092	0.13	0.13	0.092	0.092					
Manganese	0.00032	0.00032	0.00034	0.00033	0.00031	0.0064	0.0064	0.0053	0.0064	0.0064	0.0057	0.0057	0.0047	0.0058	0.0057	0.0064	0.0064	0.0053	0.0064	0.0064					
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.00089	0.00096	0.00097	0.00078	0.00079	0.00048	0.00051	0.00049	0.00042	0.00042	0.00058	0.00062	0.0006	0.00051	0.00051	0.00061	0.00066	0.00064	0.00054	0.00054					
Nickel	0.013	0.02	0.02	0.012	0.012	0.008	0.013	0.012	0.008	0.008	0.01	0.016	0.015	0.01	0.01	0.011	0.017	0.016	0.011	0.011	3.8E-08	3.8E-08	1.7E-09	3.8E-08	3.8E-08
Selenium	0.0075	0.0082	0.023	0.014	0.0077	0.0044	0.0048	0.013	0.008	0.0045	0.0061	0.0067	0.019	0.011	0.0063	0.0065	0.007	0.02	0.012	0.0066					
Trapline TR0515T020 Cabin 2																									
Antimony	0.047	0.015	0.058	0.027	0.031	0.028	0.009	0.034	0.016	0.019	0.035	0.011	0.043	0.021	0.024	0.038	0.012	0.046	0.022	0.025					
Arsenic	0.00063	0.00086	0.00048	0.00019	0.00013	0.0053	0.0054	0.0051	0.005	0.005	0.0047	0.0049	0.0045	0.0044	0.0043	0.006	0.0062	0.0058	0.0057	0.0056	7.3E-07	7.7E-07	6.2E-07	6.7E-07	6.6E-07
Cadmium	0.0048	0.0057	0.0057	0.0048	0.0048	0.0046	0.0051	0.0036	0.0046	0.0046	0.0053	0.006	0.0045	0.0053	0.0053	0.0055	0.0062	0.0048	0.0056	0.0056	1.5E-08	1.5E-08	1.5E-10	1.5E-08	1.5E-08
Cobalt	0.12	0.17	0.17	0.12	0.12	0.068	0.099	0.098	0.068	0.068	0.087	0.13	0.13	0.087	0.087	0.092	0.13	0.13	0.092	0.092					
Manganese	0.00032	0.00032	0.00034	0.00033	0.00031	0.0064	0.0064	0.0053	0.0064	0.0064	0.0057	0.0057	0.0047	0.0058	0.0057	0.0064	0.0064	0.0053	0.0064	0.0064					
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.00089	0.00096	0.00097	0.00078	0.00079	0.00048	0.00051	0.00049	0.00042	0.00042	0.00058	0.00062	0.0006	0.00051	0.00051	0.00061	0.00066	0.00064	0.00054	0.00054					
Nickel	0.013	0.02	0.02	0.012	0.012	0.008	0.013	0.012	0.008	0.008	0.01	0.016	0.015	0.01	0.01	0.011	0.017	0.016	0.011	0.011	3.8E-08	3.8E-08	1.6E-09	3.8E-08	3.8E-08
Selenium	0.0075	0.0082	0.023	0.014	0.0077	0.0044	0.0048	0.013	0.008	0.0045	0.0061	0.0067	0.019	0.011	0.0063	0.0065	0.007	0.02	0.012	0.0066					
Trail Buffer 3																									
Antimony	0.06	0.028	0.07	0.04	0.045	0.035	0.016	0.041	0.023	0.026	0.042	0.018	0.05	0.028	0.031	0.043	0.018	0.051	0.028	0.031					
Arsenic	0.041	0.041	0.041	0.04	0.04	0.032	0.032	0.032	0.032	0.032	0.03	0.03	0.03	0.03	0.03	0.029	0.029	0.029	0.029	0.029	6.7E-06	6.7E-06	6.6E-06	6.6E-06	6.6E-06
Cadmium	0.12	0.12	0.12	0.12	0.12	0.061	0.061	0.06	0.061	0.061	0.059	0.06	0.058	0.059	0.059	0.049	0.049	0.048	0.049	0.049	1.5E-08	1.5E-08	1.9E-10	1.5E-08	1.5E-08
Cobalt	0.13	0.18	0.18	0.13	0.13	0.073	0.1	0.1	0.073	0.073	0.092	0.13	0.13	0.092	0.092	0.096	0.14	0.14	0.096	0.096					
Manganese	0.0071	0.0071	0.0072	0.0072	0.0071	0.0095	0.0095	0.0085	0.0095	0.0095	0.0087	0.0087	0.0078	0.0088	0.0087	0.0087	0.0087	0.0078	0.0087	0.0087					
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.0011	0.0011	0.0011	0.00093	0.00095	0.00054	0.00058	0.00056	0.00048	0.00049	0.00064	0.00068	0.00067	0.00057	0.00058	0.00066	0.00071	0.00069	0.00059	0.00059					
Nickel	0.025	0.032	0.032	0.024	0.024	0.015	0.019	0.019	0.015	0.015	0.017	0.022	0.022	0.016	0.016	0.017	0.022	0.022	0.016	0.016	3.8E-08	3.8E-08	2.2E-09	3.8E-08	3.8E-08
Selenium	0.27	0.27	0.28	0.27	0.27	0.13	0.13	0.14	0.14	0.13	0.14	0.14	0.15	0.14	0.14	0.11	0.11	0.13	0.12	0.11					
SW2																									
Antimony	0.8	0.78	1.3	0.42	0.05	0.39	0.39	0.64	0.21	0.028	0.39	0.37	0.62	0.2	0.033	0.32	0.3	0.51	0.17	0.033					
Arsenic	0.31	0.31	0.26	0.072	0.013	0.16	0.16	0.14	0.045	0.016	0.15	0.15	0.13	0.042	0.015	0.13	0.13	0.11	0.038	0.016	4.0E-05	4.0E-05	3.4E-05	1.0E-05	2.9E-06
Cadmium	0.17	0.1	0.3	0.15	0.034	0.086	0.054	0.15	0.076	0.019	0.083	0.052	0.14	0.074	0.019	0.068	0.043	0.12	0.061	0.017	1.5E-08	1.5E-08	1.9E-10	1.5E-08	1.5E-08
Cobalt	0.13	0.18	0.18	0.13	0.14	0.073	0.1	0.1	0.075	0.078	0.092	0.13	0.13	0.093	0.097	0.096	0.14	0.14	0.097	0.1					
Manganese	0.033	0.03	0.035	0.023	0.0047	0.023	0.021	0.023	0.018	0.0087	0.021	0.02	0.021	0.017	0.008	0.019	0.018	0.019	0.015	0.0082					
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.001	0.0011	0.0011	0.00092	0.00095	0.00054	0.00057	0.00055	0.00048	0.00049	0.00064	0.00068	0.00066	0.00057	0.00058	0.00066	0.00071	0.00069	0.00058	0.00059					
Nickel	0.065	0.047	0.039	0.025	0.013	0.035	0.026	0.022	0.015	0.009	0.035	0.029	0.025	0.017	0.011	0.031	0.028	0.024	0.016	0.012	3.8E-08	3.8E-08	2.2E-09	3.8E-08	3.8E-08
Selenium	0.54	0.67	1.2	0.78	0.21	0.26	0.33	0.59	0.38	0.1	0.28	0.34	0.62	0.4	0.11	0.22	0.28	0.5	0.33	0.087					
Trapline TR0502T045																									
Antimony	0.051	0.019	0.062	0.032	0.036	0.03	0.011	0.036	0.019	0.021	0.038	0.014	0.045	0.023	0.026	0.039	0.014	0.048	0.024	0.027					
Arsenic	0.074	0.074	0.074	0.074	0.074	0.046	0.046	0.046	0.046	0.046	0.043	0.043	0.043	0.043	0.043	0.039	0.039	0.039	0.038	0.038	1.1E-05	1.1E-05	1.1E-05	1.1E-05	1.1E-05
Cadmium	0.016	0.017	0.017	0.016	0.016	0.01	0.011	0.0091	0.01	0.01	0.011	0.011	0.0098	0.011	0.011	0.0098	0.01	0.009	0.0098	0.0098	1.5E-08	1.5E-08	2.0E-10	1.5E-08	1.5E-08
Cobalt	0.15	0.2	0.2	0.15	0.15	0.085	0.12	0.12	0.085	0.085	0.1	0.14	0.14	0.1	0.1	0.11	0.15	0.15	0.11	0.11					
Manganese	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.012	0.013	0.013	0.012	0.012	0.011	0.012	0.012	0.011	0.011	0.01	0.011	0.011					
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
Molybdenum	0.0011	0.0012	0.0012	0.00098	0.00099	0.00056	0.0006	0.00058	0.0005	0.00051	0.00066	0.0007	0.00068	0.00059	0.00059	0.00068	0.00072	0.0007	0.0006	0.00061					
Nickel	0.015	0.022	0.023	0.015	0.015	0.01	0.015	0.014	0.01	0.01	0.012	0.018	0.017	0.012	0.012	0.013	0.018	0.018	0.012	0.012	3.8E-08	3.8E-08	2.3E-09	3.8E-08	3.8E-08
Selenium	0.17	0.17	0.18	0.17	0.17	0.083	0.083	0.092	0.086	0.083	0.087	0.088	0.1	0.092	0.088	0.072	0.072	0.085	0.077	0.072					

Notes

Shaded value indicates hazard quotient greater than 0.2 (or 1.0 for lead) or incremental lifetime cancer risk greater than 1 in 100,000 ($1x10^{-5}$).

Table 4A: Risk Estimates for Inhalation HHRA - Mine Site and Highway 26 (1-Hour)
Cariboo Gold Project
Wells, BC

Parameter	Air Criteria (µg/m^3)	Existing Conditions (µg/m^3)	Existing Conditions HQ	MPOI-Mine Site	MPOI-Highway 26	Sugar Creek Loop Trail	Cornish X-Country Ski Trail 1	Nine Mile Lake Rec Site	Cornish X-Country Ski Trail 2	Cornish X-Country Ski Trail 3	Jubilee Trail / Wendle Park	Cow Mountain Trails 1	Chisholm Creek Rec Site	Groundhog Lake Ski Trail	Proserpine Trail	Cariboo Wagon Road (Stanley to Barkerville)	Cow Mountain Trails 2
Construction																	
Criteria Air Contaminants																	
Nitrogen Dioxide (Project Only)	79	-	-	**13**	-	-	0.18	-	0.096	**0.8**	-	**0.25**	-	-	-	-	-
Nitrogen Dioxide (Baseline+Project)	79	74	0.94	**14**	-	-	**1.1**	-	1.0	**1.7**	-	**1.2**	-	-	-	-	-
Nitrogen Dioxide (ARM Conversion)	79	74	0.94	**1.7**	-	-	**1.1**	-	**1.1**	**1.2**	-	**1.1**	-	-	-	-	-
Diesel Particulate Matter	2	-	-	**33**	-	-	-	-	-	**2.2**	-	-	-	-	-	-	-
Metals																	
Aluminum	30	0.3309	0.011	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Iron (Project Only)	8.3	0.73	0.09	**9.8**	-	-	-	-	-	-	-	-	-	-	-	-	-
Iron (Baseline+Project)	8.3	0.73	0.09	**9.9**	-	-	-	-	-	-	-	-	-	-	-	-	-
Silicon	13.5	3.5	0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Polycyclic Aromatic Hydrocarbons																	
Benzo(a)pyrene	0.00125	0.00242	1.9	**2.2**	-	-	-	-	-	-	-	-	-	-	-	-	-
Volatile Organic Compounds																	
Acrolein	1.4	-	-	**1.4**	-	-	-	-	-	-	-	-	-	-	-	-	-
Formaldehyde	10	-	-	**2.1**	-	-	-	-	-	-	-	-	-	-	-	-	-
Operations																	
Criteria Air Contaminants																	
Nitrogen Dioxide (Project Only)	79	-	-	**6.2**	-	-	0.09	-	-	**0.43**	-	0.13	-	-	-	-	-
Nitrogen Dioxide (Baseline+Project)	79	74	1	**7.2**	-	-	1.0	-	-	**1.4**	-	**1.1**	-	-	-	-	-
Nitrogen Dioxide (ARM Conversion)	79	74	1	**1.5**	-	-	**1.1**	-	-	**1.1**	-	**1.1**	-	-	-	-	-
Diesel Particulate Matter	2	-	-	**13**	-	-	-	-	-	-	-	-	-	-	-	-	-
Metals																	
Aluminum (Project Only)	30	0.33	0.01	**1.3**	-	-	-	-	-	-	-	-	-	-	-	-	-
Aluminum (Baseline+Project)	30	0.33	0.01	**1.3**	-	-	-	-	-	-	-	-	-	-	-	-	-
Iron (Project Only)	8.3	0.73	0.09	**5.5**	-	-	-	-	-	-	-	-	-	-	-	-	-
Iron (Baseline+Project)	8.3	0.73	0.09	**5.6**	-	-	-	-	-	-	-	-	-	-	-	-	-
Silicon (Project Only)	67.5	3.5	0.05	**1.9**	-	-	-	-	-	-	-	-	-	-	-	-	-
Silicon (Baseline+Project)	67.5	3.5	0.05	**2.0**	-	-	-	-	-	-	-	-	-	-	-	-	-
Volatile Organic Compounds																	
Acrolein	1.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Formaldehyde	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes
"-" = did not exceed air criteria; hazard quotient not calculated.
Bold and shaded value indicates hazard quotient greater than 1 (for criteria air contaminants where predictions include baseline and NO2 ambient ratio method) or hazard quotient greater than 0.2 for other constituents of potential concern.

Table 4A: Risk Estimates for Inhalation HHRA - Mine Site and Highway 26 (1-Hour)
Cariboo Gold Project
Wells, BC

Parameter	Air Criteria ($\mu g/m^3$)	Existing Conditions ($\mu g/m^3$)	Ned's Connector Trail	Groundhog Lake Snowmobile Trail	Yanks Peak Trail (X-DIST)	Jubilee Trail	Williams Creek Trail	Trail Buffer 1-Legal Objective	Viewing Point along Hwy 26	Water Access - Jack of Clubs Lake	Wells Baseball Diamond	Wells Elementary School	Nugget Hills RV Park	Valley Mountain Pass	Outfitter Area	Trapline TR0515T017 Cabin	Barkerville Provincial Park Campground
Construction																	
Criteria Air Contaminants																	
Nitrogen Dioxide (Project Only)	79	-	-	-	-	-	-	-	0.065	**2.0**	**2.8**	**1.9**	**3.4**	**1.6**	**3.1**	-	-
Nitrogen Dioxide (Baseline+Project)	79	74	-	-	-	-	-	-	1.0	**3.0**	**3.8**	**2.9**	**4.3**	**2.6**	**4.0**	-	-
Nitrogen Dioxide (ARM Conversion)	79	74	-	-	-	-	-	-	**1.1**	**1.3**	**1.3**	**1.2**	**1.3**	**1.2**	**1.3**	-	-
Diesel Particulate Matter	2	-	-	-	-	-	-	-	-	**5.3**	**6.9**	**4.4**	**7.7**	**4.0**	**12**	-	-
Metals																	
Aluminum	30	0.3309	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Iron (Project Only)	8.3	0.73	-	-	-	-	-	-	-	**1.7**	**2.2**	**1.2**	**2.4**	**1.1**	**4.5**	-	-
Iron (Baseline+Project)	8.3	0.73	-	-	-	-		-	-	**1.8**	**2.3**	**1.3**	**2.4**	**1.2**	**4.6**	-	-
Silicon	13.5	3.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Polycyclic Aromatic Hydrocarbons																	
Benzo(a)pyrene	0.00125	0.00242	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Volatile Organic Compounds																	
Acrolein	1.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Formaldehyde	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Operations																	
Criteria Air Contaminants																	
Nitrogen Dioxide (Project Only)	79	-	-	-	-	-	-	-	-	**1.1**	**2.0**	**1.5**	**2.7**	**1.1**	**1.3**	-	-
Nitrogen Dioxide (Baseline+Project)	79	74	-	-	-	-	-	-	-	**2.1**	**3.0**	**2.5**	**3.7**	**2.1**	**2.2**	-	-
Nitrogen Dioxide (ARM Conversion)	79	74	-	-	-	-	-	-	-	**1.2**	**1.3**	**1.2**	**1.3**	**1.2**	**1.2**	-	-
Diesel Particulate Matter	2	-	-	-	-	-	-	-	-	**1.7**	**2.4**	**1.6**	**2.7**	**1.4**	**3.6**	-	-
Metals																	
Aluminum (Project Only)	30	0.33	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aluminum (Baseline+Project)	30	0.33	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Iron (Project Only)	8.3	0.73	-	-	-	-	-	-	-	-	**1.0**	-	**1.1**	-	**1.4**	-	-
Iron (Baseline+Project)	8.3	0.73	-	-	-	-	-	-	-	-	**1.1**	-	**1.2**	-	**1.5**	-	-
Silicon (Project Only)	67.5	3.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Silicon (Baseline+Project)	67.5	3.5	-	-	-	-	-	-	-	**0.3**	**0.3**	-	**0.3**	-	**0.3**	-	-
Volatile Organic Compounds																	
Acrolein	1.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Formaldehyde	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes
"-" = did not exceed air criteria; hazard quotient not calculated.
Bold and shaded value indicates hazard quotient greater than 1 (for criteria air contaminants where predictions include baseline and NO2 ambient ratio method) or hazard quotient greater than 0.2 for other constituents of potential concern.

Table 4A: Risk Estimates for Inhalation HHRA - Mine Site and Highway 26 (1-Hour)
Cariboo Gold Project
Wells, BC

Parameter	Air Criteria ($\mu g/m^3$)	Existing Conditions ($\mu g/m^3$)	New Barkerville Residential	Historic Barkerville Town and Park	Forest Rose Campground	Government Hill Campground	Mine Site Camp	Transect 15m	Transect 25m	Transect 50m	Transect 75m	Transect 100m	Transect 150m	Transect 200m	Transect 250m	Transect 500m	Transect 1000m
Construction																	
Criteria Air Contaminants																	
Nitrogen Dioxide (Project Only)	79	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrogen Dioxide (Baseline+Project)	79	74	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrogen Dioxide (ARM Conversion)	79	74	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Diesel Particulate Matter	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Metals																	
Aluminum	30	0.3309	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Iron (Project Only)	8.3	0.73	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Iron (Baseline+Project)	8.3	0.73	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Silicon	13.5	3.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Polycyclic Aromatic Hydrocarbons																	
Benzo(a)pyrene	0.00125	0.00242	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Volatile Organic Compounds																	
Acrolein	1.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Formaldehyde	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Operations																	
Criteria Air Contaminants																	
Nitrogen Dioxide (Project Only)	79	-	-	-	-	-	**30**	-	-	-	-	-	-	-	-	-	-
Nitrogen Dioxide (Baseline+Project)	79	74	-	-	-	-	**31**	-	-	-	-	-	-	-	-	-	-
Nitrogen Dioxide (ARM Conversion)	79	74	-	-	-	-	**3.2**	-	-	-	-	-	-	-	-	-	-
Diesel Particulate Matter	2	-	-	-	-	-	**20**	-	-	-	-	-	-	-	-	-	-
Metals																	
Aluminum (Project Only)	30	0.33	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aluminum (Baseline+Project)	30	0.33	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Iron (Project Only)	8.3	0.73	-	-	-	-	**8.2**	-	-	-	-	-	-	-	-	-	-
Iron (Baseline+Project)	8.3	0.73	-	-	-	-	**8.3**	-	-	-	-	-	-	-	-	-	-
Silicon (Project Only)	67.5	3.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Silicon (Baseline+Project)	67.5	3.5	-	-	-	-	**0.9**	-	-	-	-	-	-	-	-	-	-
Volatile Organic Compounds																	
Acrolein	1.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Formaldehyde	10	-	-	-	-	-	**1.3**	-	-	-	-	-	-	-	-	-	-

Notes
"-" = did not exceed air criteria; hazard quotient not calculated.
Bold and shaded value indicates hazard quotient greater than 1 (for criteria air contaminants where predictions include baseline and NO2 ambient ratio method) or hazard quotient greater than 0.2 for other constituents of potential concern.

Table 4B: Risk Estimates for Inhalation HHRA - QR Mill and 500 Nyland Lake Road (1-Hour)
Cariboo Gold Project
Wells, BC

Parameter	Air Criteria ($\mu g/m^3$)	Existing Conditions ($\mu g/m^3$)	Existing Conditions HQ	MPOI-QR Mill	MPOI-500 Nyland Lake Road	Maude Lake Rec Site	Le Bourdais Lake	Quesnel Forks	Trail Buffer 2	Trail Buffer 3	Trail Buffer 4	Little Lake Rec Site	Prior Lake Rec Site	Trapline TR0515T020 Cabin 1	Trapline TR0515T020 Cabin 2	Trapline TR0502T045	SW2
Operations																	
Criteria Air Contaminants																	
Nitrogen Dioxide (Project Only)	79	-	-	**0.97**	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrogen Dioxide (Baseline+Project)	79	74	0.94	**1.9**	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrogen Dioxide (ARM Conversion)	79	153	**1.9**	**1.2**	-	-	-	-	-	-	-	-	-	-	-	-	-
Metals																	
Iron (Project Only)	8.3	0.73	0.09	**3.0**	-	-	-	-	-	-	-	-	-	-	-	-	-
Iron (Baseline+Project)	8.3	0.73	0.09	**3.1**	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes

"-" = did not exceed air criteria; hazard quotient not calculated.

Air quality predictions were not provided for the Construction Case as emissions are expected to be negligible.

Bold and shaded value indicates hazard quotient greater than 1 (for criteria air contaminants where predictions include baseline and NO2 ambient ratio method) or hazard quotient greater than 0.2 for other constituents of potential concern.

Table 4B: Risk Estimates for Inhalation HHRA - QR Mill and 500 Nyland Lake Road (1-Hour)
Cariboo Gold Project
Wells, BC

Parameter	Air Criteria ($\mu g/m^3$)	Existing Conditions ($\mu g/m^3$)	Existing Conditions HQ	QR Mill Camp	Transect 15m	Transect 25m	Transect 50m	Transect 75m	Transect 100m	Transect 150m	Transect 200m	Transect 250m	Transect 500m	Transect 1000m
Operations														
Criteria Air Contaminants														
Nitrogen Dioxide (Project Only)	79	-	-	**1.1**	-	-	-	-	-	-	-	-	-	-
Nitrogen Dioxide (Baseline+Project)	79	74	0.94	**2.1**	-	-	-	-	-	-	-	-	-	-
Nitrogen Dioxide (ARM Conversion)	79	153	**1.9**	**1.2**	-	-	-	-	-	-	-	-	-	-
Metals														
Iron (Project Only)	8.3	0.73	0.09	**4.2**	-	-	-	-	-	-	-	-	-	-
Iron (Baseline+Project)	8.3	0.73	0.09	**4.3**	-	-	-	-	-	-	-	-	-	-

Notes
"-" = did not exceed air criteria; hazard quotient not calculated.
Air quality predictions were not provided for the Construction Case as emissions are expected to be negligible.

Bold and shaded value indicates hazard quotient greater than 1 (for criteria air contaminants where predictions include baseline and NO2 ambient ratio method) or hazard quotient greater than 0.2 for other constituents of potential concern.

Table 4C: Risk Estimates for Inhalation HHRA - Mine Site and Highway 26 (24-Hour)
Cariboo Gold Project
Wells, BC

Parameter	Air Criteria (µg/m^3)	Existing Conditions (µg/m^3)	Existing Conditions HQ	MPOI-Mine Site	MPOI-Highway 26	Sugar Creek Loop Trail	Cornish X-Country Ski Trail 1	Nine Mile Lake Rec Site	Cornish X-Country Ski Trail 2	Cornish X-Country Ski Trail 3	Jubilee Trail / Wendle Park	Cow Mountain Trails 1	Chisholm Creek Rec Site	Groundhog Lake Ski Trail	Proserpine Trail	Cariboo Wagon Road (Stanley to Barkerville)	Cow Mountain Trails 2
Construction																	
Criteria Air Contaminants																	
Nitrogen Dioxide	200	-	-	**1.4**	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrogen Dioxide (ARM Conversion)	200	-	-	0.46	-	-	-	-	-	-	-	-	-	-	-	-	-
PM2.5 (Project Only)	25	-	-	0.36	-	0.00027	0.0077	0.0011	0.0032	0.034	0.0016	0.0097	0.00035	0.00044	0.00033	0.00073	0.0017
PM2.5 (Baseline+Project)	25	25	1.0	**1.4**	-	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
PM10 (Project Only)	50	-	-	1.0	-	-	-	-	-	-	-	-	-	-	-	-	-
PM10 (Baseline+Project)	50	43	0.86	**1.9**	-	-	-	-	-	-	-	-	-	-	-	-	-
Metals																	
Aluminum	12	0.14	0.011	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Iron (Project Only)	4	0.3	0.08	**1.3**	-	-	-	-	-	-	-	-	-	-	-	-	-
Iron (Baseline+Project)	4	0.3	0.08	**1.4**	-	-	-	-	-	-	-	-	-	-	-	-	-
Silicon	27	1.5	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Operations																	
Criteria Air Contaminants																	
Nitrogen Dioxide	200	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrogen Dioxide (ARM Conversion)	200	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PM2.5 (Project Only)	25	-	-	0.33	0.023	0.00051	0.011	0.002	0.0052	0.04	0.0029	0.013	0.0015	0.001	0.00083	0.0013	0.0042
PM2.5 (Baseline+Project)	25	25	1.0	**1.3**	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
PM10 (Project Only)	50	-	-	**1.9**	-	-	-	-	-	0.19	-	-	-	-	-	-	-
PM10 (Baseline+Project)	50	43	0.86	**2.8**	-	-	-	-	-	**1.1**	-	-	-	-	-	-	-
Metals																	
Aluminum (Project Only)	12	0.14	0.011	1.0	-	-	-	-	-	-	-	-	-	-	-	-	-
Aluminum (Baseline+Project)	12	0.14	0.011	1.0	-	-	-	-	-	-	-	-	-	-	-	-	-
Iron (Project Only)	4	0.3	0.08	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Iron (Baseline+Project)	4	0.3	0.08	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Silicon (Project Only)	27	1.5	0.05	**1.5**	-	-	-	-	-	-	-	-	-	-	-	-	-
Silicon (Baseline+Project)	27	1.5	0.05	**1.6**	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes
"-" = did not exceed air criteria; hazard quotient not calculated.
Bold and shaded value indicates hazard quotient greater than 1 (for criteria air contaminants where predictions include baseline and NO2 ambient ratio method) or hazard quotient greater than 0.2 for other constituents of potential concern.

Table 4C: Risk Estimates for Inhalation HHRA - Mine Site and Highway 26 (24-Hour)
Cariboo Gold Project
Wells, BC

Parameter	Air Criteria (µg/m^3)	Existing Conditions (µg/m^3)	Ned's Connector Trail	Groundhog Lake Snowmobile Trail	Yanks Peak Trail (X-DIST)	Jubilee Trail	Williams Creek Trail	Trail Buffer 1-Legal Objective	Viewing Point along Hwy 26	Water Access - Jack of Clubs Lake	Wells Baseball Diamond	Wells Elementary School	Nugget Hills RV Park	Valley Mountain Pass	Outfitter Area	Trapline TR0515T017 Cabin	Barkerville Provincial Park Campground
Construction																	
Criteria Air Contaminants																	
Nitrogen Dioxide	200	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrogen Dioxide (ARM Conversion)	200	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PM2.5 (Project Only)	25	-	0.0018	0.0021	0.00045	0.00079	0.00099	0.00079	0.0027	0.13	0.2	0.11	0.16	0.092	0.064	0.00058	0.0029
PM2.5 (Baseline+Project)	25	25	1.0	1.0	1.0	1.0	1.0	1.0	1.0	**1.1**	**1.2**	**1.1**	**1.2**	**1.1**	**1.1**	1.0	1.0
PM10 (Project Only)	50	-	-	-	-	-	-	-	-	0.26	0.36	0.18	0.34	0.17	0.33	-	-
PM10 (Baseline+Project)	50	43	-	-	-	-	-	-	-	**1.1**	**1.2**	1.0	**1.2**	1.0	**1.2**	-	-
Metals																	
Aluminum	12	0.14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Iron (Project Only)	4	0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Iron (Baseline+Project)	4	0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Silicon	27	1.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Operations																	
Criteria Air Contaminants																	
Nitrogen Dioxide	200	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrogen Dioxide (ARM Conversion)	200	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PM2.5 (Project Only)	25	-	0.0069	0.017	0.0011	0.0014	0.0027	0.0015	0.025	0.12	0.18	0.13	0.18	0.088	0.055	0.0011	0.0046
PM2.5 (Baseline+Project)	25	25	1.0	1.0	1.0	1.0	1.0	1.0	1.0	**1.1**	**1.2**	**1.1**	**1.2**	**1.1**	**1.1**	1.0	1.0
PM10 (Project Only)	50	-	-	0.15	-	-	-	-	-	0.33	0.41	0.22	0.48	0.29	0.27	-	-
PM10 (Baseline+Project)	50	43	-	1.0	-	-	-	-	-	**1.2**	**1.3**	**1.1**	**1.3**	**1.2**	**1.1**	-	-
Metals																	
Aluminum (Project Only)	12	0.14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aluminum (Baseline+Project)	12	0.14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Iron (Project Only)	4	0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Iron (Baseline+Project)	4	0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Silicon (Project Only)	27	1.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Silicon (Baseline+Project)	27	1.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes
"-" = did not exceed air criteria; hazard quotient not calculated.
Bold and shaded value indicates hazard quotient greater than 1 (for criteria air contaminants where predictions include baseline and NO2 ambient ratio method) or hazard quotient greater than 0.2 for other constituents of potential concern.

Table 4C: Risk Estimates for Inhalation HHRA - Mine Site and Highway 26 (24-Hour)
Cariboo Gold Project
Wells, BC

Parameter	Air Criteria (µg/m^3)	Existing Conditions (µg/m^3)	New Barkerville Residential	Historic Barkerville Town and Park	Forest Rose Campground	Government Hill Campground	Mine Site Camp	Transect 15m	Transect 25m	Transect 50m	Transect 75m	Transect 100m	Transect 150m	Transect 200m	Transect 250m	Transect 500m	Transect 1000m
Construction																	
Criteria Air Contaminants																	
Nitrogen Dioxide	200	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrogen Dioxide (ARM Conversion)	200	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PM2.5 (Project Only)	25	-	0.0019	0.0013	0.0029	0.0016	-	-	-	-	-	-	-	-	-	-	-
PM2.5 (Baseline+Project)	25	25	1.0	1.0	1.0	1.0	-	-	-	-	-	-	-	-	-	-	-
PM10 (Project Only)	50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PM10 (Baseline+Project)	50	43	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Metals																	
Aluminum	12	0.14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Iron (Project Only)	4	0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Iron (Baseline+Project)	4	0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Silicon	27	1.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Operations																	
Criteria Air Contaminants																	
Nitrogen Dioxide	200	-	-	-	-	-	**1.3**	-	-	-	-	-	-	-	-	-	-
Nitrogen Dioxide (ARM Conversion)	200	-	-	-	-	-	0.46	-	-	-	-	-	-	-	-	-	-
PM2.5 (Project Only)	25	-	0.0035	0.0026	0.0043	0.0032	**1.7**	0.023	0.019	0.014	0.0101	0.009	0.0073	0.0062	0.0052	0.0024	0.00102
PM2.5 (Baseline+Project)	25	25	1.0	1.0	1.0	1.0	**2.8**	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
PM10 (Project Only)	50	-	-	-	-	-	**2.1**	-	-	-	-	-	-	-	-	-	-
PM10 (Baseline+Project)	50	43	-	-	-	-	**2.9**	-	-	-	-	-	-	-	-	-	-
Metals																	
Aluminum (Project Only)	12	0.14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aluminum (Baseline+Project)	12	0.14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Iron (Project Only)	4	0.3	-	-	-	-	**2.4**	-	-	-	-	-	-	-	-	-	-
Iron (Baseline+Project)	4	0.3	-	-	-	-	**2.5**	-	-	-	-	-	-	-	-	-	-
Silicon (Project Only)	27	1.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Silicon (Baseline+Project)	27	1.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes
"-" = did not exceed air criteria; hazard quotient not calculated.
Bold and shaded value indicates hazard quotient greater than 1 (for criteria air contaminants where predictions include baseline and NO2 ambient ratio method) or hazard quotient greater than 0.2 for other constituents of potential concern.

Table 4D: Risk Estimates for Inhalation HHRA - QR Mill and 500 Nyland Lake Road (24-Hour)
Cariboo Gold Project
Wells, BC

Parameter	Air Criteria ($\mu g/m^3$)	Existing Conditions ($\mu g/m^3$)	Existing Conditions HQ	MPOI-QR Mill	MPOI-500 Nyland Lake Road	Maude Lake Rec Site	Le Bourdais Lake	Quesnel Forks	Trail Buffer 2	Trail Buffer 3	Trail Buffer 4	Little Lake Rec Site	Prior Lake Rec Site	Trapline TR0515T020 Cabin 1	Trapline TR0515T020 Cabin 2	Trapline TR0502T045	SW2
Operations																	
Criteria Air Contaminants																	
PM2.5 (Project Only)	25	-	-	**0.26**	0.098	0.0013	0.0011	0.002	0.0049	0.0078	0.0013	0.00097	0.00068	0.0011	0.0011	0.026	0.0082
PM2.5 (Baseline+Project)	25	25	1.0	**1.3**	**1.1**	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
PM10 (Project Only)	50	-	-	0.92	0.72	-	-	-	-	-	-	-	-	-	-	0.24	-
PM10 (Baseline+Project)	50	43	0.86	**1.8**	**1.6**	-	-	-	-	-	-	-	-	-	-	**1.1**	-
Metals																	
Iron (Project Only)	4	0.3	0.08	**1.7**	-	-	-	-	-	-	-	-	-	-	-	-	-
Iron (Baseline+Project)	4	0.3	0.08	**1.8**	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes

"-" = did not exceed air criteria; hazard quotient not calculated.
Air quality predictions were not provided for the Construction Case as emissions are expected to be negligible.

Bold and shaded value indicates hazard quotient greater than 1 (for criteria air contaminants where predictions include baseline and NO2 ambient ratio method) or hazard quotient greater than 0.2 for other constituents of potential concern.

Table 4D: Risk Estimates for Inhalation HHRA - QR Mill and 500 Nyland Lake Road (24-Hour)
Cariboo Gold Project
Wells, BC

Parameter	Air Criteria ($\mu g/m^3$)	Existing Conditions ($\mu g/m^3$)	Existing Conditions HQ	QR Mill Camp	Transect 15m	Transect 25m	Transect 50m	Transect 75m	Transect 100m	Transect 150m	Transect 200m	Transect 250m	Transect 500m	Transect 1000m
Operations														
Criteria Air Contaminants														
PM2.5 (Project Only)	25	-	-	**0.35**	0.098	0.08	0.059	0.055	0.047	0.031	0.026	0.021	0.013	0.0088
PM2.5 (Baseline+Project)	25	25	1.0	**1.3**	**1.1**	**1.1**	**1.1**	**1.1**	**1.1**	1.0	1.0	1.0	1.0	1.0
PM10 (Project Only)	50	-	-	0.54	0.72	0.59	0.46	0.41	0.35	0.27	0.23	0.22	0.14	-
PM10 (Baseline+Project)	50	43	0.86	**1.4**	**1.6**	**1.4**	**1.3**	**1.3**	**1.2**	**1.1**	**1.1**	**1.1**	1.0	-
Metals														
Iron (Project Only)	4	0.3	0.08	-	-	-	-	-	-	-	-	-	-	-
Iron (Baseline+Project)	4	0.3	0.08	-	-	-	-	-	-	-	-	-	-	-

Notes
"-" = did not exceed air criteria; hazard quotient not calculated.
Air quality predictions were not provided for the Construction Case as emissions are expected to be negligible.

Bold and shaded value indicates hazard quotient greater than 1 (for criteria air contaminants where predictions include baseline and NO2 ambient ratio method) or hazard quotient greater than 0.2 for other constituents of potential concern.

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Table 4E: Risk Estimates for the Chronic Inhalation HHRA - Mine Site and Highway 26 (Construction) – Non-Indigenous Resident
Cariboo Gold Project
Wells, BC

Hazard Quotients - Mine Site Construction Phase

Receptor Location	Wells Baseball Diamond	Wells Elementary School	Nugget Hills RV Park	New Barkerville Residential
Existing Conditions Case				
Nitrogen Dioxide	1.1E-01	1.1E-01	1.1E-01	
PM2.5	2.0E-01	2.0E-01	2.0E-01	2.0E-01
PM10	1.4E-01			
DPM	**NV**			
Acrolein	**NV**	**NV**	**NV**	
Operation Case				
Nitrogen Dioxide	2.3E-01	1.7E-01	1.6E-01	
PM2.5	2.4E-01	2.2E-01	2.1E-01	2.0E-01
PM10	1.8E-01			
DPM	3.8E-02			
Acrolein	1.7E-02	8.8E-03	7.2E-03	
Project Only Case				
Nitrogen Dioxide	1.6E-01	8.6E-02	7.1E-02	
PM2.5	3.8E-02	1.9E-02	1.6E-02	1.3E-04
PM10	4.2E-02			
DPM	3.8E-02			
Acrolein	1.7E-02	8.8E-03	7.2E-03	

Notes:
Bold = hazard quotient greater than 1.0

Incremental Lifetime Cancer Risks -Mine Site Construction Phase

Receptor Location	Wells Baseball Diamond	Wells Elementary School	Nugget Hills RV Park	New Barkerville Residential
Existing Conditions Case				
DPM	**NV**	**NV**	**NV**	
Operation Case				
DPM	**2.4E-05**	**1.2E-05**	1.0E-05	
Project Only Case				
DPM	**2.4E-05**	**1.2E-05**	1.0E-05	

Notes:

Bold = incremental lifetime cancer risk greater than $1x10^{-5}$

Attachment 4

Table 4F: Risk Estimates for the Chronic Inhalation HHRA - Mine Site and Highway 26 (Construction) – Indigenous Resident
Cariboo Gold Project
Wells, BC

Hazard Quotients - Mine Site Construction Phase

Receptor Location	Wells Baseball Diamond	Wells Elementary School	Nugget Hills RV Park	New Barkerville Residential
Existing Conditions Case				
Nitrogen Dioxide	1.1E-01	1.1E-01	1.1E-01	1.1E-01
PM2.5	2.0E-01	2.0E-01	2.0E-01	2.0E-01
PM10	1.4E-01			
DPM	**NV**	**NV**	**NV**	
Acrolein	**NV**	**NV**	**NV**	
Operation Case				
Nitrogen Dioxide	2.3E-01	1.7E-01	1.6E-01	
PM2.5	2.4E-01	2.2E-01	2.1E-01	2.0E-01
PM10	1.8E-01			
DPM	3.8E-02			
Acrolein	1.7E-02	8.8E-03	7.2E-03	
Project Only Case				
Nitrogen Dioxide	1.6E-01	8.6E-02	7.1E-02	5.8E-04
PM2.5	3.8E-02	1.9E-02	1.6E-02	1.3E-04
PM10	4.2E-02			
DPM	3.8E-02	2.0E-02	1.6E-02	
Acrolein	1.7E-02	8.8E-03	7.2E-03	

Notes:
Bold = hazard quotient greater than 1.0

Incremental Lifetime Cancer Risks - Mine Site Construction Phase

Receptor Location	Wells Baseball Diamond	Wells Elementary School	Nugget Hills RV Park	New Barkerville Residential
Existing Conditions Case				
DPM	**NV**	**NV**	**NV**	
Operation Case				
DPM	**2.4E-05**	**1.2E-05**	1.0E-05	
Project Only Case				
DPM	**2.4E-05**	**1.2E-05**	1.0E-05	

Notes:

Bold = incremental lifetime cancer risk greater than $1x10^{-5}$

Table 4G: Risk Estimates for the Chronic Inhalation HHRA - Mine Site and Highway 26 (Construction) – Indigenous Land User
Cariboo Gold Project
Wells, BC

Hazard Quotients - Mine Site Construction Phase

Receptor Location	Sugar Creek Loop Trail	Cornish X-Country Ski Trail 1	Nine Mile Lake Rec Site	Cornish X-Country Ski Trail 2	Cornish X-Country Ski Trail 3	Jubilee Trail / Wendle Park	Cow Mountain Trails 1	Chisholm Creek Rec Site	Groundhog Lake Ski Trail	Prosperine Trail	Cariboo Wagon Road (Stanley to Barkerville)	Cow Mountain Trails 2	Ned's Connector Trail	Groundhog Lake Snowmobile Trail	Yanks Peak Trail (X-DIST)	Jubilee Trail
Existing Conditions Case																
PM2.5	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**
DPM																
Operation Case																
PM2.5	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**
DPM																
Project Only Case																
PM2.5	9.5E-05	5.0E-03	6.9E-04	2.4E-03	2.9E-02	1.1E-03	3.1E-03	1.4E-04	1.5E-04	1.3E-04	1.8E-04	6.6E-04	6.1E-04	7.4E-04	2.1E-04	4.7E-04
DPM																

Notes:
Bold = hazard quotient greater than 1.0

Incremental Lifetime Cancer Risks - Mine Site Construction Phase

Receptor Location	Sugar Creek Loop Trail	Cornish X-Country Ski Trail 1	Nine Mile Lake Rec Site	Cornish X-Country Ski Trail 2	Cornish X-Country Ski Trail 3	Jubilee Trail / Wendle Park	Cow Mountain Trails 1	Chisholm Creek Rec Site	Groundhog Lake Ski Trail	Prosperine Trail	Cariboo Wagon Road (Stanley to Barkerville)	Cow Mountain Trails 2	Ned's Connector Trail	Groundhog Lake Snowmobile Trail	Yanks Peak Trail (X-DIST)	Jubilee Trail
Existing Conditions Case																
DPM					**NV**											
Operation Case																
DPM					**1.8E-05**											
Project Only Case																
DPM					**1.8E-05**											

Notes:

Bold = incremental lifetime cancer risk greater than $1x10^{-5}$

Table 4G: Risk Estimates for the Chronic Inhalation HHRA - Mine Site and Highway 26 (Construction) – Indigenous Land User
Cariboo Gold Project
Wells, BC

Hazard Quotients - Mine Site Construction Phase

Receptor Location	Williams Creek Trail	Trail Buffer 1-Legal Objective	Viewing Point along Hwy 26	Water Access - Jack of Clubs Lake	Valley Mountain Pass	Outfitter Area	Trapline TR0515T017 Cabin	Barkerville Provincial Park Campground	Historic Barkerville Town and Park	Forest Rose Campground	Government Hill Campground
Existing Conditions Case											
PM2.5 DPM	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**
Operation Case											
PM2.5 DPM	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.3E+00**	**1.3E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**
Project Only Case											
PM2.5 DPM	3.2E-04	2.3E-04	9.3E-04	6.1E-02	6.5E-02	2.6E-02	2.2E-04	1.2E-03	5.1E-04	1.2E-03	6.9E-04

Notes:
Bold = hazard quotient greater than 1.0

Incremental Lifetime Cancer Risks - Mine Site Construc

Receptor Location	Williams Creek Trail	Trail Buffer 1-Legal Objective	Viewing Point along Hwy 26	Water Access - Jack of Clubs Lake	Valley Mountain Pass	Outfitter Area	Trapline TR0515T017 Cabin	Barkerville Provincial Park Campground	Historic Barkerville Town and Park	Forest Rose Campground	Government Hill Campground
Existing Conditions Case											
DPM				**NV**	**NV**	**NV**					
Operation Case											
DPM				**3.8E-05**	**4.0E-05**	**1.6E-05**					
Project Only Case											
DPM				**3.8E-05**	**4.0E-05**	**1.6E-05**					

Notes:

Bold = incremental lifetime cancer risk greater than $1x10^{-5}$

Table 4H: Risk Estimates for the Chronic Inhalation HHRA - Mine Site and Highway 26 (Construction) – Hiker
Cariboo Gold Project
Wells, BC

Hazard Quotients - Mine Site Construction Phase

Receptor Location	Sugar Creek Loop Trail	Cornish X-Country Ski Trail 1	Nine Mile Lake Rec Site	Cornish X-Country Ski Trail 2	Cornish X-Country Ski Trail 3	Jubilee Trail / Wendle Park	Cow Mountain Trails 1	Chisholm Creek Rec Site	Groundhog Lake Ski Trail	Proserpine Trail	Cariboo Wagon Road (Stanley to Barkerville)	Cow Mountain Trails 2	Ned's Connector Trail	Groundhog Lake Snowmobile Trail	Yanks Peak Trail (X-DIST)	Jubilee Trail
Existing Conditions Case																
PM2.5	1.1E-01	1.1E-01	1.1E-01	1.1E-01	1.1E-01	1.1E-01	1.1E-01	1.1E-01	1.1E-01	1.1E-01	1.1E-01	1.1E-01	1.1E-01	1.1E-01	1.1E-01	1.1E-01
DPM																
Acrolein					NV											
Operation Case																
PM2.5	1.1E-01	1.1E-01	1.1E-01	1.1E-01	1.2E-01	1.1E-01	1.1E-01	1.1E-01	1.1E-01	1.1E-01	1.1E-01	1.1E-01	1.1E-01	1.1E-01	1.1E-01	1.1E-01
DPM																
Acrolein					1.3E-03											
Project Only Case																
PM2.5	9.1E-06	4.8E-04	6.5E-05	2.3E-04	2.8E-03	1.0E-04	3.0E-04	1.3E-05	1.5E-05	1.2E-05	1.7E-05	6.3E-05	5.8E-05	7.0E-05	2.0E-05	4.5E-05
DPM																
Acrolein					1.3E-03											

Notes:
Bold = hazard quotient greater than 1.0

Incremental Lifetime Cancer Risks - Mine Site Construction Phase

Receptor Location	Sugar Creek Loop Trail	Cornish X-Country Ski Trail 1	Nine Mile Lake Rec Site	Cornish X-Country Ski Trail 2	Cornish X-Country Ski Trail 3	Jubilee Trail / Wendle Park	Cow Mountain Trails 1	Chisholm Creek Rec Site	Groundhog Lake Ski Trail	Proserpine Trail	Cariboo Wagon Road (Stanley to Barkerville)	Cow Mountain Trails 2	Ned's Connector Trail	Groundhog Lake Snowmobile Trail	Yanks Peak Trail (X-DIST)	Jubilee Trail
Existing Conditions Case																
DPM					NV											
Operation Case																
DPM					1.8E-06											
Project Only Case																
DPM					1.8E-06											

Notes:
Bold = incremental lifetime cancer risk greater than $1x10^{-5}$

Table 4H: Risk Estimates for the Chronic Inhalation HHRA - Mine Site and Highway 26 (Construction) – Hiker
Cariboo Gold Project
Wells, BC

Hazard Quotients - Mine Site Construction Phase

Receptor Location	Williams Creek Trail	Viewing Point along Hwy 26	Water Access - Jack of Clubs Lake	Valley Mountain Pass	Barkerville Provincial Park Campground	Historic Barkerville Town and Park	Forest Rose Campground	Government Hill Campground
Existing Conditions Case								
PM2.5	1.1E-01	1.1E-01	1.1E-01	1.1E-01	1.1E-01	1.1E-01	1.1E-01	1.1E-01
DPM								
Acrolein			**NV**	**NV**				
Operation Case								
PM2.5	1.1E-01	1.1E-01	1.2E-01	1.2E-01	1.1E-01	1.1E-01	1.1E-01	1.1E-01
DPM								
Acrolein			2.5E-03	2.7E-03				
Project Only Case								
PM2.5	3.0E-05	8.8E-05	5.8E-03	6.2E-03	1.1E-04	4.8E-05	1.1E-04	6.6E-05
DPM								
Acrolein			2.5E-03	2.7E-03				

Notes:
Bold = hazard quotient greater than 1.0

Incremental Lifetime Cancer Risks - Mine Site Construction

Receptor Location	Williams Creek Trail	Viewing Point along Hwy 26	Water Access - Jack of Clubs Lake	Valley Mountain Pass	Barkerville Provincial Park Campground	Historic Barkerville Town and Park	Forest Rose Campground	Government Hill Campground
Existing Conditions Case								
DPM			**NV**	**NV**				
Operation Case								
DPM			3.6E-06	3.8E-06				
Project Only Case								
DPM			3.6E-06	3.8E-06				

Notes:
Bold = incremental lifetime cancer risk greater than $1x10^{-5}$

Attachment 4

Table 4I: Risk Estimates for the Chronic Inhalation HHRA - Mine Site and Highway 26 (Construction) – Camper
Cariboo Gold Project
Wells, BC

Hazard Quotients - Mine Site Construction Phase

Receptor Location	Nine Mile Lake Rec Site	Chisholm Creek Rec Site	Viewing Point along Hwy 26	Barkerville Provincial Park Campground	Historic Barkerville Town and Park	Forest Rose Campground	Government Hill Campground
Existing Conditions Case							
PM2.5	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01
Operation Case							
PM2.5	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01
Project Only Case							
PM2.5	2.9E-04	5.9E-05	4.0E-04	5.0E-04	2.2E-04	4.9E-04	3.0E-04

Notes:
Bold = hazard quotient greater than 1.0

Attachment 4

Table 4J: Risk Estimates for the Chronic Inhalation HHRA - Mine Site and Highway 26 (Construction) – Sport Fisher/Hunter
Cariboo Gold Project
Wells, BC

Hazard Quotients - Mine Site Construction Phase

Receptor Location	Yanks Peak Trail (X-DIST)	Outfitter Area	Trapline TR0515T017 Cabin
Existing Conditions Case			
PM2.5 DPM	2.1E-01	2.1E-01	2.1E-01
Operation Case			
PM2.5 DPM	2.1E-01	2.2E-01	2.1E-01
Project Only Case			
PM2.5 DPM	3.8E-05	4.7E-03	3.9E-05

Notes:
Bold = hazard quotient greater than 1.0

Incremental Lifetime Cancer Risks - Mine Site Construction Phase

Receptor Location	Yanks Peak Trail (X-DIST)	Outfitter Area	Trapline TR0515T017 Cabin
Existing Conditions Case			
DPM		**NV**	
Operation Case			
DPM		2.9E-06	
Project Only Case			
DPM		2.9E-06	

Notes:

Bold = incremental lifetime cancer risk greater than $1x10^{-5}$

Attachment 4

Table 4K: Risk Estimates for the Chronic Inhalation HHRA - Mine Site and Highway 26 (Operations) – Non-Indigenous Resident
Cariboo Gold Project
Wells, BC

Hazard Quotients - Mine Site Operations Phase

Receptor Location	Wells Baseball Diamond	Wells Elementary School	Nugget Hills RV Park	New Barkerville Residential
Existing Conditions Case				
PM2.5	2.0E-01	2.0E-01	2.0E-01	2.0E-01
PM10	1.4E-01			
Operation Case				
PM2.5	2.3E-01	2.2E-01	2.2E-01	2.0E-01
PM10	1.7E-01			
Project Only Case				
PM2.5	3.3E-02	2.0E-02	2.1E-02	2.4E-04
PM10	3.3E-02			

Notes:
Bold = hazard quotient greater than 1.0

Incremental Lifetime Cancer Risks - Mine Site Operations Phase

Receptor Location	Wells Baseball Diamond	Wells Elementary School	Nugget Hills RV Park	New Barkerville Residential
Existing Conditions Case				
DPM	**NV**	**NV**	**NV**	
Operation Case				
DPM	3.9E-06	2.3E-06	2.0E-06	
Project Only Case				
DPM	3.9E-06	2.3E-06	2.0E-06	

Notes:

Bold = incremental lifetime cancer risk greater than $1x10^{-5}$

Attachment 4

Table 4L: Risk Estimates for the Chronic Inhalation HHRA - Mine Site and Highway 26 (Operations) – Indigenous Resident
Cariboo Gold Project
Wells, BC

Hazard Quotients - Mine Site Operations Phase

Receptor Location	Wells Baseball Diamond	Wells Elementary School	Nugget Hills RV Park	New Barkerville Residential
Existing Conditions Case				
PM2.5	2.0E-01	2.0E-01	2.0E-01	2.0E-01
PM10	1.4E-01			
DPM	**NV**	**NV**	**NV**	
Iron	1.8E-02			
Operation Case				
PM2.5	2.3E-01	2.2E-01	2.2E-01	2.0E-01
PM10	1.7E-01			
DPM	6.3E-03	3.7E-03	3.2E-03	
Iron	6.7E-02			
Project Only Case				
PM2.5	3.3E-02	2.0E-02	2.1E-02	2.4E-04
PM10	3.3E-02			
DPM	6.3E-03	3.7E-03	3.2E-03	
Iron	5.0E-02			

Notes:
Bold = hazard quotient greater than 1.0

Incremental Lifetime Cancer Risks - Mine Site Operations Phase

Receptor Location	Wells Baseball Diamond	Wells Elementary School	Nugget Hills RV Park	New Barkerville Residential
Existing Conditions Case				
DPM	**NV**	**NV**	**NV**	
Operation Case				
DPM	3.9E-06	2.3E-06	2.0E-06	
Project Only Case				
DPM	3.9E-06	2.3E-06	2.0E-06	

Notes:

Bold = incremental lifetime cancer risk greater than $1x10^{-5}$

Hazard Quotients - Mine Site Operations Phase

Receptor Location	Sugar Creek Loop Trail	Cornish X-Country Ski Trail 1	Nine Mile Lake Rec Site	Cornish X-Country Ski Trail 2	Cornish X-Country Ski Trail 3	Jubilee Trail / Wendle Park	Cow Mountain Trails 1	Chisholm Creek Rec Site	Groundhog Lake Ski Trail	Proserpine Trail	Cariboo Wagon Road (Stanley to Barkerville)	Cow Mountain Trails 2	Ned's Connector Trail	Groundhog Lake Snowmobile Trail	Yanks Peak Trail (X-DIST)	Jubilee Trail	Williams Creek Trail	Trail Buffer 1-Legal Objective	Viewing Point along Hwy 26
Existing Conditions Case																			
PM2.5	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**
DPM																			
Operation Case																			
PM2.5	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**
DPM																			
Project Only Case																			
PM2.5	1.6E-04	7.3E-03	1.1E-03	3.7E-03	3.4E-02	1.7E-03	4.3E-03	6.3E-04	3.0E-04	2.5E-04	3.5E-04	1.3E-03	2.2E-03	5.3E-03	3.8E-04	7.6E-04	7.4E-04	4.2E-04	2.1E-02
DPM																			

Notes:
Bold = hazard quotient greater than 1.0

Incremental Lifetime Cancer Risks - Mine Site Operations Phase

Receptor Location	Sugar Creek Loop Trail	Cornish X-Country Ski Trail 1	Nine Mile Lake Rec Site	Cornish X-Country Ski Trail 2	Cornish X-Country Ski Trail 3	Jubilee Trail / Wendle Park	Cow Mountain Trails 1	Chisholm Creek Rec Site	Groundhog Lake Ski Trail	Proserpine Trail	Cariboo Wagon Road (Stanley to Barkerville)	Cow Mountain Trails 2	Ned's Connector Trail	Groundhog Lake Snowmobile Trail	Yanks Peak Trail (X-DIST)	Jubilee Trail	Williams Creek Trail	Trail Buffer 1-Legal Objective	Viewing Point along Hwy 26
Existing Conditions Case																			
DPM																			
Operation Case																			
DPM																			
Project Only Case																			
DPM																			

Notes:

Bold = incremental lifetime cancer risk greater than $1x10^{-5}$

Hazard Quotients - Mine Site Operations Phase

Receptor Location	Water Access - Jack of Clubs Lake	Valley Mountain Pass	Outfitter Area	Trapline TR0515T017 Cabin	Barkerville Provincial Park Campground	Historic Barkerville Town and Park	Forest Rose Campground	Government Hill Campground	Transect 15m	Transect 25m	Transect 50m	Transect 75m	Transect 100m	Transect 150m	Transect 200m	Transect 250m	Transect 500m	Transect 1000m
Existing Conditions Case																		
PM2.5	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**
DPM	**NV**	**NV**																
Operation Case																		
PM2.5	**1.2E+00**	**1.3E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**
DPM	9.9E-03	1.2E-02																
Project Only Case																		
PM2.5	6.0E-02	7.5E-02	2.5E-02	3.6E-04	2.0E-03	1.1E-03	2.0E-03	1.3E-03	2.5E-02	2.2E-02	1.5E-02	1.0E-02	8.4E-03	7.0E-03	5.5E-03	4.3E-03	1.5E-03	5.5E-04
DPM	9.9E-03	1.2E-02																

Notes:
Bold = hazard quotient greater than 1.0

Incremental Lifetime Cancer Risks - Mine Site Operations Ph

Receptor Location	Water Access - Jack of Clubs Lake	Valley Mountain Pass	Outfitter Area	Trapline TR0515T017 Cabin	Barkerville Provincial Park Campground	Historic Barkerville Town and Park	Forest Rose Campground	Government Hill Campground	Transect 15m	Transect 25m	Transect 50m	Transect 75m	Transect 100m	Transect 150m	Transect 200m	Transect 250m	Transect 500m	Transect 1000m
Existing Conditions Case																		
DPM	**NV**	**NV**																
Operation Case																		
DPM	6.1E-06	7.4E-06																
Project Only Case																		
DPM	6.1E-06	7.4E-06																

Notes:

Bold = incremental lifetime cancer risk greater than $1x10^{-5}$

Table 4N: Risk Estimates for the Chronic Inhalation HHRA - Mine Site and Highway 26 (Operations) – Hiker
Cariboo Gold Project
Wells, BC

Hazard Quotients - Mine Site Operations Phase

Receptor Location	Sugar Creek Loop Trail	Cornish X-Country Ski Trail 1	Nine Mile Lake Rec Site	Cornish X-Country Ski Trail 2	Cornish X-Country Ski Trail 3	Jubilee Trail / Wendle Park	Cow Mountain Trails 1	Chisholm Creek Rec Site	Groundhog Lake Ski Trail	Proserpine Trail	Cariboo Wagon Road (Stanley to Barkerville)	Cow Mountain Trails 2	Ned's Connector Trail	Groundhog Lake Snowmobile Trail	Yanks Peak Trail (X-DIST)	Jubilee Trail
Existing Conditions Case																
PM2.5	1.1E-01	1.1E-01	1.1E-01	1.1E-01	1.1E-01	1.1E-01	1.1E-01	1.1E-01	1.1E-01	1.1E-01	1.1E-01	1.1E-01	1.1E-01	1.1E-01	1.1E-01	1.1E-01
Operation Case																
PM2.5	1.1E-01	1.1E-01	1.1E-01	1.1E-01	1.2E-01	1.1E-01	1.1E-01	1.1E-01	1.1E-01	1.1E-01	1.1E-01	1.1E-01	1.1E-01	1.1E-01	1.1E-01	1.1E-01
Project Only Case																
PM2.5	1.6E-05	6.9E-04	1.1E-04	3.5E-04	3.2E-03	1.6E-04	4.1E-04	6.0E-05	2.9E-05	2.4E-05	3.3E-05	1.3E-04	2.1E-04	5.0E-04	3.6E-05	7.3E-05

Notes:
Bold = hazard quotient greater than 1.0

Incremental Lifetime Cancer Risks - Mine Site Operations Phase

Receptor Location	Sugar Creek Loop Trail	Cornish X-Country Ski Trail 1	Nine Mile Lake Rec Site	Cornish X-Country Ski Trail 2	Cornish X-Country Ski Trail 3	Jubilee Trail / Wendle Park	Cow Mountain Trails 1	Chisholm Creek Rec Site	Groundhog Lake Ski Trail	Proserpine Trail	Cariboo Wagon Road (Stanley to Barkerville)	Cow Mountain Trails 2	Ned's Connector Trail	Groundhog Lake Snowmobile Trail	Yanks Peak Trail (X-DIST)	Jubilee Trail
Existing Conditions Case																
DPM																
Operation Case																
DPM																
Project Only Case																
DPM																

Notes:

Bold = incremental lifetime cancer risk greater than $1x10^{-5}$

Table 4N: Risk Estimates for the Chronic Inhalation HHRA - Mine Site and Highway 26 (Operations) – Hiker
Cariboo Gold Project
Wells, BC

Hazard Quotients - Mine Site Operations Phase

Receptor Location	Williams Creek Trail	Viewing Point along Hwy 26	Water Access - Jack of Clubs Lake	Valley Mountain Pass	Barkerville Provincial Park Campground	Historic Barkerville Town and Park	Forest Rose Campground	Government Hill Campground
Existing Conditions Case								
PM2.5	1.1E-01	1.1E-01	1.1E-01	1.1E-01	1.1E-01	1.1E-01	1.1E-01	1.1E-01
Operation Case								
PM2.5	1.1E-01	1.2E-01	1.2E-01	1.2E-01	1.1E-01	1.1E-01	1.1E-01	1.1E-01
Project Only Case								
PM2.5	7.0E-05	2.0E-03	5.7E-03	7.2E-03	1.9E-04	1.0E-04	1.9E-04	1.3E-04

Notes:
Bold = hazard quotient greater than 1.0

Incremental Lifetime Cancer Risks - Mine Site Operations P

Receptor Location	Williams Creek Trail	Viewing Point along Hwy 26	Water Access - Jack of Clubs Lake	Valley Mountain Pass	Barkerville Provincial Park Campground	Historic Barkerville Town and Park	Forest Rose Campground	Government Hill Campground
Existing Conditions Case								
DPM			**NV**	**NV**				
Operation Case								
DPM			5.8E-07	7.0E-07				
Project Only Case								
DPM			5.8E-07	7.0E-07				

Notes:

Bold = incremental lifetime cancer risk greater than $1x10^{-5}$

Attachment 4

Table 4O: Risk Estimates for the Chronic Inhalation HHRA - Mine Site and Highway 26 (Operations) – Camper
Cariboo Gold Project
Wells, BC

Hazard Quotients - Mine Site Operations Phase

Receptor Location	Nine Mile Lake Rec Site	Chisholm Creek Rec Site	Viewing Point along Hwy 26	Barkerville Provincial Park Campground	Historic Barkerville Town and Park	Forest Rose Campground	Government Hill Campground
Existing Conditions Case							
PM2.5	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01
Operation Case							
PM2.5	5.1E-01	5.1E-01	5.2E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01
Project Only Case							
PM2.5	4.7E-04	2.7E-04	9.1E-03	8.5E-04	4.5E-04	8.4E-04	5.6E-04

Notes:
Bold = hazard quotient greater than 1.0

Attachment 4

Table 4P: Risk Estimates for the Chronic Inhalation HHRA - Mine Site and Highway 26 (Operations) – Sport Fisher/Hunter
Cariboo Gold Project
Wells, BC

Hazard Quotients - Mine Site Operations Phase

Receptor Location	Yanks Peak Trail (X-DIST)	Outfitter Area	Trapline TR0515T017 Cabin
Existing Conditions Case			
PM2.5	2.1E-01	2.1E-01	2.1E-01
Operation Case			
PM2.5	2.1E-01	2.2E-01	2.1E-01
Project Only Case			
PM2.5	6.7E-05	4.5E-03	6.5E-05

Notes:
Bold = hazard quotient greater than 1.0

Attachment 4

Table 4Q: Risk Estimates for the Chronic Inhalation HHRA - Mine Site and Highway 26 (Operations) – Mine Camp Worker

Cariboo Gold Project

Wells, BC

Hazard Quotients - Mine Site Operations Phase

Receptor Location	Mine Site Camp
Existing Conditions Case	
Nitrogen Dioxide	2.3E-01
PM2.5	4.2E-01
PM10	3.0E-01
DPM	**NV**
Arsenic	8.8E-03
Iron	3.8E-02
Acrolein	**NV**
Operation Case	
Nitrogen Dioxide	6.4E-01
PM2.5	9.0E-01
PM10	6.2E-01
DPM	9.4E-02
Arsenic	4.4E-01
Iron	6.8E-01
Acrolein	2.9E-02
Project Only Case	
Nitrogen Dioxide	5.4E-01
PM2.5	4.8E-01
PM10	3.2E-01
DPM	9.4E-02
Arsenic	4.3E-01
Iron	6.4E-01
Acrolein	2.9E-02

Notes:

Bold = hazard quotient greater than 1.0

Incremental Lifetime Cancer Risks - Mine Site Operations Phase

Receptor Location	Mine Site Camp
Existing Conditions Case	
DPM	**NV**
Arsenic	3.2E-07
Operation Case	
DPM	**5.8E-05**
Arsenic	**1.6E-05**
Project Only Case	
DPM	**5.8E-05**
Arsenic	**1.5E-05**

Notes:

Bold = incremental lifetime cancer risk greater than $1x10^{-5}$

Table 4R: Risk Estimates for the Chronic Inhalation HHRA - QR Mill and 500 Nyland Lake Road (Operations) – Indigenous Land User
Cariboo Gold Project

Hazard Quotients - QR Operations Phase

Receptor Location	Maude Lake Rec Site	Le Bourdais Lake	Quesnel Forks	Trail Buffer 2	Trail Buffer 3	Trail Buffer 4	Little Lake Rec Site	Prior Lake Rec Site	Trapline TR0515T020 Cabin 1	Trapline TR0515T020 Cabin 2	Trapline TR0502T045	SW2
Existing Conditions Case												
PM2.5 PM10	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**
Operation Case												
PM2.5 PM10	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**
Project Only Case												
PM2.5 PM10	4.7E-04	3.5E-04	6.5E-04	1.6E-03	2.7E-03	5.3E-04	3.6E-04	2.5E-04	4.0E-04	3.5E-04	7.9E-03	2.6E-03

Notes:
Bold = hazard quotient greater than 1.0

Table 4R: Risk Estimates for the Chronic Inhalation HHRA - QR Mill and 500 Nyland Lake Road (Operations) – Indigenous Land User
Cariboo Gold Project

Hazard Quotients - QR Operations Phase

Receptor Location	Transect 15m	Transect 25m	Transect 50m	Transect 75m	Transect 100m	Transect 150m	Transect 200m	Transect 250m	Transect 500m	Transect 1000m
Existing Conditions Case										
PM2.5	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**
PM10	8.4E-01									
Operation Case										
PM2.5	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**	**1.2E+00**
PM10	1.0E+00									
Project Only Case										
PM2.5	4.3E-02	3.6E-02	2.5E-02	2.1E-02	1.7E-02	1.2E-02	9.9E-03	8.5E-03	5.1E-03	2.2E-03
PM10	1.7E-01									

Notes:
Bold = hazard quotient greater than 1.0

Attachment 4

Table 4S: Risk Estimates for the Chronic Inhalation HHRA - QR Mill and 500 Nyland Lake Road (Operations) – Hiker

Cariboo Gold Project

Wells, BC

Hazard Quotients - QR Operations Phase

Receptor Location	Maude Lake Rec Site	Le Bourdais Lake	Quesnel Forks	Little Lake Rec Site	Prior Lake Rec Site	SW2
Existing Conditions Case						
PM2.5	1.1E-01	1.1E-01	1.1E-01	1.1E-01	1.1E-01	1.1E-01
Operation Case						
PM2.5	1.1E-01	1.1E-01	1.1E-01	1.1E-01	1.1E-01	1.1E-01
Project Only Case						
PM2.5	4.5E-05	3.4E-05	6.1E-05	3.4E-05	2.4E-05	2.5E-04

Notes:

Bold = hazard quotient greater than 1.0

Attachment 4

Table 4T: Risk Estimates for the Chronic Inhalation HHRA - QR Mill and 500 Nyland Lake Road (Operations) – Camper
Cariboo Gold Project
Wells, BC

Hazard Quotients - QR Operations Phase

Receptor Location	Maude Lake Rec Site	Little Lake Rec Site	Prior Lake Rec Site
Existing Conditions Case			
PM2.5	5.1E-01	5.1E-01	5.1E-01
Operation Case			
PM2.5	5.1E-01	5.1E-01	5.1E-01
Project Only Case			
PM2.5	2.0E-04	1.5E-04	1.1E-04

Notes:
Bold = hazard quotient greater than 1.0

Attachment 4

Table 4U: Risk Estimates for the Chronic Inhalation HHRA - QR Mill and 500 Nyland Lake Road (Operations) – Sport Fisher/Hunter
Cariboo Gold Project

Hazard Quotients - QR Operations Phase

Receptor Location	Trapline TR0515T020 Cabin 1	Trapline TR0515T020 Cabin 2	Trapline TR0502T045
Existing Conditions Case			
PM2.5	2.1E-01	2.1E-01	2.1E-01
Operation Case			
PM2.5	2.1E-01	2.1E-01	2.1E-01
Project Only Case			
PM2.5	7.1E-05	6.3E-05	1.4E-03

Notes:
Bold = hazard quotient greater than 1.0

Attachment 4

Table 4V: Risk Estimates for the Chronic Inhalation HHRA - QR Mill and 500 Nyland Lake Road (Operations) – Mine Camp Worker
Cariboo Gold Project
Wells, BC

Hazard Quotients - QR Operations Phase

Receptor Location	QR Mill Camp
Existing Conditions Case	
PM2.5	4.2E-01
PM10	3.0E-01
Arsenic	8.8E-03
Iron	3.8E-02
Operation Case	
PM2.5	5.2E-01
PM10	4.0E-01
Arsenic	3.1E-01
Iron	4.2E-01
Project Only Case	
PM2.5	9.6E-02
PM10	1.0E-01
Arsenic	3.0E-01
Iron	3.8E-01

Notes:
Bold = hazard quotient greater than 1.0

Incremental Lifetime Cancer Risks - QR Operations Phase

Receptor Location	QR Mill Camp
Existing Conditions Case	
DPM	**NV**
Arsenic	3.2E-07
Operation Case	
DPM	5.5E-06
Arsenic	**1.1E-05**
Project Only Case	
DPM	5.5E-06
Arsenic	**1.1E-05**

Notes:
Bold = incremental lifetime cancer risk greater than $1x10^{-5}$

ATTACHMENT 2:

Risk Estimates (Multimedia and Inhalation)
– Human Health and Ecological Risk Assessment, 2022 Submission

Table 2A: Risk Estimates - Non-Indigenous Resident
Barkerville Gold Mine Ltd. Cariboo Gold Project
Wells, BC

COPC	Toddler Risk Estimates					Adult Risk Estimates					Woman of Childbearing Age Risk Estimates				
	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure
Wells Baseball Diamond															
Cobalt	0.13	0.13	0.13	0.13	0.13	0.011	0.012	0.011	0.011	0.011	0.013	0.013	0.013	0.012	0.012
Manganese	0.15	0.15	0.15	0.15	0.15	0.017	0.022	0.018	0.017	0.017	0.019	0.025	0.02	0.019	0.019
Methylmercury	0.019	0.029	0.031	0.028	0.029	0.0042	0.0063	0.0067	0.006	0.0063	0.011	0.017	0.018	0.016	0.017
Molybdenum	0.0017	0.0016	0.0016	0.0017	0.0017	0.00067	0.00065	0.00065	0.00067	0.00067	0.00076	0.00073	0.00073	0.00075	0.00075
Selenium	0.021	0.043	0.084	0.053	0.03	0.012	0.024	0.047	0.03	0.017	0.013	0.027	0.053	0.033	0.019
Wells Elementary School															
Cobalt	0.13	0.13	0.13	0.13	0.13	0.011	0.011	0.011	0.011	0.011	0.013	0.013	0.013	0.012	0.012
Manganese	0.15	0.15	0.15	0.15	0.15	0.017	0.018	0.017	0.017	0.017	0.019	0.02	0.019	0.019	0.019
Methylmercury	0.019	0.029	0.031	0.028	0.029	0.0042	0.0063	0.0067	0.006	0.0063	0.011	0.017	0.018	0.016	0.017
Molybdenum	0.0017	0.0016	0.0016	0.0017	0.0017	0.00067	0.00065	0.00065	0.00067	0.00067	0.00076	0.00073	0.00073	0.00075	0.00075
Selenium	0.021	0.043	0.084	0.053	0.03	0.012	0.024	0.047	0.03	0.017	0.013	0.027	0.053	0.033	0.019
Nugget Hills RV Park															
Cobalt	0.13	0.13	0.13	0.13	0.13	0.011	0.011	0.011	0.011	0.011	0.013	0.013	0.013	0.012	0.013
Manganese	0.15	0.15	0.15	0.14	0.15	0.017	0.018	0.017	0.016	0.017	0.019	0.021	0.019	0.019	0.019
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.0017	0.0016	0.0016	0.0017	0.0017	0.00067	0.00065	0.00065	0.00067	0.00067	0.00076	0.00073	0.00073	0.00075	0.00076
Selenium	0.021	0.021	0.021	0.026	0.021	0.012	0.012	0.012	0.015	0.012	0.013	0.013	0.013	0.016	0.013
New Barkerville Residential															
Cobalt	0.13	0.13	0.13	0.13	0.13	0.011	0.011	0.011	0.011	0.011	0.013	0.012	0.012	0.013	0.013
Manganese	0.15	0.14	0.14	0.15	0.15	0.017	0.016	0.016	0.017	0.017	0.019	0.018	0.018	0.019	0.019
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.0017	0.0016	0.0016	0.0017	0.0017	0.00067	0.00065	0.00065	0.00067	0.00067	0.00076	0.00073	0.00073	0.00076	0.00076
Selenium	0.021	0.021	0.021	0.021	0.021	0.012	0.012	0.012	0.012	0.012	0.013	0.013	0.013	0.013	0.013

Notes
Shaded value indicates hazard quotient greater than 0.2.

Table 2B: Risk Estimates - Indigenous Resident
Barkerville Gold Mine Ltd. Cariboo Gold Project
Wells, BC

COPC	Toddler Risk Estimates					Adult Risk Estimates					Woman of Childbearing Age Risk Estimates				
	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure
Wells Baseball Diamond															
Cobalt	0.78	1.0	1.0	0.74	0.74	0.46	0.65	0.65	0.44	0.44	0.31	0.44	0.44	0.3	0.3
Manganese	1.5	1.6	1.6	1.5	1.5	0.41	0.45	0.44	0.4	0.4	0.32	0.35	0.34	0.31	0.31
Methylmercury	0.67	1.0	1.1	0.96	1.0	0.13	0.2	0.21	0.19	0.2	0.2	0.3	0.32	0.28	0.3
Molybdenum	0.016	0.021	0.023	0.017	0.017	0.0064	0.0096	0.011	0.0074	0.007	0.005	0.0073	0.008	0.0057	0.0055
Selenium	0.52	1.3	2.8	1.7	0.85	0.27	0.69	1.5	0.88	0.44	0.17	0.44	0.93	0.56	0.28
Wells Elementary School															
Cobalt	0.78	1.0	1.0	0.74	0.74	0.46	0.65	0.65	0.44	0.44	0.31	0.44	0.44	0.3	0.3
Manganese	1.5	1.6	1.6	1.5	1.5	0.41	0.44	0.44	0.4	0.4	0.32	0.34	0.34	0.31	0.31
Methylmercury	0.67	1.0	1.1	0.96	1.0	0.13	0.2	0.21	0.19	0.2	0.2	0.3	0.32	0.28	0.3
Molybdenum	0.016	0.021	0.023	0.017	0.017	0.0064	0.0096	0.011	0.0074	0.007	0.005	0.0073	0.008	0.0057	0.0055
Selenium	0.52	1.3	2.8	1.7	0.85	0.27	0.69	1.5	0.88	0.44	0.17	0.44	0.93	0.56	0.28
Nugget Hills RV Park															
Cobalt	0.78	1.0	1.0	0.74	0.78	0.46	0.65	0.65	0.44	0.46	0.31	0.44	0.44	0.3	0.31
Manganese	1.5	1.6	1.6	1.5	1.5	0.41	0.44	0.44	0.39	0.41	0.32	0.34	0.34	0.31	0.32
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.016	0.021	0.023	0.017	0.017	0.0064	0.0096	0.011	0.0074	0.0071	0.005	0.0073	0.008	0.0057	0.0055
Selenium	0.52	0.56	0.6	0.76	0.53	0.27	0.3	0.33	0.4	0.28	0.17	0.19	0.22	0.26	0.18
New Barkerville Residential															
Cobalt	0.78	1.0	1.0	0.78	0.78	0.46	0.65	0.65	0.46	0.46	0.31	0.44	0.44	0.31	0.31
Manganese	1.5	1.6	1.6	1.5	1.5	0.41	0.44	0.44	0.41	0.41	0.32	0.34	0.34	0.32	0.32
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.016	0.021	0.023	0.017	0.017	0.0064	0.0096	0.011	0.0075	0.0071	0.005	0.0073	0.008	0.0058	0.0055
Selenium	0.52	0.56	0.6	0.57	0.53	0.27	0.3	0.33	0.31	0.28	0.17	0.19	0.22	0.2	0.18

Notes
Shaded value indicates hazard quotient greater than 0.2.

Appendix 7.13-9
Attachment 2
Table 2C: Risk Estimates - Indigenous Land User
Barkerville Gold Mine Ltd. Cariboo Gold Project
Wells, BC

COPC	Toddler Risk Estimates					Adult Risk Estimates					Woman of Childbearing Age Risk Estimates				
	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure
Cariboo Wagon Road (Stanley to Barkerville)															
Cobalt	0.67	0.93	0.93	0.67	0.67	0.45	0.65	0.65	0.45	0.45	0.3	0.43	0.43	0.3	0.3
Manganese	1.4	1.5	1.5	1.4	1.4	0.44	0.47	0.47	0.44	0.44	0.38	0.4	0.4	0.38	0.38
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.028	0.033	0.034	0.029	0.029	0.0091	0.012	0.013	0.01	0.0097	0.0072	0.0093	0.01	0.0079	0.0077
Selenium	0.52	0.55	0.6	0.56	0.52	0.26	0.29	0.33	0.3	0.27	0.17	0.19	0.21	0.19	0.17
Jubilee Trail															
Cobalt	0.55	0.82	0.82	0.56	0.56	0.4	0.59	0.6	0.4	0.4	0.27	0.4	0.4	0.27	0.27
Manganese	1.3	1.4	1.4	1.3	1.3	0.4	0.43	0.43	0.4	0.4	0.34	0.36	0.36	0.34	0.34
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.026	0.031	0.033	0.028	0.027	0.0085	0.012	0.013	0.0095	0.0091	0.0066	0.0087	0.0095	0.0073	0.0071
Selenium	0.034	0.068	0.12	0.081	0.043	0.02	0.048	0.087	0.058	0.027	0.014	0.033	0.059	0.04	0.019
Proserpine Trail															
Cobalt	0.55	0.82	0.82	0.56	0.56	0.4	0.59	0.6	0.4	0.4	0.27	0.4	0.4	0.27	0.27
Manganese	1.3	1.4	1.4	1.3	1.3	0.4	0.43	0.43	0.4	0.4	0.34	0.36	0.36	0.34	0.34
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.026	0.031	0.033	0.028	0.027	0.0085	0.012	0.013	0.0095	0.0091	0.0066	0.0087	0.0095	0.0073	0.0071
Selenium	0.034	0.068	0.12	0.081	0.043	0.02	0.048	0.087	0.058	0.027	0.014	0.033	0.059	0.04	0.019
Sugar Creek Loop Trail															
Cobalt	0.55	0.82	0.82	0.56	0.56	0.4	0.59	0.6	0.4	0.4	0.27	0.4	0.4	0.27	0.27
Manganese	1.3	1.4	1.4	1.3	1.3	0.4	0.43	0.43	0.4	0.4	0.34	0.36	0.36	0.34	0.34
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.026	0.031	0.033	0.028	0.027	0.0085	0.012	0.013	0.0095	0.0091	0.0066	0.0087	0.0095	0.0073	0.0071
Selenium	0.034	0.068	0.12	0.081	0.043	0.02	0.048	0.087	0.058	0.027	0.014	0.033	0.059	0.04	0.019
Yanks Peak Trail															
Cobalt	0.55	0.82	0.82	0.56	0.56	0.4	0.59	0.6	0.4	0.4	0.27	0.4	0.4	0.27	0.27
Manganese	1.3	1.4	1.4	1.3	1.3	0.4	0.43	0.43	0.4	0.4	0.34	0.36	0.36	0.34	0.34
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.026	0.031	0.033	0.028	0.027	0.0085	0.012	0.013	0.0095	0.0091	0.0066	0.0087	0.0095	0.0073	0.0071
Selenium	0.034	0.068	0.12	0.081	0.043	0.02	0.048	0.087	0.058	0.027	0.014	0.033	0.059	0.04	0.019

Table 2C: Risk Estimates - Indigenous Land User
Barkerville Gold Mine Ltd. Cariboo Gold Project
Wells, BC

COPC	Toddler Risk Estimates					Adult Risk Estimates					Woman of Childbearing Age Risk Estimates				
	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure
Groundhog Lake Ski Trail															
Cobalt	0.67	0.93	0.93	0.67	0.67	0.45	0.65	0.65	0.45	0.45	0.3	0.43	0.43	0.3	0.3
Manganese	1.4	1.5	1.5	1.4	1.4	0.44	0.47	0.47	0.44	0.44	0.38	0.4	0.4	0.38	0.38
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.027	0.032	0.034	0.029	0.028	0.0088	0.012	0.013	0.0098	0.0094	0.0068	0.0089	0.0097	0.0076	0.0073
Selenium	0.52	0.55	0.6	0.56	0.52	0.26	0.29	0.33	0.3	0.27	0.17	0.19	0.21	0.19	0.17
Chisholm Creek Rec Site															
Cobalt	0.55	0.82	0.82	0.56	0.56	0.4	0.59	0.6	0.4	0.4	0.27	0.4	0.4	0.27	0.27
Manganese	1.3	1.4	1.4	1.3	1.3	0.4	0.43	0.43	0.4	0.4	0.34	0.36	0.36	0.34	0.34
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.026	0.031	0.033	0.028	0.027	0.0085	0.012	0.013	0.0095	0.0091	0.0066	0.0087	0.0095	0.0073	0.0071
Selenium	0.034	0.068	0.12	0.081	0.043	0.02	0.048	0.087	0.058	0.027	0.014	0.033	0.059	0.04	0.019
Nine Mile Lake Rec Site															
Cobalt	0.55	0.82	0.82	0.56	0.56	0.4	0.59	0.6	0.4	0.4	0.27	0.4	0.4	0.27	0.27
Manganese	1.3	1.4	1.4	1.3	1.3	0.4	0.43	0.43	0.4	0.4	0.34	0.36	0.36	0.34	0.34
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.026	0.031	0.033	0.028	0.027	0.0085	0.012	0.013	0.0095	0.0091	0.0066	0.0087	0.0095	0.0073	0.0071
Selenium	0.034	0.068	0.12	0.081	0.043	0.02	0.048	0.087	0.058	0.027	0.014	0.033	0.059	0.04	0.019
Trail Buffer 1 - Legal Objective															
Cobalt	0.55	0.82	0.82	0.56	0.56	0.4	0.59	0.6	0.4	0.4	0.27	0.4	0.4	0.27	0.27
Manganese	1.3	1.4	1.4	1.3	1.3	0.4	0.43	0.43	0.4	0.4	0.34	0.36	0.36	0.34	0.34
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.026	0.031	0.033	0.028	0.027	0.0085	0.012	0.013	0.0095	0.0091	0.0066	0.0087	0.0095	0.0073	0.0071
Selenium	0.034	0.068	0.12	0.081	0.043	0.02	0.048	0.087	0.058	0.027	0.014	0.033	0.059	0.04	0.019
Viewing Point along Hwy 26															
Cobalt	0.67	0.93	0.93	0.67	0.67	0.45	0.65	0.65	0.45	0.45	0.3	0.43	0.43	0.3	0.3
Manganese	1.6	1.6	1.6	1.6	1.6	0.51	0.54	0.54	0.51	0.51	0.46	0.47	0.48	0.46	0.45
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.027	0.032	0.034	0.029	0.028	0.0088	0.012	0.013	0.0098	0.0094	0.0068	0.009	0.0097	0.0076	0.0073
Selenium	0.52	0.55	0.6	0.56	0.53	0.26	0.29	0.33	0.3	0.27	0.17	0.19	0.21	0.2	0.17

Table 2C: Risk Estimates - Indigenous Land User
Barkerville Gold Mine Ltd. Cariboo Gold Project
Wells, BC

COPC	Toddler Risk Estimates					Adult Risk Estimates					Woman of Childbearing Age Risk Estimates				
	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure
Trapline TR0515T017 Cabin															
Cobalt	0.55	0.82	0.82	0.56	0.56	0.4	0.59	0.6	0.4	0.4	0.27	0.4	0.4	0.27	0.27
Manganese	1.3	1.4	1.4	1.3	1.3	0.4	0.43	0.43	0.4	0.4	0.34	0.36	0.36	0.34	0.34
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.026	0.031	0.033	0.028	0.027	0.0085	0.012	0.013	0.0095	0.0091	0.0066	0.0087	0.0095	0.0073	0.0071
Selenium	0.034	0.068	0.12	0.081	0.043	0.02	0.048	0.087	0.058	0.027	0.014	0.033	0.059	0.04	0.019
Highway 26 Transect 200 m															
Cobalt	0.67	0.93	0.93	0.67	0.67	0.45	0.65	0.65	0.45	0.45	0.3	0.43	0.43	0.3	0.3
Manganese	1.6	1.6	1.6	1.6	1.6	0.51	0.54	0.54	0.51	0.51	0.46	0.47	0.47	0.46	0.45
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.027	0.032	0.034	0.029	0.028	0.0088	0.012	0.013	0.0098	0.0094	0.0068	0.009	0.0097	0.0076	0.0073
Selenium	0.52	0.55	0.6	0.56	0.53	0.26	0.29	0.33	0.3	0.27	0.17	0.19	0.21	0.2	0.17
Cow Mountain Trails 1															
Cobalt	0.67	0.94	0.94	0.68	0.67	0.45	0.65	0.65	0.45	0.45	0.3	0.43	0.43	0.3	0.3
Manganese	1.6	1.6	1.6	1.6	1.6	0.45	0.47	0.47	0.44	0.44	0.36	0.37	0.37	0.36	0.35
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.014	0.02	0.021	0.016	0.016	0.006	0.009	0.01	0.007	0.0066	0.0045	0.0066	0.0074	0.0053	0.005
Selenium	0.52	0.55	0.6	0.56	0.53	0.27	0.29	0.33	0.3	0.27	0.17	0.19	0.21	0.2	0.17
Cow Mountain Trails 2															
Cobalt	0.67	0.94	0.94	0.68	0.68	0.45	0.65	0.65	0.45	0.45	0.3	0.43	0.43	0.3	0.3
Manganese	1.6	1.6	1.6	1.6	1.6	0.44	0.46	0.46	0.43	0.43	0.35	0.37	0.37	0.35	0.35
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.016	0.021	0.022	0.017	0.017	0.0066	0.0097	0.011	0.0076	0.0072	0.0052	0.0073	0.0081	0.0059	0.0057
Selenium	0.52	0.55	0.6	0.56	0.53	0.27	0.29	0.33	0.3	0.27	0.17	0.19	0.21	0.2	0.17
Jubilee Trail / Wendle Park															
Cobalt	0.56	0.82	0.83	0.56	0.56	0.4	0.59	0.59	0.4	0.4	0.27	0.4	0.4	0.27	0.27
Manganese	1.5	1.5	1.5	1.5	1.5	0.4	0.42	0.42	0.39	0.39	0.32	0.33	0.33	0.31	0.31
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.014	0.019	0.02	0.015	0.015	0.0057	0.0087	0.0098	0.0067	0.0063	0.0043	0.0064	0.0072	0.005	0.0048
Selenium	0.034	0.069	0.12	0.081	0.043	0.02	0.048	0.087	0.058	0.027	0.014	0.033	0.059	0.04	0.019

Table 2C: Risk Estimates - Indigenous Land User
Barkerville Gold Mine Ltd. Cariboo Gold Project
Wells, BC

COPC	Toddler Risk Estimates					Adult Risk Estimates					Woman of Childbearing Age Risk Estimates				
	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure
Ned's Connector Trail															
Cobalt	0.67	0.94	0.94	0.64	0.68	0.45	0.65	0.65	0.44	0.45	0.3	0.43	0.43	0.29	0.3
Manganese	1.6	1.6	1.6	1.7	1.6	0.44	0.46	0.47	0.53	0.43	0.35	0.37	0.37	0.46	0.35
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.016	0.021	0.022	0.017	0.017	0.0066	0.0097	0.011	0.0077	0.0072	0.0052	0.0073	0.0081	0.006	0.0057
Selenium	0.52	0.55	0.6	1.3	0.53	0.27	0.29	0.33	0.69	0.27	0.17	0.19	0.21	0.44	0.17
Williams Creek Trail															
Cobalt	0.68	0.94	0.94	0.68	0.68	0.45	0.65	0.65	0.45	0.45	0.3	0.43	0.43	0.3	0.3
Manganese	1.6	1.6	1.6	1.6	1.6	0.44	0.47	0.47	0.44	0.44	0.36	0.37	0.37	0.35	0.35
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.014	0.02	0.021	0.016	0.015	0.006	0.009	0.01	0.007	0.0066	0.0045	0.0066	0.0074	0.0052	0.005
Selenium	0.52	0.55	0.6	0.56	0.53	0.27	0.29	0.33	0.3	0.27	0.17	0.19	0.21	0.2	0.17
Cornish X-Country Ski Trail 1															
Cobalt	0.68	0.94	0.94	0.68	0.68	0.45	0.65	0.65	0.45	0.45	0.3	0.43	0.43	0.3	0.3
Manganese	1.7	1.7	1.7	1.7	1.7	0.49	0.52	0.52	0.49	0.49	0.41	0.43	0.43	0.41	0.41
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.015	0.02	0.021	0.016	0.016	0.006	0.0091	0.01	0.0071	0.0067	0.0046	0.0067	0.0074	0.0053	0.005
Selenium	0.52	0.55	0.6	0.56	0.53	0.26	0.29	0.33	0.3	0.27	0.17	0.19	0.21	0.2	0.17
Cornish X-Country Ski Trail 2															
Cobalt	0.68	0.94	0.94	0.68	0.68	0.45	0.65	0.65	0.45	0.45	0.3	0.43	0.43	0.3	0.3
Manganese	1.9	1.9	1.9	1.9	1.9	0.63	0.65	0.65	0.62	0.62	0.56	0.58	0.58	0.56	0.56
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.014	0.02	0.021	0.016	0.016	0.006	0.0091	0.01	0.007	0.0066	0.0045	0.0067	0.0074	0.0053	0.005
Selenium	0.52	0.55	0.6	0.56	0.53	0.27	0.29	0.33	0.3	0.27	0.17	0.19	0.21	0.2	0.17
Cornish X-Country Ski Trail 3															
Cobalt	0.67	0.94	0.94	0.64	0.64	0.45	0.65	0.65	0.43	0.43	0.3	0.43	0.44	0.29	0.29
Manganese	1.6	1.7	1.8	1.7	1.6	0.44	0.51	0.58	0.48	0.45	0.36	0.42	0.49	0.4	0.37
Methylmercury	0.67	1.0	1.1	0.96	1.0	0.13	0.2	0.21	0.19	0.2	0.2	0.3	0.32	0.28	0.3
Molybdenum	0.015	0.022	0.031	0.02	0.016	0.0062	0.011	0.016	0.0096	0.0072	0.0048	0.0085	0.014	0.0081	0.0056
Selenium	0.52	1.3	2.8	1.7	0.85	0.27	0.69	1.5	0.88	0.44	0.17	0.44	0.93	0.56	0.28

Table 2C: Risk Estimates - Indigenous Land User
Barkerville Gold Mine Ltd. Cariboo Gold Project
Wells, BC

COPC	Toddler Risk Estimates					Adult Risk Estimates					Woman of Childbearing Age Risk Estimates				
	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure
Groundhog Lake Snowmobile Trail															
Cobalt	0.7	0.96	0.96	0.64	0.7	0.46	0.66	0.66	0.43	0.46	0.31	0.44	0.45	0.29	0.32
Manganese	2.0	2.1	2.1	1.6	2.0	0.69	0.71	0.72	0.45	0.68	0.63	0.65	0.65	0.37	0.63
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.029	0.034	0.036	0.016	0.03	0.015	0.018	0.019	0.007	0.015	0.014	0.016	0.017	0.0052	0.015
Selenium	0.69	0.73	0.77	0.76	0.7	0.38	0.4	0.44	0.4	0.38	0.29	0.31	0.34	0.26	0.3
Barkerville Provincial Park Campground															
Cobalt	0.68	0.94	0.94	0.68	0.68	0.45	0.65	0.65	0.45	0.45	0.3	0.43	0.43	0.3	0.3
Manganese	1.6	1.7	1.7	1.6	1.6	0.46	0.49	0.49	0.46	0.46	0.38	0.39	0.39	0.37	0.37
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.015	0.02	0.022	0.017	0.016	0.0063	0.0094	0.01	0.0073	0.0069	0.0049	0.007	0.0077	0.0056	0.0053
Selenium	0.52	0.55	0.6	0.56	0.52	0.26	0.29	0.33	0.3	0.27	0.17	0.19	0.21	0.19	0.17
Forest Rose Campground															
Cobalt	0.61	0.88	0.88	0.61	0.61	0.42	0.62	0.62	0.42	0.42	0.28	0.41	0.41	0.28	0.28
Manganese	2.3	2.3	2.3	2.3	2.3	0.84	0.87	0.87	0.84	0.84	0.81	0.82	0.82	0.81	0.81
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.015	0.02	0.022	0.017	0.016	0.0064	0.0094	0.01	0.0074	0.007	0.0049	0.007	0.0078	0.0057	0.0054
Selenium	0.57	0.6	0.65	0.61	0.58	0.29	0.32	0.36	0.33	0.3	0.19	0.2	0.23	0.21	0.19
Government Hill Campground															
Cobalt	0.68	0.94	0.94	0.68	0.68	0.45	0.65	0.65	0.45	0.45	0.3	0.43	0.43	0.3	0.3
Manganese	1.6	1.6	1.6	1.6	1.6	0.45	0.47	0.47	0.44	0.44	0.36	0.38	0.38	0.36	0.36
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.015	0.02	0.022	0.017	0.016	0.0064	0.0095	0.011	0.0074	0.007	0.005	0.0071	0.0078	0.0057	0.0054
Selenium	0.52	0.55	0.6	0.56	0.53	0.27	0.29	0.33	0.3	0.27	0.17	0.19	0.21	0.2	0.17
Water Access – Jack of Clubs Lake															
Cobalt	0.61	0.88	0.9	0.62	0.58	0.42	0.62	0.63	0.42	0.41	0.28	0.42	0.43	0.29	0.27
Manganese	1.6	1.8	2.0	1.8	1.7	0.46	0.56	0.67	0.57	0.48	0.39	0.48	0.59	0.5	0.4
Methylmercury	8.9	14	14	14	14	1.8	2.7	2.7	2.7	2.7	2.6	4.1	4.1	4.0	4.0
Molybdenum	0.015	0.2	0.52	0.33	0.07	0.0061	0.08	0.21	0.13	0.028	0.0046	0.053	0.14	0.085	0.019
Selenium	0.57	2.0	4.5	3.0	0.97	0.29	1.0	2.3	1.5	0.5	0.19	0.64	1.5	0.97	0.32

Appendix 7.13-9
Attachment 2
Table 2C: Risk Estimates - Indigenous Land User
Barkerville Gold Mine Ltd. Cariboo Gold Project
Wells, BC

COPC	Toddler Risk Estimates					Adult Risk Estimates					Woman of Childbearing Age Risk Estimates				
	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure
Valley Mountain Pass															
Cobalt	0.68	0.94	0.94	0.68	0.68	0.45	0.65	0.65	0.45	0.45	0.3	0.43	0.43	0.3	0.3
Manganese	1.9	2.0	2.0	1.9	1.9	0.63	0.66	0.66	0.62	0.62	0.56	0.59	0.58	0.56	0.56
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.015	0.02	0.021	0.016	0.016	0.006	0.0091	0.01	0.0071	0.0067	0.0046	0.0067	0.0074	0.0053	0.005
Selenium	0.52	0.55	0.6	0.56	0.53	0.27	0.29	0.33	0.3	0.27	0.17	0.19	0.21	0.2	0.17
Historic Barkerville Town and Park															
Cobalt	0.68	0.94	0.94	0.68	0.68	0.45	0.65	0.65	0.45	0.45	0.3	0.43	0.43	0.3	0.3
Manganese	1.6	1.6	1.6	1.6	1.6	0.45	0.47	0.47	0.44	0.44	0.36	0.38	0.38	0.36	0.36
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.015	0.02	0.022	0.017	0.016	0.0064	0.0095	0.011	0.0074	0.007	0.005	0.0071	0.0078	0.0057	0.0054
Selenium	0.52	0.55	0.6	0.56	0.53	0.27	0.29	0.33	0.3	0.27	0.17	0.19	0.21	0.2	0.17
Outfitter Area															
Cobalt	0.61	0.88	0.9	0.62	0.58	0.42	0.62	0.63	0.42	0.41	0.28	0.42	0.43	0.29	0.27
Manganese	1.6	1.8	2.0	1.8	1.7	0.46	0.56	0.67	0.57	0.48	0.39	0.47	0.59	0.5	0.4
Methylmercury	8.9	14	14	14	14	1.8	2.7	2.7	2.7	2.7	2.6	4.1	4.1	4.0	4.0
Molybdenum	0.015	0.2	0.52	0.33	0.07	0.0061	0.08	0.21	0.13	0.028	0.0046	0.053	0.14	0.085	0.019
Selenium	0.57	2.0	4.5	3.0	0.97	0.29	1.0	2.3	1.5	0.5	0.19	0.64	1.5	0.97	0.32
Le Bourdais Lake															
Cobalt	0.57	0.84	0.84	0.57	0.57	0.4	0.6	0.6	0.4	0.4	0.27	0.4	0.4	0.27	0.27
Manganese	1.2	1.2	1.2	1.1	1.1	0.32	0.35	0.34	0.31	0.31	0.25	0.27	0.26	0.25	0.25
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.18	0.18	0.19	0.18	0.18	0.046	0.049	0.05	0.047	0.046	0.04	0.042	0.043	0.041	0.041
Selenium	0.027	0.062	0.11	0.074	0.036	0.018	0.046	0.085	0.056	0.025	0.012	0.031	0.057	0.038	0.017
Quesnel Forks															
Cobalt	0.57	0.84	0.84	0.57	0.57	0.4	0.6	0.6	0.4	0.4	0.27	0.4	0.4	0.27	0.27
Manganese	1.2	1.2	1.2	1.1	1.1	0.32	0.35	0.34	0.31	0.31	0.25	0.27	0.26	0.25	0.25
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.18	0.18	0.19	0.18	0.18	0.046	0.049	0.05	0.047	0.046	0.04	0.042	0.043	0.041	0.041
Selenium	0.027	0.062	0.11	0.074	0.036	0.018	0.046	0.085	0.056	0.025	0.012	0.031	0.057	0.038	0.017

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Attachment 2
Table 2C: Risk Estimates - Indigenous Land User
Barkerville Gold Mine Ltd. Cariboo Gold Project
Wells, BC

COPC	Toddler Risk Estimates					Adult Risk Estimates					Woman of Childbearing Age Risk Estimates				
	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure
Little Lake Rec Site															
Cobalt	0.57	0.84	0.84	0.57	0.57	0.4	0.6	0.6	0.4	0.4	0.27	0.4	0.4	0.27	0.27
Manganese	1.2	1.2	1.2	1.1	1.1	0.32	0.35	0.34	0.31	0.31	0.25	0.27	0.26	0.25	0.25
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.18	0.18	0.19	0.18	0.18	0.046	0.049	0.05	0.047	0.046	0.04	0.042	0.043	0.041	0.041
Selenium	0.027	0.062	0.11	0.074	0.036	0.018	0.046	0.085	0.056	0.025	0.012	0.031	0.057	0.038	0.017
Maude Lake Rec Site															
Cobalt	0.57	0.84	0.84	0.57	0.57	0.4	0.6	0.6	0.4	0.4	0.27	0.4	0.4	0.27	0.27
Manganese	1.2	1.2	1.2	1.1	1.1	0.32	0.35	0.34	0.31	0.31	0.25	0.27	0.26	0.25	0.25
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.18	0.18	0.19	0.18	0.18	0.046	0.049	0.05	0.047	0.046	0.04	0.042	0.043	0.041	0.041
Selenium	0.027	0.062	0.11	0.074	0.036	0.018	0.046	0.085	0.056	0.025	0.012	0.031	0.057	0.038	0.017
Prior Lake Rec Site															
Cobalt	0.57	0.84	0.84	0.57	0.57	0.4	0.6	0.6	0.4	0.4	0.27	0.4	0.4	0.27	0.27
Manganese	1.2	1.2	1.2	1.1	1.1	0.32	0.35	0.34	0.31	0.31	0.25	0.27	0.26	0.25	0.25
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.18	0.18	0.19	0.18	0.18	0.046	0.049	0.05	0.047	0.046	0.04	0.042	0.043	0.041	0.041
Selenium	0.027	0.062	0.11	0.074	0.036	0.018	0.046	0.085	0.056	0.025	0.012	0.031	0.057	0.038	0.017
Trail Buffer 2															
Cobalt	0.57	0.84	0.84	0.57	0.57	0.4	0.6	0.6	0.4	0.4	0.27	0.4	0.4	0.27	0.27
Manganese	1.2	1.2	1.2	1.1	1.1	0.32	0.35	0.34	0.31	0.31	0.25	0.27	0.27	0.25	0.25
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.18	0.18	0.19	0.18	0.18	0.046	0.049	0.05	0.047	0.046	0.04	0.042	0.043	0.041	0.041
Selenium	0.027	0.062	0.11	0.074	0.036	0.018	0.046	0.085	0.056	0.025	0.012	0.031	0.057	0.038	0.017
Trail Buffer 4															
Cobalt	0.57	0.84	0.84	0.57	0.57	0.4	0.6	0.6	0.4	0.4	0.27	0.4	0.4	0.27	0.27
Manganese	1.2	1.2	1.2	1.1	1.1	0.32	0.35	0.34	0.31	0.31	0.25	0.27	0.26	0.25	0.25
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.18	0.18	0.19	0.18	0.18	0.046	0.049	0.05	0.047	0.046	0.04	0.042	0.043	0.041	0.041
Selenium	0.027	0.062	0.11	0.074	0.036	0.018	0.046	0.085	0.056	0.025	0.012	0.031	0.057	0.038	0.017

Table 2C: Risk Estimates - Indigenous Land User
Barkerville Gold Mine Ltd. Cariboo Gold Project
Wells, BC

COPC	Toddler Risk Estimates					Adult Risk Estimates					Woman of Childbearing Age Risk Estimates				
	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure
500 Road Transect 200 m															
Cobalt	0.69	0.95	0.95	0.69	0.69	0.46	0.65	0.65	0.46	0.46	0.31	0.44	0.44	0.31	0.31
Manganese	1.3	1.3	1.3	1.3	1.3	0.37	0.4	0.4	0.37	0.37	0.3	0.32	0.32	0.3	0.3
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.19	0.19	0.19	0.19	0.19	0.05	0.054	0.054	0.051	0.051	0.045	0.047	0.048	0.046	0.045
Selenium	0.51	0.55	0.59	0.56	0.52	0.26	0.29	0.33	0.3	0.27	0.17	0.19	0.21	0.19	0.17
Trapline TR0515T020 Cabin 1															
Cobalt	0.57	0.84	0.84	0.57	0.57	0.4	0.6	0.6	0.4	0.4	0.27	0.4	0.4	0.27	0.27
Manganese	1.2	1.2	1.2	1.1	1.1	0.32	0.35	0.34	0.31	0.31	0.25	0.27	0.26	0.25	0.25
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.18	0.18	0.19	0.18	0.18	0.046	0.049	0.05	0.047	0.046	0.04	0.042	0.043	0.041	0.041
Selenium	0.027	0.062	0.11	0.074	0.036	0.018	0.046	0.085	0.056	0.025	0.012	0.031	0.057	0.038	0.017
Trapline TR0515T020 Cabin 2															
Cobalt	0.57	0.84	0.84	0.57	0.57	0.4	0.6	0.6	0.4	0.4	0.27	0.4	0.4	0.27	0.27
Manganese	1.2	1.2	1.2	1.1	1.1	0.32	0.35	0.34	0.31	0.31	0.25	0.27	0.26	0.25	0.25
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.18	0.18	0.19	0.18	0.18	0.046	0.049	0.05	0.047	0.046	0.04	0.042	0.043	0.041	0.041
Selenium	0.027	0.062	0.11	0.074	0.036	0.018	0.046	0.085	0.056	0.025	0.012	0.031	0.057	0.038	0.017
Trail Buffer 3															
Cobalt	0.64	1.0	1.0	0.72	0.71	0.42	0.67	0.67	0.46	0.46	0.28	0.45	0.45	0.31	0.31
Manganese	1.0	1.1	1.1	1.1	1.1	0.29	0.35	0.35	0.31	0.31	0.24	0.29	0.28	0.26	0.25
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.24	0.24	0.24	0.24	0.24	0.052	0.056	0.057	0.053	0.053	0.041	0.043	0.044	0.042	0.042
Selenium	0.029	2.9	3.0	3.0	2.9	0.019	1.5	1.6	1.5	1.5	0.013	0.96	0.99	0.97	0.95
SW2															
Cobalt	0.64	1.0	1.0	0.72	0.71	0.42	0.67	0.67	0.46	0.45	0.29	0.45	0.45	0.31	0.3
Manganese	1.1	1.3	2.7	2.1	1.1	0.3	0.43	1.3	0.91	0.35	0.25	0.37	1.3	0.94	0.31
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.24	0.25	0.25	0.24	0.24	0.056	0.062	0.063	0.055	0.053	0.046	0.05	0.051	0.043	0.042
Selenium	0.03	5.7	7.9	6.6	0.93	0.019	2.9	4.0	3.4	0.48	0.014	1.9	2.6	2.1	0.3

Appendix 7.13-9
Attachment 2
Table 2C: Risk Estimates - Indigenous Land User
Barkerville Gold Mine Ltd. Cariboo Gold Project
Wells, BC

COPC	Toddler Risk Estimates					Adult Risk Estimates					Woman of Childbearing Age Risk Estimates				
	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure
Trapline TR0502T045															
Cobalt	0.75	1.0	1.0	0.75	0.75	0.47	0.67	0.67	0.47	0.47	0.32	0.45	0.45	0.32	0.32
Manganese	1.1	1.1	1.1	1.1	1.1	0.31	0.34	0.33	0.3	0.3	0.25	0.27	0.27	0.24	0.24
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.24	0.24	0.24	0.24	0.24	0.053	0.056	0.057	0.054	0.053	0.041	0.044	0.044	0.042	0.042
Selenium	0.51	0.55	0.59	0.56	0.52	0.26	0.29	0.33	0.3	0.27	0.17	0.19	0.21	0.19	0.17

Notes
Shaded value indicates hazard quotient greater than 0.2.

Table 2D: Risk Estimates - Hiker
Barkerville Gold Mine Ltd. Cariboo Gold Project
Wells, BC

COPC	Toddler Risk Estimates					Adult Risk Estimates				
	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure
Cariboo Wagon Road (Stanley to Barkerville)										
Cobalt	0.002	0.0019	0.0019	0.002	0.002	0.00019	0.00015	0.00015	0.00019	0.00019
Manganese	0.059	0.058	0.058	0.059	0.059	0.0097	0.0091	0.0091	0.0097	0.0097
Methylmercury	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.00024	0.00023	0.00023	0.00024	0.00024	0.000065	0.000051	0.000051	0.000065	0.000065
Selenium	0.00049	0.00049	0.00049	0.00049	0.00049	0.00011	0.00011	0.00011	0.00011	0.00011
Jubilee Trail										
Cobalt	0.002	0.0019	0.0019	0.002	0.002	0.00019	0.00015	0.00015	0.00019	0.00019
Manganese	0.059	0.058	0.058	0.059	0.059	0.0097	0.0091	0.0091	0.0097	0.0097
Methylmercury	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.00024	0.00023	0.00023	0.00024	0.00024	0.000065	0.000051	0.000051	0.000065	0.000065
Selenium	0.00049	0.00049	0.00049	0.00049	0.00049	0.00011	0.00011	0.00011	0.00011	0.00011
Proserpine Trail										
Cobalt	0.002	0.0019	0.0019	0.002	0.002	0.00019	0.00015	0.00015	0.00019	0.00019
Manganese	0.059	0.058	0.058	0.059	0.059	0.0097	0.0091	0.0091	0.0097	0.0097
Methylmercury	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.00024	0.00023	0.00023	0.00024	0.00024	0.000065	0.000051	0.000051	0.000065	0.000065
Selenium	0.00049	0.00049	0.00049	0.00049	0.00049	0.00011	0.00011	0.00011	0.00011	0.00011
Sugar Creek Loop Trail										
Cobalt	0.002	0.0019	0.0019	0.002	0.002	0.00019	0.00015	0.00015	0.00019	0.00019
Manganese	0.059	0.058	0.058	0.059	0.059	0.0097	0.0091	0.0091	0.0097	0.0097
Methylmercury	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.00024	0.00023	0.00023	0.00024	0.00024	0.000065	0.000051	0.000051	0.000065	0.000065
Selenium	0.00049	0.00049	0.00049	0.00049	0.00049	0.00011	0.00011	0.00011	0.00011	0.00011

Table 2D: Risk Estimates - Hiker
Barkerville Gold Mine Ltd. Cariboo Gold Project
Wells, BC

COPC	Toddler Risk Estimates					Adult Risk Estimates				
	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure
Yanks Peak Trail										
Cobalt	0.002	0.0019	0.0019	0.002	0.002	0.00019	0.00015	0.00015	0.00019	0.00019
Manganese	0.059	0.058	0.058	0.059	0.059	0.0097	0.0091	0.0091	0.0097	0.0097
Methylmercury	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.00024	0.00023	0.00023	0.00024	0.00024	0.000065	0.000051	0.000051	0.000065	0.000065
Selenium	0.00049	0.00049	0.00049	0.00049	0.00049	0.00011	0.00011	0.00011	0.00011	0.00011
Groundhog Lake Ski Trail										
Cobalt	0.002	0.0019	0.0019	0.002	0.002	0.00019	0.00015	0.00015	0.00019	0.00019
Manganese	0.059	0.058	0.058	0.059	0.059	0.0097	0.0091	0.0091	0.0097	0.0097
Methylmercury	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.00024	0.00023	0.00023	0.00024	0.00024	0.000065	0.000051	0.000051	0.000065	0.000065
Selenium	0.00049	0.00049	0.00049	0.00049	0.00049	0.00011	0.00011	0.00011	0.00011	0.00011
Viewing Point along Hwy 26										
Cobalt	0.002	0.0019	0.0019	0.002	0.002	0.00019	0.00015	0.00015	0.00019	0.00019
Manganese	0.059	0.058	0.058	0.059	0.059	0.0097	0.0091	0.0094	0.0097	0.0097
Methylmercury	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.00024	0.00023	0.00023	0.00024	0.00024	0.000065	0.000051	0.000051	0.000065	0.000065
Selenium	0.00049	0.00049	0.00049	0.00049	0.00049	0.00011	0.00011	0.00011	0.00011	0.00011
Cow Mountain Trails 1										
Cobalt	0.0052	0.0052	0.0052	0.0052	0.0052	0.00041	0.00037	0.00036	0.00041	0.00041
Manganese	0.072	0.072	0.072	0.072	0.072	0.012	0.012	0.012	0.012	0.012
Methylmercury	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.00011	0.000097	0.000097	0.00011	0.00011	0.000033	0.000019	0.000019	0.000033	0.000033
Selenium	0.00053	0.00053	0.00053	0.00053	0.00053	0.00011	0.00011	0.00011	0.00011	0.00011

Table 2D: Risk Estimates - Hiker
Barkerville Gold Mine Ltd. Cariboo Gold Project
Wells, BC

COPC	Toddler Risk Estimates					Adult Risk Estimates				
	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure
Cow Mountain Trails 2										
Cobalt	0.0052	0.0052	0.0052	0.0052	0.0052	0.00041	0.00036	0.00036	0.00041	0.00041
Manganese	0.072	0.072	0.072	0.072	0.072	0.012	0.012	0.012	0.012	0.012
Methylmercury	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.00011	0.000097	0.000097	0.00011	0.00011	0.000033	0.000019	0.000019	0.000033	0.000033
Selenium	0.00053	0.00053	0.00053	0.00053	0.00053	0.00011	0.00011	0.00011	0.00011	0.00011
Jubilee Trail / Wendle Park										
Cobalt	0.0052	0.0052	0.0052	0.0052	0.0052	0.00041	0.00036	0.00036	0.00041	0.00041
Manganese	0.072	0.072	0.072	0.072	0.072	0.012	0.012	0.012	0.012	0.012
Methylmercury	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.00011	0.000097	0.000097	0.00011	0.00011	0.000033	0.000019	0.000019	0.000033	0.000033
Selenium	0.00053	0.00053	0.00053	0.00053	0.00053	0.00011	0.00011	0.00011	0.00011	0.00011
Ned's Connector Trail										
Cobalt	0.0052	0.0052	0.0052	0.0052	0.0052	0.00041	0.00036	0.00037	0.00041	0.00041
Manganese	0.072	0.072	0.072	0.072	0.072	0.012	0.012	0.012	0.012	0.012
Methylmercury	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.00011	0.000097	0.000097	0.00011	0.00011	0.000033	0.000019	0.000019	0.000033	0.000033
Selenium	0.00053	0.00053	0.00053	0.00053	0.00053	0.00011	0.00011	0.00011	0.00011	0.00011
Williams Creek Trail										
Cobalt	0.0052	0.0052	0.0052	0.0052	0.0052	0.00041	0.00036	0.00036	0.00041	0.00041
Manganese	0.072	0.072	0.072	0.072	0.072	0.012	0.012	0.012	0.012	0.012
Methylmercury	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.00011	0.000097	0.000097	0.00011	0.00011	0.000033	0.000019	0.000019	0.000033	0.000033
Selenium	0.00053	0.00053	0.00053	0.00053	0.00053	0.00011	0.00011	0.00011	0.00011	0.00011

Table 2D: Risk Estimates - Hiker
Barkerville Gold Mine Ltd. Cariboo Gold Project
Wells, BC

COPC	Toddler Risk Estimates					Adult Risk Estimates				
	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure
Cornish X-Country Ski Trail 1										
Cobalt	0.0052	0.0052	0.0052	0.0052	0.0052	0.00041	0.00037	0.00036	0.00041	0.00041
Manganese	0.072	0.072	0.072	0.072	0.072	0.012	0.012	0.012	0.012	0.012
Methylmercury	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.00011	0.000097	0.000097	0.00011	0.00011	0.000033	0.000019	0.000019	0.000033	0.000033
Selenium	0.00053	0.00053	0.00053	0.00053	0.00053	0.00011	0.00011	0.00011	0.00011	0.00011
Cornish X-Country Ski Trail 2										
Cobalt	0.0052	0.0052	0.0052	0.0052	0.0052	0.00041	0.00036	0.00036	0.00041	0.00041
Manganese	0.072	0.072	0.072	0.072	0.072	0.012	0.012	0.012	0.012	0.012
Methylmercury	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.00011	0.000097	0.000097	0.00011	0.00011	0.000033	0.000019	0.000019	0.000033	0.000033
Selenium	0.00053	0.00053	0.00053	0.00053	0.00053	0.00011	0.00011	0.00011	0.00011	0.00011
Cornish X-Country Ski Trail 3										
Cobalt	0.0052	0.0052	0.0052	0.0052	0.0052	0.00041	0.00039	0.00037	0.00041	0.00041
Manganese	0.072	0.072	0.072	0.072	0.072	0.012	0.012	0.012	0.012	0.012
Methylmercury	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.00011	0.000097	0.000097	0.00011	0.00011	0.000033	0.000019	0.000019	0.000033	0.000033
Selenium	0.00053	0.00053	0.00053	0.00053	0.00053	0.00011	0.00011	0.00011	0.00011	0.00011
Groundhog Lake Snowmobile Trail										
Manganese	0.072	0.072	0.072	0.072	0.072	0.012	0.012	0.012	0.012	0.012
Methylmercury	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.00011	0.000097	0.000097	0.00011	0.00011	0.000033	0.000019	0.000019	0.000033	0.000033
Selenium	0.00053	0.00053	0.00053	0.00053	0.00053	0.00011	0.00011	0.00011	0.00011	0.00011

Table 2D: Risk Estimates - Hiker
Barkerville Gold Mine Ltd. Cariboo Gold Project
Wells, BC

COPC	Toddler Risk Estimates					Adult Risk Estimates				
	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure
Water Access – Jack of Clubs Lake										
Cobalt	0.0052	0.0052	0.0052	0.0052	0.0052	0.00041	0.00044	0.00038	0.00041	0.00041
Manganese	0.072	0.073	0.072	0.072	0.072	0.012	0.013	0.012	0.012	0.012
Methylmercury	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.00011	0.000097	0.000097	0.00011	0.00011	0.000033	0.000019	0.000019	0.000033	0.000033
Selenium	0.00053	0.00053	0.00053	0.00053	0.00053	0.00011	0.00011	0.00011	0.00011	0.00011
Valley Mountain Pass										
Cobalt	0.0052	0.0052	0.0052	0.0052	0.0052	0.00041	0.00043	0.00039	0.00041	0.00041
Manganese	0.072	0.073	0.072	0.072	0.072	0.012	0.012	0.012	0.012	0.012
Methylmercury	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.00011	0.000097	0.000097	0.00011	0.00011	0.000033	0.000019	0.000019	0.000033	0.000033
Selenium	0.00053	0.00053	0.00053	0.00053	0.00053	0.00011	0.00011	0.00011	0.00011	0.00011
Historic Barkerville Town and Park										
Cobalt	0.0052	0.0052	0.0052	0.0052	0.0052	0.00041	0.00036	0.00036	0.00041	0.00041
Manganese	0.072	0.072	0.072	0.072	0.072	0.012	0.012	0.012	0.012	0.012
Methylmercury	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.00011	0.000097	0.000097	0.00011	0.00011	0.000033	0.000019	0.000019	0.000033	0.000033
Selenium	0.00053	0.00053	0.00053	0.00053	0.00053	0.00011	0.00011	0.00011	0.00011	0.00011
Le Bourdais Lake										
Cobalt	0.0024	0.0024	0.0023	0.0024	0.0024	0.00024	0.00024	0.00019	0.00024	0.00024
Manganese	0.059	0.059	0.058	0.059	0.059	0.0095	0.0095	0.0089	0.0095	0.0095
Methylmercury	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.0016	0.0016	0.0016	0.0016	0.0016	0.0004	0.0004	0.00038	0.0004	0.0004
Selenium	0.0003	0.0003	0.0003	0.0003	0.0003	0.000056	0.000056	0.000056	0.000056	0.000056

Table 2D: Risk Estimates - Hiker
Barkerville Gold Mine Ltd. Cariboo Gold Project
Wells, BC

COPC	Toddler Risk Estimates					Adult Risk Estimates				
	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure
Quesnel Forks										
Cobalt	0.0024	0.0024	0.0023	0.0024	0.0024	0.00024	0.00024	0.00019	0.00024	0.00024
Manganese	0.059	0.059	0.058	0.059	0.059	0.0095	0.0095	0.009	0.0095	0.0095
Methylmercury	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.0016	0.0016	0.0016	0.0016	0.0016	0.0004	0.0004	0.00038	0.0004	0.0004
Selenium	0.0003	0.0003	0.0003	0.0003	0.0003	0.000056	0.000056	0.000056	0.000056	0.000056
SW2										
Cobalt	0.0035	0.0035	0.0035	0.0035	0.0035	0.00035	0.00035	0.00031	0.00035	0.00035
Manganese	0.06	0.06	0.06	0.06	0.06	0.0086	0.0086	0.0081	0.0086	0.0086
Methylmercury	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.0026	0.0026	0.0026	0.0026	0.0026	0.00064	0.00064	0.00063	0.00064	0.00064
Selenium	0.00043	0.00043	0.00043	0.00043	0.00043	0.000066	0.000066	0.000066	0.000066	0.000066

Notes
Shaded value indicates hazard quotient greater than 0.2.

Table 2E: Risk Estimates - Camper
Barkerville Gold Mine Ltd. Cariboo Gold Project
Wells, BC

COPC	Toddler Risk Estimates					Adult Risk Estimates				
	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure
Chisholm Creek Rec Site										
Cobalt	0.0031	0.0029	0.0029	0.0031	0.0031	0.00046	0.00025	0.00025	0.00046	0.00046
Manganese	0.09	0.088	0.088	0.09	0.09	0.017	0.014	0.014	0.017	0.017
Methylmercury	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.0004	0.00034	0.00034	0.0004	0.0004	0.00014	0.000076	0.000076	0.00014	0.00014
Selenium	0.00074	0.00074	0.00074	0.00074	0.00074	0.00016	0.00016	0.00016	0.00016	0.00016
Nine Mile Lake Rec Site										
Cobalt	0.0031	0.0029	0.0029	0.0031	0.0031	0.00046	0.00025	0.00025	0.00046	0.00046
Manganese	0.09	0.088	0.088	0.09	0.09	0.017	0.014	0.014	0.017	0.017
Methylmercury	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.0004	0.00034	0.00034	0.0004	0.0004	0.00014	0.000076	0.000076	0.00014	0.00014
Selenium	0.00074	0.00074	0.00074	0.00074	0.00074	0.00016	0.00016	0.00016	0.00016	0.00016
Barkerville Provincial Park Campground										
Cobalt	0.016	0.016	0.016	0.016	0.016	0.0038	0.0035	0.0035	0.0038	0.0038
Manganese	0.22	0.22	0.22	0.22	0.22	0.06	0.058	0.058	0.06	0.06
Methylmercury	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.00051	0.00045	0.00045	0.00051	0.00051	0.00026	0.0002	0.0002	0.00026	0.00026
Selenium	0.0012	0.0012	0.0012	0.0012	0.0012	0.00033	0.00033	0.00033	0.00033	0.00033
Forest Rose Campground										
Cobalt	0.016	0.016	0.016	0.016	0.016	0.0039	0.0037	0.0037	0.0039	0.0039
Manganese	0.49	0.49	0.49	0.49	0.49	0.22	0.22	0.22	0.22	0.22
Methylmercury	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.00055	0.00049	0.00049	0.00055	0.00055	0.00027	0.00021	0.00021	0.00027	0.00027
Selenium	0.0013	0.0013	0.0013	0.0013	0.0013	0.00037	0.00037	0.00037	0.00037	0.00037

Table 2E: Risk Estimates - Camper
Barkerville Gold Mine Ltd. Cariboo Gold Project
Wells, BC

COPC	Toddler Risk Estimates					Adult Risk Estimates				
	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure
Government Hill Campground										
Cobalt	0.016	0.016	0.016	0.016	0.016	0.0036	0.0034	0.0034	0.0036	0.0036
Manganese	0.19	0.19	0.19	0.19	0.19	0.049	0.047	0.047	0.049	0.049
Methylmercury	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.0006	0.00054	0.00054	0.0006	0.0006	0.0003	0.00024	0.00024	0.0003	0.0003
Selenium	0.0019	0.0019	0.0019	0.0019	0.0019	0.00068	0.00068	0.00068	0.00068	0.00068
Little Lake Rec Site										
Cobalt	0.0038	0.0038	0.0035	0.0038	0.0038	0.00053	0.00053	0.00032	0.00053	0.00053
Manganese	0.09	0.09	0.088	0.09	0.09	0.017	0.017	0.014	0.017	0.017
Methylmercury	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.0025	0.0025	0.0024	0.0025	0.0025	0.00064	0.00064	0.00057	0.00064	0.00064
Selenium	0.00045	0.00045	0.00045	0.00045	0.00045	0.000084	0.000084	0.000084	0.000084	0.000084
Maude Lake Rec Site										
Cobalt	0.0038	0.0038	0.0035	0.0038	0.0038	0.00053	0.00053	0.00032	0.00053	0.00053
Manganese	0.09	0.09	0.088	0.09	0.09	0.017	0.017	0.014	0.017	0.017
Methylmercury	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.0025	0.0025	0.0024	0.0025	0.0025	0.00064	0.00064	0.00057	0.00064	0.00064
Selenium	0.00045	0.00045	0.00045	0.00045	0.00045	0.000084	0.000084	0.000084	0.000084	0.000084
Prior Lake Rec Site										
Cobalt	0.0038	0.0038	0.0035	0.0038	0.0038	0.00053	0.00053	0.00032	0.00053	0.00053
Manganese	0.09	0.09	0.088	0.09	0.09	0.017	0.017	0.014	0.017	0.017
Methylmercury	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.0025	0.0025	0.0024	0.0025	0.0025	0.00064	0.00064	0.00057	0.00064	0.00064
Selenium	0.00045	0.00045	0.00045	0.00045	0.00045	0.000084	0.000084	0.000084	0.000084	0.000084

Notes
Shaded value indicates hazard quotient greater than 0.2.

Table 2F: Risk Estimates - Sport Fisher/Hunter
Barkerville Gold Mine Ltd. Cariboo Gold Project
Wells, BC

COPC	Toddler Risk Estimates					Teen Risk Estimates					Adult Risk Estimates					Woman of Childbearing Age Risk Estimates				
	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure
Cariboo Wagon Road (Stanley to Barkerville)																				
Cobalt	0.14	0.2	0.2	0.14	0.14	0.081	0.11	0.11	0.082	0.081	0.099	0.14	0.14	0.10	0.10	0.1	0.15	0.15	0.1	0.1
Manganese	0.02	0.026	0.026	0.019	0.019	0.016	0.019	0.019	0.016	0.015	0.017	0.02	0.02	0.016	0.016	0.017	0.02	0.021	0.016	0.016
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.00081	0.0013	0.0015	0.00098	0.00092	0.00042	0.00065	0.00073	0.0005	0.00047	0.00048	0.00078	0.00088	0.00059	0.00055	0.00049	0.0008	0.00091	0.0006	0.00056
Selenium	0.14	0.15	0.16	0.15	0.14	0.07	0.074	0.079	0.075	0.071	0.073	0.079	0.087	0.081	0.075	0.059	0.065	0.074	0.068	0.061
Trapline TR0515T017 Cabin																				
Cobalt	0.11	0.17	0.17	0.11	0.11	0.066	0.10	0.10	0.067	0.066	0.085	0.13	0.13	0.085	0.085	0.09	0.14	0.14	0.09	0.09
Manganese	0.0099	0.016	0.016	0.0089	0.0087	0.01	0.013	0.013	0.0098	0.0097	0.012	0.015	0.015	0.011	0.011	0.012	0.016	0.016	0.011	0.011
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.00062	0.0011	0.0013	0.00079	0.00072	0.00034	0.00057	0.00065	0.00042	0.00039	0.00041	0.0007	0.00081	0.00051	0.00047	0.00043	0.00074	0.00085	0.00054	0.0005
Selenium	0.0038	0.011	0.02	0.013	0.0056	0.0022	0.0062	0.012	0.0077	0.0033	0.0031	0.0087	0.016	0.011	0.0046	0.0033	0.0092	0.017	0.011	0.0048
Cow Mountain Trails 1																				
Cobalt	0.14	0.2	0.2	0.14	0.14	0.082	0.12	0.12	0.082	0.082	0.10	0.14	0.14	0.10	0.10	0.1	0.15	0.15	0.1	0.1
Manganese	0.02	0.026	0.026	0.019	0.019	0.017	0.019	0.019	0.016	0.016	0.018	0.021	0.021	0.017	0.017	0.018	0.021	0.021	0.017	0.017
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.00081	0.0013	0.0015	0.00098	0.00092	0.00042	0.00065	0.00073	0.0005	0.00047	0.00048	0.00078	0.00088	0.00059	0.00055	0.00049	0.0008	0.00091	0.0006	0.00056
Selenium	0.14	0.15	0.16	0.15	0.14	0.07	0.074	0.079	0.075	0.071	0.073	0.079	0.087	0.081	0.075	0.059	0.065	0.074	0.068	0.061
Williams Creek Trail																				
Cobalt	0.14	0.2	0.2	0.14	0.14	0.082	0.12	0.12	0.082	0.082	0.10	0.14	0.14	0.10	0.10	0.1	0.15	0.15	0.1	0.1
Manganese	0.02	0.026	0.026	0.019	0.019	0.017	0.019	0.019	0.016	0.016	0.018	0.021	0.021	0.017	0.017	0.018	0.021	0.021	0.017	0.017
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.00081	0.0013	0.0015	0.00098	0.00092	0.00042	0.00065	0.00073	0.0005	0.00047	0.00048	0.00078	0.00088	0.00059	0.00055	0.00049	0.0008	0.00091	0.0006	0.00056
Selenium	0.14	0.15	0.16	0.15	0.14	0.07	0.074	0.079	0.075	0.071	0.073	0.079	0.087	0.081	0.075	0.059	0.065	0.074	0.068	0.061
Water Access – Jack of Clubs Lake																				
Cobalt	0.13	0.18	0.19	0.13	0.12	0.073	0.11	0.11	0.073	0.068	0.091	0.13	0.14	0.091	0.087	0.095	0.14	0.14	0.095	0.091
Manganese	0.014	0.026	0.037	0.023	0.014	0.014	0.021	0.026	0.019	0.014	0.015	0.023	0.027	0.019	0.014	0.015	0.023	0.026	0.019	0.015
Methylmercury	2.6	3.9	3.9	3.9	3.9	0.53	0.82	0.82	0.82	0.82	0.51	0.78	0.78	0.78	0.78	0.95	1.5	1.5	1.5	1.5
Molybdenum	0.00086	0.052	0.14	0.088	0.016	0.00044	0.022	0.059	0.037	0.0067	0.0005	0.02	0.055	0.034	0.0063	0.00051	0.016	0.044	0.027	0.0052
Selenium	0.16	0.55	1.3	0.84	0.27	0.077	0.27	0.62	0.41	0.13	0.081	0.28	0.65	0.43	0.14	0.066	0.23	0.52	0.35	0.11
Outfitter Area																				
Cobalt	0.13	0.18	0.19	0.13	0.12	0.073	0.11	0.11	0.073	0.068	0.091	0.13	0.14	0.091	0.087	0.095	0.14	0.14	0.095	0.091
Manganese	0.014	0.026	0.037	0.023	0.014	0.014	0.02	0.025	0.019	0.014	0.015	0.022	0.027	0.019	0.014	0.015	0.022	0.026	0.019	0.015
Methylmercury	2.6	3.9	3.9	3.9	3.9	0.53	0.82	0.82	0.82	0.82	0.51	0.78	0.78	0.78	0.78	0.95	1.5	1.5	1.5	1.5
Molybdenum	0.00086	0.052	0.14	0.088	0.016	0.00044	0.022	0.059	0.037	0.0067	0.0005	0.02	0.055	0.034	0.0063	0.00051	0.016	0.044	0.027	0.0052
Selenium	0.16	0.55	1.3	0.84	0.27	0.077	0.27	0.62	0.41	0.13	0.081	0.28	0.65	0.43	0.14	0.066	0.23	0.52	0.35	0.11

Table 2F: Risk Estimates - Sport Fisher/Hunter
Barkerville Gold Mine Ltd. Cariboo Gold Project
Wells, BC

COPC	Toddler Risk Estimates					Teen Risk Estimates					Adult Risk Estimates					Woman of Childbearing Age Risk Estimates				
	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure
Trapline TR0515T020 Cabin 1																				
Cobalt	0.11	0.17	0.17	0.11	0.11	0.066	0.10	0.1	0.067	0.067	0.085	0.13	0.13	0.085	0.085	0.09	0.14	0.14	0.09	0.09
Manganese	0.0099	0.016	0.016	0.0089	0.0087	0.01	0.014	0.013	0.0099	0.0098	0.012	0.016	0.015	0.011	0.011	0.012	0.017	0.016	0.012	0.011
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.00062	0.0011	0.0013	0.00079	0.00072	0.00034	0.0006	0.00065	0.00042	0.00039	0.00041	0.00073	0.00081	0.00051	0.00048	0.00043	0.00077	0.00085	0.00054	0.0005
Selenium	0.0038	0.011	0.02	0.013	0.0056	0.0022	0.0062	0.012	0.0077	0.0033	0.0031	0.0087	0.016	0.011	0.0046	0.0033	0.0092	0.017	0.011	0.0048
Trapline TR0515T020 Cabin 2																				
Cobalt	0.11	0.17	0.17	0.11	0.11	0.066	0.10	0.1	0.067	0.067	0.085	0.13	0.13	0.085	0.085	0.09	0.14	0.14	0.09	0.09
Manganese	0.0099	0.016	0.016	0.0089	0.0087	0.01	0.014	0.013	0.0099	0.0098	0.012	0.016	0.015	0.011	0.011	0.012	0.017	0.016	0.012	0.011
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.00062	0.0011	0.0013	0.00079	0.00072	0.00034	0.0006	0.00065	0.00042	0.00039	0.00041	0.00073	0.00081	0.00051	0.00048	0.00043	0.00077	0.00085	0.00054	0.0005
Selenium	0.0038	0.011	0.02	0.013	0.0056	0.0022	0.0062	0.012	0.0077	0.0033	0.0031	0.0087	0.016	0.011	0.0046	0.0033	0.0092	0.017	0.011	0.0048
Trail Buffer 3																				
Cobalt	0.11	0.2	0.2	0.13	0.13	0.067	0.11	0.12	0.076	0.076	0.085	0.14	0.14	0.095	0.094	0.09	0.15	0.15	0.098	0.098
Manganese	0.0099	0.026	0.026	0.013	0.013	0.012	0.02	0.019	0.013	0.013	0.013	0.022	0.021	0.014	0.014	0.014	0.022	0.021	0.015	0.014
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.00062	0.0013	0.0015	0.00095	0.00089	0.00034	0.00068	0.00074	0.00049	0.00046	0.00041	0.00081	0.00089	0.00058	0.00054	0.00044	0.00083	0.00092	0.0006	0.00055
Selenium	0.0038	0.84	0.85	0.84	0.83	0.0023	0.41	0.42	0.41	0.41	0.0031	0.43	0.44	0.43	0.43	0.0033	0.35	0.35	0.35	0.34
SW2																				
Cobalt	0.11	0.2	0.2	0.13	0.13	0.067	0.11	0.12	0.076	0.076	0.085	0.14	0.14	0.095	0.094	0.09	0.15	0.15	0.098	0.098
Manganese	0.0099	0.026	0.026	0.015	0.014	0.012	0.021	0.02	0.014	0.014	0.013	0.022	0.022	0.015	0.015	0.014	0.023	0.022	0.015	0.015
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.00062	0.0013	0.0015	0.00095	0.00089	0.00034	0.00068	0.00074	0.0005	0.00046	0.00042	0.00081	0.00089	0.00058	0.00054	0.00044	0.00083	0.00092	0.0006	0.00056
Selenium	0.0038	1.6	2.3	1.9	0.26	0.0023	0.8	1.1	0.92	0.13	0.0031	0.83	1.2	0.96	0.13	0.0033	0.67	0.93	0.77	0.11
Trapline TR0502T045																				
Cobalt	0.14	0.2	0.2	0.14	0.14	0.082	0.11	0.12	0.082	0.082	0.10	0.14	0.14	0.10	0.10	0.1	0.15	0.15	0.1	0.1
Manganese	0.02	0.026	0.026	0.019	0.019	0.017	0.021	0.02	0.017	0.016	0.018	0.022	0.022	0.017	0.017	0.018	0.023	0.022	0.017	0.017
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.00081	0.0013	0.0015	0.00098	0.00092	0.00042	0.00068	0.00074	0.00051	0.00048	0.00049	0.00081	0.00089	0.00059	0.00055	0.0005	0.00083	0.00092	0.00061	0.00056
Selenium	0.14	0.15	0.16	0.15	0.14	0.07	0.074	0.079	0.075	0.071	0.073	0.079	0.087	0.081	0.075	0.06	0.065	0.074	0.068	0.061

Notes
Shaded value indicates hazard quotient greater than 0.2.

Attachment 2
Table 2G: Risk Estimates - Mine Camp Worker
Barkerville Gold Mine Ltd. Cariboo Gold Project
Wells, BC

COPC	Adult Risk Estimates				
	Existing Conditions	Construction	Operations	Closure	Post-closure
Cobalt	0.0054	0.0054	0.0054	0.0051	0.0051
Manganese	0.012	0.012	0.012	0.012	0.012
Methylmercury	0.05	0.077	0.077	0.076	0.076
Molybdenum	0.00044	0.00075	0.0013	0.00099	0.00053
Selenium	0.016	0.031	0.044	0.037	0.021

Notes
Shaded value indicates hazard quotient greater than 0.2.

Attachment 2
Table 2H: Risk Estimates - Indigenous Land User
Barkerville Gold Mine Ltd. Cariboo Gold Project
Wells, BC

COPC	Toddler Risk Estimates					Adult Risk Estimates					Woman of Childbearing Age Risk Estimates				
	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure	Existing Conditions	Construction	Operations	Closure	Post-closure
Mine Site LAA															
Cobalt	0.67	0.93	0.93	0.66	0.66	0.45	0.64	0.65	0.44	0.44	0.3	0.43	0.43	0.3	0.3
Manganese	1.6	1.7	1.7	1.6	1.6	0.5	0.54	0.56	0.5	0.5	0.43	0.46	0.48	0.43	0.43
Methylmercury	4.0	6.1	6.1	6.0	6.1	0.79	1.2	1.2	1.2	1.2	1.2	1.8	1.8	1.8	1.8
Molybdenum	0.02	0.041	0.072	0.049	0.026	0.0076	0.017	0.029	0.019	0.01	0.006	0.012	0.021	0.014	0.0077
Selenium	0.6	0.83	1.2	1.0	0.68	0.33	0.45	0.66	0.54	0.37	0.21	0.29	0.42	0.34	0.24
QR Mill LAA															
Cobalt	0.7	0.97	0.97	0.69	0.68	0.46	0.66	0.66	0.45	0.45	0.31	0.44	0.44	0.3	0.3
Manganese	1.2	1.3	1.7	1.5	1.2	0.35	0.41	0.62	0.5	0.36	0.29	0.33	0.57	0.46	0.3
Methylmercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum	0.2	0.2	0.2	0.2	0.2	0.05	0.053	0.055	0.05	0.049	0.043	0.046	0.046	0.043	0.042
Selenium	0.58	2.5	3.0	2.7	1.3	0.32	1.3	1.6	1.4	0.68	0.21	0.82	1.0	0.89	0.43

Notes
Shaded value indicates hazard quotient greater than 0.2.

Table 4A: Risk Estimates for Inhalation HHRA - Mine Site and Highway 26 (1-Hour)
Cariboo Gold Project
Wells, BC

Parameter	Toxicity Reference Value (µg/m^3)	Existing Conditions (µg/m^3)	Existing Conditions HQ	MPOI-Mine Site	MPOI-Highway 26	Sugar Creek Loop Trail	Cornish X-Country Ski Trail 1	Nine Mile Lake Rec Site	Cornish X-Country Ski Trail 2	Cornish X-Country Ski Trail 3	Jubilee Trail / Wendle Park	Cow Mountain Trails 1	Chisholm Creek Rec Site	Groundhog Lake Ski Trail	Proserpine Trail	Cariboo Wagon Road (Stanley to Barkerville)	Cow Mountain Trails 2	Ned's Connector Trail
Construction																		
Criteria Air Contaminants																		
Nitrogen Dioxide (Project Only)	79	-	-	**4.7**	-	0.0025	0.079	0.011	0.045	0.34	0.018	0.12	0.0044	0.0048	0.0036	0.0058	0.027	0.022
Nitrogen Dioxide (Project Only ARM Conversion)	79	-	-	**1.3**	-	0.0025	0.079	0.011	0.045	0.34	0.018	0.12	0.0044	0.0048	0.0036	0.0058	0.027	0.022
Nitrogen Dioxide (Baseline+Project)	79	74	0.94	**5.6**	-	0.94	1.0	0.95	0.98	**1.3**	0.95	**1.1**	0.94	0.94	0.94	0.94	0.96	0.96
Nitrogen Dioxide (ARM Conversion)	79	74	0.94	**1.4**	-	-	**1.1**	-	-	**1.1**	-	**1.1**	-	-	-	-	-	-
Diesel Particulate Matter	10	-	-	**2.4**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Volatile Organic Compounds																		
Acrolein	7	-	-	**0.23**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Formaldehyde	50	-	-	**0.36**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Operations																		
Criteria Air Contaminants																		
Nitrogen Dioxide (Project Only)	79	-	-	**2.6**	0.0065	0.0022	0.042	0.007	0.028	0.15	0.011	0.047	0.0035	0.0053	0.004	0.0063	0.021	0.026
Nitrogen Dioxide (Project Only ARM Conversion)	79	-	-	**1.1**	-	0.0022	0.042	0.0069	0.028	0.15	0.01	0.046	0.0031	0.0053	0.004	0.0062	0.021	0.026
Nitrogen Dioxide (Baseline+Project)	79	74	0.94	**3.5**	0.94	0.94	0.98	0.94	0.96	**1.1**	0.95	0.98	0.94	0.94	0.94	0.94	0.96	0.96
Nitrogen Dioxide (ARM Conversion)	79	74	0.94	**1.3**	-	-	-	-	-	**1.1**	-	-	-	-	-	-	-	-
Diesel Particulate Matter	10	-	-	**1.2**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Volatile Organic Compounds																		
Acrolein	7	-	-	0.041	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Formaldehyde	50	-	-	0.093	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes
"-" = did not exceed air criteria; hazard quotient not calculated.
Baseline refers to Existing Conditions
Bold and shaded value indicates hazard quotient greater than 1 (for criteria air contaminants where predictions include baseline and NO2 ambient ratio method) or hazard quotient greater than 0.2 for other constituents of potential concern.

Table 4A: Risk Estimates for Inhalation HHRA - Mine Site and Highway 26 (1-Hour)
Cariboo Gold Project
Wells, BC

Parameter	Toxicity Reference Value (µg/m^3)	Existing Conditions (µg/m^3)	Groundhog Lake Snowmobile Trail	Yanks Peak Trail (X-DIST)	Jubilee Trail	Williams Creek Trail	Trail Buffer 1-Legal Objective	Viewing Point along Hwy 26	Water Access - Jack of Clubs Lake	Wells Baseball Diamond	Wells Elementary School	Nugget Hills RV Park	Valley Mountain Pass	Outfitter Area	Trapline TR0515T017 Cabin	Barkerville Provincial Park Campground
Construction																
Criteria Air Contaminants																
Nitrogen Dioxide (Project Only)	79	-	0.027	0.0043	0.0077	0.0095	0.0071	0.03	0.95	**1.3**	0.93	**1.7**	0.8	**1.4**	0.0061	0.026
Nitrogen Dioxide (Project Only ARM Conversion)	79	-	0.027	0.0043	0.0077	0.0095	0.0071	0.03	0.9	0.97	0.89	1.0	0.8	0.98	0.0061	0.026
Nitrogen Dioxide (Baseline+Project)	79	74	0.96	0.94	0.94	0.95	0.94	0.97	**1.9**	**2.2**	**1.9**	**2.7**	**1.7**	**2.3**	0.94	0.96
Nitrogen Dioxide (ARM Conversion)	79	74	-	-	-	-	-	-	**1.2**	**1.2**	**1.2**	**1.2**	**1.2**	**1.2**	-	-
Diesel Particulate Matter	10	-	-	-	-	-	-	-	**0.44**	**0.55**	**0.34**	**0.6**	**0.3**	**1.1**	-	-
Volatile Organic Compounds																
Acrolein	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Formaldehyde	50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Operations																
Criteria Air Contaminants																
Nitrogen Dioxide (Project Only)	79	-	0.057	0.0037	0.0051	0.0093	0.0054	0.021	0.39	0.83	0.6	0.61	0.36	0.31	0.0053	0.013
Nitrogen Dioxide (Project Only ARM Conversion)	79	-	0.057	0.0036	0.0051	0.0093	0.0054	0.015	0.38	0.83	0.59	0.61	0.36	0.31	0.0053	0.013
Nitrogen Dioxide (Baseline+Project)	79	74	0.99	0.94	0.94	0.95	0.94	0.96	**1.3**	**1.8**	**1.5**	**1.5**	**1.3**	**1.2**	0.94	0.95
Nitrogen Dioxide (ARM Conversion)	79	74	-	-	-	-	-	-	**1.1**	**1.2**	**1.1**	**1.1**	**1.1**	**1.1**	-	-
Diesel Particulate Matter	10	-	-	-	-	-	-	-	0.13	0.19	0.14	0.0084	0.0073	0.0067	-	-
Volatile Organic Compounds																
Acrolein	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Formaldehyde	50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes
"-" = did not exceed air criteria; hazard quotient not calculated.
Baseline refers to Existing Conditions
Bold and shaded value indicates hazard quotient greater than 1 (for criteria air contaminants where predictions include baseline and NO2 ambient ratio method) or hazard quotient greater than 0.2 for other constituents of potential concern.

Parameter	Toxicity Reference Value (µg/m^3)	Existing Conditions (µg/m^3)	New Barkerville Residential	Historic Barkerville Town and Park	Forest Rose Campground	Government Hill Campground	Mine Site Camp	Transect 15m	Transect 25m	Transect 50m	Transect 75m	Transect 100m	Transect 150m	Transect 200m	Transect 250m	Transect 500m	Transect 1000m
Construction																	
Criteria Air Contaminants																	
Nitrogen Dioxide (Project Only)	79	-	0.018	0.014	0.024	0.016	-	-	-	-	-	-	-	-	-	-	-
Nitrogen Dioxide (Project Only ARM Conversion)	79	-	0.018	0.014	0.024	0.016	-	-	-	-	-	-	-	-	-	-	-
Nitrogen Dioxide (Baseline+Project)	79	74	0.95	0.95	0.96	0.95	-	-	-	-	-	-	-	-	-	-	-
Nitrogen Dioxide (ARM Conversion)	79	74	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Diesel Particulate Matter	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Volatile Organic Compounds																	
Acrolein	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Formaldehyde	50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Operations																	
Criteria Air Contaminants																	
Nitrogen Dioxide (Project Only)	79	-	0.01	0.009	0.014	0.0098	**3.1**	0.0062	0.0053	0.0042	0.0037	0.0033	0.0027	0.0021	0.0019	0.0011	0.00052
Nitrogen Dioxide (Project Only ARM Conversion)	79	-	0.01	0.009	0.014	0.0098	**1.2**	-	-	-	-	-	-	-	-	-	-
Nitrogen Dioxide (Baseline+Project)	79	74	0.95	0.95	0.95	0.95	**4.0**	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Nitrogen Dioxide (ARM Conversion)	79	74	-	-	-	-	**1.3**	-	-	-	-	-	-	-	-	-	-
Diesel Particulate Matter	10	-	-	-	-	-	**0.74**	-	-	-	-	-	-	-	-	-	-
Volatile Organic Compounds																	
Acrolein	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Formaldehyde	50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes
"-" = did not exceed air criteria; hazard quotient not calculated.
Baseline refers to Existing Conditions
Bold and shaded value indicates hazard quotient greater than 1 (for criteria air contaminants where predictions include baseline and NO2 ambient ratio method) or hazard quotient greater than 0.2 for other constituents of potential concern.

Table 4B: Risk Estimates for Inhalation HHRA - QR Mill and 500 Nyland Lake Road (1-Hour)
Cariboo Gold Project
Wells, BC

Parameter	Toxicity Reference Value (µg/m^3)	Existing Conditions (µg/m^3)	Existing Conditions HQ	MPOI-QR Mill	MPOI-500 Nyland Lake Road	Maude Lake Rec Site	Le Bourdais Lake	Quesnel Forks	Trail Buffer 2	Trail Buffer 3	Trail Buffer 4	Little Lake Rec Site	Prior Lake Rec Site	Trapline TR0515T020 Cabin 1	Trapline TR0515T020 Cabin 2	Trapline TR0502T045	SW2
Operations																	
Criteria Air Contaminants																	
Nitrogen Dioxide (Project Only)	79	-	-	0.97	0.013	0.0023	0.0031	0.0039	0.011	0.031	0.002	0.0019	0.0012	0.0038	0.003	0.037	0.019
Nitrogen Dioxide (Project Only ARM Conversion)	79	-	-	0.9	-	0.0021	0.003	0.0039	0.011	0.031	0.0019	0.0019	0.0012	0.0037	0.003	0.034	0.018
Nitrogen Dioxide (Baseline+Project)	79	74	0.94	**1.9**	0.95	0.94	0.94	0.94	0.95	0.97	0.94	0.94	0.94	0.94	0.94	0.97	0.96
Nitrogen Dioxide (ARM Conversion)	79	74	0.94	**1.2**	-	-	-	-	-	-	-	-	-	-	-	-	-
Diesel Particulate Matter	10	-	-	**0.51**	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes
"-" = did not exceed air criteria; hazard quotient not calculated.
Baseline refers to Existing Conditions
Air quality predictions were not provided for the Construction Phase as emissions are expected to be negligible.
Bold and shaded value indicates hazard quotient greater than 1 (for criteria air contaminants where predictions include baseline and NO2 ambient ratio method) or hazard quotient greater than 0.2 for other constituents of potential concern.

Table 4B: Risk Estimates for Inhalation HHRA - QR Mill and 500 Nyland Lake Road (1-Hour)
Cariboo Gold Project
Wells, BC

Parameter	Toxicity Reference Value (µg/m^3)	Existing Conditions (µg/m^3)	Existing Conditions HQ	QR Mill Camp	Transect 15m	Transect 25m	Transect 50m	Transect 75m	Transect 100m	Transect 150m	Transect 200m	Transect 250m	Transect 500m	Transect 1000m
Operations														
Criteria Air Contaminants														
Nitrogen Dioxide (Project Only)	79	-	-	**1.1**	0.013	0.011	0.0075	0.0063	0.0053	0.0041	0.0034	0.003	0.0024	0.0014
Nitrogen Dioxide (Project Only ARM Conversion)	79	-	-	0.94	-	-	-	-	-	-	-	-	-	-
Nitrogen Dioxide (Baseline+Project)	79	74	0.94	**2.1**	0.95	0.95	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Nitrogen Dioxide (ARM Conversion)	79	74	0.94	**1.2**	-	-	-	-	-	-	-	-	-	-
Diesel Particulate Matter	10	-	-	**0.54**	-	-	-	-	-	-	-	-	-	-

Notes
"-" = did not exceed air criteria; hazard quotient not calculated.
Baseline refers to Existing Conditions
Air quality predictions were not provided for the Construction Phase as emissions are expected to be negligible.
Bold and shaded value indicates hazard quotient greater than 1 (for criteria air contaminants where predictions include baseline and NO2 ambient ratio method) or hazard quotient greater than 0.2 for other constituents of potential concern.

Table 4C: Risk Estimates for Inhalation HHRA - Mine Site and Highway 26 (24-Hour)
Cariboo Gold Project
Wells, BC

Parameter	Toxicity Reference Value (µg/m^3)	Existing Conditions (µg/m^3)	Existing Conditions HQ	MPOI-Mine Site	MPOI-Highway 26	Sugar Creek Loop Trail	Cornish X-Country Ski Trail 1	Nine Mile Lake Rec Site	Cornish X-Country Ski Trail 2	Cornish X-Country Ski Trail 3	Jubilee Trail / Wendle Park	Cow Mountain Trails 1	Chisholm Creek Rec Site	Groundhog Lake Ski Trail	Proserpine Trail	Cariboo Wagon Road (Stanley to Barkerville)	Cow Mountain Trails 2
Construction																	
Criteria Air Contaminants																	
PM2.5 (Project Only)	25	-	-	0.22	-	0.00016	0.0046	0.00065	0.0019	0.02	0.00093	0.0058	0.00021	0.00026	0.0002	0.00043	0.001
PM2.5 (Baseline+Project)	25	25	1.0	**1.2**	-	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
PM10 (Project Only)	50	-	-	0.9	-	0.00052	0.013	0.0032	0.013	0.063	0.0039	0.024	0.00096	0.00072	0.00056	0.00093	0.0038
PM10 (Baseline+Project)	50	43	0.86	**1.8**	-	0.86	0.87	0.86	0.87	0.92	0.86	0.88	0.86	0.86	0.86	0.86	0.86
Metals																	
Iron (Project Only)	4	0.3	0.075	**1.3**	-	-	-	-	-	-	-	-	-	-	-	-	-
Iron (Baseline+Project)	4	0.3	0.075	**1.4**	-	-	-	-	-	-	-	-	-	-	-	-	-
Operations																	
Criteria Air Contaminants																	
PM2.5 (Project Only)	25	-	-	0.13	0.023	0.00033	0.0071	0.0012	0.0034	0.019	0.0018	0.0064	0.0013	0.00061	0.00052	0.00071	0.0024
PM2.5 (Baseline+Project)	25	25	1.0	**1.1**	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
PM10 (Project Only)	50	-	-	0.66	0.059	0.0011	0.023	0.007	0.024	0.081	0.0079	0.024	0.0039	0.0029	0.0021	0.0023	0.013
PM10 (Baseline+Project)	50	43	0.86	**1.5**	0.92	0.86	0.88	0.87	0.88	0.94	0.87	0.88	0.86	0.86	0.86	0.86	0.87
Metals																	
Iron (Project Only)	4	0.3	0.075	**1.2**	-	-	-	-	-	-	-	-	-	-	-	-	-
Iron (Baseline+Project)	4	0.3	0.075	**1.3**	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes
"-" = did not exceed air criteria; hazard quotient not calculated.
Baseline refers to Existing Conditions
Bold and shaded value indicates hazard quotient greater than 1 (for criteria air contaminants where predictions include baseline and NO2 ambient ratio method) or hazard quotient greater than 0.2 for other constituents of potential concern.

Table 4C: Risk Estimates for Inhalation HHRA - Mine Site and Highway 26 (24-Hour)
Cariboo Gold Project
Wells, BC

Parameter	Toxicity Reference Value (µg/m^3)	Existing Conditions (µg/m^3)	Ned's Connector Trail	Groundhog Lake Snowmobile Trail	Yanks Peak Trail (X-DIST)	Jubilee Trail	Williams Creek Trail	Trail Buffer 1-Legal Objective	Viewing Point along Hwy 26	Water Access - Jack of Clubs Lake	Wells Baseball Diamond	Wells Elementary School	Nugget Hills RV Park	Valley Mountain Pass	Outfitter Area	Trapline TR0515T017 Cabin	Barkerville Provincial Park Campground
Construction																	
Criteria Air Contaminants																	
PM2.5 (Project Only)	25	-	0.001	0.0012	0.00026	0.00047	0.00059	0.00048	0.0016	0.078	0.12	0.067	0.093	0.055	0.039	0.00034	0.0017
PM2.5 (Baseline+Project)	25	25	1.0	1.0	1.0	1.0	1.0	1.0	1.0	**1.1**	**1.1**	**1.1**	**1.1**	**1.1**	1.0	1.0	1.0
PM10 (Project Only)	50	-	0.0029	0.0043	0.0009	0.0023	0.0017	0.0023	0.0072	0.22	0.3	0.15	0.28	0.14	0.29	0.0011	0.007
PM10 (Baseline+Project)	50	43	0.86	0.86	0.86	0.86	0.86	0.86	0.87	**1.1**	**1.2**	1.0	**1.1**	1.0	**1.1**	0.86	0.87
Metals																	
Iron (Project Only)	4	0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Iron (Baseline+Project)	4	0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Operations																	
Criteria Air Contaminants																	
PM2.5 (Project Only)	25	-	0.0038	0.011	0.00058	0.00092	0.0016	0.0011	0.023	0.053	0.091	0.064	0.058	0.038	0.025	0.0007	0.0025
PM2.5 (Baseline+Project)	25	25	1.0	1.0	1.0	1.0	1.0	1.0	1.0	**1.1**	**1.1**	**1.1**	**1.1**	1.0	1.0	1.0	1.0
PM10 (Project Only)	50	-	0.031	0.088	0.0024	0.0043	0.0078	0.0037	0.068	0.16	0.22	0.13	0.17	0.12	0.10	0.0022	0.012
PM10 (Baseline+Project)	50	43	0.89	0.95	0.86	0.86	0.87	0.86	0.93	1.0	**1.1**	0.99	1.0	0.98	0.96	0.86	0.87
Metals																	
Iron (Project Only)	4	0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Iron (Baseline+Project)	4	0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes
"-" = did not exceed air criteria; hazard quotient not calculated.
Baseline refers to Existing Conditions
Bold and shaded value indicates hazard quotient greater than 1 (for criteria air contaminants where predictions include baseline and NO2 ambient ratio method) or hazard quotient greater than 0.2 for other constituents of potential concern.

Table 4C: Risk Estimates for Inhalation HHRA - Mine Site and Highway 26 (24-Hour)
Cariboo Gold Project
Wells, BC

Parameter	Toxicity Reference Value (µg/m^3)	Existing Conditions (µg/m^3)	New Barkerville Residential	Historic Barkerville Town and Park	Forest Rose Campground	Government Hill Campground	Mine Site Camp	Transect 15m	Transect 25m	Transect 50m	Transect 75m	Transect 100m	Transect 150m	Transect 200m	Transect 250m	Transect 500m	Transect 1000m
Construction																	
Criteria Air Contaminants																	
PM2.5 (Project Only)	25	-	0.0012	0.00079	0.0017	0.00098	-	-	-	-	-	-	-	-	-	-	-
PM2.5 (Baseline+Project)	25	25	1.0	1.0	1.0	1.0	-	-	-	-	-	-	-	-	-	-	-
PM10 (Project Only)	50	-	0.0053	0.0035	0.0063	0.0049	-	-	-	-	-	-	-	-	-	-	-
PM10 (Baseline+Project)	50	43	0.87	0.86	0.87	0.86	-	-	-	-	-	-	-	-	-	-	-
Metals																	
Iron (Project Only)	4	0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Iron (Baseline+Project)	4	0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Operations																	
Criteria Air Contaminants																	
PM2.5 (Project Only)	25	-	0.0019	0.0015	0.0025	0.0018	0.26	0.023	0.019	0.014	0.01	0.009	0.0073	0.0062	0.0052	0.0024	0.001
PM2.5 (Baseline+Project)	25	25	1.0	1.0	1.0	1.0	**1.3**	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
PM10 (Project Only)	50	-	0.011	0.0097	0.011	0.011	0.48	0.055	0.05	0.037	0.032	0.029	0.023	0.018	0.016	0.0081	0.0035
PM10 (Baseline+Project)	50	43	0.87	0.87	0.87	0.87	**1.3**	0.91	0.91	0.9	0.89	0.89	0.88	0.88	0.88	0.87	0.86
Metals																	
Iron (Project Only)	4	0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Iron (Baseline+Project)	4	0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes
"-" = did not exceed air criteria; hazard quotient not calculated.
Baseline refers to Existing Conditions
Bold and shaded value indicates hazard quotient greater than 1 (for criteria air contaminants where predictions include baseline and NO2 ambient ratio method) or hazard quotient greater than 0.2 for other constituents of potential concern.

Parameter	Toxicity Reference Value (µg/m^3)	Existing Conditions (µg/m^3)	Existing Conditions HQ	MPOI-QR Mill	MPOI-500 Nyland Lake Road	Maude Lake Rec Site	Le Bourdais Lake	Quesnel Forks	Trail Buffer 2	Trail Buffer 3	Trail Buffer 4	Little Lake Rec Site	Prior Lake Rec Site	Trapline TR0515T020 Cabin 1	Trapline TR0515T020 Cabin 2	Trapline TR0502T045	SW2
Operations																	
Criteria Air Contaminants																	
PM2.5 (Project Only)	25	-	-	0.26	0.098	0.0013	0.001	0.0019	0.0044	0.0075	0.0012	0.00094	0.00066	0.0011	0.00099	0.025	0.0079
PM2.5 (Baseline+Project)	25	25	1.0	**1.3**	**1.1**	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
PM10 (Project Only)	50	-	-	0.51	0.72	0.015	0.017	0.0077	0.016	0.024	0.0084	0.0049	0.0033	0.019	0.017	0.22	0.066
PM10 (Baseline+Project)	50	43	0.86	**1.4**	**1.6**	0.87	0.88	0.87	0.88	0.88	0.87	0.86	0.86	0.88	0.88	**1.1**	0.93
Metals																	
Iron (Project Only)	4	0.3	0.075	**1.3**	0.99	-	-	-	-	-	-	-	-	-	-	-	-
Iron (Baseline+Project)	4	0.3	0.075	**1.4**	**1.1**	-	-	-	-	-	-	-	-	-	-	-	-

Notes
"-" = did not exceed air criteria; hazard quotient not calculated.
Baseline refers to Existing Conditions
Air quality predictions were not provided for the Construction Phase as emissions are expected to be negligible.
Bold and shaded value indicates hazard quotient greater than 1 (for criteria air contaminants where predictions include baseline and NO2 ambient ratio method) or hazard quotient greater than 0.2 for other constituents of potential concern.

Parameter	Toxicity Reference Value (µg/m^3)	Existing Conditions (µg/m^3)	Existing Conditions HQ	QR Mill Camp	Transect 15m	Transect 25m	Transect 50m	Transect 75m	Transect 100m	Transect 150m	Transect 200m	Transect 250m	Transect 500m	Transect 1000m
Operations														
Criteria Air Contaminants														
PM2.5 (Project Only)	25	-	-	0.34	0.098	0.08	0.059	0.055	0.047	0.031	0.026	0.021	0.013	0.0088
PM2.5 (Baseline+Project)	25	25	1.0	**1.3**	**1.1**	**1.1**	**1.1**	**1.1**	**1.1**	1.0	1.0	1.0	1.0	1.0
PM10 (Project Only)	50	-	-	0.48	0.72	0.59	0.46	0.41	0.35	0.27	0.23	0.22	0.14	0.091
PM10 (Baseline+Project)	50	43	0.86	**1.3**	**1.6**	**1.4**	**1.3**	**1.3**	**1.2**	**1.1**	**1.1**	**1.1**	1.0	0.95
Metals														
Iron (Project Only)	4	0.3	0.075	0.98	1.0	-	-	-	-	-	-	-	-	-
Iron (Baseline+Project)	4	0.3	0.075	**1.1**	**1.1**	-	-	-	-	-	-	-	-	-

Notes
"-" = did not exceed air criteria; hazard quotient not calculated.
Baseline refers to Existing Conditions
Air quality predictions were not provided for the Construction Phase as emissions are expected to be negligible.
Bold and shaded value indicates hazard quotient greater than 1 (for criteria air contaminants where predictions include baseline and NO2 ambient ratio method) or hazard quotient greater than 0.2 for other constituents of potential concern.

Attachment 4

Table 4E: Risk Estimates for Chronic Inhalation HHRA - Non-Indigenous and Indigenous Resident

Cariboo Gold Project

Wells, BC

Hazard Quotients for Community Resident (Non-Indigenous and Indigenous)

Constituent of Potential Concern	MPOI-Residence	Wells Baseball Diamond	Wells Elementary School	Nugget Hills RV Park	New Barkerville Residential
Existing Conditions					
Nitrogen Dioxide	0.11	0.11	0.11	0.11	0.11
PM2.5	0.2	0.2	0.2	0.2	0.2
PM10	0.14	0.14	0.14	0.14	0.14
Diesel Particulate Matter	-	-	-	-	
Acrolein	-	-	-	-	
Construction					
Nitrogen Dioxide (Project Only)	0.039	0.058	0.027	0.023	0.00019
Nitrogen Dioxide (Existing Conditions+Project)	0.15	0.17	0.14	0.13	0.11
Nitrogen Dioxide (ARM Conversion)	0.14	0.15	0.13	0.13	0.11
PM2.5 (Project Only)		0.023	0.011	0.0096	0.000079
PM2.5 (Existing Conditions+Project)		0.22	0.21	0.21	0.2
PM10 (Project Only)		0.036	0.013	0.013	0.00011
PM10 (Existing Conditions+Project)		0.18	0.15	0.15	0.14
Diesel Particulate Matter		0.012	0.0054	0.0049	
Acrolein		0.014	0.0074	0.0061	
Operations					
Nitrogen Dioxide (Project Only)	0.017	0.017	0.011	0.0055	0.0001
Nitrogen Dioxide (Existing Conditions+Project)	0.13	0.13	0.12	0.11	0.11
Nitrogen Dioxide (ARM Conversion)	0.12	0.13	0.12	0.12	0.11
PM2.5 (Project Only)		0.017	0.0096	0.0098	0.00015
PM2.5 (Existing Conditions+Project)		0.21	0.21	0.21	0.2
PM10 (Project Only)		0.018	0.0084	0.012	0.00022
PM10 (Existing Conditions+Project)		0.16	0.15	0.15	0.14
Diesel Particulate Matter		0.0026	0.0013	0.00093	
Acrolein		0.00066	0.00039	0.00024	

Notes:

- = not available

Blank = not a COPC at receptor location

Shaded value = hazard quotient greater than 0.2 or 1.0

Incremental Lifetime Cancer Risks for Community Resident (Non-Indigenous and Indigenous)

Constituent of Potential Concern	MPOI-Residence	Wells Baseball Diamond	Wells Elementary School	Nugget Hills RV Park	New Barkerville Residential
Existing Conditions					
Diesel Particulate Matter		-	-	-	
Construction					
Diesel Particulate Matter		1.8E-05	8.1E-06	7.3E-06	
Operations					
Diesel Particulate Matter		3.9E-06	2.0E-06	1.4E-06	

Notes:

- = not available

Shaded value = incremental lifetime cancer risk greater than $1x10^{-5}$

Target Organ Sums for Community Resident (Non-Indigenous and Indigenous)

Respiratory Effects	MPOI-Residence	Wells Baseball Diamond	Wells Elementary School	Nugget Hills RV Park	New Barkerville Residential
Existing Conditions	0.45	0.45	0.45	0.45	0.45
Construction (Project Only)	0.039	0.14	0.064	0.057	0.00038
Construction (Existing Conditions+Project)	0.14	0.58	0.51	0.5	0.45
Operations (Project Only)	0.017	0.055	0.03	0.028	0.00047
Operations (Existing Conditions+Project)	0.12	0.5	0.48	0.48	0.45

Notes:

Shaded value = hazard quotient greater than 1.0

Table 4F: Risk Estimates for Chronic Inhalation HHRA - Indigenous Land User
Cariboo Gold Project
Wells, BC

Hazard Quotients for Indigenous Land User

Constituent of Potential Concern	Cariboo Wagon Road (Stanley to Barkerville)	Jubilee Trail	Proserpine Trail	Sugar Creek Loop Trail	Yanks Peak Trail	Groundhog Lake Ski Trail	Chisholm Creek Rec Site	Nine Mile Lake Rec Site	Trail Buffer 1 - Legal Objective	Viewing Point along Hwy 26	Trapline TR0515T017 Cabin	Highway 26 Transect 200 m	Cow Mountain Trails 1	Cow Mountain Trails 2	Jubilee Trail / Wendle Park	Ned's Connector Trail
Existing Conditions																
Nitrogen Dioxide	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66
PM2.5	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
PM10	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Diesel Particulate Matter																
Acrolein																
Construction																
Nitrogen Dioxide (Project Only)	0.00027	0.00069	0.00019	0.00014	0.00031	0.00023	0.00021	0.001	0.00035	0.0014	0.00032	-	0.0047	0.00096	0.0016	0.00089
Nitrogen Dioxide (Existing Conditions+Project)	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	-	0.66	0.66	0.66	0.66
Nitrogen Dioxide (ARM Conversion)	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	-	0.66	0.66	0.66	0.66
PM2.5 (Project Only)	0.00011	0.00028	0.000075	0.000057	0.00013	0.000092	0.000083	0.00041	0.00014	0.00056	0.00013	-	0.0019	0.00039	0.00065	0.00036
PM2.5 (Existing Conditions+Project)	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	-	1.2	1.2	1.2	1.2
PM10 (Project Only)	0.00015	0.00039	0.00011	0.00008	0.00017	0.00013	0.00012	0.00057	0.0002	0.00081	0.00018	-	0.0028	0.00054	0.00091	0.0005
PM10 (Existing Conditions+Project)	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	-	0.85	0.84	0.84	0.84
Diesel Particulate Matter																
Acrolein																
Operations																
Nitrogen Dioxide (Project Only)	0.00016	0.00035	0.00012	0.000076	0.00017	0.00014	0.00013	0.00053	0.00018	0.0016	0.00018	0.00029	0.0017	0.00058	0.00075	0.00082
Nitrogen Dioxide (Existing Conditions+Project)	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66
Nitrogen Dioxide (ARM Conversion)	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66
PM2.5 (Project Only)	0.00025	0.00051	0.00019	0.00011	0.00026	0.00022	0.00056	0.00072	0.00031	0.021	0.00023	0.0055	0.0026	0.00092	0.0011	0.0015
PM2.5 (Existing Conditions+Project)	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
PM10 (Project Only)	0.0003	0.0006	0.00024	0.00013	0.00033	0.00028	0.00085	0.00081	0.00039	0.034	0.00025	0.0091	0.0032	0.0014	0.0013	0.0031
PM10 (Existing Conditions+Project)	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.88	0.84	0.85	0.85	0.84	0.84	0.85
Diesel Particulate Matter																
Acrolein																

Notes:
- = not available
Blank = not a COPC at receptor location
Shaded value = hazard quotient greater than 0.2 or 1.0

Incremental Lifetime Cancer Risks for Indigenous Land User

Constituent of Potential Concern	Cariboo Wagon Road (Stanley to Barkerville)	Jubilee Trail	Proserpine Trail	Sugar Creek Loop Trail	Yanks Peak Trail	Groundhog Lake Ski Trail	Chisholm Creek Rec Site	Nine Mile Lake Rec Site	Trail Buffer 1 - Legal Objective	Viewing Point along Hwy 26	Trapline TR0515T017 Cabin	Highway 26 Transect 200 m	Cow Mountain Trails 1	Cow Mountain Trails 2	Jubilee Trail / Wendle Park	Ned's Connector Trail
Existing Conditions																
Diesel Particulate Matter	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Construction																
Diesel Particulate Matter																
Operations																
Diesel Particulate Matter																

Notes:
- = not available
Blank = not a COPC at receptor location
Shaded value = incremental lifetime cancer risk greater than $1x10^{-5}$

Target Organ Sums for Indigenous Land User

Respiratory Effects	Cariboo Wagon Road (Stanley to Barkerville)	Jubilee Trail	Proserpine Trail	Sugar Creek Loop Trail	Yanks Peak Trail	Groundhog Lake Ski Trail	Chisholm Creek Rec Site	Nine Mile Lake Rec Site	Trail Buffer 1 - Legal Objective	Viewing Point along Hwy 26	Trapline TR0515T017 Cabin	Highway 26 Transect 200 m	Cow Mountain Trails 1	Cow Mountain Trails 2	Jubilee Trail / Wendle Park	Ned's Connector Trail
Existing Conditions	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7
Construction (Project Only)	0.00053	0.0014	0.00037	0.00028	0.00061	0.00045	0.00041	0.002	0.00069	0.0027	0.00063	-	0.0094	0.0019	0.0032	0.0018
Construction (Existing Conditions+Project)	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	-	2.7	2.7	2.7	2.7
Operations (Project Only)	0.00072	0.0015	0.00055	0.00032	0.00076	0.00065	0.0015	0.0021	0.00088	0.056	0.00067	0.015	0.0075	0.0029	0.0032	0.0055
Operations (Existing Conditions+Project)	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7

Notes:
- = not available
Shaded value = hazard quotient greater than 1.0

Table 4F: Risk Estimates for Chronic Inhalation HHRA - Indigenous Land User
Cariboo Gold Project
Wells, BC

Hazard Quotients for Indigenous Land User

Constituent of Potential Concern	Williams Creek Trail	Cornish X-Country Ski Trail 1	Cornish X-Country Ski Trail 2	Cornish X-Country Ski Trail 3	Groundhog Lake Snowmobile Trail	Barkerville Provincial Park Campground	Forest Rose Campground	Government Hill Campground	Water Access – Jack of Clubs Lake	Valley Mountain Pass	Historic Barkerville Town and Park	Outfitter Area	Le Bourdais Lake	Quesnel Forks	Little Lake Rec Site	Maude Lake Rec Site
Existing Conditions																
Nitrogen Dioxide	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66
PM2.5	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
PM10	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Diesel Particulate Matter				-					-	-		-				
Acrolein									-	-						
Construction																
Nitrogen Dioxide (Project Only)	0.00046	0.0072	0.0035	0.043	0.0011	0.0017	0.0017	0.001	0.095	0.096	0.00074	0.042	-	-	-	-
Nitrogen Dioxide (Existing Conditions+Project)	0.66	0.66	0.66	0.7	0.66	0.66	0.66	0.66	0.75	0.75	0.66	0.7	-	-	-	-
Nitrogen Dioxide (ARM Conversion)	0.66	0.66	0.66	0.69	0.66	0.66	0.66	0.66	0.73	0.73	0.66	0.69	-	-	-	-
PM2.5 (Project Only)	0.00019	0.003	0.0014	0.018	0.00044	0.0007	0.00069	0.00041	0.038	0.039	0.0003	0.016	-	-	-	-
PM2.5 (Existing Conditions+Project)	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	-	-	-	-
PM10 (Project Only)	0.00026	0.004	0.002	0.024	0.00061	0.00097	0.00096	0.00057	0.061	0.056	0.00042	0.027	-	-	-	-
PM10 (Existing Conditions+Project)	0.84	0.85	0.84	0.87	0.84	0.84	0.84	0.84	0.9	0.9	0.84	0.87	-	-	-	-
Diesel Particulate Matter				0.009					0.02	0.02		0.0089				
Acrolein									0.023	0.024						
Operations																
Nitrogen Dioxide (Project Only)	0.00031	0.0034	0.0017	0.015	0.0016	0.00084	0.00085	0.00056	0.025	0.027	0.00043	0.0094	0.000093	0.00021	0.000094	0.00011
Nitrogen Dioxide (Existing Conditions+Project)	0.66	0.66	0.66	0.67	0.66	0.66	0.66	0.66	0.68	0.68	0.66	0.67	0.66	0.66	0.66	0.66
Nitrogen Dioxide (ARM Conversion)	0.66	0.66	0.66	0.67	0.66	0.66	0.66	0.66	0.68	0.69	0.66	0.67	0.66	0.66	0.66	0.66
PM2.5 (Project Only)	0.00052	0.0044	0.0024	0.018	0.004	0.0012	0.0013	0.00086	0.033	0.037	0.0007	0.013	0.00034	0.0006	0.00034	0.00045
PM2.5 (Existing Conditions+Project)	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
PM10 (Project Only)	0.00082	0.0045	0.0027	0.019	0.0098	0.0017	0.0017	0.0013	0.043	0.044	0.0011	0.015	0.00066	0.0010	0.00062	0.0011
PM10 (Existing Conditions+Project)	0.84	0.85	0.85	0.86	0.85	0.84	0.84	0.84	0.89	0.89	0.84	0.86	0.84	0.84	0.84	0.84
Diesel Particulate Matter				0.0021					0.0041	0.0043		0.0015				
Acrolein									0.00099	0.0011						

Notes:
- = not available
Blank = not a COPC at receptor location
Shaded value = hazard quotient greater than 0.2 or 1.0

Incremental Lifetime Cancer Risks for Indigenous Land User

Constituent of Potential Concern	Williams Creek Trail	Cornish X-Country Ski Trail 1	Cornish X-Country Ski Trail 2	Cornish X-Country Ski Trail 3	Groundhog Lake Snowmobile Trail	Barkerville Provincial Park Campground	Forest Rose Campground	Government Hill Campground	Water Access – Jack of Clubs Lake	Valley Mountain Pass	Historic Barkerville Town and Park	Outfitter Area	Le Bourdais Lake	Quesnel Forks	Little Lake Rec Site	Maude Lake Rec Site
Existing Conditions																
Diesel Particulate Matter	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Construction																
Diesel Particulate Matter				3.4E-06					7.7E-06	7.6E-06		3.3E-06				
Operations																
Diesel Particulate Matter				8.0E-07					1.5E-06	1.6E-06		5.7E-07				

Notes:
- = not available
Blank = not a COPC at receptor location
Shaded value = incremental lifetime cancer risk greater than $1x10^{-5}$

Target Organ Sums for Indigenous Land User

Respiratory Effects	Williams Creek Trail	Cornish X-Country Ski Trail 1	Cornish X-Country Ski Trail 2	Cornish X-Country Ski Trail 3	Groundhog Lake Snowmobile Trail	Barkerville Provincial Park Campground	Forest Rose Campground	Government Hill Campground	Water Access – Jack of Clubs Lake	Valley Mountain Pass	Historic Barkerville Town and Park	Outfitter Area	Le Bourdais Lake	Quesnel Forks	Little Lake Rec Site	Maude Lake Rec Site
Existing Conditions	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7
Construction (Project Only)	0.00091	0.014	0.007	0.094	0.0021	0.0034	0.0033	0.002	0.24	0.24	0.0015	0.093	-	-	-	-
Construction (Existing Conditions+Project)	2.7	2.7	2.7	2.8	2.7	2.7	2.7	2.7	2.9	2.9	2.7	2.8	-	-	-	-
Operations (Project Only)	0.0017	0.012	0.0069	0.054	0.015	0.0038	0.0038	0.0027	0.11	0.11	0.0023	0.039	0.0011	0.0018	0.0011	0.0016
Operations (Existing Conditions+Project)	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.8	2.8	2.7	2.7	2.7	2.7	2.7	2.7

Notes:
- = not available
Shaded value = hazard quotient greater than 1.0

Table 4F: Risk Estimates for Chronic Inhalation HHRA - Indigenous Land User
Cariboo Gold Project
Wells, BC

Hazard Quotients for Indigenous Land User

Constituent of Potential Concern	Prior Lake Rec Site	Trail Buffer 2	Trail Buffer 4	500 Road Transect 200 m	Trapline TR0515T020 Cabin 1	Trapline TR0515T020 Cabin 2	Trail Buffer 3	SW2	Trapline TR0502T045
Existing Conditions									
Nitrogen Dioxide	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66
PM2.5	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
PM10	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Diesel Particulate Matter									
Acrolein									
Construction									
Nitrogen Dioxide (Project Only)	-	-	-	-	-	-	-	-	-
Nitrogen Dioxide (Existing Conditions+Project)	-	-	-	-	-	-	-	-	-
Nitrogen Dioxide (ARM Conversion)	-	-	-	-	-	-	-	-	-
PM2.5 (Project Only)	-	-	-	-	-	-	-	-	-
PM2.5 (Existing Conditions+Project)	-	-	-	-	-	-	-	-	-
PM10 (Project Only)	-	-	-	-	-	-	-	-	-
PM10 (Existing Conditions+Project)	-	-	-	-	-	-	-	-	-
Diesel Particulate Matter									
Acrolein									
Operations									
Nitrogen Dioxide (Project Only)	0.000068	0.00056	0.00012	0.00034	0.00011	0.000092	0.00086	0.0006	0.0013
Nitrogen Dioxide (Existing Conditions+Project)	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66
Nitrogen Dioxide (ARM Conversion)	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66
PM2.5 (Project Only)	0.00024	0.0015	0.0005	0.0099	0.00038	0.00033	0.0025	0.0025	0.0077
PM2.5 (Existing Conditions+Project)	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
PM10 (Project Only)	0.00044	0.0024	0.0011	0.039	0.00071	0.00065	0.004	0.0062	0.021
PM10 (Existing Conditions+Project)	0.84	0.84	0.84	0.88	0.84	0.84	0.85	0.85	0.86
Diesel Particulate Matter									
Acrolein									

Notes:
- = not available
Blank = not a COPC at receptor location
Shaded value = hazard quotient greater than 0.2 or 1.0

Incremental Lifetime Cancer Risks for Indigenous Land User

Constituent of Potential Concern	Prior Lake Rec Site	Trail Buffer 2	Trail Buffer 4	500 Road Transect 200 m	Trapline TR0515T020 Cabin 1	Trapline TR0515T020 Cabin 2	Trail Buffer 3	SW2	Trapline TR0502T045
Existing Conditions									
Diesel Particulate Matter	-	-	-	-	-	-	-	-	-
Construction									
Diesel Particulate Matter									
Operations									
Diesel Particulate Matter									

Notes:
- = not available
Blank = not a COPC at receptor location
Shaded value = incremental lifetime cancer risk greater than $1x10^{-5}$

Target Organ Sums for Indigenous Land User

Respiratory Effects	Prior Lake Rec Site	Trail Buffer 2	Trail Buffer 4	500 Road Transect 200 m	Trapline TR0515T020 Cabin 1	Trapline TR0515T020 Cabin 2	Trail Buffer 3	SW2	Trapline TR0502T045
Existing Conditions	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7
Construction (Project Only)	-	-	-	-	-	-	-	-	-
Construction (Existing Conditions+Project)	-	-	-	-	-	-	-	-	-
Operations (Project Only)	0.00074	0.0044	0.0017	0.05	0.0012	0.0011	0.0073	0.0093	0.03
Operations (Existing Conditions+Project)	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7

Notes:
- = not available
Shaded value = hazard quotient greater than 1.0

Hazard Quotients for Hiker

Constituent of Potential Concern	Cariboo Wagon Road (Stanley to Barkerville)	Jubilee Trail	Proserpine Trail	Sugar Creek Loop Trail	Yanks Peak Trail	Groundhog Lake Ski Trail	Viewing Point along Hwy 26	Cow Mountain Trails 1	Cow Mountain Trails 2	Jubilee Trail / Wendle Park	Ned's Connector Trail	Williams Creek Trail	Cornish X-Country Ski Trail 1	Cornish X-Country Ski Trail 2	Cornish X-Country Ski Trail 3	Groundhog Lake Snowmobile Trail	Water Access – Jack of Clubs Lake	Valley Mountain Pass	Historic Barkerville Town and Park	Le Bourdais Lake	Quesnel Forks	SW2
Existing Conditions																						
Nitrogen Dioxide	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063
PM2.5	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
PM10	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
Diesel Particulate Matter															-		-	-				
Acrolein																	-	-				
Construction																						
Nitrogen Dioxide (Project Only)	0.000026	0.000065	0.000018	0.000013	0.000029	0.000022	0.00013	0.00045	0.000092	0.00015	0.000085	0.000044	0.00069	0.00034	0.0041	0.0001	0.0091	0.0091	0.000071	-	-	-
Nitrogen Dioxide (Existing Conditions+Project)	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.067	0.063	0.072	0.072	0.063	-	-	-
Nitrogen Dioxide (ARM Conversion)	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.066	0.063	0.069	0.069	0.063	-	-	-
PM2.5 (Project Only)	0.00001	0.000027	0.0000072	0.0000054	0.000012	0.0000087	0.000053	0.00018	0.000037	0.000062	0.000035	0.000018	0.00028	0.00014	0.0017	0.000042	0.0036	0.0037	0.000029	-	-	-
PM2.5 (Existing Conditions+Project)	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.12	0.12	0.11	-	-	-
PM10 (Project Only)	0.000015	0.000037	0.00001	0.0000076	0.000017	0.000012	0.000077	0.00027	0.000051	0.000087	0.000048	0.000025	0.00038	0.00019	0.0023	0.000058	0.0058	0.0053	0.00004	-	-	-
PM10 (Existing Conditions+Project)	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.081	0.08	0.083	0.08	0.086	0.086	0.08	-	-	-
Diesel Particulate Matter															0.00086		0.0019	0.0019				
Acrolein																	0.0022	0.0023				
Operations																						
Nitrogen Dioxide (Project Only)	0.000016	0.000033	0.000012	0.0000072	0.000016	0.000014	0.00015	0.00016	0.000055	0.000072	0.000078	0.00003	0.00033	0.00017	0.0014	0.00015	0.0023	0.0026	0.000041	0.0000088	0.00002	0.000057
Nitrogen Dioxide (Existing Conditions+Project)	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.064	0.063	0.065	0.065	0.063	0.063	0.063	0.063
Nitrogen Dioxide (ARM Conversion)	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.064	0.063	0.065	0.066	0.063	0.063	0.063	0.063
PM2.5 (Project Only)	0.000024	0.000049	0.000018	0.000011	0.000024	0.000021	0.002	0.00025	0.000087	0.0001	0.00015	0.00005	0.00042	0.00023	0.0017	0.00038	0.0031	0.0036	0.000067	0.000032	0.000057	0.00024
PM2.5 (Existing Conditions+Project)	0.11	0.11	0.11	0.11	0.11	0.11	0.12	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.12	0.12	0.11	0.11	0.11	0.11
PM10 (Project Only)	0.000029	0.000058	0.000023	0.000013	0.000031	0.000027	0.0032	0.0003	0.00013	0.00012	0.0003	0.000078	0.00043	0.00026	0.0018	0.00094	0.0041	0.0042	0.00011	0.000063	0.000095	0.00059
PM10 (Existing Conditions+Project)	0.08	0.08	0.08	0.08	0.08	0.08	0.083	0.081	0.08	0.08	0.081	0.08	0.081	0.08	0.082	0.081	0.084	0.084	0.08	0.08	0.08	0.081
Diesel Particulate Matter															0.0002		0.00039	0.00041				
Acrolein																	0.000095	0.00011				

Notes:
- = not available
Blank = not a COPC at receptor location
Shaded value = hazard quotient greater than 0.2 or 1.0

Incremental Lifetime Cancer Risks for Hiker

Constituent of Potential Concern	Cariboo Wagon Road (Stanley to Barkerville)	Jubilee Trail	Proserpine Trail	Sugar Creek Loop Trail	Yanks Peak Trail	Groundhog Lake Ski Trail	Viewing Point along Hwy 26	Cow Mountain Trails 1	Cow Mountain Trails 2	Jubilee Trail / Wendle Park	Ned's Connector Trail	Williams Creek Trail	Cornish X-Country Ski Trail 1	Cornish X-Country Ski Trail 2	Cornish X-Country Ski Trail 3	Groundhog Lake Snowmobile Trail	Water Access – Jack of Clubs Lake	Valley Mountain Pass	Historic Barkerville Town and Park	Le Bourdais Lake	Quesnel Forks	SW2
Existing Conditions																						
Diesel Particulate Matter	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Construction																						
Diesel Particulate Matter															3.2E-07		7.3E-07	7.2E-07				
Operations																						
Diesel Particulate Matter															7.5E-08		1.5E-07	1.5E-07				

Notes:
- = not available
Blank = not a COPC at receptor location
Shaded value = incremental lifetime cancer risk greater than $1x10^{-5}$

Target Organ Sums for Hiker

Respiratory Effects	Cariboo Wagon Road (Stanley to Barkerville)	Jubilee Trail	Proserpine Trail	Sugar Creek Loop Trail	Yanks Peak Trail	Groundhog Lake Ski Trail	Viewing Point along Hwy 26	Cow Mountain Trails 1	Cow Mountain Trails 2	Jubilee Trail / Wendle Park	Ned's Connector Trail	Williams Creek Trail	Cornish X-Country Ski Trail 1	Cornish X-Country Ski Trail 2	Cornish X-Country Ski Trail 3	Groundhog Lake Snowmobile Trail	Water Access – Jack of Clubs Lake	Valley Mountain Pass	Historic Barkerville Town and Park	Le Bourdais Lake	Quesnel Forks	SW2
Existing Conditions	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26
Construction (Project Only)	0.000051	0.00013	0.000035	0.000026	0.000058	0.000043	0.00026	0.0009	0.00018	0.0003	0.00017	0.000087	0.0014	0.00067	0.0089	0.0002	0.023	0.022	0.00014	-	-	-
Construction (Existing Conditions+Project)	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.28	0.28	0.26	-	-	-
Operations (Project Only)	0.000069	0.00014	0.000052	0.00003	0.000072	0.000062	0.0053	0.00071	0.00028	0.0003	0.00052	0.00016	0.0012	0.00066	0.0051	0.0015	0.01	0.011	0.00022	0.0001	0.00017	0.00089
Operations (Existing Conditions+Project)	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.27	0.27	0.26	0.26	0.26	0.26

Notes:
- = not available
Shaded value = hazard quotient greater than 1.0

Attachment 4

Table 4H: Risk Estimates for Chronic Inhalation HHRA - Camper

Cariboo Gold Project

Wells, BC

Hazard Quotients for Camper

Constituent of Potential Concern	Chisholm Creek Rec Site	Nine Mile Lake Rec Site	Barkerville Provincial Park Campground	Forest Rose Campground	Government Hill Campground	Little Lake Rec Site	Maude Lake Rec Site	Prior Lake Rec Site
Existing Conditions								
Nitrogen Dioxide	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28
PM2.5	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51
PM10	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36
Construction								
Nitrogen Dioxide (Project Only)	0.000088	0.00043	0.00073	0.00072	0.00044	-	-	-
Nitrogen Dioxide (Existing Conditions+Project	0.28	0.28	0.28	0.28	0.28	-	-	-
Nitrogen Dioxide (ARM Conversion)	0.28	0.28	0.28	0.28	0.28	-	-	-
PM2.5 (Project Only)	0.000036	0.00018	0.0003	0.00029	0.00018	-	-	-
PM2.5 (Existing Conditions+Project)	0.51	0.51	0.51	0.51	0.51	-	-	-
PM10 (Project Only)	0.000051	0.00024	0.00041	0.00041	0.00025	-	-	-
PM10 (Existing Conditions+Project)	0.36	0.36	0.36	0.36	0.36	-	-	-
Operations								
Nitrogen Dioxide (Project Only)	0.000054	0.00023	0.00036	0.00036	0.00024	0.00004	0.000048	0.000029
Nitrogen Dioxide (Existing Conditions+Project	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28
Nitrogen Dioxide (ARM Conversion)	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28
PM2.5 (Project Only)	0.00024	0.00031	0.00053	0.00054	0.00037	0.00014	0.00019	0.0001
PM2.5 (Existing Conditions+Project)	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51
PM10 (Project Only)	0.00036	0.00035	0.00072	0.00072	0.00054	0.00027	0.00045	0.00019
PM10 (Existing Conditions+Project)	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36

Notes:

- = not available

Shaded value = hazard quotient greater than 0.2 or 1.0

Target Organ Sums for Camper

Respiratory Effects	Chisholm Creek Rec Site	Nine Mile Lake Rec Site	Barkerville Provincial Park Campground	Forest Rose Campground	Government Hill Campground	Little Lake Rec Site	Maude Lake Rec Site	Prior Lake Rec Site
Existing Conditions	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Construction (Project Only)	0.00017	0.00085	0.0014	0.0014	0.00086	-	-	-
Construction (Existing Conditions+Project)	1.2	1.2	1.2	1.2	1.2	-	-	-
Operations (Project Only)	0.00066	0.00088	0.0016	0.0016	0.0011	0.00045	0.00069	0.00032
Operations (Existing Conditions+Project)	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2

Notes:

- = not available

Shaded value = hazard quotient greater than 1.0

Table 4I: Risk Estimates for Chronic Inhalation HHRA - Sport Fisher / Hunter
Cariboo Gold Project
Wells, BC

Hazard Quotients for Sport Fisher/Hunter

Constituent of Potential Concern	Cariboo Wagon Road (Stanley to Barkerville)	Trapline TR0515T017 Cabin	Cow Mountain Trails 1	Williams Creek Trail	Water Access – Jack of Clubs Lake	Outfitter Area	Trapline TR0515T020 Cabin 1	Trapline TR0515T020 Cabin 2	Trail Buffer 3	SW2	Trapline TR0502T045
Existing Conditions											
Nitrogen Dioxide	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12
PM2.5	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21
PM10	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Diesel Particulate Matter					-	-					
Acrolein					-						
Construction											
Nitrogen Dioxide (Project Only)	0.000048	0.000058	0.00085	0.000083	0.017	0.0074	-	-	-	-	-
Nitrogen Dioxide (Existing Conditions+Project)	0.12	0.12	0.12	0.12	0.13	0.12	-	-	-	-	-
Nitrogen Dioxide (ARM Conversion)	0.12	0.12	0.12	0.12	0.13	0.12	-	-	-	-	-
PM2.5 (Project Only)	0.00002	0.000023	0.00034	0.000034	0.0067	0.0029	-	-	-	-	-
PM2.5 (Existing Conditions+Project)	0.21	0.21	0.21	0.21	0.22	0.22	-	-	-	-	-
PM10 (Project Only)	0.000027	0.000032	0.0005	0.000046	0.011	0.0048	-	-	-	-	-
PM10 (Existing Conditions+Project)	0.15	0.15	0.15	0.15	0.16	0.16	-	-	-	-	-
Diesel Particulate Matter					0.0037	0.0016					
Acrolein					0.0041						
Operations											
Nitrogen Dioxide (Project Only)	0.000029	0.000032	0.0003	0.000056	0.0044	0.0017	0.000019	0.000016	0.00015	0.00011	0.00024
Nitrogen Dioxide (Existing Conditions+Project)	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12
Nitrogen Dioxide (ARM Conversion)	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12
PM2.5 (Project Only)	0.000045	0.000041	0.00047	0.000093	0.0058	0.0023	0.000067	0.000059	0.00044	0.00045	0.0014
PM2.5 (Existing Conditions+Project)	0.21	0.21	0.21	0.21	0.22	0.21	0.21	0.21	0.21	0.21	0.21
PM10 (Project Only)	0.000054	0.000046	0.00057	0.00015	0.0076	0.0027	0.00013	0.00012	0.00071	0.0011	0.0037
PM10 (Existing Conditions+Project)	0.15	0.15	0.15	0.15	0.16	0.15	0.15	0.15	0.15	0.15	0.15
Diesel Particulate Matter					0.00073	0.00027					
Acrolein					0.00018						

Notes:
- = not available
Blank = not a COPC at receptor location
Shaded value = hazard quotient greater than 0.2 or 1.0

Incremental Lifetime Cancer Risks for Sport Fisher/Hunter

Constituent of Potential Concern	Cariboo Wagon Road (Stanley to Barkerville)	Trapline TR0515T017 Cabin	Cow Mountain Trails 1	Williams Creek Trail	Water Access – Jack of Clubs Lake	Outfitter Area	Trapline TR0515T020 Cabin 1	Trapline TR0515T020 Cabin 2	Trail Buffer 3	SW2	Trapline TR0502T045
Existing Conditions											
Diesel Particulate Matter	-	-	-	-	-	-	-	-	-	-	-
Construction											
Diesel Particulate Matter					4.7E-06	2.0E-06					
Operations											
Diesel Particulate Matter					9.3E-07	3.4E-07					

Notes:
- = not available
Blank = not a COPC at receptor location
Shaded value = incremental lifetime cancer risk greater than $1x10^{-5}$

Target Organ Sums for Sport Fisher/Hunter

Respiratory Effects	Cariboo Wagon Road (Stanley to Barkerville)	Trapline TR0515T017 Cabin	Cow Mountain Trails 1	Williams Creek Trail	Water Access – Jack of Clubs Lake	Outfitter Area	Trapline TR0515T020 Cabin 1	Trapline TR0515T020 Cabin 2	Trail Buffer 3	SW2	Trapline TR0502T045
Existing Conditions	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48
Construction (Project Only)	0.000095	0.00011	0.0017	0.00016	0.042	0.017	-	-	-	-	-
Construction (Existing Conditions+Project)	0.48	0.48	0.48	0.48	0.52	0.49	-	-	-	-	-
Operations (Project Only)	0.00013	0.00012	0.0013	0.0003	0.019	0.0069	0.00021	0.00019	0.0013	0.0017	0.0053
Operations (Existing Conditions+Project)	0.48	0.48	0.48	0.48	0.5	0.49	0.48	0.48	0.48	0.48	0.49

Notes:
- = not available
Shaded value = hazard quotient greater than 1.0

Attachment 4

Table 4J: Risk Estimates for Chronic Inhalation HHRA - Mine Camp Worker
Cariboo Gold Project
Wells, BC

Hazard Quotients for Mine Camp Worker

Constituent of Potential Concern	Mine Site Camp	QR Mill Camp
Existing Conditions		
Nitrogen Dioxide	0.23	0.23
PM2.5	0.42	0.42
PM10	0.3	0.3
Diesel Particulate Matter	-	
Arsenic		0.00013
Iron		0.038
Operations		
Nitrogen Dioxide (Project Only)	0.073	0.034
Nitrogen Dioxide (Existing Conditions+Project)	0.31	0.27
Nitrogen Dioxide (ARM Conversion)	0.29	0.26
PM2.5 (Project Only)	0.12	0.094
PM2.5 (Existing Conditions+Project)	0.54	0.52
PM10 (Project Only)	0.13	0.093
PM10 (Existing Conditions+Project)	0.43	0.39
Diesel Particulate Matter	0.013	
Arsenic (Project Only)		0.0037
Arsenic (Existing Conditions+Project)		0.0038
Iron (Project Only)		0.32
Iron (Existing Conditions+Project)		0.36

Notes:
- = not available
Blank = not a COPC at receptor location
Shaded value = hazard quotient greater than 0.2 or 1.0

Incremental Lifetime Cancer Risks for Mine Camp Worker

Constituent of Potential Concern	Mine Site Camp	QR Mill Camp
Existing Conditions		
Diesel Particulate Matter	-	
Arsenic		3.7E-07
Operations		
Diesel Particulate Matter	8.3E-06	
Arsenic (Project Only)		1.0E-05
Arsenic (Existing Conditions+Project)		1.1E-05

Notes:
- = not available
Blank = not a COPC at receptor location
Shaded value = incremental lifetime cancer risk greater than $1x10^{-5}$

Target Organ Sums for Sport Fisher/Hunter

Respiratory Effects	Mine Site Camp	QR Mill Camp
Existing Conditions	0.96	1.0
Operations (Project Only)	0.33	0.55
Operations (Existing Conditions+Project)	1.3	1.5

Notes:
Shaded value = hazard quotient greater than 1.0

ATTACHMENT 3:

Trigger Level and Criteria Tables
– Human Health and Ecological Risk Assessment

Table D-1 - Trigger Levels

Parameter	Soil (mg/kg) [a]				Groundwater (mg/L)				Sediment (mg/kg) [b]				Surface water (mg/L)				Fish Tissue (mg/kg)				Air- 1-hour (µg/m³)				Air- 24-hour (µg/m³)				Air-Annual (µg/m³)				
	Regional Soil Background [c]	Selected criteria	Source	Trigger Level (80% of Selected Criteria)	Average Concentration at Reference Wells	Selected criteria	Source	Trigger Level (80% of Selected Criteria)	Average Concentration at Reference Locations	Selected criteria	Source	Trigger Level (80% of Selected Criteria)	Average Concentration at Reference Locations	Selected criteria	Source	Trigger Level (80% of Selected Criteria)	Average Concentration at Reference Locations	Selected criteria	Source	Trigger Level (80% of Selected Criteria)	Average Concentration at Reference Locations	Selected criteria	Source	Trigger Level (80% of Selected Criteria)	Average Concentration at Reference Locations	Selected criteria	Source	Trigger Level (80% of Selected Criteria)	Average Concentration at Reference Locations	Selected criteria	Source	Trigger Level 1 (80% of Selected Criteria)	Trigger Level 2 (90% of Selected Criteria)
Metals																																
Aluminum	25000	15500	US EPA	12400	-	9500	ENV SDWG	7600	TBD	15500	US EPA	12400	TBD	9500	ENV SDWG	7600	TBD	66.5	US EPA	53.2	TBD	50	TCEQ	40.0	TBD	8.9	TCEQ	7.12	TBD	5.2	US EPA	4.16	4.7
Antimony	4	6.3	US EPA	5.0	-	6.0	ENV SDWG	4.8	TBD	6.3	US EPA	5.0	TBD	6.0	ENV SDWG	4.8	TBD	0.03	US EPA	0.02	TBD	5	TCEQ [(g)]	4.0	TBD	1	ATSDR	0.80	TBD	0.3	ATSDR	0.24	0.270
Arsenic	10	20	ENV CSR	16	-	10	ENV SDWG	8.0	TBD	20	ENV CSR	16	TBD	10	ENV SDWG	8.0	TBD	0.01	ATSDR	0.00	TBD	9.9	TCEQ	7.9	TBD	5.4	TCEQ	4.32	TBD	0.006	US EPA	0.00	0.005
Cadmium	0.4	14	CCME	11.2	-	5.0	ENV SDWG	4.0	TBD	14	CCME	11.2	TBD	5.0	ENV SDWG	4.0	TBD	0.05	Health Canada	0.04	TBD	18	TCEQ	14	TBD	0.03	ATSDR	0.024	TBD	0.005	WHO, MECP	0.00	0.005
Chromium	100	100	ENV CSR	80	-	50	ENV SDWG	40	TBD	100	ENV CSR	80	TBD	50	ENV SDWG	40	TBD	0.20	Health Canada	0.16	TBD	12	TCEQ[(k)]	9.6	TBD	-[f]	-	-	TBD	0.14	TCEQ[(k)]	0.11	0.13
Cobalt	20	25	ENV CSR	20	-	1.0	ENV SDWG	0.8	TBD	25	ENV CSR	20	TBD	1.0	ENV SDWG	0.8	TBD	0.09	RIVM	0.07	TBD	0.69	TCEQ	0.55	TBD	0.095	TCEQ	0.08	TBD	0.0031	US EPA	0.00	0.003
Copper	60	1100	CCME	880	-	2000	ENV SDWG	1600	TBD	1100	CCME	880	TBD	2000	ENV SDWG	1600	TBD	28.3	Health Canada	22.7	TBD	100	Cal OEHHA	80	TBD	-[i]	-	-	TBD	1	TCEQ	0.8	0.9
Iron	30000	10960	US EPA	8768	-	6500	ENV CSR	5200	TBD	10960	US EPA	8768	TBD	6500	ENV CSR	5200	TBD	46.53	US EPA	37.22	TBD	-	-	-	TBD	4	MECP [h]	3.20	TBD	-	-	-	-
Lead	15	120	ENV CSR	96	-	5.0	ENV SDWG	4.0	TBD	120	ENV CSR	96	TBD	5.0	ENV SDWG	4.0	TBD	0.03	Health Canada	0.03	TBD	-	-	-	TBD	0.5	MECP	0.40	TBD	0.15	US EPA	0.12	0.14
Manganese	850	6000	ENV CSR	4800	-	120	ENV SDWG	96	TBD	6000	ENV CSR	4800	TBD	120	ENV SDWG	96	TBD	9.31	Health Canada	7.44	TBD	9.1	TCEQ	7.3	TBD	5	TCEQ	4.0	TBD	0.3	ATSDR	0.24	0.27
Mercury	0.09	6.6	CCME	5.3	-	1.0	ENV SDWG	0.8	TBD	6.6	CCME	5.3	TBD	1.0	ENV SDWG	0.8	TBD	0.01	Health Canada	0.01	TBD	0.6	Cal OEHHA	0.48	TBD	-[i]	-	-	TBD	0.2	ATSDR	0.16	0.180
Nickel	200	200	CCME	160	-	80	ENV SDWG	64	TBD	200	CCME	160	TBD	80	ENV SDWG	64	TBD	1.33	Health Canada	1.06	TBD	1.1	TCEQ	0.88	TBD	1.1	TCEQ	0.88	TBD	0.015	US EPA	0.01	0.014
Selenium	4	80	CCME	64	-	10	ENV SDWG	8.0	TBD	80	CCME	64	TBD	10	ENV SDWG	8.0	TBD	0.40	Health Canada	0.32	TBD	2	TCEQ [(g)]	1.6	TBD	10	MECP	8.0	TBD	21	US EPA	16.80	18.90
Cyanide	-	25	ENV CSR	20	NA	200	ENV SDWG	NA	TBD	25	ENV CSR	20	TBD	200	ENV SDWG	160	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Polycyclic Aromatic Hydrocarbons																																
Acenaphthene	-	717	US EPA	574	NA	NA	NA	NA	NA	NA	NA	NA	TBD	250	ENV CSR	200	NA	NA	NA	NA	TBD	100	TCEQ [(g)]	80	TBD	-	-	-	TBD	10	TCEQ [(g)]	8.00	9.00
Acenaphthylene	-	-	-	-	NA	NA	NA	NA	NA	NA	NA	NA	TBD	-	-	-	NA	NA	NA	NA	TBD	100	TCEQ [(g)]	80	TBD	-	-	-	TBD	10	TCEQ [(g)]	8.00	9.00
Acridine	-	-	-	-	NA	NA	NA	NA	NA	NA	NA	NA	TBD	-	-	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	-	10000	ENV CSR	8000	NA	NA	NA	NA	NA	NA	NA	NA	TBD	1000	ENV CSR	800	NA	NA	NA	NA	TBD	1	TCEQ [(g)]	0.80	TBD	-	-	-	TBD	0.1	TCEQ [(g)]	0.08	0.09
Benz(a)anthracene	-	NR(d)	CCME	NR[(d)]	NA	NA	NA	NA	NA	NA	NA	NA	TBD	NR(d)	ENV SDWG	NR(d)	NA	NA	NA	NA	TBD	0.5	TCEQ [(g)]	0.40	TBD	-	-	-	TBD	0.17	US EPA	0.14	0.15
Benzo(a)pyrene	-	NR(d)	CCME	NR[(d)]	NA	NA	NA	NA	NA	NA	NA	NA	TBD	NR(d)	ENV SDWG	NR(d)	NA	NA	NA	NA	TBD	-	-	-	TBD	0.0005	MECP	0.0004	TBD	0.017	US EPA	0.01	0.02
Benzo(b,j)fluoranthene	-	NR(d)	CCME	NR[(d)]	NA	NA	NA	NA	NA	NA	NA	NA	TBD	NR(d)	ENV SDWG	NR(d)	NA	NA	NA	NA	TBD	0.5	TCEQ [(g)]	0.40	TBD	-	-	-	TBD	0.17	US EPA	0.14	0.15
Benzo(b,j,k)fluoranthene	-	NR(d)	CCME	NR[(d)]	NA	NA	NA	NA	NA	NA	NA	NA	TBD	NR(d)	ENV SDWG	NR(d)	NA	NA	NA	NA	TBD	0.5	TCEQ [(g)]	0.40	TBD	-	-	-	TBD	0.17	US EPA	0.14	0.15
Benzo(g,h,)perylene	-	NR(d)	CCME	NR[(d)]	NA	NA	NA	NA	NA	NA	NA	NA	TBD	NR(d)	ENV SDWG	NR(d)	NA	NA	NA	NA	TBD	0.5	TCEQ [(g)]	0.40	TBD	-	-	-	TBD	0.05	TCEQ [(g)]	0.04	0.05
Benzo(k)fluoranthene	-	NR(d)	CCME	NR[(d)]	NA	NA	NA	NA	NA	NA	NA	NA	TBD	NR(d)	ENV SDWG	NR(d)	NA	NA	NA	NA	TBD	0.5	TCEQ [(g)]	0.40	TBD	-	-	-	TBD	1.7	US EPA	1.36	1.53
Chrysene	-	NR(d)	CCME	NR[(d)]	NA	NA	NA	NA	NA	NA	NA	NA	TBD	NR(d)	ENV SDWG	NR(d)	NA	NA	NA	NA	TBD	0.5	TCEQ [(g)]	0.40	TBD	-	-	-	TBD	17	US EPA	13.6	15.3
Dibenz(a,h)anthracene	-	NR(d)	CCME	NR[(d)]	NA	NA	NA	NA	NA	NA	NA	NA	TBD	NR(d)	ENV SDWG	NR(d)	NA	NA	NA	NA	TBD	0.5	TCEQ [(g)]	0.40	TBD	-	-	-	TBD	0.017	US EPA	0.01	0.02
Fluoranthene	-	1500	ENV CSR	1200	NA	NA	NA	NA	NA	NA	NA	NA	TBD	150	ENV CSR	120	NA	NA	NA	NA	TBD	0.5	TCEQ [(g)]	0.40	TBD	-	-	-	TBD	0.05	TCEQ [(g)]	0.04	0.05
Fluorene	-	478	US EPA	382	NA	NA	NA	NA	NA	NA	NA	NA	TBD	150	ENV CSR	120	NA	NA	NA	NA	TBD	10	TCEQ [(g)]	8.00	TBD	-	-	-	TBD	1	TCEQ [(g)]	0.80	0.90
Indeno(1,2,3-c,d)pyrene	-	NR(d)	CCME	NR[(d)]	NA	NA	NA	NA	NA	NA	NA	NA	TBD	NR(d)	ENV SDWG	NR(d)	NA	NA	NA	NA	TBD	0.5	TCEQ [(g)]	0.40	TBD	-	-	-	TBD	0.17	US EPA	0.14	0.15
1-Methylnaphthalene	-	176	US EPA	141	NA	NA	NA	NA	NA	NA	NA	NA	TBD	5.5	ENV CSR	4.4	NA	NA	NA	NA	TBD	200	TCEQ [(g)]	160	TBD	36	MECP	28	TBD	20	TCEQ [(g)]	16.0	18.0
2-Methylnaphthalene	-	47.8	US EPA	38	NA	NA	NA	NA	NA	NA	NA	NA	TBD	15.0	ENV CSR	12.0	NA	NA	NA	NA	TBD	200	TCEQ [(g)]	160	TBD	36	MECP	28	TBD	20	TCEQ [(g)]	16.0	18.0
Naphthalene	-	850	ENV CSR	680	NA	NA	NA	NA	NA	NA	NA	NA	TBD	80.0	ENV CSR	64.00	NA	NA	NA	NA	TBD	500	TCEQ [(g)]	400	TBD	23	MECP [(j)]	18	TBD	3.1	US EPA	2.48	2.79
Phenanthrene	-	1500	ENV CSR	1200	NA	NA	NA	NA	NA	NA	NA	NA	TBD	-	-	-	NA	NA	NA	NA	TBD	8	TCEQ [(g)]	6.40	TBD	-	-	-	TBD	0.8	TCEQ [(g)]	0.64	0.72
Pyrene	-	359	US EPA	287	NA	NA	NA	NA	NA	NA	NA	NA	TBD	100	ENV CSR	80	NA	NA	NA	NA	TBD	0.5	TCEQ [(g)]	0.40	TBD	-	-	-	TBD	0.05	TCEQ [(g)]	0.04	0.05
Quinoline	-	1.81	US EPA	1.4	NA	NA	NA	NA	NA	NA	NA	NA	TBD	0.05	ENV CSR	0.04	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B(a)P TPE	-	5.3	-	4.2	NA	NA	NA	NA	NA	NA	NA	NA	TBD	0.04	BC ENV SDWG	0.03	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
IACR (CCME)	-	1	CCME	0.8	NA	NA	NA	NA	NA	NA	NA	NA	NR	NR	NR	NR	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Criteria Air Contaminants																																
PM2.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	TBD	-	-	-	TBD	25	BC ENV	20	TBD	8	BC ENV	6.4	7.2
PM10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	TBD	-	-	-	TBD	50	BC ENV	40	TBD	15	WHO	12.0	13.5
Sulphur Dioxide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	TBD	170	ENV, CCME	136	TBD	40	WHO	32	TBD	10	ENV, CCME	8.0	9.0
Carbon Monoxide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	TBD	14300	ENV	11440	TBD	5500	ENV[(f)]	4400	TBD	-	-	-	-
Nitrogen Dioxide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	TBD	79	ENV, CCME	63.2	TBD	25	WHO	20	TBD	23	ENV, CCME	18.4	20.7

Notes:

- =No value available; ATSDR= Agency for Toxic Substances and Disease Registry; B(a)P TPE - Benzo(a)pyrene total potency equivalence; BC ENV= British Columbia Ministry of Environment and Climate Change Strategy; Cal OEHHA = California Office of Environmental Health Hazard Assessment; CCME = Canadian Council of Ministers of the Environments; CSR= Contaminated Sites Regulations; IACR= Index of Additive Cancer Risk; MECP = Ontario Ministry of the Environment, Conservation and Parks; mg/kg= milligram per kilogram; mg/L= milligram per litres; µg/m^3= microgram per cubic metre; NR= Not required; PM= Particulate Matter, RIVM= Rijksinstituut Voor Volksgezondheid en Milieu; SDWG= Source Drinking Water Quality Guideline; TBD = To be determined; TCEQ = Texas Commission on Environmental Quality; US EPA= United States Environmental Protection Agency

The selection approach for selected criteria is provided in each respective screening criteria table (Tables D-2 to D-6c) and described in Appendix D.

The screening criteria considered for each medium, the approach for identifying the selected screening criteria, as well as the selected screening criteria, are presented in Tables D-2 to -6c based on a hazard quotient (HQ) of 0.2 (except for air, where an HQ=1 was considered) and incremental lifetime cancer risk (ILCR) of 1x10-5.

(a) Trigger levels developed for soil are used as surrogates for vegetation.
(b) Trigger levels for sediment are based on selected criteria for soil.
(c) Regional soil background concentrations based on BC ENV (2021) Protocol 4 for Contaminated Sites, Establishing Local Background Concentrations in Soil. Table 1 Regional estimates for background concentrations iin soil for inorganic substances for Region 5 Cariboo. February 1, 2021. Accessed online: https://www2.gov.bc.ca/assets/gov/environment/air-land-water/site-remediation/docs/protocols/p4 jan2021 revisions final signed.pdf
(d) The screening of B(a)PTPE is protective of direct contact exposure for carcinogenic PAHs.
(e) Screening value for total chromium used.
(f) Carbon monoxide 8-hour value used from primary source instead of 1-hour value from secondary source.
(g) Criteria selected for the development of a trigger level. Due to the lack of supporting documentation for the selected screening criteria, constituent will be assessed indirectly using particulate matter as a surrogate if an exceedance of the trigger level were to occur.
(h) Criteria selected for the development of a trigger level. Given that the MECP 24-hour screening criterion is based on an aesthetic endpoint (i.e., protective of rust spotting on vehicles) that is also considered to be protective of a chronic health endpoint, iron will be assessed indirectly using particulate matter as a surrogate if an exceedance of the trigger level were to occur.
(i)The 24-hour MECP value was not selected as it is based on chronic exposures. Acute exposure was assessed using the 1-hour air criteria.
(j) Criteria selected for the development of a trigger level. Given that the MECP 24-hour screening criterion is protective of a chronic health endpoint, naphthalene will be assessed indirectly using particulate matter as a surrogate if an exceedance of the trigger level were to occur.

Table D-2 - Soil and Sediment Screening Criteria

Parameter	Primary				Secondary		Tertiary						
	ENV CSR RLLD (Pathway specific)	Notes	CCME RL/PL (Pathway specific)	Notes	Selected US EPA RSL[a,b]	Notes	ENV CSR RLLD (Generic human health)	Notes	CCME RL/PL (Generic)	Notes	Selected Human Health Screening Value[h]	Notes	Source
Metals													
Aluminum	NV	-	NV	-	15,500	NC	40000	G_{HH}	NV	-	15,500	NC	US EPA
Antimony	NV	-	NV	-	6.26	NC	250	G_{HH}	20	G	6.26	NC	US EPA
Arsenic	20	I	31	SI	6.77	NC, inorganic	NV	-	12	G	20	I	ENV CSR
Cadmium	20	I	14	SI	1.43	NC, for Cd in diet	NV	-	10	G	14	SI	CCME
Chromium	100	I, CrTot	220	SI, CrTot	3.01[c]	C, Cr(III) insoluble salts	NV	-	64	G	100	I, CrTot	ENV CSR
Cobalt	25	I	NV	-	4.68	NC	NV	-	50	G	25	I	ENV CSR
Copper	3,500	I	1,100	SI	626	NC	NV	-	63	G	1,100	SI	CCME
Cyanide	25	I	29	SI	4.57	NC	NV	-	0.9	G	25	I	ENV CSR
Iron	NV	-	NV	-	11,000	NC	35,000	G_{HH}	NV	-	10,960	NC	US EPA
Lead	120	I	140	SI	-	-	NV	-	140	G	120	I	ENV CSR
Manganese	6,000	I	NV	-	366	NC, non-dietary	NV	-	NV	-	6,000	I	ENV CSR
Mercury	10	I	6.6	SI	2.17	NC, elemental	NV	-	6.6	G	6.6	SI	CCME
Nickel	450	I	200	DC	290	NC, soluble salts	NV	-	45	G	200	DC	CCME
Selenium	200	I	80	DC	78.2	NC	NV	-	1	G	80	DC	CCME
Polycyclic Aromatic Hydrocarbons (PAHs)													
Acenaphthene	NV	-	NV	-	717	NC	950	G_{HH}	NV	-	717	NC	US EPA
Acenaphthylene	NV	-	NV	-	-	-	NV	-	NV	-	-	-	-
Acridine	NV	-	NV	-	-	-	NV	-	NV	-	-	-	-
Anthracene	10,000	I	NV	-	3,590	NC	NV	-	NV	-	10,000	I	ENV CSR
Benz(a)anthracene	NV	-	see B(a)P TPE	PEF=0.1	11.3	C	50	G_{HH}	NV	-	NR[g]	See B(a)P TPE	CCME
Benzo(a)pyrene	5	I	see B(a)P TPE	PEF=1.0	1.15	C	NV	-	NV	-	NR[g]	See B(a)P TPE	CCME
Benzo(b,j)fluoranthene	NV	-	see B(a)P TPE	-	4.24 [d]	C	50	G_{HH}	NV	-	NR[g]	See B(a)P TPE	CCME
Benzo(b,j,k)fluoranthene	NV	-	see B(a)P TPE	PEF=0.1	4.24 [e]	C	50[c]	G_{HH}	NV	-	NR[g]	See B(a)P TPE	CCME
Benzo(g,h,i)perylene	NV	-	see B(a)P TPE	PEF=0.01	-		NV	-	NV	-	NR[g]	See B(a)P TPE	CCME
Benzo(k)fluoranthene	NV	-	see B(a)P TPE	-	115	C	50	G_{HH}	NV	-	NR[g]	See B(a)P TPE	CCME
Chrysene	NV	-	see B(a)P TPE	PEF=0.01	1150	C	200	G_{HH}	NV	-	NR[g]	See B(a)P TPE	CCME
Dibenz(a,h)anthracene	NV	-	see B(a)P TPE	PEF=1.0	1.15	C	5	G_{HH}	NV	-	NR[g]	See B(a)P TPE	CCME
Fluoranthene	1,500	I	NV	-	478	NC	NV	-	NV	-	1,500	I	ENV CSR
Fluorene	NV	-	NV	-	478	NC	600	G_{HH}	NV	-	478	NC	US EPA
Indeno(1,2,3-c,d)pyrene	NV	-	see B(a)P TPE	PEF=0.1	11.5	C	50	G_{HH}	NV	-	NR[g]	See B(a)P TPE	CCME
1-Methylnaphthalene	NV	-	NV	-	176	C	250	G_{HH}	NV	-	176	C	US EPA
2-Methylnaphthalene	NV	-	NV	-	47.8	NC	60	G_{HH}	NV	-	47.8	NC	US EPA
Naphthalene	850	I	NV	-	20.1	C	NV	-	NV	-	850	I	ENV CSR
Phenanthrene	NV	-	NV	-	-		1,500	G_{HH}	NV	-	1,500	GHH	ENV CSR
Pyrene	NV	-	NV	-	359	NC	1,000	G_{HH}	NV	-	359	NC	US EPA
Quinoline	NV	-	NV	-	1.81	C	NV	-	NV	-	1.81	C	US EPA
B(a)P TPE [f]	NV	-	5.3	DC	-		NV	-	NV	-	5.3	DC	CCME
IACR (CCME)	NV	-	1	PW	-		NV	-	NV	-	1	PW	CCME

Notes:

B(a)P = benzo(a)pyrene; C = carinogenic; CCME = Canadian Council of Ministers of the Environments; CrTot = total chromium; ENV CSR = British Columbia Ministry of Environment and Climate Change Strategy Contaminated Sites Regulations; DC = direct contact; G = generic; GHH = generic human health; I = ingestion of contaminated soil; IACR = Index of Additive Cancer Risks; NC = non-carcinogenic; NV= No Value; P = provisional; PAHs = polycyclic aromatic hydrocarbons; PEF = probably effects level; PW = protection of potable water; RLLD = residential low density; RL/PL = residential/parkland; RSL = regional screening level; SI = soil ingestion; TPE = total potency equivalents; US EPA = United States Environmental Protection Agency

Screening values are in units of miligrams per kilogram (mg/kg) . It is noted that while this table provides soil screening values, they were also adopted as sediment screening values.

[a] The lower of the carcinogenic (if applicable) and non-carcinogenic value was selected.

[b] US EPA RSLs were adjusted to reflect an acceptable incremental lifetime cancer risk of $1x10^{-5}$ (1 in 100,000) by applying a factor of 10 for carcinogenic values and adjusted to reflect a hazard quotient of 0.2 for non-carcinogenic values by applying a factor of 0.2.

[c] The lower of the chromium (III) and chromium (VI) screening value was used.

[d] The RSL for benzo(j)fluoranthene, which is the lower value between benzo(b)fluoranthene and benzo(j)fluoranthene, was used as a surrogate.

[e] The RSL for benzo(j)fluoranthene, which is the lower value between benzo(b)fluoranthene, benzo(j)fluoranthene and benzo(k)fluoranthene, was used as a surrogate.

[f] Benzo(a)Pyrene Total Potency Equivalents (B(a)PTPE) is the sum of the estimated cancer potency relative to benzo(a)pyrene for all potentially carcinogenic PAHs. The B(a)PTPE value of 5.3 mg/kg is protective of direct contact exposure for carcinogenic PAHs and is based on an incremental lifetime cancer risk of 1x10-5.

[g] The screening of B(a)PTPE is protective of direct contact exposure for carcinogenic PAHs.

[h] The selected human health screening value is based on the following hierarchy: 1) Lower of the primary sources (i.e., pathway-specific screening values from ENV CSR and CCME), 2) secondary source (i.e., US EPA RSL), 3) ENV CSR followed by generic CCME screening values.

References:

Canadian Council of Ministers of the Environment (CCME), 2024. Soil quality guidelines for the protection of Environmental and Human Health. Accessed February 2024, online: https://ccme.ca/en/resources#

ENV (British Columbia Ministry of Environment and Climate Change Strategy). 2023. Contaminated Sites Regulation, Schedule 3.1 accessed February 2024 from: https://www.bclaws.gov.bc.ca/civix/document/id/complete/statreg/375_96_07

United States Environmental Protection Agency (US EPA), 2024. Regional Screening Levels (RSLs), Resident Soil Scenario (chronic). Accessed February 2024 online: https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables

Table D-3 - Surface Water and Groundwater Screening Criteria

Parameter	Unit	ENV (2020) Source Drinking Water Quality Guideline (SDWG)	Notes	ENV CSR (2023) Generic Drinking Water Quality Standards	Notes	Health Canada (2024) Canadian Drinking Water Quality Guideline	Notes	US EPA (2023) RSLs for Residential Tapwater[a]	Notes	Selected Human Health Screening Value[b]	Notes	Source
Total Metals												
Aluminum	µg/L	9,500	MAC	9,500	MAC	2,900	MAC	3990	NC	9,500	MAC	ENV SDWG
Antimony	µg/L	6	MAC	6	MAC	6	MAC	1.56	NC	6	MAC	ENV SDWG
Arsenic	µg/L	10	MAC	10	MAC	10	ALARA	0.517	C	10	MAC	ENV SDWG
Cadmium	µg/L	5	MAC	5	MAC	7	MAC	0.369	NC, water	5	MAC	ENV SDWG
Chromium	µg/L	50	MAC	50[c]	MAC	50	MAC	0.35[c]	C	50	MAC	ENV SDWG
Cobalt	µg/L	1	MAC	1	MAC	-	-	1.2	NC	1	MAC	ENV SDWG
Copper	µg/L	2000 [i]	MAC, AO: 1,000	1,500	MAC	2,000	MAC, AO: 1,000	160	NC	2,000	MAC	ENV SDWG
Cyanide	µg/L	200	MAC	200	MAC	200	MAC	0.293	NC	200	MAC	ENV SDWG
Iron	µg/L	300	AO	6,500	MAC	≤300	AO	2800	NC	6,500	MAC	ENV CSR
Lead	µg/L	5	MAC	10	MAC	5	ALARA	-	-	5	MAC	ENV SDWG
Manganese	µg/L	120 [i]	MAC, AO: ≤20	1,500	MAC	120	MAC, AO: ≤20	86.7	NC	120	MAC	ENV SDWG
Mercury	µg/L	1	MAC	1	MAC	1	MAC	0.125	NC	1	MAC	ENV SDWG
Nickel	µg/L	80	MAC	80	MAC	-	-	78.5	NC, soluble salts	80	MAC	ENV SDWG
Selenium	µg/L	10	MAC	10	MAC	50	MAC	20	NC	10	MAC	ENV SDWG
Polycyclic Aromatic Hydrocarbons (PAHs)- Surface Water Only												
Acenaphthene	µg/L	-	-	250	MAC	-	-	107	NC	250	MAC	ENV CSR
Acenaphthylene	µg/L	-	-	-	-	-	-	-	-	-	-	-
Acridine	µg/L	-	-	-	-	-	-	-	-	-	-	-
Anthracene	µg/L	-	-	1,000	MAC	-	-	353	NC	1000	MAC	ENV CSR
Benz(a)anthracene	µg/L	NR[d]	MAC	0.07	MAC	-	-	0.298	C	NR[d]	MAC	ENV SDWG
Benzo(a)pyrene	µg/L	NR[d]	MAC	0.01	MAC	0.04	MAC	0.251	C	NR[d]	MAC	ENV SDWG
Benzo(b,j) fluoranthene	µg/L	NR[d]	MAC	0.07	MAC	-	-	0.649[e]	C	NR[d]	MAC	ENV SDWG
Benzo(b,j,k)fluoranthene	µg/L	NR[d]	MAC	0.07[g]	MAC	-	-	0.649[f]	C	NR[d]	MAC	ENV SDWG
Benzo(g,h,i)perylene	µg/L	NR[d]	MAC	0.07[g]	MAC	-	-	-	-	NR[d]	MAC	ENV SDWG
Benzo(k)fluoranthene	µg/L	NR[d]	MAC	0.07[g]	MAC	-	-	25.1	C	NR[d]	MAC	ENV SDWG
Chrysene	µg/L	NR[d]	MAC	7	MAC	-	-	251	C	NR[d]	MAC	ENV SDWG
Dibenz(a,h)anthracene	µg/L	NR[d]	MAC	0.01	MAC	-	-	0.251	C	NR[d]	MAC	ENV SDWG
Fluoranthene	µg/L	-	-	150	MAC	-	-	160	NC	150	MAC	ENV CSR
Fluorene	µg/L	-	-	150	MAC	-	-	58.8	NC	150	MAC	ENV CSR
Indeno(1,2,3-c,d)pyrene	µg/L	NR[d]	MAC	-	-	-	-	2.51	C	NR[d]	MAC	ENV SDWG
1-Methylnaphthalene	µg/L	-	-	5.5	MAC	-	-	11.4	C	5.5	MAC	ENV CSR
2-Methylnaphthalene	µg/L	-	-	15	MAC	-	-	7.19	NC	15	MAC	ENV CSR
Naphthalene	µg/L	-	-	80	MAC	-	-	1.17	C	80	MAC	ENV CSR
Phenanthrene	µg/L	-	-	-	-	-	-	-	-	-	-	-
Pyrene	µg/L	-	-	100	MAC	-	-	24.2	NC	100	-	ENV CSR
Quinoline	µg/L	-	-	0.05	MAC	-	-	0.239	C	0.05	-	ENV CSR
B(a)P TPE[h]	µg/L	0.04	MAC	-	-	-	-	-	-	0.04	MAC	ENV SDWG

Notes

- = no guideline available or not applicable; ALARA = as low as reasonably achievable; AO = aesthetic objective; B(a)P = benzo(a)pyrene; C=Carciogenic; CSR= Contaminated Sites Regulations; ENV= British Columbia Ministry of Environment and Climate Change Strategy; µg/L= micrograms/L; MAC = maximum acceptable concentration; NR = none required; NC = non-carcinogenic; RSL= Regional Secreening Level; SDWG= Source Drinking Water Quality Guideline; TPE = total potency equivalents; US EPA = United States Environmental Protection Agency

Screening values are in units of µg/L (micrograms per litre).

[a] US EPA RSLs were adjusted to reflect an acceptable incremental lifetime cancer risk of 1x10-5 (1 in 100,000) by applying a factor of 10 for carcinogenic values and adjusted to reflect a hazard quotient of 0.2 for non-carcinogenic values by applying a factor of 0.2.

[b] The selected human health screening value is based on the following hierarchy: 1) ENV Source Drinking Water Quality Guideline; 2) ENV CSR Pathway-specific Drinking Water Quality Standards; 3) Health Canada Canadian Drinking Water Quality Guideline; and 4)US EPA RSL

[c] Screening value for total chromium was unavailable, therefore the lower value between chromium (III) and chromium (VI) used.

[d] The screening of B(a)PTPE is protective of direct contact exposure for carcinogenic PAHs.

[e] The RSL for benzo(j)fluoranthene, which is the lower value between benzo(b)fluoranthene and benzo(j)fluoranthene, was used as a surrogate.

[f] The RSL for benzo(j)fluoranthene, which is the lower value between benzo(b)fluoranthene, benzo(j)fluoranthene and benzo(k)fluoranthene, was used as a surrogate.

[g] Value for benzo(b,j)fluoranthene used as a surrogate (i.e., lowest value between similar PAHs including benz(a)anthracene and benzo(b,j)fluoranthene)

[h] Benzo(a)Pyrene Total Potency Equivalents (B(a)PTPE) is the sum of the estimated cancer potency relative to benzo(a)pyrene for all potentially carcinogenic PAHs. The B(a)PTPE value of 0.04 µg/L is protective of direct contact exposure for carcinogenic PAHs and is based on an incremental lifetime cancer risk of 1x10-5.

[i] Health-based water quality guideline was preferentially selected over available aesthetic objective.

Guideline references:

ENV. 2020. B.C. Source Drinking Water Quality Guidelines: Guideline Summary. Water Quality Guideline Series, WQG-01. Prov. B.C., Victoria B.C. Available from https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/waterquality/water-quality-guidelines/approved-wqgs/drinking-water-and-recreation/source_drinking_water_quality_guidelines_bcenv.pdf

ENV. 2023. Contaminated Sites Regulation (CSR) Generic numerical water standards for drinking water. Schedule 3.2, Drinking water. Available from https://www.bclaws.gov.bc.ca/civix/document/id/lc/statreg/375_96_08.

Health Canada. 2024. Guidelines for Canadian Drinking Water Quality—Summary Tables. Water and Air Quality Bureau, Healthy Environments and Consumer Safety Branch, Health Canada, Ottawa, Ontario. June 2024. Available from: https://www.canada.ca/en/health-canada/services/environmental-workplace-health/reports-publications/water-quality/guidelines-canadian-drinking-water-quality-summary-table.html#t2

US EPA (United States Environmental Protection Agency). November 2023. Regional Screening Levels (RSLs) - Generic Tables; Screening levels based on a hazard quotient of 0.2, a cancer risk of 1 x 10-5, and chronic tapwater exposure. Available from https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables.

Table D-4 - Fish Tissue Screening Criteria

Parameter	Carcinogenic Classification for Oral Exposure			Carcinogenic Classification for Oral Pathway	TRV - Oral Reference Dose (mg/kg BW/day)[c]					TRV - Oral Slope Factor (mg/kg BW/day)$^{-1}$[c]				Fish Tissue Screening Value (mg/kg)[i]				Selected Fish Tissue Screening Value[j]
	US EPA IRIS (2024)[a]	US EPA PPRTV (2023)	IARC (2024)[b]		US EPA (2023, 2024)	Source	Health Canada or Other Agency			US EPA	Source	Health Canada or Other Agency	Source	Selected Non-Cancer TRV		Selected Cancer TRV		
							Toddler	Adult	Source					Toddler	Adult	Toddler	Adult	
Metals																		
Aluminum (Al)	-	IN	-	NC	1	US EPA 2006 (cited in US EPA PPRTV, 2023)	1	1	ATSDR 2008[h]	-	-	-	-	66	142	-	-	66.5
Antimony (Sb)	-	IN	2A[k]	NC	0.0004	US EPA 1987 (cited in US EPA IRIS, 2004)	0.006	0.006	RIVM 2009	-	-	-	-	0.027	0.057	-	-	0.027
Arsenic (As)	A	-	1	C	0.0003	US EPA 1991 (cited in US EPA IRIS, 2024)	0.0003	0.0003	ATSDR 2007[h]	1.5	US EPA 1995 (US EPA IRIS, 2024)	1.8	Health Canada 2021a	0.0199	0.043	0.0053	0.0053	0.0053
Cadmium (Cd)	B1	-	1	NC	0.001	US EPA 1989 (cited in US EPA IRIS, 2024)[e]	0.0008	0.0008	WHO, 2011 (cited in Health Canada 2021a, provisional)	-	-	-	-	0.053	0.11	-	-	0.053
Chromium (Cr) III	D	-	3	NC	1.5	US EPA 1998 (cited inUS EPA IRIS, 2024)[f]	1.5	1.5	US EPA, 1998 (cited in Health Canada 2021a)	-	-	-	-	100	214	-	-	100
Chromium (Cr) VI	D	-	1	NC	0.003	US EPA 1998 (cited in US EPA IRIS, 2024)	0.0022	0.0022	Health Canada, 2016 (cited in Health Canada 2021a)	-	-	-	-	0.2	0.43	-	-	0.20
Chromium Total	-	-	3	NC	-	-	-	-	-					-	-			NV[n]
Cobalt (Co)	-	-	2A	NC	0.0003	US EPA 2008 (cited in US EPA PPRTV, 2023)	0.0014	0.0014	RIVM 2001	-	-	-	-	0.093	0.199	-	-	0.09
Copper (Cu)	D	-	-	NC	-	-	0.426	0.426	Health Canada, 2019 (cited in Health Canada 2021a)	-	-	-	-	28	61	-	-	28
Cyanide	D	-	-	NC	0.00063	US EPA 2010 (cited in US EPA IRIS, 2024)	0.05	0.05	ATSDR (2006)[h]					0.042	0.090			0.042
Iron (Fe)	-	IN	-	NC	0.7	US EPA 2006 (cited in US EPA PPRTV, 2023)	-	-	-	-	-	-	-	47	100	-	-	47
Lead (Pb)	B2	-	2B	NC	-	-	0.0005	0.0005	EFSA, 2013 (cited in Health Canada 2021a, provisional)	-	-	-	-	0.033	3.6	-	-	0.033
Manganese (Mn)	D	-	-	NC	0.14	US EPA 1995 (cited in US EPA IRIS, 2024)	0.025	0.025	Health Canada, 2019 (cited in Health Canada 2021a)					9.3	19.9	-	-	9.3
Mercury (Hg) (assumed to be methylmercury)	C	-	2B	NC	0.0001	US EPA 2001 (cited in US EPA IRIS, 2024)	0.0002	0.00047	Health Canada, 2007 and WHO, 2007 (cited in Health Canada 2021a)	-	-	-	-	0.013	0.067	-	-	0.013
Nickel (Ni)	-	-	2B[l]	NC	0.02	US EPA 1991 (cited in US EPA IRIS, 2024)[g]	0.0013	0.0013	Health Canada, 1996 (cited in Health Canada 2021[m])	-	-	-	-	1.33	2.8	-	-	1.3
Selenium (Se)	D	-	3	NC	0.005	US EPA 1991 (cited in US EPA IRIS, 2024)	0.006	0.0057	IOM, 2000 (cited in Health Canada 2021a[d])	-	-	-	-	0.4	0.81	-	-	0.4

Notes:

"-" = value or classification is not available; ATSDR= Agency for Toxic Substances and Disease Registry; C = carcinogen; IARC = International Agency for Research on Cancer; EFSA= European Food Safety Authority; IOM= Institute of Medicine of the National Academies (renamed the National Academy of Medicine in 2015); IRIS= Integrates Risk Information System; mg/kg/bw = miligrams per kilogram body weight; mg/kg bw/day = milligram per kilogram body weight per day; NC = non-carcinogen; NV = no value; PPRTV= Provisional Peer-Reviewed Toxicity Values; RIVM= Rijksinstituut Voor Volksgezondheid en Milieu; TRV= Toxicological Reference Value; US EPA = United States Environmental Protection Agency.

[a] US EPA IRIS carcinogenic classification is as follows: A- Human carcinogen; B1 - Probable carcinogenic to humans, based on limited evidence of carcinogenicity in humans; B2- Probable human carcinogen, based on sufficient evidence of carcinogenicity in animals; C- Possible human carcinogen; D- Not classifiable as to its carcinogenicity to humans

[b] IARC carcinogenic classification is as follows: 1- Carcinogenic to humans; 2A - Probably carcinogenic to humans; 2B - Possibly carcinogenic to humans; 3- Not classifiable as to its carcinogenicity to humans

[c] TRVs were selected preferentially from US EPA IRIS (2024) and Health Canada (2021a), based on the more current TRV from these two primary sources, current scientific understanding and appropriate study methodologies. If a TRV was not available from US EPA or Health Canada, then other sources were consulted (e.g., ATSDR, RIVM and US EPA PPRTV).

[d] Tolerable upper intake level

[e] Based on food/diet

[f] Value for insoluble salt

[g] Value for soluble salts

[h] Minimal risk level

[i] Non-cancer and cancer fish tissue screening value calculated based on Health Canada (2021b) equation for ingestion of food, using the selected TRV, hazard quotient of 0.2 (non-cancer), incremental lifetime cancer risk of 1x10-5 (cancer) and the receptor characteristics presented in Appendix D.

[j] Selected Fish Tissue Screening Value is the lowest of the toddler and adult fish tissue screening values.

[k] Value for trivalent antimony

[l] Value for nickel (metallic)

[m] Value for nickel chloride

[n] Value for total chromium could not be calculated, therefore more conservative screening value between chromium (III) and chromium (VI) will be considered.

Shaded = selected toxicity reference value or fish tissue screening value

References:

ATSDR (Agency for Toxic Substances and Disease Registry). 2007. Toxicological Profile for Arsenic. US Department of Health and Human Services, Public Health Service. Atlanta, GA.

ATSDR. 2008. Toxicological Profile for Aluminum. US Department of Health and Human Services, Public Health Service. Atlanta, GA.

ATSDR. 2006. Toxicological Profile for Cyanide. US Department of Health and Human Services, Public Health Service. Atlanta, GA

Chan, L., Receveur, O., Sharp, D., Schwartz, H., Ing, A., Tikhonov, C. 2011. First Nations Food, Nutrition and Environment Study (FNFNES): Results from British Columbia (2008/2009). Prince George: University of Northern British Columbia, 2011.

Health Canada. 2021a. Federal Contaminated Site Risk Assessment in Canada: Toxicological Reference Values (TRVs). Version 3.0. Contaminated Sites Division. Safe Environments Directorate. Ottawa, ON.

Health Canada. 2021b. Federal Contaminated Site Risk Assessment in Canada: Guidance on Human Health Preliminary Quantitative Risk Assessment (PQRA). Version 3.0.

Health Canada. 2007. Human Health Risk Assessment of Mercury in Fish and Health Benefits of Fish Consumption. Bureau of Chemical Safety, Food Directorate, Health Products and Food Branch.

IARC (International Agency for Research on Cancer). 2024 List of Classifications, Agents Classified by the IARC Monographs, Volumes 1 - 135, last updated January 31, 2024. Accessed February 2024 from: https://monographs.iarc.fr/list-of-classifications/.

RIVM (Rijksinstituut Voor Volksgezondheid en Milieu; National Institute of Public Health and the Environment). 2001. Re-evaluation of Human Toxicological Maximum Permissible Risk Levels. RIVM Report No. 711701 025. Bilthoven, Netherlands.

RIVM. 2009. Re-evaluation of Some Human-toxicological Maximum Permissible Risk Levels Earlier Evaluated in the Period 1991-2001. RIVM Reprot No. 711701092/2009.Bilthoven, Netherlands. https://www.rivm.nl/bibliotheek/rapporten/711701092.pdf. Accessed December 2019.

US EPA. 2023. Provisional Peer-Reviewed Toxicity Values. Last updated August 2023. Accessed March 2024 from: https://www.epa.gov/pprtv/provisional-peer-reviewed-toxicity-values-pprtvs-assessments.

US EPA. 2024. Integrated Risk Information System (IRIS) Online Database. Accessed March 2024 from: www.epa.gov/iris/. The assessment date is provided for each chemical.

Table D-5a - Air Screening Criteria (1-Hour)

Parameter	CAS	Synonym(s)	Surrogate Options	Table A: 1-Hour (Acute) Air Thresholds								Toxicological Endpoints and Derivations
				Primary		Secondary			Tertiary			
				ENV (2021) AAQO	CCME (1999, 2023) CAAQS and NAAQO	ATSDR (2024) MRL	US EPA (2024) NAAQS	WHO (2010, 2021) AQG	MECP (2020) AAQC	Cal OEHHA (2020) REL	TCEQ (2023) AMCV/ReV [a]	
Criteria Air Contaminants												
Carbon monoxide (CO)	630-08-0			Pollution Control Objective (reference only) - **14,300**	Desirable NAAQO = 15,000 Acceptable NAAQO = 35,000	-	40,100 (35 ppm)	35,000	36,200	23,000	-	ENV [Reference only]: Pollution control objective for food-processing, agriculturally orientated, and other industries. The pollution control objective was developed in the 1975. This pollution control objective was rescinded in 2006 but is used by ENV for reference purposes (supporting documentation not available). CCME (NAAQO): Screening value is based on cardiorespiratory effects in people with exercise-induced myocardial ischemia, which was evaluated and derived by the CCME (CCME 1994). The CCME derived a 1-hour average maximum acceptable level (35,000 µg/m3) which is based on the maintenance of blood carboxyhemoglobin concentrations below the lowest-observed effect level (LOEL) of 2% (Allred et al. 1989; as cited in CCME 1994). A physiologically based pharmacokinetic (PBPK) model developed by Coburn, Foster, and Kane was used to extrapolate a 2% blood carboxyhemoglobin concentration to an ambient carbon monoxide concentration in the air. The maximum desirable level (15,000 µg/m^3) was derived based on 1% blood carboxyhemoglobin concentration. The maximum acceptable level is an air quality concentration that is protective of the general population against effects on the environment, visibility, personal comfort and well-being, while the maximum desirable level is the long term objective for air quality. US NAAQS: Screening value based on clinical evidence relating carboxyhemoglobin (carbon monoxide bound to blood hemoglobin) levels to various adverse health endpoints. The NAAQS of 35 ppm was converted to µg/m3 using a molecular weight of 28.01 g/mol. WHO: Screening value based on a maximum concentration of 2.5% carboxyhemoglobin in blood which is intended to be protective of non-smoking, middle-aged and elderly population groups with coronary artery disease, and fetuses of non-smoking pregnant women. The guideline is calculated using an equation that takes into account the known physiological variables that have an impact on the uptake of carbon monoxide and determines the guideline that will keep carboxyhemoglobin levels below 2.5%. MECP: Health-based 1-hr screening value based on the CCME NAAQO of 30 ppm. The MECP used a conversion factor of 1 ppm = 1.2055 mg CO/m3 to convert from the NAAQO of 30 ppm to a value of 36,200 µg CO/m3, while the CCME NAAQO applied a conversion factor of 1 ppm = 1.146 mg CO/m3 in their conversion of the NAAQO. Cal OEHHA: Screening value based on an inhalation study in humans examining the aggravation of existing angina and other cardiovascular diseases when subjects are exercising heavily (Allred et al. 1989 and Kleinman et al., 1989; as cited in Cal OEHHA 2008b). The screening values is based on a NOAEL of 1.1 to 1.3 % carboxyhemoglobin level in blood which corresponds to 23,000 µg/m3.
Nitrogen dioxide (NO2)	10102-44-0			CAAQS (Current) = 113 **CAAQS (Effective 2025) = 79**	CAAQS (Current) = 113 **CAAQS (Effective 2025) = 79**	-	188 (100 ppb)	200	400	470	-	ENV: Supporting documentation not available for screening value. The interim AQO is 188 µg/m3 and the CAAQS of 113 µg/m3 took effect on 1 January 2020. A value of 42 ppb (79 µg/m3) is proposed for the year 2025 and it was selected as the screening value as it is more conservative than the 2020 CAAQS of 113 µg/m3. The CAAQS is a three-year average of the annual 98th percentile of the daily maximum 1-hour average concentrations. The CAAQS of 42 ppb was converted to µg/m3 using a molecular weight of 46.01. CCME CAAQS: Proposed screening value for the year 2025 (supporting documentation not available) was selected as it is more conservative than the 2020 CAAQS of 113 µg/m3.. The metric is the 3-year average of the 98th percentile of the nitrogen dioxide daily maximum 1-hour average concentration. The CAAQS of 60 and 42 ppb were converted to µg/m3 using a molecular weight of 46.01. US NAAQS: Screening value based on the 98th percentile of maximum 1-hour daily concentrations, averaged over a three-year period. The NAAQS is protective of a broad range of respiratory effects in sensitive populations, such as those with asthma and those who spend time near major roadways. The NAAQS of 100 ppb was converted to µg/m3 using a molecular weight of 46.01 g/mol. WHO: Screening value based on studies of bronchial responsiveness among asthmatics. MECP: Screening value based on a health endpoint (supporting documentation not available). Cal OEHHA: Screening value is based on a study where sensitive humans (asthmatics) were exposed to 0.25 ppm of NO2 for 1 hour (Mohsenin 1987; as cited in Cal OEHHA 2008b). The critical effect was an increase in airway reactivity. No uncertainty factors were applied to the NOAEL of 0.25 ppm (470 µg/m3), which was adopted as the reference exposure level (REL) and California ambient air quality standard to protect against mild adverse effects.
Sulphur dioxide (SO2)	7446-09-5			Interim AQO = 196 CAAQS = 183 **CAAQS = 170 (effective in 2025)**	183 (70 ppb) (effective in 2020) **170** (65 ppb) **(effective in 2025)**	-	200 (75 ppb)	-	100 (40 ppb)	660	-	ENV: The CAAQS of 183 µg/m3 took effect on 1 January 2020 and a value of 170 µg/m3 is proposed for the year 2025. The 2025 value was selected as the screening criterion as it is more conservative than the 2020 CAAQS. The CAAQS is a based on the annual 99th percentile of D1HM, averaged over three consecutive years and is described below. The CAAQS of 65 ppb was converted to µg/m3 using a molecular weight of 64.07. CCME CAAQS: Screening value was developed based on respiratory health problems, focused on susceptible populations (e.g. asthmatic children and adults), and environmental impacts such as acid rain and smog (CCME 2017). A value of 170 µg/m3 is proposed for the year 2025. It was selected as the screening value as it is more conservative than the 2020 CAAQS of 183 µg/m3. The metric is the 3-year average of the 99th percentile of the sulphur dioxide daily maximum 1-hour average concentration. The CAAQS of 70 and 65 ppb were converted to µg/m3 using a molecular weight of 64.07. US NAAQS: Screening value based on epidemiological evidence of increased emergency department visits and hospitalizations associated with sulphur dioxide concentrations in the range of 75 to 150 ppb. The NAAQS of 75 ppb was converted to µg/m3 using a molecular weight of 64.07 g/mol. MECP: MECP derived the 1-hour screening value from the 10-minute MECP averaging time, using conversion factors that are derived from an exponential equation based on empirical monitoring data, ratios of concentrations measured for different averaging periods, and meteorological considerations (MECP 2017). The MECP derived the 1-hour averaging time from the more toxicologically relevant 10-minute averaging time, because exposure to short-intermittent spikes in sulphur dioxide concentrations (within the 5-10 minute range) are associated with respiratory morbidity. The AAQC of 40 ppb were converted to µg/m3 using a molecular weight of 64.07. Cal OEHHA: Screening value based on impairment of airway function (bronchoconstriction) especially in asthmatics (Linn et al., 1987; as cited in Cal OEHHA 2008b). After reviewing human several studies on acute exposures of normal, asthmatic, and atopic (susceptible to hypersensitive allergic reactions) individuals to low concentrations of SO2 (0.25 to 2.0 ppm), Cal OEHHA staff concluded that exposure to 0.25 ppm, the California Ambient Air Quality Standard (Cal AAQS) for SO2, would not result in respiratory effects causing discomfort in sensitive individuals exposed for one hour. The Cal AAQS for SO2 is intended to protect sensitive individuals (i.e., exercising asthmatics) from lower respiratory effects of acute exposure. Cal OEHHA concluded that an exposure concentration of 0.25 ppm SO2 for 1-hour is comparable to a NOAEL in sensitive individuals. It was determined by Cal OEHHA that the NOAEL would be protective of asthmatic individuals because adverse effects are consistently observed only at higher concentrations with participants undertaking moderate exercise and there is also an inconsistency in response to SO2 exposure at lower concentrations.
PM10	N/A			-	-	-	-	-	-	-	-	A 1-hour screening value is not available. Acute inhalation exposure to particulate matter is assessed utilizing the 24-hour exposure scenario.
PM2.5	N/A			-	-	-	-	-	-	-	-	A 1-hour screening value is not available. Acute inhalation exposure to particulate matter is assessed utilizing the 24-hour exposure scenario.
Metals												
Aluminum	7429-90-5			-	-	-	-	-	-	-	**50**	TCEQ: Screening value (AMCV) based on a study of male rats exposed to aluminum at concentrations of 10, 50, 100, 200 and 1000 mg/m^3 for 4-hours, in which a NOAEL and LOAEL for increased enzymatic alkaline phosphatase activities of 10 and 50 mg/m3 was observed, respectively (Thompson et al. 1986; as cited in TCEQ 2021) . The NOAEL of 10 mg/m3 was selected by TCEQ as the point of departure (POD) to derive the 1-hour screening value. This POD was then adjusted to 15.874 mg/m3 to account for exposure duration and animal-to-human dose extrapolation. Uncertainty factors were applied for interspecies variability (3), intraspecies variability (10) and database uncertainties (6), to derive a AMCV of 0.04975 mg/m3 or 50 µg/m3, based on a target HQ=1.
Antimony	7440-36-0			-	-	-	-	-	-	-	**5** [d]	TCEQ: Screening value based on a health endpoint (Interim ESL and AMCV, supporting documentation not available) in PM.
Arsenic	7440-38-2			-	-	-	-	-	-	0.2	**9.9** [c]	Cal OEHHA: Screening value based on a study by Nagymajtenyi et. al. (1985; as cited in Cal OEHHA 2014) which found decreased fetal weight in mice following maternal inhalation of As2O3 for 4 hours/day during gestation days 9 to 12. A statistically significant decrease in the weight of fetuses was observed in all concentrations used in the study; therefore, a NOAEL was not available. A LOAEL of 0.26 mg/m^3 and an uncertainty factor of 1,000 (10 for a lack of a NOAEL value, 10 for interspecies differences between mice and humans, and 10 for human interindividual differences) were used to derive the screening value. TCEQ: Screening value (AMCV) based on a study where female rats were exposed to 0, 0.3, 3, and 10 mg/m3 arsenic trioxide for 6 hours/day for multiple days (Holson et al. 1999; as cited in TCEQ 2012). The NOAEL and LOAEL for maternal effects (i.e., rales) were 3000 and 10,000 µg/m3, respectively. The TCEQ chose the NOAEL of 3000 µg/m^3 as the point of departure. The NOAEL was adjusted for exposure duration (5451 µg/m3) and a human equivalent concentration of 0.714 (3891.3 µg/m3). Uncertainty factors were applied for interspecies variability (3), intraspecies variability (10) and database uncertainties (10), resulting in a threshold of 13 ug/m3 for arsenic trioxide. The threshold for arsenic trioxide was adjusted for arsenic (arsenic trioxide is 76% arsenic by weight), resulting in an acute Air Monitoring Comparison Value (AMCV) of 9.9 µg/m3 based on a target HQ=1. The TCEQ value is chosen preferentially over Cal OEHHA values because it is based on a more recent study .
Cadmium	7440-43-9			-	-	-	-	-	-	-	**18**	TCEQ: Screening value (AMCV) based on immunotoxicity in Swiss albino mice exposed to cadmium chloride as an aerosol for 2 hours (TCEQ 2016). A NOAEL of 110 µg/m3 was identified from the study. The NOAEL was adjusted to a 1-hour exposure (138.6 µg/m3). A point of departure human equivalency concentration (PODHEC) of 554 µg cadmium/m3 was derived from the study and an uncertainty factor of 30 was applied (3 for extrapolation from animals to humans and 10 to account for intraspecies variability) to derive an acute Air Monitoring Comparison Value (AMCV) of 18 µg/m^3, based on HQ=1.
Chromium (total or trivalent)	7440-47-3			-	-	-	-	-	-	-	**12**[b]	TCEQ: Screening value for lung effects in hamsters exposed to chromium chloride (via inhalation) for 30 minutes (TCEQ 2009). The NOAEL was 77 mg/m3 and extrapolated to a 1-hour exposure (38.5 mg/m3). The human equivalent concentration (HEC) was 10.82 mg/m3 and an uncertainty factor of 300 (3 for interspecies variability, 10 for intraspecies variability and 10 for database limitations) was applied to an derive an acute (ReV) of 12 µg/m^3, based on HQ=1.
Chromium (hexavalent)	18540-29-9			-	-	-	-	-	-	-	1.3	TCEQ: Screening value (AMCV) for hexavalent chromium based on a benchmark concentration lower confidence limit corresponding to the lower 10% incidence of effect (BMCL10) of 16.06 µg Cr(VI)/m3 for increased alveolar lung weight in rats exposed to 0, 50, 100, 200, or 400 µg Cr(VI)/m3, as sodium dichromate, for 22 hours/day for 7 days/week for 30 days (TCEQ 2014). The BMCL10 was not adjusted for continuous exposure by TCEQ because the study exposure duration of 22 hours/day, 7 days/week for 30 days is much longer than the acute duration of interest (24-hour). The BMCL10 was adjusted for a human equivalent concentration (HEC) using the regional deposited dose ratio for animal to human adjustment of 2.41. Uncertainty factors for interspecies variation (3) and intraspecies variation (10) were applied. The resulting AMCV value of 1.3 µg Cr(VI)/m3 was based on an HQ = 1.0.
Cobalt	7440-48-4			-	-	-	-	-	-	-	**0.69**	TCEQ: Screening value (AMCV) based on the critical effect of respiratory irritation (coughing, sore throat and changes to forced expiratory volume) after exposure of 15 healthy male workers to hard metal dust containing 38 µg cobalt/m^3 for 6 hours (TCEQ 2017). The LOAEL of 38 µg cobalt/m3 is used as the point of departure (POD) for derivation of the 1-hour reference concentration and is adjusted to a 1-hour value of 69.05 µg cobalt/m^3. A total uncertainty factor of 100 was applied (10 for intrahuman variability and 10 to extrapolate from a LOAEL to NOAEL) to derive the Air Monitoring Comparison Value (AMCV), based on an HQ=1.
Copper	7440-50-8			-	-	-	-	-	-	**100** [c]	10	Cal OEHHA: Screening value based on a NOAEL of 1 mg copper/m3 from a study where workers were exposed to 1 to 3 mg/m3 copper for an unspecified amount of time (Whitman 1957; as cited in Cal OEHHA 2008b). No extrapolation for continuous exposure was applied because the exposure duration was not clearly specified in the reports. An uncertainty factor for intraspecies variability (10) was applied. The Cal OEHHA value was selected preferentially over the MECP and TCEQ values because there is supporting documentation. TCEQ: Screening value based on a health endpoint (interim ESL and AMCV), supporting documentation not available), as copper in PM.
Iron	7439-89-6			-	-	-	-	-	-	-	Must meet NAAQS	TCEQ: No value specific value available for iron. "Must Meet NAAQS" indicates that, for species of limited concern, the determination of the individual species impacts are not required if a National Ambient Air Quality Standards (NAAQS) analysis is completed for particulate matter of 2.5 and 10 microns or less (PM2.5 and PM10)
Lead	7439-92-1			-	-	-	-	-	-	-	-	A 1-hour screening value is not available. Acute inhalation exposure to iron is assessed utilizing the 24-hour exposure scenario.
Manganese	7439-96-5			-	-	-	-	-	-	-	**9.1**	TCEQ: Screening value (AMCV) based on an inhalation study where rhesus monkeys were exposed to manganese sulphate for 6 hours per day, 5 days per week for 3 weeks (total of 90 hours of exposure) (TCEQ 2017). The critical effect was mild inflammatory changes to the airway with a point of departure (POD) LOAEL for 6 hours of exposure of 1.5 mg manganese/m^3. The LOAEL was extrapolated from a 6-hour exposure over a single day to a 1-hour value of 2.72 mg manganese/m3. An uncertainty factor of 360 was calculated (2 for extrapolation from a LOAEL to a NOAEL, 10 for intrahuman variability, 3 for potential toxicodynamic differences between rhesus monkeys and humans and 6 to account for limitations and uncertainty in the database); however, a maximum uncertainty factor of 300 was applied. Based on AMCV value where target HQ=1.
Mercury	7439-97-6			-	-	-	-	-	-	**0.6** [c]	0.25	Cal OEHHA: Screening value based on central nervous system disturbances in rat offspring (Danielsonn et al. 1993; as cited in Cal OEHHA 2014). Maternal rats were exposed to metallic mercury vapour (1.8 mg/m3) for 1 or 3 hours/day during gestation. The offspring displayed significant dose-dependent deficits in behaviour 3 to 7 months after birth compared to controls. The behaviors measured included spontaneous motor activity, performance of a spatial learning task, and habituation to an automated test chamber. An uncertainty factor of 3000 (10 for using LOAEL for moderate to severe effects in the absence of a NOAEL, 3 for interspecies toxicokinetic differences, 10 for interspecies toxicodynamic differences, 3 for individual variability, and 3 for intraspecies differences in age differences) was used. The Cal OEHHA value was selected preferentially over the MECP and TCEQ values because there is supporting documentation. TCEQ: Screening value based on a health endpoint (interim ESL, supporting documentation not available) as mercury metal and inorganic mercury forms in PM. AMCV value was not available therefore interim ESL was selected.
Nickel	7440-02-0			-	-	-	-	-	-	0.2	**1.1** [c]	Cal OEHHA: Screening value based on a mild reduction in antibody response in mice, exposed for 2 hours to nickel and nickel compounds (Graham et al. 1978; as cited by Cal OEHHA 2012). The 2-hour benchmark dose level (BMDL) was 165 µg/m3 and was extrapolated to a 1-hour concentration of 233 µg/m^3. An uncertainty factor of 1000 (3 for benchmark response uncertainty, 10 for interspecies differences, and 30 for intraspecies differences) was applied. TCEQ: Screening value (AMCV) is based on an exposure study in which significant bronchial constriction was observed in 12 metal plating factory workers with recurring occupationally-related respiratory problems (Cirla et al. 1985, as cited by TCEQ 2017). The subjects of the study were exposed to an aerosol of 0.3 mg/m3 of nickel sulphate (67 µg nickel/m3) in an exposure chamber for 30 minutes in which respiratory effects were significant at this level of exposure (LOAEL of 67 µg/m3) and therefore a NOAEL was not available. The exposure concentration was extrapolated to 1 hour (33.5 µg nickel/m3) and an uncertainty factor of 30 (10 for using a LOAEL and 3 for an incomplete database) was applied by TCEQ to derive an acute screening value of 1.1 µg Ni/m^3 . The TCEQ value was selected preferentially over the Cal OEHHA value because the screening value is based on a controlled human study that is more recent. Based on AMCV value where target HQ=1.
Selenium	7782-49-2			-	-	-	-	-	-	-	**2** [d]	TCEQ: Screening value based on a health endpoint (interim ESL and AMCV, supporting documentation not available), as selenium and compounds in PM.
Polycyclic Aromatic Hydrocarbons												
1-Methylnaphthalene	90-12-0			-	-	-	-	-	-	-	**200** [d]	TCEQ: Screening value based on a health endpoint (interim ESL, supporting documentation not available) in PM.
2-Methylnaphthalene	91-57-6			-	-	-	-	-	-	-	**200** [d]	TCEQ: Screening value based on a health endpoint (interim ESL, supporting documentation not available) in PM.
Acenaphthene	83-32-9			-	-	-	-	-	-	-	**100** [d]	TCEQ: Screening value based on a health endpoint (interim ESL and AMCV, supporting documentation not available) in PM.
Acenaphthylene	208-96-8		Acenaphthene	-	-	-	-	-	-	-	**100** [d]	TCEQ: Screening value based on a health endpoint (interim ESL and AMCV, supporting documentation not available) in PM.
Anthracene	120-12-7			-	-	-	-	-	-	-	**1** [d]	TCEQ: Screening value based on a health endpoint (interim ESL and AMCV, supporting documentation not available) in PM.
Benzo(a)anthracene	56-55-3			-	-	-	-	-	-	-	**0.5** [d]	TCEQ: Screening value based on a health endpoint (interim ESL and AMCV, supporting documentation not available) in PM.
Benzo(a)pyrene				-	-	-	-	-	-	-	-	A 1-hour screening value is not available. Acute inhalation exposure is assessed utilizing the 24-hour exposure scenario.
Benzo(b)fluoranthene				-	-	-	-	-	-	-	**0.5** [d]	TCEQ: Screening value based on a health endpoint (interim ESL and AMCV, supporting documentation not available) in PM.
Benzo(g,h,i)perylene				-	-	-	-	-	-	-	**0.5** [d]	TCEQ: Screening value based on a health endpoint (interim ESL and AMCV), supporting documentation not available) in PM.
Benzo(k)fluoranthene	207-08-9			-	-	-	-	-	-	-	**0.5** [d]	TCEQ: Screening value based on a health endpoint (interim ESL and AMCV), supporting documentation not available) in PM.
Chrysene	218-01-9			-	-	-	-	-	-	-	**0.5** [d]	TCEQ: Screening value based on a health endpoint (interim ESL and AMCV), supporting documentation not available) in PM.
Dibenz(a,h)anthracene	53-70-3			-	-	-	-	-	-	-	**0.5** [d]	TCEQ: Screening value based on a health endpoint (interim ESL and AMCV), supporting documentation not available) in PM.
Fluoranthene	206-44-0			-	-	-	-	-	-	-	**0.5** [d]	TCEQ: Screening value based on a health endpoint (interim ESL and AMCV, supporting documentation not available) in PM.
Fluorene	86-73-7			-	-	-	-	-	-	-	**10** [d]	TCEQ: Screening value based on a health endpoint (interim ESL and AMCV, supporting documentation not available) in PM.
Indeno(1,2,3-c,d)pyrene	193-39-5			-	-	-	-	-	-	-	**0.5** [d]	TCEQ: Screening value based on a health endpoint (interim ESL and AMCV, supporting documentation not available) in PM.
Naphthalene	91-20-3			-	-	-	-	-	-	-	**500** [d]	TCEQ: Screening value (ESL) based on a health endpoint (interim, adopted from NIOSH/OSHA/TLV, supporting documentation not available). TCEQ applied a safety factor of 100 to the 8 hour TWA of 50 000 µg/m3. TCEQ value of 500 µg/m3 was not selected as the limit is based on occupational studies. Naphthalene will be assessed indirectly using particulate matter as a surrogate.
Phenanthrene	85-01-8			-	-	-	-	-	-	-	**8** [d]	TCEQ: Screening value based on a health endpoint (interim ESL and AMCV, supporting documentation not available) in PM.
Pyrene	129-00-0			-	-	-	-	-	-	-	**0.5** [d]	TCEQ: Screening value based on a health endpoint (interim ESL and AMCV, supporting documentation not available) in PM.

Notes

- = no guideline available or not applicable; AMCV= Air Monitoring Comparison Value; AQG = Air Quality Guideline; ATSDR = Agency for Toxic Substances and Disease Registry; Cal OEHHA = California Office of Environmental Health Hazard Assessment; CCME = Canadian Council of Ministers of the Environment; ENV = British Columbia Ministry of Environment and Climate Change Strategy; ESL = Effects Screening Level; LOAEL= Lowest observed adverse effect level; MECP = Ontario Ministry of the Environment, Conservation and Parks; MRL = Minimal Risk Level; NAAQO = National Ambient Air Quality Objectives; NAAQS = National Ambient Air Quality Standard; NOAEL= No observed adverse effect leve; PM= Particulate Matter; REL = Reference Exposure Level; ReV= Reference Value; TCEQ = Texas Commission on Environmental Quality; US EPA = United States Environmental Protection Agency; WHO = World Health Organization

Concentrations are in micrograms per cubic metre (µg/m^3), unless otherwise noted.

Concentrations in parts per million (ppm) were converted to mg/m^3 by applying the formula: molecular weight (grams per mol) x ppm / 24.45.

Bold and Shaded = selected screening value

(a) Air Monitoring Comparison Value (AMCV), which are based on the Reference Value (ReV) adjusted to HQ=1, are preferentially selected over the Effect Screening Level (ESL), are based on the Reference Value adjusted to HQ=0.3, where available. Where values are the same (i.e., interim values), then both AMCV and ESL are selected. ReV are toxicological studies derived from relevant studies and are presented in available supporting documentation associated with the parameter.

(b) Acute ReV. based on an HQ=1. was preferentially selected over acute ESL. based on HQ=0.3 as AMCV were not available. See footnote (a) for TCEQ selection approach.
(c) Selected values are preferentially selected over more conservative criteria of the tertiary sources if supporting documentation is available for the selected criteria only, criteria is based on more current studies, or criteria is based on studies which are more relevant to human health (i.e., human studies).
(d) Criteria selected for the development of a trigger level. Due to the lack of supporting documentation for the selected screening criteria, constituent will be assessed indirectly using particulate matter as a surrogate if an exceedance of the trigger level were to occur.

References:

ENV (British Columbia Ministry of Environment and Climate Change Strategy). 2021. Provincial Air Quality Information Sheet - British Columbia Ambient Air Quality Objectives. Updated November 2021. Available at: https://www2.gov.bc.ca/assets/gov/environment/air-land-water/air/reports-pub/prov air qual objectives fact sheet.pdf

Cal OEHHA (California Office of Environmental Health Hazard Assessment). 2020. OEHHA Acute, 8-hour and Chronic Reference Exposure Level (REL) Summary, as of August 2020. Air Toxicology and Epidemiology Branch, Office of Environmental Health Hazard Assessment. Oakland, CA. Available at: https://oehha.ca.gov/air/general-info/oehha-acute-8-hour-and-chronic-reference-exposure-level-rel-summary. Accessed February 2024.
CCME (Canadian Council of Ministers of the Environment). 2024. Canadian Ambient Air Quality Standards. CCME. Available at: https://ccme.ca/en/air-quality-report. Accessed February 2024.
ATSDR (Agency for Toxic Substances and Disease Registry). 2024. Minimal Risk Levels (MRLs) for Hazardous Substances. January 2024. US Department of Health and Human Services, Public Health Service. Available at: https://wwwn.cdc.gov/TSP/MRLS/mrlsListing.aspx. Accessed February 2024.
WHO (World Health Organisation). 2021. WHO Air Quality Guidelines for Particulate Matter (PM2.5 and PM10), Ozone, Nitrogen Dioxide, Sulfur Dioxide and Carbon Monoxide. WHO, Geneva, Switzerland. Available at: https://iris.who.int/bitstream/handle/10665/345329/9789240034228-eng.pdf. Accessed February 2024.
WHO. 2010. WHO Guidelines for Indoor Air Quality: Selected Pollutants. WHO, Geneva, Switzerland. Available at: https://iris.who.int/bitstream/handle/10665/260127/9789289002134-eng.pdf?sequence=1. Accessed February 2024.
MECP (Ontario Ministry of Environment, Conservation and Parks). 2020. Ontario's Ambient Air Quality Criteria. Human Toxicology and Air Standards Section, Technical Assessment and Standards Development Branch, MECP. Available at: https://www.ontario.ca/page/ontarios-ambient-air-quality-criteria. Accessed March 2024.
TCEQ (Texas Commission on Environmental Quality). 2023. Texas Air Monitoring Information System (TAMIS) Web Interface V 5.2.3. Available at: https://www17.tceq.texas.gov/tamis/index.cfm?fuseaction=home.welcome
US EPA (United States Environmental Protection Agency). 2024. United States National Ambient Air Quality Standards (NAAQS) Table. Last updated February 7, 2024. Available at: https://www.epa.gov/criteria-air-pollutants/naaqs-table. Accessed March 2024

Table B: 24-Hour (Acute) Air Thresholds											
				Primary		Secondary			Tertiary		
Parameter	CAS	Synonym(s)	Surrogate Options	ENV (2021) AAQO	CCME (1999, 2023) CAAQS and NAAQO	ATSDR (2024) MRL	US EPA (2024) NAAQS	WHO (2021) AQG	MECP (2020, 2023) AAQC/ACB	TCEQ (2023) AMCV	Toxicological Endpoints and Derivations
Criteria Air Contaminants											
Carbon monoxide (CO)	630-08-0			-	-	-	-	**4,000**	-	-	WHO: Based on a systemic review on CO exposure and hospital admissions for myocardial infarction. The 99th percentile daily mean concentrations in a year was calculated with the assumption that the 99th percentile is three times greater than the annual mean observed in the MCC Collaborative Research Network database. Although the risk of myocardial infarction hospital admissions and emergency room visits is expected to be elevated by about 5% on days where CO is equal to the air quality guideline, the overall health burden related to a few days with higher concentrations corresponds to a very small fraction of the total air pollution related burden (WHO, 2021).
Carbon monoxide (CO) (8-hour) [a]	630-08-0			**5,500**	Desirable NAAQO = 6,000 Acceptable NAAQO = 15,000 Tolerable NAAQO = 20,000	-	10,300 (9 ppm)	10,000	15,700	-	ENV: Pollution control objectives for food-processing, agriculturally orientated, and other industries; additional supporting documentation not available. CCME NAAQO: Screening value is based on cardiorespiratory effects in people with exercise-induced myocardial ischemia, which was evaluated and derived by the NAAQO in 1994 (NAAQO 1994). The NAAQO derived an 8-hour rolling average maximum acceptable level (15,000 µg/m3) which is based on the maintenance of blood carboxyhemoglobin concentrations below the LOEL of 2% (Allred et al. 1989; as cited in NAAQO 1994). The maximum acceptable level is an air quality concentration that is protective against effects on the environment, visibility, personal comfort, and well-being. The PBPK model developed by Coburn, Foster, and Kane was used to extrapolate a 2% blood carboxyhemoglobin concentration to an ambient carbon monoxide concentration in the air. The maximum desirable level was based on 1% blood carboxyhemoglobin concentration and the maximum tolerable level was based on a LOAEL of 2.9% carboxyhemoglobin. The maximum desirable level is the long term goal for air quality. US NAAQS: Screening value based on clinical evidence relating carboxyhemoglobin (carbon monoxide bound to blood hemoglobin) levels to various adverse health endpoints including hypoxia, cardiovascular effects, reproductive effects, central nervous system effects, respiratory effects and impairment of prenatal development. The NAAQS of 9 ppm was converted to µg/m3 using a molecular weight of 28.01 g/mol. WHO: Screening value is a time-weighted average 8-hour exposure derived so that the carboxyhemoglobin (carbon monoxide bound to blood hemoglobin) level of 2.5% is not exceeded (screening value for human health effect). MECP: Screening value based on a health endpoint (supporting documentation not available).
Nitrogen dioxide (NO2)	10102-44-0			-	-	-	-	**25**	200	-	WHO: Screening value based on studies of bronchial responsiveness among asthmatics as reviewed by the WHO. Based on their review, the WHO (2021) derived a 24-hr screening value based on the 99th percentile of common distributions of daily air pollution concentrations corresponding to an average long-term concentration equivalent to the annual air quality guideline. The effect estimates obtained from a systemic review on NO2 and daily hospital admissions for asthma supported the calculation of the short-term air quality guideline. MECP: Screening value based on a health endpoint (supporting documentation not available).
Sulphur dioxide (SO2)	7446-09-5			-	-	-	-	**40**	-	-	WHO: 24 hr screening value is based on the 99th percentile (equivalent to three to four exceedance days per year) of the annual distribution of 24-hour average concentrations. The epidemiological evidence underpinning the AQG level is discussed in a systematic review commissioned by WHO on asthma hospital admissions and emergency room visits (Zheng et al., 2021) and another on daily sulfur dioxide mortality (Orellano, Reynoso & Quaranta, 2021) (WHO 2021).
PM10	N/A			**50**	-	-	150	45	**50**	-	ENV: Supporting documentation not available. US NAAQS: Air screening level to protect against adverse health effects of inhalable airborne particles that can be deposited in the lower (thoracic) regions of the human respiratory tract. The standard is met when a 24-hr average PM10 concentration of 150 mg/m3 is not exceeded more than one day per year, on average over a three-year period. WHO: Based on non-accidental and cause-specific mortality (e.g., cardiovascular, non-malignant respiratory and cerebrovascular mortality). The guideline is derived from the 99th percentile of common distributions of daily air pollution concentrations corresponding to an average long-term concentration equivalent to the annual AQG level. MECP: Screening value based on a health endpoint (supporting documentation not available). Interim AAQC for decision making; no conversion to other averaging times.
PM2.5	N/A			**AQO = 25** CAAQS = 27	27	-	35	15	27	-	ENV: Supporting documentation not available. The provincial air quality objective is based on the annual 98th percentile of daily average, over one year and was selected as it is more conservative than the CAAQS. The objective is the primary air management tool that is used to guide decisions on environmental impact assessments and authorizations, airshed planning efforts, and regulatory development. The objective is also used to guide decisions on whether or not to issue an air quality advisory. CCME CAAQS: Air screening levels based on Canada Wide Standards, intended for the protection of respiratory effects. CCME has proposed a Canadian ambient air quality standard (CAAQS) for PM2.5 of 27 µg/m3 for the year 2020, which is intended to be protective of human health and the environment. The metric is the 3-year average of the annual 98th percentile of the daily 24-hour average concentrations. US NAAQS: Standard based on the 98th percentile of daily 24-hour concentrations averaged over 3 years and is protective of increased health effects associated with short-term PM2.5 exposure, including premature mortality and increased hospital admissions and emergency department visits. WHO: The guideline is based on the same toxicological endpoint as PM10 where exposure is associated with a 0.46 to 0.62% increase in mortality per 10 µg/m3 increase in PM10. The PM10 guideline is converted using a PM2.5:PM10 ratio of 0.5. This PM2.5:PM10 ratio is typical of that found in urban areas of developing countries and is at the bottom of the range found in urban areas in developed countries (0.5 to 0.8). The AQG is the 99th percentile of the annual distribution of 24-hour average concentrations, based on short-term exposure of PM2.5 and non-accidental mortality. MECP: Based on CCME CAAQS
Metals											
Aluminum	7429-90-5			-	-	-	-	-	12 [b]	**8.9**	MECP: 24 hr ACB screening level based on the lower annual screening value from the New York State Department of Environmental Conservation (2.4 µg/m3) and TCEQ (5 µg/m3). The MECP converted the annual New York guideline to a 24-hour averaging period using a conversion factor of 5. Screening value based on a health endpoint (supporting documentation for the annual screening value from New York not available). TCEQ: Screening value (AMCV) based on 4 h/d for 3 d (total exposure of 12 h) acute study that identified a NOAEL and a LOAEL of 3.2 and 7 mg Al/m3, respectively, for the changes in lung weight in male Hamsters (Drew 1974 as cited in TCEQ, 2021). The NOAEL was adjusted for a 24 hr exposure duration. Uncertainty factors were applied for interspecies variability (3), intraspecies variability (10) and database uncertainties (6), resulting in a threshold of 8.9 ug/m3 for aluminum.
Antimony	7440-36-0			-	-	**1**	-	-	25	-	ATSDR: Screening value based on squamous metaplasia of the epiglottis respiratory endpoints. Mice were exposed to 0, 3.71, 7.43, 14.7, 30.2 and 59.4 mg/m3 antimony trioxide gas for 17 days (ATSDR 2019). A BMCL10 of 940 µg/m3 was identified as the point of departure. The BMCL10 was adjusted for a human equivalency concentration (HEC) (35 µg/m3). Uncertainty factors for extrapolation from animals to humans using dosimetric adjustments (3), and human variability (10) were applied, for a total uncertainty factor of 30. The acute-duration inhalation MRL was adopted as the 24-hour air threshold. MECP: Screening value based on a health endpoint (supporting documentation not available).
Arsenic	7440-38-2			-	-	-	-	-	0.3	**5.4** [c]	MECP: Screening value based on an occupational exposure study conducted on retired copper smelter employees, who had worked in copper smelters for 28 years (Pinto et al. 1978 as cited in MECP 1981). The study examined urinary arsenic biomarkers and found an increased risk of mortality due to lung cancer associated with duration and degree of exposure to arsenic trioxide. TCEQ: Screening value (AMCV) based on a study where female rats were exposed to 0, 0.3, 3, and 10 mg/m3 arsenic trioxide for 6 hours/day for multiple days (Holson et al. 1999; as cited in TCEQ 2021). The NOAEL and LOAEL for maternal effects (i.e., rales) were 3000 and 10,000 µg/m3, respectively. The TCEQ chose the NOAEL of 3000 µg/m3 as the point of departure. The NOAEL was adjusted for a human equivalent concentration of 0.714 (2142 µg/m3). Uncertainty factors were applied for interspecies variability (3), intraspecies variability (10) and database uncertainties (10), resulting in a threshold of 7.14 ug/m3 for arsenic trioxide. The threshold for arsenic trioxide was adjusted for arsenic (arsenic trioxide is 76% arsenic by weight), resulting in a threshold of 5.4 µg/m3. The TCEQ value was selected preferentially over the MECP value because the MECP value is based on a carcinogenic endpoint, which is better suited for the evaluation of chronic effects.
Cadmium	7440-43-9			-	-	**0.03**	-	-	0.025	0.55	ATSDR: Screening value based on a LOAEL of 88 µg/m3 for respiratory effects in rats exposed to cadmium oxide for 6.2 hours/day, 5 days/week for 2 weeks (ATSDR 2012). A NOAEL was not available from this study because effects were observed in all concentrations tested. The LOAEL was adjusted for continuous exposure (88 µg cadmium/m3 x 6.2 hours/24 hours x 5 days/7 days) and for a regional deposited dose ratio in the pulmonary region of 0.617 to determine a human equivalent concentration (HEC; 10 µg/m3). An uncertainty factor of 300 (3 for extrapolating from animals to humans, 10 for a use of a LOAEL and 10 for human variability) was applied to the HEC (10 mg/m3). MECP: The MECP used a conversion factor of 5 to convert from the annual-averaging value (0.005 µg/m3) to the 24-hour averaging-value. Screening value is based on the annual MECP screening value, which is based on kidney effects associated with exposure to cadmium compounds (MECP 2006). TCEQ: Screening value based on the same study used to derive the ATSDR MRL. The LOAEL was 0.088 mg/m3 (total of 62 hours of exposure) (TCEQ 2016). The LOAEL was not extrapolated to a 24-hour exposure. The LOAEL was adjusted for a regional deposited dose ration (1.87), resulting in a human equivalent concentration point of departure (PODHEC) of 165 µg/m3. An uncertainty factor of 300 was applied (3 for interspecies variability, 10 for intraspecies variability and 10 for use of a LOAEL).
Chromium (total or trivalent)	7440-47-3			-	-	-	-	-	0.5(f)	-	MECP: metallic, divalent and trivalent forms: Screening value for chromium (metallic, divalent and trivalent forms) based on a subchronic inhalation study where rats were exposed to various forms of trivalent chromium at 3, 10, and 30 mg/m3 for 6 hours/day, 5 days/week for 13 weeks. The authors derived the BMCL10 value of 3.45 mg/m3 chromium sulphate for increases in total lung and trachea weights (relative to body weight) in rats. The BMCL10 was adjusted for continuous exposure (3.45 mg/m3 x 6/24 hours x 5/7 days = 0.616 mg/m3) and converted to a human equivalent concentration using a Regional Deposited Dose Ratio value of 1.31. The fraction of trivalent chromium in chromium sulfate was accounted for (17%) yielding, resulting in an adjusted concentration of 0.138 mg/m3. Uncertainty factors of 10 (intraspecies variability), 3 (interspecies extrapolation), and 10 (use of a subchronic (13-weeks) study) were applied. The MECP value was not selected as it is based on chronic exposures. Acute exposure was assessed using 1-hour air criteria.
Chromium (hexavalent)	18540-29-9			-	-	-	-	-	0.007	**1.3** [c]	MECP: The MECP used a conversion factor of 5 to convert from the annual-averaging value (0.00014 µg/m3) to the 24-hour averaging-value. Screening value is based on the annual MECP value, which is based on carcinogenic effects of chromium IV (MECP 2011). The 24-hour MECP value is based on hexavalent chromium in the TSP size fraction, which incorporates the MECP assumption that approximately 50% of TSP is in the PM10 fraction. The annual MECP screening value is based on a cancer risk of 1 in 1,000,000 and was adjusted to a cancer risk of 1 in 100,000; therefore, the 24-hour value was also adjusted by 10. TCEQ: Screening value for hexavalent chromium based on a benchmark concentration lower confidence limit corresponding to the lower 10% incidence of effect (BMCL10) of 16.06 µg Cr(VI)/m3 for increased relative lung weight in rats exposed to 0, 50, 100, 200, or 400 µg Cr(VI)/m3, as sodium dichromate, for 22 hours/day for 7 days/week for 30 days (TCEQ 2014). The BMCL10 was not adjusted for continuous exposure by TCEQ because the study exposure duration of 22 hours/day, 7 days/week for 30 days is much longer than the acute duration of interest (24-hour). The BMCL10 was adjusted for a human equivalent concentration (HEC) using the regional deposited dose ratio for animal to human adjustment of 2.41. Uncertainty factors for interspecies variation (3) and intraspecies variation (10) were applied. The resulting screening value of 1.3 µg Cr(VI)/m3 was based on an HQ = 1.0. The TCEQ value was selected preferentially over the MECP value because the MECP value is based on a carcinogenic endpoint, which is better suited for the evaluation of chronic effects.
Cobalt	7440-48-4			-	-	-	-	-	0.1	**0.095**	MECP: Screening value based on a health endpoint (supporting documentation not available). TCEQ: Screening value based on respiratory effects in occupationally-exposed people (TCEQ 2017). The 6-hour LOAEL of 38 µg/m3 was adjusted to 24 hours using the following equation: C2 = C1 * (T1/T2) , where C1 = 38 µg/m3, T1 = 6 hours and T2 = 24 hours . An uncertainty factor of 100 was applied (10 for interspecies variability, 10 for use of a LOAEL).
Copper	7440-50-8			-	-	-	-	-	50(f)	-	MECP: Screening value based on a health endpoint (supporting documentation not available). The MECP value was not selected as it is based on chronic exposures and there is a lack of supporting documentation. Acute exposure was assessed using 1-hour air criteria.
Iron	7439-89-6			-	-	-	-	-	**4** [d]	-	MECP: The MECP derived the 24-hour screening value from a 1/2-hour value (10 ug/m3) using a conversion factor of 2.5. The conversion factor of 2.5 accounts for differences in sampling time and the potential for multiple iron sources (MECP 2005). The 1/2-hour standard of 10 ug/m3 for metallic iron, derived in 1968, was established as an upper limit concentration that would not result in rust spotting on vehicles. Instances of car spotting were reported by Fochtman and Langer (1957) when this 1/2 limit was exceeded. In a subsequent review which focused on the health effects of iron, the established AAQC of 4 ug/m3 (24-hours) was determined to be health-protective for the general population (reported health effect: pulmonary siderosis, a form of pneumoconiosis due to inhalation of iron particles - a chronic endpoint), but conservatively so. For comparison, the health-based threshold limit value (TLV) of 5,000 ug/m3 (measured as iron) from an occupational study suggests that iron spotting on vehicles occurs at a much lower concentration than health-effects.
Lead	7439-92-1			-	-	-	-	-	**0.5**	-	MECP: Screening value based on neurological effects in children. The screening value is based on Cal EPA (2001; as cited in (MECP 2007) approach where the airborne lead concentration is based on a 5% probability of children in a reference population exceeding the LOAEL. The study that formed the basis of the Cal EPA derivation (Lanpear et al. 2005 as cited in CalEPA 2001) evaluated the epidemiologic incidence of increased blood lead levels and decreased intelligence quotients (IQ), in several cohorts of children. The LOAEL blood level lead was determined to be 10 µg/dL. An uncertainty factor of 2 to account for other study results that showed blood levels below the LOAEL associated lower IQ and other adverse neurobehavioural effects.

Table B: 24-Hour (Acute) Air Thresholds											
				Primary		Secondary			Tertiary		
Parameter	CAS	Synonym(s)	Surrogate Options	ENV (2021) AAQO	CCME (1999, 2023) CAAQS and NAAQO	ATSDR (2024) MRL	US EPA (2024) NAAQS	WHO (2021) AQG	MECP (2020, 2023) AAQC/ACB	TCEQ (2023) AMCV	Toxicological Endpoints and Derivations
Manganese	7439-96-5			-	-	-	-	-	0.1 (PM2.5) 0.2 (PM10) 0.4 (SPM)	**5** [(c)]	MECP: Screening value based on the occupational exposure to manganese. A $BMCL_{05}$ of 84 µg/m3 for neurological effects (eye-hand coordination impairment) was identified (Roels et al. 1992 as cited in MECP 2011). The BMCL05 was adjusted for continuous exposure (84 µg/m3 x 5/7 days x 10m3/20m3 = 30 µg/m3). Uncertainty factors of 10 (intraspecies variability), 3 (database limitations), 3 (subchronic to chronic extrapolation) were applied, resulting in a screening value of 0.1 µg/m3 for manganese in PM2.5. This was converted to a manganese concentration in PM10 and then TSP (0.4 µg/m3) on the basis that approximately 50% of ambient PM10 is made up of PM2.5 and approximately 50% of ambient TSP is made up of PM10. TCEQ: Screening value based on an inhalation study where rhesus monkeys were exposed to manganese sulphate for 6 hours per day, 5 days per week for 3 weeks (total of 90 hours of exposure) (TCEQ 2017). The critical effect was mild inflammatory changes to the airway with a point of departure LOAEL (6 hours of exposure) of 1.5 mg Mn/m3. The LOAEL did not require adjustment to a human equivalent concentration (HEC) because the particulate deposition efficiency is the same in rhesus monkeys and humans. Uncertainty factors for extrapolation from a LOAEL to a NOAEL (2), intrahuman variability (10), 3 to account for potential toxicodynamic differences between rhesus monkeys and humans and 6 for a limited database were applied; however, a maximum uncertainty factor of 300 is used to derive an acute reference value of 5 µg/m3.
Mercury	7439-97-6			-	-	-	-	-	2(f)	-	MECP: Screening value based on the NIOSH occupational limit of 50 $\mu g/m^3$ for mercury compounds (MECP 2020). The MECP divided the NIOSH occupational limit (50 $\mu g/m^3$) by a factor of 25 to obtain the 24-hour screening value (MECP 2020). The MECP value was not selected as it is based on chronic exposures. Acute exposure was assessed using 1-hour air criteria.
Nickel	7440-02-0			-	-	0.2	-	-	0.1 (PM10) 0.2 (SPM)	**1.1** [(c)]	ATSDR: Screening value based on chronic active inflammation respiratory endpoints in rats (ATSDR 2005). Rats were exposed to 0.12, 0.25,0.5,1.0, or 2.0 mg/m3 nickel sulfate hexahydrate for 6 hours per day, 5 days per week for 13 weeks. A NOAEL of 0.06 mg/m3 was observed. The NOAEL was adjusted for intermittent exposure, yielding 11 µg-Ni/m3. The NOAEL human equivalency concentration (HEC) was calculated using the adjusted NOAEL and a regional deposited dose ratio of 0.474 for the pulmonary region. The NOAEL HEC was 5.2 µg-Ni/m3. Uncertainty factors for extrapolation from animals to humans with dosimetric adjustment (3), and human variability (10) were applied for an uncertainty factor of 30. MECP: MECP used a conversion factor of 5 to convert from the annual-averaging value (0.02 µg/m3). Screening value is for nickel as a metal in PM10. Screening value based on the annual MECP screening value which is based on carcinogenic and non-carcinogenic effects (MECP 2011). The MECP screening value of 0.2 µg/m3 is based on nickel in TSP assuming that approximately 50% of ambient TSP is made up of PM10. TCEQ: Screening value (AMCV) as PM10 based on an inhalation study where rats were exposed to Ni for 72 hours over 12 exposure days (TCEQ 2021). The critical effect was lung inflammation and increased relative lung weight with a point of departure LOAEL of 0.7 mg Ni/m3. The LOAEL was adjusted to a human equivalent concentration (HEC) for a POD of 0.9191 mg Ni/m3. Uncertainty factors for extrapolation of LOAEL to NOAEL (10), intrahuman variability (10), and potential toxicodynamic differences between rats and humans (3) were applied to derive a final acute reference value of 3.1 µg Ni/m3. The candidate interim 24-ReV of 3.1 µg Ni/m3 is higher than the 1-hour ReV of 1.1 µg Ni/m3 (based on bronchial constriction in human volunteers with occupational asthma). While associated with uncertainty that is an order of magnitude higher, the candidate interim 24-ReV supports use of the 1-hour ReV (1.1 µg Ni/m3) as the interim 24-hour ReV. TCEQ AMCV was selected as it is derived from an acute exposure study, while MECP and ATSDR are based on longer intermediate or chronic exposure durations.
Selenium	7782-49-2			-	-	-	-	-	**10**	-	MECP: Screening value based on a health endpoint (supporting documentation not available).
Polycyclic Aromatic Hydrocarbons											
1-Methylnaphthalene	90-12-0			-	-	-	-	-	**35.5** [(b)]	-	MECP: 24 hr ACB screening level based on a health endpoint (supporting documentation not available).
2-Methylnaphthalene	91-57-6			-	-	-	-	-	**35.5** [(b)]	-	MECP: 24 hr ACB screening level based on a health endpoint (supporting documentation not available).
Acenaphthene	83-32-9			-	-	-	-	-	-	-	A 24-hour screening value was not available; acute exposure evaluated for 1-hour averaging time only.
Acenaphthylene	208-96-8		Acenaphthene	-	-	-	-	-	-	-	A 24-hour screening value was not available; acute exposure evaluated for 1-hour averaging time only.
Anthracene	120-12-7			-	-	-	-	-	-	-	A 24-hour screening value was not available; acute exposure evaluated for 1-hour averaging time only.
Benzo(a)anthracene	56-55-3			-	-	-	-	-	-	-	A 24-hour screening value was not available; acute exposure evaluated for 1-hour averaging time only.
Benzo(a)pyrene	50-32-8			-	-	-	-	-	**0.0005 (0.00005)**	-	MECP: MECP used a conversion factor of 5 to convert from the annual-averaging value (0.00001 µg/m3) to the 24-hour averaging value. Screening value based on the annual MECP screening value, which is based on carcinogenic effects (MECP 2011). The annual MECP screening value is based on a cancer risk of 1 in 1,000,000 and was adjusted to a cancer risk of 1 in 100,000; therefore, the 24-hour value was also adjusted by 10 for this assessment.
Benzo(b)fluoranthene	205-99-2			-	-	-	-	-	-	-	A 24-hour screening value was not available; acute exposure evaluated for 1-hour averaging time only.
Benzo(g,h,i)perylene	191-24-2			-	-	-	-	-	-	-	A 24-hour screening value was not available; acute exposure evaluated for 1-hour averaging time only.
Benzo(k)fluoranthene				-	-	-	-	-	-	-	A 24-hour screening value was not available; acute exposure evaluated for 1-hour averaging time only.
Chrysene	218-01-9			-	-	-	-	-	-	-	A 24-hour screening value was not available; acute exposure evaluated for 1-hour averaging time only.
Dibenz(a,h)anthracene	53-70-3			-	-	-	-	-	-	-	A 24-hour screening value was not available; acute exposure evaluated for 1-hour averaging time only.
Fluoranthene	206-44-0			-	-	-	-	-	-	-	A 24-hour screening value was not available; acute exposure evaluated for 1-hour averaging time only.
Fluorene	86-73-7			-	-	-	-	-	-	-	A 24-hour screening value was not available; acute exposure evaluated for 1-hour averaging time only.
Indeno(1,2,3-c,d)pyrene	193-39-5			-	-	-	-	-	-	-	A 24-hour screening value was not available; acute exposure evaluated for 1-hour averaging time only.
Naphthalene	91-20-3			-	-	-	-	-	**22.5** [(e)]	-	MECP: Screening value based on adverse respiratory effects in mice following single intraperitoneal injections of naphthalene (0.05- 2.0 mmol/kg) dissolved in corn oil. The endpoint measured in mice included ultrastructural or histopathological changes in the nonciliated bronchiolar epithelial cells. The study found a NOAEL of 6.4 mg/kg, which was converted to the human equivalent concentration (6.4 mg/kg x 70 kg ÷ 20 m3/d = 22.5 mg/m3), and an uncertainty factor of 1000 was applied for the extrapolation from acute to chronic, intraspecies extrapolation, and interspecies extrapolation (MECP 1987).
Phenanthrene	85-01-8			-	-	-	-	-	-	-	A 24-hour screening value was not available; acute exposure evaluated for 1-hour averaging time only.
Pyrene	129-00-0			-	-	-	-	-	-	-	A 24-hour screening value was not available; acute exposure evaluated for 1-hour averaging time only.

Notes

- = no guideline available or not applicable; ACB = Air Contaminant Benchmarks; AMCV= Air Monitoring Comparison Values; AQG = Air Quality Guideline; ATSDR = Agency for Toxic Substances and Disease Registry; CCME = Canadian Council of Ministers of the Environment; ENV = British Columbia Ministry of Environment and Climate Change Strategy; LOAEL= Lowest observed adverse effect level; MECP = Ontario Ministry of the Environment, Conservation and Parks; MRL = Minimal Risk Level; NAAQO = National Ambient Air Quality Objectives; NAAQS = National Ambient Air Quality Standard; NOAEL= No observed adverse effect level; ReV= Reference value; TCEQ = Texas Commission on Environmental Quality; US EPA = United States Environmental Protection Agency; WHO = World Health Organization.

Concentrations are in microgram per cubic metre (µg/m3), unless otherwise noted.
Concentrations in parts per million (ppm) were converted to mg/m3 by applying the formula: molecular weight (grams per mol) x ppm / 24.45.
(a) Carbon monoxide was evaluated using an 8-hr averaging time rather than a 24-hr averaging time as no 24-hr screening value was available.
(b) MECP (2021) Air Contaminant Benchmark (ACB) was selected given MECP (2020) Ambient Air Quality Criteria (AAQC) were unavailable. The ACBs are standards, guidelines and screening levels for assessing point of impingement concentrations.
(c) Selected values are preferentially selected over more conservative criteria of the secondary or tertiary sources if criteria is based on more current studies, non-carcinogenic endpoint and/or acute exposure instead of chronic exposure.
(d) Criteria selected for the development of a trigger level. Given that the MECP 24-hour screening criterion is based on an aesthetic endpoint (i.e., protective of rust spotting on vehicles) that is considered to also be protective of a chronic health endpoint, iron will be assessed indirectly using particulate matter as a surrogate if an exceedance of the trigger level were to occur.

(e) Criteria selected for the development of a trigger level. Given that the MECP 24-hour screening criterion is protective of a chronic health endpoint, naphthalene will be assessed indirectly using particulate matter as a surrogate if an exceedance of the trigger level were to occur.
(f)The 24-hour MECP value was not selected as it is based on chronic exposures. Acute exposure was assessed using the 1-hour air criteria.
Bold and Shaded = selected screening value

References:

ENV (British Columbia Ministry of Environment and Climate Change Strategy). 2021. Provincial Air Quality Information Sheet - British Columbia Ambient Air Quality Objectives. Updated November 2021. Available at: https://www2.gov.bc.ca/assets/gov/environment/air-land-water/air/reports-pub/prov_air_qual_objectives_fact_sheet.pdf

Cal OEHHA (California Office of Environmental Health Hazard Assessment). 2020. OEHHA Acute, 8-hour and Chronic Reference Exposure Level (REL) Summary, as of August 2020. Air Toxicology and Epidemiology Branch, Office of Environmental Health Hazard Assessment. Oakland, CA. Available at: https://oehha.ca.gov/air/general-info/oehha-acute-8-hour-and-chronic-reference-exposure-level-rel-summary
CCME (Canadian Council of Ministers of the Environment). 2024. Canadian Ambient Air Quality Standards. CCME. Available at: https://ccme.ca/en/air-quality-report. Accessed February 2024.
ATSDR (Agency for Toxic Substances and Disease Registry). 2024. Minimal Risk Levels (MRLs) for Hazardous Substances. January 2024. US Department of Health and Human Services, Public Health Service. Available at: https://wwwn.cdc.gov/TSP/MRLS/mrlsListing.aspx. Accessed February 2024.

WHO (World Health Organisation). 2021. WHO Air Quality Guidelines for Particulate Matter (PM2.5 and PM10), Ozone, Nitrogen Dioxide, Sulfur Dioxide and Carbon Monoxide. WHO, Geneva, Switzerland. Available at: https://iris.who.int/bitstream/handle/10665/345329/9789240034228-eng.pdf. Accessed February 2024.

WHO. 2010. WHO Guidelines for Indoor Air Quality: Selected Pollutants. WHO, Geneva, Switzerland. Available at: https://iris.who.int/bitstream/handle/10665/260127/9789289002134-eng.pdf?sequence=1. Accessed February 2024.
MECP (Ontario Ministry of Environment, Conservation and Parks). 2020. Ontario's Ambient Air Quality Criteria. Human Toxicology and Air Standards Section, Technical Assessment and Standards Development Branch, MECP. Available at: https://www.ontario.ca/page/ontarios-ambient-air-quality-criteria. Accessed March 2024.
MECP. 2023. Air Contaminants Benchmarks List: standards, guidelines and screening levels for assessing point of impingement concentrations of air contaminants. Last updated November 2023. Available at: https://www.ontario.ca/document/air-contaminants-benchmarks-list-standards-guidelines-and-screening-levels-assessing-point

TCEQ (Texas Commission on Environmental Quality). 2023. Texas Air Monitoring Information System (TAMIS) Web Interface V 5.2.3. Available at: https://www17.tceq.texas.gov/tamis/index.cfm?fuseaction=home.welcome
US EPA (United States Environmental Protection Agency). 2024. United States National Ambient Air Quality Standards (NAAQS) Table. Last updated February 7, 2024. Available at: https://www.epa.gov/criteria-air-pollutants/naaqs-table. Accessed March 2024

Table D-5c - Air Screening Criteria (Annual)

Table C: Annual (Chronic) Air Thresholds													
					Primary		Secondary			Tertiary			
Parameter	CAS	Synonym(s)	Surrogate Options	Carcinogen Classification	ENV (2021) AAQO	CCME (2023) CAAQS	ATSDR (2020) MRL	US EPA (2023, 2024) RSL/NAAQS[a], [b]	WHO (2021) AQG	MECP (2020) AAQC [c]	Cal OEHHA (2020) REL [d]	TCEQ (2023) AMCV/ReV [e]	Toxicological Endpoints and Derivations
Criteria Air Contaminants													
Carbon monoxide (CO)	630-08-0			NC	-	-	-	-	-	-	-	-	Chronic screening values not available because health effects linked to CO are associated with shorter term exposures (i.e., 1- or 8 hours).
Nitrogen dioxide (NO2)	10102-44-0			NC	Interim AQO = 60 CAAQS = 32 **CAAQS = 23** **(effective in 2025)**	32 (17 ppb) (effective in 2020) **23** **(12 ppb)** **(effective in 2025)**	-	100 (53 ppb)	40	-	-	-	ENV: Supporting documentation not available for screening value. The interim AQO is 60 µg/m3 and the CAAQS of 32 µg/m3 took effect on 1 January 2020. A value of 23 µg/m3 is proposed for the year 2025 and it was selected as the screening value as it is more conservative than the 2020 CAAQS of 32 µg/m3. The CAAQS is the annual average of 1-hour average concentrations over one year. The CAAQS of 12 ppb was converted to µg/m3 using a molecular weight of 46.01. CCME CAAQS: Proposed screening value for the year 2025 was selected as it is more conservative than the 2020 CAAQS of 32 µg/m3 (supporting documentation not available). The metric is the average over a single calendar year of all 1-hour average concentrations. The CAAQS of 17 and 12 ppb were converted to µg/m3 using a molecular weight of 46.01. US NAAQS: Screening value based on a large body of evidence for respiratory effects from exposure to nitrogen oxides. The key clinical studies on human health effects are based on shorter exposure durations (0.5 to 3 hours). The health effects reported include increased airway responsiveness in asthmatics, small decreases in forced vital capacity and forced expiratory volume in one second (FEV1) with mild exercise in patients with chronic obstructive pulmonary disease, increased airway responsiveness to bronchoconstrictors in healthy adults, and changes in lung function in healthy adults (US EPA 1993). The key epidemiological studies on human health effects indicated increased risk of lower respiratory symptoms/disease in children (aged 5 to 12 years). Exposure to NO2 in occupational settings was associated with bronchial pneumonia and bronchitis (25 to 100 ppm). In high occupational exposure cases (>200 ppm), effects ranged from hypoxemia/transient airway obstruction to death (US EPA 1993). The NAAQS is a primary and secondary value, which is protective of "sensitive" populations such as asthmatics, children, and the elderly. The NAAQS of 53 ppb was converted to µg/m3 using a molecular weight of 46.01 g/mol. WHO: Screening value based on a health endpoint. Epidemiological studies show that reduced lung function in children is linked to elevated NO2 concentrations within communities already at current North American and European urban ambient air levels. Studies indicated that a 28.2 µg/m3 increase in nitrogen dioxide is associated with a 20% increase in the odds of lower respiratory symptoms. WHO (2000) states that there is still no robust basis for setting a guideline value based on any direct toxic effect. The screening value was set based on a meta-analysis of indoor air studies; however, there is evidence to suggest that there are health effects at the current screening value. The extent to which observed health effects in studies are attributable to NO2 itself is still unknown (WHO 2000).
Sulphur dioxide (SO2) (10-minute)	7446-09-5												
Sulphur dioxide (SO2)	7446-09-5			NC	CAAQS = 13 **CAAQS = 10** (4 ppb) (effective in 2025)	13 (5 ppb) (effective in 2020) **10** (4 pbb) (effective in 2025)	-	-	-	-	-	-	ENV: Supporting documentation not available. A value of 10 µg/m3 is proposed for the year 2025. It was selected as the screening value as it is more conservative than the 2020 CAAQS of 13 µg/m3. The CAAQS is the average over a single calendar year of all the 1-hour average concentrations. The CAAQS of 4 ppb was converted to µg/m3 using a molecular weight of 64.07. CCME CAAQS: The annual screening value of 4.0 ppb is intended to be applied to the average over a single calendar year of all the 1-hour average SO2 concentrations. It was selected as the screening value as it is more conservative than the 2020 CAAQS of 13 µg/m3. Based upon protection of human health and the environment. The CAAQS of 5 and 4 ppb were converted to µg/m3 using a molecular weight of 64.07.
PM10	N/A			NC	-	-	-	-	**15**	-	-	-	WHO: The PM10 annual AQG level was reduced from 20 µg/m^3 to 15 µg/m^3 (WHO 2021). This reflects the new evidence of effects on mortality occurring at concentrations below 20 µg/m3. In this update of the air quality guidelines, an analysis was introduced to identify the most appropriate level of the long-term air quality guidelines that is more formalized than what was used in 2005. However, the change from 20 µg/m3 to 15 µg/m3 primarily reflects the new evidence about effects occurring at low levels. It is important to note that the assessment of PM10 was based on studies that had actually measured PM10, without taking into consideration the ratios between PM10 and PM2.5. In 2005 based on empirical data, a PM10 : PM2.5 ratio of 2 was used to establish the PM10 AQG levels. The GDG notes that the empirical PM10 : PM2.5 ratios have not changed, but the method used to derive the AQG levels has changed. The resulting PM10 annual AQG level is less protective than the PM2.5 annual AQG level in most practical circumstances.
PM2.5	N/A			NC	**Provincial AAQO= 8** CAAQS = 8.8	8.8	-	9	5	8.8	-	-	ENV: Supporting documentation not available. The CAAQS of 8.8 µg/m3 comes into effect on 1 January 2020 and is based on the annual average, averaged over three consecutive years. The planning goal of 6 µg/m3 is a voluntary target used to guide airshed planning efforts and encourage communities to maintain good air quality during economic growth and development. The air quality objective of 8 µg/m3 is an air management tool used to guide decisions on environmental impact assessments and authorizations, airshed planning efforts and regulatory development (ENV 2008; BC MHLS 2009). The air quality objective is based on the annual average, over one year, and was selected as the screening value because it is more conservative than the CAAQS. CCME CAAQS: Canadian ambient air quality standard protective of human health and the environment. The standard represents a balance between achieving the best health and environmental protection possible and the feasibility and costs of reducing pollutant emissions; a value of 8.8 µg/m3 is proposed for the year 2020. The metric is the 3-year average of the annual average concentrations. US EPA: The NAAQS is protective of adverse health effects associated with long-term PM2.5 exposure, including premature mortality, asthmatic symptoms, heart attacks, emergency room visists, and lost work/school days. Achievement is based on the annual mean, averaged over 3 years. In February 2024, US EPA announced its decision to lower the primary health-based annual standard from its current level of 12 ug/m3 to 9.0 ug/m3 to be more stringent and protective of public health in order to meet the Clean Air Act, which requires that primary standards are ""requisite to protect public health with an adequate margin of safety,"". This decision is based on review of the mose recent scientific evidence which suggest adverse health effects may occur from exposure at levels permitted by the previous standard of 12 ug/m3 . WHO: A long-term air quality guideline of 5 ug/m3 was established to protect against non-accidental and cause-specific mortality (e.g., circulatory, lung cancer, and non-malignant respiratory mortality). This guideline is derived from the average of the five lowest 5th percentile levels measured in five studies (WHO 2021). MECP: Based on CCME CAAQS
Inorganics													
Aluminum	7429-90-5			NC	-	-	-	**5.2**	-	-	-	1.5	US EPA: Screening value based on a provisional reference concentration (RfC) of 0.005 mg/m3 for neurotoxic effects (psychomotor and cognitive impairment) in occupationally exposed workers (US EPA 2006). Workers were exposed to a time-weighted average concentration of 4.6 to 11.5 mg/m3 for an average of 12 years. The LOAEL of 4.6 mg/m3 based on an 8-hour exposure was adjusted for continuous exposure and corrected for a human equivalent concentration (HEC). The LOAELHEC is 1.64 mg/m3. An uncertainty factor of 300 (10 for intrahuman variability, 10 for using a LOAEL and 3 for database limitations) was applied. A residential scenario exposure factor was applied to the RfC to derive the screening level. TCEQ: Screening value based on a health endpoint (Interim ESL and AMCV, supporting documentation not available) in PM.
Antimony	7440-36-0			NC	-	-	**0.3**	0.31	-	-	-	0.5	ATSDR: Screening value based on lung inflammation in Fischer rats exposed to 0, 0.06, 0.51 or 4.5 mg/m3 antimony trioxide dust for 6 hours/day, 5 days/week for 12 months followed by a 12-month observation period (Newton et al. 1994; as cited in ATSDR 2019). The minimum risk level was derived from a BMCL10 of 0.10 mg/m3. The BMCL10 was adjusted for intermittent exposure (PODADJ) followed by an adjustment to a human-equivalent concentration by multiplying the PODADJ by a regional deposited dose ratio (RDDR). A total uncertainty factor of 30 was then applied (3 for intraspecies variability and 10 for human variability) in the calculation of the minimum risk level. US EPA: Screening value based on the same study used to derive the ATSDR MRL. The benchmark concentration of 0.87 mg/m3 was adjusted for exposure duration (6/24 hours, 5/7 days) and a human equivalent concentration of 0.46, resulting in a concentration of 0.074 mg/m3. An uncertainty factor of 300 (3 for extrapolation from animals to humans with dosimetric adjustments, 10 for human variability and 3 for database deficiencies). The US EPA applies a residential scenario exposure factor to the reference concentration to derive the screening level (Target HQ=1). TCEQ: Screening value based on a health endpoint (Interim ESL and AMCV, supporting documentation not available) in PM..
Arsenic	7440-38-2			NC	-	-	-	**0.016**	-	-	0.015	-	US EPA (RSL): Screening value based on a Cal OEHHA chronic REL, and a residential scenario exposure factor was applied to the REL to derive the screening level. Cal OEHHA: Screening value based on decrease in intellectual function and adverse effects on neurobehavioural development in humans (Wasserman et al. 2004; as cited in Cal OEHHA 2014). An inhalation dose was estimated from an oral dose (drinking water) to give a value of 0.46 µg/m3. An uncertainty factor of 30 (3 for estimating a LOAEL based on quantitative dose-response analysis and 10 for inter-individual variation) was used.
				C	-	-	-	**0.0065** **(0.00065)**	0.0066	-	0.003	0.067	US EPA (RSL): Screening level based on an inhalation unit risk (IUR) of 0.00429 per µg/m3 based on lung cancer in occupationally-exposed male workers (Brown and Chu 1983a, b; as cited in US EPA 1988). The risk-based concentration for a cancer risk of 1 in 100,000 is 0.002 µg/m3. A residential scenario exposure factor was applied to the risk-based concentration to derive the screening level. WHO: Screening level based on an estimated incremental lifetime cancer risk of 1 in 100,000 and an inhalation unit risk (IUR) of 0.0015 per µg/m3, derived from lung cancer incidences in exposed workers at metal smelters. Cal OEHHA: Screening level based on an inhalation unit risk (IUR) of 0.0033 per µg/m3 based on lung tumour incidence in occupationally-exposed workers and an incremental lifetime cancer risk of 1 in 100,000 (Tseng et al. 1968, 1977; as cited in Cal OEHHA 2011). TCEQ: Screening level (AMCV and ESL) based on respiratory and lung cancer in occupational workers. The screening value is based on an inhalation unit risk (IUR) of 0.00015 per µg/m3 and an incremental lifetime cancer risk of 1 in 100,000 (TCEQ 2012).
Cadmium	7440-43-9			NC	-	-	0.01	0.01	**0.005**	**0.005**	0.02	0.011	ATSDR: Screening value based on a urinary cadmium level associated with 10% extra risk of low molecular weight proteinuria (ATSDR 2012). A urinary cadmium dose corresponding to a 10% excess risk of low molecular proteinuria of 0.5 µg/m3 creatinine was calculated from three occupational exposure studies and used as the point of departure (POD). It was estimated that an exposure of 0.1 µg/m3 in air and 0.3 µg/kg/day in diet would result in urinary cadmium level of 0.5 µg/m3 creatinine. The inhalation concentration was divided by an uncertainty factor of 9 (3 for human variability and 3 as a modifying factor to address the lack of human data to assess the relative sensitivities of the lungs and the kidneys). US EPA (RSL): Screening level derived from a Cal OEHHA REL. The US EPA applies a residential scenario exposure factor to derive the screening level. WHO: Screening value based on data collected in industrial workers with lung cancer and renal effects. Cadmium exposure may result in various renal alterations, whether it is absorbed via inhalation or contaminated food. WHO (2000) indicated that the lowest estimate of the cumulative exposure to airborne cadmium in industrial workers leading to an increased risk of renal dysfunction (low-molecular-weight proteinuria) or lung cancer was 100 µg/m3-year for an 8-hour exposure, and this was extrapolated to a continuous lifetime exposure estimate of 0.3 µg/m3. WHO (2000) indicated that existing levels of cadmium in the air of most urban or industrial areas are around one-fiftieth of this value. The screening value was derived to prevent a further increase of cadmium in agricultural soils, which is likely to increase exposure to future generations through dietary intake. MECP: Screening value based on kidney effects in humans associated with exposure to cadmium compounds (MECP 2006). A LOAEL OF 100 µg/m3-years was identified from the study. A continuous lifetime exposure of 270 ng/m3 for the general population was derived from the cumulative occupational exposure of 100 µg/m3-years. The occupational exposure level was converted into an equivalent continuous lifetime exposure by extrapolating the occupational LOAEL from 8 hours to 24 hours, from 225 working days to 365 days and distributed over an average human lifetime of 75 years (100 µg/m3-years x 8/24 hours x 225/365 days x 1/75 years = 270 ng/m3), resulting in an adjusted LOAEL of 0.27 µg/m^3. An uncertainty factor of 10 for intraspecies variability and an uncertainty factor of 5 for use of a LOAEL were applied. Cal OEHHA: Screening value based on kidney and respiratory system effects in an occupational study (Lauwerys et al., 1974; as cited in Cal OEHHA 2008b). A LOAEL of 21 µg/m3 and a NOAEL of 1.4 µg/m3 were identified. Cal OEHHA derived an average occupational exposure concentration of 0.5 µg/m3 and assumed exposure occurred 5 days per week, 8 hours per day with an average exposure duration of 4.1 years. The NOAEL was converted to an average occupational exposure of 0.5 µg/m3 and an uncertainty factor of 30 (3 for use of a subchronic study and 10 for intraspecies uncertainty) was applied. TCEQ: Screening value based on kidney effects in humans (TCEQ 2016). A meta-analysis of multiple studies in humans identified beta2-microglobulin proteinuria as a critical effect. A human equivalent concentration point of departure (PODHEC) for urine of 0.5 µg cadmium/g creatinine based upon a 10% increase in the critical effect was adjusted to a PODHEC for air of 0.1 µg cadmium/m3 using a pharmacokinetic model. A total uncertainty factor of 9 was used which was comprised of 3 for interspecies sensitivity (i.e., protection of diabetics) and 3 for database uncertainty to derive an AMCV value of 0.011 µg/m^3 based on HQ=1.
				C	-	-	-	**0.016** **(0.0016)**	-	-	0.0024	0.02	US EPA (RSL): Screening level based on an inhalation unit risk (IUR) of 0.0018 per µg/m3 for lung, trachea and bronchial cancer deaths in occupational exposure studies. An incremental lifetime cancer risk of 1 in 100,000 was used to convert the IUR to a risk-based concentration of 0.0056 µg/m3. The US EPA applies a residential scenario exposure factor to derive the screening level. Cal OEHHA: Screening criteria (ReV) based on human occupational exposure lung cancer data; an inhalation unit risk (IUR) of 0.0042 per µg/m3 was derived and an incremental lifetime cancer risk of 1 in 100,000 was used to convert the IUR to a screening value (Charest-Tardif et al. 2006; as cited in Cal OEHHA 2009). TCEQ: The screening value is based upon an inhalation unit risk (IUR) of 0.000487 per µg/m3 considering background lung cancer mortality rates in cadmium smelter workers adjusted for co-exposure to arsenic, worker health and ethnicity (TCEQ 2016). The screening value was derived using an incremental lifetime cancer risk of 1 in 100,000 to adjust the IUR.
Chromium (total or trivalent)	7440-47-3			NC	-	-	-	-	-	-	-	**0.14** [f]	TCEQ: Screening value (ReV) based on a study where rats were exposed to 0, 17, 54, or 168 mg/m^3 chromic sulphate particulate for 6 hours/day, 5 days/week for 13 weeks (Derelanko et al. 1999; as cited in TCEQ 2009). The critical effects were increased total lung and trachea weight relative to body weight in male and female rats. The benchmark concentration lower confidence limit corresponding to a 10% increase in effect (BMCL10) was 3.45 mg/m^3. The BMCL10 was adjusted for continuous exposure (6 hours/24 hours and 5 days/7 days) and a regional deposition dose ratio (of 1.31, resulting in a point of departure [human equivalent concentration]) (PODHEC) of 0.81 mg/m3. An uncertainty factor of 1000 for interspecies variability (3), intraspecies variability (10), subchronic duration (10), and database limitations (3) was applied. The value was adjusted for the proportion of trivalent chromium in chromium sulphate (0.171) to derive a chronic ReV value of 0.14 µg/m^3 based on HQ=1.

Table C: Annual (Chronic) Air Thresholds													
					Primary		Secondary			Tertiary			
Parameter	CAS	Synonym(s)	Surrogate Options	Carcinogen Classification	ENV (2021) AAQO	CCME (2023) CAAQS	ATSDR (2020) MRL	US EPA (2023, 2024) RSL/NAAQS[a, b]	WHO (2021) AQG	MECP (2020) AAQC [c]	Cal OEHHA (2020) REL [d]	TCEQ (2023) AMCV/ReV [e]	Toxicological Endpoints and Derivations
Chromium (hexavalent)	18540-29-9			NC	-	-	-	**0.1**	-	-	0.2	0.22	US EPA (RSL): Screening value based on a reference concentration (RfC) of 0.0001 mg/m^3 for lower respiratory effects (lactate dehydrogenase in bronchioalveolar lavage fluid) in rats following inhalation of Cr(VI) particulates, and using a benchmark concentration (BMC) approach. The BMC was 0.016 mg/m3. A regional deposited dose ratio of 2.1576 was applied to account for differences in the deposition pattern of inhaled Cr(VI) dusts in the respiratory tract of humans and Wistar rat test animals. An uncertainty factor of 300 was applied (10 to account for variation in the human population, 10 to account for using a subchronic study rather than a chronic study, and 3 to account for pharmacodynamic differences not accounted for by the regional deposited dose ratio [0.016 mg/m3 x 2.1576 / (300)]. The US EPA applies a residential scenario exposure factor to derive the screening level.
													Cal OEHHA: Screening value applies to soluble hexavalent chromium compounds other than chromic trioxide (Glaser et al. 1986; as cited in Cal OEHHA 2008c). Sodium dichromate aerosol was inhaled by rats for 22 hours/day, 7 days/week for 90 days. The health effect observed was bronchoalveolar hyperplasia. The LOAEL identified in the study was 50 µg/m3. A NOAEL was not observed as effects were identified at all exposure levels tested in this study. The BMC05 (the benchmark concentration calculated to be associated with a 5% incidence of effect) was 12.50 µg/m3 and adjusted to a human equivalent concentration (HEC) of 24.47 µg/m3 and an uncertainty factor of 100 (3 for subchronic to chronic extrapolation, 3 for interspecies variability and 10 for intraspecies variability) was applied.
													TCEQ: Cr(VI): Screening value (AMCV) based on NOAEL of 25 µg/m^3 for no observed increase in relative lung weight in rats exposed to 25, 50, 100, or 200 µg Cr(VI)/m^3, as sodium dichromate, for 22 hours/day, 7 days/week for 90 days (Glaser et al. 1985; as cited in (TCEQ 2014). The NOAEL was not adjusted for continuous exposure because the exposure duration in the study closely resembled continuous exposure. An uncertainty factor of 270 (3 for interspecies variation, 10 for intraspecies variation, 3 for extrapolation from sub-chronic to chronic exposure, and 3 for database limitations) was applied to the point of departure [human equivalent concentration]) (PODHEC) of 60.25 µg Cr(VI)/m^3 to derive a resulting AMCV of 0.22 µg/m^3, based on a HQ = 1.0.
				C	-	-	-	**0.00012 (0.000012)**	0.00025	0.0007 (0.00007)	0.000067	0.0043	US EPA: Screening level based on an inhalation unit risk (IUR) of 1.2 x 10-2 per µg/m3, which is based on lung cancer mortality in a cohort of chromate workers. The IUR is based on an assumed 1:6 ratio of Cr(VI):Cr(III).
													WHO: Screening criteria derived from exposed workers to Cr(VI) assuming a linear dose-response relationship between exposure and lung cancer. An inhalation unit risk (IUR) of 0.04 per µg/m3 was derived from the geometric mean of cancer risk estimates from several occupational studies (epidemiological data sets range from 0.011 to 0.13 per µg/m3 for a lifetime exposure) (WHO 2000). The IUR was converted to a screening value using an incremental lifetime cancer risk of 1 in 100,000.
													MECP: Screening level is based on lung cancer mortality in occupationally-exposed workers. The inhalation unit risks (IURs) reported in two epidemiological studies were 3.96x10-2 per µg/m3 (Gibb et al. 2000; as cited in (MECP 2011) and 9.15x10-3 per µg/m3 (Luippold et al. 2003; as cited in (MECP 2011). The IURs were converted to screening values using the following equation: screening value (µg/m3) = target risk/IUR, where target risk = 1x10-6. The average of the exposure range associated with a 1x10-6 cancer risk (2.5x10-5 µg/m3 to 1.1x10-4 µg/m3) was selected as the screening value of 0.00007 µg/m3. The screening value was adjusted for a cancer risk of 1 in 100,000 to 0.0007 µg/m3 and is applicable to chromium in the PM10 size fraction based on the potential for lung deposition, retention and ultimately lung carcinogenicity. A screening value of 0.00014 µg/m3 is applicable to the TSP fraction, which incorporates the MECP assumption that approximately 50% of TSP is in the PM10 fraction, and based on a cancer risk of 1 in 1,000,000. The screening value was adjusted for a cancer risk of 1 in 100,000 to 0.0014 µg/m.
													Cal OEHHA: Screening level based on an inhalation unit risk (IUR) of 0.15 per µg/m3 and an incremental lifetime cancer risk of 1 in 100,000 (Mancusco 1975, US EPA 1984, and CDHS 1985; as cited in Cal OEHHA 2009). The health effects identified were lung cancer mortality in humans occupationally exposed to Cr(VI).
													TCEQ: Screening level based on an inhalation unit risk (IUR) of 2.3 x 10-3 per µg Cr(VI)/m3 (for a risk level of 1 in 100,000) for lung cancer mortality in humans. The IUR was derived by weighting the IURs from two studies (Crump et al. 2003 and Gibb et al. 2000; as cited in (TCEQ 2014). A weight of 44.4% was given to the Crump et al. 2003 study, from which an IUR of 1.94 x 10-3 was selected, and a weight of 55.6% was given to the Gibb et al. (2000; as cited in (TCEQ 2014) study, from which an IUR of 2.56 x 10-3 was selected. The IUR was converted to an AMCV of 0.0043 µg/m3 using an incremental lifetime cancer risk of 1 in 100,000. This same value was adopted as the chronic ESL.
Cobalt	7440-48-4			NC	-	-	0.1	**0.0063**	-	-	-	0.063	ATSDR: Screening value based on a decrease in pulmonary function in occupationally-exposed workers (ATSDR 2004). The same key study was used in US EPA 2008). The NOAEL was 5.3 µg/m3 and adjusted for continuous exposure (1.3 µg/m3) and an uncertainty factor of 10 (for human variability) was applied.
													US EPA: Screening value based on a provisional reference concentration (RfC) of 0.006 mg/m3 based on decreased pulmonary function and respiratory tract irritation in occupationally-exposed workers (US EPA 2008). A NOAEL of 5.3 µg/m3 was identified and adjusted for continuous exposure (1.9 µg/m3). An uncertainty factor of 300 (3 for extrapolating from a subchronic to chronic exposure duration, 10 for database insufficiencies and 10 for human variability) was applied to derive a provisional RfC of 0.006 µg/m3. The US EPA applies a residential scenario exposure factor to derive the screening level.
													TCEQ: Screening value based on respiratory irritation and reduced lung function in humans (TCEQ 2017). A NOAEL of 5.3 µg/m3 was derived from an occupational study in which exposed workers experienced eye, nose, and throat irritation, cough, and reduced lung function. A dosimetric adjustment for the ventilation rate during an 8-hour day was made to reflect to continuous exposure, resulting in a human equivalent concentration point of departure (PODHEC) of 1.89 µg/m3. The PODHEC was then adjusted using a total uncertainty factor of 30 (10 for intrahuman variability, 3 for extrapolation from subchronic to chronic exposure duration, and 1 for database uncertainties) to derive the chronic ReV. It is noted that the screening value is also considered to be protective of developmental endpoints.
				C	-	-	-	**0.0031 (0.00031)**	-	-	-	0.0017	US EPA: Screening level based on a 2 year rat study where adenoma and carcinoma of the lung was observed. An inhalation unit risk (IUR) of 9 per mg/m3 and an incremental lifetime cancer risk of 1 in 100,000 was used to derive a risk-based concentration of 0.0011 µg/m3. The US EPA applies a residential scenario exposure factor to derive the screening level.
													TCEQ: Screening level based on two key studies by the National Toxicology Program (NTP; as cited in (TCEQ 2017). The key studies identified inhalation unit risks (IURs) of 0.0091 per µg cobalt/m3 and 0.003 per µg cobalt/m3 and were associated with an increased incidence of lung adenomas and carcinomas in female rats. The mid-point of the two IURs (i.e., 0.006 per µg cobalt/m3) was selected as the final IUR, and was adjusted to the AMCV using an incremental lifetime cancer risk level of 1 in 100,000. This same value was adopted as the chronic ESL.
Copper	7440-50-8			NC	-	-	-	-	-	-	-	**1**	TCEQ: Screening value based on a health endpoint (interim ESL and AMCV, supporting documentation not available), as copper dusts and mists in PM10.
Iron	7439-89-6			NC	-	-	-	-	-	-	-	"Must Meet NAAQS"	TCEQ: No value specific to iron. "Must Meet NAAQS" indicates that, for species of limited concern, the determination of the individual species impacts are not requried if a National Ambient Air Quality Standards (NAAQS) analysis is completed for particulate matter of 2.5 and 10 microns or less (PM2.5 and PM10)
Lead	7439-92-1			NC	-	-	-	**0.15**	0.5	-	-	"Must Meet NAAQS"	US NAAQS: Screening value is a rolling 3-month average based on neurological effects (decrease of less than 2 IQ points) in children, and the potential for cardiovascular and renal effects in adults. An air concentration of less than 0.15 µg/m3 of lead would correspond to a blood lead concentration of approximately 1 µg/dL which leads to less than a 2 IQ point decrease in American children based on an air-to-blood ratio of 1:7.
													WHO: Screening value based on preventing blood lead levels exceeding 100 µg/L in order to protect 98% of the population including children (WHO 2000). Various international expert groups have determined that the earliest signs of adverse effects of lead in young children begin at 100 to 150 µg/L in blood. It also appears that 1 µg/m3 of lead in air directly contributes approximately 19 µg/L of lead in blood in children and 16 µg/L in adults.
													TCEQ: No value specific to lead. "Must Meet NAAQS" indicates that, for species of limited concern, the determination of the individual species impacts are not requried if a National Ambient Air Quality Standards (NAAQS) analysis is completed for particulate matter of 2.5 and 10 microns or less (PM2.5 and PM10).
Manganese	7439-96-5			NC	-	-	**0.3** [g]	0.052	0.15	-	0.09	0.84	ATSDR: Screening value for respirable manganese based on abnormal performances in eye-hand coordination in an occupational study (ATSDR 2012). The exposure was determined for each employee based on their jobs and the length of time they had worked at the factory. On average, workers were exposed for an average of 5.3 years to an average concentration of respirable manganese of 0.25 mg/m3. The benchmark concentration lower confidence limit corresponding to a 10% incidence of effect (BMCL10) of 142 µg/m3 was adjusted for continuous exposure and then an uncertainty factor of 100 was applied (10 for human variability and 10 for database limitations).
													US EPA: Screening value based on a reference concentration (RfC) of 0.05 µg/m3 for impairment of neurobehavioural function in occupationally-exposed workers. A NOAEL was not available because a single geometric mean exposure concentration was calculated for this cross-sectional study and effects were observed in workers who had been exposed. The LOAEL was 150 µg/m3 and the LOAEL adjusted for a human equivalent concentration (LOAELHEC) was 50 µg/m3. An uncertainty factor of 1,000 (10 to protect sensitive individuals, 10 for using a LOAEL and 10 for database limitations) was applied. The US EPA applies a residential scenario exposure factor to derive the screening level.
													WHO: Screening value based on neurotoxic effects observed in occupationally-exposed workers and an estimated NOAEL of 30 µg/m3 (WHO 2000). The screening value was derived using a benchmark approach and by dividing by a factor of 4.2 for continuous exposure and an uncertainty factor of 50 (10 for interindividual variation and 5 for developmental effects in younger children).
													Cal OEHHA: Screening value based on impairment of neurobehavioral function in humans (occupational study) for manganese and compounds. A benchmark concentration lower confidence limit corresponding to a 5% response (BMCL05) of 72 µg/m3 was obtained and adjusted for continuous exposure, resulting in a value of 26 µg/m3 (Roels et al. 1992; as cited in Cal OEHHA 2014). An uncertainty factor of 300 (3 for extrapolation from subchronic to chronic exposure duration, 100 for intraspecies differences [10 for adults to children and 10 for the more sensitive developing brains of newborns and infant children]) was used to derive the REL.
													TCEQ: Screening value based on the same key study as ATSDR, ysing the same point of departure of 142 µg/m3 (see details from ATSDR above), an uncertainty factor of 60 was applied (10 for intrahuman variability and 6 for database uncertainties) to derive the AMCV, based on an HQ=1.
Mercury	7439-97-6			NC	-	-	**0.2**	0.31	1	-	0.03	0.025	ATSDR: Screening value based on neurological effects (hand tremors) in 26 male workers exposed to metallic mercury for an average of 15.3±2.6 years (ATSDR 1999). A NOAEL was not observed in this study as a single mean concentration was calculated from personal air monitors of workers and effects were identified in workers. A LOAEL of 0.026 mg/m3 associated with an increased frequency of hand tremors was determined and adjusted for continuous exposure (by multiplying 5/7 days and 8/24 hour = 0.0062 mg/m3). An uncertainty factor of 30 (3 for using a LOAEL and 10 for human variability) was applied.
													US EPA: Screening value based on a reference concentration (RfC) of 0.0003 mg/m3 for hand tremors, increases in memory disturbance and central nervous system effects in occupational workers (Fawer et al. 1983; as cited in US EPA 1995). A NOAEL was not observed in this study as a single mean concentration was calculated from personal air monitors of workers and effects were identified in workers. A LOAEL of 0.025 mg/m3 was calculated as a time weighted average and adjusted using occupational ventilation rates and workweek hours to a LOAEL of 0.009 mg/m3. An uncertainty factor of 30 (10 to protect sensitive individuals and 3 for a lack of a database) was used. The US EPA applies a residential scenario exposure factor to derive the screening level.
													WHO: Screening value based on the LOAELs for mercury vapour (15 to 30 µg/m3, tremors, renal tubular effects, and changes in plasma enzymes) and applying an uncertainty factor of 20 (10 for uncertainty in variable sensitivities in higher risk populations and 2 for extrapolating from LOAEL to NOAEL).
													Cal OEHHA: Screening value based on neurotoxicity as measured by tremor, memory and sleep disturbances, decreased performance on neurobehavioural tests and decreased electroencephalography activity in occupational studies (Piikivi and Hanninen 1989; as cited in Cal OEHHA 2014). Humans were exposed to mercury for 8 hours/day, 5 days/week for 13.7 to 15.6 years. A NOAEL was not observed as only a single exposure concentration was assessed and effects were seen at this level. A LOAEL of 0.025 mg/m3 was adjusted for continuous exposure (0.009 mg/m3) and an uncertainty factor of 300 (10 for neurotoxicity being a moderate to severe effect, 3 to reflect interindividual variability and 10 for the higher susceptibility of the developing nervous system) was applied to derive the screening value.
													TCEQ: Screening value based on a health endpoint (interim ESL, supporting documentation not available) as metallic mercury and inorganic mercury forms in PM10.
Nickel	7440-02-0			NC	-	-	0.09	**0.015,** 0.094, 0.021	-	0.02 (PM10) 0.04 (SPM)	0.014	0.23	ATSDR: Screening value based on chronic active inflammation and lung fibrosis in rats exposed to nickel sulphate hexahydrate (6 hours/day, 5 days/week for 2 years) (ATSDR 2005). The NOAEL was 0.03 mg/m3 and adjusted for continuous exposure (5/7 days and 6/24 hours = 0.0054 mg/m3) and to a human equivalent concentration (HEC) (0.0027 mg/m3). An uncertainty factor of 30 (3 for animal to human extrapolation and 10 for human variability) was applied to derive the screening value.
													US EPA: For nickel refinery dust and nickel subsulphide (regional screening level [RSL] of 0.015 µg/m3), the screening value is based on a Cal OEHHA REL of 0.014 µg/m3 (see below). A residential scenario exposure factor was applied by US EPA to derive a screening level. For nickel soluble salts (RSL of 0.094 µg/m3), the screening value is based on a chronic ATSDR minimal risk level of 0.09 µg/m3 (see below). US EPA applied a residential scenario exposure factor to the ATSDR minimal risk level to derive a screening level. For nickel oxide (RSL of 0.021 µg/m3), the screening value is based on a Cal OEHHA REL derivation for nickel oxide. Health effects (active pulmonary inflammation and alveolar proteinosis) were observed in mice following exposure to nickel oxide for 6 hours/day, 5 days/week for 104 weeks. A benchmark concentration lower confidence limit corresponding to a 5% response (BMCL05) of 117 µg/m3 was obtained and adjusted for continuous exposure, resulting in a value of 20.9 µg/m3. This value was then adjusted to a human equivalent concentration (HEC) of 2.0 µg/m3. An uncertainty factor of 100 (3 for interspecies variability and 30 for intraspecies variability) was applied to derive an inhalation REL of 0.02 µg/m3. A residential scenario exposure factor was applied by US EPA to derive a screening level.
													MECP: Screening value is based on health effects and calculated using an annual averaging period. The screening value of 0.04 µg/m3 is based upon consideration of both carcinogenic and non-carcinogenic effects due to nickel and nickel compounds (MECP 2011a); a cancer risk level of 1 in 1,000,000 is considered. The MECP considers that the carcinogenic effects are of a greater potency than non-carcinogenic effects. Although the non-carcinogenic critical effects of the various nickel compounds were reviewed by the MECP, their potencies were not discussed in detail. Therefore, adjustment of the MECP value considering a cancer risk level of 1 in 1,000,000 may not necessarily be protective of non-carcinogenic endpoints. Therefore, no adjustment of the MECP value has been made. The MECP screening value of 0.04 µg/m3 is based on nickel in TSP assuming that approximately 50% of ambient TSP is made up of PM10.
													Cal OEHHA: Screening value based on pathological changes in lung, lymph nodes and nasal epithelium in rats exposed to nickel and nickel compounds (except nickel oxide) for 6 hours/day, 5 days/week for 104 weeks (Benson et al. 1987; as cited in Cal OEHHA 2012). The benchmark dose level corresponding to a 5% response level (BMDL05) was 30.5 µg/m3 and the human equivalent concentration (BMDLHEC05) was 1.4 µg/m3. An uncertainty factor of 100 (3 for interspecies differences and 30 for intraspecies differences) was applied.
													TCEQ: Screening value based on chronic active lung inflammation and associated lesions in rats exposed to nickel sulphate hexahydrate for 6 hours/day, 5 days/week for 2 years (NTP 1996c; as cited in TCEQ 2017). The NOAEL/point of departure (POD) was 0.03 mg nickel/m3, the POD adjusted for continuous exposure was 5.357 µg nickel/m3 and the human equivalent concentration (HEC) was 7.034 µg/m3. An uncertainty factor of 30 (3 for interspecies variability and 10 for intraspecies variability) was applied to derive the AMCV, based on HQ=1.
				C	-	-	-	0.12, 0.11, 0.058	**0.025**	0.04	0.038	0.059	US EPA: Screening level for nickel refinery dust (RSL of 0.12 µg/m3) is based on an inhalation unit risk (IUR) of 0.00024 per µg/m3 which was derived from several epidemiological studies (excess lung cancer mortality in four studies of nickel refinery workers) (Enterline and Marsh 1982, Chovil et al. 1981, Peto et al. 1984, Magnus et al. 1982; as cited in US EPA 1987). The risk-based concentration for a cancer risk of 1 in 100,000 is 0.042 µg/m3. A residential scenario exposure factor was applied to the risk-based concentration to derive the screening level. Screening value for nickel soluble salts (RSL of 0.11 µg/m3) is based on an IUR of 0.00026 per µg/m3 from Cal OEHHA (see below). A residential scenario exposure factor was applied to the risk-based concentration to derive the screening level. Screening value for nickel subsulphide (RSL of 0.058 µg/m3) is based on an IUR of 0.00048 per µg/m3, which was based on excess lung cancer mortality observed in four (4) studies of workers exposed to nickel compounds (Enterline and Marsh 1982, Chovil et al. 1981, Peto et al. 1984, Magnus et al. 1982; as cited in US EPA 1987). The IUR was the incremental unit risk estimate of nickel refinery dust (2.4 x 10 4 per µg/m3) used with a multiplication factor of 2.0 to account for a nickel subsulphide composition of about 50% in the refinery dust. The risk-based concentration for a cancer risk of 1 in 100,000 is 0.021 µg/m3. A residential scenario exposure factor was applied to the risk-based concentration to derive the screening level.
													WHO: Screening level based on an inhalation unit risk (IUR) of 0.00038 µg/m3 for 1 µg/m3 of nickel in the air, based on lung cancer incidences in exposed human workers. The concentration corresponding to an incremental lifetime risk of 1 in 100,000 is 0.025 µg/m3.
													MCEP: Refer to the description under the non-cancer endpoint provided above.
													Cal OEHHA: Screening value based on an inhalation unit risk (IUR) of 0.00026 per µg/m3 and an incremental lifetime cancer risk of 1 in 100,000 (Chovil et al. 1981, Roberts et al. 1984, Muir et al. 1985; as cited in Cal OEHHA 2011). The IUR is calculated from Ontario nickel refinery worker lung cancer mortality data.
													TCEQ: Screening level based on lung cancer in workers exposed to various forms of nickel in air (Grimsrud et al. 2003; and Enterline and Marsh 1983; as cited in TCEQ 2017). An inhalation unit risk (IUR) of 0.00017 per µg/m3 was used to derive the AMCV, based on an incremental lifetime risk of 1 in 100,000. This value was adopted as the chronic ESL.

Table D-5c - Air Screening Criteria (Annual)

Table C: Annual (Chronic) Air Thresholds													
					Primary		Secondary			Tertiary			
Parameter	CAS	Synonym(s)	Surrogate Options	Carcinogen Classification	ENV (2021) AAQO	CCME (2023) CAAQS	ATSDR (2020) MRL	US EPA (2023, 2024) RSL/NAAQS[a], [b]	WHO (2021) AQG	MECP (2020) AAQC [c]	Cal OEHHA (2020) REL [d]	TCEQ (2023) AMCV/ReV [e]	Toxicological Endpoints and Derivations
Selenium	7782-49-2			NC	-	-	-	**21**	-	-	20	0.2	US EPA: Screening value based on the REL from Cal OEHHA (see below). The US EPA applies a residential scenario exposure factor to derive the screening level. Cal OEHHA: Screening value based on environmental exposure of selenium (in soil and food supplies) to people in China over a lifetime in their diets (as selenium subsulphide) (Kuper et al. 1988; as cited in Cal OEHHA 2008c). Health effects were clinical selenosis (liver, blood, skin and central nervous system). The LOAEL was 0.023 mg/kg/day and the NOAEL was 0.015 mg/kg/day. The inhalation chronic REL is based on the oral chronic REL and an inhalation extrapolation factor of 3,500 µg/m3 per mg/kg/day. An uncertainty factor of 3 to account for intraspecies differences was applied. One of the assumptions of route-to-route extrapolation assumes that a chemical is equally absorbed by both oral and inhalation routes; Cal OEHHA indicated that the available data are not adequate to depart from the default assumption of equal absorption across the lungs and gastrointestinal tract. TCEQ: Screening value based on a health endpoint (interim ESL and AMCV, supporting documentation not available), as selenium in PM.
Polycyclic Aromatic Hydrocarbons													
1-Methylnaphthalene	90-12-0			NC	-	-	-	-	-	-	-	**20** [h]	TCEQ: Screening value based on a health endpoint (interim ESL, supporting documentation not available).
2-Methylnaphthalene	91-57-6			NC	-	-	-	-	-	-	-	**20** [h]	TCEQ: Screening value based on a health endpoint (interim ESL, supporting documentation not available).
Acenaphthene	83-32-9			NC	-	-	-	-	-	-	-	**10** [h]	TCEQ: Screening value based on a health endpoint (interim ESL and AMCV), supporting documentation not available) in PM.
Acenaphthylene	208-96-8		Acenaphthene	NC	-	-	-	-	-	-	-	**10** [h]	TCEQ: Screening value based on a health endpoint (interim ESL, supporting documentation not available) in PM.
Anthracene	120-12-7			NC	-	-	-	-	-	-	-	**0.1** [h]	TCEQ: Screening value based on a health endpoint (interim ESL, supporting documentation not available) in PM.
Benzo(a)anthracene	56-55-3			C	-	-	-	**0.17 (0.017)**	-	-	0.091	0.05	US EPA: Screening level based on the Cal OEHHA inhalation unit risk (IUR). Cal OEHHA: Screening level based on a potency equivalence factor (PEF) of 0.1 relative to benzo(a)pyrene (inhalation unit risk [IUR] = 0.00011 per µg/m3 (US EPA/IRIS 1996; as cited in Cal OEHHA 2009). TCEQ: Screening value based on a health endpoint (interim ESL, supporting documentation not available) in PM.
Benzo(a)pyrene	50-32-8			NC	-	-	-	**0.0021**	-	-	-	-	US EPA: Screening value was calculated from a reference concentration (RfC) of 0.000002 mg/m3 based on developmental toxicity in rats exposed to 25, 75 and 100 µg/m3 of benzo(a)pyrene for 4 hours daily for 10 days . A LOAEL of 25 µg/m3 for decreased embryo/fetal survival was selected as the POD and adjusted to account for discontinuous exposure (PODADJ) and then adjusted to human equivalent concentration (HEC) resulting in a PODHEC of 4.6 µg/m3. An uncertainty factor of 3000 (3 for extrapolating from animals to humans, 10 for interindividual variability, 10 for extrapolating from subchronic to chronic exposure, and 10 for database limitations) was applied. The US EPA applies a residential scenario exposure factor to derive the screening level.
				C	-	-	-	**0.017 (0.0017)** [g]	0.00012	0.0001 (0.00001)	0.0091	0.017	US EPA: Screening value based on incidence of upper respiratory tract and upper digestive tract tumors in male hamsters exposed to benzo(a)pyrene for a lifetime (US EPA 2017). The inhalation unit risk was derived using linear extrapolation from a benchmark concentration level of 0.16 mg/m3. The US EPA screening value was selected as it is more current than WHO. WHO: Based on epidemiological data from studies on coke-oven workers exposed to a mixture of PAHs, an inhalation unit risk (IUR) for benzo(a)pyrene as an indicator in air constituent was determined to be 8.7 × 10-5 per ng/m3. The corresponding concentrations of benzo(a)pyrene producing an incremental lifetime cancer risk of 1 in 100,000 is 0.12 ng/m3. MECP: Screening level based on carcinogenic potential endpoint from an evaluation of coke-oven worker epidemiological studies by the WHO that derived an inhalation unit risk (IUR) value of 8.7x10-5 per ng/m3 for benzo(a)pyrene, equivalent to 0.1 ng/m3 of benzo(a)pyrene at a risk level of 1 in 100,000. Screening value for benzo(a)pyrene as a surrogate for total PAHs. Cal OEHHA: Screening level based on respiratory tract tumors in hamsters. A linearized multistage model was fit to the respiratory tract tumor data resulting from inhalation exposure of hamsters to benzo(a)pyrene (Thyssen et al. 1981; as cited in Cal OEHHA 2009). A human equivalent inhalation unit risk (IUR) of 0.0011 per µg/m3 was derived and an incremental lifetime cancer risk of 1 in 100,000 was used to convert the IUR to a screening value (US EPA/IRIS 1996; as cited in Cal OEHHA 2009). TCEQ: Screening value based on a health endpoint (interim ESL, supporting documentation not available) in PM.
Benzo(b)fluoranthene	205-99-2			C	-	-	-	**0.17 (0.017)**	-	-	0.091	0.05	US EPA: Screening value based on the Cal OEHHA inhalation unit risk (IUR). Cal OEHHA: Screening value based on a potency equivalence factor (PEF) of 0.1 relative to benzo(a)pyrene (inhalation unit risk (IUR) = 0.00011 per µg/m3; supporting documentation for benzo(a)pyrene available) (US EPA/IRIS 1996; as cited in Cal OEHHA 2009). TCEQ: Screening value based on a health endpoint (interim ESL, supporting documentation not available) in PM.
Benzo(g,h,i)perylene	191-24-2			C	-	-	-	-	-	-	-	**0.05** [h]	TCEQ: Screening level based on a health endpoint (interim, supporting documentation not available), in PM.
Benzo(k)fluoranthene				C	-	-	-	**1.7 (0.17)**	-	-	0.091	0.05	US EPA: Screening level based on the Cal OEHHA inhalation unit risk (IUR). Cal OEHHA: Screening level based on a potency equivalence factor (PEF) of 0.1 relative to benzo(a)pyrene (inhalation unit risk [IUR] = 0.00011 per µg/m3; supporting documentation for benzo(a)pyrene available) (US EPA/IRIS 1996; as cited in Cal OEHHA 2009). TCEQ: Screening value based on a health endpoint (interim ESL, supporting documentation not available) in PM.
Chrysene	218-01-9			C	-	-	-	**17 (1.7)**	-	-	0.91	0.05	US EPA: Screening level based on the Cal OEHHA inhalation unit risk (IUR). Cal OEHHA: Screening level based on a potency equivalence factor (PEF) of 0.01 relative to benzo(a)pyrene (inhalation unit risk [IUR] = 0.00011 per µg/m3; supporting documentation for benzo(a)pyrene available) (US EPA/IRIS 1996; as cited in Cal OEHHA 2009). TCEQ: Screening value based on a health endpoint (interim ESL, supporting documentation not available) in PM.
Dibenz(a,h)anthracene	53-70-3			C	-	-	-	**0.017 (0.0017)**	-	-	0.0083	0.05	US EPA: Screening level based on the inhalation unit risk of 6E-04. Cal OEHHA: Screening criteria based on an oral slope factor of 4.1 per mg/kg/day derived using a linearized multistage model with dose-response data from a drinking water study which reported alveolar carcinomas of the lung in male mice due to dibenz(a,h)anthracene (Snell and Stewart 1962; as cited in Cal OEHHA 2009). An inhalation unit risk (IUR) was derived from the oral slope factor with the assumption that dibenz(a,h)anthracene was equally absorbed and equally potent by oral and inhalation routes and that a 70 kg person inhales 20 m3 of air per day. An incremental lifetime cancer risk of 1 in 100,000 was used to convert the IUR (0.0012 per µg/m3) to a screening value. TCEQ: Screening value based on a health endpoint (interim ESL, supporting documentation not available) in PM.
Fluoranthene	206-44-0			NC	-	-	-	-	-	-	-	**0.05** [h]	TCEQ: Screening value based on a health endpoint (interim ESL, supporting documentation not available) in PM.
Fluorene	86-73-7			NC	-	-	-	-	-	-	-	**1** [h]	TCEQ: Screening value based on a health endpoint (interim ESL, supporting documentation not available) in PM.
Indeno(1,2,3-c,d)pyrene	193-39-5			C	-	-	-	**0.17 (0.017)**	-	-	0.091	0.05	US EPA: Screening value based on the Cal OEHHA inhalation unit risk (IUR). Cal OEHHA: Screening value based on a potency equivalence factor (PEF) of 0.1 relative to benzo(a)pyrene (inhalation unit risk (IUR) = 0.00011 per µg/m3; supporting documentation available) (US EPA/IRIS 1996; as cited in Cal OEHHA 2009). TCEQ: Screening value based on a health endpoint (interim ESL, supporting documentation not available) in PM.
Naphthalene	91-20-3			NC	-	-	4 (0.0007 ppm)	**3.1**	10	-	9	50	ATSDR: Screening value based on induced nasal lesions in rats exposed to naphthalene, from two chronic inhalation toxicity and carcinogenicity studies with mice (ATSDR 2005). The LOAEL identified was 10 ppm (52.4 mg/m3), adjusted for continuous exposure (multiplied by 6 hours/24 hours x 5 days/7 days = 1.8 ppm or 9.4 mg/m3) and converted to a human equivalent concentration (HEC) US EPA: Non-carcinogenic screening value based on a reference concentration (RfC) of 0.003 mg/m3 for nasal effects (hyperplasia and metaplasia in respiratory and olfactory epithelium) in mice. The human equivalent (LOAELHEC) was 9.3 mg/m3 and an uncertainty factor of 3000 (10 for sensitive individuals, 10 for interspecies extrapolation, 10 for use of LOAEL, 3 for database limitations) was applied. The US EPA applies a residential scenario exposure factor to derive the screening level. WHO: Non-carcinogenic screening value based on respiratory tract lesions leading to inflammation and olfactory epithelial metaplasia in animal studies (rats) when chronically exposed to 53 mg/m3 of naphthalene for 6 hours/day, 5 days/week for 104 weeks (WHO 2010). The LOAEL was 53 mg/m3 and adjusted for continuous exposure (6 hours/24 hours, 5 days/7days) to obtain a value of about 10 mg/m3. An uncertainty factor of 1000 (10 for using a LOAEL rather than a NOAEL, 10 for interspecies variation, and 10 for inter-individual variation) was applied. Cal OEHHA: Screening value based on LOAEL of 10 ppm for nasal inflammation, olfactory epithelial metaplasia, and respiratory epithelial hyperplasia in mice exposed to 0, 10, or 30 ppm naphthalene vapour for 6 hours/day, 5 days/week for 104 weeks (NTP 1992; as cited in Cal OEHHA 2014). The LOAEL was adjusted for continuous exposure (6 hours/24 hours, 5 days/7days). Uncertainty factors were applied for use of a LOAEL (10), interspecies variability (10), and intraspecies variability (10). TCEQ: Screening value based on a health endpoint (interim ESL and AMCV, supporting documentation not available) in PM.
Phenanthrene	85-01-8			NC	-	-	-	-	-	-	-	**0.8** [h]	TCEQ: Screening value based on a health endpoint (interim ESL and AMCV, supporting documentation not available) in PM.
Pyrene	129-00-0			NC	-	-	-	-	-	-	-	**0.05** [h]	TCEQ: Screening value based on a health endpoint (interim, supporting documentation not available).

Notes:
- = no guideline available or not applicable; AMCV= Ambient Monitoring Comparison Value, AQG = Air Quality Guideline; ATSDR = Agency for Toxic Substances and Disease Registry; C = carcinogenic; Cal OEHHA = California Office of Environmental Health Hazard Assessment; CCME = Canadian Council of Ministers of the Environment; ENV = British Columbia Ministry of Environment and Climate Change Strategy; ESL = Effects Screening Level; IUR= Inhalation unit risk; LOAEL= Lowest observed adverse effect level; MECP = Ontario Ministry of the Environment, Conservation and Parks; MRL = Minimal Risk Level; NAAQO = National Ambient Air Quality Objectives; NAAQS = National Ambient Air Quality Standard; NOAEL= No observed adverse effect level; NC = Non-carcinogenic; PM= Particulate Matter; REL = Reference Exposure Level; ReV= Reference value; TCEQ = Texas Commission on Environmental Quality; US EPA = United States Environmental Protection Agency; WHO = World Health Organization.

Concentrations are in microgram per cubic metre (µg/m^3), unless otherwise noted.
Concentrations in parts per million (ppm) were converted to mg/m3 by applying the formula: molecular weight (grams per mol) x ppm / 24.45.
Carcinogenic parameters have been adjusted based on incremental lifetime cancer risk of 10-5; values in parantheses are unadjusted values based on incremental lifetime cancer risk of 10-6.
(a) US EPA values recorded as ppm or ppb have been converted to µg/m³ assuming 25 °C and an atmospheric pressure of 1.
(b) RSLs are based on a target HQ of 1 (non-carcinogenic values) and a carcinogenic risk of 10^{-6}
(c) MECP derived carcinogenic AAQC based on a target cancer risk of 10^{-6} (value in brackets). For the purpose of this assessment, carcinogenic AAQC were adjusted to a target cancer risk of 10^{-5} (value not in brackets).
(d) Cal OEHHA IURs are based on a cancer risk level of 1 in 1,000,000 (10^{-6}); for this assessment carcinogenic REL were calculated for risk level of 1 in 100,000 by dividing 10^{-6} by the IUR then multiplying by a factor of 10 .
(e) Fpr non-carcinogenic values Air Monitoring Comparison Value (AMCV), which are based on the Reference Value (ReV) adjusted to HQ=1, are preferentially selected over the Effect Screening Level (ESL), are based on the Reference Value adjusted to HQ=0.3, where available. Where values are the same (i.e., interim values), then both AMCV and ESL are selected. ReV are toxicological studies derived from relevant studies and are presented in available supporting documentation associated with the parameter.
(f) Acute ReV, based on an HQ=1, was preferentially selected over acute ESL, based on HQ=0.3 as AMCV were not available. See footnote (a) for TCEQ selection approach.
(g) Selected values are preferentially selected over more conservative criteria of the primary sources if criteria is based on more current studies.
(h) Criteria selected for the development of a trigger level. Due to the lack of supporting documentation for the selected screening criteria, constituent will be assessed indirectly using particulate matter as a surrogate if an exceedance of the trigger level were to occur.
Bold and Shaded = selected screening value

References:

ENV (British Columbia Ministry of Environment and Climate Change Strategy). 2021. Provincial Air Quality Information Sheet - British Columbia Ambient Air Quality Objectives. Updated November 2021. Available at: https://www2.gov.bc.ca/assets/gov/environment/air-land-water/air/reports-pub/prov_air_qual_objectives_fact_sheet.pdf
Cal OEHHA (California Office of Environmental Health Hazard Assessment). 2020. OEHHA Acute, 8-
CCME (Canadian Council of Ministers of the Environment). 2024. Canadian Ambient Air Quality Standards. CCME. Available at: https://ccme.ca/en/air-quality-report. Accessed February 2024.
ATSDR (Agency for Toxic Substances and Disease Registry). 2024. Minimal Risk Levels (MRLs) for Hazardous Substances. January 2024. US Department of Health and Human Services, Public Health Service. Available at: https://wwwn.cdc.gov/TSP/MRLS/mrlsListing.aspx. Accessed February 2024.
WHO (World Health Organisation). 2021. WHO Air Quality Guidelines for Particulate Matter (PM2.5 and PM10), Ozone, Nitrogen Dioxide, Sulfur Dioxide and Carbon Monoxide. WHO, Geneva, Switzerland. Available at: https://iris.who.int/bitstream/handle/10665/345329/9789240034228-eng.pdf. Accessed February 2024.
WHO. 2010. WHO Guidelines for Indoor Air Quality: Selected Pollutants. WHO, Geneva, Switzerland. Available at: https://iris.who.int/bitstream/handle/10665/260127/9789289002134-eng.pdf?sequence=1. Accessed February 2024.
MECP (Ontario Ministry of Environment, Conservation and Parks). 2020. Ontario's Ambient Air Quality Criteria. Human Toxicology and Air Standards Section, Technical Assessment and Standards Development Branch, MECP. Available at: https://www.ontario.ca/page/ontarios-ambient-air-quality-criteria. Accessed March 2024.
TCEQ (Texas Commission on Environmental Quality). 2023. Texas Air Monitoring Information System (TAMIS) Web Interface V 5.2.3. Available at: https://www17.tceq.texas.gov/tamis/index.cfm?fuseaction=home.welcome
US EPA (United States Environmental Protection Agency). 2023. Regional Screening Levels (RSLs) – Generic Tables. Tables as of: November 2023. National Center for Environmental Assessment. https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables
US EPA. 2024. United States National Ambient Air Quality Standards (NAAQS) Table. Last updated February 7, 2024. Available at: https://www.epa.gov/criteria-air-pollutants/naaqs-table. Accessed March 2024