OSISKO DEVELOPMENT

CARIBOO GOLD PROJECT

AQUATIC EFFECTS MONITORING PLAN REV2

June 2025

OSISKO DEVELOPMENT

Cariboo Gold Project

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REVISION HISTORY

Rev. No.	Date	Author	Description
0	April 18, 2024	B. Wernick	Initial version for environmental assessment condition review
1	January 17, 2025	B. Wernick	Revised to address environmental assessment condition review comments
2	June 24, 2025	K. Serben	Revised to address BC Environmental Office and Indigenous nation review comments, and to confirm concordance with the Human Health Monitoring and Management Plan

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 (CRD).

The Aquatic Effects Monitoring Plan (the Plan or AEMP) has been developed to meet the requirements of Condition #22 of Schedule B of EAC #M23-01 for the Project. The Plan provides:

- An overview of baseline information available for the Project area;
- Monitoring objectives and methods for effluent, surface water, sediment, biological communities, and tissue chemistry;
- A schedule for implementation;
- Reporting requirements;
- Triggers and actions to respond to the monitoring results; and
- The process for plan updates.

Key aspects of the monitoring design are:

- The Plan is applicable to the Mine Site (Mine Site Complex and Bonanza Ledge Site) and Quesnel River Mill (QR Mill), with monitoring stations located in Lowhee Creek, Stouts Gulch, Williams Creek, Willow River, Jack of Clubs Lake, Rudy Creek, Sandy Lake, Unnamed Creek, Unnamed Lake, Maud Creek, Creek 3 Wetland, and Quesnel River.
- Monitoring components are as follows: effluent quality (chemistry and toxicity), surface water quality, sediment chemistry (toxicity to be included as a focused study if needed), tissue chemistry, plankton community structure, and benthic invertebrate community structure. Effects on fish health and communities will also be evaluated using these monitoring components.
- Proposed frequency is annually for the first three years for all monitoring components. After three years, effluent and surface water quality monitoring will continue annually, and the other components (plankton community, sediment quality/benthic invertebrate community, and tissue chemistry) will be monitored every three years.
- Effluent quality will be monitored per effluent discharge permits and the Metal and Diamond Mining Effluent Regulations (MDMER).
- Surface water quality will be sampled monthly during the open-water season (July, August, September):

  - Surface water quality sampling will occur at all sampling stations and will consist of field measurements (e.g., pH, dissolved oxygen [DO], temperature, etc.) and grab samples to be analyzed for general parameters, major ions, nutrients, cyanide, and metals.
- Plankton community samples will be collected from Jack of Clubs Lake at the same time as the surface water quality samples and will consist of depth-integrated samples analyzed for phytoplankton taxonomy and biomass as chlorophyll *a*, and a vertical haul through the water column for zooplankton taxonomy.
- Sediment chemistry and benthic invertebrate community will be sampled once in late summer (typically August):
  - Sediment collection will occur at creek and lake stations, and samples will be analyzed for particle size, total organic carbon (TOC), and metals.
  - Benthic invertebrate communities will be sampled at all stations but using collection methods consistent with the habitat and historical sampling:
    - at the Bonanza Ledge creek areas using a Hess sampler,
    - at the QR Mill near-field lotic areas using a Surber sampler,
    - at the QR Mill far-field lotic areas using a kick net following CABIN protocols, and
    - at depositional/lake stations using an Ekman (or similar) grab sampler.
- Tissue chemistry will be sampled once concurrently with community sampling:
  - Periphyton biomass from creeks will be analyzed for chlorophyll *a* and possibly metals if there is sufficient biomass available.
  - Zooplankton biomass from lakes will be analyzed for lipids, moisture, and metals.
  - Benthic invertebrate tissues from lakes and creeks will be analyzed for lipids, moisture, and metals.
  - When present, Rainbow Trout (*Oncorhynchus mykiss*) will be collected from creeks and Jack of Clubs Lake, and the dorsal muscle, gonads, and livers analyzed for lipids, moisture, and metals. Aging structures will also be submitted for aging analysis.

This document is being developed and will be updated in consultation with Lhtako Dené Nation, Xatśūll First Nation, and Williams Lake First Nation (Participating Indigenous nations), the BC Environmental Assessment Office (EAO), BC Ministry of Environment and Parks (ENV), BC Ministry of Water, Land and Resource Stewardship (WLRS), and BC Ministry of Forests (MoF). Previous versions of this Plan incorporated comments from these reviewers.

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
µg	microgram
µm	micrometre
AEMP	Aquatic Effects Monitoring Plan
ANOVA	analysis of variance
BC	British Columbia
BC SQG	BC sediment quality guideline
BC WQG	BC water quality guideline
BEAST	Benthic Assessment of Sediment
BGM	Barkerville Gold Mines Ltd.
CABIN	Canadian Aquatic Biomonitoring Network
CALA	Canadian Association of Laboratory Accreditation
CCME	Canadian Council of Ministers of the Environment
cm	centimetre
CRD	Cariboo Regional District
CRM	certified reference material
DO	dissolved oxygen
DOC	dissolved organic carbon
DQO	data quality objective
EAC	Environmental Assessment Certificate
EAO	Environmental Assessment Office
ECCC	Envrionemnt and Climate Change Canada
EMA	*Environmental Management Act*
ENV	Ministry of Environment and Parks (BC)
EPT	Ephemeroptera/Plecoptera/Trichoptera
g	gram
ha	hectare
ISQG	interim sediment quality guidelines
km^2	square kilometre
L	litre
LEL	lowest effects level

Abbreviation	Description
m	metre
m/s	metres per second
MDL	method detection limit
MDMER	Metal and Diamond Mining Effluent Regulations
mg/m^2	milligrams per square metre
mm	millimetre
MoF	Ministry of Forests
NAD	North American datum
ODV	Osisko Development Corp.
ORP	oxidation-reduction potential
PEL	probably effects levels
Project	Cariboo Gold Project
QA/QC	quality assurance / quality control
QP	Qualified Professional
QR Mill	Quesnel River Mill
RIVPACS	River Invertebrate Prediction and Classification
RPD	relative percent difference
SEL	severe effects levels
SFS	Society of Freshwater Science
TBC	to be confirmed
TDS	total dissolved solids
TOC	total organic carbon
TSF	tailings storage facility
TSS	total suspended solids
WAD	weak acid dissociable
WLRS	Ministry of Water, Land and Resource Stewardship (BC)
WQG	water quality guideline
WRSF	Waste Rock Storage Facility
WSP	WSP Canada Inc.
WTP	Water Treatment Plant
ww	wet weight

1. INTRODUCTION

This document presents the proposed Aquatic Effects Monitoring Plan (AEMP) for the Cariboo Gold Project (the Project) as required by Environmental Assessment Certificate (EAC) #M23-01 Schedule B, primarily Condition #22.

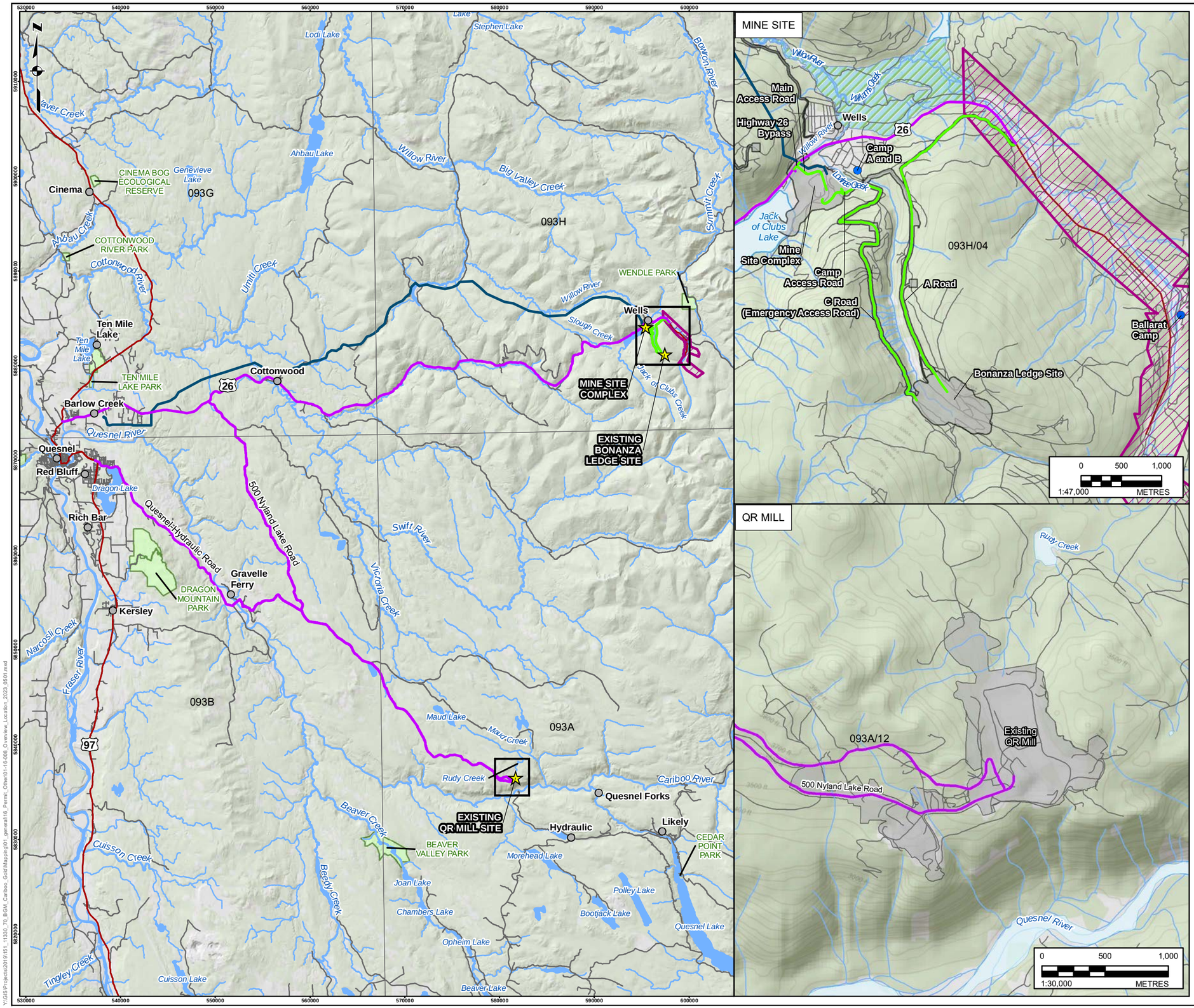
1.1 Project Overview

Barkerville Gold Mines Ltd. (BGM) is developing the Project, which is 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), British Columbia (BC). BGM is a wholly-owned subsidiary of Osisko Development Corp. (ODV). The Project includes the following sites and key components (Figure 1–1):

Mine Site:

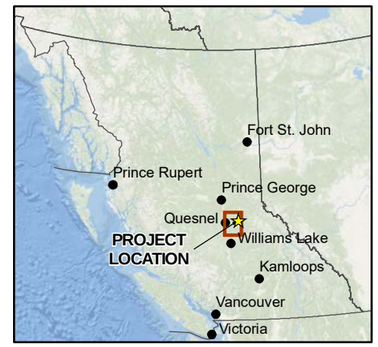
- Mine Site Complex:
  - Waste management facilities;
  - Water supply and management structures and facilities;
  - Services Building;
  - Electrical Substation;
  - Camp (Worker Accommodation);
  - Valley Portal;
  - Water Treatment Plant (WTP); and
  - Other ancillary infrastructure.
- Bonanza Ledge Site:
  - A Waste Rock Storage Facility (WRSF) and associated water management structures;
  - Overburden Stockpiles;
  - Temporary Ore Stockpile;
  - Cow Portal; and
  - 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.



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



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

OSISKO DEVELOPMENT

CARIBOO GOLD PROJECT

LOCATION AND ACCESS

REV.	DESCRIPTION	DATE	INITIALS
0		5/9/2023	MY

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

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

0 25mm

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1.2 Overview of Environmental Assessment Certificate Conditions

EAC #M23-01 Schedule B – Table of Conditions relevant to the AEMP are summarized in Table 1–1, with the location of the information.

Table 1–1: Summary of Environmental Assessment Certificate Conditions Pertaining to Aquatic Effects Monitoring

EAC Condition	Contents	Section in Plan
3.2	At a minimum, documents must include the following information:	
	a) Purpose and objectives of document;	1.4
	b) Plain language summary of the document;	Executive Summary
	c) Roles and responsibilities of the Holder, Project personnel and any contractors employed for the purposes of implementing the document;	1.6
	d) Names and, if applicable, professional certifications and professional stamps, of those responsible for the preparation of the document;	1.6, Appendix A
	e) Schedule for implementing the actions in the document throughout the relevant Project phases;	3.4
	f) How the effectiveness of any mitigation measures will be evaluated including the schedule for evaluating effectiveness;	The Plan, 1.4, 4
	g) Schedules and methods for the submission of required reporting under the applicable condition, and the form and content of those reports; and	4
	h) 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
3.3	Where a document includes monitoring requirements, the document must include:	
	a) A description of baseline information that will be used to support monitoring of the effectiveness of mitigation;	2
	b) Methods, objective, location, frequency, timing, and duration of monitoring; and	3
	c) Scope, content, and frequency of reporting of the monitoring results.	4
4.1	Where the following conditions of this Certificate requires the Holder to develop a plan, program or other document that includes monitoring, including monitoring of mitigation measures or monitoring to determine the effectiveness of the mitigation measures, the Holder must, subject to 4.4, include trigger-response actions in that plan.	5
4.2	The objective of trigger-response planning is to identify the circumstances that will require the Holder to implement alternate or additional mitigation measures, monitoring, or other adjustments through adaptive management to address effects of the Project if the monitoring shows that those effects:	5
	a) Are not being mitigated to the extent contemplated in the Application;	3.1, 5
	b) Are different than those predicted in the Application; or	3.1, 5
	c) Have exceeded the triggers identified in paragraph 4.3a of this condition.	5, 6

EAC Condition	Contents	Section in Plan
4.3	The trigger-response in the plan must include at least the following:	
	a) The identification of qualitative and quantitative triggers (a trigger is a type or level of change using ENV's Development and Use of Trigger Response Plans Technical Guidance (March 2022, or as updated or replaced from time to time), which, when observed through monitoring and/or stakeholder/community/service provider feedback, will require the Holder to alter existing, or develop new, mitigation measures to avoid, reduce, and/or remediate effects);	5
	b) The methods that will be applied to detect when a qualitative or quantitative trigger, or type or level of change referred to in 4.3a has occurred;	5
	c) A description of the process and timing to alter any existing mitigation measures or develop new mitigation measures to reduce or avoid effects;	5
	d) The means by which the identification of the new and/or altered mitigation measures will be applied when any of the changes identified in paragraphs 4.2 occur, or the process by which those will be established and updated over the relevant timeframe for the specific condition;	5
	e) The monitoring program that will be used to determine if the altered or new mitigation measures and/or remediation activites are effectively mitigating or remediating the effects and or avoiding potential effects; and	5
	f) The scope, content, and frequency of reporting on the implementation of altered or new mitigation measures.	5
4.4	If there are any requirements or mitigation measures required in the plan, program, or other documents for which trigger-response, or elements of trigger-response listed in 4.3, is assessed to be not appropriate or applicable, the plan must include identification of those requirements and measures, and the rationale for that assessment.	5
22.1	The Holder must retain one or more Qualified Professionals to develop a plan for the management of adverse Project effects to the aquatic environment at each of the Mine Site, Bonanza Ledge Site, and the QR Mill. The plan must be developed in the consultation with Participating Indigenous Nations, ENV, WLRS, and MOF.	1.6 The Plan
22.2	Following development of the plan, the holder must provide the plan to the EAO for review a minimum of 90 days prior to the planned commencement of Consultation unless otherwise authorized by the EAO.	The Plan
22.3	The plan must include at least the following:	
22.3	a) A conceptual site model to visually represent (e.g., using a box and line diagram) the potential interactions and the biophysical components of and relating to the aquatic environment;	3.1
	b) A summary of the mitigation measures proposed in any aquatic-related management plans and permit requirements that aim to ensure the Project does not cause receiving environment water quality changes that result in negative impacts on the overall health of the aquatic ecosystem, including fish health, fish reproduction, and benthic invertebrate communities based on sampling in (c); and	1.4
	c) A description of the locations, sample sizes, methods, and timing and frequency of sampling for each measurement endpoint and metric including, but not limited to:	3
	i. Surface water chemistry and toxicity;	3.5.2
	ii. Sediment chemistry and toxicity;	3.5.3

EAC Condition	Contents		Section in Plan
	iii.	Tissue chemistry (at minimum for benthic invertebrates and fish as applicable);	3.5.4
	iv.	Periphyton or phytoplankton, as applicable;	3.5.5, 3.5.6
	v.	Aquatic invertebrate (including benthic invertebrates or zooplankton, as applicable) communities;	3.5.6, 3.5.7
	vi.	Fish communities; and	3.5.8
	vii.	Fish health metrics and observations.	3.5.8

1.3 Provincial Permits

In addition to the EAC issued by the EAO, the mine will be regulated by provincial permits issued pursuant to the *Mines Act* and *Environmental Management Act*, as follows:

- *Mines Act* – Permit M-198 (QR Mill) and Permit M-247 (Cariboo Gold – both the Mine Site Complex and Bonanza Ledge sites); and
- *Environmental Management Act* – Permit 12601 (QR Mill), Permit 17876 (Bonanza Ledge), and Permit 111511 (Mine Site Complex).

These permits contain "aquatic-related" conditions that are relevant to this AEMP.

1.4 Purpose and Objectives of the AEMP

The purpose of the Plan is to meet the requirements of Condition #22 of Schedule B of EAC #M23-01. The objectives of the Plan are to:

- Obtain information that can be used in the evaluation of potential mine-related effects on surface water quality and aquatic biota in the aquatic receiving environment.
- Provide information that can be used in the evaluation of effectiveness of mitigation measures implemented for the Project.

1.5 Summary of Mitigation Measures

The primary mitigation measure that will be evaluated by the AEMP is water treatment. The AEMP is designed to monitor biological components in the receiving environment of each of the three WTPs that will be installed and operated from construction through closure, as follows:

- Mine Site Complex—the WTP will discharge to Jack of Clubs Lake, which then flows into Willow River.
- Bonanza Ledge—the WTP will discharge to Lowhee Creek, which joins the Willow River downstream of the outlet of Jack of Clubs Lake.
- QR Mill—the WTP will discharge to Rudy Creek, which flows to Maud Creek and then the Quesnel River.

Mitigation measures associated with preventing changes in receiving environment water quality that result in negative impacts to the overall health of the aquatic ecosystem are summarized in

Table 1–2. This table summarizes the mitigation measures, the relevant aquatic-related management plans or permit requirements, and the monitoring associated with each mitigation measure. The overall AEMP design will evaluate the effectiveness of those measures and the annual reporting is the schedule for evaluating their effectiveness.

Table 1–2: Summary of Mitigation Measures

Potential Project Related Aquatic Effect Addressed in the EAC Application	Mitigation Measures	Relevant Management Plan and Permit Condition	Management Plan Section	Monitoring that will be used to evaluate the effectiveness of the mitigation measures
Increased erosion and sedimentation (Construction, Operations, Closure, Post-Closure active care period)	Sediment and erosion control measures (e.g., silt curtains, runoff management) will be used to control sediment releases to aquatic environments during construction.	Surface Erosion Prevention and Sediment Control Plan (SEPSCP) - CEMP Appendix D	Section 4, Appendix B, C, and D	Visual inspections of sediment and erosion control measures monitored under the SEPSCP (Section 5.2). Water quality monitoring under the AEMP (section 3.2) and Mine Site Water Management Plan (WMP; Section 2.2.1); sediment chemistry parameters monitored under the AEMP (Section 3.2).
	In-stream work during road crossing construction may be required. If required, it will either be avoided or be limited to when watercourses within or adjacent to the construction area are not flowing or during low flow conditions.	Construction Environmental Management Plan (CEMP)	Section 5.2, Table 5.2-1	Monitoring and reporting in CEMP (Section 6.1).
	Dust suppression measures along the unpaved haul roads, work areas, and storage piles will be used to control the dust generation potential from contruction/transport activities and dust depostion in nearby waterbodies.	Waste (Refuse and Emissions) Management Plan (WREMP) - CEMP Appendix F	Section 4.1; Table 4.1-1	Monitoring and reporting in CEMP (Section 6.1).
Increase in pH (Construction)	Best management practices will be followed to minimize indirect or direct deposition of concrete, concrete fines, and/or concrete wash or contact water associated with construction activites to nearby watercourses.	Waste (Refuse and Emissions) Management Plan (WREMP) - CEMP Appendix F	Section 4.2.3.3	Monitoring, reporting and recordkeeping in WREMP (Section 5 and 6); monitoring and reporting in CEMP (Section 6.1).
Reduction in sedimentation and surface runoff (Construction, Operations, Closure, and Post-Closure)	Reclamation of disturbed areas will occur progressively throughout Project life, and will include contouring and revegetation.	Vegetation Management Plan (VMP)	Section 2	Monitoring and reporting in VMP (Section 3.5.1) and CEMP (Section 6.1).

Potential Project Related Aquatic Effect Addressed in the EAC Application	Mitigation Measures	Relevant Management Plan and Permit Condition	Management Plan Section	Monitoring that will be used to evaluate the effectiveness of the mitigation measures
Discharge of effluent at the Mine Site and QR Mill (Construction, Operations, Closure, Post-Closure active care period)	Non-contact water will be directed around the Project disturbance areas.	Mine Site Water Management Plan (Mine Site WMP) - CEMP Appendix K	Section 3.3.1.2	Water quality parameters monitored under the AEMP (section 3.2) and Mine Site WMP (Appendix F and G); sediment chemistry parameters monitored under the AEMP (Section 3.2).
		QR Mill Water Management Plan (QR Mill WMP) - CEMP Appendix K	Section 4	Water quality parameters monitored under the AEMP (section 3.2) and QR Mill WMP (Appendix C, Table C-2); sediment chemistry parameters monitored under the AEMP (Section 3.2).
	Surface water runoff and shallow seepage from the Filtered Stack Tailings Storage Facility (FSTSF), waste rock storage facilities (WRSF), and overburden facilities or that has been in contact with mine waste materials will be capture through a series of perimeter collection ditches and sumps and treated to meet permit requirements prior to discharge to the environment.	QR Mill Water Management Plan (QR Mill WMP) - CEMP Appendix K	Section 4	Water quality parameters monitored under the AEMP (section 3.2) and QR Mill WMP (Appendix C, Table C-2); sediment chemistry parameters monitored under the AEMP (Section 3.2).
	Mine contact water will be treated prior to discharge to Jack of Clubs Lake. Water treatment plant technology was selected through a best achievable technology (BAT) assessment.	Mine Site Water Management Plan (Mine Site WMP) - CEMP Appendix K	Section 3.3.2.2	Water quality parameters monitored under the AEMP (section 3.2) and Mine Site WMP (Appendix F and G); sediment chemistry parameters monitored under the AEMP (Section 3.2).
	Mine contact water will be treated prior to discharge to Lowhee Creek. Water treatment plant technology was selected through a best achievable technology (BAT) assessment.	Mine Site Water Management Plan (Mine Site WMP) - CEMP Appendix K	Section 3.3.1.2	Water quality parameters monitored under the AEMP (section 3.2) and Mine Site WMP (Appendix F and G); sediment chemistry parameters monitored under the AEMP (Section 3.2).
	Treated mine effluent will be released to Jack of Clubs Lake via a diffuser outfall sited and designed following BC ENV guidance, and designed to effectively disperse the effluent through the water and promote mixing of the effluent in the lake ambient water.	Mine Site Water Management Plan (Mine Site WMP) - CEMP Appendix K	Section 3.3.2.2; Permit 111511 includes the diffuser as an authorized work	Water quality parameters monitored under the AEMP (section 3.2) and Mine Site WMP (Appendix F and G); sediment chemistry parameters monitored under the AEMP (Section 3.2).
	A monitoring program will be undertaken in Jack of Clubs Lake to validate the plume dispersion modeling results and to verify that permit and regulatory requirements are being met.	Aquatic Effects Monitoring Plan (AEMP)	Section 5; Table 5-1	Triggers and response actions in AEMP (Section 5; Table 5-1).
		Mine Site Water Management Plan (Mine Site WMP) - CEMP Appendix K	Appendix G, Section 2.2.1.2	Surface water monitoring in Mine Site WMP (Appendix G).
	Aquatic effects monitoring programs will be conducted in the receiving environment to confirm the lack of	Aquatic Effects Monitoring Plan (AEMP)	Section 3.2	Monitoring objectives in AEMP (Section 3.2).

Potential Project Related Aquatic Effect Addressed in the EAC Application	Mitigation Measures	Relevant Management Plan and Permit Condition	Management Plan Section	Monitoring that will be used to evaluate the effectiveness of the mitigation measures
	adverse effects on aquatic life and to inform adaptive management.	Mine Site Water Management Plan (Mine Site WMP) - CEMP Appendix K	Section 6	Water quality parameters monitored in Mine Site WMP (Appendix F and G).
		QR Mill Water Management Plan (QR Mill WMP) - CEMP Appendix K	Section 7.2	Water quality parameters monitored in QR Mill WMP (Appendix C).
	Site contact water at QR Mill will be collected in existing water management infrastructure and new infrastructure to collect runoff from the FSTSF. Excess water will be treated prior to discharge to Rudy Creek, if required, to meet permit and regulatory requirements. Water treatment will include chemical-physical processes to remove trace metals, sulphate, and other trace constituents from contact water.	QR Mill Water Management Plan (QR Mill WMP) - CEMP Appendix K	Section 4.3	Water quality parameters monitored in QR Mill WMP (Appendix C, Section C.2) and AEMP (Section 3.5.2).
	Development of a site water management plan that provides details of water management strategies and guidance on protecting natural waterways surrounding the Project to follow applicable BMPs, including reference to water treatment, effluent discharge permits, and legislation.	Aquatic Effects Monitoring Plan (AEMP)	Section 3.5.2	Water quality parameters monitored in AEMP (Section 3.5.2).
		Mine Site Water Management Plan (Mine Site WMP) - CEMP Appendix K	Section 3.3	Water quality parameters monitored in Mine Site WMP (Appendix F and G).
		QR Mill Water Management Plan (QR Mill WMP) - CEMP Appendix K	Section 4.3	Water quality parameters monitored in QR Mill WMP (Appendix C, Section C.2) and AEMP (Section 3.5.2).
	All hazardous substances and waste dangerous goods will be stored on or in secondary containment in accordance with applicable permits and regulations.	Chemicals and Materials Storage and Handling Plan (CHMSHP) - CEMP Appendix G	Section 4.1	Monitoring, reporting and recordkeeping in CHMSHP (Section 5 and 6); monitoring and reporting in CEMP (Section 6.1)
	No fuels, oils, or other hazardous subtances will be stored within 100m of any waterbody.	Fuel Management and Spill Contingency Plan (FMSCP)	Table 4.1-1	Monitoring, reporting and recordkeeping in FMSCP (Section 4.1); monitoring and reporting in CEMP (Section 6.1).
	No equipment maintenance or re-fueling will be conducted within 100m from any waterbody.	Fuel Management and Spill Contingency Plan (FMSCP)	Table 4.1-1	Monitoring, reporting and recordkeeping in FMSCP (Section 4.1); monitoring and reporting in CEMP (Section 6.1).
	In the event of a spill, an appropriate spill response will be implemented that addresses site-specific conditions (e.g., soil type, chemical properties of the spill material).	Fuel Management and Spill Contingency Plan (FMSCP)	Table 4.1-1	Monitoring, reporting and recordkeeping in FMSCP (Section 4.1); monitoring and reporting in CEMP (Section 6.1).
	Spill response training and protocols will be provided to staff.	Fuel Management and Spill Contingency Plan (FMSCP)	Table 4.1-1	Monitoring, reporting and recordkeeping in FMSCP (Section 4.1); monitoring and reporting in CEMP (Section 6.1).

Potential Project Related Aquatic Effect Addressed in the EAC Application	Mitigation Measures	Relevant Management Plan and Permit Condition	Management Plan Section	Monitoring that will be used to evaluate the effectiveness of the mitigation measures
	Water treatment facilities and associated water management infrastructure will remain active until permit and regulatory requirements are met in the contact water basins.	Mine Site Water Management Plan (Mine Site WMP) - CEMP Appendix K	Section 3.3.1.5, Section 3.3.2.5	Success criteria summarized in End Land Use Plan (ELUP; Section 4.2)
		QR Mill Water Management Plan (QR Mill WMP) - CEMP Appendix K	Section 4.3	Success criteria summarized in End Land Use Plan (ELUP; Section 4.2)
	Potentially acid generating material will be segregated and stored seperately from non-potentially acid generating material.	Metal Leaching / Acid Rock Drainage (ML/ARD) Management Plan (MLARDMP) - CEMP Appendix I	Section 18	Monitoring Schedule outlined in MLARDMP (Section 18).
	An engineered cover will be placed on potentially acid generating material.	Metal Leaching / Acid Rock Drainage (ML/ARD) Management Plan (MLARDMP) - CEMP Appendix I	Section 18	Monitoring Schedule outlined in MLARDMP (Section 18).
	During post-closure (passive after care), after active water management activites have ceased, shallow seepage from stockpiles will be collected by perimetered ditching and will be passively conveyed to the receiving environment through the closure drainage systems.	Mine Site Water Management Plan (Mine Site WMP) - CEMP Appendix K	Section 3.3.1.5, Section 3.3.2.5	Refer to ELUP Section 4.2
		QR Mill Water Management Plan (QR Mill WMP) - CEMP Appendix K	Section 4.3.3	Refer to ELUP Section 4.2
	Following release of supernatant water directly to the environment, the Mine Site Sediment Pond bottom sediments will be removed or covered and the retaining dike will be breached or removed.	Mine Site Water Management Plan (Mine Site WMP) - CEMP Appendix K	Section 3.3.1.5, Section 3.3.2.5	Refer to ELUP Section 4.2
	Mine waste stockpiles will be covered at closure with low permeability materials that are designed to reduce infiltration flow into the stockpiles such that residual seepage will be of very limited magnitude during Post-Closure.	Mine Site Water Management Plan (Mine Site WMP) - CEMP Appendix K	Section 3.1.4	Refer to ELUP Section 4.2
		QR Mill Water Management Plan (QR Mill WMP) - CEMP Appendix K	Section 4.3.6	Refer to ELUP Section 4.2
	Water Management Plan including diversion of contact water to sediment ponds and upgraded Water Treatment Plant prior to discharge into Jack of Clubs or Willow River.	Mine Site Water Management Plan (Mine Site WMP) - CEMP Appendix K	Section 3.3.2.2	Water quality parameters monitored in Mine Site WMP (Appendix G, Section 2.2) and AEMP (Section 3.5.2).
	Water Management Plan including diversion of contact water to sediment ponds and upgraded Water Treatment Plant prior to discharge into Rudy Creek.	QR Mill Water Management Plan (QR Mill WMP) - CEMP Appendix K	Section 4.3.2	Water quality parameters monitored in QR Mill WMP (Appendix C, Section C.2) and AEMP (Section 3.5.2).

Potential Project Related Aquatic Effect Addressed in the EAC Application	Mitigation Measures	Relevant Management Plan and Permit Condition	Management Plan Section	Monitoring that will be used to evaluate the effectiveness of the mitigation measures
	Implement avoidance or measures for the application of pesticides/herbicides near watercourses.	Invasive Plant Management Plan (IVMP)	Section 4.2	Monitoring in IVMP (Section 4.3).
	Use of salt for road traction aggregate/sand will be prohibited. No application of salt or sand de-icing measures will occur within 30 m of a watercourse crossings, unless safe to do so.	Wildlife Management Plan (WMP)	Section 5.2	Implementation monitoring in WMP (Section 6).

1.6 Roles and Responsibilities

1.6.1 General Manager

The General Manager bears overall responsibility for the operation of the Project and responsibility for implementing on-site environmental monitoring and for compliance related to Project activities. The General Manager, or delegate, will verify:

- That qualified personnel are in place and following the AEMP;
- The required resources are in place to execute the AEMP; and
- Compliance with relevant regulations, acts, guidelines, permits, and policies.

1.6.2 Environmental Manager

The Environmental Manager or delegate is responsible for implementation of the AEMP.

1.6.3 Qualified Professional

Qualified professionals will be retained to implement the Plan (conduct monitoring, interpret data, and make recommendations for updates).

1.7 Document Authors

This AEMP was prepared by WSP Canada Inc. (WSP). Authorship of the Plan is summarized in Table 1–3. A record of the development is published in the Revision History. A Qualified Professional (QP) Declaration of Competency form for the preparation of the AEMP is provided in Appendix A.

Table 1–3: Plan Development

Name	Title	Organization
Kerrie Serben, M.Sc., R.P.Bio.	Senior Technical Manager – Environmental Scientist	WSP Canada Inc.
Barbara Wernick, M.Sc., R.P.Bio.	Technical Fellow – Environment Scientist	WSP Canada Inc.

2. SUMMARY OF BASELINE INFORMATION

Baseline information to support the assessment of potential change during the construction, operation, and closure of the Project consists of a combination of operational monitoring data for the existing Bonanza Ledge and QR Mill sites, site investigations for the historically contaminated portions of Jack of Clubs Lake and Willow River, and additional information collected expressly to establish existing conditions to support future monitoring for the Project. Relevant, recent (i.e., < 5 years old) information is summarized below by primary receiving waterbody (see Figure 3–1 and Figure 3–2 for relative locations). Sources for this information are:

- Surface Water Quality Existing Conditions Report, Appendix 7.4-3 to the EAC Application (Golder 2022a);
- Aquatic Health Existing Conditions Report, Appendix 7.9-1 to the EAC Application (Golder 2022b);
- Fish and Fish Habitat Existing Conditions Report, Appendix 7.9-2 to the EAC Application (Golder 2021a);
- Results of Soil, Vegetation, Soil Invertebrate, and Fish Tissue Analysis – Technical Memorandum (Golder 2022c); and
- Fish and Fish Habitat Assessment of Jack of Clubs Lake (Golder 2021b).

2.1 Jack of Clubs Lake

Baseline characterization of Jack of Clubs Lake has been conducted over a series of sampling programs between 2016 and present. Consistent stations have not yet been sampled, as the discharge location and characteristics were only recently confirmed. Data are available for:

- Surface water chemistry;
- Sediment chemistry;
- Tissue chemistry – periphyton, benthic invertebrates, and fish;
- Benthic invertebrate community structure;
- Phytoplankton and zooplankton community structure; and
- Fish distribution and use (via hydroacoustic methods).

2.2 Willow River

Sampling in Willow River near the outlet of Jack of Clubs Lake is conducted regularly in conjunction with operational monitoring for the Bonanza Ledge Mine. Surface water samples

have been collected at JCL-OUT. Sampling is also conducted intermittently to support operational monitoring, with the following components being sampled:

- Surface water chemistry;
- Sediment chemistry;
- Benthic invertebrate community structure; and
- Fish health.

2.3 Lowhee Creek

Sampling of Lowhee Creek is conducted regularly to meet the requirements of an existing effluent discharge permit issued pursuant to the *Environmental Management Act* for the Bonanza Ledge Mine. Surface water is collected throughout the year at two primary exposure stations, LC-3.9 and LC-1.5, and a reference station in Watsons Gulch, WG-0.25.

Biological monitoring is conducted as part of the *Environmental Management Act* (EMA) permit requirements, as well as of the Metal and Diamond Mining Effluent Regulations (MDMER), with the following components being sampled:

- Surface water chemistry;
- Sediment chemistry;
- Benthic invertebrate community structure; and
- Periphyton community structure.

2.4 Stouts Gulch

Sampling of Stouts Gulch is conducted regularly to meet the requirements of an existing effluent discharge permit issued pursuant to the EMA for the Bonanza Ledge Mine. Surface water is collected throughout the year at two primary stations, SG-1.35 and SG-0.25, and a reference station in Emory Gulch, EG-0.25.

2.5 Rudy Creek

Sampling of Rudy Creek is conducted regularly to meet the requirements of an existing effluent discharge permit issued pursuant to the EMA for the QR Mill site. Surface water is collected throughout the year at two primary exposure stations, SW2 and SW3.

Biological monitoring is conducted as part of the EMA permit requirements. as well as of the MDMER, with the following components being sampled:

- Surface water chemistry;
- Sediment chemistry;
- Benthic invertebrate community structure; and
- Periphyton biomass.

3. STUDY DESIGN

The spatial extent, monitoring locations, frequency of sampling, sampling sizes, and sampling methods are proposed to address Project activities based on the following:

- Maintaining the ability to compare data among mine phases and years, where possible, based on the sampling design of previous monitoring programs and the need to design the AEMP to meet the needs of the Project. For example, the study designs for the Bonanza Ledge Mine AEMP and the QR Mill AEMP were most recently updated for the 2023 sampling events (BBA 2023, Hatfield 2023). Both BBA (2023) and Hatfield (2023) apply to existing activities; however, it will be useful to maintain similar stations and components, if doing so allows this AEMP to meet its objectives.
- To be consistent with the following guidance documents, as applicable[1]:
  - Water and Air Baseline Monitoring Guidance Document for Mine Proponents and Operators (ENV 2016);
  - BC Field Sampling Manual (ENV 2013);
  - Canadian Aquatic Biomonitoring Network (CABIN) Field Manual (Environment Canada 2012a); and
  - Metal Mining Technical Guidance for Environmental Effects Monitoring (Environment Canada 2012b).

Environmental data collection and interpretation will be undertaken by a QP. If necessary, the QP will revise the study design based on monitoring results and changes to the study design will be documented in the interpretative reports.

3.1 Conceptual Site Model

As discussed in Chapter 7.4 of the EAC Application (ODV 2022), potential residual effects are those effects remaining after implementation of all mitigation measures, including offsetting measures, and therefore are the expected consequences of the Project and those that are expected to have the most influence on the aquatic receiving environment. The potential residual effects for both sites are the changes in water quality in the aquatic receiving environment due to treated effluent discharge during the Construction, Operations, Closure, and Post-Closure (active care) Phases, and seepages from the waste rock piles and flooded underground workings in the Post-Closure (passive care) Phase.

[1] Regulatory guidance changes from time to time. The QP will be responsible for verifying that applicable/current guidance is being followed.

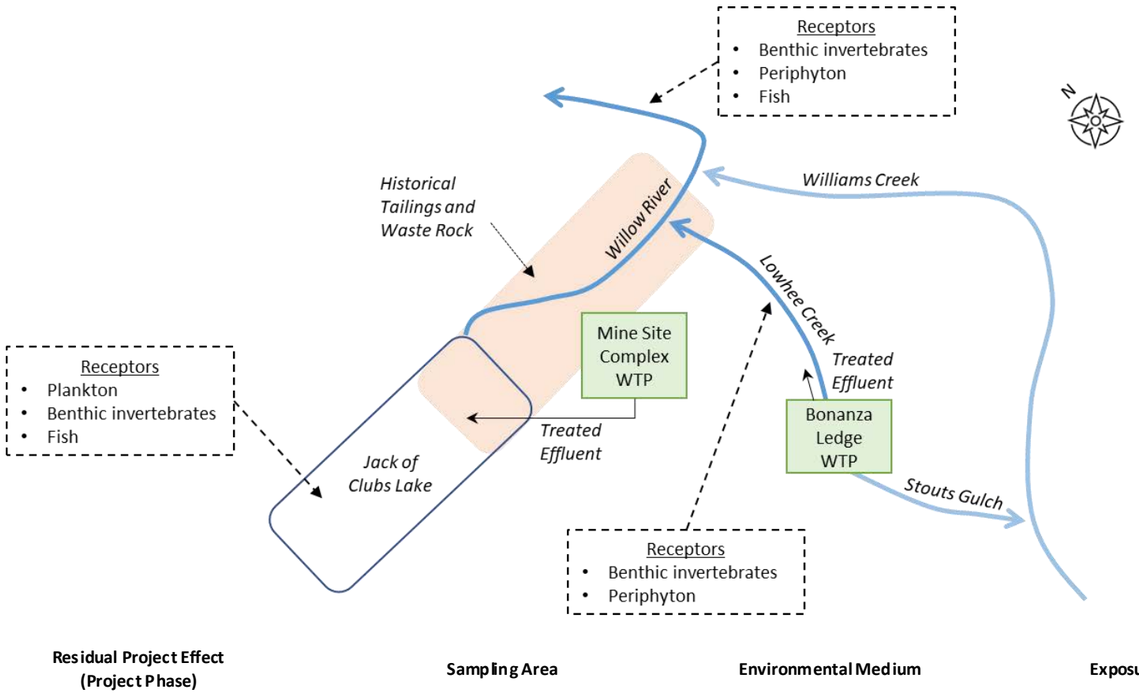
3.1.1 Mine Site

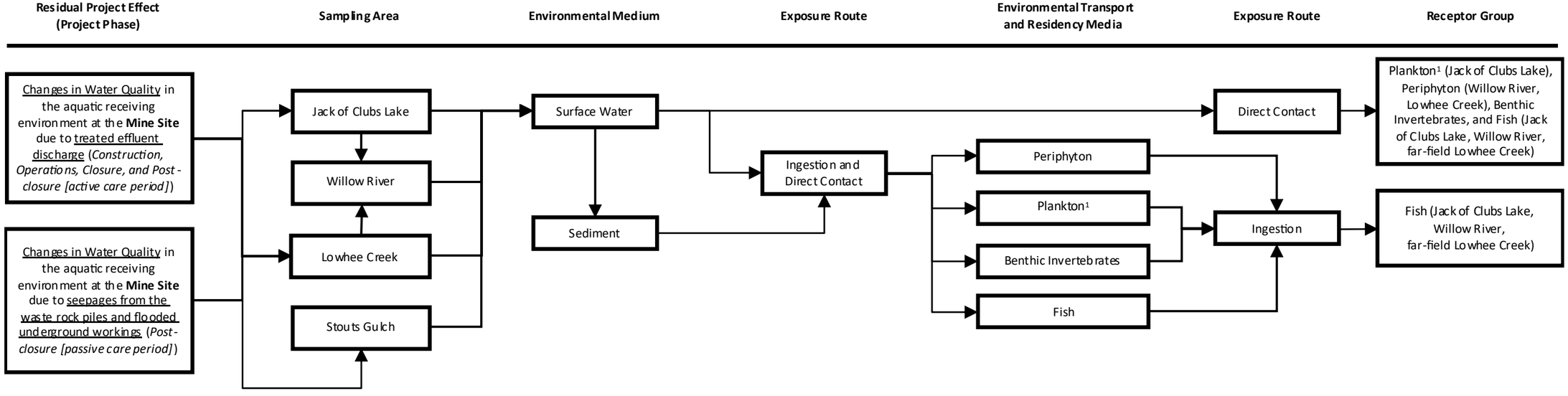
Figure 3–1 illustrates the conceptual site model for the Mine Site. The primary source of parameters of potential concern will be the WTPs at the Mine Site Complex and Bonanza Ledge, and the receiving environments will be:

- Jack of Clubs Lake—the lake receives water from the 44 square kilometre (km^2) Jack of Clubs Creek watershed and drains to Willow River. The lake has a surface area of ~1.2 km^2 and a maximum depth of ~60 metres (m).
- Lowhee Creek—the ~4.3 km^2 watershed is fed by discharges from the current Bonanza Ledge operations, as well as runoff from Cow and Barkerville mountains. The creek joins Willow River downstream of the outlet from Jack of Clubs Lake.

Potential aquatic receptors for the Mine Site Complex and Bonanza Ledge Site are:

- Periphyton,
- Plankton,
- Benthic invertebrates, and
- Fish.





Notes: 1 Phytoplankton and zooplankton

Figure 3–1: Conceptual Site Model for the Mine Site

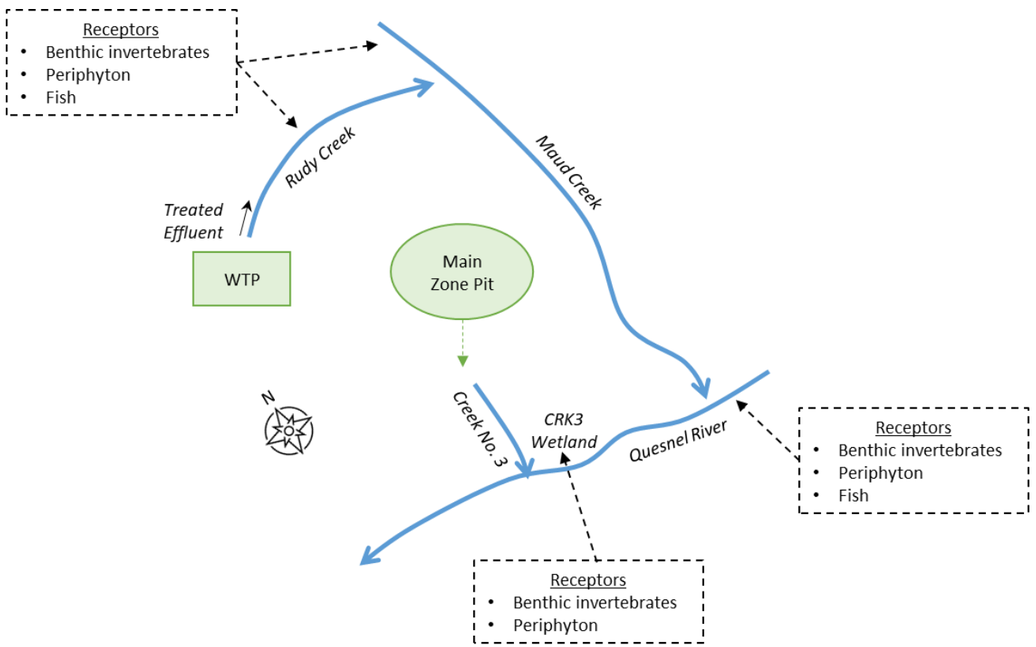
3.1.2 QR Mill

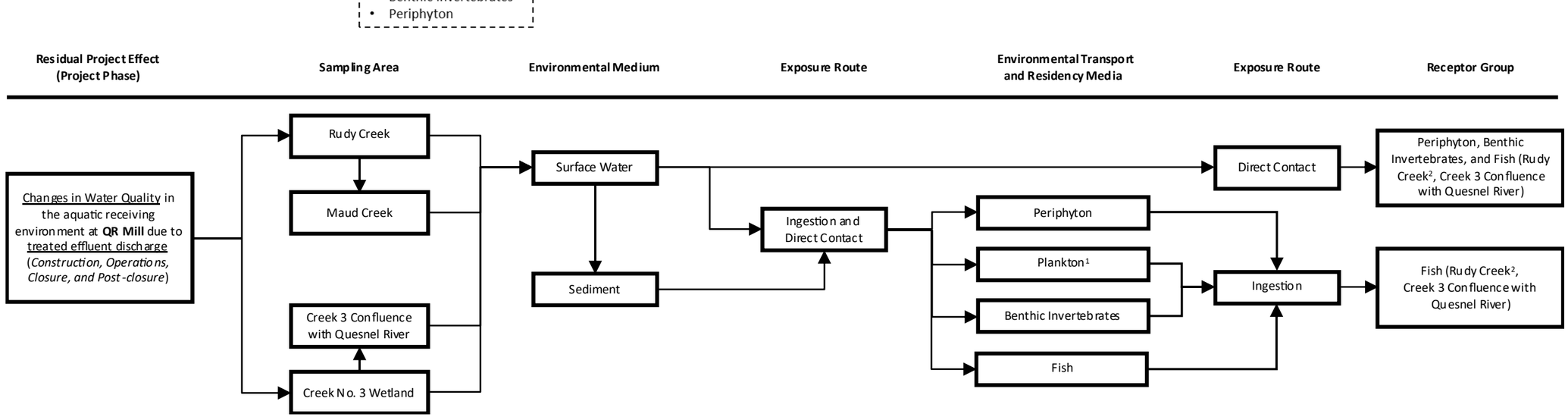
Figure 3–2 illustrates the conceptual site model for the QR Mill site. The primary source of parameters of potential concern will be the WTP, and the receiving environments will be as follows:

- Rudy Creek – the 3.9 km^2 watershed is fed primarily by water from the existing tailings storage facility (TSF). The creek flows through Sandy Lake before reaching Maud Creek. Maud Creek then drains to the Quesnel River.

Potential aquatic receptors for the QR Mill site are:

- Periphyton,
- Benthic invertebrates, and
- Fish (although the near-field area of Rudy Creek has low-quality habitat and low fish presence).





Notes: [1] Phytoplankton and zooplankton; [2] Although fish have been observed in Rudy Creek, they occur in low numbers in the area of potential exposure to effluent. The quality of fish habitat in the near-field area is also low.

Figure 3–2: Conceptual Site Model for the QR Mill Site

3.2 Monitoring Objectives

A summary of proposed monitoring components and objectives is provided in Table 3–1.

Table 3–1: Monitoring Components and Objectives

Monitoring Component	Monitoring Objective	Section
Habitat Characteristics	To document the physical condition of the sampling area at the time of sampling to provide supporting information for interpretation of biological data.	3.5.1
Surface Water	To evaluate chemical concentrations in water in waterbodies potentially affected by mine-related inputs, as well as reference areas, and to provide supporting information for interpretation of biological data. Monitoring effluent quality (chemistry and toxicity) is required under the provincial waste discharge permits and the MDMER. Information on the quality of effluent discharged from the respective WTPs will be considered in the AEMP to provide information on the potential for toxicity of the effluent.	3.5.2
Sediment	To evaluate chemical concentrations in sediment in waterbodies potentially affected by mine-related inputs, as well as reference areas, and to provide supporting information for interpretation of biological data. Samples will also be collected only during investigation of cause sampling events, to provide information on the potential for toxicity of sediments in areas receiving treated effluent.	3.5.3
Periphyton Biomass	To evaluate effects of mine-related inputs on nutrient concentrations and related plant (algae) growth in creek receiving environments, reflecting the combined effect of changes in water and sediment quality and other potential mine related stressors, such as suspended sediment loadings.	3.5.5
Plankton Community	To evaluate the effects of mine-related inputs on plankton communities, reflecting the effect of changes in water quality.	3.5.6
Benthic Invertebrate Community Structure	To evaluate effects of mine-related inputs on benthic invertebrate communities, reflecting the combined effect of changes in water and sediment quality and considering local habitat differences.	3.5.7
Tissue Chemistry	To evaluate effects of mine-related inputs on tissue chemistry of periphyton, plankton, benthic invertebrates, and fish in receiving waters. The data may also be suitable for use in bioaccumulation modelling, should it be necessary.	3.5.4
Fish Community and Health	Fish community sampling is not proposed for the AEMP at this time, but will be added to the AEMP if monitoring results identify a trigger for such monitoring. Additional rationale is provided in Section 3.5.8.	3.5.8

Notes: < = less than; % = percent; µg/L = milligrams per litre; AEMP = Aquatic Effects Monitoring Plan; EAC = Environmental Assessment Certificate; MDMER = Metal and Diamond Mining Effluent Regulations; n/a = not applicable; QR Mill = Quesnel River Mill; WQG = water quality guideline; WTP = Water Treatment Plant.

3.3 Monitoring Locations

3.3.1 Mine Site

Sampling locations are summarized in Table 3-2 and illustrated in Figure 3-2 for the Mine Site. The study design is based on a gradient approach at near-field and far-field locations in Lowhee Creek, Stouts Gulch, and Jack of Clubs Lake. Williams Creek is proposed as a reference area for creeks. A suitable reference lake that is comparable to Jack of Clubs Lake has not been identified

in the area and, therefore, the assessment of potential for effects will rely on a before-after and gradient design.

Generally, the station types will be as follows, with specific distances variable from the point of discharge depending on the waterbody: near-field (at the edge of the initial dilution zone), mid-field, and far-field.

3.3.2 QR Mill

Sampling locations for QR Mill are summarized in Table 3-4Table 3–3 and illustrated in Figure 3-3Figure 3–4. The study design is based on a “control-impact” approach at near-field and far-field locations in Rudy Creek, Unnamed Creek, and Maud Creek up and downstream of the confluences with Rudy Creek and Unnamed Creek. Sampling is also conducted in Creek 3 Wetland (CRK3) and Quesnel River (QR2), on the south side of the QR Mill site.

595000

600000

5885000

5880000

Red Gulch

Mosquito Creek

Willow River

Malleve Creek

Valley Creek

Lowhee Creek

Wilsons Creek

Jack of Clubs Lake

Hwy 26

Eureka Gulch

Williams Creek

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

Wetland

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

SG-1.35

SG-0.74

WC-8.9

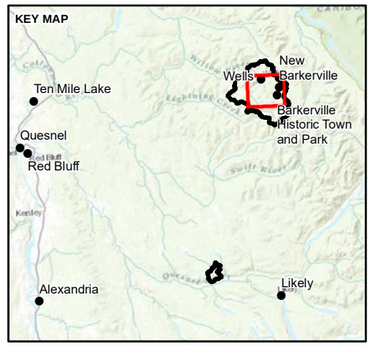
SG-0.25

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.
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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
3	FINAL - APPROVED	2025-06-23	K.S.
0	FINAL - APPROVED	2023-05-29	B.W.
0	FINAL - REVIEWED	2026-05-29	S.W
0	FINAL	2023-05-29	J.P.

PROJECT NO.	PHASE	REV.	FIGURE
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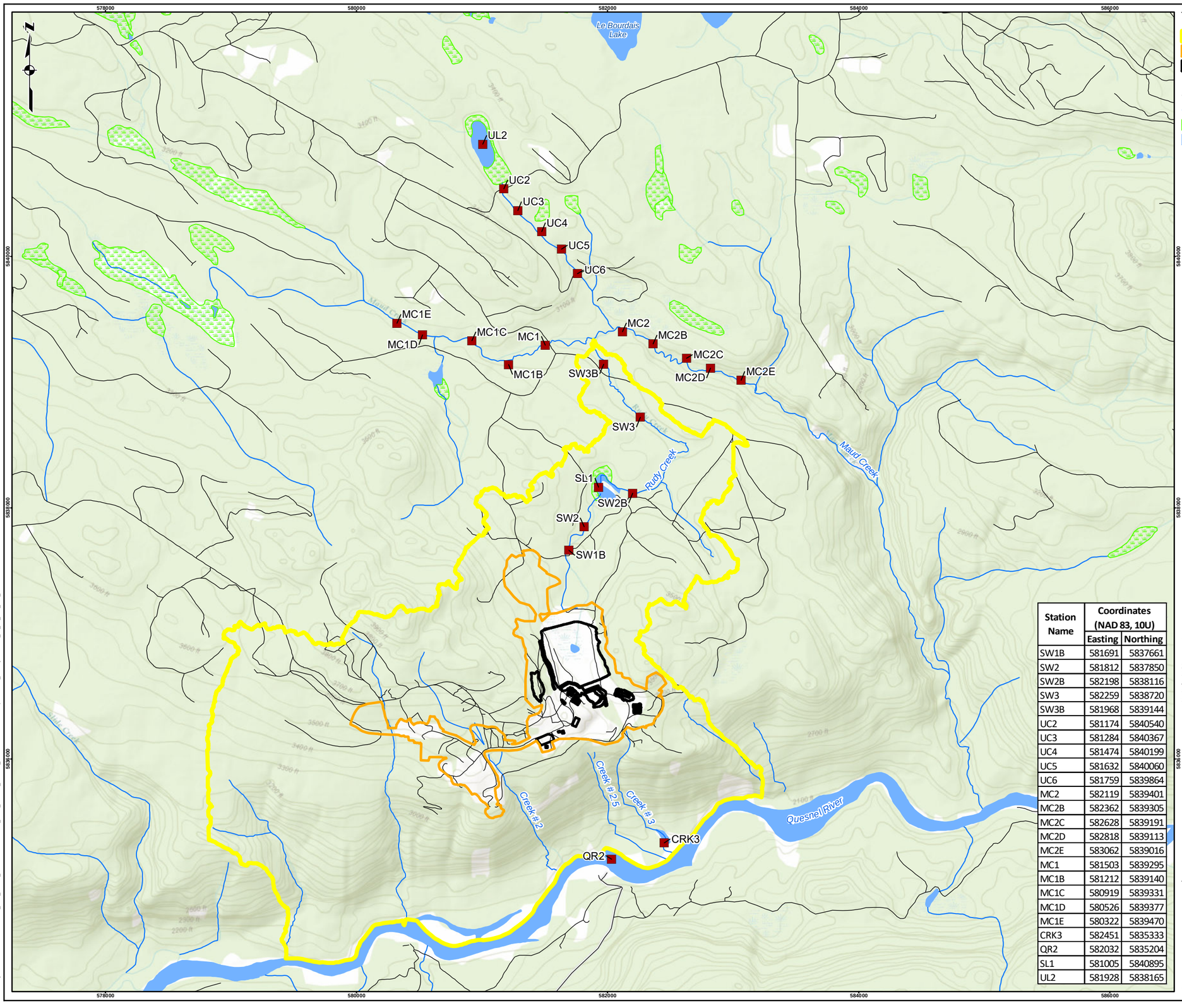

Station Name	Coordinates (NAD 83, 10U)	
	Easting	Northing
SW1B	581691	5837661
SW2	581812	5837850
SW2B	582198	5838116
SW3	582259	5838720
SW3B	581968	5839144
UC2	581174	5840540
UC3	581284	5840367
UC4	581474	5840199
UC5	581632	5840060
UC6	581759	5839864
MC2	582119	5839401
MC2B	582362	5839305
MC2C	582628	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

LEGEND

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

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.

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OSISKO DEVELOPMENT

CARIBOO GOLD PROJECT

QR MILL AQUATIC EFFECTS MONITORING PLAN - SAMPLING LOCATIONS

REV.	DESCRIPTION	DATE	INITIALS
0	FINAL - APPROVED	2023-05-26	B.W.
0	FINAL - REVIEWED	2023-05-26	S.W.
0	FINAL	2023-05-26	J.P.

PROJECT NO.	PHASE	REV.	FIGURE
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Table 3–2: Mine Site Sampling Locations and Components

Sampling Area	Type	Station Name	Coordinates		Sampling Component											
			Latitude	Longitude	Effluent Quality[a]	Surface Water Chemistry	Sediment Chemistry	Sediment Toxicity	Periphyton Biomass	Plankton Community	Benthic Invertebrate Community	Benthic Invertebrate Tissue	Periphyton Tissue	Plankton Tissue	Fish Tissue
Mine Site Complex WTP	Effluent	TBC	TBC	TBC	✓	-	-	-	-	-	-	-	-	-	-
Bonanza Ledge WTP	Effluent	TBC	TBC	TBC	✓	-	-	-	-	-	-	-	-	-	-
Lowhee Creek	Near-field	LC-3.9	53.07763	-121.558	-	✓	✓	TBC	✓	-	✓	✓	✓	-	-[c]
	Mid-field	LC-3.0	53.08966[b]	-121.561[b]	-	✓	✓	TBC	✓	-	✓	✓	✓	-	-[c]
	Far-field	LC-1.5	53.09773	-121.565	-	✓	✓	TBC	✓	-	✓	✓	✓	-	✓
Stouts Gulch	Near-field	SG-1.35	53.06687	-121.539	-	✓	✓	TBC	✓	-	✓	✓	✓	-	-[c]
	Mid-field	SG-0.74	53.06479	-121.531	-	✓	✓	TBC	✓	-	✓	✓	✓	-	✓
	Far-field	SG-0.25	53.06283	-121.521	-	✓	✓	TBC	✓	-	✓	✓	✓	-	✓
Williams Creek	Reference	WC-8.9	53.06234	-121.521	-	✓	✓	TBC	✓	-	✓	✓	✓	-	✓
	Reference	WC-9.8	53.05455	-121.521	-	✓	✓	TBC	✓	-	✓	✓	✓	-	✓
	Reference	WC-10.55	53.04791	-121.518	-	✓	✓	TBC	✓	-	✓	✓	✓	-	✓
Willow River	Near-field	JCL-OUT	53.09708	-121.581	-	✓	✓	TBC	-	✓	✓	✓	-	✓	✓
Jack of Clubs Lake	Near-field	JCL-IDZ-1	53.09443	-121.584	-	✓	✓	TBC	-	✓	✓	✓	-	✓	✓[d]
	Near-field	JCL-IDZ-2	53.09424	-121.582	-	✓	✓	TBC	-	✓	✓	✓	-	✓	
	Near-field	JCL-IDZ-3	53.09328	-121.582	-	✓	✓	TBC	-	✓	✓	✓	-	✓	
	Mid-field	JCL-MF-1	53.09188	-121.587	-	✓	✓	TBC	-	✓	✓	✓	-	✓	✓[d]
	Mid-field	JCL-MF-2	53.08952	-121.593	-	✓	✓	TBC	-	✓	✓	✓	-	✓	
	Mid-field	JCL-MF-3	53.09061	-121.590	-	✓	✓	TBC	-	✓	✓	✓	-	✓	
	Far-field	JCL-FF-1	53.08806	-121.597	-	✓	✓	TBC	-	✓	✓	✓	-	✓	✓[d]
	Far-field	JCL-FF-2	53.08596	-121.601	-	✓	✓	TBC	-	✓	✓	✓	-	✓	
	Far-field	JCL-FF-3	53.08424	-121.604	-	✓	✓	TBC	-	✓	✓	✓	-	✓	

Notes: WTP – water treatment plant; TBC = to be confirmed; ✓ = yes; - = no or not applicable.
(a) Toxicity testing will be conducted on the same sample as submitted for chemical analysis (synoptic sampling).
(b) The originally proposed location of LC-3.0 (i.e., latitude 53.08535, longitude -121.561 as specified in the *Environmental Management Act* discharge permit) is not safely accessible and thus the sampling station has been moved downstream to the coordinates indicated in the table.
(c) Fish are not present.
(d) Fish will be collected from a given area rather than at each station because fish are expected to move within the area.

Table 3–3: QR Mill Sampling Locations and Components

Sampling Area	Exposure/ Reference (Waterbody)	Station Name	Coordinates		Sampling Component					
			Latitude	Longitude	Effluent Quality[a]	Surface Water Chemistry	Sediment Chemistry	Sediment Toxicity	Periphyton Biomass	Benthic Invertebrate Community
QR Mill WTP	Effluent	TBC	TBC	TBC	✓	-	-	-	-	-
Near-field	Exposure (Rudy Creek)	SW1B	52.68271	-121.792	-	✓	✓	TBC	✓	✓ (S)
		SW2	52.68439	-121.790	-	✓	✓	TBC	✓	✓ (S)
		SW2B	52.68673	-121.784	-	✓	✓	TBC	✓	✓ (S)
		SW3	52.69214	-121.783	-	✓	✓	TBC	✓	✓ (S)
		SW3B	52.69600	-121.787	-	✓	✓	TBC	✓	✓ (S)
	Exposure (Sandy Lake)	SL1	52.68721	-121.788	-	✓	✓	TBC	-	✓ (E)
	Reference (Unnamed Creek)	UC2	52.70867	-121.798	-	✓	✓	TBC	✓	✓ (S)
		UC3	52.70710	-121.797	-	✓	✓	TBC	✓	✓ (S)
		UC4	52.70556	-121.794	-	✓	✓	TBC	✓	✓ (S)
		UC5	52.70428	-121.792	-	✓	✓	TBC	✓	✓ (S)
		UC6	52.70250	-121.790	-	✓	✓	TBC	✓	✓ (S)
	Exposure (Unnamed Lake)	UL2	52.71189	-121.801	-	✓	✓	TBC	-	✓ (E)
Far-field	Exposure (Maud Creek)	MC2	52.69829	-121.785	-	✓	✓	TBC	✓	✓ (C)
		MC2B	52.69739	-121.781	-	✓	✓	TBC	✓	✓ (C)
		MC2C	52.69632	-121.777	-	✓	✓	TBC	✓	✓ (C)
		MC2D	52.69559	-121.775	-	✓	✓	TBC	✓	✓ (C)
		MC2E	52.69468	-121.771	-	✓	✓	TBC	✓	✓ (C)
	Reference (Maud Creek)	MC1	52.69743	-121.794	-	✓	✓	TBC	✓	✓ (C)
		MC1B	52.69608	-121.798	-	✓	✓	TBC	✓	✓ (C)
		MC1C	52.69784	-121.803	-	✓	✓	TBC	✓	✓ (C)
		MC1D	52.69831	-121.808	-	✓	✓	TBC	✓	✓ (C)
		MC1E	52.69918	-121.811	-	✓	✓	TBC	✓	✓ (C)
Creek 3	Exposure (Creek 3 Wetland)	CRK3	52.66167	-121.781	-	✓	✓	TBC	✓	✓ (E)
Quesnel River	Exposure	QR2	52.66058	-121.787	-	✓	✓	TBC	✓	✓ (C)

Notes: QR Mill = Quesnel River Mill; WTP = water treatment plant; TBC = to be confirmed; S = Surber; E = Ekman; C = CABIN.
(a) Toxicity testing will be conducted on the same sample as submitted for chemical analysis (synoptic sampling).

3.4 Schedule

The duration of monitoring will be from the initiation of effluent discharge until after the cessation of effluent discharge. Effluent discharge to Jack of Clubs Lake, Lowhee Creek, and Rudy Creek will occur during the Construction, Operations, and Closure Phases, and during the active care period of the Post-Closure Phase. Effluent discharge to Lowhee Creek is currently occurring at the Bonanza Ledge site. Data collected prior to the initiation of effluent discharge to Jack of Clubs Lake or Rudy Creek will be considered to represent "baseline" or "existing" conditions. Upon cessation of effluent discharge (i.e., at the start of the passive care period of the Post-Closure Phase), monitoring under this AEMP will occur until the end of a three-year cycle.

For each component, the following schedule is proposed:

- Effluent quality (chemistry and toxicity) will be monitored per effluent discharge permits and the MDMER. One of the effluent sampling events for toxicity testing will occur once in late summer.
- Surface water quality will be monitored monthly during the open-water season (i.e., July, August, and September). Sampling will be timed to occur concurrently with biological monitoring (i.e., monthly during lake plankton sampling and once during other monitoring components if they are not sampled within one week of plankton sampling).
- Lake plankton sampling will be conducted monthly from July to September (i.e., three sampling events).
- Sediment and benthic invertebrate sampling will occur once, in late summer (typically August).
- Tissue sampling will occur once, in late summer, coinciding with the timing of community sampling.

The proposed frequency is annually for all monitoring components for the first three years of the Project, when effluent discharge is occurring, to provide information in the early stages of the Project. After the first three years, frequency will be adjusted to a three-year cycle to coincide with the requirements of the MDMER, with the exception of effluent quality and and surface water quality, which will continue to be monitored annually throughout the life of the Project.

3.5 Methods

3.5.1 Habitat Characteristics

A habitat assessment will be conducted at each station. Habitat characteristics measured at each lotic station will include reach data (canopy coverage, periphyton coverage, and riparian vegetation), channel characteristics (gradient, width, depth, and velocity), and substrate characteristics (composition of stream bed material, surrounding material, and embeddedness). For lake stations, the maximum depth and general substrate characteristics will be described. These data will be collected to provide explanatory information for data interpretation.

3.5.2 Effluent and Surface Water Quality

Effluent samples will be collected for concurrent analytical chemistry and toxicity testing according to the permit requirements and the MDMER, as described in the Mine Site Water Management Plan and the QR Mill Water Management Plan (Appendix K of the Construction Environmental Management Plan).

Surface water quality will be monitored under the AEMP according to the methods outlined herein.

3.5.2.1 Sample Collection

The collection of *in situ* measurements and water samples for laboratory analysis will be conducted as follows:

- Creek stations:
  - *In situ* water quality parameters (pH, dissolved oxygen [DO], specific conductivity, total dissolved solids [TDS], oxidation reduction potential [ORP], turbidity, and temperature) will be measured using a multi-meter probe calibrated following the manufacturer's instructions.
  - A single sample will be collected from each station in labelled, laboratory-supplied, clean plastic or amber glass bottles as directed by the analytical laboratory. Samples will be collected away from activity by the samplers that may have disturbed sediment, and with the bottle held slightly below the water surface to avoid collection of floating debris.
- Lake stations:
  - Water column profiles – at each station, *in situ* measurements of pH, DO, specific conductivity, TDS, ORP, turbidity, and temperature will be measured at approximately 1 m depth intervals from the surface of the water column to approximately 1 m above the bottom using a calibrated multi-meter probe.
  - If the water column is stratified at the time of sampling, a water sample will be collected with a grab sampler (Kemmerer or similar) from above and below the stratification layer (two samples per site), and if the water column is weakly or not stratified, one sample will be collected from the surface (~0.3 m depth).

For those analyses requiring filtration (e.g., dissolved metals), samples will be filtered in the field with sterile syringes and 0.45 micrometre (µm) membrane disc filters and preserved, as necessary, using a laboratory-provided preservative. Samples will be kept on ice in a cooler until transferred to a refrigerator at the end of the day. Samples will be kept cool until shipped to the laboratory for analysis.

Effluent samples for analysis of chemistry will be collected as described above. The concurrent sample for toxicity testing will be a single sample collected in labelled, laboratory-supplied, clean plastic containers as directed by the analytical laboratory.

3.5.2.2 Laboratory Analysis

Samples for analytical chemistry will be submitted to a Canadian Association of Laboratory Accreditation (CALA)-accredited laboratory for analysis of the following parameters using analytical methods that achieve sufficiently low detection limits to allow for comparison to ambient water quality guidelines:

- General parameters (pH, turbidity, specific conductivity, and hardness);
- Total suspended solids (TSS) and TDS;
- Total organic carbon (TOC) and dissolved organic carbon (DOC);
- Major anions (alkalinity, bicarbonate, carbonate, chloride, fluoride, bromide, and sulphate);
- Major nutrients (total nitrogen, ammonia, nitrate, nitrite, total phosphorus, total dissolved phosphorus, and ortho-phosphate);
- Free, total, and weak acid dissociable (WAD) cyanide[2] (at QR Mill site only);
- Total and dissolved metals[3]; and
- Polycyclic aromatic hydrocarbons[4] (only during the first two AEMP programs, in conjunction with fish tissue sampling).

Effluent samples for toxicity testing will be submitted to a CALA-accredited laboratory for the following tests (or as updated from time to time by the MDMER):

- 96-h Rainbow Trout acute lethality;
- 48-h *Daphnia magna* acute lethality;
- 7-d Rainbow Trout embryo development;
- 7-d *Ceriodaphnia dubia* reproduction and survival;

[2] To meet the needs of the Human Health Monitoring and Management Plan, cyanide in surface water will be measured at the Mine Site, as well as at QR Mill, for two years. After two years, sampling frequency at the Mine Site will be reduced to every five years, or as needed to support the Human Health Monitoring and Management Plan.
[3] To meet the needs of the Human Health Monitoring and Management Plan, the analytical suite for surface water will include antimony, aluminum, arsenic, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, nickel, and selenium, as listed in Condition 19.3(b)(i)(D) of the EAC.
[4] To meet the needs of the Human Health Monitoring and Management Plan, polycyclic aromatic hydrocarbons in surface water will be measured for two years. After two years, sampling frequency will be reduced to every five years or as needed to support the Human Health Monitoring and Management Plan. The analytical suite will consist of: acenaphthene, acenaphthylene, acridine, anthracene, benz(a)anthracene, benzo(a)pyrene, benzo(b,j)fluoranthene, benzo(b,j,k)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, fluoranthene, fluorene, indeno(1,2,3-c,d)pyrene, 1-methylnaphthalene, 2-methylnaphthalene, naphthalene, phenanthrene, pyrene, quinoline, and benzo(a)pyrene total potency equivalents.

- 7-d *Lemna minor* growth; and
- 72-h *Raphidocelis subcapitata* (formerly *Pseudokirchneriella subcapitata* and *Selenastrum capricornutum)* growth.

3.5.2.3 Data Screening

Effluent and surface water chemistry results will be tabulated and compared to applicable long-term average and short-term maximum BC water quality guidelines (BCWQGs) for the protection of aquatic life (ENV 2021a,b). Long-term average guidelines (i.e., chronic) are intended to prevent sub-lethal and lethal effects over a longer term. The long-term chronic BCWQGs will be used for comparative purposes only, as they are generally intended to be applied to mean concentrations of five samples collected over a 30-day period (ENV 2021a). Short-term acute guidelines are intended to prevent severe effects (e.g., lethality) to aquatic organisms in the short term (ENV 2021a). Water quality guidelines are not directly applicable to effluent discharges and are only used for reference to identify potential parameters of interest for the receiving environment. The results will provide explanatory information for data interpretation. Effluent chemistry will also be compared to MDMER and permit limits and used in the trigger response (Section 5).

The acute toxicity test results will be confirmed as either a pass (50% or more of the Rainbow Trout or *D. magna* survived) or fail (more than 50% died); this information will be used in the trigger response (Section 5). The chronic toxicity test results will be reviewed by a QP to evaluate the potential for chronic toxicity to aquatic life in the receiving environment and to support the interpretation of the biological monitoring results.

3.5.3 Sediment Quality and Toxicity

Sediment samples will be collected for analytical chemistry. Sampling for toxicity testing will only be done as a response action to a trigger exceedance (Section 5); in that case, the methods for sampling and analysis of any toxicity testing will be determined by the QP.

3.5.3.1 Sample Collection

The collection of sediment samples for laboratory analysis will be conducted as follows:

- Creek stations—a bulk (i.e., not sieved) composite sample of the top 3 centimetres (cm) of sediments accumulated in depositional areas, or from between cobble substrates, as applicable, will be collected from at least three locations throughout the reach sampled for lotic stations. A stainless-steel spoon will be used to collect sediment samples. Large rocks and organic debris will be removed in the field.
- Lake stations—sampling will target the top 3 cm rof a 6 by 6 inch Ekman grab (or similar) sampler, with multiple grabs composited, as necessary, to provide sufficient volume for the analyses required.

The composite samples will be homogenized until colour and texture are visually consistent throughout the sample, after which time the sediment will be transferred to labelled, laboratory-supplied containers. Samples will be kept on ice in a cooler until transferred to a refrigerator at the end of the day. Samples will be kept cool until shipped to the laboratory for analysis.

3.5.3.2 Laboratory Analysis

The samples will be submitted to a CALA-accredited laboratory for analysis of the following parameters:

- On the bulk (<2 millimetre [mm] fraction) sample: particle size and TOC.
- On the <63-µm fraction (sieved by the analytical laboratory): TOC, moisture, sulphur, and total metals[5] (full suite with detection limits sufficiently low for comparison to ambient sediment quality guidelines).

3.5.3.3 Data Screening

Sediment chemistry results will be tabulated and compared to applicable working sediment quality guidelines (BC SQG) for the protection of freshwater aquatic life (ENV 2021b). The lower BC SQG is intended to represent a concentration that will protect aquatic life from adverse effects of toxic substances in most situations, whereas the upper BC SQG is intended to represent a concentration below which effects are expected only occasionally (ENV 2021b). These guidelines have adopted many interim sediment quality guidelines (ISQG) as lower SQGs and probable effects levels (PEL) as upper SQGs from the Canadian Council of Ministers of the Environment (CCME 1999). Where ISQG and PEL do not exist, BC adopted values from the Ontario Provincial Sediment Quality Guidelines, which are presented as lowest effect levels (LEL) and severe effect levels (SEL). Guidelines such as ISQG and PEL are statistically derived from arbitrarily selected percentiles of both effects and non-effects biological data that are correlated to chemical data (Chapman and Mann 1999), also called the co-occurrence method. This statistical evaluation should, therefore, not be assumed to imply cause and effect for the derived guideline concentrations. Moreover, because of the way these guidelines are derived, the more conservative benchmarks (e.g., ISQG) are more likely to predict effects when no effects are present (i.e., result in false positives) and thus may be overly conservative for a given protection goal. The results of the sediment screening will provide explanatory information for data interpretation.

[5] To meet the needs of the Human Health Monitoring and Management Plan, the analytical suite will include antimony, aluminum, arsenic, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, nickel, and selenium. Cyanide will also be measured in sediment samples for the first two years of the AEMP to meet the needs of the Human Health Monitoring and Management Plan. After two years, sampling frequency will be reduced to every five years or as needed to support the Human Health Monitoring and Management Plan.

3.5.4 Tissue Chemistry

Tissue samples will be collected from co-located Mine Site sampling stations as indicated in Table 3–2 for the biological types described below.

3.5.4.1 Sample Collection

Periphyton

Composite samples will be scraped from hard substrates where sufficient biomass (i.e., 2 grams [g] wet weight [ww]) is available, and from a minimum of three locations if possible[6]. Samples will be transferred to labelled plastic containers (e.g., Whirl-Pak® bags or similar) and frozen for transport to the analytical laboratory. If insufficient biomass is available for analysis of both chlorophyll *a* (Section 3.5.5) and metals, then analysis of chlorophyll *a* will be prioritized.

Lake Zooplankton

Collection of plankton tissues for analytical chemistry will be undertaken following collection of samples for taxonomy. Composite samples will be collected using a 0.3 by 2 m zooplankton net with a 63 µm mesh (or similar). A minimum of three vertical hauls will be conducted through the whole water column to obtain sufficient biomass (2 g ww) and, transferred to labelled plastic containers and frozen for transport to the analytical laboratory.

Benthic Invertebrates

Collection of tissues for analytical chemistry will be undertaken following collection of samples for taxonomy. At each station, a reasonable level of effort (up to 30 minutes) will be expended to collect a minimum target of 2 g ww by the following habitat-dependent methods:

- Creek—one composite sample will be collected with a kick net from mainstem riffle habitat.
- Lake—one composite sample will be collected from sediment obtained with a grab sampler (Ponar or similar). The sediment will be sieved through a 500 µm mesh.

A representative sub-sample of the collected invertebrates will be picked from the debris, then rinsed and patted dry. The sample will be photographed, and notes will be made to document the taxonomic composition to Order level, if possible[7]. Casings (e.g., for caddisflies) and shells (e.g., for snails) will be removed and the soft tissues retained. The sample will then be transferred to a labelled plastic container and frozen.

[6] It may not be possible to collect periphyton tissue from three locations within the vicinity of the monitoring station.
[7] It may not be possible to identify all specimens to the Order level because, for example, some identifying characteristics are not visible in the field.

Fish Tissue

Rainbow Trout (*Oncorhynchus mykiss*) will be targeted for tissue analysis as this species that has been observed at all of the proposed sampling locations and baseline tissue chemistry exists. Adult fish with a range of size classes will be targeted.

Prior to sampling, applicable scientific collection permits will be obtained. If permits are not obtained, sampling of fish will not occur.

From each station where fish are present, up to eight (some tissue guidelines, such as for selenium, are intended to be applied to the average of eight samples) fish will be collected from creeks by electrofishing and from Jack of Clubs Lake by angling. Collected fish will be euthanized and measured (fork length and weight to the nearest 0.1 g), photographed, and examined visually for obvious signs of lesions and parasites. The fish will be dissected and sex, liver weight, and gonad weight recorded. Dorsal muscle (skin removed), gonad (whole), and liver (whole) will be collected for analytical chemistry (minimum 1 g ww), and otoliths and scales for aging. Tissues for analytical chemistry will be placed in labelled plastic containers, and aging structures will be placed in labelled envelopes.

3.5.4.2 Laboratory Analysis

Tissue samples will be transported frozen, on ice to a CALA-accredited laboratory for analysis of lipids, moisture, and total metals[8]. Aging structures will be submitted to an experienced technician (there is no accreditation for aging).

3.5.4.3 Data Screening and Analysis

Tissue chemistry data will be compared to the dietary guidelines for selenium and methyl mercury (ENV 2021a).

3.5.4.4 Selenium Study in CRK3 and QR2

A focussed study will occur during the first year of the AEMP to provide baseline data of selenium concentrations in periphyton and benthic invertebrate tissue from CRK3 and QR2 at the QR Mill site. These data would support interpretation of future selenium bioaccumulation monitoring. Samples will be collected as described in Section 3.5.4.1.

Collection of benthic invertebrate tissues will depend on the habitat type:

- CRK3[9] (wetland)—one composite sample will be collected from sediment obtained with a grab sampler (Ponar or similar). The sediment will be sieved through a 500 µm mesh.

[8] To meet the needs of the Human Health Monitoring and Management Plan, the analytical suite will include antimony, aluminum, arsenic, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, nickel, and selenium.
[9] The CRK3 sampling station is located in a small wetland below the confluence of Creek 3 (Hatfield 2023).

- QR2[10] (river)—one composite sample will be collected with a kick net from mainstem riffle habitat.

Concurrent with the tissue sampling, water samples will be collected for selenium speciation. The results of the sampling will be reported in the first AEMP report.

3.5.5 Periphyton Biomass

3.5.5.1 Sample Collection

Samples for periphyton biomass will be collected from creek stations as listed in Table 3-2Table 3–2 and Table 3-3Table 3–3. Five replicate periphyton samples will be collected from lotic stations for biomass determination as chlorophyll *a*. A replicate will consist of the sample scraped off one rock. A minimum of five rocks[11,12] with attached periphyton representative of the overall community within the reach and suitable for placement of the sampling template (e.g., sufficiently large, flat surface), will be randomly selected. Water depth and near-bottom velocity will be recorded at the location of each rock. Prior to sampling, rocks will be photographed. Periphyton will be scraped from a known area on each rock using a clean scalpel blade and scrub brush, and transferred to a filtration unit with filtered station water. Unless otherwise directed by the analytical laboratory, a mixed cellulose ester filter membrane (0.45 µm) will be used in the filter apparatus, and the water-periphyton mixture will be filtered through the membrane. The membrane will then be folded in half, placed unpreserved in a labelled, laboratory-supplied opaque sampling tube, and kept on ice in a cooler until being transferred to a freezer at the end of the day. Samples will be kept in the dark and frozen during shipment to the laboratory to limit degradation.

3.5.5.2 Laboratory Analysis

Samples will be submitted to a CALA-accredited laboratory for analysis of chlorophyll *a*.

3.5.5.3 Data Screening and Analysis

Chlorophyll *a* data will be normalized to milligrams per square metre (mg/m^2), tabulated, and summarized as the mean and standard deviation of replicates collected from each station. Periphyton chlorophyll *a* data will be plotted with data from previous years, if available, for visual examination of variability within watercourses and among years. Mean periphyton chlorophyll *a* concentrations will be compared to the short-term maximum BC WQG of 100 mg/m^2 (ENV 2021a). The maximum BC WQG is for the protection of aquatic life in streams designed primarily to protect fish habitat and changes in communities of organisms, such as invertebrates, which are important themselves or which may be important fish-food organisms (ENV 2021a). The guideline is intended to be applied to the mean of replicate samples randomly selected from the stream.

[10] The QR2 sampling station is located in a backchannel of the Quesnel River (Hatfield 2023).
[11] If fewer than five rocks are present with attached periphyton, fewer replicates may be collected.
[12] The sampling effort will consist of a maximum time of 15 minutes per station. In the event that sufficient biomass is not available for laboratory analysis, the condition of the station will be documented, and the station will be abandoned for that sampling event.

Differences among sites, watercourses, and years will be assessed using applicable statistical analyses.

3.5.6 Plankton Community

3.5.6.1 Sample Collection

Plankton samples will be collected at the same Mine Site locations at which water samples are collected in July, August, and September (i.e., three monthly sampling events). This sampling design will provide information on the spatial and temporal distribution of plankton. To be consistent with the previous sampling programs in the lake, the samples will be collected as follows:

- **Phytoplankton taxonomy**—depth-integrated samples will be collected using a grab sampler (Kemmerer or similar) deployed at 2 m intervals through the euphotic zone (two times the Secchi depth). Where the depth is less than two times the Secchi depth, water will be collected at 2 m intervals to 1 m above the lakebed. The discrete samples will be combined in a bucket, and then an aliquot of the mixed volume will be transferred to an amber-coloured container and preserved with Lugol's solution.
- **Phytoplankton biomass (as chlorophyll *a*)**—samples will be collected and composited in the same manner as described above for taxonomy samples; however, samples will be collected in duplicate. A known volume (e.g., 1 litre [L]) of the samples will be filtered through a mixed cellulose ester filter membrane, which will be placed in a laboratory-supplied opaque sampling tube and then transported to the laboratory on ice.
- **Zooplankton taxonomy**—samples will consist of one vertical haul through the whole water column at an approximate rate of 0.5 metres per second (m/s), using a 64 µm[13] zooplankton net fitted with a detachable Dolphin bucket. After the haul, the net will be rinsed from the outside with lake water to move collected organisms into the Dolphin bucket. The collected sample will be transferred to a clear plastic container, treated with one-half of an Alka Seltzer® tablet (to prevent the organisms from contorting during preservation), and preserved with 10% phosphate-buffered formalin solution at a ratio of 1:1 (volume:volume).

3.5.6.2 Laboratory Analysis

- **Phytoplankton taxonomy:** The samples will be submitted to an experienced plankton taxonomist for identification and enumeration to the lowest practical level (typically genus or species). There are no applicable accreditations for plankton taxonomists at this time.
- **Phytoplankton biomass (as chlorophyll *a*):** The samples will be submitted to a CALA-accredited laboratory for analysis of chlorophyll *a*.

[13] This is based on the recommendations in the BC Field Sampling Manual. Note that there is variability among manufacturers in mesh sizes. Baseline zooplankton sampling was conducted with either a 63 µm or 64 µm mesh net; however, the difference between the mesh sizes would not materially affect data comparisons among years.

- **Zooplankton taxonomy:** The samples will be transferred to an experienced taxonomist for identification and enumeration to the lowest practical level (typically genus or species). There are no applicable accreditations for plankton taxonomists at this time.

3.5.6.3 Data Screening and Analysis

Community metrics (e.g., total abundance, total richness, Simpson's Diversity Index, Simpson's Evenness Index) will be calculated, and comparisons among years and stations will be made using suitable statistics (e.g., analysis of variance [ANOVA], multivariate ordination).

At the discretion of the QP, additional comparisons using other tools may be made among near-field, mid-field, and far-field areas.

3.5.7 Benthic Invertebrate Community Structure

3.5.7.1 Sample Collection

The type of habitat present in each sampling area is variable, and four different collection methods will be used as follows:

- **Bonanza Ledge creek stations** areas will be sampled with a Hess sampler (or other similar device) with an approximately 210 to 250 µm mesh. Three replicate samples, collected from downstream to upstream, will be comprised of five sub-samples collected from each station where sufficient area is available (per Metal Mining Technical Guidance for Environmental Effects Monitoring; Environment Canada 2012b). The sampler will be placed onto the substrate, the substrate will be agitated, and large components will be picked up and brushed off into the collection net.
- **QR mill near-field lotic** areas will be sampled with a Surber sampler (or other similar device) with an approximately 210 to 250 µm mesh. Five replicate samples, collected from downstream to upstream, will be comprised of five sub-samples collected from each station where sufficient area is available (per Environment Canada 2012b). The sampler will be placed onto the substrate, the substrate will be agitated, and large components will be picked up and brushed off into the collection net.
- **QR Mill far-field lotic** areas will be sampled following CABIN protocols (Environment Canada 2012a). A kick net (400 µm mesh) will be used to collect a single time-integrated composite sample from each station. The riffle sampled will be traversed in a zigzag pattern from bank to bank in an upstream direction for a collection time of three minutes per sample. The kick net will be held directly downstream of the sampler while the substrate in the top 5 to 10 cm is disturbed, and rocks are overturned to dislodge invertebrates clinging to interstitial spaces and allowing them to drift into the kick net.
- **Depositional / Lake stations** will be sampled with an Ekman (or similar) grab sampler, and each sample will be composited from three subsamples. Three replicate samples will be collected. A grab sample will be considered successful if the grab does not contain large, foreign objects, an adequate penetration depth was achieved, the sample was not overfilled

or leaking, and the samples contain as little aquatic vegetation as possible. The collected material will be sieved through a 500 µm mesh.

JCL-OUT is a creek station with some lake characteristics. Depending on the water depth at the time of sampling, an Ekman grab sampler may need to be used. Three replicate samples will be collected from JCL-OUT regardless of the collection method.

The collected material will be transferred to a plastic container and preserved with 10% buffered formalin or as otherwise directed by the taxonomist.

3.5.7.2 Laboratory Analysis

The samples will be submitted to a Society of Freshwater Science (SFS)-certified taxonomist for taxonomic identification and enumeration to the "lowest practical level" following Environment and Climate Change Canada (ECCC; 2020) methods.

3.5.7.3 Data Screening and Analysis

For samples collected by Hess, surber, or grab sampler, community metrics (e.g., total abundance, total richness, Simpson's Diversity Index, Simpson's Evenness Index, proportion of chironomid and Ephemeroptera-Plecoptera-Trichoptera [EPT] taxa) will be calculated and comparisons among years and stations will be made using suitable statistics (e.g., ANOVA, multivariate ordination).

The taxonomy results for samples collected via the CABIN method will be uploaded into the web-based CABIN database hosted by Environment and Climate Change Canada. The database provides tools for:

- Calculation of community metrics (e.g., total abundance, total richness, Simpson's Diversity Index, Simpson's Evenness Index, and proportion of chironomid and EPT taxa).
- Multivariate statistical comparison to regional reference conditions (currently based on the Fraser Basin Reference Model; Strachan et al. 2014) (i.e., BEAST, or Benthic Assessment of Sediment). The multivariate analysis assigns a "test" site to a group of reference sites based on similarities in habitat characteristics or "predictor variables" and determines if the site is similar to or divergent from the regional reference condition.
- An evaluation of observed vs. expected taxa. The River Invertebrate Prediction and Classification (RIVPACS) assessment focuses on presence/absence information and assumes that if an expected taxonomic group is not present (as determined by the reference group assigned in the BEAST analysis), the benthic invertebrate community is impaired.

At the discretion of the QP, additional comparisons using other tools may be made between reference and exposure areas.

3.5.8 Fish Community and Health

Fish community sampling is not proposed for the AEMP at this time, based on the understanding of existing conditions of the aquatic receiving environments and the potential interactions of the Project with those aquatic receiving environments. Further discussion of the rationale is provided below.

- Effluent discharge is likely to have the greatest influence on the aquatic receiving environment, and thus the AEMP is designed to monitor for effects in the near-field area of effluent discharge.
    - For all sites, effluent concentration will be less than 1% at 250 m from the point of discharge. The MDMER applies this trigger to determine whether a fish survey is necessary, in that it assumes that if the effluent is sufficiently diluted (i.e., <1% outside of 250 m), then the potential impact to fish populations is low enough to not warrant further investigation.
    - The proposed water treatment for effluent has changed since the EAC Application and effluent quality is expected to be near ambient water quality guidelines (WQGs) for Bonanza Ledge and QR Mill. Effluent exposure outside of the near-field areas of these sites is expected to be negligible.
- Based on updated effluent quality predictions, effluent discharge will not be a source of mercury or selenium to the near-field area. Mercury has not been identified in source terms for influent to the WTP, and selenium concentrations are expected to be lower than 10 µg/L maximum and 5 µg/L on average in the effluent. For the discharge to Jack of Clubs Lake, selenium concentrations will be lower than initially expected.
- At Bonanza Ledge and QR Mill, there are insufficient fish to support a fish community and health survey in the near-field areas.
    - Lowhee Creek has become increasingly inaccessible to fish due to sedimentation of the lower reaches, and due to flood mitigation works being undertaken by the District of Wells.
    - Fish are not present in the near-field and mid-field areas of Lowhee Creek or the near-field area of Stouts Gulch.
    - Although fish have been observed in Rudy Creek, they occur in low numbers in the area of potential exposure to effluent. The quality of fish habitat in the near-field area is also low.
- There is uncertainty whether it is possible to collect a sufficient number of fish in Jack of Clubs Lake to detect changes per MDMER guidance.
    - Fish tissue chemistry data will be collected from Jack of Clubs Lake to evaluate changes in support of the Human Health Monitoring and Management Plan. However, the sample size for tissue chemistry (up to 8 fish) is not sufficient to support a fish health survey; (Environment Canada 2012b) recommends at least 40 mature fish (20 females and 20 males) for a lethal survey and 100 non-young-of-year fish for a non-lethal survey.
    - Rainbow Trout were selected for fish tissue chemistry monitoring because they were the most commonly observed species during baseline studies (Appendix 7.9-2 of the EAC Application).

Given the uncertainties of whether a fish health survey can be conducted, and the expected effluent quality and near-field water quality, fish community and health monitoring is not proposed for the AEMP at this time.

A QP will evaluate the potential for mine-related effects to fish community and health, based on a review of the results of other monitoring components:

- Effluent, surface water, and sediment monitoring will confirm effluent quality and surface water and sediment concentrations.
- Monitoring of plankton and benthic invertebrate community, and tissue chemistry, will determine the potential for effects to the availability and quality of fish prey.
- Fish tissue chemistry monitoring in areas of fish presence will identify bioaccumulation potential of metals in water, sediment, and food.

These other monitoring components are sufficient to evaluate the potential for mine-related effects to fish.

3.5.9 Quality Assurance / Quality Control

Monitoring will incorporate a quality assurance / quality control (QA/QC) program. Quality assurance consists of a range of management and technical practices designed to verify that the delivered product is suitable for the intended use (ENV 2013). Quality control consists of the collection of data to assess data quality, statistical assessment of data quality, and remedial measures taken when the objectives are not realized.

3.5.9.1 Quality Assurance

Field

Samples will be collected by experienced crews with the required training to conduct the program. Water and sediment samples will be collected in laboratory-supplied, certified-clean containers. Water quality meters will be maintained and tested daily, and calibrated following the manufacturer's instructions. Reusable equipment will be decontaminated between stations. Care will be taken to limit the introduction of foreign material into samples or loss of material of interest from samples prior to analysis. Field notes will be maintained to document the field sampling program, including date and location of sample, sampler's initials, and method of sample collection. Each sample will be labelled with a unique identifier and the date sampled. Chain-of-custody forms will be updated as samples are collected and will be checked to verify the information recorded before samples are submitted.

Laboratory

Chemistry samples will be submitted to a CALA-accredited laboratory for the parameters for which analysis is requested. Typical quality assurance practices employed by the laboratory involve:

- Sample tracking from receipt at the laboratory through to final reporting.

- Calibration of measuring and testing equipment using established procedures.
- Documentation of test methods and support procedures to maintain consistency of application, repeatability of test results, and traceability of analyses.
- Relation checks to highlight anomalous relationships between test parameters.
- Data validation through several reviews prior to release of final reports.
- Method validation to confirm the test method used is the latest version of published standard methods and is fit for the intended use.
- Experimental and statistical procedures to establish method detection limits (MDL) and limits of reporting.

Taxonomy samples will be submitted to an SFS-certified taxonomist. Typical quality assurance practices involve:

- Sample tracking from receipt at the laboratory through to final reporting;
- Checking that samples were delivered with appropriate preservative; and
- Documentation of test methods and support procedures for consistency of application.

Data Management

Sample receipts and analytical reports provided by the laboratory will be checked for errors (e.g., sample names entered incorrectly, samples not analyzed for all requested compounds). Analytical reports will also be reviewed to confirm that laboratory objectives have been met and the appropriate QA/QC information reported. If necessary, the laboratory will be contacted to make corrections. Throughout data preparation and analysis, data tables, calculated values, and statistical analyses will undergo internal review to identify potential errors and make corrections as necessary.

3.5.9.2 Quality Control

The purpose and data quality objective of quality control sampling for each monitoring component are summarized in Table 3–4 and briefly described below. Field duplicates are not proposed for tissue samples comprising composites or where multiple replicates are proposed.

Table 3–4: Purposes and Objectives for Quality Control Components

QC Component	Purpose	Frequency	Data Quality Objectives[(a)]
Water and Sediment Chemistry			
Field duplicate (water)	To assess within site environmental variability.	With 10% of samples collected	RPD >20% indicate notable difference, >50% indicate potential issue, for values ≥5x MDL
Field duplicate (sediment)	To assess within site environmental variability.	With 10% of samples collected	RPD <50% for values ≥5x MDL
Field blank	To monitor contamination of samples between collection and receipt by laboratory.	One per sampling program	<MDL

QC Component	Purpose	Frequency	Data Quality Objectives[a]
Laboratory duplicate	To assess the precision of analytical methods.	One per up to 20 samples submitted	Follow laboratory specified DQOs
Laboratory control sample/ Matrix Spike/ CRM	To assess the accuracy of analytical methods.	One per up to 20 samples submitted	Follow laboratory specified DQOs
Method blank	To monitor contamination of samples during laboratory analysis.	One per up to 20 samples submitted	<MDL
Trip blank	To monitor contamination of samples during general sampling handling.	One per sampling event	<MDL
Periphyton Biomass as Chlorophyll *a*			
Laboratory control sample	To assess the accuracy of analytical methods.	One per up to 20 samples submitted	Follow laboratory specified DQOs
Method blank	To monitor contamination of samples during laboratory analysis.	One per up to 20 samples submitted	<MDL
Benthic Invertebrate Taxonomy			
Laboratory Re-sorting	To determine sorting efficiency.	On 10% of samples submitted	Discrepancy between organism counts <10%
Laboratory Re-identification	To determine identification efficiency.	On 10% of samples submitted	Error rate is 5% or less for taxonomic identifications
Tissues			
Laboratory control sample	To assess the accuracy of analytical methods.	One per up to 20 samples submitted	Follow laboratory specified DQOs
Method blank	To monitor contamination of samples during laboratory analysis.	One per up to 20 samples submitted	<MDL

Notes: % = percent; < = less than; > = greater than; ≥ = greater than or equal to; MDL = method detection limit; DQO = data quality objective; CRM = certified reference material; RPD = relative percent difference between concentrations measured in duplicates, calculated as: ([original – duplicate] ÷ mean) x 100. RSD = relative standard deviation between concentrations measured in triplicates, calculated as: (standard deviation ÷ mean) x 100. Values less than five times the MDL are not included in the RPD or RSD calculations because analytical variability near the MDL is higher and does not provide a good measure of variability associated with the collection of field samples. As applicable, the purpose and objectives of quality control components are adopted from the BC Field Sampling Manual (ENV 2013) and the CABIN Field Sampling Protocols (Environment Canada 2012b).
a) Data quality objectives may change over time, so may need to be revised as directed by a QP.

Field

Field quality control for chemistry (water and sediment) will consist of collection of field replicates for assessing methodological bias and intra-station variability. Field blanks for water chemistry will also be collected for assessing possible contamination during sampling. Replicate samples for periphyton biomass and fish tissue chemistry collected at each station will provide a mechanism for assessing intra-station variability.

Laboratory

Laboratory quality control for chemistry (water, sediment, and periphyton, invertebrate, and fish tissue) and periphyton biomass as chlorophyll *a* will consist of laboratory duplicates, control samples, method blanks, certified reference materials, and matrix spikes, as applicable, to assess precision, accuracy, and possible contamination due to sampling or methodological bias.

Laboratory quality control for taxonomic analyses will include re-sorting checks and re-identification checks to assess precision and accuracy.

4. REPORTING

An interpretive report will be prepared and submitted to the following for review by May 31[14] of the next calendar year:

- BC Environmental Assessment Office;
- BC Ministry of Environment and Parks;
- BC Ministry of Water, Land and Resource Stewardship;
- BC Ministry of Forests;
- Lhtako Dené Nation;
- Xatśūll First Nation; and
- Williams Lake First Nation.

The report contents will provide the following:

- Executive Summary—a plain-language summary of the monitoring program, results, and recommendations.
- Introduction—objectives of the monitoring program and applicable descriptions of the sites and activities that occurred in the period prior to sampling.
- History—an overview of any changes to the AEMP since its inception.
- Methods (including QA/QC)—field, laboratory, statistical, and other analyses.
- Results—tabular and graphical illustration.
- Discussion—a discussion of the results and applicable context for potential effects observed[15].
- Summary.
- Recommendations, if any, for the next cycle of monitoring cycle.
- References.
- Applicable forms signed by the QP taking responsibility for the work.

The report will provide an evaluation of the effectiveness of the main mitigation measure (water treatment) for preventing adverse effects on aquatic life in the receiving environment.

For reporting pursuant to the MDMER, sampling and submission of interpretive reports are undertaken based on a three-year cycle as specified in the regulations. Report contents are also specified in the MDMER.

[14] The submission date for the AEMP interpretative report matches the permit requirement.
[15] For example, if there were any upset conditions observed in water treatment and discharge and how the upset conditions may have contributed to the observations in the biological monitoring.

5. TRIGGERS AND RESPONSE ACTIONS

EAC condition 4.2 states that the objective of trigger-response planning is to identify the circumstances that will require the Holder to implement alternate or additional mitigation measures, monitoring, or other adjustments through adaptive management to address effects of the Project if the monitoring shows that those effects are not being mitigated to the extent contemplated in the EAC Application; are different than those predicted in the EAC Application; or have exceeded the triggers identified in this AEMP.

A description of the potential aquatic effects of the Project is provided in Section 3.1. A summary of the mitigation measures is provided in Section 1.5. Implementation of effluent treatment is the main mitigation measure to avoid adverse effects on aquatic life and the success of this mitigation measure is demonstrated through the outcomes of the biological monitoring. Table 5–1 outlines the triggers and response actions for adaptively responding to results of each monitoring component, which will be applied to the first AEMP.

Table 5–1: Trigger Responses for the Aquatic Effects Monitoring Program

Monitoring Component	Trigger	Action
Effluent Quality	Effluent chemistry exceeds 80% of MDMER or permit limits (refer to most current versions of the permit and MDMER)	Collect a confirmatory effluent sample within 48 hours of notice of exceedance. Increase sampling frequency to daily until two consecutive samples are below 80% of limits. Review effluent chemistry to determine the extent of exceedance: • If between 80 and 90% of limits, then review influent chemistry to determine if there are increasing trends or other changes that may affect treatment efficacy; if issues are identified, then identify and implement mitigation measures as recommended by a QP. • If between 90 and 100% of limits, then initiate a performance evaluation of the WTP and monitor water quality at the edge of the IDZ weekly until effluent sampling frequency is reduced. • If >100% of limits, stop effluent discharge, then continue daily sampling until three consecutive samples are below limits and toxicity testing confirms no acute lethality to Rainbow Trout or *Daphnia magna*. Evaluate if the upset condition has the potential to cause effects in the receiving environment, by collecting weekly samples at the edge of the IDZ for five weeks and comparing the average of the results to chronic WQGs. Identify mitigation options and implement as directed by a QP to avoid upset conditions in the future. Consider implications to interpretation of biological monitoring results, by comparing the magnitude and extent of the elevated concentrations in relation to the toxicological literature on effect concentrations. Document outcome of each of the above response actions in the AEMP interpretative report.

Monitoring Component	Trigger	Action
	Effluent fails acute lethality test (i.e., more than 50% of test organisms die in full-strength effluent)	Stop effluent discharge (e.g., via recirculation within the system). Resample effluent and analyze for chemistry and toxicity. Investigate cause of toxicity (e.g., upset conditions). Identify mitigation options and implement as directed by a QP to avoid upset conditions in the future. Restart discharge if effluent chemistry is below permit limits and toxicity testing confirms no acute lethality to Rainbow Trout and *Daphnia magna.* Consider implications to interpretation of biological monitoring results, by comparing the magnitude and extent of the elevated concentrations in relation to the toxicological literature on effect concentrations. Document outcome of each of the above response actions in the AEMP interpretative report.
Surface Water Quality	Level 1: Concentrations in exposure areas/stations exceed 80% of chronic WQGs (chronic WQGs to be selected using the most current WQG and sample-specific EMTFs)	Collect a confirmatory sample within 48 hours of notice of exceedance. If confirmatory sample is below trigger, then return to routine monitoring. If confirmatory sample is above trigger (>80% of chronic WQG), implement increased sampling frequency to five weekly samples in 30 days. If three consecutive weekly samples are below trigger, then return to routine monitoring. If five consecutive weekly samples are below chronic WQG, then return to routine monitoring. Document outcome of each of the above response actions in the AEMP interpretative report.
	Level 2: Concentrations in exposure areas/stations exceed chronic WQGs (chronic WQGs to be selected using the most current WQG and sample-specific EMTFs)	Implement increased sampling frequency to five weekly samples in 30 days. If five consecutive weekly samples are below chronic WQG, then return to routine monitoring. Evaluate if effects are causally linked to effluent discharge (e.g., evaluate concentrations in reference areas or far-field stations, as appropriate to the exposure areas/stations, and evaluate if WQGs were exceeded historically at those locations). Conduct sub-lethal toxicity testing at receiving environment station. Consider implications to interpretation of biological monitoring results, by comparing the magnitude and extent of the elevated concentrations in relation to the toxicological literature on effect concentrations. Document outcome of each of the above response actions in the AEMP interpretative report.

Monitoring Component	Trigger	Action
Sediment Chemistry	Concentrations in exposure areas/stations exceed SQGs (most current SQGs to be selected at the time of comparison)	Evaluate if effects are causally linked to effluent discharge (e.g., evaluate concentrations in reference areas or far-field stations, as appropriate, to the exposure areas/stations and evaluate if SQGs were exceeded historically at those locations). Consider implications to interpretation of biological monitoring results by comparing the magnitude and extent of the elevated concentrations in relation to the toxicological literature on effect concentrations. If the SQG exceedance originates from a station that does not have historical SQG exceedances, and is causally related to effluent discharge, then the QP will design a focussed study to investigate cause (e.g., toxicity testing). The QP will consider whether this focussed study should be initiated prior to the next biological monitoring period based on the magnitude and extent of the change in sediment concentrations and the potential for effects to aquatic receptors (e.g., benthic invertebrates). Document outcome of each of the above response actions in the AEMP interpretative report.
Tissue Chemistry	Selenium or methylmercury concentrations in tissue exceed tissue-based guidelines (most current guideline to be selected at time of comparison) OR Metals concentrations in tissue exceed baseline and reference or far-field conditions	Evaluate if effects are causally linked to effluent discharge (e.g., evaluate concentrations in reference areas or far-field stations, as appropriate to the exposure areas/stations). Consider implications to interpretation of biological monitoring results, by evaluating the spatial extent of elevated tissue concentrations, and comparing tissue concentrations to the toxicological literature on effect concentrations. Evaluate if focused studies are needed to further investigate potential for adverse effects on aquatic life and implement them as directed by a QP. Document outcome of each of the above response actions in the AEMP interpretative report.
Periphyton Biomass	Chlorophyll *a* concentrations exceed the BC guideline (the most current guideline to be selected at time of comparison)	Evaluate if effects are causally linked to effluent discharge (e.g., evaluate concentrations in reference areas or far-field stations, as appropriate to the exposure areas/stations). Consider implications to interpretation of biological monitoring results, by evaluating the magnitude and spatial extent of elevated chlorophyll *a* concentrations and how increased biomass may affect abundance and diversity of benthic invertebrates and fish. Evaluate if focused studies are needed to further investigate potential for adverse effects on aquatic life and implement them as directed by a QP. Document outcome of each of the above response actions in the AEMP interpretative report.
Plankton Community	Community metrics show a gradient response from near-field to far-field areas with a statistically significant difference of more than two standard deviations (based on far-field area)	Evaluate if effects are causally linked to effluent discharge. Evaluate the findings from chemical analysis and chronic toxicity testing in effluent samples, surface water chemistry, and tissue chemistry to investigate potential cause(s) of the observed effects. Implement focused study if high risk to aquatic ecosystem function is possible. Document outcome of each of the above response actions in the AEMP interpretative report.

Monitoring Component	Trigger	Action
Benthic Invertebrate Community	Community metrics show statistically significant differences between exposure and reference areas or a gradient response from near-field to far-field areas of more than two standard deviations (based on reference or far-field areas)	Evaluate if effects are causally linked to effluent discharge. Evaluate the findings from chemical analysis and chronic toxicity testing in effluent samples, surface water chemistry, sediment chemistry, and tissue chemistry to investigate potential cause(s) of the observed effects. Implement focused study if high risk to aquatic ecosystem function is possible. Document outcome of each of the above response actions in the AEMP interpretative report.

Notes: % = percent; MDMER = Metal and Diamond Mining Effluent Regulations; QP = qualified professional; WTP = water treatment plant; IDZ = initial dilution zone; > = greater than; WQGs = water quality guidelines; SQGs = sediment quality guidelines; BC = British Columbia; ETMF = exposure and toxicity modifying factors.

Timelines for the implementation of response actions depend on monitoring component: triggers for effluent quality will be responded to immediately, whereas responses to the other components will occur as part of the AEMP reporting process, as well as during the next year's AEMP. The outcome of each response action will be documented in the AEMP interpretative report. It is expected that reviewers will provide feedback on outcomes of the trigger responses during their review of the AEMP report. Focused studies, if needed, are not prescribed here; rather, they will be designed by a QP based on the findings of the monitoring program and specific site and discharge conditions at the time, and the designs will be presented in the AEMP report.

The specific triggers being exceeded, and the subsequent investigation to determine the cause of those exceedances, will determine how the existing mitigation measure (effluent treatment) will need to be altered or if new mitigation measures (e.g., changes in water management) are needed. The progress in identifying and implementing these mitigation measures will be documented in the AEMP report. After implementation, the effectiveness of the altered or new mitigation measures will be measured through the existing monitoring program, as documented in this AEMP and any future amendments to it, and reported through the AEMP report.

6. PLAN UPDATES

This aquatic effects monitoring plan is intended to be adaptive based on the observed effects from operational activities at the site and the results of monitoring. The adaptive framework recognizes that monitoring can lead to new information about the receiving environment (Figure 6–1). The framework provides feedback on this new information into the decision-making process that links monitoring and management that may need to be implemented to keep the WTP in compliance with the effluent permit. The progressive implementation of the adaptive management framework will also include a review of the monitoring program during preparation of the interpretive report to determine the potential need for revisions to planned sampling and analysis tasks. This review could include cessation of monitoring components where data show that the predictions have been verified or an increase in monitoring based on changing conditions or monitoring results. Changes to the triggers and response actions may also be applied.

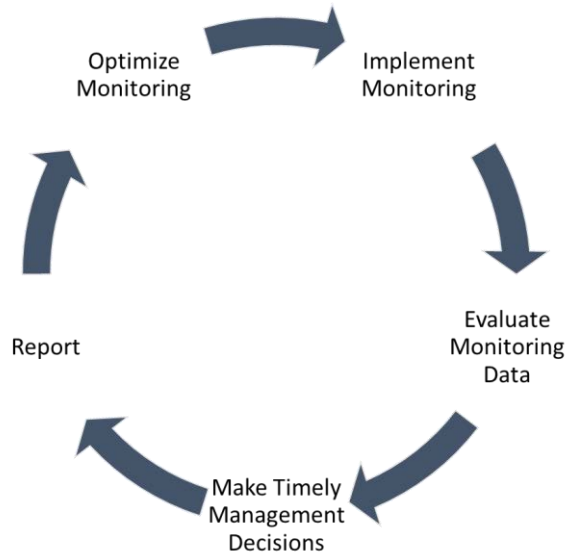

Figure 6–1: Adaptive Management Framework

As described in Section 4, the AEMP interpretive report will be provided electronically to regulatory agencies and Participating Indigenous Nations for review and comment. Feedback from reviewers on the interpretive reports is encouraged and will be considered as part of the "optimize monitoring" step in the Adaptive Management Framework, as shown in Figure 6–1. It is expected that feedback will be provided in a written format (e.g., letter to ODV), and ODV would respond to any questions or suggestions in a written format (e.g., reply letter to the reviewer). If requested by the reviewer or ODV, a meeting between ODV and the reviewer will be arranged to discuss the feedback. The AEMP will be reviewed by a QP and the AEMP will be updated if required to address recommendations included in the AEMP interpretative report and the reviewer feedback. If the AEMP is updated, then it will be submitted to the regulatory agencies and Participating Indigenous Nations. Justification will be provided in the cover letter of the updated AEMP for recommended modifications that were not applied. The expected schedule for this consultation process is:

- AEMP interpretative report submitted to regulatory agencies and Participating Indigenous Nations on May 31 of the year.
- Written feedback provided by reviewers within one month of report receipt (i.e., by June 30).
- Written response provided by ODV within one month of receipt of feedback (i.e., by July 31).
- Updated AEMP (if changes were required) provided within three months of interpretative report (i.e., by August 31).

This schedule may be adjusted to meet the needs of ODV and the reviewers, such as to allow more time for review and feedback by reviewers or to allow more time for ODV to generate a response.

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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 Kerrie Serben

   Title Senior Technical Manager, Environmental Scientist

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

   Name of Association: College of Applied Biology Registration # 5479

3. Brief description of professional services:

   Cariboo Gold Project Aquatic Effects Monitoring Plan (AEMP) 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: Witnessed by:

X Kerrie Serben **X**

Print Name: Kerrie Serben Print Name: Sean Weston

Date signed: June 24, 2025

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.*