Cariboo Gold Project

Project Description

Barkerville Gold Mines Ltd.

Box 247

3700 Ski Hill Road

Wells, BC V0K 2R0

October 2019

EXECUTIVE SUMMARY

Introduction

Barkerville Gold Mines Ltd. (BGM) is proposing the development and operation of the Cariboo Gold Project (the Project), which includes:

- The Cariboo Gold Mine, an underground mine producing up to 4,000 tonnes per day (tpd) of ore located in the District of Wells (Wells), British Columbia (BC), including underground crushing, a surface concentrator and paste backfill plant, two waste rock storage facilities (WRSF), access roads, and associated mine infrastructure (Mine Site);
- BGM's existing Quesnel River mill (QR Mill) and associated infrastructure, including upgrades to the existing QR Mill and construction of a new dry stack tailings storage facility;
- Transportation of ore between the Mine Site and QR Mill along 56 kilometre (km) of Highway 26 and 59 km of the 500 Nyland Lake Forest Service Road, a gravel forest service road maintained by West Fraser Mills Ltd (Transportation Routes);
- Transportation of workers and goods to Wells from Quesnel along Highway 26 (Transportation Routes);
- Transportation of workers and goods to QR Mill from Quesnel along Highway 26 and the 500 Nyland Lake Road, and also along the Quesnel Hydraulic Road to the 2700 Road and the 500 Nyland Lake Road (Transportation Routes); and
- A new 69 kilovolt (kV) transmission line, approximately 69 km in length, that follows a corridor along Highway 26 from Barlow Substation, near Quesnel, BC, to the Mine Site, near Wells (Transmission Line).

Total ore resources (indicated and inferred) are currently estimated to be approximately 24 million tonnes (t). The mine will have an approximate operational life of 11 years, and will operate 24 hours per day, 365 days per year. During the construction period, an average of 70 construction personnel, peaking at approximately 112 workers, will be present on-site. During operations, the Project is anticipated to employ approximately 333 people per year over the 11-year operational period.

The Project has been planned to minimize disturbance, where possible. The majority of Project infrastructure at the Mine Site will be located on brownfield sites that have been previously disturbed by historical mining operations. Infrastructure outside of the historical mine waste footprint will be located on previously disturbed areas or follow existing alignments where possible. The Project will also utilize the QR Mill, and not require additional area outside of the existing footprint at this site.

BGM has been active in the Cariboo Mining District of BC since 1994 and considers the Project to be well positioned for implementation. The Project has a relatively low projected capital cost of approximately $306 million and will provide meaningful economic partnerships, employment and training opportunities for Indigenous nations and local communities. The Project will provide an economic benefit to the Cariboo region, particularly in Wells, Quesnel, and surrounding areas, as well as to the Province of BC. BGM is committed to developing the Project in a sustainable manner that respects natural, heritage, social and environmental values, while providing economic benefits for the region.

Existing Conditions

Baseline studies were initiated for the Project area in 2016 and continued through 2019. Disciplines include the following:

- Air quality and climate
- Noise
- Light
- Hydrology
- Water quality and aquatic health
- Fish and fish habitat
- Soils
- Terrain and terrain stability
- Geochemistry
- Vegetation
- Wildlife and wildlife habitat
- Contaminated sites
- Socio-community
- Land and resource use
- Use of lands and resources for traditional purposes
- Visual quality
- Economy
- Heritage
- Human health and ecological risk assessment

Potential Project Effects and Mitigation

An overview of the potential environmental, social, economic, heritage, and health effects of the Project, based on current knowledge of the Project and the existing environment, are presented in Tables 14 and 15 (in the main body of this document). Example mitigation measures are also provided in Tables 14 and 15. Project effects, and linkages to Project components and activities, will be identified and discussed in the Environmental Assessment Certificate application.

Engagement and Consultation

BGM has initiated engagement activities for the Project. BGM has engaged with the following Indigenous nations and stakeholders through meetings, teleconferences, e-mails, presentations and printed materials:

- Lhtako Dené Nation
- Xatśūll First Nation
- Williams Lake Indian Band (T'exelc)
- Tsilhqot'in National Government
- Neskonlith Indian Band
- Nazko First Nation
- District of Wells
- City of Quesnel
- Cariboo Regional District
- Environmental Assessment Office (EAO)
- Ministry of Mines, Energy, and Petroleum Resources (BC), Ministry of Environment and Climate Change Strategy (BC)
- Forests, Lands, Natural Resource Operations and Rural Development (FLNR)
- BC Treaty Commission
- BC Hydro
- Barkerville Historic Town and Park
- CEA Agency (now IAAC)
- RCMP
- The public

BGM will work with the Indigenous nations throughout all stages of the Environmental Assessment to understand the extent to which Indigenous Interests (as defined below) and Current Use (as defined below) may be affected by the Project.

ABBREVIATIONS

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

Abbreviation	Description
APECs	areas of potential environmental concern
BC	British Columbia
BCEAA	British Columbia *Environmental Assessment Act*
BGM	Barkerville Gold Mines Ltd.
BMP	Best Management Practice
°C	degrees Celsius
CCLUP	Cariboo Chilcotin Land Use Plan
CEA Agency	Canadian Environmental Assessment Agency
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CRD	Cariboo Regional District
DFO	Fisheries and Oceans Canada
EA	Environmental Assessment
EAC	Environmental Assessment Certificate
EAO	Environmental Assessment Office (BC)
ECCC	Environment and Climate Change Canada
ESA	Environmental Site Assessment
FLNR	Ministry of Forests, Lands, Natural Resources Operations and Rural Development (BC)
g/t	grams per metric tonne
ha	hectare
HHERA	human health and ecological risk assessment
IAA	*Impact Assessment Act*
IAAC	Impact Assessment Agency of Canada

Abbreviation	Description
km	kilometre
km^2	square kilometre
kV	kilovolt
L	litre
Ltd	Limited
m	metre
masl	metres above sea level
MAPA	*Mines Act* Permit Amendment
MEM	Ministry of Energy and Mines (BC)
MEMPR	Ministry of Mines, Energy, and Petroleum Resources (BC)
ML	metal leaching
MOE	Ministry of Environment and Climate Change Strategy (British Columbia) – formerly Ministry of Environment
MOTI	Ministry of Transportation and Infrastructure (British Columbia)
MWh	megawatt hour
NOx	oxides of nitrogen
NP	neutralization potential
NPAG	Non-Potentially Acid Generating
NRCan	Natural Resources Canada
PAG	Potentially Acid Generating
PAHs	polycyclic aromatic hydrocarbons
PM	particulate matter (PM_{10}, $PM_{2.5}$)
Project	Cariboo Gold Project (proposed)
Proponent	Barkerville Gold Mines Ltd. (BGM)

Abbreviation	Description
QSRMP	Quesnel Sustainable Resource Management Plan
QR Mill	Quesnel River Mill
ROM	run of mine
SAR	species at risk
SARA	*Species at Risk Act*
SO_2	sulphur dioxide
t	tonne
TEK	Traditional Ecological Knowledge
TEM	Terrestrial Ecosystem Mapping
TNG	Tsilhqot'in National Government
tpd	tonnes per day
t/yr	tonne per year
TSF	tailings storage facility
TSP	total suspended particles
URF	uncemented rock fill
WHA	Wildlife Habitat Area
WRSF	waste rock storage facility

Table of Contents

TABLES

FIGURES

APPENDICES

User Note: This Table of Contents section acts as a reference point for the Record of Issue, Executive Summary and Study Limitations sections as and when they might be required.

Therefore, the structure of this section must not be altered in any way.

1.0 GENERAL INFORMATION AND CONTACTS

1.1 Project Summary

Barkerville Gold Mines Ltd. (BGM) is proposing the development and operation of the Cariboo Gold Project (the "Project"), which includes:

- The Cariboo Gold Mine, an underground mine producing up to 4,000 tonnes per day (tpd) of ore located in the District of Wells (Wells), British Columbia (BC), including underground crushing, a surface concentrator and paste backfill plant, two waste rock storage facility (WRSF), access roads and associated mine infrastructure (Mine Site);
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- Transportation of workers and goods to QR Mill from Quesnel along Highway 26 and the 500 Nyland Lake Road, and along the Quesnel Hydraulic Road to the 2700 Road and the 500 Nyland Lake Road (Transportation Routes); and
- A new 69 kilovolt (kV) transmission line, approximately 69 km in length, that follows a corridor along Highway 26 from Barlow Substation, near Quesnel, BC, to the Mine Site, near Wells (Transmission Line).

Ore produced at the Mine Site will undergo crushing, ore sorting, milling, flotation, and dewatering before being trucked as a concentrate along the Transportation Route to QR Mill for processing.

Total ore resources (indicated and inferred) are currently estimated to be approximately 24 million tonnes (t). Based on these resources, the mine will have an approximate life of 11 years and will operate 24 hours per day, 365 days per year.

The majority of Project infrastructure at the Mine Site will be located on brownfield sites that have been previously disturbed by historical mining operations. The Project will also utilize the QR Mill, and not require additional area outside of the existing footprint at this site. This will reduce the potential environmental effects associated with ground disturbance and vegetation clearing at both sites.

The information provided in this Project Description is reflective of a preliminary engineering design basis and will be subject to ongoing studies and optimizations. BGM is continuing to refine project components while gathering geological and socio-environmental baseline data for the Project. The Environmental Assessment will be supported by studies currently underway for the technical, environmental and socio-economic components of the Project. Through ongoing consultation and engagement, BGM will inform Indigenous nations, stakeholders, and regulatory agencies as the Project progresses.

Parties that may be potentially interested in, or affected by, the proposed Project include federal and provincial agencies, Indigenous nations, local government representatives, community and economic organizations, adjacent permit / authorization holders, environmental non-government organizations, and local businesses and residents. A summary of Indigenous consultation and public engagement undertaken to October 1, 2019 is provided in Sections 8.0 and 9.0 of this document, respectively.

The Project will:

- Not require federal funding (Section 2.4);
- Implement reasonable practices and mitigation measures to avoid and limit potential adverse effects to environmental, economic, social, health, and heritage resources (Section 7.0); and
- Undergo all required permitting and statutory regulatory approval processes, including an environmental assessment (EA), prior to initiating construction.

This Project Description has been prepared in accordance with the BC Environmental Assessment Office (EAO) *Guidelines for Preparing a Project Description for an Environmental Assessment in British Columbia* (EAO, 2016). A table of concordance is provided in Appendix A.

1.2 Project Purpose and Rationale

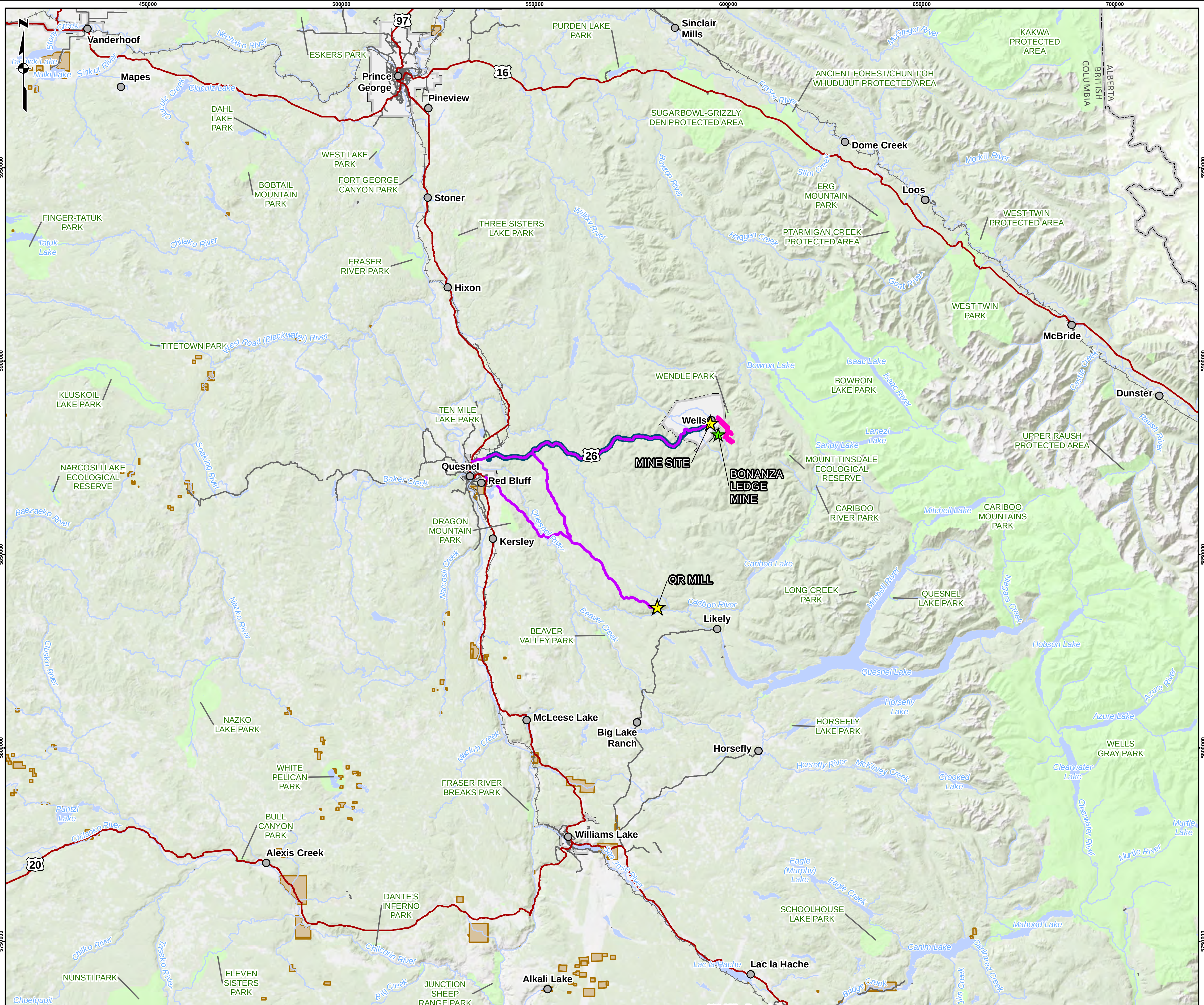
BGM considers the Project to be well positioned for implementation because it has a relatively low projected capital cost of approximately $306 million. The Project will provide approximately 333 direct full-time equivalent jobs per year for an operational period of approximately 11 years given currently delineated resources. The Project will provide meaningful economic partnerships, employment, and training opportunities for Indigenous nations and is anticipated to reduce the population drift from the Cariboo region to metropolitan centres by providing jobs in a non-urban setting. The Project will provide an economic benefit to the Cariboo region, particularly in Wells, Quesnel, and surrounding areas, as well as to the Province of BC.

The Project is situated within the Cariboo Regional District (CRD) of the Cariboo region of central BC (Figure 1) near the community of Wells and Barkerville Historic Town and Park. The Cariboo region has a history of mining that dates back to the Cariboo gold rush of the 1860s. In recent years, the region has witnessed an upsurge in tourism, recreation, and wilderness activities.

1.3 Project Site and Alternatives

The Project consists of the Mine Site including a Waste Rock Storage Facility (WRSF) at the immediately adjacent Bonanza Ledge Mine near Wells, QR Mill, the Transportation Routes and the Transmission Line (Figure 2). The proposed infrastructure at the Mine Site and QR Mill are shown in Figure 3, Figure 4, Figure 5 and Figure 6, respectively. The proposed Transmission Line corridor is shown in Figure 7. Project surface infrastructure has been located on previously disturbed or brownfield areas, wherever possible, at both the Mine Site and at QR Mill. Further details on the Project and infrastructure are provided in Section 4.0.

Most Mine Site infrastructure will be located on historical mine waste from the Cariboo Gold Quartz Mine which operated from about 1930 to 1970, for which no remediation or reclamation has been completed. Infrastructure outside of the historical mine waste footprint will be located on previously disturbed areas or follow existing alignments where possible. The final location, capacity, and layout of Project infrastructure will consider the results of current and planned geological, geotechnical, and environmental studies and inputs from consultation and engagement, and will be further defined as this information becomes available.



REFERENCE(S)

1. TRAILS, WATER FEATURES, ROADS, MUNICIPAL BOUNDARY, PARK/PROTECTED AREAS, BARKERVILLE HISTORIC TOWN/PARK, CITIES (INSET), PROVINCIAL BORDERS (INSET) OBTAINED FROM THE B.C. MINISTRY OF FORESTS, LANDS, NATURAL RESOURCE OPERATIONS AND RURAL DEVELOPMENT.
2. HILLSHADE DERIVED FROM LIDAR DATA FLOWN BY MCELHANNAY CONSULTANTS LTD. JUNE 27, 2016.
3. BASE DATA SOURCE: ESRI, GEOBASE, NRCAN, AND THE GIS USER COMMUNITY.
4. INSET BASE SOURCE: ESRI, DELORME, GEBCO, NOAA NGDC, AND OTHER CONTRIBUTORS.

NAD83 CSRS
UTM ZONE 10N

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CARIBOO GOLD PROJECT

LOCATION OF THE PROPOSED PROJECT

REV.	DESCRIPTION	DATE	INITIALS
A		2019-10-10	M.Y

PROJECT NO.	PHASE	REV.	FIGURE
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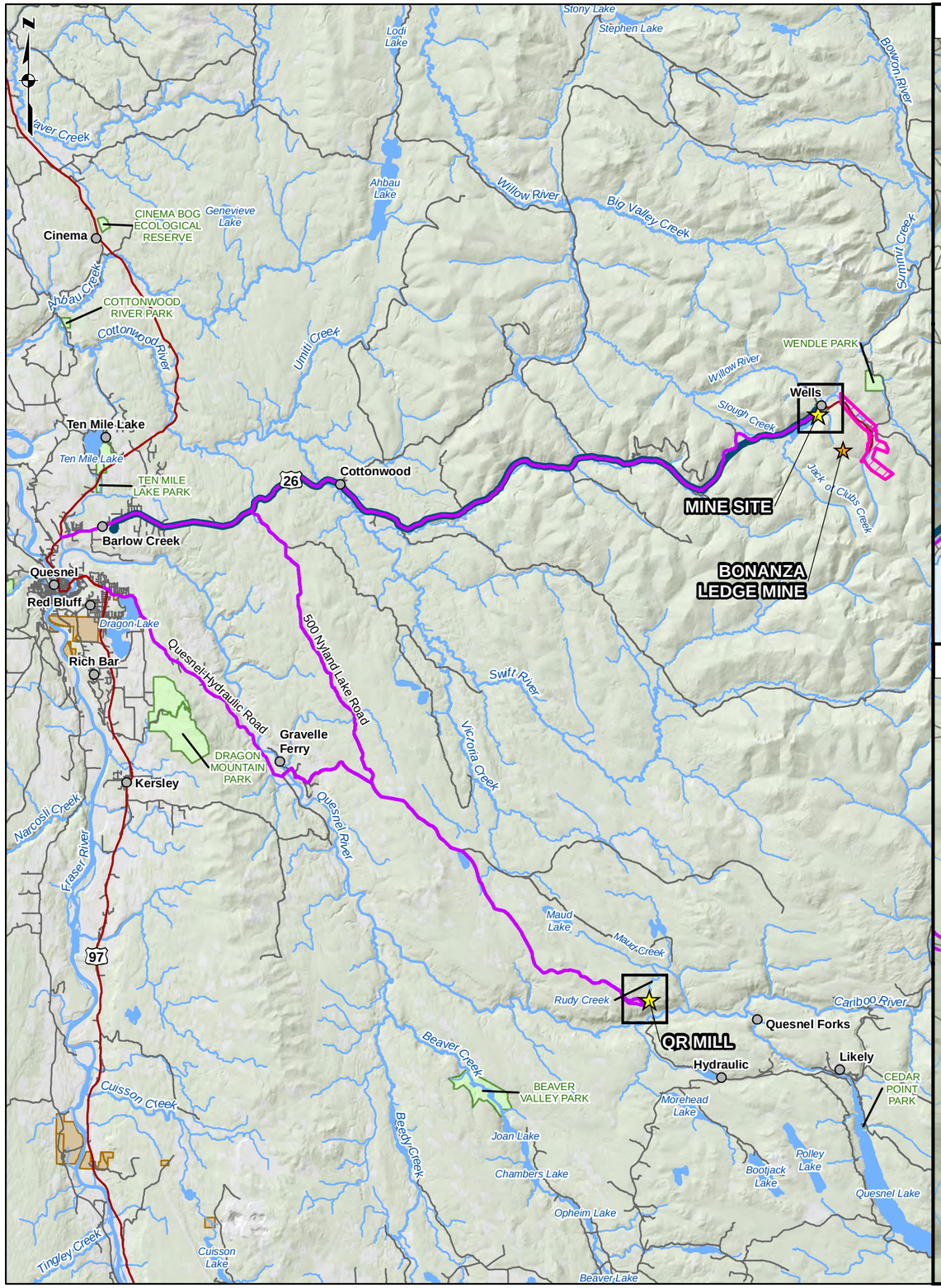
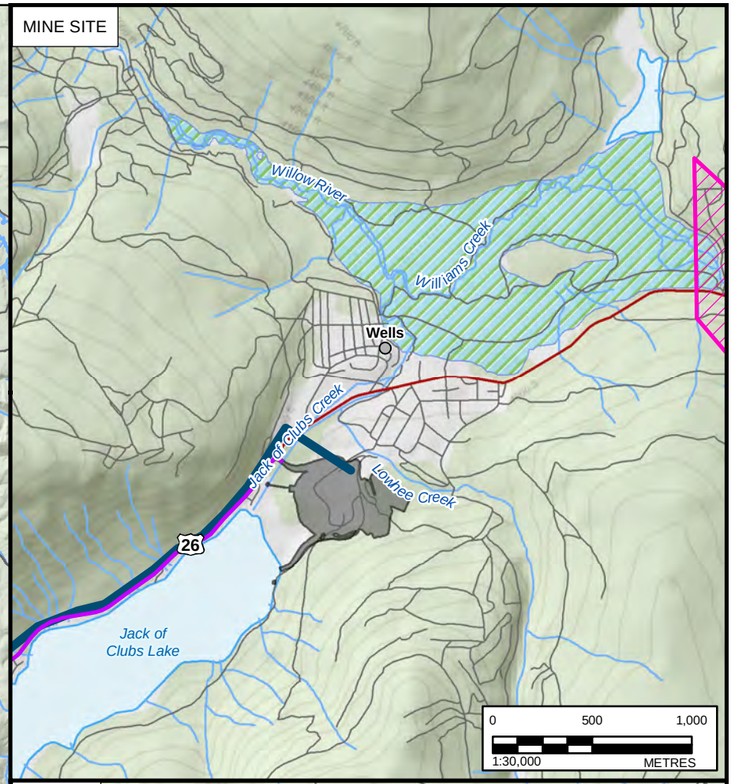
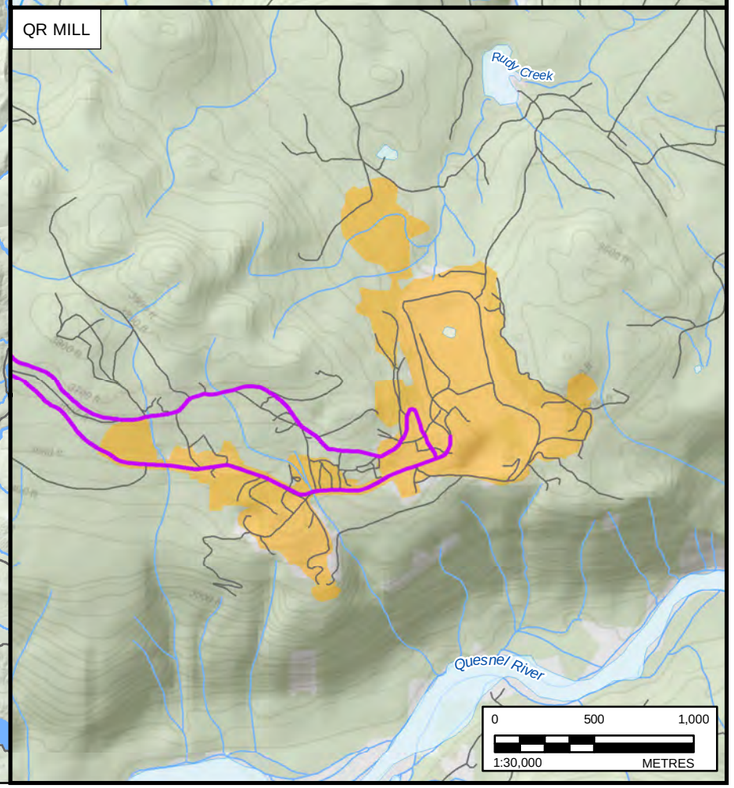
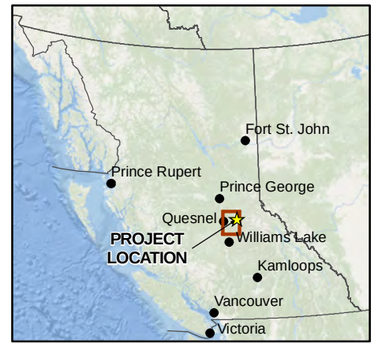






LEGEND

- POPULATED PLACE
- ROAD
- HIGHWAY
- WATERCOURSE
- WATERBODY
- PARKS/PROTECTED AREA
- FIRST NATION RESERVE
- BARKERVILLE HISTORIC TOWN AND PARK
- PROJECT INFRASTRUCTURE LOCATION
- BONANZA LEDGE MINE
- MINE SITE SURFACE INFRASTRUCTURE
- TRANSPORTATION ROUTE
- TRANSMISSION LINE ROUTE
- QR MILL



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.

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BGM

CARIBOO GOLD PROJECT

PROPOSED PROJECT COMPONENTS AND AREA

REV.	DESCRIPTION	DATE	INITIALS
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PROJECT NO.	PHASE	REV.	FIGURE
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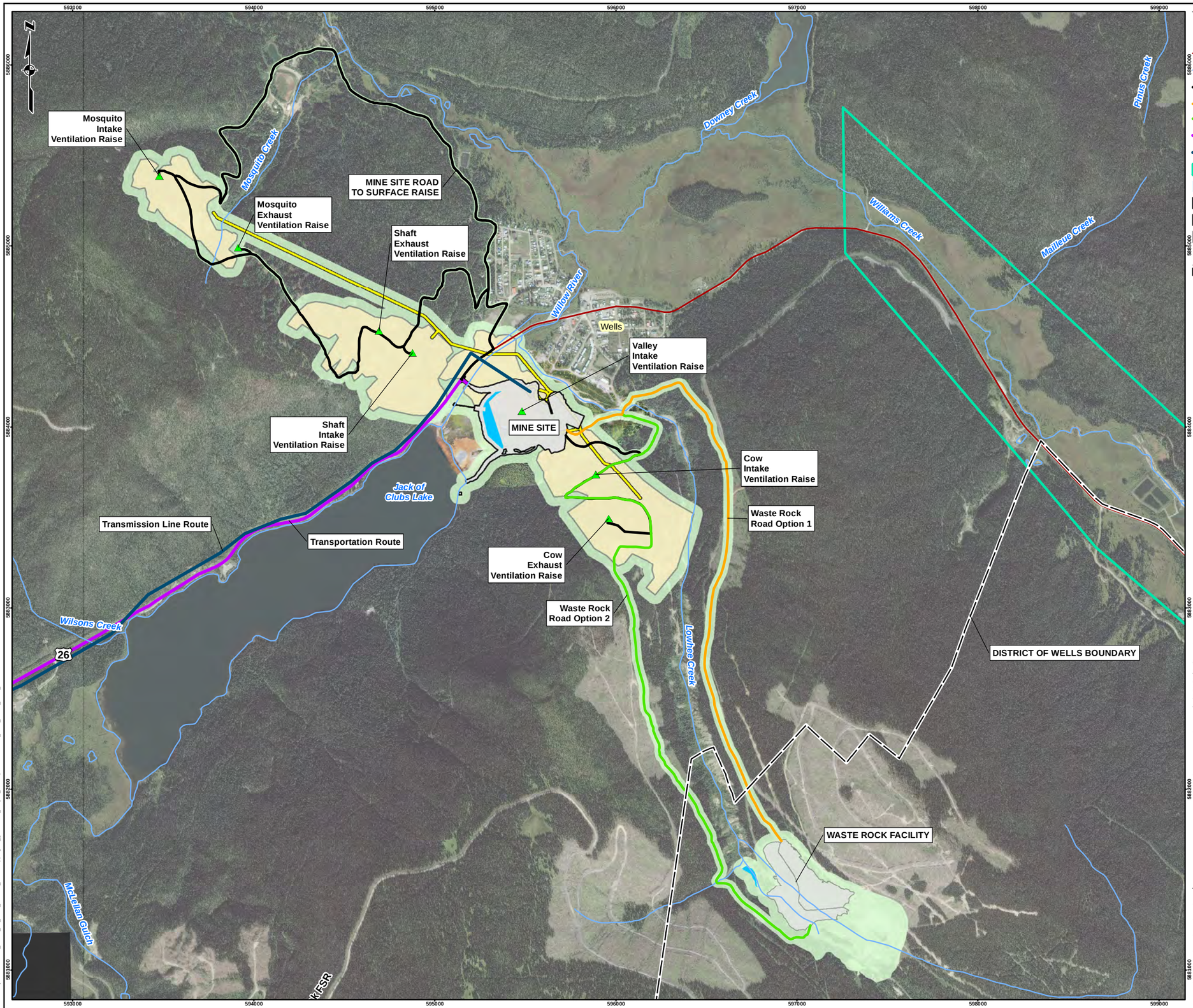
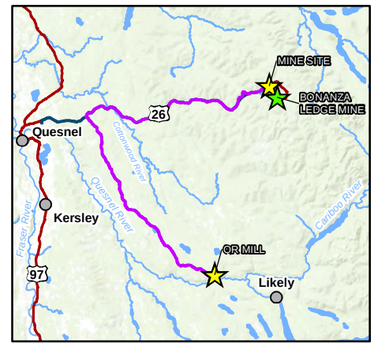


LEGEND

- VENTILATION RAISE
- HIGHWAY
- WATERCOURSE
- EXISTING MINE SITE ROAD
- WASTE ROCK ROAD OPTION 1
- WASTE ROCK ROAD OPTION 2
- TRANSPORTATION ROUTE
- TRANSMISSION LINE ROUTE
- BARKERVILLE HISTORIC TOWN AND
- MINE SITE SURFACE SEDIMENT POND
- MINE RAMP UNDERGROUND
- MINE SITE SURFACE INFRASTRUCTURE
- UNDERGROUND MINE
- FOOTPRINT
- DISTRICT OF WELLS BOUNDARY



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BGM

CARIBOO GOLD PROJECT

MINE SITE - CURRENT AND PROPOSED INFRASTRUCTURE

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PROJECT NO.	PHASE	REV.	FIGURE
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5884500 5884250 5884000 5883750

N

TRANSMISSION LINE ROUTE

TRANSPORTATION ROUTE

Willow River

Lowhee Creek

Wells

North Berm

Proposed Bridge

Access Road

Electrical Substation

East Contact Water Collection Channel

Main Entrance Gate

Camp

Discharge Point into Willow River (Option)

Pump Station

Clean Stockpile

Septic Disposal Field

26

Effluent Discharge

Water Treatment Plant

VAL-IVR-1035-S

Sediment Pond

Concentrator

Dike

Mine Ramp Underground

Emergency Spillway

Camp Access Road With Non-Contact Water Collection Channel

Historic Mine Headframe

South Non-Contact Water Diversion Berm

South Non-Contact Water Diversion Channel and Exit Channel for the Spillway

Jack of Clubs Lake

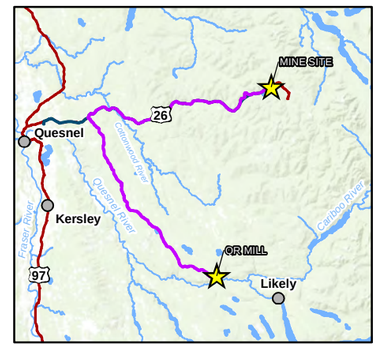
COW-IVR-1120-S

Discharge Point into Jack of Clubs Lake (Option)

Fire Water Pump Station

LEGEND

- VENTILATION RAISE
- HIGHWAY
- WATERCOURSE
- TRANSPORTATION ROUTE
- TRANSMISSION LINE ROUTE
- MINE SITE WATER MANAGEMENT STRUCTURE
- MINE SITE SEDIMENT POND
- MINE RAMP UNDERGROUND
- EXISTING MINE SITE ROAD
- MINE SITE SURFACE INFRASTRUCTURE
- FOOTPRINT



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BGM

CARIBOO GOLD PROJECT

MINE SITE - CURRENT AND PROPOSED SURFACE INFRASTRUCTURE

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PROJECT NO.	PHASE	REV.	FIGURE
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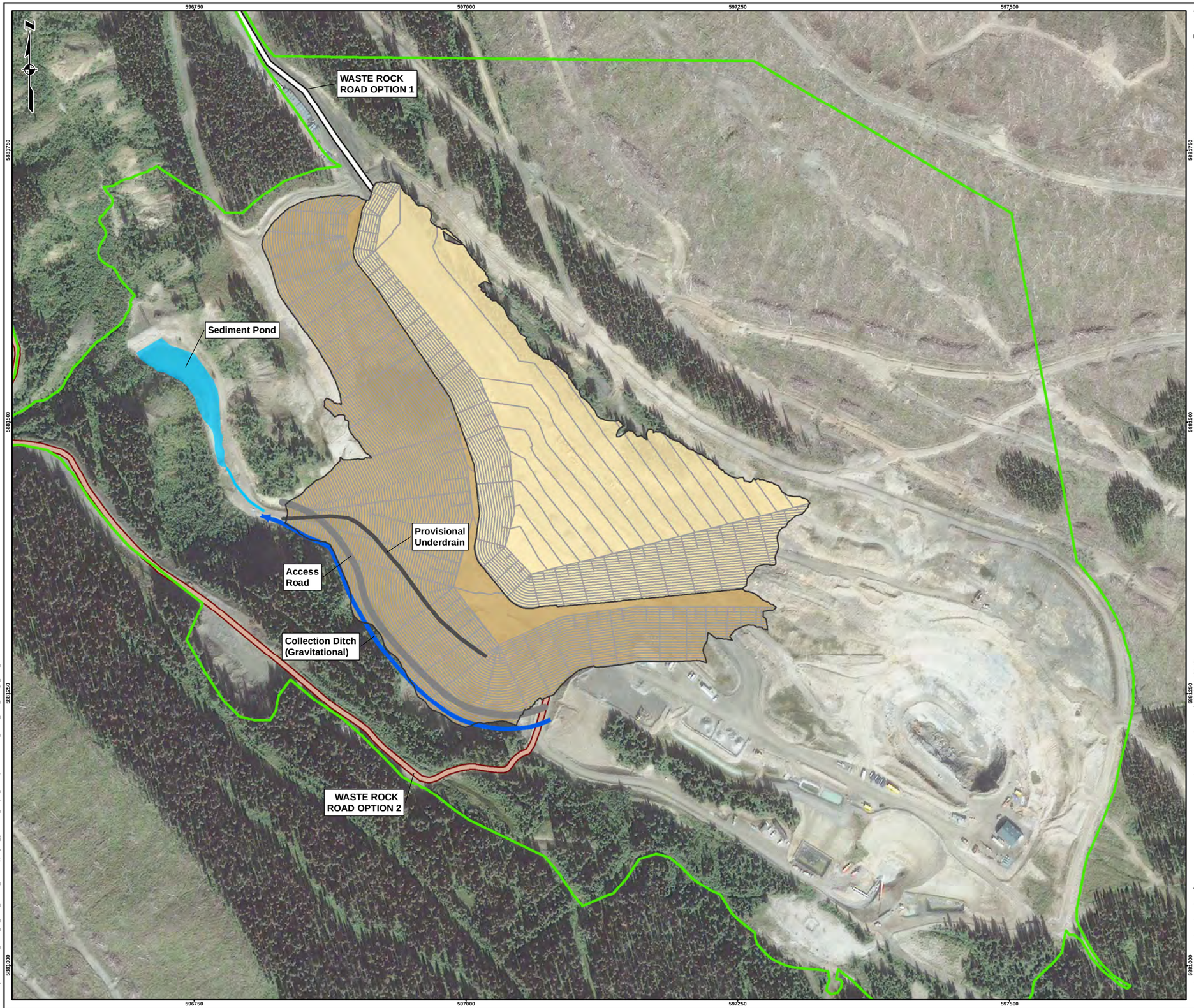
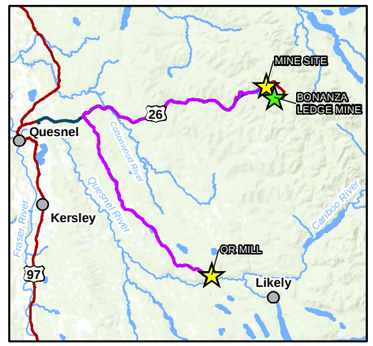


LEGEND

- ACCESS ROAD
- COLLECTION DITCH (GRAVITATIONAL)
- PROVISIONAL UNDERDRAIN
- SEDIMENT CONTROL POND
- SEDIMENT POND
- WASTE ROCK ROAD OPTION 1
- WASTE ROCK ROAD OPTION 2
- 2019 BONANZA LEDGE BOUNDARY

PROPOSED WASTE ROCK STORAGE FACILITY

- WASTE ROCK STORAGE AREA 1
- WASTE ROCK STORAGE AREA 2



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CARIBOO GOLD PROJECT

PROPOSED WASTE ROCK STORAGE FACILITY AT BONANZA LEDGE MINE

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PROJECT NO.	PHASE	REV.	FIGURE
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5837750 5837500 5837250 5837000 5836750 5836500 5836250 5836000 5835750 5835500

N

Alternate Dry-Stack TSF Location

QR TSF

TRANSPORTATION ROUTE

QR Camp

QR Mill

New Conveyor

Preferred Dry-Stack TSF Location

QR Offices

Main Zone Pit

Ore Storage

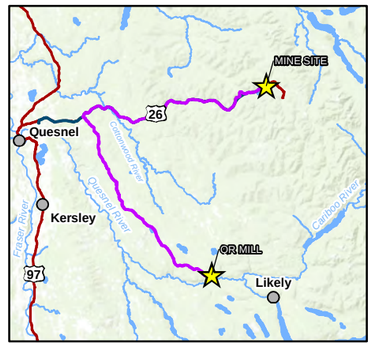
Tailings Dewatering Plant

TRANSPORTATION ROUTE

QUESNEL RIVER

LEGEND

- WATERCOURSE
- TRANSPORTATION ROUTE
- QR MILL
- MILL UPGRADE
- PREFERRED DRY-STACK TSF LOCATION
- ALTERNATE DRY-STACK TSF LOCATION
- DRY-STACK TSF WATER MANAGEMENT
- QR MILL INFRASTRUCTURE



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NAD83 CSRS
UTM ZONE 10N

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METRES

CARIBOO GOLD PROJECT

QR MILL - CURRENT AND PROPOSED SURFACE INFRASTRUCTURE

REV.	DESCRIPTION	DATE	INITIALS
B		2019-10-22	M.Y

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

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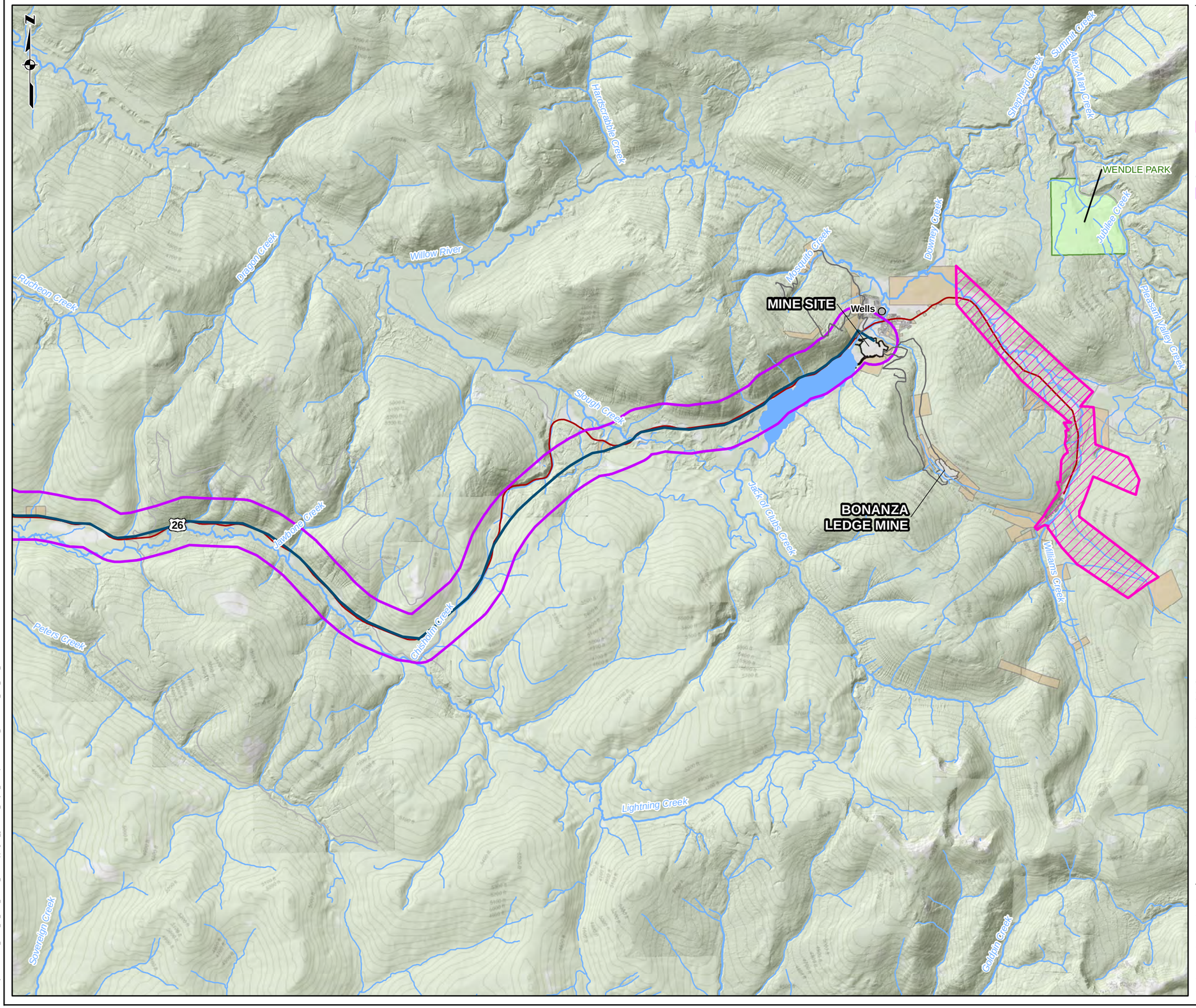
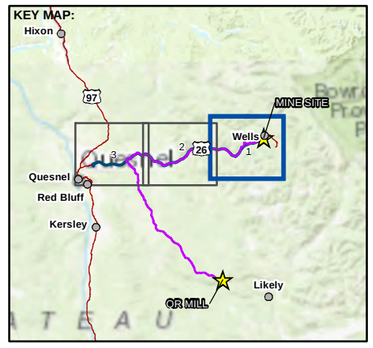


LEGEND

- POPULATED PLACE
- HIGHWAY
- ROAD
- WATERCOURSE
- WATERBODY
- PARKS/PROTECTED AREA
- BARKERVILLE HISTORIC TOWN AND PARK
- MINE SITE SURFACE INFRASTRUCTURE
- BARLOW SUBSTATION
- TRANSMISSION LINE ROUTE
- TRANSMISSION LINE BUFFER 500M
- PRIVATE PARCEL



REFERENCE(S)

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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
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BGM

CARIBOO GOLD PROJECT

TRANSMISSION LINE ROUTE OPTIONS

REV.	DESCRIPTION	DATE	INITIALS
A		2019-10-11	M.Y

PROJECT NO.	PHASE	REV.	FIGURE
151-11330-70	00	B	7

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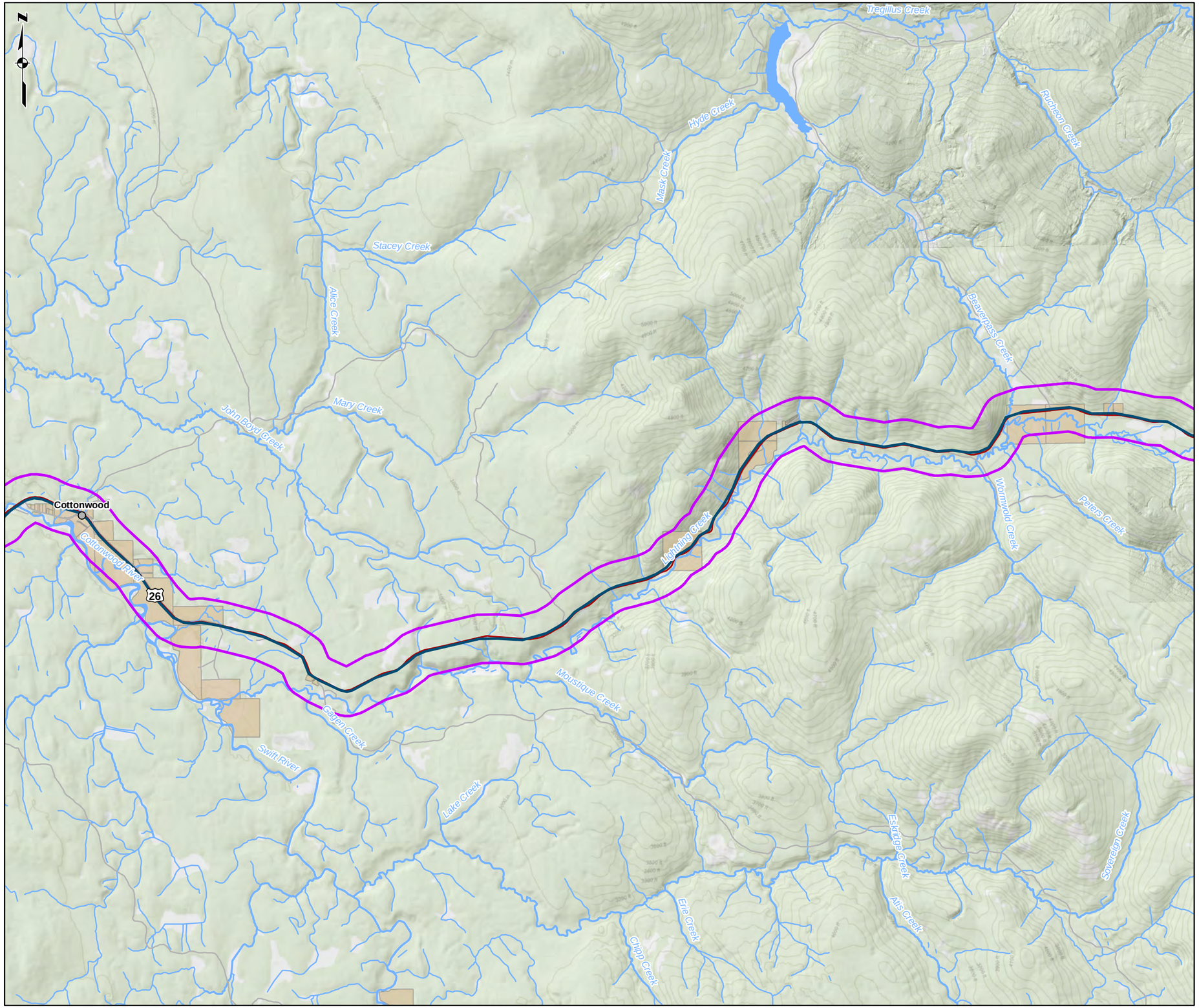
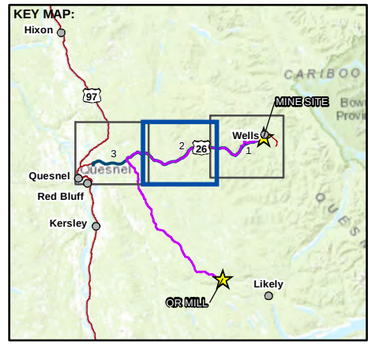


LEGEND

- POPULATED PLACE
- HIGHWAY
- ROAD
- WATERCOURSE
- WATERBODY
- PARKS/PROTECTED AREA
- BARKERVILLE HISTORIC TOWN AND PARK
- MINE SITE SURFACE INFRASTRUCTURE
- BARLOW SUBSTATION
- TRANSMISSION LINE ROUTE
- TRANSMISSION LINE BUFFER 500M
- PRIVATE PARCEL

KEY MAP:



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CARIBOO GOLD PROJECT

TRANSMISSION LINE ROUTE OPTIONS

REV.	DESCRIPTION	DATE	INITIALS
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PROJECT NO.	PHASE	REV.	FIGURE
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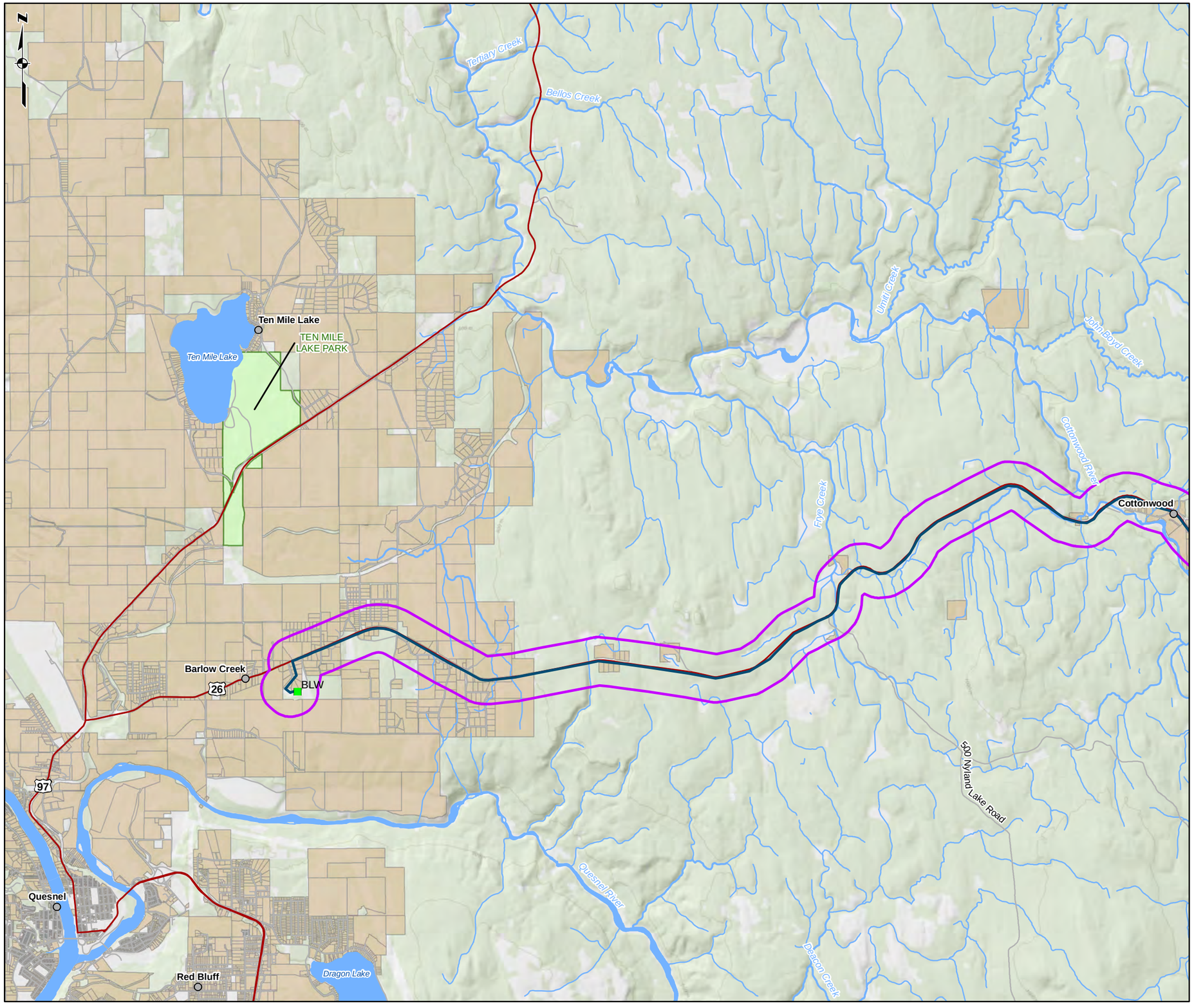

LEGEND

- POPULATED PLACE
- HIGHWAY
- ROAD
- WATERCOURSE
- WATERBODY
- PARKS/PROTECTED AREA
- BARKERVILLE HISTORIC TOWN AND PARK
- MINE SITE SURFACE INFRASTRUCTURE
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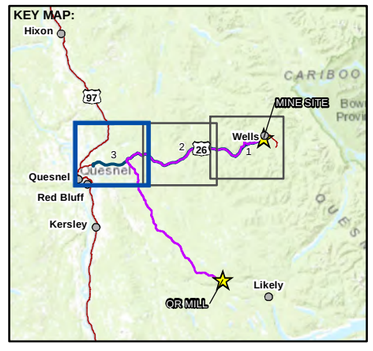

REFERENCE(S)

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CARIBOO GOLD PROJECT

TRANSMISSION LINE ROUTE OPTIONS

REV.	DESCRIPTION	DATE	INITIALS
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PROJECT NO.	PHASE	REV.	FIGURE
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At this stage, the exploration drilling program has delineated a resource, and the approximate extents of the resource have been determined. A variety of mining and milling alternatives were assessed, including open pit mining, underground mining, construction of a new mill near Wells, upgrading of the existing QR Mill, aboveground and underground ore concentration, new tailings ponds and/or dry stack tailings, and a variety of camp configurations and related infrastructure locations.

An underground mine complex will be established beneath Island Mountain, Cow Mountain, and the Valley Zone between the two mountains (Figure 3). Ore will be crushed underground. Concentration through ore sorting and flotation will occur at surface in an enclosed building. The combined sorted ore and flotation concentrates will be loaded into transport trucks in the concentrator building, then hauled to the QR Mill. Flotation tailings produced at the Mine Site will be returned underground in the form of paste backfill. Waste rock will be placed in the WRSF near the portal area (Figure 4) as well as backfilled underground. Additional waste rock will be placed at BGM's Bonanza Ledge Mine, located 4 km from the Project's Mine Site (Figure 5).

The QR Mill will be upgraded and used to process all ore generated from the Project. Additional footprint outside of the established disturbance at QR Mill property is not required. A new dry stack tailings storage facility will be constructed adjacent to the existing QR TSF on an existing disturbed site (Figure 6). Technical designs are in progress to assess and optimize the economic and technical merits of this current strategy. These studies, along with socio-environmental inputs and inputs from consultation and engagement, will guide the final shape and extent of the proposed mining and milling activities and related infrastructure.

The Transportation Routes will not be upgraded as part of this Project beyond routine maintenance. Ore trucks will travel between the Mine Site and QR Mill daily during operations. Workers and goods will be transported along the Transportation Routes between Quesnel, the Mine Site and QR Mill, daily during operations.

A new 69 kV transmission line, approximately 69 km in length, will be constructed from Barlow Substation to the Mine Site. The transmission line will be located within a corridor parallel to the existing 25 kV transmission line that currently follows Highway 26 to Wells.

1.4 Contact and Proponent Information

BGM is a Canadian company based in Wells, BC and headquartered in Toronto, Ontario. It was incorporated on February 12, 1970, as Dawson Range Ltd., under the laws of the Province of British Columbia by registration of its Memorandum and Articles pursuant to the *BC Company Act*. On January 21, 2010, the company changed its name to Barkerville Gold Mines Ltd., to acknowledge the history of gold production in the Wells-Barkerville area of BC. BGM trades publicly and is listed on the TSX Venture Exchange in Canada under the symbol TSX.V: BGM, and the Frankfurt Stock Exchange in Germany under the symbol FRA: IWUB.

Proponent:

BGM Corporate Office:

Barkerville Gold Mines Ltd.
Suite 400-365 Bay Street
Toronto, Ontario, M5H 2V1
Website: www.barkervillegold.com
Email: info@barkervillegold.com

BGM's President and Chief Executive Officer:

Mr. Chris Lodder
President and Chief Executive Officer
Barkerville Gold Mines Ltd.
Cell Phone: (416) 388-1670
E-mail: clodder@barkervillegold.com

BGM's Environmental Assessment Representative:

Mr. Chris Pharness
Vice President Environment & Sustainability
Barkerville Gold Mines Ltd.
Telephone: (236) 713-2018
Cell Phone: (250) 961-2778
Email: cpharness@barkervillegold.com

The Project Description was prepared with the support of various consultants. Appendix B lists the consultants and their qualifications.

1.5 Corporate Policies

BGM is committed to a culture of honesty, integrity, and accountability, and strives to operate in accordance with the highest ethical standards and applicable laws and regulations. BGM has implemented a Code of Business Conduct and Ethics, which outlines the ethical principles that should guide all representatives of BGM and any subsidiaries and/or controlled entities of BGM in their daily work.

BGM is subject to a number of laws, rules, and regulations with respect to the conduct of its business. Representatives are expected to maintain compliance with the letter and spirit of all laws governing the jurisdictions in which they perform their duties. The Code of Business Conduct and Ethics does not purport to address all areas of law that representatives might encounter in the day-to-day business of BGM. However, the following areas are worth specifically mentioning:

Human Rights Laws: BGM values the diversity of its representatives, customers, and suppliers, and is committed to providing equal treatment in all aspects of the business. Abusive, harassing, or offensive conduct is unacceptable, whether verbal, physical, visual or otherwise. BGM will not tolerate any conduct that is discriminatory or harassing or otherwise compromises an individual's human rights.

Privacy Laws: BGM is committed to maintaining the accuracy, confidentiality, security, and privacy of the personal information of its customers, suppliers, and representatives. Representatives who have access to personal information are expected to support BGM's efforts to develop, implement, and maintain procedures and policies designed to manage personal information.

Health and Safety Laws: BGM complies with all applicable health and safety laws and regulations as part of its commitment to providing its representatives with a safe and healthy work environment. Representatives have a responsibility to maintain this work environment. In this regard, representatives are expected to work in a safe manner with due regard for their personal safety as well as that of their co-workers and to report accidents, injuries, hazardous equipment, and unsafe practices. Representatives are prohibited from engaging in the business of BGM while under the influence of alcohol or illegal drugs.

Environmental Laws: Cognizant of its responsibility to the environment, BGM strives to conform to all applicable environmental laws and regulations and to promote the respect of the environment in its activities. Representatives are expected to support BGM's efforts to develop, implement, and maintain procedures and programs designed to protect and preserve the environment.

Securities Laws: BGM is committed to protecting security holder investments and expects all representatives to comply with the applicable reporting obligations and trading restrictions imposed by BGM, a securities commission, or stock exchange. Representatives who are in possession of material information about BGM must not trade in securities of BGM until such information is generally and publicly available. Providing inside information to others who then trade on it is also strictly prohibited.

Competition Laws: Competition laws are enacted to limit practices that are seen to impair the function of a free and open marketplace. A complete description of these laws is beyond the scope of this Code; however, they include: price fixing, bid rigging, price discrimination, allocation of markets, and boycotting of certain suppliers or customers. Representatives having regular dealings with customers and suppliers should become familiar with the laws applying to these practices, as non-compliance can result in severe penalties being imposed on both BGM and the individuals involved.

1.6 Indigenous Nations

The Project is located within the vicinity of several Indigenous nations.

Lhtako Dené Nation is the closest Indigenous nation to the Project, with four reserves located near Quesnel. As of May 2019, Lhtako Dené Nation has 181 registered members with 83 living on Lhtako reserves (INAC, 2019a).

Xats'ull First Nation has two reserves near Williams Lake, located just over one-hour driving time from the QR Mill. As of May 2019, Xats'ull First Nation had 446 registered members, of whom 139 live on Xats'ull reserves (INAC, 2019b). As part of the Northern Shuswap Tribal Council, Xats'ull First Nation is currently in final agreement negotiations with the BC Treaty Commission (BC Treaty Commission, 2019).

Williams Lake Indian Band (T'exelc) has nine reserves located near Williams Lake, BC and approximately 826 registered members with 231 members living on reserve (INAC, 2019c). As part of the Northern Shuswap Tribal Council, T'exelc is currently in final agreement negotiations with the BC Treaty Commission (BC Treaty Commission, 2019).

The Tsilhqot'in National Government represents the Tsilhqot'in community of Esdilagh. Tsilhqot'in National Government's six-member communities are located around Williams Lake (TNG, 2018). Of the Tsilhqot'in National Government member groups, only Esdilagh has reserves within 100 km of the QR Mill.

Neskonlith Indian Band has three reserves located near Little Shuswap Lake near Chase, BC, approximately six hours from Wells. As of May 2019, Neskonlith has 661 registered members, 262 of whom live on Neskonlith reserves (INAC 2018d).

Nazko First Nation has 22 reserves located near Quesnel and Prince George, BC. As of May 2019, Nazko has 405 registered members, 114 of whom live on Nazko reserves (INAC 2018e). Currently, Nazko is in active negotiations with the BC Treaty Commission (BC Treaty Commission, 2019).

BGM intends to update this list as the Project moves forward, through consultation with Indigenous nations and as advised by regulatory agencies. The consultation and engagement efforts thus far are outlined in Section 8.0.

1.7 Communities

A description of local communities is provided in the sections below.

1.7.1 District of Wells

The District of Wells covers approximately 158 square kilometres (km^2) and encompasses the Mine Site. The community of Wells is located within the District and adjacent to the Mine Site. Wells is located on Highway 26, a two-lane paved highway linking Wells to the City of Quesnel (Quesnel). Users of this road are primarily Wells residents, suppliers to Wells area businesses, and visitors to Barkerville and other tourist destinations, as well as industrial traffic from the logging industry and mining. BGM's site office is located on Ski Hill Road, immediately adjacent to Wells.

Wells was named after Fred Wells, the prospector who discovered the deposit that led to the development of the Cariboo Gold Quartz Mine in 1932. Originally developed as a company town, Wells grew to a thriving community of 4,500 during the 1940s. In 1942, Wells had a population larger than either Quesnel or Prince George. However, the population of Wells declined to about 300 following the closure of the Cariboo Gold Quartz mine in 1967 (District of Wells, 2010). As of 2016, the population was 217 (Statistics Canada 2017a). Total population change between 2001 and 2016 was -7.7% compared to the total provincial growth rate of 16.6% for the same period (BC Stats, 2015, 2016).

The local economy is based on tourism, including visits to the Barkerville Historic Town and Park (Barkerville) and Bowron Lake Provincial Park, timber harvesting, mineral exploration and development (including placer mining), arts and crafts production and sales, and outdoor recreation. The main employers in Wells are Barkerville Gold Mines and Barkerville Historic Town and Park.

The community features art galleries and artists' studios, cultural events including concerts, courses in the arts, live theatre, and an arts curriculum in the elementary school. In 1999, the BC Government designated Wells as one of BC's first Official Gateway Communities in recognition of its position as the closest community with accommodation and other visitor services to Barkerville, Bowron Lake Provincial Park, and Cariboo Mountains Provincial Park. This is now changing as accommodation is being developed at Barkerville.

As of 2016, Wells had 158 private dwellings, 112 of which were occupied by "usual residents"[1] (Statistics Canada, 2017a). Wells also has many seasonal summer residents including non-local placer miners, seasonal workers employed at Barkerville and at local accommodations, restaurants, and retail businesses, and seasonal resource industry employees. By mid-summer, the population of Wells can triple from its winter level (Northern Development Initiative Trust, 2012). Community services in Wells include paramedics, nurse practitioner visits, and RCMP detachment staffed with officers who also service Quesnel. Wells has one elementary school from kindergarten to grade 7.

Wells was incorporated as a district municipality in 1998. The current Mayor and Council were elected to a four-year term in 2018. Their priorities are to improve the District's sewer and water infrastructure and to develop an Official Community Plan and a zoning bylaw.

[1] Usual residents are people who reside in a household on a permanent basis.

1.7.2 Barkerville Historic Town and Park

Barkerville is located approximately 8 km southeast of the Mine Site, accessible by Highway 26. Barkerville is a Province of BC owned Heritage property and designated historic park, and a Government of Canada National Historic Site. In addition, two other National Historic Sites of Canada are located within Barkerville: the Cariboo Wagon Road, built to transport supplies during the gold rush, and the Chee Kung Tong building, an important community building for Chinese workers living in Barkerville during the gold rush.

A non-profit organization, the Barkerville Heritage Trust, operates and manages Barkerville on behalf of the BC Government. The board of the Barkerville Heritage Trust has members that represent communities and/or interests from across the Province. BGM is a member of the board.

Barkerville has over 100 historic buildings and is open year-round. Various visitation, interpretation, and live enactment programs are staged during the summer months and Barkerville is working to expand the scope of activities available during the winter months to develop a year-round destination. While the park offers visitors accommodations (three bed and breakfasts and four cottages within Barkerville, as well as three campgrounds), no one lives year-round in Barkerville.

1.7.3 City of Quesnel

Quesnel is located approximately 80 km west of the Mine, and 58 km northwest of QR Mill. Quesnel has a current population of 12,064 (Statistics Canada, 2017b). Quesnel's municipal government comprises a seven-member Mayor and Council. Quesnel is part of School District 28 and contains several elementary schools, as well as a Junior and a Senior Secondary School. Quesnel is also home to the College of New Caledonia and University of Northern British Columbia, which offer several tertiary education programs (City of Quesnel, 2017). Quesnel is also home to the closest hospital to Wells as well as to the closest commercial airport to the Project with regularly scheduled air service. It is not uncommon for people working at Barkerville, in Wells or at the QR Mill to live in Quesnel.

Quesnel is considered the gateway to the north Cariboo area, which offers considerable recreational opportunities, including fly-fishing, canoeing, golfing, horseback riding, river rafting, hiking, biking, downhill and cross-country skiing and snowshoeing among other activities.

1.7.4 Other Settlements

New Barkerville, located approximately 1 km from Barkerville and 7 km from the Mine, is a small unincorporated settlement consisting of eight homes. It was formed when Barkerville was taken over by the BC Government, and the residents were relocated to an area along Reduction Road Hill.

Stanley, Beaver Pass House, Pinegrove, Wingdam, Goldspring House, and Cottonwood House are unincorporated rural areas in CRD Electoral Area C that are located off Highway 26 along the Transportation Route. The original settlement at Cottonwood House is a provincially and federally recognized historic site. There are a few other unnamed settlement areas that are located along Highway 26 close to Cottonwood River forest service road as well as east and west of Cottonwood House.

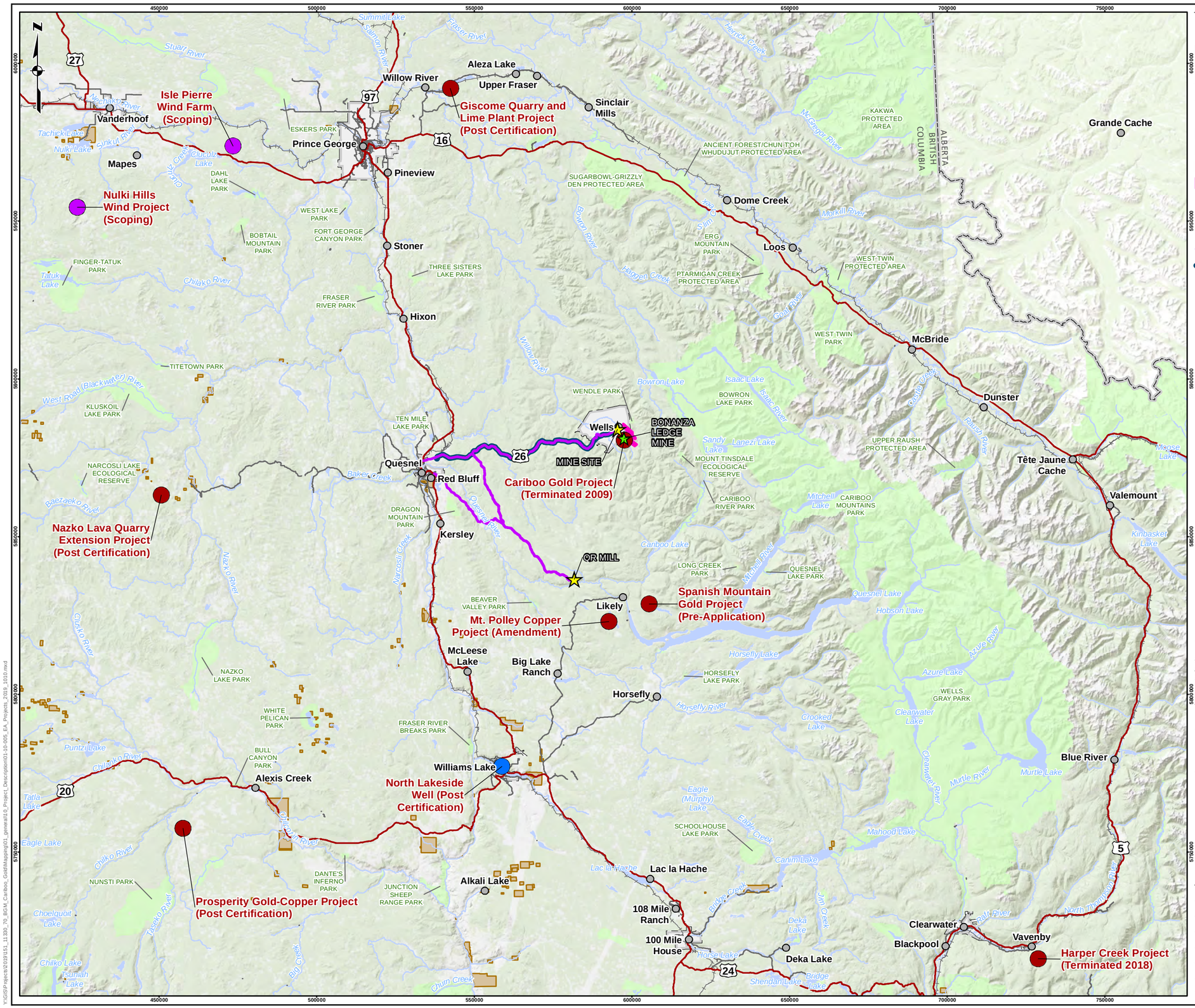
Troll Resort is a small ski and snowboard resort located approximately 30 km west of the Mine along Highway 26, on the north side of the highway.

1.7.5 Likely

Likely is a rural community located approximately 17.5 km southeast from the QR Mill, with a population of approximately 350 people (Likely BC, 2018). Businesses in Likely include the Valley General Store, Likely Restaurant and Services, Likely Lodge, and licenced mechanic (Likely BC, 2018).

1.8 Past and Current Environmental Assessments in the Region

Nine EA-reviewable projects are located within a 150-km radius of the Project (EAO, 2018a) (Figure 8). As appropriate, publicly available information from all relevant EAs in the surrounding area will be reviewed, and any relevant information will be incorporated into the Project's Application for Environmental Assessment Certificate (the Application). BGM will also complete Project-specific studies on human and biophysical environments to support the Application (Section 6.0).

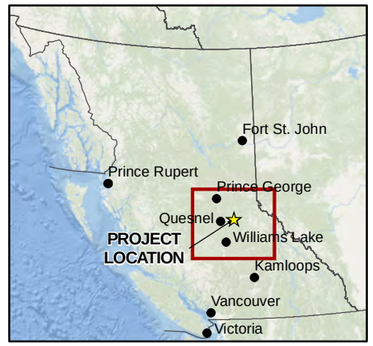


LEGEND

- POPULATED PLACE
- MUNICIPALITY BOUNDARY
- HIGHWAY
- ROAD
- RAILWAY
- WATERCOURSE
- WATERBODY
- PARKS/PROTECTED AREA
- FIRST NATION RESERVE
- BARKERVILLE HISTORIC TOWN AND PARK
- PROJECT INFRASTRUCTURE LOCATION
- BONANZA LEDGE MINE
- TRANSPORTATION ROUTE
- TRANSMISSION LINE ROUTE

ENVIRONMENTAL ASSESSMENT PROJECTS

- ENERGY
- MINING
- WATER MANAGEMENT



REFERENCE(S)

1. TRAILS, WATER FEATURES, ROADS, MUNICIPAL BOUNDARY, PARK/PROTECTED AREAS, BARKERVILLE HISTORIC TOWN/PARK, CITIES (INSET), PROVINCIAL BORDERS (INSET) OBTAINED FROM THE B.C. MINISTRY OF FORESTS, LANDS, NATURAL RESOURCE OPERATIONS AND RURAL DEVELOPMENT.
2. HILLSHADE DERIVED FROM LIDAR DATA FLOWN BY MCELHANNAY CONSULTANTS LTD. JUNE 27, 2016.
3. BASE DATA SOURCE: ESRI, GEOBASE, NRCAN, AND THE GIS USER COMMUNITY.
4. INSET BASE SOURCE: ESRI, DELORME, GEBCO, NOAA NGDC, AND OTHER CONTRIBUTORS.

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BGM

CARIBOO GOLD PROJECT

PAST AND CURRENT ENVIRONMENTAL ASSESSMENTS NEAR THE PROJECT

REV.	DESCRIPTION	DATE	INITIALS
A		2019-10-11	M.Y

PROJECT NO.	PHASE	REV.	FIGURE
151-11330-70	00	B	8

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

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2.0 REGULATORY CONTEXT

2.1 British Columbia Environmental Assessment Act

The Project is expected to require a provincial EA because it exceeds the following threshold under Part 3 (Table 6) of the *Reviewable Projects Regulation* (Government of BC, 2002b):

- "A new mine facility that, during operations, will have a production capacity of >75,000 tonnes/year (t/yr) of mineral ore".

BGM has met with the BC EAO to provide an overview of the proposed Project and initiated discussion and consultation.

2.2 Impact Assessment Act

The Project is not expected to require federal review pursuant to the IAA because it does not exceed the applicable thresholds prescribed in the *Physical Activities Regulations* (SOR/2019-285), including:

- **Section 18(c):** "The construction, operation, decommissioning and abandonment of a new metal mine, other than a rare earth element mine, placer mine or uranium mine, with an ore production capacity of 5,000 t/day or more".
- **Section 18(d)**: "The construction, operation, decommissioning and abandonment of…a new metal mill, other than a uranium mill, with an ore input capacity of 5 000 t/day or more."
- **Section 19(d)**: "The expansion of…an existing metal mill, if the expansion would result in an increase in the area of mining operations of 50% or more and the total ore input capacity would be 5 000 t/day or more after the expansion."

In addition, Project activities are not planned within a wildlife area or migratory bird sanctuary, or protected marine area, as defined by the *Physical Activities Regulations* (Government of Canada, 2019b).

2.3 Substitution

A substitution agreement is not required as the Project is not subject to federal review.

2.4 Federal Land and Federal Funding

There is no proposed or anticipated federal financial support being provided to carry out the Project. In addition, there are also no federal lands that will be used for undertaking the Project. The nearest federal property consists of three buildings owned by the Royal Canadian Mounted Police in Wells. However, it is understood that the regulation of these properties is deferred to the municipality and province.

2.5 Permits and Approvals

2.5.1 Federal Permits, Approvals, Licences, and Authorizations

In addition to the provincial EA approval discussed in Section 2.1, federal permits, approvals, and authorizations that could potentially be applicable to the proposed Project are summarized in Table 1. As the Project proceeds, specific permit requirements will be determined based on discussions with federal agencies.

Table 1: Federal Permits and Approvals Potentially Applicable to the Proposed Project

Permit/Approval	Responsible Agency	Federal Statute	Regulatory Context
Fisheries Act Authorization	Fisheries and Oceans Canada (DFO)	*Fisheries Act*	■ No person shall carry on any work, undertaking or activity other than fishing that results in the death of fish. ■ No person shall carry on any work, undertaking or activity that results in the harmful alteration, disruption or destruction (HADD) of fish habitat ■ If the death of fish or a HADD cannot be avoided during any part of the Project, an Authorization under Section 35 may be required
Migratory Birds Convention Act Authorization	Environment and Climate Change Canada (ECCC)	*Migratory Birds Convention Act and Migratory Bird Sanctuary Regulations*	■ Deposit of substances harmful to migratory birds or vegetation clearing for the Project during the migratory bird nesting season as outlined by ECCC (1 May to 15 July, Zone A4)
Navigation Protection Program Notification and/ or approval	Transport Canada	*Canadian Navigable Waters Act*	■ Notification and information to the Minister for works that are in, on, over, under, through or across any navigable water ■ Application for approval from the Minister is required for works (other than minor works) that are in, on, over, under, through or across any navigable water and may interfere with navigation
Species at Risk Act Authorizations	Environment and Climate Change Canada, DFO, and Parks Canada	*Species at Risk Act* (SARA)	■ The Competent Minister may issue a SARA permit authorizing activity that will affect a listed wildlife species, any part of its critical habitat, or the residences of its individuals
Explosive Licences and Permits	Natural Resources Canada	*Explosives Act*	■ Explosive License required for factories and magazines ■ Explosive Permit required for vehicles used for the transportation of explosives

Permit/Approval	Responsible Agency	Federal Statute	Regulatory Context
Transportation of Dangerous Goods	Transport Canada	*Transportation of Dangerous Goods Act*	■ Addresses the classification, documentation, marking, means of containment, required training, emergency response, accidental release, protective measures, and permits required for the transportation of dangerous goods by road, rail, or air

2.5.2 Provincial Permits, Approvals, and Licences

In addition to the Application discussed in Section 2.1, provincial permits, approvals, authorizations, and licences that could potentially be applicable to the proposed Project are summarized in Table 2. As the Project proceeds, specific permit requirements will be determined based on discussions with provincial agencies.

Table 2: Provincial Permits and Approvals Potentially Applicable to the Proposed Project

Permit/Approval	Responsible Agency	Provincial Statute	Regulatory Context
Mines Act Permit	BC Ministry of Mines, Energy, and Petroleum Resources	*Mines Act*	■ Approval of the Mine plan, construction, and the reclamation and closure plan
Effluent Discharge Permit and Waste Storage Approval	BC Ministry of Environment and Climate Change Strategy (MOE; formerly BC Ministry of Environment)	*Environmental Management Act*	■ Permitting system to enable authorized discharge of effluent to water, storage/treatment of wastes, disposal of solid waste to the land, and discharge of emissions to the atmosphere
Heritage Conservation Act permits	BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development (FLNR; formerly BC Ministry of Forests, Lands and Natural Resource Operations), Archaeology Branch	*Heritage Conservation Act*	■ Heritage inspection, investigation, or site alteration of lands potentially affected by the Project

Permit/Approval	Responsible Agency	Provincial Statute	Regulatory Context
Heritage Conservation Act Concurrence letters	FLNR, Archaeology Branch	*Heritage Conservation Act*	■ Heritage resources must be assessed in relation to the mandates, objectives, and intents of the *Heritage Conservation Act* for lands potentially affected by the Project ■ The Archaeology Branch issues letters to the EAO stating that appropriate assessment under the *Heritage Conservation Act* is complete
License of Occupation	FLNR	*Land Act*	■ Authorize entry, occupation and construction on Crown Lands of the Transmission Line as an interim tenure pending completion of survey requirements and issuance of statutory right-of-way
Statutory Right of Way	FLNR	*Land Act*	■ Standard tenure for electrical transmission lines on Crown Lands
Wildlife Act Permit	MOE, Environmental Stewardship Division	*Wildlife Act*	■ Wildlife and fish salvages and surveys of wildlife and their habitat ■ Bird nest removal or relocation
Construction Permit for a Potable Water Well	BC Ministry of Health, Northern Health Authority	*Drinking Water Protection Act*	■ Exploration of a groundwater well for domestic water use
Water System Construction Permit	BC Ministry of Health, Northern Health Authority	*Drinking Water Protection Act*	■ Construction of a potable water system
Drinking Water System Operations Permit	BC Ministry of Health, Northern Health Authority	*Drinking Water Protection Act*	■ Operation of a potable water system
Short Term Use of Water Permit	MOE, Water Stewardship Branch	*Water Sustainability Act*	■ Approval for short-term use of water approval from freshwater streams and lakes for construction purposes
Water Sustainability Act Approval	MOE, Water Stewardship Branch	*Water Sustainability Act*	■ For changes in and about a stream including diversions, storage, and use of water

Permit/Approval	Responsible Agency	Provincial Statute	Regulatory Context
Water Licence	MOE, Water Stewardship Branch	*Water Sustainability Act*	■ For construction and operation of Project activities requiring diversion of surface waters or groundwater sources for potable or process water
Licenses to Cut and Special Use Permit	FLNR, Forest Tenures Branch	*Forest Act*, Part 3, Section 8.2 *Licence to Cut Regulation* *Provincial Forest Use Regulation*	■ License to Cut Permit to harvest in a specific area over a relatively short time period ■ Special Use Permit to gain non-exclusive authority to use Crown Land, within Provincial Forest, if in accordance with Provincial Forest Use Regulation (annual rent and taxes apply) for the construction or maintenance of road, bridge, or drainage structure, weather station, weight scales, or quarries used for road construction or maintenance
Industrial Access Permit	BC Ministry of Transportation and Infrastructure (MOTI)	*Transportation Act*	■ Required for any new roads that join onto public roads controlled by the MOTI
Permit for regulated activities	Ministry of Health	*Public Health Act*	■ Regulated activities may, if prescribed standards are not met, endanger health or cause injury or illness, or are not regulated under an enactment (or if regulated do not sufficiently prevent, mitigate or respond to the risk to health or risk of injury or illness). Such activities could be construction of industrial camps, providing potable water, processing waste water, or managing septic systems.

2.5.3 Local Government Permits

The Project facilities are located in areas within the jurisdictions of the CRD and District of Wells. Both jurisdictions have passed Bylaws which may pertain to Project activities/operations and property ownership or business operations, including:

- CRD Bylaw No. 4949, regarding the management of invasive plants
- CRD Bylaw No. 4628, regarding the management of untidy/unsightly properties
- Wells Bylaw No. 93, Noise Control, limiting hours of noise during operations/construction
- Wells Bylaw No. 68, Traffic and Streets, providing for load and size restrictions

Other Wells bylaws are applicable to utility connections and municipal service fees related to property development (water, sewer, garbage). These will be addressed through direct applications with Wells.

3.0 PROJECT LOCATION, LAND, AND WATER USE

3.1 Project Location

The Project is located in the Quesnel Highlands, which is west of the Cariboo Mountains and east of the Fraser Plateau. The highlands extend from Bowron Lake on the north to Mahood Lake on the south, encompassing an area of approximately 8,100 km^2. Within the Quesnel Highlands, there are upland areas that are remnants of a highly dissected plateau of moderate relief. These remnants rise gradually from approximately 1,500 m above sea level (masl) on the west to over 1,900 masl on the east and become progressively more dissected.

The Mine Site is located approximately 80 km east of Quesnel, and approximately 350 m west of the nearest permanent residents in Wells (121° 34.37' W, 53° 5.82' N; Figure 1). BGM's current field offices and related facilities are also located near Wells adjacent to the Mine Site. A community relations office is located in downtown Wells. Gravel roads established during historic placer and lode gold mining activities provide access throughout the area.

Jack of Clubs Lake is located immediately southwest of the Mine Site. The lake is encompassed by Island Mountain to the northwest, Cow Mountain and Richfield Mountain to the southeast, and Barkerville Mountain to the east. Jack of Clubs Creek and Wilson's Creek flow into Jack of Clubs Lake and the Willow River is the outlet from the lake which flows to the northwest to join the Fraser River. Lowhee Creek, a historically mined stream channel, is a tributary to the Willow River and flows northwest from the Bonanza Ledge Mine Site between Cow Mountain and Barkerville Mountain past the BGM offices and related facilities. Other nearby rivers and creeks include Mosquito Creek and Peep O'Day Creek to the northwest, Promise Creek and Slough Creek to the west, Williams Creek to the east (including tributaries called Walker Gulch, Black Jack Gulch, and Stouts Gulch). Tributaries to Upper Jack of Clubs Creek (situated upstream of Jack of Clubs Lake) include Victoire Creek and Stoney Creek to the south.

The QR Mill is located approximately 115 km from the Mine Site, 58 km southeast of Quesnel, and 17.5 km west-northwest of Likely (121° 47.49' W, 52° 40.28' N; see Figure 1). Approximately 1 km south of the QR Mill is the Quesnel River. The headwaters of Rudy Creek are located near the QR Mill. Rudy Creek flows into Maud Creek.

BGM has been active in the Cariboo Mining District of BC since 1994 and has assembled a large package of land, covering the majority of historic gold mining properties that occur along the Cariboo Gold Belt near Wells. The BGM property comprises staked mineral tenures and Crown-granted mineral claims covering an area of approximately 1,346 km^2 along a strike length of 77 km, and with an approximate width varying from 22 km to 35 km. Within the BGM property, there are several legacy claims belonging to other persons or companies which have first right to the minerals contained within those boundaries. Should those legacy claims lapse, then the mineral rights will immediately belong to BGM as per the *Mineral Tenure Act*.

3.2 Land Use and Zoning

The Project is located within Cariboo Regional District Electoral Area C (the Mine Site) and Area F (QR Mill), and is subject to the Cariboo Chilcotin Land Use Plan (CCLUP) and CRD North Cariboo Area Rural Land Use Bylaw. The Mine Site is located within the District of Wells and outside of Barkerville.

The Cariboo region supports a diverse range of land uses including forestry, tourism, residential, recreation, trapping, guide outfitting, and mining. The Project area is not used for agriculture and is not within the Agricultural Land Reserve.

The Project is located in the Tree Farm License 52 (TFL52) Forest Development Unit, in which forestry tenures are held by West Fraser Mills Ltd. Several recent and planned cutblocks occur on Cow Mountain and Island Mountain adjacent to the Mine Site. West Fraser's forestry activities are guided and executed under the West Fraser *2018 Forest Stewardship Plan* (West Fraser Mills Ltd., 2018).

Wells has a history of mining and anthropogenic disturbance dating back to the 1860s. Large scale lode gold exploration began in the 1930s and the Cariboo Gold Quartz Mine in Wells went into production in 1933. There has been substantial work completed over the last 90 years on the overall claim holdings with work programs having been completed by various companies. The historic Cariboo Gold Quartz portal location for the 1,500 level is located immediately adjacent to the proposed portal location for the Project (Figure 3) at the Mine Site. BGM owns fee simple tenure to portions of the Mine Site. Project underground development and ore extraction will take place adjacent to the extensive historical underground developments associated with these mining operations.

During the operation of the Cariboo Gold Quartz Mine between 1930 and 1970 approximately 2.65 million tonnes of flotation mill tailings were deposited into the northeastern end of Jack of Clubs Lake near its outlet into the Willow River, filling approximately 30 hectares (ha) of the original lake area (SNC Lavalin, 2011). In addition to the mill tailings, hydraulic placer mining operations in Lowhee Creek also deposited an unknown quantity of placer outwash to the northeastern end of Jack of Clubs Lake. Historical waste rock associated with the 1,500 level adit is also located on the northeast end of Jack of Clubs Lake, adjacent to the proposed Mine Site portal.

Other mines that historically operated in the local Wells area included Aurum and Mosquito Creek Mine on Island Mountain.

BGM currently operates the Bonanza Ledge Mine located 5 km south-east of the historic Cariboo Gold Quartz Mine and one proposed WRSF will be located on a portion of the Bonanza Ledge Mine. In 2012, BGM received a *Mines Act* permit and *Environmental Management Act* permit to develop an open pit mine at Bonanza Ledge. In 2017, the Bonanza Ledge Mine permits were amended to increase ore production and operate underground. Permit applications to extend the life of mine for approximately three more years have been submitted.

The QR Mill is located on the Quesnel River Mine property, which has historically produced gold. The Quesnel River Mine began pre-production development and site construction under Kinross Gold in 1994 and production started from the Main Zone Pit in 1995. BGM acquired the property in 2010 and focused on mining a small remaining deposit over a 12-month period, after which the mine was put into care and maintenance. BGM began intermittent processing of Bonanza Ledge Mine ore in 2014 at the QR Mill.

3.3 Water Use

Water will be required at the Mine Site for domestic (e.g., camp and offices) and industrial uses (e.g., mining operations and dust suppression). Preliminary planning includes a new water well drilled near the northeast boundary of the District of Wells, and water transported from that well to the camp. The specific water sources for the Mine Site will be evaluated based on the results from the water balance model and infrastructure requirements that will be prepared for the Cariboo Gold technical study. The well location will be identified based on the results of the technical study and described in the Application. BGM has existing water licences for the Willow River, Lowhee Creek, and other small streams to support both exploration and the former processing operation at the Mosquito Creek Mine.

At the QR Mill, water is required throughout the ore processing circuit, from grinding to leaching. The water sources within the existing QR Mill (TSFs, pits, runoff) will be evaluated against the anticipated water requirements to identify if new sources of water (i.e., groundwater or surface water) are required. The location of the water source will be identified as part of the technical study and water balance model and will be described in the Application.

4.0 PROJECT OVERVIEW

A significant drilling and exploration program has been ongoing on BGM claims and property near Wells between 1985 and 2018 and has identified a mineable resource (InnovExplo Inc., 2018). BGM is currently working on a technical study with the latest resource estimate.

The Project will be developed as an underground gold mine. The mine production rate will be up to 4,000 tpd. Ore will be crushed, sorted, and concentrated at the Mine Site prior to being transported to the existing QR Mill facilities for final processing and storage in a dry stack tailings storage facility at the QR Mill. The resource characterization, Project components, costs, and schedule are described below.

4.1 Mineral Resource Estimates

BGM issued a press release for an Updated Underground Resource for the Cariboo Gold Project on May 29, 2019, located in Wells, BC.

Highlights of the Mineral Resource Update include:

- Indicated Resource of 2.3 million ounces of gold (12.5 million tonnes grading 5.6 grams per metric ton (g/t) Au);
- Inferred Mineral Resource of 1.9 million ounces of gold (11.8 million tonnes grading 5.0 g/t Au);
- The mineral resource estimate has factored in the internal dilution, allowing BGM to consider larger mining methods in some of the deposit areas to reduce operating costs in a future scale operation and allowing for better “resource to reserve” conversion and better continuity;
- The 2019 Mineral Resource estimate on Cow and Island Mountains covers the corridor of the Cow, Valley, Shaft and Mosquito deposits over a strike length of 3.7 km, a maximum width of approximately 700 m, down to a maximum depth of 600 m and an average depth of 350 m below surface; and
- 249 vein corridors were modelled with average dimensions of 300 m by 3 m with a thickness of the vein corridors ranging from 2 m to 40 m.

The mineral resource estimate incorporates the Cow and Valley Zones on Cow Mountain, Shaft and Mosquito Creek Zones on Island Mountain at a cut-off grade of 3.0 g/t Au. The resource is defined over only 6 km of BGM's 67-km-long land package. Infill and exploration drilling are ongoing across BGM’s claims, concentrated in the Wells area. mineral resource estimate was conducted by Talisker Exploration Services Inc. under the supervision of InnovExplo Inc., an independent consulting firm based out of Val-d'Or, Quebec.

The mineral resource estimate for Cow and Island Mountain deposits is built upon over 400,000 m from BGM's 2015 to 2018 drill campaigns and historically verified drill data using a total of 3,426 drill holes. A strong understanding of the controls of mineralization enabled BGM’s technical team to construct a mineral resource estimate constrained by lithology, alteration, structure and mineralization. The mineral resource estimate is supported by a robust 3D litho-structural model of the gold-bearing vein corridors. The 2018 exploration and category conversion drill program was successful in improving the precision of vein corridors; a total of 249 vein corridor solids were individually modelled. Average dimensions of a vein corridor are 300 m by 300 m by 3 m with a thickness of the vein corridors ranging from 2 m to 40 m. The resource estimate includes the internal dilution of the sandstone host within the vein corridors. Vein corridors are defined as a high-density network of mineralized quartz veins within the sandstones. Table 3 summarizes the Mineral Resource estimate.

Table 3: 2019 Cariboo Gold Project Mineral Resource Estimate at 3.00 g/t Au Cut-off

Cariboo Gold Project Mineral Resources			
Deposit by Categories	**Tonnes (t)**	**Au (g/t)**	**Au (oz)**
Indicated			
Mosquito	542,000	7.1	124,000
Shaft	7,200,000	5.6	1,300,000
Valley	1,212,000	5.3	208,000
Cow	3,578,000	5.5	637,000
Total Indicated	**12,532,000**	**5.6**	**2,269,000**
Inferred			
Mosquito	690,000	6.5	144,000
Shaft	5,817,000	5.0	941,000
Valley	3,475,000	4.9	545,000
Cow	1,867,000	4.7	282,000
Total Inferred	**11,849,000**	5.02	**1,912,000**

4.2 Project Components

Project infrastructure will be located at two main sites, the Mine Site and QR Mill, with a transportation route connecting them. A new transmission line will be built to deliver power to the Mine Site, while an existing transmission line will continue to deliver power to the QR Mill. The Project is being developed as an underground mine, with underground crushing as well as ore sorting, milling and flotation beneficiation processes completed in a concentrator at surface at the Mine Site prior to ore transport to the QR Mill for further milling, gold recovery and tailings management. Waste rock will be stored at two locations; the portal area of the Mine Site and at the Bonanza Ledge Mine.

4.2.1 Project Area Requirements

Area requirements for the Project are provided in Table 4. The total area for surface infrastructure at the Mine Site is 17.8 ha. The Mine Site is located on property owned by BGM, and Crown land, both of which have been previously disturbed by historical mining activities.

Outside of the Mine Site surface disturbance, the only additional disturbance for the underground mine will be ventilation raises installed for each of the four underground zones (total of seven raises). The total area for each ventilation raise and associated infrastructure is approximately 0.2 ha, for a total of 1.4 ha. These raises will be located on previously disturbed lands and will be fenced for safety purposes. Existing exploration roads will be

used to access the ventilation raises for the Mosquito, Shaft and Cow zones. The Valley zone ventilation raise will be located within the Mine Site and additional access is not required. Total length of the access roads is 9.7 km. Upgrades to the existing exploration roads will be evaluated during project development.

The waste rock at Bonanza Ledge will be placed on areas previously disturbed by the Bonanza Ledge Mine. The total area for the proposed WRSF at Bonanza Ledge is 13.2 ha. The access route to the WRSF at Bonanza Ledge will be upgraded to allow for transport of waste rock from the Mine Site. Two options are currently under consideration: Option 1, which will include upgrades to the existing B-Road and A-Road (3.5 km), and Option 2, which will include upgrades to the existing C-Road (4.8 km). Further studies are underway to evaluate the options and the selected route will be described in the Application.

Table 4: Cariboo Gold Project Components and Area Requirements

Component	Infrastructure	Area or Length Requirement
Mine Site	Mine Site Surface Infrastructure	17.8 ha
	Ventilation Raises	1.4 ha
	Ventilation Raise Access Roads	9.7 km
	WRSF at Bonanza Ledge	13.2 ha
	WRSF Access Road – Option 1 or WRSF Access Road – Option 2	3.5 km 4.8 km
QR Mill	Total area at QR Mill	133 ha
	Dry Stack TSF	15.6 ha
	Dry Stack TSF (alternate)	6.1
Transmission Line	Transmission Line Length	69 km
	Right-of-way width	36 m

The Mine Site footprint is shown on Figure 3 and includes all infrastructure with a buffer to show the potential maximum area that may be disturbed as part of the Project. Mine Site surface infrastructure has been buffered by 50 m. The footprint also includes the underground mining zones projected to surface and buffered by 50 m. Existing access roads are buffered by 10 m. The access route options to WRSF are buffered by 25 m.

The total area of the QR Mill is 133 ha and Project-related infrastructure is contained within the existing footprint. The mill upgrades will be completed within the existing mill area. The dry stack tailings storage facility (TSF) will require 15.6 ha of area, with an alternate location also under consideration (6.1 ha). No additional expansion of the QR Mill outside of the existing footprint is required. The remainder of the QR Mine site (old pits, borrow areas) will be undergoing reclamation and closure over the next few years.

No upgrades to the roads identified for the Transportation Routes are required. A new single-span 12 m bridge over the Willow River will be installed at the entrance of the Mine Site access road to Highway 26.

The new Transmission Line will generally follow the existing BC Hydro right-of-way along Highway 26 between Barlow Substation and Wells. The Transmission Line will be approximately 69 km in length, and the right-of-way width is 36 m. Preliminary design within the corridor (Figure 7) for the Transmission Line is underway. The location of the Transmission Line will be determined based on environmental and terrain constraints. Disturbance areas will be presented in the Application.

4.2.2 Mine Site

The Mine Site will consist of the components listed in Table 5.

Table 5: Mine Site Project Components

Purpose	Components	
Surface Infrastructure	■ Fuel storage and handling facilities ■ Worker accommodation ■ Sewage and septic works ■ Mine dry and mine rescue services ■ Maintenance shop and laydown area ■ Warehouse facilities ■ Offices ■ Main ventilation and mine heating infrastructure	■ Security facilities and main entrance gate ■ Fire water pumping station on Jack of Clubs Lake and fire water distribution piping system ■ Access roads ■ Willow River bridge
Mining	■ Mine development ■ Underground workings and ore passes ■ Ventilation raises (including emergency egresses) ■ Underground infrastructure	■ Underground ore storage silos ■ Portable batch plant for cemented rock fill ■ Paste backfill
Mineral Processing	■ Underground crushing	■ Surface concentrator, including ore sorting, grinding and flotation process equipment, concentrate dewatering equipment, paste backfill plant, binder silo and ore and waste storage silos
Mine Waste Management Facilities	■ Overburden and soil stockpile	■ Waste Rock Storage Facilities (WRSF), one at the new portal area and one at Bonanza Ledge Mine (4 km away)
Water Management Facilities:	■ Water storage and supply (potable and non-potable) ■ Non-contact water diversions ■ Contact water management structures	■ Pumps, pipelines, and collection systems for the water management systems at the Mine ■ Water treatment facilities ■ Water discharge

Purpose	Components	
Power supply	■ Connection of the Mine to the Transmission Line via a substation on the Mine Site ■ Generators will be used during construction and during pre-production mine development and until a transmission line with three-phase power becomes available	■ Emergency generators to maintain minimal site and underground services during a power outage

4.2.2.1 Surface Infrastructure

Site surface infrastructure includes all the buildings required to support the mine portal area, and ore transport to QR Mill, as well as offices, and accommodations. The Mine Site will be fenced for public safety and security of the site. Site surface infrastructure currently planned for the Project is discussed in the following subsections.

All new surface infrastructure at the Mine Site, except for the excavations for the concentrator building, camp access road and portal, will be built on top of the existing material present on-site. As currently planned, no excavations into the old tailings material will be required. Where possible, excavated material from the concentrator building, tunnel portal and camp access road will be placed as backfill for civil works including the main access road, water management infrastructure, and to raise the grade of the Mine Site laydown area. Excess excavated material will be placed in the WRSF at the Mine Site.

Security Gate

Access to the Mine Site will be by controlled access gate entrance to the main surface infrastructure area at Wells and near the substation to the Transmission Line.

Mine Office and Dry, Maintenance Shop, and Warehouse and Laydown Area

A multipurpose building comprising the surface concentrator, mine offices, a maintenance shop, and a warehouse will be constructed in a central location at the Mine Site, near the proposed portal entrance. This complex will also be used for mine rescue and training.

A laydown area for additional storage will be located near the multipurpose building.

Worker Accommodation

A new 139-person operations camp will be constructed at the Mine Site, located at the site of the existing core storage facility. Engineering will be completed as the Project develops to design the accommodation facility. This camp will be in operation for the duration of the Mine operation of 11 years. The camp will include single rooms with communal W/C and showers for 134 units, and five executive single room suites. The camp will also include office space for the camp administration, eight desk spaces, conference/training room, full kitchen facility, gym and common area living rooms.

BGM also has an existing camp (Camp A and Camp B) close to the current BGM office (Figure 3) and plans to use this camp during Project construction. Camp A can house up to 48 people for day/night shift. Camp B has 24 rooms with one bed in each room.

Sewage and Septic Works

A sewage and septic handling system will be constructed near the new operations camp at the Mine Site with the capacity to support a 139-person camp and will be independent of the Wells sewage system. Wastewater from the camp will be treated and effluent will flow into the septic disposal field.

Fuel Storage

Fuel storage reservoirs will be installed at the Mine Site close to the laydown area. They will be constructed and maintained in accordance with applicable law. Equipment refuelling and lubrication will be conducted on the surface and underground. A fuel truck will distribute fuel underground to mobile stations. The Mine Site fuel storage and handling facilities include:

- Three 40,000 Litre (L) diesel storage reservoirs for the generators during the construction period. Only one reservoir will be required after the Transmission Line is in service;
- One 50,000 L diesel fuel reservoir located near the Mine portal for underground and surface equipment; and
- One 20,000 L gasoline reservoir for small service equipment and pick-up trucks.

Explosives Storage and Handling Facility (Magazine)

Pending the Mine Inspector's approval, the proposed explosive storage location during the construction of the starter ramp is on the surface at the existing explosives storage magazine used for Bonanza Ledge Mine operations. Explosives will be transported via utility vehicles with clearly marked signage when required.

Upon completing approximately 1 km of development on the starter ramp, the main explosives storage and handling facility will be constructed underground.

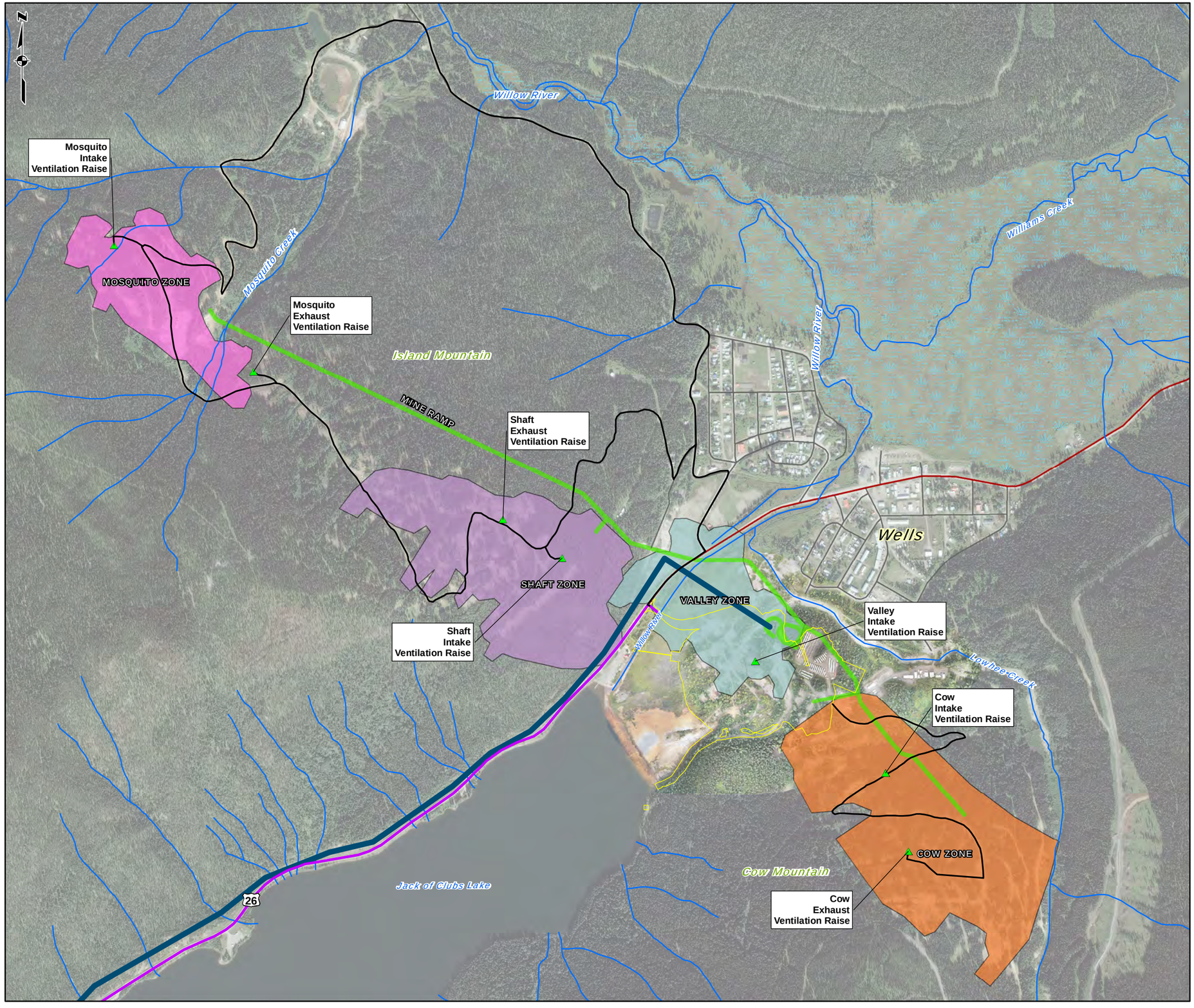
4.2.2.2 Mining

Mine Development

Basic-engineering level designs are currently in progress to assess the economic and technical merits of different mining methods at the site. These designs, along with technical input, will guide the shape and extent of the proposed underground workings. At this stage, it is expected that an underground mine complex will be established beneath Island Mountain, Cow Mountain, and the Valley between the two mountains with four distinct zones:

- Mosquito,
- Shaft,
- Valley, and
- Cow.

Figure 9 shows the Preliminary Mine Design in reference to the Mine Site surface infrastructure and the District of Wells.

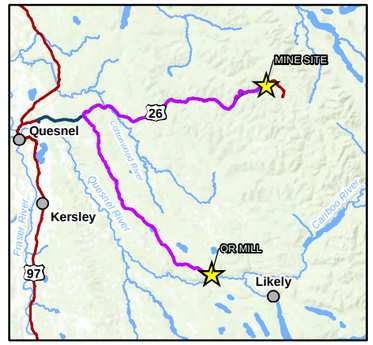


LEGEND

- VENTILATION RAISE
- ROAD
- HIGHWAY
- WATERCOURSE
- WETLAND
- TRANSPORTATION ROUTE
- TRANSMISSION LINE ROUTE
- EXISTING MINE SITE ROAD
- PROJECT COMPONENTS

UNDERGROUND MINE

- SHAFT ZONE
- COW ZONE
- VALLEY ZONE
- MOSQUITO ZONE
- MINE SHAFT



REFERENCE(S)

1. TRAILS, WATER FEATURES, ROADS, MUNICIPAL BOUNDARY, PARK/PROTECTED AREAS, BARKERVILLE HISTORIC TOWN/PARK, CITIES (INSET), PROVINCIAL BORDERS (INSET) OBTAINED FROM THE B.C. MINISTRY OF FORESTS, LANDS, NATURAL RESOURCE OPERATIONS AND RURAL DEVELOPMENT.
2. BASE DATA SOURCE: ESRI, GEOBASE, NRCAN, AND THE GIS USER COMMUNITY
3. BASE DATA SOURCE: ESRI, GEOBASE, NRCAN, AND THE GIS USER COMMUNITY.
4. INSET BASE SOURCE: ESRI, DELORME, GEBCO, NOAA NGDC, AND OTHER CONTRIBUTORS.

NAD83 CSRS
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0 100 200 300 400 Meters

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BGM

CARIBOO GOLD PROJECT

PROPOSED UNDERGROUND MINE PLAN

REV.	DESCRIPTION	DATE	INITIALS
A		2019-10-24	M.Y

PROJECT NO.	PHASE	REV.	FIGURE
151-11330-70	00	B	9

Ore mined underground will feed an underground crushing facility, while the waste rock from development will remain underground, except for during pre-production, where the development waste rock will be transported to the WRSF adjacent to the portal. A proportion of the development waste rock will be used as cemented rock fill or uncemented rock fill. Cemented rock fill and uncemented rock fill are both used to backfill underground mine workings to progress mine development. Paste backfill will also be used in the mine development and backfill strategy.

Underground Workings

A portal will be built with the entrance near the historic Cariboo Gold Quartz Mine 1500 portal on Cow Mountain, near the northeast end of Jack of Clubs Lake (Figure 3). This new portal will give access to the Mine via a new decline ramp and will be used for the development and production of the Mine. With the current knowledge of the ore deposit, a shaft for ore transport from underground to surface will not be required as the ore is relatively close to the surface. However, a vertical conveyor and excavation will be required to transport ore between the underground crushing and the surface concentrator. Ventilation raises and ore passes will also be required.

Development dimensions for the main ramp will be 5.5 m × 5.5 m, providing the space required to access all areas safely, as per BC mining regulations. The development will be carried out using either a continuous miner (Roadheader machine) or conventional drill and blast techniques.

Ventilation

During construction of the starting ramp, ventilation will be installed using ducting originating from the portal. Ventilation raises will be required for each mining zone. The order in which they are developed will be based on the detailed mining sequence, which is currently being developed. They will serve as emergency egresses as well as being the intake of fresh air for each zone to maintain proper mine ventilation. During the development of the Project, additional ventilation raises may be required, or the currently planned raises may be extended to reach the lower levels of the Mine.

Underground Infrastructure

In addition to the ventilation raises, the following underground infrastructure will be developed and implemented to follow applicable regulations, to maintain a safe workplace and to optimize mining operations. These ancillary excavations will vary in size and are listed below:

- Crushing station excavation, including excavation for a vertical conveyor to the surface,
- Safety bays,
- Garage,
- Explosive magazine,
- Sumps,
- Lunch rooms and refuges,
- Warehouse storage,
- Raw and clean water reservoirs, and
- Electrical sub-stations.

Additional excavation for production is also required, including haulage drifts, ore passes, draw points, and other service bays.

Cemented Rock Fill Batch Plant

Cement trucks will connect to an unloading station at the surface where dry cement will be delivered to an underground silo for storage through a borehole from the surface. A transport vehicle will be used to carry dry cement from the silo to a mobile batch plant, which will be temporarily installed near each stope to be backfilled. Using the mobile batch plant, the cement will be wetted and mixed to prepare an approximate 4% cement mixture for distribution to the stope for cemented rock fill preparation using cement and development and a proportion of ore sorter waste.

Ore Silos

The ore stockpiles after crushing will be conveyed to the surface by a vertical conveyor to an ore storage silo where it will either feed the ore sorters or the milling and flotation circuits. A proportion of concentrate generated from the ore sorters will also feed the milling and flotation circuits. The concentrate produced from the surface concentrator (ore sorter and flotation concentrates) will be transported by trucks to the QR Mill for further processing.

4.2.2.3 Mineral Processing

The Project includes underground crushing as well as a concentrator at surface comprising of ore sorting, milling, flotation and dewatering circuits, a paste backfill plant, waste storage prior to final placement in the WRSF and ore storage prior to transportation to the QR Mill. Figure 10 presents a simplified schematic of the Project mineral processing at the Mine Site.

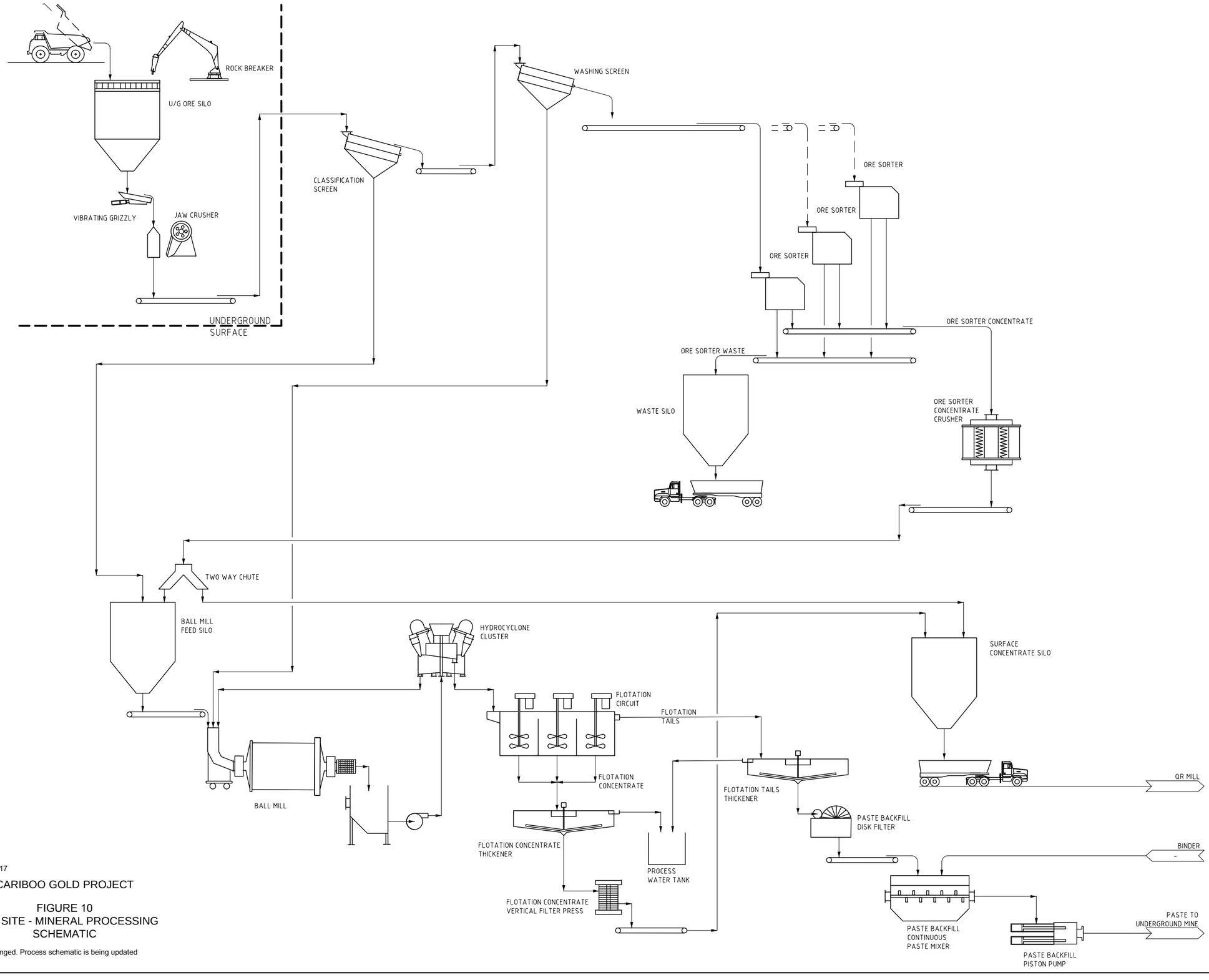
Underground Crushing

The mined ore material will feed an underground primary jaw crusher, where the crushed ore product will be transported to surface by a vertical conveyor and stored in a silo at the surface concentrator. The primary crushing equipment will be installed underground to reduce surface disturbances, increase operational efficiency, and reduce noise and dust at the surface.

Surface Concentrator

The primary crushed ore from the underground mine is stored in a silo inside the concentrator building at the surface. The first concentration step will be completed using ore sorters. The surface silo feeds a screen where coarser particles (>12 mm) are separated, washed and feed the ore sorters. Ore sorter product (sulphur and gold bearing material) is further crushed using a secondary cone crusher, for which the secondary crusher product will feed either the milling and flotation circuit for further concentration or the final ore silo for transport to QR Mill. Ore sorter waste is sent to a waste silo for placement in the WRSF.

The second concentration step is by flotation. A proportion of the ore sorter concentrate, as well as particles finer than 12 mm passing through the screens, will feed the flotation concentration circuit. The ore material will feed a ball mill closed by a cyclone cluster where the ball mill product will feed a pyrite flotation circuit. The ore will be further separated into a pyrite flotation concentrate and flotation tailings. Both the flotation concentrate and the flotation tailings will be thickened and filtered. The flotation concentrate will then be combined with a proportion of the ore sorter product in the final ore bin and stored for transport to the QR Mill.



REFERENCE(S)
1. DIAGRAM PROVIDED BY BBA - 2019-06-17

CARIBOO GOLD PROJECT

FIGURE 10
MINE SITE - MINERAL PROCESSING
SCHEMATIC

Note: that the plan for the Mine Site has changed. Process schematic is being updated

Paste Backfill Plant

Tailings from the flotation circuit will be dewatered, mixed with a binder, and returned underground with a paste backfill plant located within the surface concentrator. Paste backfill will leave the surface concentrator and use an underground piping distribution network to transport the paste to the different stopes to be filled. Paste backfill will be used as a priority in the backfill schedule. Outstanding quantities of backfill beyond that supplied by paste backfill required for mining operations will use both cemented and uncemented rock fill made from ore sorter waste and development waste rock.

4.2.2.4 Mine Waste Management Facilities

Overburden Stockpile

Excavation of overburden will be required to establish the mine for pad and construction of surface infrastructure, including three primary areas: concentrator building, tunnel portal and camp access road. A temporary overburden stockpile of approximately 175,000 m^3 is planned as part of the site layout to store the overburden generated from the portal and camp construction at the Mine. Where possible, excavated overburden material will be placed as backfill during construction of the main access road, substation, water management infrastructure and grading for the mine pad area. Excess excavated overburden will be placed within a designated portion of the WRSF.

Waste Rock Storage Facilities

Waste rock from the tunnel portal, mine development during pre-production and during initial years of operation will be placed as bulk fill material to grade the mine laydown area, and construct portions of the access road. Approximately 500,000 tonnes of waste rock will be used to build the mine laydown area. There will also be a designated WRSF for an additional 1,000,000 tonnes of material adjacent to the mine laydown area, thus providing capacity for approximately 1,500,000 million tonnes of waste rock at the Mine Site. The mine laydown area and the WRSF will be constructed on a liner to ensure separation from historic waste rock below.

The current historic waste rock pile will be surrounded by waste rock to increase stability. It will be full in the first years of operations, at which point it will be progressively reclaimed with an engineered cover. Non-potentially acid generating (NPAG) waste rock is planned to be used for the lower levels of the WRSF, as the material removed during mine ramp development is expected to be predominantly NPAG.

Approximately 4,600,000 t of additional waste rock will be transported to the Bonanza Ledge Mine WRSF, where it will be stored and progressively reclaimed with an engineered cover as each phase of the waste pile development is complete. Waste rock will be transported to the Bonanza Ledge WRSF after the pending Bonanza Ledge Phase II operations at Bonanza Ledge Mine have ceased. The waste rock will be transported to the Bonanza Ledge WRSF via an existing road that will be upgraded as part of the Project (See Section 4.2.1).

Tailings Storage Facility

A dedicated tailings storage facility (TSF) is not required at the Mine Site or in the Wells area as part of the Project. The sorting of the mined ore prior to milling and flotation, as well as the use of flotation tailings for paste backfill, will eliminate the need to have a TSF at or near the Mine. A new dry stack TSF will be constructed at QR Mill.

4.2.2.5 Water Management Facilities

The design of water management facilities required at the Mine Site will likely include the following:

- Water storage and supply (potable and non-potable).
- A new well will be drilled to supply potable water to the Mine Site and the operations camp. Preliminary planning includes a new water well drilled near the northeast boundary of the District of Wells, and water transported from that well to the camp. The proposed well will have sufficient capacity to meet the domestic Maximum Day Demand of the camp (67 m^3/day) and the concentrator (1.8 m^3/day). The well location will be identified based on the results of the technical study and described in the Application.
- Non-potable water used at the Mine Site may be pumped from Jack of Clubs Lake or another surface / groundwater source in the vicinity. This location will be determined as part of the water quality/water balance model and will be described in the Application. As underground development progresses, a water reservoir will be excavated and a treatment unit will allow for the recycling of underground water. The water will be re-used for operational needs and thus reduce the amount of water required from other sources over time. Only surplus water to that required for operations (i.e., from infiltration) will be pumped to surface.
- Process water used at the surface concentrator will be recirculated and re-used to the extent possible using thickeners and filters. If additional make-up water is required, excess water from underground will be prioritized and directed to the concentrator instead of to the water treatment plant.
- A non-contact water diversion system will be installed to manage surface water runoff from Cow Mountain upslope of the Mine Site (Figure 3).
- Surface water management and mine dewatering system at the Mine Site, including a water treatment facility.
    - Contact surface water at the Mine Site will drain naturally through the WRSF to the bottom of the waste pad into a sedimentation pond.
    - The Mine dewatering system will include sumps, pumps, pipelines, and collection systems. Excess water from the underground mine dewatering system will be pumped to surface and connect to the surface concentrator and to the water treatment plant. The water level in the historical underground workings will be maintained approximately 50 m below the development level.
    - Contact water will be collected in the surface pond and sent to the water treatment plant. Underground dewatering water in excess of the underground mine and the Mine Site's process requirements will be pumped directly to the water treatment plant. The dewatering and water treatment systems will have the flexibility to allow for the treatment of a surplus of water at surface by temporarily ceasing underground dewatering activities without affecting mining and development operations. Treated effluent meeting permit requirements will be pumped either into the Willow River on the south side of the new Mine Site access bridge, or into Jack of Clubs Lake. The final location will be chosen as part of the water quality/ water balance model and will be described in the Application.
    - The water treatment process at the Mine Site is currently planned to be a conventional neutralization and iron co-precipitation process to remove iron, arsenic, and trace metals. The water treatment plant will be constructed in advance of operations to facilitate draining and treating the water in the existing underground workings prior to effluent discharge.

- The WRSF at Bonanza Ledge will include the associated water management infrastructure to collect water from the facility and a water treatment plant. Surface water runoff will be collected and directed towards the sediment control pond before release to Lowhee Creek. Contact water treatment systems will be based on those remaining after the completion of Bonanza Ledge Phase II and will be enhanced for the Cariboo Gold Project.

A mine water management plan will be developed for the Mine Site prior to commencing operations that will provide details of mine water management strategies and guidance on protecting natural waterways surrounding the Project to follow applicable Best Management Practices (BMPs), effluent discharge permits, and legislation.

4.2.3 Transportation Route

Ore generated at the Mine Site will be hauled along the Transportation Route to the QR Mill. The Transportation Route between the Mine Site and QR Mill is comprised of Highway 26 and the 500 Nyland Lake Road. Haul truck capacity will be approximately 40 metric tonnes. Approximately 20-25 transport truck loads per day will be hauled along the Transportation Route, 365 days a year. Ore hauling will be between the times of 6 am and 8 pm each day.

Access to the Mine Site will be from Quesnel on Highway 26. BGM will build a new mine access road from Highway 26 near Wells to the Mine Site that will cross the Willow River on a bridge and then cross the historical tailings deposit on the northeast side of Jack of Clubs Lake (Figure 3). The Willow River crossing will consist of a single span bridge made of steel girders with a precast concrete deck of approximately 12 m.

Access to the QR Mill is through two routes. The first route to QR Mill is from Quesnel is along Highway 26, and then south onto the 500 Nyland Lake Road from Highway 26, near Cottonwood. The 500 Nyland Lake Road is a gravel forest service road that is maintained by West Fraser Mills Ltd. The second route is south from Quesnel along the Quesnel Hydraulic Road to the 2700 Road, where it meets with the 500 Nyland Lake Road. These routes will also be used for workers to access the Project sites, as well as for material and equipment deliveries required for the Project.

Upgrades to the Transportation Route are not required as part of the Project.

Project-related vehicle traffic to the Mine Site and QR Mill will include the following deliveries along the Transportation Route and beyond to each item’s point of origin:

- Fuel,
- Emulsion (the Mine Site only),
- Drill bits (the Mine Site only),
- Grinding media,
- Reagents,
- Equipment maintenance spare parts,
- Operational consumables, and
- Food and cleaning products for the camps.

4.2.4 QR Mill

The QR Mill is an existing plant with a daily capacity to process 850 t of mineralized material. The QR Mill is currently used to process Bonanza Ledge ore, with these tailings currently being deposited into the Main Zone Pit. Once mining is finished at Bonanza Ledge, the QR Mill will shut down for several months in order to perform the upgrades required to process concentrate from the Cariboo Gold Mine Site. Also, upon receiving applicable permits for the Cariboo Gold Project, and while Bonanza Ledge ore processing is drawing to an end, a tailings dewatering plant (thickening and filtration), as well as the site preparation and water management infrastructure for the dry stack tailings storage facility, will be built. This is also when, if required, the site water management infrastructure will be upgraded and a water treatment plant will be built to meet the needs of the Cariboo Gold Project. These new systems will tie into the QR Mill processing circuit during a planned shut down upon at the end of mining at Bonanza Ledge.

The QR Mill, as part of the Cariboo Gold Project, will consist of the components listed in Table 6.

Table 6: QR Mill Project Components

Purpose	Components	
Site Infrastructure	■ Fuel and propane storage and handling facilities ■ Worker accommodation	■ Sewage and septic works ■ Offices
Mineral Processing	■ Grinding, leaching, gold recovery, and cyanide destruction in an upgraded QR Mill	■ Tailings dewatering plant
Tailings and Waste Management Facilities	■ Dry stack tailings storage facility	■ Overburden stockpile
Water Management Facilities	■ Water storage and supply (potable and non-potable) ■ Integration of new contact and non-contact water management infrastructure from the Project to the existing water management infrastructure at QR mill and upgrades as required	■ Water treatment system and discharge (if required)
Power supply	■ The QR Mill is currently connected to a transmission line that will be sufficient for the Project's needs. Electrical equipment within the QR Mill will be upgraded and new equipment will be added as required	■ Electrical equipment upgrades within the QR Mill

4.2.4.1 Site Infrastructure

Site surface infrastructure includes all the buildings required to support the activities at QR Mill, including offices, and accommodations. Site surface infrastructure currently planned at the QR Mill is discussed in the following subsections.

Fuel Storage

There is currently one diesel storage reservoir and one gasoline storage reservoir installed at the QR Mill, as well as another reservoir for mill emergency generator. The existing reservoirs will be inspected and re-used for the Project if they meet current fuel storage standards and regulations.

Accommodations for Workers

The existing camp at the QR Mill will be re-used for operations related to processing for Cariboo Gold. The current camp can accommodate 40 workers.

Sewage and Septic Works

The existing septic system at the QR Mill is under review. If required, upgrades to the sewage and septic handling system will be constructed near the QR Mill camp.

4.2.4.2 Mineral Processing - QR Mill Upgrade

The combined ore sorter and flotation concentrates will be transported by haul trucks from the Mine Site to the QR Mill. Existing process equipment at the QR Mill will be upgraded, as required, to meet the Project's needs. It will also include the following modifications to the process:

- Addition of a covered 25,000 tonne ore stockpile;
- Addition of intensive cyanidation to the gravity recovery circuit; and
- Addition of a tailings dewatering circuit prior to disposal in the dry stack tailings storage facility.

The current technical study will establish the details on introducing the ore to the QR Mill prior to the leaching, carbon in pulp, and gold recovery circuits. Figure 11 presents a simplified schematic of the Project mineral processing at the QR Mill.

4.2.4.3 Tailings and Waste Management Facilities

Tailings from the QR Mill will be thickened and filtered prior to disposal in a new dry stack tailings storage facility that will be constructed adjacent to the existing QR TSF on disturbed land at the QR Mill. The new dry stack tailings storage facility will be constructed using mechanical delivery and placement of the filtered tailings. The tailings management design will incorporate runoff collection from the dry stack tailings storage facility, flood event management infrastructure, and direct it to the new and existing contact water containment system at the QR Mill.

The dry stack TSF has a design capacity of 2.3 million cubic metres (Mm^3) of compacted dry stack tailings, corresponding to a total dry mass of 3.9 million tonnes. The tailings cell will be self-contained, with a liner system with leakage collection. The tailings stack will be equipped with an appropriate drainage system for contact water collection (sub-drain, base drain, finer drains, collection ditches, etc.) and conveyance to the Main Zone Pit.

The existing QR TSF will not be used for the storage of tailings for the Project.

The necessity for a temporary overburden stockpile at QR Mill will be evaluated after further geotechnical investigation and technical design of the dry stack tailings storage facility location has been completed.

4.2.4.4 Water Management Facilities

The water management facilities required at the QR Mill sites will likely include the following:

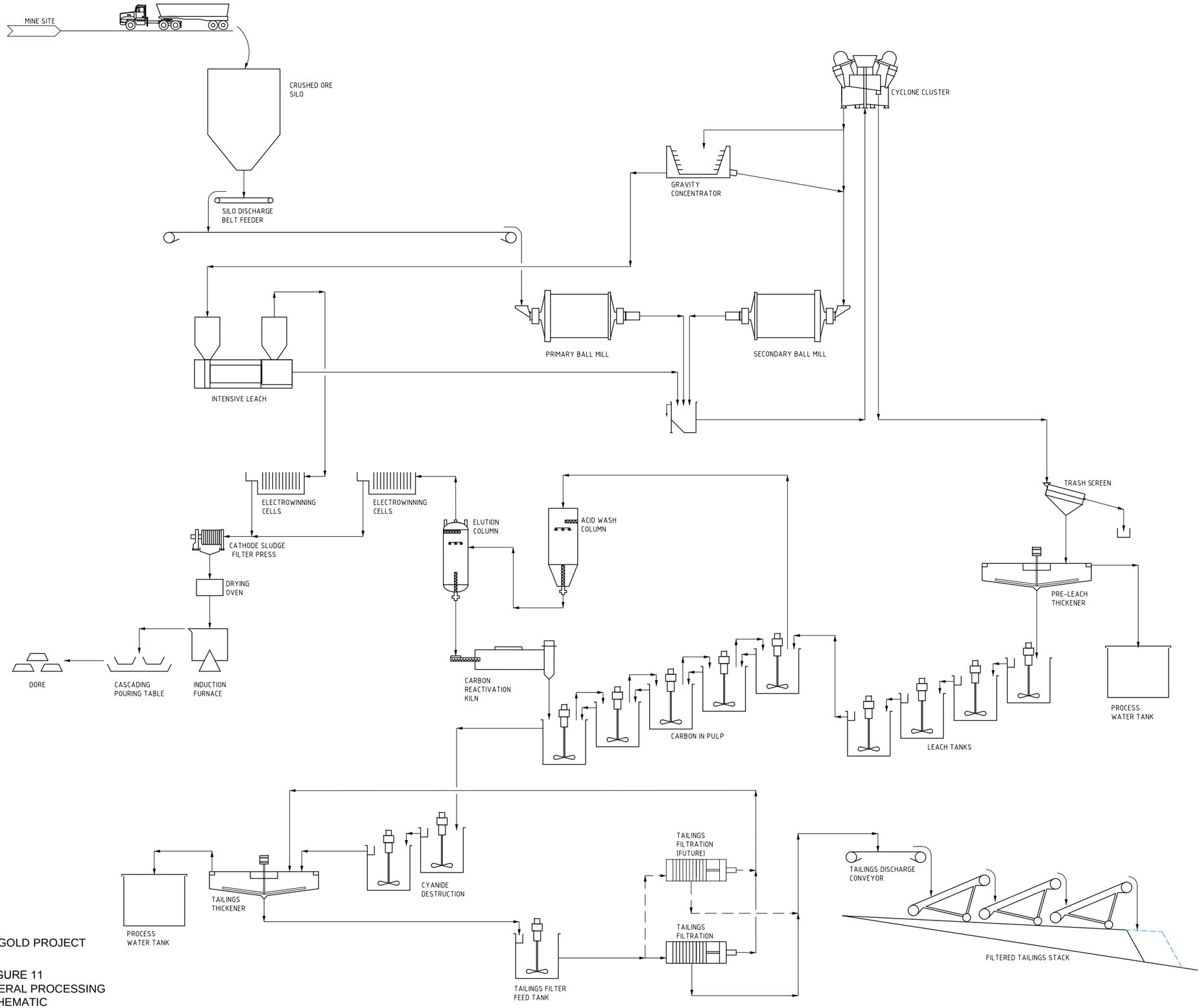
- Potable water is currently supplied from an existing well, located approximately 230 m southeast of the camp. A new well is not required for this site.
- Water management infrastructure for the dry stack TSF will include a surface water diversion ditch upslope of the dry stack TSF to route natural runoff around the dry stack TSF to the natural downstream watercourse, and internal perimeter drainage ditching to convey runoff from the tailings stack to a runoff collection pond. All drainage and seepage from the dry stack TSF will be collected in the runoff collection pond beside the MZP, from which water will be pumped to the MZP or the existing QR TSF to attenuate peak flows and to allow sedimentation of suspended solids.
- Addition to and upgrades of the existing contact water infrastructure to meet the Project's needs.
- By the time Cariboo Gold processing starts, QR Mill will be equipped with a water treatment system developed as part of current operations. Enhancements to these systems are planned as part of sustaining capital for Cariboo Gold.
- Potential receiving water bodies are the Quesnel River and/or Rudy Creek watershed.

Details regarding the water management facilities at QR Mill will be described in the Application. A site water management plan will be developed for the QR Mill prior to commencing operations that will provide details of water management strategies and guidance on protecting natural waterways surrounding the Project to follow applicable BMPs, effluent discharge permits, and legislation.

4.2.5 Transmission Line

BC Hydro currently operates a 14 kV (single phase) power line to provide power to Wells. This existing power line does not meet the requirements of the Mine Site for three-phase power. BGM will build a new 69 kV, three-phase Transmission Line from the Barlow Substation near Quesnel to Wells (Figure 2). The proposed Transmission Line corridor would parallel the existing BC Hydro right-of-way along Highway 26. The new Transmission Line will be offset from the existing line and require additional right-of-way. The right-of-way will be approximately 36 m (18 m either side of the transmission line). A new substation will be located near the Mine Site, transforming the 69 kV power to a lower voltage to meet the Project's needs.

Diesel generators will be installed near the Mine portal area for use during Mine Site construction and until the Transmission Line is operational. Diesel generators will remain on-site and will be used as an emergency backup power source during power outages.



REFERENCE(S)
1. DIAGRAM PROVIDED BY BBA - 2019-06-17

CARIBOO GOLD PROJECT

FIGURE 11
QR MILL - MINERAL PROCESSING SCHEMATIC

The current power supply to the QR Mill site is sufficient to meet Project needs. The process upgrades specified during the technical study will dictate what electrical upgrades are required within the mill.

4.2.6 Reclamation

During the reclamation period and until the sites have been restored and released by regulators, contact water will continue to be managed (and treated if required) to be compliant with all permits and regulations. The objective is to design and reclaim the sites to not require human intervention in managing the water once the site has been restored.

Post-closure monitoring and maintenance activities will be carried out for five years beyond reclamation decommissioning activities. Post-closure monitoring will include geotechnical and hydro-geotechnical monitoring and reporting, surface and groundwater monitoring, revegetation and invasive plant surveys. Water treatment units will be maintained. Only the infrastructure related to water treatment, such as access roads, contact water ditches, and sedimentation ponds will be maintained beyond the reclamation decommissioning activities, if necessary.

4.3 Project Activities

The Project will be constructed in phases as the Mine Site develops. A preliminary sequencing schedule for each phase of the Project is presented in Table 7.

Table 7: Preliminary Project Sequencing Schedule

Project Phase	Duration	Time Period
Site Preparation and Construction of Mine and Underground Crushing	1 year	2021-2022
Project Operation and Ongoing Mine	11 years	2022-2032
Site Decommissioning, Reclamation	2 years	2033-2034

Note: Target start date of surface site preparation and construction activities is 2021.

4.4 Project Capital Costs and Employment Estimates

The operational life of the Project is currently projected to be 11 years based on the currently delineated resources. Depending on the final project configuration, the estimated pre-production capital cost of the Project is expected to be approximately $306 million. The capital cost of the Project will be revised during the preliminary and detailed design phases. Projected annual operating costs are estimated at $105 per tonne mined. The estimated cost for decommissioning the Project is $15 million.

Employment opportunities during site preparation and construction will be determined during the technical study. During the 12-month construction period, an average of 70 construction personnel, peaking at approximately 112 workers, will be present on-site. This personnel count includes direct construction labour force for underground and surface facilities, contractor supervision, owner and construction management team, third-party testing technicians, vendor representatives for installation and commissioning support and underground construction crews.

The number of personnel employed during operations will be closely linked to the anticipated operational management of the Project and quantity of gold to be mined. During the operational phase, the Project is expected to create the following employment opportunities:

Project Employees – The Project is anticipated to employ approximately 333 people per year over the approximately 11-year operational period. Facility positions may include skilled technicians and operators, managers and supervisors, and labourers. The underground mine will operate on two 12-hour shifts/day for automated operations and 10-hour shift/day for other underground activities. Salaried positions will work a combination of either 4/3 or 5/2 days working/days off. Hourly employees are scheduled on a 14 days on, 14 days off roster on a fly-in/fly-out schedule.

Contracted Employment – Contractors are expected to undertake many of the operational activities for the Project, and may provide employment through several full-time equivalent positions, including heavy vehicle operators, local transportation services, audit and monitoring services, and catering. The contractor workforce is expected to work 12-hour shifts on a 14/14 roster.

Indirect Employment – Employment opportunities are likely to be created in businesses that manufacture, process, or market goods and services that support the construction, operation, and maintenance activities for the Project.

Induced Employment – Construction and operation of the Project will provide an increase in employment and household income and may promote extra spending in the local and regional economy. This additional spending could lead to higher employment in a range of sectors.

4.5 Project Schedule

A preliminary Project schedule is presented in Table 8. The Project is currently in a technical study phase. Baseline data collection has been ongoing since the second quarter of 2016.

Table 8: Preliminary Environmental Assessment and Project Schedule

Deliverable	2016 to 2018				2019				2020				2021				2022				2023				2032				2033				2034			
EAC Process and Project Schedule	**Q 1**	**Q 2**	**Q 3**	**Q 4**	**Q 1**	**Q 2**	**Q 3**	**Q 4**	**Q 1**	**Q 2**	**Q 3**	**Q 4**	**Q 1**	**Q 2**	**Q 3**	**Q 4**	**Q 1**	**Q 2**	**Q 3**	**Q 4**	**Q 1**	**Q 2**	**Q 3**	**Q 4**	**Q 1**	**Q 2**	**Q 3**	**Q 4**	**Q 1**	**Q 2**	**Q 3**	**Q 4**	**Q 1**	**Q 2**	**Q 3**	**Q 4**
Project Description							●																													
Baseline Data Collection	●	●	●	●	●	●	●	●																												
Valued Component Selection Document						●	●																													
Draft Application Information Requirements							●																													
Final Application Information Requirements								●																												
EAC Application								●	●	●																										
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Permit Preparation and Submission										●	●	●	●	●																						
Construction Start Date														●																						
Construction Completion Date																		●																		
Operational Start Date																		●																		
Operational Completion Date																												●								
Expected Reclamation Start Date																													●							
Expected Reclamation Completion Date																																				●

5.0 EMISSIONS, DISCHARGES, AND WASTES

The emissions, discharges and wastes anticipated for the Project are described in the sections below.

5.1 Air and Dust Emissions

Air and dust emissions will be generated by the Project from construction and mining activities and may include:

- Fugitive dust or particulate matter such as total suspended particles (TSP), PM_{10} and $PM_{2.5}$ associated with construction of the Mine Site, ancillary facilities, and the dry stack tailings storage facility at QR Mill, along with mining activities such as material handling, material processing operations, vehicle exhausts, vehicle travel along unpaved roads, power supply (diesel generators), and windblown emissions from exposed areas such as material stockpiles;
- Criteria air contaminants due to the combustion of diesel and gasoline fuels by equipment including oxides of nitrogen (NO_x), PM_{10}, $PM_{2.5}$, sulphur dioxide (SO_2) and carbon monoxide (CO); and
- Greenhouse gas (GHG) emissions through the combustion of fossil fuels in equipment, and minor clearing activities (though the loss of vegetation that acts as a carbon sink).

An Air Quality and Dust Control Management Plan will be implemented prior to the start of construction.

5.2 Noise and Vibration Emissions

Potential noise and vibration emissions at the Mine Site will be related to mine ventilation equipment, underground drilling and blasting at the Mine Site, concentrator operations, equipment maintenance, vehicle use and ore hauling, and generators, when in use. The Mine Site is located approximately 350 m from residential receptors in Wells. Potential noise emissions along the Transportation Route and Transmission Line are related to vehicle and machinery use, and ore hauling. Noise sources at QR Mill are expected to be similar to the current operations.

Acoustical enclosures, blankets and other measures will be utilized, as necessary, to ensure that noise-generating machinery and equipment operates within regulatory limits.

5.3 Mining, Waste, Tailings and Water Management Activities

During operations, Project activities such as ore extraction, waste rock management, tailings management, water management, and any activities causing changes to surface water or groundwater flow have the potential to affect water quality in watercourses and water bodies surrounding the Project. Operating procedures will prescribe the performance of these activities in accordance with design, permit, and regulatory requirements.

At the Mine Site, surface contact water will be collected in a sedimentation pond at the foot of the WRSF and directed to the water treatment plant and discharged after treatment. This pond will be established during the site preparation activities. Underground water in excess of the Mine Site process requirements will be pumped directly to the water treatment plant and discharged after treatment to meet permit limits. At Bonanza Ledge Mine, contact water draining from the proposed WRSF will report to an existing sediment control pond and be treated in accordance with applicable regulatory requirements.

At QR Mill, site contact water will be collected in existing water management infrastructure and new infrastructure to collect water runoff from the dry stack tailings storage facility. Water will be treated prior to discharge if required.

At both sites, non-contact water will be diverted around the sites. Sediment and erosion control measures will be implemented, as required, to divert storm-water away from exposed soils.

5.4 Solid, Hazardous, and Sanitary Wastes

Potential solid, hazardous, and sanitary wastes that may be generated by the Project include:

- Overburden and debris from removal of any site surfacing;
- Overburden and rock material from excavation activities to reach the ore body;
- Existing abandoned infrastructure removal associated with historic mining activities at the Mine Site;
- Contaminated in-situ soils from the historic operations at the Mine Site;
- Waste such as construction trash, food trash, and other wastes;
- Hazardous waste such as unserviceable batteries, used motor and hydraulic oils, contaminated filters, used chemical cleaning fluids, paints, and other waste items considered as hazardous by regulatory authorities; and
- Solid and sanitary wastes from worker accommodations (Mine and QR Mill camps), facilities at the Mine Site, and the QR Mill.

Wastes will be collected on-site, segregated, secured, contained in a designated area, and disposed of at a suitably licensed facility. A Construction Environmental Management Plan will be developed that presents procedures to reduce, segregate, safely store, and recycle or dispose of solid wastes. During operations of the Mine Site and QR Mill, solid, hazardous and sanitary wastes will be appropriately disposed of according to BMPs and applicable regulations. An Operational Waste Management Plan will be developed for the Project that presents protocols to reduce, segregate, safely store, and dispose of solid, sanitary, and hazardous wastes. Sanitary wastes from on-site worker amenities will be disposed of at permitted on-site facilities or suitably licensed offsite facilities.

5.5 Light Emissions

Construction activities will primarily be undertaken during daylight hours. The Mine Site will be in operation 24-hours per day. Light emissions at the Mine Site during night time construction and operational activities will be from mobile and fixed on-site lighting established for health and safety purposes, along with vehicular traffic. Light emissions at the QR Mill will also be from mobile and fixed on-site lighting. Light emissions will be controlled appropriately using various methods that may include directional lighting, height of lighting, and low lumen fixtures.

5.6 Accidents and Malfunctions

The potential for accidents and malfunctions to occur during construction and operations will be assessed in the EA. The assessment will include the potential effects on the biophysical and human environment, and include mitigation and proposed management plans. The mitigation measures and management plans will align with plans implemented by local agencies, such as emergency response plans and procedures. The Construction Environmental Management Plan will include emergency response procedures to address events related to accidents and malfunctions during construction, such as spills and unauthorized releases.

During operation, measures will be implemented to mitigate the potential for accidents and malfunctions occurring, as well as resulting consequences, through adherence to regulatory requirements and management practices. An emergency response procedure will be prepared to address events related to accidents and malfunctions. Precautions will be taken to avoid spills of hazardous materials to both land and the aquatic environments. To reduce the potential for accidental discharges of emissions or effluent, Project personnel will be trained in the handling, containment, storage, transport, and replenishment of the materials.

5.7 Decommissioning and Reclamation

It is expected that emissions associated with the progressive decommissioning activities will relate to air emissions from combustion engines, noise emissions from machinery to be used as portions of the Mine Site are closed and reclaimed following extraction of the ore, sources of liquid discharge, and wastes generated. The control measures identified are expected to be the same as those outlined in previous sections.

6.0 EXISTING CONDITIONS

6.1 Overview

Baseline studies were initiated for the Project area in 2016 and continued through 2019. Historical studies within the Project area were also referenced for baseline information. In 2019, environmental baseline studies will be completed for the QR Mill, Transportation Route and the Transmission Line. The socio-economic baseline study for all Project components will be completed in 2019. Photographs of the Project area are presented in Appendix C.

Baseline studies include air quality and climate, noise, light, climate and hydrology, water quality and aquatic health, hydrogeology, fish and fish habitat, soils, terrain and terrain stability, geochemistry, vegetation, wildlife and wildlife habitat, contaminated sites, socio-community, land and resource use, use of lands and resources for traditional purposes, visual quality, economy, heritage, and human health and ecological risk assessment (HHERA).

A summary of the historical information review and baseline studies are provided in the sections below. Where available, the baseline studies will include Traditional Ecological Knowledge (TEK), traditional use information and other information reflecting the social, economic, environmental, heritage and health values of Indigenous nations as provided by Indigenous nations.

6.2 Biophysical Environment

6.2.1 Air Quality and Climate

The Project is located within the Central Interior Air Zone. The existing air quality conditions in the Project area are influenced by the various industrial, commercial, residential, and recreational activities that occur in the region. Active logging and mining occur near Wells; these activities are sources of particulate emissions ($PM_{2.5}$, PM_{10}) from material and ground handling, and combustion emissions from mobile sources. In addition, local residential areas such as Likely, New Barkerville, Wells, and recreational cabins/campsites may be sources of combustion emissions, including fine particulate matter ($PM_{2.5}$), from wood and pellet stoves, heaters, generators, and recreational vehicles.

BC MOE operates several regional air quality monitoring stations across the province, with the closest active MOE station to the Project being at Quesnel Senior Secondary, located approximately 60 km west of the Mine Site. The station would be influenced by urban emission sources including vehicle and heating emissions, along with road dust and regional forest fires in the summer.

Bonanza Ledge Mine operates a dustfall monitoring network of four stations, including two stations adjacent to the Bonanza Ledge Mine (one directly north and one directly south), along with one station near New Barkerville and one station near Wells immediately adjacent to the portal at the Mine Site. Dustfall monitoring stations are also established at QR Mill at three locations within the site. Available dustfall data from these stations will be used in characterizing existing regional conditions.

The Cariboo region experiences a dry continental climate due to the coastal mountains influencing the westerly flow of winds and moisture coming from the Pacific Ocean. Meteorological data is relevant to the air quality discipline since the meteorology affects how the air emissions are transported, dispersed, and deposited.

In addition to BGM's continuous weather recording station on Barkerville Mountain immediately upslope from Bonanza Ledge Mine, there are four active meteorological stations within 80 km of the Project that record hourly data, including:

- Slide Mountain operated by MOTI located approximately 12 km northeast of the Project (MOTI, 2017);
- Big Valley operated by FLNR located approximately 22 km north-northwest of the Project (FLNR, 2017);
- Mathew operated by FLNR located approximately 50 km east-southeast of the Project (FLNR, 2017); and
- Quesnel Airport operated by ECCC located approximately 80 km west of the Project (ECCC, 2018).

The climate at the site is characterized by relatively cold winters and mild summers with average December temperatures at around -7.8 degrees Celsius (°C) and average July temperatures at around 12.3°C (ECCC, 2010). The annual precipitation amount is moderate at 1,022 mm and no distinct dry or wet season. Average monthly precipitation varies between a low of 60 mm in February and a high of 110 mm in November. Relatively long periods of sub-zero temperatures, which last on average from October to April, lead to large snow accumulation with snowmelt generally taking place in May.

Potential sensitive receptors with respect to air quality include Wells, residences at New Barkerville, and recreational cabins and campgrounds. The Project completed the following monitoring to establish baseline conditions at (Figure 12):

- Two periodic (24-hour) sampling events for PM_{10} and metals using MiniVols near the Mine Site (September 2016 and April 2017);
- Installation and data monitoring of the Barkerville Mountain meteorological station to collect one year's worth of weather data (September 2016 to August 2017, and ongoing); and
- Monitoring at QR Mill (August 1, 2018 to July 31, 2019), including a meteorological station (January 2019 to ongoing).

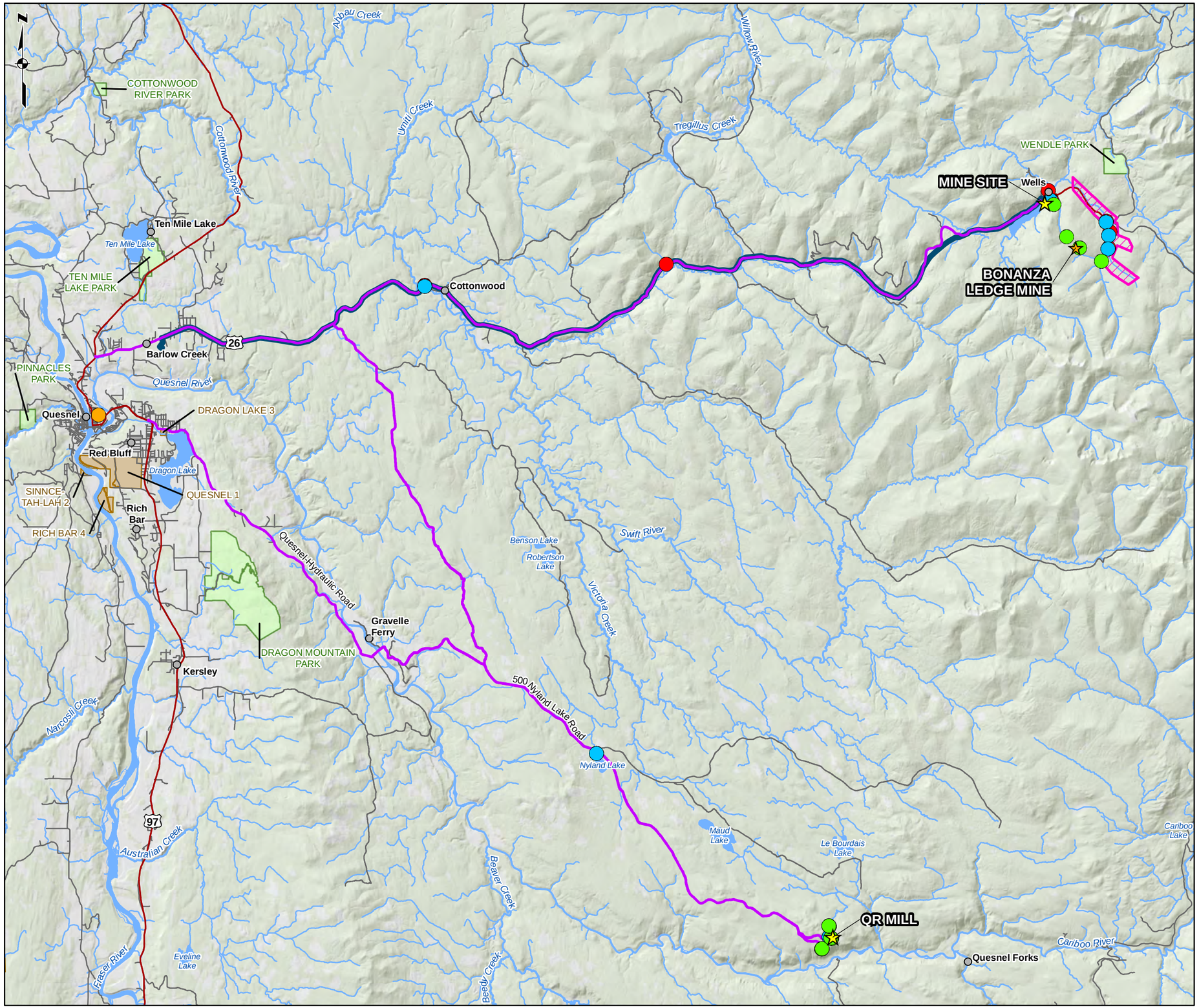
6.2.2 Noise

Ambient noise near the Project is influenced by existing mining and forestry operations, highway traffic, recreational vehicle use (i.e., all-terrain vehicles, snowmobiles), periodic road maintenance, and tourism-related activities including campgrounds and an annual local music festival.

Limited historical quantitative information is available regarding existing noise levels in the Project Area. A baseline monitoring program was performed in 2018 to quantify baseline noise levels at noise-sensitive receptors near the Mine Site, along the Transportation Route, and near the QR Mill (Figure 12). Monitoring locations included residential areas such as Wells, New Barkerville, Barkerville Historic Town and Park, communities along Highway 26, and campsites located east of the Mine on Highway 26. At each monitoring location, a Type I integrating sound level meter was used to collect noise measurements and to record audible sound for 24 hours.

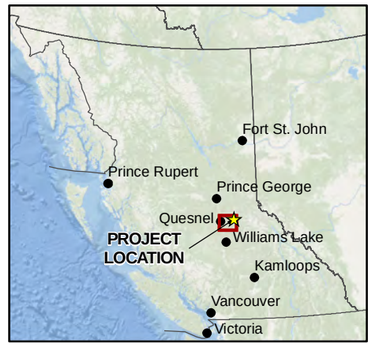
6.2.3 Light

Existing light conditions near the Mine Site are influenced by existing mining and forestry operations along with light sources from Wells. There is no historical quantitative information regarding existing light levels for the Mine Site or QR Mill.



LEGEND

- POPULATED PLACE
- HIGHWAY
- ROAD
- WATERCOURSE
- WATERBODY
- PARKS/PROTECTED AREA
- FIRST NATION RESERVE
- BARKERVILLE HISTORIC TOWN AND PARK
- PROJECT INFRASTRUCTURE LOCATION
- BONANZA LEDGE MINE
- TRANSPORTATION ROUTE
- TRANSMISSION LINE ROUTE
- LIGHT ASSESSMENT RECEPTORS
- NOISE ASSESSMENT RECEPTORS
- AIR QUALITY MONITORING STATIONS
- DUSTFALL STATIONS



REFERENCE(S)

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3. INSET BASE SOURCE: ESRI, DELORME, GEBCO, NOAA NGDC, AND OTHER CONTRIBUTORS.

NAD83 CSRS
UTM Zone 10N

0 5 10 15
1:250,000 KILOMETRES

BGM

CARIBOO GOLD PROJECT

AIR QUALITY, NOISE AND LIGHT ASSESSMENT MONITORING / SAMPLING LOCATIONS

REV.	DESCRIPTION	DATE	INITIALS
A		2019-10-11	M.Y

PROJECT NO.	PHASE	REV.	FIGURE
151-11330-70	00	B	12

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Baseline light monitoring was conducted in 2018 to quantify existing conditions at various locations, including Wells, New Barkerville, Barkerville Historic Town and Park, communities along Highway 26, and campgrounds located east of the Mine Site on Highway 26 (Figure 12). Baseline light measurements were undertaken at nine sites during a new moon to determine the baseline conditions for values of light trespass (light output from the Project perimeter on vertical surface receptors) and levels of sky glow (ratio of upward-directed light of total lighting) within the Project area. Measurements using a photometer were carried out to establish existing levels of light trespass. A sky quality meter and night-time photographs of the local night sky were used to help establish the existing sky glow levels in the direction of the Project area.

6.2.4 Hydrology

The Mine Site is located in the headwaters of the Willow River watershed, a major tributary to the Fraser River. The Mine Site is bordered by Lowhee Creek to the northeast, the Willow River to the northwest and Jack of Clubs Lake to the southwest. The Transportation Route is located within the Willow River, Cottonwood River and Quesnel River watersheds. QR Mill is located in the Quesnel River watershed, and the Quesnel River is downslope of the QR Mill site.

Regional hydrometric data has been collected at various ECCC flow monitoring stations. ECCC historically operated three flow monitoring stations on the Willow River. One station was close to the Project at Wells (between 1938 and 1975). Two stations were located further downstream with one above Hay Creek operating between 1976 and 2010, and one located much further downstream near the confluence with the Fraser River between 1953 and 1975. A total of 15 other hydrometric stations (most of which are no longer in operation) are in proximity to the Project area and those still in operation could be used to support estimating regional river flow characteristics.

Historic data in the region has also been collected. Water level measurements (three times weekly) and flow measurements (three to eight measurements depending on the stations) were collected from March 2000 to September 2000 for seven different stations along Lowhee Creek, the Willow River (two stations), Stouts Gulch, Williams Creek, Jack of Clubs Lake, and Slough Creek (International Wayside Gold Mines Ltd., 2002). Measurements allowed a preliminary assessment of flow characteristics at the station locations, though additional flow measurements would have been required to establish reliable rating curves.

Water level measurements (continuous) and flow measurements (5 to 20 measurements depending on the station) were collected from May 2006 to March 2010 for four different stations along Lowhee Creek, the Willow River, Stouts Gulch, and Williams Creek (Knight Piésold Ltd., 2010). Measurements allowed a preliminary assessment of flow characteristics at the station locations, though additional flow measurements would have been required to establish reliable rating curves, especially in consideration for the unstable streambed.

In addition, annual streamflow monitoring reports for existing operations are available for 2011, 2012, 2014, 2015, and 2016 (Triton, 2014; BGM 2015, 2016b, 2017a, 2017b; Lorax Environmental 2012, 2014).

BGM has seven hydrometric stations located near the Mine Site to collect data for existing operations. Data supplied for the Project are from 2017 to 2018. These stations include:

- Lowhee Creek approximately 1.5 km upstream from the confluence with the Willow River;
- Stouts Gulch approximately 1.4 km upstream from the confluence with Williams Creek;
- Williams Creek approximately 8.0 km upstream from the confluence with the Willow River;

- Willow River approximately 150 m downstream from the outlet of Jack of Clubs Lake;
- Stouts Gulch approximately 250 upstream from the confluence with Williams Creek;
- Emory Gulch approximately 250 m upstream of the confluence with Stouts Gulch; and
- Lowhee Creek approximately 3.9 upstream of the confluence with the Willow River.

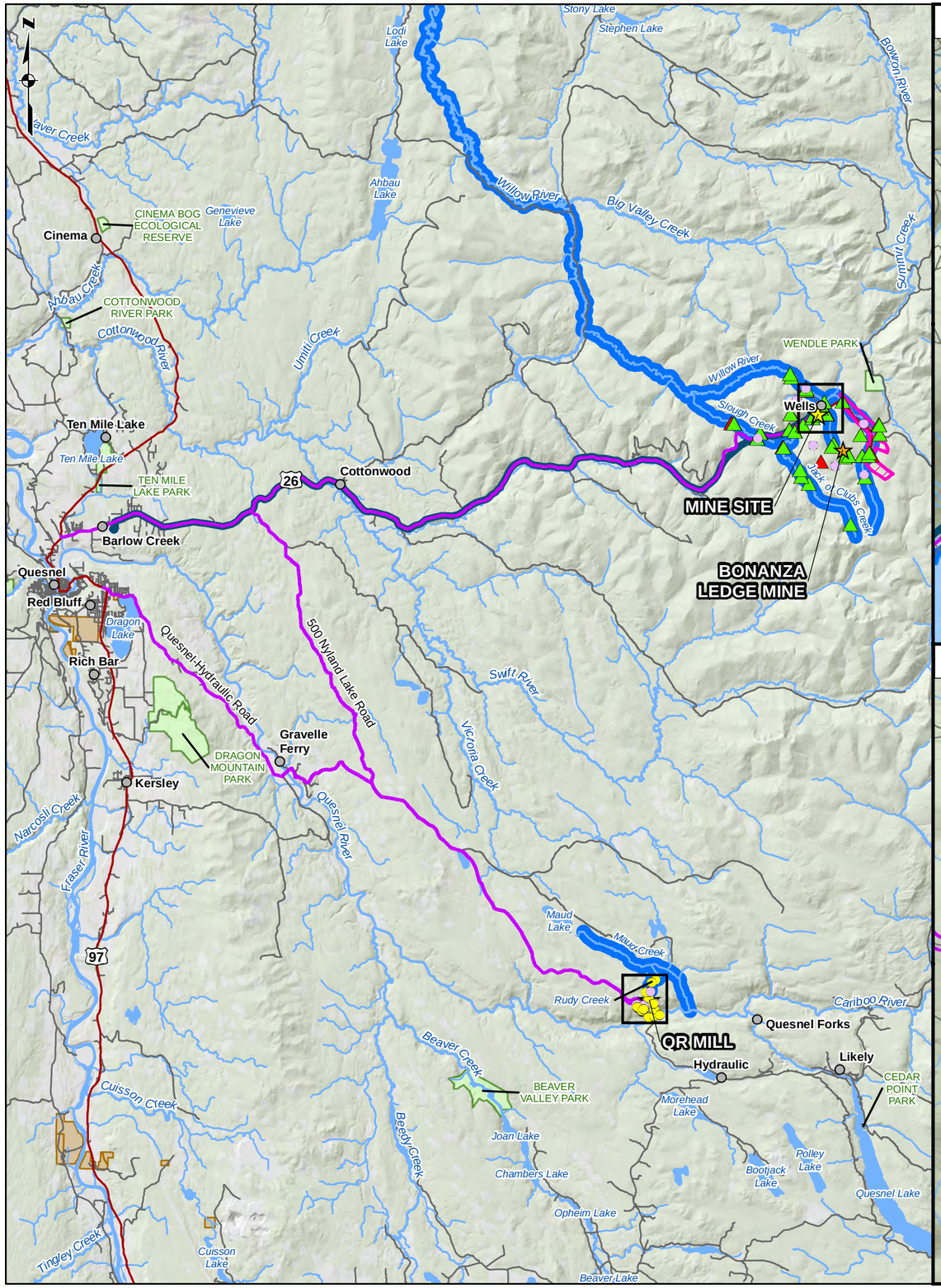
As part of the baseline studies for the Project, hydrometric stations were established from 2016 to 2018 at five locations near the Mine Site (Figure 13):

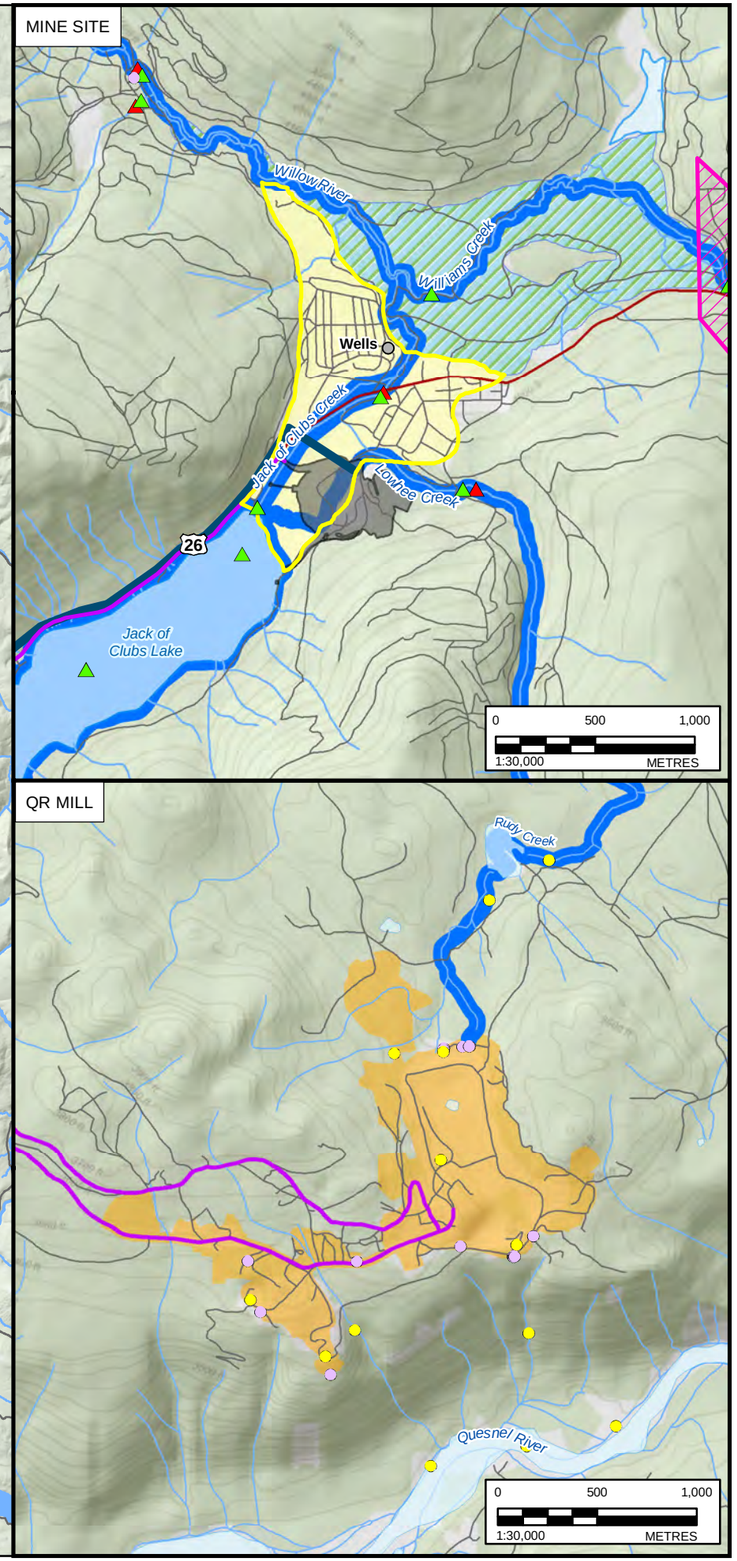
- Black Jack Gulch upstream of Barkerville;
- Mosquito Creek close to the confluence with the Willow River;
- Willow River downstream of the confluence with Mosquito Creek;
- Slough Creek downstream of the confluence with Coulter Creek and Slough Creek; and
- Jack of Clubs Creek upstream of Jack of Clubs Lake.

QR Mill has established flow monitoring stations at the site. For the baseline studies for the Project, continuous flow monitoring data and manual flow measures have been collected at QR Mill since 2018.

Monitoring (2016-present) has been conducted to further characterize hydrological properties within the Project area with respect to runoff production during normal, wet, and dry climates. The general hydrological regime of watercourses within the Project area, in terms of average flows, low summer and winter flows, and high flows, have also been characterized. Snowpack surveying was also conducted in addition to hydrometric monitoring (water level and watercourse flow). Climate variables, which are a key input to the hydrological baseline, have been monitored as part of Air Quality baseline data collection program (refer to Section 6.2.1) and as part of the surface water hydrology baseline data collection program. Regional climate stations, the closest of which is the ECCC Barkerville station (refer to Section 6.2.1), will provide records for the Project and baseline climate assessment.

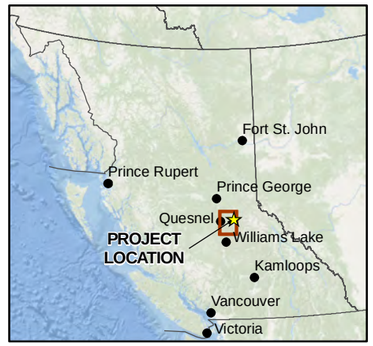
Field collection methods were consistent with standard ECCC (Water Survey of Canada) methods (Environment Canada, 1999) and, where appropriate, with previous monitoring at the site. The monitoring program followed Technical Guidance 6 on *Water and Air Baseline Monitoring Guidance Document for Mine Proponents and Operators* (MOE, 2012b). The results of the monitoring program will contribute to the EA to support verifications corresponding to hydrological regime changes as per provisions of the *Fisheries Act* (Government of Canada, 1985b) and the *Water Sustainability Act* (Government of BC, 2016b). This information will also be used in operational monitoring pursuant to provincial waste discharge permit and federal metal mining effluent regulations requirements to evaluate how mine-related activities may result in changes in the receiving environment.





LEGEND

- POPULATED PLACE
- ROAD
- HIGHWAY
- WATERCOURSE
- WATERBODY
- WETLAND
- FIRST NATION RESERVE
- PARKS/PROTECTED AREA
- BARKERVILLE HISTORIC TOWN AND PARK
- PROJECT INFRASTRUCTURE LOCATION
- BONANZA LEDGE MINE
- MINE SITE SURFACE INFRASTRUCTURE
- TRANSPORTATION ROUTE
- TRANSMISSION LINE ROUTE
- QR MILL
- HYDROLOGY
- WATER QUALITY AND SEDIMENT QUALITY STATIONS
- GROUNDWATER MONITORING
- SURFACE WATER MONITORING
- WATER SAMPLING LOCATION
- WELLS AQUIFER - ID# 0829



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3. INSET BASE SOURCE: ESRI, DELORME, GEBCO, NOAA NGDC, AND OTHER CONTRIBUTORS.

NAD83 CSRS
UTM Zone 10N

0 5 10 15
1:400,000 KILOMETRES

CARIBOO GOLD PROJECT

WATERSHEDS AND AQUATIC ENVIRONMENT MONITORING / SAMPLING LOCATIONS

REV.	DESCRIPTION	DATE	INITIALS
A		2019-10-11	MY

PROJECT NO.	PHASE	REV.	FIGURE
151-11330-70	00	B	13

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

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6.2.5 Water Quality and Aquatic Health

Historical water quality and aquatic health sampling focused primarily on Lowhee Creek, Williams Creek, and Jack of Clubs Lake, with the emphasis on surface water quality.

Surface water quality data was collected between 2000 and 2018 through the following baseline and ongoing monitoring programs related to pre-construction or operations at Bonanza Ledge Mine:

- February 2000 to January 2001 – Monthly water quality sampling in creeks and weekly sampling in March (winter low flow) and May (freshet), with Jack of Clubs Lake sampled once in August (International Wayside Gold Mines Ltd., 2002);
- April 2004 to February 2005 – Weekly water quality sampling from April 2004 to August 2004, and monthly during most other months until February 2005 (AMEC unpublished data); and
- Routine operational monitoring since 2011 within the Project area.

Historical data for sediment chemistry and lower trophic aquatic life (i.e., benthic invertebrates, periphyton, and plankton) are more limited, as described below. Lower trophic aquatic resource information is available from the following studies:

- Jack of Clubs Lake was sampled in August 2000 to describe the trophic status of the lake and levels of contamination in sediment and aquatic biota resulting from historical mining activities (International Wayside Gold Mines Ltd., 2000). Plankton and benthic invertebrate community structures were also characterized.
- Sampling of biological communities was conducted in 2009 for an ecological risk assessment of Jack of Clubs Lake and the Willow River (Azimuth Consulting Group Inc, 2010). The sampling involved the collection of sediment chemistry and benthic invertebrate community data with the objective of assessing ecological risks associated with historically deposited mine wastes.
- Environmental effects monitoring programs have been undertaken for operational monitoring of the Bonanza Ledge mine. This monitoring has involved sampling of benthic invertebrate communities (BBA, 2016).
- Bonanza Ledge Mine Underground Project - *Mines Act* Permit Amendment Application (BGM, 2016a).
- Jack of Clubs Lake sampling as a part of the Risk Based Detailed Site Investigation of the Wells Tailings Deposit between 2009 and 2011 (SNC Lavalin, 2011).

Contemporary sampling was conducted from 2016 to 2018 to further characterize water chemistry, sediment chemistry, and biotic communities (benthic invertebrates and plankton) in waterbodies where there is potential for mine-related activities to cause changes in water quality (Figure 13). Along with 15 sites that are part of the routine monitoring program, an additional 20 sites were sampled to support the baseline study.

Field collection, sampling handling methods, and laboratory analyses (including quality assurance and quality control procedures) were consistent, where appropriate, with:

- BC Field Sampling Manual (MOE, 2013);
- Environment Canada (2012a, 2012b) protocols for collecting and interpreting benthic invertebrate community data (“CABIN”); and
- Previous monitoring.

The purpose of the baseline sampling was to characterize how parameters of potential concern may vary with location and through the hydrological cycle. The data collected will contribute to the EA and the waste discharge permitting pursuant to the *Environmental Management Act* (Government of BC, 2003), and verify that the pollution prevention provisions of the *Fisheries Act* (Government of Canada, 1985b) are also being met. This information will also be used in operational monitoring pursuant to provincial waste discharge permit and federal *Metal and Diamond Mining Effluent Regulations* requirements to evaluate how mine-related activities may result in changes in the receiving environment.

6.2.6 Hydrogeology

The Project is located in the Quesnel Highlands, an area west of the Cariboo Mountains and east of the Fraser Plateau. The extent of the groundwater aquifer near the Mine Site is shown in Figure 13. The Quesnel Highlands are characterized as a complex of upland hill and plateau areas that become progressively more dissected as they rise to the west. Regionally, groundwater table elevations are expected to follow the topography with a more subdued expression. Recharge to groundwater within the area occurs predominantly via precipitation in highland areas. Groundwater flows through bedrock and overburden in the same direction as local topographic relief, eventually discharging locally at lower elevations within the valleys.

Locally, the area surrounding the Mine Site is composed of defined mountain and valley systems, with local drainage across most of the Valley zone to the Willow River. Mountainous and highland areas are generally covered by thin or discontinuous unconsolidated deposits overlying bedrock. Both the historic and recent underground mines are expected to affect the local hydrogeological conditions. Fluvial/glaciofluvial deposits are typically observed in the valleys, with reworked sediments from hydraulic and placer mining present in areas of historic mining activities. Areas of historical tailings deposits and waste rock associated with previous mining activities are present at the Mine Site.

Due to the extensive mining history of the area near Wells, numerous hydrogeological studies have been carried out in the vicinity of the Mine Site. Relevant historic environmental and hydrogeological studies and monitoring are associated with the following:

- Studies associated with previous plans for the Cow Mountain deposit (Knight Piésold Ltd., 2002);
- Studies associated with the permitting, and ongoing monitoring of the Bonanza Ledge Mine (BGM, 2010) (BGM, 2016a);
- Environmental and risk assessment investigations associated with historical mine waste in proximity to Wells (Rescan Environmental Services Ltd, 1990) (SNC Lavalin, 2011);
- Post-closure monitoring of the Mosquito Creek Gold Mine; and
- Post-closure monitoring of the Island Mountain Gold Mine.

The baseline hydrogeological investigation and monitoring program for the Project was developed in accordance with MOE's Technical Guidance 6 document (MOE, 2012a, 2012b). As part of the hydrogeological baseline study, subsurface investigations were initiated at the Mine Site in 2016, with active collection of groundwater quality and groundwater hydraulic head data beginning in 2017. The groundwater monitoring network expanded as the Project was further defined. Continuous groundwater hydraulic head monitoring and quarterly groundwater quality sampling are currently being carried out at 25 monitoring well locations. In addition to the monitoring wells, groundwater sampling is also being carried out at five historic mine openings. Additional groundwater monitoring locations are scheduled for instrumentation at the QR Mill, the Valley Zone near Wells, and the historic tailings deposit, and will be incorporated into the hydrogeological baseline monitoring network upon completion.

6.2.7 Fish and Fish Habitat

Fish and fish habitat are found throughout the Project area. Fish distribution is typically only limited by gradient, flows, and habitat quality. Several tributaries of the Willow River are located near the Mine Site, including Slough Creek, Mosquito Creek, Lowhee Creek, Williams Creek, and Jack of Clubs Creek. At the QR Mill, fish and fish habitat are found in Rudy Creek, Maud Creek, and the nearby Quesnel River. The Transportation Route and Transmission Line cross over Slough Creek, Chisholm Creek, Beaverpass Creek, Lightning Creek, Cottonwood River, and Frye Creek. The Transportation Route also crosses over Gerimi Creek.

Several historical fish and fish habitat studies have been conducted near the Mine Site. These include:

- Fish and fish habitat studies were initiated in 1995 as part of the EAC Application submitted by International Wayside Gold Mines Ltd. (Knight Piésold Ltd., 2000).
- Fish and fish habitat baseline data was collected in June and August of 2000 by Cariboo Envirotech Limited with data analyzed and reported by Knight Piésold Ltd. in 2002 (International Wayside Gold Mines Ltd., 2002).
- Baseline data was collected in Jack of Clubs Lake in the summer of 2001.
- In August 2004, a fisheries study was conducted to meet the requirements outlined in the Health, Safety and Reclamation Code for mines in BC (MEM, 2003) and the *Metal and Diamond Mining Effluent Regulations*.
- An additional survey was completed by AMEC (2005) in September 2004 designed using procedures detailed in the *Metal Mining Guidance Document for Aquatic Environmental Effects Monitoring* (Environment Canada, 2002).

Fish species documented in the Project area during the studies described above are summarized with provincial and federal designations in Table 9 and Table 10. Critical habitat for bull trout has been identified in the Cariboo region under the CCLUP (Government of BC, 2007). This includes Jack of Clubs Creek upstream of Jack of Clubs Lake, and sections of Lightning Creek, along Highway 26 near Beaver Pass House. The Quesnel River near QR Mill is also identified as critical fish habitat.

Table 9: Fish Species Documented from Historic Data Sources within the Project area near the Mine Site and QR Mill

Species	Scientific Name	BC List Status	COSEWIC	Willow River	Slough Creek	Lowhee Creek	Williams Creek	Jack of Clubs Creek	Stouts Gulch	Emory Gulch	Rudy Creek	Maud Creek	Quesnel River[1]
Rainbow Trout	*Oncorhynchus mykiss*	-	-	X	X	X	X	X	X	X	X	X	X
Bull Trout	*Salvelinus confluentus*	Blue	-	-	-	-	X	X	-	-	-	-	-
Mountain Whitefish	*Prospium williamsoni*	-	-	X	X	-	X	-	X	-	-	-	-
Burbot	*Lota lota*	-	-	X	X	-	X	-	-	-	-	-	-
Slimy Sculpin	*Cottus cognatus*	-	-	X	X	-	X	-	X	-	-	-	-
Largescale Sucker	*Catostomus macrocheilus*	-	-	-	X	-	-	-	-	-	-	-	-
Longnose Sucker	*Catostomus catostomus*	-	-	X	-	-	-	-	-	-	-	X	X
White Sucker	*Catostomus commersonii*	-	-	X	X	X	X	-	X	-	-	-	-
Lake Chub	*Couesius plumbeus*	-	-	X	-	X	X	-	-	-	X	-	-
Redside Shiner	*Richardsonius balteatus*	-	-	-	-	-	-	-	-	-	-	X	X
Chinook Salmon	*Oncorhynchus tshawytscha*	-	-	-	-	-	-	-	-	-	-	X	X
Northern Pikeminnow	*Ptychocheilus oregonensis*	-	-	-	-	-	-	-	-	-	X	X	-

Notes:
(FISS, 2018); AMEC (2005); Knight Piésold (2000); CDC (2018). [1] Fish species identified within 5 km of the QR Mill Site. [2] Middle Fraser, stream, summer population
Committee on the Status of Endangered Wildlife in Canada (COSEWIC) status: E = ENDANGERED; SC = SPECIAL CONCERN; DD = DATA DEFICIENT:

Table 10: Fish Species Documented from Historic Data Sources within the Project area near the Transportation Route and Transmission Line

Species	Scientific Name	BC List Status	COSEWIC	Chisholm Creek	Beaverpass Creek	Lightning Creek	Cottonwood River	Frye Creek	Gerimi Creek
Rainbow Trout	*Oncorhynchus mykiss*	-	-	X	X	X	X	X	X
Bull Trout	*Salvelinus confluentus*	Blue	-	X	X	X	X	-	-
Mountain Whitefish	*Prospium williamsoni*	-	-	-	X	-	X	-	-
Burbot	*Lota lota*	-	-	-	-	-	-	-	-
Slimy Sculpin	*Cottus cognatus*	-	-	-	-	-	X	-	-
Largescale Sucker	*Catostomus macrocheilus*	-	-	-	-	-	X	-	-
Longnose Sucker	*Catostomus catostomus*	-	-	-	X	X	-	X	-
White Sucker	*Catostomus commersonii*	-	-	-	-	-	X	X	-
Lake Chub	*Couesius plumbeus*	-	-	-	-	-	X	-	X
Redside Shiner	*Richardsonius balteatus*	-	-	-	-	-	X	X	-
Chinook Salmon	*Oncorhynchus tshawytscha*	-	-	-	X	X	X	-	-
Northern Pikeminnow	*Ptychocheilus oregonensis*	-	-	-	-	-	X	X	-

Notes:
(FISS, 2018); AMEC (2005); Knight Piésold (2000); CDC (2018). [1] Fish species identified within 5 km of the QR Mill Site. [2] Middle Fraser, stream, summer population
Committee on the Status of Endangered Wildlife in Canada (COSEWIC) status: E = ENDANGERED; SC = SPECIAL CONCERN; DD = DATA DEFICIENT:

The MOE's Technical Guidance 6 *Environmental Management Act Applications, Water and Air Baseline Monitoring Guidance Document for Mine Proponents and Operators* (MOE, 2012a) defines the baseline study requirements and information considerations for a mineral development Project in BC.

Therefore, the fish and fish habitat baseline program was designed to meet the requirements and information needs of the MOE Technical Guidance 6 (MOE, 2012a). The results of this baseline study will be used to inform mine planning and to assess potential Project effects to fish and fish habitat, and if required support an application for Authorization under Section 35(2) of the *Fisheries Act*.

For regulatory agencies to evaluate the effects of mine development on fish and fish habitat, baseline data collection must capture detailed information on fish populations and the habitats they use to complete their life history (MOE, 2012a). The fish and fish habitat baseline sampling program undertaken from 2016–2018 was designed to assess fish abundance, distribution and community structure, and to provide an understanding of the fish and fish habitat values potentially affected by the Project. Specific tasks associated with fish and fish habitat data collection included:

- Spring spawning surveys,
- Reconnaissance-level fish and fish habitat assessments,
- Detailed habitat assessments,
- Fish abundance estimates, and
- Fall spawning surveys.

Sampling was completed near the Mine Site within the Willow River, Lowhee Creek, Williams Creek, and tributaries Mosquito Creek, Slough Creek, Jack of Clubs Creek and tributaries, and Jack of Clubs Lake and tributaries. At QR Mill, sampling was completed in Rudy Creek, Maud Creek, and Creeks 2, 2.5 and 3 (Figure 12).

6.2.8 Soils

The majority of the Project area consists of morainal till blankets and veneers where brunisolic and podzolic soil horizons have developed on sandy loam and loam textured materials (Lord & Green, 1985). To a lesser extent, colluvial brunisolic soils with angular coarse fragments are found on steep slopes, and sandy brunisolic soils are found on fluvial plains and terraces (Lord & Green, 1985). Organic materials have developed mesic and gleysolic soils located along valley floors and in depressions (Lord & Green, 1985).

Existing soil conditions will be described using information garnered from a combination of a desktop review of existing information, a field terrain inventory mapping and terrain stability mapping program, in conjunction with soils mapping and Terrestrial Ecosystem Mapping (TEM). Information and data sources accessed during the desktop review included:

- TEM with Wildlife Habitat Interpretations for Tree Farm License 52 (GEOWEST [Geowest Environmental Consultants Ltd.], 2000);
- Soil of the Barkerville area, BC (Lord & Green, 1985);
- Agriculture Capability Maps of the Barkerville area (MOE, 2018b);
- The Soil Landscapes of British Columbia (Valentine, Sprout, Baker, & Lawkulich, 1978);

- Applicable CanSIS National Soil Database (Agriculture and Agri Food Canada, 2017) for soil survey reports and maps for the area;
- CANVEC (Natural Resources Canada, 2017) and iMapBC (Government of BC, 2018c) for geographic locations and topographic features;
- Bonanza Ledge 2010 MAPA Aug16 2010 - Section 3.6 Terrain and Soils (BGM, 2010); and
- Bonanza Ledge Underground Project - *Mines Act* Permit Amendment Application 2016, Section 3.6 Terrain and Soils (BGM, 2016).

Appendix 1 of the *Application Requirements for a Permit Approving the Mine Plan and Reclamation Program Pursuant to the Mines Act* requires a soil survey of the mine footprint at a scale of 1:5,000 following methods and soil survey procedures outlined in the *Field Manual for Describing Terrestrial Ecosystems, 2nd Edition* (BC Ministry of Forests and Range and BC Ministry of Environment, 2010). To meet these standards and requirements, a soils field program was initiated in 2016 and completed in 2018.

6.2.9 Terrain and Terrain Stability

The Project area is underlain by Barkerville Terrane, a Hadrynian and/or early Paleozoic sequence of siliciclastic rocks, which were deposited as continental shelf to slope marine clastic rocks along with lesser amounts of marine carbonate rocks and volcanic rocks adjacent to the craton of ancestral North America (Schiarizza & Fillippo, 2002).

The Quaternary history of the Project area is dominated by glacial erosion and meltwater scour during the retreat of the Fraser Glaciation approximately 10,000 years ago. Upland areas within the Quesnel Highlands are remnants of a highly dissected plateau of moderate relief (Holland, 1976). The majority of the area consists of thick silt clay to sand silt textured morainal material (till) that typically masks the underlying bedrock. Colluvial materials (material transported by gravity) are found on slope gradients greater than 70% (Lord & Green, 1985). Glaciofluvial and fluvial material are located along the lower valley bottoms. Lacustrine and organic materials are also located along wider valley floors and in discrete depressions but are less common. Anthropogenic deposits, including talus and processed deposits from historic placer mining, are common throughout narrow valleys in the area. Geomorphological processes in the area are associated with mass movement events along steep slopes and gullies, active fluvial processes in valleys, and areas with possible inundation and seepage (Lord & Green, 1985).

Existing conditions will be described using a combination of desktop review of existing information, a field terrain inventory mapping and terrain stability mapping program, and soils mapping and TEM. Information and data sources accessed during the desktop review include:

- TEM with Wildlife Habitat Interpretations for Tree Farm License 52 (GEOWEST, 2000);
- Applicable CanSIS National Soil Database (Agriculture and Agri Food Canada, 2017);
- CANVEC (Natural Resources Canada, 2017) and iMapBC (Government of BC, 2018c) – for geographic locations and topographic features;
- Digital information from DataBC (Government of BC, 2018a) for Biogeoclimatic Ecosystem Classification boundaries;

- Bonanza Ledge *Mines Act* Permit Amendment Application 2010 - Section 3.6 Terrain and Soils (BGM, 2010); and
- Bonanza Ledge Underground Project - *Mines Act* Permit Amendment Application 2016, Section 3.6 Terrain and Soils (BGM, 2016).

Terrain data were collected to fulfill the requirements for terrain and terrain stability and soil erosion potential listed in provincial guidance documents (Government of BC, BC MOE and Forest Service BC, 1999; Howes & Kenk, 1997; RIC, 1995). To meet these standards and requirements, a terrain and terrain stability field program was initiated in 2016 and completed in 2018 for the Project.

6.2.10 Geochemistry

The mineral resource of the Project is described in Section 4.1. The geochemical baseline study is used to determine the acid rock drainage and metal leaching potential of the materials that will be produced during mining. The *Water and Air Baseline Monitoring Guidance Document for Mine Proponents and Operators* (MOE, 2012b) outline the recommended scope of geochemical testing programs for mining projects in the province of BC, based on the following guidance documents:

- *Policy for Metal Leaching and Acid Rock Drainage at Minesites in British Columbia* (Price & Errington, 1998); and
- *Guidelines for Metal Leaching and Acid Rock Drainage at Minesites in British Columbia* (MEM and MOE, 1998).

A baseline geochemistry program is currently being completed for the Project. To date, the first phase (i.e., static testing) of the geochemistry program has been conducted on samples of waste rock, ore, and tailings. Kinetic testing of select waste rock and tailings samples was initiated in May 2018 and October 2018, respectively. Additional waste rock, ore, and tailings sampling will also be conducted.

To date, a preliminary assessment of the acid rock drainage and metal leaching potential has been completed on 114 waste rock samples, which underwent acid base accounting, whole rock analysis, and bulk metal analysis. Subsequent to these analyses, and based on their results, shake flask extraction (SFE) tests were performed on sub-set of 49 samples. Net acid generation (NAG) testing and NAG leachate analysis was carried out on 33 samples.

The acid base accounting results for the 114 samples indicated that the neutralization potential (NP) of the waste rock samples is generally higher than the acid potential. Total sulphur concentrations ranged from 0.01 to 2.31 (wt. % as S) and sulphide sulphur ranged from <0.01 to 2.29 (wt. % as S).

Classification of Potentially Acid Generating (PAG) samples, based on the MEND (2009) Neutralization Potential Ratio (NPR) criteria, was considered using siderite corrected (SID) NPR to account for iron carbonates that do not contribute to NP. Twenty-three of the 114 samples (20%) have a Sid-NPR value less than 2 and are classified as uncertain or potentially acid generating (PAG). The remaining 91 samples (80%) have a Sid-NPR value greater than 2 and are classified as non-potentially acid generating. The NAG pH results differ with only four samples (3.5%) having a NAG pH lesser than 4.5 and are classified as PAG.

Based on the static test results, the majority of the waste rock has limited potential to generate acidic conditions. Long term kinetic testing is currently being completed on select waste rock and tailings samples to further understand mineral reaction rates and the acid generation potential of the waste rock material with additional kinetic testing planned.

The results of short term leach testing include NAG leachate (33 samples) and SFE testing (49 samples) indicates that metal leaching, under acidic and even under near-neutral to alkaline pH conditions, from waste rock material may occur. Parameters were compared to British Columbia Water Quality Guidelines (BCWQG) and the Metal Mining Effluent Regulations (MMER) to identify Contaminants of Potential Concern (COPC). No parameters exceeded MMER guidelines in NAG leachate or SFE. Parameters that exceed BCWQG in at least one sample included; pH, total alkalinity, sulphate, antimony, arsenic, beryllium, chromium, cobalt, copper, iron, lead, manganese, mercury, nickel, selenium, silver, thallium, uranium, and zinc. Based on the results of the short-term leaching testing, parameters that could be considered COPC's in near-neutral pH conditions include; antimony, arsenic, and copper. Parameters that are considered COPC's if acidic pH conditions were to occur include; chromium, cobalt, copper, manganese, selenium, and zinc. Kinetic testing, currently being completed and planned on select samples, will better determine mineral reaction rates and potential for long term metal leaching.

6.2.11 Vegetation

Existing conditions will be described in the EAC Application using information and data collected from a combination of a desktop review of existing information, a field sampling program, and TEM. Information and data sources accessed during the desktop review include:

- BC Species and Ecosystems Explorer database for provincially blue-listed and red-listed plant species and ecological communities (CDC [BC Conservation Data Centre], 2018);
- *Species at Risk Act* Public Registry (Government of Canada, 2018d) – for information on federally listed Schedule 1 species and associated location/range information;
- COSEWIC – for plant species listed by COSEWIC that may not be on SARA Schedule 1;
- iMapBC (Government of BC, 2018c) – for geographic locations of listed species occurrences (where "masked" locations are noted, the information will be requested from the MOE);
- E-flora BC, a web-based database and information centre for rare plant species (Klinkenberg, 2018b);
- Digital information from DataBC (Government of BC, 2018c) – for Biogeoclimatic Ecosystem Classification (BEC) boundaries, Old Growth Management Areas, Special Resource Management Zones, parks, and protected area boundaries;
- Vegetation Resources Inventory (VRI) data from FLNR (2018e), with updates on recent cut blocks;
- Previous TEM for Tree Farm License 52 in the Project area (Geowest, 2000);
- Previous rare plant surveys and traditional use plant studies in the area; and
- TEK, as obtained through agreed-upon methods from Indigenous nations, relating to culturally important species in the Project area.

Data collection for the vegetation baseline program was initiated in 2016 and continued in 2018 to focus on provincially and federally listed plant species at risk (SAR) and provincially listed ecological communities at risk.

Existing TEM (GEOWEST, 2000) was field verified and updated in accordance with the Resources Information Standards Committee (RISC) standards. Additional data for the vegetation baseline program will be collected in 2019 for the Transmission Line.

The Project lies within the Cariboo Forest Region and, based on the BC provincial BEC system, spans five BEC variants (Steen & Coupé, 1997). The Sub-Boreal Spruce Willow Wet Cool variant (SBSwk1), Engelmann Spruce-Subalpine Fir Cariboo Wet Cool variant (ESSFwk1), and Engelmann Spruce-Subalpine Fir Cariboo Wet Cold (ESSFwc3) together make up over 90% of the Mine Site area. The Transportation Route, Transmission Line and QR Mill occur within the Sub-Boreal Spruce Moist Warm variant (SBSmw).

The SARA and the associated bilateral Canada-BC agreement on SAR (Government of Canada, 2002, 2005) protect plant species in BC that are listed federally as threatened or endangered (Government of Canada, 2002, 2005). A search of the *BC Species and Ecosystems Explorer* indicates 17 provincially designated plant SAR and 24 provincially listed ecological communities have the potential to occur in the Project area (CDC 2018) as shown in Table 11 and Table 12.

Table 11: Federal and Provincial Plant Species at Risk with the Potential to Occur in the Project Area

Scientific Name	English Name	SARA	COSEWIC	BC List[(a)]	Prov./ Global Status[(b)]
Vascular Plants					
Acorus americanus	American sweet-flag	n/a	n/a	Red	S2/G5
Botrychium ascendens	upswept moonwort	n/a	n/a	Blue	S3/G3
Botrychium crenulatum	dainty moonwort	n/a	n/a	Blue	S2S3/G3
Carex sprengelii	Sprengel's sedge	n/a	n/a	Red	S2/G5
Draba lactea	milky draba	n/a	n/a	Blue	S3/G5
Draba ruaxes	coast mountain draba	n/a	n/a	Blue	S3?/G4
Epilobium halleanum	Hall's willowherb	n/a	n/a	Blue	S2S3/G5
Polemonium elegans	elegant Jacob's-ladder	n/a	n/a	Blue	S3?/G4
Polystichum kruckebergii	Kruckeberg's holly fern	n/a	n/a	Blue	S3/G4
Pyrola elliptica	shinleaf wintergreen	n/a	n/a	Blue	S3/G5
Stellaria obtusa	blunt-sepaled starwort	n/a	n/a	Blue	S3?/G5
Non-vascular Plants					
Lescuraea saxicola	n/a	n/a	n/a	Blue	S3/G4G5
Meesia longiseta	n/a	n/a	n/a	Blue	S3/G5

Scientific Name	English Name	SARA	COSEWIC	BC List[a]	Prov./ Global Status[b]
Rhodobryum roseum	n/a	n/a	n/a	Blue	S2S3/G5
Collema polycarpon	gilled tarpaper	n/a	n/a	Red	S2/GNR
Leptogium brebissonii	jujube vinyl	n/a	n/a	Blue	S2S3/G5
Pannaria rubiginosa	considerable gingerbread	n/a	n/a	Red	S2/G4G5

Source: BC CDC (2018).
Notes:
n/a= Not Applicable.
(a) CDC List: The provincial list to which the species or ecological community is assigned (CDC 2018).
(a) Provincial/ Global Conservation Status = Ranks apply to a species' or ecological community's conservation status in British Columbia. S = Provincial status; G = Global status; T = Infraspecific Taxon. The ranks have the following meaning: X = presumed extirpated, H = possibly extirpated, 1 = critically imperilled, 2 = imperilled, 3 = special concern, vulnerable to extirpation or extinction, 4 = apparently secure, 5 = demonstrably widespread, abundant, and secure, NA = not applicable, NR = not ranked, U = unrankable.? = inexact or uncertain.

Table 12: Provincial Ecological Communities at Risk with the Potential to Occur in the Project Area

Site Unit	Scientific Name	English Name	BC List(a)	Provincial/ Global Status(b)
ESSFwk1/31	*Betula nana* / *Carex* spp. / *Sphagnum* spp.	scrub birch / sedges / peat-mosses	Red	S2/GNR
Fl02	*Alnus incana* / *Cornus stolonifera* / *Athyrium filix-femina*	mountain alder / red-osier dogwood / lady fern	Blue	S3/G3G4
Fm02	*Populus* spp. (*balsamifera*, *trichocarpa*) - *Picea* spp. / *Cornus stolonifera*	(balsam poplar, black cottonwood) - spruces / red-osier dogwood	Red	S2?/GNR
SBSmw/00	*Pinus contorta* / *Polystichum kruckebergii - Aspidotis densa*	lodgepole pine / Kruckeberg's holly fern - dense lace fern	Red	S1/G1
SBSmw/01	*Pseudotsuga menziesii - Picea engelmannii* x *glauca* / *Paxistima myrsinites*	Douglas-fir - hybrid white spruce / falsebox	Blue	S3/GNR
SBSmw/02	*Pseudotsuga menziesii - Abies lasiocarpa* / *Vaccinium membranaceum*	Douglas-fir - subalpine fir / black huckleberry	Blue	S2S3/GNR
SBSmw/03; SBSwk1/03	*Pinus contorta* / *Vaccinium membranaceum - Vaccinium myrtilloides*	lodgepole pine / black huckleberry - velvet-leaved blueberry	Blue	S3/GNR

Site Unit	Scientific Name	English Name	BC List(a)	Provincial/ Global Status(b)
SBSmw/04; SBSwk1/04	*Pseudotsuga menziesii - Picea engelmannii* x *glauca / Ptilium crista-castrensis*	Douglas-fir - hybrid white spruce / knight's plume	Blue	S3/G3
SBSmw/05	*Picea engelmannii* x *glauca / Spiraea douglasii*	hybrid white spruce / hardhack	Blue	S2S3/G3
SBSmw/11	*Pinus contorta / Vaccinium membranaceum / Ptilium crista-castrensis*	lodgepole pine / black huckleberry / knight's plume	Blue	S3/GNR
SBSmw/12	*Picea engelmannii x glauca / Spiraea douglasii / Sphagnum spp.*	hybrid white spruce / hardhack / peat-mosses	Blue	S3/GNR
SBSmw/13	*Picea engelmannii x glauca / Alnus incana / Athyrium filix-femina*	hybrid white spruce / mountain alder / lady fern	Red	S2?/GNR
SBSwk1/02	*Pinus contorta / Vaccinium membranaceum / Cladina* spp.	lodgepole pine / black huckleberry / reindeer lichens	Blue	S3/G3
SBSwk1/06	*Picea engelmannii x glauca / Spiraea douglasii / Gymnocarpium dryopteris*	hybrid white spruce / hardhack / oak fern	Red	S2/GNR
Wb01	*Picea mariana / Gaultheria hispidula / Sphagnum* spp. bog	black spruce / creeping-snowberry / peat-mosses bog	Blue	S3?/GNR
Wb10	*Pinus contorta / Carex pauciflora / Sphagnum spp.* bog	lodgepole pine / few-flowered sedge / peat-mosses bog	Blue	S2S3/G2G3
Wb11	*Picea mariana / Menyanthes trifoliata / Sphagnum spp.* bog	black spruce / buckbean / peat-mosses bog	Blue	S3/GNR
Wf02	*Betula nana / Carex aquatilis* fen	scrub birch / water sedge fen	Blue	S3/G4
Wf05	*Carex lasiocarpa / Drepanocladus aduncus* fen	slender sedge / common hook-moss fen	Blue	S3/G3
Wf08	*Carex limosa - Menyanthes trifoliata / Drepanocladus* spp. fen	shore sedge - buckbean / hook-mosses fen	Blue	S3/G3
Wf11	*Trichophorum cespitosum / Campylium stellatum* fen	tufted clubrush / golden star-moss fen	Blue	S2S3/G2G3

Site Unit	Scientific Name	English Name	BC List(a)	Provincial/ Global Status(b)
Wm02	*Equisetum fluviatile - Carex utriculata* marsh	swamp horsetail - beaked sedge marsh	Blue	S3/G4
Ws06	*Salix sitchensis / Carex sitchensis* swamp	Sitka willow / Sitka sedge swamp	Blue	S3/G3
Ws09	*Picea mariana / Lysichiton americanus / Sphagnum spp.* swamp	black spruce / skunk cabbage / peat-mosses swamp	Blue	S2S3/GNR

Source: BC CDC (2018)
Notes:
(a) CDC List: The provincial list to which the species or ecological community is assigned (CDC 2018).
(b) Provincial/Global Conservation Status = Ranks apply to a species' or ecological community's conservation status in British Columbia. S = Provincial status; G = Global status. The ranks have the following meaning: X = presumed extirpated, H = possibly extirpated, 1 = critically imperilled, 2 = imperilled, 3 = special concern, vulnerable to extirpation or extinction, 4 = apparently secure, 5 = demonstrably widespread, abundant, and secure, NA = not applicable, NR = not ranked, U = unrankable.? = inexact or uncertain.

6.2.12 Wildlife and Wildlife Habitat

Existing conditions for wildlife and wildlife habitat will be described in detail as part of the EAC Application using a combination of available information and data collected from wildlife surveys specifically for the Project. Background information regarding existing conditions for wildlife in areas that may be affected by the Project will be derived from the following information sources:

- Studies available from the EAO e-PIC website related to adjacent projects with relevant data (EAO, 2018);
- CDC, BC Species and Ecosystems Explorer to develop a list of SAR that has potential to occur in the Project area, based on known distribution and habitat needs (BC Conservation Data Centre (CDC), 2018);
- Provincial geographical and spatial databases, such as iMapBC (Government of BC, 2018c), Bird Studies Canada (Bird Studies Canada, 2017), and E-Fauna BC (Klinkenberg, 2018a), with reference to wildlife occurrence records, designated wildlife habitat areas (WHA) and ranges, resource management zones, ungulate winter ranges, and parks and protected areas;
- BC Cross-Linked Information Resources (CLIR) and associated databases such as the Ecological Reports Catalogue (ECOCAT) (Government of BC, 2018b), and the Species Inventory Web Explorer for wildlife reports and publications (Government of BC, 2016a);
- Species at Risk Public Registry for information and designations of wildlife SAR (Government of Canada, 2016b);
- Relevant provincial and federal species status reports, management plans, recovery plans, and implementation plans;
- Information from the CCLUP, including mapping and available databases;

- Relevant peer-reviewed scientific literature, grey literature (e.g., government documents, technical reports, industry reports, theses, conference proceedings), and existing wildlife data (e.g., harvest records, telemetry data) relevant to the Project;
- Government agency biologists with local and/or regional expertise, as relevant; and
- TEK, as obtained through agreed-upon methods from Indigenous nations, relating to culturally important species in the Project area.

Terrestrial wildlife surveys completed within the Project area between 2016 and 2018 and included:

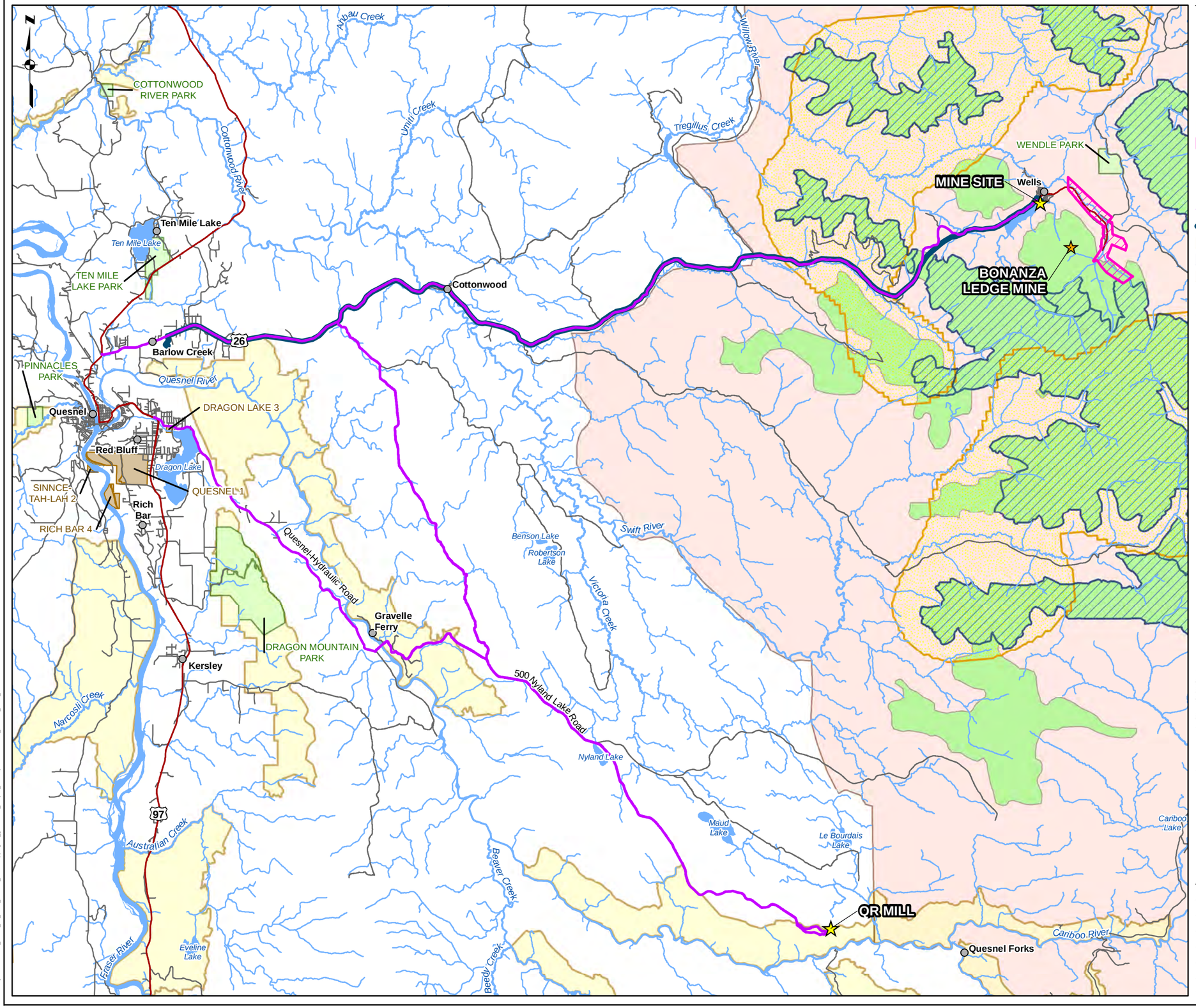
- Pond-breeding amphibian surveys;
- Breeding bird surveys;
- Acoustic bat detector data collection (spring/summer to assess foraging habitat and fall/winter to assess swarming and hibernacula use);
- Winter tracking surveys for large and medium-sized mammals; and
- Remote camera data (collected as part of BGM's ongoing Environmental Management Program).

Caribou critical habitat and ungulate winter range in the Project area is shown in Figure 14. The caribou herd present in the Project area is the Barkerville subpopulation, a part of the Quesnel Highlands Local Population Unit which is within the Southern Group of the larger Woodland, Southern Mountain Population Caribou (*Rangifer tarandus pop. 1*) in Canada. The Southern Mountain Population is considered endangered by COSEWIC, threatened by SARA and red-listed by the Province.

There are two variants of critical habitat in the Project area. The Mine Site is located within the matrix variant of critical habitat. Sections of the Transmission Line and Transportation Route are within both the matrix and the high or low elevation critical habitat. The Bonanza Ledge Mine is located with the high or low elevation range variant of critical habitat. Part of the high and low elevation critical habitat has been included within a Mountain Caribou Wildlife Habitat Area. The current and long-term trends for this population identified in the 2014 Recovery Strategy are both increasing.

The QR Mill is not within critical caribou habitat but is within ungulate winter range. The ungulate winter range follows the northern side of the Quesnel River.

Federally and provincially listed wildlife species occur within the Project area. A search of the CDC *Species and Ecosystems Explorer* indicated that 24 provincially and/or federally designated terrestrial wildlife species are either confirmed to occur or have the potential to occur in the Project area (Table 13).

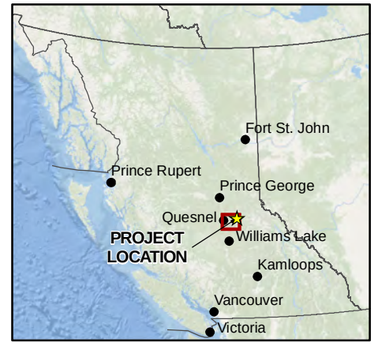


LEGEND

- POPULATED PLACE
- HIGHWAY
- ROAD
- WATERCOURSE
- WATERBODY
- PARKS/PROTECTED AREA
- FIRST NATION RESERVE
- BARKERVILLE HISTORIC TOWN AND PARK
- PROJECT INFRASTRUCTURE LOCATION
- BONANZA LEDGE MINE
- TRANSPORTATION ROUTE
- TRANSMISSION LINE ROUTE
- BARKERVILLE HERD LOCATION
- MOUNTAIN CARIBOU WILDLIFE HABITAT AREA
- UNGULATE WINTER RANGE (MULE DEER)

CARIBOU CRITICAL HABITAT

- High or Low Elevation Range
- Matrix Range



REFERENCE(S)

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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
1:250,000 KILOMETRES

BGM

CARIBOO GOLD PROJECT

CARIBOU CRITICAL HABITAT AND UNGULATE WINTER RANGE NEAR THE PROJECT

REV.	DESCRIPTION	DATE	INITIALS
A		2019-10-11	M.Y

PROJECT NO.	PHASE	REV.	FIGURE
151-11330-70	00	B	14

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

0 25mm

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Table 13: Listed Wildlife Species with the Potential to Occur in the Project Area

Scientific Name	Common Name	BC List[a]	Listed COSEWIC[b]	Listed SARA[b]	Federal Recovery Planning Document[c]
Amphibians					
Anaxyrus boreas	Western toad	Yellow	SC	1-SC	Management Plan for the Western Toad (*Anaxyrus boreas*) in Canada (ECCC, 2016b).
Birds					
Podiceps nigricollis	Eared Grebe	Blue	n/a	n/a	n/a
Pelecanus erythrorhynchos	American White Pelican	Red	NAR	n/a	n/a
Phalacrocorax auratus	Double-crested Cormorant	Blue	n/a	n/a	n/a
Ardea herodias	Great Blue Heron, *herodias* subspecies	Blue	n/a	n/a	n/a
Botaurus lentiginosus	American Bittern	Blue	n/a	n/a	n/a
Accipiter gentillis atricapillus	Northern Goshawk, *atricapillus* subspecies	Blue	NAR	n/a	n/a
Falco peregrinus anatum	Peregrine Falcon, *anatum* subspecies	Blue	NAR	1-SC	Management Plan for the Peregrine Falcon anatum/tundrius (*Falco peregrinus anatum/tundrius*) in Canada (ECCC, 2017)
Larus californicus	California Gull	Blue	n/a	n/a	n/a
Asio flammeus	Short-eared Owl	Blue	SC	1-SC	Management Plan for the Short-eared Owl (*Asio flammeus*) in Canada (ECCC, 2016a)
Chordeiles minor	Common Nighthawk	Yellow	SC	1-T	Recovery Strategy for the Common Nighthawk (*Chordeiles minor*) in Canada (ECCC, 2016c)

Scientific Name	Common Name	BC List[a]	Listed COSEWIC[b]	Listed SARA[b]	Federal Recovery Planning Document[c]
Aeronautes saxatalis	White-throated swift	Blue	n/a	n/a	n/a
Cypseloides niger	Black Swift	Blue	E	n/a	n/a
Contopus cooperi	Olive-sided Flycatcher	Blue	SC	1-T	Recovery Strategy for Olive-sided Flycatcher (*Contopus cooperi*) in Canada (ECCC, 2016d)
Hirundo rustica	Barn Swallow	Blue	T	n/1-T	n/a
Coccothraustes vespertinus	Evening Grosbeak	Yellow	SC	n/a	n/a
Euphagus carolinus	Rusty Blackbird	Blue	SC	1-SC	Management Plan for the Rusty Blackbird (*Euphagus carolinus*) in Canada (ECCC, 2015a)
Mammals					
Gulo luscus	wolverine, *luscus* subspecies	Blue	SC	1-SC	n/a
Myotis lucifugus	little brown myotis	Yellow	E	1-E	Recovery Strategy for Little Brown Myotis (*Myotis lucifugus*), Northern Myotis (*Myostis septentrionalis*), and Tri-colored Bat (*Perimyotis subflavus*) in Canada (ECCC, 2015b)
Myotis septentrionalis	Northern Myotis	Blue	E	1-E	Recovery Strategy for Little Brown Myotis (*Myotis lucifugus*), Northern Myotis (*Myostis septentrionalis*), and Tri-colored Bat (*Perimyotis subflavus*) in Canada (ECCC, 2015b)
Pekania pennanti	Fisher	Blue	n/a	n/a	n/a
Ursus arctos	Grizzly Bear	Blue	SC	1-SC	n/a

Scientific Name	Common Name	BC List[a]	Listed COSEWIC[b]	Listed SARA[b]	Federal Recovery Planning Document[c]
Rangifer tarandus pop. 1	Caribou (southern mountain population)	Red	E	1-T	Recovery Strategy for the Woodland Caribou, Southern Mountain population (*Rangifer tarandus caribou*) in Canada (ECCC, 2014)
Oreamnos americanus	Mountain Goat	Blue	n/a	n/a	n/a
Invertebrates					
Enallagma clausum	Alkali bluet	Blue	n/a	n/a	n/a
Enallagma civile	Familiar bluet	Red	n/a	n/a	n/a
Somatochlora forcipata	Forcipate emerald	Blue	n/a	n/a	n/a
Galba obrussa	Golden fossaria	Blue	n/a	n/a	n/a
Cicindela hirticollis	Hairy-necked tiger beetle	Blue	n/a	n/a	n/a
Sphaerium occidentale	Herrington fingernailclam	Blue	n/a	n/a	n/a
Oeneis jutta chermocki	Jutta Arctic, *chermocki* subsp.	Blue	n/a	n/a	n/a
Physella propinqua	Rocky Mountain physa	Blue	n/a	n/a	n/a
Ophiogomphus occidentis	Sinuous snaketail	Blue	n/a	n/a	n/a
Gyraulus crista	Star gyro	Blue	n/a	n/a	n/a
Sphaerium stratinum	Striated fingernailclam	Blue	n/a	n/a	n/a
Physella virginea	Sunset physa	Blue	n/a	n/a	n/a

Source: (Government of Canada, 2018d).
Notes:
(a) Source: CDC (2018): Search criteria: Animal AND Restricted to Red, Blue, and Legally designated species AND Forest District = Quesnel Forest District (DQU) AND MOE Regions:5- Cariboo AND Regional Districts: Cariboo (CBRD) AND BGC Zone: ESSF, SBS.
(b) C = Candidate; DD = Data deficient; E = Endangered; NAR = Not at Risk; SC = Special Concern; T = Threatened; XT = Extirpated; and XX = Extinct.

6.2.13 Contaminated Sites

Mining activities have been within the Project area since the 1860s, and have included underground and open pit mines, waste rock and tailings disposal areas, former mill areas, offices, and mechanical shops. The historical Cariboo Gold Quartz mine property extends southeasterly from the town of Wells, covering the north spur of Cow Mountain, Lowhee Creek, and the westerly slopes of Barkerville Mountain. The Cariboo Gold Quartz mine workings extend southeasterly from the north end of Jack of Clubs Lake through Cow Mountain to the Cariboo claim at the head of Lowhee Creek, a distance of 3 km. The Aurum or Island Mountain mine was located on the southeast slope of Island Mountain, extending from the town of Wells southwesterly along the west shore of Jack of Clubs Lake. The property is adjoined to the northwest and southeast by the Mosquito Creek Mine (active in the 1980s) and Cariboo Gold Quartz mines, respectively.

The former Island Mountain and Cariboo Gold mine sites have been undergoing contaminated sites investigation. Tailings contaminated with arsenic and other metals from historical mine waste produced by previous owners and operators extend over 65 hectares including around and in Jack of Clubs Lake and the Willow River (FLNR, 2018f). Water quality in the lake and river generally meets provincial water quality guidelines for the protection of freshwater aquatic life despite the extensive mine waste.

Areas of potential environmental concern (APECs) and constituents of potential concern were identified based on readily available information. Readily available records were reviewed on past and present activities in the Project area and immediately adjacent properties. Historical contaminated sites information sources for the Mine Site included historical land title searches, aerial photographs, fire insurance records, EcoLog Environmental Risk Information Service searches , companies historically operating at the site, PAG and NPAG mine wastes, sawmill operations, the MOE Contaminated Site Registry, BC Government Mineral Titles Online database, Federal Contaminated Sites Inventory, historical records and archives, environmental reports, and regulatory information applicable to contaminated sites.

A contaminated sites assessment completed in 2016 focused on environmental conditions within the following areas:

- Cow Mountain Mining Area – located along the northern slopes of Cow Mountain in the former area of the Cariboo Gold Quartz Mine;
- Bonanza Ledge Mine Area – located along the southwest slope of Barkerville Mountain; and
- Area consisting largely of private properties to the northeast of the junction of Highway 26 and Bowron Lake Park Road and Matthew Valley Road (Cunningham Forest Service Road).

The Phase I Environmental Site Assessment (ESA) completed for the above-listed areas was conducted in general accordance with the Canadian Standards Association Standard Z768-01, Phase I Environmental Site Assessment (reaffirmed 2012) and with reference to MOE reporting requirements for a Stage 1 Preliminary Site Investigation, as outlined in the Checklist for Reviewing a Preliminary Site Investigation (MOE, 2016c). The Phase I ESA involved reviewing readily available records to collect data on past and present activities within the Project area, conducting a site reconnaissance to select areas, interviewing individuals knowledgeable about the past and current activities within the Project area, and evaluating the information collected to identify APECs.

Based on the results of the Phase I ESA, 23 APECs were identified, and a limited scope Phase II ESA was conducted to evaluate whether or not soil contamination was present in the APECs. A total of 43 test pits were excavated and soil samples were collected from various depths and submitted for chemical analyses of selected constituents of potential concern. One wood sample was collected from the former Island Mountain mine shaft area where suspected copper sulphate treated wood was stored. Analytical results were compared to the BC Contaminated Sites Regulation Industrial Land use soil standards, BC Hazardous Waste Regulation criteria, and the MOE Protocol 4 Background Soil Quality Estimates for the Cariboo Region (MOE, 2010, 2016a, 2016b).

6.3 Human Environment

6.3.1 Socio-community

Sections 1.6 and 1.7 describe the general socio-community and Indigenous nations context of the Project. The nearest communities to the Project are Wells, New Barkerville, Quesnel and Likely. The Project overlaps the traditional territories of several Indigenous Nations. Lhtako Déne Nation has the closest reserves to Wells. There are four reserves, all of which are located near Quesnel, approximately one-hour driving time from Wells. Xats'ull First Nation has two reserves near Williams Lake, located just over two hours driving time from Wells.

A socio-community baseline program is being carried out to:

- Develop community profiles, including past trends, current status, and projections in population and age demographics;
- Characterize trends and current status of housing availability and affordability;
- Characterize demand, supply, capacity, and development planning of local and regional public infrastructure and services; and
- Identify perceptions of local and regional communities and First Nations representatives and service providers on potential effects of the Project on socio-community matters.

The baseline program will involve a review of secondary data from key sources such as:

- Barkerville Gold Mines' 2010 *Mines Act* Permit Application for the Bonanza Ledge Mine (BGM, 2010);
- Barkerville Gold Mines' 2016 *Mines Act* Permit Application for the Bonanza Ledge Mine (BGM, 2016);
- Mining industry reports and EAs for similar Projects;
- Local and regional government information, planning, policies, studies, and reports;
- Government and service provider websites;
- Statistics Canada and BC Stats data on population and demographics, housing characteristics, community well-being, and other relevant indicators; and
- Reports prepared for other ongoing activities in the area around the Project (e.g., TFL 52 related studies, etc.).

Primary data is being collected via a field program consisting of interviews with local and regional municipal representatives; health, protective, infrastructure, and service providers; others active in the local economy and local residents to verify data and information obtained through secondary sources, address identified data gaps, and obtain views on Project effects. BGM will work with Indigenous nations to identify opportunities to implement collaborative baseline data collection and EA processes addressing their specific interests.

6.3.2 Land and Resource Use, Recreation, and Tourism

The Project area supports a diverse range of commercial and non-commercial land uses including mining and mineral exploration, forestry, hunting and trapping, guide outfitting, outdoor recreation, range, and residential settlement. Mining and exploration date back to the 1860s during the Cariboo Gold Rush period when miners and prospectors frequented the area for exploration of the Cariboo goldfields. Commercial timber harvesting occurs in the Project area in West Fraser's Tree Farm License 52 tenure. The Wells Barkerville Community Forest, which covers approximately 4,300 ha north of Wells, is managed by the District of Wells and provides recreation trails, forms part of the town's viewscape, is a popular non-timber forest product harvesting area and contains one local home (Community of Wells Website, 2019).

Heritage tourism is an important activity with the Barkerville Historic Town and Park, located 8 km east of Wells, being internationally recognized as a tourist destination (Barkerville Historic Town and Park, 2018). Outdoor recreation is a regional tourist attraction, particularly snowmobiling in the winter that uses an extensive system of groomed trails near Wells and Barkerville, and on Cow Mountain.

Hunting, trapping and guide outfitting occurs throughout the Project area for a variety of species. Recreational activities such as angling, canoeing, boating, and swimming occur on Jack of Clubs Lake.

Highway 26 links the Wells-Barkerville area to Quesnel to the west and to Bowron Lake Provincial Park to the east. Numerous forest service roads support access to resource development locations and outdoor recreation and tourism activities in the area.

Baseline data will be collected from secondary and primary information sources. Secondary data will be accessed from a variety of sources including:

- Barkerville Gold Mine 2010 *Mines Act* Permit Application for the Bonanza Ledge mine (BGM, 2010);
- Barkerville Gold Mine 2016 *Mines Act* Permit Amendment Application for the Bonanza Ledge mine (BGM, 2016);
- Local, regional, and provincial land use plans, studies, and reports (e.g., CCLUP and Quesnel Sustainable Resource Management Plan);
- Tenure and ownership information and mapping from the Integrated Land and Resource Registry and DataBC databases;
- Information on parks and protected areas and their use from Parks Canada and B.C. Parks publications and websites;
- Information about forestry tenure and harvesting activity from the FLNR;
- Information about mining tenure and mining activity from the MEMPR;
- Wildlife harvesting regulations and data provided by the FLNR; and
- Tourism and outdoor recreational use information collected from available tourism, recreational club, and service provider reports and websites.

Based on the results of the desktop analysis of secondary data, primary source information will be gathered through a field program of an interview and/or mapping sessions to confirm findings as well as address gaps. Interviewees will include representatives of local, regional and provincial governments, outdoor recreation user groups, tourism operations, resource interests, authorization holders, and the BC Conservation Officer Service among others.

6.3.3 Use of Lands and Resources for Traditional Purposes

Project components and activities have the potential to adversely affect the use of lands and resources for traditional purposes (Current Use) that supports traditional diets, economies, social and spiritual life, governance, and cultural transmission (e.g., transfer of traditional language, laws, stories, and beliefs associated with places and sites on the landscape, harvesting of resources, and formation and maintenance of cultural identity). Potential Project-related effects to Current Use may also extend to the exercise of Aboriginal Interests that may be associated with that use. Aboriginal Interests, which are defined as asserted or determined Aboriginal rights, including Aboriginal title and treaty rights, will be assessed separately from Current Use in Part C of the EAC Application (refer to Section 8.0).

Indigenous nations in the vicinity of the Project include Lhtako Déne Nation, Xats'ull First Nation, Williams Lake Indian Band (T'exelc), Tsilhqot'in National Government, Neskonlith Indian Band and Nazko First Nation. Additional details on these Indigenous nations is provided in Section 1.6. Information on Current Use in the Project area by Indigenous nations will be identified through consultation with Indigenous nations. This information will be supplemented where needed by information from publicly available sources, including published reports and studies and regulatory submissions for other projects in the area.

6.3.4 Visual Quality

Visual quality of the landscape is highly valued by both residents and visitors within BC and is particularly important for an area where the landscape supports tourism and recreation values (BC Ministry of Forests, Mines and Lands, 2010). The Project area is recognized as having visual landscapes associated with tourism (i.e., Barkerville) and access corridors leading to tourism and recreation areas such as Jack of Clubs Lake, Wells Snowmobile Club trails, and Bowron Lakes Provincial Park. Scenic areas management of the landscape surrounding the Project is identified as an objective in current land and resource planning (i.e., CCLUP and the QSRMP) (FLNR, 1998, 2007).

A desktop review of existing information will provide an understanding of the current visual quality and context of visual quality management in the Project area. The desktop analysis of existing information will include the following data sources and processes:

- Review of the Barkerville Gold Mine 2010 *Mines Act* Permit Application for the Bonanza Ledge mine (BGM, 2010) and the Barkerville Gold Mine 2016 *Mines Act* Permit Amendment Application for the Bonanza Ledge mine (BGM, 2016);
- Review of local, regional, and provincial land use plans, visual assessment studies, and reports to identify visual quality management policy and objectives;

- Review of the current BC Visual Landscape Inventory (VLI) database to identify established viewpoints, related visually sensitive areas, and classification of visual characteristics (Government of BC, 2018c); and
- Review of data describing topography, water features, land cover, transportation networks, recreation and tourism features, and orthographic imagery to understand the existing landscape and cultural features surrounding the Project, and to determine preliminary locations for viewing the Project.

A photographic field survey program was undertaken in 2018 to inventory and describe the existing landscape setting and viewing conditions surrounding the Mine Site as a baseline for measuring potential visual effects. This program included ground level site photography taken from several potential viewing locations along Highway 26, from the town of Wells, and from recreation and tourism sites. An additional field survey program will be undertaken in 2019 to inventory and describe the existing landscape setting and viewing conditions surrounding the QR Mill.

6.3.5 Economy

The local economy is based on tourist visitation to Barkerville and Bowron Lake Provincial Park, timber harvesting, mineral exploration and development (including placer mining), arts and crafts production and sales, and outdoor recreation and tourism. In 2010, Barkerville supported an estimated 120 full-time equivalent positions (including both full-time and seasonal opportunities) in the region encompassing Wells and Quesnel. About 15 merchants have stores in Barkerville, including souvenir shops, food vendors, accommodations, and a theatre. From 15 to 20 special events are annually staged at Barkerville (Barkerville Historic Town and Park, 2018). While in the past, Barkerville was open seasonally, in 2016, it remained open year-round for the first time.

The Project's procurement requirements for materials, goods, and services would have economic implications for the existing industry and business profile in the Project area. Consumer-oriented spending derived from the wages and salaries of Project employees and employees of Project contractors and suppliers would also support business opportunities and economic development.

The Project would contribute to tax revenues for local government and revenues for the BC government from personal income and corporate income taxes and various property, consumption, and mineral taxes.

An economy baseline program will be carried out in 2019 to:

- Develop community economic profiles, including information on the labour force, employment levels, income, and industry characteristics;
- Characterize economic development initiatives and priorities in the region; and
- Characterize government revenues and expenditures.

Secondary data from the following relevant, publicly available sources such as the following types of information sources, will also be reviewed:

- Literature review of mining industry reports and EAs for similar Projects;
- Local government studies and reports;
- Statistics Canada data on population and demographics, employment and income, and other relevant indicators available through the Census Program of Canada; and
- Workshops and interviews with representatives from local businesses, communities of interest, and Indigenous nations.

Primary data will be collected via phone interviews and a field program consisting of in-person interviews with local and regional municipal representatives, representatives of the tourism industry, and economic development organizations and employers in the region to fill information gaps and verify secondary research findings.

BGM will work with Indigenous nations to identify opportunities to implement collaborative baseline data collection and reporting into the EA process.

6.3.6 Heritage

The Project is located in the Quesnel Resource District within the Interior Plateau Culture Area Boundary defined by the FLNR Archaeology Branch (FLNR, 2018b). The heritage resources within the Project area are composed of palaeontological, archaeological, and historical sites, objects, and features. Archaeological or historical sites that predate AD 1846 are automatically protected under the *Heritage Conservation Act* (Government of British Columbia, 1996).

Palaeontological sites are defined as locations containing fossilized remains, imprints, or traces of past plants or animals. Archaeological sites are defined as locations containing physical remains of past human activity which are studied through the methods and techniques employed in the discipline of archaeology (FLNR, 2018c). Indigenous nations have been present in the Project area since time immemorial. Archaeological sites can be associated with pre-contact or post-contact periods, that is, the time before and after the first arrival of non-First Nations people in the region.

Historical sites are defined as any structure, site, or thing that is of historical or architectural significance (Parks Canada, 2018). Historical sites and locations in BC are primarily attributable to post-contact Euro-Canadian settlement and land use, but also include habitations and other evidence left by Indigenous nations. These historical sites include structures, engineering works, architectural features, and artifacts.

Information and data sources accessed to compile baseline heritage data include:

- Geoscience Data Repository, Earth Science Sector (Government of Canada, 2018b);
- Geoscan (Government of Canada, 2018a);
- Geogratis – geographical maps, data, and publications (Government of Canada, 2018c);
- National Research Council Research Press (NRC Research Press, 2018);
- Provincial reports and maps (using the online publication database maintained by the Province of BC and the Provincial Archaeological Report Library [PARL] maintained by the Archaeology Branch [FLNR, 2018b]);
- Provincial Heritage Register (using the Remote Access to Archaeological Data [RAAD] application maintained by the Archaeology Branch [FLNR, 2018a]);
- Ethnographic reports (Archaeo, 2002);
- Archival photographs (Barkerville Historic Town and Park, 2018; Holler, 2015);
- Historical land use records (Barkerville Historic Town and Park, 2018; FLNR, 2018d); and
- Canadian Register of Historic Places (Parks Canada, 2018).

A palaeontological resource baseline overview and a heritage resources overview assessment have been completed for the Project (Branta, 2017; Golder, 2017). Both studies focused on existing information, identified the distribution of known heritage resources, and modelled heritage site potential. Heritage resources are known to exist within, and adjacent to, the Project area. Recorded sites and features strongly correlate with specific landforms and environmental characteristics present elsewhere in the Project area, suggesting that there are areas with potential for as-yet unrecorded heritage resources.

Heritage resources that have the potential to interact with the Project will be identified through a review of existing information, a heritage resources inventory, and an assessment program, recognizing that undetected heritage resources may also be encountered during the life of the Project. BGM will have a Chance Find Procedure in place during all phases of the Project. Identified heritage resources will be managed and mitigated in a manner consistent with applicable legislation, policies, and guidelines.

6.3.7 Human Health and Ecological Risk Assessment

Project site information specific to the HHERA component will be described using a combination of available information from previous reports and data collected from the 2016 and 2018 baseline sampling program. Previous information available may be used from the following sources to support the HHERA, including:

- Human Health Risk Assessment for Wells, BC (Golder, 1993);
- Island Mountain and Cariboo Gold Quartz Mine Waste Preliminary Ecological Risk Assessment (Azimuth, 2010);
- Application for the Proposed Development of an Open Pit Gold Mine at Bonanza Ledge, Wells, BC (International Wayside Gold Mines Ltd., 2006);
- Preliminary Human Health Risk Assessment of the Wells Tailings Site (SNC Lavalin, 2010); and
- Risk Based Detailed Site Investigation, Wells Tailings Deposit, Wells, BC (SNC Lavalin, 2011).

A summary of these documents is provided below as it relates to the type of information available and whether it can be utilized to support the HHERA for this Project. In 1993, a human health risk assessment was conducted for residents of Wells associated with exposure to arsenic in soils for concentrations ranging from 30 to 150 mg/g (Golder, 1993). The human health risk assessment was undertaken following large-scale remediation of soil containing arsenic concentrations in excess of 150 mg/g within the town and utilized a multi-media approach (Golder, 1993). The exposure pathways included in the risk assessment were soil, sediment, and tailings (adjacent to the Jack of Clubs Lake and the Willow River), ground and surface water, fish from Jack of Clubs Lake and the Willow River, and fruit and vegetables grown in the arsenic-containing soils within the town (Golder, 1993). While the data used in the 1993 risk assessment are too old to be representative of current conditions, they do provide historical context that can be included in the human health risk assessment to support the Project.

In 2009-2010, a Risk Based Detailed Site Investigation (DSI) was conducted for the crown-related portions of the tailings and aquatic receiving environment associated with the historic Island Mountain and Cariboo Gold Quartz mines (SNC Lavalin, 2011). The DSI identified areas of concern (AEC) and contaminants of potential concern (COPCs) within each AEC. In addition, a detailed field investigation was conducted in 2009 to support the HHERA including the collection of sediment, water, soil, vegetation, and insects. Following the DSI, a Preliminary Ecological Risk Assessment (Azimuth Consulting Group Inc, 2010) and a Human Health Risk Assessment (SNC Lavalin, 2010) were conducted to evaluate the potential health risks of COPCs identified in the DSI to people and ecological receptors. These reports will be used to provide context to the Project but the data are again not current enough to provide an estimate of baseline conditions for the HHERA.

Based on the review of the above documents, proposed baseline sampling and data collection within the Project area to support the HHERA included:

- Co-located soil, vegetation (grass, leaves, and berries), and soil invertebrate samples to be analyzed for metals and polycyclic aromatic hydrocarbons (PAHs) (soil will also be analyzed for total organic carbon);
- Fish tissue samples to be analyzed for metals and PAHs;
- Dietary preferences and consumption rates for local First Nations; and
- Drinking water quality data from communities using public water supply in proximity to the Project.

Co-located soil and vegetation samples and co-located soil and soil invertebrate samples were collected in 2018 and are currently being analyzed. Fish tissue samples were collected and analyzed in 2016 and 2018. Additional baseline sampling is planned for 2019 to include the QR Mill.

Sensitive or vulnerable environmental, economic, social, heritage, or health values to be included in the HHERA are considered as follows:

- Indigenous interests and land use will be included in the human health risk assessment (refer to Section 6.3.3); and
- Federally and provincially listed fish, plant, and wildlife species with the potential to occur in the Project area (see Sections 6.2.7, 6.2.11, and 6.2.12).

7.0 POTENTIAL ENVIRONMENTAL, SOCIAL, ECONOMIC, HERITAGE, AND HEALTH EFFECTS

7.1 Environment Effects

An overview of the potential environmental, social, economic, heritage, and health effects of the Project, based on current knowledge of the Project and the existing environment, are presented in Tables 14 and 15. Other Project interactions with these five pillars may be identified through further Project scoping. Project effects will be identified and discussed in the EA. Potential effects are linked to Project components and activities as described in Section 4.0 as well as Emissions, Discharges and Wastes identified in Section 5.0.

A Valued Component (VC) Selection document will be prepared for the Project, outlining candidate VCs and the rationale for inclusion in the effects assessment. Candidate VCs will be identified based on the results of the baseline studies, input from consultation and engagement activities with stakeholders, Indigenous nations, government agencies, and land use plans. The process and rational for VC selection will be included in the Application Information Requirements.

Study areas for the effects assessment will be described in the Application Information Requirements. Study areas will be applicable to the VC they represent and will include the extent of direct and indirect effects.

7.2 Mitigation and Management Strategies

Technical and economically feasible measures to avoid, minimize, restore, or otherwise offset potential effects on environmental, social, economic, heritage, and health components have been considered early in the project planning process and will be described in the EAC Application. Overarching measures BGM is taking to prevent or reduce the adverse effects caused by the Project include plans to:

- Use disturbed areas and brownfields sites for the Project footprint including the historic mill and tailings area at the Mine Site, and previously disturbed areas at QR Mill to reduce ground disturbance and vegetation clearing, whenever possible;
- Minimize surface activities by mining underground; and
- Plan underground ore crushing to reduce visual and noise disturbances.

Examples of potential mitigation measures are presented in Table 13 and Table 14.

Appropriate mitigation strategies will be incorporated into the Project design and/or implemented during all Project phases to avoid or reduce the potential adverse effects. Preliminary measures to mitigate project effects are identified in Table 14 and Table 15.

The provincial Procedures for Mitigating Impacts on Environmental Values (MOE, 2014) will be followed, as appropriate. In addition, relevant provincial guidelines, BMPs, and other general practices will be identified so that Project activities are planned and conducted in compliance with applicable legislation, regulations, permits, standards, policies, procedures, and BMPs. If it is not feasible to follow applicable guidelines or BMPs, consultation with the primary regulatory authority will be undertaken to discuss the most appropriate course of action.

Table 14: Preliminary Identification of Potential Interactions of the Project with the Biophysical Environment and Examples of Potential Mitigation

Component	Examples of Potential Interactions	Examples of Potential Mitigation
Air Quality and Climate	■ Change in air quality due to increased emissions of criteria air contaminants and particulates resulting in potential impacts on human health and wildlife ■ Increase in greenhouse gas emissions	■ Implement an air quality / dust control management plan ■ Select machinery / technology to reduce emissions ■ Water roads and other exposed areas during dry conditions ■ Limit exposed soils by re-vegetating as soon as possible ■ Cover trucks along Transportation Route ■ Limit idling of vehicles ■ Minimize use of diesel generators ■ Maintain equipment on a regular basis
Noise and Vibration	■ Disturbance to human populations, and displacement and/or sensory disturbance to wildlife caused by noise from mining activities ■ Disturbance to human populations, wildlife and aquatic community caused by vibrations from mining activities	■ Use acoustical enclosures, insulation and other noise reduction technology ■ Maintain equipment on a regular basis ■ Use physical barriers such as berms to limit noise effects ■ Implement a noise and vibration management plan that limits blasting events to daytime hours
Light	■ Increase in light trespass and sky glow during nighttime hours, resulting in disturbance to human populations and displacement and/or sensory disturbance to wildlife	■ Use directional lighting and adjustment of light fixture height ■ Use low lumen fixtures ■ Implement a light management plan that takes into consideration sensitive receptors
Hydrology	■ Alteration of stream flows near the Project ■ Change in runoff and drainage patterns ■ Channel erosion, sedimentation and flooding with changes in stream flows	■ In collaboration with design engineers identify project engineering structures for water collection and freshwater diversion ■ Implement water management plans that address drainage, erosion and sediment control and storm water runoff for all Project phases ■ Implement a reclamation and closure plan

Component	Examples of Potential Interactions	Examples of Potential Mitigation
Water Quality and Aquatic Health	■ Changes to surface water quality due to resource extraction, waste rock placement, storage of tailings and surface water management including acidification, geochemical loading of water quality constituents, erosion and dust deposition ■ Changes in water quality due to accidental fuel or chemicals spills	■ Implement water management plan including aquatic effects monitoring program for all Project phases ■ Implement a reclamation and closure plan ■ Minimize acid generation by implementing a PAG material management plan
Hydrogeology	■ Changes to groundwater levels and flows ■ Changes in groundwater quality due to infiltration of contact water from waste rock piles, water treatment ponds and tailings storage facility and collection ponds, soil acidification or accidental chemical, fuel, or sewage releases ■ Alteration of groundwater recharge and discharge locally due to an increase in impervious areas and construction of a storm-water collection system	■ Implement a groundwater management plan during all Project phases ■ Reuse water to the maximum extent possible ■ Implement a reclamation and closure plan
Soils and Terrain	■ Loss and alteration of soils due to admixing, compaction, and erosion of soil materials during site clearing and the removal of vegetation cover ■ Changes in soil quality due to contamination by fuel or chemical spills and alterations in chemical and physical characteristics during mining and reclamation activities ■ Changes in terrain stability due to alterations in slope morphology and/or drainage ■ Opportunity to improve stability of historic waste dumps and soil conditions	■ In collaboration with design engineers identify project engineering structures to avoid, where possible, and minimize Project disturbances ■ Implement environmental management plans that address soil erosion control, soil quality maintenance, soil contamination mitigation and terrain stability for all Project phases ■ Implement a reclamation and closure plan that ensures land use objectives are addressed
Geochemistry	■ Acid rock drainage or metal leaching potential within excavated rock materials, exposed rock cuts, and tailings, resulting in groundwater and surface water quality effects	■ Minimize acid generation by implementing a PAG material management plan ■ Implement a reclamation and closure plan

Component	Examples of Potential Interactions	Examples of Potential Mitigation
Fish and Fish Habitat	■ Changes to fish habitat including habitat availability and indirect effects due to sensory disturbance (e.g., habitat avoidance), and reduction of habitat patch size (i.e., increased fragmentation) ■ Changes in fish mortality risk ■ Alteration of migration or spawning use patterns from disturbance, flow changes, habitat suitability, habitat quality, flow timing, and water quality ■ Health effects to fish and aquatic resources due to changes in water quality	■ Implement applicable BMPs and environmental management plans during all Project phases (i.e., sediment and erosion control) ■ Maintain water flows, quality and habitat values ■ Implement reclamation and closure plan
Vegetation	■ Loss and /or alteration of vegetation and wetland ecosystems from clearing and restoration during all Project phases ■ Health effects to vegetation and wetland species and ecosystems due to alterations in drainage patterns, loss or degradation of soil, dust deposition, changes in chemical compounds in environment, or proliferation of noxious/invasive species	■ Limit clearing to required areas only ■ Implement applicable BMPs and environmental management plans including air quality and dust control plan and surface water runoff control plan ■ Implement a reclamation and closure plan
Wildlife and Wildlife Habitat	■ Change in habitat availability ■ Change in habitat distribution or access ■ Change in wildlife survival and reproduction	■ Limit clearing to required areas only ■ Implement appropriate BMPs and wildlife management plans ■ Limit Project interaction with wildlife ■ Implement a reclamation and closure plan that ensures land use objectives are addressed ■ Incorporate a wildlife component into the water management plan ■ Conduct clearing outside of the migratory bird nesting period

Component	Examples of Potential Interactions	Examples of Potential Mitigation
Contaminated Sites	■ Erosion of contaminated soil materials and mobilization of historical contaminants due to site clearing, excavating and soil stockpiling ■ Localized changes to natural drainage patterns, dust deposition, or airborne deposition of chemical compounds ■ Opportunity to improve historically contaminated areas	■ Limit contaminant transport (i.e., runoff, infiltration, dust deposition), during the removal of contaminated soil materials ■ Identify areas of historical contamination and opportunities for remediation in a site-specific remediation plan

Table 15: Preliminary Identification of Potential Interactions of the Project with the Human Environment and Examples of Potential Mitigation

Component	Examples of Potential Interactions	Examples of Potential Mitigation
Socio-Community	■ Changes to community health, well-being with a focus on vulnerable sub-populations including low-income families, children and seniors ■ Changes in community character ■ Pressures on infrastructure, traffic and roads, and community services, due to Project demand or Project-driven population change ■ Changes to local and regional population and demographics due to Project-driven labour market changes ■ Changes to availability of local housing and temporary accommodation ■ Changes to health and safety of workers and public	■ Work with the community to understand their interests and issues to ensure that proposed mitigation reflects community needs ■ Implement a mechanism that facilitates community feedback ■ Work cooperatively with community in the development of local initiatives that contribute to community health and well being and maintenance of community character ■ Initiate skills inventory and employment planning ■ Implement appropriate BMPs and EMPs that address specific socio-community concerns (i.e., traffic management plan, occupational health and safety plan) ■ Implement a reclamation and closure plan that ensures land use objectives are addressed
Land and Resource Use	■ Changes to opportunities associated with public and tenured land and resources including forestry, mineral exploration and development, hunting, fishing, guide outfitting and trapping due to changes in access to the Project area, increases in noise and other disturbance and availability of certain species ■ Changes in tourism and outdoor recreation opportunities due to changes in, infrastructure, access, use, and environmental setting (through Project related changes in air quality [dust], noise, and visual)	■ Identify access opportunities and issues and implement a communication plan that facilitates community feedback and information exchange to ensure that community members and other land and resource users are aware of areas where activities can be undertaken ■ Implement appropriate BMPs and EMPs that address specific concerns (i.e., traffic management plan, noise management plan, dust management plan) ■ Maximize use of brownfield sites for Project infrastructure and activities ■ Implement a reclamation and closure plan that ensures land use objectives are addressed
Current Use of Lands and Resources for	■ Change in the ability to access preferred locations used for traditional purposes	■ Work cooperatively with Indigenous groups to identify concerns and develop specific mitigation plans that address use of lands and resources

Component	Examples of Potential Interactions	Examples of Potential Mitigation
Traditional Purposes	■ Change to the safe and productive use of the land for traditional purposes by Indigenous Groups ■ Changes in presence, absence, abundance, quality or spatial distribution of freshwater, terrestrial, or other resources that are currently used for traditional purposes ■ Changes in the quality of experience associated with the current use of lands and resources for traditional purposes as a result of items such as increased activity in the area, noise, dust, light, etc. ■ Changes to Indigenous interests including socio-economic status, community well being and cultural sustainability (e.g., the ability to transfer Indigenous knowledge)	■ Incorporate traditional knowledge and traditional land use in Project planning ■ Maintain an ongoing dialogue with Indigenous nations to ensure that their specific interests and concerns are understood and that such Indigenous nations have the information required to inform consideration of potential effects ■ Mitigation as discussed earlier for noise, dust, light, water quality, traffic, etc. Develop participation agreements with Indigenous groups
Visual Quality	■ The introduction and development of vegetation clearing, landform modifications (e.g., grading, earthworks, storage, and stockpiles), and mine infrastructure features (i.e., built structures) during all Project phases ■ Changes in air quality (dust) from vehicle traffic could potentially result in visual disturbance and alteration to existing visual resources	■ Retain landforms and existing vegetation where possible and revegetate new landforms to provide screening of the Project area ■ Implement a dust control plan that focus on limiting dust and utilize suppression techniques during all Project phases ■ Implement a reclamation and closure plan that ensures land use and visual quality objectives area addressed
Economic	■ Change in employment, income, and labour market ■ Direct and indirect demand for goods and services may affect availability ■ Change in government revenues ■ Change in gross domestic product (GDP) ■ Change in economic activity associated with businesses in the Project area (i.e., forestry, recreation and tourism) ■ Increased demand for local government expenditures	■ Implement a communication plan that facilitates community feedback ■ Work with community in the development of local initiatives that address concerns ■ Work to understand the local labour market and implement employment and training plans, as needed

Component	Examples of Potential Interactions	Examples of Potential Mitigation
Heritage	■ Changes to resource integrity and increased or decreased accessibility to palaeontological, archaeological, or historical sites could result during all Project phases	■ Conduct an archaeological impact assessment ■ Develop an archaeology chance find procedure ■ Implement a heritage resources management plan that outlines any areas where ground disturbance should be avoided and mitigative strategies if disturbance to archaeological sites is anticipated
Human and Ecological Health	■ Changes in ambient particulate matter concentrations (i.e., TSP, $PM_{2.5}$ and PM_{10}), which may cause health risk to local communities ■ Deposition of dust to plants and soil, which can result in uptake of contaminants of concern (i.e., metals and polycyclic aromatic hydrocarbons [PAHs]) in plants and animals, and could be consumed by people or by wildlife ■ Changes in water quality may result in uptake of metals and PAHs in fish which are then consumed by people or wildlife ■ Surface water affected by the Project may be consumed by wildlife or by people (in a recreational scenario) ■ Alterations in noise, traffic and vibrations may cause stress to people and wildlife ■ Alterations in community character, increased pressure on limited local infrastructure, and increased discrepancy in wages in the local area which may cause stress to people	■ Implement appropriate BMPs and EMPs ensuring sensitive human and ecological receptors are identified (i.e., air quality / dust, noise, traffic and water management plans) ■ Work with the community to identify potential stressors and implement mitigation identified in the previous Human Health sections above

7.3 Cumulative Effects Assessment

A cumulative effects assessment will be conducted to identify the potential interactions of residual project effects with residual effects from other existing and reasonably foreseeable projects and activities in the vicinity of the Project.

Future projects and activities considered in the cumulative effects assessment will be restricted to those that:

- Have been publicly announced with a defined project execution period and with sufficient project details for assessment;
- Are currently undergoing an EA; or
- Are in a permitting process.

As described in Section 6.3.2, the Project area supports a diverse range of activities including forestry, mining and mining and mineral exploration, hunting and trapping, guide outfitting, outdoor recreation, and residential settlements. Heritage tourism is also an important activity in the Project area.

The cumulative effects assessment will examine the extent of spatial and temporal overlap of residual Project effects with those of other projects and activities. Study areas for the cumulative effects assessment will be focused on affected VCs. Where possible, the cumulative effects will be quantified in terms of the degree of change in a measurable parameter(s) where and when the interactions between the Project residual effects and the residual effects of other projects and activities are expected to occur.

7.4 Trans-Boundary Effects

Trans-boundary effects are not expected as the Project is located more than 400 km to the north of the United States border and 120 km to the west-northwest of the border with Alberta.

7.5 Monitoring

The EAC Application will include a conceptual description of the monitoring and management plans for Project construction and operation. A range of measures will be described in these management plans to mitigate the potential effects of the Project and to assess the effectiveness of the mitigation measures. These plans will include adhering to guidelines and BMPs, reducing the incidence of adverse Project effects, as well as monitoring and reporting requirements. Preliminary monitoring and management plans for the Project are expected to include:

- Ground Control Management Plan,
- Erosion and Sediment Control Plan,
- Metal Leaching and Acid Rock Drainage Management Plan,
- Transportation Management Plan,
- Access Management Plan,
- Noise Management Plan,
- Air Quality and Dust Control Management Plan,

- Surface and Mine Water Management Plan,
- Surface and Groundwater Monitoring Plan,
- Aquatic Effects Monitoring Plan,
- Fish Habitat Offsetting Plan (if triggered),
- Wetland Offsetting Plan (if triggered),
- Landscape and Soil Management Plan,
- Invasive Species Management Plan,
- Wildlife Management Plan,
- Caribou Mitigation and Management Plan,
- Waste Management Plan,
- Spill Prevention and Response Plan,
- Operational Health and Safety Plan including Emergency Response, and
- Reclamation and Closure Plan.

Additional Management Plans will be developed as required.

8.0 CONSULTATION AND ENGAGEMENT WITH INDIGENOUS NATIONS

8.1 BGM's Principles

BGM recognizes the unique cultural, legal and historical identity of Indigenous nations, and strives to engage with their communities in a respectful and appropriate manner. BGM has developed a consultation and engagement strategy based around the following principles:

- **Shared Process** – BGM's consultation program will be developed based on a shared process that seeks and considers input from Indigenous nations.
- **Respect** – BGM respects Indigenous nations culture and values and is committed to developing relationships based on mutual respect and understanding.
- **Timeliness** – BGM is committed to early engagement and providing timely and accurate exchange of information about the Project and opportunities to participate in consultation activities.
- **Relationships** – BGM will seek to establish and maintain long-term relationships with Indigenous nations with an interest in the proposed Project. These relationships will evolve as the Project advances.
- **Responsiveness** – BGM will work to understand, consider and respond to input from Indigenous nations and provide feedback on how input has been considered in Project planning, including mitigation plans. Results from the consultation process will be compiled in Indigenous Consultation Reports.
- **Open Communication** – BGM will consult with respect to the project and regulatory process. BGM will gather and listen to feedback and work with Indigenous nations to address concerns identified.

8.2 Approach

BGM proposes to share Project information, seek input, and involve Indigenous nations in the Project on an ongoing basis. Section 8.7 provides an overview of general activities and materials. Additional detail specific to each phase identified below will be discussed in the Indigenous Consultation Plan.

- **Initial Engagement,** covering the time from Project inception to the filing of the Project Description, including a portion of the baseline development.
- **Pre-Application Phase Consultation,** covering the time from the filing of the Project Description to submission of the EAC Application.
- **Application Review Phase Consultation,** covering the time from acceptance of the EAC Application by the EAO to the receipt of the EAO and/or federal decision on the EAC Application.
- **Ongoing Engagement,** covering the time from receipt of the EAO and/or federal decision on the EAC Application, through permitting, construction, operations, and decommissioning of the Project.
- Activities undertaken as part of Initial Engagement to date are discussed in Section 8.5.

8.3 Potentially Affected Indigenous Nations

To the best of BGM's knowledge, neither the EAO nor the CEA Agency (now IAAC) has undertaken strength of claim analysis and BGM has not received direction from either agency as to the appropriate level of consultation for each Indigenous nation. However, based on a review of potential interests in the Project area and guidance from both the EAO and IAAC, the Indigenous nations listed in Table 16 have a potential interest in the Project.

Table 16: Indigenous Nations with a Potential Interest in the Project

Indigenous Nation	Agency Guidance
■ Lhtako Dené Nation ■ Xat'sull First Nation ■ Tsilhqot'in National Government ■ Neskonlith Indian Band	■ On June 23, 2017, the EAO advised BGM to engage with these Indigenous nations
■ Williams Lake Indian Band (T'exelc) ■ Nazko First Nation	■ On March 21, 2018, the EAO advised BGM to engage with T'exelc based on shapefiles which included the QR Mill ■ The EAO further advised that the Transportation Route may or may not overlap with the Nazko First Nation consultation area.

BGM understands additional guidance and input with respect to the scope of consultation may be provided by the EAO and that the list of Indigenous groups set out in the Section 11 order may be different than that identified above and that the list may change as the Project advances. Where Indigenous nations identified in Table 16 are not identified in the Section 11 order, BGM will continue to inform them about the Project.

8.4 Aboriginal Interests

BGM recognizes that the scope of consultation with each Indigenous nation will vary with the scope of their Aboriginal interests and the degree to which their interests may be affected by the Project. The EAO defines "Aboriginal Interests" as asserted or proven Aboriginal rights, including Aboriginal title and treaty rights that require consultation and, if appropriate, accommodation. BGM understands that identifying and recommending measures to address potential adverse impacts of the Project on Aboriginal Interests will be an essential element of the EAC Application and the fulfillment of the Crown's duty to consult and accommodate.

The EAC Application will meet the legal requirements for addressing any potential impacts on Aboriginal Interests and Current Uses.

A review of available information, including documentation submitted to the Crown for other EAs, indicates that each Indigenous nation identified in Section 8.3 may have Aboriginal Interests and Current Uses in proximity to the Project that may be associated with:

- Aboriginal title to the lands, waters, and resources within their territories, including economic interests in those lands, waters, and resources; and
- Aboriginal rights related to the use of terrestrial, freshwater, heritage, visual, and other resources within these territories, which may include harvesting activities, such as fishing, hunting, trapping and gathering, and other traditional and cultural activities (e.g., travel routes, cultural expression, and spiritual practices).

Based on this information, and information provided in Sections 6.3.3 and 7.0, BGM anticipates that the Project may affect Aboriginal Interests linked to past, present, and desired future use of lands and resources. Through consultation BGM will seek to confirm and expand upon the current understanding of the following:

- Past, current, and desired future use in the Project area;
- TEK with respect to lands and resources in the vicinity of the Project;
- The potential for adverse or beneficial Project effects on Aboriginal Interests; and
- The appropriate measures to avoid or mitigate identified adverse effects.

BGM plans to work with the Indigenous nations identified in Section 8.3 prior to issuance of a Section 11 order to understand whether, and to what extent, their Aboriginal Interests and Current Use may be affected by the Project. Following the issuance of a Section 11 order, BGM will consult with Indigenous nations as set out in the order to better understand how the Project may affect past or current Indigenous practices, traditions and customs, and how measures may be incorporated into the Project to avoid, mitigate or otherwise address potential effects.

8.5 Engagement and Consultation Activities to Date

BGM initiated discussions with Indigenous nations in 2015 and engagement and consultation are ongoing (Table 17).

Table 17: Key Engagement and Consultation Activities with Indigenous Nations to Date

Indigenous Nation	Key Activities
■ Lhtako Dené Nation	■ Initiate engagement in 2015 to establish relationships and develop plans to support their involvement in the Project ■ Relationship Agreement signed in November 2016 ■ Capacity funding agreement ■ Letter including preliminary Project overview and map in May 2018 ■ Meetings with Leadership – 2015 - ongoing ■ Site visit May 2018, follow-up to visit ■ Draft Project Description sent for review/comment (December 2018, April 2019) ■ Comments on Project Description received May 2019 ■ Meeting on June 25, 2019 to discuss Project Description and EA process ■ On July 18, 2019, BGM shared its responses to Lhtako Dené Nation's comments on the Project Description, along with a revised Draft Project Description for final comment and review ■ On August 30, 2019, BGM submitted its final Project Description to Lhtako Dené Nation

Indigenous Nation	Key Activities
■ Xatśūll First Nation	■ Interim relationship agreement in August 2017 ■ Letter including preliminary Project overview and map in May 2018 ■ Site tour July 2018 ■ Meeting with leadership – 2016 ■ Project update meeting November 2018 ■ Draft Project Description sent for review/comment (December 2018, April 2019) ■ Comments on Project Description received February and May 2019 ■ On July 18, 2019, BGM shared its responses to Xatśūll First Nation's comments on the Project Description, along with a revised Draft Project Description for final comment and review ■ On August 30, 2019, BGM submitted its final Project Description to Xatśūll First Nation ■ On September 19, 2019, BGM met with Xatśūll First Nation to provide a project overview to leadership
■ Williams Lake Indian Band (T'exelc)	■ Initiate engagement in 2016 to establish relationships and develop plans to support their involvement in the Project ■ Letter including preliminary Project overview and map in May 2018 ■ Meetings with leadership - 2018 ■ Project update meeting June 2018 ■ Site tour June 2018 ■ Draft Project Description sent for review/comment (December 2018, April 2019) ■ Revised draft Project Description shared with Williams Lake Indian Band (T'exelc) on July 18, 2019 ■ On August 30, 2019, BGM submitted its final Project Description to Williams Lake Indian Band (T'exelc)
■ Tsilhqot'in National Government	■ Letter including preliminary Project overview and map in May 2018 ■ Draft Project Description sent for review/comment (December 2018, April 2019) ■ Revised draft Project Description shared with Tsilhqot'in National Government on July 18, 2019 ■ On August 30, 2019, BGM submitted its final Project Description to Tsilhqot'in National Government
■ Nazko First Nation	■ Letter including preliminary Project overview and map in May 2018 ■ Draft Project Description sent for review/comment (December 2018, April 2019) ■ Revised draft Project Description shared with Nazko First Nation on July 18, 2019 ■ On August 30, 2019, BGM submitted its final Project Description to Nazko First Nation

Indigenous Nation	Key Activities
■ Neskonlith	■ Letter including preliminary Project overview and map in May 2018 ■ Project information requested and sent June/July 2018 ■ Draft Project Description sent for review/comment (December 2018, April 2019) ■ BGM shared Project information requested by Neskonlith in January 2019 ■ Revised draft Project Description shared with Neskonlith on July 18, 2019 ■ On August 30, 2019, BGM submitted its final Project Description to Neskonlith

Additional activities have included meetings, written correspondence, emails, and telephone conversations with leaders and representatives of Indigenous nations.

Topics discussed have included:

- Project description,
- Employment,
- The regulatory and permitting process,
- Participation in field studies and investigative work,
- Capacity funding,
- Potential Project impacts on Aboriginal Interests and Current Use, and
- Potential Project-related agreements.

BGM has invited representatives from Indigenous nations to participate in field studies. Members participated in surveys (2016 to 2018) for wildlife, vegetation, water quality and aquatic health, fish habitat, terrain and soils, hydrology, heritage, human health and ecology risk assessment, and hydrogeology.

8.6 Key Interests and Concerns

A summary of the key interests and concerns raised to date is provided in Table 18. This list is a high-level summary and is not intended to be exhaustive or representative of the interests of all Indigenous nations.

Table 18: Summary of Interests and Concerns Identified Through Indigenous Engagement and Consultation

Topic	Description
Employment and Training Opportunities	■ Types of work available for both short and long-term employment ■ Funding support for education and training ■ On the job training
Employment, Contracting and Business Opportunities	■ Identification of opportunities for Indigenous-owned businesses to be suppliers ■ Contracting ■ Joint venture opportunities ■ Revenue sharing ■ Indigenous hiring practices

Topic	Description
Community Initiatives	■ In-kind or financial support for community-based projects, initiatives, and events
Capacity Funding Support	■ Time for representatives from Indigenous nations to participate in Project review ■ Hiring technical experts to assist in Project review
Project-related Agreements	■ Engagement and consultation protocols and agreements ■ Traditional land use and knowledge studies ■ Impact Benefit Agreements
Meaningful Participation in Project Review	■ Provision of information early in the Project stages so that concerns from Indigenous nations can be considered and addressed ■ Direct engagement with the proponent rather than through government representatives ■ Involvement in VC identification ■ Incorporation of TEK and TU information in project studies ■ Proponent working with Indigenous nations to discuss study methodologies prior to assessments being completed ■ Ensuring baseline scope is sufficient to support effects assessment ■ Consideration of “nation specific” assessments ■ Involvement in the development of mitigation and management strategies
Project Description	■ Ensure sufficient detail is available to enable a complete Project assessment
Field Studies	■ Thorough and appropriate baseline studies should be conducted ■ Opportunity to review and provide input into the development of studies ■ Opportunity to monitor field studies

BGM acknowledges that the above-noted interests have been identified by Indigenous nations based on information available at the time the comments were made. BGM is committed to working with Indigenous nations through the regulatory review process and as more detailed Project information becomes available, to identify potential adverse effects on Aboriginal rights, and develop strategies to avoid, mitigate or otherwise accommodate those rights, where appropriate, throughout subsequent stages of consultation.

8.7 Ongoing and Proposed Engagement and Consultation

BGM is committed to ongoing engagement and consultation with Indigenous nations that may be affected by the Project as identified in the Section 11 order. BGM will develop an Indigenous Consultation Plan based on direction from regulatory agencies and consultation with Indigenous nations. Drafts of this Indigenous Consultation Plan will be provided to Indigenous nations prior to submission to the regulators to facilitate discussion and input.

BGM will continue to work with leadership and representatives from Indigenous nations to identify appropriate methods of engagement, consultation and communications. Potential engagement and consultation methods and communications materials are identified in Table 19.

Table 19: Potential Engagement and Consultation Methods and Communications Materials

Engagement and Consultation	Communications Materials
■ Face-to-face and phone meetings with elected leadership and nation representatives ■ Workshops on specific topics (e.g., VC selection, effects assessment, employment opportunities) ■ Open houses ■ Advisory committees ■ Presentations ■ Technical meetings ■ Tours and site visits ■ Participation in community events ■ Written correspondence	■ Project website ■ Maps and figures ■ Poster boards ■ Fact sheets ■ Newsletters ■ Letters ■ Information advertisements ■ Presentations ■ Videos/animations depicting the 3-dimensional layout of Project surface infrastructure

Other activities will include:

- Indigenous participation in field and baseline studies;
- Agreements with Indigenous nations, including capacity funding; and
- Providing regulatory filings (e.g., Project Description, Valued Component selection document, draft and final Application Information Requirements, EAC Application, and the Indigenous Consultation Reports) to Indigenous nations for review and comment prior to submission to the EAO.

BGM has a process for tracking engagement and consultation activities with Indigenous nations in relation to the Project. Records of engagement and consultation, as well as a report of how comments received have been addressed will be included in the EAC Application.

Proposed consultation steps and activities will be further defined and detailed in an Indigenous Consultation Plan that will be submitted to the EAO to fulfill regulatory requirements. Input on the Indigenous Consultation Plan will be sought from potentially affected Indigenous nations identified in the Section 11 order. Until the Indigenous Consultation Plan is prepared, BGM's engagement and consultation will be guided by principles identified in Section 8.1 and the methods proposed above.

9.0 ENGAGEMENT WITH GOVERNMENTS, THE PUBLIC, AND OTHER PARTIES

9.1 BGM's Principles and Approach

Public and stakeholder engagement will be undertaken before, during, and after the EAC Application is submitted.

9.2 Stakeholder Identification

A variety of potential stakeholders have been identified to date, including members of the general public; local, regional, provincial and federal government elected officials and staff; community organizations; recreational groups; authorization holders; land owners; resource users; temporary residents of Wells, and others. These individuals, groups and organizations have been identified based on their potential interests in, or potential interactions with, the Project, including their ability to contribute local knowledge and expertise. As the engagement program broadens and activities increase, additional stakeholders may be identified and will be included in information sharing and engagement activities.

The participation of all interested parties in the engagement process will provide BGM with the opportunity to learn about and incorporate local knowledge, issues of concern and potential opportunities and consider them in Project design and as the Project progresses.

9.3 Engagement to Date and Key Interests and Concerns

Stakeholder engagement began in 2016 and is ongoing. Engagement initially focused on the District of Wells and Wells residents to introduce the Project. BGM also met with the EAO early in the planning process to discuss the Project.

9.3.1 Government Elected Officials and Agencies

A summary of engagement with government agencies to-date is presented in Table 20.

Table 20: Summary of Government Engagement To-Date

Government	Date	Summary of Engagement
Local Governments		
District of Wells	2016 to Present	BGM has met with the Mayor and Council on a regular basis keep them informed about the Project and to discuss infrastructure, housing, and taxes. BGM has also met with individual council members and staff to discuss specific community concerns.
City of Quesnel	February 2017	Presentation on the Project to City Council. Information included near-term objectives, the Project area, Bonanza Ledge Mine plan, and First Nations and Community Relations and Employment statistics.
	June 11, 2019	Meeting with the Director of Development Services and Economic Development Officer to discuss housing strategy, economic activity in the City and area, and other items.

Government	Date	Summary of Engagement
Regional Government		
Cariboo Regional District	June 5, 2019	Discussion with planner regarding information available about Electoral Areas C and F.
	June 7, 2019	Presentation to CRD Board. Focus was on corporate update.
	June 10, 2019	Meeting with Electoral Area C Director to discuss activities in the Electoral Area and to provide a Project update.
Provincial Government		
EAO	2016 to Present	BGM initiated meetings with the EAO in 2016 to discuss engagement and consultation with Indigenous nations and initiation of baseline studies. BGM has had ongoing dialogue with the EAO as the scope and extent of the Project has evolved, seeking advice on project components, regulatory and procedural changes, Indigenous nations engagement and consultation, and the Project Description.
MEMPR	2016 2018	BGM sought advice and guidance regarding aspects of concurrent and synchronous permitting, as well as guidance on reclamation, bonding, Indigenous nations engagement, and the Crown's duty to consult.
MOE	2018	BGM sought advice regarding aspects of permitting requirements and concurrent and synchronous permitting as part of the EA process.
FLNR	2016	BGM sought direction regarding which Indigenous nations to notify and engage with regarding the 2016 Bonanza Ledge *Mines Act* Permit Amendment. This information informed Project engagement activities.
BC Treaty Commission	2016	BGM engaged the Commission to determine if any First Nations being engaged were in the treaty process, and if so, at what stage.
BC Hydro	2016 to Present	Ongoing discussions related to the development of a 69 kV three-phase transmission line from Barlow substation near Quesnel to Wells.
Barkerville Historic Town and Park	2017 - 2019	Discussion on collaboration for three-power power transmission line; accommodation in Barkerville, and access permit to authorize baseline work within the Park boundaries.
Federal Government		
CEA Agency (now IAAC)	June 13, 2019	Discussion regarding the Project and potential federal review.
RCMP	June 14, 2019	Discussion regarding Project overview and baseline law enforcement conditions in the area covered by the Wells detachment.

In addition to continuing discussions with the government agencies and elected officials listed in Table 20, BGM will initiate discussions with additional government agencies, as required, as part of the EA process. These agencies are expected to include DFO, Environment and Climate Change Canada (ECCC) and Natural Resources Canada (NRCan).

9.3.2 Stakeholders

Engagement with stakeholders to date has primarily been via public meetings and one-on-one meetings.

BGM held public meetings on August 25, 2016, January 19 and October 19, 2017, and February 1, 2018, July 9, 2019 and September 18, 2019 in Wells, BC. The meetings were advertised broadly in the District of Wells. They were also advertised on social media and community members on the District of Wells' contact list were notified through email.

BGM also held a public meeting on September 17, 2019 in Quesnel at the Barlow Community Hall.

The meetings were held to keep the public informed about both the Bonanza Ledge Mine and Cariboo Gold Project. At the meetings, BGM provided presentations on both projects. An open discussion format followed where BGM answered questions from attendees. BGM took notes on the concerns and questions asked at the meetings. The key topics recorded at the meetings are presented in Table 21.

Table 21: Summary of Interests and Concerns from Public Meetings

Topic	Description	BGM Response
Employment and Community	■ Local jobs to help sustain Wells and attracting families are important	■ BGM is interested in employing local people to the greatest extent possible
Noise	■ Noise is a concern	■ BGM will investigate methods to reduce noise ■ The ore sorter is run with air and will be relatively quiet
Recreation	■ Recreational opportunities on Cow Mountain have been restricted by mining. Some trails have closed and others will be affected by the footprint.	■ Health and safety requirements can affect trails. BGM will work with the community to identify ways to save trails, where possible.
Housing	■ Building housing is preferable to camps for mine employees and families	■ Given the life of the Project and location of operations, BGM sees camps as a more practical and cost-effective alternative
Effects to Surface Water	■ Underground mine will reduce effects to creeks and watersheds	■ Potential effects to creeks and watersheds will be considered and mitigated
Light	■ Lights from camp are shining on the apartments in Wells	■ BGM will put covers on lights

Topic	Description	BGM Response
Electrical Supply	■ What about three-phase power?	■ The Project needs more power and BGM is discussing this with BC Hydro and government ■ Generators will be used until a new power source is in place
Quesnel River Mill	■ Will the Quesnel River Mill be used as part of the Project?	■ Yes

In addition to the public meetings, meetings have been held with a variety of stakeholders, service providers and members of the public including adjacent landowners, land and resource users, local service providers, Community Forest representative, and other interested parties that have potential environmental and economic interests pertaining to the Project. A summary of items raised in discussions is provided in Table 22.

Table 22: Summary of Interests and Concerns from 2016 to Present

Topic	Description
Electricity Supply	■ Availability of three-phase power for Wells and Barkerville
Economic Benefits	■ Contracting and employment opportunities ■ Skills training ■ Opportunities for financial benefits to local communities
Worker Camp	■ Location ■ Potential demand for District water and sewer services
Accommodation	■ Workforce housing ■ Demand from mine limiting tourist accommodation options ■ BGM purchase of the local motel
Transportation Route	■ BGM's mine haul road maintenance procedures affecting drinking water quality
Infrastructure	■ Potential for increased strain on local services and infrastructure
Air Quality	■ Effect of truck idling ■ GHG emissions from the facility
Light	■ Lights from operations in town affecting residents
Visual Quality	■ Mine being visible when visitors enter Wells
Recreation Access	■ Trail access being restricted by mining operations
Noise	■ Increased noise from increased activity and traffic
Reclamation	■ How much existing contamination will the Project help clean up

9.4 Ongoing and Proposed Activities

BGM is committed to open, transparent, and meaningful engagement. BGM recognizes the need to respect, to listen, and to engage. BGM has developed an engagement approach to involve and seek input from local communities so that opportunities and concerns are addressed as part of the planning process. Engagement helps the public build an understanding of the nature and scope of the Project, address potential misconceptions, and identify concerns to be addressed during Project design and development.

Potential engagement methods and communications materials are identified in Table 23.

Table 23: Potential Engagement and Consultation Methods and Communications Materials

Engagement and Consultation	Communications Materials/Methods
■ Face-to-face and phone meetings ■ Workshops on specific topics (e.g., VC selection, effects assessment, employment opportunities) ■ Open houses ■ Presentations ■ Technical meetings ■ Tours and site visits ■ Participation in community events ■ Written correspondence	■ Project website ■ Maps and figures ■ Poster boards ■ Fact/Information sheets ■ Newsletters ■ Letters ■ Information advertisements ■ Presentations ■ Videos/animations depicting the 3-dimensional layout of Project surface infrastructure ■ District of Wells distribution list for community updates ■ Information sharing through Facebook with Wells Information Page and District of Wells

BGM has a process for tracking engagement activities and tracking and considering comments received on the Project. Records of engagement and consultation, as well as a report of how comments received have been addressed will be included in the EAC Application.

Proposed engagement activities will be further defined and detailed in a Public Engagement Plan that will be submitted to the EAO to fulfill regulatory requirements. A variety of activities and means of getting information and providing input will be included to ensure that people have the opportunity to participate.

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