

# Assessment Report for Sukunka Coal Mine Project (Sukunka)

**With respect to the application by Glencore for an Environmental Assessment Certificate pursuant to the *Environmental Assessment Act*, S.B.C. 2002, c. 43 and the *Canadian Environmental Assessment Act*, 2012. S.C. 2012, c. 19 as a substituted assessment**

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## ACRONYM LIST

µg/L	Micrograms Per Litre	CEMP	Construction Environmental Management Plan
µg/m <sup>3</sup>	Micrograms Per Cubic Metre	CH <sub>4</sub>	Methane
ACR	Aboriginal Consultation Report	CHPP	Coal Handling and Preparation Plant
Act	<i>Environmental Assessment Act, SBC 2002, C. 43</i>	CMMP	Caribou Mitigation and Monitoring Plan
Agency	Impact Assessment Agency of Canada	CMT	Culturally Modified Trees
AIA	archaeological impact assessment	CO	Carbon Monoxide
AIR	Application Information Requirements	CO <sub>2</sub>	Carbon Dioxide
ALR	Agricultural Land Reserve	CO <sub>2</sub> e	Carbon Dioxide Equivalents
Application	Application for an Environmental Assessment Certificate	COPC	Chemical of Potential Concern
AQO	Air Quality Objective	COSEWIC	Committee on the Status of Endangered Wildlife in Canada
ARD	Acid Rock Drainage	CPD	Certified Project Description
B.C.	British Columbia	CRA	Commercial, Recreational and Aboriginal Fisheries
B.C. CDC	British Columbia Conservation Data Centre	Db	Decibel
BEC	Biogeoclimatic Zone	dBA	A-weighted decibel
CAC	Criteria Air Contaminants	DFO	Fisheries and Oceans Canada
CCME	Canadian Council of Ministers of the Environment	EA	Environmental Assessment
CDC	Conservation Data Centre	EAC	Environmental Assessment Certificate
CEAA 2012	<i>Canadian Environmental Assessment Act, 2012</i>	EAO	Environmental Assessment Office
		EC	Environment Canada

ECCC	Environment and Climate Change Canada	km <sup>2</sup>	Square Kilometer
EMA	<i>Environmental Management Act</i>	Kt	Kilotonne
EMP	Environmental Management Plan	kV	Kilovolt
ENV	Ministry of Environment and Climate Change Strategy	LAA	Local Assessment Area
EPIC	EAO Electronic Project Information Centre	LWRS	Ministry of Lands, Water and Resource Stewardship
FOR	Ministry of Forests	LEWR	Low elevation winter range
FSR	Forest Service Road	LHA	Local Health Area
FTE	Full Time Equivalent	LNG	Liquefied Natural Gas
GBPU	Grizzly Bear Population Unit	LPU	Local Population Units
GDP	Gross Domestic Product	LRMP	Land and Resource Management Plan
GHG	Greenhouse Gases	LSA	Local Study Area
ha	Hectare	m	Metre
HCA	Heritage Conservation Act	m <sup>2</sup>	Square Metre
HESR	High Elevation Summer Range	m <sup>3</sup>	Cubic Metre
HEWR	High Elevation Winter Range	MA	<i>Mines Act</i>
HFC	Hydro-Fluorocarbons	MDMER	Metal and Diamond Mining Effluent Regulations
HHRA	Human Health Risk Assessment	mg/dm <sup>2</sup> /d	Milligrams Per Square Decimetre Per Day
HQ	Hazard Quotient	mg/L	Milligrams per litre
hr	Hour	MIA	Mine Infrastructure Area
ILCR	Incremental Lifetime Cancer Risk	ML	Metal Leaching
IR	Information Request	MMO	Major Mines Office
km	Kilometre		

MOTI	BC Ministry of Transportation and Infrastructure	QP	Qualified Professional
MOU	Memoranda of Understanding	RAA	Regional Assessment Area
MPOI	Maximum Point of Impingement	RCMP	Royal Canadian Mounted Police
Mt	Million Tonnes	Report	Assessment Report
Mt/y	Million Tonnes Per Year	RISC	BC Resources Information Standards Committee
N <sub>2</sub> O	Nitrous Oxide	RQ	Risk Quotient
NO <sub>2</sub>	Nitrogen Dioxide	RSEA	Regional Strategic Environmental Assessments
NO <sub>x</sub>	Nitrogen Oxides	SARA	<i>Species at Risk Act</i>
NRCan	Natural Resources Canada	SF6	Sulphur Hexafluoride
°C	Degree Celsius	SO <sub>2</sub>	Sulphur Dioxide
Offset Tool	B.C. Habitat Offset Decision Tool	SPO	Site Performance Objective
PAG	Potentially Acid Generating	TOC	Table of Conditions
PAH	Polycyclic Aromatic Hydrocarbon	UWR	Ungulate Winter Range
PDA	Project Development Area	VC	Valued Component
PFC	Perfluorocarbons	WHA	Wildlife Habitat Area
PM	Particulate Matter	WQG	Water Quality Guidelines
PM <sub>2.5</sub>	Fine Particulate Matter 2.5 Micrometres or Smaller In Diameter	WRI	World Resource Institute
PM <sub>10</sub>	Coarse Particulate Matter Less than 10 Micrometers in Diameter	WSA	<i>Water Sustainability Act</i>
PNCP	Peace Northern Caribou Plan	Yahey decision	British Columbia Supreme Court decision in <i>Yahey v. British Columbia</i>
PRRD	Peace River Regional District		

## PART A - INTRODUCTION AND BACKGROUND

### 1.0 PURPOSE OF THE ASSESSMENT REPORT

The purpose of this Assessment Report (Report) is to summarize the procedures and findings of the Environmental Assessment (EA) conducted by the Environmental Assessment Office (EAO) for the Sukunka Coal Mine Project (Sukunka or Project). The Application for an Environmental Assessment Certificate (EAC) was submitted by Glencore on August 4, 2015. The EAO accepted the Application for review on August 9, 2015 and Application Review began on August 10, 2015.

The EAO has prepared this report as the Assessment Report for provincial Ministers who are responsible for making a decision under Section 17 of the *Environmental Assessment Act*, S.B.C. 2002, c. 43 (the Act) regarding whether to issue an EAC for Sukunka. For coal mines, the deciding provincial Ministers are the Minister of the Environment and Climate Change Strategy and Minister Responsible for TransLink, and the Minister of Energy, Mines and Low Carbon Innovation (EMLI).

On April 15, 2013, the federal Minister of the Environment approved the substitution of the British Columbia (B.C.) EA process for the federal process. The substituted process must meet the EA requirements of the *Canadian Environmental Assessment Act, 2012* (CEAA 2012).

The substitution approval was granted with the understanding that the EA would be conducted by the EAO in accordance with the Memorandum of Understanding (MOU) between the Impact Assessment Agency of Canada ('the Agency') and the EAO. The essence of the MOU on substitution is that the EAO would consider the factors as set out in subsection 19(1) of the CEAA 2012 when conducting the EA, would gather information from Indigenous Groups about the impacts of Sukunka on their potential or established Aboriginal Interests (Aboriginal Interests are Aboriginal rights, including Treaty rights, and title) and ways to prevent, mitigate or otherwise address those impacts as appropriate, and would provide an EA Report to the Agency that includes the findings and conclusions of the EA with respect to those factors. Ultimately, substitution results in one EA process designed to support the making of both provincial and federal EA decisions. Consistent with paragraph 34(1)(e) of CEAA 2012, the Report will be made available to the public during the final public comment period.

This Report:

- Provides an overview of the Project;
- Describes the substituted EA process, and consultation undertaken during the EA;
- Documents work undertaken by the EAO to consult and accommodate Indigenous Groups in accordance with the Supreme Court of Canada's direction in *Haida v. Minister of Forests* and related case law;
- Identifies the potential environmental, economic, social, health and heritage effects of Sukunka, including cumulative effects, and how Glencore proposed to mitigate adverse effects;

- Identifies the residual adverse effects after mitigation;
- Summarizes all environmental management plans, key mitigation measures and follow up plans described in the Application;
- Identifies the conditions proposed by the EAO to prevent or mitigate significant adverse environmental, social, economic, health or heritage effects, as well as potential adverse effects to asserted or established Aboriginal rights, including Treaty rights, and title (Aboriginal Interests);
- Sets out conclusions based on Sukunka's potential to result in significant adverse residual effects with respect to both the Act and CEAA 2012; and
- Documents procedural aspects of consultation with Indigenous Groups, including the Métis Nation of British Columbia and Kelly Lake Métis Settlement Society, on behalf of Canada.

This Report does not replicate the content presented in the Application. In the preparation of this Report, the following information has been considered:

- The Application and supplemental information provided by Glencore;
- Advice provided on the Application and supplemental information by the Working Group and Indigenous Groups; and
- Input received from members of the public.

This information has been posted to the EAO's Project Information Centre (EPIC) website under the project name Sukunka Coal Mine at <https://projects.eao.gov.bc.ca/p/sukunka-coal-mine/detail>.

## 1.1 READER'S GUIDE TO PART B OF THE ASSESSMENT REPORT

Each section in Part B of this Assessment Report focuses on a particular VC (Valued Component) or set of related VCs and ICs (Intermediate Component), and is structured with the following headings:

- **Background** – contains relevant background information for the VCs, primarily found in the Application.
- **Potential Project Effects and Proposed Mitigations Identified in the Application** – summarizes Glencore's assessment findings, description of residual effects and cumulative effects, and proposed mitigation measures as provided in its Application for an EAC and supplemental information.
- **Potential Project Effects and Proposed Mitigations Identified during Application Review** – describes key issues and concerns raised by Working Group members and the public during the Application Review period. Each description of a key issue or concern is typically followed by Glencore's response, including critical outcomes from any additional analysis. Many of the EAO's proposed conditions also include mitigations to further address the issues.

- **The EAO’s Characterization of Residual Effects** – contains the EAO’s analysis of all information received from Glencore, the Working Group and the public, and describes the EAO’s understanding of residual adverse effects of Sukunka.
- **Cumulative Effects Assessment** – contains the EAO’s analysis and determination of residual cumulative effects, including past, present and reasonably foreseeable projects and activities with the potential to act cumulatively with Sukunka.
- **The EAO’s Conclusions** – summarizes the EAO’s determination of whether the Project is likely to result in significant adverse effects on the VC or set of related VCs.

## 2.0 PROJECT OVERVIEW

### 2.1 PROPONENT DESCRIPTION

Glencore is a globally diverse natural resource company and a producer and marketer of over 90 commodities, including coal, operating worldwide. Glencore’s corporate headquarters is located in Baar, Switzerland, with an executive team located at a regional office in Vancouver, B.C.

The tenure for Sukunka is owned by Boreas Coal Limited (Boreas), a Glencore-controlled entity. Boreas is a jointly owned subsidiary of Glencore Coal Canada Resources Limited and First Coal Corporation.

Sukunka would be managed out of Glencore’s Vancouver office at:

#### **Glencore**

Suite 500, 666 Burrard St  
Vancouver, BC V6C 3P6  
Phone: 1 888-744-3551

### 2.2 PROJECT DESCRIPTION AND SCOPE

The purpose of Sukunka would be to produce hard coking (or metallurgical) coal that is saleable for export. Glencore proposed to develop and operate Sukunka as an open pit mine, which would produce up to three million tonnes per year (Mt/y) of saleable coal.

Sukunka would be located within the Peace River Regional District (PRRD), which is approximately 55 kilometres (km) south of Chetwynd and 40 km west of Tumbler Ridge, B.C. (see Figure 1: Communities Proximal to Sukunka). The Sukunka mine site would be located southeast of the Sukunka River and northwest of Bullmoose Creek. The Sukunka Project Development Area (PDA) would be 2,716 hectares (ha) (see Figure 2: Project Components).

The temporal boundary is defined as the life of the project, from Construction through Post-Closure

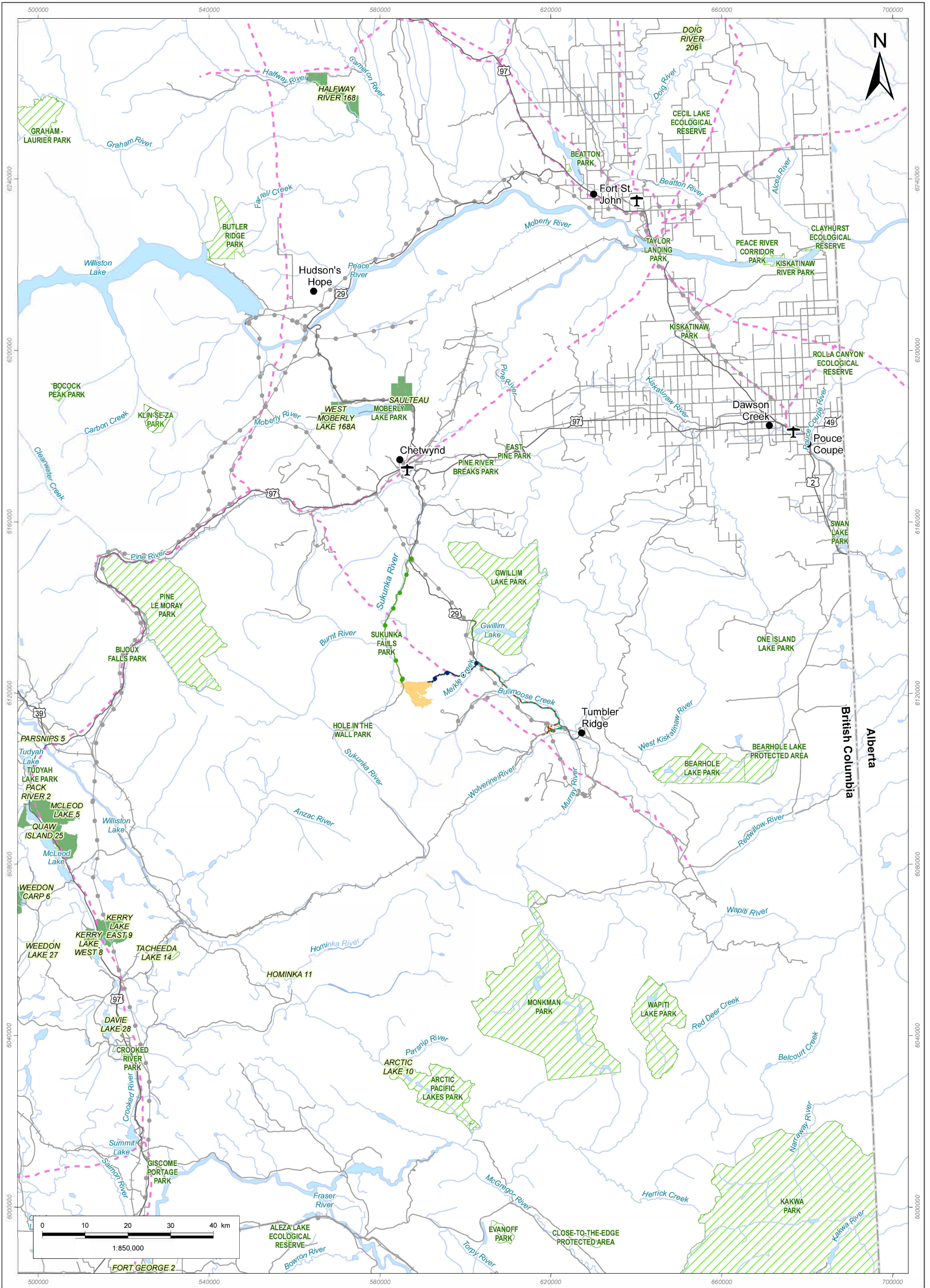
(phases are described in Section 2.2.3). For the effects assessments within this Report, the temporal boundaries are as follows:

- Construction phase: Years -2 and -1;
- Operations phase: Years 1 to 22;
- Closure phase: Years 23 to 29; and
- Post-closure phase: Years 30+

Glencore expects Sukunka would be commissioned in 2026, pending issuance of an EAC and subsequent regulatory approvals.

Sukunka would be located within the southwestern area of Treaty 8 territory and within 100 km of three Treaty 8 Nations communities, including West Moberly First Nation at 74 km, Saulteau First Nations at 75 km and McLeod Lake Indian Band at 95 km from Sukunka (Figure 1: Communities Proximal to Sukunka).

Figure 1: Communities Proximal to Sukunka



<p><b>SUKUNKA COAL MINE PROJECT</b></p> <p><b>COMMUNITIES PROXIMAL TO THE PROJECT</b></p>		<p>PREPARED BY:</p> <p><b>Stantec</b></p>
<p><b>Legend</b></p> <ul style="list-style-type: none"> <li>Airport</li> <li>City / Town / Village</li> <li>Highway</li> <li>Road</li> <li>Railway</li> <li>Pipeline</li> <li>Transmission Line</li> <li>Provincial Border</li> <li>Watercourse</li> <li>Waterbody</li> <li>First Nations Reserve</li> <li>Provincial Park</li> <li>Project Development Area</li> <li><b>Transmission Line Options</b></li> <li>Option 2</li> <li>Option 3</li> <li><b>Haul Options</b></li> <li>Option A</li> <li>Option B</li> </ul>		<p>PREPARED FOR:</p> <p><b>GLENCORE</b></p>
<p><i>Data Sources:</i> Glencore, Province of British Columbia, Government of Canada  <i>Disclaimer:</i> Although there is no reason to believe that there are any errors associated with the data used to generate this product or in the product itself, users of these data are advised that errors in the data may be present.  <i>File Path:</i> fig_123110482_eao_01_01_Communities_Proximal_to_Project</p>		
<p>DATE: 17-DEC-18</p> <p>FIGURE ID: 123110482</p>	<p>PROJECTION: UTM 10</p> <p>DATUM: NAD 83</p>	<p>DRAWN BY: S. PARKER</p> <p>CHECKED BY: P. HAYWARD</p>

## 2.2.1 PROJECT COMPONENTS

Glencore proposes to construct and operate an open pit mine and associated infrastructure including:

- Open pits;
- Waste rock stockpiles;
- Coal handling and preparation plant (CHPP);
- Water management structures, including water treatment plant and associated components, including buffer ponds and residuals management areas;
- Residuals management area;
- Mine infrastructure area;
- Mine infrastructure haul roads;
- Electrical transmission line and substation;
- Coal haul route / load-out facility;
- Explosives facility; and
- Employee camp.

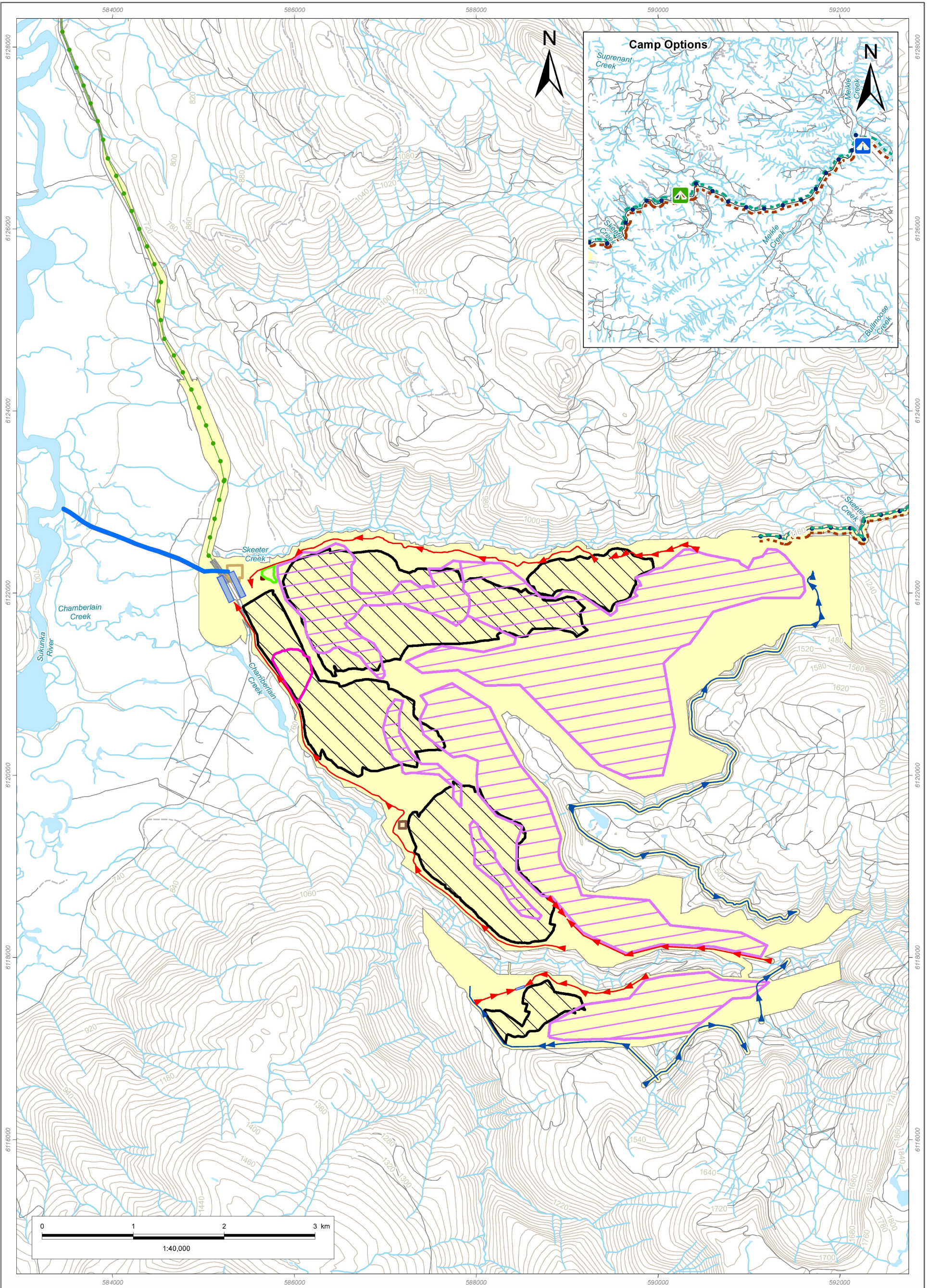
### 2.2.1.1 OPEN PITS

Six pits would be developed in sequence covering an area extending 5.5 km north-south and 3.5 km east-west. Mine plan designs call for a staged expansion of the footprint beginning in the northeast and northwest (near mine infrastructure), which would gradually progress towards the centre and south of the mine site. The pit design details are described in section 2.2.6.2.1.2 of the Application, the locations of which are shown in Figure 2. Glencore estimated that up to 3.0 Mt/y saleable coal would be produced from the pits.

### 2.2.1.2 WASTE ROCK STOCKPILES

Sukunka would utilize both external and in-pit waste rock stockpiles. External waste rock stockpiles (with additional backfilling in the pits) are designed to meet the need of approximately 436 million banked cubic metres of waste material to be mined from the pits over the 20+ year mine life of Sukunka. The stockpiles would be developed progressively as open pits are established. The location of the waste rock stockpiles are shown in Figure 2.

Figure 2: Project Components



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<p>Existing Road</p> <p>Trail</p> <p>Contour (m)</p> <p>Watercourse</p> <p>Waterbody</p> <p>Water Pipes and Access Road</p> <p>Sediment Pond</p>		<p>Collection Ditch</p> <p>Diversion Ditch</p> <p>Water Treatment Plant</p> <p>Residuals Management Area</p> <p>Lower Dump Lift</p> <p>Substation</p> <p>Open Pit</p> <p>Explosive Storage</p> <p>Waste Rock Stockpile</p> <p>Project Development Area</p>	<p><b>Haul Options</b></p> <p>Option A</p> <p>Option B</p> <p><b>Transmission Line Options</b></p> <p>Option #2</p> <p>Option #3</p> <p>Camp Option 1</p> <p>Camp Option 2</p>	<p align="center"><b>SUKUNKA COAL MINE PROJECT</b></p> <p align="center"><b>PROJECT DEVELOPMENT AREA</b></p> <p><i>Data Sources: Glencore, Province of British Columbia, Government of Canada</i></p> <p><i>Disclaimer: Although there is no reason to believe that there are any errors associated with the data used to generate this product or in the product itself, users of these data are advised that errors in the data may be present.</i></p> <p><i>File Path: fig_123110482_eao_01_02_Project_Development_Area</i></p>	<p>PREPARED BY:</p> <p align="center"></p> <p>PREPARED FOR:</p> <p align="center"></p>
<p>DATE: 17-DEC-18</p> <p>FIGURE ID: 123110482</p>		<p>PROJECTION: UTM 10</p> <p>DATUM: NAD 83</p>		<p>DRAWN BY: S. PARKER</p> <p>CHECKED BY: P. HAYWARD</p>	

Open pit mining would produce approximately 8.6 million tonnes (Mt) of reject coal over the 20+ year operating life of mine. Both coarse and fine (tailings) rejects with tailings representing less than 1% of the waste material. Combined coarse rejects and dewatered tailings would be co-disposed in waste rock stockpiles or backfilled in mined out pits. Co-disposal would occur by placing coarse rejects and tailings in independent layers, allowing the fine-grained tailings to infill the voids of the coarser-grained rejects, producing a single waste. Poor quality waste rock, with metal leaching (ML) or acid rock drainage (ARD) potential, would be consigned to in-pit waste rock stockpiles.

Glencore predicts that potentially acid generating (PAG) waste rock would be managed by blending it with non-PAG waste rock such that PAG rock would be neutralized and that the waste rock stockpile would not be anticipated to produce ARD.

The foundation of the stockpile, the pit footprint, and the access road would be cleared and grubbed before waste rock would be stockpiled. Soil considered suitable for reclamation would be removed and set aside for re-use during reclamation.

Waste rock stockpiles would be developed in an ascending construction sequence upon natural ground and include the following actions:

- Commissioning of water management structures, including the water treatment plant and associated components such as buffer ponds and residuals management area;
- Preparation of foundation across project development area;
- Development of foundation drainage (as required);
- Initial dump lift placement at specified height; and
- Ascending dump placement.

The typical waste rock stockpile development sequence is illustrated in Figure 2.2-7 in the Application. The waste rock stockpiles would range in height between 150 and 450 metres (m).

### 2.2.1.3 COAL HANDLING AND PREPARATION PLANT

Processing facilities (illustrated in Figure 2.2-5 of the Application) would consist of a coal handling and preparation plant (CHPP) and associated infrastructure including: process water management, run-of-mine coal stockpiles, and a load-out facility. The CHPP would have a sewage treatment facility, an operations office, coal testing laboratory and small maintenance shop building, and a reagent handling and storage facility.

The CHPP design would be a conventional coal plant with full washing, including fine coal flotation, and would have a capacity to process up to 7.5 Mt/y run-of-mine coal. The CHPP would consist of the feed, refuse and product material handling components and modular processing units. The run-of-mine coal from the open pit mining areas would be truck dumped on to one or more stockpiles (depending on the type or quality of coal being mined), fed into a breaker or crusher and conveyed to the raw coal stockpiles. From the raw coal stockpile coal would be fed to the CHPP via a surge bin.

Product coal would be stacked in stockpiles. Coarse rejects and thickened fine rejects would be conveyed to a bin for truck hauling into the waste rock stockpiles or backfilled into mined out pits.

Glencore would endeavor to recycle water as much as practicable. Recycled water would be pumped to the CHPP for reuse as process water. Sources of recycled water include:

- Precipitation that falls in the active mine pit that would be directed towards in-pit sumps and pumped to the CHPP; and
- Clarified water from truck washing (grey water) would be pumped to the CHPP.

#### **2.2.1.4 EROSION AND SEDIMENT CONTROL AND WATER MANAGEMENT STRUCTURES**

Structures to reduce erosion and manage water across the mine development area include:

- Engineered measures on cleared soils and soils replaced on reclaimed sites;
- Rolling dips and water bars on roads;
- Bioengineered/mulch placement measures on cleared soils and soils replaced on reclaimed sites;
- Engineering water management features for sediment control;
- Diversion channels for clean (non-contact) water;
- Collection channels for mine-influence (contact) water (open channel construction);
- Buffer pond and water treatment plant; effluent holding and flow attenuation ponds, and associated components;
- Water pipes and an access road for treated contact water discharge from the water treatment plant into the Sukunka River; and
- Clean water intake pipe and pumping system for potable water, fire water and process water systems from a water supply well field.

As part of the water management system, treated mine contact water is proposed to discharge from the water treatment plant through an enclosed pipe to the Sukunka River via a diffuser. Multiple alignment options for the pipe were proposed and are discussed in detail in Section 2.4 and illustrated in Figure 2.4-2 of the Application. The proposed option D for the pipe alignment was chosen as the preferred option because it has the least overlap with wetlands and blue-listed ecosystems and would also maintain a 100 m buffer for the riparian zone around Skeeter Creek.

#### **2.2.1.5 MINE INFRASTRUCTURE AREA (MIA)**

Maintenance and administration infrastructure would be located on the northeastern edge of the project development area. The centralized buildings in the MIA would be constructed in a mined-out pit that is excavated in the first year of construction.

The facilities located in the MIA would include: a mine office and wash house, heavy vehicle maintenance shop, warehouse and materials storage, truck wash, tire shop, fire truck and mine rescue station, fuel depot, sewage treatment facility, waste collection facility, communications infrastructure, water supply infrastructure, natural gas infrastructure, electricity distribution infrastructure, substation and helipad.

### 2.2.1.6 MINE INFRASTRUCTURE HAUL ROADS

Mine site haul roads would be developed along the edges of the pits, to the east of Chamberlain Creek and south of Skeeter Creek, to provide access for mining and support equipment between the pits and the CHPP. Other haul roads would be constructed within the active mining area as required during operation.

### 2.2.1.7 ELECTRICAL TRANSMISSION LINE AND SUBSTATION

Three transmission line route options were assessed in the EA; however, Option 1 was removed by Glencore during Application Review. Only two remaining options are being considered by Glencore for supplying power to the mine site, which were both assessed during the EA. If Sukunka is issued an EAC, only one option would be built:

- Option 2 would be a 16 km route which includes a 230 to 69 Kilovolt (kV) substation on Highway 29 (Don Philips Way) near Meikle Creek Haul Road, a 69 kV transmission line along Meikle Creek Haul Road to the site, which would be then stepped down to 25 kV; or
- Option 3 would be a 33 km route which includes a 128 kV transmission line from the SKN substation to a new 128 kV to 69 kV substation, near Sukunka Falls Provincial Park and a 69 kV transmission line to the mine site along Sukunka Forest Service Road to the site, which would be then stepped down to 25 kV.

For a detailed description of transmission line routes see section 2.4.1 in the Application and Figure 3 below.

### 2.2.1.8 COAL HAUL ROUTE / LOAD-OUT FACILITY

Glencore proposes to haul coal on 40- to 50-tonne coal trucks from Sukunka along a newly constructed road and the upgraded Meikle Creek Haul Road down Highway 29 (Don Philips Way) to one of two load-out facilities (See 3).

The Meikle Creek Haul Road would start at the northeast corner of Sukunka. It would extend east and connect with the existing Meikle Creek Haul Road that services wood lots and Talisman gas compressor stations and natural gas collection network. The new road and the existing Meikle Creek Haul Road would be upgraded to a two-lane gravel road. The new road would accommodate trucks to transport coal product to the rail load-out facility. This haul road would also be the main access road to Sukunka for operation personnel, service personnel and visitors. The estimated truck traffic during peak operations is 13 trucks per hour.

The distance from the CHPP along Meikle Creek Haul Road to the connection with Highway 29 would be approximately 16 km, and the distance along Highway 29 and to the final load-outs would be 12-18 km, depending on the rail load-out option chosen (see 3). Coal would be transported by trucks to a rail load-out facility along Meikle Creek Haul Road and Highway 29 Don Philips Way to either the:

- Bullmoose load-out, an existing load-out facility, 45.1 km from Sukunka just north of the municipality of Tumbler Ridge (Option A); or

- A new load-out outside of Tumbler Ridge (Option B).

The rail load-out would consist of a bottom dump style truck dump pocket, conveyor reclaim and transport to two silos, two 11,000 tonne over the track style concrete “mass flow” silos, each capable of loading a unit train, and a 50,000 to 100,000 tonne overflow storage area.

#### **2.2.1.9 EXPLOSIVES FACILITY**

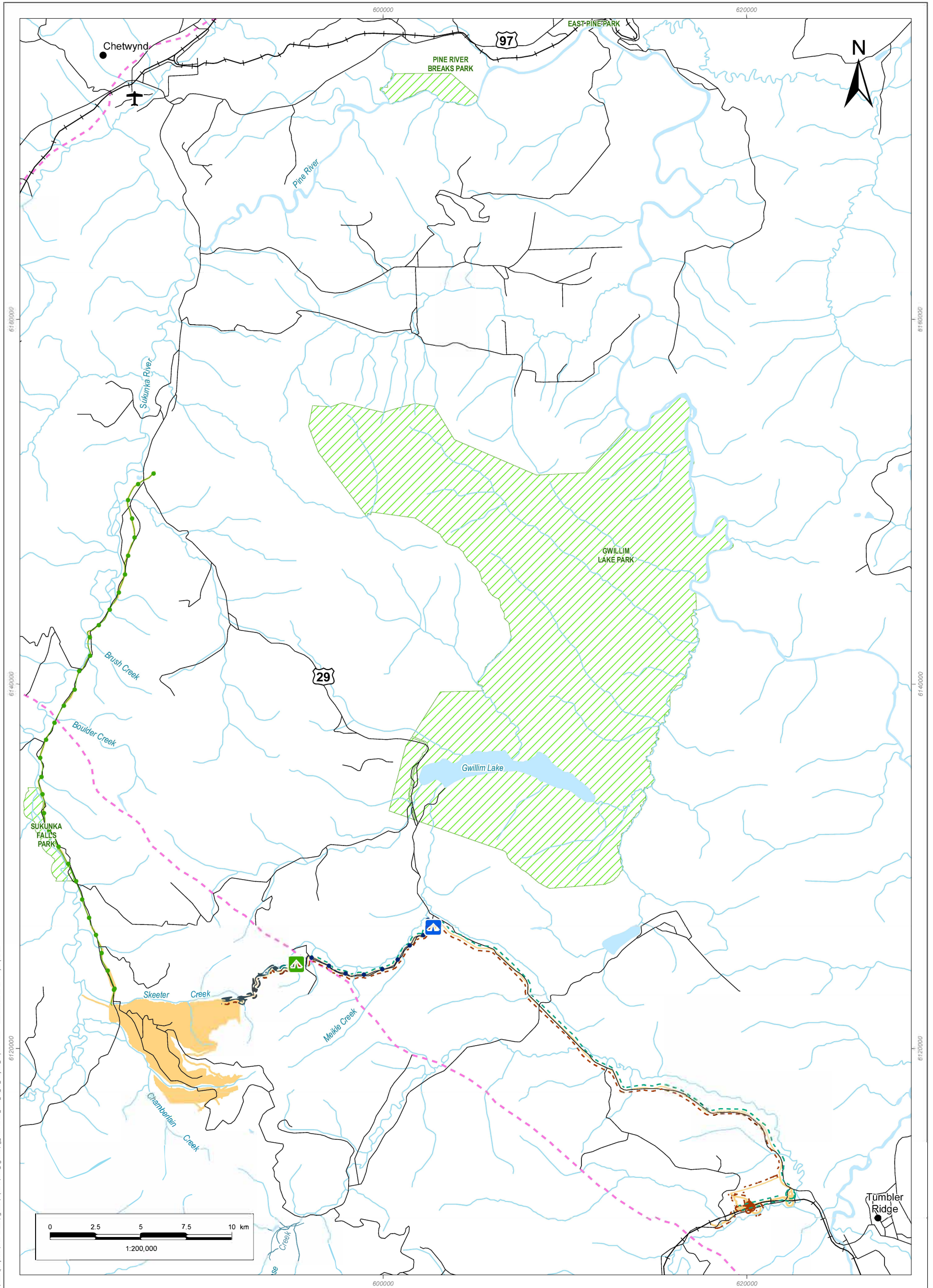
Open pit mining requires blasting to expose coal seams. Explosives would be manufactured and stored on site in an explosives manufacturing facility (or bulk explosives mixing plant), and would require an explosive factory license from Natural Resources Canada (NRCan) under the *Explosives Act*. The explosives manufacturing facility would be located to meet the requirements of the explosives permit and the quantity-distance criteria under NRCan’s explosives regulations. The explosives manufacturing facility would be located outside of the mine and mine infrastructure area but within the PDA, within 100 m of Meikle Creek Haul Road (see Figure 2). A fleet of mixing trucks would supply various explosives components from the plant to the pit during explosives loading operations.

Glencore developed a preliminary Explosives Management Plan (Section 20.A-4 of the Application) to ensure control of risks posed by the manufacture, storage, and use of explosives in the surface mine; avoid damage to personnel, environment, and equipment on the proposed Project; and ensure that all activities involving manufacture of explosives are compliant with regulations specified by the explosives factory license, under the federal *Explosives Act*.

#### **2.2.1.10 EMPLOYEE CAMP**

One approximately 250-person camp would be constructed and located along the Meikle Creek Haul Road at one of two proposed locations. During the Application Review stage of the EA, Glencore confirmed that the preferred camp location is situated at 8 km on the Meikle Creek Haul Road (see camp location option 1 in 3). Camp location 2 is situated near the connection of Highway 29 and the Meikle Creek Haul Road (see 3).

Figure 3: Coal Haul Route, Transmission Line and Substations, and Camp Options



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<p><b>●</b> City / Town / Village</p> <p><b>✈</b> Airport</p> <p>— Road</p> <p>— Railway</p> <p>— Existing Pipeline</p> <p>— Watercourse</p> <p>— Waterbody</p> <p>▨ Provincial Park</p>		<p>▨ Project Development Area</p> <p><b>Haul Options</b></p> <p>--- Option A</p> <p>--- Option B</p> <p><b>Transmission Line Options</b></p> <p>— Option 2</p> <p>— Option 3</p>	<p><b>🏠</b> Camp Option 1</p> <p><b>🏠</b> Camp Option 2</p>	<p><b>SUKUNKA COAL MINE PROJECT</b></p> <p><b>PROJECT LAYOUT</b></p>		<p>PREPARED BY:</p> <p><b>Stantec</b></p> <p>PREPARED FOR:</p> <p><b>GLENCORE</b></p>
<p><b>Date Sources:</b> Glencore, Province of British Columbia, Government of Canada</p> <p><b>Disclaimer:</b> Although there is no reason to believe that there are any errors associated with the data used to generate this product or in the product itself, users of these data are advised that errors in the data may be present.</p> <p><b>File Path:</b> fig_123110482_eao_01_03_Project_Layout</p>			<p>DATE: 17-DEC-18</p> <p>FIGURE ID: 123110482</p>	<p>PROJECTION: UTM 10</p> <p>DATUM: NAD 83</p>	<p>DRAWN BY: S. PARKER</p> <p>CHECKED BY: P. HAYWARD</p>	

## 2.2.2 PROJECT ACTIVITIES

### 2.2.2.1 SITE PREPARATION AND CONSTRUCTION

Glencore anticipates that the site preparation and construction phase would be completed over a one to two-year period. Construction activities would include:

- Site clearing for mine infrastructure and initial pits;
- Progressive clearing, grading, and topsoil removal (grubbing);
- Excavation of water management facilities, including diversion channels;
- Construction of mine infrastructure (camp, power, water supply, office, equipment repair);
- Construction of explosives facility;
- Construction and operation of water management components;
- Development of a haul road network;
- Preparation of an open pit mine;
- Construction of the coal handling and preparation plant (CHPP); and
- Development of transportation system: construction of rail load-out facilities and coal transport infrastructure from the Mine Site to the rail load-out facilities.

### 2.2.2.2 OPERATIONS

Once construction is complete, the operations phase would begin. The life of the mine is estimated to be 22 years. Operational activities would include:

- Mining, handling and processing of coal and waste rock;
- Deposition of waste rock in rock stockpiles and in-pit placement;
- Deposition of coarse rejects in waste rock stockpiles;
- Operation of sediment control and water management facilities;
- Progressive reclamation of disturbed areas;
- Environmental monitoring, supervision, and surveillance; and
- Loading of coal into trucks and rail cars for transport by CN Rail to Prince Rupert or an alternative Canadian West Coast port.

### 2.2.2.3 RECLAMATION, CLOSURE AND POST-CLOSURE

Reclamation of Sukunka would occur progressively, commencing during the operation phase and continuing through closure and post-closure. Glencore would be required to reclaim the proposed Project area to an average capability of the predevelopment conditions.

Reclamation activities are likely to include water quality management, geotechnical stability assessments, the protection of watersheds, as well as creating functional landscapes and ecosystems that include land capability for vegetation and wildlife habitat.

A preliminary Reclamation Plan is described in Appendix 20.0-A-14 of the Application.

### 2.2.3 ALTERNATIVE MEANS OF UNDERTAKING SUKUNKA

The Application includes a comparative evaluation of alternative means that are technically and economically feasible of implementing and carrying out various aspects of the proposed Project, consistent with paragraph 19(1)(g) and paragraph 34(1)(a) of CEAA 2012.

The specific alternative means that were evaluated included the following:

- Layout of project components, including location of work camp and CHPP, and water pipe alignment;
- Transmission line route options; and
- Haul route/load-out options.

The evaluation of alternative means was conducted using the following approach:

- Technical description for the project alternative;
- Economic feasibility of implementing the alternative;
- The potential for Project-related environmental effects, including the environmental effects as identified in Section 5 of CEAA 2012; and
- Discussion of the rationale for the selection of the preferred alternative.

#### 2.2.3.1 EMPLOYEE CAMP

Glencore evaluated three locations of the employee camp based on the level of accessibility early in project construction and economic feasibility. All three camps locations were considered economically feasible. However, with updated mine designs, the original mine infrastructure area (MIA) camp location was determined to have a low level of accessibility early in the mine construction phase and was no longer considered feasible. Camps 1 and 2 have a high level of accessibility early in the mine construction phase.

Glencore considered the construction cost and the potential for environmental effects in determining the location of the work camp. Camp 1 option would be on a previously cleared site along Meikle Creek Road. This reduces construction costs and potential for environmental effects from additional clearing. Camp 2 option would be located in caribou low elevation ungulate winter range critical habitat. Therefore, camp 1 is the preferred option for the construction camp location. However, both camp 1 and camp 2 were carried forward for consideration in the EA.

#### 2.2.3.2 COAL HANDLING AND PREPARATION PLANT (CHPP)

Glencore evaluated three sites for the CHPP based on constructability and economic feasibility. All three options were considered economically feasible and constructible and were carried forward in the EA. Glencore considered the following selection criteria for CHPP sites: potential for interference with mine development, haul distances and costs, potential for environmental effects and community views on haul options.

### 2.2.3.3 WATER PIPE ALIGNMENT

Glencore initially considered four options for the water pipe alignment (see Figure 2.4-2 in the Application). Glencore considered the constructability, economic feasibility and environmental impact in its evaluation. All four options for the water pipe were considered feasible and were carried forward for further assessment. Glencore then considered the following selection criteria for water pipe alignments: avoidance of listed ecosystems, wetlands, and stream riparian areas. Based on the criteria above, Glencore selected a preferred option for the water pipe alignment that would have the least overlap with wetlands and blue-listed ecosystems and would maintain a 100 m buffer for the riparian zone around Skeeter Creek.

### 2.2.3.4 TRANSMISSION LINE ROUTE

Glencore evaluated three options for the transmission line route and considered the following feasibility criteria: constructability, economic feasibility, and power capacity. All three transmission line options were considered constructible and economically feasible and met the minimum requirements of providing a minimum 25 kV power supply. All three options were carried forward for consideration in the EA.

Glencore is seeking authorization for both options 2 and 3, although Glencore selected option 3 as the preferred transmission line route based on the construction cost and potential for environmental effects. Only one option would be built.

### 2.2.3.5 HAUL ROUTE / LOAD-OUT OPTIONS

Glencore evaluated five road and rail options (haul options) based on constructability and economic feasibility. All five options were considered feasible and were carried forward to the EA. However, during the Application Review, the rail option was removed from the Project Description.

Glencore considered the following selection criteria for the four haul options: construction cost, potential for environmental effects, route capacity (including capacity for additional volume) and community and Indigenous group concerns. Based on these criteria, Glencore selected four haul route options which were carried forward to the EA. Following submission of the EA, two of the four haul route options were removed from the Project Description (Options D and E – see Section 2.2.2 for detail on the remaining two options).

## 2.2.4 PROJECT DESIGN AS A RESULT OF THE ENVIRONMENTAL ASSESSMENT

A summary (as identified by Glencore) of project design features, including changes, that occurred during the EA prior to the 2018 suspension is provided in [Table 1](#).

**Table 1: Project Design Features or Measures Resulting from Working Group, Indigenous Group and Public input in the EA Process**

PROJECT FEATURE	PROJECT DESIGN MEASURES	CHANGE IN POTENTIAL EFFECTS
<b>Underground mine</b>	Removal of the underground component of mine.	Reduced potential exploration surface disturbance in caribou habitat.
<b>Tailings storage facility</b>	Removal of tailing storage facility (dam). Tailings would be dewatered and co-disposed with waste rock in stockpiles.	The CHPP would use a closed water circuit process that dewater tailings enabling co-disposal with mine waste rock improving PAG management and control of discharge water quality.
<b>Mine features</b>	The mine features in the Saddle Creek area are no longer components of the proposed Project and removed from the EA including: Saddle Creek pit, potential underground mine areas, and the waste rock stockpile.	Reduced potential exploration surface disturbance in caribou habitat.
<b>Size of open pits</b>	Reduction of the size of open pit features to reduce the amount of disturbance in high-elevation summer caribou habitat from 256 ha to 124.7 ha.	Reduced potential surface disturbance in caribou habitat.
<b>Clean water diversion ditch</b>	Reduction of the total disturbance area of the clean water diversion ditch in high-elevation winter habitat for caribou from 23 ha to 7.8 ha.	Reduced potential surface disturbance in caribou habitat.
<b>MIA and CHPP</b>	Relocation of the MIA and CHPP from the northwest of the lease area to the northeast.	Site selection optimizes coal haulage and minimizes site disturbance and conflict with other mine activities.
<b>Construction camp</b>	Removal of the construction camp options from the previous MIA location to two potential locations on Meikle Creek Haul Road.	Site selection is based on improving safety and security, constructability and reducing interference with mining activities.
<b>CHPP</b>	Removal of the central CHPP option.	Site selection improves constructability and reduces coal haulage.
<b>Transmission line</b>	Removal of transmission line option 1.	Reduces potential adverse effects associated with fish and fish habitat, and wildlife resources.
<b>Haul route</b>	Removal of haul route option D.	As the PDA diminishes in area, it is anticipated that the removal of Haul Option D would reduce potential adverse effects associated with fish and fish habitat, wildlife resources, vegetation resources, air quality, social environment, and human and ecological health.

PROJECT FEATURE	PROJECT DESIGN MEASURES	CHANGE IN POTENTIAL EFFECTS
<b>Haul route</b>	Removal of haul route option E.	As the PDA diminishes in area, it is anticipated that the removal of Haul Option E would reduce potential adverse effects associated with fish and fish habitat, wildlife resources, vegetation resources, air quality, social environment, and human and ecological health.
<b>Fish habitat mitigation and offsetting</b>	Revised proposed fish habitat offset plan to increase the amount of instream and riparian habitat created. Proposal to construct clear-span bridges on fish bearing crossings on Meikle Creek Haul Road and to avoid aquatic footprints for the Chetwynd Transmission line crossing in order to reduce residual effects to fish habitat that would require offsetting.	Reduced potential effects to fish and fish habitat.
<b>Water management structures, including residuals management</b>	Change to active water treatment from in-situ attenuation via saturated backfill. Proposed water treatment is permanent or until water quality is confirmed to be suitable for release to the environment without the need for treatment.  Proposal to construct a lined contact water buffer pond (as a component of the active water treatment plant) and a lined water treatment residuals landfill to permanently store water treatment wastes.	Improves confidence in effectiveness of water quality mitigation.  Changes transmission line duration to potentially permanent duration.

## 2.2.5 PROJECT BENEFITS AND PURPOSE

This section summarizes the benefits of Sukunka during construction and operations, as reported by Glencore.

### 2.2.5.1 ECONOMIC BENEFITS FROM SUKUNKA CONSTRUCTION

[Table 2](#) provides a summary of Glencore’s estimated annual economic benefits from the construction of Sukunka. Sukunka would generate economic impacts through direct expenditures on goods and services, creation of employment opportunities and generation of tax revenues for local, provincial, and federal governments. Glencore estimates that approximately \$273.4 million would be spent in B.C. during the construction period.

**Table 2: Summary of Estimated Economic Benefits during Sukunka Construction (\$ millions)**

Type	Local (\$ millions)	B.C. (\$ millions)
<b>Direct Project Construction Expenditures</b>	45.8	273.4
<b>Contribution to Gross Domestic Product (GDP)</b>		

Type	Local (\$ millions)	B.C. (\$ millions)
Direct	-	141
Indirect	-	136
<b>Labour Income</b>		
Direct	14.4	94.6
Indirect	2.5	-
<b>Effects on Government Revenues<sup>1</sup></b>		
Federal Taxes	-	54.1
Provincial Taxes	-	34.5

Glencore estimated the 790 direct full-time equivalent (FTEs) during construction (year 1 and 2) would also be accompanied by 1470 indirect FTEs and additional induced employment in B.C. [Table 3](#) provides a summary of anticipated employment during the two-year construction period in B.C. and the local area.

**Table 3: Estimated Employment Impact during Sukunka Construction**

Type <sup>2</sup>	Local (FTEs)	B.C. (FTEs)
Direct	120	790
Indirect	40	1470
Induced	-	755
<b>Total Employment</b>	<b>160</b>	<b>3015</b>

### 2.2.5.2 ECONOMIC BENEFITS FROM SUKUNKA OPERATIONS

[Table 4](#) provides a summary of estimated annual economic benefits from operations. Sukunka would generate economic impacts through direct expenditures on goods and services, creation of employment opportunities and generation of tax revenues for local, provincial, and federal governments. Glencore estimates that approximately \$277.3 million would be spent annually in B.C.

**Table 4: Summary of Estimated Annual Economic Benefits during Project Operations (\$ millions)**

	Local (\$ millions)	B.C. (\$ millions)	Canada (\$ millions)
<b>Estimated Direct Expenditures in Canada (excluding labour)</b>	104.7	277.3	317.1
<b>Gross Domestic Product</b>			
Direct	-	428	429
Indirect	-	36	65
<b>Labour Income</b>			
Direct	20.6	69.9	69.9

<sup>1</sup> Includes direct, indirect, and induced employment

<sup>2</sup> Direct employment refers to employees of Sukunka. Indirect employment is generated by employers who supply goods and services to Sukunka. Induced employment refers to the increase in employment in the broader economy of the area based on the presence of the other types of employment.

	Local (\$ millions)	B.C. (\$ millions)	Canada (\$ millions)
Indirect	4.0	-	
<b>Government Revenues</b>			
Federal Taxes		29.4	
Provincial Taxes		36.8	
Municipal Tax Revenues		0.3	

[Table 5](#) provides a summary of anticipated employment benefits during project operations. Annual Project operations would be expected to create direct employment for approximately 543 FTEs per annum in B.C., with an average annual income of \$128,700.

**Table 5: Estimated Annual Operations Labour Force**

Positions	Annual Operation Employment (FTEs)
Miners	135
Skilled Trades	128
Professionals (mining and other)	44
Industrial labour	64
Inexperienced labour	172
<b>Total</b>	<b>543</b>

### 2.2.5.3 SUKUNKA CONTRIBUTIONS TO BUSINESS DEVELOPMENT

Sukunka would be expected to create procurement opportunities for businesses. In addition to increased spending resulting from employment wages, Glencore estimates that \$45 million would be spent on services contracted locally on capital goods. Glencore estimates that during operations, \$87.2 million would be spent annually on services contracted from the local area.

According to the Application, Glencore would procure goods and services from suppliers located in northeast B.C., elsewhere in B.C., and elsewhere in Canada. [Table 6](#) identifies the types of supply and service contracts anticipated at the local, provincial, and national level for construction and operations. The costs of reclamation, which would occur progressively through the operational phase, are included in the costs of operating Sukunka. The costs of closing the mine are estimated to be approximately \$50 million.

**Table 6: Regional Breakdown of Contractor Supply Services**

Business/Contract Type		Construction			Operations		
		Local	B.C.	Other Canada	Local	B.C.	Other Canada
Direct Labour			✓		✓	✓	✓
Services	Construction Services	✓	✓				
	Professional Services		✓			✓	
	Other Services		✓		✓	✓	

Business/Contract Type		Construction			Operations		
		Local	B.C.	Other Canada	Local	B.C.	Other Canada
Goods	Machinery	✓	✓	✓		✓	✓
	Spare parts and supplies	✓	✓	✓	✓	✓	✓
	Fuel				✓	✓	
	Utilities				✓	✓	
	Other Goods	✓	✓	✓	✓	✓	

#### 2.2.5.4 COMMUNITY AND SOCIAL BENEFITS OF SUKUNKA

In addition to the employment opportunities above, Glencore has committed to support community development by creating new employment and recruiting and training local or regional workers for these jobs. Glencore would continue to work with individual communities to identify and support community development programs that fulfil long-term community requirements and that, while having an immediate impact, can eventually become self-sustaining. Support would range from direct financial donations to in-kind contributions, technical skills and medical or other specialist support. Glencore's support for community development would be aligned with its business priorities and deliver value to its host communities in ways that it can consistently monitor.

## 3.0 AUTHORIZATIONS

In addition to provincial and federal EA approvals, Sukunka would need various authorizations from federal, provincial, and local governments.

### 3.1 FEDERAL REGULATORY ENVIRONMENT

[Table 7](#) lists several key federal permits, approvals, and authorizations that Glencore anticipates would be required for Sukunka, should it receive an EAC:

**Table 7: Anticipated Federal Permits and Authorizations**

Permit	Agency	Legislation	Description
Authorization of Explosives	Natural Resources Canada	<i>Explosives Act</i>	Authority under subsection 7(1) to work with explosives.
Authorization for works or undertakings affecting fish and fish habitat	Fisheries and Oceans Canada	<i>Fisheries Act</i>	Authorization under paragraphs 34.4(2) and/or 35(2) of the <i>Fisheries Act</i> to carry on a proposed work, undertaking or activity that may result in death of fish and/or harmful alteration, disruption or destruction of fish habitat.

### 3.2 PROVINCIAL AUTHORIZATIONS

Sukunka would require multiple provincial authorizations, licenses, and permits for Construction, Operations and Closure, including but not limited to those identified and described in [Table 8](#).

**Table 8: Potential Provincial Authorizations, Licenses and Permits**

Permit	Agency	Legislation	Description
Agricultural Land Commission permit	Agricultural Land Commission	<i>Agricultural Land Commission Act</i>	Authorization for non-farm use on agricultural reserve land
Refuse (Solid Waste) Permit	BC Ministry of Environment and Climate Change Strategy	<i>Environmental Management Act</i>	Authorization to discharge inert refuse into the receiving environment
Air Emissions Permit	BC Ministry of Environment and Climate Change Strategy	<i>Environmental Management Act</i>	Authorization to discharge air emissions into the receiving environment
Effluent Permit	BC Ministry of Environment and Climate Change Strategy	<i>Environmental Management Act</i>	Authorization for discharge from any water storage facility or diversion structure
Sewage Discharge Permit	BC Ministry of Environment and Climate Change Strategy	<i>Environmental Management Act</i>	Authority to discharge sewage into holding tank or construct subsurface disposal system
Hazardous Waste Permit	BC Ministry of Environment and Climate Change Strategy	<i>Environmental Management Act</i>	Authority for temporary storage of hazardous waste.
Road Use Permit	BC Ministry of Forests	<i>Forest and Range Practices Act</i> ; Road Use Regulation; Oil and Gas Regulation	Section 47 license to cut timber, road use permit for the approval to use forest service roads and petroleum development roads
Special Use Permit	BC Ministry of Forests	<i>BC Forest Practices Code Act</i>	Approval to construct an access road on Crown Land and construct access road /trails to access the railway corridor
Section 14 Heritage Inspection and Investigation Permits, Section 12 Site Alteration Permit	BC Ministry of Forests,	<i>Heritage Conservation Act</i>	Permission to conduct a field study to assess the archaeological significance of land or other property; Authorizes the removal of residual archaeological deposits once the inspection and investigation are completed
License of Occupation	BC Ministry of Forests	<i>Land Act</i>	Authorization to occupy Crown Land for a powerline right of way
Mines Act Permit	BC Ministry of Energy, Mines, and Low Carbon Innovation	<i>Mines Act and Code Part 8</i>	Permit to construct, operate and close/decommission a mine, including the approval of proposed work systems and

Permit	Agency	Legislation	Description
			reclamation program; Permit to store and use explosives, if applicable.
Camp Permit	Northern Health Authority	<i>Public Health Act</i>	Authority to operate a camp
Domestic Water System Health Permits	Northern Health Authority	<i>Public Health Act</i>	Approval for domestic water system construction and operation for camp
Camp Kitchen Health Permit	Northern Health Authority	<i>Public Health Act</i>	Authority to operate camp kitchen; responsibility of camp service provider
Permit to connect to powerline	BC Hydro	<i>Safety Standards Act; Electrical Safety Regulation</i>	Permit to connect to powerline
Utility and Highway Access Permits	BC Ministry of Transportation and Infrastructure	<i>Transportation Act</i>	The approval to construct a utility within a highway right of way
Section 11 Approval for Changes In and About a Stream; Section 9 Approval, Water Use License	BC Ministry of Environment and Climate Change Strategy	<i>Water Sustainability Act</i>	Section 11 approval for changes in and about a stream, Section 9 water use license for the authority to divert and use surface water (formerly under section 8 of the <i>Water Act</i> )
Various approvals	BC Oil and Gas Commission	<i>Petroleum and Natural Gas Act</i>	Approvals for crossing pipelines, decommission and relocation of oil and gas infrastructure

If an EAC is issued, the Major Mines Office (MMO) will coordinate the permit review for Sukunka within EMLI, including public consultation. Permit issues raised during the EA were tracked and would be carried forward into the permit review process for resolution under the auspices of the multi-disciplinary Mine Review Committee.

### 3.3 LOCAL GOVERNMENT AUTHORIZATIONS

Glencore did not specify the requirement for any specific local government permits, approvals and/or authorizations.

## 4.0 ASSESSMENT PROCESS OVERVIEW

### 4.1 OVERVIEW AND SCOPE OF THE ENVIRONMENTAL ASSESSMENT

In conducting this EA, the EAO considered the potential environmental, economic, social, heritage and health effects, including cumulative effects, of the Sukunka Project for the provincial EA under the Act and the requirements under CEAA 2012 for the federal EA.

Table 9: Major Milestones of the B.C. and Federal EAs

Date	Milestone
January 25, 2013	The EAO issued an Order under Section 10 of the Act to start the Provincial EA.
April 15, 2013	The federal Minister of the Environment approved the EAO's request to have the provincial EA process substituted for the federal process in accordance with the <i>Memorandum of Understanding between the Canadian Environmental Assessment Agency and the British Columbia Environmental Assessment Office on Substitution of Environmental Assessments (2013)</i> .
May 6, 2013	The EAO issued an Order under Section 11 of the Act outlining the scope and procedures of the EA process. The scope of the assessment was required to consider the factors identified under Subsection 19(1) of CEAA 2012, and any environmental effects as defined by Section 5 of the Act.
June 14, 2013 to July 15, 2013	The pre-Application phase public comment period was carried out on the draft Application Information Requirements (AIR). An open house was held on June 24, 2013 in Chetwynd, B.C.
October 23, 2013	The EAO approved the final AIR, establishing the information that must be collected, analyzed and included as part of Glencore's application for an EAC. The AIR was developed to meet the purposes of the EA pursuant to both the Act and CEAA 2012.
January 21, 2015	Glencore submitted an application for an EAC (Application) for Sukunka.
January 21, 2015 to February 20, 2015	The EAO evaluated the Application against the AIR. The EAO extended the evaluation period by 14 days, until March 6, 2015, to allow Glencore to respond to evaluation comments before the EAO made the determination whether the Application met the AIR.
March 6, 2015	The EAO determined that the Application did not meet the AIR and made the decision to not accept the Application for detailed review.
March 19, 2015	The EAO amended the Section 11 Order, pursuant to Section 13 of the Act to address requirements for proposed mining projects as a result of the Mount Polley tailings facility breach.
June 9, 2015	The EAO amended the Section 11 Order, pursuant to Section 13 of the Act to reflect changes to Sukunka, including the removal of the underground mine and dedicated tailings storage facility.
August 4, 2015	The EAO accepted Glencore's Application under Section 16 of the Act.
August 10, 2015	The 180-day Application Review began.
August 19, 2015 to October 8, 2015	A public comment period was held during the Application Review phase.
January 21, 2016	On day 164 of the 180-day Application Review Period, at Glencore's request, the EAO suspended the Application review time limit for Sukunka under Section 24(2) of the Act to allow Glencore to gather additional information on caribou and water quality.
April 12, 2016	The EAO issued a Section 13 Order to add Doig River First Nation to Schedule B.
October 28, 2016	The EAO determined that the requested caribou information had been provided but the timeline remained suspended in relation to water quality information requests.
January 30, 2018	The EAO issued a Section 13 Order to add Halfway River First Nations to Schedule B.
August 23, 2018	The EAO determined that water quality information had been provided, but at the request of Glencore, the EAO suspended the timeline in order for Glencore, in consultation with Indigenous groups, to develop a report summarizing the outcomes of additional caribou regulatory discussions and implications to the Sukunka EA.
December 16, 2021	Glencore provided the report summarizing the outcomes of additional caribou regulatory discussions and implications for the Sukunka EA, beginning the EAO's review of whether the report met the criteria to begin the process for lifting the suspension.
March 4, 2022	Following further discussions between the FNITR and the EAO, Glencore requested an additional 60-day period to undertake further discussions and analysis in relation to caribou.
March 17, 2022	The EAO determined that the report submitted December 16, 2021 met the criteria outlined in the August 2018 suspension order, beginning a 60-day process to incorporate the information presented in the report into the EAO's referral materials. The EAO also indicated that an additional 60-day suspension would be issued once the 60-day process to incorporate the information from the suspension report had elapsed.

Date	Milestone
<b>May 16, 2022</b>	The EAO issued an additional suspension under Section 24 of the Act, suspending Application Review for a period of up to 60 days.
<b>July 15, 2022</b>	The 180-day Application Review time limit resumed.
<b>August 2, 2022</b>	The EAO held a 30-day public comment period on draft provincial referral materials and draft potential federal conditions.
<b>October 2022</b>	This Report and the EAO's Indigenous Consultation Report (in Part C of this Report) will be provided to the responsible provincial Ministers for consideration in their decision of whether to issue an EAC for Sukunka.

## 4.2 ROLE OF THE ADVISORY WORKING GROUP

The EAO established a Working Group, made up of federal, provincial, and local government staff or representatives with the mandates and expertise relevant to the review of Sukunka, as well as representatives of potentially affected Indigenous Groups listed on Schedule B of the Section 11 Order. See list of Working Group members in [Appendix 1: List of Working Group Members](#).

The EAO sought and considered advice from the Working Group to understand and assess any potential adverse effects associated with Sukunka. Working Group members were responsible for providing timely advice to the EAO on:

- Key EA documents including, but not limited to, the selection of VCs, Application Information Requirements, Application, the EAO's Assessment Report and proposed provincial conditions, and potential federal conditions;
- Government policy direction and/or gaps that could affect the conduct of the EA;
- Potential conflicts with the legislation and/or regulations of their organizations;
- EA information requirements, as compared with permitting design and information requirements; and
- Technical issues raised by the public and Indigenous Groups during the public consultation process.

Local governments were invited and/or participated in the working group, including the District of Chetwynd and the Peace River Regional District.

The following federal departments with specialist information or expert knowledge relevant to Sukunka participated in the evaluation and the review of Glencore's Application:

- The Agency provided guidance and information directly to the EAO regarding the substituted process and federal EA requirements under CEAA 2012, but did not participate in the Working Group;
- Environment and Climate Change Canada (ECCC) provided comments and information related to its regulatory and statutory responsibilities within the themes of vegetation resources, wildlife resources, surface water quality, human health, cumulative effects, and Aboriginal Interests;
- Fisheries and Oceans Canada (DFO) provided comments and information related to its regulatory and statutory responsibilities within the themes of fish and fish habitat;

- Health Canada provided advice and information related to its regulatory and statutory responsibilities in regard to human health, with a primary focus on Indigenous health;
- Natural Resources Canada (NRCan) provided advice and information related to its expertise in seismicity, geohazards, and sediment dispersion modelling; and
- Transport Canada (TC) provided comments on the AIR and information related to its regulatory and statutory responsibilities within the themes of navigable waters, rail safety, transportation of dangerous goods, accidents and malfunctions and Aboriginal Interests.

The EAO reviewed the adequacy of Glencore's responses to all comments received from Working Group members and held various meetings with Working Group members to discuss outstanding issues and concerns. In development of this Report and recommended provincial conditions, the EAO considered all comments and issues raised during the EA.

### **FIRST NATIONS INDEPENDENT TECHNICAL REVIEW (FNITR)**

McLeod Lake Indian Band, Sauteau First Nations, and West Moberly First Nations sent a letter to the EAO on February 6, 2015, indicating that they would be conducting a First Nations Independent Technical Review (FNITR) with the objective of creating a collaborative process with Glencore to resolve issues and ensure a sustainable development program for the entire lifecycle of the project.

When Doig River First Nation and Halfway River First Nation were added to Schedule B later in Application Review, they were invited by the FNITR to join; Doig River First Nation agreed to join, and Halfway River First Nation opted to conduct its own independent review of the materials. While the Sukunka EA process was suspended, McLeod Lake Indian Band informed the EAO that they would no longer form part of the FNITR; however, McLeod Lake Indian Band continued to engage with Glencore and the EAO collaboratively with the FNITR.

This group review approach allowed the four Indigenous groups to share resources, consult with Glencore and the EAO, and provide, in most cases, a shared view of the potential impacts to their Aboriginal Interests (asserted or established Aboriginal rights, including Treaty rights, and title).

Although the FNITR chose not to consult with the EAO thoroughly during the early part of Application Review, engagement gradually increased during the EA. Once drafting of Part C and conditions began, the EAO was working with the FNITR, McLeod Lake Indian Band, and Halfway River First Nation in a collaborative manner, including co-drafting of Part C and the Table of Conditions.

Glencore and the EAO's engagement with Indigenous groups is summarized in Part C of the Assessment Report.

## **4.3 INDIGENOUS CONSULTATION**

On May 6, 2013, the EAO issued an Order establishing the scope and procedures of the EA (Section 11 Order) which specified the consultation activities that both the EAO and Glencore would undertake with all Indigenous Groups potentially affected by Sukunka.

At the initial stages of the EA for Sukunka, the EAO conducted a preliminary assessment to determine whether an Indigenous Group would be included on Schedule B or C of the Section 11 Order.

Indigenous Groups in Schedule B of the Section 11 Order were consulted at the deeper end of the consultation spectrum, and provided the following opportunities:

- Participation in the Working Group;
- Participation in meetings to identify and discuss the exercise of proven and asserted Aboriginal Interests that may be affected by Sukunka and potential measures to avoid, mitigate, address or otherwise accommodate impacts;
- Review and comment on key documents, including the draft AIR, Glencore's Application, and the EAO's draft proposed conditions, Summary and Assessment Reports, as well as co-drafting the Indigenous Consultation Report (Part C);
- Submission of a document outlining the Indigenous Group's views on the Summary and Assessment Reports to be included in the package of materials sent to the provincial Ministers when Sukunka is referred for decision;
- Notification of key milestones – such as the issuance of the AIR, acceptance of the Application for review, timing of public comment periods (including open houses) – when the final Assessment Report is referred to Ministers and the resulting decision;
- The ability to submit a separate report to the Ministers on behalf of the Indigenous group;
- Invitation to meet with the EAO to discuss any Aboriginal Interests in the Project area; and
- Review and comment on potential draft federal conditions during the final public comment period.

Indigenous Groups in Schedule C of the Section 11 Order were consulted at the lower end of the consultation spectrum, and provided the following opportunities:

- Notification of key milestones – such as the issuance of the AIR, acceptance of the Application for review, timing of public comment periods (including open houses) – when the final Assessment Report is referred to the provincial Ministers and the resulting decision;
- Invitation to meet with the EAO to discuss any Aboriginal Interests in the Project area;
- Invitation to review and comment on the EAO's draft Summary and Assessment Reports, including the Indigenous Consultation Report; and
- Review and comment on potential draft federal conditions during the final public comment period.

Indigenous Groups consulted at a deeper level (i.e., on Schedule B of the Section 11 Order) were:

- West Moberly First Nations;
- Sauteau First Nations;
- McLeod Lake Indian Band;
- Doig River First Nation (from April 12, 2016, when added to Schedule B); and
- Halfway River First Nation (from January 30, 2018, when added to Schedule B).

Indigenous Groups consulted at a notification level (i.e., on Schedule C of the Section 11 Order) were:

- Blueberry River First Nations;
- Fort Nelson First Nation;
- Prophet River First Nation;
- Horse Lake First Nation;
- Kelly Lake Métis Settlement Society; and
- Métis Nation BC.

Further detail regarding consultation with Indigenous Groups is provided in Part C of this Report.

### 4.3.1 MEETING THE CROWN'S DUTY TO CONSULT AND ACCOMMODATE INDIGENOUS GROUPS

The EAO is required to ensure that the honour of the Crown is discharged by ensuring appropriate consultation and accommodation of potential impacts of Sukunka on Aboriginal Interests in respect of the decision by Ministers as to whether to issue an EAC.

As Sukunka is also a federally substituted EA, the EAO is also responsible for the procedural aspects of consultation on behalf of Canada and is required to ensure that consultation is carried out in a manner consistent with Canada's determination of the scope and content of consultation. Indigenous Groups' comments and interests in terms of consultation and specific consideration of the Crown's duty to consult and accommodate Aboriginal Interests are factored into the analysis in Part C of this Report.

There is often considerable overlap between the interests of Indigenous Groups and the assessment of environmental, economic, social, heritage and health VCs. Indigenous Groups' comments and interests that directly relate to the environmental, economic, social, heritage and health assessments are discussed in Part B of this Report.

#### *Yahey v. British Columbia*

On June 29, 2021, the British Columbia Supreme Court (BCSC) released its decision in *Yahey v. British Columbia* (the *Yahey* decision) in which it ruled that the Province has unjustifiably infringed Blueberry River First Nations' Treaty 8 rights by authorizing industrial development in Blueberry River First Nations' traditional territory over many years. Justice Burke directed the Province and Blueberry River First Nations to work together to improve provincial land management and permitting processes to assess and manage cumulative effects while protecting Blueberry River First Nations' Treaty 8 rights.

The *Yahey* decision is a decision with implications for several industries on how the Province authorizes activities in Blueberry River First Nations and Treaty 8 territory. Additional information regarding the *Yahey* decision, as well as Indigenous Groups' comments and interests in terms of consultation and specific consideration of the decision are factored into the analysis in Part C of this Report.

### 4.3.2 FUNDS DISTRIBUTED BY THE EAO TO ASSIST INDIGENOUS PARTICIPATION AND CONSULTATION

The EAO distributed provincial funding to assist Indigenous Groups to participate in the EA process. Additionally, the EAO distributed funding provided by the Agency to support potentially affected Indigenous Groups' participation in the substituted EA. Refer to Part C of this Report for additional details regarding funding.

## 4.4 PUBLIC CONSULTATION

Public consultation is an important aspect of the EA process. The EAO required Glencore to prepare a Public Consultation Plan which laid out Glencore's consultation objectives and activities.

### 4.4.1 SUMMARY OF CONSULTATION ACTIVITIES LED BY GLENCORE

Prior to the start of the EA process, in 2012, Glencore contacted public groups with potential interest in Sukunka, including municipal employees, recreational users, and private land holders, regarding information on Sukunka and baseline field studies and programs.

Through the course of the EA, Glencore submitted multiple Public Consultation Reports to the EAO. The first Public Consultation Report (October 2013) was submitted during the Pre-Application Stage, the second (August 2015) was submitted with the Application, and the third (November 2015) was submitted during the Application Review. The Public Consultation Plan and all Public Consultation Reports are posted on the EAO's EPIC website at <https://projects.eao.gov.bc.ca/p/sukunka-coal-mine/docs?folder=131>.

During the Pre-Application stage, Glencore undertook several consultation activities in support of its Public Consultation Plan (as outlined in Glencore's Public Consultation Reports), including:

- Opening a community project office in Chetwynd (which has since been closed);
- Participating in the 2013 Chetwynd Chamber of Commerce Trade Show;
- Leading meetings with local governments (Chetwynd and Peace River Regional District), community groups and stakeholders (Chetwynd Outdoor Society and Snowmobile Club);
- Leading meetings with local land owners;
- Advertising the EAO-led open house and public comment period on the AIR through newspaper ads;
- Supporting one open house led by the EAO in Chetwynd during the public comment period on the AIR; and
- Maintaining open communication portals via email and toll-free information hotline, and Glencore's community newsletter.

In addition to the consultation activities listed above (which continued where applicable into the Application Review process), the following is a summary of the public consultation activities carried out by Glencore during the Application Review process, as outlined in Glencore's Third Public Consultation

#### Report:

- Advertising the EAO-led open house and public comment period on the Application through newspaper ads;
- Supporting one open house led by the EAO in Chetwynd during the public comment period on the Application; and
- Responding to public comments on the Application received during the public comment period.

Through public engagement during the EA, the EAO is satisfied with Glencore's understanding and responsiveness to the public interests.

### 4.4.2 SUMMARY OF CONSULTATION ACTIVITIES LED BY THE EAO

The EAO held three public comment periods and hosted two open houses during the EA.

- During the pre-Application phase, the EAO led a 32-day comment period, from June 14, 2013, to July 15, 2013, on the draft AIR document. One public comment was submitted during the public comment period. The EAO hosted an open house in Chetwynd on June 24, 2013, which was attended by approximately 15 people;
- During the Application Review phase, the EAO held a 50-day public comment period from August 19, 2015, to October 8, 2015, on Glencore's Application. The EAO hosted an open house in Chetwynd on September 1, 2015, which was attended by approximately 2 people. The EAO received comments from seven members of the public; and
- The EAO held a 30-day public comment period, from August 2 to September 1, 2022, on draft assessment package (including the EAO's draft referral materials and the draft potential federal conditions) at the end of 180-day Application Review stage and received comments from 991 members of the public.

Public consultation opportunities described in this section fulfill the requirements outlined in Paragraph 34(1)(b) of CEAA 2012 and section 4(b)(ii) of the MOU. Public input received during the public comment periods, as well as Glencore's responses are posted on the EAO's website. Below is a summary of the key issues or themes raised by the public during the Public Comment Periods:

- **Water Treatment** – Concerns about the uncertainties regarding the effectiveness of water treatment, including management of contact water, and assumptions that went into the water quality modeling;
- **Vegetation** – Concerns about the impacts to the Sukunka Lousewort Bog;
- **Soils** – Concerns about soil erosion control and soil loss during construction;
- **Water Quality** – Concerns about the potential for flooding events and risk to surrounding water quality, degrading a healthy watershed and impacting Indigenous groups' ability to fish;
- **Greenhouse Gas Emissions** – Concerns about GHG emissions from equipment and removal of trees;
- **Economic** – Concerns with the employment opportunities calculations, social impacts to local

communities, and employment loss post-closure;

- **Caribou** – Concerns about the loss of critical caribou habitat, potential risk of extinction to the Quintette herd and potential impacts to Indigenous groups based on this culturally-important species;
- **Climate Change** – Concerns that opening a coal mine will contribute to the increasing impacts of climate change including fires, heat domes, flooding and drought; and
- **Impacts to Indigenous Groups** – Concerns about the impacts of Sukunka on Indigenous groups, primarily related to the exercise of their Treaty rights to fish and hunt caribou.

The EAO carefully reviewed and considered all public input in reaching the conclusions and proposed conditions, found within this Report.

#### 4.4.3 SUPPLEMENTAL REQUESTS FOR INFORMATION DURING APPLICATION REVIEW

During Application Review, the EAO requested additional reference materials and supplemental information from Glencore to support the EA. The EAO's requests for additional information were primarily driven by concerns raised and requests from the Working Group and Indigenous Groups during the EA, including requests for additional information on water quality and caribou related to the suspension of the EA. Supplemental information provided to the EAO by Glencore during Application Review is described in the Issues Tracking Table available to the public on the EAO's website<sup>3</sup>. During Application Review, Glencore's responses to the Working Group comments on the Application and supplemental information were captured in the Issues Tracking Table, posted at the EAO's EPIC website<sup>4</sup>. The EAO has considered the comments from Working Group members and the responses from Glencore in the preparation of this Report.

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<sup>3</sup> Available at : <https://projects.eao.gov.bc.ca/p/588511c8aaecd9001b8259de/project-details>

<sup>4</sup> Available at:

[https://www.projects.eao.gov.bc.ca/api/document/62e457cb9e47b60022504724/fetch/tbl\\_suk\\_master\\_IRTable\\_20220729.pdf](https://www.projects.eao.gov.bc.ca/api/document/62e457cb9e47b60022504724/fetch/tbl_suk_master_IRTable_20220729.pdf)

## PART B – ASSESSMENT OF POTENTIAL EFFECTS, INCLUDING CUMULATIVE EFFECTS, MITIGATION, AND SIGNIFICANCE OF RESIDUAL EFFECTS

### 5.0 ASSESSMENT OF EFFECTS TO FISH AND FISH HABITAT

#### 5.1 BACKGROUND

Fish and fish habitat were selected as a VC due to the importance of local recreational and Indigenous fisheries, and because fish are important indicators of overall aquatic ecosystem health.

The results of the fish and fish habitat assessment are considered in the assessment of other VCs in this report, including:

- Human and Ecological Health ([Section 16](#)), which considers effects from changes in fish tissue metal concentrations on human and ecological health;
- Summary of Statutory Requirements under CEAA 2012 ([Section 17](#)), which assesses impacts to traditional use and fish and fish habitat; and
- Part C ([Section 20](#)), which considers the effects on Indigenous fishing interests.

##### 5.1.1 REGULATORY CONTEXT

Key legislation, policy, and other regulatory guidance documents relevant to the protection and management of fish and fish habitat in the Sukunka area are described below.

The federal *Fisheries Act*, administered by Fisheries and Oceans Canada (DFO), is the main statute related to the conservation and protection of fish and fish habitat. When Application Review for Sukunka began in 2016, the *Fisheries Act* (2012) prohibited ‘serious harm’ to fish that are part of, or support, commercial, recreational and Aboriginal (CRA) fisheries.

While Application Review was suspended (2016 to July 2022), a modernized *Fisheries Act* (2019) came into force, with amended provisions for fish and fish habitat protection and pollution prevention. Paragraphs 34.4(1) and 35(1) of the *Fisheries Act* (2019) now prohibit the death of fish by means other than fishing and the harmful alteration, disruption or destruction (HADD) of fish habitat. Activities that may result in death of fish or HADD of fish habitat that cannot be avoided or mitigated require authorization from DFO under paragraphs 34.4(2) and/or 35(2) of the *Fisheries Act* (2019), with mitigation and offsetting required to maintain or improve the productivity of fisheries.

While most of the EA process was completed in the context of the serious harm provisions under the *Fisheries Act* (2012), the fish and fish habitat protection provisions under the *Fisheries Act* (2019) now

apply and Sukunka would be assessed under the latter during any subsequent *Fisheries Act* authorization processes (should an EAC be issued). DFO provided comments on this chapter to the EAO regarding the changed context of the federal regulatory regime and implications for the residual effects characterization and any future permitting processes, should Sukunka receive an EAC. As such, this chapter summarizes the information provided in Glencore's Application in the context of the *Fisheries Act* (2012) and concerns raised by DFO about this chapter in relation to the changed regulatory context are further characterized in [Section 5](#) and referenced throughout this chapter where applicable.

In addition to the *Fisheries Act*, other legislation and policy relevant to the protection and management of fish and fish habitat in the Sukunka area include:

- CEAA 2012 aims to protect the components of the environment that are within federal jurisdiction including fish and fish habitat as defined in subsection 2(1) (paragraph 5(1)(a)(i) of the CEAA 2012;
- The provincial *Mines Act* (MA) and *Environmental Management Act* (EMA) include requirements for the management and protection of aquatic life and fish and fish habitat;
- The *Water Sustainability Act* (WSA) is BC's principal law for managing the diversion and use of water resources, and includes the Water Sustainability Regulation and Groundwater Protection Regulation;
- The federal *Species at Risk Act* (SARA) prohibits killing, harming, capturing, or harassing species listed (in schedule 1 of the Act) as endangered, threatened, or extirpated, and provides protection for habitat that supports these species. The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) assesses and identifies species at risk;
- The B.C. Conservation Data Centre (CDC) assigns species at risk to one of three ranked lists: red-, blue-, and yellow-lists. These lists help to identify species that can be considered for designation as Endangered or Threatened either provincially under the B.C. *Wildlife Act*, or nationally by the COSEWIC;
- The provincial *Riparian Areas Protection Act*, and associated Riparian Areas Regulation that protects features, functions and conditions of riparian areas to maintain stream health and fish productivity;
- The B.C. *Forest and Range Practices Act* provides guidance on discretionary and mandatory Riparian Management Areas around fish bearing streams, lakes, and wetlands, provides guidance on the rate at which wood can be removed from a watershed, and provides regulations on road building; and
- Under the provincial *Wildlife Act*, a Fish Collection Permit would be required for any fish salvage activities, fish for monitoring, or fish collection for tissue analysis.

Key relevant guidelines include:

- The Canadian Council of Ministers of the Environment (CCME) Water Quality, Sediment Quality and Tissue Residue guidelines, and the B.C. Water Quality guidelines (WQG) provide guidance on water quality requirements for aquatic life and wildlife consumers of aquatic biota; and
- The Fish-stream Crossing Guidebook (Revised Edition, September 2012), which provides practitioners with current legislative and technical reference material to guide the implementation

of sound fish-stream crossing practices to maintain fish passage and protect fish and fish habitat as required by the *Forest and Range Practices Act* and the federal *Fisheries Act*.

### 5.1.2 STUDY AREA DESCRIPTION

[Figure 4](#) shows the Local Assessment Area (LAA) and Regional Assessment Area (RAA) for fish and fish habitat and delineates the mine site and proposed haul and transmission line options. The LAA includes the following watercourses in the immediate vicinity of the Project components and haul options:

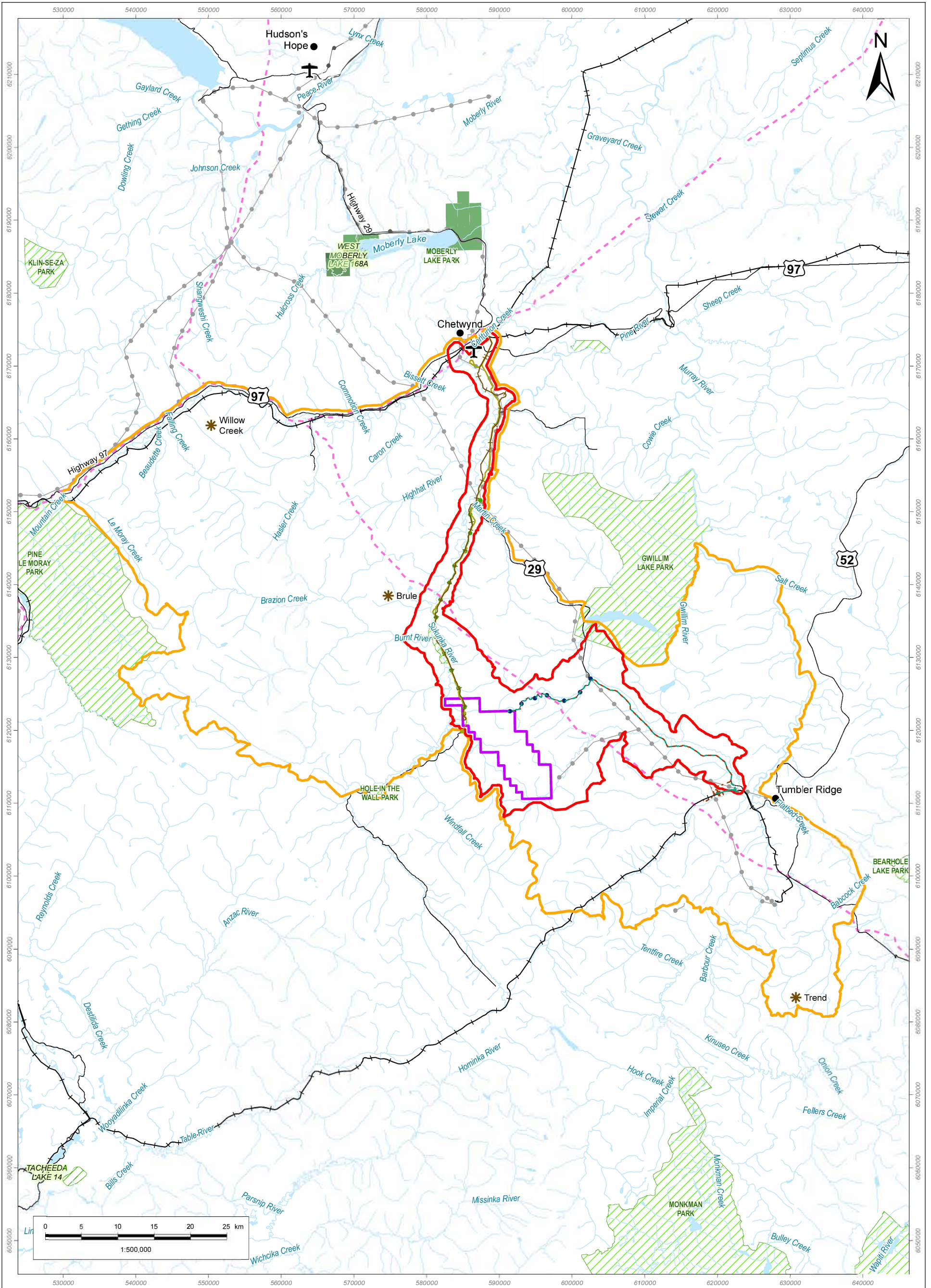
- Skeeter Creek and its tributaries;
- Chamberlain Creek and its tributaries;
- Bullmoose Creek and its tributaries near the proposed PDA;
- Meikle Creek and its tributaries; and
- Sukunka River and its tributaries.

The RAA is based on the overall watershed boundaries in the area, considering the extent of fish population movements and connectivity of watercourses and potential effects of other projects in the area. The RAA includes:

- Sukunka River from approximately 40 km upstream of the Burnt River confluence to its confluence with the Pine River;
- Bullmoose Creek from its confluence with west Bullmoose Creek to the confluence with the Wolverine River;
- Wolverine River from the confluence with Bullmoose Creek; and
- Murray River.

The temporal boundaries for the fish and fish habitat assessment include two years of construction, 22 years of operation, an approximate six years of closure for most of the mine site, and an additional post-closure period including a potentially permanent period of water treatment.

Figure 4: LAA and RAA for Fish and Fish Habitat



<ul style="list-style-type: none"> <li>Airport</li> <li>City / Town / Village</li> <li>Road</li> <li>Railway</li> <li>Pipeline</li> <li>Transmission Line</li> <li>Watercourse</li> <li>Waterbody</li> </ul>	<p><b>Transportation Options</b></p> <ul style="list-style-type: none"> <li>Option A</li> <li>Option B</li> <li>Option D</li> <li>Option E</li> </ul> <p><b>Transmission Line Options</b></p> <ul style="list-style-type: none"> <li>Option 1</li> <li>Option 2</li> <li>Option 3</li> </ul>	<ul style="list-style-type: none"> <li>Operating Mine Project</li> <li>First Nations Reserve</li> <li>Provincial Park</li> <li>Local Assessment Area</li> <li>Regional Assessment Area</li> <li>Sukunka Project Tenure Area</li> </ul>	<p align="center"><b>SUKUNKA COAL MINE PROJECT</b>  <b>FISH AND FISH HABITAT</b>  <b>LOCAL AND REGIONAL ASSESSMENT AREAS</b></p> <p align="center">ENVIRONMENTAL ASSESSMENT APPLICATION</p> <p><i>Data Sources:</i> Glencore, Province of British Columbia, Government of Canada  <i>Disclaimer:</i> Although there is no reason to believe that there are any errors associated with the data used to generate this product or in the product itself, users of these data are advised that errors in the data may be present.  <i>File Path:</i> fig_10482_ea_fish_ffh_05_01-01_fish_and_fish_habitat_local_and_regional_assessment_areas</p> <p>DATE: 23-FEB-15      PROJECTION: UTM 10      DRAWN BY: N. PUREWAL          FIGURE ID: 123110482      DATUM: NAD 83      CHECKED BY: A. PARSAMANESH</p>	<p>PREPARED BY:</p> <p align="center"><b>Stantec</b></p> <p>PREPARED FOR:</p> <p align="center"><b>GLENCORE</b></p>
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## 5.2 POTENTIAL PROJECT EFFECTS AND PROPOSED MITIGATIONS IDENTIFIED IN THE APPLICATION

Existing conditions, project interactions for the potential effects, and proposed mitigation measures are described in the subsections below.

### 5.2.1 EXISTING CONDITIONS

Glencore reviewed desktop information on fish and fish habitat and undertook field sampling of project area watercourses during the summer and fall of 2012, and the summers of 2013 and 2014, as described in Section 5.1.3 of the Application. [Figure 5](#) provides an overview of waterbodies and fish presence/absence near the proposed Sukunka mine site. The following paragraphs summarize the fish and fish habitat baseline for each waterbody that is expected to be directly affected by the Sukunka mine site.

Overall, bull trout were the focus of Glencore's assessment of fish and fish habitat because they are a provincially blue-listed species, and an important species in recreational and Aboriginal fisheries. The B.C. CDC conservation status report states that "Although the interior group of bull trout is considered relatively stable overall at present, there are many uncertainties associated with climate change and impacts to this highly temperature-sensitive species. Elsewhere (and in some B.C. areas based on climate-change predictive modelling as Porter and Nelitz 2009), bull trout have become increasingly isolated in cold headwater refuges, resulting in fragmentation of populations. Globally, this species is considered G3 [vulnerable to extirpation or extinction], and B.C. is considered the remaining stronghold for the species." Bull trout are particularly sensitive to development that removes riparian vegetation, as the subsequent loss of shading can lead to temperature increases in streams. Because bull trout populations do not act as metapopulations, genetic diversity can only be maintained through the conservation of as many populations as possible across species distribution and range.

#### 5.2.1.1 THE SUKUNKA RIVER

The Sukunka River originates in the Rocky Mountains and flows for 115 km north to its confluence with the Pine River, 16 km south of Chetwynd. The Sukunka River main channel meanders through a broad valley with adjacent wetland complexes, while tributaries to the river descend steeply from the hillsides to the valley floor, where they cross the floodplain to meet the Sukunka River. A 6 m waterfall and long cascade section, located 11 km downstream of the mine site, delineates the upstream limit of distribution of some fish species. Upstream of the falls, the Sukunka River supports several regionally important fish species, including mountain whitefish, bull trout, rainbow trout, longnose dace, longnose sucker, slimy sculpin, dolly varden, northern pike, arctic grayling, and lake chub. The Application also noted the presence of finescale dace.

#### 5.2.1.2 SUKUNKA WETLAND

About 1 km upstream of their confluence with the Sukunka River, Skeeter Creek and Chamberlain Creek disperse into a wetland complex that extends roughly 2.5 km along the Sukunka River. The wetland is located within the active floodplain of the Sukunka River, receiving water from annual flooding as well as

precipitation, groundwater, and surface flows from the creeks. The extent of the wetland varies from year to year with water inputs. Fish species captured in Glencore's surveys of the wetland in summer 2012 and 2014 were bull trout, slimy sculpin, rainbow trout, redbreast shiner, longnose sucker, and brassy minnow. The wetland is potentially accessible to all of the fish species occurring in the Sukunka River, but habitat use likely varies with water levels, time of year, and habitat requirements specific to species and life-stage. Expected habitat utilization includes overwintering in deep pools, rearing, and refuge during freshet high flows.

### 5.2.1.3 SKEETER CREEK

Skeeter Creek is a 13.2 km long stream flowing in a north-westerly direction along the northern side of the PDA. Water flow in Skeeter Creek follows a seasonal pattern typical for the Sukunka River Basin, with a winter low flow period (December-March), spring break up (April-May), peak freshet flows in June, late summer low flows (August-early September), high autumn flows related to rainfall events (September-October) and diminishing flows through fall and early winter (late October-early November). The lower section of Skeeter Creek can be completely dry upstream of its confluence with the Sukunka River, as was the case for 1.5 km in late August to late September 2012, disrupting access by fish species in the Sukunka River.

Glencore found fish in most of the length of Skeeter Creek, with a 50 m high waterfall blocking fish passage about 13 km upstream of the confluence with the Sukunka River, although a series of falls and cascades between 4.5 km and 4.8 km upstream of the confluence present partial barriers to fish passage. Glencore's 2012 field sampling captured rainbow trout, bull trout, and slimy sculpin. Longnose sucker has also been reported in Skeeter Creek. Glencore rated habitat quality for salmonid overwintering and rearing during the low flow winter and summer months to be poor in reaches of Skeeter Creek upstream of the Sukunka River floodplain due to the paucity of deep pools, high channel gradient, and discontinuous flow. Habitat quality for salmonid spawning, staging, and migration was considered moderate during spring and fall when flows were higher. Glencore rated the overall habitat quality for salmonids in Skeeter Creek as moderate.

A large, 2.9 km long tributary (SCT015) draining a headwater lake enters Skeeter Creek from the south about 6.5 km upstream of the confluence with the Sukunka River. Bull trout redds were observed near the confluence of this tributary and Skeeter Creek, but fish passage is prevented about 0.6 km upstream by a 4 m high waterfall, above which Glencore concluded the tributary is not fish-bearing, based on electrofishing and minnow trapping field sampling. Glencore identified that the only bull trout overwintering habitat in Skeeter Creek is found in a plunge pool directly below the falls.

### 5.2.1.4 CHAMBERLAIN CREEK

Chamberlain Creek is a 12.1 km long stream flowing northwesterly into the Sukunka River. For the purposes of the EA, Chamberlain Creek is considered to include the lower 6 km of the creek, plus the entire 7 km length of an unnamed major tributary (CCT011) that joins the creek at 6 km upstream of its confluence with the Sukunka River. A series of waterfalls about 8.5 km upstream from the confluence of Chamberlain Creek are considered permanent barriers to upstream fish passage. Most tributaries to the creek are high-gradient streams with cascades and waterfalls. Glencore found bull trout, long-nose sucker,

rainbow trout, mountain whitefish, and slimy sculpin in the fish-bearing reaches of Chamberlain Creek.

Flow in Chamberlain Creek follows the same seasonal pattern as the flows in Skeeter Creek, with the lower section of the creek running completely dry during low flow periods in late summer and during winter, preventing fish movement between Chamberlain Creek and the Sukunka River during this time. Glencore rated rearing and migration habitat as poor for Chamberlain Creek owing to the low flows and discontinuous habitat in the lower reaches in summer. Spawning, staging, and overwintering habitat were rated as moderate due to the higher flows in spring and fall, the presence of gravel and cobble substrates in most reaches upstream of the Sukunka River floodplain, and the presence of pools, particularly in the lower reaches. Glencore rated the overall habitat quality for salmonids in lower Chamberlain Creek as moderate.

[Table 10](#) provides a summary of fish species known to be present in the Sukunka River near Sukunka, Skeeter Creek, and Chamberlain Creek.

**Table 10: Fish species known to be present in Skeeter Creek, Chamberlain Creek, the Sukunka wetland, and the Sukunka River upstream of the Sukunka Falls (11 km downstream of the mine site)**

Fish Species		Documented in:			
Common name	Scientific name	Sukunka River	Sukunka Wetland*	Skeeter Creek	Chamberlain Creek
Rainbow trout	<i>Oncorhynchus mykiss</i>	x	x	x	x
Bull trout	<i>Salvelinus confluentus</i>	x	x	x	x
Dolly Varden	<i>Salvelinus malma</i>	x			
Mountain whitefish	<i>Prosopium williamsoni</i>	x			x
Slimy sculpin	<i>Cottus cognatus</i>	x	x	x	x
Longnose sucker	<i>Catostomus catostomus</i>	x	x	x	x
Longnose dace	<i>Rhinichthys cataractae</i>	x			
Finescale dace	<i>Phoxinus neogaeus</i>	x			
Redside shiner	<i>Richardsonius balteatus</i>		x		
Northern Pike	<i>Esox Lucius</i>	x			
Arctic Grayling	<i>Thymallus arcticus</i>	x			
Lake Chub	<i>Couesius plumbeus</i>	x			

Fish Species		Documented in:			
Common name	Scientific name	Sukunka River	Sukunka Wetland*	Skeeter Creek	Chamberlain Creek
Brassy Minnow	<i>Hybognathus hankinsoni</i>		x		

## Notes:

\* Glencore identified that the Sukunka River wetland is potentially accessible to all fish species occurring in the Sukunka River. Whether a particular fish species is present depends on the time of year and water level in the wetland, as these affect the availability of the habitat specific requirements for that species and life stage.

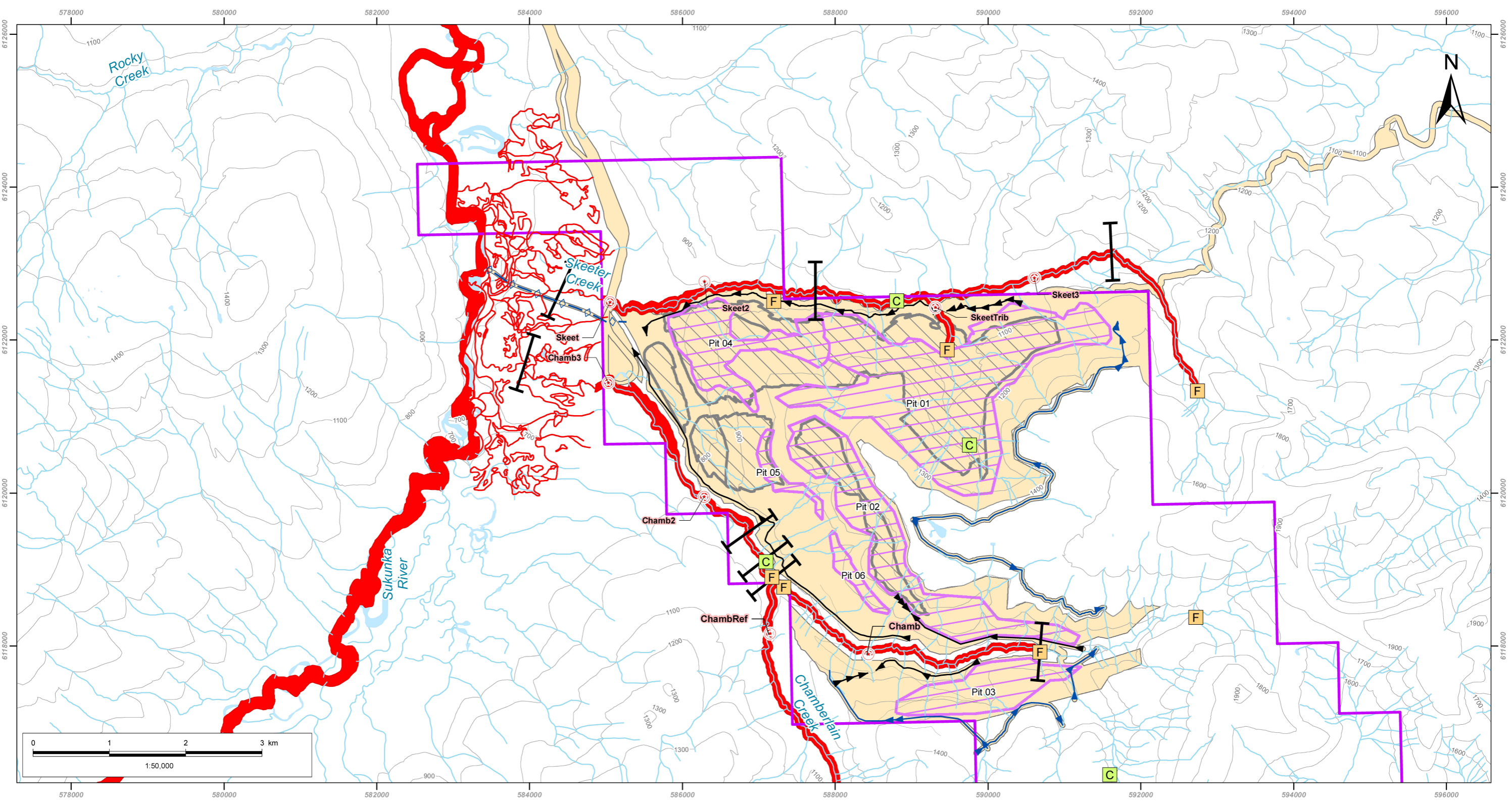


Figure 5: Fish presence/absence near the proposed Sukunka mine site

- Road
- Watercourse
- Countour Line (100 metre interval)
- Sukunka Project Tenure Area
- Waterbody
- Fish Bearing Watercourse
- Open Pit
- Waste Rock Stockpile
- Mine Boundary
- Waterfall (F)
- Cascade (C)
- Water Monitoring Node (star in circle)
- Reach Break (T-bar)
- Pipe (blue line with diamond)
- Collection Ditch (black arrow)
- Diversion Ditch (blue arrow)

**SUKUNKA COAL MINE PROJECT**  
**FISH-BEARING WATERCOURSES**  
**IN THE PROJECT AREA**  
 ENVIRONMENTAL ASSESSMENT APPLICATION

*Data Sources:* Stantec (2014), Glencore, Province of British Columbia, Government of Canada.  
*Disclaimer:* Although there is no reason to believe that there are any errors associated with the data used to generate this product or in the product itself, users of these data are advised that errors in the data may be present.  
*File Path:* fig\_10482\_ea\_05\_02-03\_wetland\_areas\_along\_lower\_skeeter\_and\_chamberlain\_creeks\_vers2

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			FIGURE NO:

### 5.2.1.5 TRENDS IN EXISTING CONDITIONS

Although no analysis was provided in the Application of how climate change might be expected to affect water flows, and thus fish habitat, Section 19 of the Application provided predictions that the 1961–1990 mean air temperature will increase by 3.5°C by 2040. Precipitation is predicted to increase in summer and winter, and snowpack and extreme precipitation events are expected to increase. The predicted increases in temperature are particularly relevant for bull trout, which are vulnerable to temperature increases.

## 5.2.2 POTENTIAL PROJECT EFFECTS

Glencore's assessment focused on impacts to fish species composition, distribution, and relative abundance during various life stages, particularly on stream systems that could be affected by mine-influenced drainage.

Glencore used a habitat modelling tool to estimate habitat effects from instream flow alteration in Skeeter and Chamberlain creeks. To assess potential fish habitat in the tributaries to Skeeter and Chamberlain creeks, which are difficult to access due to steep and hazardous terrain, Glencore conducted a GIS-based analysis using LiDAR elevation contours.

The main sources of effects to fish and fish habitat are construction and operation activities that could potentially alter or remove key components of fish habitat, change base flows, introduce substances into watercourses that are deleterious to fish, including through erosion, or cause the direct mortality of fish.

Glencore identified that the construction of mine infrastructure in streams and riparian areas (e.g. water intake and discharge structures, waste rock stockpiles, pits), haul roads, site water management, and water use and disposal have the potential to interact with fish and fish habitat. Glencore identified that Sukunka would result in:

- The removal of tributaries to Skeeter Creek and Chamberlain Creek, and diversion of their water to the Sukunka River;
- Flow reductions in Skeeter Creek and Chamberlain Creek;
- Potential impacts from stream crossings built or upgraded for the access routes and transmission line;
- Construction of a water pipe through the Sukunka River wetland; and
- Introduction of contaminants to fish habitat.

Glencore identified the following potential effects on fish and fish habitat:

- Permanent alteration or destruction<sup>5</sup> of fish habitat resulting from access route and transmission line upgrades; construction of the pipeline and access road through the wetland; and infilling of tributaries on the mine site;
- Effects resulting from flow alteration in Skeeter Creek, Chamberlain Creek; and the wetland near the Sukunka River, including:
  - Reduction in available habitat;
  - Reduction of available food and nutrients;
  - Change in peak flow timing and intensity (flushing flow) in Chamberlain and Skeeter creeks;
  - Change in behavioural cues (e.g., change in flow regime and/or water temperature); and
  - Change in habitat connectivity as a result of flow reduction;
- Increase in fish mortality risk; and
- Degraded water quality resulting from the introduction of contact water to Skeeter Creek, Chamberlain Creek and the Sukunka River.

#### 5.2.2.1 PERMANENT ALTERATION OR DESTRUCTION OF FISH HABITAT

Construction of preliminary Mine Site Water Management Plan components would disconnect the tributaries from Skeeter and Chamberlain creeks, diverting their water to the Sukunka River (via the sediment pond, treatment plant, and effluent pipeline). Seventeen tributaries of Skeeter Creek and nine tributaries of Chamberlain Creek would be affected, most of which are high-gradient, headwater, ephemeral, non-fish-bearing streams.

Over the course of Application Review, Glencore narrowed down their project design to two coal haul route options and two load-facilities. [Table 11](#) provides the estimated areas of instream fish habitat and riparian habitat directly affected by project components, considering the updated design proposed during the Application Review period.

Following Working Group input during Application Review, Glencore proposed to offset these losses by creating 2,400 square metres (m<sup>2</sup>) of instream overwintering and rearing habitat in a channel near the Sukunka River, and by planting appropriate vegetation species along the length of the newly created channel to create approximately 32,000 m<sup>2</sup> of functional riparian habitat.

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<sup>5</sup> While it is acknowledged that the proponent assessments were carried out under the previous *Fisheries Act (2012)*, DFO notes that “permanent alteration or destruction of fish habitat” was applicable under the *Fisheries Act (2012)*. During the permitting process, DFO will require a detailed description of any harmful alteration, disruption, or destruction (HADD) or death of fish (DoF) that may potentially occur because of Sukunka.

**Table 11: Estimated direct permanent alteration or destruction of fish habitat after mitigation**

Watercourse/ Watershed	Project Component	Fish- Bearing	Linear Distance (m)	Average Width (m)	Stream Class	Instream Area altered or destroyed (m <sup>2</sup> )	Riparian Habitat Width	Riparian Area altered or destroyed (m <sup>2</sup> )
Skeeter Creek Tributary SCT015 (Mine Site)	COP, CC, CWS	Yes	600	1.5	3	900 <sup>i</sup>	40	24,000
Meikle Creek and tributaries (Option B for Haul Road and Option 2 for Transmission Line)	Fish-bearing Crossings (3 fish-bearing crossings, one beaver dam complex)	Yes	40	Various	S2 and S3 <sup>ii</sup>	0 <sup>iii</sup>	0	0 <sup>iii</sup>
Sukunka River tributaries (Option 3 for Transmission Line)	Fish-bearing Crossings (32 fish- bearing, 3 beaver dam complexes)	Yes	Various	Various	S1, S2, S2, S4, WL, BDC	0 <sup>iv</sup>	Various	0 <sup>iv</sup>
Sukunka Wetland (Diffuser pipe and road)	Water pipe and its access road	Yes	100	2	Wetland	600 <sup>v</sup>	n/a	n/a
<b>Total potential impact: Skeeter Creek Tributary SCT015, Sukunka Wetland, Meikle Creek haul road, Sukunka FSR transmission line</b>	<b>Fish Bearing Crossings</b>	<b>Yes</b>	<b>Various</b>	<b>Various</b>	<b>S1, S2, S3, S4, WL, BDC</b>	<b>1, 500</b>	<b>Various</b>	<b>24,000</b>

Notes: CC: Collection Channel, COP: Conceptual Open Pit, CWS: Conceptual Waste Stockpile, WL: Wetland Complex, BDC: Beaver Dam Complex

i: Only the lower 600 m are considered fish-bearing.

ii: Values provided for affected habitat areas are estimates. Accurate instream areas affected would be surveyed and calculated during the permitting phase.

iii: Revised during Application Review, based on Glencore’s commitment to use clear-span bridges for crossings of fish-bearing streams. The bridges would replace existing culverts on the Meikle Forest Service Road which have already removed the riparian area at the three stream crossings requiring upgrades.

iv: Revised during Application Review, based on removal of haul road option, and Glencore’s commitment to not place any permanent structures for the transmission line in fish habitat, and apply best management practices.

v: Revised during Application Review, following feedback from DFO.

### 5.2.2.2 FLOW ALTERATIONS

[Appendix 2](#) contains tables showing mean monthly flow changes and mean annual flow changes for each assessment point during all project phases except Construction, which are summarized in the following section.

#### 5.2.2.2.1 Effects on Fish Habitat from Flow Alterations

Although Glencore provided bull trout habitat modelling results in the Application, Working Group members stated their lack of confidence in the results of this habitat modelling (see [Section 5.2](#), Potential project effects and proposed mitigations identified during Application Review). Further, Glencore did not update the bull trout habitat modelling results following the changes to project design to reflect the updated surface flow predictions. Glencore stated that there would be no substantial changes in the outcomes of the modelling, and that the original assessment of potential changes in bull trout habitat, which indicated no loss of bull trout habitat in Skeeter or Chamberlain Creek, would remain valid.

#### 5.2.2.2.2 Effects on Channel-Forming Processes

In addition to the flow changes described above, the Application predicted changes to five assessment points not considered in the updated modelling, which restricted predictions for flow changes to the flow nodes considered in the updated water quality model. Of these, the one with the most notable changes was assessment point SK05, located on a tributary to Skeeter Creek upstream of the Sukunka mine site. This tributary is assumed to be non-fish-bearing based on field observations, ephemeral flows, and steep gradient. The Application predicted a 769 percent increase in mean annual discharge during Operations at this assessment point, and up to a 1177 percent increase in June. This change can be attributed to the inflow of non-contact water captured by the diversion ditch. Glencore stated that the residual effect of this change on channel-forming processes, erosion, and downstream sedimentation in Skeeter Creek is low to negligible because:

- The unnamed tributary downstream of the diversion ditch would be armoured with rip-rap and an energy dissipater would be installed at the outlet of the diversion ditch to reduce erosion;
- The predicted increase in peak flows in April in this unnamed tributary represents only five percent of the baseline flows in Skeeter Creek at the model node immediately downstream (SKEET 3, located approximately 500 m downstream from the unnamed tributary); and
- Immediately downstream, Skeeter Creek is confined in a steep-sided canyon, with generally stable substrates.

As indicated in the summary tables included in [Appendix 2](#), mean flows in May, the month during which peak flows typically occur, would be expected to change due to Sukunka, although the nature and magnitude of the change would vary with the project phase and stream location. Mean flows in May are predicted be lower than baseline in upper Chamberlain Creek (Chamb [-17 percent to -19 percent] and Chamb2 [-6 percent to -7 percent]), and in lower Skeeter Creek (Skeet2 [-22 percent to -34 percent], Skeet [-6 percent to -7 percent]), during all project phases. May mean flows are predicted to increase in lower Chamberlain Creek (Chamb3, by 7-8 percent), and upper Skeeter Creek (up to 1 percent for Skeet3). Glencore did not provide updated predictions for peak flows in dry years, as had been provided in the

### Application.

Peak flows play an important role in maintaining in-stream habitat conditions for fish, by flushing fine sediment and organic material from gravel stream beds; depositing larger substrates; building or eroding banks; filling in or deepening pools; and adding and distributing coarse woody debris. Flood flows can also cause mortality to salmonids in the egg or alevin life stage. A significant decrease in flushing flow timing and intensity may cause increased sedimentation, which may lead to a lower egg-to-fry survival rate and lower production of aquatic invertebrates, in addition to altering channel morphology.

Glencore concluded that the changes to peak flows in Skeeter and Chamberlain creeks would not substantially alter channel-forming processes. Glencore stated that in Skeeter Creek, with its cobble and boulder substrates, the peak flows would still be sufficient to erode banks, contribute gravel to the creeks, and minimize channel infilling (i.e., via fine sediment deposition). In Chamberlain Creek, the largest change in peak flows (-19 percent) are predicted in the upper reaches of the creek, where the channel is steepest and has the largest substrates. In lower Chamberlain Creek, the seven percent predicted increase in May peak flows is not likely to be sufficient to alter channel forming processes. Glencore did state that a more detailed analysis of channel-forming processes may be required to assess potential effects of flow alterations in Skeeter Creek.

However, Glencore had previously clarified, in response to a comment from ENV, that it is possible that Sukunka would reduce bed material supply to lower Skeeter and Chamberlain creeks (due to the reduced catchment area), resulting in geomorphic changes to the creeks such as increased sediment deposition, channel narrowing (due to vegetation encroachment), or bed material coarsening.

#### **5.2.2.2.3 Reduction in Available Food and Nutrients**

Tributary flows carry organic material into mainstems of Skeeter and Chamberlain creeks to provide food and nutrients for aquatic invertebrates (the primary food supply for fish) and fish. Removal of flow input from tributaries of Skeeter and Chamberlain creeks may cause a reduction in available food and nutrients in these watercourses. The Application reported that in Skeeter Creek, the reduction in mean annual discharge may cause a reduction in available food and nutrients; however, this potential reduction may not be directly measurable. Glencore proposed a follow-up program to study the abundance and species composition of benthic and drifting invertebrates, an indirect indicator for reduction in available food and nutrients, in Skeeter Creek. The Application concluded that in Chamberlain Creek, the reduction in mean annual discharge would not have a measurable effect on the availability of food and nutrients.

#### **5.2.2.2.4 Behavioural Cues**

The natural flow regime in rivers provides behavioural cues (e.g., fall rain events) for fish for life processes such as migration or spawning. Bull trout in the Sukunka River with a fluvial life history may potentially migrate to Skeeter and Chamberlain creeks to spawn in September-October.

The Application stated that bull trout in Skeeter and Chamberlain creeks are expected to have a stream-resident life history, rather than a fluvial life history, because the lack of an open and well-defined channel through the Sukunka River wetland, coupled with a lack of surface flow during low flow periods (generally

late summer through winter) provide a barrier to fish passage. Therefore, Glencore argued that a change in flow regime in Skeeter and Chamberlain creeks would not have any measurable effect on behavioural cues for bull trout migration.

Flow regime alteration effects on temperature regime in streams may also affect behavioural cues for life processes such as spawning, egg incubation and larval development. It is noted that the critical period for the bull trout lifecycle is overwintering and egg incubation. Glencore stated there would be no measurable change in the Chamberlain Creek flow regime. In Skeeter Creek, Glencore predicted a reduction in winter flow in the lower sections. Glencore proposed a follow-up program to assess potential changes in water temperature and its effects on fish species in Skeeter and Chamberlain creeks.

### 5.2.2.3 INCREASE IN FISH MORTALITY RISK

Construction of Sukunka components such as open pits, waste rock stockpiles, sediment control structures, water management components (i.e., diversion and collection ditches) and access route water crossings would require destruction of fish-bearing watercourses (such as tributaries to Skeeter Creek and Chamberlain Creek). In addition, the following proposed activities could increase the risk of fish mortality in all assessed species due to the physical harming of fish or the introduction of deleterious substances into fish-bearing watercourses:

- During isolation of watercourses, diversion of streams, construction of watercourse crossings and the construction of mine infrastructure, fish can become stranded;
- During water extraction pumps used to divert flows around work areas (for the isolation of instream work site) and water withdrawal from streams for various uses can trap and harm or kill fish;
- Use of industrial equipment within the stream channel may cause mortality and harm to fish species present within the work area through direct crushing of fish and eggs, and disturbance of channel substrates that may contain alevins or other early life stages of fish;
- Blasting near fish habitat can induce pressure waves causing mortality and harm to fish;
- The introduction of blasting residues such as ammonia, can lead to fish mortality if released in sufficient quantities;
- Accidental release of sediments into watercourses during construction of mine components and watercourse crossings for the access route may cause an increase in turbidity, which could have both lethal and sub-lethal effects on fish and fish eggs; and
- Mine contact water containing metals, sulphates and other constituents may seep into fish-bearing watercourses during any phase of Sukunka and is also expected to be directly discharged to the Sukunka River.

### 5.2.2.4 WATER QUALITY IMPACTS

The EAO noted in [Section 6](#) that there was uncertainty regarding the effects on aquatic life in the lotic<sup>6</sup> waters of Skeeter and Chamberlain creeks due to the predicted changes in water quality. In the Sukunka River, the only predicted adverse effects to fish, specifically slimy sculpin, arise from the discharge of

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<sup>6</sup> Waters that are continuously in motion

selenium. Slimy sculpin have very small home ranges, and may be adversely affected by mine effluent due to selenium bioaccumulation in the initial dilution zone (IDZ). However, the number of slimy sculpin affected would represent a very small portion of the population of slimy sculpin in the Sukunka River. For lentic<sup>7</sup> waters (i.e., the Sukunka wetland), the EAO concluded that there is an increased risk that selenium would bioaccumulate to a greater extent, leading to potential adverse effects to egg laying vertebrates, such as fish, amphibians and birds.

Also, the addition of nitrates from blasting may lead to increased periphyton growth in Chamberlain Creek, which may result in effects to habitat and to the food web composition in Chamberlain Creek.

The EAO also notes the risk of erosion throughout the project life could affect water quality by introducing sediment to fish streams. The erosion potential mapping for the project noted 80 percent of the PDA has soils with moderate erosion potential, and 18 percent has soils with high erosion potential. Twenty five percent of the PDA is found in class IV and V<sup>8</sup> terrain.

The EAO proposes Condition 21: Water Quality Management requiring Glencore to manage downstream water quality impacts, Condition 23: Aquatic Effects Management and Monitoring Plan requiring aquatic effects monitoring and adaptive management, and Condition 14: Construction Environmental Management Plan requiring erosion and sediment control measures.

### 5.2.3 MITIGATION MEASURES

In addition to considering mitigation in project design, Glencore proposed the following measures to mitigate potential effects on the productive capacity of fish habitat and on fish mortality risk:

- Maintain an appropriate riparian buffer (based on stream class and direction in BC's Stream Identification Guidebook<sup>9</sup> and Riparian Management Area Guidebook<sup>10</sup>) between mine components (including temporary workspaces and stockpiles) and fish-habitat;
- Where possible, use existing roads and rights-of-way and install appropriate temporary crossing methods (e.g., temporary bridges and clear span bridges) for fish-bearing stream crossings along the transmission line and haul road;
- Apply erosion and sediment control methods, including sediment and erosion control ponds, as detailed in the preliminary Surface Erosion and Sediment Control Plan;
- Conduct instream and riparian construction activities in minimum risk windows (e.g., the dry season or when streams are frozen), avoiding high risk weather and flow conditions;
- Conduct instream work in fish-bearing watercourses in isolation of flows, and conduct fish salvages before isolating channels;
- Re-introduce flows to isolated watercourses immediately downstream of isolated areas to avoid

<sup>7</sup> Slow flowing, or stagnant, water

<sup>8</sup> Terrain Stability Class IV (13 percent of the PDA) has a high potential for failure, while Terrain Stability Class V (12 percent of the PDA) displays evidence of failure and mass movement, and has a high likelihood of landslide initiation.

<sup>9</sup> BC Ministry of Environment, 1998. Available at <https://www.for.gov.bc.ca/tasb/legsregs/fpc/fpcguide/FISH/FishStream.pdf>

<sup>10</sup> BC Ministry of Environment, 1995. Available at <https://www.for.gov.bc.ca/tasb/legsregs/fpc/fpcguide/riparian/rip-toc.htm>

fish stranding, while dissipating discharge water energy to avoid channel degradation and increased suspended sediments;

- Ensure industrial equipment operating near fish-bearing watercourses is in good working condition and free of leaks;
- Follow DFO's Guidelines for the Use of Explosives in or near Canadian Fisheries Waters where blasting occurs in or near fish-bearing watercourses;
- To minimize disturbance to the wetland:
  - Keep work areas and disturbed areas in wetland to a minimum;
  - For wetland water pipe construction, use low-ground-weight construction equipment, or operate normal equipment on timber riprap, prefabricated equipment mats, or terra mats, to prevent compaction of wetland soils;
  - Avoid using rock, soil, tree stumps, or brush riprap imported from outside the wetland to support equipment on the construction right of way; and
- Offset for unavoidable death of fish and harmful alteration, disruption or destruction of fish habitat following the conceptual Fish Habitat Offsetting Plan, which was updated during Application Review.

### 5.3 POTENTIAL PROJECT EFFECTS AND PROPOSED MITIGATIONS IDENTIFIED DURING APPLICATION REVIEW

During Application Review, the EAO received and reviewed comments from the public, Indigenous groups, and the working group. From these comments (which are included in the public, Indigenous groups and working group tracking tables), in addition to the issues related to the prediction of water quality effects (discussed in detail in [Section 6](#)), the EAO has distilled the following central issues related to fish and fish habitat:

- Concerns with the adequacy of baseline data;
- Concern with Glencore's characterization of the potential impacts to fish and fish habitat, particularly with respect to changes in flow and water quality. Changes to surface flows are discussed below, while potential impacts of changes to water quality on fish are discussed in [Section 6](#), Water Quality and Aquatic Biota; and
- Concerns with the adequacy of the Fish Habitat Offsetting Plan.

#### 5.3.1 ADEQUACY OF BASELINE DATA

Reviewers raised concerns that the baseline data collected was not adequate to provide high confidence in the assessment of potential effects.

DFO raised concerns with Glencore's assumption that bull trout use of Skeeter and Chamberlain creeks is likely incidental and seasonal. Glencore was unable to provide the requested population data to support its view. DFO concluded that it cannot be confirmed whether the bull trout within Skeeter and Chamberlain creeks are resident, fluvial or a combination of both. As a result, there is uncertainty and risk

regarding the scale and magnitude of predicted effects, and the adequacy of proposed offsetting measures. DFO indicated that supporting data such as size-at-age and age-at-50 percent-maturity would be required to provide more certainty about habitat utilization by bull trout, and that this information should be gathered in future regulatory phases if Sukunka proceeds.

The Ministry of Environment and Climate Change Strategy (ENV) raised concerns that sampling of the wetland was insufficient, and questioned Glencore's assumptions about fish overwintering use of the wetlands. Glencore provided additional information on the wetland sampling conducted, which included additional wetland sampling in July 2014, and committed to working with ENV to develop a wetland characterization workplan. Although ENV raised questions about the sampling approach to date, ENV was satisfied that further characterization work could be captured in an EAC condition.

ENV and DFO raised questions regarding whether tributary streams to Skeeter and Chamberlain creeks are not fish-bearing, as Glencore claimed. Glencore provided clarification of their field study results for tributary streams, noting that it is the non-fish-bearing headwaters section of tributary SCT015, above an impassable waterfall, that would be infilled by the waste rock dump. ENV stated that if a tributary stream is determined to be fish-bearing habitat either during EA review or at future times, WQGs or Science-Based Environmental Benchmarks will be applied to that tributary, as necessary. In response, Glencore noted that any tributary shown to be fish-bearing at a later date would be unlikely to remain fish-bearing once it is disconnected from the Chamberlain and Skeeter Creek mainstem, as it is highly unlikely that there is sufficient habitat quantity or quality to sustain an isolated population. In this scenario, additional offsetting would be required. DFO noted that additional fish sampling at appropriate times of year to capture potential seasonal habitat fish use of all tributaries deemed non-fish-bearing and upstream of gradient barriers would be required in support of the non-fish-bearing claim, if Sukunka proceeds to the permitting phase.

The EAO proposes Condition 23, requiring the development and implementation of an Aquatic Effects Management and Monitoring Plan in consultation with ECCC, ENV, EMLI, Ministry of Lands, Water and Resource Stewardship (LWRS) and Indigenous Groups that would include (1) additional pre-construction surveys, including bull trout population life history characterization in Skeeter and Chamberlain Creek; fish habitat characterization, fish population sampling, and fish tissue sampling immediately downstream of the proposed effluent discharge location in the Sukunka River; study of channel-forming processes in Skeeter Creek and benthic and drifting invertebrates in Skeeter Creek; and further characterization of the Sukunka wetland (2) ongoing aquatic monitoring, including monitoring of surface flows, surface water quality, and wetland groundwater quality and aquatic biota (3) key mitigations for fish mortality and impacts to fish habitat productive capacity.

In addition, the EAO proposes Condition 17: Wetlands Plan for wetland management including a description of how this plan relates to the fish management and baseline monitoring.

### 5.3.2 FLOW CHANGES

Both the FNITR and DFO expressed a lack of confidence in Glencore's instream flow study, which was used

to assess potential impacts to bull trout habitat, noting that it did not meet the Provincial instream flow methods (BCIFM) standard, or best practices. As a result, the predicted effects of Sukunka on fish and fish habitat may be underestimated. In addition, both DFO and FNITR noted the uncertainty associated with the estimated flow reductions; the FNITR note that error bars range between 75 percent to >200 percent during a critical time of the year for bull trout spawning. DFO highlighted uncertainty related to the relatively large flow changes predicted for Skeeter Creek (average annual decreases of 15-22 percent were presented in the Application) and noted that flow reductions should be included in offsetting calculations. DFO asked that further detailed analysis consider the potential impacts to the wetland, given that Skeeter and Chamberlain creeks are significant water sources for the wetland and flow reductions of up to 35 percent during freshet are predicted in lower Skeeter Creek. DFO also noted that the proposed offsetting plan, which would involve the creation of an overwintering channel near the Sukunka River, could lead to further effects on the wetland by diverting water to the new channel.

Glencore did not amend its offsetting calculations to account for the flow reductions, maintaining that its instream flow modelling showed that there would be no impact to bull trout habitat, and restating its commitment to a follow-up and monitoring program for the Skeeter Creek bull trout population. The EAO is of the view that the predicted flow reductions suggest an adverse effect to bull trout habitat in Skeeter and Chamberlain creeks is likely, and that there is also potential for adverse effects to fish habitat within the wetland. DFO noted that any residual adverse effects to fish habitat from the flow reduction would need to be counterbalanced through offsetting. In addition to the follow-up monitoring proposed by Glencore, the offsetting plan should account for the predicted flow changes.

The EAO proposes Condition 23, requiring the development of an Aquatic Effects Management and Monitoring Plan, described above, that would include mitigations for fish habitat protection and management. This plan would be developed in consultation with ECCC, ENV, EMLI, LWRS and Indigenous Groups. In addition, CEAA is expected to propose a condition requiring the certificate Holder to develop and implement a fish habitat offsetting plan to the satisfaction of DFO; the EAO will rely on this condition to ensure that fish habitat offsetting is adequate (see next [Section 5.3.3](#)).

### 5.3.3 ADEQUACY OF OFFSETTING PLAN

DFO raised concerns with the Offsetting Plan presented in Appendix 20.A-10 of the Application, identifying that (1) there was insufficient detail to determine if the plan is technically and economically feasible, and (2) Glencore had failed to include portions of wetland, instream, or riparian habitat in offsetting requirements calculations, and had incorrectly included baseline data collection such as habitat suitability indices validation and bull trout life history studies as “complementary measures” that count toward offsetting requirements.

DFO noted that an offsetting plan requires candidate sites to evaluate merit and technical feasibility, with conceptual and/or detailed design drawings of proposed offsetting measures showing locations relative to existing habitat features and access points of each option proposed, as well as discussion of preliminary site sampling. DFO also recommended that additional sites be considered if preferred sites are ultimately not feasible. Glencore indicated that this more detailed information would be provided during the

permitting phase in its Application for a *Fisheries Act* Authorization.

With respect to estimated project impacts, DFO commented that the extent of impacts in the Sukunka wetland from the diffuser pipe and road must consider riparian impacts. As described above, DFO also stated that due to the uncertainties in the assessment of flow reductions in Skeeter Creek, these flow reductions should be counterbalanced through offsetting, and that future analysis would need to consider the impacts to the wetland, since the wetland water budget shows Skeeter/Chamberlain creeks are key water sources. DFO also noted that reduction of the wetland wetted area available as fish habitat which could result from water diversion to support newly created offsetting habitat may be considered a loss in fish habitat.

Glencore revised its conceptual offsetting plan provided in a [memo](#) dated February 24, 2016 (at the request of the EAO and in response to DFO comments). The updated conceptual offsetting plan increased the amount of riparian habitat impacted by the diffuser pipe and road, and the updated plan committed to creating 2,400 m<sup>2</sup> of instream overwintering and rearing habitat in a channel near the Sukunka River. To offset the total losses of riparian vegetation, Glencore proposed to plant appropriate vegetation species along the length of the newly created channel to create approximately 32,000 m<sup>2</sup> of functional riparian habitat.

Following their review of Glencore's updated conceptual offsetting plan, DFO provided a letter dated March 24, 2016, stating that Glencore's updated offsetting option "has a high likelihood of counterbalancing the unavoidable serious harm to fish resulting from the Project". The final assessment of technical feasibility would occur during the *Fisheries Act* Authorization process. DFO advised that the contingency options identified by Glencore may not be adequate to offset the impacts to fish if the preferred option proves unfeasible. In 2022 (near the end of Application Review), DFO noted that the content of the March 24, 2016 letter was based on the previous *Fisheries Act* (2012) and supporting DFO policies, and that the offsetting plan will need to meet the offsetting requirements under the current Policy for Applying Measures to Offset Impacts to Fish and Fish Habitat Under the Fisheries Act, which Glencore acknowledged. DFO further noted that Glencore would also need to describe the potential effects to riparian vegetation at the various watercourse crossings and demonstrate how those effects could be avoided and/or mitigated.

The EAO noted that the maximum extent of habitat loss, if a combination of the remaining transmission line and haul options are used, appeared to be higher than the 1,500 m<sup>2</sup> instream habitat, and 24,000 m<sup>2</sup> riparian habitat that Glencore proposed to offset, because the remaining Chetwynd transmission line option (Option 3), had not been considered in the totals. Glencore responded that impacts to fish habitat could be avoided or reduced along the Chetwynd transmission line. Glencore committed to designing the transmission line so that no permanent structures are located in fish habitat, and to apply best management practices to stream crossing upgrades, including, but not limited to construction of temporary clear-span bridges with abutments above the high water mark; limiting riparian vegetation removal to the bridge footprint work area; re-vegetating any disturbed riparian areas with native plant species; and implementation and monitoring of an erosion prevention and sediment control plan. The EAO notes that the same requirements should be applied to riparian habitat areas crossed by the Tumbler

Ridge transmission line option (Option 2) and the Meikle Creek haul road options.

In 2016, DFO was satisfied that the best practices proposed by Glencore could minimize impacts to riparian function. In 2022, DFO noted that this likely remains true; however, DFO recommended that Glencore become familiar with the updated federal mitigation measures, standards, and codes of practice to protect fish and fish habitat.

The EAO notes that there is nevertheless a residual impact to riparian function that has not been fully quantified. This residual impact is expected to be small, and to be offset by the riparian habitat offsetting proposed by Glencore, which exceeds the expected loss of riparian habitat in Skeeter Creek Tributary SCT015 by 8000 m<sup>2</sup>. Given the 2019 amendments to the *Fisheries Act*, the extent of the habitat loss would need to be re-assessed during the permitting process.

As noted above and given the uncertainty identified, the EAO proposes Condition 23, requiring the development of an Aquatic Effects Management and Monitoring Plan that would include mitigations for fish habitat including (1) Glencore's commitments to the use of clear-span bridges for the Meikle Creek haul option, and (2) Glencore must design the transmission line such that permanent structures are not located in fish habitat and use best management practices at any stream crossing upgrades needed for construction and maintenance of the transmission line.

The preferred effluent pipe location selected during Application Review discussions and considered in the assessment of effects to fish and fish habitat, is included in the Certified Project Description.

### 5.3.4 CHANGES TO FISHERIES ACT

As noted in [Section 5.1.1: Regulatory Context](#), DFO reviewers noted that a modernized federal *Fisheries Act* (2019) came into force while the Sukunka EA process was suspended. Glencore's Application and subsequent information provided in 2016-2018 regarding fish were based on the requirements of the former *Fisheries Act* (2012).

Given these changes to the federal regulatory regime for the protection of fish and fish habitat, DFO was concerned that the overall characterization of potential effects to fish and fish habitat (including the estimated footprints of instream and riparian habitat) may be underestimated. The EAO has advised Glencore that, Sukunka would need to comply with the *Fisheries Act* (2019) and the fisheries offsetting plan would need to meet DFO's 'Policy for applying measures to offset adverse effects on fish and fish habitat under the Fisheries Act'.

Given the uncertainty identified, the EAO also proposes Condition 23: Aquatic Effects Management and Monitoring Plan that would require pre-construction surveys for bull trout population characterization in Skeeter and Chamberlain creeks as well as fish habitat characterization, fish population sampling, and fish tissue sampling immediately downstream of the proposed effluent discharge location in the Sukunka River.

## 5.4 THE EAO'S CHARACTERIZATION OF RESIDUAL EFFECTS

After considering the proposed mitigation measures, the EAO anticipates the following residual effects to fish and fish habitat from Sukunka:

- Loss of up to 1,500 m<sup>2</sup> of instream and up to 24,000 m<sup>2</sup> of riparian habitat in the Skeeter Creek watershed and Sukunka wetland;
- Alteration of riparian function in the Meikle Creek watershed, and along streams crossed by the Sukunka transmission line route;
- Increased mortality risk to fish resulting from the construction of project components;
- Risk of selenium bioaccumulation in lentic areas, and potential effects to fish in lotic areas of Skeeter and Chamberlain creeks as well as to slimy sculpin near the discharge point to the Sukunka River;
- Habitat loss or alteration in Skeeter Creek due to changes in surface flows;
- Habitat loss or alteration in Chamberlain Creek due to changes in surface flows; and
- Habitat loss or alteration in the Sukunka wetland due to changes in surface flows, including potential changes resulting from offsetting measures.

As identified in the previous section of this chapter, the EAO has proposed Condition 23, requiring the development and implementation of an Aquatic Effects Management and Monitoring Plan requiring pre-construction surveys, mitigation, and monitoring of aquatic effects

The EAO's characterization of the expected residual effects of Sukunka on fish habitat, fish, and bull trout (as a key species) is summarized below, as well as the EAO's level of confidence in the effects determination (including their likelihood and significance). [Appendix 4](#) provides definitions of the residual effect characterization criteria.

**Table 12: Summary of Residual Effects for Fish and Fish Habitat**

*Note: Criteria and assessment ratings are defined in [Appendix 4](#), Residual Effects Characterization Definitions*

Criterion	Assessment Rating	Rationale
Context	<p><b>Fish habitat:</b> Moderate</p> <p><b>Fish:</b> Moderate</p> <p><b>Bull trout:</b> Low to moderate</p>	<p>The Sukunka River has a relatively high fisheries value and supports several regionally important sport-fish populations. Mountain whitefish, bull trout, rainbow trout, longnose dace, longnose sucker, finescale dace, redbside shiner, slimy sculpin, brassy minnow, dolly varden, lake chub, northern pike, and arctic grayling are all present in the Sukunka River or the Sukunka wetland near the proposed Sukunka mine site. The watersheds surrounding Sukunka have experienced moderate levels of logging and seismic exploration, causing a <b>moderate</b> resiliency for fish and fish habitat.</p> <p>Of particular interest is the impact on bull trout, a provincially blue-listed species that are sensitive to the loss of riparian vegetation and to temperature increases. Based on Glencore’s assessment, Skeeter and Chamberlain creeks provide moderate quality habitat for bull trout. Given that the interior group of bull trout is considered relatively stable, the resilience is considered <b>low to moderate</b>. However, because this species is vulnerable to the impacts of temperature, which is predicted to increase by 3.5°C during the mine life due to climate change, the resilience could decrease over time.</p>
Magnitude	<p><b>Fish habitat:</b> Low</p> <p><b>Fish:</b> Moderate</p> <p><b>Bull trout:</b> High</p>	<p>Direct habitat loss of over 1,500 m<sup>2</sup> of instream and up to 24,000 m<sup>2</sup> of riparian habitat in the Skeeter Creek watershed and Sukunka wetland are expected to result from Sukunka. Glencore proposes to offset these losses by creating an additional 2,400 m<sup>2</sup> of instream overwintering and rearing habitat, and 32,000 m<sup>2</sup> of functional riparian habitat.</p> <p>Although the conceptual offsetting plan proposes creating 900 m<sup>2</sup> more instream habitat than Glencore anticipates directly destroying, it is not clear that this additional amount could compensate for the potential loss of habitat quantity or quality resulting from surface flow changes. In addition, some portion of riparian habitat function is expected to be lost in riparian areas crossed by the Meikle Creek haul road and by the Tumbler Ridge (Option 2) or Chetwynd (Option 3) transmission-line routes. The EAO will rely on a proposed federal condition requiring a fisheries offsetting plan, and on DFO’s previous statements that an authorization under the <i>Fisheries Act</i> (2019) would be required, including an Offsetting Plan. In consideration of federal requirements for fish habitat offsetting, residual effects on Fish and Fish Habitat due to habitat loss is predicted to be <b>low</b> in magnitude.</p> <p>Mitigation measures proposed to reduce fish mortality (including use of riparian buffers, clear span bridges and restricting construction activities to minimum risk windows) are expected to result in <b>low</b> magnitude effects to fish mortality. Residual effects to water quality (as described in <a href="#">Section 6</a> Water Quality and Aquatic Biota) are predicted to result in <b>moderate</b> magnitude effects to fish and fish habitat.</p> <p>However, the EAO notes that the fish species of interest is bull trout, a provincially blue-listed species. As described in EAO’s residual effects characterization definitions, measurable effects, including mortality, on provincially-listed or SARA-listed fish species, or loss of habitat for provincially-listed or SARA-listed fish species, are considered a <b>high</b> magnitude effect.</p>

Criterion	Assessment Rating	Rationale
Extent	<b>Fish habitat:</b> Local <b>Fish:</b> Local <b>Bull trout:</b> Local	The primary effects to fish and fish habitat are restricted to the LAA, a <b>local</b> extent. Habitat loss and alteration would be restricted to a tributary to Skeeter Creek, Skeeter and Chamberlain creeks from the top of Sukunka through their confluence with the Sukunka River, and the Sukunka wetland. Changes to fish mortality risk would be restricted to the mine site. Changes to water quality with potential adverse effects to fish, including bull trout, are predicted to be restricted to Skeeter and Chamberlain creeks, the Sukunka wetlands and a small portion of the Sukunka River at the effluent discharge point and to the Sukunka wetland.
Duration	<b>Fish habitat:</b> Permanent <b>Fish:</b> Short-term <b>Bull trout:</b> Short-term	The effects of habitat loss and alteration, and related loss of productive capacity, would be <b>permanent</b> and not likely to recover to baseline conditions. In addition, water quality impacts to fish habitat, including bull trout habitat, are expected to be <b>permanent</b> , as water treatment may be required in perpetuity. Increases in mortality risk, including bull trout, due to project construction would be <b>short term</b> (restricted to the construction period).
Reversibility	<b>Fish habitat:</b> Irreversible <b>Fish:</b> Irreversible <b>Bull trout:</b> Irreversible	The alteration and destruction of fish habitat, including changes to surface flows would result from the construction of project components that cannot be permanently removed. Changes to water quality affecting fish habitat quality would be irreversible. Fish mortality, including bull trout mortality, is <b>irreversible</b> .
Frequency	<b>Fish habitat:</b> Continuous <b>Fish:</b> Regularly <b>Bull trout:</b> Regularly	Direct habitat loss is <b>continuous</b> . Changes to habitat quantity and quality occurring due to changes in surface flows and changes in water quality would be <b>continuous</b> , although the magnitude would vary with time. Increases in mortality risk due to project construction, including to bull trout, would occur <b>regularly</b> during project construction.
Likelihood	<b>Fish habitat:</b> High <b>Fish:</b> High <b>Bull trout:</b> High	<b>High.</b> Residual effects to fish habitat and fish mortality (including bull trout) are highly likely, as these effects result directly from project construction and operation.

Criterion	Assessment Rating	Rationale
Significance Determination	<b>Not significant</b>	<p>The EAO considered the six factors, and gave weight to the magnitude, extent, and reversibility of potential effects.</p> <ul style="list-style-type: none"> <li>• In the EAO’s characterization of residual effects to fish and fish habitat from reduced surface water quality predicts <b>moderate</b> magnitude effects that are local in extent and irreversible.</li> <li>• Residual effects on fish and fish habitat due to habitat loss and changes in surface flows are predicted to be <b>low to high</b> in magnitude, local in extent and irreversible. The fish habitat affected is not considered limited or essential habitat; however, for the provincially-listed bull trout, impacts to their habitat is considered high magnitude.</li> <li>• Effects to fish mortality are predicted to be <b>low</b> in magnitude, site-specific, and irreversible.</li> <li>• There are no predicted far-reaching effects on regional productivity or diversity of fish and fish habitat, including bull trout.</li> </ul> <p>In consideration of applicable provincial (EMA and MA) and federal (<i>Fisheries Act</i>) legislative requirements, conditions identified in the Certified Project Description and Table of Conditions, and other key mitigation measures, the EAO concludes that Sukunka is <b>not likely</b> to result in significant adverse residual effects on Fish and Fish Habitat.</p>
Confidence	<b>Low to moderate</b>	<p>There is a <b>low to moderate</b> level of confidence in the likelihood and significance determinations based on the data provided and the analytical techniques used to support the assessment of fish and fish habitat. Some areas of uncertainties that could result in adverse effects to be greater than predicted include:</p> <ul style="list-style-type: none"> <li>• Assumptions regarding bull trout use of the LAA;</li> <li>• Understanding of changes to surface flows, changes to channel morphology and impacts to fish and fish habitat;</li> <li>• Understanding of the water balance of the Sukunka wetland (including the relative importance of the contribution of flows from Skeeter and Chamberlain creeks);</li> <li>• Whether the proposed conceptual offsetting would be adequate to offset all habitat impacts;</li> <li>• Understanding of potential impacts to food and nutrients for fish; and</li> <li>• Uncertainties related to water quality impacts and water treatment (see <a href="#">Section 6: Water Quality and Aquatic Biota</a>).</li> </ul> <p>To address the uncertainties regarding potential residual effects and effectiveness of mitigation measures, the EAO proposes an Aquatic Effects Management and Monitoring Plan condition requiring mitigations and monitoring for effects to fish and fish habitat. The EAO also considered that Sukunka would require a <i>Fisheries Act</i> (2019) authorization for the loss of habitat, including a Fish Habitat Offsetting Plan. The EAO is satisfied that fish habitat losses would be adequately addressed as part of the <i>Fisheries Act</i> (2019) authorization process.</p>

## 5.5 CUMULATIVE EFFECTS

Glencore's Application noted potential overlapping effects within the RAA between Sukunka and existing forestry activities, the proposed Rocky Creek Wind Energy Project, and the proposed CGL Route Rev D. However, Glencore did not undertake a cumulative effects assessment for fish and fish habitat, because they concluded in the Application that there would be no residual effects after application of offsetting. Water quality effects accounted for in Glencore's cumulative effects assessment for water quality and aquatic biota included consideration of effects from the Brule mine.

As described above, the EAO is of the view that Sukunka would result in residual adverse impacts to fish and fish habitat after application of offsetting. A cumulative effects assessment is therefore warranted.

At the EAO's request, Glencore provided a memo<sup>11</sup> providing regional context for the project-specific effects of Sukunka on fish and fish habitat. The memo notes that a 6 m high waterfall impassable to fish is located roughly 11 km downstream of the proposed mine site, restricting fish from moving upstream from the lower reaches of the Sukunka River to the Sukunka mine site. Populations of fish upstream of the falls are geographically isolated. Within the Sukunka River watershed, Glencore identified several populations of concern. These include a genetically-isolated resident population of bull trout in upper Brazion Creek; a migratory sub-population of Sukunka River bull trout that spawn in the upper Burnt and lower North Burnt Rivers; and the Arctic grayling population of the lower Sukunka River. These populations are downstream of the impassable falls in the Sukunka River and are thus not expected to be connected to fish populations in the Sukunka PDA.

The residual effects of Sukunka on Fish and Fish Habitat are expected to be restricted to the LAA, apart from changes to water quality discussed in [Section 6](#) (Water quality and aquatic biota, including an assessment of cumulative effects). The other activities within the LAA that may also affect fish and fish habitat appear to be limited to forestry; the Rocky Creek Wind Energy Project has been withdrawn from the EA process, and would be located downstream of Sukunka, and the EAO has not received notice of a CGL Route Rev amendment. As noted above, the watersheds surrounding Sukunka have experienced moderate levels of logging and seismic exploration. Several cutblocks are in the Skeeter Creek and Chamberlain Creek watersheds. However, the EAO is unable to determine the extent to which previous disturbance in the LAA has interfered with the productive capacity of aquatic ecosystems, or the anticipated extent of future logging.

The EAO considers that there is some potential for cumulative effects from forestry and the Sukunka Project. However, the EAO notes that the proposed condition requiring an Aquatic Effects Monitoring and Management Plan, and fisheries offsetting consistent with requirements of the federal *Fisheries Act*, would likely reduce the risk to a non-significant level.

## 5.6 CONCLUSIONS

Considering the above analysis and having regard to the conditions identified in the Certified Project

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<sup>11</sup> Horne, B. 2018. Regional Significance of Potentially Affected Fish in Sukunka River. Memorandum prepared for Stantec.

Description (CPD) and Table of Conditions (TOC) (which would become legally binding if an EAC is issued), the EAO is of the view that Sukunka would not have significant adverse effects on fish and fish habitat.

## 6.0 ASSESSMENT OF EFFECTS TO WATER QUALITY AND AQUATIC BIOTA

### 6.1 BACKGROUND

Water quality and aquatic biota were selected as a VC because they are important to Indigenous Groups, regulators, and the public. Water quality could be altered by Sukunka through:

- Erosion and sedimentation to receiving waters;
- Discharge of metals, non-metal elements, and nutrients to receiving waters, resulting from weathering of exposed pit walls, pit backfills and waste rock with co-disposed coal reject, particularly if acid rock drainage exists;
- Discharge of nitrogen compounds from blasting residues; and
- Release of airborne contaminants from dust and air emissions with a pathway to receiving waters.

Changes in water quality could lead to changes in aquatic communities through acute or chronic toxicity, bioaccumulation, or eutrophication<sup>12</sup>.

The results of the assessment to the water quality and aquatic biota VC are considered in the assessment of other VCs in this report, including:

- Fish and Fish Habitat ([Section 5](#)), which assesses effects of water quality changes and eutrophication on freshwater fish and fish habitat;
- Wildlife Resources ([Section 7](#)), which assesses effects on wildlife habitat;
- Land and Resource Use ([Section 14.4.4](#)), which assesses effects on access to recreational use areas;
- Health ([Section 16](#)), which assesses community health and wellness, including the consumption of country foods; and
- Part C ([Section 20](#)) which assesses effects related to Indigenous Groups' Aboriginal Interests (asserted or established Aboriginal rights, including Treaty rights, and title).

#### 6.1.1 REGULATORY CONTEXT

A range of provincial policy and legislative tools apply to surface water and aquatic biota in British Columbia.

The *Water Sustainability Act* (WSA) is BC's principal law for managing the diversion and use of water

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<sup>12</sup> Eutrophication is the process by which a water body becomes enriched in dissolved nutrients that cause the growth of algae, which deplete dissolved oxygen when they decompose. Oxygen depletion may in turn cause the death of fish, and other adverse effects to biodiversity. Eutrophication could also lead to a change in plant, invertebrate or fish species composition.

resources and includes the Water Sustainability Regulation and Groundwater Protection Regulation.

The *Environmental Management Act* (EMA) and associated regulations regulates municipal and industrial waste discharge, pollution, hazardous waste, and contaminated site remediation. Any discharge from a prescribed industry to surface water bodies in B.C. are to meet the requirements of EMA. Under EMA, most waste discharges from mining activities require an approval or permit.

The *Mines Act* and the Health, Safety and Reclamation Code for Mines in British Columbia (the Code) regulate all mines and mining activity in BC. All works and activities on a mine site require authorization under the *Mines Act*, including water management and mitigation of contact water quality.

BC has developed several water quality guidelines (WQGs) related to surface water quality. BC's WQGs are generic numerical concentrations or narrative statements recommended to protect designated water uses (e.g., aquatic life, wildlife, drinking water, recreational use) on a provincial basis. WQGs are the main tools used to assess water quality in B.C. and inform water quality-related management decisions. WQGs have no direct legal standing but can be used to derive limits for effluent discharge permits and other authorizations, which are legally enforceable. WQGs represent levels that, when met, are highly unlikely to result in adverse effects on a given water use. An exceedance of a WQG does not automatically indicate an effect on water uses, but indicates a higher potential for an effect and thus the need to investigate further. WQGs are set as long-term average and/or short-term maximum concentrations. Long-term average (i.e., "chronic") WQGs are intended to protect the most sensitive aquatic species and life stage against sub-lethal and lethal effects for indefinite exposures. An averaging period approach is used for these WQGs. This approach allows concentrations of a substance to fluctuate above and below the guideline, provided that the short-term maximum is never exceeded, and the long-term average is met over the specified averaging period (e.g., 5 samples in 30 days). Long-term WQGs for selenium include guidelines for the water column, sediment, and tissues. Short-term maximum (i.e., "acute") WQGs are set to protect against severe effects such as lethality to the most sensitive species and life stage over a defined short-term exposure period (e.g. 96 hours). For substances that are relevant to BC but do not have formally approved WQGs, working water quality guidelines (WWQGs) are adopted.

Science-Based Environmental Benchmarks can be proposed by project proponents to inform decisions made by permitting decision makers for specific sites, following the procedures outlined in "A Framework for the Development and Use of Freshwater Science-Based Environmental Benchmarks for Aquatic Life in Environmental Management Act Permitting for Mines." Science-Based Environmental Benchmarks are designed to be protective of the most sensitive aquatic species and life stages at the site and must be accompanied by an aquatic effects monitoring program to verify that the Science-Based Environmental Benchmarks is protective of aquatic life and inform adaptive management.

The Canadian Council of Ministers of the Environment (CCME) has developed Environmental Quality Guidelines for freshwater and sediments that are protective of aquatic life as well as drinking water. Where the CCME and BC WQGs differ, the BC WQGs are generally considered to better reflect conditions in BC waters.

The Metal and Diamond Mining Effluent Regulations (MDMER) under the federal *Fisheries Act* govern

maximum allowable concentrations in mining discharges to water bodies. The MDMER does not apply to coal mines, but an analogous Coal Mining Effluent Regulation is under development. Currently, coal mining discharges into fish-bearing water bodies are regulated federally by Section 36 of the *Fisheries Act*, which prohibits the discharge of deleterious substances into fish-bearing waters.

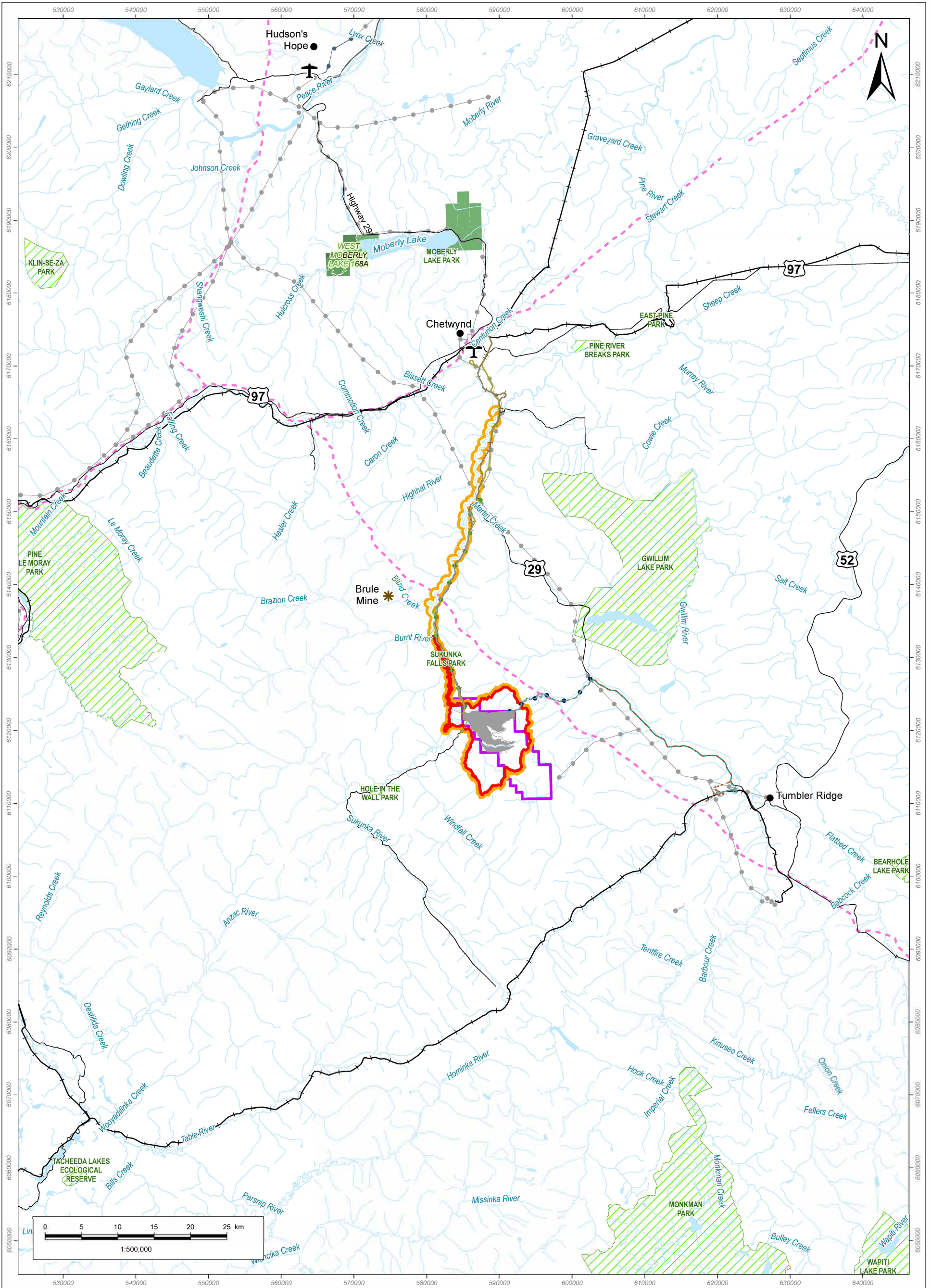
### 6.1.2 STUDY AREA DESCRIPTION

Section 5.2.3.5 of the Application identifies spatial boundaries, including a map of the LAA and RAA for water quality and aquatic biota (Figure 5.2-1 of the Application, and [Figure 6](#) below). The LAA was defined by the drainage basins encompassing the following watercourses, which are expected to receive mine contact water:

- Chamberlain Creek, which flows in a northwesterly direction into the Sukunka River; a stream with a length of approximately 12.1 km; and
- Skeeter Creek, which flows in a northwesterly direction into the Sukunka River; a stream with a length of approximately 13.2 km.

In addition, the LAA captures the Sukunka River from just upstream of the confluence with Chamberlain Creek to just upstream of the Burnt River confluence. The Sukunka River is approximately 115 km long and flows north into the Pine River approximately 16 km south of Chetwynd. The RAA includes the LAA with the addition of the Sukunka River through to its confluence with the Pine River.

Figure 6: LAA and RAA for water quality and aquatic biota



<p><b>SUKUNKA COAL MINE PROJECT</b></p> <p><b>WATER QUALITY AND AQUATIC BIOTA LOCAL AND REGIONAL ASSESSMENT AREA</b></p> <p>ENVIRONMENTAL ASSESSMENT APPLICATION</p> <p><small>Data Sources: Glencore, Province of British Columbia, Government of Canada Disclaimer: Although there is no reason to believe that there are any errors associated with the data used to generate this product or in the product itself, users of these data are advised that errors in the data may be present. File Path: fig_10482_ea_water_quality_05_02-01_water_quality_aquatic_biota_local_and_regional_assessment_areas</small></p>			<p>PREPARED BY:</p> <p><b>Stantec</b></p> <p>PREPARED FOR:</p> <p><b>GLENCORE</b></p>
<p><b>Legend:</b></p> <ul style="list-style-type: none"> <li>Airport</li> <li>City / Town / Village</li> <li>Road</li> <li>Railway</li> <li>Pipeline</li> <li>Transmission Line</li> <li>Watercourse</li> <li>Waterbody</li> </ul>	<p><b>Transportation Options</b></p> <ul style="list-style-type: none"> <li>Option A</li> <li>Option B</li> <li>Option D</li> <li>Option E</li> </ul> <p><b>Transmission Line Options</b></p> <ul style="list-style-type: none"> <li>Option 1</li> <li>Option 2</li> <li>Option 3</li> </ul>	<ul style="list-style-type: none"> <li>First Nations Reserve</li> <li>Provincial Park</li> <li>Project Development Area</li> <li>Local Assessment Area</li> <li>Regional Assessment Area</li> <li>Sukunka Project Tenure Area</li> </ul>	
<p>DATE: 19-JUN-15</p> <p>FIGURE ID: 123110482</p>	<p>PROJECTION: UTM 10</p> <p>DATUM: NAD 83</p>	<p>DRAWN BY: NDPOBEWAL</p> <p>CHECKED BY: L. KENNEDY</p>	

## 6.2 POTENTIAL PROJECT EFFECTS AND PROPOSED MITIGATIONS IDENTIFIED IN THE APPLICATION

Existing conditions, predicted effects, and proposed mitigation measures are described in the subsections below. The discussion of predicted effects includes supplemental information received from Glencore during Application Review, which in some cases superseded information provided in the Application.

### 6.2.1 EXISTING CONDITIONS

The Project would be located in the Skeeter Creek and Chamberlain Creek watersheds, which form part of the larger Sukunka River watershed. The two creeks, which are fish-bearing, discharge over large alluvial fans, where much of the flow infiltrates into groundwater. The creeks then flow into a large wetland complex (the “Sukunka wetlands”) before discharging into the very low-gradient (0.2 percent) Sukunka River. The Sukunka River in this area flows in a wide floodplain, with wetlands and riparian areas along the banks. The wetland area, which contains both seasonal and permanent wetlands, extends downstream of the LAA.

The watersheds surrounding the project area have experienced moderate levels of logging and seismic exploration, which may have altered nutrient and sediment conditions in local waters. The Sukunka River north of the project site, receives discharges from the Brule mine entering the Sukunka River downstream of the proposed Project discharge location via a tributary.

Although Glencore was not required to provide analysis in the Application of how climate change might be expected to affect water flows, Section 19 of the Application (Effects of the Environment on the Project) provided predictions that the 1961–1990 mean air temperature is predicted to increase by 3.5°C by 2040. Precipitation is predicted to increase in summer and winter, and snowpack and extreme precipitation events are expected to increase.

Glencore undertook an aquatic baseline monitoring program from 2012-2014 in the LAA and RAA. Field programs included collection of on-site water data; sampling of water, sediment, and biota to assess baseline concentrations of chemical parameters; and sampling of the abundance and diversity of periphyton<sup>13</sup> and benthic invertebrates<sup>14</sup>. The baseline conditions are described in the Application in Section 5.2.4.2, and in Appendix 27.0-A.13. Baseline sampling sites and water quality modeling nodes are shown in Figure 5.2-2 of the Application.

Glencore described the following baseline conditions for water quality, periphyton, benthic invertebrates, fish tissue, and nutrients:

- Most water quality parameters in the Sukunka River, Skeeter Creek, and Chamberlain Creek were within BC WQG for the protection of aquatic life. Exceedances in some of the water samples occurred for total and dissolved metals, including beryllium, copper, iron, mercury, selenium, silver,

<sup>13</sup> Periphyton is the assemblage of microbes, algae, and detritus found on submerged surfaces in aquatic ecosystems.

<sup>14</sup> Benthic invertebrates are invertebrates that live in or on the bottom sediments of rivers, streams, and lakes.

zinc, and aluminum. Concentrations varied seasonally. Most of the samples with WQG exceedances for metals were collected during freshet months and were associated with high turbidity and total suspended solids.

- Chlorophyll *a* (a measure of periphyton biomass) levels were below the recreational WQG in all samples and were highest in the Sukunka River.
- Baseline measures of benthic invertebrate and periphyton diversity, abundance, and tissue concentrations (metal and selenium) varied among sites on the Sukunka River, Skeeter Creek and Chamberlain Creek.
- Fish tissue baseline samples collected from rainbow trout (*Oncorhynchus mykiss*) and slimy sculpin (*Cottus cognatus*) showed selenium concentrations greater than the BC tissue guideline in most samples.
- Based on nitrogen and phosphorus ratios (N:P ratios<sup>15</sup>), Skeeter Creek and the Sukunka River were identified as phosphorus limited, whereas Chamberlain Creek is nitrogen limited in June and July. This means if additional nitrogen is added to the Creek, an increase in plant and algal growth (e.g., periphyton) and a change in species composition could occur.

#### 6.2.1.1 WETLAND HABITAT BASELINE

The Sukunka wetlands consist of fens, marshes, swamps, and a small number of bogs. A baseline description of plant species and wetlands classifications for the Vegetation Resources LAA (which differs in geographic extent from the Water Quality and Aquatic Biota LAA) is presented in Appendix 27.0-A.5 to the Application. Wetland conditions due to their water balance are summarized in Appendix 4.2.1-A to the Application (“Conceptual Wetland Water Budget Memo”).

Water supply to the wetlands includes:

- Streamflows and overbank flows from Skeeter and Chamberlain creeks;
- Overbank flows from the Sukunka River during spring freshet;
- Groundwater discharge, primarily from the alluvial fans of Skeeter and Chamberlain creeks, but also including the upgradient deeper groundwater system, particularly during the summer months; and
- Direct precipitation.

Fish habitat surveys found no distinct continuous channels through the Sukunka wetland for much of the year, but fish were found in some intermittent channels. Figure 5.2.3 of the Application provides a composite map of the Sukunka wetland.

A preliminary assessment of baseline water quality of wetlands was carried out in August 2014 at two sites, one upstream and one downstream of the proposed effluent discharge pipeline. The only baseline water quality parameter that exceeded WQGs was iron (total and dissolved). Sediment concentrations of

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<sup>15</sup> The ratio of nitrogen to phosphorus groups is an indicator of ecological health. While essential for animal and plant growth and nourishment, overabundance of either nitrogen or phosphorus may cause adverse effects.

metals and selenium were also below guidelines, apart from nickel and cadmium.

## 6.2.2 POTENTIAL PROJECT EFFECTS

The primary effect pathway for the water quality and aquatic biota VC is the introduction of mine contact water to receiving waters, which would result from:

- Contact water seeping from the collection ditches into Skeeter and Chamberlain creeks, the Sukunka wetland complex, and ultimately the Sukunka River;
- Seepage from the open pits and waste rock stockpiles that bypasses the collection ditches and discharges into Skeeter and Chamberlain Creeks, the Sukunka wetland complex, and ultimately the Sukunka River via a groundwater pathway; and
- Discharge of collected contact water via water pipe to the Sukunka River.

Glencore identified three types of potential effects to water quality and aquatic biota:

- Change in baseline surface water chemistry (total suspended solids [TSS], turbidity, metals, nitrate, ammonia, phosphorus, and sulphate);
- Change in baseline tissue concentrations of selenium (in periphyton, benthic invertebrates, and fish); and
- Change in baseline nutrient levels in surface water (ammonia, nitrate, nitrite, and phosphorus concentrations in water; chlorophyll *a* in periphyton).

The predictions for each of these effects is described in a sub-section below. All three types of effects would result from changes in surface water chemistry, which can lead to changes to aquatic communities due to direct toxicity, bioaccumulation, and eutrophication.

Glencore predicted changes to water chemistry using watershed and water quality modelling. Glencore developed a mine site watershed model to determine the runoff and infiltration at each mine facility, and to describe the potential flow changes at modelling nodes. Glencore used the watershed model results as inputs into the water quality model presented in the Application. In September 2017, Glencore provided an updated water quality modelling report (“Sukunka Coal Mine Project September 2017 Water Quality Model Report”) reflecting changes made to the project design in response to Working Group comments. Given this served as a replacement for many of the model results in the Application, this section focuses on the final results presented in the September 2017 report, rather than the results presented in the original Application. The key project changes and how they addressed potential effects or concerns from the Working Group are discussed in [Section 6.2](#), (Potential Project Effects and Proposed Mitigations Identified during Application Review). Part A of this Report captures changes made during the EA to the design of Sukunka.

Glencore provided water chemistry predictions for the expected case and upper case scenarios. Upper case predictions provide an estimated upper bound on the range of water quality that might occur. Glencore compared water quality modelling predictions to WQGs and found that selenium levels were

predicted to be consistently higher than the WQGs in Chamberlain and Skeeter Creeks. As noted in [Section 6.1.1](#), (Regulatory Context), an exceedance of a WQG indicates a higher potential for an effect to water uses that warrants further investigation and does not automatically indicate an adverse effect on aquatic biota. Glencore therefore proposed preliminary site-specific, scientifically-defensible benchmarks below which adverse effects would not be expected. Although development of these benchmarks did not implement all elements of the methodology required to develop protective levels for permitting, the proposed benchmarks were considered by ENV reviewers as preliminary benchmarks for the purposes of evaluating potential adverse effects at the EA stage with significant uncertainty attached.

Glencore did not include modelled predictions for TSS but committed in the Application to meeting a 15 milligrams per litre (mg/L) criterion for TSS in effluent discharges during operation, closure, and post-closure, asserting that this would result in TSS levels that meet BC WQGs in the watercourses.

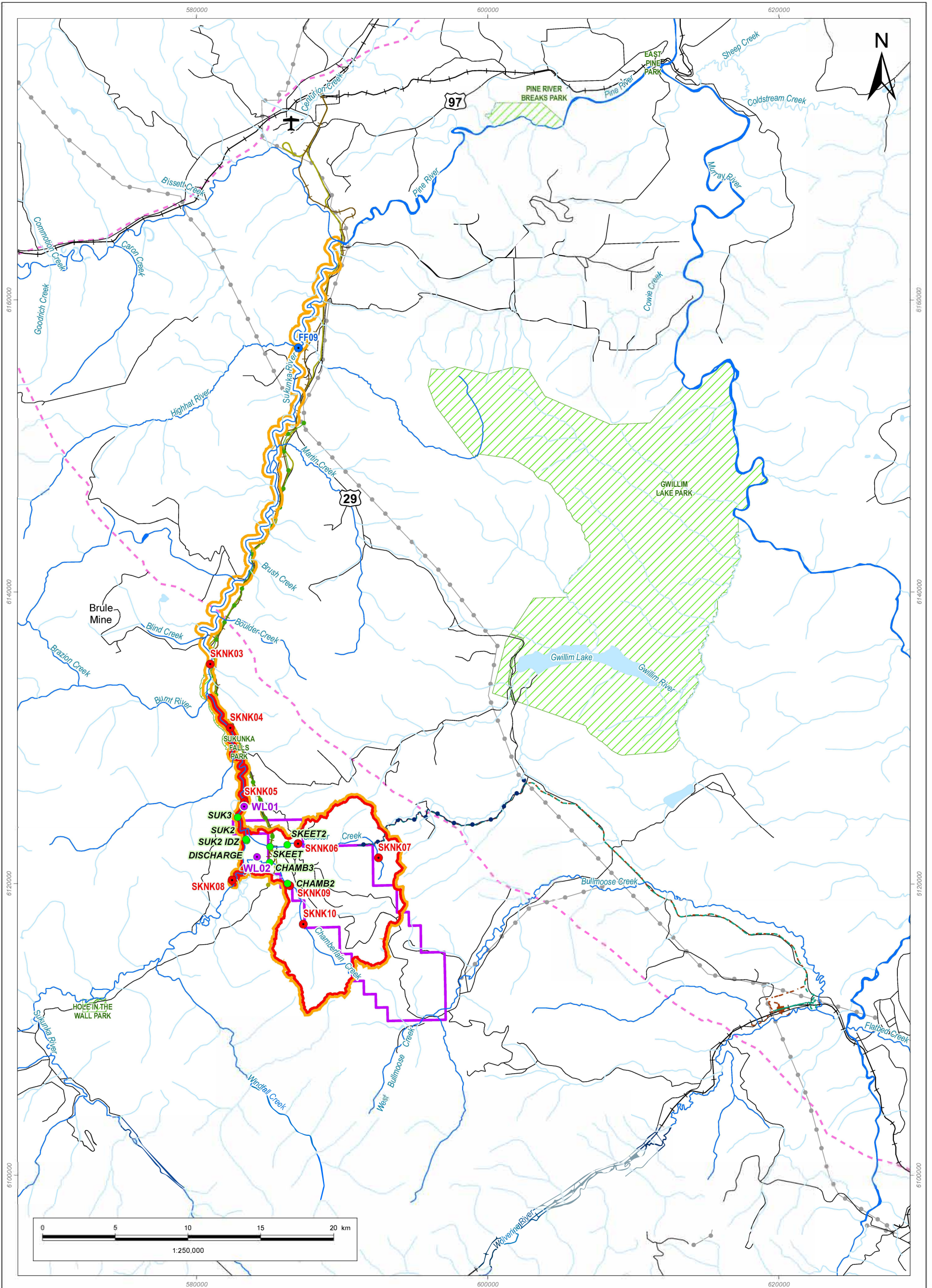
The updated water quality model predicted water quality for the modelling nodes shown in [Figure 7](#) below. Modelling nodes were selected to report on water quality at key locations in Skeeter Creek, Chamberlain Creek, and the Sukunka River. Different nodes were selected to reflect background water quality; contact water influence from key mine components; and downstream locations capturing all contaminant loadings from the project. All modelling nodes represent lotic<sup>16</sup> habitat types except for the most downstream nodes on the creeks (Skeet and Chamb3), located on alluvial fans, and considered to represent lentic<sup>17</sup> habitat.

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<sup>16</sup> Lotic waters are continuously flowing waters, in this case within the Creeks and Sukunka River.

<sup>17</sup> Lentic waters are still or slow-moving waters, in this case within the Sukunka wetland complex.

Figure 7: Water quality assessment nodes



		<b>Transportation Options</b> Option A (dashed green) Option B (dashed red) Option D (solid yellow) Option E (solid brown)		<b>Transmission Line Options</b> Option 1 (solid yellow) Option 2 (solid blue) Option 3 (solid green)		<b>Prediction Nodes</b> Sukunka Aquatic Sampling Site (red dot) Far-Field Aquatic Sampling Sites (blue dot) Wetland Sample Location (purple dot)		<b>Other Features</b> First Nations Reserve (green hatched) Provincial Park (green hatched) Local Assessment Area (orange outline) Regional Assessment Area (purple outline) Waterbody (light blue)	
<b>SUKUNKA COAL MINE PROJECT</b> <b>WATER QUALITY AND AQUATIC BIOTA SAMPLING SITES AND PREDICTION NODES</b> ENVIRONMENTAL ASSESSMENT APPLICATION				PREPARED BY: 					
Data Sources: Glencore, Province of British Columbia, Government of Canada Disclaimer: Although there is no reason to believe that there are any errors associated with the data used to generate this product or in the product itself, users of these data are advised that errors in the data may be present. File Path: fig_10482_ea_05_02-02_water_quality_aquatic_biota_sampling_sites_and_prediction_nodes				PREPARED FOR: 					
DATE: 04-JUN-15 FIGURE ID: 123110482		PROJECTION: UTM 10 DATUM: NAD 83		DRAWN BY: N. PUREWAL CHECKED BY: K. MUNRO					

Predicted concentrations of parameters with exceedances to WQGs at the modelling nodes in Skeeter and Chamberlain Creeks that are furthest downstream, which are considered to represent lentic habits, are summarized in [Appendix 3, Tables 52 and 53](#) of this Report. Several of the exceedances can be fully or partially attributed to exceedances in baseline concentrations. Although many other parameters (not reported in [Appendix 3](#)) showed predicted changes from baseline values, these parameters remained within WQGs for the expected and upper-case predictions.

Predicted exceedances of WQGs are localized to Skeeter and Chamberlain Creeks and the Sukunka River immediately downstream of the effluent discharge location. For those parameters with notable increases from baseline levels due to the Sukunka Project, the changes are likely to be regional in extent, extending downstream until adequate dilution brings parameters within baseline levels of variability, likely prior to the confluence of the Sukunka River with the Pine River.

#### 6.2.2.1 SELENIUM BIOACCUMULATION

Sukunka has the potential to change selenium tissue concentrations in aquatic life. Although selenium is an essential element for organisms, it can also cause adverse effects at higher concentrations, with the difference between beneficial and harmful levels sometimes very small. In the aquatic environment, short-term selenium exposure can cause acute mortality at levels much higher than the long-term WQG for the protection of aquatic life.

Most toxic effects of selenium result from bioaccumulation. Bioaccumulation occurs when primary producers, such as periphyton, uptake selenium which is then transferred up the food chain. Sensitivity of organisms to selenium varies by species; however, egg-laying vertebrates (fish, water-feeding birds, and amphibians [frogs, toads & salamanders]) are particularly sensitive to selenium toxicity, which can cause developmental deformity and thus lead to effects at the population level.

The dynamics of selenium bioaccumulation are very specific to a given site or ecosystem. Relevant factors influencing selenium bioaccumulation include food preferences, type of habitat, life stage of receptor species, species sensitivity, and food web structure. In addition, selenium bioaccumulation is influenced by the amount of selenium present, the chemical form of selenium (which can be determined through selenium speciation), water temperature and flow rate, bottom substrate, and the presence of other elements or compounds (e.g., organic carbon).

Glencore's assessment of effects to aquatic life was based on proposed target water concentrations, they called "site-performance objectives" ("SPOs") in the Application, which were derived by applying a bioaccumulation model from southeastern BC's Elk Valley (described in Orr et al. 2012<sup>18</sup>) to the Sukunka site. Glencore developed different target water concentrations for lentic waters and lotic waters to account for the typically higher bioaccumulation rates in lentic habitats. The target water concentrations were developed by selecting toxicity thresholds for sensitive fish and bird species and applying the bioaccumulation model to back-calculate to target water concentrations. The most sensitive species in the

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<sup>18</sup> Orr PL, Wiramanaden C., Paine MD, Franklin W, Fraser C. 2012. Food chain model based on field data to predict westslope cutthroat trout (*Oncorhynchus clarkii lewisi*) ovary selenium concentrations from water selenium concentrations in the Elk Valley, British Columbia. *Environ. Toxicol. Chem.* 31:672-680.

Elk Valley model was westlope cutthroat trout (*Oncorhynchus clarkii lewisi*), while the most sensitive species in the Sukunka system was assumed to be rainbow trout (*Oncorhynchus mykiss*). Glencore proposed a selenium target water concentration of 5 micrograms per litre ( $\mu\text{g/L}$ ) in lotic areas of Skeeter and Chamberlain creeks (based on potential toxic effects to aquatic-feeding birds); a range of 2.5-4.5  $\mu\text{g/L}$  (based on the range of published toxicity endpoints for rainbow trout) for the lentic areas of Skeeter and Chamberlain creeks and the wetland areas in the Sukunka River floodplain; and the BC WQG of 2  $\mu\text{g/L}$  for the Sukunka River.

The estimated increase in selenium in lotic habitats in Skeeter and Chamberlain Creeks is below the proposed lotic benchmark proposed by Glencore for both the expected and the upper case. In the Sukunka River, apart from the modelled initial dilution zone (discussed in [Section 6.3.9](#) below, Initial Dilution Zone), the increased levels of selenium would remain below the BC WQG for the expected and upper case.

In lentic areas of Skeeter and Chamberlain creeks, selenium concentrations are predicted to be higher than the BC WQG during some months (see [Appendix 3, Tables 52 and 53](#)) and [Figures 8 and 9](#) below, showing the expected and upper case for lentic habitats at the end of operations, when selenium levels would be highest), indicating some potential risk to the aquatic environment. Predicted concentrations are lowest during the spring freshet (May and June), when flows and therefore dilution are highest, and highest during fall, winter and early spring, when flows are lowest. Glencore highlighted that the concentrations are predicted to be below 2.5  $\mu\text{g/L}$  during the active growing season for periphyton (May through September, except for a slightly higher concentration for Chamberlain Creek in September for the upper case), which Glencore stated is the period during which selenium is most likely to be taken up into the food web. Glencore also noted that predicted water concentrations are lowest during the period when migratory birds would be present in the wetlands (spring-summer and early fall).

However, once selenium has been able to accumulate in the wetland sediment outside of the growing period, it can be taken up by the food chain during the growing period. This means that selenium levels exceeding the WQGs outside of the growing season can still have a potential effect on aquatic biota.

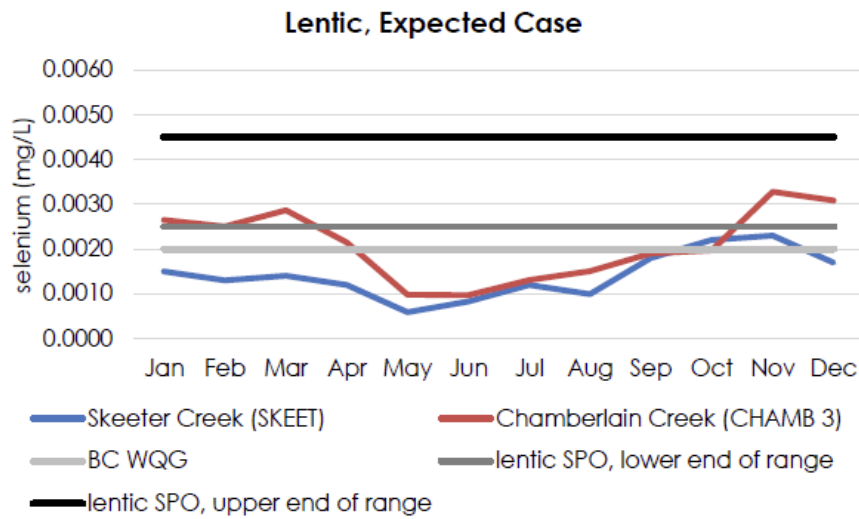


Figure 8: Expected Case Selenium Predictions for Lentic Habitat, End of Operations

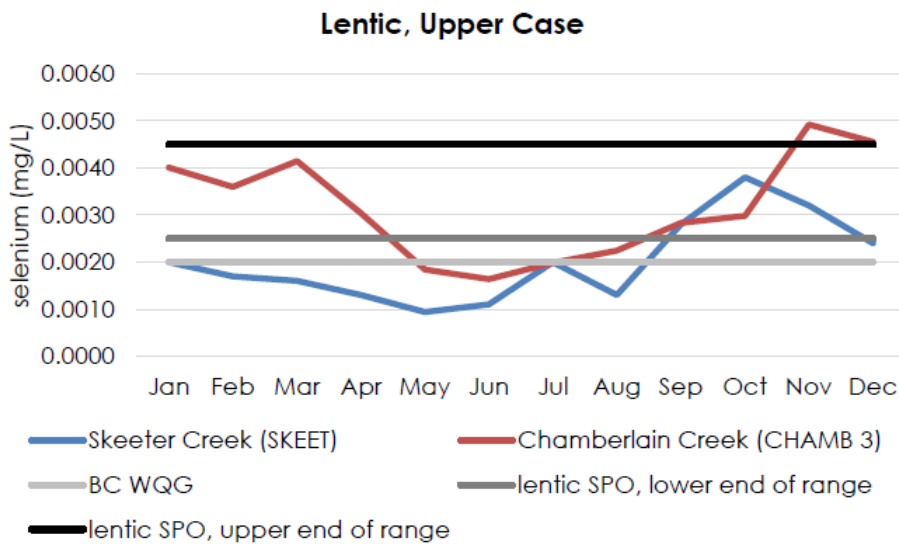


Figure 9: Upper Case Selenium Predictions for Lentic Habitat, End of Operations

6.2.2.2 NUTRIENTS

Increases in concentration of nitrogen species (i.e., nitrite, nitrate, and ammonia) and phosphorus in surface waters can alter nutrient dynamics, leading to eutrophication and increased periphyton biomass. Excessive periphyton growth can result in changes to benthic habitat, depletion of dissolved oxygen (due to increased decomposition), and the loss of benthic organisms that provide food for aquatic biota and birds. BC WQGs exist for total phosphorus (in lakes), nitrate, nitrite, and ammonia for the protection of aquatic life from direct toxicity. However, even if changes in nutrient concentrations from background remain below those toxicity-based guidelines for nitrogen, eutrophication can lead to effects.

The use of explosives during mining provides a source for nitrogen loading into surface water, while waste rock seepage is a potential source of phosphorus. Glencore's water quality model assumes that infiltration of water through the waste rock stockpiles would mobilize any residual nitrogen from explosives residue. The model predicts nitrogen levels to increase during operation and to decrease to baseline levels during closure and post-closure, as residual nitrogen in the waste rock stockpiles is assumed to have leached out by that time. Phosphorus loadings would persist from waste rock sources.

As described in [Section 6.2.1](#) (Existing conditions), N:P ratios from the baseline data for Skeeter Creek and the Sukunka River suggest the waterbodies to be phosphorus limited during the June to September growing season for periphyton. In both Skeeter Creek and the Sukunka River, nitrogen inputs are predicted to increase due to mining operations over the growing season. However, since mean phosphorus levels are predicted to remain similar and the creeks are phosphorus limited, the addition of more nitrogen would not be expected to increase periphyton growth.

The N:P ratios from the baseline data for Chamberlain Creek suggest nitrogen limitation in June and July, with no clear limiting nutrient in August and September. Modelling predictions showed increases in nitrogen inputs during the growing season, with a 4.8-fold increase in mean nitrate levels in July (for the expected case, at the most downstream node on Chamberlain Creek). Total and dissolved phosphorus are predicted to increase slightly for mean values at most nodes. Glencore stated that they did not believe the changes from baseline would be large enough to change the oligotrophic (nutrient-limited) status of Chamberlain Creek. The increased nitrate concentrations predicted for June and July (by 4.8 times of baseline conditions), when Chamberlain Creek is nitrogen limited, have the potential to increase periphyton growth in the creek. Glencore also noted that periphyton accumulation in June and part of July is typically regulated by the fast flows associated with freshet, which would reduce the potential for heavy periphyton growth at that time. Regardless, there is a potential for it to result in eutrophication and benthic community effects in receiving environment of Chamberlain Creek.

### 6.2.2.3 WATER QUALITY PARAMETERS OTHER THAN SELENIUM

BC WQG exceedances that are not fully attributable to baseline exceedances were predicted for total nitrite, nitrate, aluminum, cadmium, beryllium, mercury, and silver in Chamberlain Creek, although these exceedances are small. In some cases, they most likely are predicted only due to limitations in modelling; for example, for both silver and mercury exceedances, humidity cell test results and analogue mine data showed concentrations below the analytical detection limit. Samples with concentrations less than detection limits were reported at the detection limit in the model, resulting in overestimates.

For Skeeter Creek, BC WQG exceedances that cannot be attributed to baseline exceedances were predicted for nitrite. These exceedances are very small in magnitude and infrequent, occurring only in December of Year 3 and January/February of Year 4, based on the upper case predictions.

In summary, the predicted exceedances to BC WQGs for parameters other than selenium are small in magnitude, infrequent and are unlikely to result in toxic effects to aquatic biota.

### 6.2.3 MITIGATION MEASURES

The key mitigations that were originally proposed in the Application are outlined in Table 23.1-1 and proposed Environmental Management Plans (EMPs) in Chapter 20 of the Application. Glencore incorporated the mitigation measures into the water quality model. Changes to these original mitigation measures throughout the course of Application Review are discussed in subsequent sections of this chapter, particularly [Section 6.3](#).

The EMPs that include the original mitigation measures relevant to water quality include:

- Surface Erosion and Sediment Control Plan;
- Mine Site Water Management Plan;
- Groundwater Management Plan;
- Metal Leaching/ ARD Prevention, Management and Monitoring Plan incorporating selenium management;
- Explosives Management Plan;
- Fish Habitat Offsetting Plan;
- Air Quality and Dust Control Plan;
- Solid Waste Management Plan;
- Reclamation Plan, incorporating soil management; and
- Hazardous Materials and Waste Management Plan, including flocculent management plan.

Sections 5.2.6.2.2, 5.2.6.3.2, and 5.2.6.4.2 of the Application list the originally proposed mitigation measures included in Glencore's water modelling, including the following:

- Schedule mining and waste rock disposal to provide attenuation of selenium and nitrate through the use of saturated backfills in pits;
- Build collection ditches with sufficient capture efficiency (85 percent for individual sections and 75 percent overall) to intercept mine contact water from waste rock stockpiles and pits and direct the water to either saturation zones in backfilled pits (for selenium and nitrate attenuation) or into sediment control ponds;
- Build clean water diversion ditches to direct non-contact water away from disturbed areas and into receiving streams;
- Limit the extent of waste rock stockpiles within the Chamberlain Creek watershed to reduce selenium and nitrate loadings;
- Use sediment control ponds to settle suspended materials (to a TSS limit of 15 mg/L in contact water) before releasing contact water through a water pipe to the Sukunka River. Sediment control ponds would be lined with an impervious barrier to minimize seepage to groundwater;
- Convey contact water to the Sukunka River using a water pipe through the wetland, to minimize introduction of contact water into sensitive habitat;
- Release treated domestic effluent into appropriate disposal field site(s) within the Project Development Area, and transport solids to a disposal site in Chetwynd;

- Maintain water management infrastructure through closure and post-closure, until monitoring indicates water quality at the Sukunka compliance point and Skeeter and Chamberlain creeks meets regulatory requirements; and
- Implement contingency mitigations in the Adaptive Water Management Strategy if monitoring of contact water, groundwater, or surface water quality early in operation identifies the need for additional mitigation measures.

Additional mitigations developed during Application Review are discussed below.

### 6.3 POTENTIAL PROJECT EFFECTS AND PROPOSED MITIGATIONS IDENTIFIED DURING APPLICATION REVIEW

During Application Review, EAO received and reviewed comments from the public, Indigenous Groups, and the Working Group<sup>19</sup>. As discussed in Part C of this report, First Nations on Schedule B of the Section 11 Order were invited to participate in the Working Group, but instead chose to undertake an independent technical review to resolve concerns directly with Glencore. On January 19, 2017, the First Nations Independent Technical Review (FNITR) First Nations (at the time comprising West Moberly First Nations, Sauteau First Nations, and McLeod Lake Indian Band) submitted to EAO a list of key issues raised during their review, which included six issues related to water quality in Glencore's Application. In May 2022, the FNITR updated the list of key issues raised during their review, some of which had been resolved through discussions with Glencore. These comments are discussed in this chapter, as well as Part C where applicable.

The primary mitigation proposed in Glencore's Application to limit selenium contamination of receiving waters was initially flow-through in-pit treatment via saturated rock fills, referred to throughout Application Review as "saturated backfills". Waste rock would be backfilled into mined-out pits, the lower portion of which would become saturated, and most contact water flowing through waste dumps on the mine site would report to saturated backfill zones for treatment. Chemically reducing conditions in the saturated portion of the backfill could remove dissolved selenium from contact water by reducing selenate to selenite, which adsorbs more readily than selenate, and by reducing selenite to elemental selenium, which precipitates as a solid. Similarly, nitrate can be reduced to nitrite, nitrogen oxides, and ultimately nitrogen gas. The source of electrons for these reactions is usually oxidation of dissolved carbon. The dissolved carbon may come from native components of the rock or from an introduced source. EMLI, ENV, ECCC, and the FNITR raised several concerns regarding the reliability of the proposed saturated backfill treatment. Working group members also raised concerns regarding other aspects of the assessment of effects to water quality and aquatic life.

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<sup>19</sup> Public comments and Glencore responses are available at [https://www.projects.eao.gov.bc.ca/api/public/document/5ab4277d5741ad0024588309/download/tbl\\_suk\\_review\\_irs\\_public\\_20151216.pdf](https://www.projects.eao.gov.bc.ca/api/public/document/5ab4277d5741ad0024588309/download/tbl_suk_review_irs_public_20151216.pdf). Working group comments and Glencore responses are available at [https://www.projects.eao.gov.bc.ca/api/public/document/6323c6f7101c24002282dd03/download/tbl\\_suk\\_master\\_IRTable\\_20220713.pdf](https://www.projects.eao.gov.bc.ca/api/public/document/6323c6f7101c24002282dd03/download/tbl_suk_master_IRTable_20220713.pdf)

In January 2016, Glencore requested a suspension of the Application Review timeline to develop further information to address issues related to water quality, including the use of saturated backfills, and caribou. With respect to water quality, the EAO issued the following information requirements to Glencore:

- Information to support the use of saturated backfills as a primary mitigation for treatment of selenium and nitrate, or information regarding alternate effective water quality mitigation, including:
  - Use of a representative and conservative water quality model; and
  - Information related to uncertainties in the capture efficiency of seepage collection channels;
- Clarification of the mine plan timing and progression;
- A proposed approach to managing potentially acid-generating materials, including contingency plans and operational monitoring programs;
- Information on the need for an additional carbon source as a mitigation or contingency measure; and
- Information supporting source term development.

The discussion of issues below outlines the related information produced by Glencore, including project design changes, and any subsequent working group discussions. In some cases, there were multiple further information requests from working group members and the EAO to address key uncertainties related to the effects assessment.

### 6.3.1 WATER TREATMENT

Glencore provided additional information to meet the EAO's January 2016 information requirements (described in the previous section) in an April 29, 2016 submission. After reviewing the information, EMLI identified that there was still insufficient information provided to demonstrate that flow-through in-pit treatment in saturated backfill could be engineered into the large-scale water treatment system needed to achieve the water quality predicted by Glencore. EMLI also noted that the available information was not adequate to provide confidence in the effectiveness of Glencore's other proposed contingency measures, which include passive bio-reactors, active water treatment, and the addition of labile carbon.

In response to these comments, Glencore committed to proposing active water treatment as a primary mitigation for water quality effects. The EAO provided a letter (April 4, 2017) to Glencore outlining information requirements regarding active water treatment, which included:

- Information to address uncertainties related to water conveyance, the capture efficiency of seepage collection channels and the hydrogeological interactions of saturated backfills with the proposed water management strategies;
- The requirement that if new and/or innovative mitigations are proposed for the project that are not in conventional use at mines sites in BC, Glencore must provide results of pilot testing, research and development work, and/or provide relevant analogues from other mining applications to demonstrate their effectiveness and appropriateness for the project;

- Information on the scheduling of the water treatment plant, with specific reference to selection of plant design, construction, testing, and implementation of operations through the various phases of mine development (construction, operations, closure and post-closure); and
- Updates to the effects assessment capturing all changes to project components and any changes in water quality or quantity that could have effects on valued components.

In a supplemental information package provided April 13, 2017, entitled “Active Water Treatment Submission – 2017”, Glencore proposed the application of biological removal of selenium from mine site water in a treatment plant with an estimated capacity of 15,000 cubic metres (m<sup>3</sup>) per day, based on year-round operation. Two different treatment technologies were considered (Envirogen Fluid Bed Reactor and GE ABMet process). Glencore also provided revised water quality modelling scenarios, a schedule for implementation (including future research and development into both active water treatment and passive saturated backfills), and memos reviewing changes to the effects assessment.

Glencore noted that the addition of active water treatment would not change the spatial extent of the project. Water would still flow into the saturated backfill zones; these would now be water reservoirs with no attenuation assumed. Water from the reservoirs would then be directed via a network of enclosed water conveyance piping to a water treatment plant near the two proposed sediment control ponds. The west sediment control pond would operate as an effluent holding pond, where effluent from the water treatment plant is mixed with untreated water from the West collection ditches prior to discharging via a pipeline to the Sukunka River. The east sediment control pond would operate as a flow attenuation pond storing feed water for the water treatment plant. A lined, impermeable facility for managing water treatment residuals would be located near the water treatment plant. The currently proposed project infrastructure, including additional infrastructure required to implement active water treatment, are captured in the proposed CPD.

It was also evident through the review of the active water treatment proposal that active water treatment would be required in perpetuity for the site. Provincial policy discourages water treatment in perpetuity, as it is significant financial liability to BC. Reclamation liability, including water treatment, would be evaluated during initial *Mines Act* permitting in accordance, prior to construction of the mine. In the *Mines Act* permit, the security would be set at a level that reflects outstanding reclamation, environmental and closure obligations associated with the site. The amount of security may be increased or decreased at the discretion of the Chief Permitting Officer based on the mine’s actual reclamation liability at any point in time. EMLI regularly reviews reclamation liability cost estimates during the review of major permit amendments and Reclamation and Closure Plan updates.

Working group review of the Active Water Treatment Submission resulted in further discussion of several issues described below.

### 6.3.2 WATER TREATMENT TECHNOLOGY EFFECTIVENESS

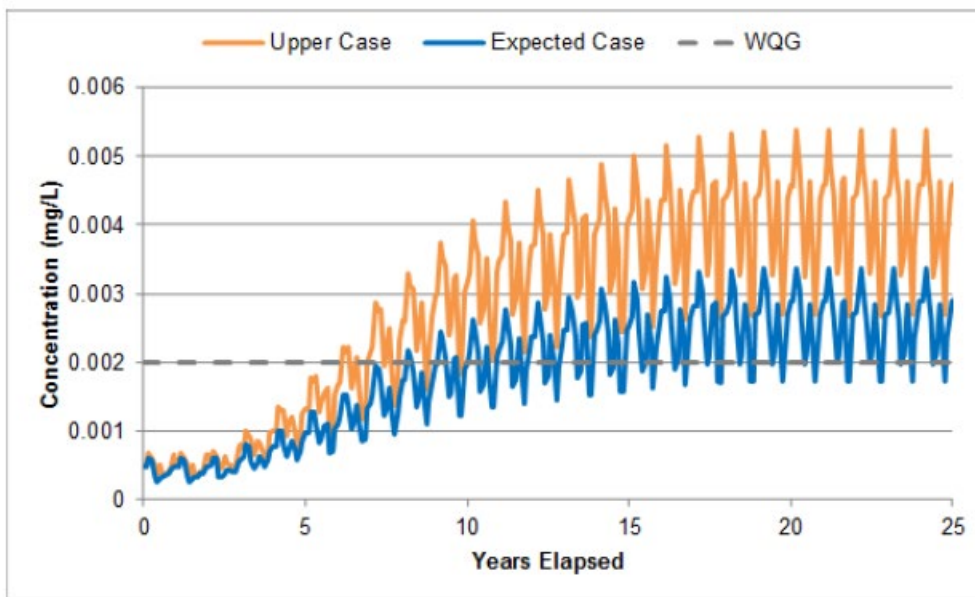
EMLI, ECCC, ENV, and the FNITR raised questions about the effectiveness of the proposed active water treatment technology, including the ability of the technology to treat the throughput volume required, and

remove contaminants to the degree required to meet water quality predictions. Working group members also highlighted the potential for the treatment technology to lead to elevated nitrate and selenium bioavailability.

EMLI and ECCC noted uncertainties in the effectiveness of the performance in the analogue treatment systems described in the submission. In particular, the reviewers state there are challenges with treatment capacity and changes to the chemical form of selenium (determined through selenium speciation), resulting in more bioavailable forms being released, which can lead to greater risk of adverse effects to fish and aquatic biota.

With further examination of this issue through discussions between Glencore and the working group, EMLI concluded that sufficient information for the EA stage had been provided in 2018 to demonstrate the technical feasibility and conceptual effectiveness of biological treatment technologies. However, there remains uncertainty about the ability of the proposed water treatment technology to achieve the results assessed, as Glencore did not undertake pilot testing or provide site-specific information. ECCC also noted that it was unclear if the expected treatment capacity of the active water treatment plant would be adequate given the forthcoming federal coal mining effluent regulations. Given this uncertainty, as well as the fact that the treatment would be needed within the first five years of operations, EMLI stated that detailed design, which may require pilot testing, would be required at the initial *Mines Act* permitting stage should Sukunka receive an EAC.

Considering the remaining uncertainty on the treatment technology, the EAO requested that Glencore provide modeling results assuming no water treatment. The EAO recognized that these results were not expected to represent a real-life scenario; however, they provide an indication of the potential worst case- outcome in the event of an extended treatment failure. The results, shown in Figure 10 below, demonstrate that selenium levels would increase in the Sukunka River to up to approximately 3.5 µg/L for the expected case, and 5.5 µg /L for the upper case. (As noted in [Section 6.3.1](#), with treatment in place, selenium values in the Sukunka River were predicted to remain below the BC WQG.) These findings indicate that the consequence of a treatment failure would include exceedances to the selenium BC WQG in the Sukunka River, a finding that informs the EAO's characterization of residual effects in [Section 6.4](#).



**Figure 10: Model Results of Total Selenium Concentration in the Sukunka River, No Water Treatment**

Figure 10 (above) provides model results of total selenium concentration in the Sukunka River in the absence of water treatment starting from the beginning of operations. The results show predictions downstream of the effluent discharge location (modelling node SUK3), after all inputs of effluent and from Skeeter and Chamberlain creeks have been fully mixed into the Sukunka River.

### 6.3.3 TIMING OF WATER TREATMENT

With the submission of the water treatment information package in April 2017, Glencore anticipated that based on water quality modelling results, active water treatment would not be required until mid-way through year four of Operations (based on a modelling scenario showing that in the absence of water treatment, selenium concentrations could begin to exceed BC WQGs in the Sukunka River starting in year five). EMLI identified that detailed design and site-specific treatment technology would be required at initial *Mines Act* permitting, given that water treatment would be required during the first five years of mine life. Although Glencore maintained that treatment would not be needed until year four, EMLI highlighted that (1) modelling predictions indicate parameter concentrations that come close to exceeding guidelines earlier than year four, and (2) recent experience in BC indicates that commissioning a selenium treatment plant is likely to require five to six years from design to operation. EMLI advised that the plant should be operational before a substantial amount of contact water is accumulated. Similarly, ENV identified the need to build in sufficient time to ensure that the plant could be adjusted to meet site-specific conditions, and treat to the proposed treatment volume.

In addition, ECCC identified that Glencore's water quality predictions showed selenium and nitrate levels in end-of-pipe discharge to the Sukunka River prior to the onset of active water treatment that are well above water quality guidelines (although dilution from the Sukunka River would result in selenium and nitrate concentrations near water quality guidelines downstream of the initial dilution zone). The federal

*Fisheries Act* prohibits the release of deleterious substances to fish-bearing waterways, and ENV noted that it would be unlikely to permit discharge levels that could be acutely toxic to aquatic life.

In order to address EMLI, ECCC, ENV, and the FNITR's concerns; the risk associated with reliance on an uncertain treatment technology; and related uncertainties in the assessment of effects to water quality and aquatic biota, the EAO has proposed Condition 21: Water Quality Management, that would require active water treatment be used to treat contact water prior to discharge to the Sukunka River (as opposed to year four). Should Glencore demonstrate that the use of an alternative technology would not exceed BC WQGs, background concentrations, or a protective level contained in a future EMA permit for Sukunka, the condition would allow for Glencore to submit a proposal to the EAO to modify the timing of the active water treatment.

### 6.3.4 WATER QUALITY MODELLING AND WATER MANAGEMENT PLAN

Several questions and concerns related to water quality modelling assumptions were raised in Application Review, which resulted in Glencore providing further explanations and assessments to address the issues raised. Working group members also raised concerns regarding contact water storage, water treatment capacity and the potential for seepage to groundwater and ultimately to the Sukunka wetland.

In response to these concerns regarding contact water storage capacity, Glencore proposed the following changes to the water management plan:

- An increase to the water treatment plant capacity, from 15,000 m<sup>3</sup>/day to 17,500 m<sup>3</sup>/day. This increase in capacity would reduce the need for contact water to bypass the water treatment plant, allowing for all contact water, except for the water captured in the West Collection Channel, to be routed through the water treatment plant, including during high flow periods; and
- The addition of a lined contact water buffer pond with a capacity to hold up to 1.8 million m<sup>3</sup> of contact water pumped to the mine's feed-water pond. The buffer pond would be sited near the water treatment plant and would provide primary storage for contact water. The pond would require a 15 m high dam, a high-density polyethylene liner, and a spillway and outlet channel to the Sukunka River floodplain for design flood events.

Glencore provided a final updated version of the water quality model report entitled "Sukunka Coal Mine Project September 2017 Water Quality Model Report" to reflect these changes and respond to outstanding questions from working group members. These results are reflected in the [Section 6.3](#) above on Potential Effects and Proposed Mitigation Identified in the Application.

Considering the importance of the liner for the buffer pond to achieve the water quality outcomes modelled, the EAO proposes to include a requirement in the CPD that the buffer pond be lined, with specifics of the liner to be determined during permitting, should the project proceed to permitting.

EMLI raised concerns about the stability analysis of the buffer pond water retainment structure and were satisfied with Glencore's responses. Working group members also questioned the potential effects on the stability of the waste rock dump of reducing the footprint but extending the height of the waste rock

dump. Concerns about the geotechnical stability of the waste dumps were not addressed to EMLI's satisfaction during the EA, but would be addressed at the permitting stage, should the project proceed to permitting.

### 6.3.5 RESIDUALS MANAGEMENT

Glencore proposed to store water treatment residuals in a lined management area, with surface runoff and leachate collecting in a sump before being pumped to the water treatment plant. EMLI highlighted that remobilization of selenium from the water treatment residuals could occur depending on conditions within the landfill and identified that this could be a source of contaminants in the influent to the water treatment plant during mine life and into closure. EMLI noted that detailed geochemical characterization and testing to assess the long-term geochemical stability of residuals, updated water quality modeling including the residuals landfill source terms, and a residuals management plan would be required for *Mines Act* permitting.

The EAO asked Glencore to clarify the total storage volume available in the residuals management area, and how that compares to the amount of waste being produced. Glencore indicated that the annual sludge production is approximately 625 m<sup>3</sup> per year, and the residuals management area would be able to store approximately 27,500 m<sup>3</sup> of waste, amounting to about 44 years' worth of storage. The proposed mine life is 22 years, but the water treatment is proposed in perpetuity. Glencore stated that additional capacity, if required, would be identified as part of the progressive mine reclamation and closure planning. The EAO notes that *Mines Act* permitting would require the identification of residuals storage capacity for the duration of water treatment. Storage options could include additional on-site storage as well utilizing a hazardous waste landfill off-site. As well, the residuals management area is included in the proposed CPD. If additional waste storage were required in the future that exceeded that area or if Glencore proposed a different approach to managing residuals (e.g., trucking off-site), a Certificate amendment would likely be required.

### 6.3.6 PAG<sup>20</sup> MANAGEMENT

Metal leaching (ML) / acid rock drainage (ARD) is formed by the natural oxidation of sulphide minerals when they are exposed to water and air. ML/ARD can result from coal mining because mining activities increase the amount of exposed rock surface, and because many coal deposits are rich in sulphide minerals. The oxidation of sulphide minerals, in the absence of sufficient neutralizing capacity, creates low pH conditions that can result in elevated concentrations of metals through ML. Even with sufficient buffering capacity available to neutralize acid production, neutral ML can still occur, which can result in elevated concentrations of metals, such as Se. Because ML/ARD chemical reactions require the presence of both air (oxygen) and water, ML/ARD can be prevented by eliminating exposure of potentially acid-generating (PAG) waste rock materials to either air or to water. For example, submerging PAG waste rock under a water cover eliminates exposure to air or storing PAG waste rock in arid conditions limits

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<sup>20</sup> PAG rock is rock that may form acid, which can leach metals from the rock, when it is exposed to surface weathering.

exposure to water.

The Application states that in the excavation of mine rock waste, approximately 33 percent of the waste is expected to be PAG, and 67 percent is expected to be non-PAG. Glencore proposes to manage PAG waste rock by blending it with non-PAG waste rock so the blended material is non-PAG overall. Glencore assumed successful PAG management in its water quality modeling.

EMLI, ENV, and ECCC raised concerns about the uncertainty of achieving assumed blending ratios, the availability of sufficient non-PAG material, insufficient geochemical characterization, and ultimately the impacts to receiving waters. EMLI, ENV, and ECCC highlighted that achieving the water quality predictions would require very precise blending, which could be challenging. Glencore undertook a sensitivity analysis of the PAG blending strategy, considering scenarios where up to 10 percent of PAG components become acidic, and reported expected concentrations of cadmium, cobalt, manganese, nickel, and zinc (as these metals are more likely to remain in solution at lower pH than are other metals). The results indicate that a failure in the PAG management strategy could be expected to result in large WQG exceedances for these metals in Skeeter and Chamberlain Creeks, with potential adverse effects to aquatic life.

In addition to concerns around the feasibility of achieving the PAG/non-PAG blends assumed, EMLI noted that with the revised water quality model, it was unclear if PAG in the backfilled pits would be submerged, given predicted water levels.

EMLI identified that additional geochemical sampling, research results, reassessment of blending criteria, detailed waste rock scheduling information, Standard Operating Procedures, and detailed monitoring programs would be required for *Mines Act* permitting. Glencore identified that should contact water have levels of dissolved metals and sulphate higher than permit requirements resulting from ARD, a lime water treatment step would need to be added in series with the biological selenium/nitrate treatment, with the same treatment capacity (17,500 m<sup>3</sup>/day) for both processes. In light of the comments from the Working Group, the EAO is of the view that the PAG blending strategy is a key outstanding uncertainty at the EA stage that would be further addressed should the project proceed to permitting. At the EA stage, the EAO has proposed outcome-based Certificate conditions (condition 21: Water Quality Management and Condition 22: Selenium Management Plan) that would require the Holder to not exceed BC WQGs, background concentrations, or a protective level contained in a future EMA permit for Sukunka (see also [Section 6.3.8](#) Selenium bioaccumulation).

### 6.3.7 COLLECTION CHANNEL EFFICIENCY AND SEEPAGE MANAGEMENT MEASURES

A key issue raised by the working group was understanding how Glencore's assessment of the efficiency with which contact water and seepage would be captured, as water quality modeling predictions in the Application relied heavily on effective collection of contact water in the North and West collection channels to prevent site contact water from reaching Skeeter and Chamberlain creeks.

The model assumed that all non-contact water from undisturbed sub-catchments reports to Skeeter or Chamberlain creeks, while all contact water from developed sub-catchments reports to the North or West

collection ditches. The model did not account for contact water bypassing ditches in the southern portion of the mine site, on the assumption that it would be a minor source of flows and loadings that would not have a meaningful effect on either water quality or the design of mitigation measures. The model applied a net seepage capture efficiency to the north and west collection ditches that considered both the proportion of runoff or groundwater not collected by the ditches (capture efficiency) and the loss of water flowing in the ditches (ditch/seepage loss). The model assumed 85 percent net seepage capture efficiency for each section of the ditch (as defined by modeling nodes), resulting in an overall capture efficiency of 75 percent for the collection channels. In other words, 75 percent of all flows would be collected, report to the sediment control ponds (or, in the updated project design introduced during Application Review, the effluent holding pond or buffer pond), and be discharged into the Sukunka River, and 25 percent of flows would bypass the collection channels and report to the creeks, and ultimately drain into the Sukunka River. This capture efficiency was identified based on a sensitivity analysis to find the seepage capture rate required to meet water quality objectives. The water quality modeling assumed that the capture and pump-back systems would collect and convey 85 percent of contact water.

EMLI, ENV, ECCC, and the FNITR raised several concerns regarding the reasonableness of this assumed efficiency. As well, ENV noted risks of major and ongoing sediment loss to Skeeter and Chamberlain Creeks, given the nature of the terrain in which the collection ditches are proposed.

To address concerns about the reasonableness of the collection efficiency, EMLI requested additional information on:

- Site characterization, including further information on hydraulic conductivity;
- A comprehensive groundwater seep survey; and
- Site-specific information to support the water quality assumptions regarding the waste rock water balance.

There was considerable discussion between Glencore and the Working Group on this issue, resulting in Glencore providing additional information and further Working Group reviews through 2016 and 2017, including an evaluation of site-specific conditions and estimated capture efficiency based on topographical, geological, and hydraulic characteristics. As well, Glencore proposed additional mitigation measures to enhance confidence in the feasibility of the capture efficiency. Revisions to the mine plan to improve seepage collection and surface contact water collection included:

- Maintenance of open pits in a dewatered state (with the exception of Pit 04, which would be used as a contact water storage reservoir, in addition to the buffer pond);
- Construction of waste rock foundation drains at the low points beneath the dumps to enhance water collection;
- Use of trenches or seepage interception ponds to collect potential seepage from contact water collection areas;
- Use of seepage interception wells downgradient of waste dumps in sub-catchments 5B and 6F;
- Use of horizontal drains to drain the sandstone unit that underlies the mined Chamberlain seam; and

- Pumping of collected contact water from WD02, Pit01-01, Pit01-05 and Pit02-01 to Pit04-01 and the contact water buffer pond.

Interception of most of the contact water from the site using sumps and groundwater extraction wells is proposed to minimize seepage to Skeeter Creek. The Application proposed that water in the West Collection Ditch (running alongside Chamberlain Creek) would report to the effluent holding pond and mixed with treated water prior to discharge to the Sukunka River.

ECCC raised concerns regarding this mixed effluent being discharged to the Sukunka River and noted that subsection 36(3) of the *Fisheries Act* prohibits any person from depositing or permitting the deposit of a deleterious substance of any type in water frequented by fish. While there are currently no such federal regulations for coal mines, proposed coal mine effluent regulations are under development and may come into force during the life of mine of Sukunka. ECCC also noted that, under the current proposed approach for the new proposed coal mine effluent regulations, all seepage that flow through or out of a coal mine would be considered effluent, and all effluent originating from a mine would be required to be collected and deposited through a final discharge point three years after the new regulations come into force. The EAO notes that, while the proposed coal mining effluent regulations are not yet in force, Glencore would be required to comply with the regulation when it is implemented, which Glencore acknowledged.

EMLI stated that successful implementation of the proposed mitigations would rely on thoroughly characterizing the hydrogeology of the site, including groundwater levels, groundwater gradients, and hydraulic conductivity, and therefore there remains uncertainty as to the actual collection efficiency that can be achieved. The EAO notes that a failure in seepage capture and related increase in the amount of contact water reaching the receiving environment, could result in higher contaminant levels (all parameters) in all receiving waters. However, EMLI concluded for the purposes of the EA that the modifications of the mine plan had been demonstrated as technically feasible at the conceptual level. Significant additional information to support engineering design and detailed monitoring plans, would be required at *Mines Act* permitting. The EAO also notes that the uncertainties regarding these measures contribute to uncertainties regarding project impacts to water quality and aquatic life. However, the EAO is satisfied that issues related to specific engineering and monitoring requirements can be addressed through *Mines Act* permitting.

### 6.3.8 SELENIUM BIOACCUMULATION

ENV, ECCC, LWRS, and the FNITR raised concerns about selenium bioaccumulation, including the uncertainties associated with applying the Elk Valley bioaccumulation model to Sukunka. Reviewers noted that there was limited information to demonstrate that conditions in the Sukunka area are comparable to those in the Elk Valley. In addition, working group reviewers highlighted:

- Uncertainty as to the conversion factor to transform the data collected for Sukunka from whole body rainbow trout fish tissue to estimates for fish ovary tissue concentrations;
- A lack of data available for lentic habitat in the Elk Valley model;
- A lack of data on both the selenium toxicity to amphibians, and amphibian use of the Sukunka

wetland;

- A lack of data on effects to juveniles, which represents the life stage of rainbow trout found in the Sukunka wetland during baseline surveys; and
- Uncertainty as to the use of toxicity thresholds for known sensitive species, which may not necessarily reflect toxicity thresholds for species in the Sukunka system (that have not yet been tested for sensitivity to selenium).

Glencore provided additional information to address the applicability of the bioaccumulation model, including:

- The whole body to ovary conversion factor;
- A comparison of the environmental conditions (including selenium tissue concentrations) in lentic areas of the Elk River and Sukunka River watershed study areas; and
- A comparison of the composition of periphyton/biofilm and benthic invertebrates in the Elk Valley model to those present at the Sukunka aquatic sampling sites.

Glencore highlighted two primary sources of uncertainty in the application of the Elk Valley model to Sukunka. First, there were no periphyton/biofilm samples collected in the Sukunka wetland. The first step in bioaccumulation, from water to periphyton/biofilm, represents the most significant concentration of selenium and can also be the most variable. Second, there is a substantial difference in the fish communities present in lentic habitats. Glencore stated that it is unclear whether the wetland provides overwintering habitat or summer rearing habitat for fish, and that it may be more appropriate to consider birds as the most sensitive receptor, in which case Glencore asserts that a 5 µg/L target water concentration would be applicable to lentic areas as well as lotic areas.

Additional information provided by the proponent showed that the concentrations from the Sukunka area fit well into the Elk Valley model. However, the range of the selenium concentrations in the Sukunka area were much smaller than the range used to create the Elk Valley model, thus resulting in significant uncertainty at higher selenium levels predicted.

ENV noted that the risk of adverse effects to aquatic biota increases in lentic areas, where slow moving water and higher organic carbon in sediments can promote selenium accumulation. Selenium accumulation in sediment then has the potential for biological uptake in organisms residing in the sediments (e.g., benthic invertebrates, algae), ultimately leading to bioaccumulation within the food chain. This is of particular concern for Sukunka where elevated concentrations of selenium would enter the wetlands at the base of Skeeter Creek (SKEET model node) and Chamberlain Creek (Chamb3 model node), which were evaluated as the areas of highest risk during this review. Selenium concentrations also exceed the BC WQG in lotic sections of Skeeter Creek, indicating potential impact to aquatic biota residing in these areas of Skeeter Creek.

ENV stated that Glencore's proposed selenium benchmark for lotic environments in Skeeter and Chamberlain Creeks provided a reasonable preliminary benchmark for impact assessment at the EA stage, which still carried significant uncertainty and thus does not eliminate a potential for effects in lotic waters. ENV did not, however, accept Glencore's proposed benchmark range for lentic environments. For this

reason, the EAO's assessment compares selenium levels in lotic nodes in Skeeter and Chamberlain Creeks to the 5 µg/L level lotic benchmark, and all other nodes to the BC WQG of 2 µg /L. ENV identified that significant uncertainty remains in the approach, which would need to be re-examined at EMA permitting based on further site-specific data. Ongoing monitoring and adaptive management would be required to improve the bioaccumulation model and modify mine water management as needed. ECCC, LWRS, and the FNITR called for a similar monitoring program, emphasizing monitoring amphibians, bull trout, and slimy sculpin.

There also was discussion during the Application Review on whether the seasonality of the exceedances mattered in assessing the effects within the aquatic environment or on migratory birds. Predicted concentrations are lowest during the spring freshet (May and June), when flows and therefore dilution is highest, and highest during fall and winter, when flows are lowest. Glencore highlighted that the concentrations are predicted to be below 2.5 µg/L during the active growing season for periphyton (May through September), which is the period during which selenium is most likely to be taken up into the food web. Glencore also noted that this is also the period when migratory birds would be present in the wetlands. However, ENV indicated that because the effects of selenium on reproduction of egg-laying vertebrates are based on uptake via the food web, selenium that accumulated in the sediment during the winter months may be taken up by organisms residing in the sediments (e.g., benthic invertebrates, algae), and those same organisms may be consumed by fish or birds using the area during the spring or summer months.

Considering the advice from ENV, the EAO is of the view that there is substantial uncertainty related to the degree of bioaccumulation of selenium in aquatic life in Skeeter and Chamberlain creeks and the Sukunka wetland. Further analytical work and bioaccumulation modeling will help determine whether these B.C. WQG exceedances are expected to cause adverse effects to aquatic biota. The EAO notes that in subsequent permitting, ENV will provide discharge limits for receiving waters to limit adverse effects.

ECCC noted that additional studies, including site-specific selenium bioaccumulation modelling, would be completed as part of the provincial permitting process to address gaps identified in the EA. These information gaps, coupled with the substantial uncertainty surrounding selenium bioaccumulation effects, have implications for the water quality and aquatic biota effects assessment. Since ECCC is not involved in post-EA provincial permitting, these information gaps are, from a federal perspective, considered substantial outstanding sources of uncertainty. ECCC raised issues of uncertainty for the EA, with key water quality information pertaining to mitigation measures and anticipated project effects being provided outside of the environmental assessment process (e.g., provincial permitting and/or management plans provided post-EA). ECCC considers this information necessary for the assessment of effects to water quality and aquatic biota for the purposes of the EA.

The EAO's residual effects assessment for Water Quality and Aquatic Biota is informed by ENV's advice that the lotic benchmarks can reasonably be applied at the EA stage, with uncertainty and some potential effects to aquatic life, but that the B.C. WQG should be considered in lentic areas. Given the importance of the water quality predictions to the effects assessed in the EA, the EAO has proposed Condition 22: Selenium Management Plan, that requires the Holder to develop a selenium management plan to limit the

potential for adverse effects associated with elevated water quality parameters and to improve confidence in the conclusions of the effects assessment. In addition, the EAO has proposed Condition 23 requiring the development of an aquatic effects monitoring plan to outline monitoring requirements for effects to water quality, nutrient concentrations, and selenium and mercury tissue concentrations.

### 6.3.9 INITIAL DILUTION ZONE (IDZ)

Glencore applied the mixing model scenario described in the Application to assess the geographic extent of impacts to water quality on the Sukunka River from effluent discharges based on the proposed operation of the water treatment plant beginning in year 4, assuming the 7Q10 low flow (the lowest 7-day average flow that occurs, on average, once every 10 years). For selenium, the results of this model show that selenium concentrations would be higher than the BC WQG in a 20 m long and up to 4 m wide section of the Sukunka River for the post-closure upper case scenario. Glencore stated that the likely fish habitat use in these locations is primarily for rearing, with the presence of spawning habitat for species used in commercial, recreational and Indigenous fisheries being unlikely. Glencore noted that additional assessment of fish habitat near the IDZ would occur during permitting.

The FNITR raised concerns that the assessment relied on IDZs, as the FNITR maintained that water quality guidelines should be met at end-of-pipe rather than in an IDZ. Additional discussion of the FNITR's concerns regarding IDZs and the potential impact on Aboriginal Interests is presented in Part C of this report.

ECCC raised concerns that slimy sculpin have a small home range, feed almost exclusively on benthic invertebrates, and are prey to fish such as trout and salmon. ECCC questioned whether there could be adverse effects to fish through food web interactions in the proposed dilution zone.

Glencore responded that the area that exceeds the selenium long-term WQG is 11 percent of the habitat in a stretch of the river that is 36 m by 20 m, and the area with greater than 5 µg/L selenium is 1.4 percent of the habitat. Glencore stated that while periphyton and benthic invertebrates themselves would not be adversely affected by the selenium levels in the effluent discharge, it is possible that slimy sculpin in this area would take up selenium in their diet. However, Glencore noted that several of the baseline samples of slimy sculpin showed concentrations of selenium above the B.C. tissue guideline; that research indicates that even in relatively pristine conditions, slimy sculpin may accumulate selenium more efficiently than other species; that there is no published information on slimy sculpin sensitivity to selenium exposure; and that the fraction of slimy sculpin population that could be affected adversely by elevated selenium concentrations is expected to be small. Other fish species that may use the IDZ, such as rainbow trout and bull trout, have much wider home ranges, such that smaller proportions of their diet would come from within the IDZ, with less risk of bioaccumulation of selenium. Having considered the rationale provided by Glencore, the EAO is of the view that effects of selenium to slimy sculpin in the IDZ would be low in magnitude.

During Application Review, EMLI raised concerns about nitrate levels. While the predicted upper-case concentrations for nitrate in effluent, 15 mg/L, are below the maximum B.C. WQG and the threshold for

acute toxicity, they are above the B.C. WQG for chronic effects (3.0 mg/L). Although Glencore did not provide mixing zone model predictions for nitrate, Glencore assumed the same dilution would apply to nitrate as to selenium, which would reduce nitrate concentrations to less than 1 mg/L within 20 m of the point of discharge, and nitrate concentrations would be expected to exceed the long-term aquatic life guideline within only a few metres of the diffuser. Within this area there is potential for localized increases in productivity of periphyton communities (as discussed in Section 5.2.6.4 of the Application). However, because the Sukunka River is phosphorus-limited during the growing season, measurable effects on periphyton growth in the IDZ are not expected. The EAO is of the view that the effects of nitrate to aquatic biota in the IDZ would be low in magnitude, given the small physical extent of guideline exceedances and lack of bioaccumulation risk for nitrates. However, some uncertainty remains related to toxicity within a few meters of the discharge pipe, given that the nature of toxicity in mixtures is harder to predict than in specific analytes alone (Nordin and Pommen 2009<sup>21</sup>).

Based on the advice from the Working Group, the EAO also notes that the initial dilution model was not updated to consider effluent levels prior to the predicted onset of water treatment in year four of Operations, which were expected to be as high as 120 µg/L for selenium (upper case; 80 µg/L for lower case). Acute toxicity occurs at aqueous concentrations of selenium in the range of 100 mg/L and higher (Beatty and Russo, 2014)<sup>22</sup>. The predicted effluent concentrations for nitrate prior to water treatment are as high as 45 mg/L (upper case; 23 mg/L expected case), above the maximum B.C. WQG of 32.8 mg/L. Glencore's modelling showed that downstream of the IDZ, these higher effluent concentrations would not result in B.C. WQG exceedances due to the relatively small volume of effluent discharge prior to year four. ENV noted that effluent discharges that may cause acute toxicity to fish would not likely be permitted for an EMA effluent permit, and ECCC noted that levels in discharge that cause harm to fish (not limited to acute toxicity) may result in an offense under the *Fisheries Act*.

As stated previously, the EAO is proposing Condition 21, which would ensure that active water treatment is in place prior to discharge of contact water to the Sukunka River. To address concerns regarding remaining potential effects to fish within the proposed IDZ, the proposed Condition 23: Aquatic Effects Monitoring Plan would require an additional assessment of fish habitat near the diffuser pre-construction, in addition to monitoring requirements during all project phases. The EAO notes that ENV has policy for IDZs that requires proponents to first apply best practices in site management and best available technology which may reduce or eliminate the need for an IDZ, further reducing potential effects to Fish and Fish Habitat.

## 6.4 THE EAO'S CHARACTERIZATION OF RESIDUAL EFFECTS

After considering the proposed mitigation measures and proposed Certificate conditions, the EAO concludes that the Project would result in the following residual adverse effects on Water Quality and

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<sup>21</sup> Nordin, R.N. and L.W. Pommen. 2009. Water quality guidelines for nitrogen (nitrate, nitrite, and ammonia): overview report update. Prepared for Water Stewardship Division, Ministry of Environment, Province of British Columbia.

<sup>22</sup> Beatty, J.M and G. A. Russo. 2014. Ambient water quality guidelines for Selenium Technical Report Update. Prepared for Water Protection and Sustainability Branch, Environmental Sustainability and Strategic Policy Division, British Columbia Ministry of Environment.

**Aquatic Biota:**

- Changes to surface water quality in Skeeter and Chamberlain creeks and the Sukunka River;
- Change in nutrient levels (nitrogen species) and resulting increased algal growth in Chamberlain Creek, which is predicted to be nitrogen limited; and
- Potential change in baseline tissue concentrations of selenium, resulting from bioaccumulation through the food web, and causing effects on fish, bird, and amphibian reproduction.

The EAO’s characterization of the expected residual effects of the Project on water quality and aquatic biota is summarized below, along with the EAO’s level of confidence in the effects determination (including likelihood and significance). The significance determination focused on aquatic biota as a receptor to changes to water quality. Please refer to [Appendix 2: Residual Effects Characterization Definitions for Water Quality and Aquatic Biota](#) for information regarding the assessment ratings.

**Table 13: Summary of Residual Effects for Water Quality and Aquatic Biota**

*Note: Criteria and assessment ratings are defined in [Appendix 4, Residual Effects Characterization Definitions](#)*

Criterion	Assessment Rating	Rationale
Context	<b>Unknown</b>	<p>Given the information provided in Glencore’s Application and comments raised by the working group, the current and future resilience of water quality and aquatic biota in the LAA and RAA is <b>unknown</b>.</p> <p>The watersheds surrounding the project area have experienced moderate levels of logging and seismic exploration, which may have altered nutrient and sediment conditions in local waters. Discharges from the Brule mine enter the Sukunka River downstream of the proposed Project discharge location. Climate change projections suggest that climate change may increase flows at low flow times, diluting water quality parameter concentrations.</p>
Magnitude	<b>Low to high, depending on the parameter and location</b>	<p>The predicted magnitude of change from baseline water quality varies by parameter and location. Exceedances to BC WQGs are predicted for selenium in Skeeter Creek, Chamberlain Creek, and the Sukunka River (within the IDZ only), nitrite in Skeeter Creek and Chamberlain Creek, nitrate in the Sukunka River (within the IDZ only), and total aluminum, cadmium, beryllium, mercury, and silver in Chamberlain Creek.</p> <p><u>Selenium bioaccumulation</u></p> <p>The predicted increases in selenium concentrations that exceed BC WQGs are a <b>high</b> magnitude change to water quality. With the mitigation measures including water treatment, these predicted selenium concentrations are not, however, expected to cause effects downstream of the IDZ in the Sukunka River and thus result in a <b>moderate</b> magnitude effect to aquatic biota. Given the potential for bioaccumulation in lentic waters, the adverse effects to aquatic biota are predicted to be <b>moderate to high</b> in lentic areas of Skeeter and Chamberlain creeks and in the Sukunka wetland. It is <b>uncertain</b> whether the predicted</p>

Criterion	Assessment Rating	Rationale
		<p>exceedances in selenium are expected to cause adverse effects on aquatic life in the lotic waters of Skeeter and Chamberlain creeks.</p> <p><i>Metals (other than selenium)</i></p> <p>The predicted exceedances for metals other than selenium are small and infrequent. Changes to water quality are rated as <b>moderate-high</b> because exceedances occur. However, the expected effects of these changes to water quality on aquatic biota in the creeks, wetland, and Sukunka River are expected to be <b>low</b> magnitude.</p> <p><i>Nutrients</i></p> <p>Nitrogen loadings to Chamberlain Creek may cause <b>moderate</b> magnitude effects to aquatic biota due to eutrophication.</p> <p><i>Initial Dilution Zone</i></p> <p>Increases to nitrate and selenium concentrations are expected to cause <b>low</b> magnitude effects to aquatic life within the IDZ in the Sukunka River.</p>
Extent	<b>Local to regional</b>	Changes to water quality parameter concentrations are expected to be <b>regional</b> . However, BC WQG exceedances and adverse effects to aquatic biota are expected to be <b>local</b> , restricted to the LAA.
Duration	<b>Permanent</b>	Water quality changes in the receiving environment are predicted to occur during all project phases. Although nitrogen levels are expected to decrease following operations because loadings from blasting are finite, increases to other parameters are expected to remain <b>permanently</b> . Water treatment is expected to be needed in perpetuity.
Reversibility	<b>Irreversible</b>	Once rock surfaces have been exposed through mining activities, loadings cannot be reversed. Except for effects resulting from nitrogen loading, residual impacts are <b>irreversible</b> .
Frequency	<b>Regular to Continuous</b>	Residual effects to surface water quality would occur <b>continuously</b> through the life of the mine, during all project phases. However, BC WQG exceedances are not expected to occur across all months of the year during the different project phases and are rated as <b>regular</b> (intermittent).
Likelihood	<b>High.</b> The likelihood of changes to water quality and associated residual effects is high.	
Significance Determination	<p>Sukunka is predicted to alter the water chemistry of receiving watercourses, including exceedances of some parameters of the WQGs. This significance determination focused on aquatic biota as a receptor to changes to water quality.</p> <p>The EAO notes that the effects to aquatic biota due to the small and infrequent exceedances of metals are expected to be low. The predicted exceedances in selenium concentrations (a high magnitude effect to water quality) are expected to be moderate to aquatic biota and this effect is expected to be confined to a small area (the lentic waters of Chamberlain and Skeeter creeks and immediately downstream of the</p>	

Criterion	Assessment Rating	Rationale
		<p>effluence discharge location).</p> <p>In consideration of applicable provincial (MA and EMA) and federal (<i>Fisheries Act, 2019</i>) legislative requirements for subsequent authorizations, the conditions identified in the Table of Conditions, and the key mitigation measures identified, the EAO concludes that the changes to water quality as a result of Sukunka are <b>not likely</b> to result in significant adverse residual effects on aquatic biota.</p>
Confidence		<p>There is a <b>low to moderate</b> level of confidence in the likelihood and significance determinations.</p> <p>Areas of uncertainty that could result in adverse effects being greater than predicted include:</p> <ul style="list-style-type: none"> <li>• The reliance on a PAG blending strategy that requires precise PAG blending;</li> <li>• The requirement for a high proportion of seepage capture for a site that is hydrogeologically complex and has not been well characterized through baseline survey programs;</li> <li>• The reliance on a water treatment technology that has not yet been successfully implemented in BC for the volumes of water that would require treatment for the Sukunka project, a failure in which would lead to selenium WQG exceedances in the Sukunka River;</li> <li>• Potentially inadequate on-site storage of water treatment residuals, relative to expected water treatment duration; and</li> <li>• Effects of selenium on aquatic life, given the applicability of bioaccumulation modeling from analogous sites to Sukunka has not been confirmed.</li> </ul> <p>The EAO is of the view that adequate information was provided for the EA stage regarding water quality mitigations, and also acknowledges that substantial uncertainties remain regarding the feasibility and effectiveness of the mitigations. The detailed technical review of the primary mitigations for water quality occurs during <i>Mines Act</i> permitting, and uncertainties related to effects to the receiving environment are expected to be further addressed through <i>Environmental Management Act</i> permitting, should the project proceed to permitting.</p> <p>The project is expected to require active water treatment in perpetuity, with associated environmental risks. There is also the potential for future technology advances that would allow passive water treatment, which reduce the operational risk for running a treatment plant.</p>

## 6.5 CUMULATIVE EFFECTS ASSESSMENT

During Application Review, the cumulative effects of the project considering the Brule mine (11 km downstream from the Project) were assessed. The Brule Mine is the only past, present or reasonably foreseeable project with effects on water chemistry that is expected to interact cumulatively with the effects of Sukunka, as it is the only other project within the RAA with direct discharges into the Sukunka River.

Glencore identified that, despite a projected increase of selenium, nitrate, and sulphate concentrations resulting from the Brule mine, the cumulative effect of the Sukunka project on these parameters would remain below the WQGs for all project phases, assuming a fully built Brule Mine. Glencore concluded that the cumulative effects on water quality, nutrient levels in surface water, and tissue levels of selenium would not be significant.

Near the end of Application Review, the EAO learned that the Brule mine has been discharging mine contact water well above their permitted limit. Formerly, Brule was operating with a discharge permit including a site performance objective (SPO) of up to 70 µg/L selenium in Blind Creek (at a compliance point about 4 km upstream of the confluence with the Sukunka River, annual average), and was discharging to reach about 55 µg/L at that compliance point. Currently, the permitted SPO is 10 µg/L as of 2020; however, the company has not yet been able to achieve the new SPO. Glencore's assessment of cumulative effects assumed a range of selenium water concentrations of between 13 µg/L and 28 µg/L at the same compliance point, indicating that if the Brule mine does not lower selenium discharges substantially to meet 2020 permitting requirements, cumulative effects may be larger than predicted.

Glencore assumed that the effects to TSS and turbidity would be mitigated through the Surface Erosion and Sediment Control Plan, and that any residual impacts to TSS or turbidity would be localized, and would not interact cumulatively with forestry, oil and gas, or mining activities. The EAO notes that the EAO's standard EAC condition requiring the development of a sediment and erosion plan (as part of the Construction Environmental Management Plan) would require the application of best management practices to minimize the introduction of sediment to receiving waters.

The EAO concludes that cumulative effects for water quality are expected because of the effects of the project interacting with the effects of other past, present, and reasonably foreseeable future projects and activities. These cumulative effects are predicted to be moderate in magnitude and would extend within the RSA. They would be continuous, permanent in duration, and irreversible. The likelihood of the cumulative effects occurring is medium, given that the Brule Mine is in operation and the Certificate Holder of the Brule Mine is working with ENV to reduce their selenium concentrations.

If Glencore's proposed mitigations are effective, contaminant levels assessed would remain within provincial regulatory guidelines. However, if the proposed project mitigations are less effective than predicted, the cumulative effects could be high in magnitude, resulting in contaminant loadings higher than applicable water quality guidelines, and a larger cumulative effect to water quality, and potentially aquatic life (via eutrophication and bioaccumulation in aquatic species).

As noted previously in this chapter, the EAO has proposed several conditions to address the residual adverse on water quality and aquatic biota and the uncertainty identified in the assessment of effects on this VC, which would also address the cumulative effects identified in this assessment. These conditions include:

- Condition 21: Water Quality Management, requiring an active water treatment plant to treat contact water prior to discharge in the Sukunka River, commissioned prior to Operations;
- Condition 22: Selenium Management Plan, which would require Glencore to not exceed B.C. WQGs, background concentrations, or a protective level contained in the EMA permit for Sukunka in waters other than the Sukunka River; and
- Condition 23: Aquatic Effects Management and Monitoring Plan, which would outline monitoring requirements for effects to water quality, nutrient concentrations, and selenium and mercury tissue concentrations (further discussed in [Section 5: Fish and Fish Habitat](#)).

The EAO also notes that, should the project proceed to permitting, there would be a coordinated authorizations process that requires more information and undertakes detailed technical reviews to assess and address uncertainties related to the primary mitigations for water quality and uncertainties related to effects to the receiving environment.

## 6.6 CONCLUSIONS

Considering the above analysis, the mitigations proposed in the Certified Project Description and the proposed conditions (which would both become legally binding if an EAC is issued), and the requirements of the *Mines Act* and the *Environmental Management Act* should the project proceed to and be successful at the permitting stage, the EAO is of the view that the project would not have significant adverse effects on water quality and aquatic biota.

## 7.0 ASSESSMENT OF EFFECTS TO WILDLIFE

### 7.1 BACKGROUND

In addition to its importance to Indigenous Groups and British Columbians, wildlife was selected as a VC because Sukunka has the potential to cause loss and alteration and degradation of wildlife habitat, harm wildlife, and affect wildlife movement, populations, and health. Sukunka would be located in an area where past and present natural resource activities have had negative effects on wildlife.

Glencore chose indicator species and bird communities for the assessment (listed in [Table 14](#)) to represent a broad range of wildlife species and habitat types that could be affected by Sukunka. These indicator species and bird communities were chosen with input from the EAO, Indigenous Groups, the Working Group, and the public. The species were intended to represent various parts of the food chain, as well as different habitat uses over different timeframes for a representative assessment. Glencore paid particular attention to species groups that are species of conservation concern and species of traditional use and value for Indigenous Groups.

Given the importance of caribou to the understanding of Project effects, this species has been excluded from this wildlife assessment and is assessed separately as its own VC (see [Section 8](#) of this Report).

**Table 14: Wildlife Indicators Used to Assess Effects**

Class	Indicators	
	Change in habitat availability, mortality risk, movement, and population dynamics	Change in health
Mammals	Elk <sup>23</sup> Moose <sup>24</sup>	Cougar Grey wolf Black bear Ermine

<sup>23</sup> Designated as regionally-significant species by ENV

<sup>24</sup> Designated as regionally-significant species by ENV

Class	Indicators	
	Change in habitat availability, mortality risk, movement, and population dynamics	Change in health
	Mountain goat Mule deer White-tailed deer Grizzly bear Black bear	Coyote Wolverine <i>luscus</i> subspecies Fisher Marten
		Masked shrew Meadow vole Moose Mule deer Muskrat Red fox Snowshoe hare
Birds and Bird Communities	Northern goshawk and olive-sided flycatcher Bird communities used to infer effects on several bird species including migratory birds: Mature forest bird community <sup>25</sup> Young forest bird community <sup>26</sup> Grassland bird community <sup>27</sup> Wetland bird community <sup>28</sup>	American robin Bald eagle Canada goose Common merganser Mallard Red-winged blackbird Ruffed grouse
Amphibians	Western toad	Aquatic amphibians

This wildlife assessment is linked to and informed by other VCs and assessments in this Report, including:

- Water Quality ([Section 6](#)), which examines the effects of changes in water quality on freshwater resources used by wildlife;
- Vegetation ([Section 9](#)), which assesses effects on vegetation species and ecological communities which form wildlife habitat;
- Air Quality ([Section 11](#)), which assesses chemical and dustfall deposition rates from air emissions on wildlife habitat;
- Summary of Statutory Requirements under the *Canadian Environmental Assessment Act* (CEAA) 2012 ([Section 17](#)), which assesses federally listed wildlife species and their habitats; and
- Part C ([Section 20.4](#)) which assesses effects related to the loss of wildlife resources available for use by Indigenous Groups.

<sup>25</sup> Including: Bay-breasted warbler, black-throated green warbler, broad-winged hawk, Canada warbler, Cape May warbler, Connecticut warbler, Baltimore oriole, boreal owl, brown creeper, dusky flycatcher, evening grosbeak, mourning warbler, northern pygmy-owl, pacific-slope flycatcher, pine siskin, purple finch, red crossbill, red-eyed vireo, rufous hummingbird, Swainson’s thrush, Vaux’s swift, and western wood-pewee.

<sup>26</sup> Including: Connecticut warbler, dusky grouse, Philadelphia vireo, pine siskin, red-eyed vireo, ruffed grouse, rufous hummingbird, Swainson’s thrush, western wood-peewee, Wilson’s warbler, and yellow warbler.

<sup>27</sup> Including: Barn swallow, common nighthawk, sharp-tailed grouse, short-eared owl (listed as threatened on Schedule 1 of SARA), upland sandpiper, American kestrel, horned lark, killdeer, northern harrier, vesper sparrow, and violet-green swallow.

<sup>28</sup> Including: American bittern, bank swallow, horned grebe, Le Conte’s sparrow, Nelson’s sparrow, red-necked phalarope, rusty blackbird, surf scoter, tundra swan, western grebe, yellow rail, American coot, Barrow’s goldeneye, belted kingfisher, black tern, blue-winged teal, canvasback, common goldeneye, eastern kingbird, greater scaup, lesser scaup, northern pintail, northern rough-winged swallow, pied-billed grebe, redhead, tree swallow, trumpeter swan, Wilson’s phalarope, Wilson’s snipe, and yellow-headed blackbird.

### 7.1.1 REGULATORY CONTEXT

Key legislation, policy, and other regulatory guidance documents relevant to the protection and management of wildlife resources include:

- Federal *Species at Risk Act* (SARA): Provides for the protection of plant and wildlife species to conserve their biological diversity and prevent extirpation or extinction. Under Sections 32 and 33 of SARA, individuals and residences of aquatic species and birds protected by the *Migratory Birds Convention Act* are protected anywhere they are found in Canada;
- Federal *Migratory Birds Convention Act, 1994*, and corresponding Migratory Birds Regulations: Protects birds listed under Article 1 of the Act (not just those that migrate) and their nests and eggs;
- BC Conservation Framework: Provides rankings of all wildlife species in B.C. and ecosystems of conservation priority
- BC Conservation Data Centre (CDC): Tracks all wildlife species and their provincial conservation status, as well as occurrence and distribution data;
- BC *Wildlife Act*: Protects all wildlife species (including all birds) and includes requirements for handling and surveying wildlife; and
- BC *Forest and Range Practices Act*: Reduces the effects of forest and range practices on ecosystems associated with wildlife habitat.

### 7.1.2 STUDY AREA DESCRIPTION

The assessment of impacts on wildlife was conducted for the Project Development Area (PDA), which was considered the maximum disturbance area during construction and operations. The PDA, after considering the changes to proposed project components made by Glencore during the review of the Application, would be 2,716 ha and includes the mine site, transmission line, and haul route options.

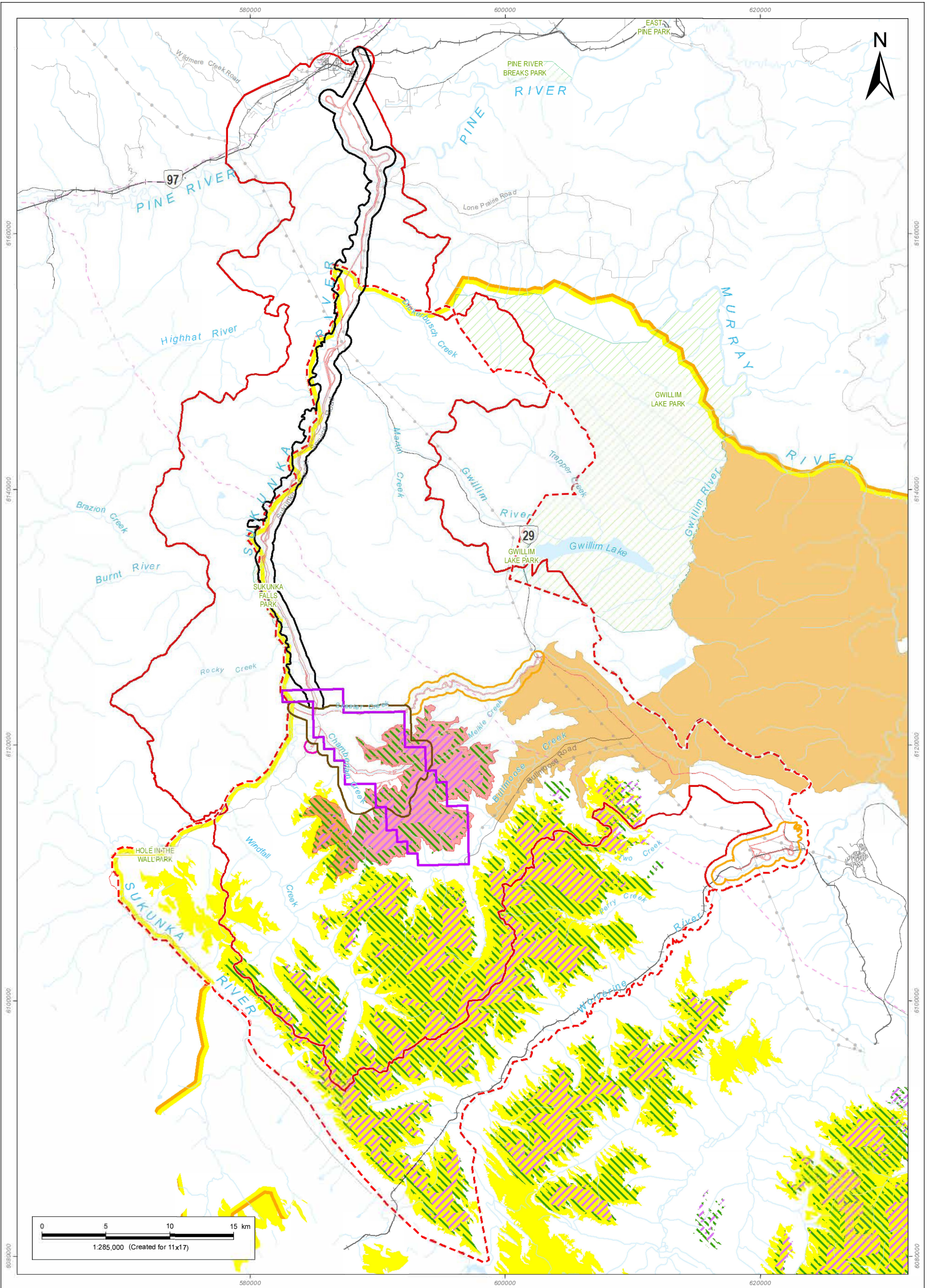
The wildlife assessment used a Local Assessment Area (LAA) to quantify direct and indirect effects (such as sensory disturbance), which included the PDA and a buffer of at least 500 m, following natural topographic breaks. The west boundary of the LAA was the Sukunka River and the south boundary of the LAA was the watershed boundary. The LAA was 17,530 ha.

The wildlife assessment also used a Regional Assessment Area (RAA) to provide regional context for determining the significance of Project-specific effects on wildlife and cumulative effects. The RAA was 183,230 ha and extended south from Chetwynd, generally following the height of land on either side of the Sukunka River valley south to the Wolverine Landscape Unit.

The temporal boundaries for the wildlife assessment included two years of construction, an approximate 22 years of operation, an approximate six years of closure for most of the mine site, and an additional post-closure period including a potentially permanent period of water treatment.

The Wildlife LAA and RAA are shown in [Figure 11](#) below.

Figure 11: Sukunka Wildlife LAA and RAA



<p><b>SUKUNKA COAL MINE PROJECT</b></p> <p><b>WILDLIFE RESOURCES LOCAL AND REGIONAL ASSESSMENT AREAS</b></p> <p>ENVIRONMENTAL ASSESSMENT APPLICATION</p>			<p>PREPARED BY:</p> <p><b>Stantec</b></p>
<p>PREPARED FOR:</p> <p><b>GLENCORE</b></p>			<p>DATE: 16-OCT-14</p> <p>FIGURE ID: 123110482</p>
<p>PROJECTION: UTM 10</p> <p>DATUM: NAD 83</p>			<p>DRAWN BY: R. STOHMANN</p> <p>CHECKED BY: J. PRESTON</p>

<ul style="list-style-type: none"> <li>Road - Gravel Surface</li> <li>Road - Paved Surface</li> <li>Railway</li> <li>Pipeline</li> <li>Transmission Line</li> <li>Watercourse</li> <li>Waterbody</li> <li>Provincial Park</li> </ul>	<ul style="list-style-type: none"> <li>Caribou Assessment Area</li> <li>Regional Assessment Area</li> <li>Sukunka Project Tenure Area</li> <li>Local Assessment Areas</li> <li>Chetwynd Options</li> <li>Mine Site</li> <li>Transmission Line Option 1</li> <li>Tumbler Ridge Option</li> <li>Project Development Area</li> </ul>	<ul style="list-style-type: none"> <li>High Elevation Winter Range - High Quality</li> <li>High Elevation Winter Range - Very High Quality</li> <li>Quintette Caribou Herd Range</li> <li>Ungulate Winter Range 9-002 SPC-009</li> <li>Ungulate Winter Range 9-002 SPC-013 / Wildlife Habitat Area 9-058</li> <li>Summer Core Caribou Habitat</li> </ul>
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*Data Sources:* Glencore, Province of British Columbia, Government of Canada  
*Disclaimer:* Although there is no reason to believe that there are any errors associated with the data used to generate this product or in the product itself, users of these data are advised that errors in the data may be present.  
*File Path:* fig\_10482\_ea\_wild\_05\_03\_01\_LAA

## 7.2 POTENTIAL PROJECT EFFECTS AND PROPOSED MITIGATIONS IDENTIFIED IN THE APPLICATION

Existing conditions, potential Project effects, and proposed mitigation measures identified in the Application are described in the subsections below. Section 5.3 of the Application describes in more detail Glencore's wildlife effects assessment.

### 7.2.1 EXISTING CONDITIONS

Sukunka would be located in the Northern Interior Forest Region and within the Central Canadian Rocky Mountains Ecoregion. The dominant vegetation type is mixed deciduous and coniferous forests, with wetlands occurring frequently along the Sukunka River.

The Application based its characterization of baseline wildlife information on existing data sources, field studies, Indigenous Groups' traditional knowledge and land use studies, habitat suitability models, and the results of Terrestrial Ecosystem Mapping. Field surveys were conducted in the summer of 2012, though the results may not represent the full range of species occurrence and habitat use. Species detected in the RAA included those designated species at risk under SARA, recommended for status by COSEWIC, red/blue-listed in B.C.<sup>29</sup>, and/or special interest to Indigenous Groups.

Species detected in the RAA included waterfowl and waterbirds of special interest (e.g., belted kingfisher, greater scaup, lesser scaup, common goldeneye, and trumpeter swan) and the following bird species of conservation concern: common nighthawk (listed as threatened on Schedule 1 of SARA), black-throated green warbler (blue-listed in B.C.), olive-sided flycatcher (listed as threatened on Schedule 1 of SARA), Baltimore oriole (blue-listed in B.C.), evening grosbeak (listed as special concern on Schedule 1 of SARA), Canada warbler (listed as threatened on Schedule 1 of SARA), Connecticut warbler (blue-listed in B.C.), Cape May warbler (blue-listed in B.C.), bank swallow (listed as threatened on Schedule 1 of SARA), broad-winged hawk (), and northern goshawk (blue-listed in B.C.).

The majority of amphibian observations (65 percent) from amphibian surveys were western toad (listed as special concern on Schedule 1 of SARA). Mammals of conservation concern detected included two bat species at risk (little brown myotis and northern myotis), grizzly bear (listed as special concern on Schedule 1 of SARA), wolverine (listed as special concern on Schedule 1 of SARA), and mountain goat (blue-listed in B.C.). Grizzly bear tracks were observed in early spring, suggesting that denning sites are likely present within the LAA.

### 7.2.2 POTENTIAL PROJECT EFFECTS

Glencore identified the following potential effects on wildlife:

- Change in habitat availability (direct and indirect);

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<sup>29</sup> Red-listed are those extirpated, endangered or threatened. Blue-listed are those of special concern.

- Change in mortality risk;
- Change in movement;
- Change in population dynamics; and
- Change in health.

*Change in habitat availability*

The extent of the direct habitat loss would be 2,716 ha due to vegetation removal (equal to the area of habitat within the PDA) from the mine, water management ditches, haul options (roads and rail load-outs), the water pipe corridor, and transmission lines. Indirect effects on habitat availability primarily are due to sensory disturbance, reduced habitat patch size (i.e., discrete habitat area) and dustfall. Glencore assessed the change in habitat available for the indicators listed below in [Table 15](#).

**Table 15: Wildlife Indicators Used to Assess Change in Habitat Availability**

Potential Effect	Indicators
Change in habitat availability	Elk, moose, mountain goat, grizzly bear, fisher, American marten, mature forest bird community, young forest bird community, grassland bird community, wetland bird community, northern goshawk, olive-sided flycatcher, western toad

Direct loss of habitat for some wildlife species would be partly reversed during post-closure with reclamation. Early successional habitats<sup>30</sup> is expected to return within approximately 15 years post closure with revegetation and reduced disturbance. This would result in an increase from baseline in this type of habitat, which could benefit elk, moose, mountain goat, and grizzly bear, which feed in primarily early successional habitats. Species that depend on late successional (e.g., mature forest) habitats (such as mature forest bird communities, fisher, marten, and northern goshawk) would likely not return until these are re-established, which for some habitat types can take over 250 years. The pit walls, pit lakes, water treatment features, and some infrastructure, such as the transmission lines and access roads, would result in the permanent loss of wildlife habitat (419.7 ha or 15.4 percent of the PDA); the remainder would be reclaimed.

Glencore used models to predict indirect habitat loss for wildlife key indicators. [Table 16](#) below lists the predicted direct and indirect loss of habitat for different indicator species and bird communities.

Glencore predicted that loss of habitat within the LAA would occur for all wildlife indicators assessed. Direct habitat loss by removal and indirect habitat loss through sensory disturbance and decreased patch size was considered. The predicted total habitat loss was between 1.5 to 3 percent of the habitat in the RAA and 7 to 61 percent in the mine site LAA, as described in [Table 16](#) by indicator.

<sup>30</sup> Early successional refers to new growth and an ecosystem at a young age

**Table 16: Loss of Habitat in the LAA by Indicator<sup>31</sup>**

Indicator		Effective Habitat Available at Baseline (ha)	Predicted Direct Loss of Habitat (ha)	Predicted Indirect Loss of Habitat (ha)
Elk		272.9	30.4	28.3
Moose		896.2	103.6	112
Mountain goat	summer	390.4	0	32.1
	winter	56.2	0	4
Grizzly bear	spring	1196.6	141.2	378.3
	summer	3251.5	525.5	773
	fall	3700.5	531.7	1419.7
Fisher		1695.9	516.2	155.5
American marten		5037.1	1457.6	263.4
Northern goshawk		3104	879.5	9.5
Olive-sided flycatcher		838	277.1	144.9
Mature forest bird community		2254.7	729.7	341.8
Young forest bird community		1107.8	305.2	373.8
Grassland bird community		362.5	6.2	14.8
Wetland bird community		295.2	2.4	94
Western toad	Breeding	178.6	3.6	8.7
	Overwintering	4284.9	1275	375.7

Glencore predicted that the loss of habitat during life of mine would be:

- Low magnitude for mountain goat, elk, American marten, grassland bird community, northern goshawk (listed as threatened on Schedule 1 of SARA), and western toad breeding; and
- Moderate magnitude for grizzly bear, fisher, mature forest bird community, young forest bird community, olive-sided flycatcher (listed as threatened on Schedule 1 of SARA), and western toad overwintering.

#### *Change in mortality risk*

Mortality risk was assessed for wildlife indicators listed in [Table 17](#). Increased linear feature density due to

<sup>31</sup> Data provided in the Application using only Tumbler Ridge options as Chetwynd options were later removed. Note that numbers provided in columns two through five were derived from habitat suitability models, and only include high through moderate suitability classes. Numbers in the last column 'Reclamation Prediction' were derived from habitat capability based on revegetation recovery and succession.

the construction of roads, rail load-out, transmission lines, pipelines, water diversion ditches, and water collection channels would result in increased mortality risk for mammals due to increased human and predator access.

**Table 17: Wildlife Indicators Used to Assess Change in Mortality Risk**

Potential Effect	Indicators
Change in mortality risk	Moose, grizzly bear, birds (general) Grizzly, amphibians (primarily western toad)

In addition, mortality risk for grizzly bear was quantified using core security analysis, which is a method of analyzing linear feature density impacts to grizzly bear. Core security habitat is defined as suitable habitat that is more than 1,000 ha in size and located more than 500 m from linear features. Core security habitat was found in the LAA and RAA and shown on Figure 5.3-3 of the Application. Core security habitat patches less than 1,000 ha are considered to have an increased risk of mortality. The critical threshold used in the Application<sup>32</sup> for grizzly bears in the RAA was a minimum of 68 percent for core security habitat. The baseline amount of core security habitat is 47 percent of the RAA and 8 percent of the LAA, which is already below the minimum acceptable amount for grizzly bears. Sukunka would further reduce core security habitat by 0.3 percent in the RAA and 1.6 percent in the LAA. At post closure, core security habitat would be expected to be partially reclaimed at the mine site due to closure of some linear features; however, the amount of core security habitat in the RAA and LAA would remain below the baseline amount.

Clearing and grubbing activities were predicted to present an increased mortality risk for wildlife species with limited mobility and those occupying specialized habitat features such as nests or dens. Increased mortality risk was also predicted due to vehicle collisions with mammals, birds, and amphibians, and transmission line collisions for birds. Amphibians are particularly susceptible to mortality from vehicles, and areas of high risk include the intersection of the haul route and wetlands. Western toad tadpoles were detected adjacent to the Sukunka Forest Service Road, and wetlands also occurred along the proposed haul routes, suggesting increased mortality risk at these locations.

Unlike other wildlife species where an increased likelihood of mortality was identified, there would be amphibian mortalities from Sukunka. It is unlikely that 100 percent of amphibians would be salvaged and excluded from the PDA, and mortalities are likely to occur during salvage and relocation (see Best Management Practices for Amphibian and Reptile Salvages in British Columbia, June 2, 2016).

Human-wildlife conflict resulting from operation of the camp and site facilities could result in increased mortality where lethal measures are used to deal with habituated wildlife, particularly bears.

<sup>32</sup> This cautionary threshold was based on the threshold used for the Northern Continental Divide Grizzly Bear Ecosystem in northwest Montana.

### *Change in movement*

The primary mechanism for change in wildlife movement would be the presence of the open pit mine site. Project components such as ditches, roads, rail load-outs, and the above ground pipe could also alter movement by acting as semi-permeable or impermeable barriers to wildlife. Change in movement was assessed for wildlife indicators listed in [Table 18](#).

**Table 18: Wildlife Indicators Used to Assess Change in Movement**

Potential Effect	Indicators
Change in movement	Ungulates (primarily elk, moose, caribou), grizzly bear, birds (primarily songbirds), amphibians (primarily western toad)

Glencore indicated that the mine site and water diversion and collection channels could act as a barrier to ungulates and grizzly bear that complete seasonal movements between valley-bottom habitats and alpine habitats. The Application indicated that it would be likely that ungulates and grizzly bear would find alternate travel routes within the RAA.

### *Change in predator-prey dynamics*

Large mammal predator-prey dynamics were assessed within the context of the RAA ([Table 19](#)). Human activity and development can influence predator-prey dynamics by displacing predators or prey from an area. Some species are more susceptible to displacement than others.

**Table 19: Wildlife Indicators Used to Assess Change in Predator-Prey Dynamics**

Potential Effect	Indicators
Change in predator-prey dynamics	Elk, moose, mountain goat, mule and white-tailed deer, grey wolf, grizzly bear, black bear, wolverine, cougar, coyote, caribou (discussed separately in <a href="#">Section 8</a> ).

During operations, less sensitive species such as deer, elk, and moose could be attracted to new foraging areas within the mine sites while predator species such as grizzly bear, wolf, and cougar could be displaced from these areas, creating refuges for prey species. Wolves could use transmission line rights-of-way (which would have relatively low human use) as movement corridors and in search of elk and moose that could be attracted to those cleared areas.

Post closure, reclaimed areas with early successional vegetation could attract ungulates and bears. The permanent pit walls could result in a long-term shift in predator prey dynamics at higher elevations due to increased use by mountain goats, which could attract predators.

### *Change in health*

The quantitative assessment of effects on wildlife health is included in Section 9.1 (Human and Ecological

Health) and Section 5.2 (Water Quality and Aquatic Biota) of the Application and was based on the extent that dustfall from vehicle emissions on haul routes would be deposited in the LAA. The species considered were listed in [Table 14](#) of this Report and Table 5.3-3 f the Application. Glencore used the indicators listed in [Table 20](#) to assess the change in wildlife health.

**Table 20: Wildlife Indicators Used to Assess Change in Health**

Potential Effect	Indicators
Change in health	Masked shrew, meadow vole, snowshoe hare, ermine, muskrat, moose, mule deer, red fox, black bear, American robin, red-winged blackbird, bald eagle, ruffed grouse, Canada goose, common merganser, mallard, aquatic amphibians

The primary exposure pathways for wildlife receptors would be through the ingestion of food, water, soil, or sediment, or contact with environmental media where concentrations of chemicals of concern found in coal dust – such as molybdenum and selenium – have increased. Ecological health risks were measured using risk quotients (RQ), which represented a ratio of the exposure (in this case, the cumulative daily dose of a substance) to the species-specific toxicity benchmark. The RQ ecological benchmark is 1.0: an RQ below 1.0 represents negligible effects to the species under consideration, and an RQ above 1.0 represents increasing adverse effects to the species.

Selenium concentrations would be expected to increase in fish due to Sukunka, although at baseline, selenium concentrations were already considered high in the area. Health effects were considered negligible or low for wildlife indicator species that do not have a main diet of fish. Effects were considered moderate for American mink, bald eagle, and common merganser because they have a primary diet of fish. The Application predicted exceedances of the RQ benchmark of 1.0 for selenium in the future cases for American mink, bald eagle, and common merganser (see Tables 9.1-15, 9.1-16 and 9.1-17 in the Application). For bald eagle, there would be a small increase from baseline, leading to a small exceedance of the benchmark RQ. For American mink and common merganser there would be a moderately higher incremental increase from baseline, leading to a moderate exceedance of the benchmark RQ.

The Application also predicted that the base case nickel RQ for masked shrew exceeded the benchmark of 1.0 (2.61), but this RQ would not be anticipated to increase in the future case (i.e. no predicted changes as a result of Sukunka).

Higher levels of molybdenum in plants could impact ruminants, such as moose, which are sensitive to high concentrations of molybdenum. Based on the small area of exposure along haul routes, the health effects were considered negligible or low for ruminants.

### *Cumulative Effects*

The Application included an assessment of cumulative effects on all potential wildlife effects in Section 5.3.7 of the Application. Cumulative effects on wildlife from industrial development could arise from currently existing projects and reasonably foreseeable projects. Mining, energy (oil and gas facilities and

pipelines), agriculture, forest harvesting, transportation (roads and rail load-outs), power (transmission lines), recreational areas, and urban development have occurred within the RAA and are proposed in the future, affecting wildlife habitat availability. These current and reasonably foreseeable future projects are listed in [Section 7.5](#) of this Report.

Although water and air quality has been affected by urban development, agriculture, forestry, and mining in the RAA, Glencore anticipated that through standard operating practices and best management practices, additional impacts to wildlife health can be managed to acceptable levels.

Linear feature density was above the cautionary thresholds for moose and grizzly bears and core security habitat was below the minimum acceptable levels for grizzly bears in the RAA at baseline. An increase in linear features could also increase barriers to or influence wildlife movement in the RAA and could facilitate predator access in the landscape.

The increase in cumulative mortality risk to grizzly bears was considered in detail in the Application. An increase in linear feature density would increase the potential for human-bear interactions, hunting pressure, and vehicle collisions with grizzly bears. Linear feature density, which is detrimental to grizzly bears, would be expected to increase by 1.8 percent for a total of 2.2 km/km<sup>2</sup> due to Sukunka, and it would be expected to increase in the RAA due to reasonably foreseeable projects by an additional 3.2 percent for a total of 2.9 km/km<sup>2</sup>. A critical threshold of 2.4 km/km<sup>2</sup> for linear feature density for grizzly bear was identified in the Application; therefore, the cumulative increase in mortality risk in the RAA would exceed this critical threshold.

Grizzly bear core security habitat at baseline (47 percent of the RAA) was below the identified minimum acceptable amount of 68 percent. Sukunka would further decrease it by 0.3 percent, and it was expected to decrease further in the RAA due to reasonably foreseeable projects by an additional 0.8 percent. Glencore anticipated that with proposed mitigation measures, and provincial initiatives<sup>33</sup> such as banning grizzly bear hunting, restricting access, and reducing vehicle collision risks, cumulative effects of Sukunka to grizzly bear mortality risk would be not significant.

### 7.2.3 MITIGATION MEASURES

Key mitigation identified in the Application to address effects to wildlife included:

- Conduct pre-disturbance surveys along boundaries of clearing areas and within the PDA where overlap with identified ungulate winter range (UWR) and wildlife habitat area (WHA) habitats occur to identify wildlife habitat features and determine any additional mitigation measures required,

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<sup>33</sup>Initiatives relate to the Hart and Moberly Grizzly Bear Population Units and includes the Dawson Creek Land and Resource Management Plan (focuses on protected areas for grizzly bear habitat (e.g., Elephant Ridge South - Mt. Meikle) where access restrictions apply; major river corridors (e.g., Sukunka River) with the objective of managing resource development and access to minimize negative human/bear conflicts (e.g., summer road restrictions); and Sensitive Access Management which may include access restrictions). Human/bear conflicts are also addressed by programs and activities conducted by the Conservation Officer Service.

- such as setbacks;
- Complete site-clearing activities outside of breeding bird and denning/rearing periods for wildlife where possible, or conduct a pre-disturbance wildlife habitat features survey to identify areas for avoidance;
- Develop a Bird Nest Mitigation Plan that clearly outlines how risk of incidental take of birds would be managed in accordance with provincial and federal guidance. This plan must include:
  - Identification of project activities that could cause incidental take;
  - Preventive and mitigation measures such as timing windows and setbacks;
  - Methods for undertaking nesting activity surveys by one or more Qualified Professionals (QP) that follow existing standards and species-specific survey and inventory methods where applicable;
  - Reporting requirements for discovery of active nests to the Environmental Manager on site;
- Within and adjacent to UWR habitats, avoid clearing and site preparation activities during the winter to minimize sensory disturbance to ungulates;
- Conduct pre-disturbance surveys to identify where potential western toad breeding and dispersal habitats intersect the PDA and develop a Western Toad Protection Plan, including mitigation measures that extend through all Project phases;
- Design water management ditches to allow for safe wildlife crossings; and
- Provide crossing opportunities for wildlife to move along linear features such as channels, breaks in snowbanks along roads, and culverts for western toad under haul routes if pre-disturbance surveys in the LAA identify locations where potential western toad breeding and dispersal habitat are intersected.

Complete lists of the proposed mitigation measures can be found in the Application in Section 5.3.6.2.3 (habitat availability), Section 5.3.6.3.3 (mortality risk), Section 5.3.6.4.3 (movement), Section 5.3.6.5.3 (health), and Section 5.3.6.6.3 (population dynamics). Additional detail was also provided in response to IR#96 in Table 2-1 and IR#770 during Application Review.

### **7.3 POTENTIAL PROJECT EFFECTS AND PROPOSED MITIGATIONS IDENTIFIED DURING APPLICATION REVIEW**

During Application Review, the EAO received and reviewed comments from the public, Indigenous Groups and the Working Group (which can be found in the public, Indigenous Groups and Working Group issues tracking tables). From these comments, the EAO has distilled the following main issues:

- Assessment of species at risk;
- Assessment of migratory birds;
- Assessment of western toad; and
- Assessment of grizzly bear.

#### *Assessment of species at risk*

ECCC and LWRS raised concerns about the use of indicator communities to assess effects to birds and

whether such an approach appropriately assessed effects on bird and bat species at risk. ECCC indicated that species-specific baseline surveys (using appropriate survey protocols) would contribute to a better understanding of habitat usage and inter-annual variation for species at risk, and this additional analysis would inform a more accurate and biologically meaningful effects assessment, including cumulative effects assessments where residual effects are identified. ECCC requested that a species-specific effects assessment for bat species (little brown myotis and northern myotis) be provided, as there is uncertainty in the characterization of effects to bat species without this information. Species-specific surveys would also assist in determining if proposed mitigation measures were sufficient for reducing potential effects.

Glencore responded that indicator communities were chosen to infer effects on several wildlife species, including species at risk, because it was not feasible to assess all species individually. An exception to this was made for olive-sided flycatcher (listed as threatened on Schedule 1 of SARA), which was assessed separately in the Application because of its specific habitat requirements that could not be incorporated adequately within the bird communities. Bat species (little brown myotis and northern myotis) foraging habitat requirements were identified by Glencore to overlap the wetland bird community and other wildlife indicators. To address remaining concerns from ECCC, Glencore provided an assessment of the specific behaviours and habitat needs of each species at risk, identifying information gaps, and describing mitigation measures to address these information gaps. These details are provided in Glencore's memo "Information Request #94, #96, #104, and #770" dated February 24, 2016 in Table 2-1. Glencore also made a commitment to complete additional pre-disturbance wildlife surveys.

Considering the concerns about the Application regarding species at risk, the EAO has proposed Condition 18: Wildlife Protection and Mitigation Plan, requiring Glencore to:

- Prior to construction, conduct pre-disturbance, species-specific surveys for all SARA-listed birds and bats in suitable habitat within the LAA, specifically including: little brown myotis, northern myotis, Canada warbler, common nighthawk, rusty blackbird, short-eared owl (listed as threatened on Schedule 1 of SARA), peregrine falcon, barn swallow, bank swallow, and yellow rail. These surveys would:
  - Document key habitat features (including nesting colonies and roosting habitat for bank swallow and barn swallow, roost sites and hibernacula for little brown myotis and northern myotis);
  - Include species-specific surveys in all wetlands and riparian areas impacted by Sukunka as well as wetlands hydrologically-connected to those wetlands; and
  - Use species-specific appropriate survey methods (including Resources Information Standards Committee (RISC) for bank swallow, barn swallow, yellow rail, rusty blackbird, Canada warbler, and short-eared owl (listed as threatened on Schedule 1 of SARA); the *Canadian Nighthawk Survey Protocol* for common nighthawk; and additional bat detectors at all suitable habitat and desktop surveys for little brown myotis and northern myotis), with methods developed in consultation with ECCC, ENV, FOR, LWRS, and Indigenous Groups;
- Implement mitigation measures for any potential environmental effects to species at risk birds and bats, including maintaining appropriate setbacks between disturbance areas and active bat roost sites, bat hibernacula, and bird habitat as recommended by LWRS, Indigenous Groups, and ECCC;

- Compensate for any loss of bat maternal roosting and hibernacula sites, including through the establishment of artificial habitat features that mimic those previously available in the project area (such as artificial roost trees that simulate trees with loose bark);
- Compensate for any loss of nesting sites for barn swallow and bank swallow; and
- For offset measures that do not involve financial contributions, implement offset measures in such a way that either allows wildlife habitat to be available at the time of or before such habitat is lost.

### *Assessment of migratory birds*

In addition to the mitigation measures identified for species at risk above, ECCC also recommended that Glencore commit to mitigation measures specifically for bird communities and olive-sided flycatcher (e.g., providing coarse woody material, retaining snags, and installing nest boxes). Glencore agreed to this, where habitat is identified in pre-disturbance surveys. These mitigation measures would be developed in detail in Glencore's operational Wildlife Protection and Monitoring Plan, Bird Nest Mitigation Plan, and Reclamation Plan in consultation with ECCC, Indigenous Groups and LRWS.

To address potential effects on migratory birds, the EAO proposes that the Wildlife Protection and Mitigation Plan (condition 18) also require Glencore to:

- Informed by the pre-construction surveys and in consultation with ECCC, Indigenous Groups and LRWS, develop a Wildlife Protection and Monitoring Plan which will include mitigation measures related to bird communities, olive-sided flycatcher, and in particular:
  - Provide coarse woody material;
  - Retain snags;
  - Prevent use of contaminated water bodies by wildlife;
  - Install nest boxes; and
  - Maintain a buffer around wildlife trees.
- Appropriate standard protocols employed for surveying breeding birds, including but not limited to the BC provincial Resources Information Standards Committee (RISC) standards, as well as other species-specific survey and inventory methods, where applicable, for species that are often not detected using RISC standards;

### *Assessment of western toad*

ECCC raised concerns that the Application was not adequate to assess baseline conditions and potential effects to western toad and amphibians in general. ECCC also wanted Glencore to commit to specific mitigation measures for western toad (in particular, to prevent use of human made structures for breeding). Glencore provided additional information on the surveys conducted in 2012 and 2015, but did note that survey effort in 2012 was not recorded. A total of 165 breeding bird surveys and 409 wildlife habitat assessments were completed in the LAA, where amphibian surveys were conducted opportunistically when amphibian habitat was encountered. Amphibian surveys were also completed along Meikle Creek haul route in August 2015. Glencore also committed that pre-disturbance surveys would be conducted to identify breeding and dispersal habitats, and a Western Toad Protection Plan would be developed.

ENV and LWRS also raised concerns that amphibian surveys were not completed in the Sukunka wetland adjacent to the mine site. Glencore assumed in the Application that western toad uses this wetland and so planned to implement mitigation measures related to western toad in this wetland (as listed in Appendix 20.0-A.11 of the Application), and committed to completing pre-disturbance amphibian surveys in the Sukunka wetland.

To address the potential effects on amphibians, the EAO proposes that a Wildlife Protection and Mitigation Plan (condition 18) include requirements for Glencore to:

- Prior to the commencement of construction, conduct additional baseline surveys for western toad and other amphibian species. These surveys should be conducted by a Qualified Professional and be conducted:
  - Across multiple years, during the appropriate time period to capture information on breeding, post-breeding migration, emergence, and non-breeding periods;
  - At all potential breeding sites (including the Sukunka wetland);
  - At all potential migration corridors that connect breeding ponds to upland terrestrial habitats; and
  - Along roads and highways associated with project-related traffic, including estimates for scavenger-removal and observer detection rates.
- Include specific details on amphibians, with a focus on western toad, which will include:
  - The results of the additional baseline surveys as described above;
  - Identification of potential road mortality hotspots based on road surveys;
  - A salvage and relocation program for amphibians, following British Columbia's *Best Management Practices for Amphibian and Reptile Salvages in British Columbia*;
  - A description of how British Columbia's *Guidelines for Amphibian and Reptile Conservation during Urban and Rural Land Development in British Columbia* will be taken into account;
  - The following mitigation measures:
    - A buffer of at least 150 m around core wetlands and aquatic habitats to protect it from edge effects<sup>34</sup> surrounding all breeding ponds, or where this is not possible, a map, rationale for the decreased buffer size, and additional mitigation measures that would be applied;
    - Adjustment of timing of project activities to avoid habitats when amphibians are occupying the habitat or during sensitive periods, including during breeding and migration;
    - Maintenance of travel corridors between breeding
    - Instalment of multiple wildlife crossings designed for amphibians, with a focus on identified road mortality hotspots; and
    - Instalment of fencing adjacent to all identified breeding ponds to direct western toad dispersal movements towards crossing features (e.g. tunnels, overpasses) and away from project infrastructure and human-made habitats; and

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<sup>34</sup> Edge effects are those that occur along the boundary of habitat patches.

- A monitoring program to evaluate effectiveness of the mitigation measures implemented, including an assessment of its use of all fencing and crossing structures.

### *Assessment of grizzly bear*

ENV and LWRS indicated that more recent literature has identified the critical linear feature density threshold for grizzly bears to be between 0.75 to 2.0 km/km<sup>2</sup> (depending on vehicle traffic and hunting pressure), not the 2.4 km/km<sup>2</sup> identified in the Application. Glencore responded that this information was published after the wildlife effects assessment had been completed, and the Application used the best available information at the time. The EAO considered the current recommended threshold (reflecting best available science) as well as the information provided in the Application in its assessment given the amount of time that has elapsed since the Application was submitted.

ENV and LWRS also raised concerns about the increased risk to mortality of grizzly bears in the region. Although there is currently a ban on hunting grizzly bear in the region, this would likely have a small impact on the population as most harvested animals were males, and the hunting level was sustainable. The Hart Grizzly Bear Population Unit (GBPU) which covers the Sukunka RAA has been highly impacted from habitat loss and fragmentation. An increase in road density would also increase illegal hunting pressure, risk of human-wildlife conflicts, and vehicle collisions.

LWRS also indicated that grizzlies tend to use the same routes year after year, and this species may not easily find new travel routes, as indicated in the Application<sup>35</sup>. As well, the habitat that would be impacted by Sukunka is considered high-value and necessary to grizzly bear populations<sup>36</sup>.

Glencore responded that mitigation measures would be developed in consultation with Indigenous Groups and the agencies through the Wildlife Protection and Monitoring Plan, an Access Management Plan, and a Solid Waste Management Plan. Preliminary drafts of these plans were included as part of the Application and these plans would be finalized as part of permitting requirements in consultation with Indigenous Groups and the relevant agencies.

Aspects of the Access Management Plan during construction and the Solid Waste Management Plan related to impacts to grizzly bear would form part of the Construction Environmental Management Plan (CEMP), which the EAO proposes as Condition 14. The Wildlife Protection and Mitigation Plan, also proposed by the EAO as Condition 18, would also include the following mitigation measures to address the increased risk to grizzly bear mortality:

- Monitoring and reporting of all human-wildlife conflicts during all phases of Sukunka;
- Use training procedures to minimize human-wildlife interactions and protect personnel and contractors;
- Use bear-safe waste management facilities at the camp and mine site;

<sup>35</sup> See Roever, Boyce & Stenhouse; Nielsen et al 2004; Northrup et al 2012

<sup>36</sup> See Turney and Roberts 2004 for Grizzly bear habitat suitability models in BC

([http://a100.gov.bc.ca/appsdata/acat/documents/r1526/hsm\\_4065\\_murar\\_1115307155824\\_ee60c663264b43aba7b2a8923b1f9018.pdf](http://a100.gov.bc.ca/appsdata/acat/documents/r1526/hsm_4065_murar_1115307155824_ee60c663264b43aba7b2a8923b1f9018.pdf))

- Seed roadsides with seeding mixtures that minimize or eliminate the use of plant species attractive to bears and are native and endemic to the region;
- Require project personnel and contractors to report roadside wildlife carcasses to the Environmental Manager who will ensure they are removed;
- Require project personnel and contractors to report wildlife incidents and encounters related to garbage or other attractants to the Environmental Manager who will take corrective action;
- Require project personnel and contractors working in active zones to relay wildlife sightings to other workers as soon as possible (e.g., by radio); and
- Require that any direct intervention with respect to problem wildlife be done by authorized personnel in consultation with, and as approved or directed by, the British Columbia Conservation Officer Service and a wildlife biologist from LWRS.

## 7.4 THE EAO'S CHARACTERIZATION OF RESIDUAL EFFECTS

The EAO's characterization of the expected residual effects of Sukunka on wildlife is summarized below, as well as the EAO's level of confidence in the effects assessment (including their likelihood and significance).

After considering the proposed mitigation measures, the EAO concludes that Sukunka would result in the following residual adverse effects on wildlife:

- Loss of habitat for all assessed species from direct disturbance and sensory disturbance;
- Increase in mortality risk for all species assessed as a result of clearing activities, from predators due to an increase in linear features, and from collisions with vehicles, trains and the transmission line;
- Change in movement for all assessed species due to construction of the mine site, haul roads, water diversion channels;
- Reduction in health due to increased selenium concentrations for American mink, bald eagle, and common merganser; and
- Change in predator-prey dynamics by displacing or attracting predators and prey to different areas.

The EAO notes that impacts from past development in the region have contributed to low-to-moderate resilience for species of conservation concern, and low resiliency of grizzly bear because of the existing extent of linear features and low core security habitat in the region along with their high sensitivity to human disturbance.

As identified in the previous section of this chapter, the EAO has proposed the following condition to address the residual effects and concerns raised by the Working Group:

- A Wildlife Protection and Monitoring Plan that would include requirements for Glencore to conduct pre-disturbance species surveys for amphibians, SARA-listed birds, migratory birds, and bats within the LAA, documenting key habitat features, and identify where and the means by which mitigation measures would be implemented.

**Table 21: Summary of Residual Effects for Wildlife**

*Note: Criteria and assessment ratings are defined in [Appendix 4, Residual Effects Characterization Definitions](#)*

Criteria	Assessment Rating	Rationale
Context	<b>Low to moderate</b>	<p>Impacts from past development in the region have contributed to <b>moderate</b> resiliency for most wildlife species), but <b>low to moderate</b> for species of conservation concern (wolverine, fisher, western toad, olive-sided flycatcher and other bird species). Effects on caribou were assessed in <a href="#">Section 8: Caribou</a>.</p> <p>Grizzly bear has a <b>low</b> resiliency because of their high sensitivity to human disturbance (due to population demographics and late sexual maturity) as well as the baseline extent of linear features and low core security habitat in the region.</p> <p>The base case levels for RQs for selenium in American mink, bald eagle, and the common merganser and for nickel in the masked shrew are already above benchmark levels, suggesting an elevated health risk amongst these species near Sukunka and a <b>moderate</b> resiliency.</p>
Magnitude	<b>Low to moderate</b>  <b>Habitat availability</b> <b>Mortality risk</b> <b>Movement</b> <b>Population dynamics</b> <b>Health</b>	<p>The magnitude of the predicted effects is considered <b>low to moderate</b> because of the low to moderate amount of <b>habitat disturbance</b> (1-3 percent of the RAA; 0-61 percent of the LAA); the <b>low to moderate</b> increase in <b>mortality risk</b> (mortality of individuals would not exceed the resilience limits of wildlife populations); and <b>low</b> magnitude change in the RAA to <b>population (predator-prey) dynamics (negligible to minor</b> measurable effect) and <b>movement (negligible to minor</b> measurable effect).</p> <p>The magnitude of the predicted effects to ecological <b>health</b> from selenium range from <b>low</b> for bald eagle (less than one point increase, or low exceedance, of RQ) to <b>moderate</b> for American mink, and the common merganser (1 to 1.7 point increase, or <b>moderate</b> increase, of RQ).</p>
Extent	<b>Local to regional</b>	<p>Effects to wildlife would be confined generally to the <b>local</b> area of the mine site and adjacent habitat. Effects would extend, however, to the <b>regional</b> area for species with large home ranges, in particular grizzly bear.</p>
Duration	<b>Long-term to permanent</b>	<p>Some infrastructure would be <b>permanent</b> and would not be decommissioned. There would be some <b>permanent</b> loss of habitat and alteration of habitat from current conditions. Otherwise, the effects of direct habitat loss would persist over the long-term until habitat is effectively re-established following reclamation. Sensory disturbance would persist in post-closure, and potentially <b>permanently</b> due to activities associated with active water treatment, although presumably at a decreased level.</p> <p>Effects to mortality risk, health, movement, and population-dynamics would be <b>long-term</b> until post closure after reclamation and natural revegetation on linear features; however, some mortality risk would persist permanently from the creation of permanent linear features (i.e. the Meikle Creek Forest Service Road (FSR) in the Tumbler Ridge</p>

Criteria	Assessment Rating	Rationale
		haul option and the transmission line option chosen).
Reversibility	<b>Reversible and irreversible</b>	<p>Direct effects to habitat would be <b>reversible</b> for early successional habitat and potentially reversible within a very long-time frame (250+ years) for mature vegetation habitat such as old forest (such as such as mature forest bird communities, fisher, marten, and northern goshawk).</p> <p>Sensory disturbance would be mostly <b>reversible</b> upon mine closure, but <b>irreversible</b> in the areas of potentially permanent use.</p> <p>Effects to mortality risk, movement, and population dynamics from increased access would be <b>reversible to some degree</b> where mitigation is implemented to block access; however, effects would be <b>irreversible</b> where access remains open and in use for active water treatment (potentially in perpetuity).</p> <p>Effects to health would be <b>reversible</b> post-closure and reclamation as effects are considered at the population level.</p>
Frequency	<b>Once and continuous</b>	<p>Direct effects to habitat would occur <b>once</b> during clearing and construction. Effects to sensory disturbance, mortality risk, movement, and population dynamics would be <b>continuous</b> through construction and operations and through the ongoing period of active water treatment.</p> <p>Effects to health would be <b>continuous</b> through operations but would not continue post-closure.</p>
Likelihood	<b>High</b>	There would be a <b>high</b> likelihood of adverse effects to wildlife occurring.
Significance Determination	<b>Not significant</b>	While the effects are unevenly distributed between wildlife species, the EAO has proposed a comprehensive Wildlife Protection and Monitoring Plan to adaptively manage effects on wildlife. The EAO concludes that residual adverse effects to wildlife would be <b>not significant</b> , which takes into consideration the characterization of residual effects (low to moderate magnitude and reversibility of impacts in the PDA outside of the infrastructure and activities associated with ongoing active water treatment), the mitigation measures identified by Glencore, and the conditions proposed by the EAO requiring additional pre-construction surveys and development of species-specific mitigations.
Confidence	<b>Low to moderate</b>	There is <b>low to moderate</b> confidence in the significance and likelihood determination for wildlife indicators. While the EAO understands that there is a reasonable amount of certainty provided by the data and models used in the assessment and effects and measures to mitigate these are understood, the rating takes into account the lack of species-specific surveys completed for baseline assessments and uncertainties related to ongoing water treatment and the eventual outcomes of mine site reclamation.

## 7.5 CUMULATIVE EFFECTS ASSESSMENT

There are eight existing and reasonably foreseeable projects and activities that have the potential to act

cumulatively with Sukunka.

Cumulative effects on wildlife from industrial development are present at baseline. Mining, energy (oil and gas facilities and pipelines), agriculture, forest harvesting, transportation (roads and rail load-out), power (transmission lines), recreational areas, and urban development have occurred within the RAA. Forestry, new road development, oil and gas exploration, and coal exploration are likely planned for the RAA in the future and would likely contribute further to residual effects on wildlife resources. Within the RAA, existing projects include the Brule Mine, Meikle Creek Wind Energy, Bullmoose Mine, and Kwoen Gas Plant.

Future projects that overlap the RAA include Sundance Wind Energy, Quality Wind Energy; and Coastal GasLink Pipeline.

Habitat availability for all wildlife species assessed has been reduced by past and current projects, and the availability of mature and old pine-dominated forest has been reduced through beetle kill and salvage harvesting. The Application noted that at baseline, cumulative loss of mature and old forest within the RAA already exceeded habitat thresholds for moose and grizzly bear, whereas cumulative loss of wetland and alpine habitat was likely minimal due to the location of development activities and regulations limiting harvesting in wetland habitats.

Increased access from roads and other linear developments has greatly increased mortality risk for wildlife indicators such as ungulates and grizzly bear within the region. At baseline, linear feature density was above the cautionary threshold<sup>37</sup> for moose and grizzly bear. Linear features act cumulatively to affect wildlife movement and change predator-prey dynamics. This cumulative effect would occur continuously until linear features are reclaimed. For grizzly bear, the Application shows that the baseline linear feature density was above the cautionary threshold and in the view of ENV, the critical threshold as well. Glencore carried forward the residual effects on mortality risk to grizzly bear for the detailed cumulative effects assessment. A detailed assessment of cumulative effects to grizzly bear is provided in the following section.

As the residual effects of Sukunka on wildlife movement, population dynamics, and wildlife health were determined to be not significant, Glencore did not undertake a cumulative effects assessment on these aspects.

The change in wildlife movement is related to the addition of infrastructure and roads, as well as other disturbance activities in the RAA. Sukunka would contribute to cumulative effects primarily in the LAA, which would impact only a small portion of the regional wildlife populations. Glencore assessed that the change in movement overlaps with similar effects from existing mining, forestry, agriculture, urban development, recreation, roads, and other linear features; however, the overall cumulative impact of Sukunka in the region would be expected to be low for the change to wildlife movement due to a predicted no to minor measurable effect to movement. Overlap with reasonably foreseeable projects would be likely for a change to wildlife movement and could result in an additive cumulative effect;

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<sup>37</sup> A 'cautionary threshold' is a level indicating that additional monitoring is required to understand impacts to the local population.

however, this would not be considered significant due to the moderate resiliency of wildlife populations in the RAA, the low additional impact of Sukunka, mitigation measures proposed by Glencore, and regional wildlife management by the Province.

The predicted low magnitude and reversibility of impact to wildlife population dynamics and wildlife health due to Sukunka related to infrastructure and deposition of selenium would not be expected to contribute significantly to cumulative effects in the region. Although the levels of selenium are considered high at baseline, the impact on wildlife health through the consumption of fish was considered not significant. The impacts of selenium on human consumption of fish are discussed further in [Section 16](#) (Human Health).

For indicators of change in habitat availability, mortality risk, population dynamics, and health, given that the increased impact of Sukunka in the RAA is anticipated to be low, the EAO concludes that significant cumulative effects generally to wildlife, other than grizzly bear, are not expected as a result of the effects of Sukunka interacting with the effects of other past, present, and reasonably foreseeable future projects and activities.

#### *Cumulative effects to grizzly bear*

The primary mechanism for change in mortality risk to grizzly bear is the increase in linear feature density for Sukunka and existing and future projects. These increases would worsen human-bear encounters, illegal hunting pressure, and vehicle collisions, causing increased bear mortality.

Sukunka would increase linear feature density from 2.18 km/km<sup>2</sup> to 2.22 km/km<sup>2</sup> and future projects, if built, would further increase to as much as 2.9 km/km<sup>2</sup>; however, it should also be considered that most linear features for future projects have not been quantified. The critical threshold<sup>38</sup> for grizzly bear in the application was assumed to be 2.4 km/km<sup>2</sup>, but it was identified by LWRS that more recent literature indicates the critical threshold for linear feature density could be much lower for grizzly bear (0.75 to 2.0 km/km<sup>2</sup>). The cumulative linear feature density would be above or well above these identified critical thresholds. Road density is a main factor considered in LWRS's Cumulative Effects Framework, and road density is already above the maximum density managed for by the Province<sup>39</sup>. The existing core security habitat condition is below the minimum acceptable amount needed for grizzly bear, meaning that there is not enough core security habitat for grizzly bears to maintain their current population density in the region.

ENV noted that any increase in mortality risk in this part of the Hart GBPU is of great concern given the recent human caused mortality history, high existing open road densities, and lack of core security habitat. ENV also noted that there is additional cumulative mortality risk from the planned location of two construction camps associated with the Coastal GasLink pipeline in the Sukunka RAA. In the Hart GBPU, there are nine mines on the landscape, which is the highest number of mines present in a GBPU in the

<sup>38</sup> A 'critical threshold' is a level based on scientific knowledge, reflecting the maximum amount of stress that a sensitive species can support without long-term adverse impacts.

<sup>39</sup> See the Auditor General's report on cumulative effects, available at:

<https://www.bcauditor.com/sites/default/files/publications/reports/OAGBC%20Cumulative%20Effects%20FINAL.pdf>

Province.

Regional initiatives have sought to reduce cumulative effects to grizzly bear in the region, such as the Dawson Creek Land and Resource Management Plan, and activities by the Conservation Officer Service, as detailed in Section 5.1.2. A ban on hunting throughout the province also took effect on December 18, 2017 (excluding Indigenous Group's harvest for food, social, or ceremonial purposes or treaty right).

Glencore stated that the Access Management Plan, Human-Wildlife Conflict Plan, and Reclamation Plan would address cumulative effects on grizzly bear mortality risk. The EAO agrees that these plans are necessary although not sufficient to fully avoid additional effects to grizzly bears in the RAA. Preliminary plans were submitted as part of the EA Application, and they would be finalized during permitting.

The EAO considers the cumulative effects to grizzly bear to be high in magnitude since, due to reasonably-foreseeable projects, linear feature density could exceed the critical threshold, and at baseline core security habitat already is below the minimum acceptable amount. The cumulative effects would be regional in extent (affecting the Hart GBPU) and long-term in duration as they are driven by the reestablishment of habitat and suitable core security areas. Some cumulative effects could be reversible to the extent that access is closed and reclaimed; however, it would not be expected that this would be the case for all future or current access. The frequency of effects depends on the timing of future projects, but generally the effects of increased mortality risk are ongoing and would continue to occur in the future.

For the purposes of this assessment, residual adverse cumulative effects would be considered significant if there is a long-term or irreversible potential residual adverse cumulative effect with a magnitude that is predicted to exceed an acceptable biological threshold or standard, or is predicted to affect the indicator population such that stated management or conservation objectives might not be attainable. The EAO took into account the following factors in its conclusion of significance of cumulative effects on grizzly bear:

- Exceedance of the grizzly bear linear feature density critical threshold identified in the Application if all reasonably-foreseeable projects are built and exceeds the current identified critical threshold;
- The December 2017 province-wide ban on hunting grizzly bear;
- Exceedance of the minimum acceptable amount of core security habitat for grizzly bear at baseline;
- Mitigation measures proposed by Glencore to address the potential increase to grizzly bear mortality;
- The Wildlife Protection and Monitoring Plan proposed as Condition 18 by the EAO;
- Grizzly bear mitigation measures that would likely be applied by other Certificate Holders to other similar projects in the RAA; and
- Regional initiatives to reduce grizzly bear mortality in the region including the LWRS-led Grizzly Bear Program to monitor and mitigate cumulative impacts of LNG pipeline development on grizzly bear populations in Northern B.C.

Although the EAO is of the view that Sukunka would not on its own have a significant adverse residual effect to grizzly bears, the EAO concludes that there is an existing significant adverse cumulative effect to grizzly bear because of current disturbance, and that Sukunka would further contribute to this. Considering

the effects from past and existing projects and activities on grizzly bear, and the status of the Hart GBPU, as well as reasonably foreseeable projects and activities, cumulative effects to grizzly bear are considered significant.

## 7.6 CONCLUSIONS

Considering the above analysis and having regard to the conditions identified in the CPD and TOC (which would become legally binding if an EAC is issued), excluding caribou, the EAO is of the view that Sukunka would not have significant adverse residual effects on wildlife. Although Sukunka itself would not have a significant adverse residual effect on grizzly bear, the EAO is of the view that there is an existing significant cumulative adverse effect on grizzly bear to which Sukunka would further contribute.

## 8.0 ASSESSMENT OF EFFECTS TO CARIBOU

### 8.1 BACKGROUND

Although caribou are generally considered under the wildlife valued component (VC) (Section 7.0), caribou were selected as a key indicator in Glencore’s assessment because of their importance to Indigenous Groups and British Columbians, as well as the growing concern regarding their population decline and high levels of habitat disturbance in B.C. The EAO therefore considered caribou separately within this Report.

Caribou ranges extend throughout much of B.C., and the herds use different habitats and experience different challenges. In 2014, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) assessed Caribou, Central Mountain population (Designatable Unit 8) as endangered. The Central Mountain population includes six herds in the South Peace area of British Columbia (Scott, Moberly<sup>40</sup>, Kennedy Siding, Burnt Pine, Quintette, and Narraway, which ranges into Alberta) as well as additional herds in Alberta. These caribou spend a significant portion of their time in higher elevation habitats that act as a refuge from predation compared to lower elevation forests, and provide a stable food source – lichen – throughout the winter months. This population has experienced dramatic declines over recent decades, largely attributed to landscape development that has resulted in unsustainably high levels of wolf predation on caribou. The Central Mountain population’s Burnt Pine herd has been considered extirpated since 2013.

The British Columbia Conservation Data Centre has included the Central Mountain population on the provincial red list. The red list includes any native species or ecological communities that have, or are candidates for, extirpated, endangered, or threatened status in British Columbia.

The Central Mountain population is part of the Woodland Caribou, Southern Mountain population (often referred to as “Southern Mountain Caribou”) that is listed on Schedule 1 of the federal *Species at Risk Act* as threatened.

The Quintette is the herd of primary relevance to the assessment of Sukunka. This herd has been declining for many years, with a population estimate of 173-218 caribou in 2008 and 114-129 individuals in 2013. In 2016, the population estimate focused on those caribou remaining in high elevation habitat, and it was estimated that 41 remained (62 total in all habitats). In 2018, an increase to 65 individuals in high elevation habitat was estimated (58 observed) and 74 total in all habitats. In 2022, 69 individuals were observed within High Elevation Winter habitat as defined by the Province of B.C., with a population estimate of 132 across all Quintette habitats. These short-term increases are attributed to predator control efforts that commenced in 2015 as part of the Provincial Caribou Recovery Program in the area. Since 2018, very few caribou are known to be using previously occupied high elevation habitat in the Quintette/Roman/Babcock areas, with most remaining caribou using the Bullmoose/Spieker/Collier high elevation areas of

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<sup>40</sup> These herd names are used in the 2014 COSEWIC assessment report. The Scott and Moberly herds are now known as the Klinse-za herd.

the Quintette range

## 8.2 REGULATORY CONTEXT

There are several key provincial and federal legislation, policy, and other regulatory guidance documents relevant to the protection and management of caribou in the Quintette herd, and which have informed the assessment of Sukunka. These documents are:

*Species at Risk Act (SARA), including Federal Recovery Strategy and Imminent Threat Determination*

The purposes of the federal SARA are to prevent Canadian indigenous species, subspecies, and distinct populations from being extirpated or becoming extinct, to provide for the recovery of species that are extirpated, endangered, or threatened because of human activity, and to manage species of special concern to prevent them from becoming at risk, endangered or threatened.

The Quintette herd is considered part of the Woodland Caribou, Southern Mountain population which has been listed under the federal SARA as Threatened since 2003. The Federal Recovery Strategy<sup>41</sup> for Woodland Caribou, Southern Mountain population in Canada was published in 2014. The Recovery Strategy distinguishes between three “groups” (Southern, Central, and Northern). The Quintette herd, referred to as the Quintette local population unit (LPU), is included in the Central Group.

The Recovery Strategy identifies critical habitat throughout the species’ range, which includes Sukunka. It includes a recovery goal of achieving self-sustaining caribou populations in all local population units (LPUs) within their current distribution, which should result in sufficiently large local caribou populations to support traditional Indigenous harvesting activities. The Recovery Strategy identifies the critical habitat considered necessary to achieve that recovery goal. Multiple categories of critical habitat are identified including high and low elevation winter and summer ranges that provide important feeding, calving, and breeding habitat, as well as matrix ranges that provide connectivity between seasonal ranges, security from disturbance, and low predation risk. For the Central Group, the management objectives for critical habitat include:

- Minimal disturbance of high elevation winter and summer ranges;
- Maintenance, or achievement of, a minimum of 65 percent undisturbed low elevation winter range and Type 1 matrix habitat; and
- An overall ecological condition that allows for low predation risk in Type 2 matrix habitat.

SARA states that, if the relevant federal Minister forms the opinion that the laws of the province do not effectively protect critical habitat located on non-federal lands, and there are no federal provisions or measures that protect critical habitat, the Minister must make a recommendation that the Governor in Council make an order to prohibit the destruction of the unprotected critical habitat.

On May 4, 2018, informed by an imminent threat assessment (full version publicly posted to the Species at

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<sup>41</sup> Available online: [https://www.registrelep-sararegistry.gc.ca/document/default\\_e.cfm?documentID=1309](https://www.registrelep-sararegistry.gc.ca/document/default_e.cfm?documentID=1309)

Risk Public Registry on June 12, 2018)<sup>42</sup>, the federal Minister of Environment and Climate Change determined that southern mountain caribou were facing imminent threats to recovery, with particular concern noted for ten local population units, including the Quintette herd. It described the threats facing southern mountain caribou (unsustainable levels of predation resulting from the cumulative impacts of human activities), the continuing nature of the threats, the small population sizes, and declining trends of many LPUs, and the uncertainty of the effectiveness of current mitigation measures. It was determined that the threats required immediate intervention to allow for eventual recovery of the species. Under Section 80 of the *Species at Risk Act*, if the Minister is of the opinion that a species that faces imminent threats to its survival or recovery, the Minister must recommend that the federal Governor in Council make an emergency order to provide for the protection of the species.

The federal government issued a statement<sup>43</sup> in March 2021 indicating that the Minister of Environment and Climate Change had recommended the making of an emergency Order to provide for the protection of Southern Mountain Caribou under subsection 80(2) of SARA, but the federal government declined to make the emergency order having considered several factors, including the signing of the three conservation agreements relating to Southern Mountain Caribou in British Columbia and Alberta.

#### *Canada-British Columbia Southern Mountain Caribou (Central Group) Protection Study*

In 2016-17, a Canada-British Columbia Southern Mountain Caribou (Central Group) Protection Study<sup>44</sup> ('Protection Study') was undertaken to review the legislative tools in place to protect Southern Mountain Caribou and their habitat. The study focused on the Central Group of Southern Mountain Caribou and its purpose was to inform federal and provincial decision making with respect to the ongoing protection and recovery of southern mountain caribou. The study was prepared collaboratively by ECCC and B.C. and finalized in May 2017.

#### *Bilateral Conservation Agreement*

On February 21, 2020, the federal and provincial governments signed the *Canada British Columbia Conservation Agreement for Southern Mountain Caribou in British Columbia*<sup>45</sup> ('Conservation Agreement'), enabled by Section 11 of SARA, which established a framework for cooperation and describes the commitments, measures, and strategies both the federal and provincial governments will undertake to support the recovery of southern mountain caribou in B.C. to self-sustaining populations, aligning outcomes with the 2014 federal Recovery Strategy and with the rights of directly affected Indigenous Groups.

#### *Partnership Agreement*

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<sup>42</sup> Available online: [http://www.registrellep-sararegistry.gc.ca/document/default\\_e.cfm?documentID=3319](http://www.registrellep-sararegistry.gc.ca/document/default_e.cfm?documentID=3319) Available online: [http://www.registrellep-sararegistry.gc.ca/document/default\\_e.cfm?documentID=3319](http://www.registrellep-sararegistry.gc.ca/document/default_e.cfm?documentID=3319)

<sup>43</sup> Available online: <https://species-registry.canada.ca/index-en.html#/documents/228>

<sup>44</sup> Available online: [https://www.registrellep-sararegistry.gc.ca/virtual\\_sara/files/ProtectionStudy-Smc-central-v01-0217-Eng.pdf](https://www.registrellep-sararegistry.gc.ca/virtual_sara/files/ProtectionStudy-Smc-central-v01-0217-Eng.pdf)

<sup>45</sup> Available online: [canada\\_british\\_columbia\\_conservation\\_agreement\\_for\\_southern\\_mountain\\_caribou\\_in\\_british\\_columbia.pdf](http://canada_british_columbia_conservation_agreement_for_southern_mountain_caribou_in_british_columbia.pdf) ([gov.bc.ca](http://gov.bc.ca))

Also on February 21, 2020, the *Intergovernmental Partnership Agreement for the Conservation of the Central Group of the Southern Mountain Caribou*<sup>46</sup> (“Partnership Agreement”) was signed by the federal and provincial governments, West Moberly First Nations, and Saúlteau First Nations for a term of 30 years. The Partnership Agreement, also enabled by Section 11 of SARA, sets out the actions that the parties agreed to take to achieve their shared objective of immediately stabilizing and expeditiously growing the population of the Central Group of Southern Mountain Caribou to levels that are self-sustaining and support traditional Indigenous harvesting activities, consistent with existing Aboriginal and Treaty rights<sup>47</sup>. As a result of implementation of the Partnership Agreement, the Government of B.C. has put in place a series of regulatory measures that prohibit new industrial activities in specific identified zones that are centered on some core caribou habitat. Other specified zones are subject to provincial decision making that considers, amongst other factors, that any adverse effects on caribou or caribou habitat may be incapable of being fully mitigated, and the recommendations of a Caribou Recovery Committee. In areas that are included in the scope of the Partnership Agreement (e.g., Central Group caribou ranges in B.C.) but outside any specified zones, the 2013 Peace Northern Caribou Plan (discussed below) currently remains the active policy in consideration of the shared recovery objectives of the Partnership Agreement. As part of the implementation of the Partnership Agreement, caribou recovery related land use objectives are being developed that will eventually complete the replacement of the PNCP.

#### *Peace Northern Caribou Plan*

Seven caribou herds in the South Peace area, including the Quintette herd, are included in the *Implementation Plan for the Ongoing Management of South Peace Northern Caribou (Rangifer tarandus caribou pop. 15)*<sup>48</sup> in British Columbia<sup>49</sup>, also known as the Peace Northern Caribou Plan (PNCP). This provincial plan was released in 2013 and includes, among other objectives, protecting 80 percent or more of identified high elevation winter habitat in the Quintette herd range. The accompanying direction from the Natural Resource Board on the planning and approval of development activities in the South Peace Northern Caribou Area identified the following principles for development relating to the management of caribou:

- 1) Principle 1: Development activities and associated mitigation (including offsetting) can be demonstrated to result in a net neutral or positive effect on the viability of the South Peace Northern Caribou within ten years of receiving approval; and
- 2) Principle 2: Proponents are responsible for developing caribou mitigation and monitoring plans and

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<sup>46</sup> Available online: [https://www2.gov.bc.ca/assets/gov/environment/plants-animals-and-ecosystems/wildlife-wildlife-habitat/caribou/partnership\\_agreement\\_for\\_the\\_conservation\\_of\\_the\\_southern\\_mountain\\_caribou\\_central\\_group\\_2020-02-21.pdf](https://www2.gov.bc.ca/assets/gov/environment/plants-animals-and-ecosystems/wildlife-wildlife-habitat/caribou/partnership_agreement_for_the_conservation_of_the_southern_mountain_caribou_central_group_2020-02-21.pdf)

<sup>47</sup> Available online: <https://www.newswire.ca/news-releases/governments-of-canada-and-british-columbia-to-collaborate-with-first-nations-on-recovery-of-southern-mountain-caribou-674238843.html>

<sup>48</sup> Available online: [https://www2.gov.bc.ca/assets/gov/environment/plants-animals-and-ecosystems/wildlife-wildlife-habitat/caribou/implementation\\_plan\\_for\\_the\\_ongoing\\_management\\_of\\_south\\_peace\\_northern\\_caribou.pdf](https://www2.gov.bc.ca/assets/gov/environment/plants-animals-and-ecosystems/wildlife-wildlife-habitat/caribou/implementation_plan_for_the_ongoing_management_of_south_peace_northern_caribou.pdf). Note that ‘pop.15’ as defined by the BC Conservation Data Centre now refers to Northern Mountain population; the Central Mountain population, which was defined after the publication of the PNCP, is now ‘pop. 18’. Six of the seven “PNCP” herds are now part of pop. 18; the Graham herd is part of pop.15.

<sup>49</sup> BC Ministry of Environment. 2013. Available online: <http://a100.gov.bc.ca/pub/eirs/finishDownloadDocument.do?subdocumentId=9341>.

resourcing the management actions required to meet Principle 1.

British Columbia also developed the Quintette Strategic Action Plan in 2017 (a companion document to the PNCP) as a plan on how to meet goals specific to the Quintette herd.

#### *Caribou Recovery Program*

In addition to the actions outlined in the Bilateral Conservation Agreement, the Partnership Agreement and the Peace Northern Caribou Plan to support the recovery of the Quintette herd, the Province is also implementing a Caribou Recovery Program<sup>50</sup> that was established in 2017 (for a 3 year term) and has been extended to present day as a long-term commitment that includes all BC caribou herds in a comprehensive and uniform approach to conservation, based on traditional knowledge and science. The Caribou Recovery Program is jointly managed by ENV and LWRS and is responsible for the planning and implementation of recovery actions in alignment with the Policies listed above.

### **8.3 STUDY AREA DESCRIPTION**

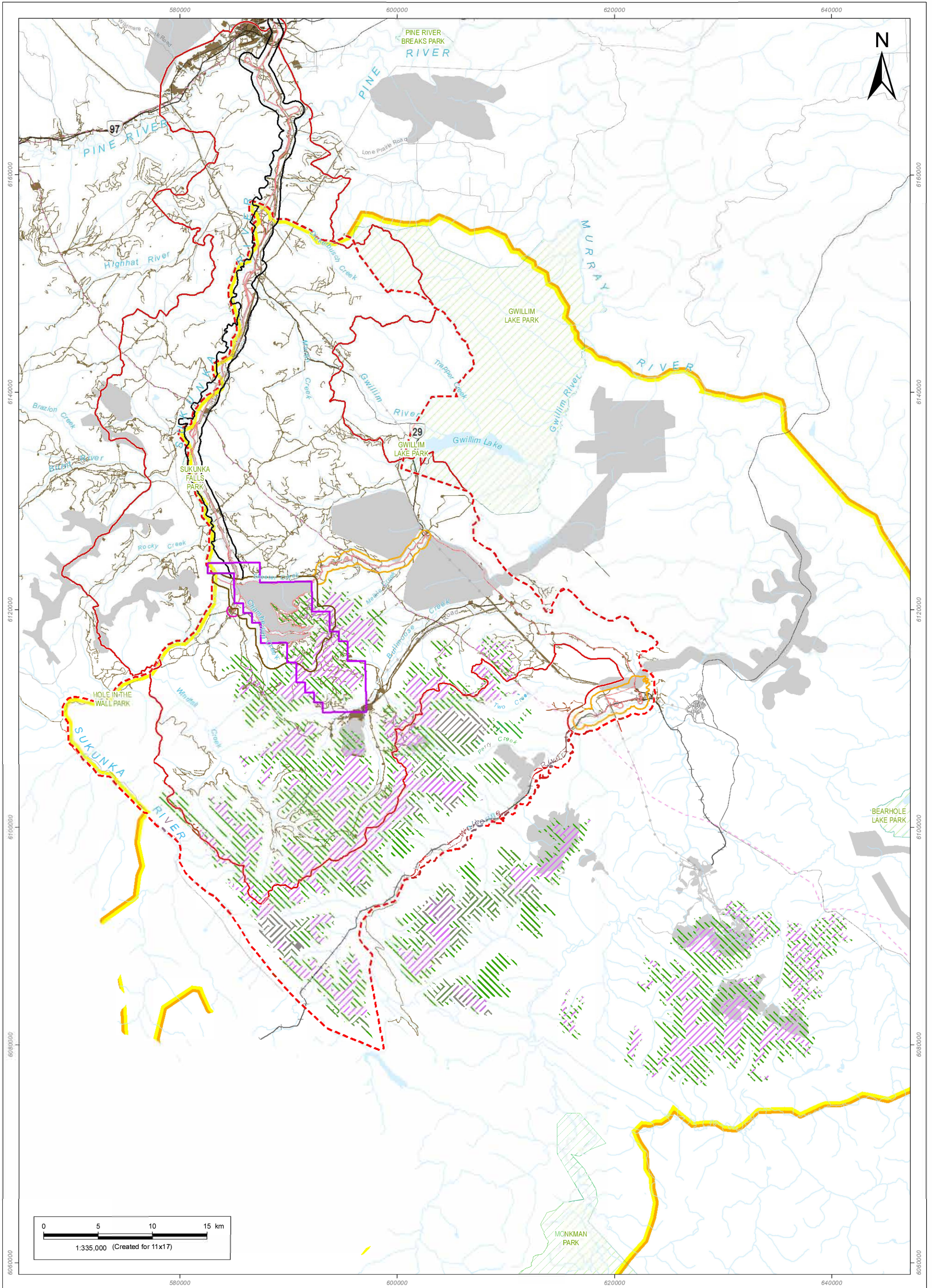
Glencore's assessment of impacts to caribou presented in the Application was conducted within a Caribou Assessment Area, which was established to assess the effects of the project on caribou habitat availability and mortality risk. The area generally follows the Quintette herd's range boundary to the west and north, Sukunka's RAA to the east, and the Wolverine River to the south, and totals 188,859 ha in size (see [Figure 12](#) of this Report).

The Caribou Cumulative Effects Assessment Area (also shown on [Figure 12](#) of this Report) includes all the Quintette herd's high elevation winter range (HEWR), as defined in the Federal Recovery Strategy.

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<sup>50</sup> More information available at: <https://engage.gov.bc.ca/caribou/>

Figure 12: Caribou Assessment Area and Caribou Cumulative Effects Assessment Area



<ul style="list-style-type: none"> <li>— Road - Gravel Surface</li> <li>— Road - Paved Surface</li> <li>— Railway</li> <li>- - - Pipeline</li> <li>— Transmission Line</li> <li>— Watercourse</li> <li>— Waterbody</li> <li>▨ Provincial Park</li> </ul>	<ul style="list-style-type: none"> <li>- - - Caribou Assessment Area</li> <li>▨ Regional Assessment Area</li> <li>▨ Sukunka Project Tenure Area</li> <li>▨ Local Assessment Areas</li> <li>▨ Chetwynd Options</li> <li>▨ Mine Site</li> <li>▨ Transmission Line Option 1</li> <li>▨ Tumbler Ridge Options</li> <li>▨ Project Development Area</li> </ul>	<ul style="list-style-type: none"> <li>▨ Disturbance Footprint - Existing</li> <li>▨ Disturbance Footprint - Future</li> <li>▨ High Elevation Winter Range - High Quality</li> <li>▨ High Elevation Winter Range - Very High Quality</li> <li>▨ Quintette Caribou Herd Range</li> </ul>	<p><b>SUKUNKA COAL MINE PROJECT</b></p> <p><b>CARIBOU ASSESSMENT AREA AND CUMULATIVE EFFECTS ASSESSMENT AREA</b></p> <p>ENVIRONMENTAL ASSESSMENT APPLICATION</p> <p><small>Data Sources: Glencore, Province of British Columbia, Government of Canada</small></p> <p><small>Disclaimer: Although there is no reason to believe that there are any errors associated with the data used to generate this product or in the product itself, users of these data are advised that errors in the data may be present.</small></p> <p><small>File Path: fig_10482_ea_wild_05_03_02_CAA_CE</small></p>	<p>PREPARED BY:</p> <p><b>Stantec</b></p> <p>PREPARED FOR:</p> <p><b>GLENCORE</b></p>
<p>DATE: 16-OCT-14      PROJECTION: UTM 10      DRAWN BY: R. STOHMANN</p> <p>FIGURE ID: 123110482      DATUM: NAD 83      CHECKED BY: J. PRESTON</p>				

## 8.4 POTENTIAL PROJECT EFFECTS AND PROPOSED MITIGATIONS IDENTIFIED IN THE APPLICATION

Existing conditions, the potential effects of Sukunka, and proposed mitigation measures identified in the Application are described in the subsections below. Section 5.3 of the Application describes Glencore's caribou effects assessment in more detail.

### 8.4.1 EXISTING CONDITIONS

Although caribou habitat types are defined differently between the federal and provincial governments and cover slightly different areas, there is substantial overlap between habitat types. The Application, using information that was available at the time, considered all types of habitat. Glencore determined that Sukunka would interact with:

- Low elevation winter range (LEWR), high elevation winter ranges (HEWR), and caribou matrix ranges, all of which are identified as critical habitat in the Federal Recovery Strategy<sup>51</sup>; and
- Ungulate winter ranges (UWR) for caribou, and wildlife habitat areas (WHA) used by caribou for calving and rutting as designated under B.C.'s *Forest and Range Practices Act*.

Caribou matrix habitat includes areas within a herd's annual range that have not been delineated as summer or winter range, and may include seasonal migration areas, trace occurrences<sup>52</sup>, and travel zones between summer or winter range, or between LPUs. Matrix habitat also includes the areas surrounding a herd's annual range where predators can access and impact the caribou population.

Baseline data was collected by Glencore using existing data sources (such as maps of telemetry locations and traditional knowledge studies), conducting field surveys (such as ground and aerial track surveys and wildlife habitat assessments), and developing habitat suitability models. Caribou were observed during Glencore's field surveys within the Caribou Assessment Area during ground and aerial track surveys.

### 8.4.2 POTENTIAL PROJECT EFFECTS

In the Application Glencore assessed the following potential effects of Sukunka on caribou:

- Change in habitat availability by measuring the change in habitat area;
- Change in mortality risk to caribou and change in population dynamics by measuring the changes to linear feature density (the density of linear features such as roads, pipelines, and transmission lines on the landscape) and change in volume of traffic on roads and railways; and
- Change to movement of caribou using summer and winter telemetry locations.

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<sup>51</sup> While high elevation summer range (HESR) was delineated before Glencore submitted the Application, this mapping did not overlap Sukunka. The new mapping, provided by LWRS during Application Review, overlaps Sukunka and is discussed in Section 8.4.4: Potential Project Effects and Proposed Mitigations Identified during Application Review.

<sup>52</sup> Observed caribou locations that are considered rare

Of these potential effects, Glencore predicted Sukunka would result in significant adverse effects on caribou due to habitat loss, an increase in mortality risk, and a change in population dynamics leading to an increase in predation.

*Direct and Indirect Habitat Loss*

The Application predicted direct and indirect losses of high elevation UWR/WHA, low elevation UWR, HEWR, and matrix habitat, as detailed in [Table 22](#) below. It is noted that all indirect effects in the Application were based on a 500 m buffer around the Project Development Area (PDA), and were later updated during Application Review.

**Table 22: Disturbance to Caribou Habitat Predicted in the Application**

HABITAT TYPE	MINE FEATURES LOCATED IN CARIBOU HABITAT	DIRECT DISTURBANCE AREA (ha)	INDIRECT DISTURBANCE AREA (ha)	TO BE RECLAIMED BY GLENCORE (ha)
High elevation UWR/WHA	Water diversion ditch	43.8	619.3	43.8
Low elevation UWR	Meikle Creek FSR expansion and work camp	4.0	120.6	4.0
HEWR	Water diversion ditch	23.1 <sup>53</sup>	458.5	23.1
Matrix	Mine site, Meikle Creek FSR expansion, work camp, and rail load-out	2275.9	7003.4	1856.0

Reclamation and natural revegetation are predicted to reclaim some caribou habitat, in the long term. Progressive reclamation is proposed to be ongoing through operations where possible. In high elevation forest, all the directly-disturbed HEWR and UWR/WHA are predicted to be reclaimed. However, full reclamation of this habitat, including regrowth of lichen species and high-elevation or subalpine forest, could take up to 250 years.

The directly-disturbed low elevation UWR habitat would also be reclaimed by Glencore. In the matrix habitat, approximately 400 ha would be permanently lost due to pit walls and lakes, rail loadout, and the Meikle Creek FSR expansion, and the remainder of the directly disturbed areas (1856 ha) would be reclaimed. The reclamation of low elevation UWR and matrix habitat would take at least 40 years post-closure to regrow these forests.

The Application indicated that, following closure of the mine, sensory disturbance, and associated indirect effects, would be lessened due to reduced activity on the mine site and haul routes. However, some activity would remain on site as water treatment is proposed to continue after closure (potentially in perpetuity)<sup>54</sup>.

<sup>53</sup> Note that this number was reduced during the Application Review period.

<sup>54</sup> For additional information regarding the Province’s views on water treatment in perpetuity, please see Section 6.3.1: Water Treatment in Part B – Section 6: Water Quality and Aquatic Biota.

### *Increase in Mortality Risk and Change in Population Dynamics*

Linear feature density was used in the Application as one indicator for mortality risk. Increases in linear feature density in the Quintette herd range have increased wolf access to habitats preferred by caribou. In the Application, Glencore found that the creation of additional linear features for Sukunka would likely increase wolf access to caribou habitats in the LAA and therefore increase predation on caribou.

A threshold of 1.2 km of disturbance/km<sup>2</sup> was adopted in the Application based on provincial direction<sup>55</sup> to indicate a significant adverse effect to mortality risk, however more recent research shows that linear feature densities below 1 km of disturbance/km<sup>2</sup>, and potentially much lower, is required for self-sustaining caribou populations<sup>56</sup>. Linear feature density within the Caribou Assessment Area at baseline is 1.39 km/km<sup>2</sup> and thus is already above this threshold. Resource road networks associated with primarily forest harvesting have historically been the mechanism for increasing access throughout the project region. More recently, oil and gas exploration, pipelines, coal exploration, and seismic development have contributed to increased access within the project region. Glencore found that, as a result of Sukunka, the linear feature density would increase to 1.42 km/km<sup>2</sup>.

Increased linear features in high-elevation forest as a result of Sukunka may increase access to HEWR for wolves; however, the Application states that wolves are expected to avoid high use areas of the project area during the operations phase as they are sensitive to human disturbance. In the early phases of post-closure, linear features may provide travel corridors for wolves where forest cover has not yet re-established.

Post-closure, some linear features would be reclaimed, such as some access roads. Supplemental information provided by Glencore during Application Review determined that some linear features would remain, such as the transmission line and water ditches to aid with continuous active water treatment. The extension of Meikle Creek FSR is also expected to be permanent.

### *Change in Movement Patterns of Caribou*

In the Application, Glencore used caribou telemetry locations to determine that there is the potential for caribou movement patterns to change due to impassable features at Sukunka such as the open pit and semi-permeable features such as roads, ditches, and above-ground pipe. However, Glencore concluded that in the context of the sustainability of the regional population of caribou, significant adverse effects would not be predicted for change in movement, due to the ability of caribou to find alternate routes in the RAA.

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<sup>55</sup> Natural Resource Board. 2013. Direction: Planning and Approval of Development Activities in the South Peace Northern Caribou Area. Available at: <http://www.env.gov.bc.ca/wld/speciesconservation/nc/index.html>.

<sup>56</sup> Dickie, M., N. Love, R. Steenweg, C. Lamb, J. Polfus, A. Ford. 2020. The Effects of Linear Features on Woodland Caribou: A review to inform management thresholds. Technical Report prepared for the Technical Working Group of the *Intergovernmental Partnership Agreement for the Conservation of the Central Group of the Southern Mountain Caribou*.

### *Cumulative Effects*

Previous forest harvesting, oil and gas activities, and mines, in the region have reduced mature forest habitat and increased early successional habitats. In addition, mining has reduced high elevation habitat availability until the mines are fully reclaimed (100-250 years, where feasible). Wildfires can reduce availability of low elevation and matrix habitat for up to 40 years; timescales of the effects of wildfire on high elevation habitat are unknown. In 2021, approximately 33 km southeast of Sukunka on the eastern side of Mesa Ridge, the Tent Creek Wildfire burned 3400 ha of habitat, of which approximately 700 ha occurred in high elevation caribou habitat matrix habitat. Mountain pine beetle has also affected the availability of mature forest and old pine dominated forest through beetle kill and salvage (i.e., increased rate of forest) harvesting.

Existing disturbances from mining have resulted in a loss of 2,635.7 ha of HEWR within the Quintette caribou herd range. Existing mining projects in this area include Bullmoose Mine, Mesa-Wolverine Mine, Quintette Mine (Babcock), and Trend Mine.

Reasonably foreseeable future disturbances from mining alone are predicted to result in a loss of 2,168.6 ha of additional HEWR from the follow: expanding the Wolverine Mine<sup>57</sup>, Quintette Mine, Trend-Roman Mine<sup>58</sup>, and Horizon Ridge Mine.

HEWR currently covers 71,578 ha of the Quintette caribou range. The direct loss of HEWR habitat due to mining (including existing and reasonably foreseeable projects listed above) represents a total loss of 6.7 percent. Other resource development activities including forestry, roads, oil and gas exploration, and coal exploration will contribute an additional amount that was not quantified in the Application as the numbers were not available. Glencore assessed that Sukunka would contribute an additional 0.03 percent of direct loss. These levels are higher than Federal Recovery Strategy recommendations for minimal disturbance in high elevation winter/summer range to enable self-sustaining populations.

### **8.4.3 MITIGATION MEASURES**

Glencore developed a preliminary Caribou Mitigation and Monitoring Plan (CMMP), submitted as part of the Application. While submitted as part of the Application, this plan is a requirement of the provincial permitting process and will be further refined should the project receive an EAC. The CMMP contained the following proposed mitigation measures:

- Implement best management practices for encountering caribou during construction and operations, as guided by provincial best practices;

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<sup>57</sup> At the time Glencore submitted their Application, the Certificate Holder for the Wolverine Mine had proposed an expansion of the East Bullmoose Pit (one of the pits authorized by the Wolverine Environmental Assessment Certificate #M04-01). In 2019, the Certificate Holder agreed to temporarily defer the expansion of the East Bullmoose Pit in light of Indigenous nations' concerns regarding caribou. The EAC was amended in 2021 to authorize the development of a third pit, Hermann. This is further discussed in Section 8.4.6: Cumulative Effects Assessment.

<sup>58</sup> Since Glencore submitted their Application, the Roman Mine (an expansion of the Trend Mine) was substantially started. This is further discussed in Section 8.4.6: Cumulative Effects Assessment.

- Remove and reclaim linear features and access when they are no longer required for mine operation and following mine closure, including deactivation and re-vegetation of roads;
- Reduce line of sight along linear features;
- Impede predator and human movement along linear features;
- Re-vegetate within high-elevation forest using plant species not preferred as forage by moose and elk;
- Prior to the planted vegetation reaching an effective blocking height (i.e., 2-4 m), structural access blocks will be installed on linear features within high-elevation forest moist very cold variant ecosystem;
- Use structural access blocks on linear features to reduce predator movement from low to high elevation caribou habitat;
- Reduce or eliminate the recovery of forage species that are attractive to alternate prey species such as moose and elk;
- Seed roadsides with seeding mix that reduces or eliminates the use of plant species attractive to bears (predators of caribou) and ungulates;
- Maintain a minimum ferrying altitude of 500 m above ground-level over HEWR, high elevation summer range (HESR), UWR, and WHA for mine-related air traffic and avoid landing helicopters in these habitats;
- Blasting, clearing, and site preparation activities will not occur within at least 500 m of HEWR, HESR, WHA, and UWR designated for caribou during the critical period (January 15 – July 15);
- Where feasible, blasting, clearing, and site preparation within 500 m of high elevation caribou range will be avoided during the cautionary period (September 15 – January 14);
- Maintain vegetation cover along the boundaries of high activity areas (e.g., haul routes, mine pits, mine dumps, and mine buildings);
- Construct and maintain the clean water diversion ditch in HEWR without the construction of an access road;
- The maximum width of the clean water diversion ditch in HEWR will be 20 m;
- Design water management ditches to allow wildlife to cross unharmed; and
- Provide wildlife crossing opportunities along extensive open ditches to align with existing wildlife trails, where appropriate to meet site-specific objectives and design ditches to minimize the potential for wildlife entrapment.

## 8.5 POTENTIAL PROJECT EFFECTS AND PROPOSED MITIGATIONS IDENTIFIED DURING APPLICATION REVIEW

During Application Review, the EAO received and reviewed comments from the public, Indigenous Groups and the Working Group (which can be found in the public, Indigenous Groups and Working Group issues tracking tables). From these comments, the EAO has distilled the following main issues:

- The need for additional analysis of habitat types;
- The impact of the loss of caribou critical habitat;
- The extent of sensory disturbance, particularly regarding the risk of displacement to lower

- elevations and potential for increased wolf predation;
- Concerns over inconsistency with provincial and federal caribou management and recovery initiatives;
- Inadequate approach to cumulative effects analysis; and
- Inadequacy of offsets and mitigation measures.

During Application Review, the volume and nature of the review comments led Glencore to request a suspension of the timeline to resolve issues related to caribou and water quality; as such, the EA timeline was suspended on January 21, 2016. EAO formed a Caribou Sub-Working Group, consisting of representatives from participating Indigenous Groups, and their consultants and federal and provincial agencies, to discuss and provide input on aspects of the caribou effects assessment. On October 28, 2016, the EAO confirmed that the requirements outlined in the timeline suspension related to caribou had been met, although the suspension was not lifted at that time due to outstanding information regarding water quality.

On August 23, 2018, the EAO determined that the information related to water quality was sufficient and lifted the suspension. At the same time, Glencore requested and was granted a new timeline suspension to allow further discussion regarding the recovery of caribou and caribou habitat. Following a series of Caribou Sub-Working Group meetings that took place during this suspension, Glencore submitted a Synopsis Report of the Project Effects Assessment and Proposed Offsets for Caribou (Synopsis Report<sup>59</sup>) on September 2, 2021, as an update to the information on caribou found in the original 2015 Application. The Synopsis Report contained additional analysis and assessment of potential effects on caribou and mitigation and offsets for Sukunka, in response to additional information and discussions with the caribou Sub-Working Group.

On December 16, 2021, Glencore submitted a report ('the Caribou Report'<sup>60</sup>) required by the EAO's 2018 suspension order, which summarized the engagement undertaken with the First Nations Independent Technical Review (FNITR), the implications of updated provincial and federal caribou policy on Sukunka, and any additional mitigations proposed by Glencore. Following a series of discussions between Glencore, the FNITR, and the EAO, Glencore requested a third suspension in May 2022 to undertake additional meetings and discussion regarding caribou. On July 15, 2022, the EAO lifted the suspension and Application Review timeline resumed.

Updates that were made to Glencore's assessment based on the Synopsis Report and the Caribou Report are incorporated into the subsections below.

#### *Additional analysis of habitat types*

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<sup>59</sup> Synopsis of the Project Effects Assessment and Proposed Offsets for Caribou (Stantec). September 2, 2021: [https://www.projects.eao.gov.bc.ca/api/public/document/62ace9bf532ff90022554ca6/download/rpt\\_caribou\\_assessment\\_synopsis\\_20210902\\_final.pdf](https://www.projects.eao.gov.bc.ca/api/public/document/62ace9bf532ff90022554ca6/download/rpt_caribou_assessment_synopsis_20210902_final.pdf)

<sup>60</sup> Report of Discussions on Caribou and Implication on the Assessment (Glencore). December 16, 2021: [https://www.projects.eao.gov.bc.ca/api/public/document/62268fae1a2ee00022e959f5/download/let\\_glencore\\_suspension\\_report\\_caribou\\_final.pdf](https://www.projects.eao.gov.bc.ca/api/public/document/62268fae1a2ee00022e959f5/download/let_glencore_suspension_report_caribou_final.pdf)

Throughout Application Review (including the periods of timeline suspension), the Working Group raised extensive concerns related to the methods for mapping and quantifying the extent of habitat disturbance, particularly HESR. The federal and provincial management strategies and agreements, described in [Section 8.4.3](#) above, are key to contextualizing the comments made by the Working Group and Indigenous Groups.

In the time since Glencore prepared its Application, the Province has completed additional work to delineate HESR, LEWR, and matrix habitat for the Quintette herd. For the purpose of the review of this project, ECCC and the Province reached an agreement on the habitat mapping for the high elevation critical habitat for the Quintette herd. As outlined in [Section 8.4.3](#) above, the federal management objectives for critical habitat types (i.e., high elevation winter/summer, low elevation winter, and Type 1 and Type 2 matrix habitats) are described in the Federal Recovery Strategy. The Federal Recovery Strategy indicates that minimal disturbance of high elevation winter and/or summer ranges; a minimum of 65 percent undisturbed habitat level for low elevation winter range and Type 1 matrix range; and an overall ecological condition of low predation risk in Type 2 matrix, are all considered necessary to achieve recovery of LPUs in the Central Group. Recent analyses (e.g., Stantec 2016, the 2017 Canada-BC Protection Study) have documented that current levels of disturbance in the Quintette range already exceed these thresholds and continue to increase,<sup>61</sup> which was identified as key concern by the FNITR and Halfway River First Nation.

In response to LWRS' request that HESR be considered in the EA review or during permitting, Glencore provided an updated assessment of direct and indirect disturbance in caribou habitat due to Sukunka that included an estimate of 125 ha of direct disturbance in HESR.

Glencore also committed to conducting additional pre-disturbance surveys within the PDA and along the boundaries of all clearing areas to determine the presence of important caribou habitat features (e.g., terrestrial lichen patches, mineral licks, and associated wildlife trails). Any identified wildlife habitat features will be evaluated for potential mitigation measures to be implemented during construction and operations (e.g., setbacks, restricted activity periods, maintain visual screening), consistent with provincial guidelines.

#### *Direct and indirect loss of critical habitat*

In April 2016, ENV provided the EAO with its analysis of the direct and indirect project impacts to both HEWR and HESR, after revising the HESR mapping available at the time of the Application. ENV indicated that Sukunka would result in a direct disturbance of 256 ha of HESR (which overlaps the disturbance to HEWR that Glencore listed in its Application). After additional analysis was performed to reduce clearing boundaries and diversion ditches in the PDA, Glencore indicated that the direct disturbance in HEWR and HESR would be reduced to a total of 125 ha ([Table 23](#)).

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<sup>61</sup> "Habitat loss accelerates for the endangered woodland Caribou in western Canada." Available here: [The Society for Conservation Biology \(wiley.com\)](#)

In a November 30, 2018, letter, ECCC stated that even with the reduced direct disturbance, there is still a high risk to the Quintette herd leading to potential extirpation, and these effects of Sukunka could not be fully mitigated due to high levels of uncertainty about the effectiveness of offsetting. It is ECCC's view that this critical habitat proposed for removal by Sukunka is likely irreplaceable considering the objectives of the Federal Recovery Strategy. The FNITR and Halfway River First Nation concurred, noting that the project area is directly adjacent to one of three important HEWR areas used by the Quintette herd, and that two of the HEWR areas have effectively been abandoned.

ECCC, ENV, and Indigenous Groups raised concerns that Sukunka, with some mine components situated in high elevation caribou habitat, would not be consistent with the management objective set out in Section 7.1 of the Federal Recovery Strategy of minimal disturbance to HEWR and HESR. Although a definition of minimal disturbance is not provided in the Federal Recovery Strategy, it is generally interpreted as close to zero percent disturbance, and existing disturbance in the Quintette range already exceeds that level of disturbance by a considerable margin.

LWRS also raised concerns over camp option #2 being constructed within low elevation UWR for caribou and contributing to sensory disturbance, although Glencore noted that this camp option is located within 500 m of a highway. Camp option #1 is a previously cleared site along Mickle Creek Road, and is not located in caribou LEWR, and therefore is the preferred option by both LWRS and Glencore. The final camp location would be determined during permitting, considering a variety of factors including potential impact to caribou.

As part of the Application, Glencore submitted a preliminary CMMP. The finalization of the CMMP, following LWRS guidance for CMMPs and developed in consultation with the Province and Indigenous Groups, is proposed by the EAO as Condition 19, should an EAC be issued. Glencore has committed to update the analysis of effects of Sukunka on caribou habitat during the permitting stage so that the final CMMP aligns with current provincial and federal conservation and recovery objectives. Mitigation measures already proposed by Glencore to address the loss of critical caribou habitat include avoiding caribou habitat through mine design (such as removing portions of the design within caribou habitat where possible), minimizing mine features in caribou habitat (such as removing the access road adjacent to the diversion ditch in HEWR and providing a maximum width of the diversion ditch), conducting construction and maintenance activities outside of the critical caribou timing windows, and restoring habitat in the PDA after closure.

#### *Extent of sensory disturbance and indirect impacts to habitat*

To characterize the scale of indirect impacts to critical habitat from Sukunka, in 2016 the EAO applied a 500 m buffer to any direct impacts found in all caribou habitat. This buffer was based on direction from Steve Wilson (Ecologic), hired by the EAO as a third-party caribou expert, as a distance commonly used by environmental assessment professionals and cited frequently in scientific and management literature<sup>62</sup>. At the time, the EAO calculated that the 500 m buffer would result in a total (direct and indirect) disturbance of 1,776 ha to HEWR, HESR, and previously undisturbed LER and matrix habitat. Glencore accepted the

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<sup>62</sup> Steve Wilson (Ecologic) – Sukunka Final Caribou Report (Apr 8, 2016)

EAO's characterization of the scale of impacts to critical habitat and revised its proposed mitigations which are detailed in revised Information Request (IR) response #94.

ENV, ECCC, and the FNITR argued that according to recent studies, the extent of sensory disturbance could be up to three km from the mine site based on scientific literature reflecting data from the Trend and Roman mine sites built in the Quintette herd area<sup>63</sup>, which is greater than the 500 m Glencore used in its Application and that the EAO used to estimate the scale of impacts to critical habitat. Glencore commented that the 500 m buffer was based on site-specific acoustic modeling (based on modelling the range of 35 A-weighted decibels (dBA) noise, equivalent to the sound of drizzle, which was found to extend approximately 500 m from the PDA). Glencore also noted that the literature referring to three km described that this occurred under different site conditions and only in the summer months, whereas the caribou telemetry data from near Sukunka show that caribou use this area primarily in the winter months. Glencore provided additional analysis suggesting that increasing the disturbance buffer to three km maintained a low risk to caribou disturbance as Sukunka with a three km buffer only overlaps with 1.3 percent of summer caribou telemetry locations, analysis with which the FNITR strongly disagreed. An increase in buffer to three km increased the total indirect disturbance area from 846 ha to 3,785 ha.

Steve Wilson (Ecologic) and ENV caribou experts agreed that Glencore's assessment of sensory disturbance risk to caribou due to Sukunka was technically sound and that Sukunka presents less of a sensory disturbance risk to caribou than Trend and Roman mine sites used in the literature pointing to three km; however, that some level of risk up to three km is still present.

Although there are other areas of HEWR available to the herd, telemetry data indicate that caribou primarily use the high elevation habitat areas on Mt. Speiker and Bullmoose Mountain, and therefore these areas are much more valuable than other HEWR areas. Glencore agreed about the importance of these areas and identified them as 'high quality' HEWR in its Application. However, ENV and ECCC stated that, no matter what the extent of the sensory disturbance, there is a risk that caribou could entirely abandon habitat on Bullmoose Mountain. The FNITR concurred, indicating that the HEWR on Bullmoose Mountain near the project area is one of the most important, as two important HEWR areas previously used the Quintette herd have already been abandoned. ENV and the FNITR cited the Trend Mine example, which, when the mine expanded into the Quintette Mountain caribou habitat, resulted in most of the caribou leaving the HEWR and instead using LEWR, which increased their mortality risk due to predation.

Glencore responded that the Trend Mine presented a range and magnitude of effects much higher than that of Sukunka. Glencore also noted that wolves are expected to avoid high use areas of the project area during the operations phase as they are sensitive to human disturbance. ENV and the FNITR agreed that while the magnitude of effects would likely be lower at Sukunka because less HEWR is being directly impacted, the actual impact to the individuals in the herd that remain on and currently use Bullmoose Mountain is not certain and could be detrimental to the Quintette herd.

LWRS, ECCC, ENV, the FNITR, and Halfway River First Nation all stated that given the precarious state of the Quintette herd, even a small risk of displacement of caribou is of significant concern, as a potential

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<sup>63</sup> Johnson et al. (2015)

outcome where the herd abandons Bullmoose Mountain could result in a reduction of the population size, jeopardizing recovery and potentially leading to the unacceptable consequence of the extirpation of the herd. In a letter dated August 5, 2022, LWRS stated that the position of B.C.'s Caribou Recovery remained unchanged and was consistent with this view. ECCC indicated in a letter dated June 15, 2018, that, given the level of disturbance in the Quintette LPU and the previous experience of the Trend Mine, it is likely that caribou using habitat on Bullmoose Mountain would be displaced to low elevation habitat, where they would become more prone to predation and mortality unless the current levels of wolf control are enhanced to approach 100 percent wolf removal, which may represent a technical challenge. ECCC, ENV, and the Indigenous Groups stated that due to this risk, the direct and indirect effects of Sukunka to this caribou habitat are immitigable.

In 2019, a Sukunka/Quintette Caribou technical workshop process took place that included an expert elicitation process moderated by Compass. The purpose of the expert elicitation process was to quantify the professional judgements of six caribou biologists on the specific pathways of effects and to characterize the uncertainty about the strength of these effects on the viability of the Quintette herd. More specifically, the expert elicitation process was intended to determine the magnitude of sensory disturbance effects and the effects of possible displacement of caribou from the Bullmoose/Chamberlain mountain complex and the magnitude of effect that might have on the viability of the Quintette herd.

The results<sup>64</sup> of the expert elicitation were varied between the experts; however, four out of five experts were at least 75 percent confident that an indirect disturbance zone of influence would be more than 1,200 m and less than 4,500 m. An expanded analysis<sup>65</sup> of these expert elicitation results determined that the disturbance distance is likely between 3,000 and 5,000 m. As a result, Glencore used 4,500 m as a local assessment area for bounding the upper limit of potential indirect effects on caribou in subsequent analysis. [Table 23](#) summarizes the updated predicted direct and indirect losses of caribou habitat provided throughout the EA, compared to the information presented in [Table 22](#), including the most recent buffer representing a 4500 m direct disturbance area.

**Table 23: Predicted Direct and Indirect Disturbance to Caribou Habitat as Updated in the Synopsis Report**

HABITAT TYPE	MINE FEATURES LOCATED IN CARIBOU HABITAT	DIRECT DISTURBANCE AREA (ha)	500 m INDIRECT DISTURBANCE AREA (ha)	3000 m INDIRECT DISTURBANCE AREA (ha)	4500 m INDIRECT DISTURBANCE AREA (ha)	TO BE RECLAIMED BY GLENCORE (ha)
High elevation UWR/WHA	Water diversion ditch	44	619	3284	5885	44

<sup>64</sup> Sukunka/Quintette Caribou Technical Workshop (Compass Report). December 17, 2019:

[https://www.projects.eao.gov.bc.ca/api/public/document/603d90bac8939b00229e65a6/download/SukunkaQuintette\\_TechnicalWorkshopReport\\_FINAL.pdf](https://www.projects.eao.gov.bc.ca/api/public/document/603d90bac8939b00229e65a6/download/SukunkaQuintette_TechnicalWorkshopReport_FINAL.pdf)

<sup>65</sup> An Extension to Analyses in "Sukunka / Quintette Caribou Technical Workshop Final Report" (Wildlife Infometrics). December 31, 2020:

[https://www.projects.eao.gov.bc.ca/api/public/document/603d9204c8939b00229e6612/download/WII%20Report741\\_FNITR%20Sukunka%20technical%20brief\\_Finald.pdf](https://www.projects.eao.gov.bc.ca/api/public/document/603d9204c8939b00229e6612/download/WII%20Report741_FNITR%20Sukunka%20technical%20brief_Finald.pdf)

Low elevation UWR	Meikle Creek FSR expansion and work camp	4	121	n/a	n/a	4
HEWR	Water diversion ditch	8	402	2894	5351	8
HESR	Water diversion ditch, pits, dumps	125	846	3785	6403	125
Matrix	Mine site, Meikle Creek FSR expansion, work camp, and rail load-out	2276	3512	8312	12065	1856

## NOTES:

- 1 There is considerable overlap in habitat types at high elevation; therefore, areas in this table are not additive (e.g., 8 ha direct disturbance in HEWR overlaps entirely with HESR)
- 2 Area includes 16.8 ha existing disturbance areas include existing disturbances such as cut blocks, roads, and other anthropogenic features which have no current value as caribou habitat
- 3 Within 500 m zone of influence, the area excluding existing disturbances is 694 ha in HESR of which 380 ha is HEWR (Stantec and TWC 2019)
- 4 The 500-m zone of influence was applied to the mine site and access road
- 5 The 3,000-m and 4,500-m zones of influence were applied to the mine site only, which was then added to the 500-m zone of influence around the access road to calculate these totals

The final CMMP, which would be required by Condition 19, would include some mitigation related to sensory disturbance, including requirements to maintain a minimum ferrying altitude of 500 m above ground-level over high-elevation critical caribou habitat for mine-related air traffic, avoiding site preparation (e.g., blasting) within 500 m of high-elevation caribou habitat designated for caribou during the critical period for caribou, and avoiding clearing and site preparation activities within 500 m of HEWR and HESR during the critical period, which is inclusive of the calving season. The final CMMP would also include a commitment to avoid blasting, clearing, and site preparation within 500 m of high elevation caribou range during the cautionary period (September 15 – January 14), where feasible. As previously noted, ECCC is of the view that the effectiveness of these mitigation strategies is uncertain.

#### *Approach to cumulative effects analysis*

ECCC raised concerns over the lack of a cumulative effects assessment for impacts to LEWR or matrix habitat and recommended that measures to avoid and minimize impacts to LEWR and matrix habitat should be included in the CMMP to ensure consistency with the Federal Recovery Strategy. Glencore addressed these concerns in a technical memo (see IR response #95) on April 7, 2016, which provided the following detail:

- At baseline, the total area of disturbed low elevation or matrix habitat in the Quintette herd range is 294,467 ha, or 62.18 percent. This exceeds the critical habitat threshold in the Federal Recovery Strategy of 35 percent;
- Effects of Sukunka would increase the extent of disturbance by 0.12 percent, and cumulative effects from other reasonably foreseeable projects will increase the extent of disturbance by 2.13 percent.

ECCC further indicated in letters dated June 15, 2018 and November 30, 2018 that current disturbance levels in the high elevation habitat of the Quintette herd exceed the management objective of minimal disturbance, as set out in Section 7 of the Federal Recovery Strategy. As such, ECCC stated that the Sukunka Project would contribute to the existing cumulative effects on the Quintette LPU and its critical habitat, and thus increase the risk to the LPU of immediate or near-immediate extirpation.

Additionally, it was noted by CEAA that additional projects, such as the Murray River Coal Project, should be included in Glencore's cumulative effects assessment as reasonably foreseeable projects. Glencore listed additional projects used in their analysis as part of IR response #95, which included an additional mine (Murray River Coal Project), one additional wind project, and one additional pipeline project than were listed in the original Application. These disturbances contributed to the analysis of loss of low elevation and matrix habitat (as described above) but do not contribute to additional impacts to high elevation habitat.

#### *Offsets and mitigation measures and inconsistency with provincial and federal caribou recovery plans*

In their 2015 Application, Glencore's preliminary CMMP proposed a financial contribution of \$92,000 toward regional caribou recovery initiatives based on the direct loss of 23 ha of HEWR. The PNCP allowed up to 20 percent of HEWR habitat destruction provided the destruction is offset with a series of financial and habitat offsets, and provided a suggested financial offset of \$4,000 per hectare of direct disturbance.

LWRS and ENV indicated that, although at the time of submission in 2015 the Application and preliminary CMMP appeared to meet the requirements of the PNCP, the PNCP needs updating to incorporate new science to better align with the Federal Recovery Strategy and with West Moberly and Sauteau First Nations' Action Plan for the Klinse-za Herd of Woodland Caribou in Canada<sup>66</sup> that contain a number of features which would better facilitate recovery of caribou.

The EAO's third-party caribou expert, Dr. Steve Wilson, reviewed the Application and preliminary CMMP to assess whether the analysis and mitigations met the requirements of the PNCP and the Federal Recovery Strategy. On May 27, 2016, Steve Wilson submitted his report in which he concluded that the Sukunka project as described in the Application and with the mitigations and offsets outlined in the preliminary CMMP would be:

- Unlikely to meet the principle of the PNCP of achieving a net neutral or net positive effect on the viability of the South Peace northern caribou (i.e., including the Quintette herd) within ten years of receiving approval;
- Expected (through direct, indirect, and cumulative effects) to result in the destruction of federally-designated critical habitat which would not meet the requirements of the Federal Recovery Strategy; but
- Unlikely to have a measurable effect on the current, rapid population decline in the Quintette herd.

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<sup>66</sup> Available online: [https://docs2.cer-rec.gc.ca/ll-eng/llisapi.dll/fetch/2000/90464/90550/554112/915551/1060220/2452372/2478467/2478615/C36-3-2\\_Action\\_Plan\\_for\\_the\\_Klinse-Za\\_Herd\\_of\\_Woodland\\_Caribou\\_%28Rangifer\\_tarandus\\_caribou%29\\_in\\_Canada\\_-\\_Public\\_Consultation\\_-\\_A3X4D3.pdf](https://docs2.cer-rec.gc.ca/ll-eng/llisapi.dll/fetch/2000/90464/90550/554112/915551/1060220/2452372/2478467/2478615/C36-3-2_Action_Plan_for_the_Klinse-Za_Herd_of_Woodland_Caribou_%28Rangifer_tarandus_caribou%29_in_Canada_-_Public_Consultation_-_A3X4D3.pdf)

However, it was also noted that HEWR in the Bullmoose/Mount Spieker area is the only HEWR still receiving significant use by the Quintette herd and abandonment would have serious consequences for the LPU.

Glencore disagreed that Sukunka, once mitigation and financial compensations are applied, would not reach the PNCP principle of a neutral or better effect within ten years, and voluntarily increased the financial compensation from the originally proposed amount of \$94,600 to \$2,496,000 towards regional caribou initiatives. In response, Steve Wilson provided an additional analysis of the new financial compensation and determined that this proposal would meet the principle of neutral or better if the actions through the implementation of the PNCP, such as predator control and maternal penning, were successful. In 2019, recognizing the possibility that caribou could be displaced and potentially subjected to increased predation risk, Glencore revised the financial contribution for predator management to \$3,300,000, as a contribution of \$150,000 per year for 22 years (assumed life of mine) toward the predator management component of the Provincial Caribou Recovery Program. Glencore stated that since current spending on predator management by the Provincial Caribou Recovery Program within the Quintette herd range is estimated at \$125,000 – \$150,000 per year, its contribution could support continued predator control for the entire operational life of the mine.

Additionally, Glencore's revised offset proposal increased its financial contribution toward habitat restoration to \$1,500,000 based on 125 km of linear features (e.g., of old rough roads and trails) from \$92,000 for 23 ha of HEWR. The revised restoration of 125 km of linear features would recover approximately 1,750 ha of undisturbed caribou range, an offset ratio of 14:1.

ECCC and the FNITR raised concerns that the financial compensation cannot compensate for the loss of irreplaceable habitat, and that the mitigation measures and how these fit within the objectives of the Federal Recovery Strategy and action plans (in particular, herds that are self-sustaining without ongoing management intervention), analysis of their limitations, and an assessment of the impact of displacement on the Quintette herd was needed. Glencore thus provided a technical memo (see IR response #94) to address these concerns. This memo provided details on proposed mitigation measures for off-site linear feature deactivation, off-site restoration of habitat disturbance, and financial contribution offsets. In the departmental letter dated June 15, 2018, ECCC indicated that high levels of uncertainty remain about the effectiveness of the proposed offsets and mitigation measures, due to:

- The time lag between when caribou need the habitat and when it will be available;
- The lack of long-term evidence that it is possible to restore habitat to a functional state for caribou; and
- The identification of locations for habitat restoration and securement not being finalized.

Glencore also proposed habitat securement in the form of relinquishing surface access within its tenure as offsets, forming part of their mitigations listed in revised IR #94 to offset effects from Sukunka on caribou. Glencore provided the EAO with additional information (see IRs 'Sukunka - candidate habitat securement' and 'Habitat Securement Options') that identified candidate habitat securement sites at a ratio of 4:1 based on the impact to 256 ha of high elevation caribou habitat. The candidate habitat securement sites

totaling 1,024 ha are located within Glencore's tenure to the southeast of Sukunka, within Quintette HEWR and HESR habitat<sup>67</sup>. These sites fall within Zone A1 of the Partnership Agreement. Zone A1 is identified as one of the 'Sustainable Resource Activity Areas' that is subject to provincial decision making that considers impacts to caribou and the recommendations of a Caribou Recovery Committee. These sites also fall within a designated Ungulate Winter Range, which restricts forest harvesting activities, and are part of a conditional withdrawal designation for conservation purposes under section 17 of the *Land Act*, which restricts new authorizations for tenures under the *Land Act* to tenures that are deemed compatible with the stated conservations purposes. These existing designations do not apply to mining or oil and gas development. Several existing tenures overlap the proposed habitat securement area, including mineral tenures (coal, oil and gas, and gas grid projects), Crown tenures (rights of-way for communication sites, commercial recreation, and fish and wildlife management), and recreation trails. The total direct loss of HEWR and HESR was reduced in 2019 from 256 ha to 125 ha, but the total proposed habitat securement of 1,024 ha was retained by Glencore. Glencore recognized that engagement and negotiation with the Province and Indigenous groups, as well as collaboration with other developers, land managers, and road operators with overlapping tenure are necessary to implement and achieve long term habitat securement and is committed the establishment of protection measures for long term habitat securement in the detailed mine planning and permitting phase.

Trial Version 1.0 of a B.C. Habitat Offset Decision Support Tool (Offset Tool) was developed by the Province in 20XX as a component of the B.C. *Environmental Mitigation Policy*, to establish a standardized method to assess offsets based on ecological factors and known risk, with focus on impacts to direct habitat loss. In 20XX, Glencore calculated an estimate of the area of offsets required to address direct effects using the Offset Tool for 125 ha, which was 7.6:1. A securement area of 1,024 ha represents a ratio of 8.2:1.

Sample calculations using a September 2021 caribou-specific version of the Offset Tool yielded ratios (for the direct disturbance impacts only, not including indirect impacts) at between 8.75:1 and 17:1 or higher depending on the habitat types at the offset site and assumptions around the action being taken (e.g. securement or restoration, time lag, certainty of implementation).

In addition to ECCC's views that the direct loss of HE ranges cannot be mitigated or offset, ECCC stated that the Operational Framework for Use of Conservation Allowances<sup>68</sup> would not support the proposed habitat securement as an offset as it is their view that the proposed securement does not address the concept of additionality. The proposed securement areas, while within the Sukunka tenure, are outside the proposed direct impact area associated with the project currently under review and therefore authorizations for development of those areas are unlikely to be sought in the near to medium term (and may not be approved even when requested). As such, the proposed securement would not prevent an identified threat from mining activities. ECCC noted that forest harvesting is already restricted in the proposed securement areas due to the Ungulate Winter Range designation, and that there is uncertainty whether

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<sup>67</sup> The final areas for habitat securement would be required to be submitted as part of Condition 19: Caribou Mitigation and Monitoring Plan and negotiated with the Province.

<sup>68</sup> [ECCC 2012, available at: https://www.canada.ca/en/environment-climate-change/services/sustainable-development/publications/operational-framework-use-conservation-allowances/chapter-6.html](https://www.canada.ca/en/environment-climate-change/services/sustainable-development/publications/operational-framework-use-conservation-allowances/chapter-6.html)

agreements with other tenure holders could be reached that would allow comprehensive legal protection to be put in place by the Province. In view of these factors, ECCC is of the opinion that the Proponent cannot at this time demonstrate that the proposed securement would be additional to existing regulatory measures. As such, it is ECCC's view that the proposed securement would not result in incremental conservation benefits to caribou.

During consultation meetings with the EAO, Indigenous Groups also expressed concerns that the overlapping tenure holders could potentially develop the candidate habitat securement sites, thereby reducing the effectiveness of Glencore's proposed mitigation. Without securing surface tenure for the proposed caribou habitat securement options, there is a lack of certainty associated with the effectiveness of offsets as mitigations. The responsibility for mitigating impacts and for any associated implementation costs and compensation payments rests with Glencore. Therefore, Glencore would be responsible for consulting with those other tenure holders and securing agreement on necessary relinquishment or deferral of those other tenure activities to ensure the effectiveness of the offset. If Glencore were to reach agreement with these tenure holders<sup>69</sup> and the cost of the associated lost resource development were to be acceptable to the Province, the Province would be responsible for implementing any required regulatory mechanism to give effect to the proposed protection/offset. At this point in time, an agreement between Glencore and the other tenure holders has not been reached, and this contributes to the uncertainty in the effectiveness of the offsets as mitigations for Sukunka. To address this uncertainty, the EAO has proposed Condition 19: Caribou Monitoring and Mitigation Plan, which would require Glencore to secure this agreement with other tenure holders and confirm that the habitat offsets have been appropriately protected from disturbance prior to construction.

As a result of additional consultation with the Caribou Sub-Working Group, EAO, and Indigenous Groups, Glencore developed an Adaptive Management Framework that was designed to be implemented in conjunction with the Wildlife Protection and Monitoring Plan. The purpose of this framework is to monitor and improve the caribou mitigation measures proposed by Glencore. The EAO has also proposed Condition 19: Caribou Monitoring and Mitigation Plan, requiring detailed information as part of the adaptive management plan required for the CMMP. Further, the EAO would require Condition 20: Caribou Financial Agreement (if the EAC were issued) requiring that Glencore enter into an agreement with the Province to make the financial contributions committed during the EA (\$3,300,000 towards regional predator management initiatives and \$1,500,000 towards restoration of 125 km of linear features).

## 8.6 THE EAO'S CHARACTERIZATION OF RESIDUAL EFFECTS

The EAO's characterization of the expected residual effects of Sukunka on caribou, as well as the level of confidence in the effects determination (including their likelihood and significance), is summarized below. As identified in the previous sections, the EAO has proposed Condition 19: Caribou Mitigation and Monitoring Plan to require Glencore to finalize the CMMP in consultation with LWRS and Indigenous Groups, which will include the mitigation measures described in Section 5.1.2.3 and additional offsets that

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<sup>69</sup> Environmental Mitigation Policy for BC is available at: <https://www2.gov.bc.ca/gov/content/environment/natural-resource-stewardship/laws-policies-standards-guidance/environmental-guidance-and-policy/environmental-mitigation-policy>

Glencore proposed during Application Review.

After considering the proposed mitigation measures, the EAO concludes that Sukunka would result in the following residual adverse effects on caribou:

- Direct, long-term effects on habitat through removal of high and low elevation caribou habitats from clearing and construction;
- Indirect, long-term effects on habitat through sensory disturbance from construction and operations. There is also uncertainty around the extent of sensory disturbance and the impacts to the herd, including the potential for abandonment of the important Bullmoose Mountain HEWR and to increased risk of predation;
- Increased mortality risk resulting from increased access by wolves into high elevation range; and
- Change in movement due to the construction of the mine site, haul routes, and the diversion ditch within HEWR.

**Table 24: Summary of Residual Effects for Caribou**

*Note: Criteria and assessment ratings are defined in [Appendix 4 Residual Effects Characterization Definition](#)*

CRITERIA	ASSESSMENT RATING	RATIONALE
Context	<b>Low resiliency</b>	The Quintette herd is considered to have <b>low resiliency</b> , due to substantial decline in habitat suitable to sustain their population. The herd has been impacted by past and current development that has reduced their habitat and changed the predator/prey dynamics, increasing wolf mortality on caribou. Federally, Southern Mountain Caribou are listed as threatened under SARA; the Central Group has been assessed as Endangered by COSEWIC, and Quintette is noted as one of the LPUs of particular concern in the federal Minister’s finding of imminent threat to recovery of the species. Wolf control is an emergency measure currently necessary to support caribou populations in the face of existing habitat disturbance; the continuation of that measure is not assured and is not consistent with the objectives of a self-sustaining caribou population and represents a serious concern to Indigenous Groups.
Magnitude	<b>Moderate to High</b>	The magnitude of the effects of habitat loss, sensory disturbance, increased mortality risk, and changes to movement and population dynamics are considered <b>moderate to high</b> because any additional adverse effects to the Quintette herd are expected to negatively affect the sustainability, and possibly survival, of the population.
Extent	<b>Beyond regional</b>	The combined effects on caribou would extend <b>beyond regional</b> , as impacts would occur throughout the range of the Quintette caribou herd and beyond with impacts to Southern Mountain Caribou (Central Group) overall.
Duration	Habitat loss (direct): <b>Long-term to permanent</b>  Habitat loss	The effects of direct habitat loss would persist after operation ends for 100-250 years until habitat regenerates. Sensory disturbance would persist throughout the period of active water treatment, which is proposed to continue <b>potentially in perpetuity</b> , although disturbance would be greatly reduced after operations end.

CRITERIA	ASSESSMENT RATING	RATIONALE
	(indirect): <b>long-term</b> Mortality risk: <b>Long-term</b> Movement: <b>Long-term</b>	Increased mortality risk would be reduced in the <b>long-term</b> after post closure reclamation and natural revegetation on some linear features; however, some increased risk would <b>persist permanently</b> from the creation of permanent linear features.  There is a potential for <b>long-term</b> change in caribou movement, as the Quintette herd may abandon the HEWR on Bullmoose Mountain and increase the risk of predation to the herd.
Frequency	Habitat loss (direct): <b>single</b> Habitat loss (indirect): <b>continuous</b> Mortality risk: <b>continuous</b> Movement: <b>Continuous</b>	Direct effects to habitat would occur in a <b>single</b> event during clearing and construction. Effects of sensory disturbance would be <b>continuous</b> through construction, operation, and ongoing active water treatment.  Effect of increased mortality risk and on caribou movement would be <b>continuous</b> .
Reversibility	Habitat loss (direct): <b>irreversible</b> Habitat loss (indirect): <b>reversible</b> Mortality risk: <b>reversible</b> Movement: <b>reversible</b>	Direct effects to habitat would be <b>irreversible</b> , or reversible only within a very long timeframe (100-250 years).  Sensory disturbance would be <b>reversible</b> upon mine closure, although it is unknown if caribou would move back into the area once operation ends.  Effects to mortality risk from increased access for predators and change in movement may be <b>reversible</b> with implementation of mitigation to block access, functional restoration, and predator control that removes sufficient numbers of wolves. While Glencore has committed to funding predator management over the life of mine, these measures are likely unsustainable over the long-term they would be required indefinitely considering the Quintette herd's long-term decline.
Likelihood	<b>High</b>	There is a <b>high</b> likelihood of adverse effects to caribou. The EAO considered the moderate to high magnitude and long-term to permanent nature of effects as well as the low resiliency of caribou to further adverse effects, including the rapidly declining trend (without the use of predator management) of the Quintette herd, the imminent threat assessment, and the risk of extirpation if that decline continues. The EAO also considered that Sukunka, with the proposed mitigation measures and offsets, is unlikely to meet the objectives of the PNCP, the Partnership Agreement, Bilateral Conservation Agreement, or the Federal Recovery Strategy.
Significance Determination	<b>Significant</b>	The EAO determined that Sukunka is expected to have a <b>significant</b> adverse effect to the Quintette caribou herd after mitigations and offsets are applied.
Confidence	<b>High</b>	There is <b>high</b> confidence in the likelihood and significance determinations because the effects of habitat loss and increased

CRITERIA	ASSESSMENT RATING	RATIONALE
		mortality risk on caribou populations are well known.

## 8.7 CUMULATIVE EFFECTS ASSESSMENT

Residual effects to caribou from Sukunka are likely to interact with reasonably foreseeable future projects to create additional cumulative effects. Even with the finalization of a CMMP (which is a proposed condition), these cumulative effects are considered to be high in magnitude and long-term to permanent in duration. ECCC, Indigenous Groups, and LWRS are of the view that the effects of Sukunka on high elevation caribou habitat cannot be mitigated.

There were 14 existing and reasonably foreseeable projects and activities identified in the Application, and an additional 3 identified during Application Review, that have the potential to interact cumulatively with Sukunka. Since the time the Application was submitted, two of the reasonably-foreseeable projects were authorized (Expansion of Wolverine Mine) or substantially started (Roman Mine). There is high potential for significant cumulative adverse effects from these projects and activities because cumulative effects on caribou habitat (HEWR, LEWR, HESR, and matrix) resulting from industrial development were significant at baseline, resulting in the decline of caribou numbers over the past decades, the federal designation of Southern Mountain Caribou as threatened, and the federal Minister's finding that the species is facing imminent threats to recovery.

ECCC, Indigenous Groups, and LWRS identifies the overall threat level from the cumulative effect of all projects and activities over the next ten years as very high for the Central Group (which includes the Quintette herd), as any further loss of critical habitat is a threat to the recovery of the species.

## 8.8 CONCLUSIONS

Considering the above analysis and having regard to the conditions identified in the CPD and table of conditions (which would become legally binding if an EAC is issued), the EAO is of the view that, after the application of the proposed mitigation and offsetting, Sukunka would have significant adverse and cumulative effects on caribou.

## 9.0 ASSESSMENT OF EFFECTS TO VEGETATION

### 9.1 BACKGROUND

Vegetation was selected as a VC because of its importance to Indigenous Groups and British Columbians and because vegetation resources would be affected by Sukunka. Vegetation is used by Indigenous Groups for traditional purposes, provides habitat and forage for wildlife, and supports specific communities of plants in terrestrial ecosystems.

The results of the vegetation assessment are considered in the assessment of other VCs in this Report, including:

- Wildlife Resources ([Section 7](#)), which assesses effects on wildlife habitat;
- Health ([Section 16](#)), which assesses community health and wellness and harvested foods.
- Summary of Statutory Requirements under CEAA 2012 ([Section 17](#)), which assesses federally listed plant species, ecological communities, and wetlands; and
- Part C ([Section 20](#)), which assesses effects related to the loss of traditional use plants used by Indigenous Groups;

#### 9.1.1 REGULATORY CONTEXT

Key legislation, policy, and other regulatory guidance documents relevant to the protection and management of vegetation and wetland resources include:

- Federal *Species at Risk Act* (SARA), which prohibits killing, harming, or taking of federally-listed species;
- Federal Policy on Wetland Conservation, which has the goal of no-net-loss of wetland functions on federal lands and waters or where there are federal permits, licenses, or authorizations required;
- Federal Operational Framework on Use of Conservation Allowances, which sets the parameters, based on existing legislated authorities, practice and policy, for how and when conservation allowances should be used or recommended by ECCC;
- B.C. Non-Spatial Old Growth Order, which establishes old-growth objectives for landscape units;
- B.C. Conservation Framework, which provides rankings of species and ecosystems of conservation priority;
- B.C. *Integrated Pest Management Act* and Regulations, which would be required if Glencore plans to treat more than 20 ha a year for industrial vegetation purposes and more than 50 ha a year for invasive plants;
- B.C. *Forest and Range Practices Act*, which reduces the effects of forest and range practices on ecosystems associated with wildlife habitat, and on wetlands; and
- B.C. *Weed Control Act* and associated regulations, which require control of designated noxious plants.

### 9.1.2 STUDY AREA DESCRIPTION

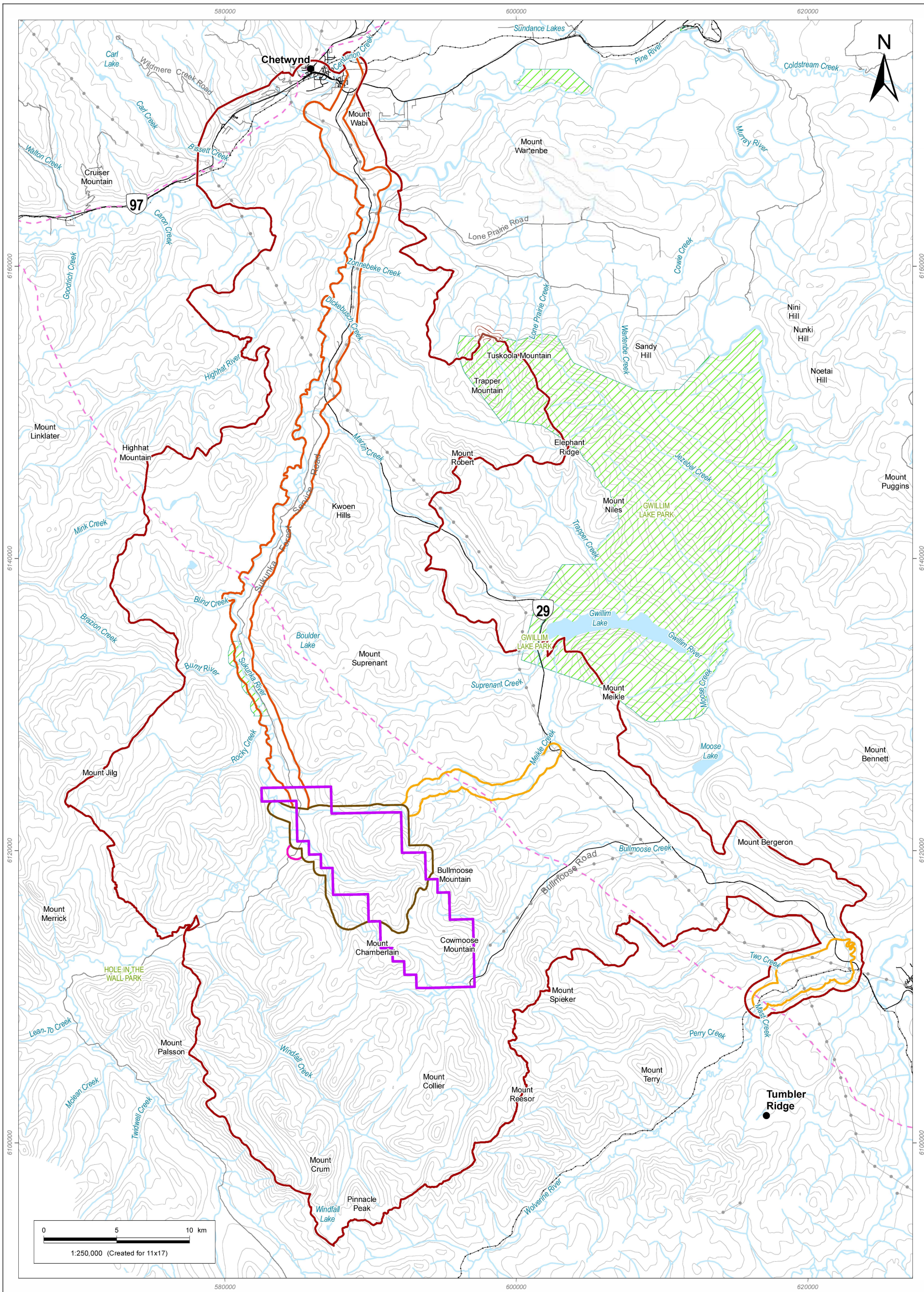
The assessment of impacts on vegetation was conducted for the Project Development Area (PDA), which would be considered the maximum disturbance area during construction and operations.

The vegetation assessment used a Local Assessment Area (LAA) which included the PDA and a buffer of at least 500 m, following natural topographic breaks. The LAA would cover approximately 9,200 ha.

The vegetation assessment also used a larger Regional Assessment Area (RAA) to provide regional context. The RAA would be 183,230 ha and extend south from Chetwynd, B.C., generally following the height of land on either side of the Sukunka River valley south to the Wolverine Landscape Unit. The RAA was used to establish the context for determining the significance of Project-specific effects on vegetation and encompassed the assessed area where Project-specific effects overlap with effects of past, present, and reasonably foreseeable future activities and contributes to cumulative effects on vegetation.

The temporal boundaries for the vegetation assessment included two years of construction, 22 years of operation, an approximate six years of closure for most of the mine site, and an additional post-closure period including a potentially permanent period of water treatment.

Figure 13: Vegetation Study Area



<b>Legend</b> <ul style="list-style-type: none"> <li>● City / Town / Village</li> <li>- - - Pipeline</li> <li>- - - Railway</li> <li>— Road - Gravel Surface</li> <li>— Road - Paved Surface</li> <li>● Transmission Line</li> <li>— Watercourse</li> <li>— Contour</li> <li>— Waterbody</li> <li>▨ Provincial Park</li> </ul>		<ul style="list-style-type: none"> <li>▭ Regional Assessment Area</li> <li>▭ Sukunka Project Tenure Area</li> <li>▭ Local Assessment Areas</li> <li>▭ Chewynd Options</li> <li>▭ Mine Site</li> <li>▭ Transmission Line Option 1</li> <li>▭ Tumbler Ridge Option</li> </ul>	
<b>SUKUNKA COAL MINE PROJECT</b> <b>VEGETATION SPATIAL BOUNDARIES</b> ENVIRONMENTAL ASSESSMENT APPLICATION			
PREPARED BY: <b>Stantec</b> PREPARED FOR: <b>GLENCORE</b>			
Data Sources: Glencore, Province of British Columbia, Government of Canada Disclaimer: Although there is no reason to believe that there are any errors associated with the data used to generate this product or in the product itself, users of these data are advised that errors in the data may be present. File Path: fig_10482_ea_veg_5_4_1_1.raa			
DATE: 05-NOV-14	PROJECTION: UTM 10	DRAWN BY: S. PARKER	
FIGURE ID: 123110482	DATUM: NAD 83	CHECKED BY: M. MEIER	

## 9.2 POTENTIAL PROJECT EFFECTS AND PROPOSED MITIGATIONS IDENTIFIED IN THE APPLICATION

Existing conditions, potential Project effects, and proposed mitigation measures identified in the Application are described in the subsections below. Section 5.4 of the Application describes Glencore's vegetation effects assessment in more detail.

### 9.2.1 EXISTING CONDITIONS

Sukunka would be located in the Northern Interior Forest Region. The dominant vegetation type in this area is mixed deciduous and coniferous forests, with wetlands occurring frequently along the Sukunka River.

The Application used four main data sources to characterize baseline vegetation information: field studies, desktop reviews, Indigenous Groups' traditional knowledge and land use studies, and the results of Predictive Ecosystem Mapping and Terrestrial Ecosystem Mapping. Detailed baseline data can be found in the Application in the Vegetation and Ecosystems Technical Report (Appendix 27.0 – A5).

Baseline field surveys were conducted by Glencore in the summer of 2012 and 2013 in the RAA to complete Predictive Ecosystem Mapping and Terrestrial Ecosystem Mapping, rare plant surveys, and wetland function surveys. The following were identified:

- A total of 85 ecosystem units, including 21 ecosystems of conservation concern, in the LAA;
- Ten blue-listed plant and one red-listed plant species of conservation concern in the LAA but outside the PDA;
- No SARA-listed plant species;
- A total of 981 species of vascular plants identified in the LAA;
- Approximately 300 species of plants used by Indigenous Groups for traditional use, well-distributed throughout the LAA; and
- Invasive plant species commonly in disturbed habitats and uncommonly in the undisturbed habitats in the LAA, although they were identified in the majority of ecosystem units.

### 9.2.2 POTENTIAL PROJECT EFFECTS

Glencore's vegetation effects assessment focused on changes to vegetation through overlaying the PDA with the baseline data. Vegetation would be directly lost due to clearing and grubbing of mine site, roads, camp site, and transmission line rights-of-ways. Vegetation would be indirectly affected by dustfall and trace element deposition and changes in water supply through changes in hydrology.

Glencore assessed the following potential effects on vegetation:

- Changes in species distribution and abundance of:
  - Species of conservation concern;

- Species important to Indigenous Groups, such as traditional use plants; and
- Non-native invasive plants.
- Changes in community distribution and abundance of:
  - Ecosystems of conservation concern;
  - Wetlands;
  - Riparian ecosystems;
  - Alpine and parkland ecosystems; and
  - Old forest.
- Changes in community function related to:
  - Wetland area and function;
  - Forest productivity;
  - Ecological communities that would experience substantial dustfall; and
  - Sensitive ecological communities.

### CHANGES IN SPECIES DISTRIBUTION AND ABUNDANCE

Provincially-listed species of conservation concern were sparsely distributed throughout the LAA, but were not observed in the PDA, resulting in no predicted direct impacts. It was noted, however, that the diversity of ecosystems in the mine site LAA indicated a high potential for additional species of conservation concern to be found in the PDA. Four plant species of conservation concern were found within 300 m of the PDA: dainty moonwort (*Botrychium crenulatum*), hooded bristle-moss (*Orthotrichum cupulatum*), mountain fork-moss (*Dicranum montanum*), and birdfoot buttercup (*Ranunculus pedatifidus ssp. Affinis*).

It was assumed that all plants used by Indigenous Groups in the PDA would be lost during construction. The majority of direct effects on traditional use plants were expected to be limited to the PDA, although indirect effects from dustfall and increased levels of trace elements would occur in the LAA. Increased levels of the trace metal molybdenum in 4.2 ha of the LAA was also expected to affect the usability of traditional use plants in the area near the mine site.

Molybdenum in coal dust that can be taken up by vegetation can have adverse effects to ruminants sensitive to excessive molybdenum; however, concentration of molybdenum in local soils was found to be naturally high. The effects to ruminants are discussed in more detail in [Section 7](#) (Wildlife).

Invasive plant populations could expand or colonize new areas due to disturbance through clearing, aided through the movement of equipment and vehicles.

### CHANGES IN COMMUNITY DISTRIBUTION AND ABUNDANCE

Ecosystems of conservation concern occupied approximately 25,577 ha of the RAA. Project activities would result in direct losses of 677 ha of 19 blue-listed ecosystems and two red-listed ecosystems of conservation concern at the mine site. The greatest percentage loss compared to RAA abundance would be to the White spruce-Currant-Horsetail ecosystem, which would lose 21 percent of its baseline area in the RAA.

Wetland ecosystems occupied approximately 3,862 ha in the RAA and include bogs, fens, swamps, marshes, and shallow water wetlands. Wetlands would be lost across the PDA, for a total loss of 7.1 ha

(0.2 percent) of wetlands in the RAA.

Riparian ecosystems occupied approximately 9,204 ha of the RAA. Riparian ecosystems would be lost across the PDA, for a total loss of 216 ha (1.2 percent) of RAA riparian ecosystems.

Alpine and parkland ecosystems occupied approximately 13,408 ha of the RAA. A total of 1.0 ha (less than 0.01 percent) of transitional parkland ecosystem was predicted to be lost at the mine site during construction.

Old forest ecosystems were identified using the Predictive Ecosystem Mapping and relating forest type to minimum age requirement to be considered 'old forest' (i.e. between 100-250 years based on type). Old forest ecosystems occupied approximately 63,371 ha of the RAA. Old forest would be lost in the PDA, mostly at the mine site, for a total loss of 1,198 ha (1.9 percent) of old forest in the RAA.

### **CHANGES IN COMMUNITY FUNCTION**

The loss of wetlands in the PDA would reduce wetland function. Glencore's hydrology and hydrogeology assessments did not predict additional losses of wetlands due to changes in hydrology caused by water diversion, site drainage, or seepage management.

The loss of forest in the PDA would reduce forest productivity. The greatest area of lost forest productivity would be on the mine site, where a net loss of 1,912 ha of high and moderate productivity forest would occur.

### **CUMULATIVE EFFECTS**

The Application included an assessment of cumulative effects. At baseline, 4,237 ha (2.3 percent) of the RAA is disturbed. Overlaying Sukunka and all likely known future projects would cause an additional loss of 7,292 ha (4.0 percent) of vegetation. The overall disturbance to vegetation at the RAA level was considered minimal. The residual effects to species distribution and abundance and community function were considered negligible as no species of conservation concern were identified in the PDA, mitigation measures were expected to reduce potential adverse effects of dustfall, and reclamation would recover the majority of vegetation. A quantitative cumulative effects assessment was not completed for these effects. Residual effects to ecosystems of conservation concern were also considered negligible because only small portions of ecosystems of conservation concern were identified in the PDA, mitigation measures were expected to reduce potential adverse effects to ecosystems, and reclamation would recover the majority of vegetated ecosystems in the long term, with the exception of old growth forests. For old growth forests, additional impacts assessed from timber harvesting amounting to an estimated cumulative loss to old growth forests of 10-15 percent within each Biogeoclimatic Ecosystem Classification (BEC) unit using data current to 2013, which was below the old growth target threshold within each BEC unit.

Overall, Glencore assessed the residual and potential cumulative effects of Sukunka on vegetation as not significant.

### 9.2.3 MITIGATION MEASURES

Glencore's key mitigation to address impacts to vegetation included:

- Limit disturbance from activities such as clearing and grubbing to the PDA;
- Re-vegetate disturbed areas following a Reclamation Plan and monitoring program;
- Re-vegetate disturbed areas with plants of cultural, economic, or social importance;
- Clearly identify mapped and unmapped wetlands that fall near disturbed areas to facilitate avoidance during construction and operation;
- Maintain a buffer around ecosystems of conservation concern, wetlands, riparian ecosystems, alpine and parkland ecosystems, and old forest to avoid these communities where possible;
- Flag all observed occurrences of plant species of conservation concern within 300 m of the PDA, and establish a 30 m no-disturbance buffer around these plants;
- Manage the effects of mine site water and potential acid rock drainage and metal leaching using the following plans:
  - Mine Site Water Plan;
  - Surface Water Management Plan;
  - Groundwater Management Plan; and
  - Metal Leaching/Acid Rock Drainage Prevention Management and Monitoring Plan;
- Limit encroachment of invasive species through an Invasive Species Management Plan, which includes washing the undercarriage and bumpers of all vehicles after work in a weed-infested area;
- Limit the production of dust and the effects of dust on vegetation through an Air Quality and Dust Control Plan, which would include operational measures to suppress dust; and
- Restrict use of herbicides in areas with a high abundance of traditional use plant species.

Complete lists of the proposed mitigation measures can be found in the Application in Section 5.4.6.2.2 (species distribution and abundance), Section 5.4.6.3.2 (community distribution and abundance), and Section 5.4.6.4.2 (community function).

## 9.3 POTENTIAL PROJECT EFFECTS AND PROPOSED MITIGATIONS IDENTIFIED DURING APPLICATION REVIEW

During Application Review, the EAO received and reviewed comments from the public, Indigenous Groups, and the Working Group (included in the public, Indigenous Groups, and Working Group issues tracking tables). From these comments, the EAO has distilled the following main issues:

- Glencore's approach to baseline data collection;
- Glencore's approach to assessment and analysis; and
- Impacts to the Sukunka Lousewort Bog.

With the removal of haul options D and E and transmission line option 1 during Application Review, Glencore anticipated a reduction of adverse effects to vegetation. The following losses of vegetation were expected from the remaining Project components: 2,236 ha on the mine site, 276 ha for Tumbler Ridge

haul routes (options A and B), and 204 ha for transmission line option 3. Glencore noted that some of the ecosystem losses could be recovered through reclamation; however, wetlands, riparian areas, and ecosystems of conservation concern are generally considered difficult to restore.

### ISSUES WITH GLENCORE'S APPROACH TO BASELINE DATA COLLECTION

ENV raised concerns about the rare plant surveys, noting a lack of spatial coverage in the Meikle Creek LAA and Bullmoose load out LAA and a lack of repeated sampling methods to ensure data robustness. DFO was also concerned about rare plant and wetland function surveys along the proposed fish offsetting channel (if built) due to potential wetland loss from decreased flows from Skeeter Creek to the Sukunka wetland (see [Section 5](#) – Fish and Fish Habitat for more information). ECCC also noted that the baseline data related to wetlands did not include the Meikle Creek LAA and Bullmoose load out LAA.

Glencore responded that additional rare plant surveys and ground verification of mapped ecosystems for the footprint of the water pipe, the access road to the water pipe, the fish offsetting channel (if built), and the selected haul option would take place during permitting.

The EAO has proposed Condition 16: Vegetation Management Plan and Condition 27: Air Quality and Emissions Management Plan to address these concerns, requiring Glencore to:

- Conduct detailed vegetation surveys where data deficiencies were identified, including for rare plants on the chosen haul route, Bullmoose load out PDA, water pipe and access road footprint, and fish offsetting channel, and wetland function surveys on the chosen haul, transmission, and camp options prior to the start of construction;
- Conduct pre-construction surveys for species at risk and ecosystems of conservation concern in the mine site PDA in the BWBSwk1 ecosystem; and
- Complete dustfall monitoring on the selected haul option for species of conservation concern and within sensitive ecosystems at year 1, 5, and 10.

### ISSUES WITH APPROACH TO WETLANDS ASSESSMENT AND ANALYSIS

ECCC noted that the wetlands analysis of effects compared the predicted wetland losses to wetland availability in the RAA, rather than in the LAA, showing regional effects of Sukunka rather than local effects. ECCC requested that Glencore provide percentage losses of wetlands in the LAA and re-evaluate the magnitude and residual effects assessment. Glencore provided the following percentage losses for the LAA after reclamation: 4.4 percent of LAA wetlands lost on the mine site, and 0.9 percent of LAA wetlands lost in the Tumbler Ridge haul route options. ECCC noted that assessments of wetland function were not prepared for the LAAs for all project components, and that no site-specific assessments of wetland function were completed. This could limit the ability to assess impacts of changes to wetland function on species at risk and migratory birds. ECCC recommended that, prior to construction, Glencore undertake a detailed quantitative assessment of wetlands, including habitat-supporting functions related to migratory birds and species at risk. ECCC also recommended that Glencore assess impacts to each individual red and blue-listed wetland in the LAA that could be directly impacted by Project activities, or is hydrologically connected to a directly impacted wetland. ECCC also requested that Glencore add detail to their proposed Reclamation Plan on specifically how wetlands would be reclaimed, and how no net loss of wetland

function would be considered in these reclamation measures.

Glencore responded that a wetland management plan would be developed in permitting which would address no net loss and hold detailed reclamation measures for wetlands.

To address ECCC's concerns related to the assessment of wetlands in the EA, the EAO proposes Condition 17, which would require Glencore to develop a Wetlands Plan containing:

- A wetland function assessment, including:
  - Direct and indirect impacts to wetland habitat functions for each of the individual red and blue-listed wetlands that may be impacted by Sukunka, including those within an area subject to a federal authority, license, or permit or wetlands that are hydrologically connected to impacted wetlands;
  - A description of the correlation of baseline wetland function data to specific reclamation measures, reclamation success criteria, and how the monitoring of wetland wildlife functions would be used to determine reclamation success and need for compensation;
  - Surveys for migratory birds and species at risk (SARA-listed) that use wetlands as part of their lifecycle, as well as an assessment of habitat functions that support the viability of these species, as detailed in [Section 7](#) (Wildlife); and
  - Mitigation measures to address impacts to wetland functions.
- A wetland compensation plan, including:
  - A full mitigation hierarchy of avoid, minimize, and compensate;
  - Identification of compensation sites, rates, and ratios for red and blue-listed wetlands that may be impacted by Sukunka, including those within an area subject to a federal authority, license, or permit or wetlands that are hydrologically-connected (connected via groundwater or surface water systems) to impacted wetlands;
  - Rationale for the location, extent, and area of wetlands for which residual effects should be addressed through offset measures;
  - The goal of no net loss of wetland functions;
  - How wetland functions for non-fish species would be maintained if fish are present or introduced;
  - A process of selecting proposed compensation sites, associated baseline conditions, and the functions that would be gained;
  - A compensation ratio of at least 2:1;
  - Measures to address the time lag in availability of wetland habitat and functions between when the adverse effects occur to when they have been fully replaced;
  - Description of how replacement wetlands represent the same wetland types and functions as those at the impacted sites;
  - The monitoring schedule, parameters, plans, and analysis, as well as clear and measurable success criteria for monitoring; and
  - A list of the parties and responsibilities for implementation of wetland compensation.
- An effects assessment of changes to wetland community distribution, function, and abundance in the LAA, including identification and description of residual adverse effects; and

- A description of any changes to proposed wetland reclamation measures as a result of the change to active water treatment during Application Review, this description should also include:
  - Measures to prevent the use of areas containing contaminated water by migratory birds and species at risk;
  - How the no net loss of wetland functions for migratory birds and species at risk is taken into account; and
  - Quantitative reclamation success criteria to inform the need for compensation.

## PROTECTION AND COMPENSATION FOR WETLANDS

LWRS and ECCC noted concern about riparian area and wetland buffers. ECCC requested that Glencore consider using a minimum of 150 m buffer around wetlands and recommended further review of best practices sources. West Moberly First Nations requested that the buffer be a minimum of 300 m around wetlands and ecosystems of conservation concern for use by ungulates. ENV also asked if an expanded buffer would be used for an ecosystem of conservation concern.

ECCC also requested that Glencore prepare a wetland compensation plan since areas of wetlands would be lost to proposed Project activities. ECCC recommended that wetland compensation sites be located as close to the impacted wetlands as technically feasible, that the replacement wetlands represent the same wetland types and functions as those at the impacted sites, and that compensation measures are incorporated to account for the time lag in availability of habitat and functions between impact and compensation.

The EAO has proposed Condition 17: Wetlands Plan, that would require a minimum of 150 m buffer around wetlands and ecosystems of conservation concern and a wetland compensation plan, with a consideration for extending that buffer in ungulate habitat.

## SUKUNKA LOUSEWORT BOG

Members of the public and ENV questioned the Application's assessment of the Sukunka Lousewort Bog. The areas of concern are related to:

- The severity of potential impacts on this bog and asked how impacts to blue-listed species would be kept below the 20 percent threshold identified by Glencore in the Application;
- Whether Glencore proposes a specific management plan for this ecosystem; and
- Whether Glencore had considered reclamation measures such as translocation of rare plants, to address the impact expected on this bog.

Glencore responded that this bog would be directly affected by vegetation clearing for the water pipe, and possibly indirectly through dust deposition from the mine site. Glencore noted that impacts to this bog would be limited by applying the mitigation measures in the Application relating to wetlands. While there was no specific management plan proposed for this wetland, Glencore committed to rare plant surveys and ground verification of the wetland mapping in the water pipe footprint. Glencore also committed that if rare plant confirmation surveys confirm the presence of rare plants in areas specifically impacted by

Project activities, a mitigation plan would be developed. If Project activities cannot be designed to avoid species of conservation concern, methods such as translocation, seed collection, and habitat enhancement would be considered.

To address the concerns raised during Application Review, the EAO has proposed Condition 16: Vegetation Management Plan, that would require Glencore to conduct a vegetation survey of the Sukunka Lousewort Bog prior to construction, in the footprint of the water pipe and for mitigation measures for any rare species and ecosystems of conservation concern to be developed. The Wetlands Plan, proposed by the EAO as Condition 17, would also cover this bog.

## 9.4 THE EAO'S CHARACTERIZATION OF RESIDUAL EFFECTS

The EAO's characterization of the expected residual effects of Sukunka on vegetation as well as the level of confidence in the effects determination (including their likelihood and significance) is summarized below.

The EAO considered the surveys, data, information, and memos provided by Glencore on plant species and ecological communities of interest to be adequate to support the assessment of effects. However, the information provided by Glencore regarding wetland function assessment suggested that there is uncertainty in the effectiveness of proposed mitigation measures, particularly the ability of the conceptual Wetland Management Plan to mitigate effects. The EAO also considered that most Project effects on vegetation and wetlands are limited to the PDA and adjacent ecological areas.

After considering the proposed mitigation measures, the EAO concludes that Sukunka would result in residual effects on the vegetation VC with respect to plant species and ecological communities and function for the following reasons:

- Loss of vegetation, including losses of traditional use plants, in the PDA due to vegetation clearing;
- Possible loss of up to five plant species of conservation concern in the LAA due to indirect effects of dustfall and trace element deposition;
- Increases in the distribution and abundance of invasive plant species;
- Loss of 695.5 ha (377.2 ha or more post-reclamation, depending on when the reclaimed areas become functional) of blue-listed ecosystems of conservation concern, including part of the Sukunka Lousewort Bog;
- Loss of 7.1 ha (2.0 ha post-reclamation) of wetland function and extent in the PDA;
- Loss of 216 ha (122 ha post-reclamation) of riparian areas;
- Negligible loss (1.1 ha or <0.01 ha post-reclamation) of alpine and parkland ecosystems; and
- Loss of 1,196 ha of old forest, and loss of forest productivity.

As identified in the previous section of this chapter, the EAO has proposed Condition 16 that would require Glencore to develop a Vegetation Management plan, including additional vegetation surveys (including at the Sukunka Lousewort Bog), species at risk and ecosystems of conservation concern surveys.

The EAO has also proposed Condition 17: Wetlands Plan, that would require an effects assessment of changes to wetland community distribution, function, and abundance; the development of a plan for

wetlands reclamation and offsetting, and a minimum 150 m buffer around wetlands and ecosystems of conservation concern, with consideration of extending that buffer in ungulate habitat.

**Table 25: Summary of Residual Effects for Vegetation**

**Note: Criteria and assessment ratings are defined in [Appendix 4 Residual Effects Characterization Definitions](#)**

Criteria	Assessment Rating	Rationale
Context	<p><b>Plant species:</b> Low to high</p> <p><b>Ecological communities and function:</b> Low to moderate</p>	<p><u>Plant Species:</u> Federally or provincially-listed plant species have a <b>low</b> resilience to disturbance given their lower regional population numbers and listed status. Other plant species that are widely dispersed in the broader region (i.e. the RAA) including traditional use species would have a <b>high</b> resilience to disturbance and continue to thrive in the surrounding area. The PDA currently has a <b>moderate</b> resilience to invasive plant species.</p> <p><u>Ecological Communities:</u> Ecosystems of conservation concern are uncommon across the landscape and are expected to have <b>low</b> resilience to disturbance based on their conservation status and need for niche habitats, such as soil and climate conditions. Red- and blue-listed ecological communities-at-risk, old growth forest and ecological communities sensitive to dustfall are also difficult to restore to baseline conditions or at reasonable timeframes. Riparian ecosystems have a <b>moderate</b> resilience as they are well-distributed through the RAA and provide important ecosystem functions. Alpine and parkland ecosystems have <b>moderate</b> resilience, as parkland areas can recover after disturbance, such as from ungulate overgrazing, over time. Wetland communities and their functions have a <b>low</b> resilience to disturbances, sometimes rely on complex hydrological regimes, and are difficult to restore to baseline conditions.</p>
Magnitude	<p><b>Plant species:</b> low to moderate</p> <p><b>Ecological communities and function:</b> low to high</p>	<p><u>Plant Species:</u> Effects from loss of traditional use species is expected to be <b>low</b> in magnitude, even considering losses outside the PDA due to molybdenum deposition, due to their prevalence throughout the region and their use in revegetation. <b>Moderate</b> magnitude of effects from invasive species is also expected given the presence of invasive plant species in the PDA. Effects to plant species-at-risk are expected to be of <b>moderate</b> magnitude given uncertainty regarding the full extent of their regional populations and the success of proposed mitigation measures. Invasive plant populations would increase in a <b>low</b> magnitude as a result of Project activities but are not expected to expand to levels that would threaten the viability of local vegetation populations.</p> <p><u>Ecological Communities:</u> Effects to ecological communities of interest are considered <b>moderate</b> due to direct loss of blue-listed ecological communities of conservation concern and wetlands, although over half would be attempted to be restored following reclamation. An exception to this is for the losses to three ecological communities of concern: white spruce-currant-horsetail, scrub birch-water sedge fen, and Sukunka lousewort bog communities; impacts to these would be considered <b>high</b> in magnitude due to loss of area in the RAA. Effects to wetlands are considered <b>low to moderate</b> magnitude because, although only a small percentage (5.3 percent) of wetlands in the LAA would be affected and reclamation may replace parts of lost wetlands, reclamation</p>

		<p>success is not certain.</p> <p>Effects to riparian areas are considered <b>low to moderate</b> magnitude, considering that a permanent loss of at least 108 ha and up to 196 ha of riparian areas would occur on the mine site, with additional losses on transportation and transmission line options. Reclamation could replace some riparian areas, depending on the success of reclamation and the options chosen, but some effects would be permanent.</p> <p>The magnitude of effects to alpine and parkland ecosystems would be <b>very low</b> given the very small area (one ha of transitional parkland) impacted, and the likely reclamation of parkland ecosystems.</p> <p>Effects to old forest are considered <b>low to moderate</b> magnitude because the losses on mine site and transportation options are expected to be approximately two percent of the total area in the terrestrial RAA; however, this would still result in more than 1,000 ha of old forest lost.</p>
Extent	<b>Local</b>	<p>The direct effects of loss of plant species and ecological communities would be confined to a <b>local</b> extent (PDA), with indirect effects extending into the LAA near the PDA. The indirect effects of air emissions and deposition would mainly occur within the tenure boundary and along the haul options, and overall are expected to be contained within the RAA.</p>
Duration	<p><b>Plant species:</b> long-term to permanent</p> <p><b>Ecological Communities and function:</b> long-term to permanent</p>	<p><u>Plant Species:</u> Residual effects on all plant species removed in the PDA during site clearing would be <b>permanent</b>, unless plant species-at-risk are translocated (the effects would then be considered long-term). Indirect effects from dustfall on plant species of interest would be <b>long-term</b> and occur for the duration of Sukunka.</p> <p><u>Ecological Communities:</u> <b>Long-term</b> since residual effects would last throughout the construction and operation phases and beyond. Recovery time is particularly long for old-growth forests (i.e. 250+ years) but function can eventually be restored and is thus considered <b>long-term</b>. Direct and indirect residual effects to wetland function would be <b>permanent</b> as there would be a permanent loss of all wetlands in the PDA (with a compensation ratio of at least 2:1 required following reclamation), along with permanent changes to local hydrological cycles.</p>
Reversibility	<b>Reversible to irreversible</b>	<p>Direct losses of vegetation and ecosystems are overall <b>irreversible</b>, though effects to some directly affected areas (wetlands, riparian areas, all forest types) may be <b>reversible</b> with reclamation over very long time periods (250+ years), if appropriate species are planted during revegetation upon completion of operations and appropriate post-planting adaptive management and monitoring occurs.</p>
Frequency	<p><b>Plant species:</b> Single event</p> <p><b>Ecological communities and function:</b> Single event and</p>	<p><u>Plant Species:</u> <b>Single event</b> during vegetation clearing of the PDA.</p> <p><u>Ecological communities and functions:</u> Direct impacts to ecological communities' function in the PDA would occur during a <b>single event</b> during clearing of the PDA. Indirect impacts to ecological communities function would occur <b>continuously</b> during operations due to effects from air emissions.</p>

	continuous	
Likelihood	<b>High</b>	There is a <b>high</b> likelihood of the adverse effects to plant species and ecological communities and function occurring as a result of Sukunka due to vegetation and wetland clearing in the PDA.
Significance Determination	<b>Not significant</b>	<p>The EAO has proposed conditions requiring a Vegetation Management Plan and a Wetland Management Plan that would include reclamation and monitoring, rare plant surveys, ground verification of the wetland mapping in the area of the water pipe (including access road), wetland function assessments, a minimum 150 m buffer around wetlands and ecosystems of conservation concern, and a Wetland Compensation Plan).</p> <p>Taking into consideration the local, long-term to permanent duration of direct residual effects, which are low to moderate in magnitude, the mitigation measures identified by Glencore, and the proposed conditions by the EAO, the EAO concludes that Sukunka’s residual adverse effects on plant species (including plant species-at-risk) and ecological communities (including ecological communities of conservation concern and wetlands) are <b>not significant</b>.</p>
Confidence	<b>Moderate to high</b>	<p>There is a <b>high</b> level of confidence in the likelihood and significance determinations because the direct effects of the mine and haul options, such as vegetation loss and loss of ecosystem extent and function, are certain to occur. There is a <b>moderate</b> level of confidence regarding the precise effects on species and ecosystems of conservation concern (depending on the actual number of species and area of ecosystems lost), the success of reclamation measures for wetlands and riparian areas, and the responses of vegetation to dustfall and air emissions over the operation phase of Sukunka.</p> <p>There is uncertainty in the magnitude of effects on vegetation for the following reasons:</p> <ul style="list-style-type: none"> <li>• Reclamation of wetlands can be difficult due to complexity of hydrological regimes and species composition;</li> <li>• Glencore’s proposed mitigation measures are not based on habitat identified for species-at-risk and migratory birds affected by the loss of wetlands; and</li> <li>• The Wetland Management Plan, Wetland Compensation Plan, and the results of the additional assessments are to be completed prior to construction are not available to inform the EAO’s understanding of effects.</li> </ul>

## 9.5 CUMULATIVE EFFECTS ASSESSMENT

There were found to be seven existing and reasonably foreseeable projects and activities that have the potential to act cumulatively with Sukunka. Cumulative effects on vegetation from industrial development are present in the LAA and RAA. Mining, energy (oil and gas facilities and pipelines), agriculture, forest harvesting, transportation (roads), power (transmission lines), recreational areas, and urban development have occurred within the region. Within the RAA, existing projects include:

- Brule Mine;
- Bullmoose Mine; and
- Kwoen Gas Plant.

Reasonably foreseeable projects that overlap the RAA include:

- Sundance Wind Energy;
- Meikle Creek Wind Energy;
- Quality Wind Energy; and
- Coastal GasLink Pipeline.

In addition, forestry, new road development, oil and gas exploration, and coal exploration are likely planned for the proposed RAA in the future and would very likely contribute further to residual effects on vegetation resources, with the Application predicting a loss of a further four percent of vegetation in the RAA because of Sukunka and known future developments listed above. The EAO recognizes that the Province is working within the context of the *Yahey vs. British Columbia decision* (further discussed in Part A and Part C of this Report) to develop new approaches to cumulative effects management, and that the ongoing work between Treaty 8 Nations and the Province will inform subsequent authorization processes (should Sukunka receive an EAC). Without Sukunka, disturbance is expected to affect approximately 2.3 percent of vegetation in the RAA.

#### **CHANGES IN PLANT SPECIES DISTRIBUTION AND ABUNDANCE**

The Application did not assess effects on changes in species distribution and abundance, as Glencore believed that the incremental effect of Sukunka on vegetation would not have a significant impact. Mitigation measures would be expected to minimize impacts to species of conservation concern. Though the effects on traditional use plants were not reported for other projects, traditional use plants identified in the PDA are common and abundant throughout the RAA, therefore, cumulative effects on traditional plant species would be expected. Given the distribution of traditional use plants, it is expected that regional populations would remain. Increases of invasive plants would not be expected to lead to a significant cumulative effect on native vegetation.

#### **CHANGES IN COMMUNITY DISTRIBUTION AND ABUNDANCE**

Impacts to ecosystems of conservation concern would not be expected to result in a significant cumulative effect. This includes ecosystems expected to be removed by Sukunka, such as the White spruce-Currant-Horsetail, as other projects in the region are not expected to impact this very specific ecosystem in the RAA. Residual effects to wetlands, riparian areas, and sensitive and difficult-to-restore habitats would be expected to occur; however, the losses attributed across the RAA and the LAA would not be expected to result in a significant cumulative impact to ecosystems of conservation concern. No cumulative effects to alpine and parkland ecosystems would be expected due to the very small area of alpine and parklands to be disturbed. Old growth forest losses in the RAA would combine with residual losses from other activities such as forestry, but would not be expected to exceed retention targets set for old growth forest.

#### **CHANGES IN COMMUNITY FUNCTION**

Changes in wetland function, forest productivity, surface hydrology and groundwater, and dustfall would not be expected to result in cumulative effects to vegetation or ecosystems. Wetland function losses and impacts to forest productivity would be expected to remain at less than two percent of associated areas in the RAA, and the effects of dustfall are expected to remain localized to the LAA. Changes in surface hydrology and groundwater flow would not be expected to be significant.

Cumulative effects to vegetation, ecosystems, and community function are regional in extent, long-term to permanent in duration, and low in magnitude, other than for ecosystems of conservation concern and old growth forest, which are moderate magnitude. Cumulative effects could be reversible to the extent that vegetation is re-established in the RAA through reclamation and reforestation measures, though this depends on reclamation and silviculture success. Ecosystems and community function could also be restored in the PDAs depending on reclamation success. The frequency of effects depends on the timing of future projects, but generally the effects of loss of vegetation and ecosystems are considered to be ongoing.

In determining the potential significance of cumulative adverse effects to vegetation and wetlands, the EAO considered the residual effects from Sukunka, the cumulative disturbance to the RAA from Sukunka, and reasonably foreseeable projects, including consideration of historical disturbance. The EAO concludes that the cumulative residual adverse effects to vegetation and ecosystems within the RAA are not likely to be significant.

## 9.6 CONCLUSIONS

Considering the above analysis and having regard to the conditions identified in the CPD and TOC (which would become legally binding if an EAC is issued), the EAO is satisfied that Sukunka would not have significant adverse effects on vegetation.

## 10.0 ASSESSMENT OF EFFECTS TO SOIL

### 10.1 BACKGROUND

Soils were selected as a VC because of their importance to Indigenous Groups and British Columbians, and because these resources have the potential to be affected by Sukunka. Further, soil resources support terrestrial ecosystems, and Project activities have the potential to change soil quality and quantity which would affect soil biota, wildlife habitat, and agricultural land uses.

Glencore considered the following potential effects to soils in the Application:

- Changes to soil quality, including:
  - Reclamation suitability of soil (admiring and fertility of soil);
  - Compaction as measured by extent of clearing area with soils rated with high potential for compaction and rutting;
  - Potential contamination as measured by trace element concentrations; and
  - Changes to soil moisture as measured by changes to groundwater elevations;
- Changes to soil quantity, including:
  - Potential erosion and soil loss resulting from changes in soil vegetation cover and landform; and
  - Changes to soil volume as measured by soil salvage, replacement volumes, and area reclaimed.

The results of the soils assessment are considered in the effects assessment of other VCs in this report, including:

- Fish and Fish Habitat ([Section 5](#)), which assesses effects of acidification and eutrophication on freshwater fish and fish habitat;
- Water Quality ([Section 6](#)), which examines the potential effects of acidification and eutrophication on freshwater resources;
- Vegetation ([Section 9](#)), which assesses Project-related effects on vegetation and ecological communities;
- Air Quality ([Section 11](#)), which assesses coal dust deposition rates onto soils from Project-related air emissions;
- Health ([Section 16](#)), which assesses community and ecological health and wellness and harvested foods, and
- Part C ([Section 20](#)) which assesses effects related to any damage caused to traditional use plants harvested by First Nations through deposition of coal dust.

Provincial legislation and policies relevant to the soils assessment include:

- *BC Agricultural Commission Act* (2014), which has requirements for soil descriptions and handling, in particular when soils with agricultural capability are disturbed;
- *BC Mines Act* (2012), which provides guidance for the terrain and soils data in environmental assessments;

- BC *Environmental Management Act* (2012), which provides a template for soil survey information, including identification and mapping of soil units, characterization of soil for reclamation, waste rock salvage locations, erosion ratings, and soil metal mapping;
- BC *Forest and Range Practices Act* (2004), which provides best management practices for the management of soils and limits the amount of disturbance to soils; and
- Dawson Creek Land and Resource Management Plan (1999), which provides regional objectives for the management of soils, particularly in forested lands.

### 10.1.1 STUDY AREA DESCRIPTION

The spatial boundaries for the soils assessment include the Project development area (PDA) and local assessment area (LAA). The PDA is the area directly disturbed from Project activities such as clearing, construction, pit development, and road construction. Indirect effects to soils from soil dust contamination and changes in moisture regime may extend to the LAA. The LAA includes a 500 m buffer around the mine site, a 250 m buffer on each side of existing roads and conveyors, and a 500 m buffer on each side of proposed new roads and haul routes.

Glencore did not define a regional assessment area (RAA) for the soils assessment. However, portions of the vegetation and wildlife RAA include a soil contamination assessment. Vegetation is assessed in [Section 9](#) and wildlife is assessed in [Section 7](#) of this report.

The temporal boundaries for the soils assessment include two years of construction, 22 years of operation, approximately six years of closure for most of the mine site, and an additional post-closure period including a potentially permanent period of water treatment.

## 10.2 POTENTIAL PROJECT EFFECTS AND PROPOSED MITIGATIONS IDENTIFIED IN THE APPLICATION

Existing conditions, Project interactions for the potential effect, as well as proposed mitigation measures are described in the subsections below. Glencore's assessment of effects of Sukunka on soils can be found in Section 5.5 of the Application.

### 10.2.1 EXISTING CONDITIONS

The existing conditions of soils were determined through a combination of desktop review of data sources, fieldwork, baseline mapping, soil modelling, and laboratory analysis. At the time the Application was prepared, there was no publicly-available traditional knowledge information relevant to soils. Soil fieldwork was conducted and data was collected for the baseline from June to September in 2012 and 2013. A summary of the baseline information is in the Terrain and Soils Technical Data Report (Appendix 27.0 – A.6 of the Application).

A total of 88 soil metal samples were collected from 70 plots (Section 5.5 of the Application) and paired

with vegetation sample plots to provide a baseline for reclamation monitoring of trace element concentrations in soils. An additional 15 soil samples were collected from 15 plots for the Human Health and Ecological Risk Assessment (Section 9.1 of the Application) to create the baseline for trace elements for the soil contamination assessment. A soil survey was also conducted at 1,361 sites, at a scale of 1:5,000 at Survey Intensity Level 2; 590 of these sites were detailed, modified, or ground inspections.

Soil types within the LAA were mapped and identified mainly as Brunisols, Luvisols, or Regosols<sup>70</sup>. A high percentage of coarse fragments by volume were identified in several areas of the LAA (approaching 70 percent coarse fragments or more), especially at greater depths. Most of the soil would be salvaged from the PDA. The Application states that over 92 percent of the PDA contains soil suitable for reclamation.

The risk of soil compaction was assessed based on bare soil conditions, which can occur during construction and operation activities. Glencore reported that, based on the top 30 centimetres of the soil profiles in the LAA, 81 percent of the LAA was rated as having low to moderate compaction risk, and 18 percent was rated as high or very high compaction risk.

Glencore made a number of assumptions to determine the amount of trace element loading on soil. The assumptions considered coal dust and deposition pattern in the soil assessment. Only coal dust generated during operation was assessed for soil contamination effects.

Glencore assessed change in soil moisture regime by comparing modelled hydrogeological scenarios against present soil moisture conditions. Very wet or very dry site features such as organic soils, gleysols, or alpine areas were compared to areas with predicted changes in groundwater elevations.

Glencore determined that 80 percent of the LAA was rated as having low or moderate risk of soil erosion and 16 percent of the LAA was rated as high soil erosion risk. The remaining area was not rated.

Glencore assessed change in area of soil cover by comparing the area of land in the baseline and post closure Terrestrial Ecosystems Mapping mapped as features such as rock (or pit) walls, permanent roads, or lakes (including pit lakes). Glencore assessed change in soil volume by comparing the volume of soil available for salvage with the volume of soil predicted to be salvaged and replaced for reclamation.

### *Cumulative Effects*

The existing Perry Creek (Wolverine)<sup>71</sup> and Brule Coal Mines (located approximately 20 km southeast and 15 km northwest of Sukunka, respectively) and the proposed EB Pit Mine (located approximately 10 km southeast of Sukunka) are potential sources of fugitive coal dust emissions in the region. The Application

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<sup>70</sup>Brunisols: Developed primarily on colluvial, till or glaciofluvial material with some developing on fluvial material

Luvisols: Developed primarily on till and glaciofluvial material with some subgroups developing on fluvial or lacustrine material

Regosols: Developed primarily on fluvial material associated with streams or colluvial material on upland areas

<sup>71</sup> This section references the cumulative effects assessment provided in Glencore's Application, and there have been changes to the Wolverine and Hermann Mine Projects since Application Review began. On November 24, 2018, the Environmental Assessment Certificate for the Hermann Mine expired, as the project had not been substantially started. On February 12, 2021, the Environmental Assessment Certificate for the Wolverine Mine was amended to include an area that was previously certified as the Hermann Mine.

stated that these mines, however, do not have the potential to act cumulatively on soil quality with Sukunka due to their distance from the Sukunka LAA, which means that no overlap in coal dustfall is predicted.

The Application did not include an assessment of cumulative effects on soil quantity as it was determined that there are no existing or proposed projects in the region with effects on soil quantity that would act cumulatively with Sukunka.

### 10.2.2 POTENTIAL PROJECT EFFECTS

Glencore identified the following potential Project effects to soil quality:

- Soil compaction, with potential exposure of bare soils and lowered soil fertility from clearing and grubbing;
- Changes to soil moisture regimes through drying, wetting, or fluctuations in soil moisture that will change soil characteristics and vegetation cover from water diversion;
- Dustfall and soil contamination from borrow pit and open pit preparation activities such as blasting;
- Soil admixing, soil compaction, and loss of soil fertility from earthwork including soil salvaging, transport, and stockpiling;
- Dustfall and soil contamination from equipment operation including handling of coal;
- Soil admixing and compaction from road upgrading and construction;
- Direct soil disturbance from borrow pit excavation;
- Admixing, compaction, and changes in soil moisture from rail construction;
- Generation and dispersion of trace metal rich dust from open pit mining and coal handling, loading, and transporting; and
- Soil admixing, erosion, and compaction during reclamation activities such as soil handling, transportation, and replacement.

Glencore identified the following potential Project effects to soil quantity:

- Exposure of bare soils and erosion from clearing and grubbing;
- Unstable soils, soil erosion, or soil cover loss from open pit preparation activities such as blasting;
- Under-stripping, burial, and erosion from general earthworks, road upgrading, and construction;
- Direct soil cover loss from borrow pit excavation;
- Loss of soil cover during the creation of the pit walls during open pit mining; and
- Soil loss and erosion during progressive reclamation activities such as soil handling, transportation, and replacement.

### 10.2.3 MITIGATION MEASURES

Glencore identified the following key mitigation measures to address potential effects on soils:

- Train or arrange to train machine operators to salvage only the appropriate depth of soil;
- Implement route planning and traffic control to minimize vehicle travel on cleared soils;
- Limit machine traffic during periods of wet soil conditions;
- Use appropriate low weight or wide track machinery, and use materials such as slash or existing road tracks to reduce compaction;
- Assess replaced soils for available plant nutrients and, if necessary, add fertilizer and other amendments as required;
- Seed vegetative covers on soil stockpiles and mix organic material into mineral soils to mitigate effects to fertility;
- Salvage soils from operational areas and stockpile them away from the highest dust deposition area, particularly away from the areas predicted to have exceedances within the mine footprint based on the soil dust model;
- Implement the air quality and dust control plan;
- Construct waste rock stockpiles with a stable 2:1 slope, and reclaim other features such as the diversion channels to stable slopes;
- Increase surface roughness of replaced soils to minimize concentration of run-off and localized slope length;
- Promptly revegetate all replaced soils, or where immediate revegetation is not feasible, cover with geotextiles, mulch, or erosion control blankets and/or install slope breaks such as straw bales or coir logs;
- If deemed necessary, compact the surface of soil stockpiles to reduce wind erosion or cap with an erosion resistant material (e.g. geotextile, gravel cover); and
- If deemed necessary, implement bioengineering structures such as wattles or live stakes for high erosion risk areas (e.g. adjacent to watercourses, areas where existing erosion is visible).

The Air Quality and Dust Control and Reclamation Plans contain mitigation measures for effects on soil quality and the preliminary Surface Erosion and Sediment Control Plan contains mitigation measures for effects on soil erosion. A complete list of the proposed mitigation measures can be found in Section 5.5.6.2.6 of the Application.

### **10.3 POTENTIAL PROJECT EFFECTS AND PROPOSED MITIGATIONS IDENTIFIED DURING APPLICATION REVIEW**

In February 2016, Glencore notified the EAO that they made the decision to remove haul options D and E and transmission option 1 from the Sukunka design, based on Glencore's discussions with landholders and feedback from the Working Group on the Application. Glencore anticipates that with the removal of these options there would be no implications to residual adverse effects on soil and no changes to the significance conclusions set out in the Application.

The EAO did not receive any comments from the public, First Nations, or the Working Group regarding issues related to soils.

## 10.4 THE EAO'S CHARACTERIZATION OF RESIDUAL EFFECTS

The EAO's characterization of the expected residual effects of Sukunka on soils as well as the level of confidence in the effects determination (including their likelihood and significance) are summarized below.

After considering the proposed mitigation measures, the EAO concludes that Sukunka would result in residual effects on the soils VC for the following reasons:

- Changes to soil quality due to:
  - Changes to soil moisture in areas immediately adjacent to the open pits during operation due to pit dewatering; and
  - Contamination from fugitive coal dust with trace element concentrations from multiple irregular dusting events throughout the operation phase of Sukunka.
- Changes to soil quantity due to:
  - Changes in soil volume during soil salvage and handling during construction, operations, and post-closure; and
  - Soil cover loss due to replacement of soil-covered ecosystem supporting areas with non-soil areas (rock, water and permanent roads, and rail features) during operation and post-closure.

The EAO has proposed Condition 27 that would require Glencore to develop an Air Quality and Emissions Management Plan, which would require monitoring of dust deposition on soil. The EAO also notes that, should Sukunka receive an EAC, the provincial permitting process would require the development of a number of plans that would provide additional mitigations, including a Surface Erosion Prevention and Sediment Control Plan, Soil Management Plan, Mine Site Water Management Plan, and Reclamation and Closure Plan.

**Table 26: Summary of Residual Effects for Soils**

*Note: Criteria and assessment ratings are defined in [Appendix 4 Residual Effects Characterization Definitions](#)*

Criteria	Assessment Rating	Rationale
Context	<p><b>Soil Quality:</b> Moderate</p> <p><b>Soil Quantity:</b> Moderate</p>	Soils in the PDA have <b>moderate resiliency</b> . Presently, there is minimal disturbance in the undeveloped areas of the PDA. Areas within the LAA have varying degrees of disturbance from human activity.
Magnitude	<p><b>Soil Quality:</b> Low</p> <p><b>Soil Quantity:</b> Negligible and moderate</p>	<p>The magnitude of the effect to soil quality due to changes in the soil moisture regime is <b>low</b> because the effect is limited to operations, including pit dewatering and water diversion, and the predicted exceedances of molybdenum concentrations in the soils from coal dust are below a 10 percent change from baseline.</p> <p>The magnitude of the effect to soil quantity due to soil volume loss is <b>negligible</b> because replacement and progressive reclamation of soil would result in adequate soil volume to meet reclamation objectives. The magnitude of the effect to soil quantity due to soil cover loss is <b>moderate</b> as there would be a</p>

Criteria	Assessment Rating	Rationale
		12 percent decrease in soil cover. Mitigations and reclamation would provide for the return of equivalent land capability.
Extent	<b>Soil Quality:</b> Project area to local <b>Soil Quantity:</b> Project area	Direct effects to soil quality and quantity would be limited to the <b>Project area</b> . Indirect effects to soil quality resulting from molybdenum exceedances may extend into the <b>LAA</b> .
Duration	<b>Soil Quality:</b> Long-term to permanent <b>Soil Quantity:</b> Permanent	The effects to soil quality due to changes in soil moisture regime would be <b>long-term</b> , throughout operation, due to pit dewatering. The effects to soil quality due to contamination from fugitive coal dust would be permanent.  The effects to soil quantity due to volume and cover loss would be <b>permanent</b> . Soil volume loss is predicted to occur throughout the life of Sukunka. Project activities during operation and post-closure are predicted to result in a loss of soil cover area due to permanent pit walls, filling of pit lakes, and creation of permanent road and rail features.
Reversibility	<b>Soil Quality:</b> Reversible and irreversible <b>Soil Quantity:</b> Irreversible	The effects to soil quality due to changes in the soil moisture regime would be <b>reversible</b> after operations activities – dewatering and water diversion – have ceased. The effects to soil quality due to soil contamination from fugitive coal dust with increased amounts of molybdenum concentrations in soils would be <b>irreversible</b> .  The effects to soil quantity due to loss of soil volume would be <b>irreversible</b> for the life of the Project. The effects to soil quantity due to loss of soil cover would be <b>irreversible</b> , because there are no potential measures proposed to mitigate soil cover loss.
Frequency	<b>Soil Quality:</b> Regular to infrequent; and continuous <b>Soil Quantity:</b> Once and frequent; regular and continuous	Effects to soil quality due to changes in soil moisture regime would be <b>regular and continuous</b> during pit dewatering, throughout operation. Effects to soil quality from contamination are likely to be <b>infrequent and continuous</b> , during operation activities resulting in unpredictable fugitive coal dust emissions.  Effects to soil quantity from soil volume loss are likely to occur <b>once</b> during construction and then <b>frequently</b> during operation, closure, and post closure as soil is replaced and the PDA is progressively reclaimed. Effects to soil quantity from soil cover loss are likely to be <b>regular and continuous</b> during operation, closure, and post closure.
Likelihood	There is a <b>high likelihood</b> of the adverse effects to soils due to proposed Project activities due to pit dewatering, water diversion, and permanent infrastructure in the PDA and dustfall in the LAA.	
Significance Determination	Considering the above analysis and having regard to the conditions identified in the TOC (which would become legally binding if an EAC is issued), including requirements of the provincial permitting process for a Surface Erosion Prevention and Sediment Control Plan, Soil Management Plan, Mine Site Water Management Plan, and Reclamation and Closure Plan, the EAO is satisfied that Sukunka’s residual adverse effects on soils resources would be <b>not significant</b> .	
Confidence	There is <b>moderate to high confidence</b> in the significance and likelihood and significance determination for soils based on the understanding of existing information, baseline data, and conservative modeling used in the assessment.	

## 10.5 CUMULATIVE EFFECTS ASSESSMENT ON SOIL QUALITY

Residual effects to soil quality are predicted from changes to soil moisture regime and soil contamination due to Sukunka related activities in the PDA. No cumulative effects are predicted because there are no other existing or proposed projects or activities in the PDA/LAA, and therefore no overlap with residual effects for soil moisture regime or soil contamination with Sukunka. Considering the lack of interaction with past, present, and reasonably foreseeable future projects, the EAO is satisfied that there are no cumulative effects to soil quality due to Sukunka.

Residual effects to soil quantity are predicted from changes in soil volume and soil cover due to Sukunka related activities in the PDA. No cumulative effects are predicted because there are no other existing or proposed projects or activities in the PDA/LAA, and therefore no overlap with residual effects for soil volume or soil cover with Sukunka. Considering the lack of interaction with past, present, and reasonably foreseeable future projects, the EAO is satisfied that there are no cumulative effects to soil quantity due to Sukunka.

## 10.6 CONCLUSIONS

Considering the above analysis and having regard to the conditions identified in the CPD and TOC (which would become legally binding if an EAC is issued), the EAO is satisfied that Sukunka would not have significant adverse effects on soils.

## 11.0 ASSESSMENT OF EFFECTS TO AIR QUALITY

### 11.1 BACKGROUND

Air quality was selected as a valued component (VC) in the assessment as changes in ambient concentrations of particulates and emissions in the air can have potential adverse effects on ecosystems and human health. Mining activities release fugitive dust and gaseous emissions from combustion into the air and transporting contaminants from emissions sources to receptors. The quality of the air can affect soils, vegetation, wildlife, and other biota, as well as human and ecological health.

The changes in ambient concentrations of contaminants in the air and the deposition of dust (dustfall) are indicators of air quality changes due to Sukunka. The Application assessed activities and physical works that would release contaminants that, without implementing mitigation measures, could exceed ambient air quality regulatory criteria which were developed to protect human health and the environment.

The results of the air quality assessment are considered in the assessment of other VCs in this Report, including:

- Wildlife Resources ([Section 7](#)), which assesses effects on wildlife and wildlife habitat;
- Vegetation ([Section 9](#)), which assesses effects on vegetation resources;
- Soils ([Section 10](#)), which assesses effects on soils, including the deposition of minerals;
- Greenhouse Gases ([Section 12](#)), which assesses greenhouse gas (GHG) emissions;
- Human Health ([Section 16](#)), which assesses effects on community health and wellness and harvested foods.
- Summary of Statutory Requirements under CEAA 2012 ([Section 17](#)), which assesses effects on federally-listed plant species, ecological communities and wetlands; and
- Part C ([Section 20](#)) which assesses impacts to the Aboriginal Interests of Indigenous Groups;

#### 11.1.1 REGULATORY CONTEXT

The Ministry of Environment and Climate Change Strategy (ENV) is the regulatory authority for industrial air emissions in BC and has published the British Columbia Ambient Air Quality Objectives as guidance, which follow the criteria developed in the B.C. Air Quality Objectives (B.C. AQO)<sup>72</sup>, the National Ambient Air Quality Objectives<sup>73</sup>, and the Canadian Ambient Air Quality Standards (CAAQS)<sup>74</sup>.

Should Sukunka be issued an EAC and proceed to the permitting application process, a waste discharge

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<sup>72</sup> For more information, see: <https://www2.gov.bc.ca/assets/gov/environment/air-land-water/air/reports-pub/aqotable.pdf>

<sup>73</sup> Canada Gazette, Part I, Department of the Environment, National Ambient Air Quality Objectives for Air Contaminants, August 12, 1989.

<sup>74</sup> CAAQS for PM<sub>2.5</sub> and ozone were endorsed by the Minister of Environment in 2012 and by Canadian Council of Ministers of the Environment, and supersede Canada-wide Standards for Particulate Matter and Ozone (see: <https://ccme.ca/en/air-quality-report#slide-7>). CAAQS for SO<sub>2</sub> were endorsed by the Canadian Council of Ministers of the Environment in 2016.

permit would be required from ENV<sup>75</sup>, and this permit may include provisions to manage fugitive dust emissions from the mine site. An air emissions permit from ENV would also address emissions from the coal processing plant (for example, combustion emissions from the thermal coal dryer) and production handling systems. In addition, the Health, Safety and Reclamation Code for Mines in British Columbia has specific requirements regarding exposures of workers to airborne contaminants. A *Mines Act* (MA) permit would also be required from EMLI and this may include requirements related to fugitive dust management. ENV and EMLI have jointly developed a guidance document for fugitive dust management entitled *Ministry of Energy and Mines and Petroleum Resources and Ministry of Environment and Climate Change Strategy Developing a Fugitive Dust Management Plan for Industrial Projects* (May 2018). ENV and EMLI would advise Glencore to consult this document when developing the Fugitive Dust Management Plan for Sukunka.

In addition to the ENV and EMLI guidance, other key legislation, policy, and regulatory guidance documents relevant to the protection and management of air quality include:

- *Environmental Management Act* and the Waste Discharge Regulation which are the main pieces of legislation for air quality in B.C., and define Provincial Air Quality Objectives;
- BC Guidelines for Air Quality Dispersion Modelling in British Columbia (2008) which guides how the dispersion modelling is conducted in B.C.;
- *Canadian Environmental Protection Act*, containing the National Ambient Air Quality Objectives, which provides national ambient air quality criteria for environmental and human health exposures; and
- *Canadian Council of Ministers of the Environment (CCME) Air Quality Management System (AQMS)*, developed by the 2012 Canadian Ministers of the environment (except Quebec) to guide work on air emissions across Canada. AQMS provides a framework for collaborative action across Canada, and which included the development of CAAQS for PM<sub>2.5</sub>, ozone, SO<sub>2</sub>, and NO<sub>2</sub>. CAAQS for PM<sub>2.5</sub> replaced the Canada Wide Standards for Ambient Air Quality.

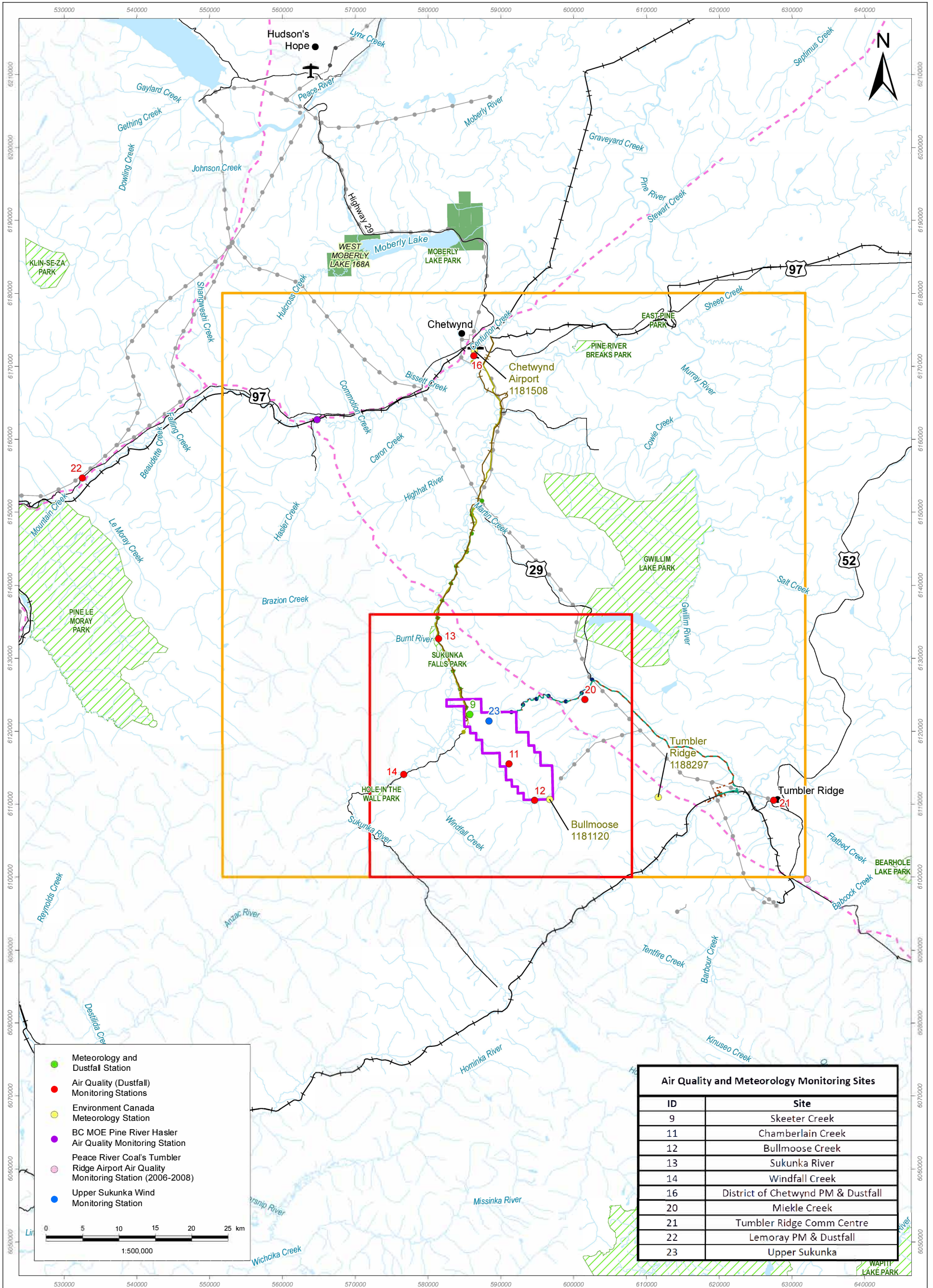
### 11.1.2 STUDY AREA DESCRIPTION

The main population centres in the region include Tumbler Ridge, which is located 40 km to the southeast from Sukunka, and Chetwynd which is located 55 km north of Sukunka. Provincial parks near Sukunka include Sukunka Falls Provincial Park (10 km northwest), Gwillim Lake (10 km northeast), and Hole-in-the-Wall (15 km southwest). According to the Application, there were no known permanent residences or federal lands within 10 km of Sukunka.

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<sup>75</sup> Under the *Environmental Management Act, Waste Discharge Regulation*.

Figure 14: Local Assessment Area and Regional Assessment Area for Air Quality Assessment



Air Quality and Meteorology Monitoring Sites	
ID	Site
9	Skeeter Creek
11	Chamberlain Creek
12	Bullmoose Creek
13	Sukunka River
14	Windfall Creek
16	District of Chetwynd PM & Dustfall
20	Miekle Creek
21	Tumbler Ridge Comm Centre
22	Lemoray PM & Dustfall
23	Upper Sukunka

<ul style="list-style-type: none"> <li>Airport</li> <li>City / Town / Village</li> <li>Road</li> <li>Railway</li> <li>Pipeline</li> <li>Transmission Line</li> <li>Watercourse</li> <li>Waterbody</li> </ul>	<ul style="list-style-type: none"> <li>Transportation Options</li> <li>Option A</li> <li>Option B</li> <li>Option D</li> <li>Option E</li> <li>Transmission Line Options</li> <li>Option 1</li> <li>Option 2</li> <li>Option 3</li> </ul>	<ul style="list-style-type: none"> <li>First Nations Reserve</li> <li>Provincial Park</li> <li>Sukunka Air Quality Local Assessment Area</li> <li>Air Quality Regional Assessment Area</li> <li>Sukunka Project Tenure Area</li> </ul>	<p align="center"><b>SUKUNKA COAL MINE PROJECT</b></p> <p align="center"><b>LOCAL AND REGIONAL ASSESSMENT AREAS AND BASELINE AIR QUALITY AND METEOROLOGY MONITORING SITES</b></p> <p align="center">ENVIRONMENTAL ASSESSMENT APPLICATION</p> <p><i>Data Sources:</i> Glencore, Province of British Columbia, Government of Canada  <i>Disclaimer:</i> Although there is no reason to believe that there are any errors associated with the data used to generate this product or in the product itself, users of these data are advised that errors in the data may be present.  <i>File Path:</i> fig_10482_ea_air_quality_05_06-01_laa_raqa_baseline_qir_quality_and_monitor_sites</p> <p>DATE: 28-JUL-14      PROJECTION: UTM 10      DRAWN BY: D. COOK              FIGURE ID: 123110482      DATUM: NAD 83      CHECKED BY: A. PARSAMANESH</p>	<p>PREPARED BY:</p> <p align="center"><b>Stantec</b></p> <p>PREPARED FOR:</p> <p align="center"><b>GLENCORE</b></p>
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The air quality assessment in the Application focused on air quality changes along and outside Glencore's tenure area. The Application notes that this assessment boundary is appropriate since public access is restricted in the tenure area. The Local Assessment Area (LAA) used for the air quality assessment is a 36 km by 36 km area centered on the Sukunka tenure area, which includes a 10 km buffer on all sides of the tenure area. The Regional Assessment Area (RAA) used for the air quality assessment is an 80 km by 80 km area that includes the Sukunka tenure area, Chetwynd, and Tumbler Ridge. **Error! Reference source not found.** 14 shows the LAA and RAA used in this assessment.

While air emissions could occur during all project phases, the greatest emission rates would occur during the operation phase, which would last 22 years. Emission rates were modelled to this timeframe. The maximum coal production was estimated to occur in year seven of the operation, and since the air emissions are proportional to the coal production rate, Glencore conservatively selected this year to represent the maximum air emission rate (that is, the worst-case scenario).

## 11.2 POTENTIAL PROJECT EFFECTS AND PROPOSED MITIGATIONS IDENTIFIED IN THE APPLICATION

Existing conditions, potential project effects, and proposed mitigation measures identified in the Application are described in the subsections below. Section 5.6 of the Application described Glencore's air quality effects assessment.

### 11.2.1 EXISTING CONDITIONS

According to the Application, there were no known and currently operating large emission sources within 10 km of Sukunka. For emission sources beyond a 10 km distance, the maximum concentrations of emissions were not anticipated to overlap with Sukunka.

Forestry and oil and gas activities were found to occur in the RAA. Ambient dustfall measurements conducted by Glencore in the RAA demonstrated that background dustfall concentrations are within regulatory limits. Baseline measurements for other parameters of interest were obtained from existing monitoring stations both inside and outside the RAA. Glencore characterized the existing air quality near Sukunka as good.

### 11.2.2 POTENTIAL PROJECT EFFECTS

Sources of air emissions from Sukunka would include open pit mining, coal handling and preparation, equipment operation, and coal loading and transporting. These and other sources would generate fugitive dust and combustion particulate matter (PM), combustion gas, and GHG emissions. Processed coal from the coal handling and preparation would be loaded on trucks and transported to an existing rail load-out for market distribution along coal haul routes.

An air quality transport, dispersion and deposition model was used to predict the magnitude and the spatial variation of ambient concentrations of Criteria Air Contaminants (CAC) and dustfall in the LAA and

the RAA for the worst-case emission scenario. The model predictions were then added to the baseline concentrations to include the contributions from existing emission sources within the LAA and the RAA. The combined model predictions were then compared to regulatory ambient air quality objectives, guidelines, and standards.

Air emissions from project-related activities would include the following air contaminants, known as CACs: sulphur dioxide (SO<sub>2</sub>), nitrogen dioxide (NO<sub>2</sub>), carbon monoxide (CO), fine particulate matter less than 2.5 micrometers in diameter (PM<sub>2.5</sub>), and coarse particulate matter less than 10 micrometers in diameter (PM<sub>10</sub>).<sup>76</sup> These CACs could cause adverse environmental and human health effects.

Although not considered a CAC, total metals in PM deposition, also known as metals in dustfall, were assessed to provide information for the Human Health and Ecological Risk Assessment to estimate metal accumulation in soil and surface water over the operational life of the mine. The contaminants of concern in total dustfall would include antimony, arsenic, cadmium, cobalt, copper, lead, mercury, molybdenum, nickel, and selenium. Details on the assessment of impacts to human health are provided in this Report in [Section 16](#) (Human Health), to soils in [Section 10](#) (Soils), and to surface water in [Section 6](#) (Water Quality and Aquatic Biota).

Baseline values were added to the predicted values from Sukunka to account for other air emission sources (natural and anthropogenic) affecting the RAA, and then compared to B.C. AQO and CAAQS which were created to protect human health and the environment.

The predicted maximum concentrations for NO<sub>2</sub>, and CO for all averaging periods due to emissions from Sukunka were less than the B.C. AQO and CAAQS. SO<sub>2</sub> predictions meet the old B.C. AQO but slightly exceed the 2020 1-hour CAAQS. The maximum 1-hour SO<sub>2</sub> value along and outside the tenure area boundary (i.e., locations where public access is not restricted) was predicted to occur just outside of the NE corner of the tenure area. All other locations outside of the tenure area are predicted to meet the 2020 CAAQS for SO<sub>2</sub>.

Along the haul routes, PM<sub>2.5</sub> concentrations are predicted to be greater than the 24-hour and annual PM<sub>2.5</sub> objectives<sup>77</sup>, the predicted PM<sub>10</sub> concentration would be greater than the 24-hour PM<sub>10</sub> objective, and the predicted monthly dustfall would be greater than the monthly total dustfall objective. These predicted exceedances are tied mainly to fugitive dust emissions which are generated along the Meikle Creek coal haul road by haul trucks. The geographical extent of these exceedances are predicted to be restricted to a two km distance from the Meikle Creek coal haul road routes, and no permanent residences or hunting, fishing, recreation camps, or cabins were identified in this area, although Indigenous Groups identified that they have traditional use sites in the area.

Maximum predicted concentrations for each CAC, background concentrations, and corresponding ambient air quality objective or CAAQS are provided in [Table 27](#) below.

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<sup>76</sup> 'PM<sub>2.5</sub>' and 'PM<sub>10</sub>' refer to the maximum diameter of the particulate matter, in micrometres.

<sup>77</sup> Where the Provincial Air Quality Objectives, Canadian Ambient Air Quality Standards, or the National Ambient Air Quality Objectives varied, Glencore used the most stringent objective.

**Table 27: Maximum Predicted Ambient Concentrations for Sukunka (Haul Route Options A and B)**

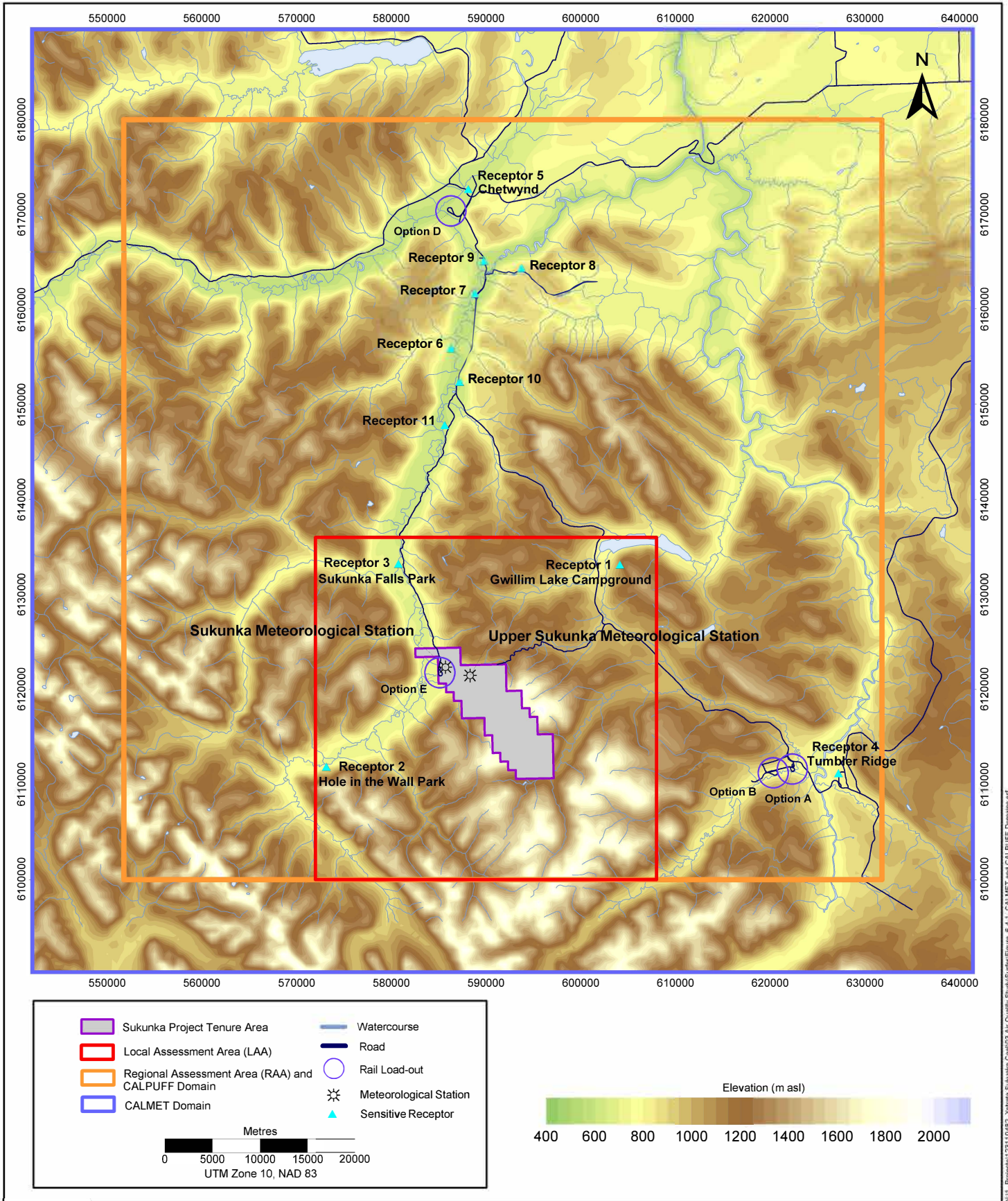
Substance	Averaging Period	Maximum Predicted Concentration (project only)( $\mu\text{g}/\text{M}^3$ )	Ambient Background Concentration ( $\mu\text{g}/\text{M}^3$ )	Maximum Predicted Concentration With Background ( $\mu\text{g}/\text{M}^3$ )	Ambient Air Quality Objective ( $\mu\text{g}/\text{M}^3$ )
SO <sub>2</sub> ( $\mu\text{g}/\text{m}^3$ )	1-hour	<b>192</b>	<b>3.3</b>	<b>195</b>	196 <sup>a</sup> (183 <sup>b</sup> )
	3-hour	154	3.3	157	375
	24-hour	53.9	3.1	57.0	150
	Annual	7.0	1.2	8.2	13 <sup>a</sup> (13 <sup>b</sup> )
NO <sub>2</sub> ( $\mu\text{g}/\text{m}^3$ )	1-hour	77.0	31	78.9	188 <sup>a</sup> (113 <sup>b</sup> )
	24-hour	74.8	23	97.4	200
	Annual	22.9	7	29.4	60 <sup>a</sup> (32 <sup>b</sup> )
CO ( $\mu\text{g}/\text{m}^3$ )	1-hour	1,554	757	2,311	14,300
	8-hour	335	648	983	5,500
PM <sub>2.5</sub> ( $\mu\text{g}/\text{m}^3$ )	24-hour	<b>25.5</b>	<b>12.7</b>	<b>38.2</b>	25
	Annual	<b>8.8</b>	<b>3.3</b>	<b>12.1</b>	8
PM <sub>10</sub> ( $\mu\text{g}/\text{m}^3$ )	24-hour	<b>316</b>	<b>19.7</b>	<b>336</b>	50
Dustfall (mg/dm <sup>2</sup> /d)	30-day	<b>35.0</b>	<b>0.42</b>	<b>35.4</b>	2.9 <sup>c</sup>
<b>NOTES:</b>					
Bolded and italicized numbers represent model predictions that exceed the ambient air quality objective					
a. Interim BC Air Quality Objective, introduced in 2016, until the Canadian Ambient Air Quality Standards (CAAQS) take effect in 2020					
b. CAAQS, 2020					
c. Milligrams per square decimetre per day (mg/dm <sup>2</sup> /d)					

Glencore further evaluated the maximum predicted concentration of CACs at 11 sensitive receptors located in the modelling domain as described in [Table 28](#) and shown in [Figure 15](#) below. The corresponding maximum predicted ground-level concentrations at these receptors are presented in Table 6-2 of Information Request #786 to 794. The results indicate that predicted concentrations are well below applicable AQOs and CAAQS at all locations examined.

**Table 28: Listing and description of sensitive receptors.**

Sensitive Receptor	
No.	Name
1	Gwillim Lake Campground
2	Hole in the Wall Park
3	Sukunka Falls Park
4	Tumbler Ridge Elementary School
5	Chetwynd
6	Cabin
7	Cabin
8	Cabin
9	Residence
10	Residence
11	Residence

Figure 15: Location of the sensitive receptors



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Sukunka Coal Mine Project

**The 100 km x 100 km CALMET Domain and the 80 km x 80 km CALPUFF Domain/RAA**

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**Stantec**

PREPARED FOR  
**GLENCORE**

Glencore's air quality assessment incorporates several sources of conservatism. Project emissions were estimated for a worst-case emission scenario associated with the peak production year. Maximum emission rates used in the modelling are estimated based on a combination of emission factors, engineering estimates, and maximum emission limits. Emission factors have inherent uncertainty and are generally conservative. The predicted exceedances reported above for PM<sub>2.5</sub>, PM<sub>10</sub>, and Dustfall assumed that 55 percent control efficiency would be obtained by watering the haul roads twice daily; however, Glencore noted that recent studies conducted for other mines indicated that 80 percent control efficiency could be achieved by road watering and 94 percent control efficiency could be achieved naturally by snow and ice cover in the wintertime. Glencore also reported that the presence of a forest canopy could reduce the ambient PM<sub>10</sub> concentrations between 80 and 100 percent; however, the air quality model took a conservative approach and did not account for the removal of airborne dust by the forest canopy.

### 11.2.3 MITIGATION MEASURES

The preliminary Air Quality and Dust Control Plan in the Application identified mitigation measures and included adaptive management recommendations to respond to potential future exceedances of the air quality objectives.

The preliminary Air Quality and Dust Control Plan included the following key mitigation measures:

- Minimize the area of exposed soil and rock and re-vegetate disturbed areas progressively as per the Reclamation Plan;
- Minimize forest clearing around operational areas to maintain as much of a windbreak as possible to prevent wind erosion;
- Maintain and operate mobile equipment appropriately to minimize idling time;
- Use multi-passenger vehicles to transport workers where possible;
- Seal, cover, or use a wetting agent on product coal transport trucks prior to travel, whether loaded or unloaded;
- Water roads, and use chemical suppressants, if necessary, to suppress dust emissions;
- Construct roads with coarse gravel and aggregate materials and route to minimize haul distances;
- Utilize water or a dust suppression agent for fugitive dust control at the primary crusher during summer;
- Enclose and have a dust collection system at secondary crusher;
- Use protective hoods on conveyors and enclose some of the conveyor transfer locations;
- Use a dynamic dust scrubber and mist eliminator downstream of the cyclones at the thermal coal dryer;
- Store stockpiled coal in silos or enclosed areas where practicable;
- Avoid blasting when wind speeds and wind direction would potentially cause a safety concern;
- Orient exposed stockpiles to minimize wind exposure; and
- Implement dust suppression measures on dust-producing surfaces (for example, soil stockpiles, and waste rock stockpiles) during operations.

Glencore proposed to submit a detailed Air Quality and Dust Control Plan as part of its *Mines Act* permit application. Additional detail regarding the mitigation measures were found in the preliminary Air Quality and Dust Control Plan in the Application under Appendix 20A-15.

### 11.3 POTENTIAL PROJECT EFFECTS AND PROPOSED MITIGATIONS IDENTIFIED DURING APPLICATION REVIEW

During Application Review, Glencore removed haul route options D and E and transmission option 1 from their proposed project design based on their discussions with landholders and on feedback from the Working Group. Glencore anticipated that removing these options would reduce the potential adverse effects to air quality. Removing the haul options D and E would eliminate potential predicted impacts along the Sukunka Forest Service Road (FSR)/Highway 29 coal hauling corridor, including at Sukunka Falls Provincial Park and other sensitive receptors along the Sukunka FSR and the northwest corner of the tenure area boundary. The air quality information reported above is for haul options A and B.

During the Application Review, the EAO received review comments from ENV, ECCC, and the FNITR. Based on comments received and on the EAO's review of the Application, the following key issues were identified:

- Underestimation of effects due to a limited study area;
- Exclusion of some activities and physical works from the Application;
- Lack of monitoring and management plans in the preliminary Air Quality and Dust Control Plan for each project phase;
- Change in CAAQS; and
- Off-road equipment emissions.

#### LIMITED STUDY AREA

The Application assumed that the highest predicted concentrations or deposition rates would be within Glencore's tenure boundary and predicted that concentration and dustfall values would decrease with increasing distance from the boundary. The air quality assessment in the application was therefore focused on areas outside of the tenure area. This assumption would be more reasonable for the smaller Project Development Area (PDA) where active mining operations would be taking place, and ENV requested information about air quality or depositions inside Glencore's tenure area. As the public can access the tenure area (which includes areas outside the PDA), in particular the sections of the haul routes that are on publicly accessible FSRs, it would be important to understand if air quality exceedances could impact users of the area. There was also no consideration in the air quality assessment of terrestrial animal species entering, occupying, and foraging within Glencore's tenure area boundary.

Glencore responded to these comments in a March 18, 2016, memo (see IR #786-794), which provided air quality model results and exceedance frequency maps for areas inside the tenure area boundary and PDA. Glencore indicated that predicted exceedances inside the tenure area boundary would be mainly located within the PDA where public access would be restricted and where terrestrial wildlife would be less likely to enter due to project-related activities.

ENV stated that their concerns had been addressed by these responses.

The FNITR also raised concerns about the use of permanent residences in the Application to determine impacts of changes to air quality. They stated that members use the area along the haul routes to exercise their Aboriginal and Treaty rights and interests throughout the year and on a consistent basis and this should be considered. They requested that Glencore be required to consult with Indigenous Groups to determine if additional air quality monitoring locations along the haul routes should be added. The EAO has proposed Condition 27: Air Quality and Emissions Management Plan, that would require Glencore to consider and propose additional air quality monitoring locations, in consultation with Indigenous Groups.

The FNITR also requested that speed limiters to be used on Glencore's haul trucks and that speed limits and monitoring to reduce speeds on haul routes occurs. Glencore committed to using speed limiters on their haul trucks. The EAO has proposed Condition 24: Road Management Plan, that would require Glencore to limit speeds on haul routes and require monitoring of speeds by Glencore.

Additional details and the assessment of impacts of changes to air quality on Indigenous Groups are provided in Part C of this Report (Consultation with Indigenous Groups).

#### **ACTIVITIES AND PHYSICAL WORKS EXCLUDED FROM THE APPLICATION**

ENV commented that the Application did not assess activities and physical works that were not expected to release air emissions to the atmosphere, which included, for example, the explosives facility and fuel tank farm during operations. The Application also did not assess activities and physical works assumed to release air emissions, but which were expected to be managed to acceptable levels through standard operating practices, application of best management or codified practices, or mitigation measures. This included construction, closure, and post-closure activities as air emissions released during these activities were considered to be typically short in duration and not be significant compared to the worst-case (peak production) year. ENV was concerned that site preparation, site clearing, and pit preparation would be scheduled to take a full year, and exceedances could occur during this phase.

Glencore responded in a memo (see IR #786-794) that these works were not assessed because emissions would be short-term, transient in nature, and less than peak production year emissions. Glencore proposed that the additional assessment of emissions from these activities could be provided during permitting under the *Environmental Management Act*.

ENV also commented that the Application stated that no residences or sensitive receptors were present in the LAA; however, it did not consider the proposed work camp. The work camp would be a 250 person camp during the 22-year operations phase to house off duty project workers at one of two chosen locations along the Meikle Creek haul route. Glencore responded in a memo (see IR #786-794), providing air quality modeling information for the two proposed work camp locations. The maximum predicted 24-hour and annual average PM<sub>2.5</sub> concentrations at the two camp option locations would be less than the respective ambient air quality objectives.

The model, however, predicted maximum 24-hour average PM<sub>10</sub> concentrations at both camp option locations to be greater than the ambient air quality objectives and the 30-day average dustfall at Camp

Option 1 to be greater than the pollution control objective. To minimize fugitive dust emissions along the Meikle Creek coal load-out road, Glencore committed that the road would be watered twice daily and ambient air monitoring at the work camp would be considered further during at permitting.

To ensure this mitigation action would be implemented, the EAO proposes requirements under condition 24: Road Management Plan that would require Glencore to mitigate road dust on the Meikle Creek haul road and to link this activity to continuous monitoring (ambient air quality and meteorology) at the work camp. An adaptive Fugitive Dust Management Plan required by ENV would also include mitigation measures such as minimum suppression requirements augmented by monitoring that may trigger additional response to maintain levels below air quality objectives for PM<sub>10</sub>.

### **LACK OF MONITORING AND MANAGEMENT PLANS**

ENV raised concerns that the preliminary Air Quality and Dust Control Plan did not contain detail regarding monitoring and management plans for each project phase. ENV provided guidance for an Air Quality and Emission Monitoring and Management Plan which included:

- A plan to monitor emissions and ambient air quality during each project phase;
- A meteorological monitoring program;
- Clearly defined goals, objectives, and methods for each of the monitoring programs, including linkages to monitoring programs and management plans for other VCs;
- An annual report summarizing and analyzing the meteorological, emissions, and ambient monitoring information; and
- A regular review period with representatives of the appropriate governments, agencies, Indigenous Groups, and communities.

Glencore responded that a final Air Quality and Emission Monitoring and Management Plan would be developed during the permitting phase and would consider the details provided by ENV. ENV stated that this was an acceptable response.

The EAO notes that a Waste (Refuse and Emissions) Management Plan and a Fugitive Dust Management Plan, which addresses air contaminants, would also be requirements of the provincial permitting process (should Sukunka receive an EAC); however, the EAO notes that this would not manage air contaminants outside of the mine site. The requirement for an Air Quality and Emission Monitoring and Management Plan is proposed as Condition 27 by the EAO because this is a key mitigation in addressing issues of concern with respect to air quality. The proposed plan reflects ENV's recommendations on monitoring, reporting and review and also includes mitigation measures for CACs and dust at the work camp and along the haul route.

### **CHANGES IN CANADIAN AMBIENT AIR QUALITY STANDARDS**

In 2020, while the EA timeline was in suspension, the CAAQS for SO<sub>2</sub> and NO<sub>2</sub> were revised. If Sukunka proceeds to permitting, Glencore would be required by ENV to remodel SO<sub>2</sub> emissions compared with the new CAAQS. Considering these permitting requirements, the EAO is not proposing an EAC condition for

this issue.

### OFF-ROAD EQUIPMENT EMISSIONS

ECCC commented that within the air quality assessment, Glencore assumed that above-ground engines would meet Tier IV standards under the *Off-Road Compression Ignition Engine Emission Regulations*<sup>78</sup>. ECCC expressed concerns that the project could start construction before Tier IV standards were fully in place. Glencore noted they would expect to procure off-road heavy-duty diesel equipment that complies with Tier IV emission standards. Given this, ECCC recommended a commitment to Tier IV equipment be incorporated as an EAC condition to validate their assessment. ECCC also recommended that the EAO include a condition requiring that Glencore ensure that emission control technologies on off-road equipment are not removed or tampered with.

Considering these recommendations, the EAO proposes that Condition 27: Air Quality Emission Monitoring and Management Plan include the requirements that all off-road equipment meet Tier IV standards under the *Off-road Compression-Ignition (Mobile and Stationary) and Large Spark-Ignition Engine Emission* regulations (which have replaced the former *Off-Road Compression Ignition Emission Regulations*), and that Glencore must ensure that emissions control technologies on off-road equipment are present and functioning normally.

## 11.4 THE EAO'S CHARACTERIZATION OF RESIDUAL EFFECTS

The EAO's characterization of the expected residual effects of Sukunka on air quality is summarized below in [Table 29](#), as well as the EAO's level of confidence in the effects determination (including their likelihood and significance). After considering the proposed mitigation measures, the EAO concludes that Sukunka would result in the following residual effects on air quality:

- Along the tenure boundary and coal haul roads, primarily due to fugitive dust, Sukunka would cause:
  - Exceedances of PM<sub>2.5</sub> daily and annual objectives;
  - Exceedances of PM<sub>10</sub> daily objectives; and
  - Exceedances of the monthly dustfall objectives;
- At the work camp locations:
  - Exceedances of PM<sub>10</sub> daily objectives; and
  - Exceedances of the monthly dustfall pollution control objective for sensitive receptors at Camp Option 1;
- Exceedances of 1-hour SO<sub>2</sub> CAAQS predicted in a small area just outside the North-east corner of the tenure boundary along the Meikle Creek FSR.
- Maximum predicted values of NO<sub>2</sub> and CO were below ambient air quality objectives at areas along and outside the tenure area boundary.

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<sup>78</sup> This regulation has since been replaced by the *Off-road Compression-Ignition (Mobile and Stationary) and Large Spark-Ignition Engine Emission* regulations.

As identified in the previous sections of this chapter, the EAO has proposed the following requirements:

- Condition 27: Air Quality and Emissions Management plan, that would require Glencore to develop in consultation with ENV and Indigenous Groups, including consultation on air quality monitoring locations and a requirement to mitigate road dust;
- As part of the Air Quality and Emission Monitoring and Management Plan, any off-road, heavy-duty equipment must meet the standards for Tier IV engines under the *Off-Road Compression Ignition (Mobile and Stationary)* and *Large Spark-Ignition Engine Emission* regulations (under the *Canadian Environmental Protection Act, 1999*);
- Condition 28: Human Health Monitoring and Management Plan, which would include requirements for air quality monitoring and adaptive management to minimize health effects associated with air quality at the work camp; and
- Condition 24: Road Management Plan, that would require Glencore to limit speeds on haul routes, post speed limits on haul routes, monitor speeds, and use speed limiters in Glencore-owned vehicles.

**Table 29: Summary of Residual Effects for Air Quality**

**Note: Criteria and assessment ratings are defined in [Appendix 4 Residual Effects Characterization Definitions](#)**

Criteria	Assessment Rating	Rationale
Context	<b>Moderate to high resilience</b>	Background ambient air quality levels are considered within regulatory limits. There are currently no permanent residences, or hunting, fishing, recreation camps and cabins within the air quality LAA.  Due to these factors, the LAA has a <b>moderate to high</b> resilience to changes in air quality. Impacts to traditional use by Indigenous Groups are assessed further in Part C in this Report.
Magnitude	<b>High</b>	The EAO predicts the effects would be <b>high</b> magnitude because of predicted exceedances of ambient air quality objectives along and outside the project tenure area boundary. As a result of Sukunka, PM <sub>2.5</sub> concentrations <sup>79</sup> are predicted to increase above baseline concentrations by three times at the Maximum Point of Impingement (MPOI; fenceline), 42 percent at Camp Option 1 and 30 percent at Camp Option 2. The concentration of PM <sub>2.5</sub> is predicted to approach the air quality objective at Camp Option 1 and exceed it at the MPOI. PM <sub>10</sub> is predicted to increase by 16 times at the MPOI, nine times at Camp Option 1 and three times at Camp Option 2 and exceed the air quality objective in all three locations. Exceedances could be expected 27 percent of the time at Camp Option 1 and 3 percent of the time at Camp Option 2. Concentrations of SO <sub>2</sub> (1-hour) are predicted to increase 59 times at the MPOI and two times at Residence 3 (values were not predicted at the camps). The predicted SO <sub>2</sub> level would marginally exceed the 2020 CAAQS at the MPOI but not Residence 3 or at either camp location.
Extent	<b>Local</b>	The predicted effects would be <b>localized</b> to the LAA; the highest concentrations, where receptors could be present would be localized to a two km buffer around the coal haul routes and at the work camp.

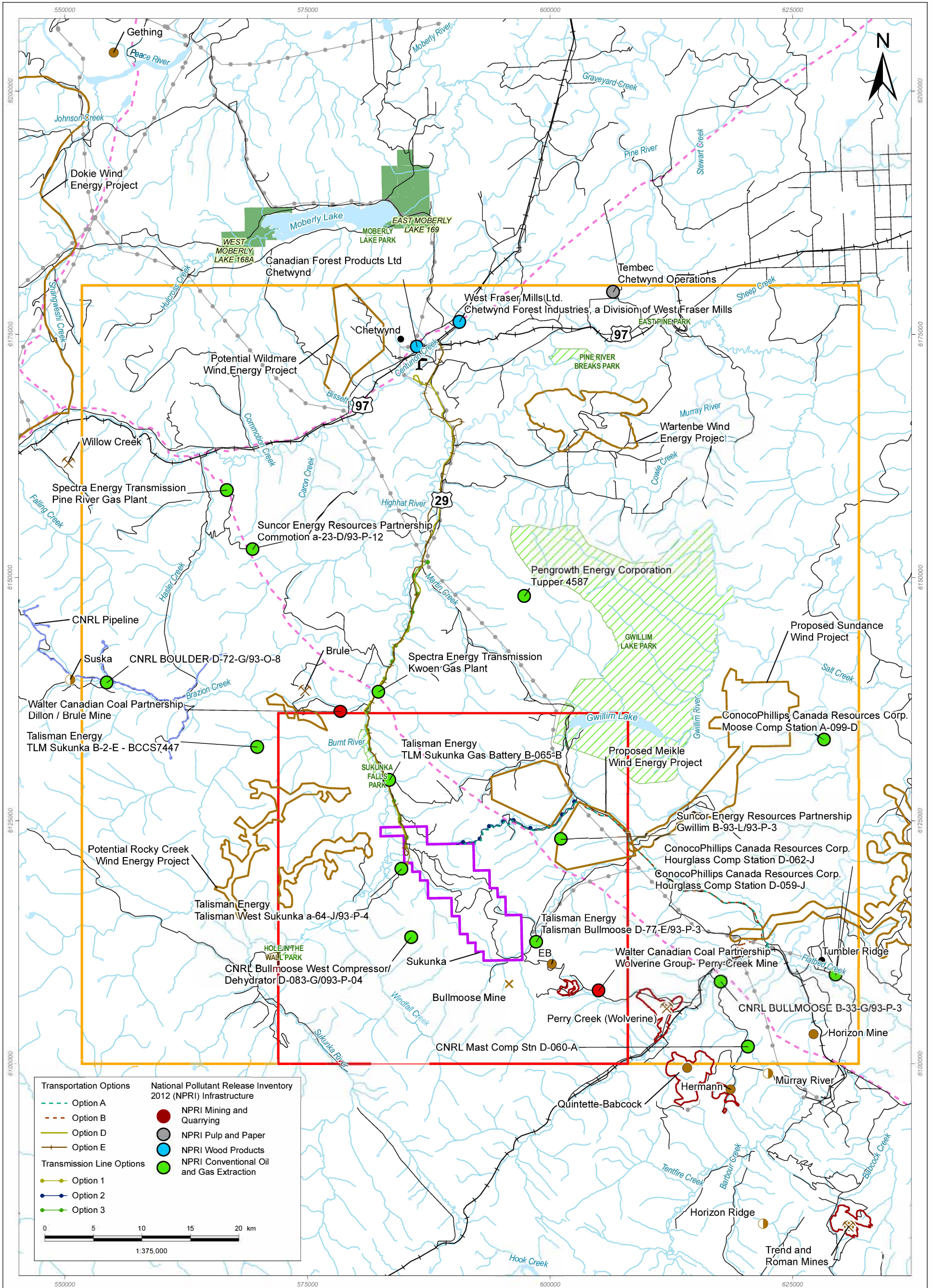
<sup>79</sup> Reported changes are for PM concentrations averaged over a 24-hour period.

Criteria	Assessment Rating	Rationale
Duration	<b>Long-term</b>	Ambient air quality changes greater than baseline would occur in the <b>long-term</b> , through the Construction and Operations of Sukunka.
Frequency	<b>Regular</b>	Emissions of SO <sub>2</sub> , NO <sub>2</sub> , PM <sub>2.5</sub> , PM <sub>10</sub> , and dust during operation would occur <b>regularly</b> and on a repetitive schedule; the majority of emissions would be generated by the coal haul trucks, and the trucks would operate on regular basis with some inactive time (associated with activities such as worker breaks, blasting, shift changes, and poor weather).
Reversibility	<b>Reversible</b>	CAC ambient air concentrations would be <b>reversible</b> and ambient air quality levels would return to background levels quickly after closure.
Likelihood	<b>High</b>	The likelihood of residual adverse effects would be <b>high</b> because Sukunka’s air emissions are well understood, and there would be a high likelihood of a predicted change in ambient air quality levels over the operation life of Sukunka.
Significance Determination	<b>Not significant</b>	Sukunka would not be expected to have significant adverse effects on air quality from CAC emissions given the predicted ambient air quality levels are local in geographic extent with no existing permanent residences, the conservative assumptions used in the calculations, and the proposed mitigation measures to monitor and minimize emissions. A work camp is proposed to be built; however, mitigation and monitoring measures are proposed to minimize emissions near this camp.
Confidence	<b>High</b>	The EAO has <b>high</b> confidence in the likelihood and significance determinations because the assessment used a standardized methodology and local measurements and representative input data.

## 11.5 CUMULATIVE EFFECTS ASSESSMENT

Emissions from existing emissions sources in the LAA and the RAA were accounted for in the Application by adding representative background concentrations to Sukunka’s predicted ambient concentrations. The residual effects on air quality therefore included the contribution from other emission sources in the LAA and RAA. Existing facilities in the RAA included oil and gas, agricultural, forestry, wind energy, and mining activities (Figure 16).

Figure 16: Regional Emission Sources in the Sukunka Air Quality RAA



<p><b>Legend</b></p> <ul style="list-style-type: none"> <li>Airport</li> <li>City / Town / Village</li> <li>Road</li> <li>Railway</li> <li>Pipeline</li> <li>Transmission Line</li> <li>Watercourse</li> <li>First Nations Reserve</li> <li>Provincial Park</li> <li>Local Assessment Area</li> <li>Regional Assessment Area</li> <li>Sukunka Project</li> <li>Tenure Area</li> <li>Coal Mine</li> <li>Proposed Coal Mine</li> <li>Selected Coal Project</li> <li>Closed Coal Mine</li> <li>CNRL Pipelines ROW</li> <li>Project Area</li> <li>Wind Projects</li> </ul>		<p><b>SUKUNKA COAL MINE PROJECT</b></p> <p><b>REGIONAL EMISSION SOURCES IN THE SUKUNKA AIR QUALITY REGIONAL ASSESSMENT AREA</b></p> <p>ENVIRONMENTAL ASSESSMENT APPLICATION</p> <p><i>Data Sources:</i> Glencore, Province of British Columbia, Government of Canada  <i>Disclaimer:</i> Although there is no reason to believe that there are any errors associated with the data used to generate this product or in the product itself, users of these data are advised that errors in the data may be present.  <i>File Path:</i> fig_10482_ea_air_quality_05_06-02_air_emissions_in_sukunka_air_quality_RSA</p> <p>DATE: 28-JUL-14      PROJECTION: UTM 10      DRAWN BY: D. COOK          FIGURE ID: 123110482      DATUM: NAD 83      CHECKED BY: D. JARRETT</p>		<p>PREPARED BY:</p> <p><b>Stantec</b></p> <p>PREPARED FOR:</p> <p><b>GLENCORE</b></p>	
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Wind energy facilities are not known to produce measurable emissions of SO<sub>2</sub> or particulate matter. Traffic along the Sukunka FSR and the Meikle Creek Road would result in air emissions, which were already accounted for in background air concentrations. Oil and gas facilities in the RAA would include five compressor stations and gas dehydrators in the LAA, and an additional eight oil and gas facilities outside the LAA. A Canadian Natural Resources pipeline has also been proposed in the area.

Coal mines include Brule, located approximately 15 km northwest of Sukunka, and the Wolverine Coal Mine, which consists of the operating Perry Creek pit, and the proposed Hermann<sup>80</sup> and East Bullmoose pits, located approximately 15 km and 10 km southeast of Sukunka, respectively. The Horizon Ridge Coal Mine identified in Figure 16 is no longer being proposed. The Perry Creek and Hermann pits are located just outside of the RAA defined by Glencore but the EAO considered the potential for cumulative effects from these projects due to their proximity to the boundary of the RAA.

Oil and gas facilities release only small quantities of particulate matter. Reports to the National Pollutant Release Inventory indicated the five operating facilities in the LAA released less than five tonnes per year of PM<sub>10</sub> and PM<sub>2.5</sub>, compared to 3,366 tonnes per year of total particulate matter that Glencore predicted would be released from Sukunka; however, the compressor stations are a source of SO<sub>2</sub>, and the coal projects are a source of both SO<sub>2</sub> and PM. The proposed pipeline would not be a source of emissions except in the event of an accident or malfunction. At its maximum emission rate, Glencore estimated Sukunka would contribute 21 percent of SO<sub>2</sub>, 52 percent of NO and NO<sub>2</sub>, 76 percent of CO, 48 percent of PM<sub>2.5</sub>, and 21 percent of PM<sub>10</sub> compared to total cumulative emissions in the LAA (based on 2012 emission rates).

Glencore did not predict that the oil and gas facilities or coal mines would interact with Sukunka to create cumulative effects on human health risk from inhalation of SO<sub>2</sub> or PM because the air emissions from these other projects would not be predicted to overlap with the emissions from Sukunka. The zone of influence of air emissions is generally less than 10 km and the closest projects are located further away than that, with the exception of the East Bullmoose pit, which is not currently proposed for development. Future predicted air concentrations in the RAA with Sukunka incorporated baseline air contaminants levels, which included emissions from existing projects; therefore, the EAO considers this analysis to represent cumulative effects. The EAO notes that Glencore's predictions showed that maximum SO<sub>2</sub> and PM levels after development of Sukunka would be slightly above baseline levels but would remain well-below the 2020 CAAQs and BC AQOs, respectively, at provincial parks and campgrounds in the RAA as well as in Chetwynd. The EAO notes that some additional emissions would be expected from the proposed Hermann pit, which is not captured in existing measures values; however, because this pit would be 15 km away from Sukunka, the cumulative impact of this project with Sukunka would be expected to be limited.

The EAO concludes that cumulative effects on air quality from SO<sub>2</sub> and PM are of moderate magnitude,

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<sup>80</sup> This section references the cumulative effects assessment provided in Glencore's Application, and there have been changes to the Wolverine and Hermann Mine Projects since Application Review began. On November 24, 2018, the Environmental Assessment Certificate for the Hermann Mine expired as the project had not been substantially started. On February 12, 2021, the Environmental Assessment Certificate for the Wolverine Mine was amended to include an area that was previously certified as the Hermann Mine.

local extent, long-term duration, low likelihood, and are not significant. Further, the proposed Air Quality Emissions Management Plan, as well as requirements of the *Mines Act* and *Environmental Management Act*, would allow for emissions of CACs to be monitored and managed.

## 11.6 CONCLUSIONS

Considering the above analysis and having regard to the conditions identified in the TOC and the CPD (which would become legally binding if an EAC is issued), the EAO is satisfied that Sukunka is not likely to have significant adverse residual or cumulative effects on air quality.

## 12.0 ASSESSMENT OF EFFECTS TO GREENHOUSE GASES

### 12.1 BACKGROUND

A greenhouse gas (GHG) can be any atmospheric gas that absorbs and re-emits infrared radiation, thereby acting as a thermal blanket for the planet and warming the lower levels of the atmosphere. GHGs are released to the atmosphere from both natural and human generated sources. GHGs would be expected to be released during construction, operations, closure, and post-closure of Sukunka, although peak GHG emissions would be expected during operations.

Glencore did not conduct an effects assessment on GHGs for the Application, as it was not a requirement in the Application Information Requirements which were issued in 2014, prior to the release of CleanBC (2018), the *Climate Change Accountability Act* and B.C.'s legislated emission reduction targets, or the CleanBC Roadmap to 2030<sup>81</sup> (2021). However, Glencore did complete a GHG study and reported on GHG emissions, including carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O) and carbon dioxide equivalents (CO<sub>2</sub>e), in total tonnes per year, resulting from Sukunka construction and operation related activities.

In the Application, annual releases of GHGs from both construction and operation were estimated for the open pit and underground mine components (note: the underground mine component is no longer proposed) based on worst case scenarios for the first year of construction and peak operating year. Closure and post-closure were not assessed specifically by Glencore due to lower anticipated emissions than during construction and operations; however, mitigation measures for GHGs will apply during all phases. The annual GHG emissions from Sukunka are described below and a more detailed estimate is provided in the GHG Technical Data Report (see Appendix 27.0 – A.23 in the Application). Glencore did not include upstream emissions beyond Sukunka as these emissions would not relate to resource extraction.

Climate change was assessed in a manner consistent with 2003 guidance from the Federal-Provincial-Territorial Committee on Climate Change and Environmental Assessment<sup>82,83</sup>. More detail on climate change is provided in [Section 18](#) Accidents, Malfunctions, and Effects of The Environment on Sukunka.

#### 12.1.1 REGULATORY CONTEXT

Both the federal and provincial governments have policy and legislative initiatives with the goal of reducing GHG emissions. As of 2017, ECCC requires any facility emitting more than 10 kilotonnes (kt) CO<sub>2</sub>e to report its annual GHG emissions<sup>84</sup> under the Greenhouse Gas Reporting Program. As of April 2021, the

<sup>81</sup> Available at: [https://www2.gov.bc.ca/assets/gov/environment/climate-change/action/cleanbc/cleanbc\\_roadmap\\_2030.pdf](https://www2.gov.bc.ca/assets/gov/environment/climate-change/action/cleanbc/cleanbc_roadmap_2030.pdf)

<sup>82</sup> The Federal-Provincial-Territorial Committee on Climate Change and Environmental Assessment, 2003, Incorporating Climate Change Considerations in Environmental Assessment: General Guidance for Practitioners.

<sup>83</sup> Given that Glencore's Application was submitted in 2015, the federal government's Strategic Assessment of Climate Change Rules (issued July 2020 and revised October 2020) did not apply.

<sup>84</sup> see <https://www.canada.ca/en/environment-climate-change/services/climate-change/greenhouse-gas-emissions/facility-reporting/about.html>

Government of Canada has set a target of reducing Canada's total GHG emissions by 40-45 percent from 2005 levels by 2030.

B.C.'s *Climate Change Accountability Act* (formerly the *Greenhouse Gas Reduction Targets Act*) established new legislated targets to reduce provincial GHG emissions by 40 percent by 2030 (relative to 2007 levels), 60 percent by 2040 and 80 percent by 2050, with an interim target to reduce emissions 16 percent by 2025. The amendment also repealed the 2020 emissions target. To achieve its legislated GHG reduction goals, B.C. has designed and implemented a suite of policy, regulatory, and legislative measures to reduce emissions across the province.

Relevant to Sukunka, the *Greenhouse Gas Industrial Reporting and Control Act* (GGIRCA) enacted in January 2016, streamlines several aspects of existing GHG legislation and regulation into a single legislative and regulatory system, including the emission reporting framework established under the *Greenhouse Gas Reduction (Cap and Trade) Act*. The GGIRCA provides authority for the Greenhouse Gas Emission Reporting Regulation, the Greenhouse Gas Emission Control Regulation, and the Greenhouse Gas Emission Administrative Penalties and Appeals Regulation. Under the Greenhouse Gas Emission Reporting Regulation (the Regulation), a single facility that emits more than 10,000 or more tonnes of CO<sub>2</sub>e per year is required to report attributable emissions during the reporting period.

As Sukunka operations would exceed 10,000 tonnes CO<sub>2</sub>e per year, Glencore would be required to report on its GHG emissions as per the B.C. and federal reporting requirements. Sukunka's activities resulting in GHG emissions would include general stationary combustion, fuel combustion by mobile equipment, and fugitive emissions.

While the Sukunka Application Review process was suspended, ENV announced the CleanBC Roadmap to 2030, which outlined a series of actions to meet the province's 2030 emission reduction targets and sets the course to a net-zero economy by 2050. The Roadmap to 2030 also includes a commitment for future net-zero legislation, and a new requirement for all new large industrial facilities to have a credible plan to achieve net-zero emissions by 2030. New facilities will also have to show how they align with B.C.'s interim 2030 and 2040 targets. In the Province's Greenhouse Gas Emissions Inventory Report (the 2019 inventory), B.C.'s 2019 net CO<sub>2</sub>e emission levels were reported at 68.6 million tonnes (Mt) CO<sub>2</sub>e, 4.5 percent above 2007 levels (65.7 Mt CO<sub>2</sub>e).

To achieve the legislated GHG reduction goals, B.C. has designed and implemented a suite of policy, regulatory, and legislative measures to reduce emissions across the province. Using public information in the 2019 Greenhouse Gas Emissions Inventory Report, specific emission levels would be 39.42 Mt in 2030 (40 percent reduction), 27.44 Mt in 2040 (60 percent reduction) and 13.72 Mt in 2050 (80 percent reduction). While the Roadmap to 2030 was released while the Sukunka EA process was suspended, the EAO notes that Glencore would be required to comply with all current legislation, regulations, and policy (should Sukunka receive an EAC).

### 12.1.2 STUDY AREA DESCRIPTION

As the effects of GHGs from Sukunka (or any other point source) would be global in nature, the Application did not establish a local or regional study area for GHGs. The temporal boundary for the GHG study and analysis included two years of construction (of the mine site and associated infrastructure) and 22 years of operation.

## 12.2 POTENTIAL PROJECT EFFECTS AND PROPOSED MITIGATIONS IDENTIFIED IN THE APPLICATION

### 12.2.1 EXISTING CONDITIONS

Glencore obtained estimates of total provincial and federal GHG emissions from the B.C. GHG Inventory and Environment Canada National Inventory, reported annually in the National Inventory Report (EC 2014). Global emissions were obtained from the World Resource Institute (WRI) (WRI 2013). The GHG analysis for Sukunka was based on the accounting and reporting principles of GHG Protocol developed by the WRI and the World Business Council for Sustainable Development (2004).

In the pre-Application stage of the environmental assessment process, Glencore proposed that Sukunka include both open pit and underground operations. Prior to submitting the Application that was accepted for review by the EAO, Glencore revised Sukunka to exclude the underground mining component. While Glencore's Application estimated GHG emissions for underground and open pit mining components, Glencore revised the GHG estimates to exclude underground components in a memo<sup>85</sup>.

### 12.2.2 POTENTIAL PROJECT EFFECTS

In the GHG Technical Report (Appendix 27A-23 in the Application), Glencore reported on estimated GHG emissions during the construction and operation phases of Sukunka.

#### CONSTRUCTION

Sources of GHGs during construction were anticipated to include: diesel fuel burning for the electricity generator set, off-road equipment and on-road vehicles, on-site open burning of biomass from grubbing activities and decay of organic matter in areas from land clearing. The maximum annual construction GHG emissions were estimated to be 286,651 tonnes CO<sub>2</sub>e per year<sup>86</sup>. Glencore reported that forested areas would be progressively reclaimed to their original state during the operations, closure, and post-closure phases of Sukunka. Glencore noted this was a conservative estimate as this assessment had not considered that much of the site would be reclaimed with new forest, and that reforestation would restore

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<sup>85</sup> Additional information can be found in Glencore's memo dated March 29, 2018 entitled 'Sukunka Coal Mine – Information Request: Greenhouse Gas – Climate Action Secretariat (January 18, 2018).

<sup>86</sup> Note that the numbers presented in this Section were provided by Glencore as updates throughout the Application Review process

most of the carbon sink.

Estimated construction GHG emissions are summarized in [Table 30](#).

**Table 30: Estimated Emissions during Construction**

Activities	Emissions (tonnes/year)				Percentage of Total CO <sub>2</sub> e Emission by Activity (%)
	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2</sub> e	
Fuel Combustion	41,277	2	6	43,176	15
Land Clearing (includes biomass burning and decay)	-	-	-	243,475	85
Total	41,277	2	6	286,651	100

## OPERATION

Sources of GHGs during operation were anticipated to include: fugitive release of coal bed methane from run-of-mine coal, and fuel combustion associated with mobile equipment, the vehicle fleet, and the coal thermal dryer. GHG emissions from the operation of Sukunka were estimated to be 259,648 tonnes CO<sub>2</sub>e/year at peak production for at least 20 years. Operation GHG emissions are summarized in [Table 31](#).

**Table 31: Estimated Emissions during Operations**

Activities	Emissions (tonnes/year)				Percentage of Total Emissions (%)
	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2</sub> e	
Fuel Combustion (includes Thermal dryer)	190,316	7	20	196,359	76
Fugitive	0	2,532	0	63,289	24
Total	190,316	2,539	20	259,648	100

## ANNUAL EMISSIONS FROM SUKUNKA – COMPARISON TO PROVINCIAL, NATIONAL AND GLOBAL LEVELS

Considering the provincial and national GHG baselines reported in the EC's 2014 National Inventory Report, Glencore reported on the contributions to the provincial, national and global annual GHG emissions expected from the Sukunka construction and operation activities, based on the worst-case scenarios (that is, for initial construction year and the peak operation year) (See [Table 32](#)). Glencore also compared Sukunka emissions to 2013 estimates from WRI to demonstrate Sukunka's contribution to global emissions. At the time of submission of the Application, Glencore assumed construction to begin in 2016-2017; however, the current estimated date of commencement of construction is 2024.

**Table 32: Annual Project GHG Emissions from Sukunka – Provincial, National and Global Emissions (2014)**

Project Phase	Total Annual Emissions (tonnes/year)	Percentage of Total Provincial Emissions annually (%)	Percentage of Total National Emissions annually (%)	Percentage of Total Global Emissions annually (%)
Construction	286,651	0.5	0.04	0.0007
Operation	259,648	0.4	0.04	0.0006

### 12.2.3 MITIGATION MEASURES

Key mitigations identified in the Application to reduce the contribution of GHG emissions were:

- Follow best management practices when undertaking land clearing activities; avoid unnecessary vegetation loss around the PDA by adhering to construction plans; and limit the extent of grubbing and clearing of shrubs and herbaceous species;
- Monitor advancements in technology which in the future may provide a financially feasible option for the recovery of fugitive coal bed methane;
- Minimize diesel fuel combustion by ensuring the vehicle fleet and mobile equipment are in good condition, utilizing fuel efficient equipment and multi passenger vehicles to transport work crews, and provide training for equipment operators about reducing air emissions; and
- Minimize the use of the thermal dryer and ensure maximum emission control through regular maintenance.

## 12.3 POTENTIAL PROJECT EFFECTS AND PROPOSED MITIGATIONS IDENTIFIED DURING APPLICATION REVIEW

During the Application review, in January 2016, the Ministers of Environment and Climate Change and Natural Resources announced principles to guide federal decision making and restore confidence in Canada’s environmental assessment process<sup>87</sup>. In line with these principles, the Agency will be assessing GHG emissions as part of EAs under CEEA 2012. Furthermore, because the EA for Sukunka is a substituted project, on behalf of the Agency, the EAO must report on the assessment of GHG emissions.

The EAO directed Glencore to provide additional information on proposed mitigations and to complete an assessment, including a significance determination, on GHG emissions associated with Sukunka. In response, Glencore submitted a technical memo “Sukunka Coal Mine Project Greenhouse Gas Environmental Assessment – Significance Determination” (May 19, 2016)<sup>88</sup>.

In the May 19, 2016 memo, Glencore proposed the following additional measures to mitigate GHG emissions from project activities:

<sup>87</sup> See <https://www.canada.ca/en/natural-resources-canada/news/2016/01/government-of-canada-moves-to-restore-trust-in-environmental-assessment.html>

<sup>88</sup> Available at: <https://projects.eao.gov.bc.ca/api/document/58869001e036fb010576888d/fetch>

- Applying best management practices during land clearing and reclamation activities such as:
  - Minimize unnecessary vegetation loss around the project disturbance area by complying with construction plans;
  - Limit grubbing and clearing of shrubs and herbaceous species; and
  - Assisted re-vegetation (that is, human intervention of re-vegetation including the selection, planting, monitoring and maintenance of vegetation) to occur progressively throughout the project life;
- Manage the operation and maintenance of mobile vehicle and auxiliary equipment throughout the project life, by:
  - Implementing an engine maintenance program to conduct regular equipment inspection and maintenance;
  - Imposing idling restrictions for waste haul and delivery trucks, employee/service vehicles and mobile construction equipment; and
  - Operating vehicles within posted maximum speed limits and minimizing rapid starts.

In addition to compliance reporting, Glencore has committed to follow up measures related to GHG emissions, including monitoring Sukunka energy consumption, assessing the effectiveness of the proposed mitigations, and validating whether the GHG emissions estimates are accurate. As necessary, Glencore intends to implement adaptive management to further reduce GHG emissions. Glencore reported in the Application that Sukunka would be designed and operated to comply with federal GHG emission programs and provincial policies.

### 12.3.1 ISSUES RAISED BY WORKING GROUP AND GLENCORE'S RESPONSES

#### METHANE LIBERATION AND REPORTING METHODOLOGY

During the Application Review, the Climate Action Secretariat (CAS) noted that the GHG emissions assessment did not include emissions from coalbed methane liberation during mining. CAS requested that the GHG emission assessment be revised to consider methane liberation from coalbed extraction and to focus only on the emissions from the open pit mining component, given Glencore was no longer proposing underground operations. Further CAS commented that the GHG emissions assessment should be updated to be consistent with provincial methodology, "Effects of Project GHG's on Provincial Emission Targets," and include a comparison against 2020<sup>89</sup> and 2050 provincial targets and global warming potential values specific to sulfur hexafluoride (SF<sub>6</sub>), hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs).

Glencore provided the requested information to CAS in a memorandum, dated March 29, 2018<sup>90</sup>, which included the following updates for open pit mining:

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<sup>89</sup> While this concern was raised during Application Review, the EAO notes that the 2019 amendments to the Climate Change Accountability Act repealed the 2020 emission reduction targets. The amendments legislated targets for reducing greenhouse gas emissions 40 percent below 2007 levels by 2030, 60 percent by 2040, and 80 percent by 2050. The Province also has an interim target to reduce emissions 16 percent by 2025.

<sup>90</sup> Available at: <https://projects.eao.gov.bc.ca/api/document/5b73597e2400e50024428fcc/fetch>

- An estimate of GHG emissions from diesel fuel combustion;
- An estimate of fugitive methane emissions;
- A summary of GHG emissions during operations; and
- A comparison of Sukunka GHG emissions to other mines and B.C. GHG targets.

The GHG emissions from diesel fuel combustion for open pit mining are estimated at 132,687 tonnes of CO<sub>2e</sub> per year. Glencore recalculated the amount of fugitive methane emissions into the atmosphere based on open pit coal production rates at peak operating year. The recalculated fugitive methane emissions followed methods documented by the Western Climate Initiative (WCI 2010) specific to coal storage and underground coal mines. More details on the methodology used for this calculation can be found in the GHG Technical Data Report (see Appendix 27.0 – A.23 in the Application). The operation of Sukunka would result in 63,289 tonnes of fugitive CO<sub>2e</sub> emissions per year. The total GHG emissions during operations are estimated to be 259,648 tonnes of CO<sub>2e</sub> per year. The numbers were updated and are shown in Section 12.2.2.

In the memorandum, Glencore provided an updated estimate of the comparison of the total Sukunka GHG emissions during operations to other operating mines in B.C. and B.C.'s GHG targets for 2030 and 2040. See [Table 33](#) below.

**Table 33: Sukunka Contribution to total GHG Emission Targets**

Sukunka Contribution to total GHG emissions from operating coal mines in B.C. (%)	Contribution to total Provincial emissions (%)	Contribution to B.C. Target for 2030 (%)	Contribution to B.C. Target for 2040 (%)
16	0.4	0.7	1.0

Glencore noted that the Sukunka mine would be expected to be depleted within 22 years; therefore, it would no longer be in operation at the time of the B.C. GHG target for 2050.

In the memo, Glencore explained that SF<sub>6</sub>, HFCs, and PFCs were excluded from the GHG assessment as Sukunka GHG emissions were expected from CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O contributions only. Since the GHGs: SF<sub>6</sub>, HFCs, and PFCs were not part of the overall calculation in the Application, the reported global warming potential for SF<sub>6</sub>, HFCs, and PFCs has no bearing on the overall Sukunka GHG emissions. The presented total GHG emissions were an accurate account of Sukunka GHG emissions and do not need to be revised as suggested by CAS.

### EFFECTS OF COAL FIRED COAL DRYER

ECCC raised concerns about the impact of GHG emissions from Glencore's use of a coal fired coal dryer. While Glencore stated in its Application that it intends to use high-efficiency and low-emission technologies for Sukunka to reduce GHG emissions, ECCC requested that Glencore carry out a cost benefit analysis for using a natural gas fueled coal dryer or other alternative fuels. A cost-benefit analysis of alternative fuels was not provided.

## FUGITIVE METHANE EMISSIONS

ECCC also raised the possibility of recovering fugitive methane emissions and suggested that Glencore investigate opportunities to do so, including a cost-benefit analysis of options. In response to ECCC's concerns on fugitive methane emissions, Glencore provided a memorandum dated April 6, 2018.

Glencore indicated that a detailed Energy Efficiency Plan and GHG Minimization Plan would be completed during permitting and updated annually once Sukunka is operational. Glencore also noted that because the design of Sukunka has changed and only open pit mining is being considered, methane recovery is no longer viable.

Subsequently, ECCC provided information on June 20, 2018 to indicate a possibility that fugitive coal bed methane from surface mines can be recovered using pre-mine drainage techniques under certain geological conditions. Glencore responded on August 10, 2018 that these drainage options are generally not applicable or economical for surface mines, and committed to reducing GHG emissions and would investigate further opportunities during permitting.

## 12.4 THE EAO'S CHARACTERIZATION OF RESIDUAL EFFECTS

After considering the proposed mitigation measures, the EAO concludes that Sukunka would result in the following residual adverse effect: an increase in GHG emissions during construction and operations.

Given the changes to Canada and B.C.'s GHG emissions targets while the Sukunka EA process was suspended, the EAO has proposed Condition 29: Greenhouse Gas Reduction Plan, that would require Glencore to develop a Greenhouse Gas Reduction Plan during construction and operations, in consultation with the Climate Action Secretariat (CAS), ECCC, Indigenous Groups and EMLI. The plan would include an estimation of the projected annual GHG emissions, total GHG emissions for operations, and GHG emissions over Sukunka's lifetime, as well as a requirement to consider emission reduction targets and schedules as set out in relevant provincial statutes and supporting policies.

The EAO's characterization of the expected residual effects of Sukunka on GHG is summarized below, as well as the EAO's level of confidence in the effects determination (including their likelihood and significance).

**Table 34: Summary of Residual Effects for GHG Emissions**

*Note: Criteria and assessment ratings are defined in [Appendix 4, Residual Effects Characterization Definitions](#)*

Criteria	Assessment Rating	Rationale
Context	Low	The atmosphere in the provincial and national context has been previously disturbed by anthropogenic sources, resulting in a <b>low</b> context.
Magnitude	Low	GHG emissions from Sukunka would represent a small

		contribution to national and global targets. During construction, Sukunka would increase annual provincial GHG emissions by 0.5 percent. Sukunka would also increase national GHG emissions by 0.04 percent and contribute 0.0007 percent to global GHG emissions. During operations, Sukunka would increase annual provincial GHG emissions by 0.4 percent. Sukunka would also increase national GHG emissions by 0.04 percent and contribute 0.0006 percent to global GHG emissions for a rating of <b>low</b> .
Extent	<b>Global</b>	The geographic impact of GHG emissions from Sukunka would be <b>global</b> .
Duration	<b>Long-term</b>	CO <sub>2</sub> would be <b>long-term</b> and constitute the majority of Sukunka's GHG emissions. CO <sub>2</sub> remains in the atmosphere for 100 years or more.
Reversibility	<b>Irreversible</b>	Given current technology and the persistence of CO <sub>2</sub> in the atmosphere, the effects of the GHG emissions would be effectively <b>irreversible</b> while GHG emissions would cease after decommissioning.
Frequency	<b>Continuous</b>	GHG emissions would be <b>continuous</b> for the life of Sukunka.
Likelihood	<b>High</b>	The likelihood is <b>high</b> . It is certain that Sukunka would emit GHGs. GHG emissions may be reduced over time due to changes in technology and/or regulatory requirements, and the emissions are based on the peak levels during construction and operations.
Significance Determination	<b>Not significant</b>	Considering the above analysis, the EAO's proposed Greenhouse Gas Reduction Plan, and having regard to provincial and federal programs to reduce total GHG emissions over time, the EAO is satisfied that Sukunka's residual adverse effects on GHGs would be <b>not significant</b> . The low magnitude relative to existing national and global levels is based on a peak GHG emissions level, which will not extend throughout the life of Sukunka, although some level of GHG emissions will occur continuously.
Confidence	<b>High</b>	The EAO has a <b>high</b> level of confidence in the significance and likelihood determinations. However, the EAO has a low level of confidence in the extent to which mitigation measures measurably reduce GHG emissions because no quantifiable analysis of this was undertaken.

## 12.5 CUMULATIVE EFFECTS ASSESSMENT

The Application notes that a variety of past, present and future projects and activities with the potential to affect climate change exist in the region, including forestry (via the use of machinery, vehicles and the removal of trees) and transportation activities. Given the nature of GHGs, which remain in the atmosphere for many years, Sukunka would result in a residual effect on the environment.

A cumulative effects assessment of the residual effects of GHG emissions was not undertaken because the comparison of GHG emissions to national and provincial targets inherently considers the cumulative impacts of GHGs on the environment.

## 12.6 CONCLUSIONS

Considering the above analysis, the proposed Greenhouse Gas Reduction Plan, and having regard to the provincial and federal programs to reduce total GHG emissions over time, the EAO is satisfied that Sukunka would not have significant adverse effects on GHG emissions.

## 13.0 ASSESSMENT OF ECONOMIC EFFECTS

### 13.1 BACKGROUND

The economic environment was selected as a VC to address the interrelated economic effects that may result from project construction, operations, and closure. Project employment and purchases of goods and services from local and regional businesses would provide employment opportunities and sources of income for local and regional residents and businesses. These effects could be enhanced through the provision of training programs and the adoption of policies that support local and regional procurement and hiring. Indigenous Groups have expressed an interest in ongoing employment opportunities with Sukunka. The Application noted that the creation of new industrial jobs could also affect the size, diversity, and stability of the local and regional economies.

Sukunka would be located in the Peace River Regional District (PRRD), which has extensive natural resources including hydro and wind power, coal, oil and natural gas, forests, and agricultural land. The economy of this region is driven largely by the resources sector.

Glencore identified the following potential effects on the economic environment due to Sukunka:

- Change in labour demand and change in employment income;
- Change in regional economy; and
- Change in government finances.

The EAO notes that the baseline information presented in the Application for the economic environment VC is largely from 2011 and 2012 and that Glencore submitted the Application in 2015. See [Section 14](#) (Social) of this Report for a discussion regarding the dated baseline information.

#### 13.1.1 REGULATORY CONTEXT

The economic effects assessment was informed by the following strategies:

- B.C.'s Mineral Exploration and Mining Strategy (B.C. Ministry of Energy and Mines 2012);
- B.C. Jobs Plan (Government of B.C. 2012); and
- Minerals and Metals Policy of the Government of Canada (Ministry of Public Works and Government Services Canada 1996).

#### 13.1.2 STUDY AREA DESCRIPTION

The LAA for the economic environment VC included communities located within reasonable road access to the PDA and that have the greatest potential to be affected by the demands of Sukunka.

Sukunka would be located in the District of Chetwynd. Other communities in the LAA included the District of Tumbler Ridge, the Village of Hudson's Hope, the West Moberly Lake 168A and East Moberly Lake 169

Indian Reserves, PRRD Electoral Areas D and E, and the City of Dawson Creek, which is the largest community in proximity to Sukunka.

The RAA comprised the area where economic impacts resulting from Sukunka would be expected to be somewhat dispersed. For example, some of the economic impacts relating to employment and procurement could be experienced in population centres located at some distance from Sukunka. Accordingly, the RAA consisted of the LAA and other communities in the PRRD.

## **13.2 POTENTIAL PROJECT EFFECTS AND PROPOSED MITIGATIONS IDENTIFIED IN THE APPLICATION**

Existing conditions, project interactions, potential project effects, and proposed mitigation measures as presented in the Application are described below.

The labour force in the LAA was described as having been relatively stable since 2006, with a reported increase of 345 workers, which represents an increase of one percent since 2011. The Application also referenced more recent information from B.C. Stats that showed a decrease in unemployment rates between 2011 and 2012 in the Northeast Economic Region, which includes the RAA, but unemployment rates rose again to greater than seven percent in February 2014.

In 2011, unemployment rates in the LAA and RAA were lower than the unemployment rate for B.C. overall while participation rates in the LAA and RAA were higher than that for B.C.

Employment in basic industries (primary industries such as mining, quarrying, oil and gas extraction, construction, manufacturing, forestry, and agriculture) accounted for approximately 37 percent of employment in the LAA while non-basic industries (service industries such as retail and wholesale trade, health care and social services, education, business, and other services) accounted for the remaining 63 percent of employment in the LAA.

The Application indicated that the ratio of non-basic to basic employment can be used to measure the diversity of regional economies. In the LAA, the ratio of non-basic to basic employment was 1.74:1 in 2011, which is slightly lower than the ratio for the RAA (1.8:1) and much lower than the ratio for B.C. (4.36:1). According to the Application, this suggests that the LAA and RAA have smaller and relatively less diverse economies than compared to B.C.

Average earnings for individuals and families in the LAA were noted as being lower than for residents and families in the RAA but higher than the earnings for B.C.

Direct employment during construction was estimated to be 790 full time equivalent (FTE) positions with a peak workforce of approximately 250 workers. The percentage of the construction labour force that would be hired locally and regionally would depend on the number of workers who have construction experience and the demands of other projects that are underway at the same time. As described in Section 6.1 of the Application, there were 3,835 persons in the PRRD who had experience in the construction industry while the LAA construction labour force was estimated at 1,750 workers. Based on the labour demands of other

construction projects that could be underway at the same time (see Section 6.1.4.2.3 of the Application), it is likely that a portion of the construction labour force in the LAA would be employed on other projects. Accordingly, it is estimated that during the peak year of construction for Sukunka there would be 80 FTEs of employment for LAA residents, which is equivalent to six percent of the LAA construction labour force in 2011.

Sukunka operations would be anticipated to directly employ 543 workers per year, which would include 110 existing LAA residents and an additional 50 workers that would relocate to the LAA from other parts of B.C. and outside of B.C. (a 0.3 percent increase in population, not considering family members that may migrate with workers). The remaining 383 workers would be expected to commute to and from Sukunka and live in the camp during their work rotations.

The potential effects related to change in labour demand, change in employment income, and change in regional economy were anticipated to be positive during construction and operations and adverse during closure and post-closure. The change in government finances was anticipated to be neutral as Glencore could increase costs for municipal and regional governments while at the same time generating revenue through payment of user fees and regional taxes.

Glencore identified the following key mitigation measures to address these potential effects:

- Develop a local hiring and procurement strategy, which would include posting qualifications and skill requirements in advance of construction, active local recruitment, providing training; and developing work packages that reflect capabilities of local and regional businesses; and
- Support community development through programs that meet long-term community requirements, which could include direct financial donations to in-kind contributions, technical skills and medical or other specialist support. Glencore noted that their support for community development would be aligned with business priorities and deliver value to its host communities in ways that can be consistently monitored.

### **13.3 POTENTIAL PROJECT EFFECTS AND PROPOSED MITIGATIONS IDENTIFIED DURING APPLICATION REVIEW**

Northern Health commented that the Application did not adequately consider potential effects of Sukunka to vulnerable populations due to socio-economic inequities. In addition, Northern Health indicated that the mitigation would not adequately include measures to assist communities and workers during market-driven shutdowns and downturns (for example, closure plans that consider layoffs due to downturns). A member of the public also commented that cyclical ups and downs in the world commodity prices of coal, as well as care and maintenance periods, should be accounted for in terms of potential effects on employment and revenue. Another member of the public recommended that Glencore provide training programs and workshops to help mine employees affected by mine closure apply for new jobs.

West Moberly First Nation also commented on the need for Glencore to create a workplace that supports diversity including providing opportunities for Indigenous women. West Moberly First Nation noted that

women are proven to have excellent job performance and one of the barriers to employment for this population is the availability of safe childcare and support.

In response to the above concerns, Glencore committed to providing career development opportunities and establishing appropriate partnerships with a number of local training and education providers. Through these measures, Glencore aimed to provide workers with the opportunity to address potential barriers to participation in the workforce and to develop transferrable skills that could be used to secure alternative employment should they be affected by market-driven shutdowns and downturns.

At Glencore's request, the EAO proposes Condition 25: Community Effects Management Plan, that would require Glencore to design and deliver programs to support local employment and contracting opportunities, skills training and education during all phases of Sukunka, including closure and post-closure, to be developed in consultation with Northern Health and Indigenous Groups.

The Working Group also provided comment in more general terms on the assessment and monitoring of other socio-economic effects, which is discussed in [Section 14](#) (Social) of this Report.

### **13.4 THE EAO'S CHARACTERIZATION OF RESIDUAL EFFECTS**

The EAO acknowledges the positive contributions of increased government revenue and enhanced economic activity in the regional and local economy from the new jobs to the local economy that would result from Sukunka. Of the 790 FTEs anticipated to be hired during construction, the Application anticipated that during the peak year of construction there would be 120 local FTEs of employment. Operations would be anticipated to directly employ 543 workers per year, which would include 110 existing LAA residents and an additional 50 workers that would relocate to the LAA from other parts of B.C. and outside of B.C.

The Application noted that the percentage of the construction labour force that would be hired locally and regionally would depend on the number of workers who have construction experience and the demands of other projects that are underway at the same time. The efficacy of training programs in allowing sufficient time for residents to develop their skills for project work also would contribute to potential uncertainty related to local employment estimates from Sukunka.

Regardless of the uncertainty in estimating local employment with Sukunka, the EAO is of the opinion that Sukunka would contribute to some form of reduced labour availability and result in an increase in labour costs for local business and service providers. These considerations in combination with higher wages needed to retain employees could lead to an increased cost of living due to an associated increase in the costs of goods and services set by employers, which could result in implications for vulnerable populations in the LAA and RAA.

The EAO also notes that a decrease of 543 jobs in the event of a temporary or permanent closure would result in adverse effects to the regional economy and beyond, given most workers would be anticipated to be hired from outside of the LAA and RAA. Employment opportunities would occur for a small number of LAA residents during reclamation activities.

After considering the information presented in the Application and the concerns highlighted by the Working Group and the public during Application Review, the EAO proposes a requirement in Condition 25: Community Effects Management Plan, for Glencore to develop a Local Employment and Training Plan, which would be developed in consultation with key stakeholders and Indigenous Groups and would include measures for temporary and permanent closures.

The EAO is of the view that the implementation of this condition would help to reduce potential adverse effects on the economic environment as identified in the Application and through concerns raised by the Working Group and the public. However, potential effects related to the economic environment would be unlikely to be fully mitigated. The EAO, therefore, concludes that Sukunka would result in the following residual adverse effects on the economic environment:

- Reduced availability of local labour and increased labour costs for businesses and service providers; and
- Reduced employment and associated income during mine closure (temporary or permanent).

The EAO's characterization of the expected residual adverse effects of Sukunka on the economic environment VC is summarized below, as well as the EAO's level of confidence in the effects determination (including their likelihood and significance). The characterizations take into consideration information provided in the Application, as well as input from the Working Group and the public.

**Table 35: Summary of Residual Effects for Economic Environment**

*Note: Criteria and assessment ratings are defined in [Appendix 4, Residual Effects Characterization Definitions](#)*

Criteria	Assessment Rating	Rationale
Context	<b>Moderate</b>	In general, the LAA and RAA have a relatively limited labour availability compared to B.C., which would further be reduced due to Sukunka. Even so, the number of workers anticipated to be sourced locally is limited, which would also offset potential effects related to temporary and/or permanent closures.
Magnitude	<p><b>Labour availability:</b> Low</p> <p><b>Loss of jobs:</b> Moderate</p>	<p><b>Labour availability:</b> The number of workers in the LAA employed on Sukunka would be relatively small compared to the local labour force. It is anticipated that the economic benefits related to direct and indirect employment would help to alleviate some of the negative implications of reduced labour supply.</p> <p><b>Loss of jobs:</b> Although most workers would be located outside of the LAA, the loss of 545 jobs in the event of a temporary or permanent closure would result in adverse effects at a regional level. Efforts made by Glencore regarding planning for closure would help to reduce the adverse effects related to temporary or permanent closures.</p>

Extent	<p><b>Labour availability:</b> Regional</p> <p><b>Loss of jobs:</b> Beyond regional</p>	<p><b>Labour availability:</b> While adverse effects related to reduced labour supply and increased labour costs would be most acute in Chetwynd and Tumbler Ridge, they also would be felt <b>regionally</b>.</p> <p><b>Loss of jobs:</b> The majority of the operational workforce would be hired from outside of the RAA so potential effects related to temporary and permanent closures would be experienced <b>beyond the region</b>.</p>
Duration	<p><b>Labour availability:</b> Medium-term</p> <p><b>Loss of jobs:</b> Long-term</p>	<p><b>Labour:</b> The duration of effects from Sukunka would commence during construction and persist into operations. Even so, the local labour supply is relatively limited and the adverse effect is anticipated to lessen over time as workforce supply grows to meet demand.</p> <p><b>Loss of jobs:</b> Temporary and/or permanent closures could occur at any time depending on the market for coal and could last a few months or several years. For final closure at the end of mine life, the labour demand is permanently lost.</p>
Reversibility	<p><b>Reversible to irreversible</b></p>	<p>The effects on labour supply would be <b>reversible</b> after temporary closure when the mine resumed operations. At final closure the loss in labour demand is <b>permanent</b>, however over time the regional and local economies would evolve in ways which may or may not make up for the losses from mine closure.</p>
Frequency	<p><b>Labour availability:</b> Continuous</p> <p><b>Loss of jobs:</b> Once to infrequent</p>	<p><b>Labour availability:</b> The adverse economic effects would occur <b>continuously</b> during construction but would lessen over time during operations as workforce supply grows to meet demand.</p> <p><b>Loss of jobs:</b> Adverse effects related to mine closure could occur <b>once</b> at the end of operations and/or <b>infrequently</b> during a coal market downturn (that is, temporary closure).</p>
Likelihood	<p><b>High</b></p>	<p>The likelihood is <b>high</b> that Sukunka would have some degree of adverse effects on labour supply and labour costs during construction and operations. However, many local and regional residents and businesses would also experience benefits from the increased economic activity. In addition, the mine has a discreet operational life and, as such, the likelihood is <b>high</b> that employment opportunities would be lost at closure.</p>
Significance Determination	<p><b>Not significant</b></p>	<p>Given the low to moderate magnitude and considering that the number of workers anticipated to be sourced locally is limited, as well as the conditions identified in the TOC (which would become legally binding if an EAC is issued), the EAO is satisfied that Sukunka would <b>not have significant</b> adverse residual effects on the economic environment.</p>

Confidence	<b>Moderate</b>	There is a <b>moderate</b> level of confidence in the likelihood and significance determination in that there is some uncertainty regarding the ratio of workers that would be hired from the local and regional labour force as well as in predicting temporary or permanent closures that may be linked to the international market for metallurgical coal. The EAO also notes that the baseline information presented in the Application for the economic environment VC is largely from 2011, which may not reflect the current status of labour force, employment and income in the LAA and RAA.
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### 13.5 CUMULATIVE EFFECTS ASSESSMENT

The Application identified 22 major projects proposed for the LAA, including nine mining projects, and another eight major projects that have been proposed for the rest of the RAA. With proposals for numerous mines, wind energy projects and other major projects within the RAA, economic expansion and employment growth is expected in the near future. Although it is not known if and when these projects would be constructed, they could result in competition for labour, goods and services in the LAA and RAA.

Given the size of the RAA construction labour force (3,835 workers in 2011) and the potentially large demands for labour from other proposed projects in the RAA (75,000 FTEs), Glencore concluded that a limited number of regional residents would be available to construct Sukunka. Similarly, given the number of RAA workers with experience in mining, quarrying, and oil and gas extraction industries (6,995 workers in 2011) and proposals to develop up to 10 other mines in the LAA, relatively small numbers of regional residents would be available to operate Sukunka.

Temporary or permanent closures of Sukunka and the accompanying loss of jobs would have an adverse effect on regional employment. However, Sukunka demands on the regional labour force, in the context of demands of other reasonably foreseeable projects, would be relatively small.

In determining the potential significance of cumulative adverse effects to the economic environment, the EAO considered the residual effects from Sukunka, the cumulative effects to the RAA from Sukunka, and reasonably foreseeable projects, including consideration of the current context. The EAO concludes that the cumulative residual adverse effects to the economic environment within the RAA are not likely to be significant.

### 13.6 CONCLUSIONS

Considering the above analysis and having regard to the conditions identified in the certified project description and table of conditions (which would become legally binding if an EAC is issued) the EAO is of the view that Sukunka would not have significant adverse effects on the economic environment.

## 14.0 ASSESSMENT OF SOCIAL EFFECTS

### 14.1 BACKGROUND

Sukunka is located within the Peace River Regional District (PRRD). The closest communities to Sukunka are Chetwynd, approximately 55 km north of the Project and Tumbler Ridge, about 40 km east of the Project ([Figure 17](#)). At the time of the submission of the Application in 2015, these communities had approximately 2,700 residents each. Fort St. John is located approximately 125 km north of the Project and is the largest city in the PRRD with approximately 20,155 residents. The PRRD has the largest land base of any regional district in BC, with an area of 119,000 square kilometres (km<sup>2</sup>) and a population of 60,000 residents. The mine site can be accessed off Highway 29 (Don Phillips Way) from Chetwynd by traveling along the Sukunka Forest Service Road (FSR) or via the Meikle Creek Road from Tumbler Ridge.

The workforce would include an estimated 250 workers per year during Construction and 545 workers per year during Operations. A worker camp with a maximum capacity of 250 persons would be built along the Meikle Creek Haul Road east of Sukunka to house workers during Construction and Operations. Glencore estimates the workforce would consist of a combination of local residents, who would commute from Chetwynd and Tumbler Ridge on a daily basis, and “fly-in-fly-out” workers, who would maintain their homes outside of the LAA. Fly-in-fly-out workers would travel via commercial airlines into Dawson Creek or the North Peace Regional airports and Glencore-supplied vans or buses into the mine site. Rotations would be seven days on, seven days off or longer and fly-in-fly-out workers would reside at the camp when not working. The camp would be “closed”, meaning that workers would not be permitted to travel outside of the camp after their shifts (unless it was the end of a rotation).

Glencore considered the following VCs for the assessment of potential social effects:

- Population and demographics;
- Community services and infrastructure;
- Community health;
- Land and resource use; and
- Visual quality.

The assessment of population and demographics incorporates information from the economic effects assessment ([Section 13](#)). Impacts to human health from pollutants and noise are not assessed in community health VC but are included in the assessment of human health ([Section 16](#)).

The EAO notes that the baseline information presented in the Application for the social VCs is largely from 2011 and 2012 and that Glencore submitted the Application in 2015. See [Section 14](#) (Social) of this Report for a discussion regarding the dated baseline information.

### 14.1.1 REGULATORY CONTEXT

The following provides an overview of relevant regulatory, policy, and guideline requirements that pertain to the assessment of the social VCs:

**Community Services and Infrastructure** are regulated by various organizations or levels of government, depending on the type of service or infrastructure including official community plans, municipal bylaws, provincial acts and ministry service plans.

**Community Health:** In British Columbia, public health is the responsibility of the B.C. Ministry of Health and the five regional health authorities in accordance with the *Public Health Act*, as well as the Provincial Health Services Authority and First Nations Health Authority. The provincial permitting requirements below relate to human health.

- *Mines Act:* Several regulatory requirements relate to the health of workers at the mine site. Glencore would require a Mine Plan and Reclamation Plan as part of the *Mines Act* (MA) permitting process for Sukunka. This permit could include provisions relating to occupational health. Additionally, requirements in the Health, Safety and Reclamation Code for Mines in B.C. protect employees and the public from risks arising out of or in connection with activities at mines;
- *Workers Compensation Act:* Worksafe B.C.'s Occupational Health and Safety Regulation applies to workers at the camp that are not captured under the Health, Safety and Reclamation Code for Mines in B.C.;
- *Public Health Act:* Under the *Public Health Act*, Glencore would require a Health Operating Permit for the camp, which is required for all food service establishments in B.C. Also applicable under the *Public Health Act* there is the Industrial Camps Regulation, the Food Premises Regulation, the Sewerage System Regulation and potentially others (e.g. Reporting Information Affecting Public Health Regulation), including potential provincial and regional public health orders related to Covid 19;
- *Drinking Water Protection Act:* Glencore would also require a Construction Permit and an Operating Permit under the *Drinking Water Protection Act* if groundwater was used as water source for the camp. Permitting requirements relating to the environmental protection of air and water quality, described in [Sections 11](#) and [6](#), would also protect the health of workers and users or residents of the area indirectly; and
- *Environmental Management Act:* regulates industrial and municipal waste discharge, including sewage.

**Land and Resource Use** legislation includes:

- *Land Act:* governs the disposition of provincial Crown land;
- *Parks Act:* provides legal protection of parks and protected areas;
- *Forest and Range Practices Act:* provides legal designation of forestry tenures and requirements regarding removal of timber from Crown land;
- *Mines Act, Mineral Tenure Act:* provides legal designation of any overlapping mineral tenures, including oil and gas activities;

- *Oil and Gas Activities Act*: provides legal designation of oil and gas tenures; and
- *Agricultural Land Reserve Act*: provides legal protection of lands within the agricultural land reserve (ALR).

The Project is within the Dawson Creek Land and Resource Management Plan (LRMP) area. This regional land use planning area provides broad direction for sustainable use of Crown land and resources. Sukunka is subject to consistency with the Plan's objectives.

**Visual Quality:** The Government of British Columbia manages visual impacts on Crown forest land. B.C.'s visual resource management program conducts a range of activities to ensure the scenic quality expectations of the public and the tourism industry are met. The Dawson Creek LRMP also provides guidance relating to visual quality.

## 14.1.2 STUDY AREA DESCRIPTION

### 14.1.2.1 POPULATION AND DEMOGRAPHICS AND COMMUNITY SERVICES AND INFRASTRUCTURE

The LAA for population and demographics and community services and infrastructure includes communities that are within reasonable road access to Sukunka and have the greatest potential to be affected by Sukunka ([Figure 17](#)). At the time Glencore conducted baseline studies (June 2011), 26,560 people lived in the LAA including the following locations: Dawson Creek (11,583 residents), Tumbler Ridge (2,710 residents), Chetwynd (2,635 residents), Hudson's Hope (1,012 residents), PRRD Electoral Area D (5,479 residents) and Area E (2,764 residents). There were 95 residents in the Indian Reserves of West Moberly Lake 168A and 324 residents in East Moberly Lake 169.

The RAA comprises the area where project-related effects on population and demographics and community services and infrastructure are expected to be somewhat dispersed ([Figure 17](#)). The RAA includes the LAA and other communities in the PRRD including the City of Fort St. John, the District of Taylor, the Village of Pouce Coupe, Peace River Electoral Areas B and C, and Indian Reserves Blueberry River 205, Doig River 206, Fort Ware and Halfway River 168, as well as Indian Settlement Ingenika Point.

### 14.1.2.2 COMMUNITY HEALTH

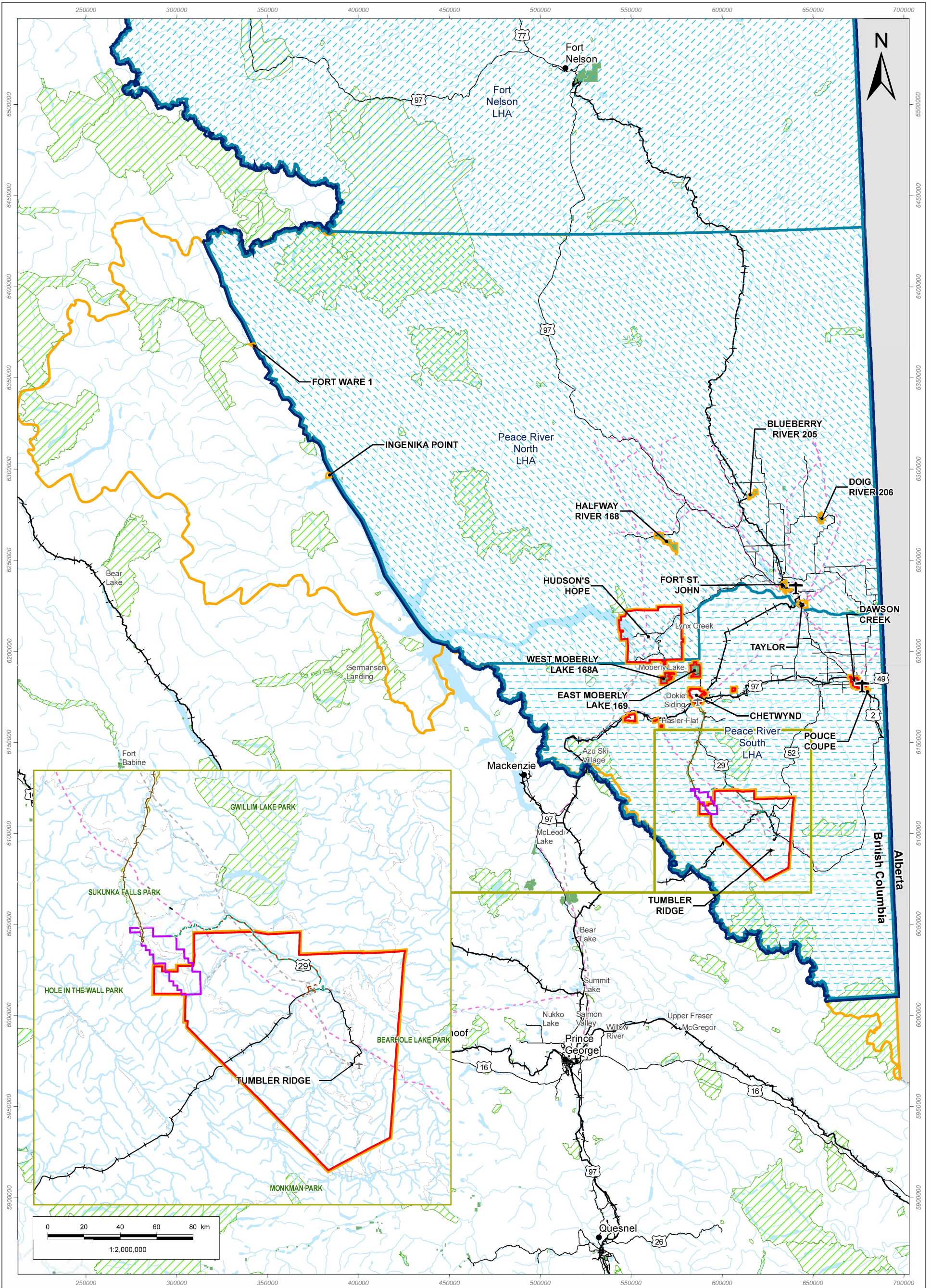
The LAA for community health is the Peace River South Local Health Area (LHA) ([Figure 17](#)). It encompasses communities within a 50 km radius of, and within reasonable road access to, the project site, including the District of Chetwynd and Tumbler Ridge. This area includes many of the same LAA communities assessed in the economic environment, population and demographics, and community services and infrastructure VCs. Data are included at the LHA level whenever available. The Northeast Health Services Delivery Area (HSDA) encompasses the Peace River South and Peace River North LHAs in addition to the Fort Nelson LHA and is used when data are not available or reliable at the LHA level. The RAA for community health is the Peace River South LHA combined with the Peace River North LHA.

### 14.1.2.3 LAND AND RESOURCE USE

The land and resource use LAA encompasses the area within which project effects are likely to be most concentrated and can be predicted with a reasonable degree of accuracy and confidence (**Error! Reference source not found.**). Since resource uses are often closely connected to the land base, its resources, or its attributes, the LAA for all land and resource use is defined by a 1.5 km buffer around the Sukunka tenure area and from the centerline of the access roads.

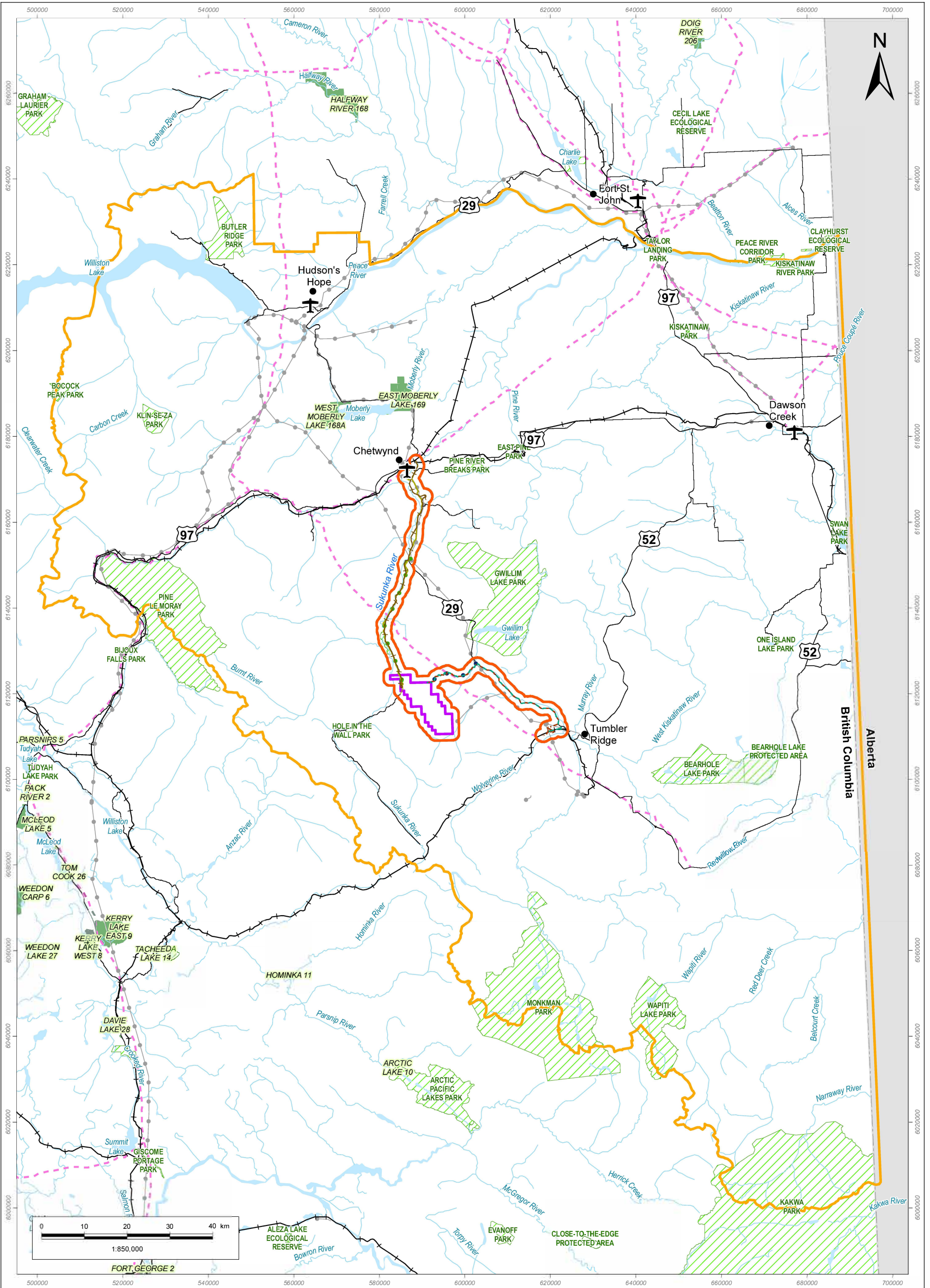
The land and resource use RAA ([Figure 18](#)) is a broad area within which project effects may be more wide reaching. Effects may occur because of the displacement of activities to other locales (for example, hunters shift to another area) or because of some interdependency in the management of the regional land base or resource. The RAA is the Dawson Creek LRMP planning area.

Figure 17: Population and Demographics, Community Services and Infrastructure, and Community Health Local and Regional Assessment Areas



<b>Legend</b> <ul style="list-style-type: none"> <li>✈ Major Airport</li> <li>✈ Minor Airport</li> <li>● Town</li> <li>— Railway</li> <li>— Road</li> <li>- - - Transmission Line</li> <li>- - - Pipeline</li> <li>— Watercourse</li> <li>Waterbody</li> <li>First Nations Reserve</li> <li>Provincial Park</li> <li>Local Health Authority</li> <li>Fort Nelson</li> <li>Peace River North</li> <li>Peace River South</li> <li>Northeast Health Service Delivery Unit</li> <li>Regional Assessment Area</li> <li>Sukunka Project Tenure Area</li> <li>Transportation Options</li> <li>Option A</li> <li>Option B</li> <li>Option D</li> <li>Option E</li> </ul>		<b>SUKUNKA COAL MINE PROJECT</b> <b>SOCIOECONOMIC LOCAL AND REGIONAL ASSESSMENT AREAS</b> VC ASSESSMENT REPORT – SOCIOECONOMIC <small>Data Sources: Glencore, Province of British Columbia, Government of Canada</small> <small>Disclaimer: Although there is no reason to believe that there are any errors associated with the data used to generate this product or in the product itself, users of these data are advised that errors in the data may be present.</small> <small>File Path: fig_10482_ea_socio_ec_06_01-01_socioeconomic_assessment_areas</small>		PREPARED BY: 
		PREPARED FOR: 		
DATE: 30-MAY-14	PROJECTION: UTM 10	DRAWN BY: D. COOK		
FIGURE ID: 123110482	DATUM: NAD 83	CHECKED BY: L. MCDONALD		

Figure 18: Communities in the Land and Resource Use RAA



<b>Legend</b> 		<b>SUKUNKA COAL MINE PROJECT</b> <b>COMMUNITIES WITHIN THE REGIONAL ASSESSMENT AREA</b> VC ASSESSMENT REPORT - LAND AND RESOURCE USE		PREPARED BY: 
		DATE: 28-JUL-14 FIGURE ID: 123110482		PREPARED FOR: 
		DATA SOURCES: Glencore, Province of British Columbia, Government of Canada DISCLAIMER: Although there is no reason to believe that there are any errors associated with the data used to generate this product or in the product itself, users of these data are advised that errors in the data may be present. FILE PATH: fig_10482_ea_lru_07_04-05_communities_raq		DRAWN BY: A. BOONE CHECKED BY: L. MCDONALD

#### 14.1.2.4 VISUAL QUALITY

The LAA for visual quality is the maximum area within which the project-related effects can be predicted or measured with a reasonable degree of accuracy and confidence. The LAA for visual quality includes all project components visible in the foreground (0-1 km) and mid-ground (1-8 km) distances from a viewpoint.

The RAA is the area within which cumulative effects for visual quality might occur. The RAA for visual quality includes the LAA and the area beyond the LAA which is greater than 8 km from a viewpoint where Sukunka would potentially be visible.

## 14.2 POTENTIAL PROJECT EFFECTS AND PROPOSED MITIGATIONS IDENTIFIED IN THE APPLICATION

The existing conditions, potential project effects, and proposed mitigation measures as presented in the Application by each social VC are described below.

### 14.2.1 EXISTING CONDITIONS

#### 14.2.1.1 POPULATION AND DEMOGRAPHICS

Population sizes of communities within the LAA at the time the Application was prepared are reported in [Section 14.1.2](#) (Study Area Description).

#### 14.2.1.2 COMMUNITY SERVICES AND INFRASTRUCTURE

The Community Services and Infrastructure VC consisted of the following measurable parameters:

- Housing;
- Traffic and transportation infrastructure; and
- Community and emergency services and infrastructure.

### HOUSING

The Application notes that, as of 2014, there was limited housing stock in the LAA and it was a challenge to rent or buy quality housing in both Chetwynd and Tumbler Ridge. As of 2012, both communities were planning to support the development of additional housing stock to meet future demand.

### COMMUNITY AND EMERGENCY SERVICES AND INFRASTRUCTURE

The Application noted, that as of 2015, utilities (water, wastewater, landfill and electrical) and school (elementary and secondary) were operating below capacity; Royal Canadian Mounted Police (RCMP) (Dawson Creek, Tumbler Ridge) and emergency fire services for communities was adequate to meet current demand; and health services and the Hudson Hope RCMP were slightly overcapacity.

### TRAFFIC AND TRANSPORTATION INFRASTRUCTURE

Sukunka is accessible via Highway 29, connecting to Highway 97 through Chetwynd, or Highway 52 through Tumbler Ridge. From Highway 29, road traffic from Tumbler Ridge would use the existing Meikle Creek Road to access Sukunka, while traffic from Chetwynd would use the Sukunka FSR. Meikle Creek Road is a designated 85 tonne route, except in winter when it is lower. According to the Application, the Sukunka FSR is a well maintained, all-weather gravel road suitable for forestry trucks and other industrial traffic.

Canadian National (CN) Rail provides heavy rail freight service in the LAA and RAA, and is the only rail option between Sukunka and a port facility for shipping coal. Rail load-out facilities exist in Tumbler Ridge and Chetwynd, and there are also potential sites for future development. CN Rail serves both communities with lines running west towards Prince Rupert. These lines have capacity for at least 25 million tonnes per year (Mt/y) of coal. CN Rail is considering future upgrades involving additional sidings and double tracking to handle up to 60 Mt/y.

There are two airports in the RAA served by commercial airlines: the North Peace Regional Airport near Fort St. John, and the Dawson Creek Regional Airport just outside Dawson Creek. Both airports are approximately three hours by road from Sukunka. There are also airports in Chetwynd and Tumbler Ridge available for use by charter flights.

#### 14.2.1.3 COMMUNITY HEALTH

The Application considered the following measurable parameters in the assessment of the potential effect:

- Physical health and safety (worker safety, traffic safety);
- Health behaviours (diet and nutrition, exercise, drug and alcohol abuse, mental health and well-being); and
- Family and community dynamics (economic hardship, marital status, children and youth at risk, crime).

According to the Application, the percentage of the population in the Northeast HSDA that smokes, drinks heavily and uses cannabis (in their lifetime) was higher than B.C. averages. In addition, a greater percentage of the population is obese, overweight and has diabetes in the Northeast HSDA compared to B.C. These values could be interpreted to indicate that a higher percentage of the population is vulnerable to certain health concerns than in B.C. overall.

In contrast, the Application indicates that the community health RAA had higher average family incomes and lower percent of the population receiving income assistance (\$86,583 and 1.3 percent, respectively) than when compared to B.C. (\$80,511 and 1.7 percent, respectively). Higher incomes are associated with reduced vulnerability to health effects. However, B.C. Stats publishes a composite index of children at risk, and of youth at risk, that ranks LHAs on a scale of one (worst) to 77 (best). The Peace River South LHA (the LAA) is ranked 17<sup>th</sup> while the Peace River North LHA is ranked 46<sup>th</sup>.

#### 14.2.1.4 LAND AND RESOURCE USE

No parks or protected areas are in the Project Development Area (PDA) or project tenure area. Sukunka Falls Provincial Park is located entirely within the land and resource use LAA and approximately 4.5 km

from the northern extent of the PDA.

No private land is in the Sukunka tenure area (see Figure 7.4-4 of the Application) and the majority of private land in the land and resource use LAA is located within the District of Chetwynd, as well as south along Highway 29 between Chetwynd and the Sukunka FSR.

Tenured land uses identified by Glencore in the Sukunka tenure area and the land and resource use LAA and RAA included past, current or proposed oil and gas activities, Agricultural Land Reserves (ALR), forestry, mining and mineral exploration, wind power developments, traplines and guide outfitting.

Non-tenured land uses in the RAA include hunting, fishing and other recreational uses such as snowmobiling and hiking the Cowmoose Mountain Trail and Pinnacle Peak Trail.

#### 14.2.1.5 VISUAL QUALITY

The Sukunka tenure area lies almost entirely within the Chamberlain Creek, Skeeter Creek and Bullmoose Creek watersheds within the northern Rocky Mountains. Topography in the Sukunka tenure area is typified by high elevation (1,800 to 2,000 m) mountain ridges, rounded peaks and steep-sided headwater valleys and relatively flat-bottomed river valleys. The Sukunka River valley and its associated terrain in the north, as well as Bullmoose and Chamberlain mountains and their classical alpine glaciation features in the south contrasted against the flat river bottoms and mixed deciduous-conifer forests of the river valleys give the Sukunka tenure area its visual appeal ([Figure 19](#) and [20](#)).



**Figure 19: Typical Topography along the Sukunka River Valley**



Figure 20: Typical Topography near the Mine Site

## 14.2.2 POTENTIAL PROJECT EFFECTS

### 14.2.2.1 POPULATION AND DEMOGRAPHICS

Glencore identified that a change in population structure could occur because of Sukunka.

The Application indicates that 790 Person Years of labour are anticipated to be required for Construction, with approximately 250 workers per year at peak Construction. Approximately 545 workers per year (Full Time Equivalent) would be required during Operations. Glencore provided the following estimates for the peak workforce:

- 110 workers are anticipated to be hired from communities in the socio-economic LAA, including 25 workers from Chetwynd and/or Tumbler Ridge. All 110 workers would be expected to commute to Sukunka from their residences using project vans or buses to transport them to the mine site from a designated parking area;
- 50 workers and their families are anticipated to in-migrate into communities in the socio-economic LAA such as Chetwynd or Tumbler Ridge from other parts of B.C. and outside of B.C. Family members are estimated to account for an additional 70 people; and
- The remaining 385 workers are anticipated to be fly-in-fly-out and work on a shift-rotation basis.

The in-migrant population of workers and families is expected to increase the current male proportion of Chetwynd and Tumbler Ridge by less than one percent. While no disruption to the age composition of the LAA due to in-migration was predicted by Glencore, it has been suggested that there may be an increase in

younger families.

#### 14.2.2.2 COMMUNITY SERVICES AND INFRASTRUCTURE

Glencore identified the following potential effects related to the assessment of the community services and infrastructure VC:

- Change in housing availability and affordability: with a limited stock of available housing, project-related demand for housing and accommodation may result in shortages of available housing and/or increases in housing costs. Glencore stated that project demands are not expected to exceed the capacity of the housing stock on a persistent basis;
- Effects on traffic and pressure on transportation infrastructure: road or rail transport of equipment, materials, workers, and coal may affect traffic conditions, or affect railway operations. Additionally, a fly-in-fly-out workforce may result in congestion at airports, resulting in a decreased level of service for users. Glencore determined that project demands are not likely to exceed the available capacity or decrease the level of service provided by transportation infrastructure at any time during the life of Sukunka; and
- Effects on community and emergency services and infrastructure: the growth in population associated with Sukunka would result in increased demand for community and emergency services, including municipal infrastructure, education, health services, police and fire-fighting. Sukunka may also create direct demand on municipal infrastructure or utilities such as water and waste disposal. Glencore concluded that while many services and infrastructure would be able to support increased demands of an increased population, two potential points of concern were identified: law enforcement and health services. It was expected that if demand warrants, new law enforcement members would be hired, and health care services expanded, though there may be a short period of time where demand nears or exceeds capacity while the population is initially increasing. Even so, Glencore stated that project demands are not likely to persistently exceed the available capacity or substantially decrease the quality of services.

#### 14.2.2.3 COMMUNITY HEALTH

Glencore identified that a change in community health conditions could occur because of Sukunka. Changes in employment, population or lifestyle may result in changes to community health indicators and outcomes via the following mechanisms:

- Potential for injury or sickness from job tasks or workplace conditions;
- Changes in diet, nutrition, exercise or drug or alcohol use linked to changes in income or stress following new employment; and
- Changes to family or community dynamics related to changes in employment status or residence of individuals.

Glencore stated that potential residual effects on community health conditions as measured by change in physical health and safety, health behaviours, and family and community dynamics were negligible or low in magnitude. It was not anticipated that changes in any of the indicators of community health conditions would be highly distinguishable from the normal range of variability in baseline conditions.

#### 14.2.2.4 LAND AND RESOURCE USE

Glencore identified the following potential effects related to the assessment of the land and resource use VC:

- Effects on private property and protected areas: There are no parks, protected areas or private land within the Sukunka tenure area; however, there are parks and private land within the LAA and RAA. Glencore stated that adverse effects as a result of all Construction and Operations activities could be managed to negligible or acceptable levels and would not result in a residual effect;
- Effects on tenured land use: Oil and gas, mineral or mining, energy, forestry, trapping and guide outfitting activities could be affected by Sukunka. Certain land uses (e.g., oil and gas extraction) could be incompatible with components of Sukunka and Glencore would negotiate with commercial tenure holders (including mining, oil and gas and electrical generation and transmission) to determine if relocation or compensation is required, as described in the mitigation section below. Sukunka activities may result in effects to trapping and guide outfitting because of disturbance to local wildlife (noise, air emissions and light). The Sukunka tenure area overlaps three traplines and is located in the southern portion of one guide outfitter area; and
- Effects on non-tenured land use: non-tenured land uses such as recreation, tourism, fishing, and hunting may be affected by the presence of Sukunka and project-related activities through a change in land base, quality of experience, or access. Throughout the life of Sukunka, three recreational sites in the Sukunka tenure area would either be closed to the public (Chamberlain Mountain Viewpoint) or have access restricted (Cowmoose Mountain, and Pinnacle Peak Trails).

#### 14.2.2.5 VISUAL QUALITY

Glencore identified that Sukunka could result in a change in visual quality from sensitive viewpoints. The visual quality assessment included sixty-three candidate viewpoints which were identified through literature review and stakeholder interviews. Fifty-two of these viewpoints were determined to be either outside of the area of visual sensitivity, beyond the visual quality LAA, or duplicated by another viewpoint. The remaining eleven viewpoints were selected for field visits and visual quality assessment).

Glencore determined that Sukunka would result in a high visual effect for two viewpoints: Chamberlain Mountain<sup>91</sup> and Bullmoose Mountain. Open pits, waste rock stockpiles, collection ditches and mine haul roads are expected to be visible from these viewpoints. According to the Application, the remaining viewpoints would experience a very low to moderate visual effect.

### 14.2.3 MITIGATION MEASURES

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<sup>91</sup> Note that this viewpoint is not the same as the Chamberlain Mountain Viewpoint recreation site, which is located 5 km to the north.

#### 14.2.3.1 POPULATION AND DEMOGRAPHICS

Glencore identified the following main mitigation measures to address the above potential effect:

- Develop an employment strategy: include measures to source local and regional labour where possible; and encourage diversity in the workplace;
- Use an on-site camp during construction and operations; and
- Maintain a project office in Chetwynd and employ a local liaison to facilitate communication through construction and operations.

#### 14.2.3.2 COMMUNITY SERVICES AND INFRASTRUCTURE

Glencore identified the following main mitigation measures to address the above potential effects:

- Provide camp accommodation that includes recreational and leisure amenities;
- Employ a local liaison to facilitate communication;
- Use buses or crew vans to transport fly-in-fly-out workers;
- Establish a park-and-ride system for the commuter workforce;
- Negotiate road use agreements;
- Obtain water supply from the Sukunka River as opposed to municipal sources;
- Develop a sewage treatment facility;
- Provide fire-fighting and mine rescue services;
- Provide on-site medical services and infrastructure: first aid personnel; first aid treatment room, ambulance and helipad;
- Employ security personnel and a zero-tolerance policy for violence, substance abuse and criminal behaviour; and
- Collect recyclables to incorporate into recycling programs in Chetwynd or Tumbler Ridge.

In addition to the above mitigation, Glencore has committed to developing and implementing the following management plans:

- Dangerous Goods and Hazardous Materials Management Plan (see [Section 19.1.11](#) (Land and Resource Use));
- Transportation Plan (see [Section 19.1.18](#) (Land and Resource Use));
- Mine Site Water Management Plan, which would include measures to manage water in a manner that provides sufficient water to support coal processing while minimizing contact water and the potential for storm flows to cause damage to mine structures, and thereby minimizing the potential for mining operations to cause adverse effects to downstream water quality;
- Solid Waste Management Plan, which would include measures to avoid unnecessary resource consumption, and maximization of resource recovery (including reuse, reprocessing, recycling, and energy recovery) to avoid disposal of waste generated on site, and thereby reducing potential effects on local and regional waste management facilities; and
- Emergency Response Management Plan (see [Section 19.1.14](#) (Land and Resource Use)).

### 14.2.3.3 COMMUNITY HEALTH

Glencore identified the following main mitigation measures to address the above potential effect:

- Implement a project-specific health and safety plan;
- Minimize risk of traffic collisions<sup>92</sup>: require winterization and snow tires; walk-around inspections for vehicles; regular vehicle maintenance; upgrades and maintenance to roads used by coal transport trucks; driver training for mine driving; and fit-for-duty policies (for example, considering drug and alcohol use and fatigue);
- Promote healthy behaviours: include recreation and exercise facilities in the camp; implement an employee drug and alcohol policy; and provide an employee and family assistance program; and
- Maintain a 'closed' camp where workers are not permitted to travel outside of the camp after their shifts.

### 14.2.3.4 LAND AND RESOURCE USE

Glencore identified the following main mitigation measures to address the above potential effects on and land and resources use:

- Compensation for tenured land uses if deemed necessary during consultation and on a case-by-case basis;
- Relocation of existing oil and gas facilities and infrastructure at Glencore's expense or through negotiated agreements;
- Notification to land users of project activities throughout construction including notice of access restrictions;
- Scheduling of project activities to minimize disruption of wildlife during sensitive periods; and
- Prohibition of employees from hunting, fishing and using recreational vehicles within a buffer zone to be determined prior to construction.

In addition to the above mitigation, Glencore has committed to developing and implementing the following management plans, which would help to reduce project effects on land and resource use:

- Access Management Plan, which would include measures to:
  - Restrict public access in and around the PDA;
  - Restrict motorized access to designated trails in and around the PDA;
  - Install signage to identify access points and roads and areas that are closed to the public;
  - Enforce increased radio calls on radio-controlled transportation options during construction and operations;
  - Consult and collaborate with outdoor recreational groups and organizations to identify and, if required, relocate active staging areas; and
  - Establish a cooperative maintenance program for access routes where use is shared by the public, commercial, and industrial activities in the Sukunka tenure area;

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<sup>92</sup> According to Glencore, these measures would apply to work-related vehicles and Glencore vehicles operated by employees. Personal vehicles would be the responsibility of the owner.

- Transportation Plan, which would include measures to:
  - Notify road users of any road and/or bridge construction activities associated with Sukunka, through direct contact and engagement, signage, both in advance of and during construction, or other appropriate means;
  - Manage road construction activities and traffic according to appropriate standards such as the MOTI's Traffic Management Guidelines (MOTI 2001) or FOR standards;
  - Minimize Sukunka-related traffic generated by workers by using buses to transport workers between local communities, airports, the PDA, and the camp whenever possible;
  - Minimize conflict with existing traffic and maximize safety by identifying preferred routing and timing for the movement of workers, goods, equipment, and coal to and from the PDA; and
  - Maintain haul roads as per road use agreements to maximize safety for all users;
- Explosives Management Plan, which would include measures to:
  - Provide direction on methods and procedures that would be used to minimize risks related to the use of explosives;
- Emergency Response Management Plan, which applies to the PDA and all project personnel, would include measures to:
  - Prevent adverse effects from an emergency spill on offsite communities, resources, and biosystems; and
  - Reduce the risks to personnel, environment, and equipment that may occur as the result of an emergency spill;
- Reclamation Plan, which would include measures to:
  - Identify opportunities to include traditional knowledge in reclamation planning as part of Sukunka (for example, use of native plants);
  - Develop strategies to engage communities and include traditional knowledge in reclamation planning; and
  - Site visits to invite community members to engage in discussions regarding reclamation and to refine end-land-use objectives;
- Dangerous Goods and Hazardous Material Management Plan, which include measures to:
  - Maximize the use of materials that present a lower risk;
  - Minimize the total number of hazardous materials;
  - Minimize the potential for environmental issues emanating from hazardous materials; and
  - Define appropriate training of personnel in the handling and use of hazardous materials;
- Wildlife Protection and Monitoring Plan, which would include measures to:
  - Provide signage that warns project personnel, contractors, and other road users to be vigilant for wildlife on roads. The signage would be targeted to areas where potential problems are anticipated or known to occur (e.g., areas of poor visibility, known or likely wildlife crossing locations).

#### 14.2.3.5 VISUAL QUALITY

Glencore identified the following main mitigation measures to address the above potential effect:

- Coordinate with other projects regarding siting of infrastructure;
- Site mine operations and infrastructure to minimize visual effects;
- Employ visual design techniques: use screening of natural topography and vegetation; minimize the height of facilities and infrastructure; use non or low reflective coatings and stains; promote integration of Sukunka with adjacent landscape; and
- Install interpretative signage at popular recreation sites outlining mitigation and reclamation strategies.

## **14.3 POTENTIAL PROJECT EFFECTS AND PROPOSED MITIGATIONS IDENTIFIED DURING APPLICATION REVIEW**

### **14.3.1 FOLLOW UP AND MONITORING**

Working Group members expressed concern regarding potential socio-economic effects related to the community health, and community services and infrastructure VCs. Working Group members noted that predicting and characterizing socio-economic effects can be challenging, due in part to the assumptions and uncertainty related to these VCs. Some members of the Working Group noted that the application did not satisfy contemporary best practices related to the scoping, data gathering and mitigation measures for major industrial projects. To alleviate these concerns, the Working Group recommended Glencore consider the cumulative socio-economic effects from other projects and activities and develop a plan to adaptively manage socio-economic effects.

In response to these concerns, Glencore indicated that mitigation measures (identified above) are sufficient to avoid significant adverse socio-economic effects. Some measures have been designed to be actionable and incorporate an adaptive management approach where stakeholder feedback is used to inform and guide ongoing management.

To address these concerns, the EAO has proposed Condition 25: Community Effects Management Plan, that would require Glencore to track, assess and adaptively manage potential effects on community health and community infrastructure and services resulting from the Sukunka workforce and activities should an EAC be issued. Under this condition, Glencore would be required to establish communication and engagement processes with Indigenous Groups, Northern Health and local governments to provide updates on Sukunka activities and provide a mechanism for addressing community concerns, which could include concerns related to Sukunka's contribution to cumulative impacts in the region. In addition, the EAO's assessment of cumulative effects is provided in the section below on the Characterization of Residual Effects.

### **14.3.2 HEALTH AND MEDICAL SERVICES**

Northern Health raised concerns that rural health care services in the RAA are already underserved and fragile and the additional demands created by workers on non-urgent and emergency health care services may exacerbate this problem. Northern Health recommended that Glencore be required to develop a Health and Medical Services Plan as a condition attached to the EAC. The proposed plan should follow the best practices outlined in Northern Health's *Health and Medical Services Plan Best Management Guide for Industrial Camps*.

Glencore responded that workforce and in-migration estimates were conservative and proposed mitigation measures, including a closed camp, would reduce the magnitude of potential increased demand on health care services. Glencore indicated that mitigation measures would align with best management practices identified in the aforementioned document produced by Northern Health.

During their review of the EAO's draft referral materials, Northern Health identified several concerns related to Covid-19, which occurred while Application Review was suspended. Northern Health commented that they are currently struggling with staff retention and recruitment and staffing levels are at crisis levels across the Northern Health region, but especially in northeastern B.C. Recovery within the health sector from Covid-19 is expected to be lengthy and health service impacts need to be extremely well managed to ensure that the system is sustainable. Experience from other projects has demonstrated how project impacts can significantly put the local health service system into jeopardy, affecting services available to local populations.

Northern Health requested that their recently developed guidance documents *Communicable Disease Control Plan Best Management Guide for Industrial Camps* and *Health and Safety During the Opioid Overdose Emergency: Northern Health's Recommendations for Industrial Camps* be included be in a condition. Northern Health also requested that the Health and Medical Services Plan consider health service demands of workers residing in community, not just those within the camp and include close collaboration and planning with Northern Health to ensure services between the project and the community are aligned.

To address these concerns, the EAO has proposed Condition 26: Health and Medical Services Plan, that would require Glencore to incorporate guidance from the Northern Health Management Guides mentioned above and must include a description of on-site health and medical services and protocols and a process for communication and coordination with other health care services in the region should an EAC be issued.

### 14.3.3 BASELINE INFORMATION

Northern Health noted several concerns related to the baseline information presented in the Application, which was largely collected in 2011-2012, including:

- The use of outdated and aggregated Statistics Canada data;
- Failure to adequately capture existing local information using data collected at the community level or other sources;

- Lack of acknowledgement of recent economic downturns; and
- Not including fly-in-fly-out workers employed at industrial projects in the region in demographic information.

Glencore noted that, at the time of writing, existing conditions were described using publicly available information. The EAO followed up with Glencore on this concern and Glencore responded that 2011 Statistics Canada datasets were only publicly released in 2012 with Aboriginal profile information released in 2013. As this information was considered the most statistically accurate publicly available information at the time the Application was prepared, Glencore indicated that baseline socio-economic information would not be updated.

Glencore also indicated that while changes in baseline conditions could have occurred since 2011, these changes were unlikely to result in changes in residual or cumulative effect characterizations and significance determinations provided by Glencore. Glencore stated that project activities with the potential to affect socio-economic conditions remain unchanged and mitigation measures still apply. Glencore also highlighted data sources which included interviews with key informants and various reports.

In response to concerns regarding lack of acknowledgement of recent economic downturns, Glencore indicated that many of the closures occurred after the date of the Social and Economic Conditions Technical Data Report. In addition, the Application noted that the LAA communities have less diverse economies than in the province overall, which can have implications during slow down and ramp up periods of economic activities in the resource sector.

In their review of the EAO's draft referral materials, Northern Health highlighted the rapid fluctuations in food and housing costs currently being experienced in Chetwynd due to the influx of transient workers associated with several industrial developments, including (but not limited to) the High Pine Expansion Project, Jackfish Lake Pipeline Expansion Project, Wyndwood Pipeline Looping Project, and the reopening of the Brule, Wolverine and Willow Creek mines. Northern Health noted that these trends in increasing costs of living may continue with future projects such as the Spruce Ridge Pipeline Expansion Project, North Montney Mainline Project, and Coastal Gas Link Pipeline Project.

During their review of this report in 2022, Northern Health commented that the Application would not meet current practices and expectations as it does not incorporate traditional and local knowledge, a GBA+ lens, consideration of health inequities, and socio-economic determinants of health (beyond just income). Health outcomes, generally, are much lower in northeastern B.C. than in the rest of the province which has, in part, been linked to the significant income inequities and industrial pressures faced by northeast communities. For housing, a GBA+ analysis is vital to identify how this will impact certain groups inequitably. Experiences from other projects has shown that housing impacts from projects can have far reaching and significant social impacts, including, but not limited to, challenging health care staff recruitment, renovations, overcrowding and homelessness. Chetwynd produced a new strategic plan and recently completed a housing study which demonstrated significant impacts from shadow populations from industrial projects.

Northern Health requested that Glencore develop a technical memo which provides an updated

assessment that aligns with current approaches or commit to socio-economic effects management system, which includes: the establishment of a robust socio-economic baseline that incorporates GBA+ and Health Impact Assessment approaches, is facilitated and led by a qualified Health Impact Assessment practitioner, and looks to develop a strong understanding of the risks and associated mitigations that are needed to appropriately manage these risks.

To address these concerns, the EAO has proposed Condition 25: Community Effects Management Plan, that would require Glencore to monitor and address effects on infrastructure and services and community health resulting from the Sukunka workforce and activities. The EAO is of the view that this plan would help to offset some of the concerns related to the accuracy of the now dated baseline information by providing a mechanism to adaptively manage social and economic effects related to Sukunka. The adaptive management requirement means that Glencore would be required to develop additional measures to address social and economic effects of Sukunka if monitoring shows that these effects were not mitigated to the extent predicted in the Application or were not predicted at all.

#### 14.3.4 PROJECT DESIGN CHANGES

Glencore submitted the Application for review in August 2015. In February 2016, Glencore notified the EAO that Haul Options D and E, and Transmission Option 1 were being removed from the project description based on discussions held with landowners and feedback from the Working Group on the Application. Glencore stated that these project changes would result in the following updates to the Application's assessment:

- The removal of Haul Option D would reduce potential adverse effects associated with increased traffic along the Sukunka FSR and Highway 29, as assessed in community services and infrastructure and land and resource use, of the Application;
- The removal of Haul Option D and E would reduce potential adverse effects:
  - On recreation sites and other land uses along the Sukunka FSR and Highway 29;
  - At Viewpoints 1 (Natural Springs Golf Resort) and 2 (Brazen Bridge), as assessed in visual quality, of the Application; and
- The removal of Transmission Option 1 would not affect the conclusions of population and demographics, community health, land and resource use, visual quality or community services and infrastructure, of the Application.

The EAO's characterizations and conclusions below reflect these project design changes.

### 14.4 THE EAO'S CHARACTERIZATION OF RESIDUAL EFFECTS AND CUMULATIVE EFFECTS

The EAO's characterizations of the expected residual effects of Sukunka on social VCs are summarized below, as well as the EAO's levels of confidence in the effects determinations (including their likelihood and significance).

### 14.4.1 POPULATION AND DEMOGRAPHICS

Given the relatively small size of the construction workforce for Sukunka in relation to the local population and use of an on-site camp during construction and operations, the EAO is of the view that potential effects on net population and demographics distribution would be low. Furthermore, any potential effects related to changes in population and demographics are generally captured under the assessment of other social and economic VCs. The EAO, therefore, does not anticipate potential residual effects related to the population and demographics VC.

### 14.4.2 COMMUNITY SERVICES AND INFRASTRUCTURE

The EAO is of the view that Sukunka could result in adverse effects on community services in the LAA and RAA. These effects would be limited by the use on-site workforce accommodation and Glencore's provision of its own potable water, sewage treatment facility, fire-fighting services, medical services, and recreation amenities. Regardless of Glencore's mitigation commitments, the EAO anticipates some level of increased demand on community services and infrastructure in the LAA and RAA due to Sukunka. These changes to community services and infrastructure such as healthcare services are typically most acutely experienced by vulnerable populations.

The EAO has proposed the following conditions:

- Glencore would be required to develop a Community Effects Management Plan that would address potential effects on infrastructure and services, include mitigations measures related to access and the workforce, and support employment and training; and
- Glencore would be required to develop a Health and Medical Services Plan as per Northern Health's Health and Medical Services Plan Best Management Guide for Industrial Camps.

Although much of the transportation infrastructure is operating at or below capacity, project activities are likely to result in increased use along transportation corridors.

After considering all relevant proposed mitigation measures, the EAO concludes that Sukunka would result in the following residual adverse effects on community services and infrastructure:

- Adverse effects on housing availability and affordability;
- Increased demands for community and emergency services and infrastructure; and
- Increased traffic and pressure on transportation infrastructure, including air, rail and road corridors.

Summarized below is the EAO's characterization of the expected residual effects of Sukunka, as well as the EAO's level of confidence in the effects determination (including their likelihood and significance).

**Table 36: Summary of Residual Effects on Community Services and Infrastructure**

*Note: Criteria and assessment ratings are defined in [Appendix 4, Residual Effects Characterization Definitions](#)*

Criteria	Assessment Rating	Rationale
Context	<p><b>Housing:</b> Low to moderate</p> <p><b>Transportation:</b> Moderate to high</p> <p><b>Services and Infrastructure:</b> Low</p>	<p><b>Housing:</b> Housing availability in Chetwynd and Tumbler Ridge is relatively <b>low but likely able to meet</b> the increase in demand generated by Sukunka. Even so, the availability, affordability, and potentially quality of housing for other residents may be affected.</p> <p><b>Transportation:</b> The existing road, rail and airport infrastructure are <b>anticipated to have the capacity</b> to meet the increased demands related to Sukunka.</p> <p><b>Services and Infrastructure:</b> The Application notes that some local services (e.g., utilities and education services) would <b>have the capacity</b> to support an increase in demand, whereas health care services such as physicians per 100,000 population in the Northeast HSDA are <b>well below</b> the B.C. average. The information contained in the Application is also dated and does not capture the demand for services associated with fly-in-fly-out workers in the region. Therefore, the EAO conservatively concludes that there is a <b>low capacity</b> for existing community and emergency services and infrastructure to meet an increase in demand and a <b>low capacity</b> for health care services.</p>
Magnitude	<p><b>Housing:</b> Moderate</p> <p><b>Transportation:</b> Low</p> <p><b>Services and Infrastructure:</b> Moderate</p>	<p><b>Housing:</b> Glencore has also committed to the use of an on-site camp to house most workers during both construction and operations, which would help <b>limit potential effects</b> from Sukunka on housing availability and affordability. The housing market is anticipated to respond to the increased demand although <b>elevated housing costs may result</b>.</p> <p><b>Transportation:</b> Although transportation infrastructure is reported to be <b>operating below capacity</b>, an increase in demand for airports, railways and road corridors could still result in <b>increased congestion and travel times</b>.</p> <p><b>Services and Infrastructure:</b> Although the workforce is relatively small, Sukunka would lead to an increase in demand on those infrastructure and services that are already <b>operating over capacity</b> (largely due to the COVID-19 pandemic). The proposed condition to adaptively manage potential effects on infrastructure and services resulting from the workforce and activities of Sukunka would help to manage the magnitude of these effects.</p>
Extent	<p><b>Housing:</b> Local</p> <p><b>Transportation:</b> Local to</p>	<p><b>Housing:</b> Adverse effects on housing would be <b>experienced primarily in Chetwynd and Tumbler Ridge</b> where most of the in-migration related to Sukunka is anticipated to occur.</p>

	regional <b>Services and Infrastructure:</b> Local to regional	<b>Transportation:</b> Effects on roads would generally occur <b>locally</b> and effects on rails would occur regionally. Effects on airports would primarily occur <b>locally</b> but may extend to <b>regional communities</b> that also provide air transportation services (i.e., City of Fort St. John). <b>Services and Infrastructure:</b> Effects on community services and infrastructure would occur primarily in <b>local</b> communities but would also occur at a <b>regional</b> level due to emergency service providers that have jurisdictional boundaries that extend beyond community boundaries.
Duration	<b>Long-term</b>	Effects would occur during the construction of Sukunka, would likely persist <b>during operations</b> and could extend <b>into closure</b> until infrastructure and services have adapted to increased demand.
Reversibility	<b>Reversible</b>	The adverse effects to infrastructure and services would <b>lessen</b> once local and regional communities have adapted, however, housing costs <b>may remain higher</b> than current values.
Frequency	<b>Continuous</b>	Adverse effects would occur <b>continuously</b> .
Likelihood	The likelihood is <b>high</b> that some degree of adverse effects would occur to infrastructure and services.	
Significance Determination	Despite the long-term duration and continuous frequency of the potential residual effects on community services and infrastructure, the magnitude remains <b>low to moderate</b> . In consideration of this and the conditions identified in the TOC (which would become legally binding if an EAC is issued), the EAO is satisfied that Sukunka would <b>not</b> have significant adverse residual effects on community services and infrastructure.	
Confidence	There is a <b>moderate</b> level of confidence in the likelihood and significance determination as the baseline information and assessment is dated. However, the proposed conditions have been developed to address the existing gaps in the analysis.	

## CUMULATIVE EFFECTS

At the time the Application was submitted, Glencore identified eighteen future projects in Table 7.6-14 of the Application that may act cumulatively with Sukunka towards effects on community services and infrastructure. According to the Application, other projects that are either past or existing are already accounted for in the baseline conditions. The EAO notes that, since the Application was submitted, several other projects within the RAA have become operational (e.g. Brule Mine Project).

Residual effects of Sukunka on housing availability and affordability would likely overlap with the effects of the proposed projects because the related in-migrant population (including indirect and induced) is likely to reside in the same communities. Projects nearer to Chetwynd or Tumbler Ridge such as the expansion of the Wolverine Coal Mine or Horizon Mine Coal Project are expected to have the greatest overlap of

effects, particularly if the timelines for these projects are concurrent with Sukunka.

According to the Application, much of the transportation infrastructure in the community services and infrastructure RAA is operating well below capacity and at a high level of service, and is expected to be able to handle growth in demand for a number of years to come. Upgrades at key locations may be required over time, and the increase in tax base from the increased population would help with funding.

Residual effects related to community and emergency infrastructure and services are expected to overlap with effects of any of the future projects because the related in-migrant population is likely to use the services and infrastructure in the same RAA communities. The most notable overlap of effects is anticipated to occur in Chetwynd or Tumbler Ridge. Services such as health care and protective services may experience a period of lag time in being able to meet an increase in demand associated with permanent population in-migration, however, early communication and planning by Glencore and other project proponents is aimed at reducing the effects of such a gap.

While there is some uncertainty regarding the cumulative effects given the time that has elapsed since the Application was submitted, the EAO does not anticipate that Sukunka would contribute to significant adverse cumulative effects on community services and infrastructure due to the relatively small project workforce anticipated to relocate to Tumbler Ridge and Chetwynd, the use of an on-site camp to house most workers during both construction and operations, and the proposed conditions requiring a Community Effects Management Plan and a Health and Medical Services Plan.

### 14.4.3 COMMUNITY HEALTH

After considering all relevant proposed mitigation measures, the EAO concludes that Sukunka would result in a residual adverse effect on community health as it relates to changes in some of the social determinants of health presented in the Application (for example, exercise, smoking, drug and alcohol use, obesity). It is anticipated that low income and vulnerable populations would be most susceptible to changes in community health indicators due to Sukunka. Accordingly, and as identified previously, the EAO has proposed Condition 25: Community Effects Management Plan, that would require Glencore to adaptively manage potential community health effects should an EAC be issued. Summarized below is the EAO's characterization of the expected residual effects of Sukunka, as well as the EAO's level of confidence in the effects determination (including their likelihood and significance).

**Table 37: Summary of Residual Effects on Community Health**

*Note: Criteria and assessment ratings are defined in [Appendix 4, Residual Effects Characterization Definitions](#)*

Criteria	Assessment Rating	Rationale
Context	<b>Low to moderate resilience</b>	Many of the community health indicators exceed provincial rates (e.g., exercise, smoking, drug and alcohol use, obesity), which indicate an <b>increased sensitivity</b> to the effects of an increase in population from Sukunka or the sudden loss of employment in the event of a temporary or

		permanent closure. These project-related activities could <b>further contribute</b> to unhealthy behaviours.
Magnitude	<b>Low to moderate</b>	Given the relatively small workforce that would reside in the community health LAA and RAA, it is <b>not anticipated</b> that changes in the indicators of human health due to Sukunka would vary substantially from baseline conditions. Even so, reduced employment opportunities during temporary or permanent closures <b>may exacerbate</b> community health indicators beyond baseline conditions.
Extent	<b>Local to regional</b>	Adverse effects on community health would be felt primarily <b>in the community</b> health LAA but may extend into <b>transportation centres</b> in the community health RAA.
Duration	<b>Long-term</b>	Adverse effects on community health could commence <b>during project construction and persist throughout operations</b> . A change in community health is anticipated to occur beyond the closure of Sukunka due to adverse social effects related to job loss.
Reversibility	<b>Reversible to irreversible</b>	The adverse effects on community health are generally considered to be <b>reversible</b> although for some vulnerable populations may be <b>irreversible</b> .
Frequency	<b>Continuous</b>	The effects would occur <b>continuously</b> throughout all project phases.
Likelihood	<b>Low</b>	Given the relatively small size of the construction workforce for Sukunka compared with other mine projects in the area and in relation to the local population and use of an on-site camp during construction and operations, the likelihood is <b>low</b> that there would be residual effects to community health as a result of Sukunka.
Significance Determination	<b>Not significant</b>	Considering the low likelihood of the potential residual effect, as well as the conditions identified in the TOC (which would become legally binding if an EAC is issued), the EAO is satisfied that Sukunka would <b>not have significant adverse</b> residual effects on community health.
Confidence	<b>Moderate</b>	There is a <b>moderate</b> level of confidence in the analysis undertaken to support the conclusions given challenges in predicting potential effects on social determinants of health and health outcomes.

## CUMULATIVE EFFECTS

Eighteen future projects were identified in the Application that may act cumulatively with Sukunka towards a change in community health conditions. The Application assumes that past or existing projects are already accounted for in the baseline conditions.

Even without Sukunka, it is anticipated that project proponents, Northern Health and other health and social service providers would need to plan for and respond to potential community health issues as proposed projects and activities move forward. It is not anticipated that potential project effects would result in a highly distinguishable change in community health when compared to other projects with larger workforces; Sukunka's contribution to overall cumulative effects on community health would be limited given the relatively small workforce.

### 14.4.4 LAND AND RESOURCE USE

After considering all relevant proposed mitigation measures, the EAO concludes that Sukunka would result in the following residual adverse effects on land and resource use:

- Effects on tenured land uses; and
- Effects on non-tenured land uses including recreationists, hunters and anglers.

The EAO has proposed the following conditions to help to reduce the residual effects noted above:

- Condition 25: Community Effects Management Plan, which would require Glencore to establish communication and engagement processes with Indigenous groups, Northern Health and local governments to provide updates on Sukunka activities and provide a mechanism for addressing community concerns;
- Condition 13: Notification of Selected Options, that would require Glencore to provide a report detailing consultation with Indigenous Groups, existing tenure holders, permit holders, property owners, recreationalists and other land users potentially impacted by the transmission line routing options on the potential effects of the transmission line to those parties and the proposed mitigation measures; and
- Condition 24: Road Management Plan, that would require Glencore to include mitigations for access effects to non-tenured and tenured land users should an EAC be issued.

Summarized below is the EAO's characterization of the expected residual effects of Sukunka, as well as the EAO's level of confidence in the effects determination (including their likelihood and significance).

**Table 38: Summary of Residual Effects on Land and Resource Use**

*Note: Criteria and assessment ratings are defined in [Appendix 4, Residual Effects Characterization Definitions](#)*

Criteria	Assessment Rating	Rationale
Context	<b>Moderate</b>	Although Sukunka is located in an area associated with recreational use, industrial activities such as mining and mineral exploration, oil and gas, and forestry are not uncommon on the landscape.
Magnitude	<b>Tenured:</b> Low to moderate <b>Non-tenured:</b> Moderate	<b>Tenured:</b> Effects of Sukunka on tenured land uses such as oil and gas facilities, ALR, forestry and other industrial uses are mitigated to a <b>low magnitude</b> based on ongoing and generally routine negotiations between tenure holders and Glencore. Adverse effects on trappers and guide outfitters are more challenging to fully mitigate and, as such, a magnitude rating of <b>low to moderate</b> was conservatively assigned. <b>Non-tenured:</b> Project effects on recreationists, hunters and anglers are anticipated to be of a <b>moderate magnitude</b> due to both the direct change in access and the perceived effects on such land users such as a lessened experience. Although access to the three recreation sites identified in the Sukunka tenure area would be restricted throughout the life Sukunka, there are various other recreation areas in the LAA and RAA that would help in offsetting these effects.
Extent	<b>Tenured:</b> Local <b>Non-tenured:</b> Regional	<b>Tenured:</b> Adverse effects on tenured land use would generally occur in the <b>PDA</b> where direct effects related to ground disturbance are anticipated. Even so, the potential for effects related to access to tenured sites may extend into the <b>land and resource use LAA</b> . <b>Non-tenured:</b> Adverse effects on non-tenured land uses would largely be restricted to the <b>PDA and land and resource use LAA</b> ; however, effects may also extend into the <b>land and resource use RAA</b> due to access restrictions and the perception of reduced quality and subsequent avoidance of previously used areas.
Duration	<b>Long-term</b>	The effects on tenured and non-tenured land uses would begin during <b>construction and continue throughout operations and closure</b> until reclamation has occurred. If access to the Sukunka tenure area is deemed appropriate based on outcomes of inspection during closure and post closure under the requirements of the mine permit, Glencore will not restrict access.
Reversibility	<b>Reversible</b>	The effects would be <b>reversible</b> after the closure of Sukunka and reclamation of the site with the <b>potential exception of</b>

		the three recreation sites located in the Sukunka tenure area if they are not deemed safe to access post-closure.
Frequency	<b>Continuous</b>	Effects of Sukunka on tenured and non-tenured land and resource use are expected to occur <b>continuously</b> during construction and operations.
Likelihood	<b>High</b>	There is a <b>high</b> likelihood that potential residual effects on tenured and non-tenured land uses would occur.
Significance Determination	<b>Not significant</b>	Despite the long-term duration and continuous frequency of the potential residual effects on land and resource use, the magnitude remains <b>low to moderate</b> . In consideration of this and the conditions identified in the TOC (which would become legally binding if an EAC is issued), the EAO is satisfied that Sukunka would <b>not</b> have significant adverse residual effects on land and resource use.
Confidence	<b>High</b>	There is a <b>high</b> level of confidence in the likelihood and significance determination.

**CUMULATIVE EFFECTS**

The Application used the land and resource use LAA for the cumulative effects assessment, stating that the residual effects for land and resource use are limited to the LAA. Accordingly, only five other projects and activities were identified in Table 7.4-13 of the Application that may act cumulatively with Sukunka towards potential cumulative effects related to the land and resource use VC. Glencore concluded that due to the limited spatial extent of the potential residual effects along with the identified mitigation, Sukunka is not anticipated to contribute to residual effects from other projects and activities in a way that would result in cumulative effects of concern. Based on this conclusion, the Application did not carry out a detailed cumulative effects assessment related to tenured and non-tenured land uses.

The EAO disagreed with the use of the land and resource use LAA for the cumulative effects assessment. According to CEEA’s *Cumulative Effects Assessment Practitioner’s Guide*, the regional study area includes “the spatial area within which cumulative effects are assessed (that is, extending a distance from the project footprint in which both direct and indirect effects are anticipated to occur).” CEEA further notes that:

*Environmental Impact Assessments have traditionally involved defining more or less arbitrary boundaries around action sites that are often local and limited to the effects of the single action. Cumulative effects assessment, by definition, expands those spatial horizons... The implication of too small a boundary is that important regional and long-term effects may not be examined.*

Based on the above guidance, cumulative effects assessments should be completed at a regional level regardless of where the residual effects were determined to be experienced. Due to this feedback, Glencore submitted a memorandum entitled RAA Cumulative Effects Assessment for Land and Resource

Use<sup>93</sup>, which assessed cumulative effects at the land and resource use RAA.

According to the memorandum, there are 39 other projects or activities that are anticipated to act cumulatively with Sukunka on tenured and non-tenured land uses in the land and resource use RAA.

Sukunka intersects with less than 0.3 percent of the guide-outfitting and trapline tenure areas in the RAA and less than 0.4 percent of the Dawson Creek Timber Supply Area. Sukunka, however, after removal of the haul route options D & E does not overlap with ALR lands and so does not contribute to the cumulative effect on ALR tenured lands in the RAA.

Glencore noted (and EAO is in agreement) that the cumulative effects of Sukunka combined with existing and reasonably foreseeable projects in the RAA are not expected to affect the viability or sustainability of tenured or non-tenured land uses, and assessed cumulative effects as not significant.

#### 14.4.5 VISUAL QUALITY

The EAO has identified the following potential residual adverse effect of Sukunka on visual quality:

- Change in visual quality due to site clearing, infrastructure development and mining operations.

Summarized below is the EAO's characterization of the anticipated residual effect, as well as the EAO's level of confidence in the effects determination (including likelihood and significance).

**Table 39: Summary of Residual Effects on Visual Quality**

*Note: Criteria and assessment ratings are defined in [Appendix 4, Residual Effects Characterization Definitions](#)*

Criteria	Assessment Rating	Rationale
Context	<b>Low to moderate resilience</b>	Sukunka and surrounding area have been visually modified by past development and activities, but the level of modification is not yet overbearing and still affords views of visually intact landscapes. In general, the visual quality LAA was determined to have a <b>moderate to high</b> visual sensitivity with a <b>limited ability</b> to absorb human modifications.
Magnitude	<b>Moderate</b>	Two of the 11 viewpoints assessed in the Application, Chamberlain and Bullmoose Mountain, were determined to have <b>high visual sensitivity</b> and are anticipated to experience a <b>high visual effect</b> due to Sukunka. Both sites were ranked as having a viewpoint importance of high related to tourism and recreation. Two other viewpoints were determined to result in a <b>moderate visual effect</b> due to Sukunka, and the remaining seven viewpoints were

<sup>93</sup> Available at: <https://projects.eao.gov.bc.ca/api/document/58869003e036fb010576889a/fetch>

		determined to experience <b>very low to low</b> visual effect. Accordingly, the EAO is of the view that Sukunka would result in a <b>moderate visual change</b> from baseline conditions.
Extent	<b>Local</b>	The effects would be limited to the visual quality <b>LAA</b> .
Duration	<b>Long-term</b>	The effects would begin during <b>construction and continue throughout operations</b> and into decommissioning.
Reversibility	<b>Reversible to irreversible</b>	The EAO has characterized visual effects to be <b>reversible</b> following reclamation activities for the majority of mine infrastructure and <b>irreversible</b> for the pit, some water management facilities and the transmission line as they would likely remain permanent features on the landscape.
Frequency	<b>Continuous</b>	Effects of Sukunka would be <b>continuous</b> throughout construction and operations.
Likelihood	<b>High</b>	While there is a <b>high</b> likelihood of residual effects due to the nature of industrial development and infrastructure, visual quality is highly subjective and effects would be interpreted differently by individuals.
Significance Determination	<b>Not significant</b>	Given the local extent of the potential effects and moderate magnitude, as well as the conditions identified in the TOC (which would become legally binding if an EAC is issued), as well as the reclamation following decommissioning that would occur at the end of mine life, the EAO is satisfied that Sukunka would <b>not</b> have significant adverse residual effects on visual quality.
Confidence	<b>Moderate</b>	There is a <b>moderate</b> level of confidence in the analysis undertaken to support the conclusions given the likelihood of adverse residual effects and that visual quality may differ amongst viewers.

## CUMULATIVE EFFECTS

According to the Application, six other projects or activities are anticipated to act cumulatively within Sukunka's foreground and mid-ground viewsheds. The Application notes that past and present projects are limited in their visibility from assessed viewpoints and, with the exception of the past Bullmoose Mine and forest harvesting operations, these projects generally integrate with the baseline visual conditions in the visual quality LAA and become less visually prominent in the visual quality RAA. Reasonably foreseeable projects that are anticipated to interact with Sukunka include the Rocky Creek and Meikle Wind Energy projects. As these projects are expected to be sited at higher elevations, it is unlikely that the proposed wind turbines would integrate well with the adjacent landscape character and may be visible from viewpoints that are also affected by Sukunka.

Notably, land uses, including coal mining, and the management of visual quality, are guided by the Dawson Creek LRMP which recognizes the importance of mitigating development effects on visual quality, but also acknowledges the importance of resource development and general acceptance of coal development effects on visual quality. The EAO does not anticipate that Sukunka would contribute to significant adverse cumulative effects related to the visual quality VC in consideration of the reversibility of potential effects during reclamation of the Sukunka site.

## 14.5 CONCLUSIONS

Considering the above analyses and the conditions identified in the CPD and table of conditions (which would become legally binding in the event that an EAC is issued), the EAO is of the view that Sukunka would not have significant adverse effects on the social VCs.

## 15.0 ASSESSMENT OF EFFECTS TO ARCHAEOLOGICAL AND HERITAGE RESOURCES

### 15.1 BACKGROUND

Archaeological and heritage resources were selected as a VC because of their cultural and historical importance to Indigenous Groups and British Columbians and because these resources have the potential to be affected by Sukunka.

Glencore assessed the following potential effects on archaeological and heritage resources:

- Impacts on terrestrial archaeological or heritage sites (including historic sites); and
- Impacts on or destruction of culturally modified trees (CMTs).

According to the Archaeology Branch's site inventory, most archaeological sites recorded in the general vicinity of the project area are lithic scatters (stone tools, tool fragments, and debitage<sup>94</sup>). Glencore reported that CMTs are rare in northeast B.C., though known to be present in the general vicinity of Sukunka.

#### 15.1.1 REGULATORY CONTEXT

In B.C., archaeological, historic, and architectural sites on private or Crown land are protected under the *Heritage Conservation Act* (HCA) and are provincially regulated. Historic places may also be formally recognized and protected under the *Local Government Act* and regulated by local governments. Under the HCA, sites can be protected through designation or automatic protection. Sites automatically protected under the HCA include localities containing physical evidence of human use or activity predating 1846, burial places and aboriginal rock carvings or paintings. For example, CMTs would be protected if the modification predated 1846.

#### 15.1.2 STUDY AREA DESCRIPTION

Glencore's Local Assessment Area (LAA) for the archaeological and heritage resources effects assessment was determined to be the area of ground disturbance, including pre-construction site clearing for the Sukunka Project Development Area (PDA) and the associated infrastructure. The Regional Assessment Area (RAA) for the archaeological and heritage resources assessment is the same as the LAA (see [Figure 18](#)).

The temporal boundaries for the archaeological and heritage resource assessment include two years of construction, 22 years of operation, and a six-year closure period.

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<sup>94</sup> The detached pieces of rock discarded during the manufacture or maintenance of stone tools

## 15.2 POTENTIAL PROJECT EFFECTS AND PROPOSED MITIGATIONS IDENTIFIED IN THE APPLICATION

### 15.2.1 EXISTING CONDITIONS

Glencore conducted a preliminary archaeological review (PAR) for Sukunka which provided the framework for the subsequent archaeological impact assessment (AIA). The PAR included a review of previously recorded archaeological sites, using FOR Archaeology Branch's Remote Access to Archaeological Data application to determine the nature, location, and distribution of prehistoric and historical resources in the vicinity of Sukunka. Glencore completed a desktop review of existing historical, ethnographic, archaeological, and paleo-environment records and documents, including previous archaeological studies and data on historical and traditional sites and place names. Glencore reviewed three AIAs conducted by other proponents that overlap portions of the tenure area of Sukunka in the northwest, northeast and southeast. The Sukunka tenure area is located approximately 55 km south of Chetwynd and is bordered by the Sukunka River valley to the west, Skeeter Creek to the north, Chamberlain Creek to the southwest and West Bullmoose Creek to the southeast.

Glencore's desktop review identified three previously recorded sites, GhRk-1, GiRj-6, and GiRj-11 within the LAA, located along the haul route alternative options D and E proposed in the Application, north of Sukunka; however, haul route options D and E were later removed from the Application.

At the time Glencore was preparing the Application, Sauteau First Nations submitted a Knowledge and Use Study to Glencore. Glencore reviewed the study for information that was relevant to the area of disturbance proposed for Sukunka. During the Application Review period, McLeod Lake Indian Band provided additional traditional use information to Glencore. To date, other Indigenous Groups (listed on Schedule B and C of Section 11 Order) participating in the EA have not provided any traditional knowledge information related to archaeological and heritage resources in the project area. An overview of publicly available traditional knowledge and traditional land use information is discussed in Chapter 12 of the Application.

AIA field work occurred in 2012-13 within the Sukunka tenure area. The field work focused on the northwest portion of the Sukunka tenure area (which includes the PDA) and the associated haul route options, which altogether comprise a total area of 10,154.82 ha. Field crews consisted of professional archaeologists and representatives from Indigenous Groups, including members from Doig River First Nation, Halfway River First Nation, McLeod Lake Indian Band, Sauteau First Nations, and West Moberly First Nations. As a result of the field work and desktop review, portions of the PDA were considered to have high archaeological potential, where subsurface testing was completed.

The field work included 659 shovel tests conducted in 30 areas of high archaeological potential within the PDA. As a result of the shovel testing program, two previously unrecorded archaeological sites were identified in the LAA. Shovel testing at a location approximately 1 km south of Skeeter Creek resulted in the recording of an archaeological site: 31 shovel tests were completed with one shovel test yielding a single quartzite flake.

Shovel testing at a location approximately 50 m north of Skeeter Creek resulted in the recording of an additional archaeological site: 144 shovel tests were completed with 16 shovel tests yielded 234 lithic artifacts and two nodules of ochre (a red pigment frequently used in pictographs or rock art). This site was recorded as a moderately significant lithic scatter.

No historic sites or CMTs were identified during the AIA field work in the LAA.

### 15.2.2 POTENTIAL PROJECT EFFECTS

The Application identified the following potential effects on archaeological and heritage resources due to project-related activities:

- Alteration or removal of archaeological and heritage sites; and
- Damage to or removal of CMT sites.

#### ALTERATION OR REMOVAL OF ARCHAEOLOGICAL AND HERITAGE SITES

For the two archaeological sites found in the LAA, both are located outside the PDA and would be avoided through project design. However, there is a possibility that additional sites would be found in the LAA during construction. There would be a potential to affect archaeological and heritage sites during project-related construction activities. Decommissioning related activities such as the removal of site infrastructure which would involve disturbance or displacement of soils and sediments could also affect archaeological and heritage sites.

#### DAMAGE TO OR REMOVAL OF CMT SITES

Even though no CMTs were identified during the archaeological assessment, Glencore assumed that there could be a possibility that CMTs could be found during subsequent archeological field work. There would be the potential for CMTs to be damaged or removed during site preparation and ground disturbance activities such as clearing and grubbing, and site grading.

CMTs that pre-date 1846 cannot be removed or otherwise altered, except under the authority of an alteration permit issued pursuant to HCA Section 12.

### 15.2.3 MITIGATION MEASURES

For archaeological and heritage sites identified in the LAA which have the potential to be affected by project-related activities, and additional archaeological and heritage sites that may be discovered in the LAA during construction, Glencore proposes the following mitigation measures:

- Avoidance of sites through project redesign to ensure compliance with the HCA; and
- Where sites cannot be avoided, complete a systematic data recovery program for archaeological sites under the authority of a HCA Section 12 alteration permit issued by the Archaeology Branch, including:
  - Complete or partial systematic surface collection, excavation, or both;

- Comparative analysis and interpretation of content and contextual information; and
- Archaeological monitoring during construction activities to standards defined by FOR; and
- Production of a final alteration permit report for submission to FOR.

Glencore would prepare a Preliminary Management Plan and Chance Find Protocol for the Protection of Archaeological and Heritage Sites which would include detailed procedures to protect known archaeological and heritage sites, and a notification and communication plan if undetected archaeological or heritage resource are discovered during any phase of the Sukunka project development. The Chance Find Protocol document would be provided to construction supervisors, in the absence of an onsite archaeologist. A CFP provides individuals conducting ground disturbance activities with descriptive information on site types commonly found in the project area, and a protocol to identify them and to help avoid their unforeseen disturbance. The Chance Find Protocol also would include steps to take to contact an archaeologist for any advice, as necessary.

In the event that unrecorded CMTs were encountered in the LAA, Glencore would cease work affecting these features until the trees were properly assessed by a professional archaeologist. Also, measures proposed by Glencore to mitigate effects to archaeological and heritage sites in the section above would apply to CMTs. However, where Sukunka could not be redesigned to avoid impacts to CMTs, mitigation measures would focus on recording identified CMTs completely and systematically. This would involve the following activities conducted under the authority of a HCA Section 12 alteration permit:

- Where necessary, Level II recording as outlined in the CMT Handbook (Archaeology Branch 2001), including the direct dating of CMTs by stem-round sampling; and
- Monitoring of CMT removal by a crew comprised of a professional archaeologist and a local Aboriginal representative.

### **15.3 POTENTIAL PROJECT EFFECTS AND PROPOSED MITIGATIONS IDENTIFIED DURING APPLICATION REVIEW**

No additional issues related to archaeological and heritage resources were identified by the EAO, Indigenous Groups, Working Group members, or the public during the Application Review phase. No additional mitigation measures were required during Application review.

### **15.4 THE EAO'S CHARACTERIZATION OF RESIDUAL EFFECTS**

Given the low presence of CMTs and archaeological and heritage sites in the area, their limited interaction with construction and decommissioning activities, and the mitigation measures identified in the Application, the EAO does not anticipate residual effects on archeological and heritage resources. Therefore, the EAO did not characterize residual effects for archaeological and heritage resources.

- The EAO proposes Condition 14: Construction Environmental Management Plan, which must include chance find procedures to mitigate the potential to encounter unrecorded archaeological or heritage sites during construction activities outside of the mine site boundary.

## **15.5 CUMULATIVE EFFECTS ASSESSMENT**

No residual effects are predicted to occur to archaeological or heritage resources; therefore, a cumulative effects assessment was not completed.

## **15.6 CONCLUSIONS**

Considering the above analysis and having regard to the conditions identified in the CPD and TOC (which would become legally binding if an EAC is issued), the EAO is of the view that Sukunka would not have significant residual effects on archaeological and heritage resources.

## 16.0 ASSESSMENT OF EFFECTS TO HUMAN HEALTH

### 16.1 BACKGROUND

Human health was selected as a VC because of its importance to Indigenous Groups and the general public. Open pit mining, handling, and transport of coal, as well as the management of associated waste rock and water affected by mining would generate noise and release chemicals into the air, soil and water. Vegetation and animals could absorb and consume these chemicals, resulting in contamination of country foods. Human health in the region could be affected through exposure to noise and inhalation and consumption of chemicals through water, country foods, incidental ingestion of soil and dermal contact with soil.

The assessment of potential effects to human health incorporates information from the assessments of project effects to:

- Fish and Fish Habitat ([Section 5](#));
- Water Quality and Aquatic Biota ([Section 6](#));
- Wildlife ([Section 7](#)); and
- Air Quality ([Section 11](#)).

Social inputs to health are assessed through Community Health ([Section 14.4.3](#)).

In this section, noise impacts and risks to human health from the consumption of potentially contaminated country foods and water, incidental ingestion of soil, and dermal contact with soil are described. Impacts to Indigenous Groups' health are also discussed specifically in [Section 17](#) (CEAA 2012), which includes a summary of environmental effects from Sukunka on Indigenous Groups, and in Part C, which includes a discussion of impacts of Sukunka on Aboriginal Interests.

#### 16.1.1 REGULATORY CONTEXT

In British Columbia, public health is the responsibility of the B.C. Ministry of Health and the five regional health authorities in accordance with the *Public Health Act*, as well as the Provincial Health Services Authority and First Nations Health Authority. The provincial permitting requirements below relate to human health.

- *Mines Act*: Several regulatory requirements relate to the health of workers at the mine site. Glencore would require a Mine Plan and Reclamation Plan as part of the *Mines Act* (MA) permitting process for Sukunka. This permit could include provisions relating to occupational health. Additionally, requirements in the Health, Safety and Reclamation Code for Mines in B.C. protect employees and the public from risks arising out of or in connection with activities at mines;
- *Public Health Act*: Under the *Public Health Act*, Glencore would require a Health Operating Permit for the camp, which is required for all food service establishments in B.C. Also applicable under the *Public Health Act* there is the Industrial Camps Regulation, the Food Premises Regulation, the

Sewerage System Regulation and potentially others (e.g. Reporting Information Affecting Public Health Regulation), including potential provincial and regional public health orders related to Covid-19; and

- *Drinking Water Protection Act*: Glencore would also require a Construction Permit and an Operating Permit under the *Drinking Water Protection Act* if groundwater was used as water source for the camp. Permitting requirements relating to the environmental protection of air and water quality, described in [Sections 11](#) and [6](#), would also protect the health of workers and users or residents of the area indirectly.

Federally, Health Canada's expertise related to human health includes air quality effects, contamination of country foods, drinking and recreational water quality, noise, and human health risk assessment. Glencore's Human Health and Ecological Risk Assessment (HHERA) followed guidance frameworks published by Health Canada, the B.C. Ministry of Environment and Climate Change Strategy, and Canadian Council of Ministers of the Environment (CCME), as follows:

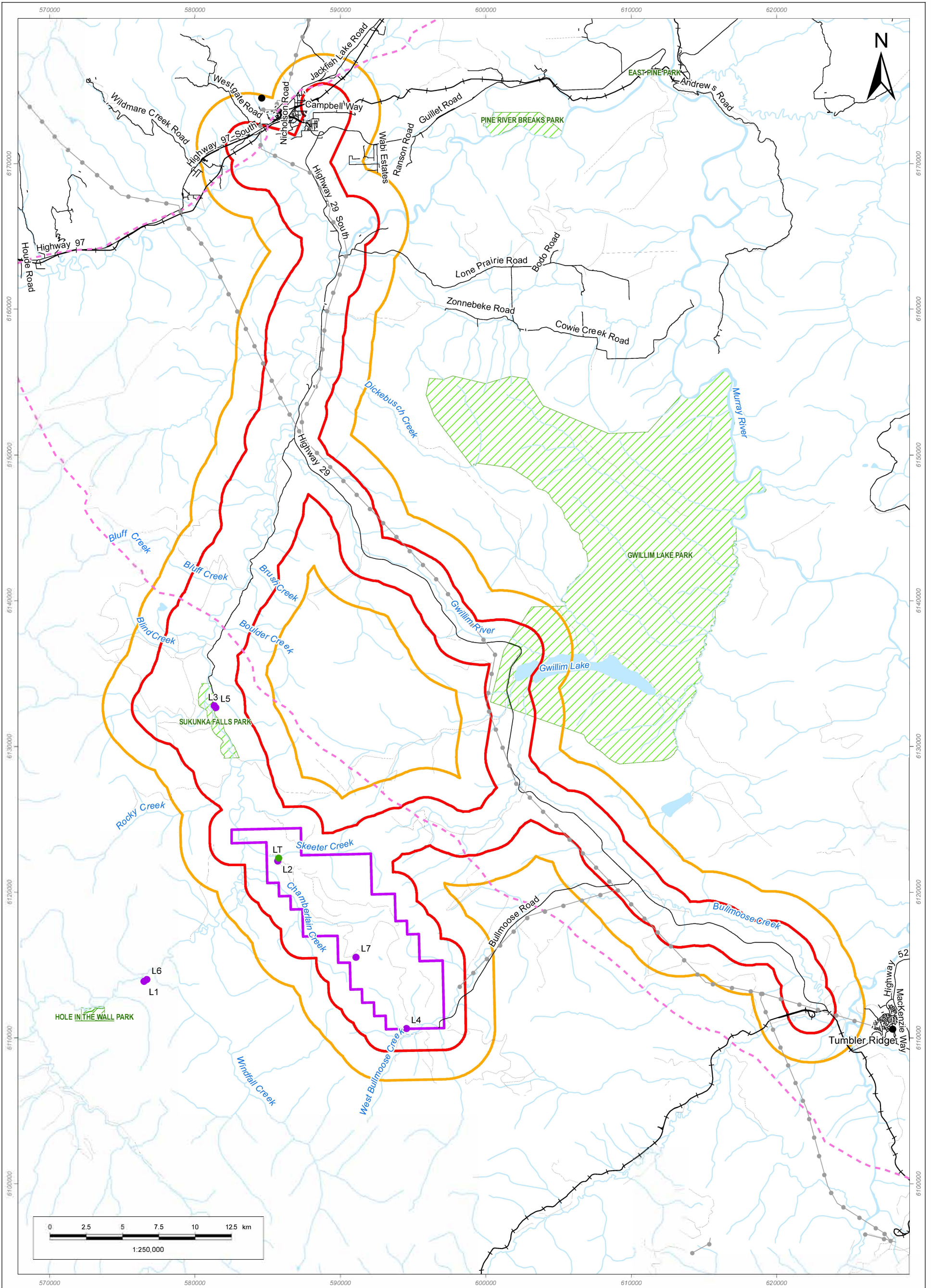
- Federal Contaminated Sites Risk Assessment in Canada, Part I: Guidance on Human Health Risk Preliminary Quantitative Risk Assessment, Version 2.0, Health Canada, 2012;
- Federal Contaminated Sites Risk Assessment in Canada, Part II: Health Canada Toxicological Reference Values and Chemical-Specific Factors, Version 2.0, 2010;
- Federal Contaminated Sites Risk Assessment in Canada, Part V: Guidance on Human Health Detailed Quantitative Risk Assessment for Chemicals, Health Canada, 2010;
- Federal Contaminated Site Risk Assessment in Canada: Supplemental Guidance on Human Health Risk Assessment of Air Quality, Version 2, Health Canada, 2017;
- Protocol 1, Recommended Guidance and Checklist for Tier 1 Ecological Risk Assessment of Contaminated Sites in British Columbia, BC Ministry of Environment Lands and Parks, 1998;
- Tier 1 Ecological Risk Assessment Policy Decision Summary, BC Ministry of Environment Lands and Parks; and
- A Framework for Ecological Risk Assessment, CCME, 1996.

In April 2021, while the Sukunka EA process was suspended, the Ministry of Health released the *B.C. Guidance for Prospective Human Health Risk Assessment* (updated in April 2022). This guidance reflects the current leading practices for human health risk assessment (HHRA) in B.C., including but not limited to a full multimedia risk assessment for camp receptors, a full HHRA for all contaminants of potential concern that are elevated at baseline, and an accidental release assessment.

## 16.1.2 STUDY AREA DESCRIPTION

The local assessment area (LAA) and regional assessment area (RAA) for the human health assessment for chemical exposures are based on the spatial boundaries defined in the air quality assessment ([Figure 16](#)), which encompass the potential changes to the environment relevant to health effects including air emissions and discharges to water. The LAA and RAA for noise is provided in [Figure 21](#).

Figure 21: Study Areas for the Noise Assessment



<b>Legend</b> <ul style="list-style-type: none"> <li>● City / Town / Village</li> <li>— Railway</li> <li>— Road</li> <li>— Watercourse</li> <li>● Short-term Measurement Location</li> <li>● Long-term Measurement Location</li> <li>Regional Assessment Area</li> <li>Local Assessment Area</li> <li>Sukunka Project Tenure Area</li> <li>Provincial Park</li> </ul>	<b>SUKUNKA COAL MINE PROJECT</b> <b>NOISE MONITORING LOCATIONS WITHIN THE LOCAL AND REGION STUDY AREAS</b>		PREPARED BY: 
	PROJECT DESCRIPTION <i>Data Sources:</i> Glencore, Province of British Columbia, Government of Canada <i>Disclaimer:</i> Although there is no reason to believe that there are any errors associated with the data used to generate this product or in the product itself, users of these data are advised that errors in the data may be present. <i>File Path:</i> fig_10482_pd_02_01-01_noise_local_and_regional_study_areas		PREPARED FOR: 
DATE: 15-JAN-14 FIGURE ID: 123110482	PROJECTION: UTM 10 DATUM: NAD 83	DRAWN BY: D. COOK CHECKED BY: E. TO	

## 16.2 POTENTIAL PROJECT EFFECTS AND PROPOSED MITIGATIONS IDENTIFIED IN THE APPLICATION

### 16.2.1 OVERVIEW OF METHODS

Glencore conducted a HHERA to assess the potential short- and long-term health impacts for humans and wildlife from exposure to chemical emissions from Sukunka. Results from the Ecological Risk Assessment are discussed in [Section 7](#) on wildlife. Glencore did not assess the risks to the health of workers on the job in the HHERA because occupational exposure is addressed through the WorkSafe B.C. Occupational Health and Safety Regulations, the *Health, Safety and Reclamation Code for Mines* in B.C., and Glencore's Occupational Health and Safety Plan, which is a MA permit application requirement.

Glencore assessed the potential effects of direct and indirect human exposure to the following chemicals of potential concern (COPCs) in the HHERA:

- Criteria air contaminants (CACs): sulfur dioxide (SO<sub>2</sub>), nitrogen dioxide (NO<sub>2</sub>), carbon monoxide (CO), particulate matter with a diameter less than 2.5 micrometres (PM<sub>2.5</sub>), and particulate matter with a diameter less than 10 micrometres (PM<sub>10</sub>); and
- Metals: antimony, arsenic, barium, cadmium, chromium, cobalt, copper, lead, manganese, mercury, nickel, selenium, uranium, and zinc.

The exposure routes considered were:

- Inhalation (CACs and metals within coal dust);
- Consumption of country foods (metals); and
- Incidental ingestion of soil and dermal contact with soil (metals).

The HHERA considered impacts to “human receptors”. A human receptor is a hypothetical person, inclusive of all life stages (that is, infant, toddler, child, adolescent, and adult) who potentially is exposed to a COPC while in the RAA. General physical and behavioural characteristics specific to the receptor (for example, body weight, breathing rate, food consumption rate) are used to estimate the level of COPC exposure (i.e. dose) received by each receptor. The HHERA included receptors with the greatest potential for exposure to COPCs, and those who have the greatest sensitivity, or potential for developing adverse health effects from these exposures. Glencore assessed COPC exposure to human receptors at 12 locations in the RAA, including three permanent (year-round) residences, three provincial parks and a spot along the fence line of the project. For the purposes of the HHERA, an Indigenous toddler who consumes country foods was considered to represent the most sensitive group of people for risks from non-carcinogens. Similarly, an Indigenous person who consumes country foods and is exposed to carcinogens over their entire lifetime was considered to represent the most sensitive group of people for risks from carcinogens.

Baseline sampling was conducted for soil, vegetation, air, surface water, sediment, and fish. Baseline

concentrations in wild meat (moose) were modelled based on assumptions about the amount of COPCs a moose ingests and absorbs from the environment. Future concentrations in media were estimated based on the results of predictive modelling. Glencore compared baseline and future predicted concentrations of COPCs to applicable health-based thresholds. Glencore predicted that emissions released during Construction, Closure and Post-closure activities would be less than those released during the Operation phase, thus Glencore only predicted health effects during Operations.

Glencore did not undertake a detailed assessment of exposure to COPCs from receptors drinking surface and ground water because it did not identify any year-round users of surface or groundwater in the area predicted to be affected by Sukunka. Glencore screened predicted maximum concentrations of COPCs in surface water against drinking water guidelines as an additional precautionary step.

Glencore also assessed effects of noise from Sukunka due to its implications for human health. Glencore measured baseline ambient levels and predicted future noise from Operations activities.

Baseline conditions, project interactions and potential effects, as well as proposed mitigation measures are described in the subsections below.

## 16.2.2 EXISTING CONDITIONS

The RAA is sparsely populated and rural; however, the area supports a variety of land uses, including hunting, fishing, trapping, camping, all-terrain vehicle and snowmobile use, commercial forestry, wind energy, mining and oil and gas development. The Districts of Chetwynd (located 55 km north of Sukunka) and Tumbler Ridge (located 40 km east of Sukunka) are the closest communities to Sukunka. Residences and agricultural lands, including active grazing tenures, are located in the Sukunka Valley along the Sukunka Forest Service Road and Highway 29.

Glencore assumed the baseline risk associated with the inhalation of airborne dust containing metals was zero based on baseline sampling that showed metals levels in dustfall were low or below detection levels.

Glencore did not expect risks from the inhalation of non-threshold CACs under the baseline scenario because the levels of CACs in air would be below air quality objectives ([Table 40](#)). Glencore estimated that consumption of COPCs in country foods by Indigenous toddlers (the most sensitive age group) could currently be resulting in hazard quotients (HQ) that exceed the Health Canada benchmark of 0.2<sup>95</sup>. Glencore indicated that fish, which exceeds the benchmark due to the presence of naturally-elevated levels of metals in fish in the Sukunka River, contribute most of the HQ associated with the consumption of

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<sup>95</sup> The hazard quotient (HQ) is the ratio of the estimated daily intake of a contaminant to the toxicity reference value. Toxicity reference values are specific thresholds for each contaminant, developed by Health Canada and other international health organizations. HQs over 1.0 indicate that the exposure to that contaminant is greater than the toxicity reference value (threshold level). For non-carcinogenic contaminants, Health Canada suggests that an HQ of less than 0.2 indicates that the exposure does not pose a significant health risk to human receptors. An HQ of 0.2 is used (instead of 1.0) because people could be exposed to additional intake of contaminants through food and retail products in other locations or environments or through other pathways not assessed in the HHERA. According to Health Canada, predicted health risks higher than the benchmark of 0.2 does not necessarily indicate a health problem, but rather indicates the need for further investigation.

country foods.

Ambient noise levels in the area of Sukunka are generally low and typical of remote and quiet rural environments. General observations and recordings indicated that noise originates from mostly natural sources (for example, birds and wind). Noise from distant traffic and Sukunka Falls is audible in some parts of the RAA.

## 16.2.3 POTENTIAL PROJECT EFFECTS

### 16.2.3.1 CRITERIA AIR CONTAMINANTS

Baseline and predicted Operations concentrations of CACs are provided in [Table 40](#) for Residence 3 and the Maximum Point of Impingement (MPOI). The MPOI is the location with the highest predicted ground-level concentration for a particular chemical determined using air dispersion modelling at the fence line of the project tenure area. Residence 3 is the receptor location known to be used by people and is located near the junction of the Sukunka Forest Service Road and Highway 29, approximately 20 km from the northern Project boundary.

Glencore predicted all CACs would remain below air quality objectives during Operations except for SO<sub>2</sub> (1-hour), PM<sub>2.5</sub> (24-hour and annual) and PM<sub>10</sub> (24-hour) at the MPOI. No exceedances were predicted at Residence 3. Glencore's assessment was that human receptors are not expected to be present at the MPOI locations and therefore Glencore did not predict health risks to result from these exceedances; Glencore was of the view that potential health risks should be evaluated for locations where people currently reside and camp, as these are the locations where exposure may occur.

**Table 40: Baseline and predicted operations concentrations (MPOI and Residence 3 of Criteria Air Contaminants). Values in bold denote threshold exceedances**

CRITERIA AIR CONTAMINANT (CAC)	AVERAGING PERIOD	AIR QUALITY OBJECTIVE (µg/m <sup>3</sup> )	BASELINE (µg/m <sup>3</sup> )	OPERATIONS RESIDENCE 3 (µg/m <sup>3</sup> )	MPOI <sup>a</sup> (µg/m <sup>3</sup> )
SO <sub>2</sub>	1-hour	183 <sup>b</sup>	3.3	7.2	<b>194.8</b>
	Annual	13 <sup>b</sup>	3.1	3.7	8.2
NO <sub>2</sub> <sup>d</sup>	1-hour	113 <sup>b</sup>	31.4	40.9	78.9
	Annual	32 <sup>b</sup>	6.5	6.6	29.4
CO	1-hour	14,300 <sup>e</sup>	757	809	2311
	8-hour	5,500 <sup>e</sup>	648	661	983
PM <sub>2.5</sub>	24-hour	25 <sup>c</sup>	12.7	13.4	<b>38.2</b>
	Annual	8 <sup>c</sup>	3.3	3.3	<b>12.1</b>
PM <sub>10</sub>	24-hour	50 <sup>c</sup>	19.7	23.3	<b>335.6</b>

**NOTES:**  
**BOLD** represents exceedance of air quality objective or standard.  
a. 95% Upper confidence limit of the mean  
b. CAAQS, 2020  
c. [B.C. Air Quality Objective \(B.C. AQO\)](#)  
d. Value calculated using the ARM correction for conversion of NO<sub>x</sub> to NO<sub>2</sub>.  
e. BC Pollution Control Objective for PCOs for Food-processing, Agriculturally Orientated, and Other Misc. Industries

### 16.2.3.2 METALS

Glencore assessed human health risks from metals in drinking water, air, country foods, and soil (dermal contact and ingestion). Country foods were assumed to consist of wild meat (moose), vegetation (90 percent berries and 10 percent leafy plants) and fish (rainbow trout fillet).

Glencore indicated that drinking water affected by Sukunka would not pose a risk to human health because predicted concentrations were below the Guidelines for Canadian Drinking Water Quality.

Glencore predicted that exposure from metals in coal dust (inhalation), as well as metals in soil (dermal contact and inhalation) would remain below guidelines under all scenarios considered. Glencore predicted exposure from country foods would result in HQs that exceed the Health Canada benchmark of 0.2 for both the baseline and future cases for non-carcinogenic health risks for nine metals: arsenic, cadmium, chromium, cobalt, lead, manganese, mercury, nickel, and selenium ([Table 41](#)). However, for all of these metals, except for mercury, Glencore predicts there to be a difference of less than one percent between the base case and future cases. Glencore noted that incremental increase in lifetime cancer risk associated with a lifetime exposure to arsenic in country foods is higher than the benchmark for both baseline and future case exposures, but the benchmark did not increase between the baseline and future cases. The HQ for mercury is predicted to increase by 73 percent from baseline to the future case, which is attributable to the predicted consumption of fish contaminated with mercury. Glencore predicted that the maximum predicted future case concentration in fish tissue for mercury meets Canadian standards and guidelines and considered it unlikely to result in adverse health effects.

Under both the baseline and future case, Glencore predicted that the increase in lifetime cancer risk associated with a lifetime exposure to arsenic in country foods is 6.57 out of 100,000 people. This means that 6.57 out of 100,000 people could be expected to develop cancer as a result of this exposure. This risk exceeds the Health Canada Incremental Lifetime Cancer Risk (ILCR) risk benchmark of 1 in 100,000. However, Sukunka would not be expected to contribute additional risk, as the risk under baseline conditions and the predicted risk with Sukunka are the same.

**Table 41: Non-carcinogenic human health risks to toddlers associated with exposure to metals in country foods.**

Metal	HAZARD QUOTIENT	
	Baseline	Future
Antimony	0.0252	0.0306
Arsenic (non-cancer)	<b>0.218</b>	<b>0.218</b>
Barium	0.0725	0.0725
Cadmium	<b>0.324</b>	<b>0.325</b>
Chromium	<b>0.324</b>	<b>0.337</b>
Cobalt	<b>0.337</b>	<b>0.337</b>
Copper	0.0394	0.0394
Lead	<b>0.215</b>	<b>0.215</b>
Manganese	<b>0.623</b>	<b>0.623</b>
Mercury	<b>0.252</b>	<b>0.436</b>
Nickel	<b>0.318</b>	<b>0.318</b>

Selenium	<b>0.307</b>	<b>0.310</b>
Uranium	0.00886	0.00897
Zinc	0.0951	0.0951
<b>BOLD</b> represents hazard quotients greater than 0.2.		

### 16.2.3.3 NOISE

Glencore estimated that the highest predicted Operations noise levels from Sukunka along the LAA boundary would be 42.1 dBA equivalent continuous sound level ( $L_{eq}$ ) during both day and night. The haul trucks travelling between Pit 1 and waste rock stockpiles are the major noise contributors at the highest prediction point along the LAA boundary (northeast corner). This value is less than the British Columbia Oil and Gas Commission Noise Control Best Practices 2009 Guideline (B.C. OGC Guideline) permissible sound level of 50 dBA  $L_{eq}$  but exceeds the nighttime limit of 40 dBA  $L_{eq}$ . Glencore indicated that this is not a large exceedance and that no permanent dwellings or residences are identified within the acoustic environment LAA boundary. Glencore predicted that noise associated with project activities would be within 30 dBA at night and 35 dBA during the day at all human health receptor locations identified in the assessment. Glencore indicated that this is within the acceptable daytime and nighttime baseline levels as per the B.C. OGC guideline.

Glencore indicated noise associated with site construction is exempt from meeting the requirements of the B.C. OGC guideline; therefore, it did not assess noise during Construction.

Glencore did not provide information regarding potential noise effects at the camp that would house Sukunka workers during Construction and Operations. Although the location is not yet finalized, the worker camp would be located either 4.8 km (Option 1) or 13.7 km (Option 2) east of the northeast boundary of the project tenure area. Both of these options are along the proposed haul route within the noise LAA boundary; therefore, the noise levels at the camp would be expected to be similar or higher than the value reported above (42.1 dBA  $L_{eq}$ ), depending on how far the camp is from the LAA boundary.

### 16.2.4 MITIGATION MEASURES

Glencore's key mitigation measures include operational design mitigation measures to reduce the pathways for impacting human health:

#### COPCs

- Measures to reduce coal dust and other air emissions, such as an idling reduction policy and dust suppression (see [Section 6.2.3](#) for further details); and
- Measures to control discharges to water from Sukunka through collection and treatment of surplus mine contact water before discharge to the environment (see [Section 6.2.3](#) for further details).

#### NOISE

- Installing mufflers on construction equipment and keeping equipment in good working condition;

and

- Installing louvers, vent hoods and silencers to reduce noise coming out of the processing plant.

### 16.3 POTENTIAL PROJECT EFFECTS AND PROPOSED MITIGATIONS IDENTIFIED DURING APPLICATION REVIEW

In February 2016, Glencore notified the EAO that it had made the decision to remove haul routes D and E, and Transmission Line Option 1 from Sukunka based on Glencore's discussions with landholders and feedback from the Working Group on the Application. The predicted health effects associated with haul routes D and E are not described in this report because of the decision to remove them; however, Glencore noted that the removal of these haul routes reduces potential adverse effects associated with inhalation exposures to PM<sub>10</sub> at Sukunka Falls Park and Residence 3. Glencore noted that the removal of Transmission Line Option 1 would not alter the conclusions of the assessment of human health. As a result of removing these options from Sukunka, Glencore did not identify any changes to the significance conclusions set out in the Application.

During Application Review, the EAO received comments from Health Canada, Northern Health, the Ministry of Environment and Climate Change Strategy (ENV), Northern Health, the McLeod Lake Indian Band, Saulteau First Nations, West Moberly First Nations, and Doig River First Nations. The Indigenous Groups above collectively submitted comments as part of a First Nations Independent Technical Review (FNITR). In addition, West Moberly First Nations and Doig River First Nation submitted individual comments. The following key human health issues were raised:

- Potential effects from increased Polycyclic aromatic hydrocarbon exposure;
- The way that increased metal exposure was assessed;
- Increased health risks from mercury;
- The selection of human health receptors for air quality and human health effects;
- Potential future exceedances of air quality objectives related to PM<sub>10</sub>, PM<sub>2.5</sub>, and dustfall;
- Potential effects from increased noise;
- Potential discrepancies in the proposed Human Health Monitoring and Management Plan certificate condition; and
- Indigenous Groups involvement in monitoring.

#### 16.3.1 POLYCYCLIC AROMATIC HYDROCARBONS

Health Canada recommended assessing the potential effects of polycyclic aromatic hydrocarbons (PAHs) in the HHERA, which are toxic substances found in coal and diesel particulates. Indigenous Groups also expressed concerns about this issue. Exposure to PAHs can occur through sediment, air, drinking water and country foods. In response, Glencore indicated that it did not assess the potential risk from PAHs in coal dust because it considered the risk negligible based on its research. Glencore noted literature suggesting that PAHs from coal are not generally bioavailable (that is, not readily absorbed by living organisms) in various environmental media and absorption through direct contact with skin is limited. A

difference of views remained between Glencore and Health Canada during the EA.

Given the difference of professional opinion regarding the bioavailability of PAHs, Indigenous Groups' concerns, the fact that several other recent mine environmental assessments in Canada have included an analysis of PAHs, the potential carcinogenic risks of being exposed to PAHs, and the recommendation from Health Canada, the EAO has proposed Condition 28: Human Health Monitoring and Management Plan that would include monitoring of PAHs in soil, water, and air. If levels of PAHs observed in environmental media are found to exceed a pre-defined trigger, Glencore would also be required to update the human health risk assessment to evaluate the health risk associated with PAH releases from Sukunka and implement additional mitigation measures.

### 16.3.2 METALS

Health Canada, Northern Health and FNITR raised concerns with the way Glencore assessed the risks from metals to human health, which have been summarized below.

#### *Exposure from Multiple Pathways*

Working Group members raised concerns that Glencore had not calculated overall health risk from multiple exposure pathways. In response, Glencore indicated that it assessed inhalation exposures separately from the direct contact exposures (incidental soil ingestion, dermal contact, drinking water consumption, fish consumption and country food consumption) because the toxicity reference values that are used to assess the potential human health risks associated with inhalation exposures are based on different toxicological end-points than the direct contact exposures and there is no toxicological basis for summing inhalation and direct contact exposures when estimating risks. The direct contact exposures were evaluated individually in the Application, which is consistent with Health Canada's application of a hazard acceptability benchmark of 0.2 per environmental medium. The results showed negligible increases in exposures and that the associated health risks between baseline case and future case conditions were below the Health Canada benchmark of 0.2.

Glencore provided updated calculations showing that when direct contact exposures were summed for Baseline Case and Future Case conditions, the hazard indices for the combined direct contact exposures were below the Health Canada hazard acceptability benchmark of 0.2 for most of the contaminants of concern. Where the hazard indices were above 0.2 (arsenic, cadmium, chromium, cobalt, lead, manganese, mercury, nickel, and selenium), these risks were above 0.2 under both Baseline Case and Future Case conditions and the increase in the hazard index between Baseline Case and Future Case exposures was less than one percent.

#### *Drinking Water*

In response to comments that Glencore should assess drinking water exposure at locations for recreational and traditional use activities, Glencore noted that drinking water quality guidelines are developed to protect human health in drinking water supplies that are used daily year-round (continuous use). Recreational and traditional uses of drinking water while on the land do not represent continuous use of

drinking water. Therefore, the assessment of potential exposures should be based on a drinking water source where there is a potential that it may be used on a daily year-round basis. Glencore selected a location near Sukunka Falls Park for estimating changes in media consumed by humans (including drinking water) because it is located downstream of the location of the effluent pipe and had the potential for human exposure, although a single person would not be expected to use this site continuously.

In response to concerns that Glencore had not included drinking water in detailed exposure calculations, Glencore provided updated calculations predicting that drinking water would contribute less than two percent of the combined HQ for most of the metals (cadmium, cobalt, copper, manganese, mercury, nickel, selenium, and zinc). For the remaining metals (antimony, arsenic, barium, chromium, lead and uranium), Glencore predicted drinking water would contribute between 3.5 percent (chromium) and 54.6 percent (uranium) of the combined HQ in toddlers. However, Glencore noted that the total HQ values are less than the 0.2 hazard acceptability benchmark for all metals except for arsenic, chromium and lead for toddlers. For those metals, increases are predicted to be less than five percent from baseline and have a HQ between 0.2 and 0.4. Thus, Glencore was of the view that including the drinking water pathway in the assessment of potential human health risk would not alter the original conclusion that exposure to metals represents a negligible human health risk.

#### *Methods and Assumptions*

The Working Group also expressed concerns with receptor locations for fish tissue; assumptions regarding baseline levels and COPC screening methods; types of country foods included and country food preparation assumptions; methods used to estimate the concentration of metals in soil; assumptions regarding uptake factors for fish (that is, the rate at which fish absorb COPCs); and the form of metals (total vs dissolved) used in the calculations and how they were calculated. In response, Glencore provided updated calculations and rationales indicating why its methodological approaches and assumptions for assessing risks from metals were conservative and within the range of practices used by human health assessment professionals.

Health Canada and FNITR were not satisfied with this response and were of the view that the methods used by Glencore may have resulted in: 1) screening out metals that should have been assessed in the HHERA; and 2) underestimating the risks for metals that were screened in. Both Health Canada and FNITR recommended follow-up monitoring for metals, to which Glencore agreed. Therefore, the EAO recommends Condition 28: Human Health Monitoring and Management Plan, described above for PAHs, also include verification of the level of metals in environmental media and biota (metals bound to PM<sub>10</sub>, and in water, fish tissue, soil and vegetation). If levels of metals observed in environmental media are found to exceed a pre-defined trigger, Glencore would also be required to monitor metals in country foods, update the human health risk assessment to evaluate the health risk associated with metal releases from Sukunka and implement additional mitigation measures, including a consideration of when and how country foods advisories and consumption advice would be required.

However, the EAO notes that preventing people, especially Indigenous land users, from consuming fish from the Sukunka River would come with its own social, physical and mental health impacts, which are further discussed in Part C of this Report.

### 16.3.3 PREDICTED CHANGES TO HUMAN HEALTH RISK FROM MERCURY

Health Canada raised concerns that the risk to human health from consuming fish contaminated with mercury was predicted to increase by 73 percent as a result of Sukunka, as well as exceed the HQ benchmark of 0.2. Health Canada and FNITR recommended that Glencore assess the risk to health from methylmercury rather than inorganic mercury because methylmercury is the predominant type of mercury present in fish and is the most toxic form of mercury for humans. Methylmercury is a neurotoxin known to have developmental effects on children and infants. Doig River First Nation also commented that methylmercury is a possible carcinogen, and its carcinogenic effects were not assessed in the HHERA. In response, Glencore calculated that the risk of methylmercury exposure to toddlers consuming country foods and found that the future case HQ would be 0.64 for methylmercury compared to 0.44 for mercury.

Glencore provided a variety of reasons why these increases are not significant, including the fact that it incorporated conservative assumptions into the HHERA, which may result in an overestimation of predicted impacts to human health. These assumptions included:

- 100 percent of the fish consumed by humans are from the portion of the Sukunka River with the highest estimated changes to surface water quality;
- Fish spend their entire lifetime in this area and absorb 100 percent of COPCs from ingested foods;
- The concentration of mercury in fish tissue used in the baseline assessment was the 95 percent upper confidence level of the mean, which means that 95 percent of fish would be expected to have lower concentrations of mercury than the value used in calculating health risks; and
- The future concentrations of mercury in fish were based on a worst-case change in mercury concentrations in water.

In Glencore's view, these assumptions result in an overestimate of the exposures and risks from Sukunka associated with mercury by 10-fold or more. Further, Glencore noted that levels of mercury in fish are unlikely to cause an adverse health effect because the concentration levels meet the Canadian Food Inspection Agency (CFIA) guidelines.

Health Canada stated that it is inappropriate to use the CFIA guidelines as an explanation for the likelihood of health effects in the absence of knowledge of local consumption levels. The standards are established for the commercial sale of fish in Canada and do not reflect the possible range of consumption levels across different populations and places. Health Canada recommended that Glencore undertake a fish monitoring program that establishes a baseline prior to commencing the Project and monitor the human health risks of exposure to mercury in fish at least once a year throughout the life of Sukunka. Health Canada recommended that mercury speciation data be included in any fish monitoring program because compounds such as methylmercury are more toxic to humans than total mercury. As well, Health Canada noted that the fish species, size, type of tissue and sample preparation method should be representative of the how people are most likely to consume the fish (for example, fillet including skin vs. skinned fillet, raw vs. cooked). FNITR also recommended that metals in fish tissue be monitored and Glencore agreed to

this recommendation.

Indigenous Groups, supported by Northern Health, remained deeply concerned about the health impacts of mercury, its impact upon their people's ability and willingness to fish in and consume fish from the Sukunka River, the potential for cumulative effects from Sukunka and the Brule Mine on the Sukunka River, and the potential for fish in the Sukunka River to become contaminated with mercury. This was noted as concerns considering that the Sukunka River is seen as one of the last "clean" rivers in a region where the Williston Reservoir has a fish consumption advisory for mercury. These effects are discussed further in Part C.

Considering Indigenous Groups' concerns, the lack of community specific data on fish consumption and inherent uncertainties in HHERA methodologies, the disagreement regarding risk assessment methodologies discussed in the section on metals above, and the health concerns associated with methylmercury exposure, the EAO has proposed Condition 28: Human Health Monitoring and Management Plan, that would require Glencore to monitor methylmercury in fish tissue.

#### 16.3.4 HUMAN HEALTH RECEPTORS

Health Canada, ENV, Indigenous Groups, and Northern Health raised concerns regarding the selection of receptors for air quality and human health effects. The closest human health receptor locations used by Glencore in the HHERA were provincial parks (Gwillim Lake, Hole-in-the-Wall and Sukunka Falls Park), the closest of which is approximately 10 km away from the mine site. Working Group noted that several recreational sites and trails would be closer proximity to Sukunka than the identified receptor locations (e.g. Cowmoose Mountain Trail, Bullmoose Marshes, Mt Spieker, Windfall Creek Recreation Site). Glencore also modelled air quality at a single location at the fence line of the project tenure because this would be the closest accessible area to Sukunka by people not working at the mine. Health Canada, FNITR and ENV pointed out that a worker camp is proposed for Sukunka during Construction and Operations and Glencore did not assess potential impacts from noise, air quality effects or COPC exposure to off-duty workers residing at the camp, who would not be covered by occupational health and safety legislation. Health Canada also advised that locations that are of importance for cultural, spiritual or other traditional activities within the LAA or RAA should have been considered in the HHERA and Northern Health commented that Glencore did not consider the potential for exposure of people using recreational trails in the RAA.

Glencore indicated that the Knowledge and Use study from Saulteau First Nations noted the presence of trap lines and areas where hunting may occur but did not identify specific locations. Glencore therefore did not assess potential exposures at any receptor locations for the purposes of estimating potential Indigenous Groups' exposures through cultural, spiritual or other traditional activities. Glencore indicated that exposure of people on recreational trails would be short-term and transient and unlikely to coincide with worst-case conditions. Glencore was of the view that the potential for adverse health effects on trails would be much diminished compared to permanently occupied dwellings, which were considered in the HHERA.

In response to concerns about potential air quality effects at the worker camp, Glencore identified the closest receptor to each camp option in the modelling receptor grid and extracted and analyzed the modelled concentrations of PM and dustfall<sup>96</sup> for these camp receptors. The results for PM are provided in [Table 42](#).

**Table 42: Maximum predicted ground-level concentrations of air contaminants at Camp Options 1 and 2**

Substance	Averaging Period	Ambient Background Concentration ( $\mu\text{g}/\text{m}^3$ )	Maximum Predicted Concentration With Background ( $\mu\text{g}/\text{m}^3$ )		Frequency Of Exceedance Of The BC AQO (%)		BC AQO ( $\mu\text{g}/\text{m}^3$ )
			Camp Option 1	Camp Option 2	Camp Option 1	Camp Option 2	
PM <sub>2.5</sub>	24-hour <sup>a</sup>	12.7	22.0	16.5	0	0	25
	Annual	3.3	4.36	3.67	0	0	8
PM <sub>10</sub>	24-hour	19.7	<b>200</b>	<b>80.6</b>	27	3	50

At Camp Option 1, the 24-hour average PM<sub>10</sub> B.C. AQO is exceeded approximately 27 percent of the time or 99 days in a year. At Camp Option 2, the 24-hour average PM<sub>10</sub> B.C. AQO is exceeded approximately three percent of the time or 11 days in a year.

Glencore noted that several the exceedances of B.C. AQO for PM would occur in winter when there is a high probability that snow cover would provide a natural mitigation for fugitive dust. Glencore proposed to water the road twice daily along the Meikle Creek coal load-out road to minimize fugitive dust emissions. Additionally, Glencore stated that it would consider ambient air monitoring at the camp during the permitting phase of Sukunka. Glencore would assess the need for additional mitigations if the ambient air monitoring program indicated that the ground-level concentrations of PM at the camp were approaching or exceeding the B.C. AQO. ENV was satisfied with the information provided.

Glencore did not assess health effects to off-duty workers from SO<sub>2</sub>, NO<sub>2</sub>, CO, metals in coal dust, exposure from drinking water, or dermal contact and/or ingestion from soils. Glencore did note that country foods are the dominant contributor to COPC exposure; therefore, the COPC risk estimates for Indigenous people could be a conservative estimate of human health risks even when workers are assumed to have a greater duration of exposure than Indigenous people. In discussion with the EAO regarding this issue, Glencore noted that its mitigation measures for air quality and noise impacts would reduce potential health impacts to Indigenous land users, and both on and off duty workers. Northern Health raised concern that given local hiring practices, many of the workers on-site would also be Indigenous land users, and therefore would have intersectional vulnerabilities. Given this, Northern Health does not consider the COPC risk estimates for Indigenous peoples to be a conservative estimate.

In response to reviewers' concerns, the EAO has proposed Condition 28: Human Health Monitoring and Management Plan (with monitoring for PAHs and metals) to provide a more accurate estimate of risks to Indigenous users in the area and off-duty workers, and would require further mitigations if established

<sup>96</sup> Dustfall predictions are not considered meaningful for assessing risks to human health so have not been discussed here.

thresholds are exceeded. Discussion of mitigations for exposure from criteria air contaminants is provided in the air quality issues section below.

### 16.3.5 AIR QUALITY

Health Canada suggested that an air quality and dust control adaptive management plan be developed to address potential future exceedances of the air quality objectives for PM<sub>10</sub>, PM<sub>2.5</sub> and dustfall, to effectively prevent potential human health risks. Health Canada and Northern Health noted that there is no safe threshold for effects from PM<sub>10</sub>, PM<sub>2.5</sub> or NO<sub>2</sub>. Health Canada further indicated that it would be desirable for Glencore to make a commitment regarding this plan as part of the EA process rather than the permitting process in order to provide more certainty regarding the specific requirements at the EA stage. As described in Part C, FNITR also expressed the view that dust from the haul routes is a health concern for Indigenous users of the RAA.

Glencore indicated that the preliminary Air Quality and Dust Control Plan (Appendix 20.0-A.15) includes the following commitments:

- Assessment of the effectiveness of air quality and dust control mitigation measures during Construction, Operations, Closure and Post-Closure;
- Assessment of whether or not the predicted air quality effects were accurate; and
- Adaptive management of air quality effects by implementation of additional measures to minimize air emissions and maintain air quality, where necessary.

The EAO recommends Condition 27: Air Quality and Emissions Management Plan, that would require Glencore to implement measures to mitigate dust and CAC emissions, monitor ambient air quality and undertake adaptive mitigation measures to minimize health effects associated with air quality at the worker camp and along the haul routes. Condition 28: Human Health Monitoring and Management Plan, would also require Glencore to monitor metals bound to PM<sub>10</sub> and CACs should an EAC be issued.

### 16.3.6 NOISE

West Moberly First Nations asserted that noise levels greater than 15 dBA are not natural within forest landscapes and disturb the peaceful enjoyment of Indigenous Groups that exercise their hunting, trapping and fishing rights within the LAA and along the haul roads proposed by Glencore. Health Canada expressed concern that Glencore did not consider the effects of Construction noise impacts (for example, blasting and hauling) on Indigenous Groups. Health Canada also expressed concerns about noise impacts from hauling on Indigenous Groups during all phases of Sukunka. Health Canada and Northern Health recommended a Noise Management Plan be developed that would: apply during all phases of the project; include monitoring and management of noise at the camp and in areas where Indigenous Groups may be present (to verify modelled sound levels and ensure actual noise levels do not exceed applicable criteria); and include a complaint resolution process to address any noise-related complaints or concerns raised by potentially affected Indigenous Groups or members of the community.

Glencore indicated that noise associated with project activities at receptor locations identified in the assessment is predicted to be within the 30 dBA at night and 35 dBA during the day, which is within B.C. OGC guidelines. Northern Health noted that receptors could exist at locations throughout the LAA, including in areas that exceed the B.C. OGC guidelines. Glencore also indicated that it would implement a complaint resolution process consistent with the B.C. OGC Guideline and the Alberta Energy Regulator Directive 038: Noise Control (2007).

Given the concerns raised by Indigenous Groups and the Working Group, the has EAO proposed Condition 25: Community Effects Management Plan, that would require Glencore to develop a process for receiving and responding to noise complaints should an EAC be issued.

### 16.3.7 CERTIFICATE CONDITIONS

Doig River First Nation expressed concern that the approach of using a Human Health Monitoring and Management Plan condition in the EAC potentially places land users at risk of exposure to harmful substances if actual risks are not assessed until exposure has already occurred. Doig River First Nation further expressed concern that, in their opinion, there is no ability to amend an EAC to consider the results of monitoring or new information unless the Certificate Holder applies for an amendment and questioned what mechanism would provide certainty that issues will be mitigated.

The EAO notes that the proposed Human Health Monitoring and Management Plan and the Air Quality Emissions Management Plan have requirements for monitoring, considerations for country foods advisories and consumption advice, and adaptive management and would be developed in consultation with EMLI, ENV, Northern Health, Health Canada and Indigenous Groups. The EAO would require these plans to implement a schedule of monitoring that would provide an early warning if levels of COPCs or CACs were increasing as a result of Sukunka so action could be taken before health effects were realized. The EAO clarified for Doig River First Nation that the plans must include adaptive management if pre-determined triggers are exceeded; therefore, no amendments would be required to the conditions under existing or future legislation to allow the EAO to enforce the requirement for mitigation. Indigenous Groups would be consulted on the identification of monitoring plans, triggers and additional mitigation specified in the plan.

### 16.3.8 INDIGENOUS GROUPS INVOLVEMENT IN MONITORING

West Moberly First Nations expressed the view that an Indigenous-led, collaborative monitoring process should be implemented, within which Indigenous Groups would be funded by Glencore to undertake third-party monitoring processes, supported by FNITR.

Glencore was supportive of this initiative and the EAO has proposed Condition 11: Indigenous Monitoring Program, that would provide one full-time monitoring position for each of McLeod Lake Indian Band, Saulteau First Nations, West Moberly First Nations, Doig River First Nation and Halfway River First Nation. The program would be developed in consultation with Indigenous Groups and include capacity development and opportunities for the monitors to be involved in monitoring for air, water and soil

quality, fish, vegetation and country foods.

## 16.4 THE EAO'S CHARACTERIZATION OF RESIDUAL EFFECTS

The EAO's characterization of the expected residual effects of Sukunka on human health is summarized below, as well as the EAO's level of confidence in the effects determination (including likelihood and significance).

The EAO concludes that after the implementation of Glencore's mitigation measures, Sukunka could have residual adverse effects on human health including increased health risks associated with the following exposures:

- Consumption of fish containing mercury from the Sukunka River; and
- Inhalation of SO<sub>2</sub>, PM<sub>10</sub> and PM<sub>2.5</sub> by camp residents and local land users.

The EAO concludes that noise and exposure to metals other than mercury is not likely to result in a residual effect. Predicted noise levels either meet (daytime) or marginally exceed (nighttime) noise guidelines and are not at the level that health effects would be expected. However, the EAO has included a requirement for a complaint resolution process in the Community and Workforce Effects Management Plan in consideration of the concerns expressed by Indigenous Groups and Health Canada.

Exposure from inhalation of metals in coal dust as well as metals in soil (dermal contact and inhalation) would remain below guidelines under all scenarios considered. Although exposure from country foods would result in exceedances of the Health Canada benchmark of 0.2 for arsenic, cadmium, chromium, cobalt, lead, manganese, nickel and selenium, Glencore predicted the difference between baseline and future cases to be less than one percent. The EAO views this incremental change as sufficiently small that it is unlikely to lead to a measurable or substantive change in actual human health outcomes. However, the EAO proposes a Human Health Monitoring and Management Plan in consideration of the differences in views between Health Canada, FNITR and Glencore regarding assessment methods of metals. This plan would provide data on the potential changes of levels of metals in the environment, which would require Glencore to adaptively manage the release of COPCs and reduce residual effects to human health if any changes were observed.

In summary, the EAO has proposed the following conditions:

- Condition 28: Human Health Monitoring and Management Plan that would require Glencore to monitor CACs in air, PAHs in air, soil and water and metals (including methylmercury) in soil, water, fish tissue, vegetation, and bound to PM<sub>10</sub>. Condition 28 would require additional mitigation and monitoring of metals in country foods if environmental media show concentrations exceed pre-determined trigger levels, including the means and timing by which Glencore would provide the country foods advisories and/or consumption advice;
- Condition 27: Air Quality and Emissions Management Plan that would require Glencore to include mitigation measures for dust and CAC emissions and to monitor ambient air quality at receptor locations, including locations outside the mine boundary;

- Condition 25: Community Effects Management Plan that would require Glencore to include a process for receiving and responding to noise complaints; and
- Condition 11: Indigenous Monitoring Program that Glencore would be required to develop in consultation with Indigenous Groups and include capacity development and opportunities for the monitors to be involved in monitoring air, water and soil quality, fish and country foods.

**Table 43: Summary of Residual Effects for Human Health**

*Note: Criteria and assessment ratings are defined in [Appendix 4, Residual Effects Characterization Definitions](#)*

Criteria	Assessment Rating	Rationale
Context	<p><b>Mercury:</b> Low</p> <p><b>PM and SO<sub>2</sub>:</b> Moderate</p>	<p><b>Mercury:</b> The indicator has low resiliency and is sensitive to existing conditions because the baseline HQ of methylmercury exceeds the Health Canada benchmark of 0.2 (up to 0.38). In addition, the potential for mercury exposure from other sources in the region exists; the Williston Reservoir has a fish consumption advisory for mercury. Mercury is a neurotoxin known to have developmental effects on children and infants.</p> <p><b>PM and SO<sub>2</sub>:</b> Baseline PM and SO<sub>2</sub> levels meet B.C. air quality objectives. However, other sources of CAC emissions exist in proximity to Sukunka and PM<sub>2.5</sub> air quality objectives are not thresholds for health effects; adverse health effects can occur at levels below the objectives. PM<sub>2.5</sub> can affect breathing and heart functioning and is most dangerous for children, pregnant women and the elderly or those with underlying breathing or heart conditions. PM<sub>10</sub> also has potential adverse health effects on the respiratory and cardiovascular system, although it contributes less to the overall burden of disease than PM<sub>2.5</sub>. Short-term exposures to elevated SO<sub>2</sub> concentrations can cause breathing difficulties for asthmatics.</p>
Magnitude	<p><b>Mercury:</b> Moderate</p> <p><b>PM and SO<sub>2</sub>:</b> Moderate to High</p>	<p><b>Mercury:</b> The risk to human health from consuming fish contaminated with mercury is predicted to increase 73 percent as a result of Sukunka and exceed the HQ benchmark of 0.2 by up to three times; however, the assumptions were intended to be conservative.</p> <p><b>PM and SO<sub>2</sub>:</b> As a result of Sukunka, PM<sub>2.5</sub> concentrations<sup>97</sup> are predicted to increase by three times at the MPOI (fenceline), 42 percent at Camp Option 1 and 30 percent at Camp Option 2. The concentration of PM<sub>2.5</sub> is predicted to approach the air quality objective at Camp Option 1 and exceed it at the MPOI. PM<sub>10</sub> is predicted to increase by 16 times at the MPOI, nine times at Camp Option 1 and three times at Camp Option 2 and exceed the air quality objective in all three locations. Exceedances could be expected 27 percent of the time at Camp Option 1 and 3 percent of the time at Camp Option 2. Concentrations of SO<sub>2</sub> (1-hour) are predicted to increase 59 times at the MPOI and two times at Residence 3 (values were not predicted at the camps). The predicted level at the MPOI but not Residence 3 would marginally exceed the 2020 CAAQS for SO<sub>2</sub>.</p>

<sup>97</sup> Reported changes are for PM concentrations averaged over a 24-hour period.

Criteria	Assessment Rating	Rationale
Extent	<p><b>Mercury:</b> Regional</p> <p><b>PM and SO<sub>2</sub>:</b> Local</p>	<p><b>Mercury:</b> The predicted effects may occur in the <b>regional</b> assessment area because fish may travel away from the area of Sukunka discharge.</p> <p><b>PM and SO<sub>2</sub>:</b> The predicted effects are limited to the <b>local</b> assessment area.</p>
Duration	<p><b>Mercury:</b> Permanent</p> <p><b>PM and SO<sub>2</sub>:</b> Long-term-Permanent</p>	<p><b>Mercury:</b> While emissions of mercury would eventually cease following the closure of Sukunka, mercury is a persistent contaminant that would remain in the environment and could be available for transfer to humans for a very long time. The predicted effects to human health from mercury exposure could persist over the <b>lifetime of an individual</b>.</p> <p><b>PM and SO<sub>2</sub>:</b> Concentrations of CACs in the air would go back to close to baseline levels once the mine operation ceased. Certain health effects resulting from exposure to CACs would ameliorate after exposure ceases while others would last over the <b>lifetime of an individual</b>.</p>
Reversibility	<b>Irreversible</b>	<p>Mercury and PM: The predicted effects to human health from CACs and mercury are potentially <b>irreversible</b>.</p>
Frequency (of residual effect)	<b>Continuous</b>	<p>Mercury and PM: The potential effects due to increases of CACs and mercury are anticipated to be <b>continuous</b> throughout Construction and Operations.</p>
Likelihood	<p><b>Mercury:</b> One of the unknown factors in the human health risk assessment is the specific consumption levels of country foods by local populations. Results from the HHERA suggest that Sukunka could increase the health risk to those populations that rely on fish from the most affected reaches of the Sukunka River. These effects might vary depending on the level of fish consumption. Despite this potential variability in effect, the EAO considers the likelihood of residual adverse effects to human health from mercury to be <b>low</b> because of the number of conservative assumptions in the HHERA and the proposed Human Health Monitoring and Management Plan would provide follow-up monitoring and adaptive management of potential effects. While an objective of this plan would be to prevent mercury levels in fish from posing a health risk, if mercury levels in fish were to increase to a level unsafe for consumption and additional mitigation is unable to reduce levels (in the short or long-term), people would be advised against consuming fish from the Sukunka River. This would reduce the likelihood that people would experience any health effects associated with consuming fish containing mercury. A fish advisory of this kind would have impacts on Aboriginal Interests, which is discussed in Part C.</p> <p><b>PM:</b> There is also uncertainty related to the presence of receptors in areas of poor air quality (including indoor air quality). Although elevated levels of PM are predicted at both camp options and the MPOI, it is possible that off-duty workers spend may most of their time inside the camp (rather than recreating outside) and that Indigenous Groups or other users of the area would be unlikely to spend extended periods of time close to the fence line of Sukunka. In addition, adverse health effects are considered more likely to result from exposure to PM<sub>2.5</sub> than PM<sub>10</sub>. For Sukunka, PM<sub>2.5</sub> concentrations are increased to a smaller degree than PM<sub>10</sub> and do not exceed air quality objectives. Thus, the likelihood of health effects associated with inhalation of PM is considered <b>moderate</b>.</p>	

Criteria	Assessment Rating	Rationale
Significance Determination		Considering the above analysis and having regard to the conditions identified in the TOC (which would become legally binding if an EAC is issued), including requirements for a Human Health Monitoring and Management Plan and an Air Quality and Emissions Management Plan, the EAO is satisfied that Sukunka's residual adverse effects on human health would be <b>not significant</b> .
Confidence		There is low confidence in the likelihood and significance determination for human health based on the understanding of existing information, baseline data, conservative modeling and benchmarks developed by various regulatory agencies that are designed to be protective of sensitive members of the population.

## 16.5 CUMULATIVE EFFECTS ASSESSMENT

The EAO considered the potential for past, present and reasonably foreseeable future projects and activities within the RAA, including vehicle traffic, wind energy projects, coal mines, and oil and gas facilities, to cumulatively interact with residual effects from Sukunka ([Figure 14](#)).

### *SO<sub>2</sub> and Particulate Matter*

Wind energy facilities are not known to produce measurable emissions of SO<sub>2</sub> or particulate matter. Traffic along the Sukunka FSR and the Meikle Creek Road results in air emissions, which are already accounted for in background air concentrations. Oil and gas facilities in the RAA include five compressor stations and gas dehydrators in the LAA and an additional eight oil and gas facilities outside the LAA. A Canadian Natural Resources pipeline has also been proposed in the area.

Coal mines include Brule, located approximately 15 km northwest of Sukunka, and the Wolverine<sup>98</sup> Coal Mine, which consists of the operating Perry Creek pit as well as the potential Hermann and East Bullmoose pits, located 15 km and 10 km southeast of Sukunka, respectively. The East Bullmoose pit is not proposed for development at this time. The Horizon Coal Mine identified in [Figure 14](#) is no longer being proposed. The Perry Creek and Hermann pits are located just outside of the RAA defined by Glencore but the EAO considered the potential for cumulative effects from these projects due to their proximity to the boundary of the RAA.

An analysis of the potential for cumulative impacts on air quality from SO<sub>2</sub> and PM from traffic, oil and gas facilities, and coal projects in the area is provided in [Section 11.5](#). In that section, the EAO concludes that cumulative effects on air quality from SO<sub>2</sub> and PM are of low magnitude, local extent, long-term duration, low likelihood, and are not significant.

Based on this analysis, the EAO concludes that cumulative effects on human health from inhalation of SO<sub>2</sub> and PM are of low magnitude, local extent, long-term duration, low likelihood, and are not significant. Further, the proposed Air Quality Emissions Management Plan would allow for emissions of CACs to be monitored and health effects associated with PM and SO<sub>2</sub> to be minimized and the proposed Human Health Monitoring and Management Plan would reduce the potential for health effects associated with air quality.

### *Mercury in Fish*

For potential health effects from exposure from mercury in fish, the Brule Mine is the only past, present or reasonably foreseeable project with effects on water chemistry that is expected to interact cumulatively with the effects of Sukunka because it is the only other project within the RAA with direct discharges into

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<sup>98</sup> This section references the cumulative effects assessment provided in Glencore's Application, and there have been changes to the Wolverine and Hermann Mine Projects since Application Review began. On November 24, 2018, the Environmental Assessment Certificate for the Hermann Mine expired as the project had not been substantially started. On February 12, 2021, the Environmental Assessment Certificate for the Wolverine Mine was amended to include the area that was previously certified as the Hermann Mine.

the Sukunka River. Brule is approximately 15 km away from Sukunka, located downstream on the Sukunka River. The EAO concludes that cumulative effects to water quality were likely but not significant, although these were not specifically related to mercury (see [Section 5](#) for further details). The EAO also notes that Williston Reservoir, located approximately 100 km from Sukunka, has a fish consumption advisory for mercury. While this is outside the RAA and the area formally considered for cumulative effects, the presence of elevated levels of mercury in the region in other water bodies increases the potential for cumulative health effects associated with consuming mercury in fish.

A cumulative effect on human health associated with consuming mercury-contaminated fish could occur if 1) the Brule Mine also releases mercury and results in fish in the Sukunka River that have higher concentrations of mercury than predicted from Sukunka alone; or 2) people consume fish from sources additional to the Sukunka River that have higher concentrations of mercury than those predicted from Sukunka; and 3) fish are consumed at a rate higher than assumed, with a rate high enough to result in health thresholds for mercury being exceeded. The EAO concludes that cumulative effects on human health from mercury in fish are of moderate magnitude, regional extent, permanent duration, low likelihood, and are not significant because the proposed Human Health Monitoring and Management Plan would require mercury levels in fish tissue to be monitored and adaptively managed to reduce risks to human health. If levels of mercury in fish in the Sukunka River exceeded health thresholds and were immitigable (which is considered to be of low likelihood), it is also unlikely that people would continue to consume them, which may contribute to other social and mental health impacts as a result

## 16.6 CONCLUSIONS

Considering the above analysis and having regard to the conditions identified in the certified project description and table of conditions (which would become legally binding if an EAC is issued), the EAO is satisfied that Sukunka would not have significant adverse effects on human health.

## 17.0 CEAA 2012 REQUIREMENTS

Subsection 19(1) of CEAA 2012 identifies the factors which must be taken into account in an EA under CEAA 2012. These factors have been addressed by the EAO in the appropriate sections of this Report. In addition to the factors that are considered as part of the assessment of individual VCs (i.e., fish and fish habitat), the following factors are considered in separate sections of this Report: alternative means of undertaking Sukunka in Part A, [Section 2.2.3](#); the purpose of Sukunka in Part A, [Section 2.2.5](#); and accidents and malfunctions and effects of the environment on Sukunka in Part B, [Section 18](#).

In conducting a substituted EA, under the provisions of CEAA 2012, the EAO is required to consider the environmental effects identified in Section 5 of CEAA 2012. This section discusses the assessment for each of the environmental effects and how these changes may affect Indigenous peoples as described under Section 5 of CEAA 2012 and references other relevant parts of this Report where additional details are presented.

### 17.1 ENVIRONMENTAL EFFECTS RELATED TO CEAA 2012 PARAGRAPH 5(1)(A)

CEAA 2012 paragraph 5(1)(a) requires an assessment of changes Sukunka may cause to the following federal areas of responsibility:

- (i) Fish and fish habitat as defined in subsection 2(1) of the *Fisheries Act*;
- (ii) Aquatic species as defined in subsection 2(1) of the *Species at Risk Act*; and
- (iii) Migratory birds as defined in subsection 2(1) of the *Migratory Birds Convention Act, 1994*.

The assessments of these effects are included within the assessments of various VCs as described in [Part B](#) of this Report. [Table 44](#) highlights the linkages to the relevant sections of this Report and highlights the key mitigation measures as well as the EAO's significance conclusion. The mitigation measures that the federal Minister of the Environment and Climate change is taking into account when making its EA decisions are referred to as "key mitigation measures" in this chapter. Key mitigation measures are measures that are essential to ensure that a project will not result in significant adverse environmental effects. In other words, if, in the absence of implementing a mitigation measure, the project is likely to result in a significant adverse environmental effect, this mitigation measure is considered a "key mitigation measure". In specific circumstances, if potential significant adverse environmental effects cannot be avoided despite the mitigation measures, key mitigation measures are those that reduce or control the significant adverse environmental effects to the extent possible.

**Table 44: Summary of Effects Related to CEAA 2012 Paragraph 5(1)(a)**

*Note: Criteria and assessment ratings are defined in [Appendix 4, Residual Effects Characterization Definitions](#)*

Description	Effects Assessment (Predicted Residual Effects)	Key Mitigations Identified by the EAO	The EAO's Significance Conclusion
<b>Fish and fish habitat as defined in subsection 2(1) of the <i>Fisheries Act</i></b>			
<p>The Fish and Fish Habitat section (<a href="#">Section 5</a> of this Report) directly assesses fish and fish habitat, as defined in subsection 2(1) of the <i>Fisheries Act</i>.</p> <p>The Application assessed potential effects to fish and fish habitat by considering construction and operation activities that could alter or remove key components of fish habitat, change base flows, introduce substances into watercourses that are deleterious to fish, or cause the direct mortality of fish. The LAA included Chamberlain, Bullmoose and Skeeter Creeks, the Sukunka River, and the Sukunka Wetland.</p>	<p>Loss of instream and riparian fish habitat through construction of project infrastructure and change in surface flows.</p>	<p>Maintain a riparian buffer (based on stream class) between mine components (including temporary work spaces and stockpiles) and fish streams following LWRS's Forest Planning and Practices Regulation (2019 or as updated or replaced).</p> <p>Maintain a 150 m buffer around wetlands from the high water mark and, where this buffer is not possible, a rationale for the decreased buffer size and additional mitigation measures that will be applied.</p> <p>Offset for residual effects to fish and harmful disruption or destruction of fish habitat, following the conceptual Fish Habitat Offsetting Plan. Use clear-span bridges at all crossings of fish-bearing streams along the Meikle Creek haul road.</p> <p>The unnamed tributary to Skeeter Creek downstream of the clean water diversion ditch must be armoured with riprap and an energy dissipater must be installed at the outlet of the diversion ditching into the tributary to reduce erosion.</p>	<p>Context – low to moderate resilience                      Magnitude – low to high                      Extent – local                      Duration – short-term to permanent                      Frequency – regular to continuous                      Reversibility – irreversible                      Likelihood – high                      Confidence – low to moderate</p> <p><b>Significance – not significant</b></p>
	<p>Increased mortality risk to fish resulting from the construction of project components.</p>	<p>Implement measures to protect fish and fish habitat when undertaking activities in or near water, taking into account Fisheries and Oceans Canada's Measures to Avoid Causing Harm to Fish and Fish Habitat, including but not limited to:</p> <ul style="list-style-type: none"> <li>• Conduct instream work in fish-</li> </ul>	

Description	Effects Assessment (Predicted Residual Effects)	Key Mitigations Identified by the EAO	The EAO's Significance Conclusion
		bearing watercourses in isolation of flows and conduct fish salvage before isolating channels. <ul style="list-style-type: none"> <li>• Reintroduce flows to isolated watercourses immediately downstream of isolated areas to avoid fish stranding, while dissipating discharge water energy to avoid fish stranding.</li> <li>• Conduct instream activities in minimum risk windows defined by the Province.</li> </ul>	
	Decrease in fish health due to reduction of available food and nutrients in Skeeter and Chamberlain creeks.	Offset for residual effects to fish and harmful disruption or destruction of fish habitat, following the conceptual Fish Habitat Offsetting Plan.	
	Increased risk of toxic effects to fish due to increases in several water quality constituents.	Ensure the Project does not exceed the British Columbia Water Quality Guidelines, background concentrations, or a protective level, developed in consultation with Indigenous groups included in the EMA permit for Sukunka.  Maintain water management infrastructure through closure and post-closure, until monitoring indicates water quality at the Sukunka compliance point and Skeeter and Chamberlain creeks meets regulatory requirements.  Mitigation measures applied to <i>Indigenous peoples' current use of land and resources</i> for water quality (Table 45 below) also apply to Fish and Fish Habitat as defined in subsection 2(1) of the <i>Fisheries Act</i> .	
<b>Aquatic species as defined in subsection 2(1) of the <i>Species at Risk Act</i></b>			
Aquatic species include fish and marine plants.  The assessment of effects to	N/A	N/A	N/A

Description	Effects Assessment (Predicted Residual Effects)	Key Mitigations Identified by the EAO	The EAO's Significance Conclusion
<p>fish is summarized in the row above.</p> <p>There are no marine plants in the Sukunka area or which have the potential to be affected by it (the location is far inland).</p>			
<b>Migratory Birds as defined in <i>Migratory Birds Convention Act, 1994</i></b>			
<p>Migratory birds are assessed as part of the <a href="#">Section 7</a> (Wildlife) of this Report, which included the following bird and bird communities:</p> <ul style="list-style-type: none"> <li>• Olive-sided flycatcher</li> <li>• Groupings of bird species were used to infer effects on bird species, including migratory birds, which use similar habitats<sup>99</sup>:               <ul style="list-style-type: none"> <li>○ Mature forest bird community</li> <li>○ Young forest bird community</li> <li>○ Grassland bird community</li> <li>○ Wetland bird community</li> </ul> </li> <li>• The wildlife health assessment focused on the following migratory birds: American robin, Canada goose, common merganser, mallard, and red-winged blackbird.</li> </ul> <p>The Application assessed impacts to these species and groups from change in habitat availability,</p>	<p>Decrease in effective breeding habitat availability in the LAA from construction of mine site and chosen haul route option.</p>	<p>Protect and avoid injuring, killing or harassing migratory birds or destroying, taking or distributing their eggs, or damaging, destroying, removing or disturbing their nests (e.g., complete site-clearing activities outside of breeding bird periods), taking into account Environment and Climate Change Canada's current Guidelines on Avoiding Harm to Migratory Birds.</p>	<p>Context – low to moderate resilience            Magnitude – low to moderate            Extent – local            Duration – long-term to permanent            Frequency – once and continuous            Reversibility – reversible and irreversible            Likelihood – high            Confidence – low to moderate</p>
	<p>Moderate exceedance in risk quotient ecological benchmark selenium concentrations in diet for fish-eating migratory birds (common merganser).</p>	<p>Ensure the Project does not cause downstream water quality to exceed British Columbia Water Quality Guidelines, background concentrations, or a protective level, developed in consultation with Indigenous groups included in the EMA permit for Sukunka.</p>	<p><b>Significance – not significant</b></p>
	<p>Increase in direct mortality risk due to collision risk with vehicles (increased rate of 0.7 to 9.4 birds per day), project components, and transmission lines, as well as during clearing for construction during the breeding bird period.</p>	<p>Impose speed limits on the access road (considering provincial guidelines) to limit direct mortality to birds</p> <p>Protect active bird nest sites by avoiding nesting periods in accordance with ECCC's General Nesting Periods of Migratory Birds in Canada (ECCC 2022, or as replaced or updated from time to time).</p>	

<sup>99</sup> Complete list of bird species provided in Section 7 Wildlife.

Description	Effects Assessment (Predicted Residual Effects)	Key Mitigations Identified by the EAO	The EAO's Significance Conclusion
<p>mortality risk, change in movement of forest birds, and health.</p>		<p>If avoidance of nesting period is not possible, set species-specific buffers in accordance with ECCC's Guidelines to Reduce Risk to Migratory Birds (ECCC 2022, or as replaced or updated from time to time).</p> <p>Identify areas adjacent to or under the transmission line route that may be a high risk for line strikes by birds and implement measures such as flight diverters to reduce the risk prior to construction.</p> <p>Design and build the transmission line in a manner that avoids electrocution, discourages nesting prior to nests being built and makes the transmission line more visible to migratory birds taking into account the Avian Power Line Interaction Committee's Suggested Practices for Avian Protection on Power Line.</p>	
	<p>Increase in indirect mortality through disturbance during breeding bird period in adjacent habitat (e.g., noise) and the creation of increased edge habitat.</p>	<p>Protect active bird nest sites by avoiding nesting periods in accordance with ECCC's General Nesting Periods of Migratory Birds in Canada (ECCC 2022, or as replaced or updated from time to time).</p> <p>If avoidance of nesting period is not possible, set species-specific buffers in accordance with ECCC's Guidelines to Reduce Risk to Migratory Birds (ECCC 2022, or as replaced or updated from time to time).</p> <p>Use elements placed over ventilation openings such as louvers, vent hoods and silencers to attenuate noise break-out through these openings to the outside.</p> <p>Develop a Bird Monitoring and Mitigation Plan that clearly outlines</p>	

Description	Effects Assessment (Predicted Residual Effects)	Key Mitigations Identified by the EAO	The EAO's Significance Conclusion
		<p>how risk of incidental take would be managed in accordance with ECCC guidance. This plan must include:</p> <ul style="list-style-type: none"> <li>• Survey methods, in accordance with ECCC's current Guidelines on Avoiding Harm to Migratory Birds, conducted by one or more QPs that follow existing standards (e.g., the BC provincial Resources Information Standards Committee [RISC]) and species-specific survey and inventory methods where applicable;</li> <li>• Reporting requirements for discovery of active nests to the Environmental Manager on site.</li> <li>• Establishing species-appropriate setbacks, restricted activity periods, and monitoring of the active nest (according to Environment Canada guidance).</li> </ul>	
	<p>Reduction in movement due to an increase in canopy gaps from roads, mine site, transmission lines and the water pipe.</p>	<p>Revegetation of the site to facilitate succession and supplement natural regeneration.</p> <p>Implement measures to reduce the size of clearing areas such as canopy gaps and reducing the intensity of sensory disturbance, including:</p> <ul style="list-style-type: none"> <li>• Retain, and maintain a buffer around, actual or potential wildlife trees (e.g., standing dead trees) wherever possible and safe to do so according to provincial guidelines;</li> <li>• Provide coarse woody debris during site restoration in areas where</li> </ul>	

Description	Effects Assessment (Predicted Residual Effects)	Key Mitigations Identified by the EAO	The EAO's Significance Conclusion
		habitat was lost as a result of the Project; and <ul style="list-style-type: none"> <li>• Maintain vegetation cover along the boundaries of high activity areas (e.g., transportation routes) to reduce sensory (noise and visual) disturbance.</li> </ul>	

### Cumulative Effects

As described in [Section 5](#) (Fish and Fish Habitat) and [Section 6](#) (Water) of this report, cumulative effects on fish and fish habitat may occur as a result of Sukunka, the Brule Mine, and forestry activities in the area. The Brule Mine is the only activity with impacts on water quality that could interact cumulatively with Sukunka as it is the only other project within the RAA with direct discharges into the Sukunka River, which may have in turn contribute to cumulative effects on fish and fish habitat in the Sukunka River.

As noted in [Section 6](#) (Water Quality), the EAO learned near the end of Application review that the Brule mine had been discharging mine contact water well above its permitted limit and, if the Brule mine does not lower selenium discharges substantially to meet 2020 permitting requirements, any additional discharge from Sukunka could mean that cumulative effects may be larger than predicted. These cumulative changes to water quality are predicted to be moderate in magnitude, extending within the RAA, continuous, permanent in duration, and irreversible. The cumulative effects of Sukunka and forestry on fish and fish habitat are expected to be limited to the LAA.

The EAO concludes that the likelihood of the cumulative effects to fish and fish habitat, considering the implementation of mitigation measures summarized in [Table 44](#) above is medium, and given that the Brule Mine is in operation and the Certificate Holder of the Brule Mine is legally required to reduce its selenium concentration and is being closely monitored by ENV.

As described in [Section 7](#) (Wildlife), cumulative effects on wildlife from industrial development are present at baseline. Sukunka is predicted to contribute to cumulative effects primarily in the LAA, which would impact only a small portion of the regional wildlife populations. Although the levels of selenium are considered high at baseline, the impact on aquatic migratory bird health through the consumption of fish was considered not significant. Considering the low incremental impacts of Sukunka in the RAA, the mitigation measures proposed by Glencore, and regional wildlife management by the Province, the EAO does not anticipate any significant adverse cumulative effect to migratory birds resulting from the interaction of Sukunka and other past, present, and reasonably foreseeable future projects and activities.

## 17.2 ENVIRONMENTAL EFFECTS RELATED TO CEAA 2012 PARAGRAPH 5(1)(B)

CEAA 2012 paragraph 5(1)(b) requires an assessment of a change that may be caused to the environment by Sukunka that would occur:

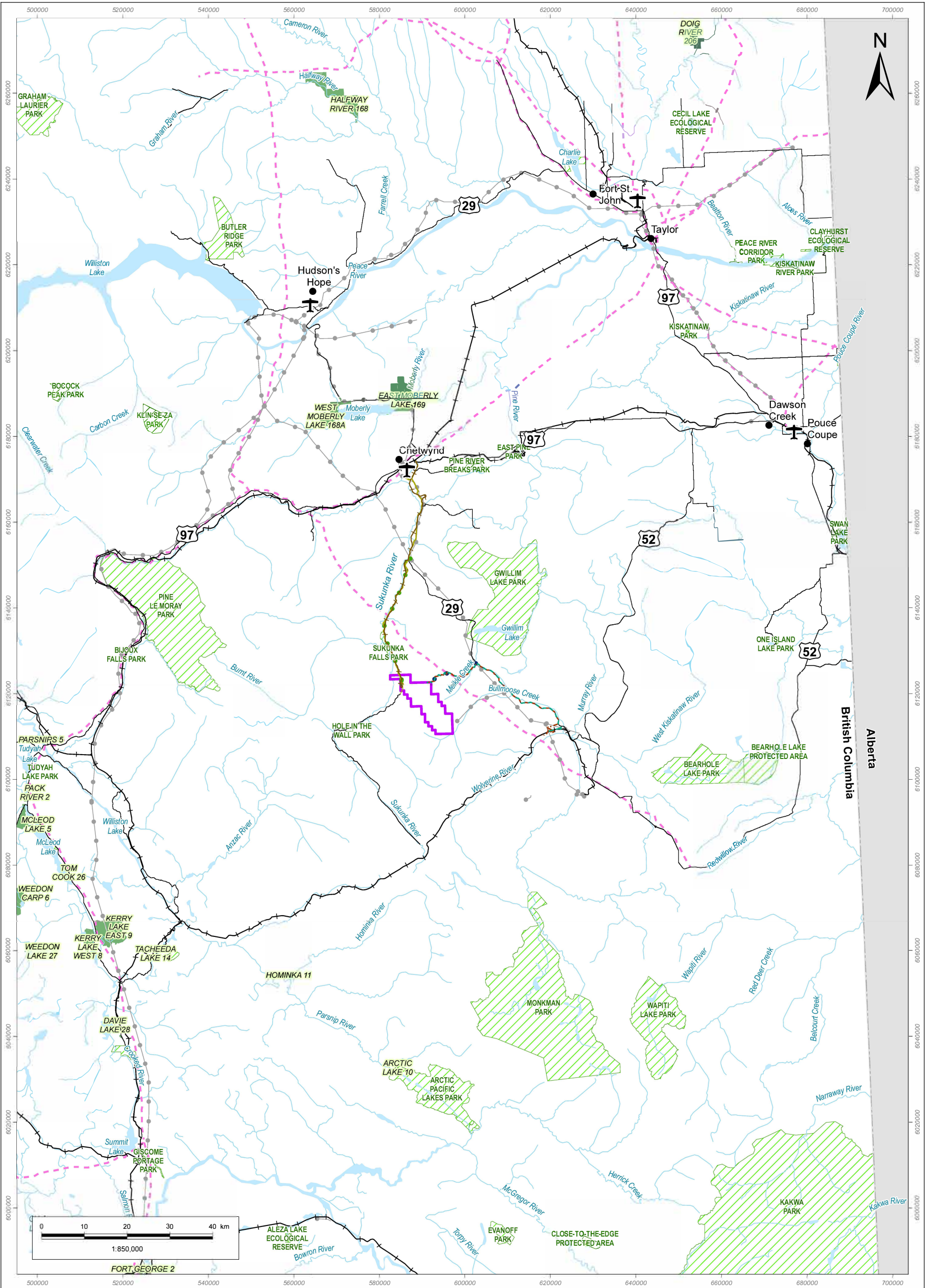
- (i) On federal lands,
- (ii) In a province other than the one in which the act or thing is done or where the physical activity, the designated project or the project is being carried out, or
- (iii) Outside Canada.

### 17.2.1 FEDERAL LANDS

The nearest federal lands to Sukunka are the Indian Reserves of West Moberly Lake 168A (61 km), East Moberly Lake 169 (63 km), McLeod Lake 5 (81 km) and Kerry Lake East 9 (84 km) (see [Figure 22](#)). None of the Indian Reserves are within the regional assessment boundaries for the VCs under the environmental VCs.

As the regional assessment boundaries for various VCs were selected in consideration of “the geographic extent over which Project activities and their effects are likely to occur and be of concern” (Section 4.1.3 of the Application), and federal lands fall outside of the boundaries for environmental VCs, there are no predicted changes to the environment from Sukunka that might occur on federal lands.

Figure 22: Location of Federal Lands near Sukunka



<b>Legend</b> 		<b>SUKUNKA COAL MINE PROJECT</b> <b>COMMUNITIES PROXIMAL TO THE PROJECT</b> ENVIRONMENTAL ASSESSMENT APPLICATION <small>Data Sources: Glencore, Province of British Columbia, Government of Canada</small> <small>Disclaimer: Although there is no reason to believe that there are any errors associated with the data used to generate this product or in the product itself, users of these data are advised that errors in the data may be present.</small> <small>File Path: fig_10482_ea_02_02-02_Communities_Proximal_to_Project</small>		PREPARED BY:  PREPARED FOR: 
DATE: 13-FEB-15 FIGURE ID: 123110482	PROJECTION: UTM 10 DATUM: NAD 83	DRAWN BY: A. BOONE CHECKED BY: L. MCDONALD		

### 17.2.2 OTHER PROVINCES

The Sukunka PDA is located approximately 98 km from the Alberta border and haul route option A is approximately 68 km from the Alberta border (see [Figure 22](#)). The Province of Alberta is not within any of the regional assessment boundaries for Sukunka. Accordingly, there are no predicted changes to the environment from Sukunka that might occur in another province or territory (except for greenhouse gases, which are discussed in the following section).

### 17.2.3 OUTSIDE CANADA

The only predicted effect from Sukunka outside of Canada would be related to greenhouse gas (GHG) emissions. As discussed in [Section 12](#) of this Report, the EAO concludes that Sukunka would not result in significant adverse residual effects related to GHG emissions in the context of CEAA 2012 paragraph 5(1)(b). The summary of effects from GHG emissions is provided in [Table 37](#).

The EAO concludes that although Sukunka would have a residual adverse effect on climate change based on an increase in GHG emissions during construction and operations from fuel combustion, release of stored carbon resulting from land clearing, and fugitive release of coal bed methane from run-of-mine coal, this effect would not be significant.

Details of the EAO's assessment of GHGs from Sukunka are provided in [Section 12](#) of this Report. Glencore estimated that during the construction of Sukunka, the maximum annual GHG emissions would be 286,651 tonnes CO<sub>2</sub>e per year. This equates to about 0.5 percent increase in total provincial emissions and 0.04 percent increase in national emissions. Based on most recent estimates, Sukunka is estimated to increase total global GHG emissions by 0.0006 percent. During operations, Glencore estimated that maximum annual GHG emissions would be 259,648 tonnes CO<sub>2</sub>e. This equates to about 0.4 percent increase in total provincial emissions and 0.04 percent increase in national emissions. Based on most recent estimates, Sukunka is estimated to increase total global GHG emissions by 0.0006 percent.

Sukunka is over 500 km from the United States border (Alaska or Washington State). The United States is not within any of the regional assessment boundaries for Sukunka. Accordingly, there are no other predicted changes to the environment from Sukunka that might occur outside of Canada.

#### Cumulative Effects

The comparison of GHG emissions to national and provincial targets inherently considers the cumulative impacts of GHGs on the environment. Therefore, no additional cumulative effects assessments were undertaken. Additional information can be found in Section 12 (GHG) of this Report.

## 17.3 EFFECTS OF CHANGE TO ENVIRONMENT ON INDIGENOUS PEOPLES RELATED TO CEAA 2012 PARAGRAPH 5(1)(C)

CEAA 2012 paragraph 5(1)(c) requires the assessment of, with respect to Indigenous peoples, any change

to the environment caused by Sukunka on:

- (i) Health and socio-economic conditions;
- (ii) Physical and cultural heritage;
- (iii) The current use of lands and resources for traditional purposes; or
- (iv) Any structure, site or thing that is of historical, archaeological, paleontological or architectural significance.

Indigenous peoples seasonally occupy and use the area impacted by Sukunka. The effects on Indigenous peoples have been considered and assessed in other sections of this Report, including the assessments of social, economic, vegetation, heritage, wildlife, caribou, fish and fish habitat, and health VCs, as well as the sections on Indigenous Consultation in Part C of this Report. The assessment below is informed by the effects discussed in these chapters.

All components and activities within the scope of the EA for Sukunka (as defined by the May 6, 2013, Section 11 Order and the April 12, 2016 and January 30, 2018 Section 13 Orders) are within Treaty 8 territory. The following BC-based First Nations are signatories to Treaty 8:

- Blueberry River First Nations;
- Doig River First Nation;
- Fort Nelson First Nation;
- Halfway River First Nation;
- McLeod Lake Indian Band;
- Prophet River First Nation;
- Sauteau First Nations; and
- West Moberly First Nations.

While all signatories to Treaty 8 have the right to exercise their Aboriginal and Treaty rights throughout the entirety of the area covered by Treaty 8, some signatory groups have indicated areas that they consider as their traditional territory within the broader Treaty 8 region. Glencore's Application states that Sukunka is located within an area that overlaps the traditional territories of West Moberly First Nations, Sauteau First Nations, and McLeod Lake Indian Band. Halfway River and Doig River First Nations have also indicated that their traditional territories overlap with Sukunka. Horse Lake First Nation (also part of Treaty 8 but located in Alberta) also indicated that their traditional territory overlaps with Sukunka.

During the EA, McLeod Lake Indian Band, Sauteau First Nations, West Moberly First Nations, and Doig River First Nation conducted a joint First Nations Independent Technical Review (FNITR) with the objective of creating a collaborative process with Glencore to resolve issues and ensure a sustainable development program for the life of Sukunka. The FNITR retained ERM Canada Consultants Ltd. in August 2015 to conduct a third-party technical review of the Application.

During the suspension of Application Review, the composition of the FNITR shifted. While Sauteau First Nations, West Moberly First Nations, and Doig River First Nation continued to comprise the FNITR, McLeod Lake Indian Band did not formally continue as part of the committee but has continued to provide

review and comments in collaboration with the FNITR. The FNITR and McLeod Lake Indian Band retained the services of Ursus Wildlands Consulting, who continued to conduct the independent review of the referral materials until Sukunka was referred to Ministers.

As all signatories to Treaty 8 have rights throughout Treaty 8 territory regardless of their preferred areas of practice, the EAO notified all BC-based Treaty 8 Nations of key milestones in the EA and offered each of them capacity funding provided by the Agency to participate in the EA. Prophet River and Horse Lake First Nations accepted the offer of capacity funding and confirmed their interest in participating in the Application review stage of the EA. The EAO did not receive a response from Blueberry River or Fort Nelson First Nations despite several efforts at communication. Horse Lake First Nation was the only Treaty 8 Nations on Schedule C (notification level) to provide comments during Application Review.

Saulteau First Nations and McLeod Lake Indian Band provided the EAO with traditional knowledge and land use information during the EA, which is used in this section of this Report and in [Part C](#). Glencore funded an archaeological overview assessment for Sukunka area, the results of which were incorporated into relevant chapters of the Application: [Section 15](#) (Heritage), this section and [Part C](#) of this Report.

The Government of Canada recognizes that members of Métis Nation British Columbia and Kelly Lake Métis Settlement Society may also exercise Aboriginal rights and carry out traditional activities in the area of Sukunka.

The Local Assessment Area (LAA) for each VC is the area around Sukunka footprint where there would be a reasonable probability of immediate effects on a VC. The potential biophysical effects of Sukunka would be limited to the Regional Assessment Area (RAA) for a VC, which would be the largest geographical extent of Sukunka effects. The LAA and RAA boundaries used in this section are the same as those used for the wildlife, vegetation, and fish and fish habitat assessments in order to capture potential effects related to resource harvesting (including hunting, trapping, fishing and gathering).

In consideration of the information available to the EAO, Glencore's proposed mitigation measures, proposed conditions of any EAC issued, Sukunka is expected to have moderate to serious impacts on Treaty 8 rights to hunt, trap, gather and fish in the area of Sukunka. These conclusions are discussed in more detail in Part C of this report.

### **17.3.1 EFFECTS ON THE HEALTH AND SOCIO-ECONOMIC CONDITIONS OF INDIGENOUS PEOPLES RELATED TO CEAA 2012 SUBPARAGRAPH 5(1)(C)(I)**

In relation to CEAA 2012 subparagraph 5(1)(c)(i), the environmental effects of Sukunka on the health and socio-economic conditions of Indigenous peoples, along with an overall conclusion, are summarized in [Table 45](#).

Glencore's Application assessed impacts due to changes to air quality, water quality, visual quality, changes in acoustics, and the availability of and access to country foods on the health and socio-economic conditions of Indigenous peoples.

Site-specific use information was provided by McLeod Lake Indian Band and Saulteau First Nations. The Application indicates that McLeod Lake Indian Band has identified hunting areas located within the local and regional assessment areas for Sukunka. Additionally, Saulteau First Nations has indicated areas of high importance for hunting, trapping, and fishing in the area of Sukunka.

Sukunka may result in restrictions in access to harvesting sites used by Indigenous peoples, leading to adverse changes to traditional harvesting practices, which may have an adverse effect on diet and nutrition. Glencore has proposed mitigation measures, including providing advance notice to land and recreation users of construction activities, maintaining access for Indigenous peoples where possible, and the reclamation of mine pits and waste rock stockpiles to rehabilitate the area following mine closure.

Glencore identified that site drainage may affect water quality and surface water chemistry, which could in turn affect water sources used by Indigenous peoples, or wildlife that are consumed by Indigenous peoples. To mitigate these potential effects, Glencore would construct a water pipe through the wetland to minimize introduction of contact water into sensitive habitat, as well as clean water diversion ditches to divert water from Sukunka. A lined sediment control pond to settle suspended materials would also be installed to help prevent contamination of water sources.

Based on concerns identified by Working Group reviewers and Indigenous groups related to Glencore's proposed water treatment and impacts to water quality (explained in greater detail in [Section 6: Water Quality](#)), EAO has proposed several conditions to address the identified uncertainty including:

- Condition 21: Water Quality Management that outlines requirements for Glencore to treat effluent for contaminants of potential concern influenced by Sukunka to address potential effects to downstream water quality;
- Condition 23: Aquatic Effects Management and Monitoring Plan that would require Glencore to monitor and use adaptive management to address potential effects on fish and aquatic biota;
- Condition 22: Selenium Management Plan that would require Glencore to address potential selenium bioaccumulation issues; and
- Condition 14: Construction Environmental Management Plan that would require Glencore to include mitigations for erosion and sediment control, metal leaching, and acidic rock drainage management and spill response.

Other key design mitigation measures are reflected in the proposed CPD include seepage collection measures, active water treatment, a lined buffer pond and a lined residuals management area.

Glencore's Application stated that atmospheric emissions, including vehicle exhaust and coal dust, have the potential to cause respiratory problems and affect the health of Indigenous peoples engaged in hunting, trapping, fishing, gathering and other traditional activities in the area surrounding Sukunka. Glencore has proposed mitigation, including the use of water or dust suppression agents on haul roads, stockpiles, rail cars, and coal transport trucks, to reduce dust emissions.

Sukunka would result in increased noise levels during construction and operation. These changes in noise could have negative effects on the experience of Indigenous people engaging in traditional activities in the

area and potentially on their health. Further details on impacts of noise are provided in [Section 16](#) (Human Health). No potential residual adverse effects of noise were found, as predicted noise levels either meet (daytime) or marginally exceed (nighttime) noise guidelines and do not occur at a level that health effects would be expected. The EAO has also proposed Condition 25: Community Effects management Plan, that would require Glencore to provide a resolution process for noise complaints.

### Views Expressed

West Moberly First Nations, Saulteau First Nations, Doig River First Nation and McLeod Lake Indian Band indicated that community wellness is linked to opportunities to practice traditional ways of life, such as hunting and fishing, and as such, adverse environmental effects on these traditional ways of life can have negative effects on the health and well-being of community members. Indigenous groups have expressed concern that, even if the fish they harvest are considered safe to eat, their fear of contamination could result in reduction or avoidance of consumption of fish and use of fishing sites near Sukunka.

Indigenous groups remain deeply concerned about the health impacts of mercury, including:

- Its impact upon their people's ability and willingness to fish in and consume fish from the Sukunka River;
- The potential for cumulative effects from Sukunka and the Brule Mine on the Sukunka River; and
- The potential for fish in the Sukunka River to become contaminated with mercury when this river is seen as one of the last "clean" rivers in a region that includes a fish consumption advisory for mercury in the Williston Reservoir.

Methylmercury is a neurotoxin known to have developmental effects on children and infants. See [Section 16](#) (Human Health) of this Report for additional detail.

West Moberly First Nations, Saulteau First Nations, Doig River First Nation and McLeod Lake Indian Band have also expressed their belief that they have a right to access clean drinking water in Treaty 8 territory, and that the level of selenium in the Sukunka River should meet the Canadian Drinking Water Guidelines at the end of the water treatment pipe, not after an initial dilution zone. See [Section 6](#) (Water Quality and Aquatic Biota) of this Report for additional detail.

**Table 45: Summary of Effects Related to CEEA 2012 Subparagraph 5(1)(c)(i), the Health and Socio-Economic Conditions of Indigenous Peoples**

*Note: Criteria and assessment ratings are defined in [Appendix 4](#), Residual Effects Characterization Definitions*

VC/Topic	Potentially Impacted Indigenous Peoples	Predicted Residual Effects	Key Mitigations Identified by the EAO	The EAO's Significance Conclusion
Air Quality	Saulteau First Nations, McLeod Lake Indian Band, West Moberly First Nations, Doig River First Nation, and Halfway River First Nation	Increased human health risk from elevated SO <sub>2</sub> , PM <sub>2.5</sub> , PM <sub>10</sub> , and dustfall in ambient air.	Seal, cover, or use a wetting agent on product coal transport trucks prior to travel, whether loaded or unloaded.  Mitigate road dust through dust suppressants on the haul route during construction, operations, and closure in the PDA.	Context – moderate to high resilience Magnitude – high Extent – local Duration – long-term Frequency – regular Reversibility – Reversible Likelihood – high Confidence – high  <b>Significance – not significant</b>
Country Foods – Quality and Access	Saulteau First Nations, McLeod Lake Indian Band, West Moberly First Nations, Doig River First Nation, and Halfway River First Nation	Adverse effects to diet and nutrition of Indigenous peoples.	Establishment of an Environmental Monitoring Committee (not a Monitoring Committee described in Paragraph 156(2)(e) of the Impact Assessment Act) to provide a venue for Indigenous groups to have input on mine development, mitigation and monitoring measures and adaptive management.	Context – low resilience Magnitude – moderate Extent – regional Duration – permanent Frequency – continuous Reversibility – irreversible Likelihood – low Confidence – low  <b>Significance – not significant</b>
		Potential reduction in safe consumption levels of fish harvested from the Sukunka River.	Develop a Human Health Monitoring and Management Plan, that includes the monitoring of PAHs and metals to provide an accurate estimate of risks to Indigenous users in the area  Mitigation measures applied to <i>Fish and Fish Habitat</i> ( <a href="#">Table 44</a> , above) for water quality also apply to Country Foods.	
		Potential reduction in nutritional value of vegetation gathered along haul route due to dustfall.	See mitigation measures listed above for 'air quality'.	

VC/Topic	Potentially Impacted Indigenous Peoples	Predicted Residual Effects	Key Mitigations Identified by the EAO	The EAO's Significance Conclusion
		<p>Lack of caribou in diet, leading to increase in reliance on non-traditional foods from stores. This leads to increase in processed food consumption, affecting Indigenous people's health.</p>	<p>Environmental Monitoring Committee (not as described in Paragraph 156(2)(e) of the Impact Assessment Act) to provide a venue for Indigenous groups to have input on mine development, mitigation and monitoring measures and adaptive management.</p> <p>See additional mitigation measures listed in <a href="#">Section 8</a> of this chapter for 'caribou'.</p>	
Water Quality	Saulteau First Nations, McLeod Lake Indian Band, West Moberly First Nations, Doig River First Nation, and Halfway River First Nation	<p>Increased human health risk from elevated mercury and selenium concentrations in surface water.</p>	<p>Construction of a water pipe through the Sukunka wetland to release effluent directly into the Sukunka River with a diffuser to prevent effluent from entering the Sukunka wetland.</p> <p>Use of seepage collection measures to collect site contact water seepage, designed with sufficient capture efficiency to keep contaminant concentrations in Chamberlain and Skeeter creeks within permit requirements.</p> <p>Use of active water treatment, through post-closure (no end date identified), to reduce selenium, nitrates and other potential contaminants of concern in effluent, taking into account predicted concentrations of parameters in Table 4.3-1 in Appendix 27-A.14 of the environmental assessment application, British Columbia's Water Quality Guidelines for the Protection of Aquatic Life and Canadian Council of Ministers of the Environment's Canadian Water Quality Guidelines for the Protection of Aquatic Life.</p> <p>In all phases of the project, install and use erosion and sediment control measures to allow settling of suspended material prior to discharge (e.g. lined</p>	<p>Context – unknown resilience            Magnitude – low to high            Extent – local to regional            Duration – permanent            Frequency – regular to continuous            Reversibility – irreversible            Likelihood – high            Confidence – low to moderate</p> <p><b>Significance – Significant</b></p> <p>While the Water Quality VC chapter did not find a conclusion of significance, the EAO recognizes that members of Indigenous Groups may avoid using the area for drinking and fishing due to the perception of contamination from mercury and selenium.</p>

VC/Topic	Potentially Impacted Indigenous Peoples	Predicted Residual Effects	Key Mitigations Identified by the EAO	The EAO's Significance Conclusion
			<p>sedimentation ponds, silt fencing). TSS in effluent discharge should be controlled to meet all applicable legislative requirements (e.g., British Columbia's Water Quality Guidelines).</p> <p>Install, use and maintain a lined contact water buffer pond to provide primary storage for contact water that will be directed to the water treatment plant.</p> <p>Install, use and maintain lined water treatment residuals management area for containment of water treatment residuals. Leachate and surface runoff from the residuals management area will be collected prior to being pumped to the water treatment plant.</p> <p>Potentially Acid Generating waste rock will be managed by blending with non-PAG waste to prevent acidification and large-scale acid-rock drainage. PAG waste rock will not exceed 50% of total waste rock and the ratio of neutralization potential to acid potential will exceed 3. Additionally, PAG material will be confined to in-pit waste rock storage areas.</p>	

### Cumulative Effects

The EAO predicts that adverse cumulative effects on the health and socio-economic conditions of Indigenous peoples associated with air quality and the consumption of mercury-contaminated fish would not be significant. An analysis of the potential for cumulative impacts on air quality, [Section 11](#) (Air Quality) of this report, from SO<sub>2</sub> and PM from traffic, oil and gas facilities, and other coal projects in the RAA concludes the cumulative effects on air quality to be of low magnitude, local extent, long-term duration, low likelihood, and not significant.

The currently operating Brule Mine is the only past, present or reasonably foreseeable project that may act cumulatively with Sukunka to change the water chemistry; however, it is unlikely that Sukunka would result in the mercury levels in fish exceeding the Guidelines for Canadian Drinking Water Quality health

threshold, as conservative modelling showed that exceedances of mercury above baseline concentrations were low, infrequent, and only occurred in Chamberlain Creek. Drinking water quality guidelines are set for drinking water supplies that are used on a continuous, daily year-round basis. Cumulative effects on human health from mercury in fish are of moderate magnitude, regional extent, permanent duration, low likelihood, and are not significant.

Due to the lack of interacting effect with past, present and reasonably foreseeable future projects and activities, and the mitigation proposed, such as the Human Health Monitoring and Management Plan that would provide follow-up monitoring and adaptive management of project effects, the potential for cumulative health risks is expected to be low.

### **17.3.2 EFFECTS ON INDIGENOUS PEOPLES' PHYSICAL AND CULTURAL HERITAGE RELATED TO CEAA 2012 SUBPARAGRAPH 5(1)(C)(II) AND EFFECTS ON STRUCTURES, SITES, OR THINGS THAT ARE OF HISTORICAL, ARCHAEOLOGICAL, PALEONTOLOGICAL, OR ARCHITECTURAL SIGNIFICANCE TO INDIGENOUS PEOPLES RELATED TO CEAA 2012 SUBPARAGRAPH 5(1)(C)(IV)**

In relation to CEAA 2012 subparagraphs 5(1)(c)(ii) and (iv), the effects of Sukunka on the physical and cultural heritage of Indigenous peoples, as well as any structure, site or thing that is of historical, archaeological, paleontological or architectural significance, along with an overall conclusion, are summarized in [Table 46](#).

Glencore has described potential effects of Sukunka on Indigenous peoples' physical heritage and cultural heritage. Per Glencore's assessment in the Application, effects on physical heritage relate to alteration to, or removal of, culturally modified trees (CMTs) or other terrestrial archaeological or heritage sites associated with Indigenous groups, and disturbance to sacred and/or culturally important sites, landforms and/or natural features associated with ritual or spiritual use. Effects on cultural heritage also relate to the quality of resources, which contribute to the experience of engaging in cultural activities, and changes in availability and quality of resources traditionally harvested for consumptive or other cultural purposes.

As described in [Section 15](#) (Heritage) of this Report, no CMTs were identified in the archaeological field work and archaeological impact assessment within the Sukunka tenure area. However, Glencore assumed there is a possibility that CMTs could be found in the tenure area during subsequent archeological field work. If possible, heritage sites and CMTs would be avoided through project redesign. Glencore would develop a Construction Environmental Management Plan that would address archeology and heritage management (including chance find procedures) should any unrecorded heritage sites or CMTs be encountered during construction, which is also required by the *Heritage Conservation Act*.

A change in visual quality in the LAA is expected due to the presence of Sukunka. The changes to the appearance of the area may deter Indigenous people from engaging in cultural activities in the area, which may affect cultural heritage. Glencore's proposed measures to mitigate effects on visual quality including siting mine operations and infrastructure to minimize visual effects as well as using screening of natural topography and vegetation, minimizing the height of project facilities and infrastructure and using

non-reflective paint. The EAO has concluded that there would be no significant impact to visual quality due to Sukunka (see [Section 14](#) Assessment of Social Effects) and no significant impact to cultural resources due to Sukunka (see [Section 15](#) Archaeological and Heritage Resources).

## Views Expressed

Treaty 8 Nations have indicated that caribou form an essential part of their culture and history, with spiritual and social importance to the right to hunt, connection to the land, and transfer of knowledge, values, and language. Effects of Sukunka on caribou, including increased mortality and decreased habitat, could result in negative effects on the cultural heritage of Treaty 8 Nations. Part C also includes discussion of potential impacts to the rights of each Indigenous Group.

**Table 46: Summary of Effects Related to CEAA 2012 Subparagraph 5(1)(c)(ii), Indigenous Physical and Cultural Heritage**

*Note: Criteria and assessment ratings are defined in [Appendix 4, Residual Effects Characterization Definitions](#)*

VC/Topic	Potentially Impacted Indigenous Peoples	Predicted Residual Effects	Key Mitigations Identified by the EAO	The EAO’s Significance Conclusion
Heritage sites – Culturally modified trees	Saulteau First Nations, McLeod Lake Indian Band, West Moberly First Nations, Doig River First Nation, and Halfway River First Nation	Although no CMTs were identified during the archaeological field work and Archaeological Impact Assessment, Glencore assumed there is a possibility that CMTs could be found in the tenure area during subsequent archeological field work. There is the potential for CMTs to be damaged or removed during site preparation and ground disturbance activities such clearing and grubbing, and site grading.	<p>Avoidance of sites through project redesign to ensure compliance with the <i>Heritage Conservation Act</i>.</p> <p>Where sites cannot be avoided, complete a systematic data recovery program for archaeological sites under the authority of a HCA Section 12 alteration permit issued by the Archaeology Branch of LWRS.</p> <p>Glencore will prepare a Preliminary Management Plan and Chance Find Protocol for the Protection of Archaeological and Heritage Sites which will include detailed procedures to protect known archaeological and heritage sites and a notification and Chance Find Protocol communication plan in case undetected archaeological or heritage resources, in particular CMTs, are discovered during any phase of the Sukunka project</p>	No residual effects are anticipated to archaeological or heritage resources; therefore, the EAO did not characterize residual effects for the archaeological and heritage resources.

			development.	
Heritage sites – access to heritage sites	Saulteau First Nations, McLeod Lake Indian Band, West Moberly First Nations, Doig River First Nation, and Halfway River First Nation	Reduced access to physical or cultural heritage sites.	<p>Advance notice of access restrictions would be provided to land and resource users throughout the construction phase.</p> <p>Provide access through the project development area during all phases of the project <i>to Indigenous groups for the purpose of accessing heritage sites, unless not possible for safety reasons and develop procedures for groups to request and gain access.</i></p> <p>During closure and post-closure, retain new access (transportation) options established for the Project through the improvement (e.g., cleaned up, erosion filled in) of existing trails used by Indigenous Groups, or provision of new opportunities for area users within the project tenure area and PDA, where possible/feasible</p> <p>Reclamation of mine pits and waste rock stockpiles in accordance with the Reclamation Plan to rehabilitate the area to as close to predevelopment conditions as possible.</p>	No residual effects are anticipated to archaeological or heritage resources; therefore, the EAO did not characterize residual effects for the archaeological and heritage resources, and so no significant impact would be expected.
Cultural heritage	Saulteau First Nations, McLeod Lake Indian Band, West Moberly First Nations, Doig River First Nation, and Halfway	Effects on cultural heritage due to increased caribou and grizzly bear mortality and decreased caribou and grizzly bear habitat.	<p>See mitigation measures listed under ‘caribou’ in <a href="#">Table 48</a> and ‘decreased access to heritage sites’ in <a href="#">Table 46</a>.</p> <p>Prohibit the following in the PDA and along haul roads by project workers: hunting, firearms, feeding wildlife, littering, harming or harassing wildlife, disturbing wildlife habitat, and pets.</p> <p>Design all water management ditches to allow wildlife to cross</p>	<b>Significant</b> impact to cultural heritage due to potential impacts to hunting caribou

	River First Nation		safely.	
Cultural Heritage – visual quality and noise	Saulteau First Nations, McLeod Lake Indian Band, West Moberly First Nations, Doig River First Nation, and Halfway River First Nation	In Glencore’s visual quality assessment, Sukunka was determined to result in a high visual effect for two viewpoints: Chamberlain Mountain and Bullmoose Mountain. Glencore stated that Sukunka would result in a partial loss of or alteration to the landscape character in visually sensitive areas in the LAA, but that the effects on physical or cultural heritage would be not significant after mitigation measures.	Paint mine structures in colours that harmonize with the adjacent natural environment and using a low-reflectance matte paint.  Site mine operations and infrastructure to minimize visual effects.  Use screening of natural topography and vegetation.  Minimize the height of project facilities and infrastructure.	Context – low to moderate resilience Magnitude – moderate Extent – local Duration – long-term Frequency – continuous Reversibility – reversible to irreversible Likelihood – high Confidence – moderate  <b>Significance – not significant</b>
		Glencore anticipated the change in noise to affect the enjoyment and overall experience of Indigenous peoples who currently use land and resources in close proximity to the PDA. The residual effects would be local in extent	Install mufflers on construction equipment and keeping equipment in good working condition.  Install louvers, vent hoods and silencers to reduce noise coming out of the processing plant.  Develop a Community Effects Management Plan, including a process for receiving and responding to noise complaints.	

**Cumulative Effects**

The EAO does not predict any residual, and therefore, cumulative effects, to the archaeological or heritage resources from Sukunka.

Adverse cumulative effects on cultural heritage are anticipated to be significant, due to the adverse residual effects on caribou and grizzly bear, and therefore, on Aboriginal peoples’ ability to hunt, share traditional knowledge, and engage in cultural practices with respect to these species. In addition, there is a moderate likelihood for adverse cumulative effects on visual quality at the regional level.

### 17.3.3 EFFECTS ON INDIGENOUS PEOPLES' CURRENT USE OF LANDS AND RESOURCES FOR TRADITIONAL PURPOSES RELATED TO CEAA 2012 SUBPARAGRAPH 5(1)(C)(III)

In relation to CEAA 2012 subparagraph 5(1)(c)(iii), the effects of Sukunka on Indigenous peoples' current use of lands and resources for traditional purposes, along with an overall conclusion, are summarized in this section. Current uses of lands and resources by Indigenous peoples for traditional purposes were identified based on information from Indigenous groups related to harvesting, the aesthetic experience of land and aquatic use, and sites, landforms and natural features associated with ritual or spiritual use.

Glencore's Application considered the following potential adverse Project effects when assessing effects on the current use of lands and resources for traditional purposes:

- Changes in availability and quality of harvested resources;
- Changes in quality of resources which contribute to the experience of using current lands and resources for traditional purposes (air quality, visual quality, water quality, acoustic environment); and
- Disturbance to traditional use areas, sacred and culturally important sites, landforms and natural features as well as changes to the quality of experience of these locations.

Glencore's Application stated that the Indigenous groups identified the use of Hole in the Wall Park as one specific site that is unique, more productive, or more frequently used than other areas within the Sukunka River Valley. Glencore did not expect Sukunka to have any impact to the water quality of fish habitat at Hole in the Wall Park. This park is used primarily for fishing, collection of drinking water, and spiritual or cultural activities. The park is located southwest of Sukunka and approximately 15 km upstream along the Sukunka River, which is outside the RAA for water quality.

Sukunka would result in an altered visual landscape from a number of viewpoints. To mitigate effects to visual quality, Glencore would minimize the height of project facilities and infrastructure and utilize non- or low-reflective paint colours that promote integration with the landscape. Further detail on impacts to visual quality are described in [Section 14](#) (Social).

The *Saulteau First Nations Knowledge and Use Study*, released in 2015, reports that the Saulteau First Nations practice hunting, fishing, and berry picking in and around Sukunka. The Study describes Sukunka access road as a primary transportation route to access areas of importance beyond Sukunka. In 2016, Glencore prepared a summary of a traditional knowledge/land use study undertaken by McLeod Lake Indian Band. This summary indicated that the portion of the Sukunka River within five kilometers of Sukunka is a particularly important area for transportation routes, as well as hunting, fishing, and gathering opportunities for members of the McLeod Lake Indian Band. Other Indigenous groups did not provide site-specific use information, but have indicated that they practice fishing, hunting, trapping, gathering, and cultural activities in areas of their traditional territory that would be affected by Sukunka. Part C further includes more discussion of the exercise of rights for each Indigenous Group.

### Effects on fishing practices

The Saulteau First Nations Knowledge and Use Study describes the Sukunka River as one of the healthier rivers in the region, with Saulteau members viewing it as a preferred location for harvesting rainbow trout, among other fish species. Species harvested by Saulteau First Nations members in the vicinity of Sukunka include, but are not limited to, rainbow trout, bull trout, whitefish, Dolly varden and grayling.

McLeod Lake Indian Band members fish for rainbow trout, Dolly varden, char and grayling in the area of Sukunka, including Gwillim Lake. Gwillim Lake was also identified as an important area for cultural teaching and group gatherings.

Glencore predicted that potential declines in the overall abundance of traditionally harvested fish or the quality of fish resources due to Sukunka could result in a reduction of fish harvested by Indigenous peoples. Mitigation measures proposed to reduce, minimize, or avoid adverse effects on the quantity or quality of fish resources includes implementing fish habitat offsetting, maintaining a 150 m buffer around wetlands, and the use of water diversion ditches, as well as monitoring and adaptive management through aquatic effects monitoring.

### Effects on hunting and trapping practices

Sukunka would result in direct habitat loss for wildlife species that are harvested by Indigenous peoples due to vegetation removal, and indirect effects due to sensory disturbance. Mammals would also be exposed to increased human and predator access, leading to increased risk of mortality (see [Section 7 – Wildlife](#), for additional details). Glencore’s proposed measures to mitigate effects on wildlife resources include avoiding ungulate winter range, minimizing loss of vegetation, and implementing caribou and wildlife mitigation and monitoring. Saulteau First Nations and McLeod Lake Indian Band provided site-specific information indicating that members harvest wildlife species in the vicinity of Sukunka including, but not limited to, moose, deer, grizzly bear, elk, caribou, mountain goats, rabbits, marmot, geese, and grouse.

Caribou were traditionally hunted by Treaty 8 Nations in the vicinity of Sukunka; however, due to reduced population levels, caribou are no longer hunted. The EAO has determined that Sukunka is expected to have a significant adverse effect to the Quintette caribou herd (See [Section 8: Caribou](#) for additional details). The EAO’s findings are that there would be serious impacts to the Treaty right to hunt caribou for West Moberly First Nations, Saulteau First Nations, and McLeod Lake Indian Band, and moderate-to-serious impacts for Halfway River First Nation and Doig River First Nation due to their distance from the PDA and their historic connection to hunting different caribou herds in the region. The significant adverse environmental effects of Sukunka on caribou could be a reduction in the Southern Mountain caribou population (including the Quintette herd), which would affect the current use as well as any future use of this resource for Treaty 8 Nations.

### Effects on gathering practices

Glencore’s Application described that Saulteau First Nations has identified the Sukunka River valley as a location where its members pick berries, gather medicinal plants, and harvest bark for smoking meat. Vegetation species gathered in around Sukunka area include, but are not limited to, medicinal plants,

chokecherries, wild peas, huckleberries, cranberries, blueberries, and firewood.

Increased levels of molybdenum, a trace metal found in coal dust, are expected to be taken up by vegetation, which would affect the quality and quantity of plants harvested for traditional purposes. Additionally, invasive plant populations may expand or take over new areas due to clearing disturbance, leading to a potential decrease in the availability of traditional plant species. Glencore has proposed an Invasive Species Management Plan, which includes washing the undercarriage and bumpers of all vehicles after work in a weed-infested area to address effects of Sukunka on vegetation resources.

## Views Expressed

### Effects on fishing practices

Through the FNITR process, Indigenous groups expressed concerns regarding the potential for increased levels of mercury in surface water due to Sukunka, which could impact the health of those who ate fish from these water bodies. The Sukunka River is viewed as one of the last remaining safe areas to fish in the Treaty 8 territory.

### Effects on hunting and trapping practices

Through the FNITR process, Indigenous groups have indicated that Sukunka could result in increased access to the area by non-Indigenous hunters and recreational users. This increased use of the area could have negative effects on the availability of traditionally hunted species such as moose, as well as interfering with the peaceful enjoyment of the exercise of Aboriginal and Treaty rights and interests. Glencore has indicated that Sukunka personnel would be prohibited from hunting, fishing, and using recreational vehicles within a buffer zone to be determined prior to construction.

Treaty 8 Nations have identified caribou as a culturally important species. While these Indigenous groups have self-imposed a moratorium on all hunting of caribou, due to low population numbers, it is still considered to be a current use of lands and resources as these groups would prefer to harvest caribou should the herd size increase to levels able to sustain Indigenous hunting. Sukunka would result in decreased habitat availability, potential for increases in predation, and increased risk of mortality for caribou. West Moberly First Nation has described that the inability to harvest caribou has led to a loss of traditional knowledge and opportunities for intergenerational teachings, in addition to impacts to the traditional seasonal round. Treaty 8 Nations have expressed that the mitigation measures proposed by Glencore for effects on caribou, including the size of the area proposed for habitat offsets, are not sufficient for reducing the risk to caribou to an acceptable level. Through the FNITR process, concerns were raised related to the cumulative effects of industrial development in the area, in addition to the direct effects of Sukunka, on the recovery of the Quintette caribou herd. Sauteau First Nations, West Moberly First Nations, Doig River First Nation, McLeod Lake Indian Band and Halfway River First Nation have all indicated that the potential impacts to caribou prevent them from supporting Sukunka as currently designed.

### Effects on gathering practices

Through the FNITR process, Indigenous groups expressed concerns related to increased dust on vegetation

near haul routes, and potential safety concerns for community members travelling to access gathering sites near haul roads.

#### Additional concerns

The FNITR expressed concerns about the cumulative effects of industrial development in their territory and the subsequent effects on the ability of their members to carry out traditional activities. Cumulative effects of development include decreased wildlife habitat, decreased access to harvesting areas, and decreased ability to have peaceful enjoyment and conduct cultural activities.

**Table 47: Summary of Effects Related to CEAA 2012 Subparagraph 5(1)©(iii), Indigenous Peoples' Current Use of Lands and Resources for Traditional Purposes**

*Note: Criteria and assessment ratings are defined in [Appendix 4, Residual Effects Characterization Definitions](#)*

VC/Topic	Potentially Impacted Indigenous Peoples	Predicted Residual Effects	Key Mitigations Identified by the EAO	The EAO's Significance Conclusion
Fishing	Saulteau First Nations, McLeod Lake Indian Band, West Moberly First Nations, Doig River First Nation, and Halfway River First Nation	<p>Reduction in fish habitat due to construction of project infrastructure and changes in surface flows.</p> <p>Localized fish mortality due to infilling and disturbance to instream habitat.</p> <p>Decreased use of fishing areas located in Sukunka area, as the Sukunka River is viewed by the Treaty 8 Nations as one of the last remaining safe areas to fish and is very important to their Treaty right to fish.</p> <p>Increase in access to areas in the region by non-Aboriginal people.</p> <p>Potential contamination of fish or fish habitat.</p> <p>Potential cumulative impacts of mines and other development on the water quality in the Sukunka River.</p>	See mitigation measures listed under 'fishing' in <a href="#">Table 44</a> and 'decreased access to heritage sites' in <a href="#">Table 46</a> .	<p>Context – low to moderate resilience</p> <p>Magnitude – low to high</p> <p>Extent – local</p> <p>Duration – short term- to permanent</p> <p>Frequency – regular to continuous</p> <p>Reversibility – irreversible</p> <p>Likelihood – high</p> <p>Confidence – low to moderate</p> <p><b>Significance – not significant</b></p>
Hunting and Trapping	Saulteau First Nations, McLeod Lake Indian Band, West Moberly First Nations, Doig River First Nation, and Halfway River First Nation	<p>Increased ungulate mortality due to vehicle collisions.</p> <p>Loss of wildlife habitat, including high elevation critical caribou habitat.</p> <p>Loss of hunting locations and access, hunted species, and the hunting experience.</p>	See mitigation measures listed under 'caribou' in <a href="#">Table 48</a> and 'decreased access to heritage sites' in <a href="#">Table 46</a> .	<p>Context: low resiliency</p> <p>Magnitude: moderate to high</p> <p>Extent: beyond regional</p> <p>Duration: long-term to</p>

VC/Topic	Potentially Impacted Indigenous Peoples	Predicted Residual Effects	Key Mitigations Identified by the EAO	The EAO's Significance Conclusion
				permanent Reversibility: Irreversible and reversible Frequency: single and continuous Likelihood: High Confidence: High  <b>Significance:                      Significant</b>
Plant harvesting/ Gathering	Saulteau First Nations, McLeod Lake Indian Band, West Moberly First Nations, Doig River First Nation, and Halfway River First Nation	Increased dust on vegetation near haul routes.  Decreased safety for community members travelling to gathering sites near haul roads due to increased traffic.  Increase in invasive plant species.  Loss of access to gathering sites.  Increased risk of respiratory health problems due to dustfall near haul routes.	See mitigation measures in previous tables related to 'air quality' in <a href="#">Table 45</a> and 'decreased access to country foods' in <a href="#">Table 45</a> .  Inspect and wash all vehicles, machinery and equipment after work in an invasive species-infested area.	Context – moderate to high resilience Magnitude – high Extent – local Duration – long-term Frequency – regular Reversibility – reversible Likelihood – high Confidence – high  <b>Significance – not significant</b>
Cultural and spiritual practices	Saulteau First Nations, McLeod Lake Indian Band, West Moberly First Nations, Doig River First Nation, and Halfway River First Nation	Loss of traditional knowledge and opportunities for intergenerational teachings related to exercise of Aboriginal and Treaty rights, in particular related to caribou.	See mitigation measures in previous tables related to 'decreased access to country foods' in <a href="#">Table 45</a> .	Context – low to moderate resilience Magnitude – high Extent – local to regional Duration – long-term Frequency – regular Reversibility – reversible to irreversible

VC/Topic	Potentially Impacted Indigenous Peoples	Predicted Residual Effects	Key Mitigations Identified by the EAO	The EAO's Significance Conclusion
				Likelihood – high Confidence – moderate  Significance – Significant

**Cumulative Effects**

The adverse residual effects of Sukunka in combination with past, existing, and reasonably foreseeable projects and activities, could cause cumulative effects to the current use of lands and resources for traditional purposes by increasing wildlife mortality, reducing hunting and gathering areas. These would, in turn, affect Indigenous people’s ability to exercise, or peacefully enjoy the exercise of, their rights to fish, hunt, trap, gather, and engage in cultural practices.

**17.4 CEEA 2012 SUBSECTION 5(2) REQUIREMENTS**

CEEA 2012 paragraph 5(2)(a) requires an assessment of changes to the environment that are directly linked or necessarily incidental to the exercise of a power or performance of duty or function by a federal authority. Paragraph 5(2)(b) requires an assessment of changes to any associated effects on health, socio-economic conditions, any structure, site or thing of historical, archaeological, paleontological or architectural significance, or other matters of physical or cultural heritage not already considered under paragraph 5(1)(c).

If approved, Sukunka may require a *Fisheries Act* authorization for any unavoidable harmful alteration, disruption, or destruction of fish habitat and/or death of fish. Should an authorization be required, the Proponent would need to develop an Offsetting Plan consistent with ‘DFO’s Policy for Applying Measures to Offset Adverse Effects on Fish and Fish Habitat under the *Fisheries Act*’ to counterbalance these effects.

In addition to a potential *Fisheries Act* authorization, the following federal authorization is anticipated to be required by Sukunka: permit for the manufacture of explosives from Natural Resources Canada under the federal *Explosives Act*.

Glencore stated that explosives would be used mainly in the open cut coal mining process and lesser amounts of explosives may be required to develop the surface mine infrastructure. The Application noted that Glencore would tender and hire a licensed explosives supplier to perform all functions related to the licensing, installation, and operation of the explosives factory and magazines. The licensed explosives contractor would also perform all functions related to the procurement, delivery, manufacture, storage, and disposal of explosives and detonators. Additionally, explosives would be managed in accordance with the Explosives Management Plan.

Environmental effects not already described in the sections above, resulting in a change to health and socio-economic conditions, physical and cultural heritage and any structure, site or thing that is of

historical, archaeological, paleontological or architectural significance directly linked or necessarily incidental to the exercise of a power or performance of duty or function by a federal authority would not be anticipated as a result of Sukunka.

### 17.5 SPECIES AT RISK ACT SUBSECTION 79(2) REQUIREMENTS

*Species at Risk Act (SARA)* subsection 79(2) requires the identification of adverse effects of Sukunka on the SARA listed wildlife species and its critical habitat and, if Sukunka is carried out, measures consistent with recovery strategies or action plans must be taken to avoid or lessen those effects and to monitor them. The assessments required for SARA subsection 79(2) are summarized in [Table 48](#).

**Table 48: Summary of Effects Related to SARA Subsection 79(2)**

**Note:** Criteria and assessment ratings are defined in [Appendix 4, Residual Effects Characterization Definitions](#)

SARA Species	Effects Assessment	Key Mitigations Identified by the EAO	The EAO's Significance Conclusion
<p>Western Toad (special concern) Note: effects assessment was completed for amphibians as a class.</p>	<p>Decrease in breeding habitat availability in the LAA from mine site and chosen haul route option by 6.9% and overwintering habitat by 38.5%.</p> <p>Increase in direct mortality risk due to collision risk with vehicles along haul routes. Amphibians are particularly susceptible to mortality from vehicles, and areas of high risk include the intersection of the haul route and wetlands.</p> <p>Reduction in movement due project components such as ditches, roads, rail loadouts, and the above-ground pipe.</p>	<p>Conduct additional pre-disturbance (baseline) surveys for western toad, including road surveys and surveys in the Sukunka wetland to identify:</p> <ul style="list-style-type: none"> <li>• breeding, post-breeding migration, emergence timing, and non-breeding periods;</li> <li>• potential breeding sites (including the Sukunka wetland); and</li> <li>• potential migration corridors that connect breeding ponds to upland terrestrial habitats; and</li> <li>• identify population hotspots along roads and highways associated with project-related traffic, where haul routes intersect potential breeding and migration corridors, that take into account estimates for scavenger-removal and observer detection</li> </ul>	<p>Context – low to moderate resilience Magnitude – low to moderate Extent – local Duration – long-term to permanent Frequency – once and continuous Reversibility – reversible and irreversible Likelihood – high Confidence – low to moderate</p> <p><b>Significance: not significant</b></p>

SARA Species	Effects Assessment	Key Mitigations Identified by the EAO	The EAO's Significance Conclusion
		<p>rates.</p> <p>The results of these surveys would determine timing of project activities, to avoid habitats when western toad are occupied or during sensitive periods, such as breeding and migration, and location of additional mitigation measures below.</p> <p>A buffer of at least 150 m around wetlands and aquatic habitats to protect from edge effects surrounding western toad breeding ponds, or where this buffer is not possible, a rationale for the decreased buffer size and additional mitigation measures that will be applied.</p> <p>Where any western toad habitat will be removed, a salvage and relocation program for amphibians will be undertaken by a Qualified Professional, consistent with the BC Best Management Practices for Amphibian and Reptile Salvages in British Columbia (2016, or as updated or replaced).</p> <p>Installation of fencing adjacent to all identified breeding ponds to direct western toad dispersal movements towards crossing features (e.g., tunnels, overpasses) and away from project infrastructure and human-made habitats.</p>	
	<p>Reduction in health due to increase in selenium concentrations in lentic habitats from project activities discharge</p>	<p>Implement mitigation measures that control contact water discharge into the aquatic environment (see Water Quality in <a href="#">Table 45</a>—Effects on Indigenous Peoples Current Use</p>	

SARA Species	Effects Assessment	Key Mitigations Identified by the EAO	The EAO's Significance Conclusion
		<p>of Lands and Resources for Traditional Purposes).</p> <p>Installation of barriers to prevent amphibians and other wildlife from entering water bodies with the potential to contain contaminants of potential concern.</p>	
Caribou (threatened)	<p>Direct, long-term to permanent effects on habitat through removal of 125 ha of high elevation, 4 ha of low elevation, and 2276 ha of matrix caribou habitats from clearing and construction</p> <p>Indirect, long-term effects on habitat through sensory disturbance from construction and operations. There is also uncertainty around the extent of sensory disturbance and the impacts to the herd, including the potential for abandonment of the important Bullmoose Mountain high elevation winter range.</p>	<p>The clean water diversion ditch in high elevation winter range (HEWR) will be constructed and maintained without the construction of an access road.</p> <p>The maximum width of the clean water diversion ditch in high elevation winter range will be 20 m in the north section and 60 m in the south section.</p> <p>Prior to disturbance of high elevation critical caribou habitat, secure habitat (from all tenure holders) to offset all high elevation critical caribou habitat that would be altered or destroyed by the Project. (Glencore currently proposes an offset of 1,024 ha located within Glencore's tenure to the southeast of Sukunka, within high elevation summer and winter range for the Quintette herd.)</p> <p>All construction activities including blasting and clearing will not occur within at least 500 m of high elevation habitat designated for caribou during the critical (January 15-July 15) and cautionary (September 15-January 14) periods for</p>	<p>Context: low resiliency Magnitude: moderate to high Extent: beyond regional Duration: long-term to permanent Reversibility: Irreversible for direct habitat loss and reversible for indirect habitat loss, mortality risk and change in movement. Frequency: single and continuous Likelihood: High Confidence: High</p> <p><b>Significance: Significant</b></p>

SARA Species	Effects Assessment	Key Mitigations Identified by the EAO	The EAO's Significance Conclusion
		<p>caribou<sup>100</sup>.</p> <p>A minimum ferrying altitude of 500 m above ground-level over high elevation caribou habitat for mine-related air traffic, except where needed to construct and access mine infrastructure.</p> <p>Participate in habitat restoration of existing disturbed areas related to the predator management component of the Provincial Caribou Recovery Program in B.C.</p>	
	<p>Increased mortality risk resulting from increased vehicles traffic and access by wolves into high elevation range</p>	<p>Remove and reclaim linear features and access when they are no longer required for mine operation and following mine closure, including deactivation and re-vegetation of access roads, excluding pre-existing forest service roads</p> <p>Offsets for habitat restoration based on 125 km of linear features, recovering approximately 1,750 ha on undisturbed caribou range.</p> <p>Participate in habitat restoration of existing disturbed areas related to the predator management component of the Provincial Caribou Recovery Program in B.C.</p> <p>Reduce line of sight along linear features outside of project disturbance area by planting vegetation along linear features in high elevation caribou habitat</p>	

<sup>100</sup> See [https://www2.gov.bc.ca/assets/gov/environment/plants-animals-and-ecosystems/wildlife-wildlife-habitat/regional-wildlife/northeast-region/best-mgmt-practices/moe\\_timing\\_windows\\_rationale\\_final.pdf](https://www2.gov.bc.ca/assets/gov/environment/plants-animals-and-ecosystems/wildlife-wildlife-habitat/regional-wildlife/northeast-region/best-mgmt-practices/moe_timing_windows_rationale_final.pdf) and [https://www2.gov.bc.ca/assets/gov/environment/plants-animals-and-ecosystems/wildlife-wildlife-habitat/regional-wildlife/northeast-region/best-mgmt-practices/april\\_2011\\_least\\_risk\\_windows.pdf](https://www2.gov.bc.ca/assets/gov/environment/plants-animals-and-ecosystems/wildlife-wildlife-habitat/regional-wildlife/northeast-region/best-mgmt-practices/april_2011_least_risk_windows.pdf)

SARA Species	Effects Assessment	Key Mitigations Identified by the EAO	The EAO's Significance Conclusion
		<p>and between low and high elevation caribou habitat. Prior to the planted vegetation reaching an effective blocking height (i.e., 2-4 m), structural access blocks would be installed on linear features within high-elevation forest. These measures are intended to impede predator movement along linear features. Habitat restoration and offsetting measures described above.</p>	
	<p>Displacement of caribou to lower elevation habitats where risk of predation is higher</p>	<p>Not mitigable, as per conclusions of <a href="#">Section 8</a>: Caribou.</p>	
	<p>Change in movement due to the construction of the mine site, haul routes, and the diversion ditch within high elevation winter range.</p>	<p>Water management ditches must be designed to allow caribou to cross safely.</p> <p>Provide safe crossing opportunities for grizzly bears and ungulates along linear features. This includes installing and maintaining wildlife crossing structures over ditches where they align with pre-existing wildlife trails and-breaks in snowbanks.</p>	
<p>Birds</p> <ul style="list-style-type: none"> <li>• Migratory birds               <ul style="list-style-type: none"> <li>○ Olive-sided flycatcher (threatened)</li> <li>○ Canada warbler (threatened)</li> <li>○ Rusty blackbird (special concern)</li> <li>○ Yellow rail (special concern)</li> <li>○ Barn swallow, bank swallow (threatened)</li> <li>○ Common nighthawk</li> </ul> </li> </ul>	<p>Decrease in effective breeding habitat availability in the LAA from mine site and chosen haul route option by 5.8-61.3 percent.</p>	<p>See mitigations for “Migratory Birds as defined in Migratory Birds Convention Act, 1994” in <a href="#">Table 44</a>.</p> <p>In consultation with ECCC, replacement of any loss of barn swallow and bank swallow nest(s) or nesting site(s) by installation of artificial nest structures, which are species appropriate, one season prior to loss of the nest(s) and/or nesting site(s), and restoration of lost foraging and roosting habitat during reclamation, in locations</p>	<p>Context – low to moderate resilience            Magnitude – low to moderate            Extent – local            Duration – long-term to permanent            Frequency – once and continuous            Reversibility – reversible and irreversible            Likelihood – high            Confidence – low to moderate</p>

SARA Species	Effects Assessment	Key Mitigations Identified by the EAO	The EAO's Significance Conclusion
<p>(threatened) - grassland bird community was used to infer the potential impacts to this species</p> <ul style="list-style-type: none"> <li>Short-eared owl (threatened) - grassland bird community was used to infer the potential impacts to this species</li> </ul>		determined by a Qualified Professional.	<p><b>Significance: not significant</b></p>
	<p>Increase in direct mortality risk due to collision risk with vehicles (increased rate of 0.7 to 8.0 birds per day) and transmission lines as well as during habitat clearing for construction during the breeding bird period.</p>	<p>See mitigations for “Migratory Birds as defined in Migratory Birds Convention Act, 1994” in <a href="#">Table 44</a>.</p>	
	<p>Increase in indirect mortality through disturbance in adjacent habitat (e.g., noise) and the creation of increased edge habitat.</p>	<p>Establish species-appropriate setbacks, restricted activity periods, and monitoring of the active nest. These should be done in accordance with ECCC’s Guidelines to Reduce Risk and General Nesting Periods of Migratory Birds in Canada for migratory birds, and in consultation with EMLI and LWRS for migratory birds, and in consultation with EMLI and LWRS for other birds.</p> <p>Use elements placed over ventilation openings such as louvers, vent hoods and silencers to attenuate noise break-out through these openings to the outside.</p>	
<p>Reduction in movement due to an increase in canopy gaps from roads, mine site, transmission lines and the water pipe.</p>	<p>Establish species appropriate setbacks, restricted activity periods, and monitoring of the active nest. These should be done in accordance with ECCC’s Guidelines to Reduce Risk and General Nesting Periods of Migratory Birds in Canada for migratory birds, and in consultation with EMLI and LWRSs for migratory birds, and in consultation with EMLI and LWRS for other birds.</p>		

SARA Species	Effects Assessment	Key Mitigations Identified by the EAO	The EAO's Significance Conclusion
<p>Little Brown Myotis and Northern Myotis (endangered)<sup>101</sup></p>	<p>Decrease in effective habitat availability in the LAA from mine site and chosen haul route option.</p>	<p>Document maternal roost sites and hibernacula for little brown myotis and northern myotis) prior to disturbance. Identify year-round species presence, bat community composition and habitat preference (e.g., roosting and foraging) including cliffs, crevices, talus jumbles, forest edges, and in proximity to suitable habitat features (e.g., wetlands) using telemetry, mapping, and acoustic recording methods.</p> <p>Compensate for loss of bat maternal roosting and hibernacula sites, such as the establishment of artificial habitat features that mimic those previously available in the project area and restoration that includes planting of native tree species known to be high value roosting sites for local bats, in consultation with ECCC and LWRS.</p> <p>Implement offset measures in such a way that either allows wildlife habitat to be available at the time of or before such habitat is lost or provides additional habitat replacement to compensate for the time gap between when habitat is lost and created.</p>	<p>Context – low to moderate resilience                      Magnitude – low to moderate                      Extent – local                      Duration – long-term                      Frequency – once and continuous                      Reversibility – reversible to irreversible                      Likelihood – high                      Confidence – low to moderate</p> <p><b>Significance: not significant</b></p>
	<p>Increase in mortality during habitat removal during construction (if habitat removal occurs during roosting period).</p>	<p>Implement mitigation measures for potential environmental effects to species at risk bats, including maintaining appropriate setbacks between disturbance areas and active bat roost sites and hibernacula as</p>	

<sup>101</sup> Note: Little brown myotis and northern myotis were added to Schedule 1 of the Species at Risk Act after the submission of Sukunka draft Application

SARA Species	Effects Assessment	Key Mitigations Identified by the EAO	The EAO's Significance Conclusion
		<p>recommended by LWRS, ENV, and ECCC.</p> <p>Conduct pre-construction surveys to document key habitat features including active roost sites and hibernacula within the PDA. Identify year-round species presence, bat community composition and habitat preference (e.g., roosting and foraging) including cliffs, crevices, talus jumbles, forest edges, and in proximity to suitable (e.g., wetlands) using telemetry, mapping, and acoustic recording methods.</p> <p>Use species-specific appropriate survey methods (including Resources Information Standards Committee (RISC) for bats in consultation with ENV, EMLI, and ECCC.</p>	
<p>Grizzly Bear (western population) (special concern)</p>	<p>Decrease in habitat within the LAA</p>	<p>Complete site-clearing activities outside winter denning periods, where possible.</p>	<p>Context – low resilience            Magnitude – moderate            Extent – regional            Duration – long-term to permanent            Frequency – once and continuous            Reversibility – reversible to irreversible            Likelihood – high            Confidence – low to moderate</p> <p><b>Significance: not significant</b></p> <p><b>(Significant cumulative effects)</b></p>
	<p>Increased mortality risk due to roads, and other additional linear features</p>	<p>Design and construction of water management ditches to allow for safe grizzly bear crossing</p> <p>Provide safe crossing opportunities for grizzly bears and ungulates along linear features. This includes installing and maintaining wildlife crossing structures over ditches where they align with pre-existing wildlife trails and breaks in snowbanks along roads.</p> <p>Develop procedures and training opportunities to minimize human-wildlife interactions</p> <p>Implementation of regional initiatives to reduce grizzly bear mortality, including LWRS-led</p>	

SARA Species	Effects Assessment	Key Mitigations Identified by the EAO	The EAO's Significance Conclusion
		Grizzly Bear Program to monitor and mitigate effects on grizzly bear populations.	

**Cumulative Effects**

As described in [Section 7](#) (Wildlife), the EAO concludes that the potential for adverse cumulative effects on SARA species, with the exception of grizzly bear and caribou, from Sukunka and other past, present, and reasonably foreseeable future projects and activities to be not significant.

Cumulative effects to grizzly bear are expected to be high in magnitude, regional in extent, and long-term in duration, with the residual adverse cumulative effects predicted to be significant given the spatial overlap of Sukunka with the Hart Grizzly Bear Population Unit habitat. While some project effects that contribute to cumulative effects could be reversible to the extent that access is closed and reclaimed, however, it is not expected that this will be the case for all future or current access.

Significant cumulative effects to caribou are anticipated, as the interaction of Sukunka with other past, present, and reasonably foreseeable projects and activities, would potentially further the loss of caribou critical habitat and likely threaten the recovery of the species, especially the Quintette herd. These cumulative effects are considered high in magnitude, and long-term to permanent in duration.

**17.6 FOLLOW-UP PROGRAMS**

Under CEAA 2012, a follow-up program is required to verify the accuracy of the EA predictions and/or determine the effectiveness of any mitigation measures. The follow-up program would be focused on potential effects to VCs considered under Section 5 of CEAA 2012.

The following EAO recommendations are considered potential areas for the follow-up program under CEAA 2012:

- Fish
  - Fish habitat characterization, fish population sampling, immediately downstream of the proposed effluent discharge location in the Sukunka River;
  - Further characterization of the baseline conditions of the Sukunka wetland and wetland functions;
  - Assess potential changes in water temperature and its effects on fish species in the Skeeter and Chamberlain Creeks;
  - Monitor bull trout use of Skeeter and Chamberlain Creeks;
  - Monitor fish use of habitat created as part of the fish habitat offsetting plan;
  - Monitor the abundance and species composition of benthic and drifting invertebrates in

- Skeeter Creek;
  - in Chamberlain and Skeeter Creeks, and the Sukunka wetland;
  - Monitor surface flows, surface water quality, and wetland groundwater quality in the Sukunka River; Chamberlain Creek, Skeeter Creek, and the Sukunka wetland; and
  - Monitor of water quality downstream of mine infrastructure for all parameters with applicable BC water quality guidelines, background concentrations, or a protective level, developed in consultation with Indigenous Groups contained in the EMA permit for Sukunka.
- Wildlife, including caribou
  - Monitor ungulate and grizzly bear use of safe crossing opportunities across ditches;
  - Monitor use and effectiveness of wildlife crossing features (e.g. tunnels, overpasses) and fencing designed for amphibians. Monitor all potential breeding sites, potential migration corridors that connect breeding ponds to upland terrestrial habitat, and along roads and highways associated with project-related traffic to determine road mortality hotspots;
  - Monitor the effectiveness of mitigation measures for western toad, grizzly bear, migratory birds, myotis and caribou;
  - Monitor potential contaminants of concern in aquatic life as it relates to wildlife health;
  - Monitor the effectiveness of caribou predator management as a result of access control measures on linear features at post-closure;
  - Include quantitative thresholds where feasible and modified or additional mitigations measures; and
  - The updated follow-up program must be developed in consultation with EMPR, LWRS, ENV, ECCC, Indigenous Groups.
- Indigenous health
  - Monitor potential contaminants of concern in air, water, soil, and country foods including:
    - Methylmercury, and metals (including Arsenic, Cadmium, Chromium (including hexavalent), Copper, Lead, Manganese, Mercury, Nickel, Selenium) in fish tissue downstream of the project;
    - Polycyclic aromatic hydrocarbons (PAH), metals (including Arsenic, Cadmium, Chromium (including hexavalent)) in soil;
    - PAH and metals (including Arsenic, Cadmium, Chromium (including hexavalent), Copper, Lead, Manganese, Mercury, Nickel, Selenium) in water; and
    - Hourly monitoring of air quality parameters (including PM<sub>2.5</sub>; PM<sub>10</sub>; SO<sub>2</sub>; NO<sub>2</sub>; Arsenic, Cadmium, Chromium, Copper, Lead, Manganese, Mercury, Nickel, and Selenium bound to PM; PAH).
      - Implement a monitoring program to monitor air quality along haul roads, in consultation with Indigenous groups.
      - Undertake adaptive mitigation measures to ensure air quality at the work camp is protective of human health for all Indigenous Peoples.
- Water
  - Monitor effects in the Sukunka wetland, including changes to hydrogeology (groundwater levels, gradients, and hydraulic conductivity), water quality, and hydrology,

- GHG Emissions
  - Monitor Sukunka energy consumption, assess the effectiveness of proposed mitigation measures and validating whether predicted GHG emissions are accurate.

Based on the proposed key mitigation measures and areas for follow-up programs, the Agency has developed draft potential federal conditions for review and comment by the public prior to referral to the federal Minister of Environment and Climate Change.

## 18.0 ASSESSMENT OF ACCIDENTS, MALFUNCTIONS, AND EFFECTS OF THE ENVIRONMENT ON SUKUNKA

### 18.1 BACKGROUND

During the life of Sukunka, unplanned events could occur resulting in potential adverse effects to environmental, social, health, heritage, or economic values. This section draws on information in Glencore's Application to provide an assessment of potential unplanned events associated with Sukunka, the context within which they could arise, the potential impacts of each event, and proposed key mitigation measures for each event. This section summarizes the issues raised during Application Review, as well as the EAO's conclusion on the consequence and risk posed by each unplanned event. This section includes an assessment of environmental effects of malfunctions or accidents that may occur in connection with Sukunka and the effects of the environment on Sukunka, consistent with Sections 19(1)(a) and 19(1)(h) of CEEA 2012. Glencore's assessments of accidents and malfunctions and effects of the environment can be found in Sections 18 and 19 of the Application.

### 18.2 POTENTIAL PROJECT EFFECTS AND PROPOSED MITIGATIONS IDENTIFIED IN THE APPLICATION

#### 18.2.1 POTENTIAL EFFECTS OF ACCIDENTS AND MALFUNCTIONS ON THE ENVIRONMENT

The Application identified the following potential accidents or malfunctions of greatest concern or potential consequence for Sukunka: failure of pit walls, collection and diversion channels, or stockpiles; fires or explosions; hazardous material spills; and traffic collisions. Details of these potential accidents and malfunctions are described in the following sections.

##### 18.2.1.1 FAILURE OF PIT WALLS, COLLECTION AND DIVERSION CHANNELS, OR STOCKPILES

Sukunka would consist of multiple features with the potential to fail, including open mining pits, waste rock stockpiles, borrow pits, overburden and topsoil storage areas, and water management structures. The severity of effects would depend on the composition and volume of the material that moved (soil, rock, water, sewage, or coal) and the impact on the receptors, including on other mine infrastructure.

If the failure occurred in a sediment control pond, the effluent released would be composed of surface water runoff with suspended sediments and could result in the release of mine effluent into wetlands or watercourses, potentially affecting water quality, fish, and fish habitat. Additionally, there is a risk to human safety from an infrastructure failure. If personnel were present on or near a feature that were to collapse, injury or death could result.

##### 18.2.1.2 EXPLOSION OR FIRE

An explosion or fire could be caused by accidental ignition of flammable or explosive materials, a road or rail collision, or the spontaneous combustion of coal. Spontaneous combustion of damp coal is a process caused by complex oxidation reactions. Once exposed, coal continues to self-heat in the presence of a continuous air supply and can self-ignite if heat is not dissipated. In the worst-case scenario, blasting can lead to a coal seam fire, the release of air emissions, and a delay in mine operations.

### 18.2.1.3 HAZARDOUS MATERIAL SPILL

Hazardous materials are defined according to the Spill Reporting Regulation under the B.C. *Environmental Management Act*. In addition, diesel and gasoline are regulated substances under the Environmental Emergency Regulations and are included in the regulated substances list<sup>102</sup>. Various hazardous or toxic materials have the potential to be stored, used, or generated at the proposed facility including fuel (diesel or gasoline), kerosene, oils and lubricants, machine fluids and coolants, paints and coatings, cleaners and solvents, batteries, flocculants and frothers, and explosive materials.

Equipment such as vehicles would contain fuel and other substances for their operation that could leak or spill, affecting the surrounding environment. The most likely scenario involving a hazardous material spill is a small volume spill (less than a few litres) of fuel, hydraulic fluid, lubricants, sewage, or concrete fines. Such spills are typically highly localized, limited to the containment area, and rapidly cleaned up by onsite crews using standard equipment and materials. In a worst-case situation, impacts to the environment and to mine personnel could occur; however, a spill into a waterway would have wider-ranging impacts.

### 18.2.1.4 TRAFFIC COLLISION

The movement of mine vehicle traffic has the potential to result in an automobile or rail collision. Vehicles would be used to transport construction materials, personnel, supplies, coal, and waste. Collisions may result in impacts to humans or wildlife, and may result in spills of potentially hazardous materials.

During operations, Glencore has proposed two options for moving coal and supplies via trucking transport. Traffic volumes and the risk of collision were determined to be similar for both of the proposed options.

## 18.2.2 MITIGATION MEASURES – ACCIDENTS AND MALFUNCTIONS

Key mitigation measures proposed to address the potential failure of pit walls, collection and diversion ditches, or stockpiles include:

- Examine and consider site geotechnical characteristics and then using these data to aid in designing pit walls, stockpiles, and collection and diversion ditches to minimize the likelihood of failure;
- Consider geotechnical characteristics to increase slope stability and increasing pit wall strength by using rock bolts;
- Pile waste rock in a manner that increases short-term stability of the pile and the long-term reclamation goals for the waste rock piles;

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<sup>102</sup> If thresholds are exceeded the Proponent must report to ECCC and create an Environmental Emergency Plan.

- Infrastructure for containment purposes (i.e. pit walls, collection and diversion ditches, and stockpiles) will be designed to withstand a 1 in 2,478 year earthquake, a 1 in 20 year precipitation event, and mass movement extremes;
- Complete annual geotechnical inspections of diversion channels and dykes, and regularly inspecting all Project components;
- Train all staff in emergency evacuation procedures, as detailed in the Emergency Response Management Plan;
- Develop specific procedures for the potential for spill, including:
  - Potential effects of the incident will be incorporated into action execution with the goal of preventing further escalation of the incident and pollution;
  - The first priority will be given to the safety of site personnel;
  - Accident reporting procedures will be in place and all spills will be reported and logged internally within 24 hours. In the case of a major spill, authorities will be alerted of the incident as well as the details of any actual or potential release of harmful materials to the environment. External emergency response teams may be asked to assist in the response to a major incident if on-site resources do not have the capacity to contain the situation;
  - Immediate steps will be taken to control the pit wall, collection and diversion ditches, and stockpile failure including, where possible, stopping further material and effluent movement;
  - Response measures will be executed by trained, competent and properly equipped personnel;
  - Personnel, regulatory agencies and potentially affected Indigenous groups and stakeholders will be properly notified; and
  - If the failure of a key Project component leads to adverse effects on the environment (e.g., destruction of vegetation, habitat loss), spill containment procedures (if necessary) and restoration works will be undertaken to recover the damaged vegetation cover and/or wildlife and fish habitats.

Key mitigation measures proposed to address the risk of fires or explosions include:

- Ensure that only qualified staff handle explosives;
- Use safety equipment such as fire alarms, fire suppression systems and firefighting equipment and ensuring all vehicles carry a working fire extinguisher;
- Manufacture only the amount of explosives needed, storing explosives at required distances from other Project components and safely segregating and storing explosives manufacturing materials, as detailed in the Explosives Management Plan;
- Use a Fire Prevention Plan to limit the likelihood of fire occurring;
- Reduce heat buildup in coal stockpiles by using hydration systems and active handling of the stockpiles; and
- Follow blasting procedures, limiting smoking to designated areas, and prohibiting open flames near storage areas for flammable materials.

Key mitigation measures proposed to address hazardous material spills include:

- Transportation and storage of hazardous materials used for Sukunka as specified in the federal *Transportation of Dangerous Goods Act* and detailed in the Transportation Plan;
- Implement the Emergency Response Management Plan and other management plans, including the Dangerous Good and Hazardous Materials Management Plan, that would set measures and controls to prevent release of toxic or deleterious substances into the environment as a result of unplanned events, and also to contain and clean up spills and leaks in the event that an accidental release takes place;
- Spill response materials would be available onsite at all times and all mine related vehicles would have spill response kits;
- Any cleanup would be undertaken by properly trained and equipped staff in a manner protective of human health;
- Conservatively treat all spills of unknown materials as if it were a hazardous material; and
- Log and report all spills internally within 24 hours and immediately communicate with authorities and relevant Indigenous groups in the case of a major spill, as detailed in the Emergency Response Management Plan and required under the *Emergency Management Act*.

Key mitigation measures proposed to address traffic collisions include:

- Use an Access Management and Transportation Management Plans which address potential for collisions due to vehicles;
- Ensure proper licensing of drivers;
- Implement employee training to ensure they follow posted speed limits, or slower as dictated by cargo constraints, existing road conditions (e.g., weather related), and vehicle type;
- Train and ensure compliance of personnel and visitors on the environmental, health and safety plans and communication protocols; and
- Maintain and regularly inspect vehicles before use for equipment malfunctions.

### 18.2.3 CUMULATIVE EFFECTS OF ACCIDENTS AND MALFUNCTIONS

The Application lists the other industrial activities and Project interactions considered in the accidents and malfunctions cumulative effects analysis in Section 4.1.7.1. The potential cumulative effects of accidents or malfunctions associated with Sukunka are considered in Section 18.7 of the Application.

Glencore's analysis indicates that while a possible explosion or fire at Sukunka is expected to be contained to the mine area, potential short-term and reversible adverse interactions could occur due to other activities in the area. Air quality could be affected, depending on the site and severity of the fire or explosion. Spills of hazardous materials could result in a cumulative effect depending on the location and magnitude of the spill. Cumulative effects on wildlife may occur because of increased traffic associated with Sukunka on the proposed haul options, where increased direct mortality from collisions may occur.

The Application did not consider the cumulative effects of accidents and malfunctions associated with pit walls, collection and diversion channels, or stockpiles as Glencore considers these events as unlikely to occur due to the emphasis on the safe design of the Project, rigorous safety standards implemented, and

Emergency Response Management Plan developed.

An assessment of a fire or explosion and its potential effects to vegetation and wildlife was included in the Application (Section 18.4.3.2). Glencore found that potential effects from explosions or fire could affect vegetation and wildlife through direct mortality or habitat loss. Effects are anticipated to be largely limited to the PDA.

## **18.2.4 POTENTIAL EFFECTS OF THE ENVIRONMENT ON SUKUNKA**

The following environmental events and processes were assessed in the Application to potentially result in adverse effects to the VCs: seismic events, liquefaction, mass movement, erosion or sedimentation, climate change, extreme weather events, extreme hydrological events, and wildfires. Details of these potential effects of the environment on Sukunka are described in the following sections.

### **18.2.4.1 SEISMIC EVENTS**

Sukunka could experience potential adverse effects because of seismic events, as the area has moderate seismic risk and shows historical evidence of magnitude 5.3 and 5.4 earthquakes.

Sukunka would be designed to withstand a 1 in 475 year earthquake event. Project components will be designed to the applicable standards, including the National Building Code of Canada<sup>103</sup> and the Canadian Standards Association. These design standards promote the integrity of project infrastructure based on the level of risk for an earthquake in the region. A worst-case scenario involving an earthquake with a magnitude substantially larger than these design criteria could cause major damage to Project components. The Application notes that this is unlikely given the lifespan of Sukunka and the seismic risk of the area.

### **18.2.4.2 LIQUEFACTION**

Seismic events may cause liquefaction, which occurs when specific types of soils such as clays are saturated and the shaking due to seismic events causes the strength of soils to decrease, leading to damage to anthropogenic structures such as infrastructure. Glencore assessed the risk of liquefaction as low in the LAA as observed soil types are not vulnerable to liquefaction, and as such, no mitigation measures are proposed and effects to Sukunka from liquefaction were considered highly unlikely.

### **18.2.4.3 MASS MOVEMENT**

Mass movements occur when soils move from one area to another, such as landslides, debris flows, avalanches, and rock falls. There is potential for mass movement events to occur due to the slope of the mine site area, which could impact Project infrastructure and/or personnel. The coal haul and transportation options could also be impacted by mass movements, and additional research will be conducted prior to construction to identify specific areas of higher risk along the haul routes.

Through the use of design criteria and the mitigation measures outlined below, Glencore considered it

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<sup>103</sup> National Research Council of Canada 2010

unlikely that a mass movement would occur on Sukunka, thus impacts from mass movements are not expected.

#### **18.2.4.4 EROSION AND SEDIMENTATION**

The Application notes that erosion and subsequent sedimentation could result in areas where sediment is exposed, mobilized by wind or water, and deposited in a new area. Impacts from sedimentation include physical impacts to fish and fish habitat, such as egg smothering.

After the implementation of the proposed mitigation measures, Glencore assessed the effect of erosion and sedimentation on Sukunka as unlikely.

#### Climate change

Climate change scenarios have predicted that climate in B.C. will continue to change during the 21<sup>st</sup> century, with average temperatures predicted to increase between 1 and 4 degrees Celsius per century. Precipitation is also expected to increase, and changes in wind patterns are expected, though specific wind changes are not well understood at this time. There is currently a high level of uncertainty regarding what the actual effects of climate change will be in B.C., and more specifically, in the Sukunka area.

Increases in precipitation in the form of snow could increase risk through higher snow loading on infrastructure; however, general predictions indicate that more precipitation is likely to fall as rain in these future scenarios. Higher volumes of rain could lead to extreme hydrological events, as discussed in the following sections.

Glencore assessed the potential effect of climate change on Sukunka qualitatively by examining the potential interactions between Project infrastructure or activities and climate factors (e.g. extreme events, temperature, and precipitation). Extreme events may result in a potential interaction with infrastructure and Glencore proposed Project design criteria to address the potential for an increase in precipitation, as described in Section 5.1.2.5.

#### **18.2.4.5 EXTREME WEATHER EVENTS**

Extreme weather and weather-related events considered in the Application include changes in air temperature, extreme rainfall or snowfall, and high winds.

The Sukunka area, located on a slope open to the elements, may be vulnerable to extreme precipitation events with associated flooding, such as rainstorms. Rainstorms could lead to a range of impacts, such as flooding, erosion and washouts, and decreases in terrain stability. This may lead to mass movements or to losses of stability in mine components including pits, roads, waste rock stockpiles, sediment control ponds, and infrastructure foundations.

Extreme temperatures or drought could lead to cracking of surface materials. Drought conditions could also result in losses of vegetation and decreases in soil stability. Camp residents may also be affected by extreme weather events (e.g. by wildfire smoke and heat).

Given the location and appropriate design criteria of Sukunka and the proposed mitigations, Glencore assessed that it would be highly unlikely that extreme weather events would have a serious or long-term adverse effect on Sukunka. Short-term impacts causing delays or disruptions to mine construction and/or operational activities could occur.

#### **18.2.4.6 EXTREME HYDROLOGICAL EVENTS**

Higher elevation areas in the RAA receive about double the precipitation compared to lower elevation areas, and peaks in runoff generally occur during the spring freshet between May and June. The events expected to present the greatest risk to Project infrastructure are where large amounts of precipitation fall and then are released over a very short period from a rain-saturated snowpack, resulting in extremely high flows. These types of events could physically affect mine infrastructure through washouts and erosion, and they could impact planned operational water discharges to local streams.

With implementation of appropriate design criteria of Sukunka and proposed mitigations, Glencore assessed it as unlikely that extreme hydrological events would have a serious or long-term adverse effect on Sukunka. Short-term impacts causing disruptions to mine construction and/or operational activities could occur, and adaptive management would be necessary to manage changing hydrological conditions.

#### **18.2.4.7 WILDFIRES**

Sukunka is situated in the Dawson Creek Zone of the Prince George Fire Centre. Averaged historical data show that wildfires in the Prince George Fire Centre are more likely to be caused by lightning than by anthropogenic sources. The probability of a wildfire occurring and the size of that wildfire are influenced by local conditions including the type of vegetation in the area, the source of ignition (natural sources such as lightning versus anthropogenic), and weather conditions, including levels of precipitation and vegetation moisture, wind direction and speed, and air temperature.

The potential consequences for Sukunka from a wildfire include risk to mine personnel and damage to infrastructure. If a wildfire were to reach the mine site or transportation routes, there would be a potential for harm to or destruction of infrastructure, a decrease in visibility along transportation routes, and a risk to coal stockpiled at Sukunka. In the event of a wildfire within or immediately adjacent to the mine, Glencore would take action to extinguish the fire, report the fire to the authorities, coordinate with first responders and the B.C. Wildfire Management Branch, and, if necessary, evacuate employees from the mine. With the implementation of mitigation measures and appropriate monitoring, Glencore assessed wildfires as unlikely to have an effect on Sukunka.

## **18.3 MITIGATION MEASURES – POTENTIAL EFFECTS OF THE ENVIRONMENT ON THE PROJECT**

Key mitigation measures proposed to address potential effects from accidents and malfunctions include:

*Seismic events*

- Incorporate geotechnical assessments completed for the LAA into the final mine infrastructure engineering design; and
- Use regular inspection and maintenance programs to ensure any conditions where Project components are compromised are identified and rectified.

*Mass movements*

- Complete additional geological and geotechnical characterization of soils in final project design to determine if additional mitigation measures need to be taken in specific areas;
- Use physical activities to limit mass movement conditions, including grading, buttressing, grouting and dewatering or depressurizing, and monitoring conditions;
- Work to improve drainage by limiting the use of slope undercutting and avoiding increases in pore pressure;
- Implement an avalanche control program; and
- Monitor for changes to soil pore pressure and slope conditions to identify increases in the chance of a mass movement event, and if such conditions are observed, identifying actions to take to limit this risk.

*Erosion and sedimentation*

- Improve drainage in areas as necessary; and
- Prevent erosion by re-vegetating or installing systems such as armoured swales.

*Extreme weather events*

- Use a weather monitoring program to identify risks from weather events and arrange for corrective action (e.g. snow drift management) where possible;
- Use an avalanche control program to manage avalanche risks in areas with high snow buildup (at the mine site and along transportation routes);
- Apply at least a 10 percent increase in Project design discharge to account for potential for increased flooding due to climate change;
- Design stream crossings to account for the effects of extreme flows on the stream channel; and
- Reduce risks to infrastructure from extreme precipitation events by designing drainage and sedimentation and erosion control with these scenarios in mind.

*Extreme hydrological events*

- Implement a Mine Site Water Management Plan to be used throughout the life of the mine to manage water and reduce risks to Sukunka associated with water;
- Use adaptive management to tailor the Mine Site Water Management Plan to site conditions as needed;

- Ensure Project design includes considerations of the effects of climate change and extreme events, such as floods; and
- Design Project infrastructure to withstand short-duration extreme precipitation events.

#### *Wildfires*

- Prepare a fire prevention plan to ensure that fires are prevented, detected, reported, and personnel are evacuated as necessary;
- Clear areas around Project infrastructure to act as firebreaks;
- Train employees to prevent fires, and to be prepared to respond to a fire;
- Limit open flames or sparks through prohibitions, personnel education, and muffler maintenance; and
- Restrict smoking to designated areas.

No mitigation measures are proposed to address the potential for liquefaction.

## **18.4 POTENTIAL EFFECTS AND PROPOSED MITIGATIONS IDENTIFIED DURING APPLICATION REVIEW**

During Application Review, the EAO received a few clarifications and the following comments related to accidents and malfunctions and effects of the environment. All of these comments are included in the First Nations and Working Group tracking tables.

Horse Lake First Nation stated their concern about the risk of a large wildfire in the area of Sukunka, noting the effect of mountain pine beetle in creating areas of very dry timber vulnerable to fire. Glencore responded that recent literature suggests that beetle-killed trees are believed to be a factor in increased wildfire incidence and stated that proposed mine design and mitigation measures would help reduce the risk of wildfires impacting Sukunka.

During the review of this draft chapter, Northern Health identified concerns related to several emergency events that occurred while Application Review was suspended (including the global COVID-19 pandemic, the heat dome, multiple wildfire events, extreme flooding and associated road closures, blockades) that could affect the Project, the surrounding communities, and employees residing in camp. Northern Health highlighted the need for improved emergency response plans that accounted for these potential emergency events. Glencore responded that this information would be included in emergency planning and the EAO also notes that an Emergency Response Management Plan is a requirement under Section 3.7.1 of the Health, Safety and Reclamation Code for Mines in British Columbia.

In addition, the EAO has proposed Condition 25: Community Effects Management Plan, that would require Glencore to develop a baseline condition report and plan to manage social and economic effects; and Condition 26: Health and Medical Services Plan, that would require Glencore to develop and deliver health and medical services for all Sukunka employees and their families, both residing locally and in camp. No additional mitigation measures related to accidents and malfunctions or effects of the environment on the Project were identified during Application Review.

## 18.5 THE EAO’S CHARACTERIZATION OF RESIDUAL EFFECTS

The EAO’s characterization of the expected residual effects from accidents and malfunctions and effects of the environment of Sukunka is summarized below, as well as the EAO’s level of confidence in the effects determination (including their likelihood and significance).

Project design measures, mitigation, and contingency measures would lower the likelihood and reduce the severity of any accident or malfunction or effect of the environment on Sukunka. Prior to the start of construction activities, Glencore would be required, for the purposes of MA and EMA permit applications to develop an Emergency Response Plan, a Hazardous Materials Management Plan, a Mine Waste, Tailings, and ML/ARD Management Plan, and an Air Quality Management Plan, which would address management of hazardous materials, emergency preparedness, prevention, and response to an accident or malfunction or effect of the environment on Sukunka.

### 18.5.1 ACCIDENTS AND MALFUNCTIONS

**Table 49: Summary of Residual Effects for Accidents and Malfunctions**

*Note: Criteria and assessment ratings are defined in [Appendix 4 Residual Effects Characterization Definitions](#)*

Criteria	Assessment Rating	Rationale
Context (resiliency)	<p><b>Failure of infrastructure:</b> Low</p> <p><b>Hazardous material spills:</b> Low</p> <p><b>Fire/explosion:</b> Moderate</p> <p><b>Traffic collision:</b> Low to high</p>	<p><b>Failure of infrastructure/ Hazardous material spills:</b> A failure of pit walls, collection/diversion channels, or stockpiles may release solid material (coal waste rock, topsoil, or processed coal) or effluent (sewage water or surface water run-off) into the surrounding environment, impacting aquatic resources, vegetation, wildlife, soils, air quality, land and resource use, visual quality, archaeological and heritage resources, or human and ecological health. The ecological resiliency of these resources at baseline is considered <b>low</b> to the impact of a release of solid material or effluent.</p> <p><b>Fire/explosion:</b> As fires are a natural part of forested ecosystems, they are considered to have <b>moderate</b> resilience to fires and explosions.</p> <p><b>Traffic collision:</b> As traffic collisions have the potential to be fatal to wildlife or very minor if no injuries were incurred, wildlife resources at a population level are considered to have <b>low to high</b> resilience.</p>
Magnitude	<p><b>Failure of infrastructure:</b> Moderate to high</p> <p><b>Hazardous material spills:</b> Moderate to high</p> <p><b>Fire/explosion:</b> Low</p> <p><b>Traffic collision:</b> Low to high</p>	<p><b>Failure of infrastructure/Hazardous material spills:</b> The failure of pit walls, collection and diversion channels, or stockpiles or hazardous material spill could be considered a <b>high</b> magnitude effect to aquatic and soil resources as the release of solid materials or effluent could readily incorporate into water and could move downstream quickly. The magnitude could be <b>moderate to high</b> for vegetation and wildlife resources and air quality as the spill would not spread as quickly; however, sensitive species may be more vulnerable to impacts.</p> <p><b>Fire/explosion:</b> Since fires are a natural part of forested ecosystems,</p>

Criteria	Assessment Rating	Rationale
		<p>the resulting forested ecosystem following a fire would be within baseline conditions and is considered <b>low</b> in magnitude.</p> <p><b>Traffic collision:</b> As traffic collisions have the potential to be fatal to wildlife or very minor to wildlife if no injuries were incurred, the magnitude of impact to wildlife resources and the community could be <b>low to high</b>.</p>
Extent	<p><b>Failure of infrastructure:</b> Local to regional</p> <p><b>Hazardous material spills:</b> Local to regional</p> <p><b>Fire/explosion:</b> Local to regional</p> <p><b>Traffic collision:</b> Local</p>	<p>Effects due to accidents and malfunctions would be confined generally to the <b>local</b> area of the mine site or adjacent area (including traffic routes); however, effects would extend further into the <b>regional</b> area for aquatic resources in the case of a large hazardous material spill or failure of pit walls, collection/diversion channels, or stockpiles or into the <b>regional</b> area during fire season.</p>
Duration	<p><b>Failure of infrastructure:</b> Temporary to long-term</p> <p><b>Hazardous material spills:</b> Temporary to long-term</p> <p><b>Fire/explosion:</b> Temporary to long-term</p> <p><b>Traffic collision:</b> Temporary</p>	<p><b>Failure of infrastructure/Hazardous material spills/Fire/explosion:</b> Effects from a failure of pit walls, collection/diversion channels, or stockpiles, hazardous material spill, fire, or explosion are expected to be <b>temporary</b> in the case of a small, contained accident or malfunction to <b>long-term</b> in the case of a larger accident or malfunction.</p> <p><b>Traffic collision:</b> Effects from a traffic collision are expected to be <b>temporary</b> as the impact would be for a limited period of time.</p>
Reversibility	<p><b>Failure of infrastructure:</b> Reversible, long-term</p> <p><b>Hazardous material spills:</b> Reversible, long-term</p> <p><b>Fire/explosion:</b> Reversible, long-term</p> <p><b>Traffic collision:</b> Reversible, long-term</p>	<p>Effects from any accident or malfunction are expected to be <b>reversible</b>; however, it could be <b>long-term</b> before ecological systems return to their former state.</p>

Criteria	Assessment Rating	Rationale
Frequency	<p><b>Failure of infrastructure:</b> Rare</p> <p><b>Hazardous material spills:</b> Rare</p> <p><b>Fire/explosion:</b> Rare</p> <p><b>Traffic collision:</b> Rare</p>	With the mitigation, prevention, and contingency measures proposed by Glencore, the frequency of any accident or malfunction is expected to be <b>rare</b> .
Likelihood	<p><b>Failure of infrastructure:</b> Low</p> <p><b>Hazardous material spills:</b> Low</p> <p><b>Fire/explosion:</b> Low</p> <p><b>Traffic collision:</b> Low</p>	With the mitigation, prevention, and contingency measures proposed by Glencore, the likelihood of an accident or malfunction is <b>low</b> .
Significance Determination	<p><b>Failure of infrastructure:</b> Not significant</p> <p><b>Hazardous material spills:</b> Not significant</p> <p><b>Fire/explosion:</b> Not significant</p> <p><b>Traffic collision:</b> Not significant</p>	<p><b>Failure of infrastructure/ Hazardous material spills:</b> The failure of a pit wall, collection or diversion ditch, or stockpile or hazardous material spill is unlikely and reversible, although moderate to high in magnitude. Considering the mitigation measures, project design, and contingency and response plans proposed by Glencore, failures of infrastructure or hazardous material spills are assessed as <b>not significant</b>.</p> <p><b>Fire/explosion:</b> Fires would be rapidly extinguished, limiting their extent and severity. The EAO expects that forested ecosystems would regenerate and all effects would be reversible, if long-term. Further, fires are a natural ecological component and within baseline conditions. Therefore, fires and explosions are considered <b>not significant</b>.</p> <p><b>Traffic collision:</b> The EAO considers the residual effects from a traffic collision to be <b>not significant</b> as the effects are anticipated to be rare, local in extent, temporary in effect, and reversible.</p>
Confidence	<p><b>Failure of infrastructure:</b> Moderate</p> <p><b>Hazardous material spills:</b> Moderate</p> <p><b>Fire/explosion:</b> High</p> <p><b>Traffic collision:</b> Moderate</p>	<p><b>Failure of infrastructure/Hazardous material spills/Traffic collision:</b> Predicting the specific effects of a failure of infrastructure, hazardous material spill, or traffic collision is challenging due to numerous uncertainties, such as the extent and location of the event and ease of clean up; however, the EAO has <b>moderate</b> confidence in the significance and likelihood determination of the assessment due to the safety and response procedures planned.</p> <p><b>Fire/explosion:</b> For fires and explosions, the EAO has <b>high</b> confidence in the assessment due to the nature of the accident and the mitigations and safety measures planned.</p>

18.5.2 EFFECTS OF THE ENVIRONMENT ON THE PROJECT

Table 50: Summary of Residual Effects for Effects of the Environment

Note: Criteria and assessment ratings are defined in [Appendix 4, Residual Effects Characterization Definitions](#)

Criteria	Assessment Rating	Rationale
Context (resiliency)	<b>High</b>	Through the implementation of design criteria and proposed mitigations, Sukunka is expected to have <b>medium</b> resiliency to baseline effects of the environment.
Magnitude	<b>Low</b>	The expected size or severity of the effects of the environment on Sukunka, after the implementation of design criteria and proposed mitigations, is considered <b>low</b> .
Extent	<b>Project-area</b>	Effects of the environment on Sukunka are expected to be restricted to the <b>Project-area</b> .
Duration	<b>Temporary to permanent</b>	Effects of the environment could be a <b>temporary</b> or <b>permanent</b> change, depending on the size and severity of the effect.
Reversibility	<b>Reversible</b>	The effects of the environment on Sukunka are considered <b>reversible</b> as project design changes and adaptive management will be used.
Frequency	<b>Infrequent</b>	Effects of the environment on Sukunka are expected to be <b>infrequent</b> as they are generally infrequent events.
Likelihood	<b>Low</b>	The likelihood of an effect of the environment on Sukunka is considered <b>low</b> due to the rarity of these events.
Significance Determination	<b>Not significant</b>	<p>With implementation of appropriate design criteria of Sukunka and proposed mitigations, it is considered unlikely that effects of the environment would have a serious or long-term adverse effect on Sukunka and are assessed as <b>not significant</b>. Mitigation measures applicable to Sukunka were listed for potential effects. An environmental management plan, mine emergency response plan (a permitting regulatory requirement), health and safety plans, monitoring, and adaptive management are other tools that will be used to minimize any potential effects of the environment on Sukunka.</p> <p>The EAO is satisfied that Glencore has proposed appropriate design criteria and mitigations to adequately address the potential effects of the environment on the Sukunka Coal Mine Project. It is considered unlikely that effects of the environment would have a serious or long-term adverse effect on Sukunka. Mitigation measures applicable to Sukunka were listed for potential effects. An environmental management plan, health and safety plans, monitoring, and adaptive management are</p>

Criteria	Assessment Rating	Rationale
		other tools that will be used to minimize any potential effects of the environment on Sukunka.
Confidence	<b>Moderate</b>	The EAO has <b>moderate</b> confidence in the likelihood and significance determinations due to the nature of the effects of the environment and Glencore's proposed Project design criteria and proposed mitigations.

## 18.6 CUMULATIVE EFFECTS ASSESSMENT

The assessment of effects from accidents and malfunction is a requirement under Section 19(1) of CEAA 2012, which stipulates that the EA must consider cumulative environmental effects that are likely to result from Sukunka in combination with other physical activities that have been carried out.

As described in the previous sections, none of the above accidents and malfunctions or effects of the environment has been assessed as likely to occur; therefore, the EAO has not assessed the potential cumulative effects from these events.

## 18.7 CONCLUSIONS

Based on the above analysis and the combination of proposed Project design measures, use of adaptive management, requirements established under the *Mines Act* and the *Environmental Management Act*, implementation of the EMPs and associated plans, and adhering to the conditions identified in the CPD and TOC (which would become legally binding if an EAC is issued), the EAO is satisfied that Sukunka would not have significant adverse effects on the environment due to accidents and malfunctions and effects of the environment would not have significant adverse effects on Sukunka.

## 19.0 ENVIRONMENTAL MANAGEMENT PLANS

Environmental Management Plans (EMPs) would guide the development and operation of Sukunka to minimize the adverse effects of Sukunka. The plans provide a framework to communicate and implement monitoring, reporting, mitigation measures, and best management practices, and to support compliance with applicable legislation, terms and conditions of permits, and approvals and authorizations issued in relation to Sukunka, including an EAC if issued. EMPs would be developed in consultation with appropriate regulatory agencies, Indigenous Groups, and key stakeholders as required.

EMPs were identified by Glencore where potential impacts to VCs were identified in the assessment and a set of mitigation measures were proposed. The following sections provide an overview of the plans proposed by Glencore in the Application, as well as additional plans proposed by the EAO as part of the EAC. Where applicable, plans that are partially addressed by or have been proposed as EAC conditions are indicated.

Many of the plans proposed by Glencore or identified through the EA relate to *Mines Act* (MA) or *Environmental Management Act* (EMA) permitting requirements, as described below, and some plans fulfill other provincial and federal legislative or regulatory requirements. Plans required as part of a MA and/or EMA permit application apply to the mine site (disturbed or cleared area in use for servicing and operating a mine, not including residential facilities) as well as access roads in some cases, while those required for an EMA permit application include downstream effects for air and water. Where EMPs were also likely to be required under an MA or EMA permit, the EAO considered whether that could be sufficient for EA purposes, or whether an EMP should still be recommended as an EAC condition to address issues central to the EA or to facilitate subsequent EAC compliance and monitoring, consistent with the EAO's current policy and practice. As well, EAC conditions may relate to the mine site as well as broader areas affected by Sukunka, as specified within the individual condition.

### 19.1 SUMMARY OF PROPOSED ENVIRONMENTAL AND OPERATIONAL MANAGEMENT PLANS IN APPLICATION

The Application outlined the following stand-alone plans that would be developed prior to the start of construction:

#### 19.1.1 ACCESS MANAGEMENT PLAN

This plan would maintain public access for natural resource use while ensuring the safety and security of the public and of Glencore's personnel and facilities, including access restrictions, load restrictions, route maps, and radio frequencies to be used by local traffic. The EAO has proposed Condition 14: Construction Environmental Management Plan, that would require Glencore to address access management during construction. Many of the provisions described in the Access Management Plan would be required under the Traffic Control Plan that is required for a MA permit application.

### 19.1.2 AIR QUALITY AND EMISSIONS MONITORING AND MANAGEMENT PLAN

This plan would describe measures to be taken to reduce the effects of airborne contaminants and dust. The EAO has proposed EAC Condition 27: Air Quality and Emissions Management Plan that would require Glencore to include for mitigation measures and monitoring related to air quality beyond the active mine area. In addition, the plan would address other requirements relating to human health concerns of off-duty workers at the mine site. A Waste (Refuse and Emissions) Management Plan that would address air contaminants is also a MA and/or EMA permit application requirement, and a Fugitive Dust Management Plan, which would address dust, would be required as part of an EMA permit application.

### 19.1.3 CARIBOU MITIGATION AND MONITORING PLAN

This plan would provide detailed mitigation intended to minimize effects of Sukunka on caribou and would include monitoring requirements. The EAO is proposing Condition 19: Caribou Mitigation and Monitoring Plan, that would require Glencore to implement key caribou mitigation measures. Further details on potential effects to caribou, and mitigation measures and monitoring proposed for the plan are contained in [Section 8](#) (Caribou) of this Report.

### 19.1.4 EMERGENCY RESPONSE MANAGEMENT PLAN

This plan would provide specific procedures to be followed in the event of a materials spill, outline a response team, and communication and reporting structures for regulatory agencies and affected stakeholders. A training plan and equipment inventory would also be provided. Development of an Emergency Response Management Plan is a requirement of a MA and/or EMA permit application; therefore, the EAO is not proposing this plan as an EAC condition.

### 19.1.5 EXPLOSIVES MANAGEMENT PLAN

This plan would provide direction on methods and procedures that would be used to minimize risks related to the use of explosives for Sukunka, which could lead to harm to people, wildlife, or Project infrastructure. Federal licences for explosive manufacturing and storage would include terms and conditions for the safe and secure operation of the facility which must be constructed and operate according to requirements set out in the Guidelines for Bulk Explosives Facilities (2014). The Quantity-Distance Standard, which is applied to licences for explosives manufacturing and storage under the *Explosives Act*, requires that minimum distances be maintained between certain components of the facility, and between the facility and neighbouring vulnerable features or hazardous facilities such as roads, fuel storage, administration, and accommodation facilities and power lines. Additionally, the *Health, Safety, and Reclamation Code for Mines in British Columbia* requires an Explosives Storage and Use Permit before a magazine is built, as well as requirements for the safe storage, use, care, handling, disposal, and transporting of explosives.

As the aspects of the Explosives Management Plan are covered by other legislation, the EAO is not proposing this plan as an EAC condition. An Explosive and Nitrogen Management Plan would also be a requirement under an EMA effluent permit issued by ENV to manage nitrogen discharges into the environment.

### 19.1.6 FISH HABITAT OFFSETTING PLAN

This plan would describe the impacts of Sukunka on fish and fish habitat, and it would outline a plan for offsetting of mine impacts to fish habitat, including the estimated total area of offsetting that would be required for Sukunka to receive an authorization pursuant to the *Fisheries Act (2019)*. This plan is a requirement of the Fisheries and Oceans Canada approval process. Relatedly, the EAO is also requiring Condition 17: Wetlands Plan which would require Glencore to develop a plan for wetlands reclamation and offsetting. Further details on these issues are provided in [Section 5](#) (Fish and Fish Habitat) and [Section 9](#) (Vegetation) of this Report.

### 19.1.7 GREENHOUSE GAS MANAGEMENT STUDY

This study would describe how Glencore would work to limit Sukunka's contribution to greenhouse gases. A Waste (Refuse and Emissions) Management Plan, which addresses air contaminants, is a MA and/or EMA permit application requirement, and Glencore provided additional information about the recovery of fugitive coal bed methane, greenhouse gases, and energy efficiency.

However, there have been substantial shifts in both federal and provincial regulatory frameworks (including updated emissions targets) with respect to GHGs since Sukunka was suspended, including the announcement of the CleanBC Roadmap to 2030, with which Glencore would be required to comply should Sukunka receive an EAC. As such, the EAO has proposed Condition 29: Greenhouse Gas Reduction Plan, that would require Glencore to develop the plan in consultation with the Climate Action Secretariat (CAS), ECCC, Indigenous Groups and EMLI. Further details on this issue are provided in [Section 12](#) (Greenhouse Gases) of this Report.

### 19.1.8 GROUND CONTROL MANAGEMENT PLAN

This plan would describe design measures to mitigate potential impacts to natural features and project infrastructure due to mining subsidence, including reducing risks on water quality, people, wildlife, and the landscape. This plan is a MA and EMA permit application requirement; therefore, the EAO is not proposing this plan as an EAC condition.

### 19.1.9 GROUNDWATER MANAGEMENT PLAN

This plan would describe practices that would be used to minimize the effects of the mine on groundwater, including planned monitoring. A Mine Site Water Management Plan, which addresses groundwater, is a requirement of a MA and/or EMA permit application; therefore, the EAO is not

proposing this plan as an EAC condition.

#### **19.1.10 HAZARDOUS MATERIALS AND WASTE MANAGEMENT PLAN**

This plan would identify types of hazardous and solid non-hazardous waste material expected to be generated by Sukunka, and it would provide methods for managing each type of waste, along with directions on safe storage, handling, and transportation of these materials to reduce the risks associated with hazardous wastes on Sukunka. This plan would form part of the Environmental Management Plan, Waste Management Plan, and Chemical and Materials Storage and Handling Plan required under the MA or EMA permits. In consideration of the nature of the issues in this EA and the subsequent permitting process, the EAO is not proposing this plan as an EAC condition.

#### **19.1.11 HAZARDOUS MATERIALS MANAGEMENT PLAN**

This plan would manage the procurement, delivery, storage, handling, and use of hazardous materials to reduce the risks posed to humans, wildlife, and the environment from the use of hazardous materials. The EAO considers spills and hazardous materials to be well-regulated by existing provincial and federal legislation and does not foresee regulatory gaps in this area; therefore, the EAO is not proposing this plan as an EAC condition.

#### **19.1.12 MANAGEMENT PLAN AND CHANCE FIND PROTOCOL FOR PROTECTION OF ARCHAEOLOGICAL AND HERITAGE SITES**

This plan would provide protection for both identified and unidentified archaeological sites by planning for how impacts to known archaeological sites would be avoided and how chance archaeological finds would be treated by Project personnel. A MA permit application requires an Archaeological Management and Impact Mitigation Plan, which would include the same provisions as the Heritage Management Plan; however, this would apply only to the mine site. Therefore, the EAO is proposing that Condition 14: Construction Environmental Management Plan require Glencore to include archaeology and heritage management and chance find procedures for the protection of archaeological and heritage sites for activities not on the mine site.

#### **19.1.13 METAL LEACHING / ACID ROCK DRAINAGE PREVENTION MANAGEMENT AND MONITORING PLAN**

This plan would describe detailed mitigation measures that would be used to minimize the effects of metal leaching and acid rock drainage resulting from mining activities. This plan is a MA and EMA permit application requirement; therefore, the EAO is not proposing this plan as an EAC condition.

#### 19.1.14 MINE SITE WATER MANAGEMENT PLAN

This plan would address the management of surface water on the mine site so that water is managed to minimize risks from regular flows and extreme annual precipitation levels, including changes associated with climate change. A Mine Site Water Management Plan, which would address surface water management, is a requirement of a MA and/or EMA permit application; therefore, the EAO is not proposing this plan as an EAC condition. Although not a plan, it is important to note here that the EAO is proposing EAC Condition 21: Water Quality Management that would require Glencore to actively treat water prior to Operations. This condition is important to guarantee that water treatment would form part of Sukunka in permitting.

#### 19.1.15 RECLAMATION PLAN

This plan would be submitted annually and would discuss work and research by Glencore on reclaiming areas impacted by mining within the year, including adaptive management strategies to minimize impacts to soil, water, vegetation, and wildlife, as well as addressing invasive plant species management. The plan would also include reclamation strategies for the next five years. This plan is a MA permit application requirement; therefore, the EAO is not proposing this plan as an EAC condition.

#### 19.1.16 SOLID WASTE MANAGEMENT PLAN

This plan would describe the actions to be taken to safely handle and dispose of non-hazardous waste materials and would include best management practices and mitigation measures. A Waste (Refuse and Emissions) Management Plan is a MA and/or EMA permit application requirement; the Waste Management Plan would also be considered under the CEMP proposed by the EAO. Therefore, the EAO is not proposing this specific plan as an EAC condition.

#### 19.1.17 SURFACE EROSION AND SEDIMENT CONTROL PLAN

This plan would be used to manage erosion and movement of sediment and would outline contingency plans to address the possible failure of sediment and erosion controls. This plan is a requirement of a MA and EMA permit application and would also be considered under the EAC Condition 14: Construction Environmental Management Plan proposed by the EAO.

#### 19.1.18 TRANSPORTATION PLAN

This plan would be tailored to the haul option chosen for Sukunka and would contain measures to reduce the risk to the public, Project personnel, Indigenous Groups, and wildlife from increased traffic associated with Sukunka. Many of the provisions described in the Transportation Plan would be required under the Traffic Control Plan that is required for a MA permit application for traffic on the mine site. Requirements for forest service roads off the mine site including maintaining stream crossings are addressed by the Forest Planning and Practices Regulation under the *Forest and Range Practices Act*.

One exception is requirements within the Transportation Plan that relate to minimizing adverse impacts to wildlife from traffic along haul routes. To address this gap, the EAO has proposed Condition 18: Wildlife Protection and Mitigation Plan that would address wildlife impacts from the haul routes. Another exception is requirements within the Transportation Plan that relate to minimizing adverse impacts to traditional use in areas along haul routes. To address these gaps, the EAO has proposed Condition 24: Road Management Plan that would require Glencore to implement mitigation measures to manage effects related to Sukunka and public use of the haul road.

### 19.1.19 WILDLIFE PROTECTION AND MONITORING PLAN

This plan would describe measures to protect wildlife and would provide direction to Sukunka personnel to manage the potential for human-wildlife conflicts during construction and operation. Although a Wildlife Management Plan must be submitted as part of the MA permit application, additional wildlife mitigation measures required for Sukunka would not be addressed by the MA requirements, including those measures that extend off the mine site. Therefore, the EAO is proposing Condition 18: Wildlife Protection and Mitigation Plan that would require Glencore to include components specific to birds and bats to ensure key wildlife mitigation measures are implemented, as well as mitigation measures specific to western toad. This plan would be in addition to the Wildlife Management Plan required for the MA application, and it would also include a Human-Wildlife Conflict Management Plan to describe mitigation measures to address the increased risk to wildlife mortality due to human-wildlife conflict. Further details on potential effects to wildlife and mitigation measures proposed for the plan are contained in [Section 7](#) (Wildlife) of this Report.

## 19.2 SUMMARY OF ENVIRONMENTAL AND OPERATIONAL MANAGEMENT PLANS PROPOSED BY THE EAO

The EAO also proposes EAC conditions that require the development and implementation of several additional plans to those proposed in the Application, as determined through the Application Review process.

### 19.2.1 CARE AND MAINTENANCE PLAN

The EAO is proposing this plan as EAC Condition 15 that would require Glencore to describe which EAC conditions would apply during temporary closures.

### 19.2.2 COMMUNITY EFFECTS MANAGEMENT PLAN

The EAO is proposing this plan as EAC Condition 25 to address concerns regarding local employment and training opportunities during temporary and permanent closures, noise complaints management, communication mechanisms for stakeholders, monitoring, reporting, and adaptive management to mitigate potential effects on infrastructure and services resulting from Sukunka's workforce and activities.

The EAO is proposing this plan as an EAC condition to formalize Glencore's commitment to engaging with local communities to address socio-economic effects associated with Sukunka, should they arise. Further details on this plan are provided in [Sections 13](#) (Economic) and [14](#) (Social) of this Report.

### 19.2.3 CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN

The EAO is proposing the CEMP as EAC Condition 14 to address typical issues relating to the construction of a major project such as erosion and sediment control, waste management, access management, and human-wildlife contact. This plan is also a requirement of a MA permit application; however, the EAO is of the view the issues addressed in this plan are of sufficient importance to justify its inclusion in the EAC.

### 19.2.4 HEALTH AND MEDICAL SERVICES PLAN

The EAO is proposing this plan as EAC Condition 26 to describe the means for the provision of health services to Sukunka employees, following Northern Health's Health and Medical Services Plan Best Management Guide for Industrial Camps. The EAO is proposing the Health Services Management Plan as an EAC condition to facilitate the provision and coordination of medical services to Sukunka employees. Further details on this plan are provided in [Section 16](#) (Health) of this Report.

### 19.2.5 HUMAN HEALTH MONITORING AND MANAGEMENT PLAN

The EAO is proposing this plan as EAC Condition 28 to address concerns related to human health monitoring of critical air contaminants and contaminants of potential concern. This plan would identify monitoring locations for both soil and water quality and action thresholds for contaminants and provide additional measures required to mitigate the increased risk to human health, including updating the human health risk assessment as necessary. Further details on this plan are provided in [Section 16](#) (Health) of this Report.

### 19.2.6 ROAD MANAGEMENT PLAN

The EAO is proposing this plan as EAC Condition 24 to require Glencore to develop a plan for the management of roads to reduce wildlife mortality, impacts to Indigenous use of the roads, and dust on the haul road. Further details on this plan are provided in [Section 11](#) (Air Quality), [Section 7](#) (Wildlife), and [Part C](#) (Consultation with Indigenous Groups).

### 19.2.7 SELENIUM MANAGEMENT PLAN

The EAO is proposing this plan as EAC Condition 22 to require Glencore to develop a plan for selenium management. Further details on this plan are provided in [Section 6](#) (Water Quality and Aquatic Biota) of this Report. This plan is also a requirement of an MA and EMA permit application; however, the EAO is of the view the issues addressed in this plan are of sufficient importance to justify its inclusion in the EAC.

### 19.2.8 VEGETATION MANAGEMENT PLAN

Although a vegetation management plan is required as part of the MA and EMA permits, the EAO is proposing this plan as EAC Condition 16 to require Glencore to complete additional rare plant and ecosystem of conservation concern surveys and a description of mitigation measures for vegetation prior to the commencement of construction. This plan would also include a Reclamation and Monitoring Plan for wetlands. Further details on this plan are provided in [Section 9](#) (Vegetation) of this Report.

### 19.2.9 WETLANDS PLAN

The EAO is proposing this plan as EAC Condition 17 to provide the mitigation measures, locations, and plans for compensating for wetland loss due to Sukunka, as well as provide additional information regarding wetland functions in the vicinity of Sukunka prior to the commencement of construction. Further details on this plan are provided in [Section 9](#) (Vegetation) of this Report.

## PART C – CONSULTATION WITH INDIGENOUS GROUPS

### 20.0 SUMMARY OF CONSULTATION

The following section discusses the procedural elements of consultation and engagement activities undertaken by the EAO, IAAC, and Glencore with Indigenous Groups.

#### 20.1 EAO-LED CONSULTATION ACTIVITIES WITH INDIGENOUS GROUPS

On May 6, 2013, the EAO issued a Section 11 Order which specified the consultation activities that both the EAO and Glencore would undertake with all Indigenous Groups<sup>104</sup> potentially affected by Sukunka. Indigenous Groups are listed in two schedules in the Section 11 Order; Schedule B lists Indigenous Groups engaged at the deep end of the consultation spectrum, and Schedule C lists Indigenous Groups consulted primarily through notification.

To determine whether an Indigenous Group would be included on Schedule B or C of the Section 11 Order, consideration was given to areas of traditional use understood by the Province to be where Aboriginal Interests (asserted or established Aboriginal rights, including Treaty rights, and title) were historically or are currently exercised. The EAO's initial assessment of the required scope of the duty to consult was presented to Indigenous Groups identified on Schedules B and C for review and comment on February 21, 2013, and again on April 3, 2013, as part of consulting on the draft Section 11 Order. Comments received from Indigenous Groups were considered and the EAO issued a Section 11 Order to Glencore on May 8, 2013. Canada recognizes that members of Métis Nation British Columbia and Kelly Lake Métis Settlement Society may also exercise Aboriginal rights and carry out traditional activities in the area of Sukunka, and because Sukunka EA was substituted, these Métis groups were included in this assessment.

As a result of these discussions and the EAO's consideration of requests from Doig River First Nation and Halfway River First Nation to be consulted at a deep level, as well as additional information provided by these First Nations, Section 13 Orders were issued<sup>105</sup>, amending the Section 11 Order, as follows:

- Doig River First Nation was removed from Schedule C and added to Schedule B (April 12, 2016) – further details are provided in [Section 21.4](#) of this Report; and
- Halfway River First Nation was removed from Schedule C and added to Schedule B (January 30, 2018) – further details are provided in [Section 21.5](#) of this Report.

After the addition of each First Nation to Schedule B, the EAO directed Glencore to implement additional measures for consultation to avoid or mitigate potential adverse effects and/or to otherwise address or

<sup>104</sup> "Indigenous Groups" means those Indigenous entities identified in Schedule B and Schedule C of the Section 11 Order.

<sup>105</sup> Available online at: <https://projects.eao.gov.bc.ca/p/sukunka-coal-mine/docs?folder=98>

accommodate the concerns of Doig River First Nation and Halfway River First Nation, as appropriate, for the remainder of the EA, following the Section 11 Order. The amended Section 11 Order on January 30, 2018, identified that consultation would be required with the following Indigenous Groups:

**Table 51: Indigenous Groups Requiring Consultation, Identified in the Amended Section 11 Order**

Schedule B	Schedule C
<p><b>Treaty 8:</b></p> <ul style="list-style-type: none"> <li>• McLeod Lake Indian Band</li> <li>• Saulteau First Nations</li> <li>• West Moberly First Nations</li> <li>• Doig River First Nation</li> <li>• Halfway River First Nation</li> </ul>	<p><b>Treaty 8:</b></p> <ul style="list-style-type: none"> <li>• Blueberry River First Nations</li> <li>• Fort Nelson First Nation</li> <li>• Prophet River First Nation</li> <li>• Horse Lake First Nation</li> </ul> <p><b>Métis Groups:</b></p> <ul style="list-style-type: none"> <li>• Métis Nation British Columbia</li> <li>• Kelly Lake Métis Settlement Society</li> </ul>

Indigenous Groups in Schedule B of the Section 11 Order were provided with capacity funding during pre-Application and Application Review, and were provided with the following opportunities for consultation at the deep end of the consultation spectrum:

- Participation in the Working Group;
- Opportunities provided via written format and government-to-government meetings to identify Treaty rights (as they are all within Treaty 8) and Aboriginal rights and interests that may be adversely affected by Sukunka and discuss potential measures to avoid, mitigate, address, or otherwise accommodate potential adverse effects on Aboriginal and Treaty rights and interests, as appropriate;
- Opportunity to review and comment on key documents, including the draft Project Description, draft Section 11 Order, draft Application Information Requirements (AIR), Glencore's Application for an EAC, supplemental materials, the EAO's draft Assessment Report, including the Part C Consultation with Indigenous Groups Report, Glencore's Aboriginal Consultation Reports, the draft CPD, and draft TOC;
- Opportunity to submit a separate submission outlining their views on the Assessment Report, TOC, and CPD to be included in the package of materials sent to Ministers when Sukunka was referred for decision; and
- Additional measures for consultation and accommodation where appropriate.

Indigenous Groups listed on Schedule C of the Section 11 Order were offered capacity funding on behalf of the Agency and provided the following opportunities for consultation:

- Notification of key milestones such as the issuance of the Section 10 and 11 Orders, AIR, acceptance of the Application for review, timing of public comment periods (including open houses), referral of the final Assessment Report to Ministers, and the resulting decision;

- The EAO's offer to meet and consider information from such Indigenous Groups regarding Treaty or Aboriginal rights or interests in the Sukunka area and any potential adverse effects of Sukunka on such interests;
- Invitation to review and comment on the EAO's draft Assessment Report, including this Part C Consultation of Indigenous Groups Report, and other draft referral materials; and
- Additional measures for consultation and accommodation where appropriate.

The EAO has considered all relevant comments received from Indigenous Groups during pre-Application and Application review stages of the EA. Issues, comments, and concerns raised by Indigenous Groups in relation to Sukunka, submitted via correspondence or raised directly at meetings, were forwarded to Glencore for tracking and response, as required.

Input from Indigenous Groups was received through participation in Working Group meetings, teleconferences, direct meetings with the EAO and/or Glencore and written correspondence (letters, reports, and emails). The EAO also arranged specific Working Group meetings and offered to meet with Indigenous Groups to review responses and any additional concerns presented by Indigenous Groups. This Part C was written in collaboration with the Treaty 8 Nations in Schedule B through a series of meetings in 2018 and 2022. Additional capacity funding was offered to all Schedule B Nations in June 2018 to participate in the later stages of the Sukunka Application Review.

A draft of this Report that demonstrated how the EAO considered and addressed all Indigenous Groups on Schedule B's comments received during the EA as well as the EAO's draft conclusions, was provided to Indigenous Groups on June 17, 2022, for review and comment. On July 27, 2022, the EAO provided these Indigenous Groups with a subsequent draft version of this Report to demonstrate how the EAO considered or responded to comments provided on the earlier draft. In addition, the EAO iteratively drafted this Part C and conditions that responded to concerns raised by these Indigenous Groups. Comments on the draft Report and the EAO's referral materials were received up until September 1, 2022, have been included in the final version of this Report.

The EAO provided the opportunity for government-to-government consultation with Indigenous Groups to discuss their views on potential impacts of Sukunka on their Aboriginal Interests, including Aboriginal rights and Treaty rights. Meetings with specific Indigenous Groups are described in [Section 21](#). Key issues of concern raised by Indigenous Groups related to Aboriginal and Treaty rights and interests are discussed in [Sections 20.3](#) and [20.4](#), and concerns related to specific VCs are discussed in the VC-specific sections of this Report.

### **FIRST NATIONS INDEPENDENT TECHNICAL REVIEW COMMITTEE**

McLeod Lake Indian Band, Saulteau First Nations, and West Moberly First Nations sent a letter to the EAO on February 6, 2015, indicating that they would be conducting a First Nations Independent Technical Review (FNITR) with the objective of creating a collaborative process with Glencore to resolve issues and ensure a sustainable development program. The FNITR retained ERM Canada Consultants Ltd. (ERM) in August 2015 to conduct a third-party technical review of the Application.

The objectives of the FNITR process were to review and assess the Application, conduct research, provide submissions to the EAO, and represent the interests of its member nations. In addition, Glencore and the Indigenous Groups initiated discussions to pursue a collaboration agreement to address gaps and guide issues management and collaborative decision-making for the life of Sukunka.

When Doig River First Nation and Halfway River First Nation were added to Schedule B later in Application Review, they were invited by the FNITR to join. Doig River First Nation agreed to join, and Halfway River First Nation opted to conduct an independent review of the materials. ERM submitted a report on behalf of the FNITR to the EAO in December 2016, which outlined 61 key issues (related to broad level uncertainties with the effects assessment, lack of confidence in the conclusions and impact assessment, and effectiveness of the proposed mitigation measures) and 366 secondary issues (related to specific technical issues) with the Application.

The FNITR indicated that they planned to work with Glencore through technical workshops and meetings to address these issues, and they may provide the EAO with a final report outlining the outcomes of this process (which is discussed further in [Section 20.2: Proponent-Led Consultation with Indigenous Groups](#)). The intent of this work was to make inferences about potential impacts to Aboriginal and Treaty rights and interests that may warrant further investigation. In January 2017, the FNITR advised Glencore that the issues raised in the 2016 report had not been addressed and opted to engage directly in EAO-led engagement activities.

Beginning in early 2018, the FNITR agreed to begin meeting directly with the EAO to discuss outstanding issues and referral documents. The EAO met with the FNITR in a series of meetings beginning in early 2018, including:

- February 27, 2018: Meeting in Chetwynd, B.C. with the FNITR to discuss key concerns regarding water quality and caribou;
- March 9, 2018: Teleconference with the FNITR and caribou experts to discuss caribou in detail;
- March 16, 2018: Teleconference with the FNITR, provincial water quality experts, and federal water quality experts to discuss water quality concerns and methodology for assessment of Aboriginal and Treaty rights and interests in the EAO's Assessment Report;
- April 25 and 26, 2018: Meeting in Chetwynd, B.C. with the FNITR to discuss general concerns regarding Sukunka, the EA process, and cultural wellness;
- June 13 and 14, 2018: Meeting in Chetwynd, B.C. with the FNITR to work on the draft Part C of this Report;
- June 15, 2018: Meeting in Chetwynd, B.C. with the FNITR and caribou sub-working group to discuss the risk of displacement of caribou off Bullmoose Mountain and mitigation and offsets proposed by Glencore;
- July 24 and 25, 2018: Meeting in Chetwynd, B.C., with the FNITR to work on the draft Part C of this Report and discuss issues related to the suspension and caribou; and
- March 12 and 13, 2019: Meeting in Chetwynd, B.C., with the FNITR to discuss draft Part C conclusions and a summary of issues related to Indigenous concerns.

While the Sukunka EA process was suspended<sup>106</sup>, Glencore worked directly with the FNITR to conduct additional analysis and undertake discussions to resolve outstanding issues related to the Sukunka EA (which is discussed further in [Section 20.2](#): Proponent-Led Consultation with Indigenous Groups).

During the suspension of Application Review, the composition of the FNITR shifted. While Sauleau First Nations, West Moberly First Nations, and Doig River First Nation continued to comprise the FNITR, McLeod Lake Indian Band provided comments in collaboration with the FNITR but did not officially form part of the committee. The FNITR and McLeod Lake Indian Band retained the services of Ursus Wildlands Consulting, who continued to conduct the independent review of the referral materials until Sukunka was referred to Ministers.

On December 16, 2021, Glencore submitted a report to initiate the process to lift the suspension (as required by the EAO's August 23, 2018, suspension order). Following a series of discussions between Glencore, the FNITR, and the EAO, Glencore requested an additional 60-day period for additional analysis and discussions related to caribou on March 4, 2022. Given the re-initiation of the Sukunka EA process, the EAO held meetings with FNITR in late 2021 through 2022, including:

- December 16, 2021: Virtual meeting with the FNITR to discuss reinitiating the Sukunka EA process following the suspension and a draft workplan;
- January 16, 2022: Virtual meeting with the FNITR to discuss an updated workplan and to discuss a letter that the FNITR provided to the EAO regarding the process for lifting the suspension;
- February 2, 2022: Virtual meeting with the FNITR to discuss outstanding caribou issues and additional assessments requested;
- February 17, 2022: Virtual meeting with the FNITR for the EAO to provide an overview of the draft referral materials;
- February 22, 2022: Virtual meeting with the FNITR to continue to provide an overview of the draft referral materials;
- February 25, 2022: Virtual meeting with FNITR and Glencore for the FNITR to propose a series of discussions and technical workshops related to caribou;
- March 8, 2022: Virtual meeting with the FNITR to discuss Glencore's request for an additional 60-day period to undertake the FNITR's proposed technical workshops related to information gaps in relation to caribou;
- March 17, 2022: Virtual meeting with the FNITR for the EAO to discuss and make collaborative updates to Part C of this Assessment Report;
- May 5, 2022: Virtual meeting with the FNITR to discuss an upcoming Working Group meeting and anticipated next steps in the Sukunka EA process, given Glencore's additional suspension request;
- May 24, 2022: Virtual meeting with the FNITR and caribou sub-Working Group to examine alternative distribution patterns of caribou relative to disturbances and to make inferences about potential consequences of changes in distribution or movement patterns;
- May 26, 2022: Full day, virtual workshop on the caribou Adaptive Management Framework, facilitated by ESSA;

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<sup>106</sup> A series of three suspensions took place from January 21, 2016 to July 15, 2022.

- June 14, 2022: Virtual meeting to discuss the EAO's proposed table of conditions; and
- June 26, 2022: Virtual meeting to discuss the FNITR's proposed edits to this Part C.

On May 18, 2022, Ursus Wildlands Consulting submitted a follow-up memo<sup>107</sup> on behalf of the FNITR and McLeod Lake Indian Band to the EAO to provide an update on engagement between the FNITR and to provide an update on the status of the 61 key issues and 366 secondary issues identified in the December 2016 letter. The memo noted that the majority of the 366 technical issues identified in 2016 were resolved and some of the 61 key issues were addressed or resolved<sup>108</sup>. The remaining 28 key issues are considered by the FNITR to be ongoing and were proposed to be addressed through work directly between Glencore, the FNITR, and McLeod Lake Indian Band. Issues pertaining to caribou were not described in the memo, as Glencore and the FNITR were undertaking additional discussion and analysis on this topic. The outstanding key and technical issues are further discussed in [Part B](#) or this [Part C](#) of the Report as relevant.

The FNITR also participated in Working Group meetings throughout 2018 to 2022, which are described in the following section.

### 20.1.1 WORKING GROUP ACTIVITIES

Treaty 8 Nations on Schedule B of the Section 11 Order were invited to participate in the Working Group. The EAO held Working Group meetings and teleconferences throughout pre-Application and Application Review. Details of these meetings and attendance by the Treaty 8 Nations is provided in [Appendix 5](#).

## 20.2 PROPONENT-LED CONSULTATION ACTIVITIES WITH INDIGENOUS GROUPS

As part of the Section 11 Order and subsequent Section 13 Orders, the EAO directed Glencore to undertake certain procedural aspects of consultation during the EA with Indigenous Groups listed on Schedules B and C.

### ABORIGINAL CONSULTATION REPORTS

The Section 11 Order required Glencore to undertake an assessment of the potential impacts to Aboriginal and Treaty rights and interests, which are referenced in this section as necessary. The Section 11 Order required Glencore to develop and share drafts of an Aboriginal Consultation Plan and multiple Aboriginal Consultation Reports (ACRs) with the Indigenous Groups at prescribed milestones. These documents were revised by Glencore based on input received from and concerns expressed by Indigenous Groups prior to being submitted to the EAO. These documents enabled the EAO to:

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<sup>107</sup>

Available online at:

<https://www.projects.eao.gov.bc.ca/api/public/document/62d9c78d51f1a5002338e108/download/ISSUES%20SUMMARY%20OC%202022%20submit.pdf>

<sup>108</sup> The FNITR and MLIB also raised 7 new key issues, to which Glencore responded in the Issues Tracking Table.

- Understand Glencore’s consultation plans, and subsequent efforts and the perspectives of the Indigenous Groups related to those efforts;
- Understand any issues and concerns identified by Indigenous Groups to Glencore; and
- Evaluate Glencore’s consultation plan for subsequent consultation activities required with these Indigenous Groups during Application Review.

A summary of Glencore’s engagement activities with Indigenous Groups is provided in Glencore’s Application and in Glencore’s ACRs, which are available on the EAO’s public website<sup>109</sup>.

Glencore provided the EAO with four ACRs, each covering distinct periods of time during the EA (one during pre-Application, one at Application submission, and two during Application Review), which outlined comments received by Glencore from Indigenous Groups in meetings, correspondences, and general conversations. Glencore also provided responses to all comments received from the EAO or received directly from the Indigenous Groups in the ACRs, in tracking tables, and in other correspondence.

In the first ACR submitted to Indigenous Groups on October 23, 2013, Glencore outlined how it initiated discussions, meetings, and site visits with Indigenous Groups on Schedule B in early 2012. Initial discussions occurred during meetings with technical representatives of McLeod Lake Indian Band, West Moberly First Nations, and Sauteau First Nations. This ACR focused on:

- Glencore providing information about Sukunka and historical and planned exploration drilling programs;
- A summary of concerns raised by Treaty 8 Nations, including:
  - McLeod Lake Indian Band’s concerns regarding water management, baseline data collection, traditional knowledge information, cumulative effects, and potential disturbance to caribou;
  - Sauteau First Nations’ concerns regarding water management, potential disturbance to caribou, the Burnt River crossing and impacts to transportation routes, fish and fish habitat, selenium studies, traditional knowledge information, and impacts of noise; and
  - West Moberly First Nations’ concerns regarding reclamation plans, potential disturbance to caribou, and caribou mitigation measures;
- Glencore providing an outline of planned consultation activities with Treaty 8 Nations.

Glencore provided funding to hire a third-party consultant to conduct an independent technical review of Sukunka on behalf of the Treaty 8 Nations on Schedule B (McLeod Lake Indian Band, Sauteau First Nations, and West Moberly First Nations) of the Section 11 Order, prior to the addition of Doig River First Nation and Halfway River First Nation to Schedule B. Glencore also offered funding to McLeod Lake Indian Band, West Moberly First Nations, and Sauteau First Nations to assist in the creation of a traditional knowledge/traditional land use study for each of these Treaty 8 Nations.

The second ACR was submitted to Treaty 8 Nations on Schedule B initially on October 14, 2014, with a final version submitted with the Application, providing a summary of Glencore’s consultation activities in the

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<sup>109</sup> Available at: <https://projects.eao.gov.bc.ca/p/sukunka-coal-mine/docs?folder=131>

final stages of pre-application, including meetings, site visits, and community open houses. This ACR focused on:

- Ongoing discussions with McLeod Lake Indian Band, Saulteau First Nations, and West Moberly First Nations regarding traditional knowledge and traditional land use studies;
- A summary of Working Group meetings and a kick-off meeting with the third-party review (involving the FNITR);
- A summary of concerns raised, including:
  - McLeod Lake Indian Band expressed concerns regarding baseline data collection and noise disturbance to mountain goats and grizzly bears. Glencore provided details of the noise studies, baseline data collection programs, and assessed effects to wildlife;
  - Saulteau First Nations expressed interest in seed collection programs prior to ground disturbance which Glencore responded to by attending the opening of Twin Sisters Native Plant Nursery (owned jointly by Saulteau First Nations and West Moberly First Nations) and retaining the nursery to collect seeds for the proposed reclamation activities;
- A community meeting held in the West Moberly First Nations community on November 18, 2013. West Moberly First Nations community members raised concerns regarding contamination of the Sukunka River. Glencore provided details on how effects on water quality would be assessed and mitigation measures developed;
- Saulteau First Nations provision of a traditional knowledge/traditional land use study to Glencore on October 7, 2014, which identified concerns related to wildlife, water, fish, berries, medicinal plants, and access to traditional use sites;
- An outline of planned consultation activities with Treaty 8 Nations on Schedule B, as well as an outline of how potential adverse effects to Aboriginal and Treaty rights and interests would be assessed in the Application and proposed mitigation measures to address these effects.

The third ACR was submitted on November 2, 2015, and it focused on the initial stages of Application Review, following the addition of Doig River First Nation to Schedule B. It included the following:

- A summary of meetings, correspondence, and other consultation activities by Glencore;
- Details of an Open House held in Chetwynd, B.C., on September 1, 2015;
- Saulteau First Nations' 24 comments provided to Glencore on the Application for screening on July 8, 2015, largely focused on cumulative effects and impacts and mitigation measures related to hunting, trapping, fishing, gathering, and sacred sites. Glencore responded to these comments by letter on July 27, 2015;
- Doig River First Nation request to Glencore to be included in the FNITR; and
- An outline of planned consultation activities with Treaty 8 Nations on Schedule B.

The fourth ACR was submitted on December 8, 2015, and it focused on the Application Review period, including the following:

- A summary of meetings, correspondence, and other consultation activities;
- Incorporation of the Saulteau First Nations' traditional knowledge/traditional land use study into

the Application;

- A total of 18 comments provided by Horse Lake First Nation on the Application on October 14, 2015, primarily focused on the level of consultation provided, cumulative effects, the exercise of Aboriginal and Treaty rights, and environmental monitoring programs. Glencore provided responses to these comments on November 10, 2015; and
- An outline of planned consultation activities with Treaty 8 Nations on Schedule B.

On February 10, 2016, McLeod Lake Indian Band provided their traditional knowledge/land use study to Glencore. Glencore also participated in a meeting in the McLeod Lake Indian Band community regarding the use of the traditional knowledge/land use study in the EA.

### CARIBOU WORKSHOPS

Glencore worked with the FNITR in fall 2019 and funded two workshops facilitated by Compass Resource Management Ltd. The objective of the workshops was to determine the potential for, and consequences of, project-related disturbance on the Quintette herd.

On May 26, 2020, Glencore presented its proposed offsetting package and provided a high-level outline of its proposed approach to adaptive management for addressing impacts to the Quintette herd.

Following the re-initiation of the EA process in late 2021, Glencore provided funding to the FNITR in May 2022 to undertake additional analysis on impacts to caribou (including topics of displacement, cumulative effects, adaptive management, and wolf predation). These workshops took place on May 24 and May 26, 2022. On June 6, 2022, the FNITR indicated that they anticipate submitting additional disturbance analysis resulting from these workshops to the EAO as a separate supporting document.

Further information regarding Glencore's proposed offsets and the caribou workshops can be found in Part B ([Section 8: Caribou](#)) of this report and issues raised by Indigenous Groups in relation to caribou are also discussed in [Section 20.3.2: Caribou](#) of this Part C.

### COLLABORATION BETWEEN GLENCORE AND THE FNITR

The FNITR initially entered bilateral discussions with Glencore to address the issues raised in ERM's 2016 technical report through a cooperative and collaborative process, including a series of technical workshops. The intention of this work was to make inferences about potential impacts to Aboriginal and Treaty rights and interests that may warrant further investigation. At the conclusion of the process, the FNITR and Glencore envisioned a final report about the results and outcomes of the process would be submitted to the EAO for its consideration.

This engagement shifted to take place through the EA process in 2017, when the FNITR submitted its comments to the EAO and Glencore provided responses to the issues raised. After these series of information exchanges, it was decided that in-person technical workshops were more appropriate mechanisms to conclude some of the discussions.

As a result of these engagement activities between the FNITR and Glencore, including the provision of

additional information by Glencore and the technical workshops, a majority of the 366 secondary issues were resolved. Some of the 61 key issues identified by the FNITR remained outstanding. Given the connection between the key and secondary issues, the FNITR and Glencore agreed that resolution of the 61 key issues would likely resolve the remaining secondary issues; therefore, the secondary issues were considered closed, pending resolution of the remaining key issues.

The FNITR and Glencore met in late 2017 to discuss the outstanding issues and a Collaboration Agreement proposed by Glencore to potentially re-establish the bilateral discussions between Glencore and the FNITR, while the FNITR continued to engage with the EAO directly and through the Working Group. After providing comments on a draft Collaboration Agreement and receiving comments from Glencore, the FNITR determined that Glencore's proposed terms were not sufficient to address the issues identified by the nations and the discussions were discontinued in early 2018. In June 2018, the FNITR submitted two memos to EAO describing the issues with water quality, caribou, and cumulative effects.

As a Collaboration Agreement was not reached, the EAO proposed Condition 31: Indigenous Group Collaboration Plan, which would require Glencore to work in consultation with Indigenous Groups to describe how the Holder will engage with Indigenous Groups on the implementation of the EAC (should it be issued).

## 20.3 COMMON CONCERNS RAISED BY TREATY 8 NATIONS

This section summarizes concerns commonly identified by Treaty 8 Nations included on Schedule B related to potential impacts of Sukunka on their Aboriginal Interests (including Aboriginal rights, Treaty rights, and interests).

### 20.3.1 INCREASED CUMULATIVE DEVELOPMENT PRESSURE

Throughout Application Review, the FNITR, McLeod Lake Indian Band, and Halfway River First Nation raised concerns that the Treaty 8 region has experienced levels of industrial growth that far exceed the carrying capacity of the environment and that such growth has diminished the Indigenous Groups' ability to exercise and peacefully enjoy their Aboriginal and Treaty rights and interests.

It is the FNITR's view that every new industrial development in Treaty 8 territory negatively impacts fundamental aspects of First Nations' way of life and their ability to survive by: limiting how they use the land and resources; reducing the area available to hunt, trap, fish, and gather; decreasing the safety of hunting, trapping, fish, and gathering along haul routes; adding stress and contamination to declining wildlife, water, and vegetation; interfering in the cultural relationship between the community and the environment; reducing opportunities for knowledge transfer; and placing constraints on community governance and organization. As a result, the FNITR has described experiencing significant unmitigated losses to their food security, community health, culture, and spiritual well-being because of increased development in the area.

The FNITR expressed concern that each additional development also leads to an influx of people into the area at the construction and operation stages of a project, leading to additional recreational use and exploitation of the area. The FNITR noted that this increased use would impact the ability of the Treaty 8 Nations to have peaceful enjoyment<sup>110</sup> of their Aboriginal and Treaty rights and interests in this area due to land disturbance, pollution, unreasonable interference from increased motor vehicle access, increased numbers of non-Indigenous people present on the land, and increased use of shared wildlife and vegetation resources.

#### Peaceful Enjoyment, as defined by the FNITR

The concept of the ability of a Treaty 8 Nation to peacefully enjoy the exercise of Aboriginal and Treaty rights and interests was raised by the FNITR as an important concern related to the assessment of impacts to Aboriginal and Treaty rights and interests. The FNITR defined peaceful enjoyment as the ability to exercise an Aboriginal and Treaty right and interest – free of unreasonable disturbance by other users on the land, or issues with air, visual quality, or auditory disturbance, and free of concern of the spiritual, cultural, and physical contamination of resources.

An example of this was provided: if a mine released effluent into a waterbody, even if the fish populations were monitored and were seen by western science as being safe to eat, the fish may be viewed by the First Nations members as contaminated or spiritually unsafe to eat because they do not smell right, taste right, or look right. This “rightness” is an Indigenous value judgement, arrived at through their senses, which they have learned to trust. This would thus impact the peaceful enjoyment of the ability to exercise the Aboriginal and Treaty right to fish in that waterbody. Similarly, the peaceful enjoyment of the Treaty right to gather would also be impacted if loud haul trucks releasing dust frequently passed near a berry-gathering location.

To illustrate this point, the FNITR highlighted the work of the Regional Strategic Environmental Assessments (RSEA) that are assessing the cumulative effects of natural resource development activities<sup>111</sup>. Since 2016, West Moberly, Saúlteau and Doig River First Nations have been collaborating with provincial scientists on an RSEA and have indicated that the results so far provide the best available cumulative effects information for northeastern B.C. Whether considering the distribution of mature forests, the level of risk in watersheds, the state of moose populations (particularly in traditional hunting areas), or the capacity of First Nations to pursue the peaceful enjoyment, the conclusions are similar: 70-90% of the landscape in the RSEA study area is at moderate to high risk due to extensive disturbance.

The FNITR and McLeod Lake Indian Band stated that reversing the cumulative effects identified in the RSEA requires regulators and industry proponents to acknowledge their role in contributing to ongoing cumulative effects; that impacts are project-wide and that the standard practice of quantifying net impacts through an assessment of residual effects significantly

underestimates impacts and therefore significantly underestimates the required mitigation, restoration, and offsetting measures; and that reversing cumulative effects requires meaningful accommodation and offsetting measures that consider the entire project footprint and full suite of potential impacts, in

<sup>111</sup> Information available at: <https://www2.gov.bc.ca/gov/content/environment/natural-resource-stewardship/cumulative-effects-framework/regional-assessments/northeast>

addition to site specific mitigations.

The FNITR also noted that ongoing cumulative development pressure in the Tumbler Ridge area, in addition to reasonably-foreseeable projects such as new mines and expansions of existing mines, forestry, and wind development projects, has had a negative impact on many species in the region. The Quintette caribou herd, for example, has experienced a significant population decline over many years and FNITR, provincial and federal experts participating in this assessment concurred that evidence shows the herd is at risk of extirpation (despite short-term populations increases over the last several years).

Although the FNITR supports the regional coal agreement<sup>112</sup>, it maintains that coal mines must be subject to reasonable environmental standards and respect for Aboriginal and Treaty rights interests and that the impact on caribou as a result of Sukunka will not meet these standards. The FNITR also advised that, for decades, they have not exercised their Treaty right to hunt caribou locally due to the critical status of several herds, and the Quintette herd specifically. Community members that want to hunt caribou must travel long distances at considerable cost<sup>113</sup> to find caribou herds that are at sustainable population levels. However, traveling such distances is often out of reach for many members.

As caribou cannot be hunted locally, moose has become a larger portion of Treaty 8 Nations' diets. However, the FNITR stated that their ability to hunt moose and the area available to hunt moose has been drastically reduced due to agricultural expansion (creation of community pastures on crown lands), infrastructure from development (including oil and gas, mines, forestry and wind development), designated Agricultural Land Reserves, and increased non-Indigenous use of the landscape. The FNITR stated that these uses of Treaty 8 lands by non-indigenous groups interfere and compete with Treaty 8 Nations' rights to peaceful enjoyment of hunting, fishing, and gathering activities. The FNITR stated that Sukunka will only further degrade these lands and the Treaty 8 Nations' ability to exercise their Aboriginal and Treaty rights and interests to hunt on this land.

The FNITR has also emphasized the important of these lands for cultural education. Culturally and spiritually appropriate settings are required for transmission of traditional values and practices related to hunting.

The FNITR stressed that the above-noted changes and their cumulative impact on the Treaty 8 region has diminished the availability of a culturally appropriate diet of wild foods, forcing Treaty 8 members to instead rely on commercially-available products such as processed foods and beef. This has also caused a reduction in social cohesion normally brought about by the communal sharing of country foods. The impact on the health of community members has been significant and has resulted in high rates of obesity, heart disease, and diabetes. Any further degradation of habitat and the associated impacts on

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<sup>112</sup> Regional coal agreements were made between the Province and each of West Moberly First Nations, Saulteau First Nations, and Doig River First Nation, and identify the areas in which the signatory First Nations will be consulted with regarding coal development at levels designated within the Regional Coal Agreement. The 'Tumbler Ridge Zone' was identified as an area of special interest where coal development is emphasized. Additional details can be found here:

<https://catalogue.data.gov.bc.ca/dataset/regional-coal-agreements-first-nations>.

<sup>113</sup> The closest location to exercise the Aboriginal and Treaty right to hunt caribou is Pink Mountain, located near Prophet River (approximately 215 km northwest of Sukunka).

predator-prey dynamics, food security, community wellness, diminished social cohesion of communal sharing of country foods, and identity would significantly impact the nations' ability to exercise their Aboriginal and Treaty rights and interests. *Yahey v. British Columbia*

Near the end of Application Review, the British Columbia Supreme Court (BCSC) released its decision in *Yahey v British Columbia* (the 'Yahey decision'), a significant treaty rights infringement case. Justice Burke declared that the Province has unjustifiably infringed Blueberry River First Nations' Treaty 8 rights by authorizing industrial development in Blueberry River First Nations' traditional territory over many years. Justice Burke directed the Province to negotiate with Blueberry River First Nations to establish timely enforceable mechanisms to assess and manage cumulative effects while protecting Blueberry River First Nations' Treaty 8 rights.

BC's Attorney General subsequently stated that "the court's decision was clear that the Province must improve its assessment and management of the cumulative impact of industrial development on Blueberry River First Nations' Treaty rights, and to ensure these constitutional rights are protected."<sup>114</sup> As such, the Province is working with Blueberry River First Nations and other Treaty 8 Nations to develop new approaches to restoration, wildlife management, land use planning, cumulative effects management, decision-making and ways to honor Treaty 8.

As the *Yahey* decision emphasized how the cumulative effects of development can impact Treaty 8 rights, the EAO sought the FNITR's views on the decision and any implications for the Sukunka EA, which were provided to the EAO in the FNITR's May 18, 2022, memo<sup>115</sup> and comments on a draft version of this Part C.

The FNITR emphasized that Justice Burke found that to establish an infringement of Treaty 8 rights, the First Nations need not demonstrate that no ability to exercise treaty rights exist, but rather that no meaningful right remains. This is highlighted in the passage below:<sup>116</sup>

*"Inherent in the promise that there will be no forced interference with this way of life is that the Crown will not significantly affect or destroy the basic elements or features needed for that way of life to continue"<sup>117</sup>... While some changes may occur, this way of life is dependent on the existence of healthy mature forests, wildlife habitats (such as mineral licks), fresh clean water, and access to these places. There must be healthy populations of moose and other wildlife so that Blueberry members have a chance of being successful on their hunts, and do not need to travel far from or outside of their territory to find game. In addition, this way of life depends on a relatively stable*

<sup>114</sup> Government of British Columbia news release, July 28, 2021. Accessed at <https://news.gov.bc.ca/releases/2021AG0117-001488>

<sup>115</sup> Available online at:

<https://www.projects.eao.gov.bc.ca/api/public/document/62d9c78d51f1a5002338e108/download/ISSUES%20SUMMARY%20OC%202022%20submit.pdf>

<sup>116</sup> *Ibid* at 515.

<sup>117</sup> *Ibid* at 175.

*environment, so that the knowledge held by Blueberry members about the places to hunt, fish and trap is relevant and applicable.*<sup>118</sup>

The FNITR also noted the 2011 decision of Justice Finch in *West Moberly First Nations v. British Columbia (Chief Inspector of Mines)*, 2011 BCCA 247, which found that the specific location and species of animals shall be taken into consideration when assessing whether a proposed mining activity would adversely affect West Moberly's Treaty rights to hunt and affirmed that indigenous people had been assured "they would be as free to hunt and fish after the Treaty as they had been before it; and the Treaty would not lead to forced interference with their mode of life".<sup>119</sup> The FNITR stated that, while this current process may not be able to repair damage caused by previous industrial developments, it can prevent further damage and infringement from occurring.

In its May 18, 2022, memo<sup>120</sup> to EAO, the FNITR outlined the implications of the *Yahey* decision for the assessment of Sukunka specifically. The FNITR highlighted that any biophysical VC may not, in isolation, lend itself to an evaluation of impacts to Aboriginal and Treaty rights and interests. However, when considered collectively and in combination with pre-existing cumulative effects, the biophysical VCs begin to provide insights into how Treaty 8 Nations' way of life has been altered and will continue to be altered without intervention. The FNITR noted that the information and concerns that they had brought forward during the Sukunka EA regarding cumulative effects were consistent with themes that emerged in the *Yahey* decision, including their views that:

- Indigenous Groups are not able to exercise their Aboriginal and Treaty Rights as they used to;
- Indigenous Groups cannot access their preferred hunting, fishing, and trapping places within the core of their territory, and have to go further from their homes to find signs of wildlife;
- The habitat has been fragmented, polluted, and in some cases, has disappeared;
- The wildlife is not as healthy or abundant;
- Indigenous Groups do not have peaceful enjoyment of their traplines, or within their hunting areas; and
- Indigenous Groups do not feel safe or welcome in their territory.

The FNITR also drew the linkages between the uncertainty surrounding Sukunka's impact on Treaty rights and the *Yahey* decision, given that addressing the key issues raised by the FNITR is necessary to understand the proposed mine's

**Important Paragraph of the *Yahey* Decision with Respect to Cumulative Effects, as provided by the FNITR**

In the *Yahey* decision, Justice Burke concluded: "On the basis of all the evidence and my findings, I conclude that the time has come, the tipping point has been reached, and that Blueberry's Treaty rights... have been significantly and meaningfully diminished when viewed within the way of life in which these rights are grounded" [para 1116].

<sup>118</sup> *Ibid* at 437.

<sup>119</sup> *Ibid* at 268-270.

<sup>120</sup> Available online at:

<https://www.projects.eao.gov.bc.ca/api/public/document/62d9c78d51f1a5002338e108/download/ISSUES%20SUMMARY%20OC%202022%20submit.pdf>

contribution to pre-existing adverse cumulative effects in Treaty 8 territory.

Given the uncertainties identified regarding the impact of Sukunka on Treaty 8 rights, the EAO has proposed Condition 30: Cultural Impact Assessment that would require Glencore to build on the Socio-Economic Assessment presented in the Application by updating impacts of Sukunka on traditional use and Treaty rights and inform additional mitigations or accommodation measures.

More detail regarding the EAO's biophysical assessments, including Glencore's proposed mitigations, are provided in Section 5 (Fish and Fish Habitat), Section 6 (Water Quality and Aquatic Biota), Section 7 (Wildlife), Section 8 (Caribou), Section 9 (Vegetation), Section 111 (Air Quality) and [Sections 16](#) (Human Health) of this Report.

### 20.3.2 CARIBOU

Caribou form an essential part of the Treaty 8 Nations' culture and history. Caribou have provided not only sustenance in the form of nutrition, clothing, tools, and other goods, but also have spiritual and social importance to Treaty 8 Nations' Treaty right to hunt, connection to the land, and the passing of values, language, knowledge and culture to others in their community. Each First Nation in Schedule B identified caribou as a key concern.

Sukunka overlaps with the range of the Quintette caribou herd. The Quintette herd is considered part of Woodland Caribou, Southern Mountain population, which has been listed on Schedule 1 of the federal *Species at Risk Act* (SARA) as Threatened since 2003. As part of the Central Mountain population, the Quintette herd is red listed<sup>121</sup> in B.C. and was assessed as endangered in 2014 by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). The herd has experienced dramatic decline over the past decades, with an estimated population of 62 remaining in all habitats in 2016. From 2018 to 2022, the herd experienced some short-term growth (from 74 to 132), largely attributed to predator control efforts that commenced in 2015.

In response to these declines, most Treaty 8 Nations stopped hunting caribou and will not resume hunting caribou until population levels have recovered to a level that would sustain harvesting in accordance with the traditional seasonal round. West Moberly First Nations, for example, have not harvested caribou in their Treaty territory since the 1970s. Despite this and other recovery efforts (e.g., wolf control, maternal penning, habitat restoration efforts), caribou numbers have declined over the long term despite some small, short-term population growth.

The FNITR stated that the goal for all the participating is to protect all critical habitat within the Quintette herd and focus on caribou recovery at a pace and scale which helps caribou populations recover to a level that can sustain hunting. They do not want to lose the dietary, spiritual, and cultural relationships associated with these hunting activities. In a presentation named "I Want to Eat Caribou Before I Die," Chief Roland Willson of West Moberly First Nations indicated that members used caribou as a source of

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<sup>121</sup> The red list includes any native species or ecological communities that have, or are candidates for, extirpated, endangered, or threatened status in British Columbia.

food, clothing, art, tools, medicine, social cohesion, and transmission of knowledge.

On April 28, 2017, the FNITR (at the time representing West Moberly First Nations, Sauleau First Nations, and McLeod Lake Indian Band) submitted four issues related to caribou in Glencore's Application:

- Lack of baseline information regarding predator/prey dynamics related to ungulates;
- Lack of mitigation for reducing linear feature density;
- Glencore's lack of involvement in regional caribou recovery strategies; and
- Exclusion of caribou as a receptor in Glencore's Ecological Risk Assessment.

Later in the Application Review process, the FNITR and HRFN communicated that it agreed with the provincial and federal caribou experts who noted the current extent of cumulative disturbance and the risk of displacement to the endangered Quintette herd would increase its risk of extirpation, and that this risk is inconsistent with the objective of recovery of caribou in B.C. The FNITR, in a memo<sup>122</sup> to the EAO on May 11, 2018, concluded that:

*As currently designed, the construction and operation of Glencore's proposed Sukunka Coal Mine is not consistent with the federal Recovery Strategy objectives for the re-establishment of caribou harvesting under Treaty 8 and is likely to result in significant adverse effects to the Quintette herd of Southern Mountain Caribou. Construction and operation of the Project, in combination with the potential operation of the nearby Bullmoose Mine and Meikle wind energy projects and the cumulative effects of industrial development elsewhere in the Quintette LPU<sup>123</sup>, will impede recovery of the Quintette herd, and further delay or jeopardize the exercising of the Nations' Treaty Right to a sustainable harvest.*

The FNITR also communicated in 2018 that, in its opinion:

- The mitigation (including the size of area of habitat offsets) proposed by Glencore is not sufficient for reducing this risk to an acceptable level;
- The onus lies with the Province to ensure that the candidate offsetting habitats in caribou habitat will remain protected from other resource development activities and tenures;
- The EAO could require Glencore to participate in a stakeholder table for negotiations with other land users and tenure holders, if other land users and tenure holders agree;
- Four of the seven candidate caribou offsetting habitats are located within three km of the mine, which reduces their effectiveness as habitat;
- Glencore should consider additional caribou offsetting habitats outside of its tenure area if these habitats would be protective of caribou;
- Current research suggests that caribou are likely to avoid mining activities by five km or more, further reducing the effectiveness of the proposed caribou offsetting habitats;

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<sup>122</sup> Available online:

[https://www.projects.eao.gov.bc.ca/api/public/document/62d9c9e051f1a5002338e194/download/ERM%20Memo\\_Sukunka%20Caribou.pdf](https://www.projects.eao.gov.bc.ca/api/public/document/62d9c9e051f1a5002338e194/download/ERM%20Memo_Sukunka%20Caribou.pdf)

<sup>123</sup> LPU is a local population unit (or commonly, a herd)

- Glencore has not provided mitigation measures for when individual caribou are observed on the proposed mine site;
- Low elevation winter range and matrix habitat has not been adequately considered or mitigated. The creation of approximately 500 ha of early seral habitat adjacent to high elevation range will make these areas more attractive to moose and elk, leading to higher predation of caribou by wolves.
- The \$4,000/ha financial offsets proposed by Glencore are inadequate to restoring or creating caribou habitat<sup>124</sup>;
- It is important for B.C. to optimize and balance the development of other existing coal mines in the area with the protection of Aboriginal and Treaty rights and interests, and only open new mines as others are closed, remediated, and restored to protect caribou critical habitat, while also having to consider mines that are located in low elevation and matrix habitat; and
- The need for the Province of B.C. to focus on a strategy for sustainable development that considers caribou recovery.

On May 18, 2022, the FNITR and McLeod Lake Indian Band submitted a memo<sup>125</sup> to the EAO, which stated that both FNITR and McLeod Lake Indian Band have maintained their position that Sukunka ought not to proceed on the grounds, in part, of potential displacement of the Quintette sub-group that uses the Bullmoose area and the associated increased risk of extirpation. In light of changes to mitigations and offsets made by Glencore during the suspensions, the FNITR and McLeod Lake Indian Band maintain that the potential for displacement and extirpation cannot be mitigated or offset, particularly during a period when significant efforts are being made towards caribou recovery.

In addition to caribou considered here under the Treaty 8 right to hunt, caribou is also considered in the CEAA 2012 section (see [Section 17](#)) through impacts to cultural heritage with regards to caribou. In relation to CEAA 2012 subparagraphs 5(1)(c)(ii) and (iv), the effects of Sukunka on the physical and cultural heritage of Indigenous peoples, as well as any structure, site or thing that is of historical, archaeological, paleontological, or architectural significance need to be assessed, and caribou is considered important to the cultural heritage of Treaty 8. Therefore, the assessment of seriousness of impact to the Treaty right to hunt is also related to the assessment of impact to cultural heritage.

More detail regarding the EAO's biophysical assessments, including Glencore's proposed mitigations, is provided in Section 8 (Caribou).

### 20.3.3 WATER QUALITY

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<sup>124</sup> The FNITR described that a maternal penning program, which may help in caribou recovery, would cost far more than this proposed financial offset.

<sup>125</sup> Available online at:

<https://www.projects.eao.gov.bc.ca/api/public/document/62d9c78d51f1a5002338e108/download/ISSUES%20SUMMARY%20OC%202022%20submit.pdf>

Potential impacts to water quality in the Sukunka River were raised as a serious concern by the FNITR, McLeod Lake Indian Band, and HRFN.

The FNITR and HRFN have emphasized the critical impact that Sukunka will have on water quality in the area. The FNITR stressed the importance of protecting the Sukunka River area with respect to other projects in the area (e.g. the Brule Mine Project), as the Sukunka River is viewed by FNITR members as one of the few remaining safe areas to hunt and fish in their traditional territories due to the impact of industrial developments on other water bodies in the region; all lakes feeding the drainage area are now considered unsafe by members.

The FNITR stated that they are not confident in Glencore's water management plan and raised significant concerns with respect to long-term contamination of drinking and fishing waters. The FNITR expressed that Treaty 8 territory has been impacted by high levels of methylmercury from industrial development. For example, the levels of methylmercury in the Peace River have increased with the creation of the Williston Reservoir such that it is unsafe to eat fish that are caught in some areas, particularly for children and women of childbearing years. Being limited to safely eating only one fish per month is not reasonable or aligned with the seasonal round.

The FNITR raised particular concerns over Glencore's proposed management of selenium and nitrates. The FNITR advised Glencore and EAO that the level of selenium entering the Sukunka River should not exceed a maximum of 10 µg/L to meet the B.C. Drinking Water Guidelines<sup>126</sup> at the end of the water treatment pipe. The active water treatment description provided by Glencore during Application Review would measure the level of selenium after entering an initial dilution zone. The level of 10 µg/L was further discussed between the FNITR and Glencore, and the FNITR stated that they felt that 2 µg/L was a safer number based the BC Water Quality Guidelines for selenium for long-term aquatic life. The FNITR would like to see:

- Glencore establish the timeline required to meet the level of selenium determined to be safe<sup>127</sup>; and
- Additional monitoring stations in the Sukunka River as well as Skeeter and Chamberlain Creeks to monitor selenium levels.

HRFN also stated that the Project, should it be issued an EAC, should be required to meet B.C. WQGs to protect aquatic life and fishing rights protected under Treaty 8, both regarding long-term averages and short-term maximum concentrations and exceedances, including the Ambient Water Quality Guidelines for Selenium from B.C. Ministry of Environment (2014) and ECCC's proposed approach for a coal mine effluent regulation (which has not yet come into force). The FNITR also stated that, given the potential for Sukunka to impact Indigenous fisheries, standards for water quality and aquatic life should be developed in

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<sup>126</sup> See more detail at: <https://www2.gov.bc.ca/gov/content/environment/air-land-water/water/water-quality/water-quality-guidelines>

<sup>127</sup> The FNITR and ECCC noted that ECCC is developing coal mining effluent regulations under the *Fisheries Act* which propose effluent limits, including for selenium for coal mines. ECCC issued a discussion paper for these regulations in 2022 which proposes an effluent limit for selenium of 10 µg/L for mines like Sukunka. These regulations are not yet finalized and remain under development.

collaboration with Treaty 8 Nations.

On April 28, 2017, the FNITR (at the time representing West Moberly First Nations, Saúlteau First Nations, and McLeod Lake Indian Band) submitted six issues related to water quality in Glencore's application:

- Selenium exceedances are predicted if seepage capture efficiency is less than 85 percent, and there is uncertainty that this seepage capture rate is attainable;
- Selenium and nitrate exceedances will occur if active water treatment does not work as efficiently as predicted;
- The use of Selenium Site Performance Objectives and the assumptions in their development, particularly for lentic environments, are not protective of the aquatic receiving environment or meeting drinking water standards;
- Science-based Environmental Benchmarks should be developed instead, as well as the use of more sensitive fish species in the model considered;
- The use of saturated backfills as a mitigation technique has not been used in B.C. previously and there is uncertainty if it would be an effective technique for attenuating selenium and nitrate; and
- Effects to aquatic biota and water-dependent organisms such as birds and amphibians from changes in water quality were not assessed thoroughly in the Application.

The FNITR submitted a memo<sup>128</sup> to the EAO on June 12, 2018, detailing a number of concerns regarding the water quality model presented by Glencore, including: uncertainty with the dissolved total metal concentrations, treatment residuals, and contaminant concentrations and the need for additional plant discharge parameters; aquatic toxicity testing on plant discharge; source terms; monthly flow tables for all modeling nodes; and additional monitoring locations in the wetlands along the Sukunka River focused on water quality parameters that are important to culturally-important plants and fish nursery areas. Wetlands are important habitat for many culturally important medicinal plants and fish nurseries which thrive in a narrow niche of water quality parameters. This was also linked to the Human Health and Ecological Risk Assessment.

On May 18, 2022, the FNITR and McLeod Lake Indian Band provided a memo to the EAO that highlighted that water quality remained a key concern<sup>129</sup>. At issue is the FNITR and McLeod Lake Indian Band's view that end of pipe discharge should meet appropriate water quality guidelines rather than rely on dilution in the Sukunka River. Treaty 8 members drink water where hunting and gathering are carried out, in addition to ceremonial practices conducted with specific standards for water quality. The FNITR communicated to the EAO that Treaty 8 members must ask themselves: "would I feel honoured feeding tea to an Elder using this water?". Glencore has maintained that end of pipe objectives may not be technically and/or economically feasible, and that with treatment in place, selenium values in the Sukunka River were

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<sup>128</sup> Available online:

[https://www.projects.eao.gov.bc.ca/api/public/document/5b7326eed496410024db2240/download/ERM%20Memo\\_Water%20and%20HHERA.pdf](https://www.projects.eao.gov.bc.ca/api/public/document/5b7326eed496410024db2240/download/ERM%20Memo_Water%20and%20HHERA.pdf)

<sup>129</sup> Available online at:

<https://www.projects.eao.gov.bc.ca/api/public/document/62d9c78d51f1a5002338e108/download/ISSUES%20SUMMARY%20OC%202022%20submit.pdf>

predicted to remain below the B.C. WQGs. The original information exchange regarding water quality is summarized in items 41 – 44 in Table 2 of the FNITR's May 18, 2022 memo.

The FNITR explained that fishing is not only essential to Treaty 8 Nations' food security but is a central element in the social cohesion and community wellbeing of the Treaty 8 Nations. Without confidence that the level of selenium in the water is considered safe for fishing and consuming caught fish, the Treaty 8 Nations would be limited in their ability to access and use safe fishing sites near and downstream of Sukunka. The FNITR explained that the Treaty 8 Nations are accustomed to practices such as catch-and-release where fish offer themselves in response to the Nations' members' adherence to important community-supporting actions and values. They explained that forcing the Treaty 8 Nations to modify these practices in response to water contamination, or uncertain water quality would significantly interfere with their way of life and peaceful enjoyment.

The FNITR and McLeod Lake Indian Band are also concerned that the above-noted issues in addition to effluent discharge from the Brule Mine further downstream (which currently exceeds its effluent discharge objectives), which would impact fish populations and further interfere with the Nations' right to fish.

More detail regarding the EAO's biophysical assessment, including Glencore's proposed mitigations, are provided in [Section 16](#) (Human Health) and [Section 6](#) (Water Quality and Aquatic Biota) of this Report.

The FNITR and McLeod Lake Indian Band also identified several other issues related to water quality remained outstanding and that Glencore, the FNITR, and McLeod Lake Indian Band intended to resolve through additional collaborative work. The EAO has proposed Condition 30: Indigenous Group Collaboration Plan which would require Glencore to work with Indigenous Groups to develop a plan describing how the Holder will engage each Indigenous Group throughout all project phases, including the implementation of the requirements of the EAC (if it is issued).

### 20.3.4 ACCESS TO CULTURALLY-SIGNIFICANT AND TREATY AREAS

Parts of the Sukunka River and the Sukunka Forest Service Road that run past Sukunka provide access to Hole-in-the-Wall Provincial Park, a site noted by FNITR as being of cultural importance for accessing drinking water, camping, hunting, and fishing, located approximately 15 km upstream of Sukunka. This site has nominal industrial traffic compared to the downstream areas along the Sukunka Forest Service Road, and the FNITR notes that this allows community members to have peaceful enjoyment in the exercise of Aboriginal and Treaty rights and interests.

Although this site is located outside the hydrology Regional Assessment Area (RAA) considered in the Application and surface water impacts are not expected upstream of the site (see [Section 6](#) Water Quality and Aquatic Biota of this Report), restricting or reducing access to this site and available areas to exercise Aboriginal and Treaty rights and interests is a concern. The FNITR described that currently it is considered somewhat dangerous for community members to travel on Sukunka Forest Service Road due to the large vehicles and heavy traffic. A radio is required for safety to travel on this road, which not all community members have access to or can afford. The FNITR states that if traffic increased on this road, access to

culturally-significant and Treaty areas would be further impacted.

The proposed Meikle Creek Haul Road would increase industrial and non-Indigenous use to this area. The FNITR stressed that there would be impacts to gathering along the haul routes, particularly related to dust speed, and disruption to cultural practices from haul trucks. To mitigate these impacts, controls on public access, a speed limit of 50 km/hr, and monitoring of the speed limits were requested by the FNITR. The FNITR asked that industrial or resource development access roads, such as the proposed Meikle Creek Haul Road, be closed to motorized public use to protect these areas from additional recreation and hunting pressures, which impact their ability to exercise their Aboriginal and Treaty rights and interests with peaceful enjoyment. An Indigenous Monitoring Program and an electronic monitoring were also suggested to monitor these potential impacts from increased access.

Given these concerns, the EAO has proposed Condition 24: Road Management Plan to require speed limits on Glencore vehicles on Meikle Creek haul road to 50 km/hr and 30 km/hr within 500 m of the work camp, the use of speed limiters in vehicles, monitoring for adherence to speed limits on Meikle Creek haul road. The FNITR would also like to see public access limited on Meikle Creek haul road and further consideration of this is proposed in this condition as well, although the feasibility of this would need to be determined at permitting.

More detail regarding the EAO's biophysical assessment, including Glencore's proposed mitigations, are provided in Section 6 (Water Quality and Aquatic Biota), Section 9 (Soil), and Section 14 (Social Effects) of this Report.

### 20.3.5 INDIGENOUS MONITORING PROGRAM

The FNITR has requested Glencore provide and fund an Indigenous Monitoring Program, allowing First Nations to be involved with, and eventually carry out, environmental monitoring on Sukunka. This would allow for greater trust and efficiency and allow the Indigenous Groups to build the capacity as environmental monitors.

The EAO has proposed Condition 11, requiring require Glencore to develop an Indigenous Monitoring Program in consultation with Indigenous Groups, which would specifically include:

- Monitoring related to particulate matter (related to air quality), methylmercury in fish, water quality parameters, caribou, and metals in soils, vegetation, and country foods;
- The goal to develop capacity through training for Indigenous Groups to carry out monitoring duties; and
- Involvement of all Indigenous Groups, including the FNITR.

### 20.3.6 ENVIRONMENTAL MONITORING COMMITTEE

The FNITR would like to see an environmental monitoring committee established, in consultation with the FNITR. The EAO thus proposes Condition 12, which would require Glencore to develop an environmental

monitoring committee. This committee would be responsible for:

- Determining how monitoring information is provided to the Indigenous Groups and other members of the committee;
- Developing through training to implement the monitoring program by the Indigenous Groups, with mentoring and supporting development of community members to do the monitoring (related to the Indigenous Monitoring Program discussed in [Section 20.3.5](#)).

## 20.4 POTENTIAL IMPACTS TO ABORIGINAL INTERESTS

The following section present the EAO's views on the impact of Sukunka on Indigenous Groups and their Aboriginal and Treaty 8 rights and interests, as required in this Report. However, the FNITR and the McLeod Lake Indian Band have communicated their view to the EAO that they are solely the appropriate entities to competently and accurately determine whether industrial activities infringe on their Treaty 8 rights and do not recognize characterizations made by proponents or government agencies. The nations that comprise the FNITR (Doig River First Nation, Saulteau First Nations, and West Moberly First Nations) and McLeod Lake Indian Band have indicated that they will be providing their assessments and final views on Sukunka in a formal submission to the EAO prior to provincial and federal referral to Ministers.

### 20.4.1 FISHING

#### OVERVIEW

Treaty 8 Nations identified several fish species that are traditionally important food sources to their communities that may be impacted by Sukunka: bull trout, burbot, catfish, flat head chub, goldeneye, grayling, inconnu (whitefish), lake trout, suckers, pike (jackfish), rainbow trout, squawfish, and pickerel/walleye. Species of interest to Treaty 8 Nations identified through a review of secondary information were considered in the fish VC assessment (see details in [Section 5](#) of this Report).

#### IMPACTS ON FISHING

The EAO considered how fishing by Treaty 8 Nations could be adversely affected by Sukunka including changes to the related VCs and potential impacts to Aboriginal and Treaty rights and interests. [Sections 6](#) (Water Quality and Aquatic Biota) and [5](#) (Fish and Fish Habitat) of this Report include a discussion of the potential impacts, proposed mitigation, and residual effects of Sukunka on the biophysical aspects of these VCs and summarize the key questions and concerns raised by Treaty 8 Nations and other members of the Working Group during Application Review.

Glencore predicted that construction of the Sukunka mine site would remove 2,940 ha of area available for Treaty 8 Nations access to fishing sites, including along Skeeter and Chamberlain Creeks, as well as reducing access to further areas.

However, the reduction of the available area to fish is not the only concern – the ability to have peaceful enjoyment of the Treaty right to fish can be impacted even when access to a site is available:

contamination of, or the fear of contamination of water courses and fish would cause members of Treaty 8 Nations to stop relying on this area to fish.

The following factors have informed the EAO's assessment of potential impacts of Sukunka on a Treaty 8 Nations' Aboriginal and Treaty rights and interests associated with fishing:

- The assessment of potential effects of Sukunka on Treaty 8 Nations' Aboriginal and Treaty rights and interests associated with fishing is informed by the biophysical assessment of impacts to fish and fish habitat ([Section 5](#) of this Report) and water quality and aquatic biota ([Section 6](#) of this Report) as well as discussions with and information provided by Treaty 8 Nations;
- The Sukunka River is viewed by the Treaty 8 Nations as one of the last remaining safe areas to fish and is very important to their Treaty right to fish, and use fish as part of ensuring community food security in accordance with their custom and tradition;
- Sukunka would restrict access within the PDA for fishing;
- Sukunka would increase access to areas in the region by non-Indigenous people and the FNITR's view is that this would create unreasonable disturbance to the peaceful enjoyment of the Treaty right to fish without interference by others;
- Sukunka would cause contamination of fish or fish habitat, or cause the fear of contamination of fish, which would restrict the ability of Treaty 8 Nations to exercise their Treaty right to fish in this area. The FNITR recommended the establishment of enforceable standards for water quality and selenium content in the water column, fish tissue, and mine contact water being discharged into the Sukunka or its tributaries. The FNITR proposes that these standards protect the most vulnerable members of First Nation families;
- Because development of fish habitat offsets is proposed to be determined at permitting, it is not clear if the offset habitats will be in accessible locations for Treaty 8 Nations to exercise their Treaty right to fish, or if the offsets will mitigate or enhance the ability of Treaty 8 Nation members to have peaceful enjoyment of this Treaty right;
- The cumulative impacts of existing coal mines, proposed new coal mines, and other development on the water quality in concert with Sukunka;
- Glencore predicted that the project will further degrade water quality and cause the community to lose trust in ongoing use of the Sukunka watershed as a place where it is safe to catch fish and use fish as part of ensuring community food security in accordance with their custom and traditions;
- The permitting process may also require additional mitigation if an EAC is issued; and
- Mitigation measures, including proposed conditions, as discussed below.

## MITIGATIONS AND ACCOMMODATIONS OF IMPACTS TO FISHING

Glencore has proposed mitigation to avoid and minimize potential effects to water quality and fish, and other concerns associated with fishing activities raised by Treaty 8 Nations. Key mitigation measures included:

- A proposal for active water treatment as primary mitigation for water quality;
- Maintaining an appropriate riparian buffer (based on stream class) between mine components (including temporary work spaces and stockpiles) and fish-habitat;

- Conducting instream work in fish-bearing watercourses in isolation of flows, and conducting fish salvage before isolating channels; and
- Offsetting for unavoidable serious harm to fish and fish habitat following the conceptual Fish and Fish Habitat Offsetting Plan, which was updated during Application Review, and would be required under the *Fisheries Act*.

Conditions proposed by the EAO include:

- Condition 21: Water Quality Management, which would include a requirement for active water treatment prior to discharge to the Sukunka River;
- Condition 23: Aquatic Effects Management and Monitoring Plan, which would require the development and implementation of a fish habitat and fish population monitoring program for fish and fish habitat, and capture additional mitigations for fish and fish habitat, such as reduced risk work windows, and capture Glencore's commitments regarding fish stream crossings;
- Condition 11: Indigenous Monitoring Program, which would monitor water quality and fish in the Sukunka area; and
- Condition 12: Environmental Monitoring Committee, which would provide an opportunity for Indigenous Groups to discuss monitoring reports and results, to ensure effects are being mitigated and increase transparency and confidence in the monitoring process.

The potential impact of Sukunka on Aboriginal and Treaty rights and interests associated with fishing for each First Nation is described in Sections [20.4](#) and [21](#) of this Report.

## 20.4.2 HUNTING AND TRAPPING

### OVERVIEW

Treaty 8 Nations identified several wildlife species that are traditionally important food sources to their communities that may be impacted by Sukunka. Species of interest to Treaty 8 Nations that were identified through a review of secondary information were considered in the development of the key indicators for the wildlife and wildlife habitat VC in the AIR.

### IMPACTS ON HUNTING AND TRAPPING

Sukunka would result in the removal of 2,940 ha of land currently available for the exercise of hunting rights. This land removal would involve changes to wildlife habitat availability, mortality risk, movement patterns, predator/prey dynamics, and health. Biophysical impacts to wildlife and wildlife features were identified in the Application and considered in the EAO's assessment and characterization of residual effects in [Sections 7](#) (Wildlife) and [8](#) (Caribou) of this Report.

In its Application, Glencore predicted that the implementation of the proposed mitigation measures would prevent residual adverse effects on regional populations of wildlife species important to Treaty 8 Nations for hunting, such as moose and elk.

The increased mortality risk and loss of high elevation caribou habitat for the Quintette herd is predicted to have residual adverse effects on the ability of Treaty 8 Nations to exercise traditional caribou hunting practices far into the future. Through the application review period, it was determined that this impact would increase the risk of extirpation of the Quintette herd (see Caribou – [Section 8](#)).

The Regional Strategic Environmental Assessment has documented that moose populations within the Sukunka local and regional study area are likely declining, that sports hunters harvest significantly higher numbers of moose than First Nation community members, and that First Nation community members are not currently able to harvest sufficient moose, or other ungulates, within the local or regional study area to meet community food security needs.

In addition, the loss or reduction of the use of the area that would be affected by Sukunka for hunting and trapping, whether through reduced access, reduced preference for the area, or inability to travel the distances required to harvest, would impact the First Nation's ability to hunt, trap, and maintain peaceful enjoyment of those Aboriginal and Treaty rights and interests. It would impact the First Nations' spiritual and cultural connection to the land and cultural learning practices associated with the exercise of these Aboriginal and Treaty rights and interests. Community cultural practices connected to the land and resources are central to the Nations' social fabric.

The EAO considered how hunting and trapping by Treaty 8 Nations could be adversely affected by Sukunka, including changes to the related VCs (wildlife and caribou) and potential impacts to Aboriginal and Treaty rights and interests. [Sections 7](#) (Wildlife) and [8](#) (Caribou) of this Report includes a discussion of the potential impacts, proposed mitigation, and residual effects of Sukunka and summarizes the key questions and concerns raised by Treaty 8 Nations and other members of the Working Group during Application Review.

The EAO considered the following key factors in assessing the potential impacts of Sukunka on a Treaty 8 Nation's Right to hunt and trap:

#### Indigenous Connection to Animals, as provided by the FNITR

In the *Yahey* decision, Justice Burke cited *West Moberly First Nations v. British Columbia (Chief Inspector of Mines)*, 2011 BCCA 247, noting the Mountain Dunne-Za (i.e., the West Moberly and Saulneau First Nations) value the existence of all species, including caribou, and treat them and their habitat with respect and that the people felt and feel a deep connection they describe as spiritual. Commenting on the connection of the Dane Zaa (i.e., the Blueberry First Nations members) and the animals they harvest, she noted that "it runs deeper than sustenance. One of the most important aspects of Dane Za identity is the maintenance of a relationship between hunters and the spirits of the animals they hunt. Hunters "dream" their prey, and animals willingly give themselves to hunters who uphold their responsibilities (para 434)."

- The biophysical assessment of impacts to wildlife ([Section 7](#) of this Report) and caribou ([Section 8](#) of this Report) as well as discussions with and information provided by Treaty 8 Nations;
- Glencore predicted the residual adverse effects related to hunting (including hunting locations and access, hunted species, and the hunting experience) on Aboriginal and Treaty rights and interests would be moderate in magnitude generally but high in magnitude specifically for caribou and long-term in duration;
- Glencore predicted the residual adverse effects related to trapping (including trapping locations and access, trapping species, and the trapping experience) on Aboriginal and Treaty rights and interests would be moderate in magnitude and long-term in duration;
- Site-specific information regarding hunting and trapping sites, as well as details of the cyclical patterns of the seasonal round<sup>130</sup> to the timing of hunting and trapping throughout their traditional territory, in the Sukunka area received from Treaty 8 Nations consulted (the number of sites affected for each group where information was available is described in [Section 21](#));
- The permitting process would likely require additional mitigation if an EAC is issued; and
- Mitigation measures, including proposed conditions, as discussed below.

#### MITIGATIONS AND ACCOMMODATIONS OF IMPACTS TO HUNTING AND TRAPPING

Glencore proposed mitigation to avoid and minimize potential effects to wildlife and wildlife habitat, and other concerns associated with hunting activities raised by Treaty 8 Nations. Key mitigation included:

- Removal of haul options D and E along Sukunka Forest Service Road (allowing access to Sukunka Falls and Hole-in-the-Wall Provincial Park);
- Caribou mitigation, including:
  - Site preparation (e.g., blasting), clearing, and site preparation activities not occur within at least 500 m of high elevation habitat designated for caribou during the critical (January 15-July 15) period for caribou;
  - The clean water diversion ditch in critical caribou habitat being constructed and maintained without the construction of an access road;
  - A minimum ferrying altitude of 500 m above ground-level over high elevation caribou habitat for mine-related air traffic;
  - The maximum width of the clean water diversion ditch in high elevation winter range be 5m; and
  - Water management ditches to be designed to allow wildlife to cross unharmed.

Conditions proposed by the EAO related to hunting and trapping include:

- Condition 24: Road Management Plan, which would consider a limit on public access on Meikle Creek haul road and posting of speed limit to 50 km/hr on Meikle Creek haul road for Glencore's vehicles where gathering occurs;
- Condition 11: Indigenous Monitoring Program to monitor air quality along haul roads;
- Condition 18: Wildlife Protection and Mitigation Plan, which would require pre-disturbance species

surveys for amphibians, SARA-listed birds, migratory birds, and bats within the Local Assessment Area (LAA), documenting key habitat features and identifying where mitigation measures will be implemented;

- Condition 19: Caribou Mitigation and Monitoring Plan, which would require the creation of offset habitat areas in high elevation habitat.

The potential impact of Sukunka on hunting and trapping for each First Nation is described in Sections [20.4.2](#) and [21](#) of this Report.

However, the FNITR and McLeod Lake Indian Band maintain that additional surveys, monitoring plans, management plans and offsetting cannot address the fundamental impacts to the FNITR's Aboriginal and Treaty rights and interests and stressed that they are solely the appropriate entities to competently and accurately determine whether industrial activities impact on their Aboriginal and Treaty rights and interests.

### 20.4.3 GATHERING

#### OVERVIEW

Treaty 8 Nations advised that they gather plants for food, medicinal, and other cultural purposes. Glencore assessed potential effects of Sukunka on vegetation, including plant species of interest (at-risk plant species, traditional use plant species, and invasive plant species), ecological communities of interest (at-risk ecological communities and old growth forest), and effects of Sukunka on wetland function.

#### IMPACTS ON GATHERING

The EAO considered how gathering by Treaty 8 Nations could be adversely affected by Sukunka including changes to the related VCs and potential impacts to Aboriginal and Treaty rights and interests. The LAA would overlap with approximately 2,716 ha of vegetated areas.

Glencore's vegetation effects assessment found that vegetation, including traditional use plants, will be directly lost due to clearing and grubbing of proposed mine site, roads, camp site, and transmission lines. Vegetation will also be indirectly affected by dustfall and trace element deposition (such as molybdenum) and changes in water supply through changes in hydrology. [Section 9](#) (Vegetation) of this Report includes a more in-depth discussion of the potential impacts, proposed mitigation, and residual effects of Sukunka and summarizes the key questions and concerns raised by Treaty 8 Nations and other members of the Working Group during Application Review.

The FNITR expressed that there should be a one km potential disturbance buffer around haul routes to monitor for dust and safety related to access to gathering sites. The dust and decreased safety affect the health of community members exercising their Treaty right to gather and the suitability of the vegetation gathering sites, as well as the safety of those community members traveling to access the sites.

Dustfall and trace element deposition along the haul routes may affect the health and viability of traditional use plants that occur in the LAA. In the FNITR's view, these traditional use areas must also be

considered spiritually and culturally clean in addition to free from dust, which is strongly associated with the level of disturbance that community members experiences as they approach the site. The FNITR is concerned that people will abandon gathering sites if they experience high levels of disturbance from traffic or non-Indigenous land users. Doig River First Nation also requested a map of areas that will be impacted by trace element deposition (such as molybdenum), so harvesters can be alerted to avoid those contaminated areas.

The FNITR commented that there is a high incidence of respiratory diseases and issues in the community, and this is aggravated by increased dust. This can also impede the ability of some community members to gather in the bush to conduct gathering activities.

The FNITR also expressed that the proposed 150 m disturbance buffer around wetlands is inadequate to protect wetland functions. Wetlands can be affected by the deposition of dust and perform important functions as habitat for vegetation and wildlife. A buffer of at least 300 m was described by the FNITR as an adequate size to allow wetlands to maintain these functions.

The traditionally and currently harvest plants in the area of Sukunka. The FNITR is concerned about loss of vegetation habitat, and for vegetation near Sukunka. Along transportation corridors, there was a concern about deposition of deleterious substances on the plant-based food and medicines. In addition, it was noted that the loss or reduction of the use of the Sukunka area for gathering, whether through reduced access or reduced preference for the area, would impact not only the ability to gather or the ability to have peaceful enjoyment of this Treaty right without interference by others, but also the spiritual and cultural connection to the land and cultural learning practices associated with the exercise of this Treaty right.

The FNITR would like to see very low speed limits and aggressive dust control mitigation measures when passing camps and places used for active traditional harvesting, proposing it should be lowered to 30 km/hr, and generally no higher than 50 km/hr to limit dust. Their concern also relates to the compliance of road users with the speed limits, including those under contract with the mine.

The EAO considered the following key factors in assessing the potential impacts of Sukunka on a Treaty 8 Nation's Right associated with gathering:

- The assessment of potential effects of Sukunka on Treaty 8 Nations' gathering activities depend, in part, on the abundance and condition of preferred plant species within their area of traditional use and is informed by the analysis in [Section 9](#) (Vegetation) of this Report as well as through discussions with and information provided by Indigenous Groups;
- The primary potential effects to vegetation would be loss of habitat confined to the proposed Project Development Area (PDA) and effects of deposition of deleterious substances on vegetation may extend indirectly to the boundaries of the vegetation LAA;
- Glencore predicted that the adverse residual effects (including gathering areas, species, and the gathering experience) on Aboriginal and Treaty rights and interests would be moderate in magnitude and long-term in duration;
- Vegetation clearing during construction has the potential to result in the loss of plant species and

harvesting areas used by Treaty 8 Nations;

- Site-specific information regarding gathering sites, as well as details of the cyclical patterns of the seasonal round to time gathering throughout their traditional territory, in the area of Sukunka was received from Treaty 8 Nations consulted (the number of sites affected for each group where information was available is described in [Section 21](#));
- The permitting process would likely require additional mitigation if an EAC is issued; and
- Mitigation measures, including proposed conditions, as discussed below.

### MITIGATIONS AND ACCOMMODATIONS OF IMPACTS TO GATHERING

Glencore has proposed mitigation to avoid and minimize potential effects to vegetation, and other concerns associated with gathering activities raised by Treaty 8 Nations. Key mitigation measures included:

- Removal of haul options D and E along Sukunka Forest Service Road (allowing access to Sukunka Falls and Hole-in-the-Wall);
- Seal, cover, or use a wetting agent on product coal transport trucks prior to travel, whether loaded or unloaded; and
- Mitigate road dust on the haul route.

The EAO also proposed conditions related to gathering, including:

- Condition 24: Road Management Plan, including a limit on public access on Meikle Creek haul road and reduction of speed limit of 50 km/hr on Meikle Creek haul road where gathering occurs;
- Condition 27: Air Quality and Emission Management Plan, which would require continuous monitoring of ambient air quality/meteorology and undertake adaptive mitigation measures to ensure air quality at the work camp is protective of human health;
- Condition 11: Indigenous Monitoring Program, which would require monitoring air quality along haul roads;
- Condition 17: Wetlands Plan, which would require a minimum 150 m disturbance buffer around wetlands and ecosystems of conservation concern, and where this is not possible, apply additional mitigation as determined by a Qualified Professional; and additional pre-disturbance vegetation surveys (including at the Sukunka Lousewort Bog), wetland function assessments, species at risk and ecosystems of conservation concern surveys, and dustfall monitoring.

The potential impact of Sukunka on Aboriginal and Treaty rights and interests associated with gathering for each Treaty 8 Nation on Schedule B is described in [Sections 20](#) and [21](#) of this Report.

## 21.0 CONSULTATION WITH SCHEDULE B INDIGENOUS GROUPS

This section considers the information received from each Treaty 8 Nation on Schedule B through consultation efforts during the EA process and summarizes the consultation and accommodation of affected Treaty 8 Nations in relation to Sukunka. Throughout the review process, the EAO has learned how Aboriginal and Treaty rights and interests could be adversely affected by Sukunka during construction and operational activities if it were to be certified by Ministers.

Treaty 8, negotiated in 1899, covers an 840,000 km<sup>2</sup> area of what is now northern Alberta, northeastern BC, northwestern Saskatchewan, and the southern portion of the Northwest Territories.

Treaty 8 grants signatory First Nations the Treaty rights to:

“Pursue their usual vocations of hunting, trapping and fishing throughout the tract surrendered as heretofore described, subject to such regulations as may from time to time be made by the Government of the country, acting under the authority of Her Majesty, and saving and excepting such tracts as may be required or taken up from time to time for settlement, mining, lumbering, trading or other purposes.”

The rights to hunt, fish, and trap and the ancillary activities associated with carrying out these rights are recognized and affirmed by Section 35 of the *Constitution Act, 1982*. In understanding the scope and nature of the rights and obligations under Treaty 8, the Crown is guided by the text of the Treaty, common law, as well as the understandings and intentions of the Aboriginal and Crown participants to the making of the Treaty at the time the Treaty was entered into or subsequent adhesions.

Oral promises (recorded in the Report of Commissioners for Treaty 8, Winnipeg, Manitoba, September 22, 1899) are of considerable importance in the interpretation of Treaty 8. Following is an excerpt of those promises:

“Our chief difficulty was the apprehension that the hunting and fishing privileges were to be curtailed.... we had to solemnly assure them that only such laws as to hunting and fishing as were in the interest of the Indians and were found necessary in order to protect the fish and fur-bearing animals would be made, and that they would be as free to hunt and fish after the Treaty as they would be if they never entered into it... we assured them that the treaty would not lead to any forced interference with their mode of life.”

Through Treaty 8, the Crown has the right to “take up” lands for settlement, mining, lumbering, trading, or other purposes. The Crown’s right to take up lands under Treaty 8 is subject to the duty to consult and, as appropriate, accommodate the Treaty 8 Nations’ rights before reducing the area over which their members may continue to pursue hunting, trapping, and fishing rights. In accordance with the terms of the Treaty, where a Treaty 8 Nation no longer has a meaningful right to hunt, trap or fish in relation to the territory over which it traditionally hunted, trapped or fished, this may result in a Treaty infringement.

However, as referenced in the recent *Yahey* decision<sup>131</sup>:

*the right to take up lands is not absolute or unrestricted... it cannot be used to make the constitutional protection of Indigenous hunting, trapping and fishing rights meaningless. The Crown's power to take up lands must be exercised in a way that still honours the essential guarantee and promise to the Indigenous people<sup>132</sup>...The Government must engage in a meaningful process of consultation and accommodation when a proposed taking up may adversely affect the exercise of a First Nation's treaty right.<sup>133</sup>*

An infringement may be found where there are impacts that prevent the First Nations from meaningfully exercising their rights to hunt, trap, fish, and maintain cultural practices and ways of life.<sup>134</sup>

Potential impacts of Sukunka on Aboriginal and Treaty rights and interests are characterized in general terms in [Section 20.4](#) of this Report.

The following sections include issues identified during the EA, additional background information specific to each of the Treaty 8 Nations, considerations, and conclusions on the seriousness of impacts to the Aboriginal and Treaty rights and interests of each of the Treaty 8 Nations. Although Aboriginal and Treaty rights and interests are generally discussed in separate sections, the EAO acknowledges their interconnectedness and recognizes that factors affecting one type of Aboriginal and Treaty right and interests may also affect another. The FNITR stated that the EAO's methodology for assessment potential impacts to Aboriginal and Treaty rights and interests was determined by the EAO, not designed in collaboration in the Indigenous Groups, and that they would be providing a separate submission with their conclusions.

## 21.1 MCLEOD LAKE INDIAN BAND

### 21.1.1 COMMUNITY PROFILE

McLeod Lake Indian Band is a signatory to Treaty 8 and a member of the Treaty 8 Tribal Association. Culturally, McLeod Lake Indian Band is part of the larger Tse'Khene (Sekani) and shares kinship with the Fort Ware (Kwadacha First Nation) and Ingenika (Tsay Key Dene First Nation). It also has cultural ties with western Dane-zaa or Dunne-zaa (Beaver) groups, such as West Moberly First Nations and Halfway River First Nation.

McLeod Lake Indian Band's area includes 25 reserves totaling 20,125 ha<sup>135</sup>. The primary reserves are located approximately 150 km north of Prince George and 95 km west of Sukunka. As of February 2018,

<sup>131</sup> *Yahey v. British Columbia*, 2021 BCSC 1287 (the "Yahey decision")

<sup>132</sup> *Yahey* decision at 275.

<sup>133</sup> *Ibid* at 483.

<sup>134</sup> *Ibid* at 535-540.

<sup>135</sup> Updated numbers provided by McLeod Lake Indian Band

McLeod Lake Indian Band had a total registered population of 561, with an on-reserve population of 127, an off-reserve population of 419, and 34 living on other reserves. The government of McLeod Lake Indian Band consists of one Chief and six Councillors.

### 21.1.2 DEPTH OF CONSULTATION

Sukunka is located entirely within McLeod Lake Indian Band's area of traditional use. The EAO's proposed approach to consultation was communicated to McLeod Lake Indian Band by letter on February 21, 2013. Given the nature and location of Sukunka and the EAO's assessment of the potential impacts to McLeod Lake Indian Band's Treaty 8 rights as discussed below, the EAO is of the view that the duty to consult McLeod Lake Indian Band lies at the deep end of the consultation spectrum to honour the Treaty 8 commitments. McLeod Lake Indian Band was included on Schedule B of the Section 11 Order.

### 21.1.3 INVOLVEMENT IN THE CONSULTATION PROCESS

The EAO initially notified McLeod Lake Indian Band of Sukunka on February 21, 2013, inviting McLeod Lake Indian Band to participate in the EA process by providing information related to the Aboriginal and Treaty rights and interests exercised in the project area, joining the Working Group, participating in the development of the AIR, screening, and reviewing the Application if it was accepted. Capacity funding for participation in pre-application was offered and accepted by McLeod Lake Indian Band.

McLeod Lake Indian Band began participation in the EA process by attending pre-application meetings with the EAO. McLeod Lake Indian Band provided comments on the draft AIR on May 17, 2013, which focused on the following main concerns:

- Mitigation, monitoring, and remediation of stream crossings and riparian areas;
- Proximity of Sukunka to critical caribou habitat;
- Lack of adequate baseline data;
- Lack of early engagement of Treaty 8 Nations in VC selection, including lack of traditional use information included;
- Narrow scope of cumulative effects assessment; and
- Impacts to water quality, wildlife, human health, and regional sustainability.

The EAO met with McLeod Lake Indian Band in Chetwynd, BC, on October 2, 2014, to provide an overview of the EA process and substitution with CEAA. The EAO, CEAA and McLeod Lake Indian Band also discussed capacity funding, upcoming teleconferences, and key dates. McLeod Lake Indian Band indicated that it had been in communication with Glencore; however, historically the relationship with previous proponents had not always been productive. McLeod Lake Indian Band had the following key concerns regarding Sukunka:

- Impacts to the Quintette caribou herd;
- The potential displacement of mountain goats from their habitat; and
- Impacts to other wildlife populations in the area such as wolves and grizzly bear.

The EAO met with McLeod Lake Indian Band again after the Application was accepted for review in Chetwynd, BC, on September 3, 2015. The EAO provided an overview of the EA process to date and discussed next steps and key dates, as well as important changes to Sukunka. The EAO described the main concerns raised by the Working Group to date. McLeod Lake Indian Band indicated that it would like to see a mitigation strategy to address the displacement of mountain goats due to Sukunka, and mitigation related to the impact to their ability to hunt as well as guide outfitters' ability to hunt.

McLeod Lake Indian Band, along with West Moberly First Nations and Saulneau First Nations, formed the FNITR in 2015 and participated in the key issues report which was submitted to the EAO in December 2016.

Capacity funding was provided to McLeod Lake Indian Band in December 2015 from both the EAO and CEAA to participate in the Application Review.

On February 10, 2016, McLeod Lake Indian Band provided its traditional knowledge/land use study to Glencore. Glencore wrote a summary of the non-confidential information in the study and provided this summary to the EAO on March 16, 2016. The summary provided some additional information that was not available at the time of the Application submission. The summary indicated that the portion of the Sukunka River within five km of Sukunka is particularly important to McLeod Lake Indian Band members for hunting, fishing, and transportation. Glencore indicated that the magnitude of residual effects on hunting, vegetation gathering, cultural/spiritual use, and the current use of lands and resources for traditional purposes would increase from moderate to moderate-to-high as Sukunka could prevent McLeod Lake Indian Band members from accessing at least five medicinal plant sites, fifteen berry gathering/hunting/fishing sites, one fishing site, and sixteen transportation routes. The summary also included that there could be reduced harvesting due to fear of contaminated harvested resources. Glencore met with McLeod Lake Indian Band members on July 17, 2018, to confirm that the findings of this traditional land use study were still relevant to Sukunka, and McLeod Lake Indian Band representatives provided some minor editorial corrections to the report and agreed that the findings were still relevant.

The EAO notified McLeod Lake Indian Band of Working Group meetings, deadlines for commenting on Glencore's responses to Working Group comments, changes to Schedules B and C of the Section 11 Order, and IR requests throughout the Application Review. McLeod Lake Indian Band, a representative of the FNITR, or its consultant attended Working Group meetings, and additional comments were provided through the FNITR during Application Review.

In a series of meetings in 2018 (listed in [Section 20.1](#)), McLeod Lake Indian Band met with the EAO and the rest of the FNITR to discuss its main outstanding concerns regarding impacts to water quality and caribou issues as well as issues related to their ability to peacefully enjoy their Aboriginal and Treaty rights and interests. These issues are summarized in [Section 20.4](#).

Capacity funding was provided in June 2018 from the EAO to re-engage in the Application Review.

Additional engagement throughout 2018, early 2019, 2021, and 2022 was conducted to discuss caribou issues as well as the development of this Report.

#### 21.1.4 KEY ISSUES RAISED

Most of key issues raised by McLeod Lake Indian Band were submitted through the FNITR team and are described in detail in [Sections 20.3](#) and [20.4](#).

#### 21.1.5 IMPACTS TO ABORIGINAL AND TREATY RIGHTS AND INTERESTS

This section was informed by information provided through the summary of the McLeod Lake Traditional Use Study provided by Glencore and additional information provided by McLeod Lake Indian Band. The EAO considered all information available, including from public sources as well as relevant technical issues raised by McLeod Lake Indian Band during the EA process (in meetings, letters, and Working Group comments), in the following assessments of the potential impacts of Sukunka on McLeod Lake Indian Band's Aboriginal and Treaty rights and interests.

McLeod Lake Indian Band members follow cyclical patterns of the seasonal round to time hunting, trapping, fishing, and gathering of vegetation throughout their traditional territory, which includes harvesting along the Parsnip, Finlay, and Peace River drainages, adjacent mountains, and the plateau east of the Rocky Mountains<sup>136</sup>. The Tse'Khene vary their use of areas throughout their territory to allow for the recovery of plant and animal populations, optimizing the available food resources while following seasonal patterns.

The Sukunka LAA was and is currently used to travel by McLeod Lake Indian Band members between McLeod Lake and Gwillim Lake to meet relations using the Sukunka River and the Burnt River as transportation routes, and hunting, fishing, and gathering along the way<sup>137</sup>. McLeod Lake Indian Band members have stressed the importance of these rivers as transportation routes throughout the year. McLeod Lake Indian Band members continue to use these areas and feel a strong connection to this area. McLeod Lake Indian Band also stressed the cultural importance of the continued consumption by their members of wild foods (particularly moose, elk, and fish).

McLeod Lake Indian Band's potential reduction in the of the area available to use near the Sukunka River and Burnt River area in the Sukunka LAA would impact not only the ability to exercise their Aboriginal Treaty rights and interests to fish, hunt, trap, and gather, but also the spiritual and cultural connection to the land and cultural learning practices associated with the exercise of these Aboriginal and Treaty rights and interests. Reducing access to a preferred area of their traditional territory would potentially:

- Disturb and reduce access to land used for cultural activities and teaching;
- Reduce the connection McLeod Lake Indian Band members feel towards culturally and spiritually important sites due to changes in visual aesthetics, character, and feel of the landscape; and
- Reduce harvested species populations and contaminate or perceive to contaminate harvested

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<sup>136</sup> Ridington, R. 2013. Final Report – McLeod Lake Indian Band Traditional Land Use Study – Assessing Potential Heritage and Land Use Impacts for BC Hydro's "Site C Clean Energy Project" on the Peace River.

<sup>137</sup> Ridington 2013

resources, which would in turn reduce use of land for cultural activities and teaching.

#### 21.1.5.1 FISHING

McLeod Lake Indian Band members have historically used, and continue to use, the Sukunka area to fish (particularly for rainbow trout, Dolly Varden trout, char, and grayling). The area within five km of the Sukunka River near the proposed mine site was identified as particularly important for hunting and fishing, with numerous camping and fishing sites located along this section. Gwillim Lake (in the LAA) was identified as an important fishing, group gathering, and cultural teaching area. The Sukunka area is viewed by many McLeod Lake Indian Band members as a preferred area for fishing because development in other areas caused contamination and lack of access to other important fishing areas in their traditional territory.<sup>138</sup>

In the Application, Glencore indicated that Sukunka would prevent or strongly deter McLeod Lake Indian Band members from accessing and using fifteen hunting/berry gathering/fishing sites and one fishing site.

The loss or reduction of the use of Sukunka area for fishing, whether through reduced access, reduced preference for the area, or actual or perceived contamination of fish, would adversely impact not only the ability to fish or the ability to have peaceful enjoyment of that Treaty right, but also the spiritual and cultural connection to the land and cultural learning practices associated with the exercise of this Treaty right.

The biophysical assessments of impacts to fish and water resources are described in [Sections 6](#) (Water Quality and Aquatic Biota) and [5](#) (Fish and Fish Habitat) of this Report. Impacts to the Treaty right to fish, proposed mitigations, and accommodations are described in [Section 20.4.1](#).

In consideration of the information available to the EAO, consultation with McLeod Lake Indian Band, McLeod Lake Indian Band engagement with Glencore, proponent commitments and the EAO's proposed conditions of any EAC issued, Sukunka would be expected to result in a moderate impact on McLeod Lake Indian Band Treaty right to fish.

#### 21.1.5.2 HUNTING AND TRAPPING

McLeod Lake Indian Band members have historically used, and continue to use, the Sukunka area to hunt, identifying the area within five km of the Sukunka River near the proposed mine site as particularly important for hunting, with numerous camping and hunting sites located along this section. Roads throughout the Sukunka area are used to access large-game hunting sites. Grizzly bear, moose, and deer are the most common species hunted currently in the tenure area, but historically elk, caribou, wolves, and black bear were also hunted. Birds (such as spruce grouse, goose, duck, and ptarmigan) and small fur-

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<sup>138</sup> Stantec Consulting Ltd. 2016. Review of the McLeod Lake Indian Band Knowledge and Use Study Report. Prepared for the BC Environmental Assessment Office. March 16, 2016.

bearing mammals (rabbit, marmot, squirrel, coyote, and beaver) are also hunted and trapped.<sup>139,140</sup>

McLeod Lake Indian Band members view the Sukunka area as high value wildlife habitat for caribou, mountain sheep, mountain goats, groundhogs, moose, wolves, and elk. Gwillim Lake (in the LAA) was identified as an area used for hunting moose, camping, group gathering, and cultural teaching.

In the Application, Glencore indicated that Sukunka would prevent or strongly deter McLeod Lake Indian Band members from accessing and using 15 hunting/berry gathering/fishing sites and 16 transportation routes used for hunting or plant gathering.

McLeod Lake Indian Band identified additional impacts to hunting, including:

- Wildlife habitat destruction and fragmentation, leading to lower populations;
- Movement of wildlife away from preferred areas for harvesting reducing ability to hunt;
- Disturbance of important wildlife habitat, such as moose and caribou calving grounds and migration corridors, impacting critically declining populations;
- Contamination of water, plants, and animals from coal dust or chemicals, impacting health of wildlife and in turn health of wildlife as a food source;
- Increased non-Aboriginal hunting and use of the area, reducing available wildlife for hunting; and
- Increased traffic, reducing ability to have peaceful enjoyment of Treaty right to hunt.<sup>141</sup>

The loss or reduction of the use of the Sukunka area for hunting and trapping, whether through reduced access or reduced preference for the area, would impact not only the ability to hunt/trap or the ability to have peaceful enjoyment of those Aboriginal and Treaty rights and interests, but also the spiritual and cultural connection to the land and cultural learning practices associated with the exercise of these Aboriginal and Treaty rights and interests.

The biophysical assessments of impacts to wildlife are described in [Section 7](#) of this Report. Impacts to the Aboriginal and Treaty rights and interests to hunt and trap, proposed mitigations, conditions, and accommodations are described in Section 10.4.2.

In consideration of the information available to the EAO, consultation with McLeod Lake Indian Band, McLeod Lake Indian Band engagement with Glencore, proponent commitments and the EAO's proposed conditions of any EAC issued, Sukunka would be expected to result in a serious impact on McLeod Lake Indian Band Treaty right to hunt and trap.

### 21.1.5.3 GATHERING

McLeod Lake Indian Band members traditionally harvest several species of plants and fungi in their traditional territory, including Labrador tea, muskeg tea (lechi), muskeg peat, highbush cranberry,

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<sup>139</sup> Ridington 2013

<sup>140</sup> FMA Heritage Inc. 2010. Aboriginal Traditional Knowledge Community Report - McLeod Lake Indian Band (Tse'khene Nation) prepared for Enbridge Northern Gateway Project.

<sup>141</sup> Stantec Consulting Ltd. 2016

Saskatoon berries, highbush blueberries, lowbush blueberries, huckleberries, thimbleberries, raspberries, devil's club, soapberries, pine (both bark and sap), balsam, red willow, juniper, violets, fiddleheads, fireweed, and fungus from diamond willow trees<sup>142,143,144</sup>. The Sukunka area was identified as containing multiple plant gathering sites for berries specifically<sup>145</sup>. Gathering is often conducted as part of fishing, hunting, or trapping rounds, particularly along the Sukunka Forest Service Road in the RAA.

Glencore identified that Sukunka would prevent or strongly deter McLeod Lake Indian Band members from accessing and using:

- Five medicinal plant gathering sites;
- Fifteen hunting, berry gathering, and fishing sites; and
- Sixteen transportation routes used for hunting or plant gathering.

McLeod Lake Indian Band also identified the following potential effects on gathering:

- Airborne dust from the mine or along transport routes from trucks landing on gathering sites near the mine and access roads, contaminating plants used for human consumption;
- Increased traffic along access roads, limiting ability to peacefully enjoy Treaty right to gathering; and
- Increased non-Aboriginal use of the area and use of gathering sites.<sup>146</sup>

The loss or reduction of the use of the Sukunka area for gathering, whether through reduced access or reduced preference for the area, would impact not only the ability to gather or the ability to have peaceful enjoyment of that Treaty right, but also the spiritual and cultural connection to the land and cultural learning practices associated with the exercise of this Treaty right.

The biophysical assessments of impacts to vegetation are described in [Section 9](#) of this Report. Impacts to the Treaty right to gather, proposed mitigations, conditions, and accommodations are described in Section 10.4.3.

In consideration of the information available to the EAO, consultation with McLeod Lake Indian Band, McLeod Lake Indian Band engagement with Glencore, proponent commitments and the EAO's proposed conditions of any EAC issued, Sukunka would be expected to result in a moderate impact on McLeod Lake Indian Band Treaty right to gather.

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<sup>142</sup> Ridington 2013

<sup>143</sup> FMA Heritage Inc. 2010

<sup>144</sup> Coastal Gas Link. 2014. Coastal GasLink Pipeline Project: Application for an Environmental Assessment Certificate. Section 23: Aboriginal Consultation. Revision 1: March 2014.

<sup>145</sup> Stantec Consulting Ltd. 2016

<sup>146</sup> Stantec Consulting Ltd. 2016

## 21.2 SAULTEAU FIRST NATIONS

### 21.2.1 COMMUNITY PROFILE

Saulteau First Nations is an adherent to Treaty 8. The main Saulteau First Nations community is located at Moberly Lake, near Fort St. John, Hudson's Hope, Chetwynd and Dawson Creek, B.C. Saulteau First Nations are a Dane-zaa (Beaver), Anishnaubemowin (Saulteau), and Nēhiyawēwin (Cree) speaking community. Saulteau First Nations' reserve is located at the east side of Moberly Lake, approximately 100 km southwest of Fort St. John and 70 km north of Sukunka. The reserve is 3,025.8 ha in size.

As of February 2018, Saulteau First Nations had a total registered population of 1,121, with an on-reserve population of 371, an off-reserve population of 714, 11 living on Crown land, and 25 living on other reserves. Leadership includes one Chief and four Councillors.

The following was provided by Saulteau First Nations:

“Saulteau First Nations is the largest First Nation in Northeast British Columbia. Saulteau First Nations has a large number of traditional land users, and our members exercise their Treaty rights and continue to practice our traditional way of life throughout our territory. We continue to have a very strong connection with the land, and we rely on our lands for sustenance, cultural, spiritual, and socio-economic purposes.

At the same time, our territory is increasingly subject to large scale industrial activities, including extensive clearcut logging; open-pit coal mining; oil and gas exploration, drilling, fracking, and pipelines; power transmission lines and rights of way; hydroelectric dams and reservoirs; windfarms; and agriculture and grazing. We are concerned that we are being excluded and pushed off the land, and the traditional and environmental values that we rely upon are being destroyed, in a way that goes against the solemn promises the Crown made to us in our Treaty.

For example, to the North, our stretch of the Peace River has already been flooded by the WAC Bennett and Peace Canyon Dams, and pretty much all of what remains will be flooded by the proposed Site C Dam. We are encircled to the north, east and south by upstream oil and natural gas drilling and processing facilities (including many abandoned and orphaned contaminated sites), and all of the major gas transmission pipelines intended to serve Liquefied Natural Gas (LNG) projects cross through the heart of our territory. To the west and south we have to contend with multiple open-pit coal mines in endangered species critical habitat (e.g., mountain caribou), and with provincial agencies that do not enforce existing regulations limiting the release of selenium contaminated wastewater into rivers and streams. And, all around us, mountain pine beetle salvage logging (a short-sighted response to problems caused by climate change) is badly fragmenting our forests.

Our elders and traditional land users know that the separate and cumulative impacts of these kinds of industrial activities have already had very serious and significant impacts on the environment in our territory. This has also been confirmed by Western science. A recent study by the David Suzuki Foundation concluded that about 70 percent of the landscape in our region has been negatively impacted by industrial activities. One of the consequences of this is that our members' Treaty rights, and our ability to continue our way of life and maintain our culture and our languages, to sustain ourselves by hunting, trapping, fishing, and harvesting plants and medicines, and to camp and access areas of cultural significance and pass on traditional knowledge to younger generations – our rights, our traditional practices, and our cultural heritage, are being eroded every day.”

### 21.2.2 DEPTH OF CONSULTATION

Sukunka would be located entirely within Sauteau First Nations' area of traditional use. Sauteau First Nations are members of the Treaty 8 Tribal Association, which is an administrative body that provides support and advice to six BC Treaty 8 Nations residing in and around the Peace River Valley area of northeastern BC. The EAO consults directly with member nations of the Treaty 8 Tribal Association regarding the potential effects of Sukunka on their Aboriginal and Treaty rights and interests.

The EAO's proposed approach to consultation was communicated to Sauteau First Nations by letter dated February 21, 2013. Given the nature and location of Sukunka and the EAO's assessment of the potential impacts to Sauteau First Nations' Treaty 8 rights as discussed below, the EAO is of the view that the duty to consult Sauteau First Nations lie at the deep end of the consultation spectrum to honour the Treaty 8 commitments. Sauteau First Nations were included on Schedule B of the Section 11 Order.

### 21.2.3 INVOLVEMENT IN THE CONSULTATION PROCESS

The EAO initially notified Sauteau First Nations of Sukunka on February 21, 2013, inviting Sauteau First Nations to participate in the EA process by providing information related to the Aboriginal and Treaty rights and interests exercised in the project area, joining the Working Group, participating in the development of the AIR, screening and reviewing the Application if accepted. Capacity funding for participation in pre-application was offered and accepted by Sauteau First Nations.

Sauteau First Nations began participation in the EA process by attending pre-application meetings with the EAO. Sauteau First Nations provided initial comments on the draft AIR on April 11, 2013, which focused on the following concerns:

- Cumulative impacts in the region, related to the ability of Sauteau First Nations to exercise their Aboriginal and Treaty rights and interests;
- The addition of a new transportation corridor when a highway and rail corridor already exist;
- Lack of ecosystem mapping and regional water monitoring program;
- Impacts to sensitive species, including the Quintette caribou herd, lichen on which they feed, and rare plant sites;
- Sensitive habitats and areas on Burnt and Sukunka Rivers;

- Leaching of contaminants in Skeeter and Chamberlain Creeks;
- Lack of active water treatment details;
- Lack of reclamation details;
- Lack of baseline data and involvement of Saulteau First Nations in development of baseline monitoring programs;
- Lack of an Archaeological Impact Assessment; and
- Impacts to wildlife, soil, fish, vegetation, and human health.

Saulteau First Nations provided a non-confidential copy of an overview of the Saulteau First Nations Knowledge and Use Study for Glencore Sukunka Coal Mine Project<sup>147</sup> on September 24, 2014, to the EAO and Glencore, providing detail that the Sukunka area is used extensively by Saulteau First Nations members for hunting, fishing, gathering, camping and other uses. The study found that Sukunka would impede the exercise of these Aboriginal and Treaty rights and interests. Saulteau First Nations indicated that they are particularly concerned about contamination of vegetation, increases in traffic, and impacts to future generations who will not be able to access the land to practice traditional use.

The EAO met with Saulteau First Nations by teleconference on October 21, 2014, to provide an overview of the EA process and Sukunka. The EAO and the Agency discussed capacity funding, upcoming teleconferences, and key dates.

Saulteau First Nations provided initial comments on the Application screening on February 4, 2015, which focused on the following concerns:

- The cumulative impacts on the land base, which for this particular area exist related to pipelines, mountain pine beetle, forestry, mining, and oil and gas activities and infrastructure.
- Additional disturbance throughout the mountain range for access is considered excessive;
- Ecosystem mapping, a regional monitoring program for the watershed, and an understanding of increasing road access should be conducted through a regional cumulative effects assessment;
- The south tenure area overlaps Ungulate Winter Range and rare plant sites which should be protected during construction and operation;
- Significant sites such as Hole in the Wall and Sukunka Falls should be included in the assessment;
- Impacts to human health, wildlife populations, harvested plants, water quality, access to hunting and fishing sites, visual quality, and the acoustic environment need to be assessed thoroughly; and
- The Treaty 8 territory boundary should be added to the maps.

Capacity funding was provided in December 2015 from both the EAO and the Agency.

Saulteau First Nations, along with McLeod Lake Indian Band and West Moberly First Nations, formed the FNTR in 2015 and collaboratively developed the key issues report prepared by ERM, which was submitted to the EAO in December 2016 and updated in June 2017. The EAO requested any additional comments

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<sup>147</sup> Olsen, Rachel; Yung, K.; and The Firelight Group Research Cooperative. Saulteau First Nations Knowledge and Use Study for Glencore Sukunka Coal Mine Project. Sept 24, 2014.

raised through the third-party review be submitted.

The EAO notified Saulteau First Nations of Working Group meetings, response deadlines for commenting on Glencore's responses to Working Group comments, changes to Schedules B and C of the Section 11 Order, and IR requests throughout the Application Review. Saulteau First Nations, a representative of the FNITR, and/or its consultant attended Working Group meetings, and additional comments were provided through the FNITR during Application Review.

In a series of meetings in early 2018 (listed in Section 11.1), Saulteau First Nations met with the EAO to discuss their outstanding concerns regarding impacts to water quality and caribou issues as well as issues related to their ability to peacefully enjoy their Aboriginal and Treaty rights and interests. These issues are summarized in Section 10.3.

Capacity funding was provided in June 2018 from both the EAO and the Agency to re-engage in the Application Review.

Additional engagement throughout 2018, early 2019, 2021 and 2022 was conducted to discuss caribou issues as well as the development of this Report.

#### 21.2.4 KEY ISSUES RAISED

Most of key issues raised by Saulteau First Nations were submitted through the FNITR team and are described in detail in Sections 10.3 and 10.4.

West Moberly First Nations and Saulteau First Nations submitted a joint letter on August 21, 2018 to the EAO indicating that the potential impacts to caribou alone prevent them from supporting Sukunka as currently designed.

Additional key issues raised include, but are not limited to:

- Reduced access to clean and safe drinking water: drinking water is obtained from the mountains (headwaters) near Sukunka into downstream watersheds, including during camping. Hole in the Wall is accessed for drinking water, and this water is viewed as spiritually healthy. Saulteau First Nations would like to be involved in water quality monitoring to provide assurance of the monitoring results;
- Change in the visual character and quality of landscapes due to Sukunka: Saulteau First Nations are concerned that a change in the visual landscape will deter their members from using the area and passing along cultural knowledge about the area;
- Contamination of fish, plants, and wildlife: Release of coal dust and chemicals in the surrounding environment may reduce the health of fish, plants, wildlife, and the people who use these resources for food and medicine;
- Increased development pressure: Saulteau First Nations members have experienced an increasing amount of development pressure in their territory and believe that the impacts to their Aboriginal and Treaty rights and interests in the Sukunka area are at risk of significant further harm;

- The Sukunka River and Sukunka Forest Service Road are of high ecological value for the multiple species of fish, moose and other species important to Saulteau First Nations. Sukunka would be located near Mount Chamberlain where there is prime mountain goat, grizzly bear and critical high elevation winter caribou habitat. They are easily accessed by members and are associated with unique Saulteau First Nations oral histories and cultural knowledge.<sup>148</sup>

### 21.2.5 IMPACTS TO ABORIGINAL AND TREATY RIGHTS AND INTERESTS

This section was informed by information from the Saulteau First Nations Knowledge and Use Study and additional information provided by Saulteau First Nations. The EAO considered all information available, including from public sources as well as relevant technical issues raised by Saulteau First Nations during the EA process (in meetings, letters, and Working Group comments), in the following assessments of the potential impacts of Sukunka on Saulteau First Nations' Aboriginal and Treaty rights and interests.

Traditionally, Saulteau First Nations members moved through their territory following the seasonal round, hunting moose and caribou, trapping, and fishing<sup>149</sup>. Hunting and trapping were the focus of the historical Saulteau First Nations culture and economy<sup>150</sup>. The area within 25 km of Sukunka was identified by Saulteau First Nations as highly important and intensively used as well as a preferred area for the exercise of Aboriginal and Treaty rights and interests<sup>151</sup>. The area within 5 km of the Sukunka area contained the following specific culturally important sites:

- Hunting, fishing, trapping, gathering (berries and medicinal plants), and camping including specific large and small game kill locations, fish catch sites, and gathering sites;
- An archaeological site;
- A gathering area;
- Place names of cultural importance;
- High-value wildlife habitat for elk, moose, caribou, deer, grouse, mountain goats, grizzly bears, black bears, porcupine, wolves, and rabbits, in particular along the Sukunka River and around Mt Chamberlain;
- A permanent cabin used by Saulteau First Nations in the 1960s; and
- Transportation routes including roads and trails frequently used by Saulteau First Nations members for hunting, walking, gathering, and horse packing.<sup>152</sup>

Saulteau First Nations members continue to place economic, cultural, and social importance on the seasonal round, and continue to hunt, trap, gather, and camp annually in their traditional territory. These gatherings are culturally important to engage in traditional activities, teach youth language and culture,

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<sup>148</sup> Saulteau First Nations Knowledge and Use Study, Section 5

<sup>149</sup> Nesoo Watchie Resource Management, Ltd. 2011. Saulteau First Nations Culture and Traditions Study in Reference to the Proposed BC Hydro Site C Clean Energy Project. Prepared for BC Hydro and Saulteau First Nations. Kamloops, BC.

<sup>150</sup> Nesoo Watchie 2011

<sup>151</sup> Olsen et al. 2014

<sup>152</sup> Olsen et al. 2014

and process the harvest<sup>153</sup>. The Sukunka River and Mt Chamberlain are associated with Saulteau First Nations oral histories and cultural knowledge<sup>154</sup>.

Saulteau First Nations shared with the EAO their understanding of cultural wellness, which includes an interconnected view of authority, cultural revitalization, relationships, respect, and well-being. These factors are connected to Saulteau First Nations members connection to the land and the ability to transmit cultural knowledge through experiential practices on the land.

#### 21.2.5.1 FISHING

Fishing and associated activities (such as camping, gathering, and knowledge transfer) is a historically important activity for Saulteau First Nations people and continues to be pursued today. Saulteau First Nations describes fishing as critical to members' livelihood and way of life, through physical sustenance, maintenance of social relationships, transmission of cultural knowledge, and spirituality.

The site-specific information provided by Saulteau First Nations indicates that the PDA is intensively used by members for fishing, in particular the Sukunka River between Chamberlain Creek and Skeeter Creek. The Sukunka Forest Service Road is used to access the eastern bank of the Sukunka River. The Sukunka River is also frequently used as a water transportation route, including for trips to Sukunka Falls, an area of intensive traditional use. In the RAA, the downstream watersheds including the Burnt River, North Burnt River Boulder Creek, Wilfred Creek, Pine River, and Boulder Lake are also used by Saulteau First Nations members for fishing. Bull trout, grayling, whitefish, Dolly Varden trout, and rainbow trout are the most common fish species consumed in the community from the Sukunka area. The Sukunka River is viewed by many members of Saulteau First Nations as one of the healthier rivers in the RAA and is the preferred location for fishing.<sup>155</sup>

In the Application, Glencore indicated that Sukunka would prevent or strongly deter Saulteau First Nations members from accessing and using up to 26 sites identified by Saulteau First Nations members as having site-specific values, including fishing values.

The loss or reduction of the use of the Sukunka area for fishing, whether through reduced access, reduced preference for the area, or actual or perceived contamination of fish, would adversely impact not only the ability to fish or the ability to have peaceful enjoyment of that Treaty right, but also the spiritual and cultural connection to the land and cultural learning practices associated with the exercise of this Treaty right.

The biophysical assessments of impacts to fish and water resources are described in [Sections 6](#) (Water Quality and Aquatic Biota) and [s.5](#) (Fish and Fish Habitat) of this Report. Impacts to the Treaty right to fish, proposed mitigations, and accommodations are described in Section 10.4.1.

In consideration of the information available to the EAO, consultation with Saulteau First Nations, Saulteau

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<sup>153</sup> Nesoo Watchie 2011

<sup>154</sup> Olsen et al. 2014

<sup>155</sup> Olsen et al. 2014

First Nations' engagement with Glencore, proponent commitments and the EAO's proposed conditions of any EAC issued, Sukunka would be expected to result in a moderate impact on Saulteau First Nations' Treaty right to fish.

The Saulteau First Nations Knowledge and use Study identified that the impacts would be high, and therefore Project effects would be felt severely by Saulteau First Nations members and would prolong existing loss of use or diminished use for many decades during operation and reclamation for Sukunka. The Study further reported a decline in fish populations due to increased competition for increasingly scarce resources. Saulteau First Nations communicated that contamination of fish due to coal dust and other contaminants from the project would be felt for considerable distances downstream.

#### 21.2.5.2 HUNTING AND TRAPPING

Saulteau First Nations members have identified hunting and trapping as integral to both their community life and traditional economy. Wildlife species of interest to Saulteau First Nations used for hunting and trapping include bear, caribou, moose, elk, deer, lynx, mountain goat, marmot, geese, ducks, grouse, beaver, marten, fisher, otter, and weasel. Traplines are found throughout Saulteau First Nations territory, and several Saulteau First Nations members hold and operate registered traplines<sup>156,157,158</sup>.

In the Application, Glencore indicated that Sukunka prevent or strongly deter Saulteau First Nations members from accessing and using up to 26 sites identified by Saulteau First Nations members as having site-specific values, including hunting and trapping values.

Saulteau First Nations identified additional impacts related to hunting, including:

- Disturbance to wildlife during construction and operation, including an increase of habitat fragmentation and linear disturbances, decreasing habitat quality and increasing predation;
- An increase in non-Aboriginal hunting and recreation access;
- The potential damaging effect of coal dust on the olfactory sense in moose that may result in a decrease in their ability to sense danger and thus an increase in predation rates;
- Adverse impacts to the health of wildlife from inhalation of coal dust and impacts to human health in consumption of wildlife; and
- Limitations or barriers to current use.

The loss or reduction of the use of the Sukunka area for hunting and trapping, whether through reduced access or reduced preference for the area, would impact not only the ability to hunt/trap or the ability to have peaceful enjoyment of those Aboriginal and Treaty rights and interests, but also the spiritual and cultural connection to the land and cultural learning practices associated with the exercise of these Aboriginal and Treaty rights and interests.

The biophysical assessments of impacts to wildlife are described in [Section 7](#) of this Report. Impacts to the

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<sup>156</sup> BC Hydro 2013

<sup>157</sup> Coastal Gas Link 2014

<sup>158</sup> Traditions Consulting Services Inc. 2013

right to hunt, proposed mitigations, conditions, and accommodations are described in Section 10.4.2.

In consideration of the information available to the EAO, consultation with Saulteau First Nations, Saulteau First Nations' engagement with Glencore, proponent commitments and the EAO's proposed conditions of any EAC issued, Sukunka be expected to result in a serious impact on Saulteau First Nations' Treaty right to hunt and trap.

The Saulteau First Nations Knowledge and use Study identifies that the impacts would be high, the Project effects would be felt severely by Saulteau First Nations members and would prolong existing loss of use or diminished use for many decades during operation and reclamation for Sukunka.

### 21.2.5.3 GATHERING

Several types of plant and tree resources are harvested by Saulteau First Nations, including berries (strawberries, Saskatoon berries, and blueberries), Labrador tea, rat root, bulrush, wild onion, hay, and lumber.<sup>159,160</sup>

In the Application, Glencore indicated that Sukunka would prevent or strongly deter Saulteau First Nations members from accessing and using up to 26 sites identified by Saulteau First Nations members as having site-specific values, including gathering values.

Saulteau First Nations identified additional impacts to gathering, including:

- Contamination of plant gathering sites from coal dust from proposed mine sites and haul routes; and
- Impacts to plant species of cultural importance and their habitat.

The loss or reduction of the use of Sukunka area for gathering, whether through reduced access or reduced preference for the area, would impact not only the ability to gather or the ability to have peaceful enjoyment of that Treaty right, but also the spiritual and cultural connection to the land and cultural learning practices associated with the exercise of this Treaty right.

The biophysical assessments of impacts to vegetation are described in [Section 9](#) of this Report. Impacts to the Treaty right to gather, proposed mitigations, conditions, and accommodations are described in Section 10.4.3.

In consideration of the information available to the EAO, consultation with Saulteau First Nations, Saulteau First Nations' engagement with Glencore, proponent commitments and the EAO's proposed conditions of any EAC issued, the EAO concludes that Sukunka would be expected to result in a moderate impact on Saulteau First Nations' Treaty right to gather.

The Saulteau First Nations Knowledge and Use Study identifies that the impacts would be high, would be

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<sup>159</sup> Traditions Consulting Services Inc. 2013

<sup>160</sup> Peak Solutions Consulting Inc. and Lions Gate Consulting Inc. 2013. Site C Clean Energy Project: Saulteau First Nations Community Baseline Profile. Prepared for BC Hydro Power Authority and Saulteau First Nations. February 5, 2013.

felt severely by Saulteau First Nations Members, and would prolong existing loss of use or diminished use for many decades during operation and reclamation for Sukunka. The KUS further noted impacts to their way of life and seasonal round due to coal dust, water impacts, wildlife corridor destruction, Noise pollution and additional road impacts.

## 21.3 WEST MOBERLY FIRST NATIONS

### 21.3.1 COMMUNITY PROFILE

West Moberly First Nations is a signatory to Treaty 8 and a member of the Treaty 8 Tribal Association. West Moberly is a Dunne-Za<sup>161</sup> (Beaver) and Nēhiyawēwin (Cree) speaking community and was originally part of the Hudson Hope Band, along with Halfway River First Nation, up until 1977.

The West Moberly community is located on the west side of Moberly Lake and the reserve occupies 2,033.6 ha, located approximately 90 km southwest of Fort St. John and 70 km north of Sukunka. As of February 2018, West Moberly First Nations had a total registered population of 312 people, with an on-reserve population of 119, an off-reserve population of 184, 1 living on Crown land, and 8 living on other reserves. West Moberly First Nations are governed by a Chief and four Councillors.

### 21.3.2 DEPTH OF CONSULTATION

Sukunka is located entirely within West Moberly First Nations' area of traditional use. West Moberly First Nations are members of the Treaty 8 Tribal Association, which is an administrative body that provides support and advice to six BC Treaty 8 Nations residing in and around the Peace River Valley area of northeastern BC. The EAO consults directly with member nations of the Treaty 8 Tribal Association regarding the potential effects of Sukunka on their Aboriginal and Treaty rights and interests.

The EAO's proposed approach to consultation was communicated to West Moberly First Nations by letter dated February 21, 2013. Given the nature and location of Sukunka and the EAO's assessment of the potential impacts to West Moberly First Nations' Treaty 8 rights as discussed below, the EAO is of the view that the duty to consult West Moberly First Nations lie at the deep end of the consultation spectrum to honour the Treaty 8 commitments. West Moberly First Nations were included on Schedule B of the Section 11 Order.

### 21.3.3 INVOLVEMENT IN THE CONSULTATION PROCESS

The EAO initially notified West Moberly First Nations of Sukunka on February 21, 2013, inviting West Moberly First Nations to participate in the EA process by providing information related to the Aboriginal and Treaty rights and interests exercised in the project area, joining the Working Group, participating in the development of the AIR, screening and reviewing the Application if accepted. Capacity funding for

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<sup>161</sup> Spelling based on pronunciation and provided by West Moberly First Nations (in other texts is shown as Dane-zaa).

participation in pre-application was offered and accepted by West Moberly First Nations.

West Moberly First Nations began participation in the EA process by attending pre-application meetings with the EAO. West Moberly First Nations did not provide comments on the AIR or Application screening to the EAO.

The EAO met with West Moberly First Nations at the West Moberly First Nations Land Office on September 30, 2014 to provide an overview of the EA process, substitution, and project details. The EAO also discussed capacity funding, upcoming teleconferences, and key dates. West Moberly First Nations indicated that they would prefer government-to-government meetings over working group meetings and expressed concern over review timelines. The EAO and CEAA assured that West Moberly First Nations' comments will be recorded and addressed in any form provided (through any type of meeting or correspondence) and will provide a draft work plan and schedule to be collaboratively discussed with First Nations prior to finalization.

West Moberly First Nations, along with McLeod Lake Indian Band and Sauteau First Nations, formed the FNITR in 2015 and participated in the key issues report which was submitted to the EAO in December 2016. The EAO requested any additional comments raised through the third-party review be submitted.

Capacity funding was provided again in December 2015 from both the Province and the federal government.

The EAO notified West Moberly First Nations of Working Group meetings, response deadlines for commenting on Glencore's responses to Working Group comments, changes to Schedules B and C of the Section 11 Order, and IR requests throughout the Application Review. West Moberly First Nations, a representative of the FNITR, or its consultant attended Working Group meetings, and additional comments were provided through the FNITR during Application Review.

In a series of meetings in early 2018 (listed in Section 11.1), West Moberly First Nations met with the EAO to discuss their main outstanding concerns regarding impacts to water quality and caribou issues as well as issues related to their ability to peacefully enjoy their Aboriginal and Treaty rights and interests. These issues are summarized in Section 10.3.

Capacity funding was provided again in June 2018 from the EAO to re-engage in the Application Review.

Additional engagement throughout 2018 and early 2019 was conducted to discuss caribou issues as well as the development of this Report.

#### **21.3.4 KEY ISSUES RAISED**

The key issues raised by West Moberly First Nations were done through the FNITR and are described in detail in Sections 10.3 and 10.4.

West Moberly First Nations is deeply concerned about the impact that water contaminated by mercury,

selenium, and nitrates will have on their community's short and long-term health and ability and willingness to harvest and eat fish from the Sukunka River as a part of their community food security strategy. West Moberly First Nations also stated that noise levels greater than 15dBA are not natural within forest landscapes and would disturb their ability to peacefully enjoy their Aboriginal and Treaty rights and interests to hunt, trap, gather and fish along the coal haul roads proposed.

West Moberly First Nations and Sauteau First Nations submitted a joint letter on August 21, 2018 to the EAO indicating that the potential impacts to caribou would prevent them from supporting Sukunka as currently designed, as the probable impact of development and operations of Sukunka will be the displacement and extirpation of the Mountain Caribou sub-herd ranging adjacent to the proposed mine site.

### 21.3.5 IMPACTS TO ABORIGINAL AND TREATY RIGHTS AND INTERESTS

West Moberly First Nation has indicated to the EAO that they are not in agreement with the EAO's approach or assessment, and therefore does not agree with the EAO's impact assessment conclusions. WMFN has indicated that the EAO's description in this paragraph and in 11.3.5 do not reflect the full depth of the impact on WMFN's rights or their concern regarding those rights. From an initial review, WMFN notes that levels of impact on rights to hunt, fish, trap, and gather are likely much higher than noted by the EAO characterization and that the analysis does not factor in impacts to additional Aboriginal and Treaty rights and interests that WMFN holds. WMFN has submitted a supplementary letter to clarify its position.

This section was informed by information provided by West Moberly First Nations, although site-specific traditional use information was not provided to Glencore or the EAO. The EAO considered all information available, including from public sources as well as relevant technical issues raised by West Moberly First Nations during the EA process (in meetings, letters, and Working Group comments), in the following assessments of the potential impacts of Sukunka on West Moberly First Nations' Aboriginal and Treaty rights and interests.

West Moberly First Nations members are descendants of the Dunne-za who traditionally were semi-nomadic, gathering materials for food, heat, shelter, tools, trade items, and crafts, following a seasonal round<sup>162</sup>. These seasonal rounds adjusted each year with changes in game movements as well as purposeful land stewardship practices which allowed time for resources to rejuvenate and restore between harvests. This stewardship reflects a strong connection of the West Moberly First Nations members to the land and water resources, and this is reflected in their model of community wellness: a circular model which reflects the interconnection of knowledge of the land, leadership and guidance, respectful relationships with other people and all of creation, and health and well-being. West Moberly First Nations members describe infringement on their ability to exercise their Aboriginal and Treaty rights and interests to hunt, trap, fish, and gather in accordance with their traditional seasonal rounds as a direct impact to many aspects of community wellness – the loss of the role of men as hunters, loss of the deep

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<sup>162</sup> Treaty 8 Nations Community Assessment Team. 2012. *Telling a Story of Change the Dane-zaa Way - A Baseline Community Profile of: Doig River First Nation, Halfway River First Nation, Prophet River First Nation, West Moberly First Nations.*

connection to animals, loss of the ability to transmit cultural knowledge of the land from generation to generation, and the loss of their role as stewards of the land – which has led to other significant detrimental health issues in their community.

#### 21.3.5.1 FISHING

Fish species of importance to West Moberly First Nations include bull trout, northern pike, lake whitefish, arctic grayling, mountain whitefish, white sucker, burbot, longnose suckers, Dolly Varden trout, and rainbow trout.

In the Application, Glencore indicated that Sukunka would prevent or strongly deter West Moberly First Nations members from accessing and using fishing sites in the Sukunka area. The loss or reduction of the use of Sukunka area for fishing, whether through reduced access, reduced preference for the area, or actual or perceived contamination of fish, would adversely impact the ability to fish, peaceful enjoyment of that Treaty right, as well as the spiritual and cultural connection to the land and cultural learning practices associated with the exercise of this Treaty right.

The biophysical assessments of impacts to fish and water resources are described in [Sections 6](#) (Water Quality and Aquatic Biota) and [5](#) (Fish and Fish Habitat) of this Report. Impacts to the Treaty right to fish, proposed mitigations, and accommodations are described in Section 10.4.1.

In consideration of the information available to the EAO, consultation with West Moberly First Nations, West Moberly First Nations' engagement with Glencore, commitments made by Glencore, and the EAO's proposed conditions (should an EAC be issued), the EAO expects that Sukunka would result in a moderate impact on West Moberly First Nations' Treaty right to fish.

West Moberly First Nations has indicated to the EAO that they do not agree with EAO's methodology or conclusions regarding level of impacts to its Treaty right to fish and will provide its conclusion in a separate submission for provincial and federal decision-makers.

#### 21.3.5.2 HUNTING AND TRAPPING

West Moberly First Nations relied on hunting of large ungulates, primarily wood bison, moose, and deer and the trapping of furbearers during the fur trade era<sup>163</sup>. Carnivores and omnivores of importance to West Moberly First Nations members include grizzly bear, black bear, lynx, wolf, wolverine, marten, fox, mink and coyote. Ungulates include moose, elk, caribou, mountain goats, mountain sheep, mule deer and white-tail deer. Birds noted as being culturally significant include black capped chickadee, red-winged blackbird, purple finch, Swainson's thrush, American robin, dark-eyed junco, white-crowned sparrow, American bald eagle, and golden eagle.

West Moberly First Nations advised that hunting moose, elk, and deer remains an important activity both culturally and for sustenance and community food security, in accordance with their custom and tradition. Prior to the 1970s, caribou were harvested in the upland areas, and seasonal harvest filled an important

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<sup>163</sup> West Moberly First Nations Traditional Land Use and Occupancy Study Team. 2000. West Moberly First Nations Traditional Land Use and Occupancy Study Final Report (1999-2000). Available at: <https://apps.nrs.gov.bc.ca/int/tus/listFiles.do?tusId=49>

niche in the community's food security strategy, during periods when harvest of larger ungulates was culturally discouraged. West Moberly First Nations also maintain a communal trap line for use by any member and a 'community hunter' system that helps ensure those unable to harvest (due to lack of mobility or lack of funds, for example) can still access wild foods<sup>164</sup>.

In the Application, Glencore indicated that Sukunka would prevent or strongly deter West Moberly First Nations members from accessing and using hunting and trapping sites in Sukunka area. The loss or reduction of the use of Sukunka area for hunting and trapping, whether through reduced access or reduced preference for the area, would impact not only the ability to hunt/trap or the ability to have peaceful enjoyment of those Aboriginal and Treaty rights and interests, but also the spiritual and cultural connection to the land and cultural learning practices associated with the exercise of these Aboriginal and Treaty rights and interests.

The biophysical assessments of impacts to wildlife are described in [Section 7](#) of this Report. Impacts to the right to hunt, proposed mitigations, conditions, and accommodations are described in Section 10.4.2.

In consideration of the information available to the EAO, consultation with West Moberly First Nations, West Moberly First Nations' engagement with Glencore, proponent commitments, and the EAO's proposed conditions of any EAC issued, the EAO expects that Sukunka would result in a serious impact on West Moberly First Nations' Treaty right to hunt and trap.

West Moberly First Nations has indicated to the EAO that they do not agree with EAO's methodology or conclusions regarding level of impacts to its Treaty right to hunt and trap and will provide its conclusion in a separate submission for provincial and federal decision-makers.

### 21.3.5.3 GATHERING

Plants of importance to West Moberly First Nations members include: yarrow, monkey flower, goldenrod, tall larkspur, arnica, fireweed, aster, red baneberry, red clover, plantain, devil's club, monkshood, horsetail, highbush and lowbush cranberry, thimbleberry, wild strawberry, raspberry, and huckleberry<sup>165</sup>.

In the Application, Glencore indicated that Sukunka would prevent or strongly deter West Moberly First Nations members from accessing and using gathering sites in the Sukunka area. The loss or reduction of the use of the Sukunka area for gathering, whether through reduced access or reduced preference for the area, would impact the ability to gather, the ability to peacefully enjoy that Treaty right, as well as the spiritual and cultural connection to the land and cultural learning practices associated with the exercise of this Treaty right.

The biophysical assessments of impacts to vegetation are described in [Section 9](#) of this Report. Impacts to the Treaty right to gather, proposed mitigations, conditions, and accommodations are described in Section 10.4.3.

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<sup>164</sup> Treaty 8 Nations Community Assessment Team 2012

<sup>165</sup> West Moberly First Nations Traditional Land Use and Occupancy Study Team. 2000

In consideration of the information available to the EAO, consultation with West Moberly First Nations, West Moberly First Nations' engagement with Glencore, commitments made by Glencore, and the EAO's proposed conditions (should an EAC be issued), the EAO concludes Sukunka would be expected to result in a moderate impact on West Moberly First Nations' Treaty right to gather.

West Moberly First Nations has indicated to the EAO that they do not agree with EAO's methodology or conclusions regarding level of impacts to its Treaty right to gather, and will provide its conclusion in a separate submission for provincial and federal decision-makers.

## 21.4 DOIG RIVER FIRST NATION

### 21.4.1 COMMUNITY PROFILE

Doig River First Nation is a Dane-zaa (Beaver) speaking community and a signatory to Treaty 8. Prior to 1977, Doig River First Nation was governed together with Blueberry River First Nations as a single administrative entity known as the Fort St. John Indian Band.

Doig River First Nation has two reserves with a combined area of 1,358.1 ha, located approximately 70 km northeast of Fort St. John and 170 km northeast of Sukunka. As of February 2018, Doig River First Nation had a total registered population of 311, with an on-reserve population of 133, an off-reserve population of 164, and 14 living on other reserves. Doig River First Nation is governed by one Chief and two Councillors.

The following was submitted for inclusion by Doig River First Nation:

"Until the mid-1950s, Doig River First Nation members lived a semi-nomadic lifestyle, traveling seasonally within the Peace River area of the Rocky Mountains to the plains of Alberta to hunt, gather, and socialize with other Dane-zaa kinship groups.

In 1794, Rocky Mountain Fort was established in Doig River First Nation's traditional territory. As a result of the fur trade, European culture slowly started to impact the members' traditional way of living.

In 1900, Doig River First Nation signed Treaty 8 in an effort to preserve their lands and natural resources from outside interests. By 1914, Doig members were allotted reserve land at Dana zaq Nane (Montney), one of several traditional gathering places, but for several decades members continued to travel freely throughout their traditional lands.

During World War II, the US Army Corps of Engineers constructed the Alaska Highway across Doig River First Nation's traditional territory. After the war, the highway allowed an influx of settlers and developers to come into Doig River First Nation's traditional territories, and their lifestyle changed dramatically as a result. Doig River First Nation members were forced to settle on reserves and to send their children to government schools. The Department of Indian Affairs sold their first reserve

at Dana zaq Nane (Montney), to the Department of Veteran's Affairs, forcing the Doig River First Nation community to move further north, to the land Alaa?saatq (Peterson Crossing and on Hanás Saahgé? (the Doig River), where the community is centered today.

Doig River First Nation members continue to use the area of Sukunka for traditional activities including fishing, camping, berry picking, hunting, teaching youth, canoeing, and traversing game and other trails to access traditional use sites.”

#### 21.4.2 DEPTH OF CONSULTATION

On February 21, 2013, the EAO proposed and asked for comment on a notification-level consultation approach with Doig River First Nation for Sukunka because with the information available at the time, it did not appear that Doig River First Nation traditionally exercised Aboriginal and Treaty rights and interests in the proximity of Sukunka and there was a low likelihood of this happening in the future because of the distance between the Doig River First Nation community and Sukunka. On April 2, 2013, the EAO wrote to Doig River First Nation sharing the draft Section 11 Order, indicating Doig River First Nation is proposed to be included on Schedule C.

On September 14, 2015, Doig River First Nation wrote to the EAO objecting to the notification-level consultation approach and asked to be included on Schedule B, indicating that significant historical and present land use in the area of Sukunka has and continues to occur, including hunting, fishing, and gathering activities.

On November 24, 2015, the EAO responded to Doig River First Nation's letter indicating that although the information provided is important in understanding impacts to Doig River First Nation's Aboriginal and Treaty rights and interests, the site-specific information provided indicated that Aboriginal and Treaty rights and interests have been exercised 10-60 km away from Sukunka, and the consultation activities available to Schedule C First Nations would be more appropriate.

On December 15, 2015, Doig River First Nation responded to the EAO's letter providing additional site-specific information for traditional use activities occurring in and around Sukunka, requesting that the EAO re-consider adding Doig River First Nation to Schedule B.

The EAO scheduled a meeting with Doig River First Nation Chief and Councillors on February 24 and 25, 2016 to discuss this issue further. On April 12, 2016, the EAO wrote to Doig River First Nation, indicating a revised approach to consultation, and that Doig River First Nation will be removed from Schedule C and added to Schedule B in a Section 13 Order. This afforded consultation opportunities at the deep end of the consultation spectrum. In February 2018, additional capacity funding was provided by both the EAO and CEAA for participation in the Application Review.

#### 21.4.3 INVOLVEMENT IN THE CONSULTATION PROCESS

Prior to being added to Schedule B in 2016, the EAO notified Doig River First Nation of key steps in the

Environmental Assessment process. Once added to Schedule B, the FNITR invited Doig River First Nation to join, and Doig River First Nation accepted. The EAO notified Doig River First Nation of Working Group meetings, response deadlines for commenting on Glencore's responses to Working Group comments, changes to Schedules B and C of the Section 11 Order, and IR requests throughout the Application Review. Doig River First Nation representatives attended Working Group meetings, and additional comments were provided through the FNITR during Application Review.

In a series of meetings in early 2018 (listed in Section 11.1), Doig River First Nation met with the EAO to discuss their main outstanding concerns regarding impacts to water quality and caribou issues as well as issues related to their ability to peacefully enjoy their Aboriginal and Treaty rights and interests. These issues are summarized in Section 10.3.

Capacity funding was provided again in June 2018 from the EAO to enable Doig River First Nation to continue to engage in the additional work required for the Application Review process, and specifically to further examine predicted impacts to caribou and water quality.

Additional engagement throughout 2018 and early 2019 was conducted to discuss caribou issues as well as the development of this Report.

#### 21.4.4 KEY ISSUES RAISED

The key issues raised by Doig River First Nation were included in the FNITR's work and are described in detail in Sections 10.3 and 10.4. Doig River First Nation provided additional comments on July 12, 2017, including the following key issues:

- There was insufficient information to support saturated backfills in the original Application;
- Science Based Environmental Benchmarks should be used to identify safe water quality thresholds and conducted at a tributary-specific level;
- The water quality predictions for both Skeeter and Chamberlain Creeks and the Sukunka wetland exceed water quality guidelines for selenium and some metals – this has the potential to significantly impact Doig River First Nation's Aboriginal and Treaty rights and interests;
- The capture efficiency in the seepage collection systems should meet the acceptable water quality in perpetuity;
- There is no information concerning water management and mitigation post-closure, how long and for what capacity water treatment will be required, or what infrastructure will remain in place; and
- It is important to understand how Sukunka would add to the existing Brule Mine effluents issues, particularly for selenium, to background concentrations and to overall contaminant predictions in the Sukunka River for selenium, nitrate and sulphate.

#### 21.4.5 IMPACTS TO ABORIGINAL AND TREATY RIGHTS AND INTERESTS

This section was informed by information provided by Doig River First Nation. The EAO considered all information available, including from public sources, as well as relevant technical issues raised by Doig

River First Nation during the EA process (in meetings, letters, and Working Group comments), in the following assessments of the potential impacts of Sukunka on Doig River First Nation's Aboriginal and Treaty rights and interests.

#### 21.4.5.1 FISHING

Doig River First Nation members continue to fish at some preferred sites in the proposed project area, however with less frequency than they did historically due to perceived degradation of the quality of the fish resulting from contamination by high levels of industrial activity in the area, including coal mines, forestry, pipelines and wind projects.

Fish species important to Doig River First Nation include jackfish, whitefish, pickerel (walleye), grayling, trout (bull, lake, Dolly Varden, and rainbow), and suckers<sup>166</sup>. Members continue today to camp and fish in the Sukunka Falls and Martin Creek areas among others. However, some are practicing 'catch and release' due to perceived contamination of the fish.

Doig River First Nation believes that the risk of impacts from contaminants, such as potential selenium exceedances for Skeeter and Chamberlain Creeks, will result in impacts on fish that are already heavily impacted by industrial activity in the area. In Doig River First Nation's view, high levels of methylmercury are present across Treaty 8 territory.

Doig River First Nation also believes that pollutants from Sukunka should not be released into the receiving environment, and methods for mitigating pollution levels should not rely on dilution zones to give the appearance of reduced impacts on fish and fish habitat.

As a result of the risk of pollution and effects on fish, Sukunka would prevent or strongly deter Doig River First Nation members from accessing and using fishing sites in the Sukunka area. The loss or reduction of the use of the Sukunka area for fishing, whether through reduced access, reduced preference for the area, or actual or perceived contamination of fish, would adversely impact not only the ability to fish or the ability to have peaceful enjoyment of that Treaty right, but also the spiritual and cultural connection to the land and cultural learning practices associated with the exercise of this Treaty right. The biophysical assessments of impacts to fish and water resources are described in [Sections 6](#) (Water Quality and Aquatic Biota) and [Section 5](#) (Fish and Fish Habitat) of this Report. Impacts to the Treaty right to fish, proposed mitigations, and accommodations are described in Section 10.4.1.

In consideration of the information available to the EAO, consultation with Doig River First Nation, Doig River First Nation's engagement with Glencore, proponent commitments and the EAO's proposed conditions of any EAC issued, Sukunka would be expected to result in a minor-to-moderate impact on Doig River First Nation's Treaty right to fish.

Doig River First Nation communicated to the EAO that it does not recognize the Proponent or government as competent to assess for potential impacts to its Aboriginal and Treaty rights and interests and noted

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<sup>166</sup> Site C Clean Energy Project; Volume 5 Appendix A06 Part 4; Aboriginal Summary: Doig River First Nation, Final Report. January 2013.

that only DRFN is competent to assess the impacts.

#### 21.4.5.2 HUNTING AND TRAPPING

Doig River First Nation members continue to hunt and trap throughout their traditional territory. Preferred species hunted include moose, mule deer, elk, wolf, bear, porcupine, coyote, lynx, squirrel, rabbit, and beaver. Additional ungulates currently hunted include white-tailed deer, mountain sheep and bison. Doig members long ago discontinued harvesting caribou due to significant declines in the caribou populations across Treaty 8 territory. Moose is a principal food source, and the fall moose hunt remains the most important harvest of the year. Trapping and selling furs still make up a part of incomes for Doig River First Nation members.

Members of Doig River First Nation are closer in proximity to other caribou herds such as the Graham herd and did not hunt the Quintette herd to the same extent as the other Treaty 8 Nations.

The biophysical assessments of impacts to wildlife are described in [Section 7](#) of this Report. Impacts to the Aboriginal and Treaty rights and interests to hunt and trap, proposed mitigations, conditions, and accommodations are described in Section 10.4.2.

Doig River First Nation emphasized that the probability of Quintette caribou displacement from critical high elevation habitat, according to federal, provincial and First Nation scientists, specialists and indigenous knowledge-holders is high. The consequence of displacement, according to these same experts, is extirpation because the herd's high elevation habitat is significantly reduced due to development, and caribou will move to less favourable areas, where predators are present, and the habitat cannot sustain them. Extirpation of the herd would eliminate Doig River First Nation's Treaty right to harvest and practice traditional ways that are central to their members' way of life.

Doig River First Nation concludes that a minimum 3 km buffer for sensory displacement should be applied to the assessment. Following the devastating impact of the Trend mine on the caribou population, which was not predicted by the proponent or regulators, any sensory displacement of the Quintette herd will have significant impacts on the herd and on Doig River First Nation's Treaty right to harvest and practice traditional ways that are central to their members' way of life.

In addition to reducing wildlife habitat, including the habitat of the Quintette herd which would likely lead to extirpation, Sukunka would prevent or strongly deter Doig River First Nation members from accessing and using hunting and trapping sites in the Sukunka area. The loss or reduction of the use of Sukunka area for hunting and trapping, whether through reduced or displaced species populations, access or reduced preference for the area, would impact not only the ability to hunt/trap or the ability to have peaceful enjoyment of those Aboriginal and Treaty rights and interests, but also the spiritual and cultural connection to the land and cultural learning practices associated with the exercise of these Aboriginal and Treaty rights and interests.

The biophysical assessments of impacts to wildlife are described in [Section 7](#) of this Report. Impacts to the Treaty rights to hunt and trap, proposed mitigations, conditions, and accommodations are described in Section 10.4.2.

In consideration of the information available to the EAO, consultation with Doig River First Nation, Doig River First Nation's engagement with Glencore, proponent commitments and the EAO's proposed conditions of any EAC issued, Sukunka would be expected to result in a moderate impact on Doig River First Nation's Treaty right to hunt and trap.

Doig River First Nation communicated to the EAO that it does not recognize the Proponent or government as competent to assess for potential impacts to its Aboriginal and Treaty rights and interests and noted that only DRFN is competent to assess the impacts.

### 21.4.5.3 GATHERING

Various plant species are harvested by Doig River First Nation members for food, medicine, or other cultural uses. Traditionally harvested plants include high-bush and low-bush cranberry, currants, blueberries, frog's blanket/bed, Saskatoon berries, wild mint, strawberries, wild rose hips, huckleberries, thimbleberry, diamond willow fungus, cloudberry, lichen and peat moss, mushrooms, spruce gum, cow parsnip, wild rhubarb, sage, Labrador tea, and Devil's club<sup>167</sup>.

Sukunka would prevent or strongly deter Doig River First Nation members from accessing and using gathering sites in Sukunka area. The loss or reduction of the use of Sukunka area for gathering, whether through reduced habitat, access or reduced preference for the area, would impact not only the ability to gather or the ability to have peaceful enjoyment of that Treaty right, but also the spiritual and cultural connection to the land and cultural learning practices associated with the exercise of this Treaty right.

The biophysical assessments of impacts to vegetation are described in [Section 9](#) of this Report. Impacts to the Treaty right to gather, proposed mitigations, conditions, and accommodations are described in Section 10.4.3.

In consideration of the information available to the EAO, consultation with Doig River First Nation, Doig River First Nation's engagement with Glencore, proponent commitments and the EAO's proposed conditions of any EAC issued, Sukunka would be expected to result in a minor impact on Doig River First Nation's Treaty right to gather.

Doig River First Nation communicated to the EAO that it does not recognize the Proponent or government as competent to assess for potential impacts to its Aboriginal and Treaty rights and interests and noted that only DRFN is competent to assess the impacts.

## 21.5 HALFWAY RIVER FIRST NATION

### 21.5.1 COMMUNITY PROFILE

Halfway River First Nation is a Dane-zaa (Beaver) and Nēhiyawēwin (Cree) speaking community and was

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<sup>167</sup> Site C Clean Energy Project; Volume 5 Appendix A06 Part 4; Aboriginal Summary: Doig River First Nation, Final Report. January 2013.

originally part of the Hudson Hope Band, along with West Moberly First Nations, up until 1977 when the two First Nations separated. Halfway River First Nation is a signatory to Treaty 8 and a member of the Treaty 8 Tribal Association.

The Halfway River reserve is north of the Peace River and is 3,988.8 ha in size. It is located approximately 75 km northwest of Fort St. John and 150 km north of Sukunka. As of February 2018, Halfway River First Nation had a total registered population of 287, with an on-reserve population of 144, an off-reserve population of 135, and 8 living on other reserves. Halfway River First Nation is governed by a Chief and six Councillors.

### 21.5.2 DEPTH OF CONSULTATION

Halfway River First Nation is a member of the Treaty 8 Tribal Association, which is an administrative body that provides support and advice to six BC Treaty 8 Nations residing in and around the Peace River Valley area of northeastern BC. The EAO consults directly with member nations of the Treaty 8 Tribal Association regarding the potential effects of Sukunka on their Aboriginal and Treaty rights and interests.

On February 21, 2013, the EAO proposed and asked for comment on a notification-level consultation approach with Doig River First Nation on for Sukunka because with the information available at the time, it did not appear that Doig River First Nation traditionally exercised Aboriginal and Treaty rights and interests in the proximity of Sukunka and there was a low likelihood of this happening in the future because of the distance between the Halfway River First Nation community and Sukunka.

On November 14, 2016, Halfway River First Nation wrote to the EAO objecting to the notification-level consultation approach and asked to be included on Schedule B, indicating that Sukunka would have impacts to their Aboriginal and Treaty rights and interests.

On January 6, 2017, the EAO responded to Halfway River First Nation asking for site-specific traditional and current use information which would help the EAO consider their request to be added to Schedule B.

On March 29, 2017, Halfway River First Nation responded to the EAO that sufficient details had been provided to the Province through the negotiations of the Regional Coal Agreement in 2015 and part of their core boundary overlapped with the Sukunka PDA.

The EAO considered the information provided by Halfway River First Nation and accepted the reasoning provided to be added to Schedule B. On January 30, 2018, Halfway River First Nation was removed from Schedule C and added to Schedule B. This afforded consultation opportunities at the deep end of the consultation spectrum. In February 2018, additional capacity funding was provided by both the EAO and CEAA for participation in the Application Review.

### 21.5.3 INVOLVEMENT IN THE CONSULTATION PROCESS

Prior to being added to Schedule B in 2018, the EAO notified Halfway River First Nation of key steps in the

Environmental Assessment process. Once added to Schedule B, Halfway River First Nation was invited to join the FNITR but opted to conduct its own independent review process.

On March 12, 2018, March 23, 2018, and March 14, 2019, the EAO and Halfway River First Nation met to discuss the status of Sukunka and provide details to facilitate their review.

The EAO notified Halfway River First Nation of Working Group meetings, FNITR meetings, response deadlines for commenting on Glencore's responses to Working Group comments, and IR requests throughout the Application Review.

Capacity funding was provided again in June 2018 from the EAO for further participation in the Application Review.

Additional engagement throughout 2018, early 2019, 2021 and 2022 was conducted to discuss caribou issues as well as the development of this Report.

#### 21.5.4 KEY ISSUES RAISED

Halfway River First Nation provided a list of issues on November 14, 2018. Key issues included:

- Loss of wildlife habitat (particularly for migratory birds);
- Need for additional, targeted amphibian surveys;
- Contamination of food and water for wildlife by metals;
- Sensory and other indirect impacts to grizzly bear;
- Monitoring of fish populations should continue throughout closure and post-closure;
- Baseline data collection is now five to ten years old at time of assessment;
- A defined no hunting or fishing buffer 20 km around Sukunka was requested to protect the wildlife and fish in the area;
- Ground water, surface water, vegetation, and wildlife contamination by selenium;
- Cumulative impacts to caribou;
- Deposition of calcite in Skeeter and Chamberlain Creeks; and
- The use of a dilution zone to meet water quality guidelines.

These issues are discussed in the following sections of this Report: [Section 9](#) (Vegetation), [Section 7](#) (Wildlife), [Section 8](#) (Caribou), [Section 5](#) (Fish and Fish Habitat), [Section 6](#) (Water Quality and Aquatic Biota). Conditions proposed by the EAO related to these issues include requirements for Glencore to:

- Conduct targeted, pre-disturbance surveys for amphibians and species at risk;
- Develop a Wildlife Protection and Monitoring Plan and Bird Nest Mitigation Plan, including mitigation measures to protect wildlife (see [Section 7](#) for more details);
- Use active water treatment for selenium;
- Finalize the Caribou Mitigation and Monitoring Plan, including mitigation measures to protect caribou (see [Section 8](#) for more details);

- Meet water quality guidelines or site-specific environmental benchmarks; and
- Monitor and manage impacts to fish of changes in water quality.

Halfway River First Nation also provided additional comments on fish and fish habitat and caribou, which were incorporated into [Section 8](#) (Caribou), [Section 5](#) (Fish and Fish Habitat).

### 21.5.5 IMPACTS TO ABORIGINAL AND TREATY RIGHTS AND INTERESTS

This section was informed by information from the information provided by Halfway River First Nation. The EAO considered all information available, including from public sources as well as relevant technical issues raised by Halfway River First Nation during the EA process (in meetings, letters, and Working Group comments), in the following assessments of the potential impacts of Sukunka on Halfway River First Nation's Aboriginal and Treaty rights and interests.

Halfway River First Nation indicated to the EAO that they do not agree with assessing Treaty rights for each individual First Nation; rather, these should be assessed equally for all First Nations. Halfway River First Nation further communicated that all Treaty rights are very important to Halfway River First Nation and labelling these rights (e.g. assessing impacts as 'minor' or 'moderate') is stating that their way of life is not important.

Halfway River First Nation's traditional economy focused on hunting, trapping, plant gathering, and to a lesser extent, fishing<sup>168</sup>.

#### 21.5.5.1 FISHING

Fish species of importance to Halfway River First Nation include bull trout, burbot, catfish, Dolly Varden trout, flat head chub, goldeneye, grayling, inconnu (whitefish), lake trout, large scale sucker, long nose sucker, pike (jackfish), rainbow trout, squawfish, suckers, walleye, and white sucker<sup>169</sup>.

Sukunka would prevent or could strongly deter Halfway River First Nation members from accessing and using fishing sites in the Sukunka area. The loss or reduction of the use of the Sukunka area for fishing, whether through reduced access, reduced preference for the area, or actual or perceived contamination of fish, would adversely impact not only the ability to fish or the ability to have peaceful enjoyment of that Treaty right, but also the spiritual and cultural connection to the land and cultural learning practices associated with the exercise of this Treaty right.

The biophysical assessments of impacts to fish and water resources are described in [Section 6](#) (Water Quality and Aquatic Biota) and [Section 5](#) (Fish and Fish Habitat) of this Report. Impacts to the Treaty right to fish, proposed mitigations, and accommodations are described in Section 10.4.1.

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<sup>168</sup> Prince Rupert Gas Transmission Project: Application for an Environmental Assessment Certificate. Part C – Aboriginal Consultation, Section 33. Prepared for TransCanada Pipelines Ltd. Revision 1, May 2014.

<sup>169</sup> Prince Rupert Gas Transmission Project: Application for an Environmental Assessment Certificate. Part C – Aboriginal Consultation, Section 33. Prepared for TransCanada Pipelines Ltd. Revision 1, May 2014.

In consideration of the information available to the EAO, consultation with Halfway River First Nation, Halfway River First Nation's engagement with Glencore, proponent commitments and the EAO's proposed conditions of any EAC issued, Sukunka would be expected to result in a minor-to-moderate impact on Halfway River First Nation's Treaty right to fish.

Halfway River First Nation indicated to the EAO that they do not agree that Sukunka would only have minor-to-moderate impacts on the Treaty right to fish and stated that Halfway River First Nation's way of life or Treaty rights should not be labelled with 'minor' or 'moderate'. Further, Halfway River is of the opinion that effluent discharge, contamination, and contact water from Sukunka cannot be effectively mitigated and will affect fish health with direct deleterious effects on downstream fishing resources.

Health fish populations are required for fishing which is a legally protected right for Halfway River First Nation under Treaty 8.

### 21.5.5.2 HUNTING AND TRAPPING

The traditional hunting and trapping territories of Halfway River First Nation are concentrated within the Halfway Valley, on the edge of the foothills and mountains of the Rocky Mountains. Important game species include moose, bighorn and Stone sheep, mule and whitetail deer, bison, and woodland caribou, as well as smaller game, such as beaver and hare. Other species include porcupine, whistler (hoary) marmot, wolf, blue grouse, ruffed grouse and spruce grouse.<sup>170, 171</sup> Moose, elk and deer are the most important harvested species for local use.<sup>172, 173</sup> The fall moose hunt remains the most important harvest of the year and trapping is commonly done in the winter, with less harvesting occurring during the summer, when seasonal employment may be high.

Trapping continues to be practiced throughout the traditional territory of Halfway River First Nation, which includes several registered traplines. Trapped species include beaver, coyote, ermine, fisher, fox, groundhog, hare/rabbits, lynx, marten, mink, muskrat, river otter, red squirrel, wolf, and wolverine.<sup>174</sup>

Sukunka would prevent or could strongly deter Halfway River First Nation members from accessing and using hunting and trapping sites in the Sukunka area. The loss or reduction of the use of the Sukunka area for hunting and trapping, whether through reduced access or reduced preference for the area, would impact not only the ability to hunt/trap or the ability to have peaceful enjoyment of those Aboriginal and Treaty rights and interests, but also the spiritual and cultural connection to the land and cultural learning practices associated with the exercise of these Aboriginal and Treaty rights and interests. However,

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<sup>170</sup> Finavera Wind Energy Inc. (FWEI). 2011. Application for an EAC – Tumbler Ridge Wind Energy Project. Available at: <http://www.finavera.com>. Accessed: May 2016.

<sup>171</sup> Prince Rupert Gas Transmission Project: Application for an Environmental Assessment Certificate. Part C – Aboriginal Consultation, Section 33. Prepared for TransCanada Pipelines Ltd. Revision 1, May 2014.

<sup>172</sup> Pokiak, Roslyn; TERA Environmental Consultants Ltd. (1994). *Halfway River Band and Prophet River Band Traditional Knowledge Study - Pink Mountain/Sikanni Chief Area, B.C.* Fort St. John: Husky Oil Operations.

<sup>173</sup> Appendix A: TERA 2001-2012 Traditional Knowledge Report for the Proposed Nova Gas Transmission Ltd. Groundbirch Mainline (Aitken Creek Section) Project. July 2013. TERA Environmental Consultants.

<sup>174</sup> Prince Rupert Gas Transmission Project: Application for an Environmental Assessment Certificate. Part C – Aboriginal Consultation, Section 33. Prepared for TransCanada Pipelines Ltd. Revision 1, May 2014.

members of Halfway River First Nation are closer in proximity to other caribou herds such as the Graham herd and would likely not have hunted the Quintette herd to the same extent as the other Treaty 8 Nations.

The biophysical assessments of impacts to wildlife are described in [Section 7](#) of this Report. Impacts to the right to hunt, proposed mitigations, conditions, and accommodations are described in Section 10.4.2.

In consideration of the information available to the EAO, consultation with Halfway River First Nation, Halfway River First Nation's engagement with Glencore, proponent commitments and the EAO's proposed conditions of any EAC issued, Sukunka would be expected to result in a moderate impact on Halfway River First Nation's Aboriginal and Treaty right to hunt and trap.

Halfway River First Nation indicated to the EAO that they do not agree that Sukunka would only have moderate impacts on the Aboriginal and Treaty right to hunt and stated that Halfway River First Nation's way of life or Aboriginal and Treaty rights and interests should not be labelled with 'minor' or 'moderate'.

### 21.5.5.3 GATHERING

Various plant species are harvested by Halfway River First Nation members for food, medicine, or other cultural uses. Halfway River First Nation members harvest many plants, including berries and medicinal plants, such as alder, aspen, baneberry, beaver ears/wintergreen, birch, black currant, black poplar, bluebell, blueberry, bunchberry/whiskeyjack berry, choke cherry, cloud berry, comandra, cottonwood, cow parsnip, crow berry/marten berry, dandelion, Devil's club, dewberry, diamond willow fungus, spiny fern root, fireweed, flat leaf plant, flat lichen, frog's blanket/colt's foot, fungus/willow and other tree fungus, goldenrod, gooseberry, highbush blueberry, highbush cranberry, horsetail, huckleberry, Indian carrot/wild pea vine/bear root, Indian parsnip/sweet cicely, jack pine, juniper, kinnikinnik, Labrador tea/muskeg tea, lichen/tree moss, lowbush blueberry, lowbush cranberry, mint, mountain ash/moose berry, peat moss, puffball mushroom, mushroom, potentilla, raspberry, rat root, red osier dogwood, rhubarb, rose, rose hip, rotten wood, sage, Saskatoon berry, silver berry/wolf sallow, soapberry/bear berry, spruce gum, swamp currant/frog berry, wild cabbage, wild strawberry, willow, white spruce, and yarrow.<sup>175, 176</sup> Peppermint tea leaves and rat root are typically harvested from wetlands and used for medicinal purposes.<sup>177</sup>

Sukunka would prevent or could strongly deter Halfway River First Nation members from accessing and using gathering sites in the Sukunka area. The loss or reduction of the use of the Sukunka area for gathering, whether through reduced access or reduced preference for the area, would impact not only the ability to gather or the ability to have peaceful enjoyment of that Aboriginal and Treaty right, but also the spiritual and cultural connection to the land and cultural learning practices associated with the exercise of

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<sup>175</sup> Appendix A: TERA 2001-2012 Traditional Knowledge Report for the Proposed Nova Gas Transmission Ltd. Groundbirch Mainline (Aitken Creek Section) Project. July 2013. TERA Environmental Consultants.

<sup>176</sup> Finavera Wind Energy Inc. (FWEI). 2011. Application for an EAC – Tumbler Ridge Wind Energy Project. Available at: <http://www.finavera.com>. Accessed: May 2016.

<sup>177</sup> Appendix A: TERA 2001-2012 Traditional Knowledge Report for the Proposed Nova Gas Transmission Ltd. Groundbirch Mainline (Aitken Creek Section) Project. July 2013. TERA Environmental Consultants.

this Aboriginal and Treaty right.

The biophysical assessments of impacts to vegetation are described in [Section 9](#) of this Report. Impacts to the Aboriginal and Treaty right to gather, proposed mitigations, conditions, and accommodations are described in Section 10.4.3.

In consideration of the information available to the EAO, consultation with Halfway River First Nation, Halfway River First Nation's engagement with Glencore, proponent commitments, and the EAO's proposed conditions of any EAC issued, Sukunka would be expected to result in a minor impact on Halfway River First Nation's Treaty right to gather.

Halfway River First Nation indicated to the EAO that they do not agree that Sukunka would only have minor impacts on the Treaty right to gather and stated that Halfway River First Nation's way of life or Treaty rights should not be labelled with 'minor' or 'moderate'.

## APPENDIX 1: LIST OF WORKING GROUP MEMBERS

### INDIGENOUS GROUPS

Doig River First Nation  
Halfway River First Nation  
McLeod Lake Indian Band  
Saulteau First Nations  
West Moberly First Nations

### PROVINCIAL GOVERNMENT

Ministry of Energy, Mines and Low Carbon Innovation  
Ministry of Environment and Climate Change Strategy  
Ministry of Forests  
Ministry of Lands, Water, and Resource Stewardship

### FEDERAL GOVERNMENT

Canadian Wildlife Service  
Environment and Climate Change Canada  
Fisheries and Oceans Canada  
Health Canada  
Natural Resources Canada

### LOCAL GOVERNMENT AND HEALTH AUTHORITY

Municipality of Chetwynd  
Northern Health  
Peace River Regional District

## APPENDIX 2: UPDATED SURFACE FLOWS

The tables below compare baseline flows, as calculated in SRK's updated baseline flow model (which differ from the baseline flow modelling described by Knight Piesold in the Application), with predicted flows for watershed modelling nodes based on Sukunka design as updated during Application Review. The watershed modelling nodes presented are as follows:

Assessment Point	Watercourse	Location
Skeet3	Skeeter Creek	Skeeter Creek upstream location, upstream of where Skeeter Tributary enters the creek. No loadings from sources have been added at this point. Water quality is background water quality.
Skeet2	Skeeter Creek	A node in Skeeter Creek located north of Pit04, midway along Skeeter Creek.
Skeet	Skeeter Creek	In lower Skeeter Creek, on the alluvial fan where flow goes subsurface during some times of the year. Downstream-most node on Skeeter Creek.
CHAMB	Chamberlain Creek	Upstream-most node on Chamberlain Creek.
Chamb2	Chamberlain Creek	Midway along Chamberlain Creek, located downstream of Pit02 but upstream of the waste rock sources downstream (WD04).
Chamb3	Chamberlain Creek	Downstream-most node on Chamberlain Creek, on the alluvial fan where flow goes underground some times of the year.
Sukunka	Sukunka River	The node located immediately downstream of the Initial Dilution Zone (IDZ). This node is also referred to as "Sukunka Downstream of Project".

**Node: CHAMB**

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average Annual
<b>Watershed Modelling Node CHAMB</b>														
Construction	Baseline Flow (L/s)	22	22	26	182	1,337	1,270	437	178	132	89	44	22	313
	Flow (L/s)	Not Modelled												
	Change from Baseline (%)	Not Modelled												
Early Operations <sup>178</sup>	Flow (L/s)	18	18	20	126	1,108	1,069	367	148	111	74	37	18	260
	Change from Baseline (%)	-17%	-17%	-24%	-31%	-17%	-16%	-16%	-17%	-16%	-17%	-15%	-17%	-18%
Late Operations <sup>179</sup>	Flow (L/s)	21	21	24	151	1,086	1,037	360	151	117	84	46	23	260
	Change from Baseline (%)	-4%	-8%	-7%	-17%	-19%	-18%	-18%	-15%	-11%	-6%	5%	2%	-10%
Closure	Flow (L/s)	21	21	25	159	1,086	1,031	358	151	117	83	46	23	260
	Change from Baseline (%)	-4%	-8%	-5%	-13%	-19%	-19%	-18%	-15%	-12%	-6%	5%	2%	-9%
Post-Closure	Flow (L/s)	21	21	24	143	1,086	1,043	362	151	118	84	47	23	260
	Change from Baseline (%)	-4%	-8%	-10%	-22%	-19%	-18%	-17%	-15%	-11%	-6%	6%	2%	-10%

**Node: CHAMB 2**

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average Annual
<b>Watershed Modelling Node CHAMB2</b>														
Construction	Baseline Flow (L/s)	44	44	52	361	2,653	2,518	866	353	263	176	87	44	622
	Flow (L/s)	Not Modelled												
	Change from Baseline (%)	Not Modelled												
Early Operations	Flow (L/s)	42	42	45	283	2,497	2,410	828	333	250	167	84	42	585
	Change from Baseline (%)	-6%	-6%	-14%	-22%	-6%	-4%	-4%	-6%	-5%	-5%	-4%	-6%	-7%
Late Operations	Flow (L/s)	45	44	51	332	2,472	2,359	816	337	257	179	94	47	586

<sup>178</sup> Early Operations values reported are for year 5.

<sup>179</sup> Late Operations values reported are for year 15.

Closure	Change from Baseline (%)	2%	0%	-1%	-8%	-7%	-6%	-6%	-4%	-2%	1%	8%	6%	-1%
	Flow (L/s)	45	44	53	350	2,471	2,346	812	336	256	178	94	47	586
Post-Closure	Change from Baseline (%)	2%	0%	2%	-3%	-7%	-7%	-6%	-5%	-2%	1%	8%	6%	-1%
	Flow (L/s)	45	44	50	313	2,472	2,373	820	338	258	179	95	47	586
	Change from Baseline (%)	2%	0%	-4%	-13%	-7%	-6%	-5%	-4%	-2%	2%	9%	6%	-2%

**Node: CHAMB 3**

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average Annual
<b>Watershed Modelling Node CHAMB 3</b>														
Construction	Baseline Flow (L/s)	40	40	46	324	2,377	2,256	776	316	235	158	78	40	557
	Flow (L/s)	Not Modelled												
	Change from Baseline (%)	Not Modelled												
Early Operations	Flow (L/s)	43	43	46	292	2,569	2,479	852	343	257	172	87	43	602
	Change from Baseline (%)	8%	8%	-1%	-10%	8%	10%	10%	9%	9%	9%	11%	8%	7%
Late Operations	Flow (L/s)	47	46	54	343	2,540	2,425	839	347	266	186	99	49	603
	Change from Baseline (%)	19%	16%	15%	6%	7%	7%	8%	10%	13%	18%	27%	24%	14%
Closure	Flow (L/s)	47	46	55	362	2,540	2,411	835	347	265	185	99	49	603
	Change from Baseline (%)	19%	16%	19%	12%	7%	7%	8%	10%	13%	17%	26%	24%	15%
Post-Closure	Flow (L/s)	47	46	52	324	2,540	2,438	843	348	267	186	100	49	603
	Change from Baseline (%)	19%	16%	12%	0%	7%	8%	9%	10%	13%	18%	28%	24%	14%

**Node: SKEET 3**

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average Annual
<b>Watershed Modelling Node SKEET3</b>														
Construction	Baseline Flow (L/s)	13	14	30	134	605	355	154	65	39	26	19	13	122
	Flow (L/s)	Not Modelled												
	Change from Baseline (%)	Not Modelled												
Early Operations	Flow (L/s)	13	14	28	121	610	360	156	65	39	26	20	13	122

Late Operations	Change from Baseline (%)	0%	-2%	-7%	-10%	1%	1%	1%	1%	1%	0%	1%	0%	-1%
	Flow (L/s)	13	14	29	130	606	356	154	65	39	26	19	13	122
Closure	Change from Baseline (%)	0%	-1%	-2%	-3%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	Flow (L/s)	13	14	30	134	604	355	154	65	39	26	19	13	122
Post-Closure	Change from Baseline (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	Flow (L/s)	13	14	28	125	608	358	155	65	39	26	20	13	122
	Change from Baseline (%)	0%	-2%	-5%	-6%	1%	1%	1%	1%	0%	0%	1%	0%	-1%

**Node: SKEET 2**

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average Annual
<b>Watershed Modelling Node SKEET2</b>														
Construction	Baseline Flow (L/s)	40	42	90	410	1,850	1,086	470	199	119	80	59	40	374
	Flow (L/s)	Not Modelled												
Early Operations	Change from Baseline (%)	Not Modelled												
	Flow (L/s)	26	27	55	241	1,213	715	310	130	78	52	39	26	243
Late Operations	Change from Baseline (%)	-35%	-37%	-39%	-41%	-34%	-34%	-34%	-35%	-34%	-35%	-34%	-35%	-36%
	Flow (L/s)	31	33	68	307	1,436	844	366	154	92	62	46	31	289
Closure	Change from Baseline (%)	-23%	-23%	-24%	-25%	-22%	-22%	-22%	-22%	-22%	-22%	-22%	-23%	-23%
	Flow (L/s)	31	33	70	317	1,431	840	364	154	92	62	46	31	289
Post-Closure	Change from Baseline (%)	-23%	-23%	-23%	-23%	-23%	-23%	-23%	-23%	-23%	-22%	-22%	-23%	-23%
	Flow (L/s)	31	32	67	297	1,441	848	367	155	93	62	46	31	289
	Change from Baseline (%)	-23%	-24%	-26%	-27%	-22%	-22%	-22%	-22%	-22%	-22%	-22%	-23%	-23%

**Node: SKEET**

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average Annual
<b>Watershed Modelling Node SKEET</b>														
Construction	Baseline Flow (L/s)	33	36	76	343	1,547	908	393	166	99	67	50	33	312
	Flow (L/s)	Not Modelled												

Early Operations	Change from Baseline (%)													
	Flow (L/s)	31	32	65	287	1,446	852	369	155	93	62	47	31	289
Late Operations	Change from Baseline (%)	-7%	-10%	-13%	-16%	-7%	-6%	-6%	-7%	-6%	-7%	-6%	-7%	-8%
	Flow (L/s)	31	33	69	310	1,451	853	370	156	93	63	47	31	292
Closure	Change from Baseline (%)	-6%	-7%	-8%	-9%	-6%	-6%	-6%	-6%	-6%	-6%	-6%	-6%	-7%
	Flow (L/s)	31	33	71	320	1,446	849	368	155	93	62	47	31	292
Post-Closure	Change from Baseline (%)	-6%	-6%	-6%	-7%	-7%	-6%	-6%	-6%	-6%	-6%	-6%	-6%	-6%
	Flow (L/s)	31	33	68	300	1,456	857	371	156	93	63	47	31	292
	Change from Baseline (%)	-6%	-8%	-11%	-12%	-6%	-6%	-6%	-6%	-6%	-6%	-6%	-6%	-7%

**Node: Sukunka**

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average Annual
<b>Watershed Modelling Node: Sukunka</b>														
Construction	Baseline Flow (L/s)	3,708	3,006	4,257	18,158	76,413	72,513	30,891	11,511	12,952	16,849	10,738	4,963	22,163
	Flow (L/s)	Not Modelled												
Early Operations	Change from Baseline (%)	Not Modelled												
	Flow (L/s)	3,789	3,033	3,982	16,501	74,591	71,826	30,914	11,419	12,840	16,991	11,006	5,054	21,829
Late Operations	Change from Baseline (%)	2%	1%	-6%	-9%	-2%	-1%	0%	-1%	-1%	1%	2%	2%	-1%
	Flow (L/s)	3,808	3,092	4,191	17,520	74,516	71,092	30,584	11,441	12,941	16,994	10,861	5,066	21,842
Closure	Change from Baseline (%)	3%	3%	-2%	-4%	-2%	-2%	-1%	-1%	0%	1%	1%	2%	0%
	Flow (L/s)	3,797	3,093	4,290	18,013	74,503	70,748	30,423	11,453	12,975	16,944	10,813	5,055	21,842
Post-Closure	Change from Baseline (%)	2%	3%	1%	-1%	-2%	-2%	-2%	-1%	0%	1%	1%	2%	0%
	Flow (L/s)	3,818	3,092	4,111	17,028	74,529	71,436	30,746	11,430	12,906	17,019	10,935	5,066	21,843
	Change from Baseline (%)	3%	3%	-3%	-6%	-2%	-1%	0%	-1%	0%	1%	2%	2%	0%

## APPENDIX 3: WATER QUALITY NODE PREDICTIONS FOR PARAMETERS THAT EXCEEDED WATER QUALITY GUIDELINES IN SKEETER CREEK AND CHAMBERLAIN CREEK

**Table 52: Predicted water quality guideline exceedances in Skeeter Creek (SKEET) using expected and upper-case model predictions.**

	WQG-AL	Min	5th percentile	Mean	95th Percentile	Max	Frequency	Month	Phase
<b>Expected Case Predicted concentration (mg/L)</b>									
Total Selenium	0.002	0.00039	0.00058	0.0013	0.0023	0.0023	15%	Oct, Nov	O, C, PC
Total Chromium	0.001	0.000095	0.00011	0.00027	0.0015	0.0016	<b>17%</b>	May, June	O, PC
<b>Upper-Case Predicted concentration (mg/L)</b>									
Nitrite	0.02	0.00092	0.001	0.001	0.0041	0.023	0.3%	Jan	O (early)
Total Beryllium <sup>1</sup>	0.00013	0.000092	0.0001	0.0001	0.00017	0.00017	<b>17%</b>	-	-
Total Chromium	0.001	0.000095	0.00011	0.0003	0.0045	0.0045	<b>25%</b>	May-July	O, PC
Total Iron	1.0	0.018	0.022	0.12	3.6	3.7	<b>25%</b>	May-July	O, PC
Total Selenium <sup>2</sup>	0.002	0.00048	0.00093	0.0017	0.0038	0.0038	31%	Sept-Dec	O, PC

Phase: Con = Construction, O=Operations, C = Closure, PC = Post-Closure

**Bold** percentages indicate exceedances can be fully attributed to background conditions.

<sup>1</sup> Some information not provided in prediction summaries.

<sup>2</sup> Baseline contributed to 8% of guideline exceedances (October).

**Table 53: Predicted water quality guideline exceedances in Chamberlain Creek (Chamb3) using expected and upper-case model predictions.**

	WQG-AL	Min	5th percentile	Mean	95th Percentile	Max	Freq.	Month	Phase
<b>Expected Case Predicted concentration (mg/L)</b>									
Total Selenium	0.002	0.00033	0.00067	0.0019	0.0031	0.0033	42%	Nov-April	O, C, PC
Nitrite	0.020	0.001	0.001	0.001	0.0091	0.033	2%	Dec-Mar	O
Total Chromium	0.001	0.0001	0.00016	0.00038	0.0016	0.0017	<b>17%</b>	May, June	All

	WQG-AL	Min	5th percentile	Mean	95th Percentile	Max	Freq.	Month	Phase
<b>Upper-Case Predicted concentration (mg/L)</b>									
Dissolved Aluminum <sup>2</sup>	0.05	0.0014	0.0030	0.041	0.140	0.140	14%	May, June	O, PC
Dissolved Cadmium	0.000055	0.000010	0.000023	0.000057	0.000086	0.000086	16%	May, June	O, PC
Nitrate	3.0	0.0081	0.009	0.11	0.95	3.2	0.7%	Dec-Mar	O (early)
Nitrite	0.02	0.001	0.001	0.001	0.017	0.065	4.4%	Nov-Mar	O (early)
Total Beryllium <sup>1</sup>	0.00013	0.0001	0.0001	0.00013	0.00016	0.00016	66%	-	-
Total Chromium	0.001	0.0001	0.00018	0.00054	0.0035	0.0035	<b>25%</b>	Apr-June	O, PC
Total Copper	0.0026	0.00051	0.00058	0.001	0.0044	0.0045	<b>8%</b>	May	O, PC
Total Iron	1.0	0.011	0.051	0.15	2.1	2.1	<b>17%</b>	May, June	O, PC
Total Mercury <sup>1</sup>	0.00002	0.00001	0.00001	0.00002	0.000024	0.000024	18%	-	-
Total Selenium	0.002	0.00046	0.00081	0.0028	0.0048	0.0049	64%	Aug to May	O, PC
Total Silver <sup>2</sup>	0.00005	0.000010	0.000011	0.000038	0.000081	0.000081	22%	June	O, PC
total Zinc <sup>1</sup>	0.0075	0.0030	0.0031	0.0120	0.0270	0.0270	<b>8%</b>	-	-

Phase: Con = Construction, O=Operations, C = Closure, PC = Post-Closure

**Bold** percentages indicate exceedances are fully attributed to background conditions.

<sup>1</sup> Some information not provided in the prediction summaries.

<sup>2</sup> Baseline contributed to 8% of guideline exceedances.

## APPENDIX 4: RESIDUAL EFFECTS CHARACTERIZATION DEFINITIONS

	General Description	Assessment Report Chapters and VCs							
		Fish and Fish Habitat	Water Quality and Aquatic Biota	Wildlife Resources Caribou Vegetation Resources Soils	Air Quality	GHGs	Economic Environment Accidents and Malfunctions Effects of the Environment Social, including the following VCs: Population and Demographics Community Services and Infrastructure Community Health Land and Resource Use Visual Quality CEAA 2012 5(1)(c)	Archaeological and Heritage Resources	Human Health
<b>Context</b>	The current and future sensitivity and resilience of the VC to change caused by the project. Context draws on the descriptions of the existing conditions for the VC, which reflect cumulative effects of other projects and activities that have been carried out, and especially information about the impact of natural and human-caused trends in the condition of the VC.	<p><b>Low</b> – The indicator has low resiliency or is acutely sensitive to existing conditions</p> <p><b>Moderate</b> – The indicator has moderate resiliency or is mildly sensitive to existing conditions</p> <p><b>High</b> – The indicator has high resiliency or is generally not sensitive to existing conditions</p>							
<b>Magnitude</b>	The expected size or severity of the residual effect. Considers the proportion of the VC affected within the spatial boundaries and the relative effect (e.g., relative to natural annual variation in the magnitude of the VC or other relevant characteristics).	<p><b>Negligible</b> – Project would likely have no measurable effect on fish populations or the function of fish habitat</p> <p><b>Low</b> – Residual effect would result in small measurable changes in</p>	<p><b>Negligible</b>—Project would likely have no measurable change in water quality</p> <p><b>Low</b>—Residual effect would be</p>	<p><b>Negligible</b> – Project would likely have no measurable effect on the VC</p> <p><b>Low</b> – Residual effect would likely result in no measurable effect, or result in a minor</p>	<p><b>Negligible</b>—Project would likely have no measurable change</p> <p><b>Low</b>—Residual effect would be within normal variability of baseline conditions</p>	<p><b>Negligible</b> – No measurable change in provincial, national and global GHG emissions</p> <p><b>Low</b> – Small change to provincial GHG emissions (e.g. &lt;~2%) from baseline</p>	<p><b>Negligible</b> – Project would likely have no measurable change</p> <p><b>Low</b> – Residual effect would likely not be distinguished from baseline case conditions</p> <p><b>Moderate</b> – Residual effect would likely result in</p>	The amount of physical alteration or destruction of a heritage resource that can be expected. The resultant disturbance measured either in the amount or	<p>(Non-carcinogenic substances)</p> <p><b>Negligible</b> – No change from baseline case, below applicable guidelines, or a hazard quotient rating of less than or equal to 0.2</p>

	<p>abundance of fish, or result in the loss of low quality, non-essential fish habitat</p> <p><b>Moderate</b> – Residual effect would likely result in fish mortality with measurable changes in abundance of fish populations, or permanent loss of moderate or high-quality fish habitat.</p> <p><b>High</b> – Residual effect would likely result in large effects on fish abundance occurring at a population level, or measureable effects, including mortality, on provincially listed or SARA-listed fish species, or loss of habitat for provincially-listed or SARA-listed fish species</p>	<p>within normal variability of baseline conditions</p> <p><b>Moderate</b>— Residual effect would likely result in a change to baseline conditions but within regulatory levels and objectives</p> <p><b>High</b>— Residual effect would likely result in changes that exceed regulatory levels or objectives.</p>	<p>measurable effect to the VC</p> <p><b>Moderate</b> – Residual effect would likely result in a clearly defined change to the VC, but remain below a level of effect that could exceed the resilience and adaptability limits of the population</p> <p><b>High</b> – Residual effect would likely be sufficiently large that it approaches or falls within the range of effects that could exceed the resilience and adaptability of the population</p>	<p><b>Moderate</b>—Residual effect would likely increase or decrease with regard to baseline but within regulatory levels and objectives</p> <p><b>High</b>—The Project would itself, or as a substantial contribution in combination with other sources, cause exceedances of objectives beyond the Project boundaries</p>	<p>conditions</p> <p><b>Moderate</b> – GHG emissions would likely result in demonstrative change (&gt;~2%) from provincial baseline conditions, but would remain within historic norms</p> <p><b>High</b> – Change in GHG emissions from baseline conditions would likely be beyond historic norms and a large change from provincial baseline conditions. This could also include a notable change in national emissions while change to global emissions would be small.</p>	<p>demonstrable change, but remain within regulatory criteria or historic norms</p> <p><b>High</b> – Residual effect would likely result in changes that are beyond regulatory criteria or historic norms</p>	<p>degree of disturbance (adapted from Archaeology Branch 1998) as follows:</p> <p><b>Low</b> – minimal effects to resources of low, moderate, or high heritage value</p> <p><b>Moderate</b> – moderate to high effects to resources of low or moderate heritage value</p> <p><b>High</b> – moderate to high effects to resources of high heritage value</p>	<p><b>Low</b> – Hazard quotient rating of greater than 0.2 and potential health effects are mild and unlikely to impact receptors quality of life in any foreseeable manner</p> <p><b>Moderate</b> – Hazard quotient rating of greater than 0.2 and some sensitive individuals could be reasonably expected to experience health effects or require medical intervention</p> <p><b>High</b> – Hazard quotient rating of greater than 0.2 and members of the general population could reasonably be expected to experience health effects or require medical intervention</p>
<b>Extent</b>	The spatial scale over which the residual effect is expected to occur.	<p><b>Project area/ Site-specific</b> – Residual effect is restricted to the Project area or a specific area of the LAA</p> <p><b>Local</b> – Residual effect is restricted to the LAA</p> <p><b>Regional</b> – Residual effect is restricted to the RAA</p> <p><b>Beyond Regional</b> – Residual effect extends beyond the RAA</p> <p><b>Global</b> – Residual effect extends globally (i.e., GHGs)</p>						
<b>Duration</b>	The length of time the residual effect persists (which may be longer than	<b>Temporary</b> – Effect lasting only for a limited period of time.						

	the duration of the physical work or activity that gave rise to the residual effect).	<p><b>Short-term</b> – Residual effect is restricted to the construction, decommissioning or reclamation phases</p> <p><b>Long-term</b> – Residual effect last throughout the operational phase</p> <p><b>Permanent</b> – Residual effect is not likely to recover to baseline</p>
<b>Reversibility</b>	Whether or not the residual effect on the VC can be reversed once the physical work or the activity causing the disturbance ceases.	<p><b>Reversible</b> – Residual effect is reversible</p> <p><b>Irreversible</b> – Residual effect is permanent</p>
<b>Frequency</b>	How often the residual effect occurs and is usually closely related to the frequency of the physical work or activity causing the residual effect.	<p><b>Once/Rare</b> – Residual effect occurs one time or rarely occurs</p> <p><b>Infrequent</b> – Residual effect occurs infrequently at multiple times</p> <p><b>Frequent/ Regular</b> – Residual effect occurs frequently, at regular intervals</p> <p><b>Continuous</b> – Residual effect occurs continuously</p>

## APPENDIX 5: INDIGENOUS GROUP ATTENDANCE

DATE	MEETING PURPOSE	ATTENDANCE BY TREATY 8 NATIONS
09-Mar-13	Introductory Working Group meeting to discuss the EAO process, the role of the Working Group and an overview of Sukunka	No record of attendance
09-May-13	Working Group meeting to discuss the Federal substitution process, draft AIR, baseline work, and scope of effects assessments	Saulteau First Nations and McLeod Lake Indian Band
18-Jun-14	Teleconference to discuss the status of the EA, update on Sukunka drilling program and test pit sampling program, and overview of fieldwork studies completed to date	McLeod Lake Indian Band
01-Oct-14	Site visit to the proposed Sukunka site and Working Group meeting to discuss an overview of the effects assessment and valued components (VCs), overview of Glencore's Application, and an overview of the Application "screening" or evaluation process	West Moberly First Nations and Saulteau First Nations
17-Dec-14	Teleconference to discuss the results of Glencore's effects assessment and proposed mitigation measures	No First Nations in attendance
14-Jan-15	Teleconference to discuss the Application "screening" or evaluation process and expectations of Working Group members	ERM consultant for FNITR
29-Jan-15	Teleconference for Working Group members to ask Glencore about their Application and the EAO to clarify the steps in the Application "screening" process	West Moberly First Nations
19-Jun-15	Working Group meeting to discuss the proposed Sukunka changes and the upcoming rescreening process of Glencore's revised Application	West Moberly First Nations

15-Jul-15	Teleconference for the EAO to clarify the rescreening process for Glencore's revised Application	Saulteau First Nations
01-Sep-15 and 02-Sep-15	Working Group teleconference to provide an overview of the EA process, Application Review schedule, Glencore's effects assessment, and provide an opportunity to discuss the Application	West Moberly First Nations
03-Nov-15 and 04-Nov-15	Working Group meeting to discuss Glencore's responses to review comments and discuss key issues of water quality, water management, fish, wetlands, wildlife, socioeconomics, and health	ERM consultant for FNITR
25-Nov-15	Working Group teleconference to provide an update to the group on the EA and the next steps in Application Review	West Moberly First Nations
31-Mar-16	Teleconference for the caribou sub-working group to discuss impacts to caribou	Doig River First Nation
06-May-16	Caribou sub-working group meeting to discuss caribou information requests and mitigation measures	ERM consultant for FNITR
25-May-16	Caribou sub-working group teleconference to discuss impacts to caribou and proposed mitigation measures	ERM consultant for FNITR
06-Jul-16	Caribou sub-working group teleconference to discuss potential for displacement of caribou from Bullmoose Mountain	No record of attendance
19-Dec-16	Working Group meeting to discuss water treatment, including information requests and questions	No First Nations in attendance
26-Jan-17	Working Group meeting to discuss Glencore's proposed design changes to address water quality concerns	ERM consultant for FNITR and West Moberly First Nations

21-Jun-17	Working Group meeting to allow Glencore to present how their design changes have addressed reviewer's comments and for the Working Group to provide questions and comments	Doig River First Nation
26-Jul-17	Working Group meeting to discuss active water treatment	ERM consultant for FNITR and Doig River First Nation
05-Oct-17	Working Group meeting to discuss Glencore's water quality model and potential impacts to water quality and related VCs	Doig River First Nation and McLeod Lake Indian Band
30-Oct-17	Optional Working Group teleconference to discuss selenium speciation	No First Nations in attendance
30-Nov-17	Working Group teleconference and online meeting to discuss the status of suspension of the Sukunka EA, and discuss design changes that have occurred	Doig River First Nation
13-Aug-18	Teleconference to discuss caribou issues with the caribou sub-working group	West Moberly First Nations
13-Sep-18	Teleconference to discuss caribou issues with the caribou sub-working group	West Moberly First Nations, McLeod Lake Indian Band, Doig River First Nation, Sauteau First Nations, and ERM consultant for FNITR
16-Oct-18	Meeting in Chetwynd, BC, with the caribou sub-working group to discuss caribou issues	West Moberly First Nations, McLeod Lake Indian Band, Doig River First Nation, Sauteau First Nations, and ERM consultant for FNITR
17-Oct-1 and 18-Oct-18	Working Group meeting in Chetwynd, BC, to discuss draft assessment report chapters and findings	West Moberly First Nations, McLeod Lake Indian Band, Doig River First Nation, Sauteau First Nations, and ERM consultant for FNITR
02-Nov-18	Optional Working Group teleconference to discuss social and economic draft assessment report chapters and findings	West Moberly First Nations, McLeod Lake Indian Band and Doig River First Nation
05-Nov-18	Optional Working Group teleconference to discuss social and	West Moberly First Nations and ERM consultant for FNITR

	economic draft assessment report chapters and findings	
08-Nov-18	Optional Working Group teleconference to discuss bat wildlife mitigation plan	No First Nations in attendance
20-Nov-18	Teleconference to discuss caribou issues with the caribou sub-working group	West Moberly First Nations, McLeod Lake Indian Band, and ERM consultant for FNITR
18-Dec-18	Teleconference to discuss caribou issues with the caribou sub-working group	West Moberly First Nations, Sauteau First Nations, and ERM consultant for FNITR
12-Mar-19	Teleconference and in-person meeting to discuss caribou issues with caribou sub-working group	West Moberly First Nations, Sauteau First Nations, McLeod Lake Indian Band, and Doig River First Nation
14-Mar-19	Teleconference with Halfway River First Nation to discuss status of Sukunka EA	Halfway River First Nation, Ecora consultant for HRFN
23-Apr-19	Teleconference with FNITR to discuss draft chapter materials	Sauteau First Nations, McLeod Lake Indian Band, and Doig River First Nation, ERM consultant for the FNITR
13-May-19	Teleconference with Halfway River First Nation to discuss chapter review, caribou	Halfway River First Nation, Ecora consultant for HRFN
18-July-19	Teleconference with caribou sub-working group	West Moberly First Nations, Sauteau First Nations, McLeod Lake Indian Band, Doig River First Nation, Ursus Wildlands consultant for FNITR
25-May-20 and 26-May-20	Teleconference to discuss follow up to the Compass caribou workshop with the caribou sub-working group	West Moberly First Nations, Sauteau First Nations, McLeod Lake Indian Band, Doig River First Nation, Ursus Wildlands consultant for FNITR, Wildlife Infometrics consultant for FNITR, Ecora consultant for HRFN
13-Aug-20	Teleconference to discuss Compass report with caribou sub-working group	West Moberly First Nations, Sauteau First Nations, Doig River First Nation, Ursus Wildlands consultant for FNITR, Wildlife Infometrics consultant for FNITR,
08-Feb-21	Teleconference to discuss the FNITR's extension to analysis report, draft Adaptive Management Framework and the proposed	West Moberly First Nations, Sauteau First Nations, McLeod Lake Indian Band, Halfway River First Nation, Ursus Wildlands consultant for FNITR, Wildlife

	mitigation and offsets with the caribou sub-working group	Infometrics consultant for FNITR, Ecora consultant for HRFN
15-April-21	Optional teleconference for orientation to the synopsis report for the caribou sub-working group	West Moberly First Nations, Sauleau First Nations, Wildlife Infometrics consultant for FNITR, Ecora consultant for HRFN
13-May-21	Working group teleconference to discuss the caribou synopsis report, shared on March 31, 2021	Sauleau First Nations, McLeod Lake Indian Band, Ursus Wildlands consultant for FNITR, Wildlife Infometrics consultant for FNITR, Ecora consultant for HRFN
16-Dec-21	Teleconference with the FNITR to discuss the status of the Sukunka EA and anticipated next steps	West Moberly First Nations, Sauleau First Nations, McLeod Lake Indian Band, and Doig River First Nation, Ursus Wildlands consultant for FNITR
19-Jan-22	Teleconference with the FNITR to discuss Sukunka EA updates	West Moberly First Nations, Sauleau First Nations, McLeod Lake Indian Band, Ursus Wildlands consultant for FNITR, Wildlife Infometrics consultant for the FNITR
02-Feb-22	Teleconference with the FNITR to discuss Sukunka EA updates and upcoming working group meeting	West Moberly First Nations, Sauleau First Nations, McLeod Lake Indian Band, and Doig River First Nation, Ursus Wildlands consultant for FNITR
10-Feb-22	Videoconference to reacquaint Working Group reviewers to Sukunka and to provide an overview of next steps in the Sukunka EA process	West Moberly First Nations, Sauleau First Nations, McLeod Lake Indian Band, and Doig River First Nation
16-Feb-22	Teleconference with Halfway River First Nation to discuss updates to the Sukunka EA	Halfway River First Nation, Ecora consultants for HRFN
17-Feb-22	Videoconference workshop with FNITR to discuss Part C	West Moberly First Nations, Sauleau First Nations, McLeod Lake Indian Band, and Doig River First Nation, Ursus Wildlands consultant for FNITR
22-Feb-22	Biweekly check in with the FNITR	West Moberly First Nations, Sauleau First Nations, McLeod Lake Indian Band, and Doig River First Nation, Ursus Wildlands consultant for FNITR

25-Feb-22	Teleconference with the FNITR to discuss the draft workplan for ongoing caribou discussions	West Moberly First Nations, Sauleau First Nations, McLeod Lake Indian Band, and Doig River First Nation, Ursus Wildlands consultant for FNITR
08-Mar-22	Biweekly check-in with the FNITR	West Moberly First Nations, Sauleau First Nations, McLeod Lake Indian Band, and Doig River First Nation, Ursus Wildlands consultant for FNITR
10-Mar-22	Teleconference with HRFN to discuss updates to the Sukunka EA	Halfway River First Nation, Ecora consultant for HRFN
17-Mar-22	Workshop with the FNITR to discuss EAO's report and Part C.	West Moberly First Nations, Sauleau First Nations, McLeod Lake Indian Band, and Doig River First Nation, Ursus Wildlands consultant for FNITR
30-Mar-22	Teleconference with HRFN to discuss updates to the Sukunka EA	Ecora consultant for HRFN
05-April-22	Teleconference with the FNITR to discuss upcoming caribou sub-working group meetings and workshops	West Moberly First Nations, Sauleau First Nations, McLeod Lake Indian Band, and Doig River First Nation, Ursus Wildlands consultant for FNITR
7-Apr-22	Videoconference to provide an update on the next steps in the EA process in light of the addition suspension requested by Glencore and the forthcoming caribou technical workshops	West Moberly First Nations, Sauleau First Nations, McLeod Lake Indian Band, and Doig River First Nation, Ursus Wildlands consultant for FNITR
24-May-22	Videoconference to discuss caribou issues (displacement) with caribou sub-working group	West Moberly First Nations, Sauleau First Nations, McLeod Lake Indian Band, and Doig River First Nation, Ursus Wildlands consultant for FNITR
26-May-22	Videoconference to discuss caribou issues (adaptive management) with caribou sub-working group	West Moberly First Nations, Sauleau First Nations, McLeod Lake Indian Band, and Doig River First Nation, Ursus Wildlands consultant for FNITR
31-May-22	Videoconference to discuss caribou issues (cumulative effects, wolf predation, and the results of the caribou technical workshops) with the caribou sub-WG	West Moberly First Nations, Sauleau First Nations, McLeod Lake Indian Band, and Doig River First Nation, Ursus Wildlands consultant for FNITR
16-June-22	Biweekly check in with the FNITR	West Moberly First Nations, Sauleau First Nations, McLeod Lake Indian Band,

		and Doig River First Nation, Ursus Wildlands consultant for FNITR
28-June-22	Biweekly check in with the FNITR	West Moberly First Nations, Sauteau First Nations, McLeod Lake Indian Band, and Doig River First Nation, Ursus Wildlands consultant for FNITR
07-July-22	Teleconference with HRFN to discuss Sukunka EA updates	Ecora consultant for HRFN
12-July-22	Biweekly check-in with the FNITR	West Moberly First Nations, Sauteau First Nations, McLeod Lake Indian Band, and Doig River First Nation, Ursus Wildlands consultant for FNITR
26-July-22	Biweekly check-in with the FNITR	West Moberly First Nations, Sauteau First Nations, McLeod Lake Indian Band, and Ursus Wildlands consultant for FNITR
18-Aug-22	Biweekly check-in with the FNITR	West Moberly First Nations, Sauteau First Nations, McLeod Lake Indian Band, and Doig River First Nation, Ursus Wildlands consultant for FNITR