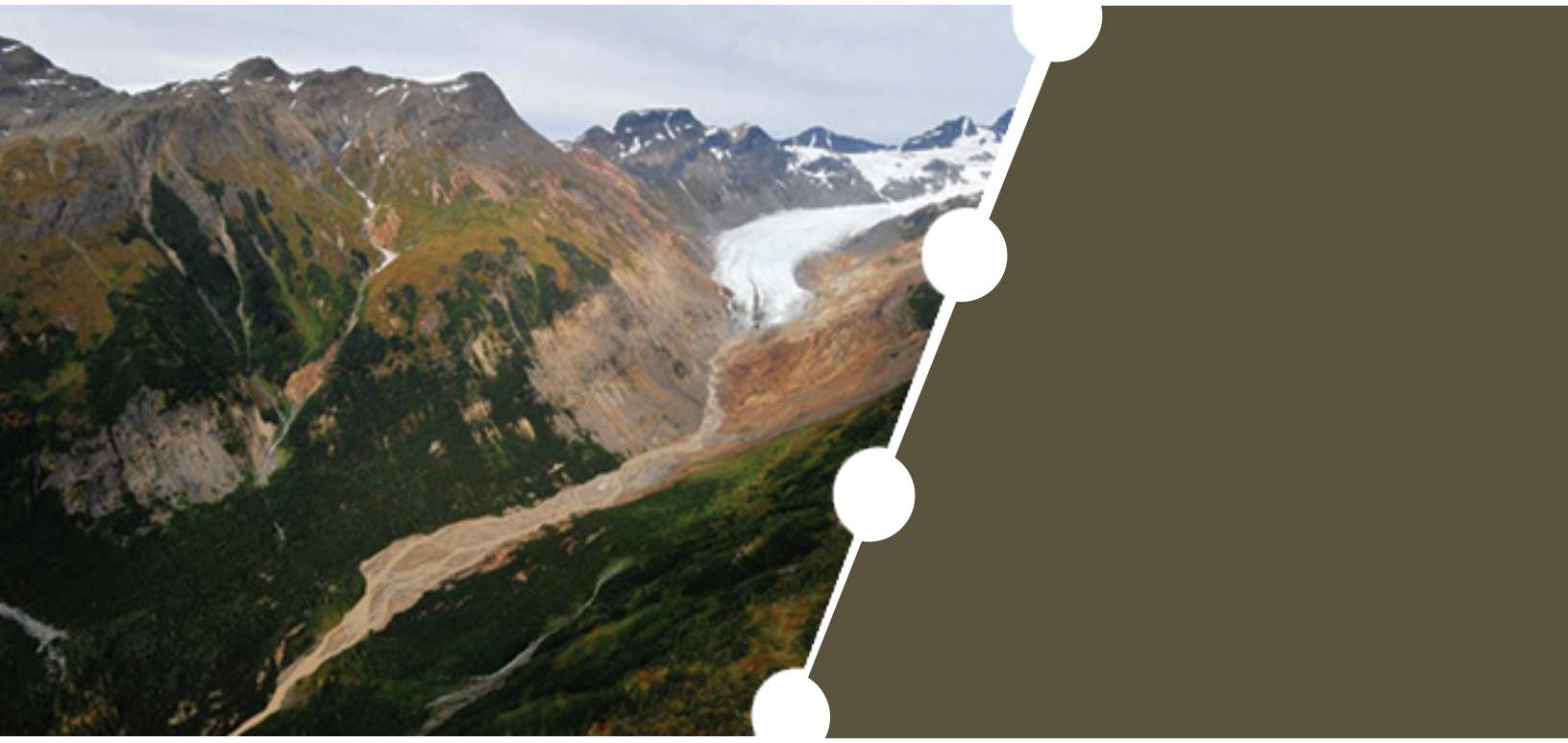
Canadian Environmental Assessment Agency
Agence canadienne d'évaluation environnementale

# KSM (Kerr-Sulphurets-Mitchell) Project

## Comprehensive Study Report



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Canada

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## Executive Summary

Seabridge Gold Inc., (the proponent) proposes to develop a gold, copper, silver, and molybdenum mine (the Project), spanning the Unuk and Bell-Irving watersheds approximately 65 km northwest of Stewart, British Columbia (BC). The Project is expected to have an average ore extraction rate of approximately 130 000 tonnes per day over an anticipated 52-year mine life. Ore would be mined by a combination of open pit and underground mining methods from four mineral deposits: the Mitchell, Sulphurets, Kerr, and Iron Cap deposits.

The Proponent may require authorizations from Fisheries and Oceans Canada under the *Fisheries Act*, Environment Canada under the *International Rivers Improvement Act* and *the Metal Mine Effluent Regulations*, and Natural Resources Canada under the *Explosives Act*.

The Canadian Environmental Assessment Agency (the Agency) prepared this Comprehensive Study Report (CSR) in consultation with Fisheries and Oceans Canada, Environment Canada, Natural Resources Canada, Transport Canada, and Health Canada following a technical review of the proponent's Environmental Impact Statement and an evaluation of the environmental effects of the Project.

The proponent, working with federal, provincial, and Nisga'a Lisims governments and impacted Aboriginal groups, identified valued components (VCs), which are notable features of the natural, human or social environment, that are likely to be affected by the Project. The Environmental Impact Statement (EIS) contains the proponent's assessment of the Project's effects on these VCs, including ground and surface water quality and quantity, fish and fish habitat, wildlife, wetlands, and human health.

The Agency evaluated the Project's potential to cause significant adverse environmental effects based on a review of the proposed project and its predicted effects on the VCs. In addition, the environmental effects on the Nisga'a Nation and the effects of the project on the existing and future economic, social, and cultural well-being of Nisga'a citizens, as set out in the Nisga'a Final Agreement (NFA), were assessed as part of the Environmental Assessment (EA).

The potential environmental effects of greatest concern identified during the environmental assessment include:

- Potential water quality degradation (through increased concentrations of selenium) in the Unuk watershed;
- Potential changes to ground and surface water quantity in the Unuk and Bell-Irving watersheds;
- Potential reductions in Dolly Varden habitat within the Teigen Creek and Treaty Creek watersheds;
- Potential effects on wildlife habitat including moose, grizzly bears, mountain goats, wetland birds and western toads;
- Potential mortality of moose from vehicle related collisions primarily on Highway 37/37A;
- Potential effects on human health from changes in the quality of water and country foods;
- Potential loss of extent and function of wetlands within the Teigen Creek and Treaty Creek watersheds; and
- Potential effects on current use of lands and resources for traditional purposes by Aboriginal persons including hunting and fishing.

Residents of the United States, including tribal groups, raised concerns over the Project's potential transboundary impacts on fish, recreational and commercial fisheries, and human health from degraded water quality and changes in water quantity in the Unuk River. The Agency is satisfied that identified mitigation measures for the Project would address potential impacts in Alaska on fish; recreational and commercial fisheries and human health from changes to water quality and quantity in the Unuk River.

The following potential effects on the economic, social and cultural well-being of Nisga'a citizens were also identified:

- Potential changes in employment and business opportunities for Nisga'a citizens;
- Potential changes in demand for services, due to increased in-migration to Nisga'a villages, primarily in the areas of housing, education and recreation services;
- Potential changes in expenditures by the Nisga'a Lisims Government in response to changes in demand for services;
- Potential changes to social well-being in response to changes in income; and
- Potential changes in time spent speaking the Nisga'a language, participating in cultural practices and activities (e.g. subsistence harvesting, traditional ceremonies) in response to changes in employment status.

Measures to reduce, eliminate or compensate for the Project's potential adverse environmental effects were identified and included:

- The storage and treatment of contact water prior to discharge into the Unuk watershed;
- The treatment and containment of mine tailings using a geo-membrane lined tailings management facility;
- The use of grout curtains and collection ponds to reduce seepage of degraded groundwater;
- The development of fish habitat compensation plans for lost fish habitat;
- The capture and relocation of Dolly Varden from the proposed tailings management area;
- The implementation of traffic management measures such as reducing speeds, and GPS tracking to reduce incidents of wildlife collisions;
- The installation of gates and other access measures at key access points to the project area to reduce increased access to hunting and fishing at pre-project levels; and
- The implementation of several management plans including the metal-leaching/acid rock drainage management plan, water management plan, selenium management plan, wildlife management plan, fish and aquatic habitat management plan, noise management plan, vegetation clearing management plan, and access management plan.

The Agency concludes that the project is not likely to cause significant adverse environmental effects, taking into account the implementation of mitigation measures described in this comprehensive study report.

With respect to potential effects on residents of Nisga'a lands, or Nisga'a interests, the Agency identified potential adverse, but not significant environmental effects on Nisga'a Nation treaty interests in relation to fisheries, wildlife and migratory birds. The Agency concludes that the Project is likely to result in overall positive effects on social and cultural well-being and a net overall increase in economic well-being of Nisga'a citizens taking into consideration the proponent's plans to minimize potential adverse effects on economic, social and cultural well-being.

Following public consultation on this report, the Minister of the Environment will decide whether, taking into account the implementation of mitigation measures, the Project is likely to cause significant adverse environmental effects. At the same time, the Minister will issue an NFA Project Recommendation in accordance with Chapter 10 of the NFA. The Project will then be referred back to the Responsible Authorities for the appropriate course of action in accordance with section 37 of the former Act and the NFA Project Recommendation.

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## List of Acronyms and Abbreviations

| | |
|---|---|
| **Agency:** | Canadian Environmental Assessment Agency |
| **AIR:** | Application Information Requirements |
| **ARD:** | Acid rock drainage |
| **BC:** | British Columbia |
| **BCEAO:** | British Columbia Environmental Assessment Office |
| **BC FLNRO:** | British Columbia Ministry of Forests, Lands and Natural Resource Operations |
| **BC MEM:** | British Columbia Ministry of Energy and Mines |
| **BC MOE:** | British Columbia Ministrry of th Enviornment |
| **BC MOTI:** | British Columbia Ministry of Transportation and Infrastructure |
| **BCWQG:** | British Columbia Water Quality Guidelines |
| **Bt:** | Billion tonnes |
| **CCAR:** | Coulter Creek Access Road |

| | |
|---|---|
| **CCME:** | Canadian Council of Ministers of the Environment |
| **CDA:** | Canadian Dam Association |
| **CIL:** | Carbon-in-leach |
| **COPC:** | Contaminants/chemicals of Potential Concern |
| **COSEWIC:** | Committee on the Status of Endangered Wildlife in Canada |
| **DFO:** | Department of Fisheries and Oceans Canada |
| **EA:** | Environmental Assessment |
| **EC:** | Environment Canada |
| **EEM:** | Environmental Effects Monitoring |
| **EIS:** | Environmental Impact Statement |
| **EMP:** | Environmental Management Plan |
| **ESCIA:** | Economic, Social, and Cultiral Impact Assessment |
| **FSC:** | Food, Social and Ceremonial |
| **former Act:** | former *Canadian Environmental Assessment Act S.C. 1992, c. 37, 1992* |
| **GPS:** | Global Positioning System |
| **ha:** | Hectare |
| **HADD:** | Harmful alteration, disruption, or destruction (of fish habitat) |
| **HDS:** | High density sludge |
| **HHMP:** | Human Health Monitorig Plan |
| **HHRA:** | Human Health Risk Assessment |
| **km:** | Kilometre |
| **KSM:** | Proposed (Kerr-Sulphurets-Mitchell) Project |
| **L/s:** | Litres per second |
| **LSA:** | Local Study Area |
| **m:** | Metre(s) |
| **masl:** | Metres above sea level |
| **MDT:** | Mitchell Diversion Tunnels |
| **ML:** | Metal Leaching |
| **MMER:** | *Metal Minning Effluent Regulations* |
| **MNBC:** | Metis Nation British Columbia |
| **Mt:** | Million tonnes |
| **MTDT:** | McTagg Twinned Diversion Tunnels |
| **MTT:** | Mitchell-Treaty Twinned Tunnels |
| **MW:** | Megawatts |
| **NFA:** | Nisga’a Final Agreement |
| **NLG:** | Nisga’a Lisims Government |
| **NTL:** | Northwest Transmission Line |
| **NRCan:** | Natural Resources Canada |

| | |
|---|---|
| **NWA:** | Nass Wildlife Area |
| **OPC:** | Ore Preparation Complex |
| **PAG:** | Potentially acid-generating |
| **PM:** | Particulate matter |
| **$PM_{2.5}$:** | Particulate matter less than 2.5 microns in diameter |
| **$PM_{10}$:** | Particulate matter less than 10 microns in diameter |
| **Proponent:** | Seabridge Gold Inc. |
| **PTMA:** | Processing and Tailing Management Area |
| **RA:** | Responsible Authority |
| **RSA:** | Regional Study Area |
| **RSF:** | Rock Storage Facility |
| **SARA:** | *Species at Risk Act* |
| **t:** | Tonne(s) |
| **TC:** | Transport Canada |
| **TCAR:** | Treaty Creek Access Road |
| **TCC:** | Tahltan Central Council |
| **TDI:** | Tolerable Daily Intake |
| **TK:** | Traditional Knowledge |
| **TMF:** | Tailings Management Facility |
| **TU:** | Traditional Use |
| **VC:** | Valued Component(s) |
| **WRMF:** | Waste Rock Management Facility |
| **WSD:** | Water Storage Dam |
| **WSF:** | Water Storage Facility |
| **WTP:** | Water Treatment Plant |

# 1. Introduction

## Overview

Seabridge Gold Inc. (the proponent) proposes to develop a gold, copper, silver, and molybdenum mine (the Project), in the Kerr, Sulphurets and Mitchell Creek watersheds approximately 65 km northwest of Stewart, British Columbia (BC) (Figure 1.0.1).

The Project is expected to have an average ore extraction rate of approximately 130000 tonnes per day over an anticipated 52-year mine life. Ore would be mined by a combination of open pit and underground mining methods from four mineral deposits: the Mitchell, Sulphurets, Kerr, and Iron Cap deposits. Waste rock storage dumps, an ore grinding circuit, water storage dam, water treatment plant, selenium treatment plant, several small hydroelectric projects, diversion tunnels, access roads, camp facilities, explosives factory and magazine, and supporting infrastructure will also be located at the Mine Site.

The Mitchell-Treaty Twinned Tunnels (MTT), a pair of 23 kilometer long tunnels, will transport crushed ore to a concentrator plant and Tailings Management Facility (TMF) located in the Treaty and Teigen Creek drainages of the Bell-Irving River (collectively referred to as the Processing and Tailings Management Area (PTMA)).

Electricity will be provided to the Mine Site via the MTT and a transmission line will connect the PTMA to the Northwest Transmission Line. Two separate access roads, the Treaty Creek access road and the Coulter Creek access road will provide access for the trucking of supplies to the mine and ore concentrate to Highway 37.

**Table 1.0.1: Project Summary**

| | |
|---|---|
| **Proponent** | Seabridge Gold Inc.<br>Brent Murphy, Vice President Environmental Affairs,<br>400-106 Front Street East<br>Toronto, Ontario M5A 1E1<br>**info@seabridgegold.net** |
| **Federal Environmental Assessment Contact** | Canadian Environmental Assessment Agency<br>Garett Cooper, Project Manager<br>410-701 West Goergia Street, Vancouver, BC V7Y 1C6<br>Telephone: 604-666-3688; Fax: 604-666-6990<br>**KSM.Project@ceaa-acee.gc.ca** |
| **Canadian Environmental Assessment Registry (CEAR)** | http://www.ceaa-acee.gc.ca<br>CEAR number: 10-03-51746 |

**Figure 1.0.1: KSM Project Location**


Source: Seabridge Gold

## 1.1 Environmental Assessment Process

### Federal EA Process

A federal environmental assessment (EA) is required for the Project under the former *Canadian Environmental Assessment Act S.C. 1992, c. 37, 1992* (former Act) due to actions that may be undertaken by Fisheries and Oceans Canada (DFO), Natural Resources Canada (NRCan) and Environment Canada (EC). The former Act applied to federal regulatory authorities when they contemplated certain actions or decisions that would enable a project to proceed in whole or in part.

The *Canadian Environmental Assessment Act, 2012* came into force on July 6, 2012. In accordance with the transition provisions of this legislation, the comprehensive study of the Project is to be completed under the former Act.

The Project is subject to a comprehensive study type EA under the former Act pursuant to paragraphs 16(b) and 16(c) of the *Comprehensive Study List Regulations*:

(b) *The proposed construction, decommissioning or abandonment of a gold mine, other than a placer mine, with an ore production capacity of 600 t/d or more*; and

(c) *The proposed construction, of a metal mill with an ore input capacity of 4000 t/d or more.*

The Canadian Environmental Assessment Agency (Agency) became legally responsible for the conduct of the comprehensive study in accordance with amendments to the former Act that came into force in July, 2010. Federal Authorities providing expert information or knowledge during the EA process included DFO, EC, NRCan, Transport Canada (TC), Health Canada (HC), Aboriginal Affairs and Northern Development Canada, Heritage Canada and Statistics Canada.

### Purpose of the Comprehensive Study Report

This report presents the Agency's analysis of whether the Project is likely to cause significant adverse environmental effects. The report's conclusions are based on a review of the proponent's environmental impact statement (EIS) and associated documents, consideration of Aboriginal and public comments, and advice offered by federal departments. The Agency prepared this report in collaboration with DFO, EC, NRCan, TC, and HC.

**This report presents the Agency's analysis of whether the Project is likely to cause significant adverse environmental effects.**

The Minister of the Environment will consider this report and comments received about this report from the Nisga'a Lisims Government (NLG), other Aboriginal groups and the public when making and issuing an EA decision statement for the Project. The Minister will also issue a federal Nisga'a Final Agreement (NFA) Project Recommendation at the same time as she makes her EA decision. More details on the NFA are provided below.

The Minister may request additional information or require that public concerns be addressed further before issuing the EA decision. The Minister will refer the Project back to DFO, EC,

and NRCan following the EA decision statement to allow them to take the appropriate course of action in accordance with section 37 of the former Act. Any subsequent decisions by these departments must also take the NFA Project Recommendation into account.

### Cooperative Environmental Assessment Process

The Project is also subject to an EA under the *British Columbia Environmental Assessment Act (2002)*. The governments of Canada and British Columbia conducted the EA cooperatively in accordance with the principles of the Canada-BC Agreement on Environmental Assessment Cooperation (Cooperation Agreement, 2004). This cooperative process included a working group comprised of federal and provincial officials, the NLG and Aboriginal groups, local government agencies, and representatives of United States federal and Alaska state agencies.

### Nisga'a Final Agreement

The NFA came into effect in May 2000 under the *Constitution Act* and represents the first modern treaty in BC and the first treaty in Canada to incorporate both land claims and constitutionally protected self-government provisions. The NFA establishes the decision-making authority of the NLG and the lands over which the Nisga'a Nation has law-making power and jurisdiction. Chapter 10 of the NFA outlines specific provisions for EAs that are required under federal, provincial, and Nisga'a law.

The Project was subject to the NFA because it may reasonably be expected to have adverse environmental effects on residents of Nisga'a Lands, Nisga'a Lands or Nisga'a interests set out in the agreement. Requirements under Chapter 10, paragraph 8 were included in the EA in addition to the requirements of the former Act. The Government of Canada considered whether the Project could reasonably be expected to have: 1) adverse environmental effects on residents of Nisga'a Lands, Nisga'a Lands, or Nisga'a interests set out in the NFA (i.e., effects under paragraph 8(e) of Chapter 10 of the NFA) and 2) effects on the existing and future economic, social, and cultural well-being of Nisga'a citizens (i.e., effects under paragraph 8(f) of Chapter 10 of the NFA).

A federal approach was established in February 2011, following consultation with the NLG and the Province of BC to clarify how the Government of Canada would meet Chapter 10, paragraph 8 requirements in the EA, including the assessment of effects under paragraphs 8(e) and 8(f) and the issuance of a Ministerial NFA Project Recommendation.

The Government of Canada worked collaboratively with the NLG and the Government of BC to facilitate the assessment of 8(e) and 8(f) effects as part of the comprehensive study. The proponent conducted an economic, social, and cultural impact assessment (ESCIA) on the well-being of Nisga'a citizens (i.e., 8(f) effects) based on a work plan that was required by the joint Application Information Requirements (AIR). Effects defined under 8(e) were described in the EIS as part of the proponent's analysis of the Project's effects on environmental valued components (VCs).

Chapter 6 of this report examines both 8(e) and 8(f) effects on Nisga'a citizens, lands, and interests, and provides the federal perspective on these effects. This chapter, together with (1) any comments received during the final public consultation opportunity on the comprehensive study report (CSR), and (2) any agreements between the proponent and the NLG concerning the effects of the Project, will inform the Minister of the Environment's NFA Project Recommendation on whether or not the Project should proceed.

The scope of the Project for this environmental assessment (EA) includes all physical works and activities associated with the construction, operation, and decommissioning of the Project.

# 2. Project Description – Scope of Project

The scope of the Project for this environmental assessment (EA) includes all physical works and activities associated with the construction, operation, and decommissioning of the Project.

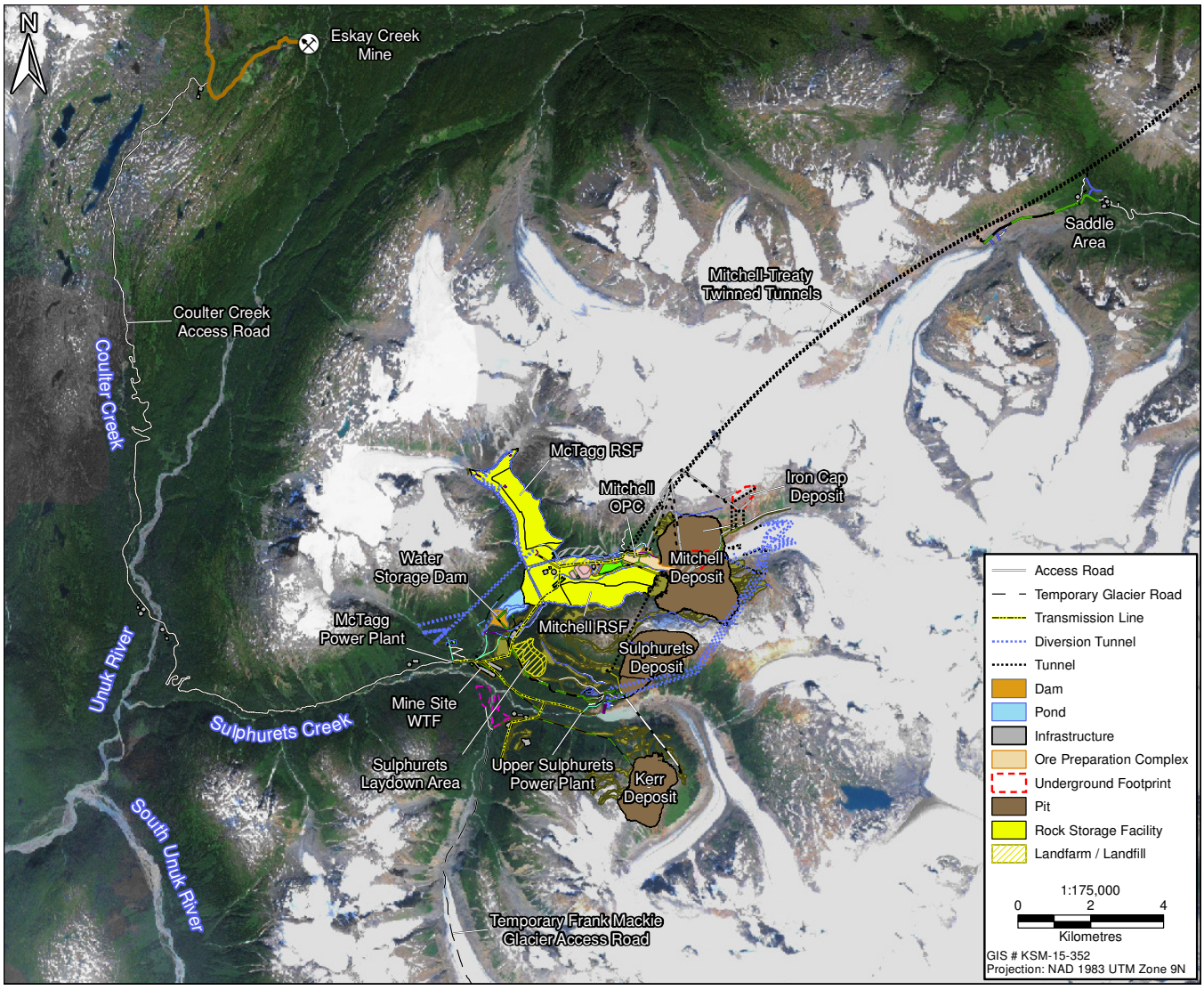
## 2.1 Project Components

The Project consists of the Mine Site, and the Processing and Tailing Management Area (PTMA) which are connected by the Mitchell-Treaty Twinned Tunnel (MTT).

### Mitchell-Treaty Twinned Tunnel (MTT)

The MTT consists of two parallel 23 km-long tunnels; one for personnel and supply access, and another for the ore conveyor, transmission line, and diesel and water pipelines.

**Figure 2.1.1: The KSM Mine Site and Mitchell Treaty Twinned Tunnel Located in the Mitchell and Sulphurets Creeks Drainage Basin / Unuk River Watershed**



## Mine Site

The Mine Site is located in the drainage basin of Mitchell and Sulphurets creeks, which are part of the trans-boundary (Canada-United States of America) Unuk River watershed (Figure 2.1.1). The Mine Site includes:

- Three separate open pit mines (Kerr, Sulphurets, and Mitchell deposits);
- Two underground block cave mines (Mitchell and Iron Cap deposits) and its ancillary infrastructure (e.g. conveyors, access ramps);
- An Explosives manufacturing facility;
- The Mitchell ore preparation complex (ore storage, fuel storage, rock crusher, electrical substation);
- Three waste rock storage areas (McTagg and Mitchell Rock Storage Facilities, and the Sulphurets Pit);
- The Mitchell Diversion tunnels and Mitchell pit north wall dewatering adits;
- The McTagg Twinned Diversion Tunnels and associated works;
- The Sulphurets Mitchell Conveyer Tunnel;
- Water Storage Facility, including a dam, a reservoir, seepage pond and a downstream Water Treatment Plant near Mitchell Creek;
- A selenium treatment plant;
- The Upper Sulphurets and McTagg power plants and associated penstocks, located in Sulphurets and Gingras creeks;
- Construction camps;
- Temporary water treatment plants during construction;
- Construction camps (10 ranging from 40-to-800 person capacity), an operation camp (minimum 350-person capacity), and administration facilities; and
- Coulter Creek Access Road (CCAR), a 35 km road connecting the Mine Site to Highway 37 via the Eskay Creek mine access road.

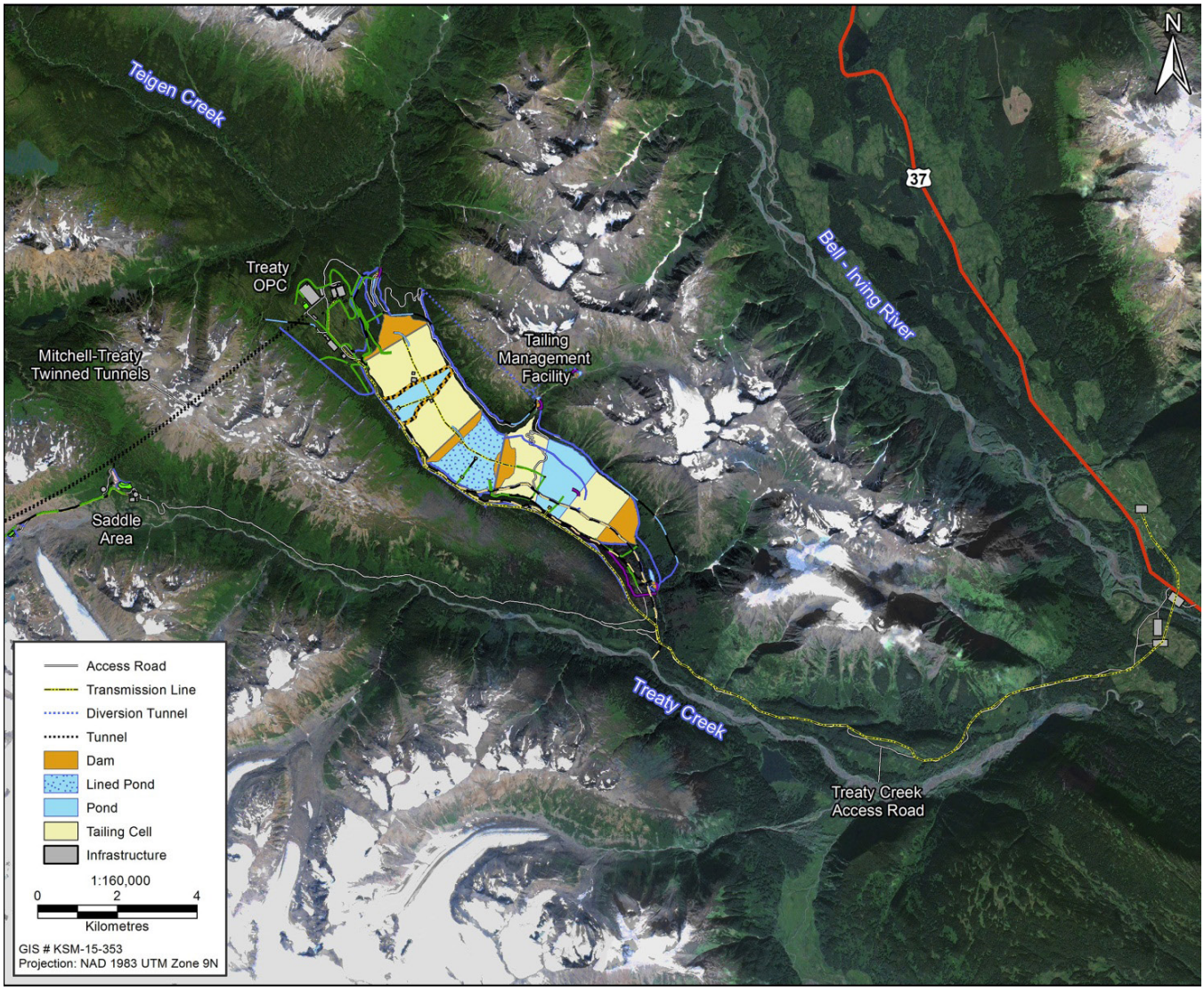
## Processing and Tailing Management Area

The PTMA is located in the upper tributaries of Teigen and Treaty creeks, which flow into the Bell-Irving River (Figure 2.1.2). The PTMA includes:

- Treaty Ore Preparation Complex (OPC) - ore storage, fuel storage, rock crusher, electrical substation, truck load-out facility;
- Treaty Process Plant, with grinding/flotation and carbon-in-leach (CIL) gold-silver recovery circuits;
- Tailings Management Facility (TMF) (comprising a north, centre (geomembrane lined), and south cell),associated access roads, diversion tunnels, and seepage ponds;
- Landfills;
- An operation camp (minimum 250-person capacity);
- Treaty Creek Access Road (TCAR), a 29 km road connecting the PTMA to Highway 37; and
- Transmission Line (287 kV), a 28.5 km line connecting the PTMA to the Northwest Transmission Line.

**The Project consists of the Mine Site, and the Processing and Tailing Management Area (PTMA) which are connected by the Mitchell-Treaty Twinned Tunnel (MTT).**

**Figure 2.1.2: General Layout of the Processing and Tailing Management Area**




## 2.2 Project Activities and Schedule

Table 2.2.1 lists the activities required for construction, operation, closure and post-closure phases of the Project. See Appendix A for a complete project description containing all activities and components.

**Table 2.2.1: Project Activities and Schedule**

| | Project Activities | Details |
|---|---|---|
| Construction - 5 yrs | Constructing Mine Site Infrastructure | • Preparing Open Pit – site clearing, benching, ore/gravel stockpiles<br>• Preparing Underground Mining – Constructing access ramps, ventilation shafts, ore stockpiles |
| | Constructing Waste and Water Management Infrastructure | • Treaty Process Plant,<br>• Tailing Management Facility,<br>• Mitchell Ore Preparation Complex<br>• Mitchell-Treaty Twinned Tunnel<br>• Water Treatment Plant, Water Storage Facility<br>• Selenium Treatment Plant<br>• Rock Storage Facilities (Mitchell and McTagg), and diversion tunnels and ditches |
| | Constructing Ancillary Infrastructure | • Installing primary crusher<br>• Access Routes – temporary Frank Mackie Glacier route, Coulter Creek and Treaty Creek roads, and on-site roads<br>• Explosives manufacturing and storage facilities<br>• Transmission line (287 kV) connecting to Northwest Transmission Line<br>• Camps (operation and construction) and administration buildings<br>• Soil salvage from surface footprint disturbance |
| Operation - 51.5 yrs | Mining | • Mining (open pit and underground block cave) from Mitchell, Sulphurets, Kerr, and Iron Cap deposits<br>• Manufacturing, handling and storing explosives<br>• Managing fuel and materials |
| | Ore Processing and Transporting | • Grinding and processing ore<br>• Conveying ore to the PTMA via Mitchell-Treaty Twinned Tunnel<br>• Transporting (via truck) concentrate by truck to Stewart, BC<br>• Transporting (via truck) Molybdenum to Prince Rupert |
| | Managing Waste, Water and Site | • Managing tailings<br>• Treating and managing water, including diverting non-contact water<br>• Storing waste rock in the Mitchell and McTagg Rock Storage Facilities and Sulphurets Pit<br>• Conducting advance reclamation (North Cell Tailing Management Facility)<br>• Closing construction camps |
| Closure – 3 yrs | Site Decommissioning | • Backfilling Sulphurets Pit with waste rock, and flooding the Mitchell Pit<br>• Decommissioning and re-contouring roads (except for Treaty Creek Access Road which is needed for continued monitoring), and removal of culverts<br>• Removing equipment, camps and administrative buildings |
| | Site Reclamation | • Laying topsoil lay-down and replanting vegetation in footprint and overburden areas<br>• Construction of habitat |
| Post-closure – 250 yrs | Long-term Site Reclamation | • Continue operating Water Treatment and Water Storage Facilities until discharge quality meets targets<br>• Reclaiming of Coulter Creek Access Road and the PTMA<br>• Conducting Environmental Monitoring as needed |

# 3. Scope of Environmental Assessment

A scoping process was conducted to focus the EA on relevant factors and concerns and to establish its temporal and spatial boundaries.

## 3.1 Factors to be Considered

Factors that were considered as part of the comprehensive study pursuant to subsections 16(1) and 16(2) of the former Act are:

- the environmental effects of the Project, including the environmental effects of malfunctions or accidents that may occur in connection with the Project and any cumulative environmental effects that are likely to result from the Project in combination with other projects or activities that have been or shall be carried out;
- the significance of the environmental effects referenced above;
- comments from the public that were received in accordance with the former Act and the regulations;
- measures that are technically and economically feasible and that would mitigate any significant adverse environmental effects of the Project;
- the purpose of the Project;
- alternative means of carrying out the Project that are technically and economically feasible and the environmental effects of any such alternative means;
- the need for, and the requirements of, any follow-up program in respect of the Project; and
- the capacity of renewable resources that are likely to be significantly affected by the Project to meet present and future needs.

The environmental effects of the Project on Nisga'a Lands, residents of Nisga'a Lands, or Nisga'a interests were included in the assessment of environmental effects defined in paragraph 2(1)(a) and (b) of the former Act, to meet the requirements of Chapter 10, paragraph 8(e) of the Nisga'a Final Agreement (NFA).

The effects on the existing and future economic, social, and cultural well-being of Nisga'a citizens as defined in Chapter 10, paragraph 8(f) of the NFA were considered as a "matter relevant to the comprehensive study" under paragraph 16(1)(e) of the former Act.

The Agency also determined that the EA, in accordance with paragraph 16(1)(e), would include a description of the need for the Project, an evaluation of the alternatives to the Project, and an examination of the benefits to Canadians as a result of the EA process.

## 3.2 Scope of the Factors and Associated Spatial and Temporal Boundaries

The EA focused on aspects of the environment, referred to as valued components (VCs), that have particular value or significance and may be affected by the Project. Key VCs were identified by the proponent in consultation with the working group and then incorporated into in the development of the joint Application Information Requirements (AIR), which were approved by the BC Environmental Assessment Office (BC EAO) and the Agency on January 31, 2011. The proponent's analysis presented in its EIS is based on the direction provided in the AIR.

The spatial boundaries for each VC encompass the geographic extent over which the Project's potential environmental effects are expected to be measureable (see Table 3.2.1 for key VCs) as specified in the AIR. The area encompassed by these boundaries is referred to as: (1) the local study area (LSA), which is the maximum area within which project-related environmental effects are measured with a reasonable degree of accuracy and confidence; and (2) the regional study area (RSA), which includes the LSA and areas related to other projects whose potential residual effects could interact with the residual effects of the Project. Temporal boundaries are based on the timing and duration of project activities that could adversely affect the environment. Temporal boundaries for the assessment were: construction (5 years), operations (51.5 years), closure (3 years), and post-closure (250 years).

**Table 3.2.1: Key VCs[1] and Spatial Boundaries[2]**

| Aspect of the Environment | Valued Component Considered | Spatial Boundaries (Local Study Area [LSA] & Regional Study Area [RSA]) |
|---|---|---|
| Groundwater Quantity | • Mine Site – changes in groundwater levels and flow patterns for mine pits, block caves, Water Storage Facility and Rock Storage Facility<br>• PTMA – changes in groundwater levels and flow patterns within groundwater environment surrounding the Tailings Management Facility (TMF) | • LSA = Mine Site (high mountain watershed extending downstream to the confluence of Sulphurets Creek with the Unuk River)<br>• LSA = PTMA (Treaty Creek, Bell-Irving River, Teigen Creek, and Teigen West Tributary)<br>• RSA include both LSAs and Coulter and Treaty Creeks Access Corridors, and nearby Brucejack and Snowfield Mining project footprints |
| Groundwater Quality | • Mine Site – concentrations of dissolved metals in groundwater<br>• PTMA – concentrations of dissolved minerals downstream of the North Cell seepage dam | • LSA = Mine Site (high mountain watershed extending downstream to the confluence of Sulphurets Creek with the Unuk River)<br>• LSA = PTMA (Treaty Creek, Bell-Irving River, Teigen Creek, and Teigen West Tributary)<br>• RSA include both LSAs and Coulter and Treaty Creeks Access Corridors, and Brucejack and Snowfield Mining project footprints |
| Surface Water Quantity | • Mine Site – changes in annual, peak and low flow<br>• PTMA – changes in annual, peak and low flow | • LSA (Mine Site) = 695 km$^2$ (Sulphurets, Mitchell, and Gingras Creeks)<br>• RSA (Mine Site) = 2899 km$^2$ (LSA and Unuk watershed)<br>• LSA (PTMA) = 611 km$^2$ (Teigen and Treaty Creeks)<br>• RSA (PTMA) = 4627 km$^2$ (LSA and Bell-Irving watershed) |

1 Key VCs for the purposes of this CSR are those VCs for which government officials, Aboriginal groups, or members of the public expressed concerns regarding the Project's potential effects.

2 Spatial boundaries for each VC were specified in the AIR which was approved by BC EAO and the Agency on January 31, 2011 (with one exception being Current Use of Lands and Resources for Traditional Purposes by Aboriginal peoples which was developed by the Agency).

*Table 3.2.1: Key VCs and Spatial Boundaries continued*

| Aspect of the Environment | Valued Component Considered | Spatial Boundaries (Local Study Area [LSA] & Regional Study Area [RSA]) |
|---|---|---|
| Surface Water Quality | • Mine Site – selenium concentrations<br>• PTMA – selenium | • LSA (Mine Site) = 261 km$^2$ (Sulphurets, Mitchell, and Gingras Creeks)<br>• RSA (Mine Site) = 2847 km$^2$ (LSA and Unuk watershed)<br>• LSA (PTMA) = 611 km$^2$ (Teigen and Treaty Creeks)<br>• RSA (PTMA) = 4627 km$^2$ (LSA and Bell-Irving watershed) |
| Fish and Fish Habitat (Mine Site and PTMA) | • Fish Habitat Loss and Alteration<br>• Dolly Varden (direct mortality from fish relocation) | • LSA = 34198 ha, includes the Unuk River and Coulter, and the Bell-Irving River and North Treaty, Snowbank, South Teigen, Teigen, Treaty and Tumbling Creeks<br>• RSA = 70876.4 ha and is the LSA plus the Treaty/Bell-Irving confluence, the Unuk River at the Canada/US Border, the south Unuk River, and West Teigen creek. |
| Wetlands | • Wetland extent and function at PTMA | • The LSA = 10021 ha which includes the Project footprint plus a 100 m buffer zone<br>• The RSA = 729784 ha which includes the Unuk, Bell-Irving and Bowser watersheds |
| Wildlife, Wildlife Habitat | • Moose – habitat loss and alteration and vehicle related direct mortality<br>• Mountain Goat – habitat loss and alteration and sensory disturbance<br>• Grizzly Bear – habitat loss or alteration<br>• Western Toad (SARA[3]) – direct mortality | • The LSA = 44983 ha which includes the Project footprint (with a 1.5 kilometer buffer)<br>• The RSA = 338000 ha and extends 24 km north and 24.5 km south of the Project footprint |
| Current Use of Lands and Resources for Traditional Purposes by Aboriginal Peoples | • Hunting and trapping<br>• Fishing | • For hunting and trapping the RSA and LSA for wildlife was used<br>• For fishing the RSA and LSA for Fish and Fish Habitat was used |
| Human Health | • Air Quality<br>• Country Foods | • Air quality LSA = Project footprint plus a 1,000-m buffer zone. RSA = 60-km (north-south) x 100-km (east-west) area, centred between the Mine Site and the PTMA<br>• Country Foods RSA and LSA same as Wildlife and Wildlife Habitat |

The Agency has also examined the effects of the environment on the Project (such as earthquakes and landslides), effects of accidents and malfunctions and cumulative effects in addition to examining the effects of the Project on the VCs listed above.

## 3.3 Purpose of and Need for the Project

The purpose of the Project as identified in the proponent's EIS is to develop the Kerr, Sulphurets, Mitchell, and Iron Cap deposits and associated infrastructure to produce metal concentrate for international markets.

The Project is needed to satisfy the global demand for gold, copper, molybdenum and silver and to generate growth and is in alignment with the natural resource objectives of Canada's 2014 Economic Action Plan. The Project will also contribute to the on-going viability of British Columbia's mining industry, and provide revenue and profits for the proponent and its shareholders.

3 SARA – *Species at Risk Act*

# 4. Project Alternatives

Paragraph 16(1)(e) of the former Act requires that alternatives to the Project be assessed as part of a comprehensive study. Alternatives to the Project are functionally different ways to meet the Project's need and purpose. As well, the comprehensive study included consideration of the alternative means of carrying out the Project that are technically and economically feasible and the environmental effects of any such alternative means in accordance with paragraph 16(2)(b) of the former Act. An evaluation of both of these factors is presented in the following sections.

## 4.1 Alternatives to the Project

The proponent provided a discussion of the possible alternatives to meet the Project's need which are:

1. not undertaking the Project,
2. changing the timing (delaying) of the Project, and
3. changing the location of the Project.

According to the proponent's EIS there would be no environmental effects associated with the first alternative, as the Project would not proceed. There would, however, be a loss of the positive socioeconomic effects associated with the Project's development, specifically, employment, business and training opportunities, and additional benefits through Aboriginal capacity building. Abandoning the Project would not fulfill the purpose of the Project.

The second alternative would have the same environmental effects as those associated with proceeding with the Project as proposed, which are discussed in other sections of this report. According to the proponent, a delay in the Project would risk a drop in mineral prices and may make the Project financially unviable.

The third alternative, changing the location of the Project, is not possible as the four ore bodies are in a fixed location. Also, due to the relatively low grades of ore and large volume of ore to be mined, the proponent states that it is not economically feasible to transport unrefined ore and tailings to existing off-site facilities for processing or disposal.

The proponent maintains that proceeding with the Project as proposed in the near-term is the preferred alternative.

## 4.2 Alternative Means of Carrying Out the Project

Alternative means of carrying out a project are the various technically and economically feasible ways that a project can be implemented or carried out. Alternative means were considered for the following components:

- Tailings Management
- Access Road to Processing and Tailing Management Area (PTMA)
- Process Plant Location
- Water Treatment
- Selenium Treatment
- Ore Handling
- Waste Rock Disposal

***Tailings Management*** – The proponent evaluated fourteen options for managing waste tailings using guidance contained within the Guidelines for the Assessment of Alternatives for Mine Waste Disposal (Environment Canada 2011), and selected four potentially feasible alternatives to assess its ability to meet government requirements, technical and engineering limitations, water management objectives, and economic constraints. These four alternatives were assessed in detail to determine the best option from environmental, socio-economic and technical perspectives. Various disposal

technologies were also considered, including conventional impoundment, saturated storage, submarine storage, in-pit storage, dry stacking, paste tailing, and co-disposal with waste rock.

Federal and provincial governments reviewed the proponent's evaluation of the fourteen alter natives and are satisfied that the best possible alter native, taking into account the above mentioned considerations, is the proposed upper Teigen/ Treaty location, with a combination of conven tional impoundment and saturated storage. This alternative was confirmed under all sensitivity analyses scenarios, including when only environmental and socio-economic criteria were considered (i.e. with no financial constraints).

The preferred alternative would use water bodies frequented by fish, which would mean that they would need to be added to Schedule 2 of the *Metal Mining Effluent Regulations* (MMER) to allow its use for mine waste disposal. The addition of these water bodies to Schedule 2 would require an amendment of the MMER.

***Access Road to PTMA*** – The proponent evaluated three potentially feasible route options: Teigen Access Road, Teigen South/ Treaty West Access Road, and Treaty Creek Access Road. While the proponent stated that the first two alternatives were shorter and less costly, it also stated that these alternatives would have potentially resulted in more impacts on wildlife, fish, and archaeological sites. The Treaty Creek access road was the option chosen by the proponent, despite being longer and more expensive, as it resulted in fewer environmental and social impacts.

***Process Plant Location*** – The proponent identified five possible locations where the process plant could feasibly be situated and chose the Teigen and Treaty creeks valley site. Although this site was found to impact wetlands it is possible to make adjustments to avoid these impacts. According to the proponent, three other options were found to have greater potential environmental impacts such as the destruction of fish habitat. A fourth option, located at the Mine Site was not viable due to lack of suitable space, coupled with terrain and geohazard challenges.

***Water Treatment –*** The proponent evaluated both low-density and high-density sludge treatment options for treating contact water from the Mine Site. High-density treatment was chosen by the proponent because it produced a denser sludge, can handle larger volumes of water, the sludge is more chemically stable, and the process can produce a clear supernatant for discharge into the receiving environment. These characteristics result in increased economic efficiency and reduce environmental effects, when compared with other treatment options.

For the TMF, the proponent also investigated two possible directions to discharge the treated water: toward South Teigen Creek, or toward Treaty Creek. While both are equally feasible, the latter option was viewed by the proponent to have lower potential impacts on fish and fish habitat and was the preferred option for potentially impacted Aboriginal groups.

In addition, the proponent opted to isolate the high sulphide tailings into a lined centre cell located between the north and south ponds. The plan is to treat sulphide rich tailing slurry and supernatant from the precious metals extraction process before storage into the centre cell. The treatment includes $SO_2$ for cyanide destruction; activated adoption columns for copper and other metal removal, and a $H_2O_2$ oxidation process to remove any thiosalts prior to discharging excess water into the main North or South tailing ponds.

Excess water from the main ponds will meet MMER and BCMOE requirements for total suspended solids, metals, and other parameters. The excess tailing water will be pumped into Treaty Creek through a pipeline and discharged through a diffuser within 100m downstream of the operational discharge to meet British Columbia Water Quality Guidelines (BCWQG).

The discharge will be timed to coincide with high water flows in Treaty Creek from late May to early October of each year to minimize the potential impact on the receiving environment.

***Selenium Treatment*** **–** The proponent evaluated three systems for removing selenium from discharge waters at the Mine Site, including:

1. Co-precipitation and adsorption (ion exchange),
2. Zero-valent iron technology (High Density Sludge (HDS) lime water treatment), and
3. Reverse osmosis

The proponent chose the ion exchange and co-precipitation option considering it is the most efficient. This option is also the most suitable to effectively treat various concentrations of selenium in the water that is a characteristic of the Mine Site under various climatic conditions. The selenium ion exchange process is being piloted this summer on acidic water from Mitchell Creek to further prove the process and provide engineering information for a full scale plant. The proponent has committed to constructing, commissioning and operating a full scale selenium treatment plant at a throughput of 500 L/s by year five of operation.

The requirement for selenium treatment was determined through the predictive water quality modeling to meet the BCWQG for the long term protection of the fisheries resources in the Unuk River. While the ion exchange selenium treatment method is relatively new and has not been proven at a large scale, piloting has been completed at other mines in BC, such as Teck Limited's ion exchange program at its mines in the Elk Valley in southeastern BC, with positive results.

***Ore Handling*** **–** The proponent evaluated several options for transporting ore from the Mine Site to the PTMA. An ore conveyor belt housed in a tunnel, while the most expensive to construct, was selected as it was found by the proponent to require less power and water, and have lower operating costs than a pipeline or trucking.

***Waste Rock Disposal*** **–** Nine options for waste rock disposal were identified of which four were found to be technically unfeasible, one was found to be technically and economically unfeasible and a sixth option was found to be too environmentally risky. The proponent chose a combination of the three remaining disposal site options: Mitchell and McTagg Rock Storage Facilities, and backfilling the Sulphurets Pit with Kerr Pit waste rock. Although less economically feasible, this option would result in fewer environmental effects than other options, and is needed to provide sufficient storage capacity to address water quality objectives.

## 4.3 Agency's Assessment

The Agency is satisfied that the proponent has identified technically and economically viable alternative means of carrying out the Project and in identifying preferred alternatives has considered the environmental effects of the alternatives and its acceptability.

**The requirement for selenium treatment was determined through the predictive water quality modeling to meet the BCWQG for the long term protection of the fisheries resources in the Unuk River.**

# 5. Environmental Effects Assessment

## 5.1 Approach

The Agency, in collaboration with federal departments, identified and assessed the potential adverse environmental impacts of the Project on the basis of:

- The proponent's EIS and associated information (e.g. reports and technical memos produced by the proponent during the EIS review to respond to comments on the EIS, commitments to implement mitigation measures);
- Information obtained during public and Aboriginal consultations;
- Comments from United States federal and Alaska state-agencies and proponent responses to the comments;
- Comments from federal and provincial government agencies and other working group members and the proponent's responses to the comments; and
- The mitigation measures the Agency considers necessary (Appendix C).

This report describes both the proponent developed baseline information, potential effects, mitigation measures, and environmental management plans for key VCs. The Agency's conclusions for the assessment of key VCs are also presented and are based on the methodology and criteria developed by the Proponent in accordance with the *Reference Guide: Determining Whether a Project is Likely to Cause Significant Adverse Environmental Effects*.

The environmental effects remaining after the implementation of mitigation measures—the residual effects—were evaluated by the Agency. A follow-up program will be further developed by the Responsible Authorities and implemented to verify environmental effects, predictions and the effectiveness of mitigation measures.

Specific criteria used by the Agency, for determining significance are described below (Table 5.1.1), while specific definitions used in the assessment of significance are described for each key VCs in Appendix F.

The following subsections provide a summary of key potential project-related environmental effects, mitigation and residual effects for key VCs. Key VCs for the purposes of this CSR are those VCs for which government officials, Aboriginal groups, or members of the public expressed concerns about the Project's potential effects.

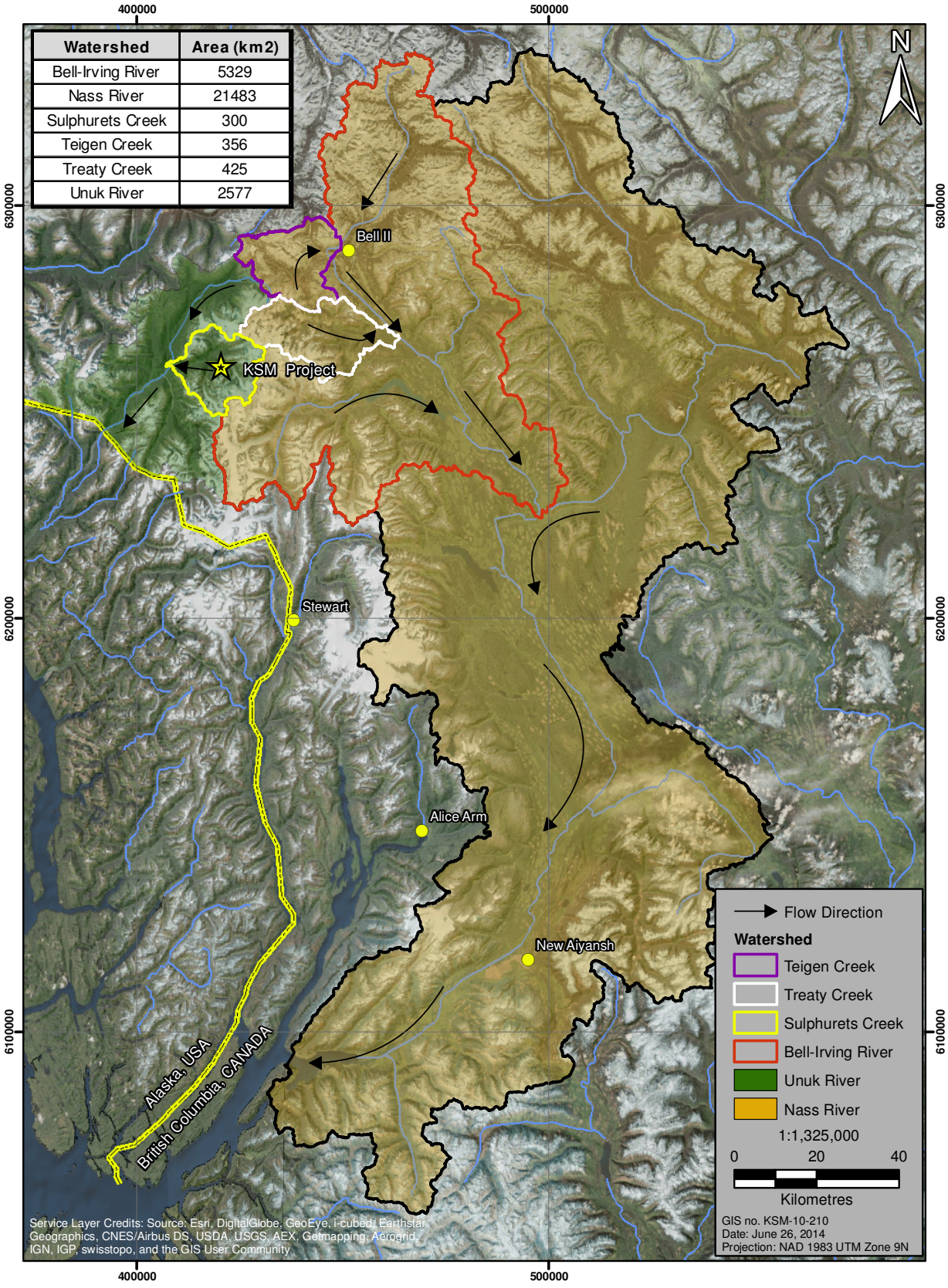
This report breaks water down into its separate components of quality and quantity of both surface and groundwater at the Mine Site and the PTMA. This is because they occupy different drainages (the PTMA is in the Teigen/Treaty watersheds and the Mine Site is located in the Unuk watershed, which drains into Alaska (Figure 5.1.1)) and the potential effects and type of effects are different.

**Table 5.1.1: Criteria for Determining Significance*.**

| Criteria | Definition |
|---|---|
| Not Significant (negligible/minor) | Residual Effects are generally of no or low magnitude, site-specific or local extent, short to medium term, low frequency (once or intermittent), reversible and negligible or low ecological context; in general, its effects are not distinguishable from those resulting from baseline conditions. |
| Not Significant (moderate) | Residual effects are generally of medium or high magnitude, local to regional extent, short-term to chronic, occur at all frequencies (once to continuous), reversible or irreversible and with medium ecological context; in general, its effects are distinguishable at the level of populations, communities or ecosystems. Follow-up and monitoring may be required. |
| Significant | Residual effects are generally of high magnitude, regional extent or greater, long-term or far future, occur at all frequencies (once to continuous), irreversible and of high context; its effects are consequential in terms of structural or functional changes in populations, communities and ecosystems. If significant effects are justified, follow-up and monitoring would be required. |

* Definitions developed by the Agency

**Figure 5.1.1: Key Watersheds Within the KSM Project Area**




Source: Seabridge Gold

## 5.2 Groundwater Quantity

Groundwater provides base flow to streams in valley bottoms in both the Unuk and Bell-Irving watershed and contributes to the overall surface water quantity and quality upon which a wide range of species depend. Groundwater conditions in these two watersheds reflect the moist, mountainous nature of the local environment. At the Mine Site, groundwater gradients are high, driven by heavy rainfall and recharge at higher elevations. Valley bottoms, including at the PTMA, are discharge zones.

As described by the proponent in the EIS, the mining of any of the four ore bodies may trigger localized changes to groundwater flows or boundary conditions that may last through the post-closure phase. Large artificial reservoirs such as the Water Storage Facility (WSF) and Tailings Management Facility (TMF) could provide significant new sources of groundwater, thereby creating new localized downward flow paths. Alterations of surface water levels, where they are directly connected to groundwater flows, will affect hydraulic gradients, which in turn may lead to flow rate, flow direction and water level changes.

### Mine Site

Predictive modeling, conducted by the proponent, indicates that there would be: (1) new groundwater sinks resulting from the dewatering of mine pits and block caves; (2) groundwater mounding beneath the McTagg and Mitchell rock storage facilities; (3) seepage reductions downstream of the water storage facility and (4) decreased groundwater levels in the Sulphurets pit backfill due to installed drainage systems. Despite these changes, the potential reduction in groundwater discharge into Mitchell/McTagg creeks is predicted to be small (0.28 $m^3$/second) in comparison to the contribution of surface flows in these creeks (see section 5.3 for more details on surface water effects).

### PTMA

The proponent states in its EIS that groundwater seepage past the north and south cell TMF dams is anticipated.

### Mitigation

Closure plans for certain project components that interact with the groundwater environment provide for recovery toward natural drainage conditions; however permanent changes in groundwater flows are expected.

The proponent will develop a lake in Mitchell Pit to allow for recovery of water levels surrounding the pit. In addition, at the end of the project, decommissioning of selected tunnels would reduce seepage through tunnel walls.

The proponent, through the TMF management and monitoring plan, will provide controlled discharge of water from the TMF cells which would result in a trend toward baseline flow conditions.

### Key Residual Effects

According to the proponent, through the implementation of mitigation measures changes in groundwater quantity would be confined to catchment surrounding the Project footprint with no effects being predicted by the proponent on groundwater discharge in the downstream Sulphurets Creek and Unuk River at the Mine Site.

Seepage past the south cell dam within the PTMA is expected to be to be fully captured by the South Seepage Collection Pond, however up to two percent of seepage from the TMF North Cell is anticipated to extend beyond the north seepage collection facilities.

**Table 5.2.1: Groundwater Quantity: Overall Predicted Degree of Effect after Mitigation***

| | Mine Site | PTMA |
|---|---|---|
| **Magnitude** | **High** – changes in groundwater levels (sinks and mounding) and flow patterns will diverge markedly from baseline conditions for mine pits, block caves, WSF, and Rock Storage Facilities (RSFs). | **High** – changes in groundwater levels (mounding) and flow patterns will diverge markedly from baseline conditions for the TMF area. |
| **Extent** | **Landscape** – the highest magnitude effects of the open pits, block caves and RSFs will be experienced locally, extending to the landscape level due to reduced seepage flows downstream are limited to the WSF containment dams. | **Landscape** – the groundwater quantity effects of the TMF extend to the landscape because of reduced seepage flows downstream of the North cell containment dam. |
| **Duration** | **Far future** – water levels will be managed in perpetuity for the Mitchell Pit, the Sulphurets RSF, the Kerr Pit, and the WSF. Alterations to flow fields associated with seepage cut-off walls beneath the Water Storage Dam, and placement of waste rock in RSFs will also be permanent. | **Far future** – water levels will be managed in perpetuity for the TMF. Alterations to flow fields associated with seepage cut-off walls beneath the TMF dams will also be permanent. |
| **Frequency** | **Continuous** – the interactions between Project components and groundwater quantity linked to pit de-watering and water level management will be ongoing. | **Continuous** – the interactions between Project components and groundwater quantity linked to water level management associated with the TMF will be ongoing. |
| **Reversibility** | **Irreversible** – residual effects at the open pits, the Mitchell Block Cave Mine, the RSFs and the WSF are considered irreversible since water levels at these project components will be managed into and beyond post-closure. | **Irreversible** – groundwater quantity changes linked to the TMF would not return to baseline. |
| **Context** | **Low** – groundwater quality at the Mine Site is naturally low, making it unsuitable for human consumption and the sustenance of aquatic life. | **Neutral** – groundwater is suitable for human consumption and the sustenance of aquatic life, although the resource potential of this water is not regionally unique. |
| **Overall Degree of Severity of Residual Adverse Effect** | **Not significant (moderate)** – reflecting the high magnitude, landscape extent and irreversibility of groundwater quantity effects. | **Not significant (moderate)** – reflecting the high magnitude, landscape extent, and irreversibility of groundwater quantity effects. |

* Analysis conducted by the Agency

## Government, Public and Aboriginal Comments and Proponent's Response

Environment Canada raised concerns over uncertainties with the water quantity model used in the assessment. The EIS provided a limited description of the relationship between project related changes in groundwater quantity and changes to where and how much discharge to surface water may occur. The proponent responded by providing a description of the areas where (and by how much) changes to locations of groundwater will occur and noted that these changes would result in a negligible effect when taking surface water inflows into account. The proponent states that no effect is predicted on groundwater discharge into the Unuk River, Teigen Creek or Treaty Creek. Environment Canada was satisfied with the response.

Environment Canada, the BC Ministry of the Environment (BC MOE), the BC Ministry of Energy and Mines (BC MEM), and NLG raised concerns over uncertainties associated with predicted groundwater infiltration rates, seepage and the viability of the seepage mitigation proposed for the TMF, WSF, and Sulphurets Pit backfill. The proponent responded by providing additional information that describes seepage pathways, infiltration rates, seepage reduction mechanisms and seepage collection systems. Several mitigation measures described within Appendix C will address uncertainties associated with seepage including the groundwater monitoring and mitigation plan, the water management plan, the selenium management plan and the aquatic effects monitoring plan. Appropriate Aboriginal consultation will take place during the development of these plans. The Agency is satisfied with the response.

NRCan requested clarification on groundwater recharge values used in groundwater modelling, and recommended calcareous materials and faults in the vicinity of the Water Storage Facility (WSF) be better delineated and characterized prior to project commencement. The proponent agreed with NRCan's recommendation that additional monitoring and sampling is undertaken to provide a greater spatial distribution of monitoring results, which could then be used to confirm groundwater model predictions prior to permitting. NRCan was satisfied with the proponent's response to these concerns.

## 5.3 Groundwater Quality

Groundwater quality is intrinsically linked with surface water quality, and is a factor in fish and aquatic ecosystem health within the Unuk and Treaty/Teigen watersheds. The proponent compared their groundwater quality model results to the BC freshwater aquatic life (BC MOE 2010) and drinking water guidelines, as there are no federal or provincial groundwater-specific water quality guidelines or standards.

### Mine site

Baseline concentrations of certain metals and elements, including aluminum, arsenic, cadmium, copper, iron, and selenium are elevated in groundwater throughout the Mine Site, and under ambient conditions are particularly high near and within the ore deposits (Table 5.3.1). As a result, groundwater in the Mitchell Creek Valley is not suitable for human consumption or the sustenance of fresh water aquatic life.

Seepage of contact water into the natural groundwater environment may occur during construction, operation, and closure phases from all pits and block caves, rock storage facilities, the Water Storage Facility, tunnels, and diversions. This seepage could result in the development of plumes with degraded water quality emanating from the seepage sources. Predictive modeling presented by the proponent in its EIS, indicates that concentrations of aluminum, copper, iron, cadmium, arsenic, and selenium in groundwater naturally exceed BC guidelines for freshwater aquatic life and project activities are anticipated to increase those concentrations (Table 5.3.1).

## PTMA

Baseline metal concentrations in groundwater at the PTMA are generally low, with all measurements falling below provincial freshwater aquatic life guidelines, according to the proponent's EIS. Although groundwater is considered suitable for consumption, the proponent notes that there are no licensed groundwater users within the Project area. Potential effects due to seepage of contact and tailing water are anticipated from the TMF during construction, operation, and closure phases (Table 5.3.2) according to the proponent.

**Table 5.3.1: Predicted Mine Site Groundwater Quality Concentrations at Sources of Effects (Construction to Post-Closure)**

| Water Quality Parameter (mg/L) | BCWQG (freshwater aquatic life / drinking water) | Baseline (95% Max) | Effect Source (Source of Plume) | | |
|---|---|---|---|---|---|
| | | | Iron Cap Block Cave (mean / 95% Max) | Mitchell/ McTagg RSF (mean / 95% Max) | Water Storage Facility (mean / 95% Max) |
| Aluminum | -/0.2 | 1.1 | 16 / 38 | 74 / 112 | 25 / 39 |
| Copper | / 0.5 | 0.79 | 12 / 16 | 29 / 44 | 15 / 22 |
| Iron | 0.35 / - | 7.8 | 68 / 164 | 882 / 1444 | 281 / 451 |
| Cadmium | - / - | 0.00014 | 0.036 / 0.050 | 0.095 / 0.14 | 0.035 / 0.052 |
| Arsenic | 0.005 / 0.025 | 0.022 | 0.034 / 0.081 | 0.39 / 0.61 | 0.13 / 0.21 |
| Selenium | 0.002 / 0.01 | 0.0054 | 0.026 / 0.052 | 0.097 / 0.14 | 0.035 / 0.053 |

**Table 5.3.2: Predicted PTMA Groundwater Quality Parameter Concentrations at Sources of Effects (Operations to Post-Closure)**

| Water Quality Parameter (mg/L) | BCWQG (freshwater aquatic life / drinking water) | Baseline (95% Max) | Effect Source (Source of Plume) | | |
|---|---|---|---|---|---|
| | | | North Cell (mean / 95% Max) | South Cell (mean / 95% Max) | Centre Cell (mean / 95% Max) |
| Nitrate | 3 / 10 | 0.012 | 28 / 50 | 36 / 56 | 1.6 / 6.5 |
| Sulphate | 100 / 500 | 50 | 855 / 1478 | 1141 / 1706 | 776 / 1437 |
| Selenium | 0.002 / 0.01 | 0.00044 | 0.021 / 0.035 | 0.028 / 0.041 | 0.026 / 0.047 |

## Mitigation

Key mitigation measures to reduce groundwater seepage and minimize the effects on downstream groundwater quality include water treatment facilities (HDS lime water treatment and ion-exchange selenium treatment) at the Mine Site, seepage cut-off grout curtains, seepage collection dams, seepage collection tunnels at the TMF and WSF, liners coving the backfilled waste rock in Sulphurets Pit and seepage collection basal drains at Sulphurets Pit and Kerr Pit. In addition, the proponent will use a geomembrane liner to reduce seepage through the centre cell of the TMF. Additional details about mitigation can be found in Appendix C.

## Key Residual Effects

At the Mine Site, plumes emanating from the Block Cave Mine and the Mitchell/McTagg Rock Storage Facility will flow to the WSF or will be re-directed to the water treatment plant. A plume

is predicted to develop directly below the footprint of the WSF reservoir and is predicted to be captured by the seepage interception tunnels and WSF seepage collection pond. As a result, effects on groundwater quality are limited to the areas situated topographically upgradient of the WSF at the Mine Site.

Forecasted concentrations of sulphate, selenium and nitrate are expected to comply with the guidelines for freshwater aquatic life for all cells taking into account mitigation for the PTMA. Concentrations in the North Cell plume may be as high as 4 percent of the source and extend as far as 50 meters beyond the seepage collection dam. However, concentrations are not expected to exceed BC WQG for any project phases (Table 5.3.3).

**Table 5.3.3: TMF North Cell Plume – Maximum Concentrations**

| Water Quality Parameter (mg/L) | BCWQG (**/**) | Baseline (95% Max) | Estimated Concentrations | |
|---|---|---|---|---|
| | | | Footprint (100%) | Outside Footprint (4%) |
| Nitrate | 3 / 10 | 0.012 | 50 | 2.0 |
| Sulphate | 100 / 500 | 50 | 1478 | 94 |
| Selenium | 0.002 / 0.01 | 0.00044 | 0.035 | 0.0016 |

* Analysis conducted by the Agency

**Table 5.3.4: Groundwater Quality: Predicted Degree of Effect After Mitigation***

| | Mine Site | PTMA |
|---|---|---|
| **Magnitude** | **High** – concentrations of degraded water (in particular aluminum, copper, iron cadmium, arsenic and selenium concentrations) will be higher than water quality guidelines at the source of the effect but are comparable to baseline measurements. | **Medium** – concentrations of some metals downstream of the North Cell seepage dam will be above the range of natural variability, although guidelines are predicted not to be exceeded. |
| **Extent** | **Local** – plumes with high concentrations of contact water will not extend beyond the footprints of Mine Site Project components, due to very rapid attenuation and containment by seepage control mechanisms. | **Landscape** – the plume emanating from the TMF north cell (flotation tailing water) is predicted to extend beyond the influence of seepage control mechanisms at concentrations as high as 4% tailing water, discharging into the South Teigen Creek tributary. |
| **Duration** | **Far future** – plumes are expected to remain well into the future and can be considered permanent. | **Far future** – plumes are predicted to attain steady states, with contact water or tailing water contributions remaining present well beyond the 50-year threshold for a far future rating, and possibly for centuries following the end of operation. |
| **Frequency** | **Continuous** – contact water loading within the area of Mine Site infrastructure will be continuous in nature. | **Continuous** – contact water within the area of the TMF will be continuous in nature. |
| **Reversibility** | **Irreversible** – remediation and restoration of baseline conditions is not considered feasible due to continuous loading. | **Irreversible** – remediation and restoration of baseline conditions is not considered feasible due to continuous loading. |
| **Context** | **Low** – groundwater quality at the Mine Site is naturally low, making it unsuitable for human consumption and the sustenance of aquatic life. | **Neutral** – groundwater quality is suitable for human consumption and the sustenance of aquatic life, although the resource potential of this water is not regionally unique. |
| **Overall Degree of Severity of Residual Adverse Effect** | **Not significant (moderate)** – reflecting the high magnitude but largely localized extent of groundwater quality effects. | **Not significant (moderate)** – reflecting the moderate magnitude but largely localized extent and neutral context. |

### Government, Public and Aboriginal Comments and Proponent's Response

Members of the working group, including the BC MOE and the BC MEM raised concerns about groundwater quality modeling and proposed that uncertainty about the success of the water quality mitigation measures could lead to an underestimation of selenium concentrations within the Unuk system. The proponent believes that its model is appropriately conservative to cover possible source concentrations of selenium, and the Water Storage Facility and seepage collection system proposed provides adequate mitigation for selenium within the Unuk watershed. In addition, the proponent has committed to a selenium management plan and additional project design features (such as having a viable selenium treatment plant operational by year five of operations) to address uncertainties within the groundwater quality modeling and the mitigation proposed to reduce the groundwater contribution of selenium to the Unuk system (see Appendix C). Additional details on selenium management are covered in section 5.5 on surface water quality. The Agency is satisfied that the issue has been addressed.

Working group members, including the BC MOE, NLG and Gitanyow, raised concerns over the potential introduction of degraded water quality into the Bell-Irving system through seepage past the TMF seepage collection pond. The Gitanyow believe that introductions of contaminants of potential concern such as selenium will impact the quality of fish bearing aquatic habitat. The proponent has re-stated that its modeling predicts seepage from the TMF will have a negligible contribution to water quality within the Bell-Irving system, and noted that selenium is already elevated in sample fish tissues. In addition, the proponent has committed to meet site specific water quality objectives 100 meters downstream of the North Seepage Dam (see Appendix C). Based on this commitment, the Agency is satisfied that the likelihood for adverse effects from degraded water quality (through seepage) in the Bell-Irving system is low.

### Agency Conclusions on the Significance of the Residual Environmental Effects

The Agency concludes that the Project is not likely to cause significant adverse environmental effects on groundwater quality when implementation of mitigation is taken into account. Follow-up described within the Groundwater and Water Management Plan, will be implemented to ensure that operational procedures to adjust water quality are done as needed and confirm the accuracy of the EA predictions.

## 5.4 Surface Water Quantity

Surface water flows are an important characteristic of fish and aquatic habitat, which when affected can in turn affect the various species that occupy those habitats. The proponent assessed the potential for project effects on local and regional hydrologic conditions specific to watersheds downstream of the Mine Site (Sulphurets Creek and the Unuk River) and PTMA (Treaty Creek, Teigen Creek, and the Bell-Irving River).

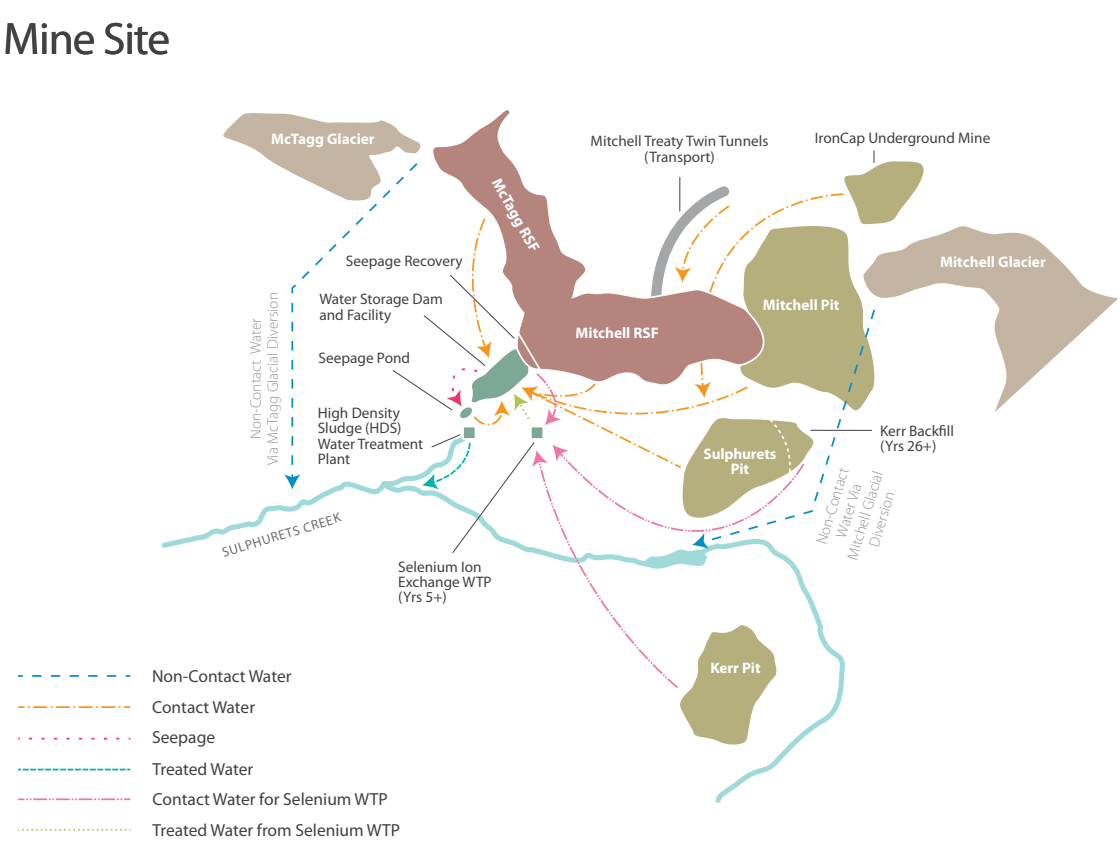
Nearly all project components have the potential to interact with surface water. During each Project phase, water from different sub-catchments of the Mine Site and the PTMA will be stored in large reservoirs, or collected and diverted through ditches, diversion channels and tunnels. The proponent predicts that flow pathways will be changed as a result and catchment areas in the LSA may be altered. Specifically, the potential exists according to the proponent for this water management system to affect 1) annual, 2) monthly, 3) peak and 4) low flows, particularly in on-site catchments. The re-routing of flows is required to ensure an adequate supply of water for the Project and to protect downstream water quality.

## Mine Site

Contact water from the open pits, block caves and rock storage facilities at the Mine Site will be collected and routed to the water storage facility for eventual treatment in the Water Treatment Plant and then released into Mitchell Creek. This will occur throughout all project phases. The Mitchell Diversion Tunnel and McTagg Twinned Diversion tunnels will route most of the non-contact runoff and glacial meltwater around the open pits, block caves and rock storage facilities (Figure 5.4.1). Changes in surface water flows within the Mine Site will impact flows within the LSA (Mitchell Creek, Sulphurets Creek and Gingras Creek) and the RSA (Unuk River).

Boundaries of the Mitchell Pit are located outside of the extent of the Mitchell Glacier; however the terminus of the glacier may be affected by Mitchell Pit development. Monitoring of the Mitchell Glacier has shown that the terminus of the glacier has been retreating at average rates of 25 to 50 m/yr in recent years, and more rapidly in the last three years.

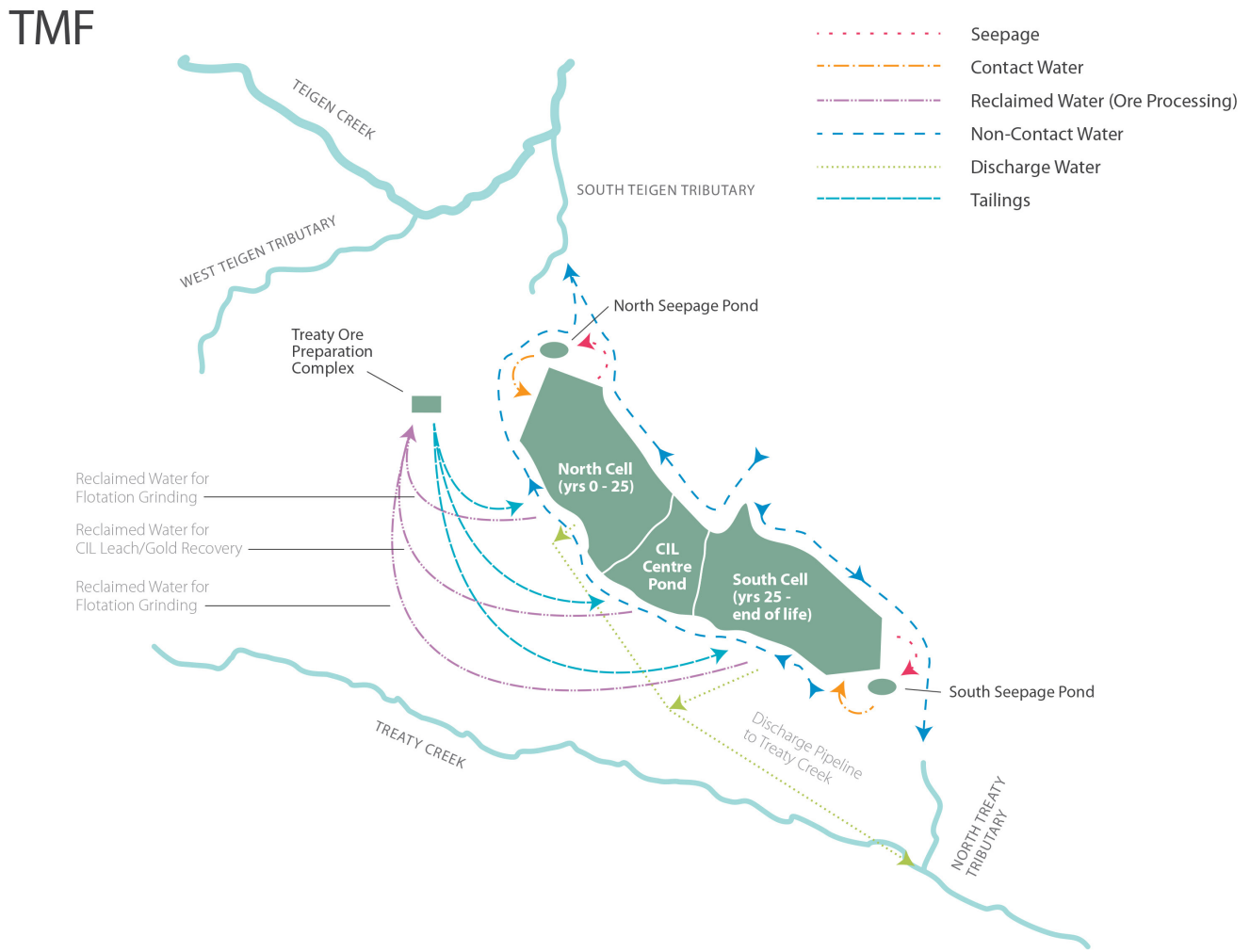
**Figure 5.4.1: KSM Mine Site Surface Water Management**



## PTMA

Surface water quantity at the PTMA will be most affected by the TMF, and the system of diversions and tunnels that route non-contact water around its three cells (Figure 5.4.2). The TMF's North Cell and the Centre (CIL) Cell will be in operation from year 1 to year 25. Diversions will carry non-contact water, including flows from the east creek catchment, to South Teigen and North Treaty creeks. Excess flows in the North Cell will be pumped via discharge pipeline to Treaty Creek until year 45, after which it is expected that water quality will satisfy receiving environment criteria, allowing discharge into South Teigen Creek via a spillway. Between years 25 and 26, the TMF South Cell will be brought online, and will then operate until year 51.5, with excess water discharged to Treaty Creek. The surface water elevations of the Centre, North and South Cell ponds will be maintained at 1054 meters above sea level beginning in year 56. During post-closure, all diversion channels except those associated with the seepage dams will be decommissioned and runoff will go to the according cells. Once water quality reaches receiving environment guidelines, pre-existing patterns will be restored.

**Figure 5.4.2: KSM PTMA Surface Water Management**



## Mitigation

Mitigation measures for surface water quantity effects will be driven by the Water Management Plan. This plan will contain measures designed to divert non-contact water around the Project and to collect and treat contact water from the Project on the Mine Site and PTMA. By minimizing the amount of contact water at the Project site, surface water diversions not only reduce the volume of water that must be treated, but also the magnitude of any potential changes in flow volumes. Additionally, surface water diversion decreases the potential for erosion and sediment production by limiting the volume of water that enters a work area.

## Key Residual Effects

### Mine Site

Streams within close proximity to the Mine Site will experience large scale changes in mean annual, peak, and 7-day low flow volumes which will diminish greatly into the regional study area (Table 5.4.1).

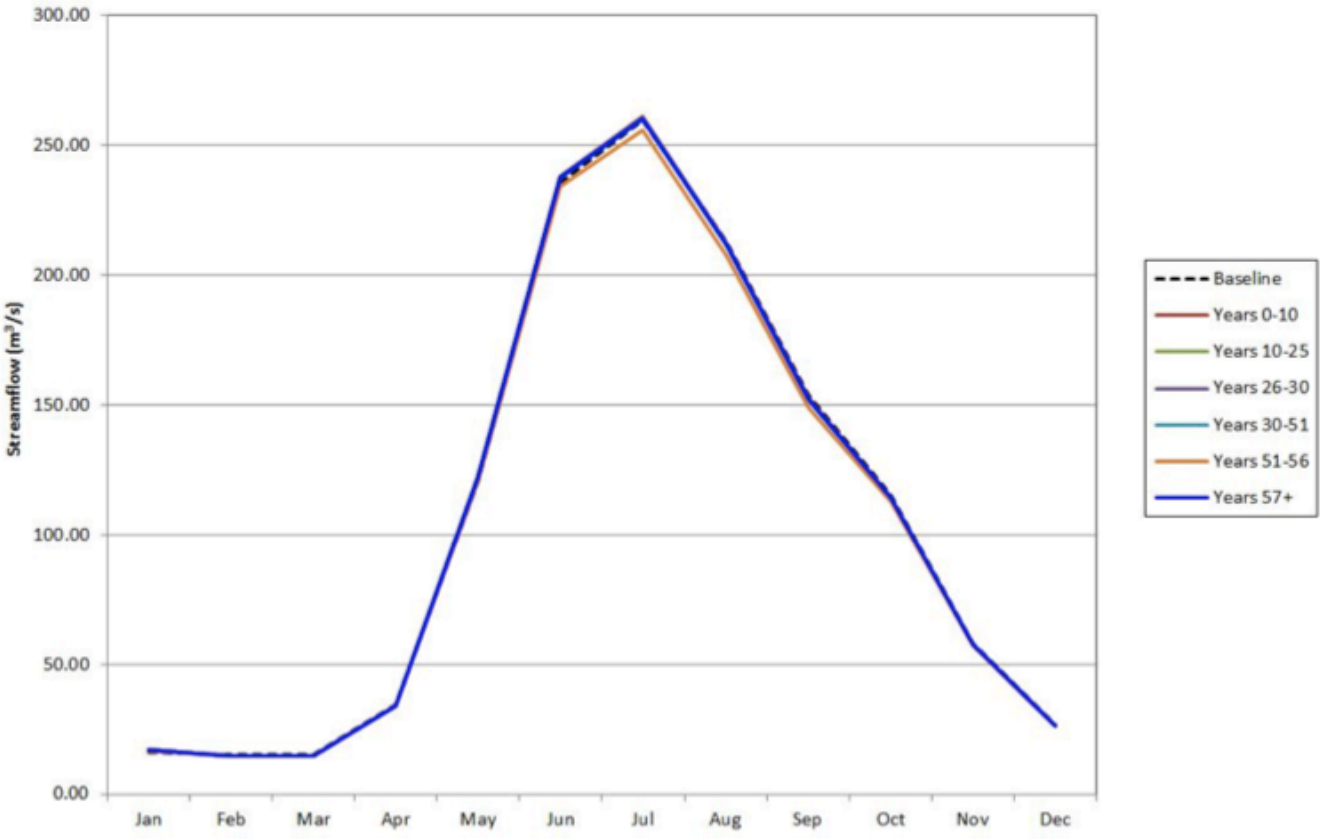
**Table 5.4.1: Predicted Mean Annual, Peak, and 7-day Low Flow Changes to Mine Site Streams (Unuk Watershed)**

| | Mean Annual Flow Change (maximum predicted % increase or decrease) | Peak Flow Changes (maximum predicted % increase or decrease) | Low Flow Changes** (maximum predicted % increase or decrease) |
|---|---|---|---|
| Upper Sulphurets Creek (SC1) | 22% increase | 25% increase | 15% increase |
| Lower Sulphurets Creek (SC3) | 8% decrease | 6% decrease | 4% decrease |
| Upper Unuk (UR1) | 3.5% decrease | 6% decrease | 3% |
| Lower Unuk River at US border (UR2) | 1.7% decrease | 2% decrease | 1% decrease |

* Maximum low-flow changes are predicted to occur at post-closure
** Low flow predictions represent 7-day low flows

As predicted by the proponent, effects on monthly flow distribution decrease downstream, and are minor at the Unuk River (UR2) (Figure 5.4.3)

**Figure 5.4.3: Average Monthly Flows at Unuk River (UR2)**




Source: Seabridge Gold

Modeling predicts that project-related residual effects on the Mitchell Glacier will be minimal. According to the proponent, any changes in the mass balance and rate of retreat during the Project life will be much more heavily influenced by natural factors such as climate than by project development.

## PTMA

North Treaty and South Teigen Creeks, which are within close proximity to the Tailings Management Facility (TMF) are predicted to experience a decrease in mean annual, and seven-day low flow volumes but an increase in peak flows. These flow changes will diminish greatly into Treaty Creek, Teigen Creek and the Bell-Irving River (Table 5.4.2).

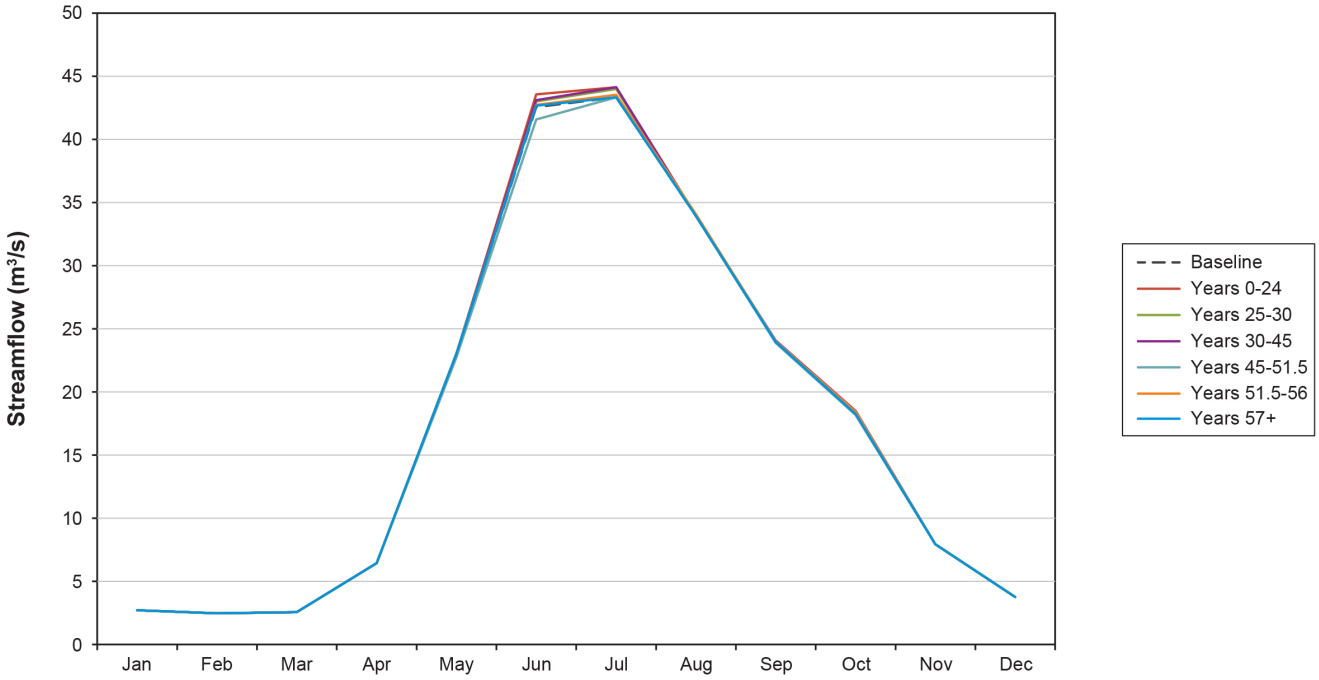
**Table 5.4.2: Predicted mean-annual, peak, and 7-day low flow changes to PTMA streams (Bell-Irving watershed)**

| | Mean Annual Flow Change (maximum predicted % increase or decrease) | Peak Flow Changes (maximum predicted % increase or decrease) | Low Flow Changes**(maximum predicted % increase or decrease) |
|---|---|---|---|
| North Treaty Creek (NTR2) | 30% decrease | 22% increase | 8% decrease |
| Treaty Creek (TRC2) | 1.5% decrease | 5% increase | 1% decrease |
| South Teigen Creek (STE3) | 19% decrease | 40% increase | 12% decrease |
| Teigen Creek (TEC2) | 5% decrease | 16% increase | 3% decrease |
| Bell- Irving River (BIRB1A) | 0.4% decrease | 4% increase | < 1% decrease |
| Bell-Irving River (BIRB2) | 0.2% decrease | 4% increase | < 1% decrease |

** Low flow predictions represent 7-day low flows

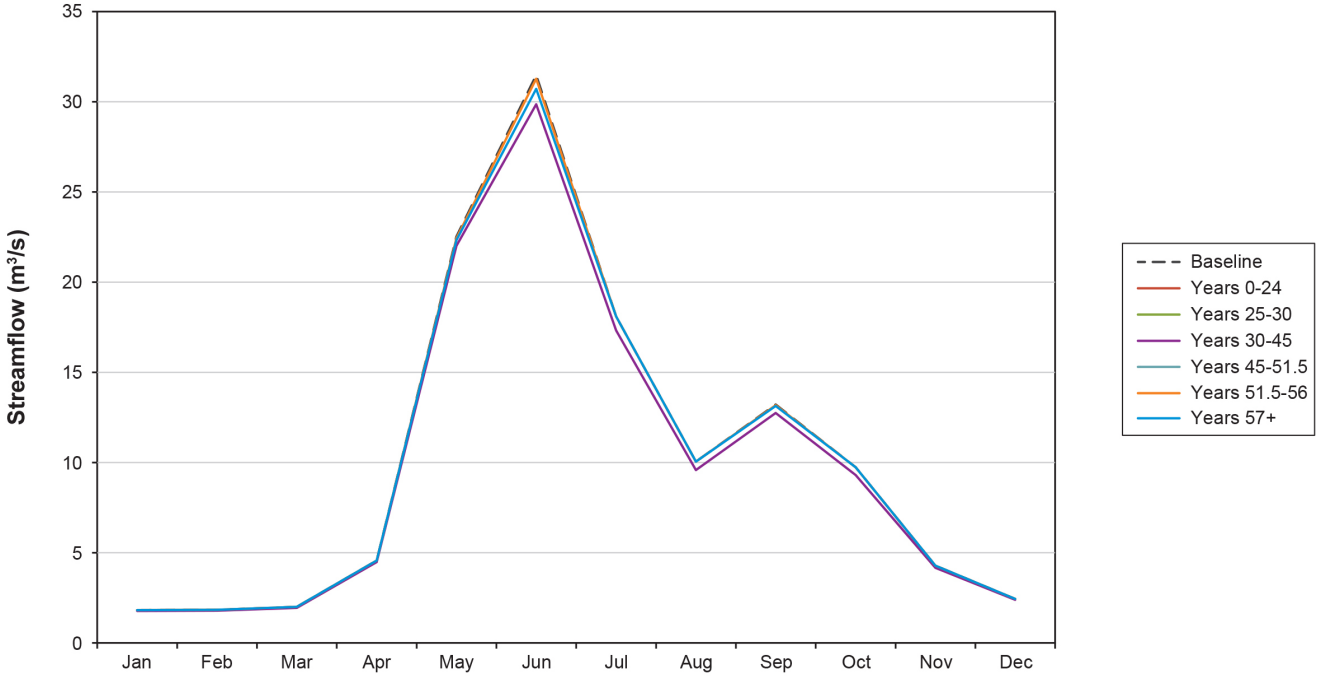
Modeling predicts that project effects on monthly flow distribution within the PTMA LSA will be minor in Teigen and Treaty Creeks (Figures 5.4.2-5.4.3). Effects on the monthly distribution of flows decrease in a downstream direction, and are very minor at other assessment points, including those in the Bell-Irving River (PTMA RSA).

**Figure 5.4.4: Average Monthly Flows at Treaty Creek (TRC2)**




Source: Seabridge Gold

**Figure 5.4.5: Average Monthly Flows at Teigen Creek (TEC2)**




Source: Seabridge Gold

**Table 5.4.3: Surface Water Quantity: Predicted Degree of Effect After Mitigation**

| | Mine Site | PTMA |
|---|---|---|
| **Magnitude** | **High** – for the LSA in close proximity to the Mine Site including upper Sulphurets Creek where annual, peak and low flow modifications are detectable beyond the range of natural variation.<br>**Low** – for the RSA including the Unuk River at the Canada-US border where annual, peak and low flow modifications are minor. | **High** – for the LSA in close proximity to the TMF including North Treaty, Treaty, South Teigen, and Teigen creeks where annual, peak and low flow modifications are detectable beyond the range of natural variation.<br>**Low** – for the RSA including the Bell-Irving River where annual, peak and low flow modifications are minor. |
| **Extent** | **Local** – for the LSA in close proximity to the Mine Site including upper Sulphurets Creek.<br>**Regional** – for the RSA including the Unuk River at the Canada-US border. | **Local** – for the LSA in close proximity to the TMF including North Treaty, Treaty, South Teigen, and Teigen creeks.<br>**Regional** – for the RSA including the Bell-Irving River. |
| **Duration** | **Far future** – effects will last more than 70 years for both LSA and RSA | **Far future** – some effects will last more than 70 years for both LSA and RSA. |
| **Frequency** | **Continuous** – effects will occur continuously through all project phases. | **Continuous** – effects will occur continuously through all project phases. |
| **Reversibility** | **Reversible long term** – effects of the RSF's, WSF, pits, block caves and WTP are reversible in the long term. | **Reversible long term** – effects of the TMF are reversible in the long term. |
| **Context** | **Neutral overall** – none of the residual effects on flows were considered critical to downstream resource values and the majority of the impact was in an area of low fisheries values (upper Sulphurets Creek). | **Neutral overall** – none of the residual effects and on flows were considered critical to downstream fish and aquatic resource values, however fisheries values are high in parts of the Treaty, Teigen and Bell-Irving rivers. |
| **Overall Degree of Severity of Residual Adverse Effect** | **Not significant (moderate)** – within the LSA reflecting the high magnitude, local extent, reversibility in the long term and neutral context.<br>**Not significant** – (minor) - within the RSA reflecting the low magnitude, long term reversibility and neutral context. | **Not significant (moderate)** – within the LSA reflecting the high magnitude, local extent, reversibility in the long term and neutral context.<br>**Not significant (minor)** – within the RSA reflecting the low magnitude, long term reversibility and neutral context. |

* Analysis conducted by the Agency

## Government, Public and Aboriginal Comments and Proponent's Response

The BC MOE, the BC MEM, Environment Canada, and NLG raised concerns over the technical feasibility of the Mine Site water balance model and suggested that the proponent would be challenged to contain and treat contact water before discharging it into the receiving environment. The proponent is confident in its assessment and restated the conservative approach used within its surface water model. In addition, the proponent has committed to develop a Mine Site Water Management Plan. The Agency is of the opinion that this plan will address uncertainties associated with the size and complexity of the Mine Site water balance model.

NRCan, BC MEM, BC MOE, NLG and Gitanyow raised concerns about the Mitchell Glacier. Uncertainties have been noted within the analysis about: 1) the impact of climate change on the recession of the glacier; 2) the impacts of project infrastructure and activities on the Mitchell Glacier; and 3) the contribution of glacial meltwater to the Mine Site water balance model. In response, the proponent restated the conservative approach used within

its surface water model. In addition the proponent has committed to develop a Mine Site Water Management Plan. The Agency is of the opinion that this plan will address uncertainties associated with the Mitchell Glacier.

The NLG, BC MEM and BC MOE have raised concern around the ability of project infrastructure (e.g. diversion ditches, pipes, and tunnels) to handle rare, high intensity weather events such as '1 in 50 year' peak and low flow events. In response, the proponent provided several examples of how the Project has been designed (tunnels, ditches, reservoirs, spill ways etc.) to address low frequency, high magnitude weather events. The proponent is confident in the modeling used to predict these events and the mitigations designed to deal with them. In addition the proponent has committed to developing a Mine Site Water Management Plan. The Agency is of the opinion that this plan will address uncertainties associated with extreme weather events.

### Agency Conclusions on the Significance of the Residual Environmental Effects

Residual effects on surface water quantity are considered highly likely for both the Mine Site and PTMA. The Agency concludes that the Project is not likely to cause significant adverse environmental effects on surface water quantity when the implementation of the proposed mitigation measures, and water management plans set out in Appendix C are taken into account. A follow-up program is planned for surface water quantity and will be developed in detail during the regulatory compliance monitoring phase.

## 5.5 Surface Water Quality

Water quality impacts arising from project activities are a key concern for many technical reviewers, Aboriginal groups, and public stakeholders. The proponent assessed water quality for several contaminants of concern including anions, nutrients, cyanides, and metals (see Appendix B). This section of the report focuses on the effects of the Project on key contaminants of concern for the Mine Site and PTMA that the proponent predicts will be above baseline conditions or BC WQG after mitigation. Effects of the Project on these parameters have the potential to affect fish health, aquatic habitat, and human health. They can also affect fish and wildlife which are important to Aboriginal communities and the public who harvest these resources.

### Mine Site

Baseline concentrations for many nutrients, metals and selenium (Table 5.5.1) in Sulphurets Creek are frequently above BC water quality and or the Canadian Council of Ministers of the Environment (CCME) water quality guidelines as a result of metal leaching (ML) linked to naturally-occurring acid rock drainage (ARD) and high mineralization at the Mine Site according to the proponent. Metal concentrations generally decrease downstream from Sulphurets Creek to the Unuk River (Appendix B). Water quality in the Unuk River is presently affected by inflow from Sulphurets Creek (Figure 5.5.1).

Project-related mining activity (e.g. excavation of open pits, block caves, and tunnels, and storing of potentially acid generating waste rock) will increase the potential for ML/ARD at the Mine Site by exposing sulphide-rich, unweathered rock which can then interact with water thus altering metals concentration in surface waters. Selenium, and sulphate concentrations within the Unuk River watershed, are anticipated to increase as a result of mining activities, as stated within the EIS.

Impacts on water quality from the Mine Site could further increase metal concentrations in fish tissue in both Sulphurets Creek and the Unuk, which may in turn affect fish health over various life stages, most notably egg and smolt survival. Dolly Varden sampled from Sulphurets Creek

have selenium tissue concentrations greater than the BC MOE tissue residue guideline, while fish sampled from the Unuk River have mercury tissue concentrations exceeding the CCME tissue residue guidelines.

### PTMA

Currently, BC Water Quality Guideline (BCWQG) exceedances in the Teigen watershed downstream of the north-end of the PTMA are most commonly observed for dissolved aluminum, total cadmium and total chromium (Appendix B). BCWQG exceedances in the Treaty and Bell-Irving watersheds downstream of the south-end of the PTMA according to the proponent, are most commonly observed for dissolved aluminum, total cadmium, total chromium, total copper, total iron and total zinc (Appendix B).

Waste produced from ore processing activities will be stored and treated within the tailings management facility (TMF) as stated in the EIS. Tailing supernatant from ore processing is predicted to contain cyanide and elevated concentrations of cyanide-complex and dissolved metals, notably copper. These compounds could affect downstream water quality.

Contaminants of concern including nutrients, metals, cyanides and selenium released during ore processing and from weathering of tailing material will be contained within the TMF. Discharge of degraded groundwater from the TMF could affect Treaty Creek (see section 5.4). Groundwater seepage from the North Cell containing flotation tailings may affect South Teigen Creek (see section 5.2). Surface discharges to South Teigen and North Treaty Creek will only occur when water quality is suitable for discharge. No surface discharge is planned for Teigen Creek.

### Mitigation

Specific Mine Site mitigation includes underground mining to reduce exposed potentially acid generating rock in the Mitchell and Kerr Pits; backfilling the mined-out and lined Sulphurets Pit with Kerr Pitt waste rock to reduce selenium loadings; diverting contaminated sub-glacier water from Mitchell Creek to the Water Storage Facility (WSF); installing a Water Treatment Plant (WTP) (including an HDS lime water treatment process to treat up to 7.5 $m^3/s$), and selenium treatment plant at the WSF to minimize metals and selenium loadings to the receiving environment; staging discharge from the WSF to mimic the natural hydrograph; and capturing sediment in the WSF before it can be released to the receiving environment. The selenium treatment plant will treat flow rates of 500 L/s).

Mitigation within the PTMA includes: using a high density polyethylene geomembrane liner within the centre cell of the TMF to reduce contact water seepage and contain deleterious substances such as cyanide; installing a pipeline to Treaty Creek, which includes an effluent diffuser; pumping of seepage collection water back into the TMF; using non-contact water diversions to supplement flows that would be altered by TMF development; using seepage collecting ponds downstream of the TMF dams in the North Teigen and South Treaty Creeks; using temporary water treatment plants at the PTMA during construction; treating tailings supernatant (including cyanide, dissolved metals and thiosalts) from ore processing; storing effluent during winter low flows; staging discharge to mimic the natural hydrograph; and capturing sediment before it can be released to the receiving environment. In addition, the proponent has designed the Mitchell Treaty Twinned Tunnels (MTT) to ensure water drains to the Mine Site where it can access the water treatment plants.

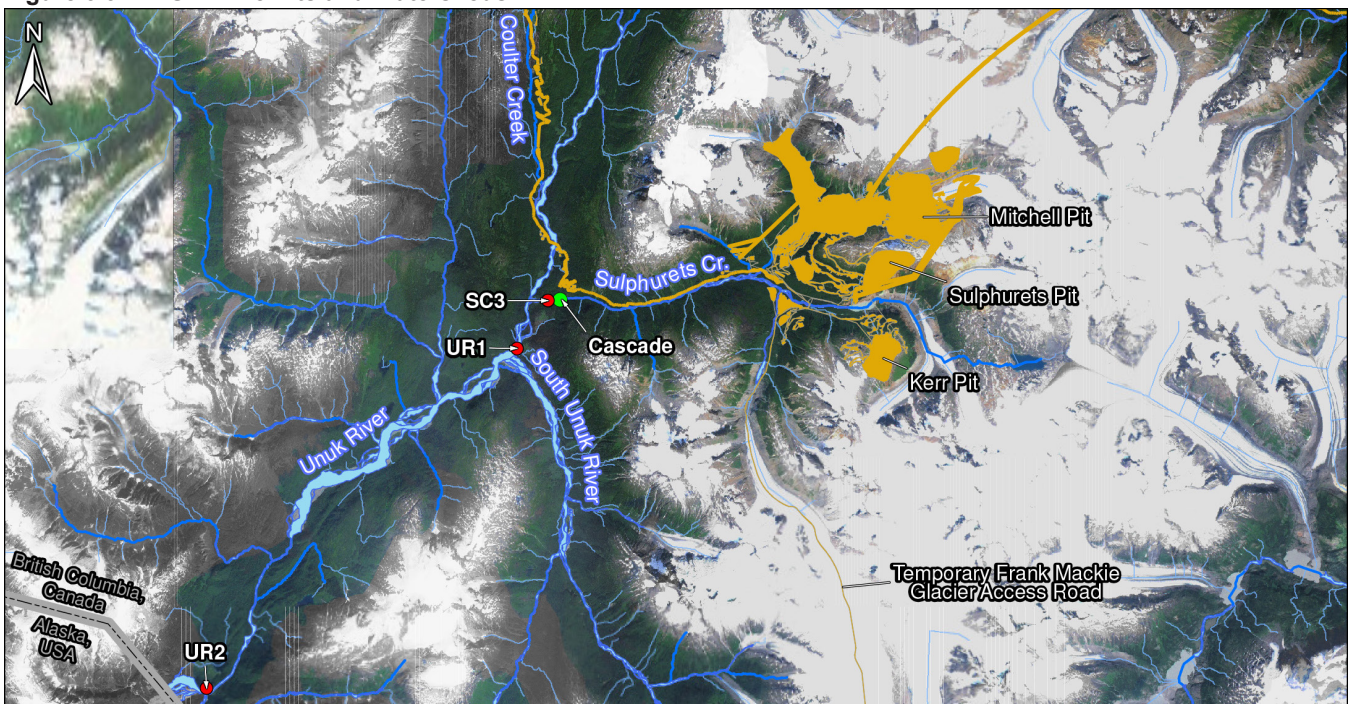
Appendix C contains a complete list of mitigation for effects to surface water quality.

## Key Residual Effects

### Mine Site

Treatment of contact water at the WTP is predicted to reduce the total concentrations of key metals such as copper, lead and cadmium below baseline conditions in Sulphurets Creek (SC3 ~ 800 m upstream of the Unuk confluence) where fish have been observed (Figure 5.5.1).

**Figure 5.5.1: KSM Mine Pits and Watersheds***




*-UR2 (Unuk River, just before Canada-USA border), UR1 (Unuk River just downstream of the confluence with Sulphurets Creek), and SC3 (Sulphurets Creek, downstream of the fish barrier)
Source: Seabridge Gold

Total selenium concentrations, are predicted by the proponent to be higher than both baseline concentrations and BC WQG (0.002 mg/L) at the Sulphurets-Unuk River confluence with the implementation of mitigation measures. Total selenium concentrations are predicted to increase throughout the operation phase (Table 5.5.1). Site-specific water quality objectives for selenium will be developed to the satisfaction of the province prior to Mine Site construction.

**Table 5.5.1: Predicted Water Quality for Key Mine Site Stations (Unuk Watershed)**

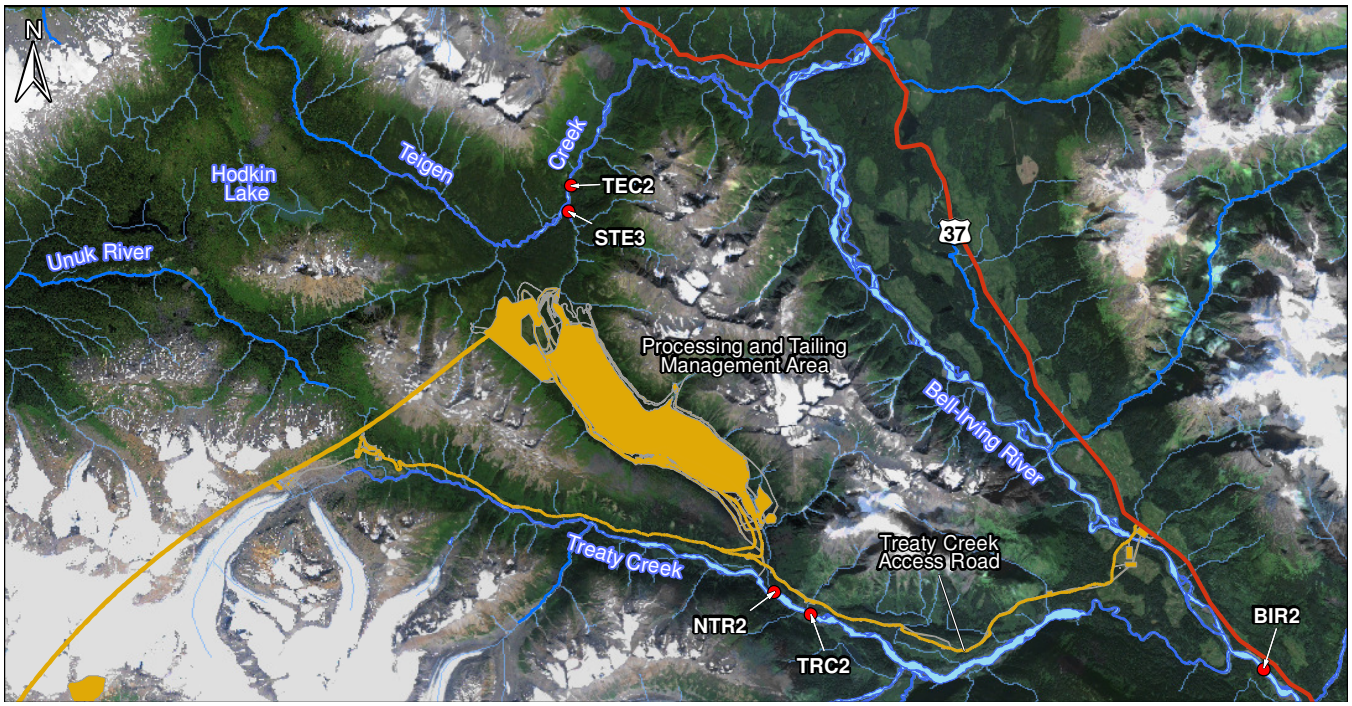
| Sampling Point | Project Phase | Sulphate (mg/L)* (BCWQG=309 mg/L) | | | Aluminum (mg/L) (BCWQG=0.05) | | | Selenium (mg/L) (BCWQG=0.002) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Min | Annual Average | Max | Min | Annual Average | Max | Min | Annual Average | Max |
| SC 3 (Sulphurets Creek downstream of fish barrier) | Baseline | 27.8 | 88.1 | 134 | 0.027 | 0.050 | 0.074 | 0.0007 | 0.0018 | 0.0026 |
| | Year** 4 | 39.9 | 94 | 136 | 0.032 | 0.058 | 0.079 | 0.0020 | 0.0031 | 0.0040 |
| | Year 35 | 87.2 | 125 | 179 | 0.036 | 0.057 | 0.081 | 0.0019 | 0.0029 | 0.0040 |
| | Year 50 | 80.8 | 118 | 161 | 0.036 | 0.056 | 0.078 | 0.0019 | 0.0028 | 0.0043 |
| | Year 55 | 71.4 | 123 | 178 | 0.036 | 0.054 | 0.076 | 0.0020 | 0.0029 | 0.0048 |
| | Year 99 | 70.6 | 119 | 155 | 0.036 | 0.054 | 0.076 | 0.0021 | 0.0027 | 0.0035 |
| UR 1 (Unuk River, downstream of the confluence with SC) | Baseline | 21.5 | 48.6 | 75 | 0.029 | 0.055 | 0.097 | 0.0006 | 0.0011 | 0.0014 |
| | Year 4 | 27.9 | 51 | 78 | 0.033 | 0.058 | 0.101 | 0.0012 | 0.0017 | 0.0021 |
| | Year 35 | 45.7 | 64 | 84 | 0.029 | 0.058 | 0.101 | 0.0011 | 0.0015 | 0.0021 |
| | Year 50 | 43.6 | 61 | 83 | 0.028 | 0.057 | 0.101 | 0.0011 | 0.0015 | 0.0020 |
| | Year 55 | 39 | 62 | 85 | 0.027 | 0.057 | 0.101 | 0.0011 | 0.0016 | 0.0021 |
| | Year 99 | 39 | 61 | 79 | 0.027 | 0.057 | 0.100 | 0.0011 | 0.0015 | 0.0018 |
| UR 2 (Unuk River near BC-Alaska border) | Baseline | 13.9 | 29.6 | 46 | 0.018 | 0.058 | 0.229 | 0.0004 | 0.0007 | 0.0008 |
| | Year 4 | 17.5 | 31 | 48 | 0.019 | 0.060 | 0.228 | 0.0007 | 0.0009 | 0.0012 |
| | Year 35 | 30.4 | 37 | 47 | 0.018 | 0.059 | 0.227 | 0.0006 | 0.0009 | 0.0011 |
| | Year 50 | 27.2 | 35 | 46 | 0.018 | 0.059 | 0.227 | 0.0006 | 0.0009 | 0.0011 |
| | Year 55 | 19.9 | 36 | 50 | 0.018 | 0.059 | 0.228 | 0.0006 | 0.0009 | 0.0012 |
| | Year 99 | 25.1 | 35 | 48 | 0.018 | 0.059 | 0.227 | 0.0007 | 0.0008 | 0.0010 |

* Hardness dependant guidelines calculated using median baseline hardness for the site (51.6 mg/L)

** 'Year' refers to year after commencement of operations

Selenium concentrations in South Teigen Creek, according to the proponent, would be occasionally greater than baseline concentrations (Appendix B) taking into account the proposed mitigation measures at the PTMA. In South Teigen and Teigen creeks all metal concentrations are predicted to be below baseline conditions. Water quality in both Teigen and Treaty creeks are not expected to change beyond the natural range of variability (i.e., less than the 95th percentile of baseline conditions) and thus the proponent does not expect residual effects on surface water quality in the Bell-Irving River.

**Figure 5.5.2: PTMA and Surrounding Waterways**




*-TRC2 (Treaty Creek, downstream of the confluence with North Treaty Creek), STE3 (South Teigen Creek at Teigen Creek confluence), TEC2 (Teigen Creek, downstream of the confluence with South Teigen Creek)
Source: Seabridge Gold

**Table 5.5.2: Surface Water Quality: Predicted Degree of Effect after Mitigation***

| | Mine Site | PTMA |
|---|---|---|
| **Magnitude** | **Medium** – selenium concentrations will moderately exceed BC water quality guidelines at the Sulphurets Creek / Unuk River confluence during the operation, closure and post-closure phases. | **Low** – effect will cause an increase over baseline at times for selenium however concentrations are still expected to be within BC water quality limits. |
| **Extent** | **Landscape** – no effects on selenium concentrations are predicted downstream in the Unuk River (at the US border, 35 km from the Project site). | **Landscape** – loading will be confined to North Treaty, Treaty, South Teigen and Teigen creeks (the near-field and mid-field receiving environments). |
| **Duration** | **Far future** – effects extend into the post-closure phase | **Far future** – effects extend until the first decade of post-closure. |
| **Frequency** | **Continuous** – effects will occur throughout all Project phases. | **Sporadic** – effects will be experienced seasonally as discharge and seepage rates change throughout the year. |
| **Reversibility** | **Irreversible** – effects are expected to be reversible upon improvement of WTP effluent quality however this is over a multi-hundred year time frame. | **Reversible long-term** – upon natural improvement of TMF effluent quality in the long term or far future. |
| **Context** | **High** – reflects the fish values (primarily salmon) that are present in the Unuk River. | **High** – reflects the high fisheries values within the Teigen and Treaty systems. |
| **Overall Degree of Severity of Residual Adverse Effect** | **Not significant (moderate)** – reflects the medium magnitude, landscape extent and high context for water quality effect downstream of the Mine Site. | **Not significant (minor)** – reflects the low magnitude and sporadic duration and high context. |

* Analysis conducted by the Agency

### Government, Public and Aboriginal Comments and Proponent's Response

Environment Canada, BC MEM, BC MOE, the NLG, Skii km Lax Ha, Tahltan, and Gitanyow raised concerns over the technical and economic feasibility of the ion exchange treatment plant proposed to mitigate selenium discharges to Sulphurets Creek. The proponent provided information through selenium specific sub-working group meetings and specific responses to working group comments on selenium treatment options, the results of its test program and cases where this technology is being used elsewhere in North America. In addition, the proponent has agreed to the development of a selenium management plan, and the development of a pilot plant to evaluate the feasibility of the proposed selenium management prior to commencing mine operations. The Agency believes that with these mitigation measures, uncertainties around selenium and water treatment will be reduced.

Aboriginal Groups, such as NLG, Tahltan and Gitanyow, and the public including Alaskan residents raised concerns over potential impacts on fish, wildlife and human health as a result of degraded water quality from the Mine Site extending beyond the regional study area and into the Alaska side of the Unuk River. Given the conservative approach taken on its water quality models, the mitigation proposed, and monitoring programs that will be developed and used the proponent believes that there will be no impact on wildlife or humans through degraded water quality. In addition, conditions such as the development of the Mine Site Water Management Plan, the Aquatic Effects Monitoring Plan, and the Selenium Management Plan will provide for monitoring and adaptive management for water quality related issues within the Unuk watershed. The Agency believes that the potential for significant impacts on fish, wildlife and human health is low given the mitigation measures outlined in Appendix C.

All Aboriginal groups participating in the working group expressed concerns over potential effects of degraded water quality on salmonids in Treaty and Teigen creeks and downstream in the Bell-Irving and Nass rivers. In response, the proponent re-stated its confidence in its assessment and that its mitigation measures will fully address any effects on salmon-bearing waters. In addition, the proponent has committed to an Aquatic Effects Monitoring Program, Selenium Monitoring Program, and Teigen Creek Salmon Monitoring Program. Based on these commitments, the Agency believes that the impacts on surface water quality in Treaty Creek, Teigen Creek, Bell-Irving River, and Nass River are not significant effects and any subsequent effects salmonids health will be appropriately mitigated through measures to address surface water quality.

### Agency Conclusions on the Significance of the Residual Environmental Effects

The Agency considers that the proponent's water quality objectives can be achieved as the proposed mitigation measures are proven, a monitoring and adaptive management plan will be implemented, and there are well-known and conventional adaptive management actions that could be implemented as contingencies if needed. More specifically, since the proponent must meet water quality guidelines (BCWQG or site specific guidelines) for the PTMA 100 meters downstream of the operational discharge,the likelihood of degraded water quality in Teigen Creek, Treaty Creek and the Bell-Irving River is considered low. At the Mine Site there is a high likelihood for degraded water quality in Sulphurets Creek, however the likelihood decreases from moderate to low for sites UR 1 and UR 2 (BC-Alaska border).

The Agency concludes that the Project is not likely to cause significant adverse environmental effects on surface water quality when the implementation of the proposed mitigation measures, water management and water treatment plans are taken into account. Follow-up measures will identify occurrence of adverse effects on surface water quality and establish criteria for which contingency measures will be required.

## 5.6 Fish and Fish Habitat

The assessment of the effects of the Project on fish and fish habitat focuses on the following fish species and their aquatic habitat: Pacific salmon (Coho, Sockeye, and Chinook), Dolly Varden, bull trout, rainbow trout, and steelhead. Several of these species and Pacific salmon in particular are of ecological, economic, or cultural importance, including for associated commercial, Aboriginal, and recreational fisheries.

The assessment of the effects of the Project on fish and fish habitat focuses on the following fish species and their aquatic habitat: Pacific salmon (Coho, Sockeye, and Chinook), Dolly Varden, bull trout, rainbow trout, and steelhead. Several of these species and Pacific salmon in particular are of ecological, economic, or cultural importance, including for associated commercial, Aboriginal, and recreational fisheries.

Decreased surface water quality, primarily from increased concentrations of selenium, can lead to increased bioaccumulation in fish, which in turn may result in reduced fish health and productivity. Water quality effects and the ability of the proposed mitigation measures to meet water quality guidelines established for the protection of aquatic life, including fish, are discussed in sections 5.3 and 5.5.

### Mine Site

As stated in the EIS, no fish are present at the Mine Site due to naturally poor water quality and natural physical barriers in the downstream portion of Sulphurets Creek. Dolly Varden are found in the lower portion of Sulphurets Creek, while other fish species, including Pacific salmon, rainbow trout / steelhead and coastal cutthroat trout, are present in the Unuk River, where Sulphurets Creek enters the Unuk River.

Five stream crossings associated with the Coulter Creek Access Road will destroy or alter a small amount of in-stream fish habitat (0.04 ha) for Dolly Varden and Coho salmon below the Mine Site. The construction of these stream crossings may result in sedimentation, riparian zone disturbance, and changes in channel morphology.

### PTMA

The proponent notes that Dolly Varden are the most widely distributed species within the regional study area and are the only fish present in the reaches of North Treaty and South Teigen creeks in the area of the PTMA. Additional fish species, including bull trout, mountain whitefish, rainbow trout, Pacific salmon and steelhead can be found downstream of the PTMA in the Teigen, Treaty and Bell-Irving watersheds.

As stated by the proponent, a total area of 5.34 ha of fish habitat will be lost from construction of the Treaty Creek Access Road crossings, TMF dams, seepage pond dams, transmission line crossings and from water quantity reductions in North Treaty and South Teigen creeks downstream of the TMF dams.

A total area of 8.96 ha of fish habitat will be lost from the South Teigen and North Treaty watersheds due to the deposit of deleterious substances into the proposed TMF and seepage collection ponds.

The proponent will facilitate the removal and relocation (through fish salvage) of an estimated 30000 Dolly Varden from South Teigen and North Treaty creeks as part of the construction of the TMF, which could result in direct mortality.

### Mitigation

The proponent has developed two plans to address the regulatory requirements of the *Fisheries Act* and to offset losses to fish habitat and fisheries productivity. The first is an offsetting plan to satisfy paragraph 35(2)(b) of the *Fisheries Act* and the second is a compensation plan for section 27.1 of the *Metal Mining Effluent Regulations* (MMER). The offsetting plan is intended to counterbalance loss of productive capacity of fish habitat associated with the construction of the transmission line and access roads to the Mine Site and PTMA, the TMF and seepage collection pond dams, and the water quantity reductions in South Teigen and North Treaty Creeks. The offsetting plan proposes two projects, resulting in the creation of 16.57 ha of new fish habitat. The final details of the plan will be required to support the regulatory permitting phase of the Project and will have to be consistent with requirements of the federal *Fisheries Act*, its regulations, and supporting policies.

The compensation plan was developed to offset for the loss fish habitat resulting from the deposit of deleterious substances within fish-bearing watercourses of the proposed TMF and related seepage collection ponds. This compensation plan is required by section 27.1 of the MMER. A total area of 20 ha of new fish habitat is proposed, which is over twice the amount of habitat predicted to be lost. The final details of the compensation plan will be required to support the regulatory permitting phase of the Project.

Prior to destroying fish habitat within the footprint of the North Cell and Centre Cell of the TMF, the proponent will capture and relocate 5000 Dolly Varden. Prior to the development of the South Pond in year 25, an additional 25000 Dolly Varden will be captured and relocated. The proponent has developed a fish salvage program that outlines a strategy to ensure the fish are relocated to suitable water bodies within the Teigen and Treaty Creek watersheds. The final details of this program will be required to meet regulatory approvals.

The proponent will alter diversion ditch flow patterns to coincide with the various phases of TMF development in recognition of the important Chinook salmon spawning habitat in Teigen Creek and to avoid downstream flow related impacts in Teigen Creek.

### Key Residual Effects

Minimal residual effects on fish habitat are expected from the construction of the Coulter Creek Access Road, Treaty Creek Access Road, transmission line and TMF as the proponent is proposing to create new fish habitat to counterbalance fish habitat losses. Although the proponent has presented a fish salvage plan to relocate Dolly Varden in the area of the TMF there is the potential for residual effects on the fish from being relocated, through direct mortality.

**Table 5.6.1: Fish and Fish Habitat: Key Predicted Degree of Residual Effects***

| | Mine Site / PTMA |
|---|---|
| **Magnitude** | **Medium** – while no change in productive capacity is expected an on-going change in the type and function of fish habitat (stream type Dolly Varden habitat to off channel pond Dolly Varden and Coho habitat) relative to baseline conditions is expected. The removal (and potential mortality) of Dolly Varden from the TMF area will represent a departure from baseline conditions. |
| **Extent** | **Landscape** – compensation works will extend beyond the Project footprint area to the broader watershed area. Fish relocation will extend beyond the project footprint. |
| **Duration** | **Short-term** – short time will elapse between habitat destruction and the creation of habitat under the fish habitat compensation and offsetting plans. Mortality form the fish relocation will mostly occur at time of relocation. |
| **Frequency** | **One-time** – effects on habitat will occur once as part of Project construction. The relocation of Dolly Varden from the TMF area will take place over 2 one-time events. |
| **Reversibility** | **Reversible short-term or Irreversible** – the creation of new, replacement of fish habitat should occur within a few years. The relocation and potential mortality is irreversible. |
| **Context** | **Neutral** – in-stream and riparian habitat vary in its level of adaptability to alteration. The majority of impacts are going to occur in Dolly Varden habitat, Dolly Varden are the most widely distributed species in the study area. |
| **Overall Degree of Severity of Residual Adverse Effect** | **Not significant (moderate)** – reflects the medium magnitude and landscape extent. The newly constructed offsetting habitat will result in ecosystem level habitat transformations and the relocation will impact a population of Dolly Varden. |

* Analysis conducted by the Agency

## Government, Public and Aboriginal Comments and Proponent's Response

DFO, BCMOE, NLG, Skii km Lax Ha and Gitanyow raised concerns about uncertainties surrounding the viability of the proposed Dolly Varden fish salvage program for the TMF area. In response, the proponent developed a conceptual fish salvage plan which included a risk based analysis that selected Hodkin Lake and Treaty Creek as the lowest risk options to receive Dolly Varden from the Teigen and North Treaty watersheds. The Agency is satisfied with the response and notes that there will be consultation with DFO, the BCMOE and Aboriginal groups during its development.

DFO raised concerns over potential impacts on fish and fish habitat resulting from flow reductions in overwintering habitats within North Treaty Creek, South Teigen Creek, and Teigen Creek. DFO requested an effects analysis of flow reductions on overwintering habitats with particular emphasis on worse case scenarios. The proponent provided an analysis of the effects and conclusions on impacts on overwintering fish and fish habitat for Treaty and Teigen Creeks. DFO noted that the issues it raised have been addressed for the purposes of the EA.

DFO, Skii km Lax Ha, and NLG raised concerns about the likelihood of the long-term success of the new fish habitat proposed by the proponent. To help address this uncertainty, the proponent will refine its fish habitat compensation plans during the regulatory phase of the Project, should the Project be able to proceed to permitting. In addition, the proponent will use a staged implementation approach to constructing the fish habitat to ensure lessons learned from the first project can be applied to others, and will monitor and maintain the new fish habitat. DFO is satisfied with the conceptual fish habitat compensation plan, noting that refinements will take place should the project carry through to the permitting stage. DFO also notes that Aboriginal consultation will continue as part of any authorizations under the *Fisheries Act* in addition to Aboriginal consultation undertaken during the environmental assessment.

DFO, NLG, and Gitanyow raised concerns over the potential for changes in water temperature downstream from the TMF to affect fish. The proponent committed to expanding its water temperature monitoring in North Treaty, Treaty, South Teigen and Teigen creeks for the life of the mine, including closure and five years post-closure. The Agency is satisfied that the monitoring and follow-up will adequately address uncertainties in the water temperature changes downstream of the TMF.

### Agency Conclusions on the Significance of the Residual Environmental Effects

Residual effects on fish and fish habitat are considered highly likely for areas on both the Mine Site and PTMA. However, the Agency concludes that the Project is not likely to cause significant adverse environmental effects on fish and aquatic habitat when implementation of the proposed mitigation measures is taken into account. A follow-up program is planned for fish and fish habitat and will be developed during the regulatory compliance monitoring phase.

## 5.7 Wetlands

Wetlands are characterized as lands having water at or near the ground surface and include bogs, fens, marshes, swamps, and shallow water wetlands. Eighteen wetland types have been identified within the regional study area including fens, marshes and swamps. Wetlands fulfill a wide range of ecological, hydrological, physical and biochemical functions and represent vital habitat as many wildlife species, spend at least part of its life cycle in wetland habitat. The Project will have an effect on wetland extent and function in areas where the Project footprint directly overlays wetland habitat, where it significantly isolates wetland habitats from other habitats, or segments existing wetlands. According to the proponent, potentially effected wetlands are not currently listed by the Province of British Columbia for conservation concerns (i.e. no red-or blue-listed wetlands).

Loss of wetland extent and function is anticipated for both the Mine Site and the PTMA; however the largest impact will primarily be associated with the construction of the TMF which accounts for approximately 82 percent of the wetlands lost in the LSA (Table 5.7.1). Wetlands within the TMF location provide important habitat for migratory birds, moose, bears and fish.

**Table 5.7.1: Predicted Wetlands Lost in the Local Study Area.**

| Project Area | Component | Wetland Loss (ha) | Loss in LSA (%) |
|---|---|---|---|
| ***Mine Site*** | Kerr Pit | 0.2 | <0.1 |
| | Coulter Creek Access Road | 0.7 | 0.1 |
| | Sulphurets laydown area | 0.2 | <0.1 |
| ***PTMA*** | Treaty Creek Access Road | 0.8 | 0.2 |
| | Construction camps | 0.3 | <0.1 |
| | TMF (North Cell) | 19.3 | 3.9 |
| | TMF (South Cell) | 9.9 | 2.0 |
| | TMF (Centre Cell) | 19.6 | 4.0 |
| | Treaty OPC | 8.3 | 1.7 |
| ***Total*** | | 59.3 ha | 12% |

## Mitigation

The proponent made project design modifications at both the Mine Site and PTMA to avoid the loss of approximately 31.3 ha of wetlands. The proponent will minimize impacts on other wetlands by establishing buffer zones, installing and maintaining sediment control and protection structures, implementing erosion and slope protection measures, minimizing vegetation clearing, minimizing soil exposure, and conducting site restoration as soon as possible to re-establish ground cover. At closure, the proponent will create a total of 275 ha of wetlands as stated in the EIS.

The proponent will also implement a wetlands compensation plan to enhance approximately 48 ha of hydrologically stable wetland habitat within Teigen Creek, Treaty Creek, Taft Creek and an offsite wetland near Smithers.

**Table 5.7.2: Proposed Wetland Compensation**

| Compensation Area | Wetland Compensation (ha) | Distance from TMF (km) |
|---|---|---|
| Teigen Creek | 11.9 | 7 |
| Treaty Creek | 9.5 | 8 |
| Taft Creek | 5.5 | 35 |
| Smithers-area Wetland | 21 | 275 |
| Total Compensation | 47.9 | |

Additional details on mitigation for wetland extent and function can be seen in Appendix C.

## Key Residual Effects

The largest residual effects on wetland extent and function will occur within the TMF footprint (48.8 ha) and the Treaty Ore Preparation Complex (8.3 ha). The wetlands compensation plan measures are proposed to mitigate loss of wetland function in areas adjacent to the TMF; however, it is not expected to preserve wetland function to baseline levels. Furthermore, wetland functions in compensation areas are not expected to develop at the same rate that wetland functions around the TMF area affected.

**Table 5.7.3: Wetlands Loss and Function: Predicted Degree of Effect After Mitigation***

| | |
|---|---|
| **Magnitude** | **High** – reflecting the localized loss of greater than 50 ha around the TMF and Treaty OPC. |
| **Extent** | **Local** – the loss of wetland extent is confined to the Project footprint, however the function could extend to the landscape. |
| **Duration** | **Permanent** – reclamation of the TMF will occur at post-closure; however other effects on wetlands outside of the TMF will not be reclaimed. |
| **Frequency** | **Sporadic** – impacts on wetlands will occur over several one-time events as specific components of the Project are constructed. |
| **Reversibility** | **Irreversible** – although the TMF footprint will be reclaimed to wetlands after closure, the area will be irrevocably altered. Wetland losses elsewhere within the LSA will not be reversed through site reclamation. |
| **Context** | **Neutral** – wetlands are persistent if its hydrology is not negatively affected, and none of the affected wetland communities are listed or considered of special concern. |
| **Overall Degree of Severity of Residual Adverse Effect** | **Not significant (moderate)** – based on the local, high magnitude of the effect in area of the TMF. Wetland compensation will partially mitigate for the loss of extent and function; however it will not occur at the same rate as the Project related losses. |

* Analysis conducted by the Agency

## Government, Public and Aboriginal Comments and Proponent's Response

Environment Canada, at the request of the proponent, NLG, Tahltan, and Gitanyow, provided clarification on the Federal Policy on Wetland Conservation and confirmed that a compensation plan would not be required, as the effected wetlands are not currently listed by the Province of British Columbia for conservation concerns (i.e. no red-or blue-listed wetlands). In addition, Environment Canada notes that the Project is not on any federal lands and wetland loss within the Project area has not reached critical levels. Environment Canada has agreed to voluntarily provide guidance and expertise for any wetland compensation plan created by the proponent in support of its environmental management efforts. The Agency is satisfied with the response.

NLG and Gitanyow have stated that wetland habitat is critical to wildlife such as moose and migratory birds and have expressed concerns that the result of the proponent's commitment to following the 'spirit' of Federal Policy on Wetland Conservation may fall short of the outcome of an official wetlands compensation plan. The proponent has committed to follow the wetlands compensation plan as described in the EIS. Environment Canada has provided advice on the original proposed wetlands compensation plan and agreed to voluntarily provide guidance

and expertise for any revised plan created by the proponent in support of its environmental management efforts. The Agency is satisfied with the response.

Gitanyow raised concerns that the Brown Bear forest service road airstrip and Van Dyke Camp were not given serious consideration as options for wetlands compensation. The proponent stated that both options were assessed during the development of the compensation plan. The proponent considers neither option to be feasible as the sites are located on private land, and would provide limited compensation value. The Agency is satisfied with the proponent response.

### Agency Conclusions on the Significance of the Residual Environmental Effects

The Agency concludes that the Project is not likely to cause significant adverse environmental effects on wetlands when mitigation is taken into account.

## 5.8 Wildlife

Key wildlife VCs discussed in this report includes moose, mountain goats, grizzly bears and wetland birds. These species are important to several Aboriginal groups within the Project area for food, social and ceremonial purposes.

Western toad is a species of special concern. If the Project is carried out the proponent must ensure that measures are taken to avoid or lessen and monitor effects on the western toad in keeping with section 79(2) of the *Species at Risk Act*. The measures must be taken in a way that is consistent with any applicable recovery strategy and action plans.

**Table 5.8.1: Anticipated Unmitigated Habitat Loss for Key Wildlife VCs***

| Valued Component | Habitat Lost and Altered (ha) | LSA - Predicted Loss (%) | RSA - Predicted Loss (%) |
|---|---|---|---|
| Moose (early winter) | 2554 | 43.6 | 6.3 |
| Moose (late winter) | 648 | 31.1 | 3.1 |
| Mountain Goat (winter) | 1150 | 17.2 | 2.0 |
| Mountain Goat (summer) | 1703 | 18.9 | 2.2 |
| Grizzly Bear (spring) | 5000 | 35.2 | 5.5 |
| Grizzly Bear (summer) | 7874 | 39.0 | 6.1 |
| Grizzly Bear (fall) | 1077 | 28.3 | 4.1 |
| Grizzly Bear (winter denning) | 308 | 13.1 | NA |
| Western Toad | 51 | 19 | 8 |

* Wetland Bird habitat loss is described in the wetland bird sub-section later in this chapter.

### Moose

Similar to other areas in BC, the moose population within the RSA has declined in recent years. The moose population in the Nass Wildlife Area (NWA), abutting the RSA to the south fell during the period from 2001 to 2011, from a population of 1595 in 2001 to 638 in 2004 to 517 in 2011 likely due to overhunting.

The density and number of moose observed by the proponent through formal surveys was higher in the eastern interior area near the PTMA, and adjacent watersheds including Treaty Creek, Bell-Irving River, and Bowser Lake (0.59 moose/km$^2$; 198 moose), than in the Mine Site area and along the Unuk River watershed (0.27 moose/km$^2$; 33 moose).

The population in the eastern portion of the RSA (which is just to the north of the Nass Wildlife Area) along the highway declined from a mean estimate of 198 to 160 between 2008 and 2011, while the numbers in the western RSA (along the Unuk River) declined from 33 to 14 moose in the same period.

Winter is a difficult season for ungulates because deep snow limits their movement, and their energy costs required to access forage resources can be greater when compared to other seasons. As a result, winter habitat is important for moose, and late winter habitat when snowpack is deepest is critical for moose.

Habitat loss and alteration (including late winter habitat), direct mortality from collisions with Project vehicles, disruption of movement (e.g. migration from Nass watershed to areas north) and indirect mortality represent key potential effects on moose according to the proponent.

### Mitigation

The proponent has redesigned the conveyor system between the Mine Site and tailings management facility (TMF) such that it passes underground through the Treaty Saddle, a key movement corridor identified by First Nations between the coastal and interior portions of the RSA to mitigate for effects on moose habitat. The proponent will also avoid high quality habitat where possible, minimize human activity in movement corridors, and reclaim a portion of habitat lost around the tailing management facility. The proponent will maintain precautionary speed limits for its drivers to mitigate for vehicle related moose mortality. The proponent will mitigate for other impacts on moose by managing roadside vegetation along the Treaty Creek Access Road and Coulter Creek Access Road (to reduce attraction to the roadside), snow bank heights on access roads (to avoid trapping wildlife), and gate access roads to minimize access by hunters near the Project site. Additional mitigation can be found in Appendix C.

### Key Residual Effects

Construction of the process plant, TMF and both access roads will result in the loss of a total of 2554 ha of early winter habitat. The amount of critical, late winter habitat is smaller; 648 ha will be removed by construction of the Treaty Creek Access Road in the lower Treaty Creek area (road footprint plus 300 m buffer). The amount of late winter moose habitat that will be lost represents a relatively small portion of the total late winter habitat available in the regional study area (3.1 percent). In addition, reclamation activities will be designed to restore comparable habitat type upon closure (approximately 67 ha of early winter habitat in the TMF area).

Direct mortality of moose caused by collisions with vehicles during construction, operation, and closure is predicted along the Coulter Creek Access Road (0.7 moose/year), Treaty Creek Access Road (0.6 moose/year) and Highway 37/37A (5.0 moose/year). The highest potential for vehicle-moose interactions is predicted to be along Highway 37 and the Treaty Creek Access Road, during the winter, because of high moose densities and high-quality habitat. Speed limits have been shown to be effective mitigation, so few if any moose mortality is expected on the access roads. Although the proponent proposes to implement speed limits, vehicle-moose collisions are predicted, particularly on highway 37.

The overall additive effect of habitat loss and alteration, direct mortality from collisions with Project vehicles, disruption of movement and indirect mortality is also considered a key residual effect to moose.

**Table 5.8.2: Moose: Predicted Degree of Effect After Mitigation***

| | |
|---|---|
| **Magnitude** | **Medium –** reflecting the loss or alteration of 42% of moose habitat within the LSA (primarily associated with the TMF; the low yearly number of moose strikes in relation to the size of the population; and the possible additive nature of other potential effects on moose. |
| **Extent** | **Landscape –** the additive nature of the effects will extend to the greater landscape |
| **Duration** | **Far Future –** all effects to moose are expected to last greater than 70 years. |
| **Frequency** | **Sporadic –** loss of habitat will begin during construction but will increase at sporadic intervals through operation. Direct mortality, disruption of movement and indirect mortality will occur intermittently throughout the life of the Project. |
| **Reversibility** | **Reversible long-term –** the additive nature of effects to moose will decline at closure; however in areas where habitat is not reclaimed, the effect is irreversible. |
| **Context** | **High –** due to the declining regional population status and importance to Aboriginal groups. |
| **Overall Degree of Severity of Residual Adverse Effect** | **Not Significant (moderate) –** reflecting the medium magnitude and the high context. |

* Analysis conducted by the Agency

## Mountain Goat

Mountain goats represent a popular recreational and Aboriginal hunting species throughout western Canada. Mountain goats in BC are ranked "S4" (apparently secure) by the B.C. Conservation Data Centre and ranked "G5" (secure) globally (BC MOE 2010). Aerial surveys were conducted by the proponent in 2008 during the summer to assess populations, which found 230 goats in 62 groups.

Goats have been observed near the Mine Site during both winter and summer. Habitat suitability modeling and provincial Ungulate Winter Ranges identified important areas for goats on the Unuk Finger and John's Peaks between the Mine Site and the Unuk River. In addition, a potential mineral lick has been identified in the valley between the Sulphurets and Kerr pits. Around the PTMA, goats have been observed on the Snowslide Range (located between the PTMA

and the Bell-Irving River). Habitat loss and alteration and sensory disturbance creating functional habitat loss as described in the EIS represent key potential impacts on mountain goats.

## Mitigation

The proponent will take measures to avoid important habitat where alternatives are available to mitigate for loss and alteration of mountain goat habitat. Goat habitat disturbances will not be compensated or reclaimed.

The proponent will use noise dampening measures such as mufflers where possible, employ design measures to reduce human goat interactions, manage helicopter use to avoid areas of goat use and use directed/focused lighting to reduce stray lighting to area with goats to mitigate for effects of sensory disturbances such as light and noise. A detailed list of mitigation can be found in Appendix C.

## Key Residual Effects

Project components primarily on the Mine Site will result in habitat loss (project footprint) and alteration (300 meter buffer) which will affect 19 percent (1703 ha) of high-quality winter and summer mountain goat habitat in the LSA, and 2 percent in the RSA.

Sensory disturbances including blasting noise, aircraft noise and human presence around the Mine Site may result in temporary or permanent displacement of mountain goats (functional habitat loss). After mitigation, approximately 13 percent of the RSA winter population, and 19 percent of a subpopulation on the massif outlined by the Unuk, Treaty and Bowser mainstems, may be exposed to noise levels loud enough to cause disturbance and/or functional habitat loss during operation.

**Table 5.8.3: Mountain Goat: Predicted Degree of Effect After Mitigation***

| | |
|---|---|
| **Magnitude** | **Medium –** although only 2 percent of habitat loss is expected with the RSA, mountain goats can be sensitive to habitat loss. Sensory disturbance from project related noise and light can result in permanent functional habitat loss for 13-19 percent of the subpopulation on the Mine Site. |
| **Extent** | **Landscape (habitat loss and alteration) –** although habitat effects will be tied to the Project footprint, functional habitat loss due to sensory disturbance can span beyond the Project footprint. |
| **Duration** | **Far Future –** habitat removal is expected to last more than 70 years, and in some cases habitat loss due to sensory disturbance will be permanent. |
| **Frequency** | **Sporadic (habitat loss and alteration) –** loss of habitat will begin during construction but will increase at sporadic intervals through operation.<br>**Regular (sensory disturbance) –** the use of lighting and blasting will be a daily occurrence. |
| **Reversibility** | **Irreversible (habitat loss and alteration) –** loss of mountain goat habitat will not be reclaimed.<br>**Reversible short term to irreversible (sensory disturbance) –** the effects of blasting will have short term disturbances, however long term exposure to noise and light may cause permanent functional habitat loss. |
| **Context** | **Neutral –** mountain goats represent an important species for Aboriginal peoples, however mountain goat numbers are stable. |
| **Overall Degree of Severity of Residual Adverse Effect** | **Not significant (moderate) –** both effects reflect the medium magnitude, the sensitivity to habitat loss (physical and functional) and neutral context. |

* Analysis conducted by the Agency

## Grizzly Bears

Grizzly bears are found throughout BC, from sea level and river-valleys to alpine regions. BC is home to more than half of the Canadian population of grizzly bears, with an estimated 13800 grizzlies in the province. Grizzly bears are considered a species of special concern by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) are blue-listed in BC and represent a culturally-valued species for many Aboriginal groups. An estimated 58 grizzly bears reside within the RSA. Two thirds of those bears are located in the coastal zone along the Unuk River presumably due to the salmon resource. The proponent identified, habitat loss as potentially having a key impact on grizzly bears.

## Mitigation

The proponent has redesigned the conveyor system between the Mine Site and TMF to mitigate for impacts on grizzly habitat by having it pass underground through the Treaty Saddle, a key movement corridor identified by First Nations between the coastal and interior portions of the RSA. The proponent will also avoid high quality habitat where possible; and reclaim a portion of habitat lost around the TMF. A detailed list of mitigation can be found in Appendix C.

## Key residual Effects

Project components on the Mine Site and PTMA will cause habitat loss and alteration which will affect 39 percent (10886 ha) of available high-quality grizzly bear habitat (summer) in the LSA (6 percent of the RSA).

**Table 5.8.4: Grizzly Bear: Predicted Degree of Effect After Mitigation***

| | |
|---|---|
| **Magnitude** | **Low –** reflects the fact that most of the grizzly bear population is located in the Unuk watershed where habitat will not be altered. |
| **Extent** | **Local –** will be tied to the Project footprint. |
| **Duration** | **Far future –** habitat removal causing grizzly displacement is expected to last greater than 70 years. |
| **Frequency** | **Sporadic –** loss of habitat will begin during construction but will increase at sporadic intervals through operation. |
| **Reversibility** | **Irreversible –** areas subject to reclamation are anticipated to be reversible in the long term, however areas where habitat is permanently removed and cannot be reclaimed an irreversible degree of effect is predicted. |
| **Context** | **Neutral –** the grizzly bear represent an important species for Aboriginal groups. The grizzly population is stable and may be able to adapt habitat use to compensate for lost areas. |
| **Overall Degree of Severity of Residual Adverse Effect** | **Not significant (minor) –** reflecting the low magnitude and neutral context. |

* Analysis conducted by the Agency

## Wetland Birds

Wetland birds include waterfowl and wading birds. Some species of water birds such as ducks and geese represent important game for Aboriginal groups including the Nisga'a Nation. Several wetland birds identified by the proponent within the regional study area migrate out of Canada seasonally and are protected under the federal *Migratory Birds Convention Act (1994)* (MBCA). They include ducks, geese and swan. The proponent has identified habitat loss, primarily within the TMF area, as a key potential impact on wetland birds.

## Mitigation

To mitigate for effects on wetland bird habitat, the proponent will avoid clearing vegetation during breeding periods, conduct pre-construction surveys and implement activity free buffer zones around active nests and breeding ponds. The proponent will also avoid high quality habitat where possible; and reclaim habitat lost around the TMF. In addition, the proponent will avoid engaging in potentially destructive or disruptive activities in key migratory bird sensitive periods and locations consulting with EC's main Incidental Take website. A detailed list of mitigation can be found in Appendix C.

## Key residual Effects

The EIS identifies three groups of wetland birds that occupy different types of habitat that will be impacted differently by project activities. These include wetland birds (e.g., dabbling duck, geese), cavity nesting waterfowl (e.g., common goldeneye) and riverine birds (e.g., harlequin duck). Table 5.8.5 summarizes predicted habitat loss for each wetland bird group.

**Table 5.8.5: Summary of Habitat Loss and Alteration for Wetland Birds**

| | | | *RSA* | | *LSA* | |
|---|---|---|---|---|---|---|
| Group | Habitat types | Habitat lost / altered (ha) | Total Habitat (ha) | Habitat Lost and Altered (%) | *Total Habitat (ha) | Habitat Lost/ Altered (%) |
| Wetland Birds | Lakes, swamps, marshes, shallow open water wetlands | 311 | 7976 | 3.9 | 804 | 38.7 |
| Cavity nesting waterfowl | Mature forested areas (usually within 1km of suitable wetlands) | 4435 | 56153 | 7.9 | 9697 | 45.7 |
| Riverine Birds** | Montane rivers and stream | 144 km | 2896 km | 5.0 | 467 km | 30.8 |

* Total habitat refers to high-quality habitat in the RSA and LSA
** Area of lost or altered habitat is given in terms of stream length (km) rather than area

**Table 5.8.6: Wetland Birds: Predicted Degree of Effect After Mitigation***

| | |
|---|---|
| **Magnitude** | **Low –** reflects the fact that the area affected is relatively low within the RSA. |
| **Extent** | **Local –** will be tied to the Project footprint and 300 m buffer. |
| **Duration** | **Far Future –** habitat removal will be largely permanent. |
| **Frequency** | **Sporadic –** loss of habitat will begin during construction but will increase at sporadic intervals through operation. |
| **Reversibility** | **Irreversible –** most habitat loss, though local and tied to the project footprint is permanent and cannot be reclaimed to baseline conditions. |
| **Context** | **Neutral –** many wetland birds represent game for Aboriginal groups including the Nisga'a Nation. |
| **Overall Degree of Severity of Residual Adverse Effect** | **Not significant (minor) –** reflecting the low magnitude and neutral context. |

* Analysis conducted by the Agency

## Western Toad

The western toad is a federally listed species of special concern that is protected under Schedule 1 of the SARA (2002). In BC it is considered secure, but is afforded protection under BC's Wildlife Act (1996). Aerial and ground-based surveys recorded several breeding ponds in the RSA, all outside of the Project footprint. Although observations of adult toads in the Mine Site and TMF indicate that breeding sites may occur in these areas. Direct mortality represents a key potential impact on western toad as toads cross roads on the landscape to reach seasonal breeding ponds as described in the EIS.

## Mitigation

The proponent will conduct pre-construction surveys and avoid the use of machinery during key breeding and emergence periods near toad breeding ponds to mitigate potential direct mortality effects. In addition, where appropriate, the proponent will use toad tunnels or other crossing structures to minimize toad vehicle interactions.

## Key Residual Effects

The greatest project-related risk to western toads will be direct mortality of adults and newly emerged terrestrial juveniles near roads and close to wetlands during the spring and late summer. Crossing both high and low-traffic roads can lead to mortality, particularly during breeding migrations between breeding ponds and upland terrestrial habitat.

### Government, Public and Aboriginal Comments and Proponent's Response

Environment Canada, NLG, BC FLNRO, NLG, Gitanyow, Skii km Lax Ha, Gitxsan and Tahltan raised concern over potential traffic related mortality to wildlife, including moose along Highway 37/37A. The proponent conducted a study to assess the potential residual and cumulative effects on wildlife mortality (spills, and collisions), from project-related traffic (see section 5.13) to help address concerns.

**Table 5.8.7: Western Toad: Predicted Degree of Effect after Mitigation***

| | |
|---|---|
| **Magnitude** | **Low –** the proportion of the population interacting with project components is expected to be low. |
| **Extent** | **Local –** will be tied to project footprint. |
| **Duration** | **Long-term –** incidences of direct mortality will end after life of mine. |
| **Frequency** | **Sporadic –** will occur intermittently throughout the life of the Project. |
| **Reversibility** | **Reversible long-term –** risk to toad machinery interactions will decrease at closure. |
| **Context** | **High –** Western toad is listed on schedule 1 of the SARA. |
| **Overall Degree of Severity of Residual Adverse Effect** | **Not significant (minor) –** reflecting the healthy state of the population in British Columbia and the low magnitude of the effect. |

* Analysis conducted by the Agency

Several Aboriginal groups, including the Tahltan, and Gitanyow raised concerns over negative effects on key wildlife species through increased access to hunting (moose, mountain goats and bears) within the LSA, as a result of Coulter Creek and Treaty Creek access roads. The proponent has committed to restricting access to these roads through monitored gates and commits to prohibit hunting by employees around the Project area. The Agency is satisfied with the response.

The Tahltan raised concerns over negative effects on key wildlife species such as bears and moose from the construction of project infrastructure in valleys that the Tahltan identified as movement corridors between the Unuk River and the Treaty Creek and Bell-Irving River complex. The proponent has redesigned the conveyor system between the Mine Site and TMF such that it passes underground through the Treaty Saddle that separates the Unuk River and Treat Creek valleys to mitigate for effects on movement corridors. The Agency is satisfied with the proponents proposed mitigation.

The Skii km Lax Ha raised concerns over the assessment of marten, specifically as it related to effects of attractants and suggested that there could be residual effect in the camps that will be set up around the Project. The proponent has committed to implement mitigation, such as waste management best practices and employee education which they believe will fully address the potential effect. The Agency is satisfied with the response.

### Agency Conclusions on the Significance of the Residual Environmental Effects

The Agency concludes that the Project is not likely to cause significant adverse effects on wildlife and wildlife habitat, taking into account the implementation of mitigation measures, provincial commitments and follow-up programs.

## 5.9 Current Use of Lands and Resources

The current use of lands and resources for traditional purposes by Aboriginal persons within the local study area of the Project includes hunting, fishing, trapping, and gathering (e.g., berries, plants, mushrooms). Travel routes, cabins, and places of cultural significance to Aboriginal peoples have also been identified in the local study area (LSA).

The proponent assessed the effects of the Project on current land and resource use for traditional purposes by Aboriginal persons using available literature, community interviews, and traditional knowledge (TK) and traditional use (TU) studies. The Agency also received additional information from Gitanyow and Tahltan, which were considered in undertaking the following assessment.

### Mine Site

No site specific information has been provided for the current use of lands and resources at the Mine Site. However, the Tahltan and Skii km Lax Ha expressed concerns about the effects of the Project on mountain goat in the area, which may be impacted during the construction and operation phases of the Project. Approximately 13 percent of the winter population in the regional study area may be exposed to noise levels causing disturbance or functional habitat loss. Access to the site would also be restricted for safety and jurisdictional reasons, further reducing any potential hunting opportunities.

### PTMA

Site-specific information on current use of lands and resources for traditional purposes in the LSA for the PTMA has only been provided by Skii km Lax Ha and includes trapping, hunting and fishing activities. The Skii km Lax Ha have identified two registered trap-lines that overlap with the PTMA, several trails used for harvesting and to access cabins in the area, wetland hunting and trapping areas, fishing locations, berry harvesting areas and culturally modified trees.

Gitanyow provided data for their food, social and ceremonial (FSC) annual fisheries allocation for the Bell-Irving and Nass watersheds, of which a varying percentage may originate in Teigen and Treaty creeks (see Table 5.91).

The release of metals through seepage and surface water discharge from the Tailing Management Facility during the operations phase could reduce water quality in Treaty and Teigen creeks, in turn reducing fish availability downstream due to reduced fish health.

Changes in the availability of wildlife resources, due to sensory disturbance, the loss of habitat and access of wildlife to that habitat from PTMA infrastructure and Mitchell-Treaty Twinned Tunnel (MTT) development and increased wildlife-traffic mortality (particularly moose) along access roads and Highway 37/37A can reduce hunting opportunities across all project phases. Increased traffic during all project phases along Highways 37/37A may also reduce access to gathering opportunities for Aboriginal peoples.

**Table 5.9.1: Gitanyow Food, Social and Ceremonial (FSC) Annual Allocation for the Nass Watershed**

| Species harvested | Annual FSC allocation (Number of fish) | Estimated Contribution of Treaty and Teigen stocks* (Number of fish) |
|---|---|---|
| Sockeye salmon | 10000 | Unknown |
| Chinook salmon | 620 | 50** |
| Coho salmon | 500 | 28* |
| Chum salmon | 25 | Unknown |
| Pink salmon | 185 | Unknown |

Estimates were developed based on information provided by the Gitanyow Hereditary Chiefs to the Agency on February 9, 2014, citing the following sources: *for Coho Salmon: Bocking and Peacock, 2004; and **for Chinook Salmon: Koski et al, 1996.

### Mitigation

#### Mine Site

Mitigation measures to reduce adverse impacts, including sensory disturbance, to mountain goat are described in the wildlife section (section 5.8).

#### PTMA

Mitigation measures to reduce adverse impacts on wildlife species, including those identified as species of value to Aboriginal groups are described in the wildlife section (section 5.8).

Surface and ground water quality effects due to seepage and surface water discharge from the tailing management facility will be mitigated through a variety of measures (see sections 5.3 and 5.5 and Appendix C) to ensure that water quality guidelines for the health of aquatic resources are met across all project phases.

Project design changes were undertaken at the request of Aboriginal groups to minimize sensory disturbances of wildlife and wildlife corridors most notably for bear and moose in the PTMA, including moving the processing plant and associated infrastructure from the more exposed saddle area of the PTMA to the more remote north end. The proponent redesigned the MTT to mitigate for effects on movement corridors so that it passes underground through the Treaty Saddle that separates these two watersheds. Increased hunting and fishing pressure on resources along the access roads will be controlled by installing gates to restrict public access. Additional mitigation measures for wildlife are described in section 5.8 and in Appendix C.

### Key Residual Effects

The Project will cause localized effects on wildlife species at the Mine Site. However, due to the low levels of use in the Mine Site area, the difficult access to the site, and the availability of resources in other more-preferred locations, the proponent anticipates that environmental effects of the Mine Site will result in little to no decrease in current use of land and resources by Aboriginal peoples.

The proponent expects that the residual adverse effects of the Project to downstream fishing practices by Aboriginal peoples in the Bell-Irving and Nass watersheds will be low to negligible taking into account mitigation measures to address effects on water quality and fish habitat.

Residual effects of the Project on wildlife harvesting by Aboriginal peoples resulting in the PTMA regional study area are limited to effects on moose harvesting resulting from increased project-related traffic acting in combination with other reasonably foreseeable projects along Highway 37/37A. However, the proponent does not consider these effects on be significant, as moose are not expected to be significantly affected by the Project (see the wildlife and cumulative effects sections 5.8 and 5.14). Furthermore, those Aboriginal peoples who harvest moose have the ability to do so elsewhere in their respective traditional territories.

A detailed assessment of the significance of the environmental effects of the Project on current use of lands and resources can be found in Appendix F.

### Government, Public and Aboriginal Comments and Proponent's Response

Tahltan, Gitanyow and Gitxsan raised concerns about the effects of Project traffic on wildlife. The Gitanyow provided a number of comments related to moose modelling (moose population viability analysis) conducted by the proponent as part of the assessment of the effects of Project traffic using Highway 37/37A. The proponent conducted an updated moose population viability analysis using the Gitanyow data based on traffic counts provided by the Gitanyow in January of 2014. As a result, the proponent determined that

the traffic data provided by the Gitanyow was consistent with those data provided by the BC Minister of Transportation and Infrastructure.

Skii km Lax Ha are concerned that construction and operation of the TMF and Treaty Creek Access Road may cause negative effects on fishing, hunting and trapping practices in the Treaty and Teigen creek areas, areas where the group fishes, hunts, and traps. The proponent has committed to mitigating environmental effects on the species that are fished, hunted, and trapped to avoid significant adverse effects and to address reduced access to trap lines and other resources through compensation agreements to mitigate the potential effects.

The Tahltan have raised concerns about water quality and potential effects on salmon fisheries. Discussion of issues specifically relating to water quality is captured in sections 5.3 and 5.5.

Concerns were raised by NLG, Gitanyow, and DFO about the accuracy of the proponent's predictions that flow reductions fall within baseline natural variability for Teigen Creek and that ultimately Chinook spawning habitat and downstream fishing opportunities for a number of Aboriginal groups that fish in the Bell-Irving and Nass watersheds would not be effected by these changes. In response, the proponent is proposing a Chinook salmon monitoring program in Teigen Creek to validate the predicted flow reductions and it's prediction that there will be no effects on Chinook salmon in Teigen Creek. This monitoring program has been expanded to a salmon monitoring plan for Teigen Creek. DFO may choose to include further conditions it deems necessary, such as completion of the salmon monitoring program, in any authorizations it issues under the *Fisheries Act*.

Gitanyow are concerned that the Project will degrade water quality downstream of the PTMA and that contaminants will reduce salmon production in the Nass Watershed. A portion of the salmon that Gitanyow rely on for food originates in close proximity to the PTMA and a reduction in these stocks may impact their potential Aboriginal right to fish. Water quality downstream of the PTMA is not predicted to vary significantly from baseline conditions as described in the EIS. Discussion of issues specifically relating to water quality is captured in sections 5.3 and 5.5.

Gitanyow disagreed with the proponent's analysis of impacts on downstream fishing practices, specifically stating that the proponent has minimized the salmon production potential of the streams and rivers found near the Project and the impact the Project may have on Gitanyow fisheries. DFO found that the information provided by both Gitanyow and the proponent for watercourses downstream of the PTMA provided fair representations of the general importance or value of the watercourses as salmon producing systems. DFO noted that the Bell-Irving River is an important Chinook producer, with Teigen Creek being an important contributor to the Bell-Irving.

### Agency Conclusions on the Significance of the Residual Environmental Effects

The Agency concludes, based on the available information that the Project is not likely to have significant adverse environmental effects on the current use of lands and resources for traditional purposes by Aboriginal persons when implementation of the proposed mitigation measures is taken into account.

## 5.10 Human Health

The Project is located within an isolated area of northwestern British Columbia with no road access, resulting in limited hunting, fishing, trapping, and recreational activities by Aboriginal peoples, residents and guide outfitting operators in the Project area. There are no permanent residents within the local or regional study areas and no known drinking water sources that would be affected by the Project.

Excavation, grading, clearing, metal leaching/acid rock drainage (ML/ARD) from waste rock storage and disposal of tailings during the construction and operations phases of the Project may reduce surface water quality (see section 5.5) which may also affect the concentrations of tissue metals (e.g. arsenic and aluminum) in country foods such as fish and birds. The proponent predicts that concentrations of metals, nutrients and cyanide will not exceed BC and Canadian drinking water guidelines in Teigen and Treaty creeks during operation, closure or post-closure phases. Intensive use of vehicles and machinery, blasting, garbage incineration and road traffic during the construction and operation phases could degrade air quality through introductions of nitrogen dioxide, sulphur dioxide, carbon monoxide, metals, $PM_{2.5}$ and $PM_{10}$.

During the closure phase, activities such as decommissioning of facilities and removal of equipment and infrastructure could affect water and air quality in the short-term through surface runoff, siltation, chemical spills, generation of airborne dust and vehicle emissions. Over the longer term, site reclamation will reduce surface runoff and siltation.

At post-closure, the proponent has stated that no effect on human health from changes in air quality is expected, as most onsite activities will have ceased. The potential will remain for ML/ARD and the release of elevated levels of metals from the TMF. The proponent anticipates that these discharges will be within legal discharge levels. Animals will likely have access to remaining mine infrastructure and may therefore be exposed to any metals released to the water and taken up by plants.

### Mitigation

The proponent will apply measures to avoid or reduce effects on the atmospheric environment, water resources, sediments, soils, vegetation, berries, fish, wildlife and other VCs to mitigate potential effects on human health.

Mitigation to reduce effects on human health linked to the ingestion of drinking water and potential contamination of country foods primarily comprises those measures proposed that reduce effects on water quality (see surface and ground water quality sections 5.3 and 5.5) and mitigation measures to reduce dust deposition, including the Fugitive Dust Emissions Management Plan and Emissions Management Plan that would be implemented to meet BC MOE ambient air quality objectives. The proponent has also committed to posting signs around the TMF to indicate that the water is not potable, and that no public access is permitted while the mine is operating. Water quality at the TMF will be monitored in the closure phase and, should water quality deteriorate after mine operation, additional mitigation may be implemented. Access management measures provided for in the proponent's Traffic and Access Management Plan will mitigate some of the risk of effects from the consumption of country foods by inhibiting direct public access to the Project footprint.

The proponent has also agreed to develop a comprehensive Human Health Monitoring Plan which would address many of the issues raised by members of the working group, such as modelling uncertainties and baseline data. The plan would require the development of triggers using health-based criteria, which, if surpassed, would initiate the implementation of corrective actions. The proponent has committed to tissue monitoring to confirm these conclusions, should metal concentrations in environmental media be found to increase beyond the baseline conditions. Further details of mitigation measures for human health can be found in Appendix C.

## Key Residual Effects

The proponent is of the view that environmental effects of the Project on human health would not be significant taking into account the proposed mitigation measures. These conclusions are supported by a quantitative estimate of potential risk to human health, which used predictions of environmental media quality (i.e. water and soil quality) to conclude that there are no unacceptable risks to human health from the consumption of country foods.

## Government, Public and Aboriginal Comments and Proponent's Response

Health Canada and the NLG raised concerns with estimated levels of arsenic in country foods, such as grouse and moose, which were determined to be above the incremental lifetime cancer risk benchmark for the baseline conditions and with the Project in its review of the proponent's Human Health Risk Assessment (HHRA). The proponent explained that this was due to over-estimated predicted tissue concentrations of toxic inorganic arsenic in wildlife species, based on surrogate domestic species, and the screening level risk assessment over-estimated the associated health risks. The proponent then revised the estimation of cancer risks based on updated model inputs, and concluded that the incremental lifetime cancer risk from all country foods did not exceed the acceptable level of risk. Health Canada and NLG expressed further concerns about modelling uncertainties and advised that collection of empirical data for arsenic in grouse and moose should under taken as part of the proponent's monitoring efforts during the operation phase of the Project to confirm modelled predictions of contaminant levels in country foods. The proponent agrees with this approach and has committed to the collection of empirical data for arsenic in grouse and moose should environmental media (soil, water, or plant) monitoring data indicate that arsenic concentrations have increased beyond baseline conditions.

**Table 5.10.1: Human Health: Predicted Degree of Effect After Mitigation***

| | |
|---|---|
| **Magnitude** | **Low –** it is expected that human health effects from the Project are expected to be low during operations and closure as access to the Project site is restricted and the quality of country foods and water is not expected to change substantially from baseline conditions. |
| **Extent** | **Individual/Household –** given limited access to the Project locations, country foods are, at most, consumed on a limited basis by individual Aboriginal people, guide-outfitters and other outdoor recreationists originating from outside the regional study area. |
| **Duration** | **Short-term –** the duration of any potential human health effects associated with the ingestion of metals in water and country foods was rated short-term given the limited access and the lack of substantial changes relative to the baseline. |
| **Frequency** | **Sporadic –** since land users visit the Project area on a seasonal and temporal basis, the frequency of any residual human health effects from the ingestion of surface water and country foods is rated sporadic. |
| **Reversibility** | **Reversible short-term –** human health effects from the exposure to water, and country foods are assessed as reversible short-term, since they are usually readily treatable. As the use of the area is restricted, few country foods are consumed from this area; any impacts on health would be short term. |
| **Context** | **High –** human health is considered important to each individual, family, and society as a whole. Land users and Project workers may have a relatively high resiliency, compared to the general population, but consumers of country foods likely include the elderly, women of childbearing age and toddlers, with lower resiliency. |
| **Overall Degree of Severity** | **Not significant (minor) –** the magnitude of most health effects is rated low to negligible and, in most cases, sporadic in frequency and affecting relatively few people. |

* Analysis conducted by the Agency

Health Canada and NLG also raised concerns over the estimated high levels of aluminum in grouse. The proponent responded that aluminum is very poorly absorbed by the body and reiterated a statement made by Health Canada that exposure to aluminum from the consumption of country foods is not expected to pose unacceptable health risks. Health Canada recommended a sampling program as part of the monitoring of the operations phase of the Project for the verification of these estimates. The proponent, in response, commits to collecting empirical aluminum grouse tissue concentrations in the future should aluminum concentrations in environmental media be found to increase beyond the baseline conditions.

NLG stated that, following recent changes in the treatment of lead in risk assessments, a re-evaluation of the assessment of lead may be useful. The proponent acknowledged that the tolerable daily intake (TDI) of 3.6 µg/kg previously published by Health Canada was removed and is currently under review by HC. It is expected that the TDI for lead will be lowered, but as it is not possible to confirm what the revised TDI will be, a re-evaluation is not considered practical at this time. NLG recommended a commitment to re-evaluate the lead exposures once the new TDI guidance is available. The proponent committed to ongoing monitoring, as outlined in the environmental monitoring plans. Lead exposures will be re-evaluated if lead concentrations increase above background levels and new guidance becomes available.

Health Canada recommended the use of dietary surveys to confirm the exposure assumptions and conclusions presented in the HHRA. The proponent submitted a dietary survey questionnaire for the Skii km Lax Ha, an Aboriginal group that would likely be impacted by increased levels of toxins in country foods due to their practice of asserted rights in the Project area. The proponent has concluded that the assumptions used in the modelling are reflective of the results found in the dietary survey.

Health Canada and NLG noted the need for further assessment of the potential for bioaccumulation of contaminants in the tissues of aquatic organisms as a number of bio accumulative substances are likely to be released into receiving waters in association with mine-related activities (e.g., arsenic, cadmium, mercury, selenium). The proponent has committed to a Human Health Monitoring Plan (HHMP) and HC has provided details on country foods considerations for the HHMP, including obtaining and monitoring fish tissue samples. The Agency recommends that the proponent use HC's guidance document "Supplemental Guidance on Human Health Risk Assessment in Country Foods[4]" as a reference. HC is available to support the Responsible Authorities upon request in reviewing monitoring and follow-up reports related to the HHMP for country foods.

### Agency Conclusions on the Significance of the Residual Environmental Effects

The Agency concludes that the Project is not likely to cause significant adverse environmental effects on human health when the implementation of mitigation measures is taken into account.

4 Health Canada. 2010. Supplemental Guidance on Human Health Risk Assessment for Country Foods (HHRAFoods). Federal Contaminated Site Risk Assessment in Country Foods (www.hc-sc.gc.ca/ewh-semt/contamsite/docs/index-eng.php).

## 5.11 Navigation

The navigation VC includes the Project's potential environmental effects on navigational *safety* or *access*, as required under the former Act.

According to the proponent, the use of streams within the Unuk and Bell-Irving watersheds for navigational purposes has historically been, and still is limited because of the remoteness and ruggedness of the terrain and as well due to heavy glaciation in the area. Navigation in lower reaches of these watersheds (e.g. Bell-Irving River and Unuk River) has been identified for Aboriginal (fishing, travel), commercial (fishing) and recreational (rafting) use by a number of Aboriginal Groups and the public (e.g. commercial fishing associations). In addition, several project components/activities such as bridge construction activities will interact with potentially navigable waters (those that have not yet been identified by Aboriginal groups or the public) and could result in a reduction in navigation.

### Mitigation

Project works on water ways that are potentially navigable will require mitigation measures specific to navigational safety and access. Should these waterways be found to be navigable, the proponent will follow construction, operation and decommissioning standards set out by Transport Canada, and other regulations such as the Canadian Highway Bridge Design Code. In addition to implementing site-specific design mitigation in accordance with Canadian Standards Association overhead systems guidelines, the proponent will use extra high clearance for transmission line crossings as required, and implement the Water Management Plan to minimize the impacts on navigable waters. Additional details on mitigation measures are captured in Appendix C.

### Key Residual Effects

Two key residual environmental effects on navigation were identified which resulted in a temporary reduction in the ability to access and use a section of each of the Unuk and Bell-Irving rivers during bridge construction.

### Government, Public and Aboriginal Comments and Proponent's Response

The proponent redrafted the Navigation chapter of the EIS to include an analysis of potential project effects on navigation for any watercourse that could be considered navigable to respond to Transport Canada's interest to have Navigation assessed as a VC. Transport Canada is satisfied with the assessment and information provided by the proponent.

### Agency Conclusions on the Significance of the Residual Environmental Effects

The Agency concludes that the Project is not likely to cause significant adverse environmental effects on navigation when the implementation of mitigation is taken into account.

**Table 5.11.1: Navigation: Predicted Degree of Effect After Mitigation***

| | |
|---|---|
| **Magnitude** | **Low –** while the Unuk and Bell-Irving River bridges are constructed, temporary activities could impose short-term constraints on navigational use of the rivers at these crossing locations. |
| **Extent** | **Local –** all residual effects are local in extent, since they are limited to the waterway area directly affected by the footprints of the bridge structures and intake pipes. |
| **Duration** | **Short-term –** constraints on navigation during construction activities will be temporary. |
| **Frequency** | **Sporadic –** the frequency of the residual effects of bridge construction and/or decommissioning is rated sporadic, given its short-term temporary nature. |
| **Reversibility** | **Reversible short-term –** the temporary residual effects of bridge construction are rated reversible short-term, and will cease as soon as construction is complete. |
| **Context** | **Neutral –** the context for all residual effects is rated neutral because, while some navigation potential may be affected, no high-value navigation opportunities are at risk. |
| **Overall Degree of Severity of Residual Adverse Effect** | **Not significant (minor) –** all residual effects are ranked not significant minor, since they are of low magnitude, localized in extent, short-term in duration in most cases, and affect stream reaches with little or no known current navigation use. |

* Analysis conducted by the Agency

## 5.12 Effects of the Environment on the Project

Environmental factors that could potentially affect the Project include excessive precipitation, floods, landslides, avalanches, glaciers, and seismic activity.

Excessive precipitation as a result of climate change could cause a 12-25 percent increase in volume of surface water to pass through the Project area, depending on the rate of climate change and the resulting changes to the local micro-climate. According to the proponent, excessive precipitation could in turn impact water management structures such as tailings dams and the water storage facility, and cause flood damage to infrastructure such as stream crossings, mine pits and roads.

Both the Mine Site and PTMA are in areas with steep terrain. As a result, the surrounding soils tend to be unstable and are prone to landslides and avalanches. These events could cause large volumes of soil, rock or snow to strike project infrastructure at high speeds, which could damage infrastructure and risk worker safety.

The Mitchell Glacier is adjacent to the Mitchell Pit, which could potentially be affected by glacial advance and recession, ice melt, and the dislodging of ice blocks from the glacier's margins. Effects on the Project from these glacial changes include: increased surface water runoff at the Mine Site causing flooding, and destabilization and possible collapse of pit edges.

The west coast of Canada is a seismically active region. Earth tremors from these events could destabilize soils and adversely impact the foundation of project infrastructure, and cause additional landslides.

### Mitigation

The effects of excessive surface water runoff at the Project will be mitigated by designing water management structures such as dams, diversion ditches and roads to a standard capable of handling the potential increases in precipitation due to climate change. Some features will be twinned to create redundant capacity and rip-rap, berms and swales will be used to protect project infrastructure.

Effects associated with steep terrain such as landslides and avalanches will be mitigated by avoiding known geo-hazards and relocating infrastructure to stable soils. Avalanche management plans will include monitoring snow pack, the strategic use of explosives, and adding defensive barriers and buffer zones to further reduce risks.

Glacial advance and recession will be monitored by the proponent in order to anticipate any potential interactions between Mitchell Glacier and the Project. The proponent plans to excavate ice benches and encroaching ice blocks to flatten the face of the glacier, which will effectively mitigate impacts from glacial movement. Planned pumping systems at the Mine Site will have sufficient capacity to accommodate increased flows from melting ice.

The proponent will design key project components to exceed the highest Canadian Dam Safety Guidelines to mitigate for earth tremors from seismic activity. This design would allow the Tailings Management Facility dams, Water Storage Facility dams and Rock Storage Facilities to withstand 1 in 10000 year seismic event.

### Key Residual Effects

Residual effects from extreme weather events, steep terrain and glacial movement are not anticipated with the application of mitigation measures. A seismic event, while unlikely, could result in significant residual impacts on project infrastructure and downstream water quality and quantity if the earth tremors are large enough to damage infrastructure.

### Government, Public and Aboriginal Comments and Proponent's Response

Environment Canada and NRCan expressed concerns about the accuracy of the proponent's climate change predictions on glacial movement, and the impact of glacial melt on surface water flows. The proponent provided an overview of the recent and historical data it is using to predict glacial movement and the impact of glacial melt on surface water flows. EC and NRCan are satisfied with the proponent's response.

NRCan was concerned about unstable soils relating to potential landslides at the Mine Site and PTMA and asked for additional details on the timing and location of proposed mitigation. The proponent stated that it will use adaptive management strategies and has identified areas that will require further assessment and monitor them to determine where and when to best apply mitigation. NRCan is satisfied with the response.

The impact of melting permafrost was also raised by NRCan. The proponent indicated that permafrost melt could affect the recharge rate of groundwater, block drainage systems due to refreezing, and destabilize slopes causing rock falls. The proponent responded stating that planned pumping systems have been designed to handle potential increase in flows, and that standard practices for mining in frozen ground, including heat tracing drainage systems and slope benching, will adequately protect the Project. NRCan is satisfied with the response.

### Agency Conclusions on the Significance of the Residual Environmental Effects

The Agency concludes that the effects of the environment on the Project have been adequately characterized. The Agency is of the view that adequate project design and mitigation measures have been integrated into the Project to prevent incidents that could result in adverse environmental effects.

## 5.13 Effects of Potential Accidents or Malfunctions

Under the former Act, an EA must consider the possible effects of accidents and malfunctions that could adversely affect the environment. Accidents and malfunctions may occur throughout all phases of the Project and its potential environmental effects on each key VC were assessed. Scenarios were assessed for the Mine Site Area, PTMA, and Mitchell Treaty Twinned Tunnels.

The most likely potential accidents and malfunctions at the Mine Site Area were those that would result in contaminated water entering Sulphurets Creek and flowing into the Mitchell Creek/Unuk River watershed. Sources include water leaching underground from rock storage facilities, water volumes overwhelming the capacity of the Water Storage Facility, and the inability of the Water Treatment Plant to remove all the predicted contaminants. Underground operations may also experience flooding if pumping systems were insufficient or failed. The proponent conducted a Catastrophic Dam Break Analysis on the Water Storage Facility dams that addressed water overtopping the wall, or an internal piping failure. A dam failure would flood the Unuk River watershed and any project infrastructure therein and damage fisheries. A flood wave from a sudden breach would be 2.0-3.5 m high on the Unuk River at the BC-Alaska border, decreasing to near zero at Burroughs Inlet.

The assessment at the PTMA found that the most likely potential accident and malfunction effects were related to erosion of the TMF dams, and from underperforming water treatment methods, both of which would result in contaminated water being discharged from the tailings facility and flotation pond thereby causing downstream impacts on fish and fish habitat. The proponent's Catastrophic Dam Break Analysis on the Tailings Management Facility dams found that if water were to overtop the wall of the North or Southeast Dams then flooding would occur in the Teigen and Treaty Creek watersheds respectively. Sections of Highway 37 along the Nass and Bell-Irving rivers would also be flooded, along with sections of Highway 113 between the villages of Gitlaxt'aamiks and Laxgalts'ap.

Accidents and malfunctions at the Mitchell Treaty Twinned Tunnels would most likely occur during its construction if there was a chance encounter with a water-bearing fault, which would result in water overwhelming the temporary water treatment plant, or if more acid-generating rock than expected was found, which could exceed the capacity of the acid-rock storage facility.

### Mitigation

Excess water at the Mine Site is primarily mitigated by incorporating additional capacity into the design of the water management facilities. A series of treatment circuits will be able to operate separately and provide additional treatment capacity if one fails. Additional diversion ditches and pumps can also be added to accommodate more water volume if required. The proponent is confident that the water management capacity will be sufficient to withstand the highest possible volumes, that redundant systems will be able to support other systems that fail, and that the system can sufficiently adapt to changing conditions.

The effects of a catastrophic failure of the dams at the Water Storage Facility and TMF will be mitigated by building the structures to exceed Canadian Dam Association Safety Guidelines.

The mitigation for erosion of the PTMA dams is to monitor them and conduct repairs as needed. Water contaminated with various metals will be treated using a suite of chemical processes, and the proponent is confident in its ability to ensure that discharge water quality will not cause significant impacts on the downstream environment.

The pumping and water storage systems will have capacity to handle the additional water volumes in the event that a water-bearing fault is discovered during the construction of the Mitchell Treaty Twinned Tunnels. Conservative estimates of the presence of acid-generating rock were used when designing rock storage facility, therefore they will be able accommodate additional rock as needed.

### Key Residual Effects

Residual effects resulting from excess mine water could degrade water quality downstream from the infrastructures for a limited period of time. However those residual effects are unlikely to occur taking into account the mitigation measures included in the Project design. While a catastrophic dam failure would likely have high magnitude downstream residual impacts on fish, fish habitat and water quality, it is considered unlikely.

### Government, Public and Aboriginal Comments and Proponent's Response

NLG and Gitanyow raised concerns about potential impacts arising from a catastrophic dam failure at either the Water Storage Facility or the TMF. The proponent acknowledged that if such an event occurred there would likely be flooding and downstream tailings deposition that would result in significant residual effects on fish and fish habitat in both the Unuk, Bell-Irving and Nass watersheds.

### Agency Conclusions on the Significance of the Residual Environmental Effects

The Agency is satisfied that the proponent has identified and assessed the key potential accidents and malfunctions associated with the Project. The Agency notes that the Project has been designed to prevent such scenarios and that contingency and response plans would be in place should an accident occur. Overall, the Agency is of the view that accidents or malfunctions that could result in significant adverse residual effects are unlikely to occur.

## 5.14 Effects on the Capacity of Renewable Resources

A comprehensive study under the former Act must address the capacity of renewable resources that are likely to be significantly affected by the Project to meet present and future needs. The assessment focused on, moose, mountain goat, grizzly bear, wetland birds, and fish (Pacific salmon species, rainbow trout, bull trout, and Dolly Varden). An adverse effect on these resources could result in a reduced capacity to support fisheries, hunting activities, other traditional uses, and healthy ecosystem functionality.

The assessment of effects on each of these resources was conducted according to the scope of assessment for the Project and environmental assessment methods that have been developed to satisfy the regulatory requirements of the former Act. Measures for significance were determined for each VC based on a regulatory standard or a threshold, where available.

The Agency has concluded in earlier sections of this report that none of the renewable resources identified above are likely to be significantly affected by the Project and, thus, the Project is not likely to cause significant adverse environmental effects on the capacity of those renewable resources, taking into account the implementation of mitigation and compensation measures.

## 5.15 Cumulative Environmental Effects

The cumulative environmental effects resulting from the residual environmental effects of the Project in combination with the effects of other projects and activities were assessed, as required under the former Act. The assessment took into consideration the Agency's *Operational Policy Statement* [5] and the *Cumulative Effects Assessment Practitioners Guide* [6].

Table 5.13.1 lists other projects and activities (land uses) in the Regional Study Area that were considered in the assessment and its potential interaction with each VC. Past and current projects and activities were considered in the baseline studies conducted by the proponent for each VC. The assessment focused on the degree of change from baseline conditions resulting from the KSM Project acting in combination with other relevant current and reasonably foreseeable projects and activities.

### Potential Cumulative Effects

The cumulative effects assessment conducted by the proponent covered a wide range of VCs. In general, the project location is within a remote and highly undeveloped area of BC. As such, the proponent noted very few interactions between the Project and activities listed in figure 5.15.1.

This report focuses on cumulative effects on moose, specifically related to vehicle related interactions. Increased traffic along the highway 37/37A corridor resulting from reasonably foreseeable projects and activities (see table 5.13.2), in combination with the Project are likely to cause increased moose mortality.

The proponent assessed the cumulative effects of the Project in combination with those projects and activities listed in table 5.13.2 on the moose population in the regional study area. The proponent developed two scenarios: (1) an 'unlikely development' scenario, where all of the projects listed in Table 15.3.2 were developed at the same time, and (2) a 'likely development' scenario in which the KSM project and 2 other projects concurrently in production. The proponent's model indicated that a population 'tipping point' will not be reached under the likely scenario, but an additional 2 percent mortality (under the unlikely scenario) would likely result in a significant adverse effects on moose in the regional study area.

BC created a traffic advisory working group on traffic to discuss traffic related effects and developing mitigation measures to address wildlife collisions and accidents and malfunctions along highway 37/37A. This group, which includes representatives of the NLG and other Aboriginal Groups potentially impacted by the Project, has met several times to identify issues and begun developing collaborative solutions.

5 Federal Environmental Assessment Review Office. 1994. A Reference Guide for the Canadian Environmental Assessment Act: Addressing Cumulative Environmental Effects.

6 Hegmann, G., C. Cocklin, R. Creasey, S. Dupuis, A. Kennedy, L. Kingsley, W. Ross, H. Spaling and D. Stalker. 1999. *Cumulative Effects Assessment Practitioners Guide*. Prepared by AXYS Environmental Consulting Ltd. and the CEA Working Group for the Canadian Environmental Assessment Agency, Hull, Quebec.

**Table 5.15.1: Activities and Project Included in the Cumulative Effects Assessment**

| | | |
|---|---|---|
| **Past Projects** | **Mining:**<br>• Eskay Creek Mine<br>• Granduc Mine<br>• Johnny Mountain Mine | • Snip Mine<br>• Sulphurets Mine<br>• Swamp Point Mine |
| **Current and Ongoing Projects and Activities** | **Mining:**<br>• Red Chris Mine<br>• Wolverine Mine (Yukon Zinc)<br>**Hydroelectric:**<br>• Forrest Kerr Hydroelectric<br>• Long Lake Hydroelectric<br>• Northwest Transmission Line<br>• **Other Use:**<br>• Aboriginal harvesting (fishing, hunting/trapping, and plant harvesting)<br>• Agriculture<br>• Fishing (commercial and recreational)<br>• Guide outfitting<br>• Mineral and energy resource exploration<br>• Nisga'a (fishing, hunting/trapping, and plant harvesting)<br>• Resident trapping<br>• Tourism and recreation (parks, skiing, rafting, etc.)<br>• Timber harvesting | **Communities:**<br>• Bell II<br>• Bob Quinn Lake settlement<br>• Dease Lake<br>• Gitanyow<br>• Gitlaxt'aamiks<br>• Gitwinksihlkw<br>• Hazelton<br>• Iskut<br>• Kincolith<br>• Laxga;ts'ap<br>• Meziadin Junction<br>• New Hazelton<br>• Smithers<br>• Stewart<br>• Telegraph Creek<br>• Terrace |
| **Reasonably Foreseeable Projects** | **Mining:**<br>• Arctos Anthracite Coal Project<br>• Bear River Gravel<br>• Bronson Slope Mine<br>• Brucejack Project<br>• Galore Creek Mine<br>• Granduc Copper Mine<br>• Kitsault Mine | **Infrastructure:**<br>• Highway 37/37A use<br>• Kutchoo Creek Mine<br>• Schaft Creek Mine<br>• Snowfield Mine<br>• Storie Molybdenum Mine<br>• Turnagain Mine<br>**Hydroelectric:**<br>• McLymont Creek Hydroelectric<br>• Treaty Creek Hydroelectric |

* Activities and projects were identified by the proponent. The proponent assessed cumulative effects of projects and activities relevant to the VC being assessed in its cumulative effects analysis for each VC.

The proponent agreed to several mitigation measures to further help address issues related to traffic and wildlife mortality the including a one-time grant of $75 000 and a yearly financial contribution of $30000 annually to a trust specified by the BC Ministry of Forests and Natural Resources Operations (BC FLNRO) for moose recovery efforts in the region.

Considering the commitments by both the proponent and work being undertaken by BC, the Agency is satisfied that the Project is not likely to have significant cumulative effects on moose in a 'likely' development scenario.

**Table 5.15.2: Potential Cumulative One-way Trips per Day as a Result of KSM and Other Projects During Operation**

| Project | | Estimated Timing of Operation | Average Annual Trips per Day for All Project Traffic per Hwy Segment | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Hwy 37 North Segment | | | Hwy 37 South Segment | | Hwy 37A |
| | | | Eskay Creek Mine Road to Treaty Creek Access Road | Treaty Creek Access Road to Newhawk Access Road | Newhawk Access Road to Meziadin Junction | Meziadin Junction to Cranberry Junction | Craberry Junction to Kitwanga | |
| Present | Forrest Kerr Hydroelectric** | 2014-2074 | 1 | 1 | 1 | 1 | 1 | 0 |
| | Red Chris Mine | 2014-2042 | 39 | 39 | 39 | 11 | 11 | 28 |
| | Wolverine Mine | 2010-2019 | 19 | 19 | 19 | 1 | 0 | 18 |
| Reasonably Foreseeable Future | Bronson Slope Mine* | 2022-2042 | 9 | 9 | 9 | 6 | 6 | 3 |
| | Brucejack Mine* | 2016-2032 | 0 | 0 | 12 | 1 | 1 | 11 |
| | Galore Creek Mine* | 2023-2033 | 70 | 70 | 70 | 36 | 36 | 34 |
| | Kitsault Mine* | 2016-2030 | 0 | 0 | 0 | 0 | 73 | 0 |
| | Kutcho Mine* | 2015-2027 | 13 | 13 | 13 | 1 | 1 | 12 |
| | McLymont Creek Hydroelectric** | 2016-2056 | 1 | 1 | 1 | 1 | 1 | 0 |
| | Schaft Creek Mine* | 2017-2032 | 111 | 111 | 111 | 57 | 57 | 54 |
| | Snowfield Project* | 2027-2054 | 0 | 0 | 83 | 45 | 45 | 38 |
| | Storie Moly Mine* | 2020-2040 | 9 | 9 | 9 | 8 | 8 | 1 |
| | Turnagain Mine* | 2017-2045 | 46 | 46 | 46 | 33 | 33 | 13 |
| Total Non-KSM Project Traffic | | | 318 | 318 | 413 | 201 | 273 | 212 |
| KSM Project | | 2019-2071 | 3 | 85 | 85 | 49 | 49 | 36 |
| Total Cumulative Traffic by Route | | | 321 | 403 | 498 | 250 | 322 | 248 |
| Estimated Baseline Traffic | | | 224 | 224 | 224 | 799 | 799 | 244 |
| Total Cumulative Traffic | | | 545 | 627 | 722 | 1049 | 1121 | 492 |
| Historical Peak Volume | | | 1014 | 1014 | 1014 | 917 | 917 | 917 |
| % Above Current Baseline | | | 143% | 180% | 222% | 31% | 40% | 102% |
| % of Historical Peak Volume | | | 54% | 62% | 71% | 114% | 122% | 54% |
| % of Hwy 37 Capacity[7] | | | 9% | 10% | 12% | 17% | 19% | n/a |

* unless otherwise referenced, estimates of product-related haul traffic were calculated based on available concentrate production amounts or production rates, ore grades, and/or concentrate grades and on the assumption that 50 tonne trucks are used. Estimates of cargo traffic were calculated based on ratios of trips per day to production rate for KSM and assumed to travel along Hwy 37 south to Hwy 16 rather than through Stewart.

** estimates were calculated based on the assumption that employees would stay in camp.

Note: NTL is not included as only a limited amount (e.g., 0.05 trips per day) is expected.

7 Based on Hwy 37 modified capacity of 252 commercial vehicles per hour one-way (equivalent to 252 one-way trips per hour) or 6,048 one-way trips per day.

### Government, Public and Aboriginal Comments and Proponent's Response

NLG, Skii km Lax Ha, Gitanyow and BC FLNRO raised concerns about the accuracy of the proponent's traffic data and the level of certainty with regards to using the model to predict effects over time period greater than 5 years. In response the proponent stated that its traffic-related mortality input is inflated by approximately 14 percent, resulting in a more conservative model. The proponent also re-analyzed the potential effects on moose using data from 2012-2013 provided by the Gitanyow, which contained greater traffic volumes. The new data did not alter the outcomes of the model. Though uncertainty remains in the moose model, the Agency is satisfied that the analysis conducted by the proponent and the mitigation measures proposed will address the issue.

Gitanyow also raised concerns about the potential cumulative effects on fish and wildlife from accidents or spills along road corridors, questioned the adequacy of the proponent's proposed mitigation measures and proposed additional mitigation measures. In addition to installing emergency response kits at strategic point along Highway 37/37A (see section 5.7 for further details), the proponent has also committed to ensuring that Global Positioning System (GPS) trackers are installed in haul trucks to ensure that speed limits are not exceeded in proponent-controlled areas. The proponent will participate in regional management and monitoring initiatives for certain environmental effects, including those resulting for anticipated increases in traffic volumes on the Highway 37/37A corridors. The Agency is satisfied with this response.

### Agency Conclusions on the Significance of the Residual Cumulative Environmental Effects

The Agency concludes that the Project is not likely to cause significant adverse cumulative environmental effects under a likely development scenario, when the implementation of mitigation is taken into account.

# 6. Nisga'a Nation Effects Assessment

The Project is subject to the Nisga'a Final Agreement (NFA) because of the potential effects of the Project on residents of Nisga'a Lands, Lands or interests.

To meet Canada's obligations under Chapter 10 of the NFA, the Agency assessed:

1) whether the Project can reasonably be expected to have adverse environmental effects on residents of Nisga'a Lands, Nisga'a Lands, or Nisga'a interests set out in the NFA, as required under paragraph 8(e) of Chapter 10 (referred to as the 8(e) effects), and

2) the effects of the Project on the existing and future economic, social, and cultural well-being of Nisga'a citizens under paragraph 8(f) of Chapter 10 (referred to as the 8(f) effects).

The Agency incorporated these two assessments into the federal comprehensive study of the Project. The 8(e) effects were examined using information and analyses generated through the environmental assessment (EA) process. The assessment of the 8(f) effects used an approach developed in close cooperation with the Nisga'a Lisims Government (NLG) and the BC EAO. The assessment of 8(f) effects were informed by the proponent's Economic, Social, Cultural Impact Assessment (ESCIA) and related documents, and information brought forward throughout the EA by representatives of NLG, Canada, B.C. and the proponent.

Federal departments provided expertise in both developing the assessment approach and to assessing the projects 8(e) and 8(f) effects, included Fisheries and Oceans Canada, Natural Resources Canada, Environment Canada, Health Canada, Aboriginal Affairs and Northern Development Canada, Canadian Heritage and Statistics Canada. The expert advice from these departments contributed to the Agency's assessment of NFA factors.

In addition to the EA decision statement, the federal Minister of the Environment will issue and NFA Project Recommendation as to whether the project should proceed based on the assessment. Any subsequent permitting or approval decisions by responsible authorities must take both the EA decision and the NFA Project Recommendation into account.

## 6.1 Assessment of Environmental Effects (8e of NFA Chapter 10)

The NFA defines the geographic range in which the Nisga'a citizens can exercise their treaty rights; it includes the Nass Wildlife Area and Nass Area (Figure 6.1.1). Components of the Project fall within the Nass Area, specifically the Processing and Tailing Management Area (PTMA), the eastern portion of the Mitchell-Treaty Twinned Tunnels (MTT), the Treaty Creek access road (TCAR), and the transmission line. All of Highway 37A and part of Highway 37 run through the Nass Wildlife Area. The Mine Site and Coulter Creek access road are entirely outside of lands subject to the NFA. The closest Nisga'a Lands to the Project are approximately 200 km downstream from the PTMA on the Nass River.

### 6.1.1 Wildlife and Migratory Birds

Under Chapter 9 of the NFA, Nisga'a citizens have the right to harvest for domestic purposes "designated species" of wildlife in the Nass Wildlife Area,the right to harvest migratory birds within the Nass Area for domestic purposes and the right to barter and trade migratory birds in accordance with the NFA, subject to measures necessary for conservation, public health, and safety (Table 6.1.1). The designated species of wildlife, for which the Nisga'a have specific allocations under the NFA are moose, grizzly bears, and mountain goats. Nisga'a wildlife harvesting rights have the same priority as the recreational and commercial harvesting interests.

The NFA also lists Nisga'a Nation trap lines held by Nisga'a citizens that are outside of Nisga'a Lands, and subject to provincial law. No trap lines fall within the Project's regional study area.

**Table 6.1.1: Nisga'a Harvesting Rights and Project Components for Those Areas Defined in the Nisga'a Final Agreement**

| Area (as described in the NFA) | Nisga'a Harvesting Rights by Area | Project Components by Area |
|---|---|---|
| Nass Area | Migratory Birds | PTMA, eastern portion of the MTT, and the TCAR |
| Nass Wildlife Area (NWA) | Designated Wildlife and Migratory Birds | Transportation route including parts of Highway 37 and 37A |

#### Potential Effects of the Project

As part of the wildlife effects assessment, the proponent considered the potential effects of Project construction, operation, closure, and post-closure on eleven valued components, including moose, mountain goats, grizzly bears, forest and alpine birds, raptors, and wetland birds (see Chapter 5.8 of this report for further details on environmental effects on moose, mountain goat, grizzly bear and wetland birds).

According to the proponent key effects on moose around the PTMA could result from: (1) the project infrastructure displacing or altering critical, moose habitat (2554 ha early winter habitat; 684 ha late winter moose habitat); (2) direct mortality from collisions with Project vehicles; (3) disruption of movement of moose between valley systems; and (4) indirect mortality due to increased hunting pressure. However, the PTMA is 31 kilometers from the NWA at its closest point, and it is not clear how these effects may impact the harvest of moose within the NWA.

Within the Nass Wildlife Area, increased project-related traffic (85 trucks per day along the northern portion of Highway 37 and 49 trucks per day along the southern portion of Highway 37 during operation) could cause an increase in direct moose mortality from vehicle-moose collisions (approximately 5 moose per year) and limit access to hunting.

Within the Nass Wildlife Area, increased project-related traffic (85 trucks per day along the northern portion of Highway 37 and 49 trucks per day along the southern portion of Highway 37 during operation) could cause an increase in direct moose mortality from vehicle-moose collisions (approximately 5 moose per year) and limit access to hunting.

The proponent predicts key Project-related effects on mountain goats from loss or alteration of habitat and sensory disturbance (creating functional habitat loss). These effects would mostly be confined to the Mine Site, which is located outside of the Nass Area and Nass Wildlife Area.

Around the PTMA, loss or alteration of habitat could result in effects on grizzly bears. As with moose, there may be an increase in grizzly bear mortality in the Nass Wildlife Area due to collisions with vehicles on Highways 37/37A.

Effects from the Project on migratory birds could result from loss or alteration of habitat primarily at the PTMA site due to the construction of Project infrastructure (Table 5.8.5). The proponent detected 25 wetland bird species during 2008 and 2009 baseline studies, many of which are migratory, including ducks and geese. Areas with high species diversity during the breeding period and/or fall staging period include wetland complexes at the Teigen/Bell-Irving confluence, along Treaty and Todedada Creeks, around Unuk Lake, and at Treaty Creek. With the exception of the Unuk Lake, all areas are within the Nass Area, where the Nisga'a Nation has harvesting rights for migratory birds.

### Mitigation

The proponent proposes to implement environmental management plans that will reduce the risk of direct wildlife mortality and potential for human-wildlife conflicts, and minimize the level of disturbance to wildlife and the overall habitat loss for wetlands (for a discussion of environmental effects on wetlands and proposed mitigation measures see section 5.7).

The proponent made changes to the project design to lessen impacts on wildlife, such as moving a conveyor system underground to facilitate moose movement. The proponent will provide a one-time grant of $75000 and a yearly financial contribution ($30000 annually) to a trust specified by the BC Ministry of Forests and Natural Resources Operations (BC FLNRO) for moose recovery efforts in the region and will develop standard operating procedures to reduce wildlife collisions (see mitigation in Appendix C).

### Key Residual Effects

Although the Mine Site and PTMA are located outside of the Nass Wildlife Area, the Agency's view is that the Project (specifically, truck traffic along Highway 37/37A) could have an adverse effect on the Nisga'a's ability to harvest moose. Additionally, the Project's contribution to cumulative effects on an already declining moose population and the Project's potential effects on the ability of moose to move between the Nass Wildlife Area and the Project site may also decrease the available moose population for harvesting.

Because any residual effects on mountain goats would be on a population far outside of the Nass Wildlife Area and mountain goats generally do not migrate across valleys, the Agency's view is that the Nisga'a's ability to harvest mountain goats would not likely be affected by the Project.

The Agency's conclusion is that the Nisga'a harvest of grizzly bears would not likely change as the grizzly bear population that could be affected by the Project is considered stable and healthy and is primarily located near the Unuk River, well outside of the Nass Wildlife Area.

The effects of the Project, according to the Agency, particularly as they relate to loss of those wetlands used by migratory birds, could have an adverse effect on Nisga'a rights to harvest migratory birds in the Nass Area, although impacts are likely to be at least partially offset by the proponent's wetland compensation plans.

### Agency Conclusions on the Significance of the Residual Environmental Effects

Based on the information in this Report, the Agency concludes that the Project may reasonably be expected to have adverse environmental effects on residents of Nisga'a lands, Nisga'a lands and Nisga'a interests related to the harvesting of moose and migratory birds. These effects are not expected to be significant with the implementation of mitigation measures described in Appendix C and in sections 5.7, 5.8 and 5.14.

## *6.1.2 Fisheries*

Chapter 8 of the NFA sets out the Nisga'a Nation's right to fish and fisheries allocation entitlements. Nisga'a citizens have the right to harvest fish and aquatic plants for domestic use (i.e. food, ceremonial and social), and to barter or trade fish and aquatic plants harvested in Nisga'a fisheries, subject to conservation and laws for public health and safety. Nisga'a citizens are also entitled to harvest fish pursuant to their right to harvest wildlife as defined in Chapter 9 of the NFA. The Nisga'a harvest steelhead and five species of Pacific salmon in the Nass Area.

### Potential Effects of the Project

Section 5.6 of this report describes effects on valued components for fish and fish habitat, while sections 5.5 and 5.12 describes effects on surface water quality and the effects of accidents and malfunctions. The proponent indicates that the Project may affect fish and fish habitat as a result of changes in water quality and quantity, physical habitat loss and effects caused by accidents and malfunctions along the proposed transportation corridors.

The only species of fish that the proponent found in the proposed TMF footprint was Dolly Varden. In South Teigen Creek, below the proposed TMF, the proponent's baseline studies found bull trout, rainbow trout and mountain whitefish. Three species of Pacific salmon (Coho, Chinook, and Sockeye) were found further downstream in Teigen Creek and in Treaty Creek.

### Mitigation

The proponent will implement a fish habitat compensation plan to counterbalance loss of productive capacity of fish habitat associated with the construction activities within the PTMA.

The proponent has designed the TMF to reduce seepage and eliminate or minimize the introduction of degraded water to the Nass watershed (sections 5.2, 5.3 and 5.5) to mitigate for water quality effects from the PTMA. Key design mitigations include installing a high density polyethylene geomembrane liner within the center cell of the TMF; pumping of seepage collection water back into the TMF; using non-contact water diversions to supplement flows that would be altered by TMF development; using seepage collecting ponds downstream of the TMF dams in the North Teigen and South Treaty Creeks; using temporary water treatment plants at the PTMA during construction; treating tailings supernatant from ore processing; storing effluent during winter low flows; staging discharge to mimic the natural hydrograph; and capturing sediment before it can be released to the receiving environment.

The proponent will design the TMF to exceed Canadian Dam Association Safety Guidelines (section 5.12) to mitigate for accidents and malfunctions within the PTMA. To mitigate for the erosion of these dams, the proponent will monitor and conduct repairs as needed.

### Key Residual Effects

Mitigation for fish habitat and water quality and meeting design criteria for the construction of the TMF will largely offset any adverse effects on Nisga'a fishing rights.

### Agency Conclusions on the Significance of the Residual Environmental Effects

Taking into account the mitigation measures described in this report, the Agency is satisfied that any adverse effects on Nisga'a fishing rights from habitat loss, reduced surface water quality, or potential accidents and malfunctions due to the Project are low to negligible.

## 6.1.3 Cultural Artifacts and Heritage

Chapter 17 of the NFA specifies provisions about heritage sites, Nisga'a artifacts, and human remains. The NFA Appendix F-1 identifies five Nisga'a heritage sites, including Treaty Rock, an area of approximately one hectare surrounding a large rock outcrop located along Treaty Creek.

**Agency Conclusions**

As Treaty Rock is located at least 20 kilometres from any Project infrastructure, no adverse effects on the site are anticipated and no mitigation measures are required. All other Nisga'a heritage sites are located far south of the Project.

## 6.1.4 Other Interests

Among other things, Chapter 3 of the NFA describes Nisga'a Lands and the nature of Nisga'a Nation ownership of Nisga'a Lands and Nisga'a Fee Simple Lands (Category A Lands and Category B Lands), which are situated outside of Nisga'a Lands. The Nisga'a Lands comprise approximately 2000 $km^2$ around the lower Nass Valley. The NFA also sets out that the Nisga'a Nation owns the mineral resources on and under Nisga'a Lands.

The NFA also defines other Nisga'a interests not described above, including interests related to water (Chapter 3), forest resources (Chapter 5), access (Chapter 6), and roads (Chapter 7). The Project is not expected to have adverse environmental effects to these other Nisga'a interests because the Nisga'a Lands and other interests are located far south of the project.

## 6.1.5 Nisga'a Nation Comments

Representatives of the NLG were given the opportunity to comment on a draft of this report and the comments they provided have been incorporated into this report.

## 6.1.6 Agency Conclusion on 8e Assessment

The Agency concludes that the EA for the proposed Project adequately met the requirements under Chapter 10, paragraph 8(e) and that the mitigation commitments, including specific mitigation measures to address the Nisga'a Nation's concerns, are considered appropriate to prevent or mitigate potential effects. The Agency concludes that the proposed Project is not reasonably expected to have adverse environmental effects on residents of Nisga'a Lands, Nisga'a Lands or Nisga'a interests set out in the NFA.

## 6.2 Assessment of Economic, Social and Cultural Effects 8f of NFA Chapter 10)

This section provides an overview of the assessment of Project-related effects on the economic, social and cultural well-being of Nisga'a citizens as defined in the NFA. This assessment is based on direction provided by NLG, Canada, B.C. and the proponent.

In November of 2010, the NLG circulated its draft Economic, Social, Cultural Impact Assessment (ESCIA) Guidelines to the Agency and the BC EAO outlining how the 8(f) requirement under the NFA should be addressed for the environmental assessments of this Project and the proposed Kitsault Project. The draft ESCIA Guidelines establish an approach to evaluating specific economic, social and cultural effects of a project on the well-being of Nisga'a citizens, including those residing in the four Nisga'a Villages (i.e. Gingolx, Laxgalts'ap, Gitwinksihlkw, and Gitlaxt'aamiks), Terrace, Prince Rupert, and other parts of B.C. (Table 6.2.0).

**Table 6.2.1: Economic, Social and Cultural Effects Identified in the ESCIA Guidelines**

| Economic | Social | Cultural |
|---|---|---|
| • Nisga'a employment and income<br>• Nisga'a business activity, earnings and investment activity<br>• Nisga'a natural resource activity and related earnings or values<br>• Nisga'a Government revenues and expenditures<br>• Future Nisga'a Nation economic opportunities and economic development | • Migration and population effects<br>• Impacts on infrastructure and services<br>• Family and community well-being | • Effects on cultural activities and practices through the change in work patterns and incomes<br>• Effects on the use of the Nisga'a Language |

The draft ESCIA Guidelines also include consideration of cumulative effects of the Project, taking into account the past, present and reasonably foreseeable projects that could occur over the same timeframe as the Project.

The Application Information Requirements, which were jointly approved by the Agency and the BC EAO, required the proponent to develop and submit a work plan that outlined how it would collect and analyse the necessary information to address the draft ESCIA Guidelines.

With guidance from the federal and provincial governments and NLG, the proponent developed a work plan that included the collection of data through surveys, formal interviews, focus groups, informal discussions with Nisga'a citizens and representatives, Nisga'a literature research and reviews, and information from relevant sections of the proponent's environmental impact statement (EIS). A Social, Economic, Resource Use, and Cultural (SERC) Survey was developed with input from the NGL, BC EAO, the Agency, Avanti Kitsault Mine Inc., and the proponent. The SERC Survey canvassed over 400 Nisga'a citizens in four Nisga'a villages, Terrace, Prince Rupert, and Vancouver between August and November of 2011 to gather data relevant to the ESCIA Report.

The proponent's work plan acknowledged that other unrelated developments that may take place in the region have the potential to affect economic, social and cultural well-being. With advice from NLG, the Agency, federal departments and the BC EAO, the proponent created low, medium and high development scenarios (Table 6.2.1) to estimate the project's effects within a broader context of regional change. The proponent used data from other proposed or planned projects in the region to derive the different scenarios.

**Table 6.2.2: Projects Considered in Regional Development Scenarios**

| Scenario | Projects |
|---|---|
| Low regional development | Northwest Transmission Line (NTL), Forrest Kerr Hydro, and McLymont Creek Hydro |
| Medium regional development | NTL, Forrest Kerr Hydro, McLymont Creek Hydro, and Kitsault Mine Project |
| High regional development | NTL, Forrest Kerr Hydro, McLymont Creek Hydro, Kitsault Mine Project, Galore Creek Mine Project, Red Chris Mine Project, and Schaft Creek Mine Project |

### *6.2.1 Potential Effects to Economic Well-being*

#### Nisga'a Employment and Income

The proponent analyzed the potential demand for workers in the region both with and without the Project and compared that demand against the Nisga'a employable labour supply[8] to determine potential employment of Nisga'a citizens for the Project.

The total number of jobs in the region, based on estimates of labour demand projections from BC Statistics, is expected to grow within the next decade as projects, both existing and planned, are constructed and operated. The current employable Nisga'a labour supply was estimated in the Economic, Social and Cultural Impact Assessment (ESCIA) at approximately 1140 Nisga'a citizens with 370 residing on Nisga'a Lands and 775 living off Nisga'a Lands. Of this estimated Nisga'a labour force, according to the proponent's ESCIA, approximately 22 percent is not currently employed and 17 percent work 5 months or less per year.

The EIS provided an estimate of a maximum of 120 jobs for Nisga'a citizens during construction and 70 jobs annually during the 51.5 years of operations. The proponent did not estimate the proportion of Nisga'a workers of the 24 jobs during decommissioning and closure. These numbers were based on an analysis of labour supply and demand specific to Nisga'a communities and estimates of demand from other development projects taking place in the region.

The proponent estimated the total labour demand for the Project under different future growth scenarios for the region (Table 6.2.2) to determine the incremental effects of the Project on labour demand (see Figure 6.2.1).

Without the Project, the potential labour demand only exceeds the available Nisga'a labour supply under scenario three (the high development scenario, which includes four other mining projects being developed in the region).

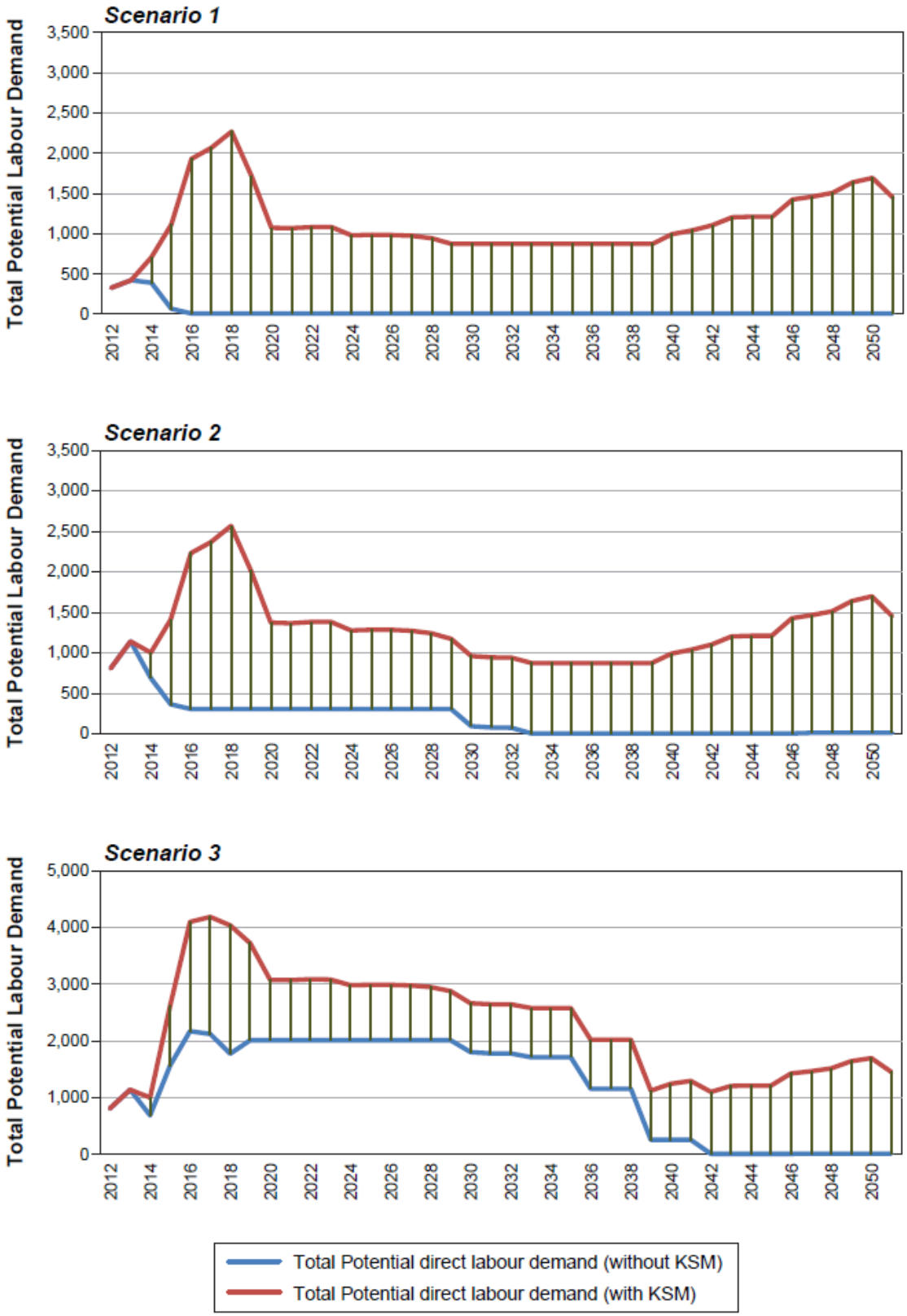
When the Project is taken into account, the potential labour demand exceeds the Nisga'a labour supply during the construction phase of the Project (2015-2020) under scenario two and then only marginally exceeds the Nisga'a labour supply during the initial operations phase of the Project (2020-2038) for the same scenario.

The ESCIA noted that the nature and number of jobs taken up by Nisga'a citizens will depend on various factors, including the uptake and quality of training, job opportunities elsewhere in the Nass Valley and in the province, the range of salaries and working conditions at the mine site, provincial economic conditions and an individual's own priorities and commitments.

The ESCIA also noted that median incomes earned by Nisga'a citizens range from $17200 to $43700 annually. For some Nisga'a citizens, some or all of their income is derived from government assistance.

8 The potential employable labour supply was defined as Nisga'a citizens who: 1) Are employed (part-time or full-time) or unemployed and looking for a job, and are 15 years of age or older, 2) have expressed an interested in working at the mine or are willing to work under mine conditions, and 3) have the minimum required skills to work at the mine (defined as high school education or higher).

**Figure 6.2.1: Scenarios of Total Potential Labour Demand from Projects**




Source: Seabridge Gold

In terms of incremental income, the average earnings for employees in equipment operator and labourer job categories for the operations phase of the Project are predicted to be $66600 per year, inclusive of wages and benefits. The current median income in the region for Aboriginal workers was estimated at $17200 for all workers and $43700 for those working full-time. Considering these income estimates, the incremental net income for Nisga'a workers that may be employed at the mine was calculated at $40000 per year, which would result in an overall Nisga'a Nation net income effect that would peak at $4.8 million in 2018, decreasing to $2.8 million by 2020.

### Nisga'a Nation Business, Earnings, and Investment Activity

The proponent conducted a survey of existing Nisga'a businesses as part of the ESCIA to understand the sectors that they serve, the goods and services they provide, and the potential business opportunities and effects associated with the Project.

The ESCIA noted that Nisga'a businesses provide goods and services to a wide range of sectors and that the majority of these businesses are small, having five employees or less. Key clients for most Nisga'a businesses include NLG or Nisga'a village governments, social or education agencies, and provincial and federal governments. Approximately one in five Nisga'a businesses have worked in the mining sector, with the same number of businesses working in construction and forestry, all of which are relevant sectors for supporting the Project. Nisga'a businesses expect their operations to grow over the next 10 years (irrespective of the Project) and over 90 percent of Nisga'a business respondents expressed an interest in becoming suppliers to the Project.

Potential revenue to Nisga'a businesses is expected to vary depending on the extent of industrial development in the region and the involvement of these businesses in providing goods and services to the mining industry. Under scenario three (the high development scenario), Nisga'a businesses could expect revenue of $7.9 million in 2013, dropping to $4.9 million in 2019 and increasing to $12 million in 2021. For all scenarios, the incre-mental net income from the Project during the construction phase is forecasted to reach $5.2 million and remain strong during the operation phase (e.g., $10.5 million in 2021).

The largest barriers to Nisga'a businesses benifiting from the Project, as reported in the ESCIA report, include access to capital and financing and the costs of running and maintaining infrastructure and equipment. Implementing business policies (e.g., health and safety plans) could be a challenge, as many Nisga'a businesses did not have these measures in place at the time of the survey.

### Nisga'a Natural Resource Activity

The Project may affect the Nisga'a Nation's traditional, cultural, and commercial natural resource activities through adverse environmental effects of the Project. These activities are an important to the economic welfare of individuals, households, and communities.

There are also Nisga'a commercial harvesting activities including fishing and forestry operations and Nisga'a businesses that depend on certain natural resources for commercial activities, including but not limited to fishing, hunting and trapping. For example, the annual Nisga'a Nation harvest of salmon for individual sale, domestic and commercial purposes, since the year 2000, has ranged between 22000 and 128000 fish and generated over a total of $6.6 million. Despite the highly variable economics of pine mushrooms, the annual harvest added approximately $1 million to the local economy while permit and surcharges provided nearly $80000 towards management of the program.

The adverse environmental effects of the Project on fish were not found to be significant (see section 5.6 and section 6.1). Furthermore, as most of the predicted adverse environmental effects occur at a significant distance from the Nass Wildlife Area (30 kilometers) and the Nass River, where the above mentioned resource activities occur, any effects on revenues from reduced resource harvesting are considered to be minimal.

With respect to culturally or economically important food (e.g., mushrooms and berries) and medicinal plants, the ESCIA states that there are no anticipated effects for Nisga'a harvesters given the relatively small areas directly impacted by the Project and, more importantly, given the availability of other, more suitable areas for harvesting that are much closer to the Nisga'a villages.

### NLG Revenue Expenditure

The ESCIA indicated that NLG collects approximately $73 million in revenue annually with $6 million excess revenue (i.e., adjusted for expenses) in 2011. Most of NLG finances are channeled towards supporting the operations and administration of NLG including transfers to the Nisga'a village governments, Nisga'a Valley Health Authority, and the Nisga'a School Board. Operating surpluses from commercial entities – such as Nisga'a Fisheries, Lisims Forest Resources, and enTel Communications – also contribute to NLG revenue stream.

The ESCIA identified two areas in which NLG revenues may be affected by the Project: the provision of housing and other support services and the costs of environmental monitoring and participation in the regulatory approvals process for the Project.

There are no anticipated direct costs to community services and infrastructure from the Project as the Project's activities will use on site facilities and will occur well outside of the Nisga'a villages. Incremental migration of citizens to Nisga'a communities may result in a cost to NLG from the provision of additional services associated with housing, education, recreation and water and sewer. Aside from housing, existing community infrastructure, facilities, and services are expected to absorb any additional demands caused by increased migration. Under the regional development scenarios the proponent considered, in-migration is expected to result in additional housing needs. The needs ranged from a low projection of three houses a year for a total cost of $700000 to a high projection of six to eight houses per year at a cost of $1.5-$1.8 million a year. Alternatively, Nisga'a citizens may choose to live outside the Nisga'a villages (e.g., Terrace) in which case additional housing would not be required.

With respect to NLG revenues and expenditures, the ESCIA did not include estimates of the costs of participating in the EA phase of the Project or the costs for monitoring, project-related education and training, and other economic development strategies to be pursued during construction and operations phases, should the Project be approved. However, the proponent has provided funding, pursuant to funding agreements, for NLG's participation in the EA to offset NLG costs and anticipates entering into similar funding agreements for the above mentioned activities, should the Project be approved.

### Management Plans

The proponent has committed to implementing the following management plans that may reduce adverse impacts and enhance benefits to Nisga'a business and Nisga'a employment and income:

- Labour Recruitment and Retention Strategy
- Procurement Strategy
- Workforce Training Strategy
- Workforce Transition Program

To assist Nisga'a businesses in taking advantage of opportunities to supply the Project, the proponent will implement a Procurement Strategy.

### Residual Effects

The Project is expected to provide employment and business opportunities for Nisga'a citizens and businesses during all phases and, in turn, offer prospects for increasing income and revenue.

The proposed management plans once implemented are expected to reduce barriers to Nisga'a citizen's ability to pursue employment opportunities through educational support and skills training, increasing awareness of career and business opportunities among Nisga'a citizens and exposing prospective workers to industry networks and contacts.

The Project is also expected to provide some contracting and business opportunities for the Nisga'a businesses, the benefits of which will not likely occur until operations get underway and key goods and services are needed. Successful implementation of the proponent's Procurement Strategy is expected to address some of the barriers facing Nisga'a businesses looking to secure contracts for the Project.

Potential project-related effects on earnings from traditional or commercial natural resources activities are not anticipated provided the mitigation measures to address the effects on environmental valued components are successfully implemented and monitored for effectiveness (see Chapter 5).

In terms of revenue expenditures, NLG may incur additional costs related to housing, education, recreation, water and sewer services associated with incremental migration. Ongoing monitoring of the effects of the Project under 8(e) and 8(f) for the construction, operation, closure and post-closure phases may also result in costs to NLG revenues.

Overall the Project is expected to have a net positive effect to economic well-being, primarily through increased employment and business opportunities.

## *6.2.2 Social Impacts of the Project*

### Migration and Population

The ESCIA assessed the potential for migration to and growth in Nisga'a communities, and used statistics from BC Statistics to evaluate potential changes the population of the Nisga'a Nation.

Population projections for the Nisga'a Valley Health Authority, taken from the BC Statistics website, forecast a five percent expansion in the Nisga'a population between 2012 and 2027 from 1975 individuals to 2077 individuals (a growth rate of 0.34 percent per year). After 2027, Statistics Canada forecasts that the population will decline to there being fewer people living in the Nass in 2036 than there are now. These forecasts are based initially on provincial level data and provincial level assumptions about overall migration, fertility, and mortality in the future. The specific impacts of mine development and other project in northwest BC on potential migration to and from Nisga'a communities are considered only in a broad or general way. As such, the proponent's view is that these estimates are conservative .

The ESCIA notes that, should people decide to relocate from outside northwest BC to be closer to the job site, it is likely they would move to larger communities such as Terrace, Prince Rupert, or Smithers; which offer more services than are typically available in small communities, such as Nisga'a villages. Given the contemporary fly-in/fly-out practices, a small community situated relatively close to a mine site has no obvious advantage for mine workers over a larger, more distant community. While this is almost certainly the case for non-Nisga'a people, the ESCIA notes that this could potentially exist for Nisga'a as well.

In order to assess the potential for demographic changes resulting from mine-related migration for the Nisga'a communities, the proponent developed two different scenarios, based on the results of the Social, Economic, Resource Use, and Culture (SERC) Survey, of Nisga'a citizen migration in and out of the Nass Area.

Under the High Net Migration scenario a net increase of 26 people to the Nass Area is predicted within the first year of Project construction. This scenario was based on 65 people moving to the Nass Area with their families (total of 88 people), minus those individuals who either choose to live in Terrace or Prince Rupert (36 people) or moved away from the Nass Area in response to the project (26 people). As a result, under the high in-migration scenario, the local Nisga'a population by 2030 is estimated to have increased by almost 30 percent to approximately 1988 inhabitants, and 2500 in 2051 (an annual growth rate of 1.75 percent).

Under the low net in-migration scenario, in-migration is expected to be the same as in the High Net Migration scenario, but out-migration rates would be higher. The resulting population would increase to 1709 people by 2025 (an annual average increase of 1.15 percent), 1863 by 2035 (an annual increase of 1.07 percent, about double the natural annual population growth rate), and 2082 by 2051 (an annual average increase of exactly 1 percent since commencement of construction in 2015).

The ESCIA notes that the occurrence of short term versus long term migration will depend on numerous social, cultural and economic variables and interactions that are likely to far outweigh the influence of a single project.

### Community Infrastructure and Services

The proponent noted in the ESCIA that based on 2006 census information, there were 531 occupied private homes in the Nisga'a Villages. Many of the dwellings (40 percent) were identified as needing major repairs and on average there were about three persons per household. Nearly 70 people are currently on waitlists for new homes. Depending on the community, different approaches have been used to manage the housing demand including building new houses on available lots, redeveloping existing housing lots, and acquiring funding for home renovations. Temporary accommodations in New Aiyansh and Gitwinksihlkw (i.e., hotels, motels, bed and breakfasts, and RV campgrounds) have a capacity of 272 units.

Community utilities within Nisga'a Lands such as water, sewer, garbage collection, and landfill services are operated by NLG and the Nisga'a village governments. The community landfill, which is funded by the Regional District of Kitimat-Stikine, is located near Gitlaxt'aamiks and services the Nisga'a communities and surrounding area. All of the water systems in Nisga'a Villages have been or are in the process of being upgraded. The majority of the community sewer systems are in good working order with only one system needing a recent upgrade in 2011. High-speed internet services are provided to all Nisga'a Villages by enTel, a company that is part of the Nisga'a commercial Group.

Each Nisga'a village operates a recreation centre that houses community-based recreation programs funded by Nisga'a Child and Family Services. The Nisga'a Nation School District No. 92 administers education services to the Nisga'a villages and employs a staff of 32 teachers as of 2011-2012. The Gitlaxt'aamiks Volunteer Fire department and the Royal Canadian Mounted Police (RCMP) Lisims-Nass Valley detachment provide emergency services in Nisga'a communities with ambulance services provided by the BC Ambulance Service for the northern region. Healthcare services (e.g., physician services, public health, dental and mental health) in the Nisga'a villages are delivered and managed by the Nisga'a Valley Health Authority. Each Nisga'a village government provides social services

in its community while the Nisga'a Child and Family Services coordinates services to ensure the protection and well-being of Nisga'a children and youth in all Nisga'a communities.

The net impact of potential mine-related migration on housing and infrastructure within the Nisga'a villages is primarily a function of the degree to which expected migration might exceed the combined stock of housing and infrastructure, including consideration of any upgrades or additions that may be proposed. The ESCIA indicated that overcrowded residences continue to be an issue in Nisga'a communities as housing is close to or at capacity. For Nisga'a citizens living outside of the Nisga'a villages, the lack of adequate housing represents a key deterrent to moving back to the Nass Area.

In the case of the High Net Migration scenario (i.e., 26 people per year), the following effects could occur:

- If more people come to the Nisga'a villages, there is likely to be a short-term increase in over-crowded households;
- Additional overcrowded housing will deter those deciding whether to move to (back to) the Nass Area for jobs; and
- Employment, businesses, and revenues generated by the Project may prompt investment to upgrade and augment local housing in some or all of the Nisga'a villages.

Until additional housing become available in the medium to long term, Nisga'a villages are predicted to likely face negative social impacts due to a shortage of housing and overcrowding of existing housing.

For most necessities, such as electricity and communications, the existing community infrastructure would be able to absorb the additional demand. Similarly, water and sewer facilities in each Nisga'a village either have ample capacity to service a larger population or are in the process of being upgraded. Recreation facilities, however, have been identified by Nisga'a citizens as an element of community infrastructure that would require upgrades to accommodate more people. Improving these facilities is considered necessary to not only attract people to (back to) the Nisga'a villages, but also to provide an incentive to keep people from moving away. Local schools have the classroom space to take in more students.

An increase in the number of people in the Nisga'a villages and to a lesser extent, individual behaviour and choices (e.g., higher income leading to substance abuse, domestic disturbance) have the potential to affect the delivery of services (e.g., education, emergency response and transportation). There will likely be an increase in the demand on infrastructure but key service infrastructure is in place and believed to be able to accommodate the moderate level of population increase anticipated. Health and education services appear to be relatively well positioned so as to not be negatively affected by increased demand and, in fact, the Nisga'a education system would likely benefit from increase in the student population to help stem recent declines.

In the event of mine related accidents along Highway 37/37A, Nisga'a emergency resources – RCMP and/or Nisga'a volunteer fire department – may be called upon if emergency services located in Gitlaxt'aamiks were the closest to an accident. The ESCIA noted that such additional demand is expected to be very short term and extremely unlikely to create a noticeable burden on Nisga'a emergency service capacity.

Nisga'a emergency services may also have to contend with a potential increase in public and domestic disturbances that are associated with increased alcohol and drug abuse. The ESCIA noted that to some extent, higher incomes from mine-related employment could lead to an increase in incidents of alcohol and drug abuse and necessitate the need for more community policing.

### Social Risks to Family and Community Well-being

The ESCIA reported on different socio-economic indicators to examine the current well-being in Nisga'a communities. For most indicators, including children at risk, youth at risk, human economic hardship, crime, health, and education, the current rates in Nisga'a communities were found to be double or triple the relevant provincial average. The assessment recognized the importance of considering local context and perceptions of well-being that are not conveyed through these statistics.

There is the potential for in-migration and increases in employment income to both positively and negatively affect community well-being. Given the contemporary fly-in/fly-out practices that are likely to be utilized by the proponent, there is unlikely to be any inflow of transient workers into Nisga'a communities. Thus, any potential change to people's behaviours, social conditions, and community dynamics, will likely be limited to the in-migration of Nisga'a citizens to Nisga'a communities.

Increased income associated with project employment can have both positive and negative effects on communities. It can improve the standard of living in which individual and family decisions can be made to improve housing, seek higher education, practice cultural activities, or invest and save for the future. The ESCIA indicated that Nisga'a citizens, although working away from their families for periods of time, would feel better knowing that they could provide a better life for their children with increased incomes. Higher incomes have also been noted to improve people's health, self-esteem, and choices, particularly for young children.

Conversely, the ESICA also reported that increased incomes can also exacerbate negative behaviours, such as alcohol and substance abuse, in communities that are already fraught with social issues. These behaviours can, in turn, lead to other family-related problems including child neglect and domestic violence. Substance and alcohol abuse can contribute to suicides, overdoses, and death. Poor spending decisions can reduce the well-being of the individual and the well-being of the wider community that is affected by the negative behaviour.

The literature, summarized by the proponent, indicates that schedules related to shift work can strain family and community dynamics as workers are separated from their families for periods of time. The ESCIA noted that the stress caused by a rotational schedule can increase family fragmentation, family break-ups and violence, altered behaviour in children, and can reduce a worker's community involvement and ability to fully participate in subsistence and traditional activities. The Nisga'a focus group interviews drew a notably different conclusion about the potential stress caused by shift work, pointing out that extended families provide a built in social safety net that help and support families which might be dealing with the challenges of one or perhaps even both, parents working at the mine.

### Health Risks

The potential risks of environmental exposures from the Project are expected to be localized to the mine site. The ESCIA stated that any health effects on Nisga'a citizens would affect Nisga'a citizens who use the back country in and around the mine area, find employment with the proposed Project or who may travel along those sections of Highway 37/37A being used by mine traffic.

### Management Plans

The proponent has committed to implementing a Labour Recruitment and Retention Strategy which would include programs and plans that may reduce adverse impacts and enhance benefits to Nisga'a family and community well-being, such as an Employee Assistance Program, financial

management and general life skills programs for employees, and a zero tolerance drug and alcohol policy for mine employees and suppliers. To minimize adverse social effects due to loss of employment at mine closure, the proponent's Workforce Transition Program will help workers prepare for securing alternative employment upon closure of the Project.

### Residual Effects

The effects of the Project on social well-being will depend on the number of Nisga'a citizens who gain employment at the Project, where those citizens that gain employment decide to live (particularly those citizens not currently living in Nisga'a villages) and how those citizens decide to spend their disposable income. Should more people move or return to Nisga'a communities to obtain employment, as outlined in the proponent's high in-migration scenario, the effects, both positive and negative of the Project on social well-being will likely to be greater in magnitude.

The Agency notes that the population increases proposed in the high in-migration scenario is significantly different from that presented by BC Statistics and Statistics Canada (annual growth rate of 1.75 percent versus 0.34 percent) and that the numbers utilized in developing the scenario are greater than those provided in the SERC Survey results. As a result, it appears that the high in-migration scenario represents an upper bound in possible in-migration to Nisga'a communities and the Agency's view is that the likely subsequent effects of in-migration on social well-being will be less than those expected in the ESCIA should the project proceed.

Proposed management plans may reduce possible adverse social effects and enhance benefits. The Labour Recruitment and Retention Strategy, for example, will offer programs to support mine employees and their families, thereby potentially minimizing adverse social effects that can result from increased incomes, such as substance abuse, stress, and domestic issues.

## *6.2.3 Cultural Well-being*

### Culture Practices and Activities

Chapter 2 of the NFA states that "Nisga'a citizens have the right to practice the Nisga'a culture and to use the Nisga'a language, in a manner consistent with this Agreement." The proponent's ESCIA identified that knowledge of the treaty right and ability to use the land is equally important to the actual pursuit of cultural practices and activities, based on results from surveys with Nisga'a citizens. Nisga'a Nation cultural practices and activities are connected to the land and aquatic resources. These include hunting, trapping, fishing, mushroom picking, and the harvest of country foods and medicinal plants.

The ESCIA revealed that most Nisga'a citizens, both on and off Nisga'a Land, consume wild fish on a weekly basis, while some Nisga'a citizens consume wild meat, berries, and plants on a weekly basis. It was noted that wild food consumption among Nisga'a citizens who live on Nisga'a Lands is consistently higher for all types of foods compared to those citizens who live off Nisga'a Lands.

The ESCIA described concerns with respect to the limited time that those employed at the mine site will have to participate in cultural activities, including resource harvesting. Additionally, missing the opportunity to process fish was identified as another consequence of shift work associated with the Project. Of the total Nisga'a citizens surveyed, 48.7 percent indicated that a remote job would affect their harvesting practices, and 55.7 percent of the surveyed Nisga'a citizens living on Nisga'a Lands surveyed indicated that a remote job would affect their harvesting practices (Table 6.2.3). 57.4 percent of those surveyed indicated that having no time to harvest, fish, or plant would be a contributor to their not being able to practice harvesting activities with 46.7 percent indicating that it would depend on the season.

Mine-related work schedules may also hinder Nisga'a workers from attending cultural family and community events such as weddings, ceremonies, funerals, and feasts. Being able to participate in these events is important for Nisga'a citizens because of the value and significance of certain ceremonies and the specific roles of key community members. The ESCIA noted that Nisga'a citizens expressed the need to allow employees to return to the community for cultural and family events, especially for Nisga'a funeral ceremonies.

Higher disposable incomes that benefit certain individuals over others have the potential to weaken cultural cohesion and resilience in communities according to the literature summarized in the ESCIA. The disparity in income can lead to an increase in individual spending, a greater interest in generating wealth, and a diminished interest in partaking in cultural activities together with family and friends. These effects tend to be more prominent for certain groups in the community, based on experiences from other northern mines. However, it is also recognized that generating more wealth can have positive results, such as improving self-worth through increased responsibility, creating more opportunities to participate in resource harvesting activities, and contributing to community well-being.

**Table: 6.2.3: Would a Remote Job Affect Your Harvesting?**

| Respopnse | Total Sample | | Living on Nisga'a Lands | | Living off Nisga'a Lands | |
|---|---|---|---|---|---|---|
| | Frequency | Valid Percent | Frequency | Valid Percent | Frequency | Valid Percent |
| Yes | 172 | 48.7 | 113 | 55.7 | 59 | 39.3 |
| No | 181 | 51.3 | 90 | 44.3 | 91 | 60.7 |
| Total | 353 | 100 | 203 | 100 | 150 | 100 |

## Nisga'a Language

Census data from 2006 shows that Nisga'a citizens use and are more fluent in the Nisga'a language compared to the provincial average for language fluency among other Aboriginal groups. However, information gathered in the SERC Survey showed that the comprehension of and the ability to read and write the Nisga'a language are limited to a small portion of Nisga'a citizens (17.8 percent understood the Nisga'a language completely while 10.4 percent could speak the language, and 6.9 percent could read and write the language).

According to the ESICIA, the Project may affect the use of Nisga'a language because:

- The working environment will be predominantly English.
- Nisga'a workers will not use Nisga'a language during their shift at the site (i.e. for weeks).
- English-only policies will be enforced to ensure clarity and consistency among employees.
- English will continue to be used at home and in the community.

The proponent recognized that the use of English at the mine could hamper the Nisga'a Nation's ongoing efforts to revive the traditional language. However, providing Nisga'a workers with the ability to spend more time participating in cultural activities with family members during off shifts may help reverse language loss and the effects on Nisga'a culture. Teaching non-Nisga'a people the Nisga'a language has been identified as another measure to strengthen the culture and increase language use.

**Management Plans**

Measures to address the potential effects of the Project on the terrestrial and aquatic resources that Nisga'a citizens have the right to harvest as defined in the NFA are provided in Chapter 5 and in section 6.1.

Components of the Labour Recruitment and Transition Strategy may help to minimize adverse effects of shift work on cultural well-being, including flexibility for workers to attend to cultural and familial responsibilities and creation of an open, respectful, supportive, and culturally-aware work environment. Part of this strategy would also include social and cultural programs such as country food preferences and language/ culture course offerings.

**Residual Effects**

The Project has the potential to positively and adversely affect the cultural well-being of Nisga'a citizens, either strengthening or weakening culture preservation and language. The effects on cultural activities, namely harvesting and the decrease use of Nisga'a language could arise from the increase in remote jobs. More specifically, shift work patterns and the remoteness of jobs may cause Nisga'a workers to potentially miss traditional harvesting opportunities; negatively impact intergenerational transmission of cultural knowledge and practices; and impact their relationships with the Nisga'a community. The Agency's view is that the extent of these effects will largely depend on the actual number of Nisga'a citizens that take a remote job of the Project and the effectiveness of the mitigation measures, including those discussed in Chapter 5, section 6.1, and the above section.

### *6.2.4 Nisga'a Nation Comments*

Representatives of the NLG were given the opportunity to comment on a draft of this report and the comments they provided have been incorporated into this report.

### *6.2.5 Agency Conclusions on 8f Assessment*

Under paragraph 8(i) of Chapter 10, Canada is required to take into account any agreements between the Nisga'a Nation and the Proponent concerning the effects of the proposed Project. NLG confirmed to the Agency that an agreement between the proponent and the Nisga'a Nation is in place which sufficiently addresses the potential effects to be assessed under paragraph 8(f) of Chapter 10 of the NFA. The Agency is satisfied that the obligations under paragraph 8(f) of Chapter 10 of the NFA have been met.

# 7. Aboriginal Consultation

The federal government has a duty to consult and, where appropriate, to accommodate, when it has knowledge that its proposed conduct might adversely impact an established or potential Aboriginal or Treaty right. Consultation is also undertaken more broadly as an important part of good governance, meaningful policy development, and informed decision-making.

In addition to the federal government's broader obligations, the former Act requires that all federal EAs consider the effect of any environmental change caused by the Project and the effect of that change on the current use of lands and resources for traditional purposes by Aboriginal peoples. The former Act also requires consideration of the effect of any project-related environmental change on physical and cultural heritage, including "any structure, site, or thing that is of historical orarchaeological significance."

The Agency served as the Crown consultation coordinator and, together with the relevant federal departments, integrated consultation into the EA process for the Project to the extent possible. In this role, the Agency ensured that Aboriginal groups were provided with opportunities to (a) learn about the Project, (b) evaluate the Project, and (c) communicate their concerns to the Crown.

The Agency identified six Aboriginal groups whose potential or established Aboriginal or Treaty rights could be adversely impacted by the Project: the Nisga'a Nation, Tahltan, Skii km Lax Ha, Gitxsan, Gitanyow, and Métis Nation of British Columbia (MNBC).

**The federal government has a duty to consult and, where appropriate, to accommodate, when it has knowledge that its proposed conduct might adversely impact an established or potential Aboriginal or Treaty right.**

**Table 7.0.1: Aboriginal Groups Identified for Crown Consultation**

| | |
|---|---|
| **Nisga'a Nation**<br>Represented by the Nisga'a Lisims Government | The Processing and Tailing Management Area (PTMA), the eastern portion of the Mitchell-Treaty Twinned Tunnels (MTT), the Treaty Creek access road, and the transmission line are located within the Nass Area, as defined in the Nisga'a Final Agreement (NFA). All of Highway 37A and part of Highway 37 are situated within the Nass Wildlife Area, as defined in the NFA. The NFA sets out Nisga'a section 35 rights within these areas. |
| **Tahltan**<br>Represented by the Tahltan Central Council | The PTMA, eastern portion of the Mitchell-Treaty Twinned Tunnels, segments of the Coulter Creek and Treaty Creek access roads, and most of the transmission line are situated within the southern boundary of the Tahltan's asserted traditional territory as set out in documents possessed by the Crown. Part of Highway 37 also overlaps the southern portion of the territory. |
| **Skii km Lax Ha**<br>Represented by Hereditary Chief, Darlene Simpson | The Skii km Lax Ha's asserted traditional territory, as documented in maps submitted during the Delgamuukw litigation, is immediately downstream of the PTMA. The Treaty Creek access road and transmission line run along that territory boundary and part of Highway 37 intersects the territory. The Skii km Lax Ha also assert a broader traditional territory that overlaps all components of the Project. |
| **Gitxsan**<br>Represented by the Gitxsan Hereditary Chiefs Office | The project footprint is situated outside the asserted territories of the Gitxsan, as set out in documents possessed by the Crown. The proposed transportation corridor from Highway 16 along Highway 37 to the Mine Site access road intersects the asserted traditional territories of two Gitxsan *huwilp*: Gaxsbgabaxs and Sakxum Higookxw. |
| **Gitanyow**<br>Represented by the Gitanyow Hereditary Chiefs Office | The project footprint is situated outside the asserted traditional territories of the Gitanyow, as set out in documents possessed by the Crown. The proposed transportation corridor from Highway 16 along part of Highway 37 intersects the asserted traditional territories of five Gitanyow huwilp: Wilp Gwass Hlaam, Wilp Malii, Wilp Gamlakyeltxw, Wilp Gwinuu, and Wilp Wii'litsxw. The asserted traditional territory of Wilp Wii'litsxw also includes part of Highway 37A and is downstream of the Tailings Management Facility. |
| **Métis Nation British Columbia** | MNBC asserts, on behalf of its membership, Métis rights and traditional uses throughout most of British Columbia. MNBC represents chartered Métis communities in Terrace and Smithers. Components of the Project overlap areas where MNBC members have identified practicing harvesting activities. |

## 7.1 Nisga'a Nation Consultation Activities

Provisions under Chapter 10 of the Nisga'a Final Agreement (NFA) specify the requirements for consultation with the Nisga'a Nation in relation to an EA of a project to be located off Nisga'a Lands. The Government of Canada worked collaboratively with the Nisga'a Lisims Government (NLG) and the Government of B.C. as part of a tripartite government approach to designing and implementing EA and consultation activities to ensure the EA process meets NFA requirements.

The Agency invited the NLG to review and provide comments on key documents relating to the EA, including the joint AIR, the EIS and corresponding reports, this comprehensive study report, and all of the products associated with the proponent's Economic Social Cultural Impact Assessment (ESCIA). In directing the proponent on the scope and content of the ESCIA, the Agency considered the NLG's Economic, Social, and Cultural Impact Assessment Guidelines that set out the NLG's perspective on how paragraph 8(f), Chapter 10 of the NFA should be assessed.

Comments and additional information were received from the NLG through the working group, technical sub-working groups, bilateral and trilateral government meetings, correspondence, open houses in Nisga'a villages and supplementary information documents. Trilateral NLG, Agency and BC EAO meetings provided opportunities to collectively discuss issues related to the ESCIA

and to identify information gaps that needed to be addressed. The Agency allocated funding through its Participant Funding Program to assist the NLG's participation in the federal EA.

## 7.2 Consultation Activities Related to Potential Aboriginal Rights

The Agency invited five Aboriginal groups whose asserted Aboriginal rights could be adversely impacted by the Project in addition to the Nisga'a to participate in consultation activities. These groups are the Tahltan, Skii km Lax Ha, Gitxsan, Gitanyow and Métis Nation of British Columbia.

**Consultation is also undertaken more broadly as an important part of good governance, meaningful policy development, and informed decision-making.**

The Agency notified each Aboriginal group of key milestones in the EA process, including opportunities for public participation; invited groups to comment on key EA documents; and invited groups to submit information to the Agency on their potential Aboriginal rights, current use of lands and resources for traditional purposes, and how the Project could impact those rights and/or lands/resource use.

The Agency extended additional consultation activities to Tahltan, Skii km Lax Ha, Gitxsan, and Gitanyow, because of the possibility of more severe impacts on their potential Aboriginal rights. These activities included participation in technical EA working groups and in-person meetings with the Agency and other federal departments.

The Agency's Participant Funding Program made funds available to reimburse eligible expenses incurred by Aboriginal groups during their participation in the EA. The Gitanyow Hereditary Chief's Office, Gitxsan, Tahltan, and MNBC applied for and received funding at the outset of the EA process. The Skii km Lax Ha applied at a later stage and were provided with funding at that time.

## 7.3 Provincial Consultation Activities

As part of the cooperative EA process (see section 1.1 of this report), the Agency and BC Environmental Assessment Office conducted joint consultations with Aboriginal groups, to the extent possible, throughout the EA. This coordinated approach included aligning public comment periods, holding joint working group meetings, and meeting together with Aboriginal groups. An exception to this coordinated approach is that only the Agency has consulted the Métis Nation British Columbia.

## 7.4 Proponent Engagement

The legal responsibility to consult and accommodate rests with the Crown. However, the efforts of the proponent can assist in the overall consultation process and inform not only the assessment of potential adverse impacts of the Project on asserted or established Aboriginal or Treaty rights, but also inform appropriate mitigation or accommodation measures that may be required to address the potential impacts.

The following are examples of additional engagement activities the proponent led or participated in during the EA process:

- Sharing project information;
- Participating in working group meetings;
- Hosing site visits, community meetings and open houses;
- Providing workshops and training opportunities to Aboriginal organizations;
- Sharing key reports with Aboriginal groups prior to submitting to the Agency, as appropriate;
- Providing capacity funding for Aboriginal groups to participate in the EA process; and
- Holding meetings with representatives of Aboriginal groups and their technical experts.

The proponent collected information on how the Project might affect Aboriginal groups through the above activities and related EA process which in turn helped to identify potential mitigation or accommodation measures. The Agency considered the information presented by the proponent in determining if the Project would cause potentially adverse impacts on potential or established Aboriginal or Treaty rights.

## 7.5 Potential Adverse Impacts of the Project on Potential Aboriginal Rights

The NLG, Tahltan, Skii km Lax Ha, Gitxsan, Gitanyow, and MNBC shared their concerns with the Agency about how the Project could adversely impact potential or established Aboriginal or Treaty rights.

The Agency maintained an issues tracking table to follow and respond to all information related to potential or established Aboriginal or Treaty rights, potential adverse impacts on those rights, and proposed mitigation or accommodation measures. A preliminary version of this table was shared with the Aboriginal groups for review and comment.

A summary of the key issues raised by Aboriginal groups follows, with a more comprehensive list of concerns and the proponent's and Agency's responses to those concerns provided in Appendix D. The potential effects of the Project on the treaty rights of the Nisga'a Nation, as defined by the NFA, are discussed in Chapter 6 of this report.

### Mine Site

The Tahltan and Skii km Lax Ha indicated that direct changes to wildlife and loss of habitat at the Mine Site could affect the availability of wildlife resources in the regional study area – especially mountain goats, grizzly bear, and moose – thereby impacting potential rights related to hunting.

The Tahltan also expressed concern that impacts from the Mine Site on water quality in the Unuk River could adversely affect Pacific Salmon, a species of great cultural importance to the Tahltan and other Aboriginal groups. The Unuk River demarcates the southern boundary of asserted Tahltan territory.

### PTMA

Aboriginal groups were very concerned about the location of the Process and Tailing Management Area (PTMA) near the upper tributaries of Teigen and Treaty creeks in the Bell-Irving watershed. The proposed location would overlap the asserted traditional territories of the Tahltan and Skii km Lax Ha and sits upstream of the asserted traditional territory of the Gitanyow.

Aboriginal groups noted that the existence of the PTMA would reduce the availability of wildlife habitat for moose, mountain goats, grizzly bear, and other culturally important fur-bearing species. The loss of wetlands in the PTMA would decrease migratory bird habitat. The Skii km Lax Ha and Tahltan indicated that their peoples' ability to practice potential Aboriginal rights to harvest these species would be diminished due to these habitat changes and the adverse effects on wildlife and migratory birds. Specifically, the Skii km Lax Ha have expressed concerns that they will be unable to continue trapping in the section of their two registered trap lines that overlap the PTMA. The Gitanyow also noted that depending on a species' range, changes to wildlife and wetlands in the PTMA could adversely impact the practice of Aboriginal rights in adjacent traditional territories, such as Gitanyow hunting moose.

The potential downstream risks to water quality and fish from the TMF were raised by all the Aboriginal groups. The Gitanyow and Skii km Lax Ha, who assert fishing rights along the Bell-Irving and Nass Rivers, were concerned about adverse effects on salmon and other fish species from changes to water quantity and quality and wetland function in the Bell-Irving watershed and downstream in the Nass River.

Aboriginal groups also raised concern about the potential for catastrophic failure of the TMF dam and the effects of such a failure on the Nass River, including landscapes of significant cultural and ecological importance, such as the Hanna-Tintina area for the Gitanyow.

### Transportation Route

Project-related traffic will travel along Highway 37 from the Treaty Creek Access Road turn-off to Kitwanga and along Highway 37A to Stewart, passing through the asserted traditional territories of the Tahltan, Skii km Lax Ha, Gitxsan, and Gitanyow. All groups were concerned that the rise in truck traffic will adversely affect the moose population by hindering movement of moose across the highway and increasing moose mortality due to collisions with vehicles, consequently impacting the availability of moose for these groups to hunt.

Other concerns relating to the impacts of truck traffic on potential Aboriginal rights included the safety of people picking berries along the highway, impacts on fishing in the case of fish mortality resulting from spills and contamination of waterways, and increased mortality of grizzly bears, a particularly culturally important animal, due to collisions with vehicles.

## 7.6 Mitigation and Accommodation

Aboriginal consultation during the EA provided opportunities for the proponent to share detailed information about the Project with Aboriginal groups, seek information on how potential effects of the Project might impact Aboriginal groups, and develop mitigation measures that will both reduce environmental effects and minimize impacts on potential Aboriginal rights.

### Mine Site

Mitigation measures that will reduce the potential impacts of the Mine Site on potential Aboriginal rights include: diverting non-contact surface water away from the Mine Site, treating all contact water to reduce contamination in downstream water bodies such as the Unuk River below the naturally occurring fish barrier, and maintaining baseline levels to the extent possible in areas of the Unuk River where Pacific Salmon are found. See section 5.5 for further details on surface water quality.

### PTMA

Similar mitigation measures will be used at the PTMA to minimize adverse effects on water quality and fish. Additionally, the proponent will implement habitat compensation plans for fish and wetlands displaced by PTMA infrastructure. Effects on creeks and rivers downstream from the PTMA will be prevented through the design and operation of the TMF, which includes measures to control seepage and prevent downstream contamination while meeting provincial and federal standards for water quality and the protection of aquatic life. See sections 5.2 to 5.6 of this report for further details on mitigation measures regarding water quality and protection of aquatic life downstream of the PTMA.

The proponent conducted an assessment of alternatives of locations for the PTMA that, as per standard practice, included consultation with Aboriginal groups (see section 4.0 of this report). The finding of the assessment was that the area at the headwaters of Teigen and Treaty creeks is the most environmentally and economically feasible location to minimize effects.

The Agency required the proponent to conduct a Catastrophic Dam Break Analysis that linked a dam break to valued components such as fish, water quality, and human health (see section 5.12 of this report) in response to concerns raised by Aboriginal groups. The analysis found that downstream effects on the Nass River are highly unlikely because of the design of the TMF and the extremely low probability of catastrophic failure of any of the TMF dams. The proponent acknowledged that if such an unlikely event occurred there would likely be flooding and downstream tailings deposition that would result in high magnitude residual effects on fish and fish habitat in the Nass and Bell-Irving watersheds.

### Transportation Route

The proponent will implement a Traffic and Access Management Plan, which includes: optimizing vehicle load rates to minimize the number of trips, using noise suppression technologies (where possible), and providing safety training to truck drivers to minimize hazards to both humans and animals along the transportation route. Other measures to mitigate traffic-related effects include requiring drivers to document collisions with wildlife, implementing a Dangerous Goods and Hazardous Materials Management Plan to prevent hazardous substances from entering the environment during transportation, and following Emergency Response Plans in the case of accidents or other emergencies.

While not specific to the Project, the provincial government has created a Highway 37/37A Advisory Group to discuss potential cumulative effects due to increased resource development and industrial traffic on Highway 37/37A. That forum was created in part as a way to discuss and potentially address concerns that local Aboriginal groups raised during the environmental assessment for this project as well as on concurrent environmental assessments of other proposed projects that would also use the same transportation route.

The proponent will continue to engage Aboriginal groups and communities to monitor the effects of the Project on Aboriginal land and resource use. The proponent will also engage Aboriginal groups on the effectiveness of the mitigation or avoidance measures, including through the involvement of Aboriginal groups in the monitoring and follow-up programs (see Appendix E). Should the results from follow-up and monitoring programs indicate that the Project is likely to cause unanticipated adverse effects on Aboriginal interests or traditional land and resource use; the proponent will undertake further consultation efforts.

## 7.7 Agency Conclusions About Impacts on Potential Aboriginal Rights

The Agency has considered the environmental effects of the Project and proposed mitigation measures in relation to the potential Aboriginal rights of the Tahltan, Skii km Lax Ha, Gitxsan, Gitanyow, and MNBC. For the purposes of the EA decision, the Agency is satisfied that either the adverse impacts of the Project on the continued exercise of potential Aboriginal rights will be appropriately avoided, mitigated or accommodated. Consultation will be carried forward in the regulatory approval phase.

## 7.8 Issues to be Addressed in the Regulatory Approval Phase

The regulatory approval phase of the Project consists of federal authorizations, licenses, approvals or permits related to areas of federal jurisdiction (e.g. effects on fish and fish habitat and navigation). Substantive work for potential federal permits and authorizations under the Fisheries Act, Explosives Act, International River Improvements Act, and the Metal Mining Effluent Regulations will be required should the EA decision conclude that the Project can proceed. In this situation, the federal Crown would consult Aboriginal groups, as appropriate, prior to taking regulatory decisions. The decision to undertake additional consultation will take into consideration:

- The consultation record resulting from the EA; and
- Mitigation, compensation, and accommodation measures proposed to address potential outstanding concerns not addressed through the EA.

After the EA concludes, federal departments will continue Crown consultation with Aboriginal groups as appropriate on matters associated with any federal regulatory approvals required for the Project to proceed.

# 8. Public Consultation

The former Act requires that the public have a minimum of three opportunities to participate in a comprehensive study. For this project, the Agency provided four public comment periods as summarized in table 8.0.1.

**Table 8.0.1: Public Consultation Opportunities During the EA of the KSM Project**

| Document/Subject of Consultation | Dates |
|---|---|
| Proposed scope of the environmental assessment | June 1 – June 30, 2010 |
| Project and conduct of the comprehensive study | July 19 – August 20, 2010 |
| EIS Summary<br>(joint federal-provincial consultation period) | September 6 – October 21, 2013 |
| Comprehensive Study Report | Current |

The Agency is currently inviting the public to comment on this Comprehensive Study Report. The Minister of the Environment will consider this report and comments received from the public and Aboriginal groups in making her EA decision.

The Agency supported public participation through its Participant Funding Program. A total of $6500 was allocated to the K.T. Industrial Development Society (KTIDS) to facilitate their participation in this EA.

The Agency considered comments received from the public in preparing this comprehensive study report. The identified issues and concerns of participants are summarized in table 8.0.2.

**Table 8.0.2: Summary of Public Comments from the EIS Review.**

| Comment type | Summary of Issues Raised |
|---|---|
| General Process | • Inadequate timelines associated with the public comment period for the EIS and KSM EA review<br>• Lack of federal / provincial lead public meetings in Alaska<br>• Lack of consultation with the Tlingit, Haida, and Tsimshian tribes of Alaska<br>• Insufficient bonding requirements to safeguard for accidents and malfunctions and remediation |
| Transboundry Concerns | • Risk to commercial and recreational fisheries in Alaska<br>• KSM study area does not include Alaska |
| Impacts to fish and fisheries | • Risk to commercial Aboriginal and recreational fisheries in the Nass watershed<br>• Potential eutrophication in system downstream of the TMF from nitrogen and phosphorous loading<br>• Uncertainties in impacts to fish habitat and the proposed compensation plan |
| Socio Economic | • Project will produce jobs and other economic opportunities in northern BC<br>• Social impacts to northern BC |
| Human Health | • Risks to human health from water quality degradation |
| Wildlife | • Impacts to wildlife from additional roads and road use<br>• Risk to the moose population in the Nass watershed |
| Project Design | • Uncertainties with the treatment of selenium on the Mine Site<br>• Uncertainties with the geomembrane liner for the CIL cell of the TMF and its ability to contain contaminants of special concern<br>• Risks to project components as a result of extreme weather events or earthquakes<br>• Closure period (250 years) is too short<br>• Uncertainty in the extent of groundwater seepage |
| Cumulative Effects | • Cumulative impacts from excess mining activity |

All comments received were shared with federal and provincial members of the EA working group, including representatives of US state and federal agencies. Further information on these themes and a selection of other public and Aboriginal comments are included in section 5 (Environmental Effects Assessment). Section 10 (Benefits to Canadians) describe changes to the Project that were made partially in response to public and Aboriginal comments.

## Transboundary Concerns

The Agency received over 400 comments related to BC-ßAlaska transboundary concerns (see table 8.0.2) during the public comment opportunity on the EIS summary. Key issues that were raised included potential impacts on fish and fisheries (recreational and commercial), and human health from degraded water quality and changes in water quantity in the Unuk River. In the EIS, the proponent assessed potential water quality and water quantity in the Unuk River at the BC-Alaska border. As described in section 5 of this comprehensive study report, the Agency has concluded that no significant adverse impacts on water quality (section 5.5), water quantity (section 5.4), fish (section 5.6), or human health (section 5.10) are expected on the Alaskan side of the Unuk River watershed.

US federal and Alaska state agencies, including the US Environmental Protection Agency, US Department of the Interior, US Forest Service, US National Oceanographic and Atmospheric Administration, Fisheries Service (NOAA), Alaska Fish and Game and the Alaska Department of Natural Resources participated in the EA. The US federal and state agencies were participants in the working group process and provided review comments on key EA documents. The participating US federal and state agencies did not identify any outstanding transboundary concerns with the EA.

### Participation Activities by the proponent

The proponent has been engaging public stakeholders since 2008, including holding public open houses in several BC and Alaskan communities. Activities by the proponent included information sharing, general face-to-face consultation with community members, and key stakeholder meetings. Specifically, the proponent:

- Created public notices to share information with the public as well as advertise for community meetings;
- Created the KSM Project website to provide project information, EA documentation, and notifications. The website also contained contact information for the public to provide comments to the proponent;
- Held several public information sessions, including in Stewart, Terrace, New Hazleton, and Smithers, B.C. and Ketchikan, Alaska, to provide information to the general public and other interested stakeholders and to offer the opportunity to provide comments on the Project; and
- Held meetings with specific stakeholders, including Rivers without Borders, Rivers West, Ketchikan business leaders, Tlingit-Haida Central Council of Alaska, and the Southeast Alaskan Tribal Council to provide information on project design, EA studies, and to identify concerns of the public.

# 9. Follow-up Program

The former Act requires that the Responsible Authorities for the KSM Project EA (DFO, EC, and NRCan) design and ensure the implementation of a follow-up program to verify the accuracy of the EA and to determine the effectiveness of mitigation measures. The results of a follow-up program may also support the implementation of contingency measures to address previously unanticipated adverse environmental effects.

The Responsible Authorities will consider the items identified in Appendix E, as appropriate in designing a follow-up program for the Project. Government agencies will be involved in the development of elements of the follow-up program that are relevant to their mandate and expertise. The program will take into account the terms and conditions of federal authorizations, provincial EA certificate commitments and approvals required to carry out the Project, any changes in environmental conditions, and the observation of environmental effects that could occur during project implementation. The results of the follow-up program will be reported to relevant agencies. The results or an indication of how the results may be obtained will be available to the public through the Agency's Canadian Environmental Assessment Registry (www.ceaa-acee.gc.ca).

# 10. Benefits to Canadians

The Agency, with the assistance of federal and provincial government authorities, assessed the potential effects of the Project on key VCs. The public and Aboriginal groups were invited to participate at key points in the EA. The proponent modified its project design through the course of the EA process and in response to comments submitted. Key modifications include:

- relocating the Highway 37-PTMA access road from Teigen Creek Valley to Treaty Creek Valley, to reduce stream crossings and potential impacts on fish, mountain goat and western toad habitat, wetlands, and eleven archaeological sites;
- eliminating the Sulphurets Rock Storage Facility, to reduce potential metal leaching into Sulphurets Creek;
- modifying the mining method of Mitchell Pit by replacing an entirely open pit mining scheme with a partially underground scheme to improve safety and reduce waste rock generation by 21 percent;
- converting the mining method of Iron Cap Pit from open pit mining to an underground method to reduce waste rock generation by 99 percent;
- constructing a Centre Cell in the Tailing Management Facility and installing a geomembrane-liner in the cell to reduce the potential for cyanide seepage;
- backfilling the mined-out Sulphurets Pit with Kerr Pit waste rock and installing impermeable liner to reduce selenium impacts;
- constructing a selenium treatment plant at the Mine Site to reduce selenium discharge into the Sulphurets Creek watershed;
- expanding the Water Treatment Plant capacity at the Mine Site to manage flows to better mimic the down-stream hydrograph;
- locating Mitchell Treaty Twinned Tunnel infrastructure underground except for the portal itself, to avoid surface disturbance, a stream diversion and potential effects on wildlife;
- redirecting the discharge from the Tailing Management Facility to Treaty Creek, instead of South Teigen Creek, to reduce impacts on salmon;
- maintaining natural flows by diverting clean water around the Tailings Management Facility to the Teigen Creek watershed, and developing a discharge schedule to mimic the seasonal flows in Treaty Creek and Sulphurets Creek; and
- moving the transmission line to the Treaty Creak Access Corridor to minimize vegetation loss and wildlife impacts associated with another linear corridor.

# 11. Conclusion of the Agency

The Agency took the documentation submitted by the proponent, including the EIS and associated amendments and the views of the public, government agencies, and Aboriginal groups into account in determining whether or not the Project is likely to cause significant adverse environmental effects

The Agency concludes that the KSM Project is not likely to cause significant adverse environmental effects taking into account implementation of the mitigation measures described in this report. Following a public consultation on this Report, the Minister of the Environment will decide whether the Project is likely to cause significant adverse environmental effects taking into account the implementation of mitigation measures, and public comments received. The Project will then be referred back to the responsible authorities for appropriate course of action in accordance with section 37 of the former Act.

**The Agency concludes that the KSM Project is not likely to cause significant adverse environmental effects taking into account the implementation of the mitigation measures described in this report.**

# 12. Appendices

## Appendix A
**Detailed Description of Key Project Components and Activities**

## Key Project Components

### Mine Site Facilities

### Mitchell Pit and Underground Mine

The Mitchell Pit will be located in the Mitchell Creek Valley, downstream of the Mitchell Glacier. The Mitchell deposit will be mined by open pit and underground block cave mining methods.

### Sulphurets Pit

The Sulphurets Pit will be located between the Mitchell and Sulphurets Creek valleys.

### Kerr Pit

The Kerr Pit will be located south of Sulphurets Lake and west of Sulphurets Glacier. The Kerr deposit will be mined by open pit methods.

### Iron Cap Underground Mine

The Iron Cap deposit will be located north of the Mitchell Pit. The Iron Cap deposit will be mined using underground block cave mining methods.

### Mitchell and McTagg Rock Storage Facilities

Waste rock that is generated from mining the Mitchell, Sulphurets and Iron Cap deposits will be stored in the Mitchell and McTagg rock storage facilities (RSFs). Waste rock from the Kerr Pit will be backfilled into the mined-out Sulphurets Pit.

### Mitchell Ore Preparation Complex

The Mitchell Ore Preparation Complex (OPC) will include facilities for rock crushing, coarse ore storage, fuel storage, impacts on an electrical substation (Substation 2) and distribution network and support infrastructure. The portals of the MTT and Mitchell underground access and conveyor adits will also be located at the OPC.

### Explosives Manufacturing Facility

The explosives manufacturing facility will be located in the Ted Morris Creek Valley.

### Mitchell Diversion Tunnels

The Mitchell Diversion Tunnels (MDT) and related inlet structures will divert non-contact flows from the Mitchell Glacier and surrounding areas located upstream of the Mitchell Pit and underground mine to the Sulphurets Creek drainage.

### McTagg Twinned Diversion Tunnels

The McTagg Twinned Diversion Tunnels (MTDT) will divert non-contact water from the McTagg Creek Valley away from the McTagg RSF and other Mine Site facilities.

### Mitchell-Treaty Twinned Tunnels

The MTT will consist of two parallel interconnected tunnels. The tunnels will be used to convey crushed ore, distribute power from the Treaty OPC (Substation 1) to the Mine Site (Substation 2), house communications infrastructure, and transport fuel, bulk materials and personnel. The MTT will slope downwards from the Treaty portal to the Mitchell portal, to allow tunnel seepage water to drain to the Mine Site, where it will be collected and treated before release to the receiving environment.

### Water Storage Facility

The Water Storage Facility (WSF) will store the Mine Site contact water to attenuate seasonal flows and regulate the flow of water to the Water Treatment Plant (WTP) prior to release. Non-contact runoff from the northwest valley slope above the WSF will be intercepted by the WSF bypass buried pipeline, while runoff from the southeast valley slope will be intercepted by the southeast WSF diversion. Both diversions will discharge to Mitchell Creek below the WSD. The WSD will be designed to resist the maximum credible earthquake and will include a freeboard allowance to manage any wave action caused by avalanches without overtopping. Seepage from the WSD will be collected by seepage interception tunnels and in a seepage recovery pond, impounded by a seepage dam located downstream of the WSD. During the Project's operation, closure and post-closure phases, the Water Storage Facility (WSF) will store for treatment in the WTP all contact water received from upstream Mine Site facilities, including the RSFs, the open pit and underground mine workings and the drainage from the MTT. The WSF will continue collecting contact water that requires treatment during the closure and post-closure phases.

### Water Treatment Plant

The WTP will treat contact water discharged from the WSF, using a high density sludge (HDS) lime water treatment process. Contact water from both the dewatering of the Mitchell underground block cave mine and the WSD seepage pond will also be treated at the WTP. The WTP will be designed with the capacity to treat up to 7.5 $m^3$/sec.

### Selenium Treatment Plant

The Selenium Treatment Plant will be designed to treat flow rates of up to 500 L/s and treat runoff from Kerr Pit waste rock that has been backfilled into the Sulphurets Pit. Drainage from the Kerr Pit, if elevated with selenium, will also be treated. Concentrated seepage from the Mitchell and McTagg RSFs will be collected and pumped to the Selenium Treatment Plant. Effluent from the Selenium Treatment Plant will report to the WSF for final treatment through the HDS WTP.

### Ore Stockpiles

An initial temporary ore stockpile will be located between the Mitchell Pit and the Mitchell OPC to receive run-of-mine Mitchell Pit ore and a long-term run-of-mine ore stockpile will be located along the northern margin of the Mitchell RSF.

### Substation 2

Substation 2, located at the Mitchell OPC, will be supplied with power from cables routed through the MTT from Substation 1 (located at the PTMA). At Substation 2, power will be stepped down for local distribution to Mine Site facilities.

### Small-scale Hydroelectric Power Facilities

Up to three small-scale hydroelectric projects will generate supplementary power for the Project via diversion of water through the MDT, the MTDT, and discharge of water from the WSF to the WTP.

### Sludge Storage

During construction, sludge will stored in a secure sludge landfill area and a winter sludge storage building during construction. During the operation phase, sludge from the Mine Site WTP will be dewatered, trucked to the Mitchell OPC, and transported via the MTT to the Process Plant, and eventually stored in the Tailing Management Facility (TMF). At closure, the sludge will be stored in a secure landfill facility located on top of the McTagg and Mitchell RSFs.

### Other Mine Site Facilities

Permanent avalanche mitigation structures will be constructed in locations around the Mine Site to protect infrastructure. There will also be areas for snow storage. Several borrow areas and quarries for construction materials at the Mine Site will be located within the WSF footprint, adjacent to the WSD. Stockpiled soils for future reclamation purposes will be maintained south of Sulphurets Creek and east of Ted Morris Creek.

A landfarm/landfill complex will be located adjacent to the Mitchell Operating Camp east of the Truck Shop to manage non-hazardous waste at the Mine Site. The landfarm will accept contaminated soils from spill clean-ups and leaks, while the landfill will be used to dispose of inert, dry industrial, and forestry waste. The landfarm will also include an area for storage of contaminated snow from Mine Site winter snow removal activities. Non-contact water will be diverted around the landfill site. Runoff from the landfill will be managed with other contact water.

## Processing and Tailing Management Area Facilities

### Treaty Ore Preparation Complex

The Treaty OPC will process mill feed an annual average production rate of 130,000 tpd. Water supply for the Treaty OPC will be provided by a fresh water system, a process water reclaim system for grinding/flotation circuits, and a process water system for carbon-in-leach (CIL)/ gold recovery circuits. Fresh and potable water for the Treaty OPC will be supplied from nearby wells and local drainage runoff areas to an elevated storage tank. Water for the grinding/ flotation circuits and the CIL leaching/gold recovery will be sourced from water reclaimed primarily from flotation.

### Tailing Management Facility

The TMF will be designed to store 2.3 Bt of tailing. The TMF water management system will include three tailing cells and four containment dams, impacts on seepage dams and ponds and surrounding non-contact water diversions, reclaim water barge and pipeline, and excess water pipeline to Treaty Creek. The TMF tailing cells and containment dams are described below:

- the initial North Cell will be contained by the North and Splitter dams;
- the carbon-in-leach (CIL) Residue Cell (also known as the Centre Cell) will be contained by the Splitter and Saddle dams; and
- the South Cell will be contained by the Saddle and Southeast dams.

The North and South cells will store desulphurdized or not potentially acid-generating rougher flotation tailing. The Centre Cell will store treated sulphide-rich cleaner or potentially acid generating tailing, and will be lined with a geomembrane liner.

During operation, the cleaner tailing in the Centre Cell will be kept flooded with supernatant to prevent oxidation of sulphide minerals. Surplus water from the Centre Cell will be routed through the Treaty OPC prior to discharge into either the North or South Cell., Management of surplus water during operation of both the North and South cells will use a combination of storage and pumped discharge via a pipeline to Treaty Creek. The TMF discharge will be staged to match seasonal flows. The water will be dissipated through a constructed rock drain to reduce the flow energy as it enters Treaty Creek. The TMF cells will be designed with enough freeboard to store all water inputs during the Probable Maximum Flood without discharge to the receiving environment. Seepage and runoff water from the tailing dams that does not meet EMA permit discharge requirements will be collected by downstream seepage collection dams and pumped back to the TMF. The seepage ponds located upstream of the main seepage collection dam will also be used to settle solids resulting from the dam building activities.

### Non-contact Water Diversions

The Northeast Diversion and the South Diversion channels will be constructed around the TMF North Cell to channel non-contact runoff from surrounding valley slopes to South Teigen Creek. Once the South Cell is in operation, non-contact water from TMF valley slopes will be diverted by the Southeast Diversion Channel, which will route non-contact flows around the east side of the South Cell to Treaty Creek. Two diversion inlet dams will be installed in the East Catchment to divert flows into South Teigen Creek.

### Small-scale Hydroelectric Power Facilities

Electrical energy will be recovered along the tailing flow from the Process Plant to the North Cell and/or South Cell.

### Other Process and Tailing Management Area Facilities

A landfarm/landfill complex will be located at the PTMA. The landfarm will accept contaminated soils and materials from the Project.

## Access Roads

### Coulter Creek Access Road (CCAR)

The Mine Site will be accessed by a new resource road, the CCAR, which will extend from the existing Eskay Creek Mine Road southwards to the Mine Site. The CCAR will commence at km 55 of the Eskay Creek Mine Road.

### Treaty Creek Access Road (TCAR)

The PTMA will be accessed by a new resource road, the TCAR. The TCAR will leave Highway 37, cross over the Bell-Irving River and will run along the Treaty Creek Valley to the PTMA.

### Other Roads

The North Treaty lower and upper roads will be built to the same standards as the TCAR. The Southwest Diversion maintenance, Treaty Saddle and Treaty Spur roads will single-lane roads.

### Temporary Frank Mackie Glacier Access Route

During construction, the Frank Mackie Glacier access route will provide temporary, winter-only access to the Mine Site. The route will run northwards from a point close to the abandoned Granduc Mine mill site, access the Frank Mackie Glacier from the Berendon Glacier, and then proceed up and over into the Ted Morris Creek Valley. The route will be decommissioned by the end of the construction phase.

## Key Project Activities

### Project Construction

Early construction activities will focus on the CCAR, TCAR, MTT and water management, as well as prestripping of the Mitchell and Sulphurets pits, and establishing waste rock and ore storage areas. Early construction water management activities at the Mine Site will include construction of the WSD, WTP (first phase), and related sludge management facilities, temporary water treatment facilities at tunnel portals and other key locations, fresh and contact water diversions, and the MDT and MTDT. Diversion structures will be constructed around the Treaty OPC and key TMF construction areas. Once diversions are in place, the Mitchell and Teigen starter dams would be established and tailing distribution and reclaim water pipelines would be installed. Avalanche control systems will be established early during construction and will operate as required for the life of the Project. Work on the PTMA will include construction of the Treaty Process Plant and related support infrastructure, including but not limited to administration buildings, camp and fuel storage. Once diversions are in place, the starter dams for the North, Saddle, and Splitter dams will commence. Seepage control dams will be established and tailing distribution and reclaim water pipelines will be installed.

## Project Operation

### Mining and Processing

Open pit and underground mining activities will take place at the Mitchell, Kerr, Sulphurets and Iron Cap deposits. Mined ore will be transported to the PTMA through the Mitchell Treaty Twinned Tunnel for processing. Mine tailing will be placed and managed within the tailings management facility.

### Water Management

Water management facilities will be constructed and maintained at the Mine Site throughout the life of the Project to divert fresh (non-contact) water around and away from disturbed areas, and to collect water that has been in contact with disturbed areas (contact water) for treatment (where required by EMA permit) prior to release into the receiving environment.

### Transportation

Concentrate: Copper-gold concentrate will be covered and trucked to the Stewart Bulk Terminals port facility in Stewart, BC and molybdenum concentrate will be covered and trucked to the Prince Rupert port. Transportation will be carried out using highway-approved trucks, operating up to 24 hours per day. Trucks will be capable of carrying 30- to 50-t loads.

## Closure and Post-closure

### Mitchell Pit and Underground Mine

When Mitchell underground mining ceases closure dam will be completed on the west side of the pit to allow for controlled pit lake discharge. The crest of the closure dam must be constructed with sufficient freeboard allowance to manage wave action caused by avalanches.

### Sulphurets Pit

Following completion of Sulphurets Pit mining, the mined out Sulphurets Pit will be backfilled with waste rock from the Kerr Pit. The backfill will be constructed from the bottom up with the outer edge of each bench lined with a synthetic liner to provide a barrier to downward movement of water within the backfill once the backfilling operation is complete. All drainage in contact with the backfill material will be collected and routed via a pipeline to the Selenium Treatment Plant and WTP.

### Kerr Pit

Following completion of Kerr Pit mining, the pit must be designed to store a 200-year flood and will pass the flood via the pipeline to the WSF.

### Iron Cap Underground Mine

Drainage from surface inflow and the Iron Cap underground works will drain into the Mitchell Pit north wall dewatering adit. This water will flow to the Mitchell Valley Drainage Tunnel and into the WSF.

### 9.5 Mitchell and McTagg Rock Storage Facilities

The tops of the Mitchell and McTagg RSFs will be used to construct secure landfills to store sludge from the WTP.

### Water Storage Facility and Water Treatment Plant

The WSF and the WTP will remain in service after mine closure to continue collecting and treating contact water during the post-closure phase. During the closure and post-closure phases, the sludge generated by water treatment will be placed during the summer months to the top of the Mitchell and McTagg RSFs, and placed in an engineered landfill. During winter, the sludge will be temporarily stored until it can be placed in the permanent secure landfill during the following summer. A run-off collection channel will collect and route contact water from the landfills to the WSF.

### Mitchell-Treaty Twinned Tunnel

During the closure and post-closure phases, the MTT will remain in operation to provide access to the Mine Site. All supplies for monitoring, and the maintenance and operation of the WTP (including lime) will be transported from the PTMA through the MTT to the Mine Site.

### Tailing Management Facility

Once mining ceases, tailing in the Centre Cell will be sealed by a cover of rougher flotation tailing and a water cover will be maintained during long term closure. The CIL tailing will remain flooded by a water cover at closure at all times. The TMF will be reclaimed to provide wildlife and wetland habitat.

### Coulter Creek Access Road

The CCAR will be decommissioned post-closure. All bridges will be dismantled and any materials that are combustible will be burned. Concrete will be broken up and used as rip-rap along creeks and culverts will be removed to restore natural drainage patterns. Cross-ditching will provide drainage across road surfaces to reduce the potential for surface erosion. Road surfaces will be ripped, where required by permit, and salvaged soil be available for reclamation purposes.

### Treaty Creek Access Road

The TCAR will remain gated and access will be limited to personnel involved in post-closure activities or where approved under the Access Management Plan (see section 10.5).

### Small-scale Hydroelectric Power Stations

With the exception of the energy recovery stations installed in the tailing lines at the TMF, the small-scale hydro-electric power stations will continue to supply electricity to the Project site during the closure and post-closure stages.

# Appendix B

**Predicted Water Quality for Key Locations in the Mine Site and PTMA**

**Chemical Parameters Modelled in the Proponents Water Quality Assessment**

| Anions / Nutrients | Cyanides | Total and Dissolved Metals | | |
|---|---|---|---|---|
| Ammonia | Weak acid dissociable cyanide | Aluminum | Copper-cyanide complex | Silicon |
| Bromide | Total cyanide | Antimony | Iron | Silver |
| Chloride | | Arsenic | Lead | Strontium |
| Fluoride | | Barium | Lithium | Thallium |
| Nitrate | | Beryllium | Magnesium | Tin |
| Nitrite | | Boron | Manganese | Uranium |
| Phosphorus | | Cadmium | Molybdenum | Vanadium |
| Sulphate | | Calcium | Mercury | Zinc |
| | | Chromium | Nickel | |
| | | Cobalt | Potassium | |
| | | Copper | Selenium | |

**Predicted Average Water Quality of Key Parameters in Sulphurets Creek (SC3)**

| | BCWQG | | Current (Baseline) | | |
|---|---|---|---|---|---|
| | | Minimum | Annual Average | Maximum | |
| Sulphate (mg/L) | 309 | 28 | 88 | 134 | |
| Aluminum (Dissolved) (mg/L) | 0.05 | 0.03 | 0.05 | 0.07 | |
| Cadmium (mg/L) | 0.0002 | 0.0007 | 0.001 | 0.002 | |
| Chromium (mg/L) | 0.001 | 0.0002 | 0.002 | 0.009 | |
| Copper (mg/L) | 0.005 | 0.04 | 0.1 | 0.3 | |
| Lead (mg/L) | 0.008 | 0.0005 | 0.003 | 0.008 | |
| Selenium (mg/L) | 0.002 | 0.0007 | 0.0018 | 0.0026 | |
| Zinc (mg/L) | 0.04 | 0.06 | 0.1 | 0.2 | |
| | **BCWQG** | | **Operations (Year 35)** | | |
| | | **Minimum** | **Annual Average** | **Maximum** | |
| Sulphate (mg/L) | 309 | 87 | 125 | 179 | |
| Aluminum (Dissolved) (mg/L) | 0.05 | 0.04 | 0.06 | 0.08 | |
| Cadmium (mg/L) | 0.0002 | 0.000005 | 0.0004 | 0.001 | |
| Chromium (mg/L) | 0.001 | 0.0003 | 0.002 | 0.009 | |
| Copper (mg/L) | 0.005 | 0.0003 | 0.03 | 0.1 | |
| Lead (mg/L) | 0.008 | 0.00003 | 0.002 | 0.006 | |
| Selenium (mg/L) | 0.002 | 0.0019 | 0.0029 | 0.0040 | |
| Zinc (mg/L) | 0.04 | 0.002 | 0.03 | 0.09 | |
| | **BCWQG** | | **Closure (Year 55)** | | |
| | | **Minimum** | **Annual Average** | **Maximum** | |
| Sulphate (mg/L) | 309 | 71 | 123 | 178 | |
| Aluminum (Dissolved) (mg/L) | 0.05 | 0.04 | 0.05 | 0.08 | |
| Cadmium (mg/L) | 0.0002 | 0.000005 | 0.0004 | 0.001 | |
| Chromium (mg/L) | 0.001 | 0.0004 | 0.002 | 0.009 | |
| Copper (mg/L) | 0.005 | 0.0003 | 0.03 | 0.1 | |
| Lead (mg/L) | 0.008 | 0.00003 | 0.002 | 0.006 | |
| Selenium (mg/L) | 0.002 | 0.0020 | 0.0029 | 0.0048 | |
| Zinc (mg/L) | 0.04 | 0.002 | 0.03 | 0.1 | |

| | Operations (Year 4) | | |
|---|---|---|---|
| | Minimum | Annual Average | Maximum |
| | 40 | 94 | 136 |
| | 0.03 | 0.06 | 0.08 |
| | 0.000005 | 0.0004 | 0.001 |
| | 0.0004 | 0.002 | 0.008 |
| | 0.0003 | 0.03 | 0.1 |
| | 0.00003 | 0.002 | 0.006 |
| | 0.0020 | 0.0031 | 0.0040 |
| | 0.002 | 0.03 | 0.1 |
| | Operations (Year 50) | | |
| | Minimum | Annual Average | Maximum |
| | 81 | 118 | 161 |
| | 0.04 | 0.06 | 0.08 |
| | 0.000005 | 0.0004 | 0.001 |
| | 0.0003 | 0.002 | 0.009 |
| | 0.0003 | 0.03 | 0.1 |
| | 0.00003 | 0.002 | 0.006 |
| | 0.0019 | 0.0028 | 0.0043 |
| | 0.002 | 0.03 | 0.09 |
| | Post-Closure (Year 99) | | |
| | Minimum | Annual Average | Maximum |
| | 71 | 119 | 155 |
| | 0.04 | 0.05 | 0.08 |
| | 0.000005 | 0.0004 | 0.001 |
| | 0.0004 | 0.002 | 0.009 |
| | 0.0003 | 0.03 | 0.1 |
| | 0.00003 | 0.002 | 0.006 |
| | 0.0021 | 0.0027 | 0.0035 |
| | 0.002 | 0.03 | 0.1 |

**Predicted Average Water Quality of Key Parameters in the Upper Unuk (UR1)**

| | BCWQG | Current (Baseline) | | | |
|---|---|---|---|---|---|
| | | Minimum | Annual Average | Maximum | |
| Sulphate (mg/L) | 309 | 21 | 49 | 75 | |
| Aluminum (Dissolved) (mg/L) | 0.05 | 0.03 | 0.05 | 0.1 | |
| Cadmium (mg/L) | 0.0002 | 0.0004 | 0.0007 | 0.001 | |
| Chromium (mg/L) | 0.001 | 0.0001 | 0.003 | 0.02 | |
| Copper (mg/L) | 0.004 | 0.02 | 0.06 | 0.1 | |
| Lead (mg/L) | 0.006 | 0.0003 | 0.002 | 0.009 | |
| Selenium (mg/L) | 0.002 | 0.0006 | 0.0011 | 0.0014 | |
| Zinc (mg/L) | 0.01 | 0.03 | 0.05 | 0.08 | |
| | **BCWQG** | **Operations (Year 35)** | | | |
| | | **Minimum** | **Annual Average** | **Maximum** | |
| Sulphate (mg/L) | 309 | 46 | 64 | 84 | |
| Aluminum (Dissolved) (mg/L) | 0.05 | 0.03 | 0.06 | 0.1 | |
| Cadmium (mg/L) | 0.0002 | 0.000005 | 0.0002 | 0.0007 | |
| Chromium (mg/L) | 0.001 | 0.0002 | 0.003 | 0.02 | |
| Copper (mg/L) | 0.004 | 0.0003 | 0.02 | 0.08 | |
| Lead (mg/L) | 0.006 | 0.00003 | 0.002 | 0.008 | |
| Selenium (mg/L) | 0.002 | 0.0011 | 0.0015 | 0.0021 | |
| Zinc (mg/L) | 0.01 | 0.002 | 0.02 | 0.06 | |
| | **BCWQG** | **Closure (Year 55)** | | | |
| | | **Minimum** | **Annual Average** | **Maximum** | |
| Sulphate (mg/L) | 309 | 39 | 62 | 85 | |
| Aluminum (Dissolved) (mg/L) | 0.05 | 0.03 | 0.06 | 0.1 | |
| Cadmium (mg/L) | 0.0002 | 0.000005 | 0.0002 | 0.0007 | |
| Chromium (mg/L) | 0.001 | 0.0002 | 0.003 | 0.02 | |
| Copper (mg/L) | 0.004 | 0.0003 | 0.02 | 0.08 | |
| Lead (mg/L) | 0.006 | 0.00003 | 0.002 | 0.008 | |
| Selenium (mg/L) | 0.002 | 0.0011 | 0.0016 | 0.0021 | |
| Zinc (mg/L) | 0.01 | 0.002 | 0.02 | 0.06 | |

| | Operations (Year 4) | | |
|---|---|---|---|
| | Minimum | Annual Average | Maximum |
| | 28 | 51 | 78 |
| | 0.03 | 0.06 | 0.1 |
| | 0.000005 | 0.0002 | 0.0007 |
| | 0.0003 | 0.003 | 0.02 |
| | 0.0003 | 0.02 | 0.08 |
| | 0.00003 | 0.002 | 0.008 |
| | 0.0012 | 0.0017 | 0.0021 |
| | 0.002 | 0.02 | 0.06 |
| | **Operations (Year 50)** | | |
| | **Minimum** | **Annual Average** | **Maximum** |
| | 44 | 61 | 83 |
| | 0.03 | 0.06 | 0.1 |
| | 0.000005 | 0.0002 | 0.0007 |
| | 0.0002 | 0.003 | 0.02 |
| | 0.0003 | 0.02 | 0.08 |
| | 0.00003 | 0.002 | 0.008 |
| | 0.0011 | 0.0015 | 0.0020 |
| | 0.002 | 0.02 | 0.06 |
| | **Post-Closure (Year 99)** | | |
| | **Minimum** | **Annual Average** | **Maximum** |
| | 39 | 61 | 79 |
| | 0.03 | 0.06 | 0.1 |
| | 0.000005 | 0.0002 | 0.0007 |
| | 0.0002 | 0.003 | 0.02 |
| | 0.0003 | 0.02 | 0.08 |
| | 0.00003 | 0.002 | 0.008 |
| | 0.0011 | 0.0015 | 0.0018 |
| | 0.002 | 0.02 | 0.06 |

**Predicted Average Water Quality of Key Parameters in the Unuk River and the Canada USA border (UR2)**

| | BCWQG | Current (Baseline) | | | |
|---|---|---|---|---|---|
| | | Minimum | Annual Average | Maximum | |
| Sulphate (mg/L) | 218 | 14 | 30 | 46 | |
| Aluminum (Dissolved) (mg/L) | 0.05 | 0.02 | 0.06 | 0.2 | |
| Cadmium (mg/L) | 0.00009 | 0.0002 | 0.0002 | 0.0004 | |
| Chromium (mg/L) | 0.001 | 0.0002 | 0.002 | 0.01 | |
| Copper (mg/L) | 0.002 | 0.01 | 0.02 | 0.05 | |
| Lead (mg/L) | 0.005 | 0.0002 | 0.002 | 0.006 | |
| Selenium (mg/L) | 0.002 | 0.0004 | 0.0007 | 0.0008 | |
| Zinc (mg/L) | 0.008 | 0.01 | 0.02 | 0.04 | |
| | BCWQG | Operations (Year 35) | | | |
| | | Minimum | Annual Average | Maximum | |
| Sulphate (mg/L) | 218 | 30 | 37 | 47 | |
| Aluminum (Dissolved) (mg/L) | 0.05 | 0.02 | 0.06 | 0.2 | |
| Cadmium (mg/L) | 0.00009 | 0.000005 | 0.00006 | 0.0002 | |
| Chromium (mg/L) | 0.001 | 0.0002 | 0.002 | 0.01 | |
| Copper (mg/L) | 0.002 | 0.0003 | 0.008 | 0.03 | |
| Lead (mg/L) | 0.005 | 0.00003 | 0.001 | 0.005 | |
| Selenium (mg/L) | 0.002 | 0.0006 | 0.0009 | 0.0011 | |
| Zinc (mg/L) | 0.008 | 0.002 | 0.009 | 0.03 | |
| | BCWQG | Closure (Year 55) | | | |
| | | Minimum | Annual Average | Maximum | |
| Sulphate (mg/L) | 218 | 20 | 36 | 50 | |
| Aluminum (Dissolved) (mg/L) | 0.05 | 0.02 | 0.06 | 0.2 | |
| Cadmium (mg/L) | 0.00009 | 0.000005 | 0.00006 | 0.0002 | |
| Chromium (mg/L) | 0.001 | 0.0002 | 0.002 | 0.01 | |
| Copper (mg/L) | 0.002 | 0.0003 | 0.008 | 0.03 | |
| Lead (mg/L) | 0.005 | 0.00003 | 0.001 | 0.005 | |
| Selenium (mg/L) | 0.002 | 0.0006 | 0.0009 | 0.0012 | |
| Zinc (mg/L) | 0.008 | 0.002 | 0.009 | 0.03 | |

| | Operations (Year 4) | | |
|---|---|---|---|
| | Minimum | Annual Average | Maximum |
| | 17 | 31 | 48 |
| | 0.02 | 0.06 | 0.2 |
| | 0.000005 | 0.00006 | 0.0002 |
| | 0.0002 | 0.002 | 0.01 |
| | 0.0003 | 0.008 | 0.03 |
| | 0.00003 | 0.001 | 0.005 |
| | 0.0007 | 0.0009 | 0.0012 |
| | 0.002 | 0.009 | 0.03 |
| | Operations (Year 50) | | |
| | Minimum | Annual Average | Maximum |
| | 27 | 35 | 46 |
| | 0.02 | 0.06 | 0.2 |
| | 0.000005 | 0.00006 | 0.0002 |
| | 0.0002 | 0.002 | 0.01 |
| | 0.0003 | 0.008 | 0.03 |
| | 0.00003 | 0.001 | 0.005 |
| | 0.0006 | 0.0009 | 0.0011 |
| | 0.002 | 0.009 | 0.03 |
| | Post-Closure (Year 99) | | |
| | Minimum | Annual Average | Maximum |
| | 25 | 35 | 48 |
| | 0.02 | 0.06 | 0.2 |
| | 0.000005 | 0.00006 | 0.0002 |
| | 0.0002 | 0.002 | 0.01 |
| | 0.0003 | 0.008 | 0.03 |
| | 0.00003 | 0.001 | 0.005 |
| | 0.0007 | 0.0008 | 0.0010 |
| | 0.002 | 0.009 | 0.03 |

**Predicted Average Water Quality of Key Parameters in Teigen Creek (TEC2)**

| | BCWQG | Current (Baseline) | | | |
|---|---|---|---|---|---|
| | | Minimum | Annual Average | Maximum | |
| Sulphate (mg/L) | 218 | 13 | 27 | 34 | |
| Aluminum (Dissolved) (mg/L) | 0.05 | 0.004 | 0.02 | 0.04 | |
| Cadmium (mg/L) | 0.00002 | 0.000006 | 0.00001 | 0.00002 | |
| Chromium (mg/L) | 0.001 | 0.0002 | 0.001 | 0.004 | |
| Copper (mg/L) | 0.002 | 0.0004 | 0.001 | 0.002 | |
| Lead (mg/L) | 0.005 | 0.00003 | 0.0001 | 0.0003 | |
| Selenium (mg/L) | 0.002 | 0.0002 | 0.0004 | 0.0005 | |
| Zinc (mg/L) | 0.008 | 0.0007 | 0.002 | 0.005 | |
| | **BCWQG** | **Operations (Year 35)** | | | |
| | | **Minimum** | **Annual Average** | **Maximum** | |
| Sulphate (mg/L) | 218 | 11 | 22 | 27 | |
| Aluminum (Dissolved) (mg/L) | 0.05 | 0.003 | 0.02 | 0.04 | |
| Cadmium (mg/L) | 0.00002 | 0.000005 | 0.000009 | 0.00002 | |
| Chromium (mg/L) | 0.001 | 0.0002 | 0.0009 | 0.004 | |
| Copper (mg/L) | 0.002 | 0.0004 | 0.0009 | 0.002 | |
| Lead (mg/L) | 0.005 | 0.00003 | 0.00008 | 0.0003 | |
| Selenium (mg/L) | 0.002 | 0.0002 | 0.0004 | 0.0005 | |
| Zinc (mg/L) | 0.008 | 0.002 | 0.002 | 0.004 | |
| | **BCWQG** | **Closure (Year 55)** | | | |
| | | **Minimum** | **Annual Average** | **Maximum** | |
| Sulphate (mg/L) | 218 | 12 | 22 | 27 | |
| Aluminum (Dissolved) (mg/L) | 0.05 | 0.004 | 0.02 | 0.04 | |
| Cadmium (mg/L) | 0.00002 | 0.000005 | 0.000009 | 0.00002 | |
| Chromium (mg/L) | 0.001 | 0.0002 | 0.0009 | 0.004 | |
| Copper (mg/L) | 0.002 | 0.0004 | 0.0009 | 0.002 | |
| Lead (mg/L) | 0.005 | 0.00003 | 0.00008 | 0.0003 | |
| Selenium (mg/L) | 0.002 | 0.0002 | 0.0004 | 0.0005 | |
| Zinc (mg/L) | 0.008 | 0.002 | 0.002 | 0.004 | |

| | Operations (Year 4) | | |
|---|---|---|---|
| | Minimum | Annual Average | Maximum |
| | 11 | 22 | 27 |
| | 0.003 | 0.02 | 0.04 |
| | 0.000005 | 0.000009 | 0.00002 |
| | 0.0002 | 0.0009 | 0.004 |
| | 0.0004 | 0.0009 | 0.002 |
| | 0.00003 | 0.00008 | 0.0003 |
| | 0.0002 | 0.0004 | 0.0005 |
| | 0.002 | 0.002 | 0.004 |
| | Operations (Year 50) | | |
| | Minimum | Annual Average | Maximum |
| | 12 | 22 | 27 |
| | 0.004 | 0.02 | 0.04 |
| | 0.000005 | 0.000009 | 0.00002 |
| | 0.0002 | 0.0009 | 0.004 |
| | 0.0004 | 0.0009 | 0.002 |
| | 0.00003 | 0.00008 | 0.0003 |
| | 0.0002 | 0.0004 | 0.0005 |
| | 0.002 | 0.002 | 0.004 |
| | Post-Closure (Year 99) | | |
| | Minimum | Annual Average | Maximum |
| | 13 | 24 | 30 |
| | 0.005 | 0.02 | 0.04 |
| | 0.000005 | 0.000009 | 0.00002 |
| | 0.0002 | 0.0009 | 0.004 |
| | 0.0004 | 0.0009 | 0.002 |
| | 0.00003 | 0.00009 | 0.0003 |
| | 0.0002 | 0.0004 | 0.0005 |
| | 0.002 | 0.002 | 0.004 |

**Predicted Average Water Quality of Key Parameters in Treaty Creek (TRC2)**

| | BCWQG | Current (Baseline) | | | |
|---|---|---|---|---|---|
| | | Minimum | Annual Average | Maximum | |
| Sulphate (mg/L) | 309 | 23 | 57 | 99 | |
| Aluminum (Dissolved) (mg/L) | 0.05 | 0.001 | 0.03 | 0.1 | |
| Cadmium (mg/L) | 0.00003 | 0.00003 | 0.0002 | 0.0008 | |
| Chromium (mg/L) | 0.001 | 0.0003 | 0.005 | 0.02 | |
| Copper (mg/L) | 0.003 | 0.001 | 0.009 | 0.02 | |
| Lead (mg/L) | 0.006 | 0.0001 | 0.003 | 0.01 | |
| Selenium (mg/L) | 0.002 | 0.0007 | 0.0009 | 0.0017 | |
| Zinc (mg/L) | 0.008 | 0.002 | 0.03 | 0.09 | |
| | **BCWQG** | **Operations (Year 35)** | | | |
| | | **Minimum** | **Annual Average** | **Maximum** | |
| Sulphate (mg/L) | 309 | 23 | 58 | 98 | |
| Aluminum (Dissolved) (mg/L) | 0.05 | 0.002 | 0.04 | 0.1 | |
| Cadmium (mg/L) | 0.00003 | 0.00003 | 0.0002 | 0.0008 | |
| Chromium (mg/L) | 0.001 | 0.0002 | 0.005 | 0.02 | |
| Copper (mg/L) | 0.003 | 0.001 | 0.009 | 0.02 | |
| Lead (mg/L) | 0.006 | 0.0001 | 0.003 | 0.01 | |
| Selenium (mg/L) | 0.002 | 0.0007 | 0.0010 | 0.0017 | |
| Zinc (mg/L) | 0.008 | 0.002 | 0.03 | 0.09 | |
| | **BCWQG** | **Closure (Year 55)** | | | |
| | | **Minimum** | **Annual Average** | **Maximum** | |
| Sulphate (mg/L) | 309 | 25 | 59 | 101 | |
| Aluminum (Dissolved) (mg/L) | 0.05 | 0.002 | 0.03 | 0.1 | |
| Cadmium (mg/L) | 0.00003 | 0.00003 | 0.0002 | 0.0008 | |
| Chromium (mg/L) | 0.001 | 0.0002 | 0.005 | 0.02 | |
| Copper (mg/L) | 0.003 | 0.001 | 0.009 | 0.02 | |
| Lead (mg/L) | 0.006 | 0.0001 | 0.003 | 0.01 | |
| Selenium (mg/L) | 0.002 | 0.0007 | 0.0010 | 0.0017 | |
| Zinc (mg/L) | 0.008 | 0.002 | 0.03 | 0.09 | |

| | Operations (Year 4) | | |
|---|---|---|---|
| | Minimum | Annual Average | Maximum |
| | 26 | 61 | 98 |
| | 0.002 | 0.04 | 0.1 |
| | 0.00003 | 0.0002 | 0.0008 |
| | 0.0002 | 0.005 | 0.02 |
| | 0.001 | 0.009 | 0.02 |
| | 0.0001 | 0.003 | 0.01 |
| | 0.0007 | 0.0011 | 0.0017 |
| | 0.002 | 0.03 | 0.09 |
| | **Operations (Year 50)** | | |
| | **Minimum** | **Annual Average** | **Maximum** |
| | 23 | 58 | 100 |
| | 0.002 | 0.03 | 0.1 |
| | 0.00003 | 0.0002 | 0.0008 |
| | 0.0002 | 0.005 | 0.02 |
| | 0.001 | 0.009 | 0.02 |
| | 0.0001 | 0.003 | 0.01 |
| | 0.0007 | 0.0010 | 0.0017 |
| | 0.002 | 0.03 | 0.09 |
| | **Post-Closure (Year 99)** | | |
| | **Minimum** | **Annual Average** | **Maximum** |
| | 23 | 57 | 99 |
| | 0.002 | 0.03 | 0.1 |
| | 0.00003 | 0.0002 | 0.0008 |
| | 0.0002 | 0.005 | 0.02 |
| | 0.001 | 0.009 | 0.02 |
| | 0.0001 | 0.003 | 0.01 |
| | 0.0007 | 0.0009 | 0.0017 |
| | 0.002 | 0.03 | 0.09 |

# Appendix C

**Key Mitigations for Valued Components Discussed in this Report**

| Mitigation | Project Phase/Timing |
|---|---|
| **Key**<br>**PD** = Preconstruction/Design<br>**C** = Construction<br>**O** = Operation<br>**DR** = Decommissioning/Reclamation | |
| **Groundwater Quantity** | |
| • Cease dewatering of mine pits upon ore extraction completion | D |
| • Decommission tunnels by capping of all portals | D |
| • Implement water reduction strategies in sections of tunnels with high-permeability, reducing overall effect on the adjacent groundwater environment | C/O |
| • Backfill of Sulphurets RSF with Kerr Pit waste rock | O/DR |
| **Groundwater Quality** | |
| • Install grout curtains to reduce seepage of contact water along sensitive flow paths at WSF and TMF | C/O/DR |
| • Implement a groundwater Monitoring and Mitigation Plan | D/R |
| • Backfill of Sulphurets RSF with Kerr waste rock, and control all contact water | O/DR |
| • Route accumulated water from the basal drain at the Kerr Pit to a buried pipeline via gravity drainage | O/DR |
| • Divert water entering Sulphurets Pit with geomembrane liners to a collection pipeline located at the toe of the backfill RSF | O/DR |
| • Implement ML/ARD Management Plan for excavated workings for reducing the potential of contact water to enter the groundwater environment from road alignments, tunnels and surface diversions to negligible levels | C/O/DR |
| • Implement WSF design for measures to reduce seepage below and through the dam and into the down-gradient groundwater environment, through use of impervious asphalt core and grout curtain | C/O/DR |
| • Construct a system of seepage interception tunnels to control groundwater at the WSF | C/O/DR |
| • Install a geomembrane liner for the base and walls of the CIL Centre Cell prior to CIL tailing disposal in the TMF | C/O |
| • Design placement of CIL Centre Cell at the centre of the TMF, where a strong natural upward vertical hydraulic gradient provides additional hydraulic containment thus further restricting potential seepage loses | C/O |
| **Surface Water Quantity** | |
| • Decommission diversion structures on the northeast side of the TMF during closure and post-closure, allowing natural drainage into the reclaimed TMF | DR |
| • Install diversion ditches and tunnels (e.g., the MDT and the MTDT) at the Mine Site to maximize the diversion of non-contact water away from disturbed areas | C |
| • Re-route non-contact water diversion ditches around the TMF to supplement altered flows in the Teigen Creek watershed | C |
| • Develop a discharge schedule to mimic the natural hydrograph of Treaty Creek, in order to avoid discharging during low-flow periods. | O |
| • Design diversion ditches to minimize water loss | PD |
| • Alter diversion ditch flow patterns to coincide with the various phases of TMF development | OM |
| • Install seepage cut-off walls below the North, Splitter, and Southeast tailing dams | C |

*Key Mitigations for Valued Components Discussed in this Report continued*

| | |
|---|---|
| • Design and construct seepage collection dams downstream of the TMF along the North Treaty and South Teigen valleys to capture shallow seepage water emanating from the TMF and to pump it back up to the cells | PD |
| • Development and implementation the Water Management Plan | PD/C/O/DR |
| **Surface Water Quality** | |
| • Implement timely re-vegetation of soil stockpiles, ditches, road cuts and embankments or seeding of exposed soils using an erosion control seed mix, or hydro-seeding with a mix of seed, mulch and a tackifier on sloped areas | C/O/DR |
| • Ensure that, during all phases of the project, water quality meets water quality guidelines or site specific objectives set by the appropriate regulatory authorities | C/O/DR |
| • Design the Project to enable the addition of infrastructure and facilities that could collect seepage and treat discharges from the TMF to ensure that water quality objectives are met during all phases of the project | PD |
| • Pumpback seepage collection dam water into TMF | C |
| • Discharge TMF water into Treaty, not North Treaty tributary | C/O |
| • Design MTT tunnels are to ensure drainage can be treated at the WTP | O |
| • Use underground mining to reduce ML/ARD in Mitchell and Iron Cap Pits | |
| • Placement Kerr waste rock in Sulphurets Pit | C/O/DR |
| • Stage discharge from the WSF to mimic the natural hydrograph | O/DR |
| • Capture sediment in the WSF before it can be released to the receiving environment | O/DR |
| • Install a geomembrane liner within the center cell of the TMF to reduce contact water seepage and contain deleterious substances | C |
| • Supplement flows that would be altered by TMF development with non-contact water | C/O/DR |
| • Develop temporary water treatment plants at the PTMA during construction | C |
| • Treat tailing supernatant from ore processing | O |
| • Store effluent during winter low flows; staging discharge to mimic the natural hydrograph; and capturing sediment before it can be released to the receiving environment | O/DR |
| • Implement slope stabilization techniques such as terracing or use of bioengineering structures (e.g., wattle fences or modified brush layers) for highly erodible soils and on long or steep slopes | C/ O/M D/R |
| • Develop and implement the following Plans: Aquatic Effects Monitoring Program, Mitchell Glacier Monitoring Program, Selenium Management Plan and Salmon Monitoring Plan | PD/C/O/DR |
| • Design TMF so that discharge reports to Treaty Creek | PD |
| • Implement appropriate off-site disposal of contaminated soils, or on-site treatment by bioremediation | C/O/D/R |
| • Develop and implement the Dangerous Goods and Hazardous Materials Management Plan, the Spill Prevention and Emergency Response Plan and the Domestic and Industrial Waste Management Plan to reduce the frequency of accidental spills of hazardous materials, and provide a framework for response involving immediately remedial clean-up actions | C/O/D/R |
| • Establish spill response procedures and ensure ready availability of spill response equipment | PD |
| • Install silt fencing, geotextile cloth, hay bales, berms or other sediment control structures to protect water quality | C/O/M |
| • Employ an on-site Environmental Monitor during in-stream activities to monitor water quality | C/O/DR |
| • Collect and divert contact water generated at the Mine Site to the WSF, for treatment in the WTP | C/O/DR |
| • Install a selenium water treatment plant on the mine side to minimize selenium loadings to the receiving environment | C/O/M |

*Key Mitigations for Valued Components Discussed in this Report continued*

| | |
|---|---|
| • Direct drainage from the backfilled Sulphurets Pit to a Selenium Treatment Plant for treatment, prior to pumping to the Mine Site WTP for further treatment | O/DR |
| • Implement appropriate measures provided for in the ML/ARD Management Plan, Erosion Control Plan, and Water Management Plan | C/O/DR |
| • Implement Water Management Plan to control water movement in the PTMA, including diverting non-contact water away from the TMF, and routing contact water into the TMF | C/O/DR |
| • Monitor in accordance with the comprehensive Aquatic Effects Monitoring Plan to detect alterations to the receiving environment including changes to sediment quality or effects on aquatic life and fish, and implementing adaptive management strategies | C/O/DR |
| • Collect any seepage water from TMF cells in seepage collection ponds located downstream of the dams, with the seepage pumped back into the TMF | C/O/DR |
| • Install HDS lime WTP at the Mine Site to treat contact water stored in the WSF to reduce concentrations of metals, TSS and various ions, as well as adjusting the pH from acidic to a more neutral pH | C/O/DR |
| • Collect seepage and runoff water from the WSD at a downstream seepage recovery dam for pumping back to the WSF | C/O/DR |
| • Separate the tailing discharge from the Processing Plant to the TMF into two streams , with water containing tailing and cyanide from ore processing (cleaner or sulphide tailing) being stored subaqueously in the TMF's Centre Cell, and the rougher tailing being stored in either the North Cell or South Cell | O/DR |
| • Protect erodible channel banks using rock materials, willow bundles or gabions | C/O/D/R |
| • Flood Mitchell Pit and Block Cave at closure to minimize the surface area of excavated walls exposed to oxidation and possible ML | D/R |
| • Store excavated or disturbed PAG rock at the Mine Site in the RSFs | C/O/DR |
| • Construct TMF dams with compacted till cores and NPAG flotation tailing, with no use made of PAG material in constructing TMF dams or diversion ditches | O |
| • Manage effluent discharges from the Mine Site WTP and North and South cells to mimic receiving environment hydrology, thereby maximizing compatibility with the receiving environment's dilution capacity | C/O/DR |
| • Backfill the Sulphurets Pit with Kerr Pit waste rock, and use infiltration rate reducing liners to reduce selenium concentrations in contact water at the Mine Site | O |
| • Direct discharge from the TMF South Cell to Treaty Creek during operation, then to North Treaty during closure once water quality meets acceptable federal and provincial discharge requirements | O/DR |
| • Direct discharge from the TMF South Cell to Treaty Creek during operation, then to North Treaty during closure once water quality is acceptable | O/DR |
| • Cap TMF Centre Cell containing the cleaner (sulphide) tailing with a flotation (rougher) tailing layer, and permanently flood materials after closure | DR |
| • Implement dust mitigation strategies when required during operations and closure | O/DR |
| • Adopt required setbacks from water bodies in cases of ground disposal of sewage effluent | C/O/DR |
| **Fish and Fish Habitat** | |
| • Develop and implement a fish habitat compensation plan to the satisfaction of Fisheries and Oceans Canada. | |
| • Use of best management practices (BMPs) by adhering to relevant DFO and BC MOE standards, guidelines and operational statements | C/O/DR |
| • Implement relevant provisions of the Fish and Aquatic Habitat Effects Protection and Mitigation Plan with respect to TMF construction work in fish habitat and riparian areas | C/O |
| • Implement an erosion monitoring system from the outset of construction to verify that mitigation measures have been properly implemented and are effective, with follow-up adaptive management measures implemented, where necessary | PD/C |

*Key Mitigations for Valued Components Discussed in this Report continued*

| | |
|---|---|
| • Implement slope stabilization techniques such as terracing or use of bioengineering structures (e.g., wattle fences or modified brush layers) for highly erodible soils and on long or steep slopes | C/O/DR |
| • Implement timely re-vegetation of soil stockpiles, ditches, road cuts and embankments or seeding exposed soils using an erosion control seed mix, or hydro-seeding with a mix of seed, mulch and a tackifier on sloped areas | C/O/DR |
| • Adherence to the Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters (Wright and Hopky 1998) and provisions of the Fish and Aquatic Habitat Protection and Mitigation Plan during the undertaking of construction activities | C/O/DR |
| • Monitor, in accordance with the comprehensive Aquatic Effects Monitoring Plan, to detect alterations to the receiving environment including changes to sediment quality or effects on aquatic life and fish, and implementing adaptive management strategies, where warranted | C/O/DR |
| • Comply with DFO's operational statements for clear-span bridges for fish-bearing stream crossings | C |
| • Adherence to appropriate fisheries operating windows for TMF construction in fish-bearing streams, and acquiring appropriate permits for any out-of-window activities | C/O |
| • Undertake construction in fish-bearing streams during appropriate fisheries operating windows (in-water works outside fisheries operating windows will only be conducted under permit) | C |
| • Isolate Project work sites to prevent fish movement into the work site, and salvaging and removing fish from the enclosed work site | C/O |
| • Implement relevant provisions of the proponent's Access Road Maintenance Plan during road maintenance activities | O |
| • Develop and implement site-specific riparian management prescriptions and riparian vegetation maintenance plan/prescriptions to guide transmission line construction and maintenance activities | PD/C |
| • Plant riparian vegetation around diversion tunnels, channels, and ditches on both the northeast and southwest sides of the TMF, to protect against temperature increases in these water conduits, and offer some new aquatic habitat for colonization during construction and operation | C/O |
| • Convert the TMF from a wetland and stream habitat to a lake-type habitat during closure and post-closure | D |
| • Decommission diversion structures on the northeast side of the TMF during closure and post-closure, allowing natural drainage into the reclaimed TMF | D |
| • Use water diversion structures to divert dirty water from TMF construction zones to a sediment control area | C/O |
| • Allow constructed ponds to settle before connecting to the stream | C |
| • Stabilize dam materials denuded of vegetation, using temporary erosion control blankets, biodegradable mats, planted vegetation or other erosion control techniques | C/O |
| • Prohibit employees and contractors from engaging in fishing while present at the Mine Site or while travelling to and from the mine on company business | C/O/D |
| • Transport personnel from communities at the start and end of each shift during construction and operation, further limiting the opportunities for employees or contractors to engage in fishing while on the site | C/O/D |
| • Restrict access to sites by designing gates and implementing other security measures to control access by, and the mobility of, snow machines and all-terrain vehicles, and gating the access roads to prohibit the entry by non-authorized vehicles | C/O/D |
| • Conduct construction activities (i.e., equipment access, construction of transmission structures, and conductor stringing) in a manner that minimizes riparian vegetation effects and maintains fish habitat and stream bank integrity | C |
| • Select structure placements and designs that minimize loss or disturbance to riparian vegetation (e.g., higher structures that allow for wider span lengths) | P/C |

*Key Mitigations for Valued Components Discussed in this Report continued*

| | |
|---|---|
| • Avoid locating structures or access roads along meander bends, braided streams, alluvial fans, active floodplains, unstable slopes or any other area that is inherently unstable and may result in erosion and scouring of the stream bed | P/C |
| • Design and construct road approaches that are perpendicular to watercourses to minimize loss or disturbance to riparian vegetation | P |
| • Avoid parallel road and transmission line alignments located directly adjacent to watercourses | P |
| • Operate machinery for constructing the transmission line above the high water mark and in a manner that minimizes disturbance to the banks of water bodies | C |
| • Cross streams only when an existing crossing at another location is not available or practical to use | C |
| • Select access road and transmission line alignments that minimize the number of watercourse crossings required | P |
| • Remove selected timber along the transmission line right-of-way in a manner that avoids removing understory vegetation | C |
| • Retain riparian shrubs and grass species at watercourse crossings along the transmission line right-of-way, while ensuring that adequate electrical clearances are preserved | C |
| • Preserve root structure and stability of topped trees located on the bank of a water body, ensuring that the root structure and stability are maintained, to help bind the soil and encourage rapid colonization of low-growing plant species | C |
| • Re-vegetate exposed or disturbed soils following transmission line construction and modify riparian cover by hand | C |
| • Locate laydown areas outside of riparian zones | C |
| • Remove vegetation within access road corridors in advance to facilitate other construction | C |
| • Implement BMPs for preventing and controlling petroleum spills, as provided for in the proponent's Spill Prevention and Emergency Response Plan and Fish and Aquatic Habitat Effects Protection and Mitigation Plan | C/O/D |
| • Monitor the effectiveness of mitigation measures, and where necessary, implementing adaptive management measures to maintain compliance with regulatory requirements and BMPs | C/O/D |
| • Conduct blasting at least 10 m away from fish-bearing streams to avoid damage to possible spawning habitat and effects on fish behaviour blast noise is kept below the recommended level of 100 dB | C/O |
| • Construct channel bank protection works, or install erosion control blankets or bonded fibre matrices onto the soil surface along water diversion channels and in other vulnerable areas | C/O/D |
| • Protect erodible channel banks using rock materials, willow bundles or gabions | C/O/D |
| **Wetlands** | |
| • Avoid wetlands where possible to reduce loss and degradation | P/D |
| • Develop and implement a wetland compensation plan with a monitoring and adaptive management plan, in the spirit of the federal policy on wetland conservation | P/D |
| • Establish reserve and management area buffers around all wetlands in accordance with provincial riparian management guidelines | P/D, C, O/M |
| • Install effective sediment control and protection structures prior to initiating construction or operation activities (i.e., silt fences, sumps, and proper ditching/culverts, etc.) | C, O/M |
| • Regular inspection of control and protection structures (i.e. silt fences) and conducting maintenance or replacement when required | C, O/M |
| • Implement erosion and slope protection measures over disturbed soils and all organic and mineral soil stockpiles (e.g., developing stockpiles away from surface water, skirting with silt fences, re-vegetation etc.) | C, O/M |
| • Minimize vegetation clearing and exposed soils | C, O/M |

*Key Mitigations for Valued Components Discussed in this Report continued*

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|---|---|
| • Conduct site restoration as soon as possible to re-establish ground cover | C, O/M |
| • Operate machinery only from outside the wetland or riparian reserve zone and in a manner that minimizes disturbance of aquatic habitat | C, O/M |
| • Avoid construction and operation activities, especially vegetation clearing, during sensitive periods for soils | C, O/M |
| • Clear only land essential for mine activities during each Project phase | C, O/M |
| **Wildlife** | |
| • Impose speed limits of 60 km/hr on traffic on the CCAR and the TCAR | C/O/DR |
| • Use of existing Provincially maintained Highways 37/37A | C/O/DR |
| • Educate employees about safe driving in wildlife areas during orientation (this should also be added to the invasive plants) | C/O/DR |
| • Install GPS trackers in project traffic accessing the TCAR or CCAR | C/O/DR |
| • Where the CCAR and TCAR bisect potential wildlife movement corridors (identified from habitat mapping or through incidental observations) impose traffic-management measures, such as signage and reduced speed limits | C/O/DR |
| • Ensure Project personnel (including drivers) record locations of wildlife observations and locations of collisions between wildlife and vehicles in an incidental wildlife log | C/O/DR |
| • Educate employees to assess and adapt their driving activities during dawn and dusk, which are periods of high wildlife activity | C/O/DR |
| • Ensure that Project drivers yield to wildlife observed along the access roads and highways and adhere to signage in areas of wildlife crossing | C/O/DR |
| • Bus or shuttle staff to the Project site to reduce traffic volumes | C/O/DR |
| • Avoid important wildlife habitat through careful Project design and layout planning, where practicable alternatives are available (e.g., by relocating project components or activities) | PD |
| • Schedule vegetation clearing activities outside of sensitive periods for wildlife (e.g., between April 1 and July 31 for breeding birds) | C |
| • Conduct pre-clearing surveys before vegetation is removed if land clearing and similar activities cannot be scheduled outside of wildlife sensitive periods | C/O |
| • Minimize human activity in known high-quality wildlife habitats and movement corridors | C/O |
| • Manage roadside vegetation (e.g., by clearing along the edges and planting vegetation that is unattractive to wildlife) to minimize attractiveness to wildlife and provide good line of sight to avoid wildlife encounters | C/O |
| • Minimize the risk of trapping wildlife along the major access roads and the on-site roads by creating escape pathways in snow banks | C/O |
| • Create and maintain road culverts in ways that facilitate wildlife movement/habitat connectivity | C/O/DR |
| • Incorporate wildlife passages into road and bridge design at river and creek crossings, to allow wildlife to move beneath these structures | PD/C/O |
| • Incorporate appropriate design provisions along Project roads to minimize wildlife/traffic collision risk, thereby facilitating wildlife movement | PD |
| • Design and place transmission line structures in such a way that strikes and electrocutions will be minimized, following published guidelines for bird protection (e.g., APLIC 2006) | PD |
| • Gate and staff the Project's access roads (the CCAR and the TCAR) to prohibit the entry by non-authorized vehicles | PD/C/O/DR |
| • Ensure circumnavigation around gates and security measures along Project access roads is effectively discouraged through location and design measures that minimize access by snow machines, all-terrain vehicles, or persons on foot | PD/C/O/DR |
| • Locate the gated access to the TCAR at the Bell-Irving River bridge crossing, eliminating the ability for hunters to circumnavigate the gate without a boat | PD/C/O/DR |

*Key Mitigations for Valued Components Discussed in this Report continued*

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|---|---|
| • Deactivate all non-essential roads, including the CCAR, when traffic volumes will be greatly reduced | DR |
| • Manage waste to minimize attractants and rewards | PD/C/O/DR |
| • Limit the amount of salt that may be included in traction grit used for winter road management | C/O |
| • Monitor and adaptively manage the use of Project structures by wildlife for security habitat (refuge, shelter), daily activities (roosting, perching) or nesting purposes | C/O/DR |
| • Avoid the creation of attractive roadside pools for western toads | C/O/DR |
| • Prior to construction, a qualified biologist experienced in amphibian salvage, should develop an amphibian salvage program in the event that western toads are detected in the wetlands/ponds that cannot be avoided | PD |
| • Monitor noise at both wildlife and human receptor locations, as part of the Noise Management Plan | C/O |
| • Consider noise specifications when selecting equipment to purchase | P/D |
| • Install and maintain mufflers on vehicles | C/O/DR |
| • Use directed/focused lighting rather than broad area lighting where possible | C/O/DR |
| • Use lighting in non-essential areas only when necessary | C/O/DR |
| • Storage and transportation of chemicals of potential concern associated with mine development will adhere to BMPs and legislated requirements (Dangerous Goods and Hazardous Materials Management Plan, the Explosives Management Plan, the Domestic and Industrial Waste Management Plan and the Spill Prevention and Emergency Response Plan) | C/O/DR |
| • Manage fugitive dust along roads, and ore stockpiles at the PTMA to control dust | C/O |
| • Plan helicopter flight routes to avoid sensitive wildlife areas | C/O/DR |
| • Stagger delays as appropriate, for each blast pattern to minimize the number of charges being ignited simultaneously | C/O |
| • Minimize the effects of attractants to bears, implement mitigation measures including storing and removing all food wastes and wildlife attractants (e.g., liquid solvents, lubricants), erecting bear fences in appropriate areas, removing carrion from roads, educating employees and contractors in wildlife awareness, and monitoring waste management | C/O/DR |
| • Initiate monitoring programs when water quality does not meet guidelines to examine water, benthic and vegetation and evaluate any potential uptake by wetland birds | O/DR |
| • Conduct of adaptive management when migratory birds are observed using project facilities during monitoring to prevent birds from use and access | O/DR |
| **Human Health** | |
| • Use gating systems to control access access to the Mine Site and the PTMA | C/O/DR |
| • Post signs around the TMF indicating the water is not potable, and no public access is permitted while the mine is operating | O |
| • Implement Air Quality Management Plan, both an Emissions Management Plan and a Fugitive Dust Emissions Management Plan to meet BC MOE AAQOs | C/O/DR |
| • Monitor and equipment test vehicle and equipment emissions and ensure emissions are meeting the levels predicted with mitigation | C/O |
| • Implement adaptive management policies when monitoring identifies a risk to human health linked to air emissions | C/O |
| • Monitor both surface water quality and levels of metals and other COPCs in mine-disturbed soils required for the Project through Environmental Effects Monitoring (EEM) with adherence to the MMER (SOR/2002-222) and the Follow-up Program required under the CEAA (1992) | C/O/DR |
| • Develop and implement the Human Health Monitoring Plan that will include further Human Health Risk Assessment to characterize potential risks from the consumption of country foods | PD/C/O/DR |

*Key Mitigations for Valued Components Discussed in this Report continued*

| Current Use of Land and Resources | |
|---|---|
| • Restrict public access to Project roads, and only permit traffic that is required for Project-related business | C/O/DR |
| • Implement speed limits along Project-controlled roads | C/O/DR |
| • Install gates and signs at the entrances of the access roads and transmission line right-of-way to indicate the restricted use of Project-related areas | C/O/DR |
| • Monitor access routes and rights-of-way to restrict their use | C/O |
| • Implement EMPs, monitoring and adaptive management to mitigate adverse effects of increased sensory disturbance. Relevant EMPs include:<br>• the Noise Management Plan<br>• Traffic and Access Management Plan<br>• Visual quality impact mitigation | C/O/DR |
| • Implement EMPs, monitoring programs, adaptive management, and negotiated agreements to mitigate reductions in the availability of resources and manage potential Project effects on wildlife and wildlife habitat. Relevant EMPs include:<br>• Wildlife Management Plan<br>• Fish and Aquatic Habitat Management Plan<br>• Noise Management Plan<br>• Vegetation Clearing Management Plan<br>• Access Management Plan (Chapter 26.25) | C/O/DR |
| • Implement and enforce a “no hunting” and “no fishing” policy for employees and contractors while on-site | C/O/DR |
| • Prohibit possession of personal firearms within the Project area | C/O/DR |
| • Educate employees to assess and adaptively manage their driving activities during dawn and dusk, which are periods of high wildlife activity | C/O/DR |
| • Impose reduced speed limits on traffic along parts of the CCAR and TCAR where they bisect potential movement corridors | C/O/DR |
| • Manage roadside vegetation to minimize attractiveness to wildlife and to provide good lines of sight, in order to minimize wildlife encounters | C/O/DR |
| • Manage snow bank height and creating escape pathways to facilitate wildlife movement | C/O/DR |
| • Create and maintain road culverts to allow passage of wildlife (including Moose) and facilitate habitat connectivity | C/O/DR |
| • Incorporate wildlife passage facilities into road and bridge designs, to allow wildlife to move underneath | PD/C/O |
| • Negotiate compensation for impacts of loss of access to trap lines and other key resources | PD |
| • Decommission the CCAR and certain other Project roads, will limit any potential indirect effects on archaeological sites due to increased human presence in the area during post-closure | DR |
| • Educate mine employees and contractors about site avoidance, and sites within the LSA will be marked as “no work zones” or on Project construction maps | C/O/DR |
| • Minimize any loss of scientific data about archaeology sites resulting from site disturbance or destruction through measures including potential fencing, systematic data recovery, construction monitoring and/or site capping | PD/C/O/DR |
| • Implement compensation plans for activities causing fish habitat, alteration, destruction or degradation (HADD) under the Fisheries Act (1992) and MMER (SOR/2002-222) to ensure adherence DFO’s policy of ‘no net loss of fish habitat’ | C/O |
| • Implement Wetland Habitat Compensation Plan (Chapter 16, Appendix 16-B) to offset losses, from indirect effects on fishery spawning habitat associated with the loss of wetland extent, at a ratio of 1.5 | PD/C |

*Key Mitigations for Valued Components Discussed in this Report continued*

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|---|---|
| • Implement the following EMPs to minimize and manage Project risks to fisheries:<br>• ML/ARD Management Plan (Chapter 26.14)<br>• ML/ARD Management Plan (Chapter 26.14)<br>• Fish and Aquatic Habitat Management Plan (Chapter 26.18)<br>• Aquatic Effects Monitoring Plan (Chapter 26.18.02)<br>• Fish Salvage Plan associated with the construction of the TMF (Chapter 26.18.03)<br>• Water Management Plan (Chapter 26.17)<br>• Erosion Control Plan (Chapter 26.20) | C/O/DR |
| • Comply with BMPs identified in guidelines and operational statements issued by DFO, BC MOE and other parties, including:<br>• Land Development Guidelines for the Protection of Aquatic Habitat (DFO 1993)<br>• Standards and Best Practices for Instream Works (BC MOE 2004)<br>• Guidelines for the Use of Explosives in or Near Canadian Fisheries Waters (Wright and Hopky 1998)<br>• Fish-Stream Crossing Guidebook (BC MOF 2002)<br>• DFO's operational statements for temporary ford stream crossings, clear-span bridges, and overhead line construction | PD/C/O/ DR |
| • Avoid vegetation losses through Project facility location and design choices that do not require disturbance of ecosystems containing culturally sensitive plants | PD |
| • Minimize impacts on culturally important plants by using low-impact clearing practices, implement erosion control and prevention measures, use techniques to reduce wind throw along forest edges | PD/C/O |
| • Install gates and signs at entranceways to the TCAR and CCAR to prohibit the entry by non-authorized vehicles (including snowmobiles and ATVs) | C/O |
| • Require authorized users to immediately report any observed unauthorized users and appropriate personnel notify unauthorized users of trespass | C/O |
| • Deactivate all non-essential roads at closure | DR |
| • Redirect TMF discharge to Treaty Creek, instead of to South Teigen Creek, to avoid impacts on salmonid values | C/O/DR |
| • Redesign of the non-contact diversion ditches on both valley walls to flow north into the Teigen Creek watershed to supplement altered flows as a result of the TMF footprint | PD |
| • Develop discharge schedule to mimic the natural hydrograph of Treaty Creek, in order to avoid creating low-flow periods and to preserve receiving environment water quality standards | O |
| • Change of access to the PTMA from Highway 37 due to First Nations and Nisga'a concerns related to potential effects on wildlife, fish and fish habitat, and wetlands, Seabridge assessed two access options (Assessment of Alternatives for the KSM Project Tailing Management Facility [Appendix 33-B]), finding a net environmental benefit if the access went up the Treaty Creek Valley rather than the Teigen Creek Valley (see Table 23.3-1 for summary of benefits). Access to the PTMA is now proposed along the Treaty Creek Valley | PD |
| • Change of Saddle portal design due to First Nations and Nisga'a concerns about potential wildlife effects. The Saddle portal original cut-and-cover design (1.1 ha surface disturbance) has been changed to be underground with only the portal remaining at surface after construction | PD |
| • Change of direction of TMF discharge to flow into Treaty and North Treaty creeks during TMF operation in order to protect fisheries values in Teigen Creek | PD |

# Appendix D
**Aboriginal Issues Tracking Tables**

| Gitanyow | | | | |
|---|---|---|---|---|
| **Summary of Key Aboriginal Consultation Concerns** | | | | |
| **Theme** | **Subject** | **Comment/Concern** | **Proponent Response** | **Agency Response** |
| Fish (Salmon) | Water Quality | Impacts on asserted fishing rights from seepage from Tailings Management Facility (TMF) to water quality in the Nass watershed, including Treaty and Teigen Creeks. | In Chapter 15 of the environmental impact statement (EIS), Seabridge assessed the potential effects on fish due to water quality changes, metals, or sediment loading in the Processing and Tailings Management Area. The studies and models conducted showed that the effects on water quality downstream of the proposed project are low to negligible, including for Treaty Creek, Teigen Creek, and the Bell-Irving River.<br>The proponent also commissioned a report on potential toxicity due to metal accumulation in salmonids from the TMF. According to the proponent, this report used the best available science and methods to predict potential effects on aquatic receptors including salmonids in Treaty and Teigen Creeks. The report concluded no significant effects on salmonids. | The Agency is satisfied, based on expert opinion, that the methods used to study the impacts of seepage from the TMF are adequate. The Agency's view is that the proponent's mitigation measures will ensure that British Columbia (BC) Water Quality guideline objectives are met in Treaty and Teigen Creeks. (Mitigation measures: use of a geomembrane liner in center cell of TMF, non-contact water diversions, temporary water treatment plants during construction, treating tailings supernatant from ore processing, sorting effluent during winter low flows, staging discharge and capturing sediment.) |
| | Habitat Loss | Impacts on asserted fishing rights from the loss of fish habitat or degradation of habitat quality. | In Chapter 15 of the EIS, Seabridge assessed the impacts of the Project's effects on physical changes or loss of habitat, including habitat upstream of salmon distribution. The proponent indicated that fish habitat destruction will occur in the headwaters of South Teigen and North Treaty Creeks; and have committed to mitigation measures that will offset the loss of fish habitat.<br>The proponent notes the particular importance around salmon species (in the case of Teigen Creek, Chinook salmon) and will alter diversion ditch flow patterns as necessary to ensure downstream flow mimics the baseline hydrograph in Teigen Creek. | Based on expert opinion, the Agency is satisfied with the assessment methodology used, impacts on the mitigation measures put forward. (Mitigation measures include: creation of 36.5 hectares of new fish habitat.)<br>The Agency's view is that the impacts on fish habitat after the proposed mitigation measures will be reduced to a low level. |

*Aboriginal Issues Tracking Tables continued*

| Gitanyow | | | | |
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| **Summary of Key Aboriginal Consultation Concerns** | | | | |
| **Theme** | **Subject** | **Comment/Concern** | **Proponent Response** | **Agency Response** |
| | Accidents and Malfunctions | Impacts on asserted fishing rights from accidents and malfunctions, specifically fuel spills along the transportation corridor of the Project. A particular area of concern for the Gitanyow is Brown Bear Creek where salmon is fished. | Section 5.2.3 of the Highways 37 and 37A Traffic Effects Assessment conducted by Seabridge discusses the risk analysis with respect to fish and aquatic habitat including fuel or lubricant spill, concentrate spills, lime and reagents, and explosives.<br>The proponent has committed to a 'Spill Prevention and Emergency Response Plan' to minimize response time and maximize clean-up efficiency, and GPS monitoring in vehicles to ensure speed limits are adhered to. | The Agency is of the opinion that the proponent has adequately characterized the potential effects of accidents and malfunctions, specifically related to spills along the traffic corridor of the Project. Taking into account the proponent's mitigation measures the Agency views the potential impacts of accidents and malfunctions as low. (Mitigation measures: spill kits along transportation corridor, GPS in vehicles.) |
| Grizzly Bear | Traffic | Impacts on grizzly bears due to the transportation route running parallel for a significant distance to very high value areas for grizzly bears, particularly in the Kitwanga and Cranberry watersheds. | Section 5.3.3.1.2 of Highway 37 and 37A Effects Assessment in Appendix 22-C discusses literature on grizzly bears and their distribution. Information related to the potential for increased grizzly bear mortality and barriers to movement are evaluated in the cumulative effects assessment (sections 18.9.4.3 and 18.9.4.4 in Chapter 18). | The Agency has reviewed the studies by the proponent, and taking into account the proponent's commitments to mitigation measures and BC's creation of the Advisory Group for HWYs 37 and 37A, is satisfied that the Crown's duty to consult for the purposes of the environmental assessment (EA) decision has been appropriately met. (Mitigation measures: maintain precautionary speed limits for its drivers, manage roadside vegetation, manage snow bank heights on access roads, and gate access roads.) |

| Gitanyow | | | | |
|---|---|---|---|---|
| **Summary of Key Aboriginal Consultation Concerns** | | | | |
| **Theme** | **Subject** | **Comment/Concern** | **Proponent Response** | **Agency Response** |
| Moose Harvesting | Traffic | Impacts on asserted moose harvesting rights from increased moose mortality due to the increase in Project-related traffic along Highway 37 and 37A. Gitanyow Hereditary Chiefs are also concerned with impacts on moose due to spills of ore concentrates or fuel along Highway 37 and 37A. | In Chapter 18 of the EIS, the proponent presented its' findings on the Project's impacts on moose mortality, including impacts from Project related traffic along Highway 37 and Highway 37A, including the results of a population variability analysis. A likely traffic scenario was developed, concluding that cumulative effects of the project in combination with other reasonably foreseeable projects and activities will be addressed by BC Ministry of Transportation through its highway advisory working groups. Potentially impacted Aboriginal groups are being consulted through this group. The traffic-related impacts of the Project in combination with 1-3 others would be not significant. The proponent has also committed $1.75M over 52 years to a habitat conservation trust fund.<br><br>The Gitanyow Hereditary Chiefs conducted a separate Traffic Effects Assessment for traffic at Meziadin Junction for Highway 37 North, Highway 37 South and Highway 37A and provided the results to the proponent. The proponent reviewed this data and concluded that the results for the moose population would remain the same as the earlier model and do not alter the outputs. | The Agency has reviewed the studies by the proponent, and taking into account the proponent's commitments to mitigation measures and BC's creation of the Advisory Group for HWYs 37 and 37A, is satisfied that the Crown's duty to consult for the purposes of the EA decision has been appropriately met. (Mitigation measures: maintain precautionary speed limits for its drivers, manage roadside vegetation, manage snow bank heights on access roads, and gate access roads.) |
| | Habitat Loss | Concern for impacts on moose harvesting rights of Project related habitat loss on moose populations. | In the Wildlife Effects Assessment, the amount of habitat loss is compared to the amount of available habitat in the Regional Study Area and the Local Study Area. This approach is consistent with other environmental assessments in British Columbia. The severity of the impact was also assessed by measuring the amount of altered habitat in terms of number of moose home ranges and number of moose given the density found during baseline surveys. | The proponent investigated the impacts of moose habitat loss caused by the Project. The Agency concludes that the proponent's analysis is adequate and is not likely to cause significant adverse impacts, taking into account the proposed mitigations measures. |

*Aboriginal Issues Tracking Tables continued*

| Gitanyow | | | | |
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| **Summary of Key Aboriginal Consultation Concerns** | | | | |
| **Theme** | **Subject** | **Comment/Concern** | **Proponent Response** | **Agency Response** |
| Land-use | Location of TMF | Impacts on use of lands and resources because of the location of the TMF in the Upper Nass Watershed.<br><br>Gitanyow Hereditary Chiefs raised concern about how the Multiple Accounts Analysis was conducted and how TMF alternatives were assessed. | The proponent, using guidance contained within the Guidelines for the Assessment of Alternatives for Mine Waste Disposal (Environment Canada 2011), conducted a Multiple Accounts Analysis evaluating fourteen options for managing waste tailings, and selected four potentially feasible sites for their ability to meet government requirements, technical and engineering limitations, water management objectives, and economic constraints. Various disposal technologies were considered including conventional impoundment, saturated storage, submarine storage, in-pit storage, dry stacking, paste tailings, and co-disposal with waste rock. The proponent presented its analysis and findings to the technical working group.<br><br>In addition to conducting the Multiple Accounts Analysis, the proponent also conducted a the Dam Break Effects Assessment which assessed dam failure scenarios for a potential failure of the North Dam, Southeast Dam and Saddle Dam in the TMF respectively. No potential residual effects on human health are predicted under any scenario. There are potential residual effects for fish (Bull Trout, Dolly Varden, Rainbow Trout/ Steelhead, and Pacific Salmon populations), and aquatic habitat in South Teigen Creek, Teigen Creek, North Treaty Creek, Treaty Creek, and the Bell-Irving River to its confluence with the Nass River. In the unlikely event of a TMF dam break, there is potential to impact the Gitanyow use of the Bell-Irving and Nass Rivers. | The Agency, based on expert opinion, is satisfied with the risk analysis conducted by the proponent, the alternatives assessment, and the location for the placement of the TMF. Based on the design of the TMF, accidents and malfunctions from the TMF are unlikely. Impacts on potential land use downstream of the TMF are minimized by the proponent's mitigation measures for water quality and quantity. (Mitigation Measures: incorporation of additional capacity into the design of water management facilities, series of treatment circuits, additional diversion ditches and pumps, monitoring programs for Processing and tailings Management Area Dams.) |

| Gitanyow | | | | |
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| **Summary of Key Aboriginal Consultation Concerns** | | | | |
| **Theme** | **Subject** | **Comment/Concern** | **Proponent Response** | **Agency Response** |
| | Wetlands | Impacts to use of lands and resources (including harvesting of fish and birds) from the destruction and degradation of wetlands. | Seabridge has committed to compensate potential impacts on wetlands. Wetland compensation plans are outlined in the EIS and are consistent with the federal policy on wetlands.<br>The wetlands that would be lost due to the TMF are valley bottom wetlands which are associated with a creek and riparian habitat. All proposed compensation projects are in similar landscape positions and will include wetland and riparian features. The proponent's proposed compensation plan has been designed to achieve no net loss of wetland function and follow up monitoring is planned to help confirm whether this objective is met. | The Agency is satisfied with the proponent's assessment of the Project's impacts on wetlands and concludes that with the proponent's mitigation measures adverse effects on wetlands in the regional study area are not significant. (Mitigation measures: Wetlands Compensation Plant)<br>The Agency notes that the Project will not impact any wetlands that contain species of concern listed under the *Species At Risk Act*. |
| | Hanna Tintina Conversancy | Gitanyow Hereditary Chiefs is deeply concern that the proponent and or its consultants are not aware that the Hanna Tintina was legally established as a Conservancy on March 14, 2013 or recognize the Gitanyow Lax-yip Land Use Plan. | Chapter 30, section 30.5.2.4 notes plans by the province to establish the conservancy area which had not been formally completed at the time of writing. The same section also describes the Gitanyow Huwilp Recognition and Reconciliation Agreement that came into effect in March 2012, noting in particular the provisions in the agreement for shared decision making with respect to land and resource use within Gitanyow traditional territory, including the Hanna-Tintina area. No Project effects on the Hanna-Tintina area are anticipated due to planned mitigation measures identified in the EIS. | The Agency is satisfied with the proponent's assessment that no project effects on the Hanna-Tintina area are anticipated due to planned mitigation measures. |

*Aboriginal Issues Tracking Tables continued*

| Gitxsan | | | | |
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| **Summary of Key Aboriginal Consultation Concerns** | | | | |
| **Theme** | **Subject** | **Comment/Concern** | **Proponent Response** | **Agency Response** |
| Fish | Water Quality | Impacts on asserted fishing rights from water quality degradation in the Project Area. | In both Chapter 15 of the environmental impact statement (EIS) the proponent provided an analysis of the impacts of the Project on water quality both for the Mine Site and Processing and Tailings Management Area.<br><br>The western portion of the Gitxsan traditional territory is approximately 1 350 metres from the Processing and Tailings Management Area and no effects are anticipated. The Dam Break Analysis conducted by the proponent states that the likelihood of any adverse effects on Gitxsan, as a result of a potential failure of the Water Storage Dam is extremely low. | The Agency, based on expert opinion, is satisfied with the findings of the proponent's Dam Break Effects Analysis.<br><br>The Agency is satisfied, based on expert opinion, that the methods used to study the impacts of seepage from the Tailings Management Facility (TMF) are adequate. The Agency's view is that the proponent's mitigation measures will ensure that British Columbia (BC) Water Quality guideline objectives are met in Treaty and Teigen Creeks. (Mitigation measures: use of a geomembrane liner in center cell of TMF, non-contact water diversions, temporary water treatment plants during construction, treating tailings supernatant from ore processing, sorting effluent during winter low flows, staging discharge and capturing sediment.) |

*Aboriginal Issues Tracking Tables continued*

| Gitxsan | | | | |
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| **Summary of Key Aboriginal Consultation Concerns** | | | | |
| **Theme** | **Subject** | **Comment/Concern** | **Proponent Response** | **Agency Response** |
| Wildlife | Habitat Loss | Impacts on asserted harvesting rights from habitat loss and disease on wildlife, specifically for moose and caribou populations. | In the Wildlife Effects Assessment the amount of habitat loss is compared to the amount of available habitat in the Regional Study Area and the Local Study Area. This approach is consistent with other environmental assessments (EA) in BC. The severity of the impact was also assessed by measuring the amount of altered habitat in terms of number of moose home ranges and number of moose given the density found during baseline surveys. Based on the conclusions of the proponent's findings, the proponent has developed mitigation measures to minimize habitat loss and alteration.<br><br>In Chapter 18 of the EIS, in Table 18.5-2, the proponent included a rationale for not assessing caribou. The species were not included because the Project area is not within the generally acknowledged current caribou range. No caribou were observed during aerial surveys for mountain goat or moose. | The Agency has reviewed the studies by the proponent and taking into account the proponent's commitments to mitigation measures and BC's creation of the Advisory Group for HWYs 37 and 37A, is satisfied that the Crown's duty to consult for the purposes of the EA decision has been appropriately met. (Mitigation measures: avoidance of high-quality habitat, minimize human activity in movement corridors, and reclaim a portion of habitat lost around TMF.)<br><br>The Agency is satisfied with the proponent's justification for not including a study of caribou in the EIS. |
| Land-use | TMF | Impacts on current use of lands and resources of the location TMF. | In the EIS the proponent assessed potential effects on water quantity, water quality, fish and aquatic habitat, and human health (including country foods). Conclusions on these valued components were used to determine potential effects on current Aboriginal use in the vicinity and downstream of the TMF and Mine Site. | The Agency, based on a thorough review of the EIS and Dam Break Effects Assessment report, is confident that the proponent has adequately assessed the effects of the TMF.<br><br>As no site specific use data was provided by the Gitxsan and the potential environmental effects are not significant, no effects on the current use of lands and resources by the Gitxsan are anticipated from the TMF. |

| Metis Nation of British Columbia | | | | |
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| **Summary of Key Aboriginal Consultation Concerns** | | | | |
| **Theme** | **Subject** | **Comment/Concern** | **Proponent Response** | **Agency Response** |
| Fish | Fish Habitat | Concern for impacts on asserted fishing rights from the removal of almost 4 hectares of fish habitat under the Fisheries Act, Metal Mining Effluent Regulations on fishing practices. | The proponent has proposed 36.5 ha of habitat compensation to offset the loss and degradation of fish habitat due to placement of project components and reduction in habitat quality. | The Agency is satisfied that the potential effects on fish habitat will be appropriately compensated for by the proponent. |
| Harvesting | Consumption | Concern for impacts on asserted wildlife harvesting rights from the Project. | The proponent has proposed a wide range of mitigation measures to address potential impacts on wildlife. (see Chapter 18 of the EIS). | Taking the proponent's mitigation measures into account, the Agency is satisfied that the environmental effects of the Project on wildlife are not significant. |
| Cultural, Spiritual and Heritage | Heritage Sites | Concern for impacts on Métis heritage sites at Fort Stikine and Stikine trail from the Project. | Based on the proponent's assessment of the location of the Project components there will be no impacts on the Métis heritage sites at Fort Stikine and Stikine trail from the Project. | The Agency is satisfied with the proponent's assessment and response. |

*Aboriginal Issues Tracking Tables continued*

| Nisga'a | | | | | |
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| **Summary of Key Aboriginal Consultation Concerns** | | | | | |
| **Theme** | **Subject** | **NFA** | **Comment/Concern** | **Proponent Response** | **Agency Response** |
| Cultural/ Spiritual/ Heritage | Heritage Site | Chapter 17 Cultural Artifacts and Heritage | Impacts on treaty cultural heritage rights from impacts of the Project to Treaty Rock located on Treaty Creek. | In Chapter 29 of the environmental impact statement (EIS), the proponent concluded that the location of Treaty Rock is a sufficient distance from the Project (25 kilometres southeast of the Tailings Management Facility (TMF) and 20 kilometres southeast of Treaty Creek Access Road) that no adverse effect to the site are anticipated. | After a review of the proponent's findings, the Agency is satisfied with the proponent's conclusions about the concern for impacts on Treaty Rock. |
| Fish | Water Quality | Chapter 8 Fish | Impacts on treaty fishing rights from water quality degradation in the Bell-Irving and Nass watershed. Nisga'a are specifically concerned with impacts on salmon species in Teigen and Treaty Creek. | In Chapter 15 of the EIS, the proponent assessed the potential effects on fish due to water quality changes, metals, metals or sediment loading in the Processing and Tailings Management Area. The studies and models conducted showed that the effects on water quality downstream of the proposed project are low to negligible, including for Treaty Creek, Teigen Creek, and the Bell-Irving River.<br>The proponent also commissioned a report on potential toxicity due to metal accumulation in salmonids from the TMF. According to the proponent, this report used the best available science and methods to predict potential effects on aquatic receptors including salmonids in Treaty and Teigen Creeks. The report concluded no significant effects on salmonids. | The Agency is satisfied, based on expert opinion, that the methods used to study the impacts of seepage from the TMF are adequate. The Agency's view is that the proponent's mitigation measures proposed by the proponent will ensure that British Columbia (BC) Water Quality guideline objectives are met in Treaty and Teigen Creeks. (Mitigation measures: use of a geomembrane liner in center cell of TMF, non-contact water diversions, temporary water treatment plants during construction, treating Tailings supernatant from ore processing, sorting effluent during winter low flows, staging discharge and capturing sediment.) |

*Aboriginal Issues Tracking Tables continued*

| Nisga'a | | | | | |
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| **Summary of Key Aboriginal Consultation Concerns** | | | | | |
| **Theme** | **Subject** | **NFA** | **Comment/Concern** | **Proponent Response** | **Agency Response** |
| Fish | Accidents and Malfunctions | Chapter 8 Fish | Impacts on treaty fishing rights from accidents and malfunctions, specifically fuel spills along the transportation corridor of the Project. A particular area of concern for the Nisga'a Lisims Government (NLG) is Brown Bear Creek where salmon is fished. | Section 5.2.3 of the Highways 37 and 37A Traffic Effects Assessment conducted by Seabridge discusses the risk analysis with respect to fish and aquatic habitat including fuel or lubricant spill, concentrate spills, lime and reagents, and explosives.<br>The proponent has committed to: 1) a 'Spill Prevention and Emergency Response Plan' to minimize response time and maximize clean-up efficiency, and 2) GPS monitoring in vehicles to ensure speed limits are adhered to. | The Agency is of the opinion that the proponent has adequately characterized the potential effects of accidents and malfunctions, specifically related to spills along the traffic corridor of the Project. Taking into account the proponent's mitigation measures the Agency views the potential impacts of accidents and malfunctions as low. (Mitigation measures: spill kits along transportation corridor, GPS in vehicles.) |
| Fish | Water Quality | Chapter 8 Fish | Impacts on treaty fishing rights from an increase selenium in water at the Mine Site Area of the Project. | The proponent provided an analysis of selenium impacts on fish in Chapter 15 of the EIS. Metal concentrations downstream of the Mine Site Area will exceed water quality guidelines.<br>The proponent has committed to implementing mitigation measures for selenium, specifically the creation of a selenium treatment facility. The proponent has committed to meeting site specific water quality guidelines, to be developed in permitting. | The Agency, based on federal expert opinion, is satisfied with the assessment conducted by the proponent impacts on the effectiveness of the proponent's mitigation measures in reducing the possibility of a significant adverse effect. |

| Nisga'a | | | | | |
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| **Summary of Key Aboriginal Consultation Concerns** | | | | | |
| **Theme** | **Subject** | **NFA** | **Comment/Concern** | **Proponent Response** | **Agency Response** |
| Fish | TMF | Chapter 8 Fish | Concern about the process used to make the decision for the location of the Processing and Tailings Management Area. | The proponent, using guidance contained within the Guidelines for the Assessment of Alternatives for Mine Waste Disposal (Environment Canada 2011), evaluated fourteen options for managing waste tailings, and selected four potentially feasible sites for its ability to meet government requirements, technical and engineering limitations, water management objectives, and economic constraints. Various disposal technologies were considered including conventional impoundment, saturated storage, submarine storage, in-pit storage, dry stacking, paste tailings, and co-disposal with waste rock. The proponent presented its analysis and findings to the technical working group. | The Agency is satisfied with the proponent's evaluation of alternative locations for the TMF for the purposes of the environmental assessment (EA) decision. It is important to note that Aboriginal consultation for a Schedule 2 amendment under the Metal Mining Effluent Regulations (MMER) is led by Environment Canada with support from Fisheries and Oceans Canada. Both departments have been involved in the EA to date and will continue to consult with the Gitanyow into the MMER process should the Minister conclude that the project can proceed to the permitting phase. |
| Fish | TMF | Chapter 8 Fish | Impact on treaty fishing rights of a potential dam failure on downstream fishing values and Nisga'a communities along the Nass River. | In the Dam Break Assessment, dam failure scenarios were assessed for a potential failure of the North Dam, Southeast Dam and Saddle Dam respectively. | The Agency, based on expert opinion, is satisfied with the risk analysis conducted by the proponent, the alternatives assessment, and the location for the placement of the TMF. Based on the design of the TMF, accidents and malfunctions from the TMF are unlikely. |

*Aboriginal Issues Tracking Tables continued*

| Nisga'a | | | | | |
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| **Summary of Key Aboriginal Consultation Concerns** | | | | | |
| **Theme** | **Subject** | **NFA** | **Comment/Concern** | **Proponent Response** | **Agency Response** |
| Fish | TMF | Chapter 8 Fish | Impacts on treaty fishing rights from changes in water quantity caused by the TMF. | The proponent assessed the impacts of both surface and ground water quantity changes of the Project in Chapters 11 and 13 of the EIS. The proponent has designed and planned a number of measures to ensure minimal water quantity changes in Processing and Tailings Management Area such as diversion ditches, measures to reduce blockages, buried pipes in areas with high avalanche risk and liners. | The Agency, based on expert opinion, is satisfied with the proponent's conclusions about changes and impacts on water quantity in the Processing and Tailings Management Area. The Agency, when taking into consideration the mitigation measures proposed in the Water Management Plan, concludes that the impacts are not significant. |
| Treaty | Economic, Social and Cultural Impact Assessment | Chapter 10 8(f) | Impacts on treaty rights caused by the methodology and used to undertake the assessment of economic, social and cultural impacts of the project in Chapter 10, Clause 8 (f) of the Nisga'a Final Agreement (NFA). NLG are particularly concerned with the adequacy of the mitigation measures proposed by the proponent for the economic, social and cultural impacts of the Project. | The proponent developed a study methodology for the Economic, Social and Cultural Impact Assessment (ESCIA) for the Project based on guidance from the NLG, the Agency and the BC Environmental Assessment Office. The methodology included surveys, interviews, focus groups and informal discussions with Nisga'a citizens, Nisga'a literature research and reviews and information from relevant sections of the EIS. | The Agency has reviewed the ESCIA report produced by the proponent and is satisfied with the assessment. The Agency will be consulting the NLG on the development of the NFA Project Recommendation for the Project. |

| Nisga'a | | | | | |
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| **Summary of Key Aboriginal Consultation Concerns** | | | | | |
| **Theme** | **Subject** | **NFA** | **Comment/Concern** | **Proponent Response** | **Agency Response** |
| Treaty | Nisga'a Final Agreement Fulfillment | ALL | Impacts on treaty rights caused by the methodology and approached used by the Crown to comply with and fulfill the 'spirit and intent' of the NFA with respect to impacts of the Project and how the environmental assessment is conducted. | The proponent conducted the research and provided information based on the Application Information Requirements developed by Canada and BC.<br>As the NFA is a treaty between NLG, Canada, and BC, fulfillment of the NFA in the case of the Project's environmental assessment is the responsibility of the Parties. | The Agency fully recognizes its' responsibility as the federal agency responsible for discharging the environmental assessment clauses of the Nisga'a Final Agreement. In a letter on October 04, 2010 and in other correspondence with the NLG, the Agency confirmed that Canada is wholly committed to honouring its obligations under the NFA. The existing and future economic, social and cultural well-being of Nisga'a citizens who may be affected by the Project will be considered a 'matter' under ss. 16(1) (e) of the Canadian Environmental Assessment Act 2010. This proposed approach was agreed to by the NLG. |

| Nisga'a | | | | | |
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| **Summary of Key Aboriginal Consultation Concerns** | | | | | |
| **Theme** | **Subject** | **NFA** | **Comment/Concern** | **Proponent Response** | **Agency Response** |
| Wildlife | Traffic | Chapter 9 | Impacts on treaty wildlife harvesting rights from wildlife mortality due to increased traffic, particularly in the area between Cranberry Junction and Kitwanga. | In Chapter 18 of the EIS, the proponent presented its' findings on the Project's impacts on moose mortality, including impacts from Project related traffic along Highway 37 and Highway 37A. In addition to this, the proponent also conducted a population variability analysis to investigate the potential for traffic to result in population-level changes in moose as a result of the Project and other proposed projects planning to use Highway 37 and Highway 37A. The results were included as Appendix D of the Traffic Effects Assessment of the EIS and concluded that the impacts of Project related traffic would be not significant. The proponent has also committed $1.75M over 52 years to a habitat compensation trust fund. | The Agency has reviewed the studies by the proponent, and taking into account the proponent's commitments to mitigation measures and BC's creation of the Advisory Group for HWYs 37 and 37A, is satisfied that the Crown's duty to consult for the purposes of the EA decision has been appropriately met. (Mitigation measures: maintain precautionary speed limits for its drivers, manage roadside vegetation, manage snow bank heights on access roads, and gate access roads.) |

| Nisga'a | | | | | |
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| **Summary of Key Aboriginal Consultation Concerns** | | | | | |
| **Theme** | **Subject** | **NFA** | **Comment/Concern** | **Proponent Response** | **Agency Response** |
| Portland Canal | N/A | N/A | Impacts on treaty fishing and wildlife harvesting rights from Project transport and shipping along the Portland Canal and Observatory Inlets. | Not applicable as the determination not to include transportation along the Portland Canal and Observatory Inlet was in the Project scope determined by Canada. | The Agency is of the opinion that transportation and shipping along the Portland Canal and Observatory Inlet is not included in the Project scope. An interdepartmental working group was established between, Aboriginal Affairs and Northern Development Canada, the Major Projects Management Office, the Agency and other responsible federal departments, and the NLG to discuss the potential impacts of Project-related transport and shipping in the Portland Canal and Observatory Inlet to established rights, as described in the NFA. These discussions are ongoing. |

| Skii km Lax Ha | | | | |
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| **Summary of Key Aboriginal Consultation Concerns** | | | | |
| **Theme** | **Subject** | **Comment/Concern** | **Proponent Response** | **Agency Response** |
| Fish | Water Quality | Impacts on asserted fishing rights from a degradation to water quality in watershed near the Tailings Management Facility (TMF), specifically Teigen Creek. | In Chapter 15 of the environmental impact statement (EIS), Seabridge assessed the potential effects on fish due to water quality changes, metals, metals or sediment loading in the Processing and Tailings Management Area. The studies and models conducted showed that the effects on water quality downstream of the proposed project are low to negligible, including for Treaty Creek, Teigen Creek, and the Bell-Irving River.<br>The proponent also commissioned a report on potential toxicity due to metal accumulation in salmonids from the TMF. According to the proponent, this report used the best available science and methods to predict potential effects on aquatic receptors including salmonids in Treaty and Teigen Creeks. The report concluded no significant effects on salmonids. | The Agency is satisfied, based on expert opinion, that the methods used to study the impacts of seepage from the TMF are adequate. The Agency's view is that the proponent's mitigation measures will ensure that British Columbia (BC) Water Quality guideline objectives are met in Treaty and Teigen Creeks. (Mitigation measures: use of a geomembrane liner in center cell of TMF, non-contact water diversions, temporary water treatment plants during construction, treating tailings supernatant from ore processing, sorting effluent during winter low flows, staging discharge and capturing sediment.) |
| Wildlife | Marten | Impacts on asserted marten harvesting rights from Project-related camp attractants. Skii km Lax Ha raised concern that marten were not assessed as a separate species and that the proxy species used were inadequate to assess impacts. | The proponent, using a proxy species, assessed the impacts of the Project on marten, specifically camp attractants. | The Agency is satisfied with the proponent's assessment including the use of a proxy. The impacts on marten, after mitigation measures, are expected to be low. The proponent has committed to implementing a furbearer management plan to reduce impacts on marten. (Mitigation measures: filters and other odour reducing measures taken at camps to prevent attractants) |

*Aboriginal Issues Tracking Tables continued*

| Skii km Lax Ha | | | | |
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| **Summary of Key Aboriginal Consultation Concerns** | | | | |
| **Theme** | **Subject** | **Comment/Concern** | **Proponent Response** | **Agency Response** |
| Fish | Mountain Goat | Impacts on mountain goat from the Project in the Mine Site Area. | In Chapter 18 of the EIS, the proponent provided commitments related to minimizing impacts on mountain goat related to the use of salt licks such as minimizing disturbance around the salt lick, monitoring the salt lick and installing additional artificial salt licks in appropriate goat habitat to offset disturbance at the existing lick. The proponent has also used remote cameras to conduct studies and continue to monitor mountain goats. There is currently no hunting or public access at the Project site and therefore no risk of increase hunting in the area of the salt lick. | The Agency is satisfied with the proponent's assessment of mountain goats and the methodologies used to assess them. The Agency is also satisfied with the proposed mitigation measures put forward by the proponent in the EIS. (Mitigation measures: avoidance of important habitat where alternatives are available, use of noise dampening measures, employ design measures to reduce human goat interactions, manage helicopter use to avoid goats and use directed lighting) |
| Wildlife | Trap Lines | Impacts on asserted wildlife harvesting rights from the Project restricting access to trap lines. The Project will impact the following Skii-km Lax Ha trap lines: 617T015 and 617T011. | The proponent acknowledges that the Project will impact access the specific trap lines listed and has proposed accommodation measures to the Skii km Lax Ha for the impacts. | The Agency is of the understanding that negotiations about accommodation measures for the impacts on access of the Skii km Lax Ha traplines. The Agency, awaits the outcome of these discussions. |
| | Traffic | Impacts on asserted wildlife harvesting rights from increased wildlife mortality from traffic related to the Project along Highway 37 and Highway 37A to wildlife harvesting rights. Skii km Lax Ha have raised particular concern of traffic related moose mortality. | In Chapter 18 of the EIS, the proponent presented its' findings on the Project's impacts on wildlife mortality, including impacts from Project related traffic along Highway 37 and Highway 37A. In addition to this, the proponent also conducted a population variability analysis to investigate the potential for traffic to result in population-level changes in moose as a result of the Project and other proposed projects planning to use Highway 37 and Highway 37A. The results were included as Appendix D of the Traffic Effects Assessment of the EIS and concluded that the impacts of Project related traffic would be not significant. | The Agency, having reviewed all of the information presented by the proponent, has taken the findings into consideration and is satisfied with the proponents assessment. The Agency is also satisfied with the proposed mitigation measures put forward by the proponent in the EIS. (Mitigation measures: maintain precautionary speed limits for its drivers, manage roadside vegetation, manage snow bank heights on access roads, and gate access roads.) |

*Aboriginal Issues Tracking Tables continued*

| Skii km Lax Ha | | | | |
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| **Summary of Key Aboriginal Consultation Concerns** | | | | |
| **Theme** | **Subject** | **Comment/Concern** | **Proponent Response** | **Agency Response** |
| Cultural/ Spiritual / Heritage | Burial Sites | Impacts on Skii km Lax Ha ancestral burial sites impacts of the Project to Skii km Lax Ha ancestral burial sites. | Two archaeology assessments were conducted for the Project under Heritage Conservation Act permits 2008-0218 and 2012-0192. The Skii km Lax Ha were sent copies of the final permit reports on Feb 27, 2013. First Nations assistants assisted on the field components of the archeological impact assessment studies. The proponent cannot disclose the exact location of these sites due to the sensitivity of this information, however the proponent will be discussing mitigation measures with the Skii km Lax Ha prior to any activities occurring that may disturb these locations. | The Agency acknowledges the sensitive nature of the information about the Skii km Lax Ha's ancestral burial sites. The Agency is of the understanding that negotiations about accommodation measures for any potential impacts on these sites are ongoing and awaits the outcome of the discussions. |
| | Smoke Houses | Impacts of the Project on their smoke houses in the Awijii Area. | The proponent has confirmed that no impacts are expected from the Project to the Awijii Area. | The Agency has noted and considered the potential impacts of the Processing and Tailings Management Area on the smoke houses in the Awijii Area and agrees with the proponent's assessment. |
| | Cabins | Impacts on access to the twenty historical cabins located within the Project Area. | The proponent provided baseline information in an appendix to the EIS on Skii km Lax Ha current use patterns and practices and traditional uses of resources. The proponent cannot disclose the exact location of these sites due to the sensitivity of this information, however the proponent will be discussing mitigation measures with the Skii km Lax Ha prior to any activities occurring that may disturb these locations. | The Agency acknowledges the sensitive nature of the information about the Skii km Lax Ha's historical cabins. The Agency is of the understanding that negotiations about accommodation measures for any potential impacts on these sites are ongoing and awaits the outcome of the discussions. |

*Aboriginal Issues Tracking Tables continued*

| Tahltan | | | | |
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| **Summary of Key Aboriginal Consultation Concerns** | | | | |
| **Right** | **Subject** | **Comment/Concern** | **Proponent Response** | **Agency Response** |
| Fish (Salmon) | Water Quality | Impacts on asserted fishing rights from degradation to water quality in watershed near the Tailings Management Facility (TMF). Tahltan expressed concern about consultation during the Metal Mining Effluent Regulations (MMER) permitting process. | In Chapter 15 of the environmental impact statement (EIS), Seabridge assessed the potential effects on fish due to water quality changes, metals, or sediment loading in the Processing and Tailings Management Area. The studies and models conducted showed that the effects on water quality downstream of the proposed project are low to negligible, including for Treaty Creek, Teigen Creek, and the Bell-Irving River.<br><br>The proponent has committed to ongoing monitoring in aquatic environments downstream of discharge postings to ensure that any changes in the aquatic environment are detected and adaptively managed. | The Agency is satisfied, based on expert opinion, that the methods used to study the impacts of seepage from the TMF are adequate. The Agency's view is that the proponent's mitigation measures will ensure that British Columbia (BC) Water Quality guideline objectives are met in Treaty and Teigen Creeks. (Mitigation measures: use of a geomembrane liner in center cell of TMF, non-contact water diversions, temporary water treatment plants during construction, treating tailings supernatant from ore processing, sorting effluent during winter low flows, staging discharge and capturing sediment.) During a meeting with Tahltan on 11th June 2014, the Agency committed to provide information to Tahltan on consultation opportunities about the MMER permitting. |

*Aboriginal Issues Tracking Tables continued*

| Tahltan | | | | |
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| **Summary of Key Aboriginal Consultation Concerns** | | | | |
| **Right** | **Subject** | **Comment/Concern** | **Proponent Response** | **Agency Response** |
| | Habitat Loss | Concern for impacts on asserted fishing rights from habitat loss. Tahltan expressed concern about the Fisheries Habitat Compensation Plan and expressed interest in participating in its development. | The proponent has assessed the impacts on fish habitat in Chapter 15 of the EIS and recognises the importance of fisheries resources, including Pacific Salmon, in the Bell-Irving and Unuk watersheds. The proponent has committed to monitoring fish and aquatic habitat in the Aquatic Effects Monitoring Program, which includes the Bell-Irving River and Unuk River watersheds. In addition to this program, the proponent has committed to monitoring Teigen Creek Chinook salmon through the implementation of a program to verify the predictions of the effects assessment. | Based on expert opinion, the Agency is satisfied with the methods used to study the impacts of the Project to fish and fish habitat, impacts on the mitigation measures put forward. (Mitigation measures: 36.5 hectares of new fish habitat to compensate the habitat loss from the deposit of deleterious substances within fish-bearing watercourses.) The Agency's view is that the impacts on fish habitat after taking into account the proposed mitigation measures will be low to negligible.<br><br>In a meeting with Tahltan on June 11th 2014, the Agency offered to arrange a teleconference between the Department Fisheries and Oceans and Tahltan to discuss the Fisheries Habitat Compensation Plan. |
| | Accidents and Malfunctions | Impacts on asserted fishing rights from fuel or other spills. | Section 5.2.3 of the Highways 37 and 37A Traffic Effects Assessment discusses the risk analysis with respect to fish and aquatic habitat including fuel or lubricant spill, concentrate spills, lime and reagents, and explosives. The proponent identified prevention as the best form of mitigating spills. A 'Spill Prevention and Emergency Response Plan' was developed to minimize response time and maximize clean-up efficiency, preventing long-term or geographically extensive effects. | The Agency is of the opinion that the proponent has adequately captured the effects of accidents and malfunctions, specifically related to spills along the traffic corridor of the Project. The mitigation measures are adequate and reduce the impacts on low. (Mitigation measures: spill kits along transportation corridor, GPS in vehicles) |

*Aboriginal Issues Tracking Tables continued*

| Tahltan | | | | |
|---|---|---|---|---|
| **Summary of Key Aboriginal Consultation Concerns** | | | | |
| **Right** | **Subject** | **Comment/Concern** | **Proponent Response** | **Agency Response** |
| Wildlife | Access | Impacts on asserted wildlife hunting rights from increased access by predators and other hunters due to the creation of Project-related access roads. Tahltan expressed concern that concurrent permitting may result in road and transmission line construction commencing, only to be abandoned in the case that funding could not be secured. | The proponent considered and assessed the impacts on wildlife from increased access by predators and other hunters due to the creation of Project-related access roads in Chapter 15 of the EIS. Based on the proponent's assessment and taking into account the mitigation measures, the proponent views the impacts to be low. | The Agency is satisfied with the proponent's assessment and proposed mitigation measures. (Mitigation measures: minimize human activity along high quality wildlife habitats and movement corridors, managing roadside vegetation and snow banks, incorporating wildlife passages into road and bridge design, and installing gates on access roads.) |
| | Traffic | Impacts on asserted wildlife harvesting rights (specifically moose harvesting) from increased wildlife mortality from traffic related to the Project along Highway 37 and Highway 37A. Tahltan expressed concern about the wildlife survey methodology and the characterization of impacts on moose. | In Chapter 18 of the EIS, the proponent presented its' findings on the Project's impacts on wildlife mortality, including impacts from Project related traffic along Highway 37 and Highway 37A. In addition to this, the proponent also conducted a population variability analysis to investigate the potential for traffic to result in population-level changes in moose as a result of the Project and other proposed projects planning to use Highway 37 and Highway 37A. The results were included as Appendix D of the Traffic Effects Assessment of the EIS and concluded that the impacts of Project related traffic would be not significant. | The Agency has reviewed the studies by the proponent and others, and taking into account the proponent's commitments to mitigation measures and BC's creation of the Advisory Group for HWYs 37 and 37A, is satisfied that the Crown's duty to consult for the purposes of the EA decision has been appropriately met. (Mitigation measures: maintain precautionary speed limits for its drivers, manage roadside vegetation, manage snow bank heights on access roads, and gate access roads.) |

| Tahltan | | | | |
|---|---|---|---|---|
| **Summary of Key Aboriginal Consultation Concerns** | | | | |
| **Right** | **Subject** | **Comment/Concern** | **Proponent Response** | **Agency Response** |
| | Accidents and Malfunctions | Impacts on asserted wildlife harvesting rights (specifically moose harvesting) from fuel or other spills. | Section 5.2.3 of the Highways 37 and 37A Traffic Effects Assessment conducted by Seabridge discusses the risk analysis with respect to fish and aquatic habitat including fuel or lubricant spill, concentrate spills, lime and reagents, and explosives.<br>Seabridge identified prevention as the best form of mitigating spills. A 'Spill Prevention and Emergency Response Plan' was developed to minimize response time and maximize clean-up efficiency, preventing long-term or geographically extensive effects. | The Agency is of the opinion that the proponent has adequately captured the issues of accidents and malfunctions, specifically related to spills along the traffic corridor of the Project. The Agency views the mitigation measures as adequate in reducing the impacts on a low level. (Mitigation measures: spill kits along transportation corridor, GPS in vehicles.) |
| Land Use | TMF Location | Impacts on Tahltan's use of lands and resources from the impacts of choice of location for the TMF in the upper Nass Watershed and the risk of accidents and malfunctions of the TMF. Tahltan expressed concern with how the alternatives for the Processing and Tailings Management Area were taken into consideration. | The proponent, using guidance contained within the Guidelines for the Assessment of Alternatives for Mine Waste Disposal (Environment Canada 2011), conducted a Multiple Accounts Analysis evaluating fourteen options for managing waste tailings, and selected four potentially feasible sites for their ability to meet government requirements, technical and engineering limitations, water management objectives, and economic constraints. Various disposal technologies were considered including conventional impoundment, saturated storage, submarine storage, in-pit storage, dry stacking, paste tailings, and co-disposal with waste rock. The proponent presented its analysis and findings to the technical working group. | The Agency, based on expert opinion, is satisfied with the risk analysis conducted by the proponent, the alternatives assessment, and the location for the placement of the TMF. Based on the design of the TMF, accidents and malfunctions from the TMF are unlikely. Impacts on potential land use downstream of the TMF are minimized by the proponent's mitigation measures for water quality and quantity. (Mitigation Measures: incorporation of additional capacity into the design of water management facilities, series of treatment circuits, additional diversion ditches and pumps, monitoring programs for Processing and Treatment Management Area Dams.) |

*Aboriginal Issues Tracking Tables continued*

| Tahltan | | | | |
|---|---|---|---|---|
| **Summary of Key Aboriginal Consultation Concerns** | | | | |
| **Right** | **Subject** | **Comment/Concern** | **Proponent Response** | **Agency Response** |
| Land Use | | | In addition to conducting the Multiple Accounts Analysis, the proponent also conducted a the Dam Break Effects Assessment which assessed dam failure scenarios for a potential failure of the North Dam, Southeast Dam and Saddle Dam in the TMF respectively. No potential residual effects on human health are predicted under any scenario. There are potential residual effects for fish (Bull Trout, Dolly Varden, Rainbow Trout/Steelhead, and Pacific Salmon populations), and aquatic habitat in South Teigen Creek, Teigen Creek, North Treaty Creek, Treaty Creek, and the Bell-Irving River to its confluence with the Nass River. In the unlikely event of a TMF dam break, there is potential to impact the Gitanyow use of the Bell-Irving and Nass Rivers. | |
| | Air Quality | Concern for impacts on Tahltan's use of lands and resources from impacts of dust and air pollution related to the Project. | Seabridge has proposed mitigation measures to reduce impacts of dust from the Project including the Fugitive Dust Emission Management Plan and Emissions Management Plan to ensure BC Ministry of the Environment Air Quality Guidelines are met. | The Agency is of the opinion that the proponent has adequately assessed and captured the impacts of dust and air pollution related to the Project, and that, taking into consideration the mitigation measures, impacts will be low. |
| | Archaeological | Tahltan expressed concern that the project may disturb areas and objects of archaeological value. | The proponent has assessed the potential disturbance of archaeological sites and objects during mine construction and operation. | In a meeting with Tahltan, the Agency committed to providing more archaeological assessment information to the Tahltan, requesting further information from the proponent if none currently exists. |

*Aboriginal Issues Tracking Tables continued*

| Tahltan | | | | |
|---|---|---|---|---|
| **Summary of Key Aboriginal Consultation Concerns** | | | | |
| **Right** | **Subject** | **Comment/Concern** | **Proponent Response** | **Agency Response** |
| | Cumulative Effects | Concern for Tahltan's use of lands and resources from cumulative effects of development in the area around the Project. | A cumulative effects assessment that included past, current, and reasonably-foreseeable projects was provided in Chapter 37 of the EIS. All effects from past and present projects are already included in the baseline concentrations and risk assessment. Potential cumulative effects on water quality, air quality, country food quality and noise from reasonably-foreseeably future projects were specifically assess in Chapter 25 of the EIS. Potential changes in access due to development of other projects that will open up new areas for fishing, hunting and collection of country foods for Aboriginal populations was assessed in Chapter 23 of the EIS. Seabridge agrees to consider any new information about access of previously inaccessible areas and potential changes in country foods quality in subsequent assessments of risk related to consumption of country foods. | The Agency is satisfied with the proponent's assessment of cumulative effects of the Project (See Chapter 5).<br>As no site specific use data was provided by the Tahltan and the potential environmental effects are not significant, no effects on the current use of lands and resources by the Tahltan are anticipated from the TMF. |

# Appendix E
**Proposed Draft Follow-up Program**

| Effects | Description of Follow-up | Phase | Reporting to |
|---|---|---|---|
| **Geohazards** | | | |
| Terrain instability and subsequent effects on geohazards (moderate) | • Monitor effects of glacier ice extraction – Mitchell Glacier diversion inlets – and influence on glacier dynamics and effects of debutressing. | • Construction<br>• Operation | NRCan |
| **Groundwater Quantity** | | | |
| Alteration of groundwater levels and flow patterns due to artificial reservoirs and implementation of associated seepage control mechanisms | • Track changes in groundwater levels and flow regimes arising from mine components;<br>• Identify occurrence of adverse effects on surface water quantity arising from alteration of groundwater conditions; and<br>• Establish criteria so that a need for contingency action can be identified. | • All phases | EC |
| **Groundwater Quality** | | | |
| Degradation of groundwater quality due to seepage of contact water | • Track degradation of groundwater quality arising from seepage of contact water from mine components;<br>• Identify occurrence of adverse effects on surface water quality arising from alteration of groundwater conditions; and<br>• Establish criteria so that a need for contingency action can be identified. | • All phases | EC |
| **Surface Water Quantity** | | | |
| Increase/decrease in annual peak and low flow volumes on streamflows in the PTMA<br>and<br>Increase/decrease in annual peak and low flow volumes on stream flows in the Mine Site; overall residual effect on streamflows in the Mine Site | • Verify the effectiveness of flow management measures in meeting fish and water quality objectives, and identify contingency actions that may be needed. | • All phases | EC |

*Proposed Draft Follow-up Program continued*

| Effects | Description of Follow-up | Phase | Reporting to |
|---|---|---|---|
| **Surface Water Quality** | | | |
| ML/ARD leachates from materials entering water bodies (tunnel, road, transmission line)<br>and<br>Contaminants of potential concern in discharge (TMF, Mine Site) | • Verify whether temporary water treatment facilities and Mine Site Water Treatment Plant are effective, and determine need for contingency measures;<br>• Verify the effectiveness of the Selenium Treatment Plant in reducing selenium in the drainage from Kerr waste rock;<br>• Verify whether the geochemical characterization of tailing material successfully validated ML/ARD predictions developed during the environmental effects assessment process and the contribution of this procedure in assuring geochemical (ML/ARD) stability of waste rock ,tailings and pit walls;<br>• Verify the water quality model predictions;<br>• Develop and implement an Aquatic Effects Monitoring Plan to:<br>• Detect any unforeseen effects as measured against the baseline established as part of the initial environmental assessment;<br>• Verify whether discharge limits and other criteria to be set at the permitting stage are effective in minimizing environmental effects to achieve environmental quality objectives;<br>• Help identify cause-effect relationships between Project activities and any environmental changes, with reference to selenium levels in effluent; and<br>• Verify the effectiveness of any contingency measures undertaken and success in achieving receiving environment water quality standards. | • All phases | EC |
| **Fish and Aquatic Habitat** | | | |
| The proponent identified a follow-up monitoring program to assess the effectiveness of new fish habitat created to offset project related fish habitat losses and to verify the accuracy of the predicted effects on fish and fish habitat. Such monitoring can be a requirement of a Fisheries Act authorization and therefore is not considered part of the EA follow-up program. Following the conclusions of the EA if the decision enables the project to proceed, DFO will continue to consult with NLG and other Aboriginal groups on the proposed offsetting measures, monitoring plans and draft Fisheries Act authorization.<br>Specifically a Fisheries Act authorization can include monitoring requirements to:<br>• Verify the accuracy of the predicted effects on salmon in Teigen Creek resulting from stream flow changes<br>• Verify the accuracy of the predicted effects on fish resulting from water temperature changes from the PTMA.<br>• Monitor the success of the fish salvage and relocation from the PTMA.<br>• Monitor the effectiveness of new fish habitat created to offset project related effects. | | |
| **Wetlands** | | | |
| If the proponent proceeds with the spirit of the Federal Policy on Wetland Conservation and produces a revised wetland compensation plan, the development and effectiveness of this plan will be assessed. | | | |

# Appendix F
**Effects Analysis Summary**

Notes:

The key below applies to all the tables in this appendix for the following characteristics Frequency, Reversibility, Context and Significance. The keys for Magnitude, Geographic Extent vary from VEC to VEC and therefore each table has an individual key, located at the end, for those characteristics.

**Frequency**

*Refers to the how often the adverse impact may occur.*

**O** Once: the effect occurs once during any phase of the Project.

**S** Sporadic: the effect occurs at sporadic or intermittent intervals during any phase of the Project.

**R** Regular: the effect occurs on a regular basis during any phase of the Project.

**C** Continuous: the effect occurs constantly during any phase of the Project.

**Reversibility**

*Refers the probability that the adverse impact is can be reversed.*

**RST** Reversible Short Term: an effect that can be reversed relatively quickly.

**RLT** Reversible Long Term: an effect that can be reversed after many years.

**IE** Irreversible Effect: and effect that cannot be reversed.

**Context**

*Refers to the type of environment that the adverse impact is likely to occur in.*

**L** Low: the valued component is considered to have little to no unique attributes and/or there is high resilience to imposed stresses.

**N** Neutral: the valued component is considered to have some unique attributes, and/or there is neutral (moderate) resilience to imposed stresses.

**H** High: the valued component is considered to be unique, and/or there is low resilience to imposed stresses.

**Significance**

*Refers to how great the adverse impact will be based on frequency, reversibility, magnitude, context, geographic extent, and duration.*

**NSMI** Not Significant Minor: residual effects have no or low magnitude, local geographical extent, short or medium term duration, and occur intermittently, if at all. There is a high level of confidence in the conclusions. The effects on the VC (at a population or species level) are indistinguishable from background conditions. Land use management objectives will be met. Follow-up monitoring is optional.

**NSMO** Not Significant Moderate: Residual effects have medium magnitude, local, landscape or regional geographic extent, are short-term to chronic (i.e., may persist into the far future), and occur at all frequencies. Residual effects on VCs are distinguishable at the population, community, and/or ecosystem level. Ability of meeting land use management objectives may be impaired. Confidence in the conclusions is medium or low. The probability of the effect occurring is low or medium. Follow-up monitoring of these effects may be required.

**SM** Significant (Major): Residual effects have high magnitude, regional or beyond regional geographic extent, are chronic (i.e. persist into the far future), and occur at all frequencies. Residual effects on VC are consequential (i.e., structural and functional changes in populations, communities and ecosystems are predicted). Ability to meet land use management objectives is impaired. Probability of the effect occurring is medium or high. Confidence in the conclusions can be high, medium, or low. Follow-up monitoring is required.

**Phases**

*Refers to stages of the Project.*

**C** Construction

**O** Operation

**CL** Closure

**PC** Post-closure

**Confidence**

*Refers to the scientific certainty of the significance determination.*

**L** Low: the cause-effect relationships between the Project and its interaction with the environment is poorly understood and/or data from the Project area and/or scientific analyses are incomplete leading to a high degree of uncertainty.

**M** Medium: the cause-effect relationship between the Project and its interaction with the environment is not fully understood and/or data from the Project area and/or scientific analyses are incomplete leading to a moderate degree of uncertainty.

**H** High: the cause-effect relationship between the Project and its interaction with the environment is well understood and/or data from project area and/or scientific analyses are complete leading to a low degree of uncertainty.

**Probability**

**L** Low: an effect that is unlikely but could occur.

**M** Medium: an effect that is likely but may not occur.

**H** High: an effect is likely to occur.

**Groundwater Quantity**

| Project Effect | Phase of Project | Criteria for Determining Significance | | | | | | Analysis | Likelihood | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Magnitude | Extent | Duration | Frequency | Reversibility | Context | Significance | Probability | Confidence |
| Degradation of groundwater quality from seepage of contact water | C,O,CL | H | LA | FF | C | IR | N | NSMO | H | H |
| Overall predicted degree of effect after mitigation to groundwater quality (Mine Site) | PC | H | LO | FF | C | IR | L | NSMO | H | H |
| Overall predicted degree of effect after mitigation to groundwater quality (Processing and Tailings Management Facility) | PC | H | LA | FF | C | IR | N | NSMO | H | H |

**Magnitude**

*Refers to the severity of the adverse impact.*

**N** Negligible: There is no detectable change from baseline conditions.

**L** Low: Groundwater quality is expected to differ from baseline conditions, but is within the range of natural variation. Guideline exceedances are possible where they fall within the range of natural variability.

**M** Medium: Groundwater quality is expected to differ from baseline conditions and likely approaches the limits of natural variation. Most constituents are expected to be below or equal to BC MOW guidelines where this is the case for baseline conditions.

**H** Groundwater quality is expected to differ significantly from baseline conditions and exceed the limit of natural variation. A number of constituents are expected to exceed BC MOE guidelines as a result of the effect.

**Geographic Extent**

*Refers to the area that the adverse impact may cover.*

**LO** Local: Effect is limited to the Project footprint and stays within a controlled environment.

**LA** Landscape: Effect extends beyond the Project footprint, but does not extend beyond the immediate drainage basin of the source.

**R** Regional: Effect extends into a downstream parent drainage basin. The effect may extend across the regional study area.

**BR** Beyond Regional: Effect extends beyond the regional study area. Effect may cross provincial or state boundaries.

**Duration**

Refers to the length of time an adverse impact may occur.

**S** Short-term: Effect lasts up to 5 years.

**M** Medium-term: Effect last up to 25 years.

**L** Long-term: Effect lasts up to 50 years.

**FF** Far Future Effect lasts more than 50 years

**Groundwater Quality**

| Project Effect | Phase of Project | Criteria for Determining Significance | | | | | | Analysis | Likelihood | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Magnitude | Extent | Duration | Frequency | Reversibility | Context | Significance | Probability | Confidence |
| Degradation of groundwater quality from seepage of contact water | C,O,CL | H | LA | FF | C | IR | N | NSMO | H | H |
| Overall predicted degree of effect after mitigation to groundwater quality (Mine Site) | PC | H | LO | FF | C | IR | L | NSMO | H | H |
| Overall predicted degree of effect after mitigation to groundwater quality (Processing and Tailings Management Facility) | PC | H | LA | FF | C | IR | N | NSMO | H | H |

**Magnitude**

*Refers to the severity of the adverse impact.*

**N** Negligible: There is no detectable change from baseline conditions.

**L** Low: Groundwater quality is expected to differ from baseline conditions, but is within the range of natural variation. Guideline exceedances are possible where they fall within the range of natural variability.

**M** Medium: Groundwater quality is expected to differ from baseline conditions and likely approaches the limits of natural variation. Most constituents are expected to be below or equal to BC MOW guidelines where this is the case for baseline conditions.

**H** Groundwater quality is expected to differ significantly from baseline conditions and exceed the limit of natural variation. A number of constituents are expected to exceed BC MOE guidelines as a result of the effect.

**Geographic Extent**

*Refers to the area that the adverse impact may cover.*

**LO** Local: Effect is limited to the Project footprint and stays within a controlled environment.

**LA** Landscape: Effect extends beyond the Project footprint, but does not extend beyond the immediate drainage basin of the source.

**R** Regional: Effect extends into a downstream parent drainage basin. The effect may extend across the regional study area.

**BR** Beyond Regional: Effect extends beyond the regional study area. Effect may cross provincial or state boundaries.

**Duration**

Refers to the length of time an adverse impact may occur.

**S** Short-term: Effect lasts up to 5 years.

**M** Medium-term: Effect last up to 25 years.

**L** Long-term: Effect lasts up to 50 years.

**FF** Far Future Effect lasts more than 50 years

**Surface Water Quantity**

| Project Effect | Phase of Project | Criteria for Determining Significance | | | | | | Analysis | Likelihood | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Magnitude | Extent | Duration | Frequency | Reversibility | Context | Significance | Probability | Confidence |
| Changes in: annual flow volumes; monthly flow distribution; in peak flows; and in low flows (within Processing and Tailings Management Facility )- for diversion and tunnels in Tailings Management Facility | C,O,CL,PC | L | R | FF | C | RLT | N | NSMO | H | L to H |
| Changes in: annual flow volumes; monthly flow distribution; in peak flows; and in low flows (within Processing and Tailing Management Facility) | C,O,CL,PC | L | R | FF | C | RLT | N | NSMI | H | L to H |
| Overall effect on stream flows (within Processing and Tailings Management Facility) | PC | L | LA | FF | C | RLT | N | NSMO | H | M |
| Overall effect on stream flows (within Mine Site) | C,O,CL,PC | H | LA | FF | C | RLT | L | NSMO | H | M |
| Overall effect on stream flows within Bell-Irving River | PC | L | R | FF | C | RLT | N | NSMI | H | M |
| Overall effect on stream flows within the Unuk | C,O,CL,PC | L | R | FF | C | RLT | N | NSMI | H | M |

**Magnitude**

Refers to the severity of the adverse impact.

**N** Negligible: there is no detectable change from baseline conditions.

**L** Low: the magnitude of the effect differs from the average value for baseline condition, but is within the range of natural variation and well below a guideline or threshold value.

**M** Medium: The magnitude of effect differs from the average value for baseline conditions and approaches the limits of natural variation, but below or equal to a guideline or threshold value.

**H** High: The magnitude of effects is predicted to differ from baseline conditions and exceed guideline or threshold values so that there will be a detectable change beyond the range of natural variation (i.e., change of state from baseline conditions).

**Geographic Extent**

Refers to the area that the adverse impact may cover.

**LO** Local: Effect is limited to the Project footprint.

**LA** Landscape: Effect extends beyond the Project footprint to a broader watershed area.

**R** Regional: Effect extends across the Regional Study Area.

**BR** Beyond Regional: Effect extends possibly across or beyond the province.

**Duration**

Refers to the length of time an adverse impact may occur.

**S** Short-term: Effect lasts approximately 1 year or less.

**M** Medium-term: Effect lasts between 1-11 years.

**L** Long-term: Effect lasts between 12-70 years.

**FF** Far Future: Effect lasts more than 70 years.

**Surface Water Quality**

| Project Effect | Phase of Project | Criteria for Determining Significance | | | | | | Analysis | Likelihood | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Magnitude | Extent | Duration | Frequency | Reversibility | Context | Significance | Probability | Confidence |
| Degradation of water quality due to total suspended solids, metal leaching/acid rock drainage, nitrogen loading | C,O,CL,PC | M | LA | M | S | RST | H | NSMI | H | H |
| Degradation of water quality in Sulphurets Creek due to elevated selenium | O,CL,PC | H | LA | FF | C | RLT | L | NSMO | M | M |
| Degradation of water quality in Unuk River at UR1 due to elevated selenium | O,CL,PC | H | R | M to FF | C | RLT | N | NSMO | M | M |
| Degradation of water quality in Unuk River at UR2 due to elevated selenium | O,CL,PC | M | LA | M to FF | C | RLT | H | NSMO | M | M |
| Degradation of water quality in Treaty watershed (North Treaty and Treaty creeks and in Teigen watershed (South Teigen and Teigen creeks) due to nitrogen loading | O,CL,PC | L to M | LA | M | S | RST | H | NSMI | M | M |
| *Sub-lethal Toxicity from Metal Exposure from Non-Point Sources (from Tailings Management Facility) | C,O,CL,PC | L | LA | M to L | S | RLT | N | NSMI | L | M |
| *Sub-lethal Toxicity from Metals or Process Chemical Exposure ( from Mine Site Waste Storage Facility and Water Treatment Plant) | O,CL,PC | H | R | M to FF | R | RLT | H | NSMO | M | M |
| Sub-lethal Toxicity from Metals or Process Chemical Exposure ( from Mine Site Waste Storage Facility and Water Treatment Plant) – for aquatic habitat | O,CL,PC | H | R | M to FF | R | RLT | H | NSMI | M | M |
| *Toxicity from Petroleum Products or Nitrogenous Compounds | C,O,CL | L | LA | S | S | RST | N | NSMI | L | H |
| Overall predicted degree of effect after mitigation to surface water quality (Mine Site) | PC | M | LA | FF | C | RLT | H | NSMO | | M |
| Overall predicted degree of effect after mitigation to surface water quality (Processing and Tailings Management Area) | PC | L | LA | LT | S | RLT | H | NSMI | | M |

*Surface Water Quality continued*

| Magnitude | Geographic Extent | Duration |
|---|---|---|
| *Refers to the severity of the adverse impact.*<br><br>**N** Negligible: there is no detectable change from baseline conditions.<br><br>**L** Low: the magnitude of the effect differs from the average value for baseline condition, but is within the range of natural variation and/or well below a guideline or threshold value.<br><br>**M** Medium: The magnitude of effect differs from the average value for baseline conditions and approaches the limits of natural variation and/or is below or equal to a guideline or threshold value.<br><br>**H** High: The magnitude of effects is predicted to differ from baseline conditions and exceed guideline or threshold values so that there will be a detectable change beyond the range of natural variation (i.e., change of state from baseline conditions). | Refers to the area that the adverse impact may cover.<br><br>**LO** Local: Effect is limited to the Project footprint.<br><br>**LA** Landscape: Effect extends beyond the Project footprint to the near or mid field receiving environment.<br><br>**R** Regional: Effect extends across the Regional Study Area.<br><br>**BR** Beyond Regional: Effect extends possibly across or beyond the province. | Refers to the length of time an adverse impact may occur.<br><br>**S** Short-term: Effect lasts approximately 1 year or less.<br><br>**M** Medium-term: Effect lasts between 1-11 years.<br><br>**L** Long-term: Effect lasts between 12-70 years.<br><br>**FF** Far Future: Effect lasts more than 70 years. |
| Note: * includes the impacts on the following fish species: Bull trout (PTMA Only), Dolly Varden, Rainbow Trout/Steelhead, Pacific Salmon and aquatic habitat. | | |

**Fish And Fish Habitat**

| Project Effect | Phase of Project | Criteria for Determining Significance | | | | | | Analysis | Likelihood | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Magnitude | Extent | Duration | Frequency | Reversibility | Context | Significance | Probability | Confidence |
| Loss and Degradation of In-stream and Associated Riparian Habitat | C,O,CL | M | LO to LA | M to FF | O to C | RST | N to H | NSMO | H | M |
| Overall fish habitat loss and alteration (Processing and Tailings Management Area and Mine Site) | PC | M | LA | S | O | RST | N | NSMO | H | M |
| Overall effect on Dolly Varden (direct mortality through removal and relocation of Dolly Varden in the TMF area) | C | M | LA | S | O | IR | N | NSMO | M | M |

**Magnitude**

*Refers to the severity of the adverse impact.*

**N** Negligible: There is no detectable change from baseline conditions.

**L** Low: the magnitude of the effect differs from the average value for baseline condition, but is within the range of natural variation and well below a guideline or threshold value.

**M** Medium: The magnitude of effect differs from the average value for baseline conditions and approaches the limits of natural variation, but below or equal to a guideline or threshold value.

**H** High: The magnitude of effects is predicted to differ from baseline conditions and exceed guideline or threshold values so that there will be a detectable change beyond the range of natural variation (i.e., change of state from baseline conditions).

**Geographic Extent**

*Refers to the area that the adverse impact may cover.*

**LO** Local: Effect is limited to the Project footprint.

**LA** Landscape: Effect extends beyond the Project footprint to a broader watershed area.

**R** Regional: Effect extends across the Regional Study Area.

**BR** Beyond Regional: Effect extends possibly across or beyond the province.

**Duration**

*Refers to the length of time an adverse impact may occur.*

**S** Short-term: Effect lasts approximately 1 year or less.

**M** Medium-term: Effect lasts between 1-11 years.

**L** Long-term: Effect lasts between 12-70 years.

**FF** Far Future: Effect lasts more than 70 years.

**Wetlands**

| Project Effect | Phase of Project | Criteria for Determining Significance | | | | | | Analysis | Likelihood | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Magnitude | Extent | Duration | Frequency | Reversibility | Context | Significance | Probability | Confidence |
| Loss of wetland in Tailing Management Facility | C,O | H | LO | FF | S | IR | N | NSMO | H | H |
| Loss of wetland | C,O | N to L | LO | FF | S | IR | N | NSMI | H | H |
| Loss, alteration, or degradation of hydrological, ecological habitat, and biochemical functions in Tailings Management Facility | C,O | M | R | FF | S | IR | N | NSMO | H | H |
| Loss, alteration, or degradation of hydrological, ecological, habitat and biochemical functions | C,O | N | R | FF | S | IR | N | NSMI | H | H |
| Overall residual effect in Tailings Management Facility | PC | H | LO to LA | FF | S | IR | N | NSMO | H | H |
| Overall residual effect | PC | N to M | LO to LA | FF to P | S | IR | N | NSMO | H | H |

**Magnitude**

Refers to the severity of the adverse impact.

**N** Negligible: No or very little detectable change from baseline conditions. For loss of wetland extent and function this is < 1% of total loss.

**L** Low: Differs from average value for baseline conditions to a small degree. For loss of wetland extent and function this is 1% to 25% of total loss.

**M** Medium: Differs substantially from the average value for baseline conditions and approaches the limits of natural variation. For loss of wetland extent and function this is >25% to 70% of total loss.

**H** High: Differs substantially from baseline conditions, resulting in a detectable change beyond the range of natural variation. For loss of wetland extent and function this is >75% of total loss.

**Geographic Extent**

Refers to the area that the adverse impact may cover.

**LO** Local: Effect is limited to within a 100m buffer of the immediate Project footprint.

**LA** Landscape: Effect is limited to a broader area but still remains tied to the Project footprint.

**R** Regional: Effect extends across the broader region (e.g., Regional Study Area, multiple watersheds, etc.).

**BR** Beyond Regional: Effect extends beyond the regional scale, and may extend across or beyond the province.

**Duration**

Refers to the length of time an adverse impact may occur.

**S** Short-term: Effect lasts approximately 1 year or less.

**M** Medium-term: Effect lasts between 1-5 years.

**L** Long-term: Effect lasts between 6-40 years.

**FF** Far Future: Effect lasts more than 40 years.

**P** Permanent: Effect is permanent.

**Moose**

| Project Effect | Phase | Criteria for Determining Significance | | | | | | Analysis | Likelihood | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Magnitude | Extent | Duration | Frequency | Reversibility | Context | Significance | Probability | Confidence |
| Habitat Loss | C | M | LO | FF | S | IR | H | NSMO | H | M |
| Disruption of Movement (Treaty Creek Access Road and Tailings Management Facility) | C | L | LA | FF | S | RLT | H | NSMI | M | L |
| Direct Mortality (Treaty Creek Access Road and Coulter Creek Access Road) | C | L | LA | FF | S | RLT | H | NSMI | M | M |
| Indirect Mortality (Treaty Creek Access Road and Coulter Creek Access Road) | C | L | LA | FF | S | RLT | H | NSMI | L | L |
| Chemical Hazard (Tailings Management Facility) | PC | L | LO | FF | S | RLT | H | NSMI | M | M |
| Overall residual effect | C | M | LA | FF | S | RLT | H | NSMO | M | M |

**Magnitude**

**N** Negligible: No detectable change from baseline conditions.

**L** Low: Differs from average value for baseline conditions but is within the range of natural variation of the local population and well below a guideline or threshold value.

**M** Medium: The magnitude of effect differs from the average value baseline conditions and approaches the limits of natural variation of the local population, but below or equal to a guideline or threshold value.

**H** High: The magnitude of effect is predicted to differ from baseline conditions and exceed guideline or threshold values so that there will be a detectable change beyond the range of natural variation of the local population (i.e. change of state from baseline conditions).

**Geographic Extent**

**LO** Local Effect is limited to the project footprint (e.g., within a 300m buffer) and/or to individuals within the buffer.

**LA** Landscape: Effect extends beyond the project footprint to a broader watershed area, but remains tied into the footprint and/or to individuals within that watershed.

**R** Regional: Effect extends across the Regional Study Area and/or the population.

**BR** Beyond Regional: Effect extends possibly across or beyond the province and/or the population.

**Duration**

**S** Short-term: Effect lasts approximately 1 year or less.

**M** Medium-term: Effect lasts between 1-11 years.

**L** Long-term: Effect lasts between 12-70 years.

**FF** Far Future: Effect lasts more than 70 years.

**Mountain Goat**

| Project Effect | Phase | Criteria for Determining Significance | | | | | | Analysis | Likelihood | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Magnitude | Extent | Duration | Frequency | Reversibility | Context | Significance | Probability | Confidence |
| Habitat Loss (Mine Site) | C | M | LO | FF | S | IR | N | NSMO | H | H |
| Disruption of Movement (Mine Site) | C | L | LO | L | S | RLT | N | NSMI | M | L |
| Sensory Disturbance (Mine Site) | C | M | LA | L | R | RST | N | NSMO | M | L |
| Direct Mortality (Controlled Avalanche) | C | N | LA | L | S | RLT | N | NSMI | L | L |
| Indirect Mortality (Project Roads) | CL | L | LA | FF | S | RLT | N | NSMI | L | L |
| Chemical Hazard (Mine Site) | C | L | LA | FF | C | RLT | N | NSMI | M | L |
| Overall residual effect | C | M | LA | FF | S | RLT | N | NSMO | M | M |

**Magnitude**

**N** Negligible: No detectable change from baseline conditions.

**L** Low: Differs from average value for baseline conditions but is within the range of natural variation of the local population and well below a guideline or threshold value.

**M** Medium: The magnitude of effect differs from the average value baseline conditions and approaches the limits of natural variation of the local population, but below or equal to a guideline or threshold value.

**H** High: The magnitude of effect is predicted to differ from baseline conditions and exceed guideline or threshold values so that there will be a detectable change beyond the range of natural variation of the local population (i.e. change of state from baseline conditions).

**Geographic Extent**

**LO** Local Effect is limited to the project footprint (e.g., within a 300m buffer) and/or to individuals within the buffer.

**LA** Landscape: Effect extends beyond the project footprint to a broader watershed area, but remains tied into the footprint and/or to individuals within that watershed.

**R** Regional: Effect extends across the Regional Study Area and/or the population.

**BR** Beyond Regional: Effect extends possibly across or beyond the province and/or the population.

**Duration**

**S** Short-term: Effect lasts approximately 1 year or less.

**M** Medium-term: Effect lasts between 1-11 years.

**L** Long-term: Effect lasts between 12-70 years.

**FF** Far Future: Effect lasts more than 70 years.

**Grizzly Bear**

| Project Effect | Phase | Criteria for Determining Significance | | | | | | Analysis | Likelihood | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Magnitude | Extent | Duration | Frequency | Reversibility | Context | Significance | Probability | Confidence |
| Habitat Loss | C | L | LO | FF | S | IR | N | NSMI | H | M |
| Disruption of Movement | C | L | LA | FF | S | RLT | N | NSMI | M | L |
| Direct Mortality (Treaty Creek Access Road and Coulter Creek Access Road) | C | L | LA | L | S | RLT | N | NSMI | M | M |
| Indirect Mortality (Treaty Creek Access Road and Coulter Creek Access Road) | CL | L | LA | FF | S | RLT | N | NSMI | M | M |
| Attractants (Camps and Project Roads) | C | L | LO | FF | S | RLT | N | NSMI | H | M |
| Overall residual effect | C | M | LA | FF | S | RLT | N | NSMO | M | M |

**Magnitude**

**N** Negligible: No detectable change from baseline conditions.

**L** Low: Differs from average value for baseline conditions but is within the range of natural variation of the local population and well below a guideline or threshold value.

**M** Medium: The magnitude of effect differs from the average value baseline conditions and approaches the limits of natural variation of the local population, but below or equal to a guideline or threshold value.

**H** High: The magnitude of effect is predicted to differ from baseline conditions and exceed guideline or threshold values so that there will be a detectable change beyond the range of natural variation of the local population (i.e. change of state from baseline conditions).

**Geographic Extent**

**LO** Local Effect is limited to the project footprint (e.g., within a 300m buffer) and/or to individuals within the buffer.

**LA** Landscape: Effect extends beyond the project footprint to a broader watershed area, but remains tied into the footprint and/or to individuals within that watershed.

**R** Regional: Effect extends across the Regional Study Area and/or the population.

**BR** Beyond Regional: Effect extends possibly across or beyond the province and/or the population.

**Duration**

**S** Short-term: Effect lasts approximately 1 year or less.

**M** Medium-term: Effect lasts between 1-11 years.

**L** Long-term: Effect lasts between 12-70 years.

**FF** Far Future: Effect lasts more than 70 years.

**Western Toad**

| Project Effect | Phase | Criteria for Determining Significance | | | | | | Analysis | Likelihood | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Magnitude | Extent | Duration | Frequency | Reversibility | Context | Significance | Probability | Confidence |
| Direct Mortality (Process and Tailings Management Area, Coulter Creek Access Road, Treaty Creek Access Road) | C | L | LO | L | S | RLT | H | NSMI | M | M |

**Magnitude**

**N** Negligible: No detectable change from baseline conditions.

**L** Low: Differs from average value for baseline conditions but is within the range of natural variation of the local population and well below a guideline or threshold value.

**M** Medium: The magnitude of effect differs from the average value baseline conditions and approaches the limits of natural variation of the local population, but below or equal to a guideline or threshold value.

**H** High: The magnitude of effect is predicted to differ from baseline conditions and exceed guideline or threshold values so that there will be a detectable change beyond the range of natural variation of the local population (i.e. change of state from baseline conditions).

**Geographic Extent**

**LO** Local Effect is limited to the project footprint (e.g., within a 300m buffer) and/or to individuals within the buffer.

**LA** Landscape: Effect extends beyond the project footprint to a broader watershed area, but remains tied into the footprint and/or to individuals within that watershed.

**R** Regional: Effect extends across the Regional Study Area and/or the population.

**BR** Beyond Regional: Effect extends possibly across or beyond the province and/or the population.

**Duration**

**S** Short-term: Effect lasts approximately 1 year or less.

**M** Medium-term: Effect lasts between 1-11 years.

**L** Long-term: Effect lasts between 12-70 years.

**FF** Far Future: Effect lasts more than 70 years.

**Current Use of Lands and Resources – Aboriginal Groups**

| Project Effect | Phase of Project | Criteria for Determining Significance | | | | | | Analysis | Likelihood | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Magnitude | Extent | Duration | Frequency | Reversibility | Context | Significance | Probability | Confidence |
| Harvesting of mountain goat: restricted access, noise disturbance and functional habitat loss in Mine Site Area | C,O | L | LO | L | C | RLT | H | NSMI | M | M |
| Subsistence: restricted access to subsistence areas in the Processing and Tailings Management Area | C,O,CL,PC | L | LA | M | C | RLT | N | NSMI | H | M |
| Trapping: restricted access to trap lines 617T015 and 617T011 in the Processing and Tailings Management Area | C,O,CL,PC | H | LO | FF | C | IR | N | NSMO | H | H |
| Fishing practices: fish resources diminished downstream of Processing and Tailings Management Area from reduction in water quality | C,O,CL,PC | L | LA | L | C | RLT | H | NSMI | M | M |
| Harvesting of moose: increased traffic along Highway 37/37A | C,O,CL | M | R | FF | S | RLT | H | NSMO | M | L |

**Magnitude**

*Refers to the severity of the adverse impact.*

**N** Negligible: There is no detectable change from baseline conditions.

**L** Low: The magnitude of the effect differs from the average value for baseline conditions, but the activity could be practiced in the same or similar manner as before.

**M** Medium: The magnitude of the effect differs from the average value for baseline conditions and preferred options for practicing the activity may be lost or modified.

**H** High: the magnitude of the effect differs from baseline conditions and the activity may be impacted over a broad area or no longer practiced.

**Geographic Extent**

*Refers to the area that the adverse impact may cover.*

**LO** Local: Effect is limited to the immediate Project footprint.

**LA** Landscape: Effect extends beyond the footprint to a broader watershed area.

**R** Regional: Effect extends across the Regional Study Area.

**BR** Beyond Regional: Effect extends possibly across or beyond the province.

**Duration**

*Refers to the length of time an adverse impact may occur.*

**S** Short-term: Effect lasts approximately 1 year or less.

**M** Medium-term: Effect lasts between 1-11 years.

**L** Long-term: Effect lasts between 12-70 years.

**FF** Far Future: Effect lasts more than 70 years.

**Human Health**

| Project Effect | Phase of Project | Criteria for Determining Significance | | | | | | Analysis | Likelihood | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Magnitude | Extent | Duration | Frequency | Reversibility | Context | Significance | Probability | Confidence |
| Health effects from surface water: human health effects due to ingestion of metals from untreated water from downstream of Tailings Management Facility and the Mine Site during Operation to Closure | O,CL | N | I/H | S | S | RLT | H | NSMI | L | L to M |
| Health effects from surface water: human health effects due to ingestion of metals from untreated water from down steam of Tailings Management Facility and the Mine Site during Post-Closure | PC | L | I/H | S | S | RLT | H | NSMI | L | L to M |
| Health effects from air quality: health effects from emission of $NO_2$, $SO_2$, CO, TSP, $PM_{2.5}$, and $PM_{10}$ | O | L | CO | FF | R | RLT | H | NSMI | L | M |
| Health effects from air quality: increase In hazard quotient for metal inhalation | O | L | CO | FF | R | RLT | H | NSMI | L | M |
| Health effects from air quality: increase in incremental lifetime cancer risk due to an increase in concentration of metals and $PM_{2.5}$ and risk of excess mortality due to an increase in concentrations of $PM_{2.5}$ | C,O | L | CO | FF | R | RLT | H | NSMI | L | M |
| Health effects from country foods: human health effects due to consumption of country foods | O, CL,PC | L | I/HH | S | S | RST | H | NSMI | L | L to M |
| Overall predicted degree of effect after mitigation to human health | PC | L to N | I/HH | ST | S | RST | H | NSMI | L | M |

**Magnitude**

*Refers to the severity of the adverse impact.*

**N** Negligible: There is no detectable change from baseline conditions health conditions.

**L** Low: The magnitude of the effect differs from the average value for baseline conditions, but is within the range of natural variation and well below a threshold or a guideline.

**M** Medium: The magnitude of effect differs from the average value for baseline conditions and approaches the limits of natural variation, but below or equal to a guideline or threshold value.

**H** High: the magnitude of effect differs from baseline conditions and exceed guideline or threshold values so that there will be a detectable change beyond the range of natural variation.

**Geographic Extent**

*Refers to the area that the adverse impact may cover.*

**I/HH** Individual/Household: Effect is limited to a few individuals, families or households.

**C** Community: Effect extends to a community level.

**R/A** Regional/Aboriginal: Effect extends across the broader regional community, or across one or more First Nations group(s).

**BR** Beyond Regional: Effect extends possibly across or beyond the province.

**Duration**

*Refers to the length of time an adverse impact may occur.*

**S** Short-term: Effect is limited to a few individuals, families or households.

**M** Medium-term: Effect lasts between 2 weeks and 1 year.

**L** Long-term: Effect lasts between 2 weeks and 1 year.

**FF** Far Future: Effect lasts a lifetime.

**Navigable Waters**

| Project Effect | Residual Environmental Effects Characteristics | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Phase | Magnitude | Extent | Duration | Frequency | Reversibility | Context | Significance | Confidence |
| Navigable Waters: effects on navigational safety and access | C,O,CL,PC | N to L | LO | S | S | RST | N | NSMI | H |

**Magnitude**

**N** Negligible: There is no detectable change from baseline conditions.

**L** Low: The magnitude of the effect differs from the average value for baseline conditions, but is within the range of natural variation and well below a guideline or threshold value.

**M** Medium: The magnitude of effect differs from the average value for baseline conditions and approaches the limits of natural variation, but below or equal to a guideline or threshold value.

**H** High: the magnitude of effect differs from baseline conditions and exceed guideline or threshold values so that there will be a detectable change beyond the range of natural variation (i.e., change of state from baseline conditions).

**Geographic Extent**

**LO** Local: Effect is limited to the immediate Project footprint.

**LA** Landscape: Effect extends beyond the footprint to a broader watershed area.

**R** Regional: Effect extends across the Regional Study Area.

**BR** Beyond Regional: Effect extends possibly across or beyond the province.

**Duration**

**S** Short-term: Effect lasts approximately 1 year or less.

**M** Medium-term: Effect lasts between 1-11 years.

**L** Long-term: Effect lasts between 12-70 years.

**FF** Far Future: Effect lasts more than 70 years.