



Screening Report and Recommendation

Kudz Ze Kayah Project Project Number 2017-0083

October 13th, 2020.

Prepared by
YESAB Executive Committee
Yukon Environmental and Socio-economic Assessment Board

Suite 200-309 Strickland Street
Whitehorse, Yukon, Y1A 2J9
Tel: 867 668-6420
Fax: 867 668-6425

This page left intentionally blank

Executive Summary

This Screening Report contains the final recommendations of the Yukon Environmental and Socio-economic Assessment Board (YESAB) Executive Committee's screening of the Kudz Ze Kayah project (the Project) proposed by BMC Minerals (the Proponent). The purpose of the proposed Project is the construction, operation, and closure of a metal mine with both an open pit and underground operations. The Project, after two years of construction, will process two million tonnes (metric) of ore annually, producing 180 000 tonnes of zinc, 60 000 tonnes of copper, and 35 000 tonnes of lead concentrates each year of operations. Operations are proposed over 10 years. From construction until the conclusion of post-closure monitoring, activities will occur over a span of approximately 38 years.

The *Yukon Environmental and Socio-economic Assessment Act* (YESAA) directs the Executive Committee to determine if the Project will have significant adverse environmental or socio-economic effects in or outside Yukon and if these effects can be mitigated by terms and conditions; and provide a recommendation to the Project's Decision Bodies – Government of Yukon, Natural Resources Canada, and Fisheries and Oceans Canada. YESAA requires that Decision Bodies consider the recommendation, and issue a decision document, prior to taking any action that would allow a project to proceed.

This report:

- Describes the Project and the screening process;
- Considers information relevant to the assessment and available to the Executive Committee;
- Characterizes potential Project impacts and determines if potential impacts are significant; and,
- Outlines terms and conditions that mitigate likely significant adverse environmental and/or socio-economic impacts.

The Executive Committee has employed a “valued component” assessment methodology to assess the environmental and socio-economic effects of the Kudz Ze Kayah project. The Executive Committee has identified the following environmental and socio-economic valued components for the Project: water resources, wildlife, traditional land use, economy, human health and safety, community wellbeing, heritage resources and climate.

The Executive Committee has determined that the Project will result in significant adverse effects to water resources, wildlife, traditional land use, economy, and human health and safety. These significant adverse effects can be eliminated, controlled or reduced through the application of mitigation measures recommended by the Executive Committee. A full list of these mitigations can be found below. Consequently, the Executive Committee recommends the Project proceed under s. 58(1)(b) of YESAA.

In addition, the Executive Committee recommends that additional monitoring take place to help inform the regulatory process, future assessments, aid in adaptive management, and reduce

uncertainty in later stages of the Project. These recommendations are made under s. 110 of YESAA and address wildlife and socio-economic impacts.

RECOMMENDED MITIGATIONS

In order to reduce, control, or eliminate likely significant adverse effects, the Executive Committee recommends the following implementations under s. 58(1)(b) of YESAA:

- 1) The proponent shall update the geochemical modelling during operations to inform detailed design of the cover systems, with the aim of reducing acid production and COPI loadings from storage facilities.
- 2) The proponent shall advance development of the WTP design and confirm expected performance for all relevant COPIs during licensing to optimize design and ensure timely implementation.
- 3) The proponent shall conduct pilot studies for in-situ pit treatment and the CWTS during operations to confirm their expected performance for all relevant COPIs, optimize their respective designs and ensure timely implementation.
- 4) The Proponent shall implement additional treatment options if the proposed CWTS cannot be demonstrated to reduce COPI concentrations to background levels consistently.
- 5) The Proponent shall revise WQOs as necessary to ensure they are based on the most recent toxicological information and guidance from CCME and BCMOE.
- 6) The Proponent shall establish effluent quality standards for the Project based on achieving WQOs in the receiving environment in Geona Creek (KZ-37) and in Finlayson Creek (KZ-15).
- 7) The Proponent shall conduct ongoing investigations into WRSA liners and cover systems to ensure that the performance objectives used in the water quality model are achieved during all Project phases.
- 8) The Proponent shall commit to ongoing geochemical studies for WRSA A and B, and studies to optimize the performance of the proposed CWTS to address the potential for acidic conditions to develop in the future.
- 9) The Proponent shall ensure the WTP remains operational until it has been demonstrated that surface water from the site meets WQOs for the receiving environment in Geona Creek (KZ-37) and in Finlayson Creek (KZ-15).
- 10) Government of Yukon shall oversee the establishment and maintenance of an oversight body, financed by the Proponent, comprised of participants representing the Proponent, Government of Yukon, LFN, and RRDC.

The proponent will be required to include in the wildlife management plan (a component of the QML, any outputs and actions agreed to by the oversight body. These components of the plan will be updated as required based on the seasonal nature of the outputs or actions.

The oversight body shall require the implementation of mitigations, and monitoring of their effectiveness, considering the following mitigation and management strategies:

- a. In general:
 - i. When and how to apply mitigation measures pertaining to caribou referred to in Appendix A (Proponent commitments).
 - ii. The prioritization of methods for reducing sensory disturbance.
 - iii. The establishment of objectives, methods and prioritization for effectiveness monitoring.
 - iv. The identification of triggers and corrective actions within the adaptive management plan.
 - v. The identification of additional mitigations that may be necessary to reduce adverse effects based on new knowledge.
 - vi. Educational and outreach activities regarding caribou in relation to the project.

- b. On a seasonal or shorter duration basis:
 - i. The implementation of daily timing windows for or temporary suspensions of blasting and crushing
 - ii. The implementation of daily timing windows for or temporary suspensions of truck transportation
 - iii. The limiting of speeds on the access road
 - iv. Restrictions on flights based on daily timing windows
 - v. Modification of flight paths
 - vi. Suspension of helicopter use
 - vii. The use of convoys for transportation
 - viii. The intervals between and location of breaks in snow berms on the access road.

11) Government of Yukon shall, in collaboration with affected First Nations and communities, develop a comprehensive long-term range management plan for the FCH based on the following principles:

- Be informed by best available scientific and traditional knowledge
- Acknowledge and be guided by people's relationship with caribou
- Help to promote the social, economic, and cultural well-being of people in the Yukon
- Promote transparency in decisions made during the range planning process
- Respect the need for a collaborative process for co-management of resources with affected First Nations.
- Recognize the potential for and encourage local community engagement and involvement in implementing the range plan

The plan should include the following sections in relation to the FCH:

- Management principles and goal:** Identification of the principles underlying the planning process and the management goal.
- Current conditions:** Best available information will be used to identify the health, trend and condition of the population and its habitat.
- Limiting factors:** Best available information will be used to identify the factors limiting the population including: habitat, predation, climate, and human activities (harvest and land-use).
- Future conditions:** Identify scenarios and projections of likely sources and locations of future impacts from development, wildfire, and climate, and their implications for the population and its habitat, including consideration of predation.
- Management objectives and thresholds:** Identify specific management objectives related to population and habitat, and thresholds of change in population and habitat related to achieving these objectives.
- Management tools and actions:** Identify specific population and habitat management tools and actions (voluntary and non-voluntary) required to achieve objectives, and the relationship of these tools and actions to community-based, regulatory and land-use planning processes.
- Implementation:** Describe how the plan will be implemented in a collaborative and timely manner.
- Monitoring:** Identify ongoing monitoring needs including outstanding questions and uncertainties faced in developing and implementing the range plan, and develop time-bound learning plans to address key uncertainties.
- Adaptive management and review:** Identify how monitoring results and new knowledge will be incorporated into revisions to the plan.
- Communication:** Establish methods of ongoing communication to ensure that advice, guidance, feedback, monitoring results, and implementation results can be shared easily and widely with communities and decision makers.

- 12) The Proponent shall ensure that LFN and RRDC have opportunities to participate in and influence the development of environmental and socio-economic management plans and closure objectives developed for the Project to ensure that potentially affected First Nations can collaboratively design, collect, report, manage and communicate the results of the monitoring programs to their citizens.
- 13) The Proponent shall ensure that LFN has the opportunity to be part of the Proponent–Kaska environmental, cultural and heritage management program.
- 14) The Proponent shall sponsor on-the-land culture activities that promote sharing of Traditional Knowledge and practices in the Project area for the duration of construction and operation of the mine. The camp details, location and structure will be developed by potentially affected First Nations and span construction, operational and closure phases of the Project.
- 15) The Proponent shall provide allowance for up to 14 days of unpaid leave to all Yukon First Nation employees to allow for the exercising of Aboriginal rights related to:
 - a. the pursuit of traditional land use activities; this will be 14 days to allow sufficient time on the land; and attending culturally important events (potlaches, dances, ceremonies, culture camps).
- 16) Proponent shall maintain in trust a transition fund with sufficient funds to ensure, in the event of an unscheduled closure:
 - a. Funds for education and retraining;
 - b. Maintenance of the employee assistance program (EAP); and
 - c. Payment of back wages and severance

for affected employees from Watson Lake and Ross River employed by the project at time of closure. The amount of funds and their administration shall be conducted by a suitable party. The administrator shall have a local representative in either Ross River or Watson Lake to aid in ensuring the fund meets its objectives.
- 17) Shall ensure staff have access to money management and budgeting information and resources through on-line tools.
- 18) Recruitment for care and maintenance positions shall be done with preference for former qualified mine employees by the body overseeing care and maintenance.
- 19) The setting of security shall take into account the potential for care and maintenance costs required to maintain environmental protections over a period between a temporary closure and decommissioning.

- 20) Security requirements shall take into consideration the potential for early unscheduled closure and the need for care and maintenance requirements to maintain environmental safeguards prior to decommissioning.
- 21) The Proponent shall develop mandatory, regular harassment prevention training in consultation with a qualified expert, to be delivered to all the Proponent's employees, contractors and consultants working at the site.
- 22) The Proponent shall ensure that human resource staff complete training to enable them to effectively support employees who disclose workplace harassment. In order to increase reporting of sexual harassment and assault, human resource staff shall provide all new staff with information about ways in which they may best record and provide evidence of harassment or bullying and what happens after they make a disclosure of workplace harassment and how they will be protected from reprisals.
- 23) Proponent shall modify their proposed Mentor program for Yukon First Nations employees¹ to:
- ensure that women have access to a mentor or supervisor who regularly checks in to address any negative experiences related to the male-dominated work environment, and who pays special attention to potential cases of abuse;
 - develop a formal feedback process to ensure that enquiries are regularly made to First Nations employees to ensure that they are able to voice concerns and have addressed any negative experiences; and
 - involve both LFN and RRDC in further developing this Program to ensure that it meets the needs of First Nation employees.
- 24) The Proponent shall, in consultation with a qualified expert and both LFN and RRDC, develop gender appropriate and gender- and sexuality-specific policies and processes which promote a safe, respectful and inclusive environment for women and gender and sexual minorities.
- 25) The Proponent shall develop, with a qualified expert, an Anti-Harassment and Bullying Policy that outlines processes and actions to address any harassment or bullying which may take place within the Project's scope.
- 26) The Proponent shall ensure that the on-site First Aid Technician or Emergency Medical Technician is trained in Mental Health First Aid and/or has formal mental health training to provide short-term or crisis support at the mine site, referrals to other mental wellness supports or navigation to other systems².

¹ YOR Document 2017-0083-200-1.

² Examples of Mental First Aid courses can be found at the following websites: <https://www.mhfa.ca/en/course-types> and <https://www.redcross.ca/training-and-certification/course-descriptions>.

27) The Proponent shall ensure that on-site employees have the ability to utilize the EAP services available (i.e. ensure that a private phone line or Internet is available to discretely reach EAP services).

28) To address and mitigate impacts to employees who are or become victims of domestic abuse, the Proponent must create a policy that:

- outlines clear procedures for the workplace to work with affected employees and provide appropriate resources and support;
- plans for and addresses safety concerns that affected employees may have while at work to ensure all workers are safe from threats of domestic violence; and
- includes a personal safety plan for employees suffering from domestic violence.

29) The Proponent shall inform all BMC employees' that their eligible dependents have access to the Employee Assistance Plan (EAP).

30) The Proponent shall develop standards for behavior at work and codes of conduct against sexual harassment and gender-based violence on the job site and in the broader community, including standards/codes of conduct in relation to the sex trade, and shall distribute education and awareness campaign materials on gender-based violence.

RECOMMENDED MONITORING

Under s.110 of YESAA, the Executive Committee recommends the following effects monitoring programs:

- A. The Proponent shall implement water quality monitoring of COPIs as early as possible beneath storage facilities and beneath their respective covers. Monitoring shall continue through operations and closure phases.
- B. The Proponent shall develop and implement adaptive management measures based on monitoring for the onset of acidic conditions that allows for early detection, management, and mitigation of acidic conditions and/or ML developing on-site.
- C. The Proponent shall implement, in collaboration with Government of Yukon, a survey program to monitor:
 - a. Caribou distribution in the Project area during the post-calving.
- D. Government of Yukon shall implement a range wide survey program to monitor:
 - a. Caribou herd composition and distribution during the rut period.
 - b. Caribou distribution during late winter.
 - c. Caribou distribution and movement in spring.
- E. That a survey program be instituted to monitor moose during late winter from construction through closure stages of the project. This survey program shall be designed through collaboration with affected First Nations.
- F. The Government of Yukon or a delegate body shall establish a monitoring program, after consulting with LFN, RRDC, LAWS, and Yukon Status of Women Council (YSWC) to measure potential project effects against pre-project baseline data. This program shall determine the extent to which the Project's effects are associated with violence against women (with special consideration for Indigenous women) and gender and sexual minorities in Ross River, Watson Lake, and Whitehorse. The development of the monitoring program should consider currently known effects but should also remain flexible so that unforeseen effects can be incorporated. The results of the monitoring shall be shared with LFN, RRDC, LAWS, and YSWC.

This page left intentionally blank

Contents

List of Figures	ix
List of Tables	x
Acronyms and Abbreviations.....	xi
1. Introduction	14
1.1 Legislative Context	14
Project Requires Assessment under YESAA	14
Project Requires an Executive Committee Screening	14
Decision Bodies Based on Authorizations Triggering Assessment.....	14
1.1 Screening Chronology	17
1.2 Consultation	20
Consultation by Proponent.....	20
Consultation by Decision Bodies and Crown Consultation	21
1.3 Matters To Be Considered.....	22
1.4 Determining the Significance of Adverse Effects.....	23
Contextual Factors	23
Effects Characterization Criteria.....	23
2. Project Overview.....	24
2.1 Proponent Information.....	24
2.2 Purpose and Description	24
2.3 Stages and Schedule	25
Construction Phase.....	25
Operations Phase	25
Decommissioning, Reclamation and Closure Phases	25
Post-Closure Phase	25
2.4 Location and Layout.....	25
2.5 Project Scope.....	29
3. Scope of Assessment	36
4. Views and Information.....	36
4.1 Comment Submissions.....	36
Adequacy Review Phase	36
Seeking Views and Information on the Proposal Phase	38

Seeking Views and Information on the Draft Screening Report Phase38

4.2 Technical Support.....39

 Reviewing the Project Proposal: Adequacy Phase.....39

 Reviewing Comments on the Proposal: Screening Phase.....40

 Drafting the Recommendation: Screening Phase.....40

 Finalizing the Recommendation: Screening Phase41

4.3 Relevant Assessments41

4.4 Relevant Studies and Research43

5. Water Resources45

5.1 Water Quality.....45

 Summary and Conclusion45

 Importance of Water Quality.....45

 Legislative and Management Setting46

 Context47

 Existing Conditions and Trends.....50

 Project Design52

 Effects Characterization61

 Significance Determination62

 Recommended Mitigations.....63

 Recommended Monitoring64

5.2 Water Quantity.....64

 Summary and Conclusion64

 Importance of Water Quantity64

 Legislative and Management Setting65

 Context66

 Existing Conditions and Trends.....66

 Project Design69

 Effects Characterization73

 Significance Determination80

5.3 Aquatic Life.....81

 Summary and Conclusion81

 Importance of Aquatic Life81

 Legislative and Management Setting81

Context83

Existing Conditions and Trends.....83

Project Design84

Effects Characterization90

Significance Determination94

Recommended Mitigations.....98

Recommended Monitoring98

6. Wildlife99

6.1 Finlayson Caribou Herd99

 Summary & Conclusion.....99

 Importance of Caribou.....99

 Legislative & Management Setting100

 Context102

 Existing Conditions and Trends.....106

 Project Design116

 Effects Characterization118

 Significance Determination122

 Recommended Mitigations and Monitoring123

6.2 Moose127

 Summary and Conclusion127

 Importance of Moose127

 Legislative and Management Setting127

 Context129

 Existing Conditions and Trends.....129

 Project Design133

 Effects Characterization134

 Significance Determination135

 Recommended Monitoring136

6.3 Grizzly Bears137

 Summary and Conclusion137

 Importance of Grizzly Bears137

 Legislative and Management Setting138

 Context138

Existing Conditions and Trends..... 140

Project Design 143

Effects Characterization 145

Significance Determination 147

6.4 Birds 148

 Summary and Conclusion 148

 Importance of Birds..... 148

 Legislative and Management Context 149

 Context 154

 Existing Conditions and Trends..... 156

 Project Design 157

 Project Effects..... 157

 Significance Determination 159

6.5 Furbearers..... 160

7. Traditional Land Use..... 160

 Summary and Conclusion..... 160

 Importance of Traditional Land Use..... 160

 Legislative and Management Setting 161

 Traditional Harvest..... 162

 Trapping 162

 Traditional Knowledge and Cultural Continuity..... 163

 Context..... 163

 The Kaska Dena Nation 163

 Kaska Way of Life 165

 Traditional Harvest..... 166

 Trapping 167

 Traditional Knowledge and Cultural Continuity 168

 Existing Conditions and Trends 171

 Traditional Harvest..... 171

 Trapping 172

 Traditional Knowledge and Cultural Continuity 173

 Project Design 174

 Effects Characterization 177

Overview.....	177
Traditional Harvest.....	177
Traditional Knowledge and Cultural Continuity.....	182
Significance Determination.....	185
Wildlife Harvest.....	185
Trapping.....	186
Traditional Knowledge and Cultural Continuity.....	186
Recommended Mitigations.....	188
8. Economy.....	189
8.1 Tourism.....	189
Summary and Conclusion.....	189
Importance of Tourism.....	189
Legislative and Management Setting.....	189
Existing Conditions and Trends.....	190
Project Design.....	191
Effects Characterization.....	191
Significance Determination.....	193
8.2 Impacts of Mine Closure.....	193
Summary and Conclusion.....	193
Importance of Mine Closure.....	194
Legislation and Regulatory Setting.....	194
Context.....	195
Current Conditions and Trends.....	195
Project Design.....	197
Effects Characterization.....	198
Significance Determination.....	198
Recommended Mitigations.....	199
8.3 Business Environment.....	200
Summary and Conclusion.....	200
Importance of Economic Diversity.....	200
Yukon Unemployment Rate Increasing.....	200
Unemployment Rates Higher Outside Whitehorse, Among First Nations Citizens.....	201
Pre-Pandemic Whitehorse Business Environment Healthy.....	201

Project Will Require Large Workforce201

Project Unlikely to Result in Reduced Economic Diversity202

9. Human Health and Safety202

9.1 Respiratory Health.....202

 Summary and Conclusion202

 Importance of Respiratory Health.....203

 Legislative and Management Setting203

 Context204

 Existing Conditions and Trends.....206

 Project Design207

 Effects Characterization209

 Significance Determination212

9.2 Noise212

 Summary and Conclusion212

 Importance of Ambient Noise Conditions213

 Legislative and Management Setting213

 Context214

 Existing Conditions and Trends.....214

 Project Design215

 Effects Characterization216

 Significance Determination217

9.3 Personal Safety217

 Summary and Conclusion217

 Importance of Personal Safety219

 Legislative and Regulatory Setting221

 Context222

 Current Conditions and Trends225

 Project Design228

 Effects Characterization229

 Significance Determination231

 Recommended Mitigations.....233

 Recommended Monitoring235

9.4 Project Engineering and Infrastructure.....235

Summary and Conclusion235

Importance of Effects of the Project Engineering and Infrastructure on Worker Safety and the Environment.....235

Legislative and Management Setting235

Context236

Existing Conditions and Trends.....237

Project Design238

Effects Characterization241

Significance Determination243

10. Community Wellbeing.....245

 10.1 Emergency Services.....245

 10.2 Traffic245

 10.3 Housing245

 Summary and Conclusion245

 Whitehorse Primarily Affected.....245

 Population Increases, Vacancy Rates and Rents.....246

 No Adverse Effects Anticipated.....247

11. Heritage Resources.....247

 Summary and Conclusion247

 Importance of Heritage Resources.....247

 Legislative and Regulatory Setting247

 Context248

 Current Conditions and Trends248

 Project Design249

 Effects Characterization249

 Determination of Significance.....250

12. Climate250

 12.1 Overview250

 12.2 Project’s Effects on Climate Change.....250

 Requests for Improvements to the Project251

 Global context required to gauge effect.....251

 Global context and potential for project-specific significant effects251

 Planning, Policy and Assessment252

13. Conclusion of the Assessment253
 13.1 Assessment Outcome.....253
 13.2 Recommended Mitigations253
 13.3 Recommended Monitoring.....260
14. Signatory Page.....261
15. References.....262

List of Figures

Figure 1: Project location in relation to the Kaska Traditional Territory	26
Figure 2: The Proposed Kudz Ze Kayah Project location	27
Figure 3: Project mine layout, Figure 4-2 of the Project proposal (the full extent of the proposed pits is seen in the dotted outline around ABM open pit Year 1).	28
Figure 4: Operations water management schematic	55
Figure 5: KZK surface water and hydrology stations (from 2018 Water Baseline)	67
Figure 6: KZK Project area sub-catchments (from Project proposal Section 4.10 Water Management).....	71
Figure 7: Predicted flow at KZ-13 by Project phase (from 2018 LOM WBM Report, Figure 5.9) 75	
Figure 8: Predicted flow at Geona Creek immediately downstream of the Project (KZ-9) by Project phase (from 2018 LOM WBM, Figure 5.1).....	77
Figure 9: Predicted flow at Geona Creek immediately upstream of its confluence with Finlayson Creek (KZ-37) by Project phase (from 2018 LOM WBM, Figure 5.3).....	77
Figure 10: Predicted flow at Finlayson Creek immediately downstream of its confluence with Geona Creek (KZ-15), by Project phase (from 2018 LOM WBM, Figure 5.5)	78
Figure 11: Predicted flow at Finlayson Creek at the Robert Campbell Highway (KZ-26), by Project phase (from 2018 LOM WBM, Figure 5.7).....	78
Figure 12: Fisheries offsetting plan from the project proposal	92
Figure 13: Finlayson Caribou Herd Seasonal Distribution and Habitat Ranges (figure 2-1 from the response to Information Request 6).	108
Figure 14: Finlayson Caribou Herd Suitable Habitat During Rut – From IR2 Response.	109
Figure 15: Finlayson Caribou Herd Suitable Habitat Post Calving – From IR2 Response	110
Figure 16: Patterns of winter presence for the Finlayson Caribou Herd, from Information Request 6 response.	112
Figure 17: Calves per 100 cows based on fall rut surveys, after most calf mortality is likely to have occurred – recruitment during the wolf control period is highlighted.....	113
Figure 18: Game Management Subzones near and overlapping the Project. The Project footprint is seen in GMS 10-07.....	115
Figure 19: Proponent Mitigation Measures as Listed in the Response to Information Request 6.	117
Figure 20: Winter habitat modelling in Game Management Subzone 10-7. Red indicates high-quality winter habitat, blue indicates low-quality. The purple line represents a 3 km buffer around the Project.....	130
Figure 21: Post-rutting habitat modelling in Game Management Subzone 10-7. Red indicates high-quality habitat, blue indicates low-quality. The purple outline represents a 3km buffer around the Project.....	132
Figure 22: Bear Assessment Units (BAU) in relation to the Project	142
Figure 23: State of the birds. Graph showing the (percentage) change in bird populations since 1970 for groups of species, grouped by where species overwinter.....	155
Figure 24: Traditional Territory of the Kaska Dena	164

List of Tables

Table 1: Scheduled activities proposed by the Project and requiring authorizations from DFO .15	15
Table 2: Scheduled activities proposed by the Project and requiring authorizations from NRCan	15
Table 3: Scheduled activities proposed by the Project and requiring authorizations from YG	15
Table 4: Assessment chronology during the Adequacy stage	17
Table 5: Assessment chronology during the Screening stage	18
Table 6: Activities included in project scope.	29
Table 7: Consultant teams, areas of focus and technical memos reviewing the Project proposal	39
Table 8: Consultant teams and areas of focus for reviewing comments on the project proposal	40
Table 9: Consultant teams, areas of focus and technical memos for drafting the Draft Screening Report.....	40
Table 10: Noted relevant previous assessments	42
Table 11: Constituents of potential interest in surface water.....	48
Table 12: Proposed mitigation measures for water quality	53
Table 13: Proposed waste rock classification	57
Table 14: Percent reduction of COPIs resulting from in-situ ABM lake treatment	59
Table 15: Conceptual schedule of completion of phased implementation of constructed wetland treatment system	60
Table 16: Proponent’s proposed mitigation measures for water quantity.....	73
Table 17: Water station location descriptions	76
Table 18: Table 5-1 from Information Request 6	107
Table 19: Estimated population of grizzly bears in various management units	143
Table 20: Conservation Strategy for Bird Conservation Region No. 4 recommended actions related to mining	152
Table 21: Conservation Strategy for Bird Conservation Region No. 4 recommended actions related to transportation	153
Table 22: Selected top activities completed by all visitors	190
Table 23: Criteria Air Contaminants	205
Table 24: Assumed air contaminants baseline concentrations	207
Table 25: Proposed mitigation measures for air quality	208
Table 26: Comparison of predicted CAC concentration with ambient air quality guidelines	210
Table 27: Proponent mitigation measures for noise	215

Acronyms and Abbreviations

'	Foot/Feet
2018 LOM WBM	2018 Life of Mine Water Balance Model
AEG	Alexco Environmental Group
AP	Acid Production Potential
ARD	Acid Rock Drainage
BAU	Bear Assessment Unit
BC	British Columbia
BCMOE	British Columbia Ministry of Environment
BCR	Bird Conservation Region
BGQ	Baseline Groundwater Quality
BMU	Bear Management Unit
CAAQS	Canadian Ambient Air Quality Standards
CAC	Criteria Air Contaminants
CaCO ₃	Calcium Carbonate
CCME	Canadian Council of Ministers of the Environment
CO	Carbon Monoxide
CO ₂	Carbon Dioxide
COPI	Constituents of Potential Interest
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CPUE	Catch per Unit Effort
CRCP	Conceptual Reclamation and Closure Plan
CWTS	Constructed Wetland Treatment System
dB	Decibel
dBa	Decibels, a-weighted
DFO	Fisheries and Oceans Canada
EC	Executive Committee
ECCC	Environment and Climate Change Canada
EDI	Environmental Dynamics Incorporated
ERCB	Energy Resource Conservation Board
FCH	Finlayson Caribou Herd
FI/FO	Fly-in / Fly-out
FOP	Fisheries Offsetting Plan
GBSA	Grizzly Bear Study Area
GHG	Greenhouse Gas
GJ	Gigajoule
GMS	Game Management Sub-zone
HDPE	High-density Polyethylene
HDV	Heavy Duty Vehicle
INAC	Indigenous and Northern Affairs Canada
kg	Kilogram
km	Kilometre
km ²	Square kilometre
kt	Kilotonne
LAWS	Liard Aboriginal Women's Society
LDV	Light Duty Vehicle

LFN	Liard First Nation
LGO	Low Grade Ore
LNG	Liquid Natural Gas
LSA	Local Study Area
LWMP	Lower Water Management Pond
m	Metre
m ²	Square Metre
m ³	Cubic Metre
MDMER	<i>Metal and Diamond Mine Effluent Regulations</i>
ML	Metal Leaching
MMIWG	Missing and Murdered Indigenous Women and Girls
MMU	Moose Management Unit
MOE	Ontario Ministry of the Environment
Mt	Million Tonnes
MW	Megawatt
NP	Neutralization Potential
NPC	Noise Pollution Control
NPMO	Northern Projects Management Office
NRCan	Natural Resources Canada
O ₃	Ozone
OGC	Oil and Gas Commission
PAG	Potentially Acid Generating
PHA	Permit Hunt Authorization
pm _{2.5}	Particulate Matter with diameter less than 2.5 micrometers
pm ₁₀	Particulate Matter with diameter less than 10 micrometers
ppbv	Parts-per Billion Volume – the concentration of units (volumetric) of parts per billion.
PPE	Personal Protective Equipment
ppm	Parts per Million
QMA	<i>Quartz Mining Act</i>
QML	Quartz Mining License
RCH	Robert Campbell Highway
ROM	Run of Mine
RRDC	Ross River Dena Council
RSA	Regional Study Area
RTC	Registered Trapping Concession
SARA	<i>Species at Risk Act</i>
SEPA	Socio-economic Participation Agreement
SO ₂	Sulphur Dioxide
SSWQO	Site-Specific Water Quality Objective
t	Tonne
TSP	Total Suspended Particulates
TSS	Total Suspended Sediment
UFA	Umbrella Final Agreement
UWMP	Upper Water Management Pond
VESEC	Valued Environmental or Socio-economic Component
WHO	World Health Organization
WL	Water License
WMP	Water Management Pond

WQB	Water Quality Baseline
WQO	Water Quality Objective
WRSA	Waste Rock Storage Area
WTP	Water Treatment Plant
YAAQS	Yukon Ambient Air Quality Standards
YESAA	<i>Yukon Environmental and Socio-economic Assessment Act</i>
YESAB	Yukon Environmental and Socio-economic Assessment Board
YG	Government of Yukon
YG EMR	Government of Yukon Department of Energy Mines and Resources
YSWC	Yukon Status of Women Council
µg/m ³	Micrograms per cubic metre

Part A

1. Introduction

1.1 Legislative Context

Project Requires Assessment under YESAA

Under s. 47(2)(c) of the *Yukon Environmental and Socio-economic Assessment Act* (YESAA), the Project requires an assessment under YESAA as the Project

- is located in Yukon;
- includes scheduled activities listed in column 1, Schedule 1 of the *Assessable Activities, Exceptions and Executive Committee Projects Regulations*, which are not excepted in column 2; and
- requires authorizations from government agencies to conduct those scheduled activities.

Tables 1, 2 and 3 list scheduled activities and authorizations required by the proposed Project.

Project Requires an Executive Committee Screening

When a project requires an assessment, the Proponent is to submit the project proposal to the Executive Committee (EC) for a screening in the event that the project involves an activity listed in Schedule 3 of the *Assessable Activities, Exceptions and Executive Committee Projects Regulations*. The Project involves an activity listed in Schedule 3, specifically item 3(a):

3. (the) construction, decommissioning or abandonment of
 - (a) a metal mine, other than a gold mine, with an ore production capacity of 1500 t/day or more

Decision Bodies Based on Authorizations Triggering Assessment

To conclude the screening process, the Yukon Environmental and Socio-economic Assessment Board's (YESAB) EC produces a set of recommendations for Decision Bodies. Decision Bodies complete the assessment process by issuing a decision document accepting, varying or rejecting the recommendations.

The authorizations or permissions required for proposed and assessable activities undertaken by the Proponent determine the Decision Bodies. Based on the proposed scheduled activities, there are three Decision Bodies for this Project: Fisheries and Oceans Canada (DFO), Natural Resources Canada (NRCan) and Government of Yukon (YG). Tables 1, 2, and 3 list the scheduled activities proposed by the Project, the required authorization and the Decision Body for that authorization.

Table 1: Scheduled activities proposed by the Project and requiring authorizations from DFO

Fisheries and Oceans Canada	
Scheduled Activity	Act & Authorization
Schedule 1, Part 10, item 2: <i>Destruction, disruption or harmful alteration of fish habitat.</i>	<i>Fisheries Act</i> s. 35(2) authorization

Table 2: Scheduled activities proposed by the Project and requiring authorizations from NRCan

Natural Resources Canada	
Scheduled Activity	Act & Authorization
Schedule 1, Part 2, item 1: <i>Construction, operation, modification, decommissioning or abandonment of, or other activity in relation to a magazine, within the meaning of section 2 of the Explosives Act.</i>	<i>Explosives Act</i> Explosives Permit

Table 3: Scheduled activities proposed by the Project and requiring authorizations from YG

Government of Yukon	
Scheduled Activity	Act & Authorization
Schedule 1, Part 1, item 1: <i>On other than an Indian reserve, construction, operation, modification, decommissioning or abandonment of, or other activity in relation to, a mine.</i>	<i>Quartz Mining Act</i> Quartz Mine Licence
Schedule 1, Part 6, item 11: <i>Construction, operation, modification, decommissioning or abandonment of, or other activity in relation to, a bridge.</i>	<i>Waters Act</i> Water License
Schedule 1, Part 8, item 1: <i>Construction, operation, modification, decommissioning or abandonment of a land treatment facility.</i>	<i>Environment Act</i> Land Treatment Facility Permit
Schedule 1, Part 8, item 8: <i>On other than an Indian reserve, construction, operation, modification, decommissioning or abandonment of, or other activity in relation to, a solid waste disposal facility.</i>	<i>Environment Act</i> Solid Waste Facility Permit
Schedule 1, Part 9, item 3: <i>Direct use of water.</i>	<i>Waters Act</i> Water License
Schedule 1, Part 9, item 4:	

<p><i>Construction, modification, decommissioning or abandonment of, or other activity in relation to, a watercourse crossing, other than one that is a bridge or is across navigable water.</i></p>	
<p>Schedule 1, Part 9, item 8: <i>Watercourse training — such as that for the purpose of erosion control or that which is by means of a channel or bank alteration, artificial accretion, spur, culvert or dock — but not including the diversion of a watercourse.</i></p>	
<p>Schedule 1, Part 9, item 10: <i>Diverting a watercourse or increasing the diversion capacity of an existing diversion.</i></p>	
<p>Schedule 1, Part 9, item 12: <i>Other than for an electrical power undertaking, the deposit of waste into water or in any other place under conditions in which the waste, or any other waste that results from the deposit, may enter water.</i></p>	
<p>Schedule 1, Part 11, item 1: <i>On other than an Indian reserve, quarrying, crushing or screening of minerals.</i></p>	<p><i>Environment Act Air Emissions Permit</i></p>
<p>Schedule 1, Part 11, item 2: <i>Operation of equipment capable of generating, burning or using heat energy.</i></p>	
<p>Schedule 1, Part 13, item 9: <i>On Crown land or settlement land, the establishment of a petroleum fuel storage facility.</i></p>	<p><i>Environment Act Authorization under Storage Tank Regulations</i></p>
<p>Schedule 1, Part 13, item 12: <i>On Crown land or settlement land, moving earth or clearing land using a self-propelled power-driven machine.</i></p>	<p><i>Territorial Lands Act Land Use Permit</i></p>
<p>Schedule 1, Part 13, item 16: <i>Operation, decommissioning, abandonment or expansion of a gravel or sand pit or stone quarry.</i></p>	<p><i>Environment Act Air Emissions Permit</i></p>
<p>Schedule 1, Part 13, item 18: <i>On Crown land or settlement land, cutting standing or fallen trees or removing fallen or cut trees.</i></p>	<p><i>Forest Resources Act Forest Resources Permit</i></p>
<p>Schedule 1, Part 13, item 19: <i>Starting an open fire to burn forest debris that has been piled or gathered using machinery.</i></p>	<p><i>Territorial Lands Act Burn Permit</i></p>

1.1 Screening Chronology

The chronology of the EC assessment is set out in Tables 4 and 5, which provide an outline of key assessment dates and stages. More detailed assessment information can be found on the YESAB Online Registry at www.yesabregistry.ca, or the YESAB Document Registry located at the YESAB Head Office in Whitehorse.

Table 4: Assessment chronology during the Adequacy stage

Proposal Submission and Adequacy Review Stage	
The Proponent submits Project proposal	March 17, 2017
The EC publishes its Adequacy Review Report requesting supplementary information	May 26, 2017 ³
The Proponent submits supplementary information in response to the Adequacy Review Report	July 5, 2017
The EC publishes its Adequacy Review Report 2 requesting supplementary information	August 4, 2017
The Proponent submits supplementary information in response to Adequacy Review Report 2	November 17, 2017
The EC determines the proposal is adequate as there is sufficient information to commence the screening	January 9, 2018
The EC determines that the Proponent has met the requirements for consultation with affected First Nations and communities under s. 50(3) of YESAA	

³ Amended June 9, 2017.

Table 5: Assessment chronology during the Screening stage

Screening Stage	
The EC screening commences	January 9, 2018
The EC issues the preliminary scope of the Project	January 15, 2018
The EC commences a public comment period to gather comment on the proposal	
The EC holds a public meeting in Watson Lake on the Project	March 7, 2018
The EC holds a public meeting in Ross River on the Project	March 8, 2018
The EC closes the public comment period	March 16, 2018
The EC issues a request for supplementary information, Information Request 3, delineating supplementary information needs in relation to water	April 9, 2018
The EC issues a request for supplementary information, Information Request 4, delineating supplementary information needs in relation to traditional land use and Traditional Knowledge	May 3, 2018
The Proponent submits supplementary information in response to Information Request 3	June 27, 2018
The EC determines that the Proponent's response to Information Request 3 is insufficient	July 30, 2018
The Proponent submits additional supplementary information in response to Information Request 3	October 16, 2018
The EC determines that the response to Information Request 3 is sufficient	November 27, 2018
The Proponent submits supplementary information in response to Information Request 4	December 17, 2018
The EC determines that the response to Information 4 is insufficient	January 19, 2019
The Proponent submits additional supplementary information in response to Information Request 4	July 2, 2019
The EC determines that the response to Information Request 4 is sufficient	July 23, 2019
The EC determines that it has sufficient information to draft a recommendation and commences drafting recommendations for the Draft Screening Report	
The EC completes its draft recommendations for the Draft Screening Report	November 20, 2019
The EC commences a public comment period to gather comment on the Draft Screening Report	

The EC temporarily suspends the assessment at the request of the proponent	January 16, 2020
The EC resumes the assessment	February 12, 2020
The EC extends the public comment periods to May 31, 2020	February 14, 2020
The EC issues Information Request 5	March 13, 2020
The Proponent submits additional supplementary information in response to Information Request 5	April 28, 2020
The EC determines that the response to Information Request 5 is sufficient	May 19, 2020
The public comment periods closes	May 31, 2020
The EC issues Information Request 6	June 23, 2020
The Proponent submits additional supplementary information in response to Information Request 6	July 24, 2020
The EC determines that the response to Information Request 6 is sufficient	August 12, 2020
The EC issues its final recommendations	October 21, 2020

1.2 Consultation

Consultation by Proponent

During the adequacy stage, the EC determined that, in its opinion, the Proponent had consulted with Ross River Dena Council (RRDC), Liard First Nation (LFN), and Town of Watson Lake and Ross River community residents in accordance with s. 50(3) of YESAA. The EC notified the Proponent in writing of its determination on January 9, 2018 (YOR 2018-0083-248-2).

FIRST NATIONS AND COMMUNITIES REQUIRING PROPONENT CONSULTATION

The Project, as proposed, is located within the Traditional Territories of the RRDC and LFN. The watersheds and the regional study areas (RSAs) identified by the Proponent are located wholly within the Traditional Territories of the RRDC and LFN. The socio-economic effects are likely to be experienced predominantly by Ross River and Watson Lake residents, including RRDC and LFN members. Based on this consideration, the EC determined that, for the purposes of s. 50(3) of YESAA, the Proponent was required to consult:

- the LFN and RRDC, being the First Nations in whose territories the Project "will be located or might have significant environmental or socio-economic effects"; and
- the residents of the Town of Watson Lake and Ross River, being the communities in which the Project "will be located or might have significant environmental or socio-economic effects."

CONSULTATION BY PROPONENT REQUIREMENTS

Pursuant to section 50(3) of YESAA, a Proponent is required to consult any First Nation in whose traditional territory the Project will be located or may have significant environmental or socio-economic effects, as well as the residents of any community in which the Project will be located or may have significant environmental or socio-economic effects, before submitting a proposal to the EC (hereinafter, "Proponent Consultation"). Proponent Consultation is to be exercised in the manner described in section 3 of YESAA.

3. Where, in relation to any matter, a reference is made in this Act to consultation, the duty to consult shall be exercised

- (a) by providing, to the party to be consulted,
 - (i) notice of the matter in sufficient form and detail to allow the party to prepare its views on the matter,
 - (ii) a reasonable period for the party to prepare its views, and
 - (iii) an opportunity to present its views to the party having the duty to consult; and
- (b) by considering, fully and fairly, any views so presented.

The EC considered the information provided by the Proponent in the Project proposal, which included a summary of consultation efforts with LFN, RRDC, the Town of Watson Lake and Ross River. The identified First Nations and the residents of Watson Lake and Ross River received information about the Project in an understandable manner and in enough detail to allow for participation. The Proponent provided a reasonable period in which views could be shared and offered opportunities and means by which to share these views.

Consultation by Decision Bodies and Crown Consultation

EC DOES NOT DIRECTLY CONSIDER EFFECTS TO RIGHTS AND TITLE

The EC and, by extension, this report do not directly assess rights, or make findings about a project's effects on asserted or established Aboriginal rights. The EC makes factual, not legal, determinations about the significance of project effects on Valued Environmental and Socio-economic Components (VESECs). The YESAB Interpretive Bulletin *Consideration of Aboriginal and Final Agreement Rights and First Nation Interest in YESAB Assessments* contains additional information on how YESAB considers Aboriginal rights.

Aboriginal rights and title play different roles in the assessment conducted by the EC, and in constitutionally required Crown consultation (hereinafter, "Crown Consultation"). Aboriginal rights and title are considered as contextual factors when characterizing project effects and determining the significance of these for the purposes of the environmental assessment. However, potential effects to Aboriginal rights and title are foundational to, and the focus of, Crown Consultation. Specifically, "the duty to consult arises when the Crown has knowledge, real or constructive, of the potential existence of the Aboriginal right or title and contemplate conduct that might adversely affect it".⁴ Further, in order to fulfill the duties associated with Crown Consultation, the Crown must show that it has "... considered and addressed the rights claimed by Indigenous peoples in a meaningful way."⁵ The Supreme Court of Canada has phrased the difference between environmental assessment and Crown Consultation efforts as follows, "... the consultative inquiry is not properly into environmental effects *per se*. Rather, it inquires into the impact on the *right*."⁶

REQUIREMENT TO CONSULT WHEN CONSIDERING RECOMMENDATIONS

In addition to, but distinct from, Crown Consultation on the project, s. 74(2) of YESAA requires Decision Bodies to consult with LFN and RRDC when considering the EC's recommendations contained in this report (hereinafter, "Section 74 Consultation"). Section 74 Consultation will inform the decision document(s) issued in respect of the project.

When conducting Crown Consultation and Section 74 Consultation, Decision Bodies are not limited to information contained in the assessment record, nor are they limited to information that predates the issuance of these recommendations.

⁴ White River First Nation v. Government of Yukon, YKSC 66, paragraph 96.

⁵ Coldwater Indian Band v. Canada, FCA 34, paragraph 40.

⁶ Clyde River (Hamlet) v. Petroleum Geo-Services Inc. 2017, SCC 40, paragraph 45.

ASSESSMENT RECORD NOT INTENDED TO BE RECORD OF CONSULTATION

Both the Government of Yukon and the Government of Canada have submitted documents regarding Crown Consultation on the project to the EC and the documents have been included in the assessment record. However, the EC does not, and has not, evaluated the adequacy of Crown Consultation for the Project. Crown Consultation continues after the issuance of the EC's final recommendations for the Project.

1.3 Matters To Be Considered

This Final Screening Report contains a recommendation under s. 58 of YESAA, based on the Project effects, as determined by the EC in its effects assessment. In conducting an effects assessment and in accordance with s. 42 of YESAA, the EC considers, but does not make determinations, with respect to

- the purpose of the project or existing project;
- all stages of the project or existing project;
- the significance of any environmental or socio-economic effects of the project or existing project that have occurred or might occur in or outside Yukon, including the effects of malfunctions or accidents;
- the significance of any adverse cumulative environmental or socio-economic effects that have occurred or might occur in connection with the project or existing project in combination with the effects of other projects for which proposals have been submitted under subsection 50(1), or any activities that have been carried out, are being carried out or are likely to be carried out in or outside Yukon;
- any studies or research undertaken under s. 112(1) that are relevant to the project or existing project;
- the need for effects monitoring;
- alternatives to the project or existing project, or alternative ways of undertaking or operating it, that would avoid or minimize any significant adverse environmental or socio-economic effects;
- mitigative measures and measures to compensate for any significant adverse environmental or socio-economic effects;
- the need to protect the rights of Yukon Indian persons under Final Agreements, the special relationship between Yukon Indian persons and the wilderness environment of Yukon, and the cultures, traditions, health and lifestyles of Yukon Indian persons and other Yukon residents;
- the interests of First Nations;
- the interests of Yukon residents and other Canadian residents;
- any matter that a Decision Body has asked it to take into consideration;
- any matter specified by the regulations; and

the capacity of any renewable resources that are likely to be significantly affected by the project or existing project to meet present and future needs.

1.4 Determining the Significance of Adverse Effects

The EC determines if a project will result in significant adverse effects by characterizing likely project effects and placing those effects within the context they will occur. To determine the context in which project effects will occur, the EC considers contextual factors. To characterize project effects, the EC applies effects characterization criteria.

Contextual Factors

Contextual factors inform the threshold of significance; they are factors that are independent of project effects. Contextual factors considered by the EC include, but are not limited to

- the nature of the importance invested in a valued component;
- legislation, regulations and management plans;
- the vulnerabilities and resiliency of effects' receptors, including thresholds and limits;
- existing conditions and trends;
- cumulative effects of other projects and activities; and
- acceptability of different types of effects.

Contextual considerations will vary for each valued component, as some may be more relevant than others.

Effects Characterization Criteria

In characterizing project effects and addressing what may constitute a significant adverse effect, the EC considers the following factors:

Magnitude: The intensity or amount of an effect or extent of change, where "effect" is defined as the change from existing conditions resulting from an activity. Depending on the effect, magnitude may be measured with familiar units; for example, in describing habitat loss, the change from existing conditions may be measured in hectares. For other effects, such as effects to heritage resources, more abstract measures may be required.

Probability: The likelihood that an adverse effect will occur. Some effects may be certain, while others will be unlikely.

Geographic Extent: The spatial bounds of project effects (i.e. the area in which effects are detectable). The geographic extent of effects can be local or regional, and in some cases may be outside the project area. For example, some effects may only occur in communities rather than the project location. The geographic extent is an important consideration in determining the receptors to an effect.

Duration and Frequency: The temporal bounds of project effects (i.e. the length of time the effect lasts and how often the effect occurs). Certain effects may persist beyond the life of the project.

Reversibility: The degree to which the effect is reversible. Effects can be reversible or permanent. Reversible effects may impact less than irreversible or permanent effects. This factor is also related to duration and context.

Not all of the factors are relevant to all effects and a specific effect's characterization and corresponding significance determination may rely on a subset of these factors.

2. Project Overview

2.1 Proponent Information

The Proponent of the Project is BMC Minerals (No. 1) Limited, a private corporation incorporated within Canada; it is a subsidiary of BMC (UK) Limited, a privately held company based out of the United Kingdom.

Where the term Proponent appears in this report, it refers to BMC Minerals (No. 1) Limited.

The contact person for the Proponent is:

Kelli Bergh
BMC Minerals (No. 1) Limited
Environmental Manager
email: kellib@bmcminerals.com

2.2 Purpose and Description

The purpose of the Project is the construction, operation and closure of a copper, lead and zinc mine using both an open pit and underground mining techniques. Over 10 years of mining operations, the Proponent proposes to mine approximately 5 500 t of ore per day, producing approximately 180 000 t of zinc, 60 000 t of copper and 35 000 t of lead concentrates each year. From construction until the conclusion of Proponent-proposed monitoring, Project activities will span approximately 38 years.

Mining is proposed by both open pit and underground methods. Ore will be processed by sequential flotation through a processing plant that will handle approximately 2 million tonnes (Mt) of ore per year. Tailings will be deposited in a dry stack storage facility, waste rock will be stored in purpose-built facilities, while strongly acid-generating rock will be paste-backfilled into the underground portions of the mine.

The Project is proposed within the Traditional Territories of Liard First Nation and the Ross River Dena Council. It is located within the Pelly Mountain Range and is about 260 km northwest of Watson Lake and 115 km south of Ross River. It lies approximately 25 km to the west of the Wolverine Mine and 24 km south of Finlayson Lake.

2.3 Stages and Schedule

The Project consists of four primary stages, which in both the proposal documents and this report are referred to as follows:

- construction phase
- operations phase
- decommissioning, reclamation and closure phase (also described as active closure in proposal documents)
- post-closure phase

The Project stages and schedule are described in greater detail below.

Construction Phase

The construction phase is proposed to last for two years. The primary activities of this stage will include clearing, site preparation and construction of site infrastructure.

Within proposal documentation, this period runs from year -2 to year 1.

Operations Phase

The operations phase will begin when the Project begins to extract and process ore; it is proposed to last 10 years. Operations will begin progressively, starting with a low production rate that will increase to final capacity (2 Mt of processed ore annually) within the first year of operations. During the first two years of operations, all ore will be sourced from the open pit, after which underground operations will also begin to produce ore.

Within the proposal documentation, this period runs from year 1 through year 10.

Decommissioning, Reclamation and Closure Phases

The decommissioning, reclamation and closure phases of the Project will commence once operations are complete and will take approximately three years. During this stage

- the majority of surface facilities will be removed; and
- the site will be reclaimed according to the proposal's reclamation objectives.

Post-Closure Phase

The post-closure phase will begin once all closure activities are complete and will continue until monitoring is no longer required. The primary activity of this phase is monitoring of environmental conditions.

2.4 Location and Layout

PROJECT LOCATION

The proposed Project location is the Pelly Mountain foothills, near the continental divide, between the Pelly River and Liard River drainages. The proposed Project location is largely within the Geona Creek valley.

The mine site is approximately 20 km from the Robert Campbell Highway (RCH) via an existing road, which would be upgraded to an all-season access road. The access road meets the RCH near the southern end of Finlayson Lake.

The proposed Project location is approximately 115 km southeast of the community of Ross River, 185 km northwest of Watson Lake, and 260 km east of Whitehorse. The Project falls within the Traditional Territories of both the LFN and the RRDC (the Kaska Traditional Territory).

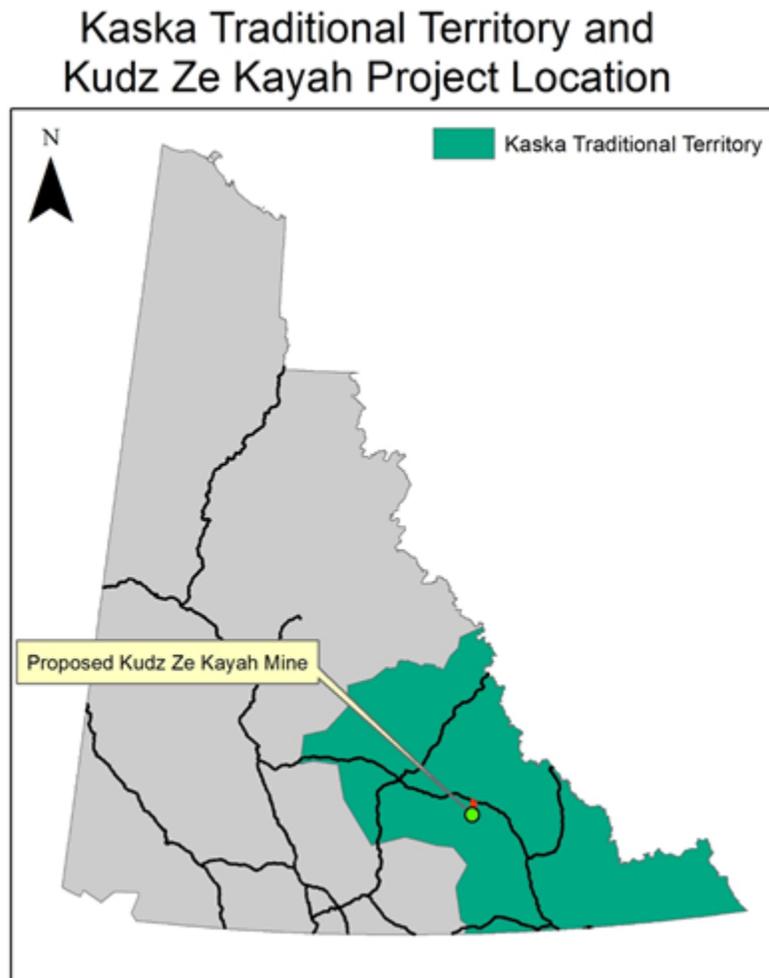


Figure 1: Project location in relation to the Kaska Traditional Territory

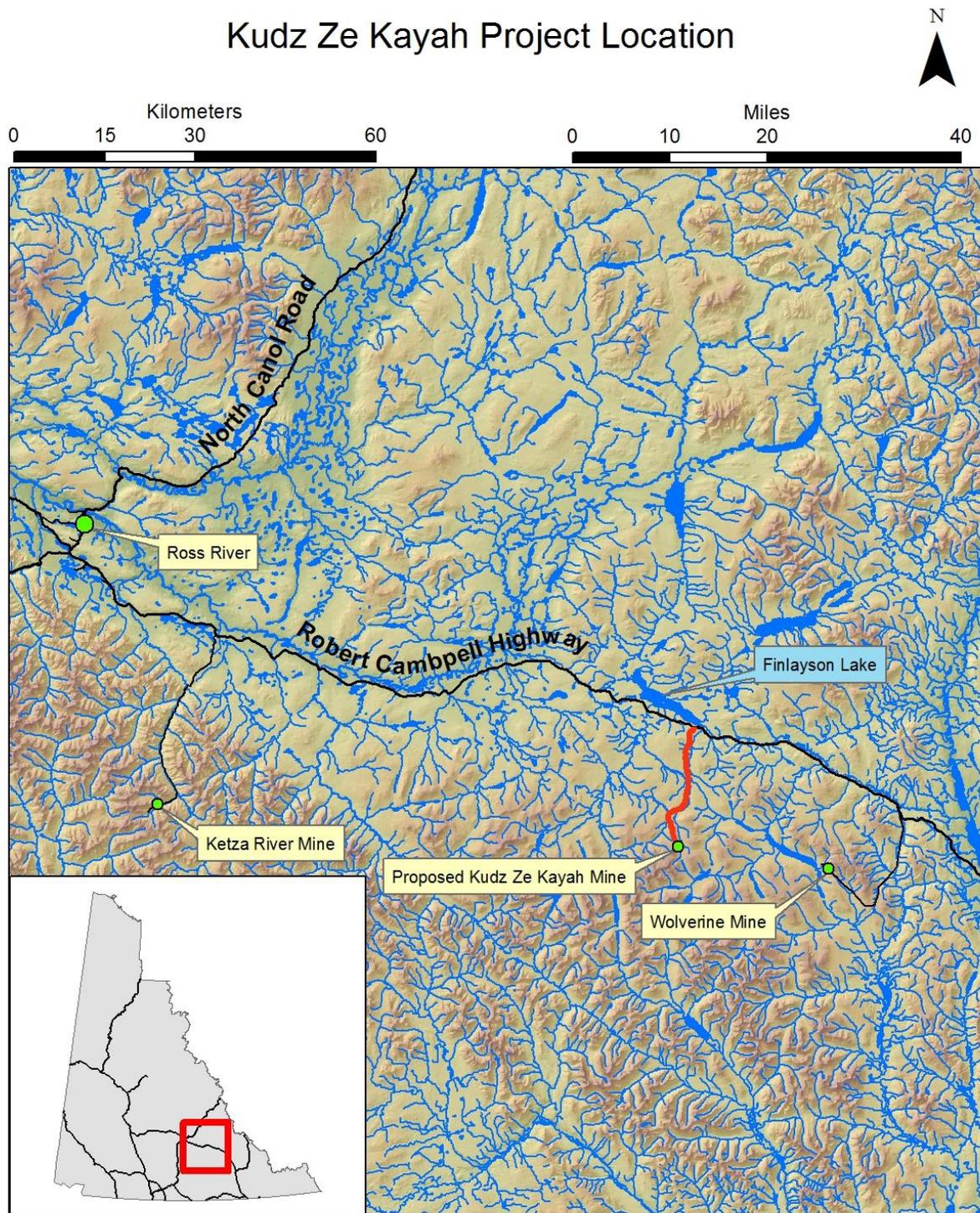


Figure 2: The Proposed Kudz Ze Kayah Project location

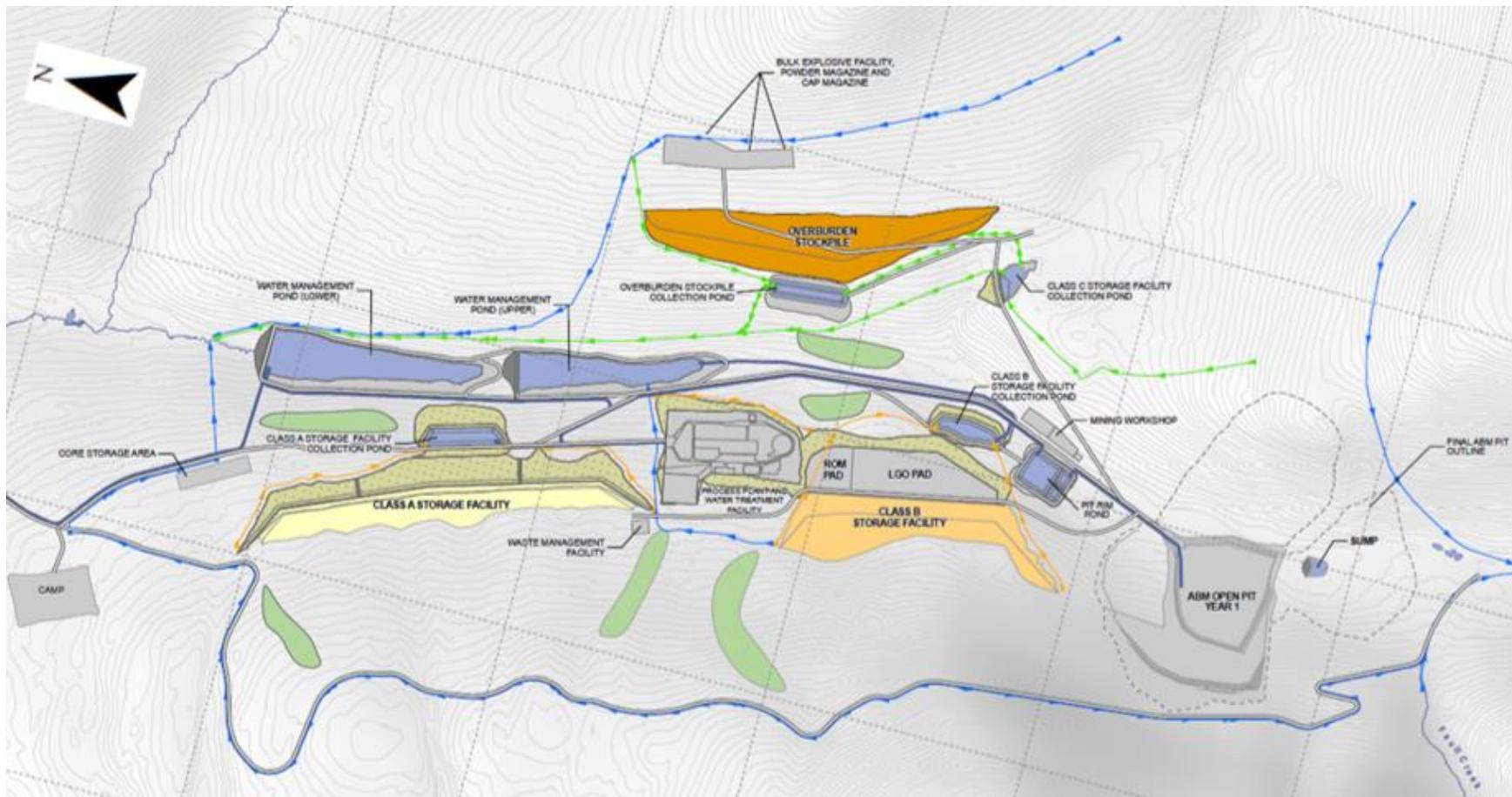


Figure 3: Project mine layout, Figure 4-2 of the Project proposal (the full extent of the proposed pits is seen in the dotted outline around ABM open pit Year 1).

PROJECT LAYOUT

The Project is largely contained within the Geona Creek valley (Figure 3). The valley bottom will include water management ponds (WMPs) as well as the pit itself. On the sides of the valley will be the mill, rock storage facilities and overburden stockpiles. Above this infrastructure will be water diversions that are intended to reduce water contact with mine materials and infrastructure.

2.5 Project Scope

The project scope defines the project to be assessed and includes all activities described in the project proposal as well as in any subsequent information provided by the proponent.

Table 6: Activities included in project scope.

Project Component	Activities
General Project	<ul style="list-style-type: none"> • The construction, operation, decommissioning and closure of an open pit and underground copper, lead, gold, silver and zinc mine • The mine site is approximately 115 km southeast of Ross River and approximately 185 km northwest of Watson Lake, connecting to the RCH via the tote road • Project phase duration: <ul style="list-style-type: none"> ○ Construction: 2 years ○ Operations: 10 years ○ Active Closure: 3 years ○ Transition Closure: 13 years ○ Post-Closure: 10 years • The ABM Deposit, consisting of the ABM and the Krakatoa zones, contains an estimated 20 Mt of ore, which will be processed at a rate of approximately 5 500 t per day over an estimated 10-year life • The Project includes 923 quartz claims • Mine site is 15 km² • Approximately two hectares (ha) of fish habitat compensation ponds to be created during construction phase of the Project and to serve as mitigation for waterfowl • Progressive reclamation • Post-closure monitoring undertaken for 26 years
Access Roads	<ul style="list-style-type: none"> • Removal of vegetation and topsoil • Construction of various on-site roads for general access and to connect the mine site infrastructure and components • Upgrading approximately the first 20 km of the existing 24 km tote road to a 5 m wide, single lane running surface during construction (Year -2 to Year 1). Upgrading activities include <ul style="list-style-type: none"> ○ improving horizontal and vertical alignment; ○ improving drainage; ○ upgrading 10 watercourse crossings (9 culverts, 1 bridge), major upgrades/replacements to all culverts;

Project Component	Activities
	<ul style="list-style-type: none"> ○ and all-weather surfacing ● Approximately 20 ha of new disturbance (excluding borrow sources) ● Development and use of borrow sources for upgrades with approximate volumes of <ul style="list-style-type: none"> ○ 31 500 m³ of subgrade material; ○ 18 000 m³ of surfacing materials; ○ 1 400 m³ of riprap material ● All culverts, bridges and drainage structures will be removed ● Decommissioning, reclamation and revegetation of access road ● Use of RCH and Alaska Highway in Yukon and Highway 37 and Highway 37A in British Columbia (BC) to access mine site and for transport of concentrates (copper, lead, zinc, gold, silver) to Stewart port in BC ● Off-site traffic on the roads⁷ <ul style="list-style-type: none"> ○ From the site travelling west on the RCH (towards Whitehorse) <ul style="list-style-type: none"> ● Approximately 6 heavy duty vehicles (HDV)/day and 12.6 light duty vehicles (LDV)/day (one-way trip) during construction ● Approximately 6 HDV/day and 21 LDV/day (one-way trip) during operations ● Approximately 6 HDV/day and 12.6 LDV/day (one-way trip) during active closure ● Approximately 1.3 LDV/day (one-way trip) during post closure ○ From the site travelling south on the RCH (towards Watson Lake) <ul style="list-style-type: none"> ● Approximately 12 HDV/day and 2.3 LDV/day (one-way trip) during construction ● Approximately 46 HDV/day and 2 LDV/day (one-way trip) during operations ● Approximately 12 HDV/day and 2.3 LDV/day (one-way trip) during active closure ● No traffic during post closure ○ From Watson Lake to Stewart and other areas in BC <ul style="list-style-type: none"> ● Approximately 10 HDV/day (one-way trip) during construction ● Approximately 46 HDV/day (one-way trip) during operations ● Approximately 10 HDV/day (one-way trip) during active closure ● No traffic during post closure

⁷ YOR Document 2017-0083-294-1, pg.68

Project Component	Activities
Airstrip	<ul style="list-style-type: none"> • Use of Finlayson Lake airstrip, located at km 246 on the RCH: <ul style="list-style-type: none"> ○ Maximum use during all phases of the Project is up-to eight weekly flights. ○ Fuel and de-icing equipment to be transported from project site for use at airstrip when required. • Additional flights may be made to/from the alternative locations of Faro and Ross River airports.
Power	<ul style="list-style-type: none"> • Construction and operation of an approximately 25 MW Liquid Natural Gas (LNG)/diesel power plant (six generators in full-time use and four generators at one time in operations) adjacent to the process plant with <ul style="list-style-type: none"> ○ use of 17 MW of power during operations (four generators) • Estimated annual maximum consumption of 981 300 GJ of LNG and 1 400 000 L of diesel • Prior to operation of the plant, use of diesel generators near power-consumption centres • Power distributed through buried electrical cables • Electrical cables de-energized upon decommissioning and buried cables to be removed and salvaged or snipped off if not removable
Topsoil Management	<ul style="list-style-type: none"> • Topsoil will be stockpiled and re-vegetated to enhance stability: <ul style="list-style-type: none"> ○ overburden stockpile volume at approximately 16 Mt (9.0 Mm³) with a 2.2:1 slope ○ topsoil stockpile volume of approximately 715 000 m³, for use in reclamation • Treatment of contaminated soil, as required
ABM Open Pit Mining	<ul style="list-style-type: none"> • Removal of vegetation, topsoil, subsoil and overburden rock • Conventional open-pit mining methods, extraction of approximately 14 600 kt of ore and 117 500 kt of waste • Estimated 690 000 m² surface area • Re-direct Fault Creek towards the open pit for filling of <ul style="list-style-type: none"> ○ the ABM open pit to create ABM lake.
Krakatoa Pit Mining	<ul style="list-style-type: none"> • Removal of vegetation, topsoil, subsoil and overburden rock • Conventional open-pit mining methods, extraction of approximately 850 kt of ore, 21 200 kt of waste • Estimated 247 500 m² surface area • The pit will extend vertically from 1 265 m above sea level (asl) at the final pit floor to a maximum of 1 460 m asl on the eastern highwall

Project Component	Activities
Krakatoa Underground Mining	<ul style="list-style-type: none"> • Development of an underground mine using long hole mining methods and cut and fill methods as appropriate • Approximate tonnages for the eight years of underground mining are 2 100 kt of ore and 400 kt of waste • Use of emulsion-style explosives for blasting • Use of cemented paste backfill to fill voids
Waste Rock Management	<ul style="list-style-type: none"> • Segregation of waste rock into three categories based on acid-generating/metal-leaching potential • Progressive construction of a low-permeability cover system above the waste rock with a seepage collection system constructed above the low-permeability foundation liner • Development and use of three waste rock storage facilities with approximate tonnage and surface areas of <ul style="list-style-type: none"> • Class A storage facility: <ul style="list-style-type: none"> ○ waste rock tonnage: 11.6 Mt of strong PAG/high metal-leaching potential ○ filtered tailings co-disposal: approximately 15.1 Mt, strong PAG ○ surface area: 741 900 m² • Class B storage facility: <ul style="list-style-type: none"> ○ waste rock tonnage: 47.5 Mt of mild PAG/moderate metal-leaching potential ○ surface area: 700 500 m² • Class C storage facility: <ul style="list-style-type: none"> ○ waste rock tonnage: 64 Mt of non-PAG/low metal-leaching potential ○ surface area: 1 255 000 m² • Final reclamation of Class A and B storage facilities with multi-layer, low-permeability cover and revegetation • All unused overburden to be transported to Class C storage facility reclamation through sloping and revegetation
Ore Processing	<ul style="list-style-type: none"> • Construction, operation and decommissioning of a process plant to crush and grind ore, and flotation processes to produce copper, lead, and zinc concentrates: <ul style="list-style-type: none"> ○ approximately 2 000 000 t ore processed per year • One or more groundwater wells installed near the process plant to mix reagent for ore processing • Thickening, filtering and stockpiling of concentrates prior to transport to third party smelting facilities • Dewatering tailings prior to disposal at Class A storage facility or combined with cement for backfill

Project Component	Activities
Support Infrastructure	<ul style="list-style-type: none"> • Construction and use of an enclosed paste fill plant: <ul style="list-style-type: none"> ○ production of approximately 1 000 m³ per day • Construction of communications tower • Construction and use of a workshop for maintenance of site vehicles and equipment • Construction of a two-storey warehouse and administration complex • Development and use of a waste treatment facility with <ul style="list-style-type: none"> ○ on-site storage of waste, recyclables and contaminated materials prior to disposal via off-site recycling/disposal or disposal via the on-site incinerator, land treatment facility or landfill; ○ approximately 500 t of waste to be shipped off-site per year of: <ul style="list-style-type: none"> ▪ recyclables: approximately 3 to 4 t/year to Yukon or outside facility ▪ tires: approximately 25 t/year to an outside facility for recycling ▪ special wastes (e.g. batteries, chemicals): approximately 13 to 16 loads (28 t/load)/year to outside facility • Infrastructure and facilities decommissioned and removed from site with <ul style="list-style-type: none"> ○ salvaging, recycling and landfilling of materials
Camp and Site Administration	<ul style="list-style-type: none"> • Workforce (approximately) <ul style="list-style-type: none"> ○ Year -2 to Year 1: 350 people ○ Year 1 to Year 10: 100 to 345 people ○ Year 11 to Year 13: 80 people ○ Year 14 to Year 26: 6 to 10 people • Camp <ul style="list-style-type: none"> ○ upgrade camp to be suitable for up to 350 people during construction ○ permanent camp facilities for 250 personnel • Waste management using the following methods: <ul style="list-style-type: none"> ○ incineration; ○ off-site disposal; ○ open burn; ○ landfill; and ○ shipment to a licensed recycle or disposal facility • Water use: potable and non-potable • Sewage treatment facilities designed for approximately 443.7 m³ per day for the camp and approximately 26.4 m³ per day for the processing plant and administration complex with on-site burial of residual sludge • Mine administration complex developed as part of the process plant

Project Component	Activities
	<ul style="list-style-type: none"> ○ facilities will include emergency services, assay and metallurgical laboratory, storage, warehouse and mine dry (lavatory and change room facility) ● Partial decommissioning of camp
Fuel, Chemical and Explosives Storage	<ul style="list-style-type: none"> ● Building of a fenced and secured bulk explosives compound adjacent to the overburden stockpile: <ul style="list-style-type: none"> ○ Ammonium nitrate prill and emulsion will be transported in 25-t trailers, separate storage silos on site: <ul style="list-style-type: none"> ▪ Total combined maximum: 80 000 kg of bulk ammonium nitrate prill and bulk ammonium nitrate emulsion. ▪ Maximum 50 t of emulsion, 25 t of ammonium nitrate. ▪ 5 t of small explosives (e.g. boosters, emulsions, etc.). ▪ Maximum 6 500 t/year or 540 t/month. ● Fuel storage facilities <ul style="list-style-type: none"> ○ the power plant facility includes <ul style="list-style-type: none"> ● 3 x 100 m³ vacuum insulated tanks of LNG ● 2 x 113 500 litre (L) diesel tanks ○ mine workshop includes <ul style="list-style-type: none"> ▪ 4 x 100 000 L tanks of diesel (for mining operations) ▪ 1 x 30 000 L tank of gasoline ○ storage of 1 x 5 000 L of aviation fuel adjacent to the helipad at camp ○ fuel storage during construction includes <ul style="list-style-type: none"> ▪ 1 tank of 28 500 L of diesel ▪ 1 tank of 30 000 L of aviation fuel ▪ Tanks will be decommissioned following early stages of construction ● Storage of waste oil in a 10 000 L tank adjacent to the mine workshop ● Use of waste oil as a fuel source for a waste oil burner ● Storage area specific for reagents ● Storage silo containing quick lime: suitable for receiving 40 t bulk loads for an approximate 6 400 t/year ● De-icing equipment to be stored at project site ● Reclamation of fuel farms area ● Explosives compound to be rehabilitated through decommissioning and salvage of structures
Water Management	<ul style="list-style-type: none"> ● Water use during construction ● Construction and use of water management features including <ul style="list-style-type: none"> ○ diversion of Fault Creek;

Project Component	Activities
	<ul style="list-style-type: none"> ○ water diversion and ditches; three major diversions plus other minor/temporary diversions; ○ seven WMPs with a combined operating capacity of approximately 1 100 000 m³, not including freeboard; ○ Water treatment plant (WTP) designed to treat Class A and B contact water and runoff from the process plant facility site as required; and ○ Perimeter sump pumps to collect runoff <ul style="list-style-type: none"> ● Fresh water supply <ul style="list-style-type: none"> ○ maximum 5.5 m³/hour water supply for the process plant; ○ maximum 25.3 m³/hour water supply for the camp (up to 350 people at 250 l/day); ○ two groundwater wells in use at one time, one at camp and one at the process plant location. Alternative backup wells may be drilled; and ○ process plant usage of approximately 276 000 m³ per year (based on average precipitation conditions) (240 000 m³ of contact water, 36 000 m³ groundwater) ● De-watering of the open pit ● WTP with a capacity of approximately 4 410 000 m³ per year ● WTP usage during mine closure, until water quality meets required target <ul style="list-style-type: none"> ○ subsequent decommissioning and demobilizing of active WTP. Passive treatment through the constructed wetland treatment system (CWTS); ○ upper water management pond (UWMP) and lower water management pond (LWMP) dams decommissioned LWMP will be converted into a CWTS ● Decommissioning or upgrading (to ensure stable and long-term drainage) of water retention and sediment control structures and appurtenances ● Pit rim pond to be decommissioned

PROPONENT MITIGATIONS

In addition to the activities that comprise the Project scope above, the EC also considered numerous Proponent commitments as being part of the Project design. These Proponent commitments are included in Appendix A – Proponent Mitigations. Where applicable and important to a significance determination, these Proponent commitments are referenced when assessing effects to values.

3. Scope of Assessment

The scope of assessment identifies the matters considered in the screening. It is determined by considering the matters set out in s. 42 of YESAA (outlined above in Section 1.4). The EC has employed a valued-component-based assessment methodology to assess the environmental and socio-economic effects of the Project.

The VESECs are identified through consideration of

- views and information submitted during the adequacy review stage and the public comment period;
- internal and external technical advice and input;
- Traditional Knowledge, where it is made available;
- previous assessments; and
- studies and research.

4. Views and Information

4.1 Comment Submissions

Adequacy Review Phase

The EC solicited comments during the adequacy review phase to determine if there was sufficient information to draft a scope of Project scope and commence the screening.

Comments were received from:

- Ross River Dena Council (RRDC)
- Liard First Nation (LFN)
- Government of Yukon (YG)
- Environment and Climate Change Canada (ECCC)
- Health Canada
- Indigenous and Northern Affairs Canada (INAC)
- Northern Projects Management Office (NPMO)
- Fisheries and Oceans Canada (DFO)
- Transport Canada, and
- Natural Resources Canada (NRCan)

Comments received were considered in drafting the Adequacy Review Report, which outlined additional information required by the EC. The EC issued the first Information Request (Information Request 1) on May 26, 2017, and amended it on June 9, 2017, for administrative reasons. Based on comments received, the EC requested additional information on a number of issues, including

- effects to outfitters, tourism operators and trapline concession holders;
- mine design and engineering including geotechnical stability and permafrost;
- tailings technology and ore processing;
- progressive cover design for closure and decommissioning of storage facilities;
- mine site infrastructure development;
- rock mass classification and structural geology;
- in-situ stresses and possible failure mechanisms;
- air quality, greenhouse gas (GHG) emissions, and Criteria Air Contaminants (CACs);
- noise levels;
- water quality and quantity, including baseline data and modelling, threshold criteria, preliminary Water Quality Objectives (WQOs), water quality predictions and management, and water treatment process;
- access road and mine site terrain analysis;
- habitat and baseline data for fish and wildlife;
- heritage resources, Traditional Knowledge and socio-economic information; and
- malfunctions, accidents and unscheduled closure.

The Proponent responded by providing additional proposal information on July 5, 2017. The EC assessed the response and replied by putting forward a second Information Request (Information Request 2) on August 4, 2017, which asked for information on a number of issues, including

- waste rock and tailings technology and management;
- final landform design for waste storage facilities;
- closure cover designs and mine site stability;
- rock characteristics;
- water management and hydrometric monitoring;
- future acidic conditions at closure and post-closure;
- CWTS;
- water quality and quantity, including baseline data and modelling, threshold criteria, preliminary WQOs, water quality predictions and management, and water treatment process;
- aquatic ecosystem resources;
- terrain stability and mine site terrain analysis;
- wildlife and wildlife habitat; and
- malfunctions and unscheduled closure.

The Proponent provided additional information on November 17 2017, addressing key issues identified in the adequacy review stage. The EC extended the Adequacy Review Phase to January 9, 2018, at which point they determined that sufficient information was provided to commence the screening.

Seeking Views and Information on the Proposal Phase

The public comment period on the proposal was from January 15 to March 16, 2018. During this phase, written comments were received from eight parties. The EC also hosted a public meeting in Watson Lake on March 7, 2018, and Ross River on March 8, 2018, where additional comments were received. The EC received comments from governments, non-governmental organizations, interested parties and individuals. These comments formed the basis of a request for additional information (Information Request 3) issued on April 9, 2018. Based on comments received during the seeking views and information phase, the EC requested additional information on

- WQOs, baseline information and modelling;
- geotechnical stability and surficial geology;
- adaptive management plans;
- wildlife and wildlife habitat;
- noise and air quality;
- roads and transportation; and
- hazardous materials.

While awaiting the response to Information Request 3, the EC put forward another request for information (Information Request 4) on May 3, 2018 regarding:

- traditional land use information specific to the LFN;
- the effects of the Project on traditional land uses;
- past and current environmental and socio-economic effects of previous mine closures on the LFN, RRDC and residents of Ross River and Watson Lake; and
- the effects of additional traffic on the RCH as a result of the Project.

Seeking Views and Information on the Draft Screening Report Phase

The public comment period on the draft screening report was from November 20, 2019 to May 31, 2020. During this phase, the EC was unable to host public meetings in Watson Lake and Ross River due to the pandemic, but received 15 comments from governments (LFN, RRDC, Canada and Yukon), non-governmental organizations, interested parties and individuals. These comments formed the basis of two information requests (Information Request 5 and Information Request 6). Based on comments received during the seeking views and information phase, the EC requested additional information on:

- the Finlayson Caribou Herd (FCH) (Information Requests 5 and 6);
- access roads (Information Request 5);
- air quality (Information Request 5);
- human health (Information Request 5).

Additionally, the EC retained the help of an expert to assist in assessing information requirements for the FCH, Fiona Schmiegelow.

4.2 Technical Support

Reviewing the Project Proposal: Adequacy Phase

During the adequacy review phase of the assessment, the EC retained five independent consultant teams to undertake a technical review of select components of the Project proposal.

The scope of work for consultants included the following:

- Reviewed and evaluated information identified by the EC;
- Participated in discussions as needed;
- Provided professional judgement on matters identified by the EC;
- Conducted appraisals of models used by the Proponent where warranted; and
- Identified, described and prioritized key issues.

Consultant teams produced technical memos to assist the EC in determining the adequacy of proposal documents. In addition, the consultant teams considered information gaps identified in comments received during the adequacy phase. Each consultant team provided technical memos during the adequacy phase which informed Adequacy Review Report 1 and Adequacy Review Report 2, and the evaluation of Proponent responses to these reports. Consultant teams, their areas of focus and their technical memos are listed in Table 7.

Table 7: Consultant teams, areas of focus and technical memos reviewing the Project proposal

Focus Topic	Independent Consultant	Technical Memo YOR Document Numbers
Hydrology and aquatic resources	EcoMetrix Inc.	2017-0083-196-1 2017-0083-213-1 2017-0083-247-1
Wildlife and wildlife habitat	SLR Consulting Ltd.	2017-0083-196-1 2017-0083-214-1
Wildlife and wildlife habitat	Environmental Dynamics Inc. (EDI)	2017-0083-247-1
Engineering and geotechnical	SNC-Lavalin Inc.	2017-0083-196-1 2017-0083-215-1
Socio-economic effects	EEM Impact Inc.	2017-0083-196-1 2017-0083-216-1

In addition to these consultant teams, an individual consultant was recruited from Artifex Engineering Hydrology Inc. to assist in providing technical advice and support in evaluating proposal documents.

Reviewing Comments on the Proposal: Screening Phase

The first reviewing comments phase of the screening is the period in which to provide comment on the Project proposal. For this phase, the EC retained two independent consultant teams to undertake a technical review of the Project proposal focusing on concerns raised in comment submissions.

The consultant teams

- reviewed relevant comment submissions;
- identified areas where additional information was required in order to draft a recommendation;
- identified possible approaches to addressing information deficiencies; and
- provided professional judgement on key aspects of the Project proposal.

Consultant teams aided in determining whether the EC had sufficient information to draft a recommendation and helped inform Information Request 3. Consultant teams, and their areas of focus, are listed in Table 8.

Table 8: Consultant teams and areas of focus for reviewing comments on the project proposal

Focus Topic	Independent Consultant
Hydrology and aquatic resources	EcoMetrix Inc.
Engineering and geotechnical	SNC-Lavalin Inc.

Drafting the Recommendation: Screening Phase

In order to draft this report, the EC retained two independent consultant teams to undertake a review of potential Project effects.

The consultant teams produced technical memos to assist the EC, which contained:

- identification and characterization of potential adverse effects;
- identification of potential mitigative measures for potential significant adverse effects;
- concerns or agreement with proposal conclusions; and
- technical advice in addressing issues raised in comments received.

Consultant teams, their areas of focus and their technical memos are listed in Table 9.

Table 9: Consultant teams, areas of focus and technical memos for drafting the Draft Screening Report

Focus Topic	Independent Consultant	Technical Memo YOR Document Numbers
Wildlife and wildlife habitat	EDI	2017-0083-0950
Socio-economic effects	EEM Inc.	2017-0083-8134

To further aid in the drafting of the Draft Screening Report, the EC worked closely and directly with the following consultants:

- EcoMetrix Inc.
- SNC-Lavalin Inc.
- Jen Clark
- Danette Moulé

Finalizing the Recommendation: Screening Phase

Based on comments received, the EC focused on changes to the effects assessment for the FCH. To aid in this, the EC retained Dr. Fiona Schmiegelow to provide expert opinion in characterizing Project effects to caribou and to aid in interpreting provided baseline data.

Additionally, the EC worked closely and directly with the following consultants in considering refinements and changes to the final screening report:

- Jen Clark
- SNC-Lavalin Inc.
- EcoMetrix Inc.
- Lucie Wright Editing

4.3 Relevant Assessments

The EC may consider previous assessments when assessing the effects of a proposed project. Previous assessments provide an additional source of information on potential effects pathways, sources and receptors. Previous assessments may provide location-specific concerns or issues relevant to an assessment in progress. The EC may consider both previous EC screenings and Designated Office evaluations. The Watson Lake Designated Office has assessed several mineral exploration and access projects on or near the Kudz Ze Kayah property, including but not limited to those listed in Table 10.

Table 10: Noted relevant previous assessments

Assessment Number	Name	Proponent
2017-0002	Kudz Ze Kayah Exploration Project	BMC Minerals (No.1) Ltd.
2016-0061	Pelly Project	BMC Minerals (No.1) Ltd.
2015-0028	Kudz Ze Kayah Exploration	BMC Minerals (No.1) Ltd.
2014-0204	Fyre Lake Exploration	Merah Resources
2013-0126	Tsa Da Glisza Winter Road	True North Gems
2010-0042	Bolt Property	Strategic Metals Inc.
2008-0107	Boot Property	Strategic Metals Inc.
2006-0076	Fyre Lake	Pacific Ridge Exploration Ltd.

4.4 Relevant Studies and Research

The EC is required to consider “any studies or research undertaken under subsection 112(1) [of YESAA] that are relevant to the project or existing project.” No research or studies have been undertaken under s. 112 of YESAA. However, in conducting its assessment, the EC may also consider other public studies and research relevant to the assessment. These references include geographic data maintained by YG, available to view on the GeoYukon platform.⁸ In addition, academic journals, governmental reports and monographs that have helped inform the assessment are listed in the bibliography.

⁸ GeoYukon can be found at: <https://mapservices.gov.yk.ca/GeoYukon/>, it is maintained by the Government of Yukon.

Part B

To assess the potential effects of the Project, the EC identified VESECs. VESECs were identified using views and information submitted, comments received during the screening, professional judgement, previous assessments, and technical input from experts. The EC selected the following VESECs:

- Water resources (Section 5)
- Wildlife (Section 6)
- Traditional Land Use (Section 7)
- Economy (Section 8)
- Human health and safety (Section 9)
- Community wellbeing (Section 10)
- Heritage resources (Section 11)
- Climate change (Section 12)

5. Water Resources

The EC has determined that the Project will result in significant adverse effects to water resources; the Project it is likely to lead to intermittent failures to meet water quality objectives (WQOs). However, the application of recommended mitigation measures is sufficient to eliminate, reduce or control these significant adverse effects.

5.1 Water Quality

Summary and Conclusion

The EC has determined that the Project will result in significant adverse effects to water quality during closure due to intermittent failures to meet WQOs in the Geona and Finlayson creeks drainage. These effects can be eliminated, reduced or controlled through the mitigation measures proposed by the EC. Uncertainty regarding the potential magnitude of effects to water quality further warrant the implementation of monitoring efforts to minimize risks of the Project.

Importance of Water Quality

CULTURAL AND ECOLOGICAL IMPORTANCE OF WATER QUALITY

Water is highly valued by Yukon residents, and holds cultural and spiritual importance for many people. As stated in YG's *Yukon Water Strategy and Action Plan*,⁹ "water is vital to life: it is a necessity for our natural environment, biodiversity, and economy. It is used for drinking and waste disposal. Water provides habitat for fish, plants and animals and supports basic life." Groundwater is an important contributor to surface water in headwater streams; therefore, it too is of fundamental importance in maintaining the proper functioning of aquatic and biophysical environments.

Concerns regarding changes to surface water quality were raised during consultation (Project Proposal Chapter 2) and throughout the screening stages. Kaska citizens have indicated that potable water is taken along the creeks which flow from the Project area (2017-0083-1434), and that headwater streams, including Geona Creek, hold an important value within their Traditional Territory (Project Proposal, Section 8). Headwater values are documented in Kaska Dena Management Practices: Kaska Dena Land Use Framework¹⁰ as follows:

Headwater and source watersheds are important to maintain water quality and support the flow, storage, and hydrology of the adjacent watersheds. In addition, these watersheds tend to have a higher density of Kaska sites, hunting areas, traditional uses, and Kaska values. The watersheds also generally have high ecological values.

⁹ Government of Yukon. Water for Nature, Water for People. Yukon Water Strategy and Action Plan. 2014. Available online at: www.env.gov.yk.ca

¹⁰ Dena Kayeh Institute. Kaska Dena Management Practices: Kaska Dena Land Use Framework. 2010.

Legislative and Management Setting

The legislative and management setting for the Project with regard to water quality is set out in the Yukon *Waters Act*, *Quartz Mining Act* (QMA) and the federal *Fisheries Act*. The Project is located within the RRDC and LFN Traditional Territories.

WATERS ACT

The purpose of the *Waters Act* is to regulate the use of water and the depositing of waste into water in Yukon. The Yukon Water Board, established by the Act, issues licences for the use of water or the deposit of waste. Under the Act, mineral exploration activities are regulated and classified according to water use and waste disposal criteria and undertakings related to Project design (watercourse diversion and watercourse training and crossings). The Yukon Water Board's objective is "to provide for the conservation, development, and utilization of waters in a manner that will provide the optimum benefit from them for all Canadians and for the residents of the Yukon in particular."¹¹

QUARTZ MINING ACT

Quartz mining projects in Yukon require a Quartz Mining Licence (QML) issued by Yukon's Department of Energy Mines and Resources (YG EMR) under the QMA. A quartz mining project requires the submission of environmental protection plans and operational plans for the development, operation and decommissioning of a mine site. These plans will describe how mining activities will be undertaken and how they will be completed in an environmentally responsible manner. A QML sets out requirements for routine monitoring and reporting, and may include a number of adaptive management plans for different aspects of the mine, as well as terms and conditions regarding reclamation of mining activities and financial security for reclamation and closure activities.

The *Yukon Mine Site Reclamation and Closure Policy for New Mines* (2006) provides guidance in implementing the QMA and *Waters Act*. According to the Policy, the goals for mine site reclamation and closure include:

- ensure a government-approved reclamation and closure plan, prepared by the mine operator, to return the mine site to a viable and, wherever practical, self-sustaining ecosystem, is in place prior to mine development;
- fully protect public and environmental health and safety and ensure that any potential discharges during mine operation and following mine closure will be managed to prevent harm to the receiving environment or to the public; and
- methods for protection of water resources during and after mine closure.

¹¹ Government of Yukon. *Waters Act*. 2007. http://www.gov.yk.ca/legislation/acts/waters_c.pdf

FISHERIES ACT

ECCC is the lead department responsible for the administration and enforcement of the pollution prevention provisions of the *Fisheries Act*.

These provisions (sections 34 to 40) serve to protect fish as a public resource by prohibiting pollution that could be deleterious to fish. Subsection 36(3) is the key pollution prevention provision. It prohibits the deposit of all deleterious substances:

- into water frequented by fish; or
- to any place, under any conditions, where it may enter water frequented by fish.

The *Metal and Diamond Mine Effluent Regulations* (MDMER), created under the *Fisheries Act*, prescribe the maximum authorized limits for deleterious substances in metal and diamond mine effluent (e.g. arsenic, copper, cyanide, lead, nickel, zinc, radium-226 and total suspended sediment (TSS)), specifies the allowable acidity or alkalinity (pH) range of mine effluent and requires that mine effluent not be acutely lethal to fish. The MDMER further requires that mine owners or operators sample and monitor effluents to ensure compliance with the authorized limits and to determine any effect on fish, fish habitat and fishery resources.

YUKON WATER STRATEGY AND ACTION PLAN

In 2014, Yukon released its *Yukon Water Strategy and Action Plan* which recognizes the common goal of all water managers in the territory in ensuring that Yukon always has “water for nature and water for people.” The strategy is intended to help YG ensure that its water management decisions maintain the quality, quantity and overall health of waters while allowing for sustainable use. The goals of the strategy are as follows:

- Sustain water quality and quantity for aquatic and terrestrial health and ecosystem services.
- Respect the intrinsic value of water.
- Ensure accessible, safe and sufficient water for drinking and other purposes, including commercial, recreational, heritage, cultural and spiritual uses and values.
- Promote sustainable and wise use of water to support environmental, social and economic needs.

Context***WATER QUALITY IS THE PRODUCT OF MANY FACTORS***

A number of natural processes including climate (precipitation, evaporation, depositions due to winds), site geochemistry (weathering of rocks, leaching from soil, runoff), vegetation cover (evapotranspiration, organic matter in soil), the groundwater regime and biological processes in the aquatic environment influence surface water quality.

CONSTITUENTS OF POTENTIAL INTEREST IN SURFACE WATER

In order to measure effects to water quality, the EC examined predicted changes to water concentrations of constituents of potential interest (COPIs). COPIs for surface water quality were defined as measurable parameters that

- are currently present at elevated concentrations at some receiving environment locations;
- are most likely to leach, at elevated concentrations, from mine materials; and
- are associated with either local natural mineralization or reagents used as part of the Project (Project Proposal, Section 8.1.1).

During the Screening Process, the baseline water quality¹² and geochemistry of site materials¹³ were revised. The list of COPIs was revised accordingly, and predicted changes to the COPIs in surface water in the receiving environments of South, Geona and Finlayson creeks were reported in the 2018 Water Quality Model¹⁴ report.

Table 11: Constituents of potential interest in surface water

Sulphate		
Nitrogen Species		
Nitrate	Nitrite	Ammonia
Fluoride		
Metals and Metalloids (total and dissolved)		
Aluminum Antimony Arsenic Cadmium Cobalt	Copper Iron Lead Manganese	Selenium Thallium Uranium Zinc

The geochemistry of water that has contacted mine components was modelled for the Project phases by developing “source terms” for all COPIs. Source terms are the release rates or leachate concentrations of COPIs predicted to be present in water following contact with particular geological materials under site-specific conditions. The results of the kinetic testing program carried out by Alexo Environmental Group (AEG) in 2018¹⁵ were the basis for source terms predictions. Multiple sets of source terms were developed to predict neutral and acidic waste rock drainage chemistry over the course of the Project. The source terms were updated during the screening based on the most recent kinetic tests and assumptions for long-term loadings, including for acid drainage from the Class A and Class B materials.

¹² YOR Document 2017-0083-296-1 inclusive through YOR Document 2017-0083-304-1.

¹³ YOR Document 2017-0083-321-1 inclusive through YOR Document 2017-0083-324-1.

¹⁴ YOR Document 2017-0083-345-1.

¹⁵ YOR Document 2017-0083-321-1 inclusive through YOR Document 2017-0083-324-1.

The amplitude of changes to water quality due to the Project can be evaluated by comparing future predicted parameters, such as concentrations of COPIs with the background (natural state) and/or baseline (current state) conditions, and to ecological health-based thresholds. For this screening, predicted changes in water quality at different locations in South, Geona and Finlayson creeks in relation to baseline conditions (derived in Appendix E¹⁶), and in comparison to proposed WQOs (derived in Appendix A¹⁷), are used to characterize potential adverse effects and to assess the significance of those effects.

WATER QUALITY OBJECTIVES (WQOs)

The EC considers WQOs in determining a threshold for significance of effects to water quality. Water quality guidelines, objectives and standards, set by federal, territorial, provincial and municipal agencies, consist of recommended concentration limits for COPIs. They are generic values that are selected to be protective of all species present in the environment. For example, Canadian Water Quality Guidelines provide nationally endorsed science-based goals for the constituent concentrations in surface water, based on different water uses (such as the protection of aquatic life), which have been developed by Canadian Council of Ministers of the Environment (CCME). These concentrations are set at levels that should result in negligible risk to biota, their functions or any interactions that are integral to sustaining the health of ecosystems (CCME 2001). The BC Ministry of Environment (BCMOE) has established similar concentration guidelines for contaminants of potential concern in surface water.

Given the diversity of natural conditions, generic water quality guidelines may not apply to all ecosystems where sensitive species are not present, where environmental conditions exist that moderate or amplify the toxic effects of certain COPIs, or where natural background conditions exceed guideline values. The Proponent has proposed WQOs for a range of COPIs associated with the Project in their 2018 Preliminary Water Quality Objectives report (Appendix A of the Proponent's response to IR No. 3). The EC is comfortable with the methodology used to select COPIs for the screening.

The derivation of the proposed SSWQOs was performed following the methods outlined by CCME (2003) and is considered to be consistent with other permitted mining projects in Yukon. The background concentration procedure, which uses the upper 95th percentile concentration of the background dataset instead of a generic guideline, was used for those COPIs for which the 95th percentile concentration at each receiving environment monitoring station within the Project study area exceeded the CCME or BCMOE water quality guidelines for protection of aquatic life.¹⁸ A sulphate-dependent objective was developed for selenium. The Proponent presented laboratory results using Finlayson Creek water, which demonstrated that selenium uptake from Finlayson Creek water was diminished in the presence of increased sulphate concentrations, thereby suggesting that selenium uptake by fish through the food chain diminishes with increasing sulphate concentrations. YESAB is comfortable with the proposed WQOs for the purpose of determining the significance of adverse effects on water quality and aquatic

¹⁶ YOR Document 2017-0083-325-1 inclusive through YOR Document 2017-0083-326-1.

¹⁷ YOR Document 2017-0083-296-1 inclusive through YOR Document 2017-0083-304-1.

¹⁸ The 95th percentile concentration characterizes a value, for which 95 percent of the time, a water sample will fall below.

resources. However, the EC notes that for those proposed SSWQOs that are based on environmental conditions (such as hardness, temperature, pH and/or sulphate), decision makers may consider use of non-variable WQOs in the receiving environment in order to more easily control water quality at points of compliance in the receiving environment.

The Proponent has proposed that future water quality monitoring will be conducted at the following stations and compared to the proposed WQOs: KZ-1 in South Creek; KZ-37 in Geona Creek; and KZ-15 and KZ-26 in Finlayson Creek. YESAB is comfortable that monitoring at these stations will be appropriate to confirm the performance of the water management strategies proposed by the Proponent for each of the Project phases.

Existing Conditions and Trends

The Project will affect water quality in two drainages: the South Creek drainage and the Finlayson Creek drainage.

BASELINE WATER QUALITY DATA GATHERING

Baseline water quality for the Project was detailed in Appendix A¹⁹ of the Proponent's response to Information Request 3's R3-1. This revised 2018 Water Quality Baseline (WQB) report was prepared in response to comments received during the comments period including those from public meetings, First Nations and Decision Bodies.

The natural background water quality described in the 2018 WQB report was based on:

- a combined data set from historical Cominco water quality surveys from 1994 to 1995;
- a subsequent water licence biannual sampling between 2002 and 2016;
- monthly water quality sampling at twelve surface water stations located on South Creek, Fault Creek, Geona Creek, Finlayson Creek and East Creek collected between April, 2015, and March, 2018; and
- a higher frequency sampling program, involving five samples in 30 days, which was carried out at most monitoring locations from May to June, 2017, and from February to March, 2018.

YESAB is comfortable that the 2018 baseline report, which supersedes the 2017 baseline report²⁰ (Appendix E-3 of the Project Proposal), has adequately characterized baseline water quality in the Project area and is adequate to support the Proponent's 2018 water quality model for the Project, which is used to predict effects on water quality and aquatic resources in Section 5.3.

Baseline groundwater quality (BGQ) for the Project is detailed in Appendix C²¹ of the Proponent's response to Information Request 3's R3-1. The BGQ report was revised in 2017 in response to comments received during the adequacy stage of the Screening. The 2017 BGQ

¹⁹ YOR Document 2017-0083-296-1 inclusive through YOR Document 2017-0083-304-1.

²⁰ YOR Document 2017-0083-296-1 inclusive through YOR Document 2017-0083-304-1.

²¹ YOR Document 2017-0083-312-1 inclusive through 2017-0083-319-1.

report combined historical 1990's data and data from 2015, 2016 and 2017 field-sampling events. Groundwater quality data were collected for both bedrock and overburden wells.

BASELINE SURFACE WATER QUALITY

Surface water in the two affected watersheds, South Creek and Finlayson Creek, including tributaries Geona Creek and East Creek, is generally circumneutral to mildly alkaline (pH ranging from 6.7 to 8.7). Water hardness is lowest (moderately hard) in the headwaters of South Creek and Fault Creek, and increases with distance from the Project area to be very hard in the lower watershed of Finlayson Creek. A number of parameters naturally exceed concentrations specified in water quality guidelines for the protection of aquatic life (CCME and/or BCMOE), including:

- fluoride;
- phosphorus;
- aluminum;
- arsenic;
- cadmium;
- chromium;
- copper;
- iron;
- selenium; and
- zinc.

Elevated metal concentrations in these creeks are generally associated with freshet and/or other periods characterized by elevated TSS levels. Elevated concentrations of fluoride, total selenium, uranium and hardness occur more frequently in late fall and winter, and appear to be associated with groundwater sources, which are the main contributor to surface water during those periods of low flow.

In comparing the older dataset from the 1990s with the newer dataset (from 2015 to 2018), it appears that the site water quality has remained largely unchanged in the past two decades of monitoring. Some localized differences between the old and new datasets were identified in Geona Creek and appear to be associated with beaver dams, which have modified the flow regime of the creek.

BASELINE GROUNDWATER QUALITY

Project-wide, groundwater is generally circumneutral to slightly alkaline (pH ranging from 5.7 to 8.6). Groundwater at wells in the Geona Creek basin, upgradient of its confluence with Finlayson Creek (MW15-10D/S) and directly downgradient of the proposed LWMP, displayed the lowest pH levels across the Project area. The groundwater source that feeds these wells also appears to feed the nearby east KZ-9 seep, which is also characterized by water of low pH (pH 5.8 to 6.0). Groundwater from overburden and bedrock wells do not show marked differences for most anions, nutrients and metals, with the exception of sulphate and fluoride, which tend to exist at higher concentrations in bedrock wells than in the overburden. Spatially, groundwater in the proposed ABM pit area exhibits higher concentrations of anions, nutrients

and metals than in other areas beneath the Project site, which is likely due to greater mineralization present in the open pit's orebody. Sulphate concentrations are also elevated in the pit area's groundwater, which may be due to the oxidation of sulphidic minerals associated with the ore deposit.

WATER QUALITY AND OTHER ACTIVITIES

There are no other activities existing or anticipated within the affected drainages that are expected to affect water quality.

Project Design

PROJECT WILL DISCHARGE WATER

The Project will have a positive water balance; therefore, active water management, including water treatment and discharge to the receiving environment, will be required. Surplus water will be stored on-site in the upper and lower WMPs and used in the process plant as required, with the excess water being released to Geona Creek and the remainder piped directly to Finlayson Creek.

PROJECT PROPOSES ALTERATIONS IN TWO WATERSHEDS

Project activities will affect water quality in two drainages: South Creek and Finlayson Creek, including Geona and East creeks. Surface water quality in the South Creek and Finlayson Creek drainages will be affected by the redirection of Fault Creek to the South Creek basin during construction and operations, and by dewatering activities associated with underground work and the ABM pit development during operations. Surface water quality in Geona and Finlayson creeks will be affected by these same activities, as well as by multiple other Project activities within the drainage, including onsite water management and storage of mine rock and tailings at the surface. Following closure, water quality may continue to be affected by flooded ABM pit and runoff overflow, and seepage from the mine rock and tailings storage areas.

PROPONENT MITIGATION MEASURES

The Project includes a number of mitigation measures to reduce the potential effects of the Project on water quality. These mitigation measures are summarized in the Project proposal (Section 8.4.2) and in the proposed Water Management Plan (Project proposal Section 18.4). The mitigation measures have been incorporated into the site water balance and water quality models, revised in 2018 to predict changes to water quality based on anticipated Project sources, during all Project phases.

Table 12: Proposed mitigation measures for water quality

Potential Effect	Project Phase	Proposed Mitigation Measures
Changes in surface water quality as a result of diversions and dewatering	Construction	<ul style="list-style-type: none"> • Manage pit development water in pit • Rim pond to settle TSS and aerate water • Lined Fault Creek diversion ditch, and • Energy dissipation structure at diversion outlet to South Creek catchment
Changes in surface water quality as a result of water management and discharge	Operations	<ul style="list-style-type: none"> • WTP • Discharge at minimum dilution ratio to Geona Creek (3:1) and Finlayson Creek (2:1) • Class A and B storage facilities constructed with a compacted composite liner constructed of a high-density polyethylene (HDPE) geomembrane and a compacted glacial till layer • Upper WMP, lower WMP, pit rim pond • Class A and B storage facilities' water collection ponds constructed with an impermeable HDPE liner, and • Progressive covering and reclamation of Class A, B and C storage facilities
Changes in surface water quality as a result of ABM open pit flooding and closure and formation of ABM lake	Closure	<ul style="list-style-type: none"> • ABM pit water treatment with lime and carbon source as it fills
Changes in surface water quality as a result of water management and discharge	Closure	<ul style="list-style-type: none"> • ABM pit water treatment with lime and carbon source as it fills • CWTS • Closure cover that consists of a composite liner comprised of a geomembrane liner underlain by a low-permeability soil for Class A and B storage facilities, and • WTP remains onsite and available until storage facilities and CWTS are meeting design objectives

WATER MANAGEMENT PLAN STRATEGIES

The goals of the Water Management Plan are to minimize the volume of contact water requiring management in the Project area and to reuse water in the Project area to the maximum practical extent. The key strategies to achieve these goals include

- three main diversions (south, northwest and northeast diversions) established during construction and maintained through operations;
- collection of runoff and seepage from Class A and Class B storage facilities and runoff from the Class C storage facility considering the HDPE system;
- two-stage WMP (upper and lower WMPs) used to manage contact water and, respectively, for settling and polishing prior to discharge to the receiving environment;
- WTP to treat excess water as required to maintain dischargeable water quality in the lower WMP;
- WTP designed to treat collection pond water from Class A and Class B storage facilities and ABM open pit water;
- runoff water from Class C storage facility and overburden stockpile conveyed from collection ponds directly to Geona Creek downstream of the lower WMP;
- limits to discharge quantity and quality such that water will be discharged to both Geona Creek and Finlayson Creek at established water quality discharge standard concentrations and at discharge volume ratios no less than 3:1 (receiving water volume: effluent volume) for Geona Creek at KZ-37 and 2:1 for Finlayson Creek at KZ-15, to meet WQOs in the receiving environment;
- groundwater and surface water intercepted and collected during the construction and operation of the ABM open pit, and pumped to the pit rim pond. Pit rim pond water either released to Geona Creek or used on-site for dust suppression during construction, and either used for process water or stored in the lower WMP prior to release to the environment during operations.

A schematic of the operational water management plan is provided in Figure 18-2 of the Project proposal.

The EC considers that some uncertainties associated with the water management plan will require additional attention during the next stages of project design including the sensitivity of the water storage system to critical conditions combining precipitation and storage, and development and pilot studies for water treatment systems to optimize design and ensure timely implementation.

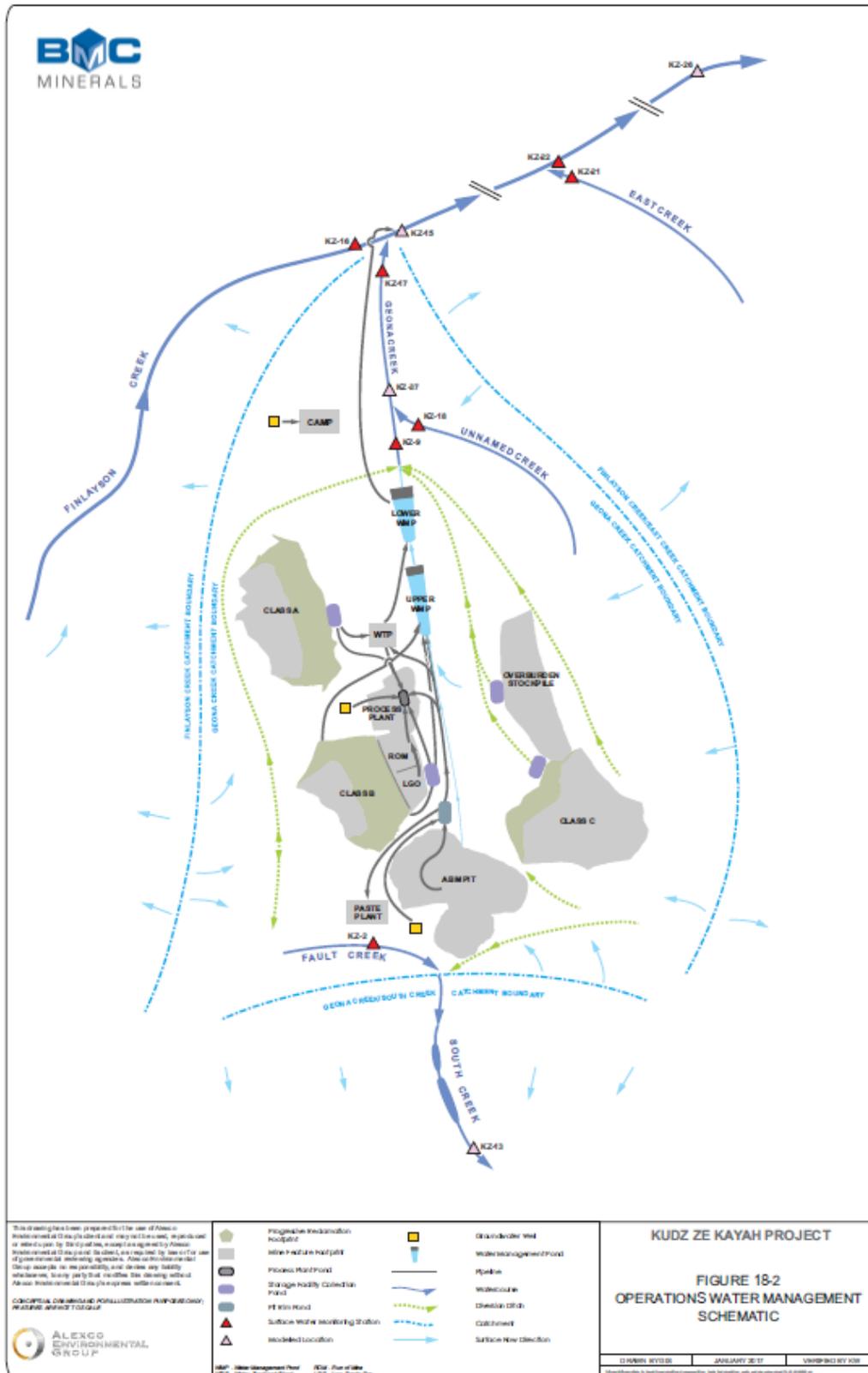


Figure 4: Operations water management schematic

WATER TREATMENT PLANT (WTP)

The Proponent has committed to constructing a WTP at the processing facility to treat water from the Class A and Class B storage facility collection ponds, the pit rim pond (ABM pit dewatering) and the process plant facility site runoff (from low grade ore (LGO)/Run of Mine (ROM) sump) water that is not used in milling.²²

The water treatment process is described as consisting of pH adjustment, clarification and any other processes that may be required to bring the water to a suitable standard for discharge to the environment. A second stage process is to treat selenium and provide polishing for other constituents. Estimated effluent concentrations, or concentrations estimated from constituent removal in similar water treatment processes in Yukon, were used as input values for the 2018 water quality model for proposed WTP discharge. Treated discharge quality used as inputs were provided in Table 5-10 of the 2018 Water Quality Model Report. Treated water will be discharged to the lower WMP for final polishing before being discharged to the receiving environment or used in the process plant circuit. The WTP will remain in place and will continue to treat water from the Class A and B ponds as required until the facility closure measures are meeting design objectives, or until wetlands to treat this water are commissioned.

YESAB is comfortable with the predicted performance of the WTP, understanding that the WTP design will continue to be developed as part of the water licence process. However, decommissioning of the WTP should be preceded by a substantial time period in which the constructed wetland independently demonstrates its ability to achieve WQOs.

VERY LOW-PERMEABILITY COVERS FOR CLASS A AND CLASS B STORAGE FACILITIES

Class A storage facility is a co-disposal facility to manage filtered, dewatered tailings and strongly PAG waste rock. It is located north of the process plant facility on the western hillside of the Geona Creek valley. The co-disposal concept is based on the premise that the tailings will mitigate the acid generation in the waste rock and this will need to be demonstrated. The Class B storage facility will be used to manage weakly PAG waste rock. It is located on the western hillside of Geona Creek adjacent to the ABM open pit. Both facilities will require multi-layered cover systems to ensure long-term chemical stability of the site. The long-term effectiveness of the engineered low-permeability covers is integral to minimizing loadings of COPs from the Class A and Class B storage facilities to the Geona Creek drainage post-closure.

In the 2017 Conceptual Reclamation and Closure Plan (CRCP) for the Project (Project Proposal, Appendix H-1), the Proponent indicates that the Class A and Class B storage facilities will require land forms and covers that reduce net percolation by 98 percent and 75 percent, respectively. Annual monitoring and inspections of the Class A and Class B storage facility covers is proposed and described conceptually in the 2017 CRCP.

In response to concerns raised during the Adequacy Stage about the long-term physical integrity and longevity of engineered covers, the Proponent indicated that they will use internationally accepted practices for consolidation of earthen dams and manual compaction, and that the design, operating methodology and method of compaction will be signed off by the

²² YOR Document 2017-0083-345-1.

design engineers prior to final granting of the QML. In addition, the Proponent committed to coupling the cover systems with short-term water treatment during operations and throughout active and transitional closure, and with CWTs during post-closure, to ensure the proposed WQOs are met. In response to Information Request 3, the Proponent committed to composite liners for the Class A and Class B storage facilities constructed of an HDPE geomembrane and a compacted glacial till layer. This assumption was carried through for the 2018 life of mine water balance and the 2018 failure assessment.

The Class C storage facility, located in a hanging valley on the east side of Geona Creek, will be used to manage non-potentially acid generating waste rock. The Class C waste rock is not considered to be a significant source of metal leaching (ML), and the stockpiled rock will be used in construction, during operations, during closure and as frost protection layers on the Class A and Class B closure covers. The remaining rock in the Class C storage facility will be covered in a manner that will promote revegetation (it does not require a cover to reduce net percolation).

Loadings inputs to the 2018 water quality model and waste rock classification criteria, which were developed based on the potential for acid generation and ML, are provided in the 2018 Acid Rock Drainage (ARD)/ ML report (Appendix D²³). The ARD/ML report provided additional information on the waste characterization and kinetic test results from several tests, and YESAB considers the information appropriate to support inputs for water quality modelling.

Table 13: Proposed waste rock classification

Class	Classification Criteria	Treatment Requirements
Class A	Strongly PAG material with an associated high potential for ML. Waste rock with a total sulphur content greater than 2.9 wt.% or a Neutralization Potential (NP) less than 10 kg calcium carbonate (CaCO ₃)/t.	Water management and treatment during operations and closure
Class B	Mildly PAG with a potential for ML that is lower than that of Class A material. After clearing the Class A criteria, waste rock is Class B if it has an NP/Acid Production Potential (AP) ratio that is less than 1.9.	Water management and treatment during operations and closure
Class C	Non-PAG and has a relatively low potential for ML. Waste rock with an NP/AP ratio greater than 1.9.	Not anticipated to require treatment

²³ YOR Document 2017-0083-321-1 inclusive through YOR Document 2017-0083-324-1.

The Proponent will need to confirm that the NP used in the waste rock classification is an “effective NP” as defined in Price (2009).²⁴

IN-SITU TREATMENT OF THE ABM PIT WATER

A single open pit will be mined, which will access the ABM and Krakatoa zones. Mining of the ABM zone has three separate phases while the Krakatoa zone will be mined in a single phase. Pit wall material loadings inputs to the 2018 water quality model are provided in the 2018 ARD/ML report (Appendix D²⁵). The untreated ABM pit water is anticipated to contain elevated concentrations of antimony, arsenic, cadmium, copper, lead, selenium, uranium and zinc. Given that elevated COPI concentrations are estimated to be present in the ABM pit upon filling, the Proponent anticipates that treatment will be required to maintain water quality in the receiving environment. The Proponent expects that ABM pit water treatment will be amenable to in-situ treatment by organic carbon (e.g. alcohol and/or molasses), which will be added to the lake to stimulate the formation of reducing conditions and will reduce COPI concentrations in the water column. In-situ treatment is expected to significantly reduce the concentrations of antimony, cadmium, copper, lead, nickel, selenium, uranium and zinc in the water.

The Proponent estimated COPI removal percentages based on field case studies from the literature. The estimated percent reductions used in the water quality model serve as the basis for the effects assessment. Uncertainty in predictions will require ongoing studies and monitoring to achieve treatment objectives. The Proponent proposed that ongoing long-term monitoring and management of ABM pit water be conducted to ensure that treated parameter concentrations of COPI are sustained and to inform any if additional treatments are needed, in order to maintain the desired level of COPI removal.

²⁴ Price, W.A. 2009. Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials. Mine Environment Neutral Drainage Program (MEND) Report No.1.20.1. Natural Resources Canada. December 2009. 579 p.

²⁵ YOR Document 2017-0083-321-1 inclusive through YOR Document 2017-0083-324-1.

Table 14: Percent reduction of COPIs resulting from in-situ ABM lake treatment²⁶

Parameter	In-Situ Treatment Reduction (percent removal)
Sulphate	5
Nitrate-N	90
Nitrite-N	90
Ammonia-N	50
Antimony	50
Cadmium	90
Copper	90
Lead	50
Nickel	50
Selenium	90
Uranium	50
Zinc	90

CONSTRUCTED WETLAND TREATMENT SYSTEM

During the transitional closure phase, CWTSs will be established down-gradient of the ABM pit in the area of the decommissioned pit rim pond, and further down-gradient in the area of the WMPs. Details on the horizontal surface flow CWTS's design is available in the *Kudz Ze Kayah Constructed Wetland Treatment System Memo*²⁷ and Section 8.4.1.6 of the Project proposal. Design specifications and removal coefficients for the treatment of select COPIs were provided for arsenic, cadmium, copper, lead, selenium and zinc by Contango Strategies Ltd. and in the Proponent's response to YESAB adequacy information request R108. Upon filling, the ABM lake will start to discharge north towards Geona Creek via a CWTS.

As with other mine sites in Yukon, a reclamation and research program will be required as part of closure planning and will include the need for demonstration scale testing. Until the test plots demonstrate that flow rates and contaminant loads can be adequately treated, alternative treatment technologies will be required.²⁸ During the Adequacy Phase, concerns were raised about scheduling a design and implementation plan for the proposed wetland treatment systems. In response to R2-17, the Proponent provided a conceptual completion and implementation schedule of CWTS. The Proponent confirmed that the purpose of the wetlands is to improve water quality and that achieving WQOs will not rely on the proposed wetlands. The

²⁶ YOR Document 2017-0083-345-1.

²⁷ YOR Document 2017-0083-166-1, Appendix B, through YOR Document 2017-0083-167-1.

²⁸ YOR Document 2017-0083-218-1, pg.9 (R2-16).

Proponent has committed to ongoing active water treatment infrastructure and capacity being retained on-site until passive water treatment systems achieve performance objectives.²⁹

Table 15: Conceptual schedule of completion of phased implementation of constructed wetland treatment system

Phase		Time Required	Available Time in Operational/ Closure Schedule	Earliest Period Applicable
1a	Information gathering and site assessment	3–6 months (completed)		Pre-operational
1b	Conceptual design and sizing			Pre-operational, once water quality predictions are available
2	Off-site bench-scale testing and optimization	3–6 months	2.5 years until start of construction, and another 1.5 years during mine construction	Pre-operational, once water quality predictions are updated
3	Off-site pilot-scale testing and optimization	8–16 months		After Phase 2 is complete
4	On-site demonstration scale implementation and monitoring	2–5 years	10 years during mining operation	Operational period
5	Full-scale implementation—North CWTS	1 year for construction and 2 years for commissioning	2 years during transition closure as pit is filling for construction and 10 years during transition closure as pit finishes filling for commissioning	After size refinement in Phase 4

²⁹ YOR Document 2017-0083-158-1 inclusive through YOR Document 2017-0083-167-1.

Effects Characterization

PROJECT WILL GENERALLY DEGRADE WATER QUALITY

The Proponent's predicted changes to water quality are provided in the 2018 water quality model report. Based on these predictions, the Project is generally expected to result in permanent changes to water quality that are characterized by an increase in concentrations of COPIs above current background levels:

- in South Creek during construction due to the diversion of Fault Creek into the South Creek drainage, and a return to near baseline levels once the Fault Creek diversion is removed during active and transition closure phases;
- in Geona and Finlayson creeks, where water is released from the site via the lower WMP during operations (due to COPI loadings increasing as the ABM pit is excavated); and
- in Geona and Finlayson creeks during active closure, as a result of drain down from the Class A and Class B storage facilities.

In contrast, COPI concentrations in Geona and Finlayson creeks are expected to be comparable to or below baseline values during construction due to the diversion of Fault Creek to the South Creek drainage and dilution from discharge of the ABM pit dewatering.

CONCENTRATIONS OF SOME COPIs WILL EXCEED WATER QUALITY OBJECTIVES

The EC compared the Proponent's water quality predictions to proposed WQOs at three downstream locations: Geona Creek (KZ-37) and upper and lower Finlayson Creek (KZ-15 and KZ-26, respectively). With all of the proposed mitigation measures considered, predicted concentrations of all COPIs are below their proposed WQOs at the receiving environment locations, with some exceptions.

The exceptions include intermittent exceedances for nitrate during active closure and for copper during the transition closure phase. In the case of copper, exceedances are characterized in the 2018 water quality model report as infrequent (one or two months of the year), with a maximum concentration of 1.5 times the proposed WQO during the transition closure phase in Geona Creek in all precipitation scenarios. Elevated copper levels in surface water during the transition closure phase are attributed to loadings in seepage, assumed to be from liner defects from the Class A storage facility. Concentrations of copper decrease after closure, when water from the ABM lake flows to Geona Creek, creating extra dilution.

Overall, YESAB is comfortable with the model and the input assumptions for each of the Project phases. To reduce uncertainties and improve confidence, the Proponent has also provided model results for wet and dry scenarios (one in 50 [1/50] wet year, and one in 10 [1/10] dry year, respectively), which indicate that the predicted changes in water quality in the South, Geona and Finlayson creeks would remain within the general spatial boundaries in the "average" scenario.

UNCERTAINTY OF PREDICTIONS

The EC recognizes that there are important uncertainties in the model that limit confidence in long-term predictions. Should Project design alter over time, then the predictions could overestimate or underestimate actual effects.

The effects characterization is contingent on the premise that mitigation measures proposed by the Proponent are consistent with best practices, will function as proposed and modelling used to support the effects characteristics is sufficiently robust. Given the permanence of potential adverse effects on water quality post-closure, uncertainties in the model assumptions that could affect the significance determination warrant special consideration and should continue to be refined over the life of the Project. These uncertainties, identified during the Screening, include

- geochemical source terms for the Class A and B waste rock storage areas (WRSAs), in which acid conditions are expected to develop over time;
- treatment performance of CWTSs for COPIs, especially if acidic conditions occur over the long-term;
- water management system captures efficiency of seepage from under the Class A WRSA during all relevant Project phases and post-closure;
- short- and long-term efficacies of the in-situ ABM pit water treatment;
- long-term performance of Class A storage facility liners to prevent mine-affected seepage from entering the groundwater system and discharging to Geona Creek, bypassing the CWTS; and
- long-term performance of Class A and Class B storage facilities' engineered covers to effectively reduce infiltration into and seepage out of the facilities.

Significance Determination

The effects characterization for water quality primarily considers increased concentrations of COPI above background levels and above proposed WQOs.

SOUTH CREEK**EFFECTS ARE LIKELY**

Effects are likely to occur during construction and operation, are limited in spatial extent, and are reversible once the Fault Creek diversion has been removed. Water concentrations are expected to return to near baseline conditions post-closure.

EFFECTS ARE ADVERSE

The effects are adverse since COPI concentrations will increase above background, but are not expected to exceed proposed WQOs.

EFFECTS ARE NOT SIGNIFICANT

The effects are not significant because they are reversible and any changes to water quality that remain below WQOs are not expected to limit other water use in the drainage. This is because no other activities which introduce changes to surface water chemistry are expected to occur in the drainage.

GEONA AND FINLAYSON CREEKS*EFFECTS ARE LIKELY*

Effects are likely to occur during all Project phases, are local in spatial extent, and are permanent—although the magnitude of effects vary over the life of the Project.

EFFECTS ARE ADVERSE

The effects are adverse since COPI concentrations will increase above background and may sporadically exceed proposed WQOs during closure.

EFFECTS ARE SIGNIFICANT

The effects are significant during the operations and closure phases due to increases in water concentrations of COPIs relative to background and intermittent failures to meet WQOs. While proposed mitigation measures largely reduce the intermittent exceedances of WQOs, restrictions on water use in the drainage could occur post-closure due to the permanence of effects on water quality. Uncertainty of the efficacy of Proponent mitigation measures increases the risks associated with predicted WQO exceedances.

Recommended Mitigations***ONGOING CHARACTERIZATION OF WASTE MATERIALS AND WATER QUALITY MODELLING***

Additional mitigation measures that focus on preventing acidic conditions from developing within the Class A and Class B storage facilities should be implemented, and should include ongoing characterization of ARD waste materials, geochemical modelling and effective in-situ monitoring of water quality and quantity in the storage facilities.

- 1) The proponent shall update the geochemical modelling during operations to inform detailed design of the cover systems, with the aim of reducing acid production and COPI loadings from storage facilities.
- 2) The proponent shall advance development of the WTP design and confirm expected performance for all relevant COPIs during licensing to optimize design and ensure timely implementation.
- 3) The proponent shall conduct pilot studies for in-situ pit treatment and the CWTS during operations to confirm their expected performance for all relevant COPIs, optimize their respective designs and ensure timely implementation.

CONSTRUCTED WETLAND TREATMENT SYSTEM

The 2018 water-quality-model-estimated input COPI concentrations were all below their respective WQO, but were not consistently near background levels. Additional improvements in water quality may be expected from the CWTS and this can be confirmed during pilot testing. In the 2018 water quality model report, the Proponent states that, at present the CWTS may be viewed as providing polishing treatment and redundancy to the closure plan. As with other mine sites in Yukon, a reclamation and research program will be required as part of closure planning, which will include the need for demonstration-scale testing. Until the test plots demonstrate that

the flow rates and COPI loadings can be adequately treated, alternative treatment technologies will be required.

- 4) The Proponent shall implement additional treatment options if the proposed CWTS cannot be demonstrated to reduce COPI concentrations to background levels consistently.

Recommended Monitoring

Due to uncertainties regarding water quality and the high societal value placed on water quality, the EC recommends, under s.110 of YESAA, that monitoring take place.

CLASS A AND B STORAGE FACILITIES COVER INSPECTIONS AND PERFORMANCE MONITORING

Covers can degrade over time and this can affect their performance. Reduced performance can result in increased volumes of contact water, and can ultimately affect the quality of water released from the site to the environment. Less-than-ideal performance of the low-permeability covers on the Class A and Class B storage facilities and/or the liners can lead to increased loadings of acidity and COPIs to the proposed CWTS, and ultimately to Geona and Finlayson creeks. In addition, 2018 groundwater modelling results suggest that leakage from the Class A storage facility may report to Geona Creek downstream of the lower management pond, which would represent a long-term risk for water quality in the receiving environment. To address these uncertainties the EC recommends

- A. The Proponent shall implement water quality monitoring of COPIs as early as possible beneath storage facilities and beneath their respective covers. Monitoring shall continue through operations and closure phases.

5.2 Water Quantity

Summary and Conclusion

The EC has determined that the Project will not result in significant adverse effects to water quantity. While changes to water quantity will occur in South Creek and the Geona and Finlayson Creek watersheds, Project effects are sufficiently eliminated, reduced or controlled through the mitigations proposed by the Proponent.

Importance of Water Quantity

CULTURAL AND ECOLOGICAL IMPORTANCE OF WATER QUANTITY

As stated in Section 5.1, water is highly valued by Yukon residents, First Nations and communities. The availability of water is a defining factor for different human water uses (spiritual purposes, consumption, domestic uses, commercial and industrial activities) and ecological water uses (lotic and lentic environments, aquatic habitats, aquatic communities). Anthropogenic flow alterations are a primary contributor to the degradation of aquatic ecosystems, the loss of freshwater biodiversity and restricted water uses for other human

needs. As stated in the *Yukon Water Strategy and Action Plan*,³⁰ “water is vital to life: it is a necessity for our natural environment, biodiversity, and economy. It is used for drinking and waste disposal. Water provides habitat for fish, plants and animals and supports basic life.”

Groundwater is an important contributor to surface water flows, in particular in headwater systems such as in the Project area; therefore, changes to groundwater flows may ultimately affect surface water quantity. Discussions with local Kaska citizens during consultation (Project Proposal Section 2) confirmed that headwater streams, including Geona Creek, hold an important value within their Traditional Territory. Headwater values are documented in *Kaska Dena Management Practices: Kaska Dena Land Use Framework*³¹ as follows:

Headwater and source watersheds are important to maintain water quality and support the flow, storage, and hydrology of the adjacent watersheds. In addition, these watersheds tend to have a higher density of Kaska sites, hunting areas, traditional uses, and Kaska values. The watersheds also generally have high ecological values.

Legislative and Management Setting

The legislative and management setting for the Project with regard to water quantity is set out in the *Yukon Waters Act*, *QMA* and the federal *Fisheries Act*. The Project is located within the Traditional Territories of the LFN and RRDC. Although RRDC and LFN are not signatories to the Yukon First Nation final agreements, consultation is required under YESAA.

WATERS ACT

Direct water use, diverting a water course and altering the flow, direction or storage of a watercourse are common triggers for a water licence under the *Yukon Waters Act (Waters Regulation)*. The Yukon Water Board issues water licences and can set limits to direct water use and/or the deposit of waste into water to achieve their objective under the *Waters Regulation* to “...provide for the conservation, development, and utilization of waters in a manner that will provide the optimum benefit from them for all Canadians and for the residents of the Yukon in particular.”

QUARTZ MINING ACT

The Project will require a Quartz Mine Licence (QML) issued by YG EMR under section 135 of the *QMA*.

- QMLs consider and address mine development, operation plans and environmental protection plans for the development, operation and decommissioning of a mine site.

³⁰ Government of Yukon. Water for Nature, Water for People. Yukon Water Strategy and Action Plan. Available online at: www.env.gov.yk.ca.2014.

³¹ Dena Kayeh Institute. *Kaska Dena Management Practices: Kaska Dena Land Use Framework*. 2010.

- The QML will set out requirements for routine monitoring and reporting, and will include pertinent adaptive management plans for different aspects of the mine to address their potential impacts.

YG EMR produced the *Yukon Mine Site Reclamation and Closure Policy for New Mines* in 2006. The policy applies to hard rock (quartz) mines in Yukon that are on mineral claims, leases and Crown grants developed pursuant to the QMA. The policy does not specifically address water quantity but rather sets out a goal for mine site reclamation and closure to “ensure a government-approved reclamation and closure plan, prepared by the mine operator, to return the mine site to a viable and, wherever practical, self-sustaining ecosystem, is in place prior to mine development”.³² The policy also states that a Reclamation and Closure Plan should “fully protect public and environmental health and safety and ensure that any potential discharges during mine operation and following mine closure will be managed to prevent harm to the receiving environment or to the public” and include “methods for protection of water resources during and after mine closure”.³³

Context

FACTORS AFFECTING WATER QUANTITY

Water quantity in a watershed is controlled by the physical characteristics of the watershed (land use, soil type, geology, vegetation, slope and aspect), interactions with groundwater (seeps, recharge rates, shallow and deep groundwater flow patterns) and climate (precipitation, timing of freeze-up and thaw, climate change). Changes to any of these characteristics, whether introduced by natural or anthropogenic activities, can affect water quantity in the drainage:

- Short-term and seasonal variabilities are influenced by weather patterns such as precipitation events, and seasonal freeze and thaw periods.
- Longer-term variability may be caused by changes to climate, which effect weather patterns and in some cases ground water systems (changes to permafrost conditions).
- Permanent changes may be caused by specific events, such as landslides and seismic activity, and by interactions with nature, such as beaver activity.

Existing Conditions and Trends

CLIMATE

The Project is located on the east side of the divide between the Pelly River and Liard River drainage basins.³⁴ The Project infrastructures and the deposit lie within a valley that drains to the north through Geona Creek into Finlayson Creek and Finlayson River, and to the south through South Creek into the North River/Lakes system. Both the north and south drainages are part of the Liard basin.

³² YG Energy, Mines & Resources. Yukon Mine Site Reclamation and Closure Policy. January 2006.

³³ Ibid.

³⁴ YOR Document 2017-0083-112-1 inclusive through YOR Document 2017-0083-115-1.

In the Project area, most precipitation falls in summer (July to September) and is relatively low through the winter. Site discharge hydrographs are typically characterized by high spring snowmelt-driven flows, lower summer flows sustained by groundwater inflows and periodic rainfall events followed by large autumn rainfall events. Winter flows are very low as a result of cold temperatures, freezing conditions and the gradual depletion of groundwater storage.³⁵

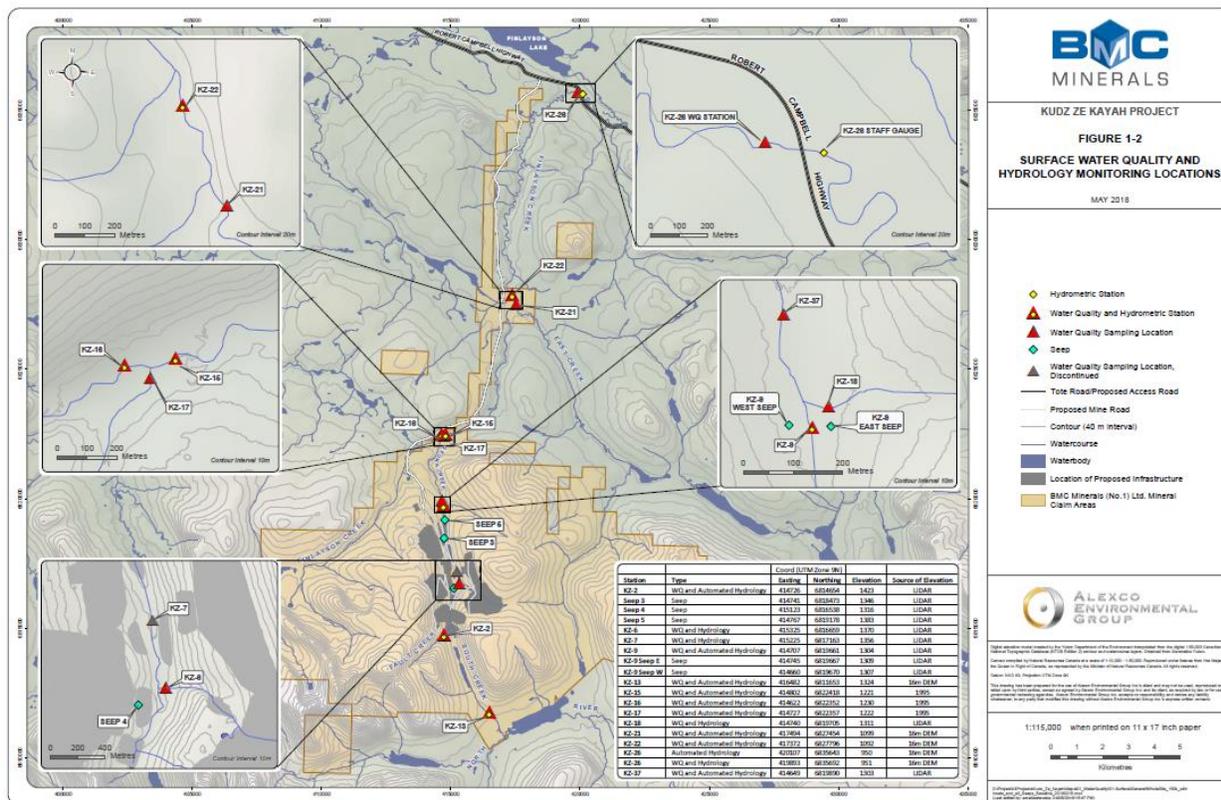


Figure 5: KZK surface water and hydrology stations (from 2018 Water Baseline)

CLIMATE CHANGE

Longer-term changes are expected to occur as a result of climate change. Long-term climate change trends are expected to manifest in an increase in short-term sudden weather events that could be relevant to the Project during operations and post-closure.³⁶ Climate change trends indicate that average temperature across Yukon is projected to increase by more than 2°C over the next 50 years, while winters are projected to warm faster than any other season. In addition, annual precipitation (rain and snowfall) is projected to increase from 10 percent to 20 percent over the next 50 years in Yukon, and snowfall is projected to arrive later in the fall and become more variable over the winter, with periods of little snow and intense snowfall events becoming more common. The anticipated results from climate change suggest that there will be changes

³⁵ YOR Document 2017-0083-308-1 inclusive through YOR Document 2017-0083-311-1.

³⁶ Research Northwest and Morrison Hershfield. 2017. Yukon 'State of Play': Analysis of Climate Change Impacts and Adaptation. November 14, 2017.

to the timing, intensity and duration of high and low flow periods, which need to be considered in the Project's water management plan.

BIOLOGICAL FACTORS

Beaver activity has been observed in the Geona and South creeks and has resulted in the formation of localized lentic environments within these creek systems.

SOUTH CREEK DRAINAGE

South Creek is approximately 5 km long and originates upstream of two small ponds located at the watershed divide between South Creek and Geona Creek. The South Creek drainage has been modified by historical beaver activity. The creek flows south through two small ponds and then through a wetland area before entering the North River. A well-defined channel connects the outlet of the second pond to the North River.³⁷

GEONA CREEK AND FINLAYSON CREEK DRAINAGES

Fault and Geona creeks are headwaters of Finlayson Creek. Fault Creek is a mountainous alpine stream confined by a narrow valley, approximately 2 km in length. Fault Creek is characterized by a highly braided reach before it converges with Geona Creek near its headwaters. Geona Creek is approximately 8 km in length, originating on the north side of the watershed divide of South Creek and Geona Creek. Geona Creek's headwaters consist of a series of small ponds that flow north for approximately 2 km before eventually entering a well-defined channel. This channel flows north for approximately 6 km through a broad valley until it eventually converges with Finlayson Creek. A few small ponds are found intermittently throughout Geona Creek and are suspected to be the result of historical beaver activity.³⁸

East Creek is another tributary to Finlayson Creek that traverses the Project area. Originating at the southeast end of the property, East Creek is approximately 18 km in length. The creek contains a small pond midway through its reach and flows into Finlayson Creek, approximately 7 km downstream from the confluence with Geona Creek.

Finlayson Creek in its entirety is approximately 38 km in length, with 28 km of its reach located downstream of the Project's potential zone of influence. Finlayson Creek originates west of the Project area and flows northeast until eventually draining into the Finlayson River downstream of its crossing of the RCH.

SURFACE WATER–GROUNDWATER INTERACTIONS

Baseline hydrogeologic characterization of the Project area was summarized in Appendix D-3 of the Project proposal.³⁹ Two hydrogeologic units are present in the Project area: bedrock and overburden. Both units display similar seasonal trends in groundwater levels: groundwater levels rise during spring and summer (from May through September) and decrease during fall and winter (October through April), with a typical range of variation between two and five metres.

³⁷ YOR Document 2017-0083-296-1 inclusive through YOR Document 2017-0083-304-1.

³⁸ Ibid.

³⁹ YOR Document 2017-0083-085-1 inclusive through YOR Document 2017-0083-091-1.

The groundwater contribution to surface waters is highest during winter baseflow conditions. This is when the relative contribution of groundwater seeps and other sources to the area creeks peak under winter low-surface flow conditions. A number of groundwater seeps have been identified across the Project area in the Geona Creek drainage, five of which were characterized as part of the baseline water quality report.⁴⁰ The proposed ABM open pit itself is located in the Geona Creek valley floor in a natural groundwater discharge area with a shallow groundwater table, local artesian conditions in the deeper bedrock aquifer and vertical upward hydraulic gradients.⁴¹

WATER QUANTITY AND OTHER ACTIVITIES

There are no anthropogenic activities expected to occur in the Project area that would change water quantity other than the Project itself.

Project Design

The Project will be situated in the upper half of the Geona Creek watershed. Structures such as the open pit and WMPs will be situated directly in the creek and floodplain. Overall, the Project's water balance in the Geona Creek basin is positive and water will need to be released during all Project phases.

PROJECT INFRASTRUCTURE RELEVANT TO WATER QUANTITY

Key mine infrastructure that will directly affect surface flows includes the following mine facilities and processes. Each of these facilities and processes have been included as mine aspects in the 2018 Life of Mine Water Balance Model⁴² (2018 LOM WBM):

- **Process plant:** Located on the western hillside of Geona Creek between the Class A and Class B storage facilities. Surface runoff is collected in the process plant site sump and pumped to the WTP.
- **Open pit and pit rim pond:** Situated in the Geona Creek bed, downstream of Fault Creek. During the construction phase, overburden dewatering is pumped to the pit rim pond prior to discharge to Geona Creek.
- **Class A and B storage facilities and collection ponds:** Located on the western hillside of Geona Creek. Non-contact runoff is directed around the facilities to Geona Creek. Contact runoff is directed to each facility's respective collection ponds during operations and active closure. Runoff from the reclaimed facilities is directed to Geona Creek during transitional and post-closure.
- **Class C storage facilities and collection pond:** Located on the east side of Geona Creek. Runoff and toe discharge are collected in the Class C collection pond, which drains to Geona Creek.
- **Overburden stockpile and collection pond:** Located on the eastern side of Geona Creek, to the north of the Class C storage facility. Surface runoff from the facility will be routed to the overburden collection pond and conveyed to Geona Creek.

⁴⁰ YOR Document 2017-0083-296-1 inclusive through YOR Document 2017-0083-304-1.

⁴¹ YOR Document 2017-0083-027-1.

⁴² YOR Document 2017-0083-344-1.

- **ROM pad, LGO stockpile and sump:** Located on the western side of Geona Creek, at the base of the Class B storage facility and adjacent to the process plant. Surface runoff and toe discharge from the ROM pad and LGO stockpile will be collected in a sump and pumped to the WTP. By the start of active closure, the ROM and LGO materials will be removed and the pad will be covered with an extension of the Class B storage facility HDPE liner and cover.
- **UWMP:** Located in Geona Creek upstream of the LWMP. Site contact water will be routed to the UWMP. The UWMP will also receive runoff from diverted and un-diverted areas, and losses from the Class C collection pond and collection ditch. Excess UWMP volumes will be pumped to the LWMP.
- **LWMP:** Located in Geona Creek downstream of the UWMP. Water from the UWMP and the WTP will be pumped to the LWMP. The LWMP will also receive runoff from un-diverted areas. LWMP water will be discharged to Geona Creek (immediately downstream of KZ-9) and to Finlayson Creek (at KZ-15). The Proponent has proposed that discharge flows from the LWMP will not exceed specific natural streamflow to discharge flow ratios in Geona and Finlayson creeks.
- **WTP:** The WTP will receive process water and contact water. Contact water will come from the Class A and B facility collection ponds/seepage collection systems, ROM pad and LGO stockpile sump, pit rim pond and process plant sump. Treated effluent from the WTP will be discharged to the LWMP during operations and directly to Geona Creek during active and transitional closure.
- **Surface water diversions:** A number of diversion channels will be used to capture and convey non-contact runoff around site infrastructure. All diversion channels will be decommissioned at the start of active closure.
 - Diversions to South Creek: south diversion channel, Fault Creek diversion channel, open pit south diversion channel, and upper access road diversion channel (upslope of the open pit and south portions of the Class B storage facility);
 - Diversions to Geona Creek: east diversion channel, tote road diversion channel (upslope of Class A storage facility), upper access road diversion channel (upslope of Class A and B storage facilities); and
 - Diversions to the UWMP: open pit north diversion channel, tote road diversion channel (upslope of Class B storage facility)
- **The north and south wetlands:** Two CWTS will be located within the Geona Creek drainage. The systems will be constructed and fully functioning by the start of post-closure. The south wetland will receive surface overflow from the ABM pit. Water from the south wetland will flow to Geona Creek and into the north wetland. The north wetland will receive water from the south wetland and runoff from the covered Class A, B and C storage facilities. Water from the north wetland will flow to Geona Creek.

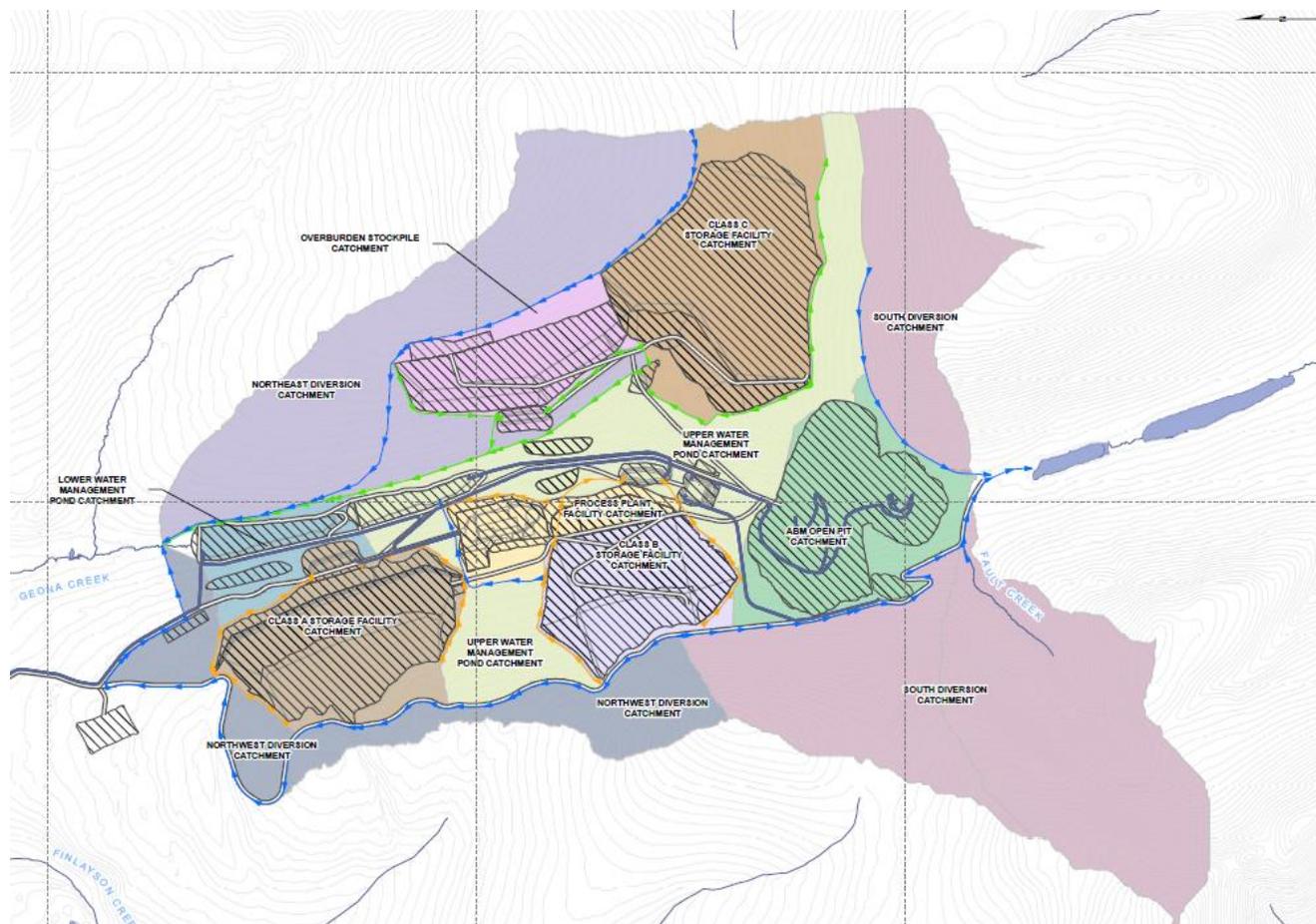


Figure 6: KZK Project area sub-catchments (from Project proposal Section 4.10 Water Management)

PROJECT ACTIVITIES BY PROJECT PHASE

Project activities that are expected to affect water quantity in the South Creek, Geona Creek and Finlayson Creek drainages will change over the various phases of the Project.

SOUTH CREEK DRAINAGE

- During construction
 - re-direction of Fault Creek and a portion of the upper Geona Creek catchment to South Creek.
- During operations
 - flows to the south from the diversions from Fault Creek and south/southwest non-contact diversions to the South Creek drainage.
- During closure
 - Fault Creek will be re-directed back to the Geona Creek watershed and contribute to filling the ABM open pit.

GEONA CREEK AND FINLAYSON CREEK DRAINAGES

- During construction

- re-direction of Fault Creek and a portion of the upper Geona Creek catchment to South Creek;
- development within upper Geona Creek watershed including construction of the UWMP and LWMP, site water diversion ditches and development/commissioning of water treatment facilities;
- dewatering of the ABM open pit including capture and pumping of volumes of water contained within a shallow water aquifer in the overburden to a sump.
- During operations
 - Discharge of water from the LWMP into Geona Creek at a maximum ratio of 3:1 (creek flow: discharge);
 - Discharge from the LWMP via a pipeline into Finlayson Creek at a maximum ratio of 2:1 (creek flow: discharge);
 - Discharge into Geona Creek from ditches and diversions;
 - Ongoing dewatering of the ABM open pit and underground workings.
- During closure
 - dewatering of the ABM open pit will cease and the ABM open pit will be allowed to fill;
 - re-direction of Fault Creek to the Geona Creek watershed via the ABM open pit;
 - cessation of direct discharge to Finlayson Creek from the LWMP; and
 - site water directed through the north and south CWTSSs.

PROPONENT MITIGATION MEASURES

Proponent mitigation measures, with regard to water quantity, minimize changes to flow volumes and flow timing. Because the Project's water management plan will affect two drainages, mitigation measures also attempt to minimize flow exchanges across drainage boundaries.

Table 16: Proponent’s proposed mitigation measures for water quantity

Potential Effect	Project Phase	Proposed Mitigation Measures
Changes in surface water quantity from diversions and dewatering that result in increased flows compared to baseline	Construction and operations	<ul style="list-style-type: none"> • Diversion of Fault Creek to South Creek • Diversion of Geona catchment above Project footprint to Geona Creek at KZ-9 (north diversions)
Changes in surface water quantity from diversions and dewatering that result in decreased flows compared to baseline		
Changes in surface water quantity from water management and discharge	Operations	<ul style="list-style-type: none"> • Diversion of Fault Creek to South Creek • Diversion of Geona catchment above Project footprint to Geona Creek at KZ-9 (north diversions) • Site runoff captured and managed in the same drainage (Geona Creek and Finlayson Creek drainages)
Changes in surface water quantity as a result of flooding of ABM open pit at closure and ABM lake formation	Closure	<ul style="list-style-type: none"> • Removal of diversions to return; baseline catchment boundaries • Installation of low-permeability covers with natural vegetation to approximate natural cover and runoff
Changes in surface water quantity as a result of water management and discharge	Closure	<ul style="list-style-type: none"> • Removal of diversions to return; baseline catchment boundaries • Installation of low-permeability covers with natural vegetation to approximate natural cover and runoff

Effects Characterization

PROJECT WILL ALTER LOCAL HYDROLOGY

Local hydrology will be altered by the Project, which will involve diversion of natural creeks, water management and storage, and dewatering activities. These activities will largely be

associated with the construction, operations and active and transitional closure phases. Over these Project phases, alterations in natural drainage patterns will cause changes to runoff volumes draining to each affected drainage basin (South Creek, Geona Creek and Finlayson Creek). Dewatering activities associated with the underground and open pit developments will increase the amount of groundwater reporting to the surface. The extent of the changes related to dewatering activities will depend on other on-site water uses, such as water used for mining and ore processing, which may reduce the need to release water. The natural annual flow cycles will be altered by dewatering and water management (water storage and treatment) in general. Local changes to natural flow regimes are expected after closure, due to changes in surface features at the site, including waste rock and tailings storage; constructed wetland features, which will cause permanent changes to surface drainage; and the flooded pit, which will cause permanent changes to groundwater flows.

Adverse effects from changes to water quantity include physical risks, such as increased risk of erosion, and changes to stream morphology caused by alterations to stream flow volumes and, by extension, streamflow velocities. Changes to streamflow volumes that remain within the natural range of variability would not be expected to cause erosion or adversely affect the drainages' stream morphology. The potential for biological effects (i.e. on fish and fish habitat) from flow alterations depends on the magnitude, timing and duration of the alterations, as well as the spatial extent of the changes and the habitats encountered.

WATER BALANCE PREDICTION RESULTS

Potential effects of the Project on water quantity have been estimated in the 2018 Life of Mine Water Balance Model (2018 LOM WBM) report, which was prepared in response to comments received during the Seeking Views phase of Screening (IR3-1). The revised 2018 LOM WBM combines the on- and off-site into one water balances model.

YESAB is comfortable that the water balance analyses and scenarios evaluated, including the completed sensitivity analyses, have been completed in sufficient detail to adequately characterize effects and support the determination of significance of adverse effects on water quantity. The 2018 LOM WBM is also considered sufficient to support the effects assessment for water quality and aquatic resources. YESAB understands that more detailed assessment of water balance at the site will be required during detailed design and licensing, before finalizing the design of engineered structures such as diversions, collection ponds, the LWMP and UWMP, the WTP and the north and south CWTSSs.

Overall, the Project will result in both increased and decreased flows in Geona Creek, Finlayson Creek and South Creek over the course of the Project, but the changes from baseline after closure are expected to be minimal. After the Fault Creek diversion is removed, the drainage areas reporting to each of the drainage basins will be comparable to baseline.

CHANGES TO SOUTH CREEK HYDROLOGY

Changes to flows in lower South Creek above its confluence with North Creek (Station KZ-13, see Figure 7) over the life of the Project are presented in Figure 5.9 of the 2018 LOM WBM.

During construction and operations, predicted flows increase approximately 50 percent (35 L/s) on an average annual basis, due to the Fault Creek diversion and diversions around the open pit into the South Creek drainage. DFO⁴³ expressed concerns about increased flows to South Creek, and adverse impacts on aquatic habitat during construction and operations, followed by decreased flows during active and transitional closure phases.⁴⁴ In response to these concerns, the Proponent acknowledged that flow monitoring in South Creek will need to be implemented as part of the Project: “This does flag the fact that hydrology in South Creek, during the active and transition closure phase, will need to be monitored closely. Monitoring during the operations phase may allow for validation of the flow predictions in advance of the Fault Creek re-diversion.”⁴⁵ Potential for adverse effects to fish and fish habitat are further discussed in Section 5.3.

From active through post-closure, flows in South Creek are predicted to be lower than baseline flows by 5 L/s (6 percent), due to the influence of the open pit on groundwater flows.

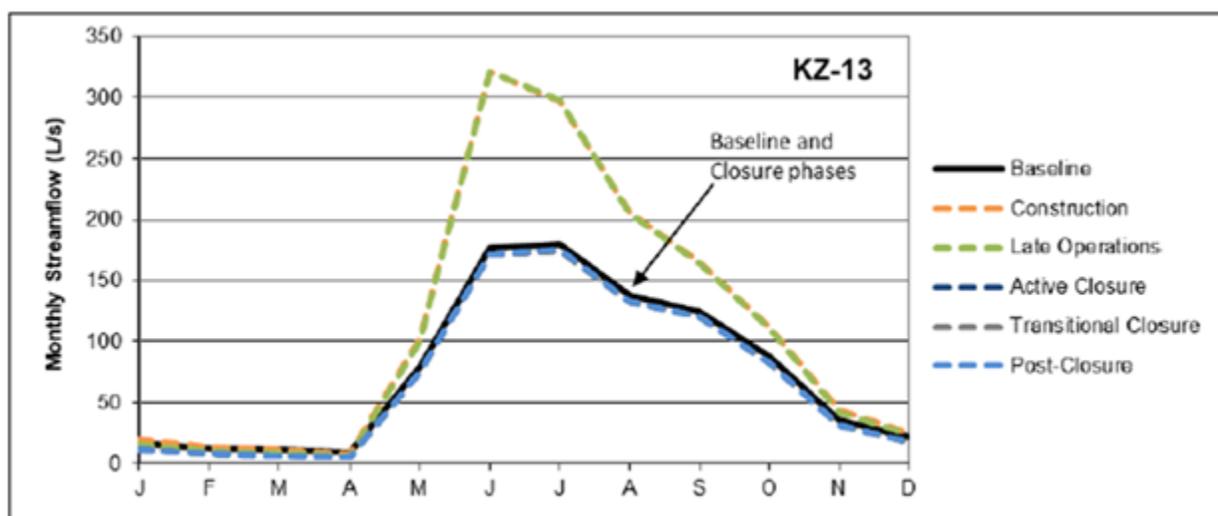


Figure 7: Predicted flow at KZ-13 by Project phase (from 2018 LOM WBM Report, Figure 5.9)

CHANGES TO GEONA CREEK AND FINLAYSON CREEK HYDROLOGY

Changes to flows in Geona Creek at Stations KZ-9 and KZ-37, and in Finlayson Creek at Stations KZ-15 and KZ-26 (see Figures 8, 9, 10 and 11, respectively, reproduced from 2018 LOM WBM). These stations are described in Table 17 below:

⁴³ YOR Document 2017-0083-268-1.

⁴⁴ YOR Document 2017-0083-293-1, pg.36-51

⁴⁵ Ibid., pg. 49.

Table 17: Water station location descriptions

Station	Location Description
KZ-9	Geona Creek: Immediately downstream of the Project
KZ-37	Geona Creek: Located north of the UWMP. KZ-37 represents the beginning of the receiving environment and includes treated flows reporting from the mine site upstream; clean non-contact water conveyed around mine infrastructure; and flow from East Creek, a small tributary located on the east side of Geona Creek, just upstream of KZ-37
KZ-15	Finlayson Creek: Located immediately downstream of the Geona Creek confluence
KZ-26	Finlayson Creek: Located in lower Finlayson at the RCH

During construction and operations, stream flows will decrease in the Geona Creek drainage compared to baseline, due to the Fault Creek diversion and dewatering of the open pit. The greatest effects on stream flows are during operations, due to active dewatering of the open pit, underground workings and flow capture from Project facilities for treatment and release from the LWMP into Geona Creek and Finlayson Creek. Once discharge of mine site water from the LWMP to Geona Creek (immediately downstream of KZ-9) and Finlayson Creek (at KZ-15) commences, the magnitude of flow reductions is expected to decrease. The average annual decrease in stream flows during construction is predicted to be greatest in the area nearest to the Project at approximately -21 percent at KZ-9, approximately -17 percent at KZ-37, and less than -5 percent at KZ-26 relative to baseline flows.⁴⁶ During early and late operations, reduction in annual flows relative to baseline are approximately -65 percent at KZ-9, approximately -25 percent at KZ-37 and less than -5 percent at KZ-26.⁴⁷

During active and transitional closure, the magnitude of decreased flows compared to the operations phase will decrease downstream of the site, due to the decommissioning of the UWMP and LWMP, which will result in increased runoff in the Project area around Geona Creek, and due to discharge of water from the WTP directly to Geona Creek upstream of KZ-9. The largest magnitude of effect will be nearest the site (KZ-9) and will decrease as distance from the site increases. During active and transitional closure phases reductions in annual flows relative to baseline will be approximately -42 percent at KZ-9, approximately -32 percent at KZ-37 and approximately -5 percent at KZ-26.⁴⁸

⁴⁶ Figures 5.2, 5.4 and 5.8 from YOR Document 2017-0083-344-1.

⁴⁷ Ibid.

⁴⁸ Ibid.

During post-closure, average annual stream flows display a minor increase in flow (2 L/s) near the Project area (KZ-9) relative to baseline conditions due to inter-basin groundwater flows from the South Creek catchment to the Geona Creek catchment. Monthly mean flows differ between post-closure relative to baseline due to differences in the physical aspects of the site, including drainage of water through the reclaimed storage facilities and evaporation from the ABM pit lake.

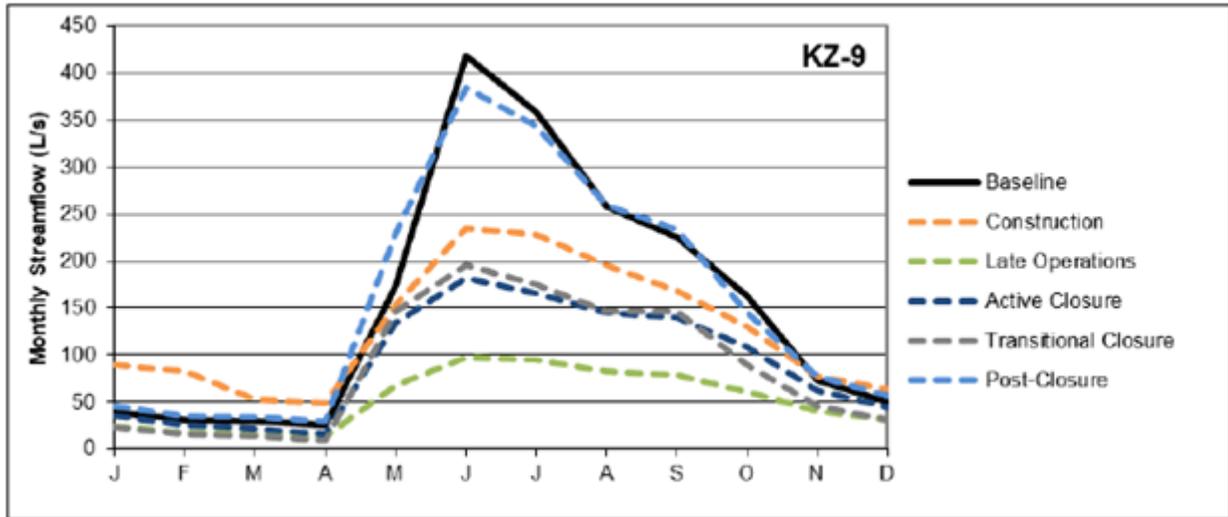


Figure 8: Predicted flow at Geona Creek immediately downstream of the Project (KZ-9) by Project phase (from 2018 LOM WBM, Figure 5.1)

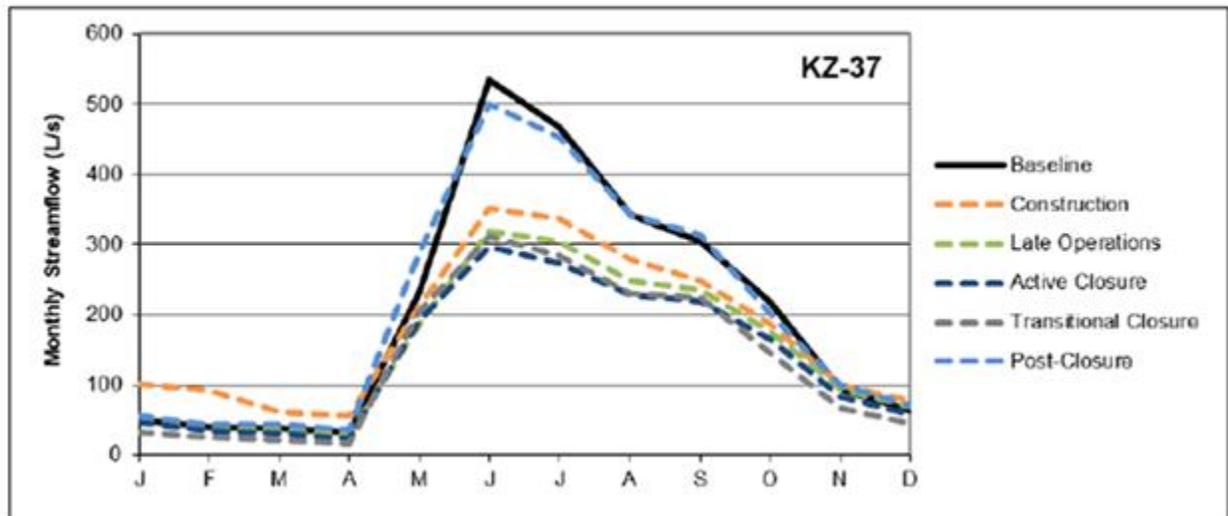


Figure 9: Predicted flow at Geona Creek immediately upstream of its confluence with Finlayson Creek (KZ-37) by Project phase (from 2018 LOM WBM, Figure 5.3)

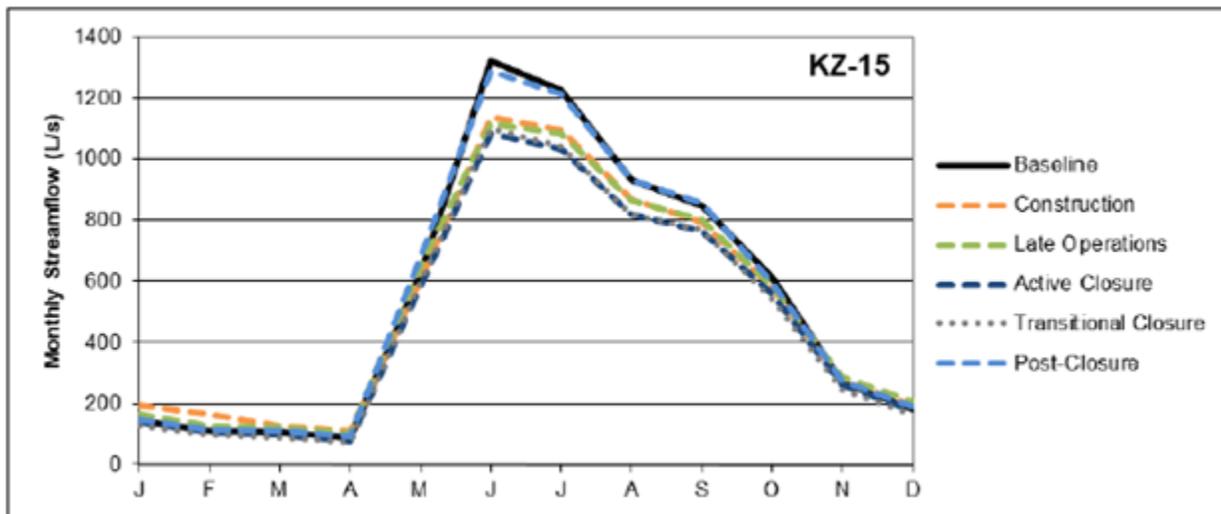


Figure 10: Predicted flow at Finlayson Creek immediately downstream of its confluence with Geona Creek (KZ-15), by Project phase (from 2018 LOM WBM, Figure 5.5)

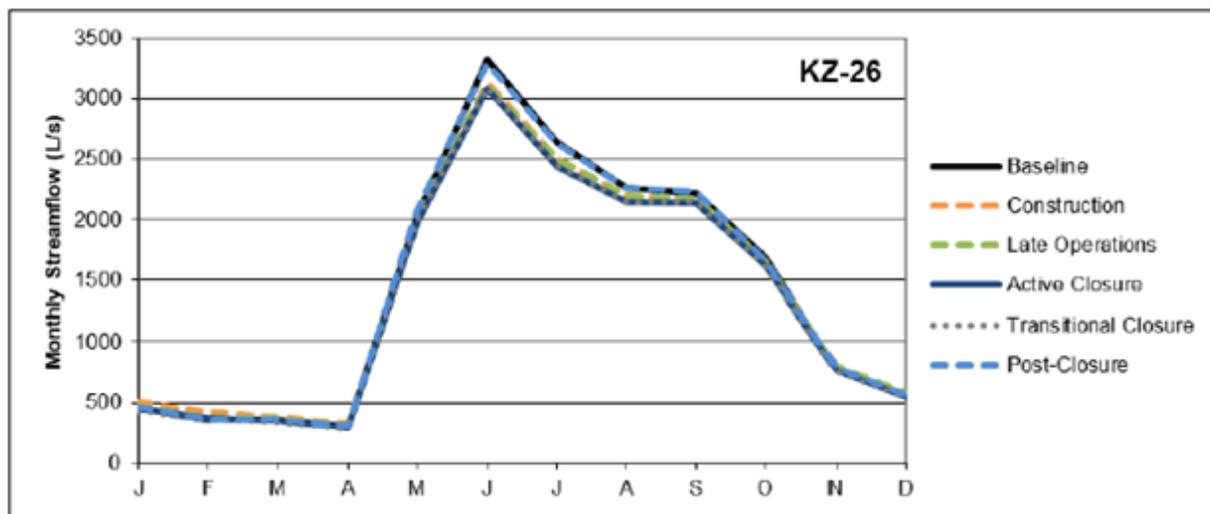


Figure 11: Predicted flow at Finlayson Creek at the Robert Campbell Highway (KZ-26), by Project phase (from 2018 LOM WBM, Figure 5.7)

SENSITIVITY TO CLIMATE AND RUNOFF VARIABILITY

The Proponent assessed the sensitivity of the model in response to YESAB’s Information Request IR3-1c,⁴⁹ stating that “The updated water balance model should include a sensitivity analysis.”⁵⁰ Sensitivity scenarios were developed to assess the simulated flows under wet and dry climates, and different proportions of runoff generated from Project facilities.

⁴⁹ YOR Document 2017-0083-283-1

⁵⁰ YOR Document 2017-0083-283-1.

CLIMATE SENSITIVITY

Climate sensitivity scenarios were developed by applying wet or dry climates to specific model years: a wet climate condition (1:50 year return period wet climate) and a dry climate condition (1:10 year return period dry climate) was placed into the climate model during each Project phase, resulting in twelve sensitivity scenarios. Results of the sensitivity case simulations were provided as inputs to the water quality model.

The results of the climate sensitivity scenarios demonstrate that the timing of pit filling is sensitive to wet or dry climate conditions during active closure or transitional closure, which leads to the pit filling sooner if wet conditions occur, and later if dry conditions occur.

RUNOFF SENSITIVITY

Runoff sensitivity scenarios were developed by varying the proportion of runoff from modelled facilities relative to the proportion of infiltration: runoff sensitivity scenarios were developed to simulate a 10 percent decrease and 10 percent increase in runoff from key mine facilities.

Results of the sensitivity scenarios indicate that the volume of water stored in the LWMP was not sensitive to the proportion of runoff from the facilities. Sufficient flows exist in the receiving environment to discharge all water that flows into the LWMP during the spring, summer and fall months, even under the increased runoff scenario. The maximum volume of water held in the LWMP would be less than the design pond volume.

The WTP treatment rates were shown to be sensitive to an increase in runoff; however, all predicted treatment rates remained below the design maximum treatment rate. The peak treatment rate predicted by the increased runoff scenario was about 30 percent of the maximum treatment capacity of the Class A treatment circuit.

The water balance model predicts water balance on a month by month basis. Therefore, more detailed modelling will need to be conducted during detailed design and licensing to evaluate the effects of short-term events, such as the impact of a rapid melt (e.g. short duration of 5 to 10 days) combined with rainfall on the proposed water management infrastructure.

EROSION POTENTIAL ASSOCIATED WITH INCREASED FLOWS IN SOUTH CREEK

The Proponent provided a quantitative assessment of the potential effects of increased flows on erosion, stream morphology and riparian vegetation in response to comments received from YG Environment.⁵¹ The Proponent's analysis was twofold:

- The predicted range of discharge, and by extension streamflow velocities, in South Creek, Geona Creek and Finlayson Creek at key water monitoring stations was compared with the measured range of baseline observations to evaluate the variability in proposed discharge velocity compared to natural baseline variability; and
- The expected monthly mean streamflow velocities were modelled using modelled water balance results. Modelled streamflow velocities were then compared to erosion potential and channel stability threshold velocities found in "the velocity-depth-grain size chart,

⁵¹ YOR Document 2017-0083-225-1 (Response to R2-45).

provided by the Natural Resources Conservation Service of the United States Department of Agriculture (NRCS 2007).”⁵²

The Proponent determined that the modelled runoff regimes would not cause significant erosion or changes to stream morphology.

Significance Determination

EFFECT ON HYDROLOGY IN SOUTH CREEK

EFFECTS ARE LIKELY

South Creek hydrology *will* be affected during all Project phases, due to underground and ABM pit dewatering and diversion of surface water (Fault Creek) to the South Creek drainage during construction and operations, and due to permanent alteration (reduction) of groundwater flows caused by the open pit post-closure. Effects will be spatially limited to South Creek and will not extend notably into North Creek.

EFFECTS ARE ADVERSE

The effects of an altered hydrological regime are adverse during construction and operations due to the amplitude of increased stream flows.

EFFECTS ARE NOT SIGNIFICANT

While effects of increased stream flows in South Creek are adverse, the amplitude of change is not expected to inhibit other water uses in the drainage, including aquatic habitat. The effects are limited temporally and will return to near baseline conditions post-closure.

Effects on hydrology in the South Creek drainage are therefore not considered significant during any Project phase.

EFFECTS ON HYDROLOGY IN GEONA CREEK AND FINLAYSON CREEK

EFFECTS ARE LIKELY

Geona Creek and Finlayson Creek hydrology *will* be affected during all Project phases. Hydrology within the Project footprint will be permanently altered by the development of the ABM pit and storage facilities. Stream flows downstream of the Project will decrease during all Project phases. Effects will be spatially limited to Geona Creek and Finlayson Creek. Effects will not be substantially different than baseline in Finlayson Creek at the RCH crossing during any of the Project phases.

EFFECTS ARE ADVERSE

The effects of an altered hydrological regime are adverse during all Project phases.

EFFECTS ARE NOT SIGNIFICANT

While the effects of altered stream flows in Geona Creek and Finlayson Creek are adverse, the amplitude of change is not expected to inhibit other water uses in the drainage, including

⁵² YOR Document 2017-0083-225-1

aquatic habitat. Effects on hydrology in the Geona Creek and Finlayson Creek drainages are not considered significant during any Project phase.

5.3 Aquatic Life

Summary and Conclusion

The EC has determined that the Project is likely to result in significant adverse effects to aquatic life during operations, closure and post-closure as a result of changes to fish habitat in Geona and Finlayson Creeks. These effects can be eliminated, reduced or controlled through Project design elements, mitigations proposed by the Proponent, compliance with relevant non-discretionary legislation and the implementation of mitigation measures recommended by the EC.

Importance of Aquatic Life

CULTURAL AND ECOLOGICAL IMPORTANCE

Aquatic life is an important indicator of aquatic and biophysical environments. Further, aquatic life, especially fish, are important from cultural, recreational and nutritional perspectives. It is widely understood that the productivity of a fishery is linked to habitat health; therefore, fish and their habitat are both considered when considering aquatic life.

The importance of aquatic life is also seen in the comments and concerns raised during the assessment and consultation by the Proponent.

Legislative and Management Setting

In Yukon, aquatic life is managed by DFO and YG (Environment Yukon) under federal and territorial legislation and regulations. The legislative and management setting for the Project with regard to aquatic life is set out in primarily in the Yukon *Waters Act* and the federal *Fisheries Act*.

YUKON WATERS ACT

Sections 6(1) and 7(1) of the *Waters Act* apply to mine operations with respect to

- the use of water and deposit of waste to surface water;
- undertakings related to project design that affect water courses, such as diversion, training and crossings.

The Yukon Water Board, an independent administrative tribunal, has the authority to issue, renew, amend, assign and cancel Water Licenses (WLs) under the *Waters Act*.

The YG *Reclamation and Closure Planning for Quartz Mining Projects* policy⁵³ lists requirements for both QMLs and WLs, and provides guidance about the processes. With regards to WLs, the policy indicates that the Yukon Water Board will endeavour to “issue

⁵³ Yukon Water Board 2013 Reclamation and Closure Planning for Quartz Mining Projects. Plan requirements and closure costing guidance. August.

licences only when there is a reasonable certainty that an acceptable level of reclamation of the site can be achieved during mining and/or following cessation of mining.”⁵⁴

FEDERAL FISHERIES ACT

Management of inland fisheries has been delegated largely to Yukon, but the administration of the provisions for fish and fish habitat protection under the *Fisheries Act* remains with the federal government.

In the August 2019 “Fish and Fish Habitat Protection Policy Statement,” DFO outlines how it will interpret and apply regulatory and non-regulatory tools in the protection of fish and fish habitat. The Policy Statement also provides guidance to proponents on the application of the fish and fish habitat protection provisions of the *Fisheries Act*.

When a proponent is not able to carry on a work, undertaking or activity without contravening s. 34.1(1) and/or s. 35(1) of the *Fisheries Act* (i.e. the death of fish and/or harmful alteration, disruption or destruction of fish habitat are likely to result), then the proponent can apply for Ministerial authorization. Before granting an authorization, the Minister must consider a range of factors, such as the contribution to the productivity of relevant fisheries by the fish or fish habitat that is likely to be affected; fisheries management objectives; Indigenous knowledge; and whether any measures and standards to offset the harmful alteration, disruption or destruction of fish habitat give priority to the restoration of degraded fish habitat.

As part of the *Fisheries Act* authorization application process, proponents must submit a detailed plan to offset any anticipated harmful alteration, disruption or destruction of fish habitat. The December 2019 “Policy for Applying Measures to Offset Adverse Effects on Fish and Fish Habitat Under the *Fisheries Act*” provides guidance to proponents by describing step-by-step procedures for developing an offsetting plan consistent with DFO policy.

The MDMER prescribes monitoring and reporting requirements for aquatic life during operations through the adoption of an Environmental Effects Monitoring (EEM) program. Proponents are required to continue this program post-closure. ECCC is the lead department responsible for administering and enforcing the EEM program.

YUKON MINE SITE RECLAMATION AND CLOSURE POLICY FOR NEW MINES

The policy applies to hard rock (quartz) mines in Yukon that are on mineral claims, leases and Crown grants developed pursuant to the QMA. According to the policy, one of the goals for mine site reclamation and closure is to “ensure a government-approved reclamation and closure plan, prepared by the mine operator, to return the mine site to a viable and, wherever practical, self-sustaining ecosystem, is in place prior to mine development.” A Reclamation and Closure Plan should “fully protect public and environmental health and safety and ensure that any potential discharges during mine operation and following mine closure will be managed to prevent harm

⁵⁴ Yukon Water Board 2013 Reclamation and Closure Planning for Quartz Mining Projects. Plan requirements and closure costing guidance. August. Section 2 Regulatory Context (p. 2)

to the receiving environment or to the public.” [Emphasis added]. The plan must include “methods for protection of water resources during and after mine closure.”⁵⁵

Context

Aquatic life, characterized as fish and fish habitat, is vulnerable to changes to physical and biological components of the aquatic habitat, including the following:⁵⁶

- **Habitat degradation:** may occur as a result of the removal or change of important habitat components; blocking fish passage; infilling of lakes, streams or wetlands to create dry land; or other activities in freshwater or marine environments that impair their ecological functions.
- **Habitat modification:** may alter habitat characteristics (such as flow); negatively affect spawning or rearing; or cause the death of fish, and which may be caused by dams or other impoundments; water diversion; stream crossings; or water extraction for municipal, industrial or other uses.
- **Aquatic invasive species:** may threaten fish through competition, predation or habitat effects.
- **Overexploitation of fish:** may lead to depleted or unsustainable populations.
- **Pollution of many kinds:** may adversely affect water quality and fish health.
- **Climate change:** is causing water temperatures to increase and is changing the geographical distribution of some species, rainfall patterns, water levels, flows, water chemistry and temperature, all of which are important to support the characteristics and proper ecological function of fish habitat.

Existing Conditions and Trends

TRADITIONAL FISHERIES

The Proponent completed traditional land use studies in the Project area for the LFN and RRDC in 2019 (albeit without the participation of these First Nations) in response to YESAB’s Request for Supplementary Information 4.⁵⁷ These studies noted that there is documented history and other evidence of historical fishing in the region. Fish of particular importance to Kaska First Nation include Arctic grayling (grayling), lake trout, jackfish (pike), whitefish and suckers. Kaska fishing efforts in the Project area are mainly in Finlayson Creek, North Lakes, Money Creek and Wolverine Lake, and are typically opportunistic and undertaken while hunting in and around the Project area.

FISH SPECIES AND FISH HABITAT IN AND AROUND THE PROJECT AREA

Historical and recent fisheries studies have indicated the presence of grayling in the upper reaches of Geona Creek within the Project footprint, and throughout the regional drainages including South Creek, North River, Finlayson Creek and East Creek. Other fish species identified in the region include slimy sculpin, burbot and lake trout.

⁵⁵ Yukon Government. Yukon Mine Site Reclamation and Closure Policy. January. 2006.

⁵⁶ Fisheries and Oceans Canada Department of Fisheries and Oceans, 2019. Fish and Fish Habitat Protection Policy Statement August 2019.

⁵⁷ YOR Document 2017-0083-362-1

Results of fish studies in Finlayson Creek provided in Section 10.3.2.1 of the Project proposal indicate some level of ecological stability demonstrated by generally consistent species composition, and aquatic conditions that provide suitable fish habitat. However, the culvert at the RCH crossing appears to act as a barrier to passage for fish attempting to migrate up Finlayson Creek.

Aquatic life studies have determined the entire length of Geona Creek to be fish-bearing. As such, all of Geona Creek is considered fish habitat. Fish surveys and habitat assessment conducted in 2015 and 2016 in Fault and Geona creeks, summarized in Section 10.3.2.3 of the Project proposal, indicate the following:

- Fault Creek provides very limited fish habitat, including overwintering habitat. In addition, high gradient stream profile and poor-quality stream substrate inhibit fish movement into Fault Creek.
- Fish habitat in Geona Creek is influenced by beaver activity and the presence of beaver dams along the upstream reaches. Geona Creek provides suitable habitat for Arctic grayling rearing in its lower reach. Some habitat favourable for grayling spawning may be present in the upstream reaches; however, it is unlikely that Geona Creek provides overwintering habitat for this species. Slimy sculpins that may have migrated into Geona Creek over the years have not developed sustaining populations possibly due to winter die-off.

WATER QUALITY CONDITIONS

Current water quality conditions are described in Section 5.1, Water Quality.

OTHER ACTIVITIES

No other industrial activities that may affect fish take place within the Geona, Finlayson or South Creek watersheds.

Project Design

The Project is located in the upper portion of the Geona Creek watershed. The open pit and WMPs will be situated within the Geona Creek floodplain, and the creek currently flows through the proposed open pit area. A portion of Geona Creek above the proposed WMPs will not be altered in a significant way. It will, however, be permanently closed off to fish as the WMPs will have a dam structure controlling water discharge. At closure, the LWMP will be converted to a wetland (north wetland).

Fault Creek, a small headwater tributary of Geona Creek, will be redirected to the South Creek watershed during operations, which will result in reduced flows to Geona Creek and a corresponding increase in flows to South Creek. Baseline investigations did not identify any suitable fish habitat in Fault Creek that would be directly affected by the redirection. The reduction of flow to Geona Creek from the diversion of Fault Creek will be partially counteracted during mine construction and operations because dewatering of the ABM open pit will be directed to Geona and Finlayson Creeks. In addition, during active closure, a portion of the water from the WMPs will be released directly into Finlayson Creek.

DFO requested additional information from the Proponent with regard to the anticipated effects of the Fault Creek diversion on South Creek hydrology and aquatic habitat (R3-13). The Proponent stated in their response that “it is important to note and as described in the Fisheries Offsetting Plan (FOP) (Appendix E-4 of Project Proposal) Fault Creek is a non-fish bearing creek. Once diverted a barrier will be placed at its lower end to prevent fish from using the creek so that it doesn’t become temporary fish habitat.”⁵⁸ The Proponent also stated in their response that, “This does flag the fact that hydrology in South Creek, during the active and transition closure phase, will need to be monitored closely. Monitoring during the operations phase may allow for validation of the of the flow predictions in advance of the Fault Creek re-diversion.”⁵⁹

A water management plan (described in Section 18.4 of the Project proposal) will be implemented and will collect mine-affected water before it is released to the receiving environment of Geona Creek and Finlayson Creek. The plan includes diversion of non-mine-affected surface water via three main diversions: collection of mine-affected runoff from Class A, Class B, and Class C storage facilities; a two-stage WMP (UWMP and LWMP); and active water treatment to treat excess water as required to maintain dischargeable water quality in the LWMP.

PROPONENT MITIGATIONS SPECIFIC TO THE PROTECTION OF FISH AND FISH HABITAT

TRADITIONAL FISHERIES

During consultation, summarized in Section 2 of the Project proposal, it was noted that a culvert on the RCH at Finlayson Creek, owned by YG, blocks fish passage to the upper reaches of Finlayson Creek. As follow-up to the first community meetings, the Proponent assessed the reported fish barrier at the culverts and determined that eliminating the barrier would open up Finlayson Creek fish habitat for grayling. The Proponent reported to the communities, at the second community meeting, that they will propose to remove the barrier as part of a FOP. Reconnecting fish habitat in Finlayson Creek by allowing fish passage through the culverts at the RCH was included as an offsetting measure in the Proponent’s preliminary FOP (Appendix E-4⁶⁰).

CONCEPTUAL FISH AND AQUATIC HABITAT MANAGEMENT PLAN

The Proponent describes a Conceptual Management Plan for fish and aquatic habitat (Project Proposal Section 18.9). The conceptual plan outlines the approach to minimizing Project effects on fisheries and aquatic habitat during construction, operation and closure. The management plan includes a commitment to control the Project discharges to meet WQOs in Geona and Finlayson Creeks; an outline of measures to protect aquatic and riparian habitat; an outline of measures to limit erosion and sediment runoff; and an outline of fish and fish habitat monitoring plans.

⁵⁸ YOR Document 2017-0083-293-1, pg.36-51.

⁵⁹ Ibid.

⁶⁰ YOR Document 2017-0083-116-1 inclusive through YOR Document 2017-0083-117-1.

SITE-SPECIFIC WATER QUALITY OBJECTIVES (SSWQOs)

The Project includes control of discharge water to meet defined WQOs at specific points in the receiving environment. The SSWQOs were originally completed in 2017 and outlined in Appendix D-8 of the Project proposal. They were revised in 2018⁶¹ in response to intervener comments and YESAB's IR 3-1.⁶²

The 2018 SSWQOs were derived following the same methodology as in 2017 but used the larger dataset to define baseline water quality conditions. The Proponent generally adopted the guidelines from *Water Quality Guidelines for the Protection of Aquatic Life*⁶³ and *British Columbia Approved Water Quality Guidelines: Aquatic Life, Wildlife and Agriculture*.^{64,65} The derivation of preliminary SSWQOs was performed following the methods outlined by CCME⁶⁶ for background concentration procedure. A sulphate-dependent objective was developed for selenium where, at baseline sulphate concentrations of 60 mg/L or less, the SSWQO would be set equivalent to the BCMOE guideline (0.002 mg/L). At higher sulphate concentrations in the receiving environment, the selenium SSWQO would be calculated based on ambient sulphate concentrations.

FISHERIES OFFSETTING PLAN (FOP)

The placement of Project facilities into the upper half of Geona Creek will result in the direct loss of fish habitat and/or restriction of that habitat to fish access. Other Project activities including water diversion or direct storage will cause changes to the hydrology of Geona Creek, thereby influencing fish habitat in the area. The Proponent is required to obtain a *Fisheries Act* authorization prior to carrying on any works, undertakings or activities that are likely to result in harmful alteration, disruption or destruction of fish habitat (and/or the death of fish). The Proponent has submitted a preliminary FOP⁶⁷ as part of the Project proposal, which describes measures that will be implemented to avoid and mitigate harmful impacts to fish and fish habitat. Residual effects (effects that are not avoided or mitigated) are then addressed by offsetting. Elements of the *Kaska Dena Management Practices*⁶⁸ have been considered in the Proponent's plan including: establishing thresholds of fish habitat disturbance and loss, especially spawning sites, and measures that maintain the water quality to support productive fisheries resources.

⁶¹ YOR Document 2017-0083-325-1 inclusive through YOR Document 2017-0083-326-1.

⁶² YOR Document 2017-0083-283-1.

⁶³ Canadian Council of Ministers of the Environment (CCME) (2018). Canadian Environmental Quality Guidelines, Water quality Guidelines for the Protection of Aquatic Life.

⁶⁴ British Columbia Ministry of Environment (BCMOE) (2017a). British Columbia Approved Water Quality Guidelines: Aquatic Life, Wildlife and Agriculture Summary Report.

⁶⁵ British Columbia Ministry of Environment (BCMOE) (2017b). Working Water Quality Guidelines for British Columbia.

⁶⁶ Canadian Council of Ministers of the Environment (CCME) (2003). Guidance on the Site-Specific Application of Water Quality Guidelines in Canada: Procedures for Deriving Numerical Water Quality Objectives. Canadian Water Quality Guidelines for the Protection of Aquatic Life – Site Specific Guidelines.

⁶⁷ YOR Document 2017-0083-116-1 inclusive through YOR Document 2017-0083-117-1

⁶⁸ Dena Kayeh Institute. Kaska Dena Management Practices: Kaska Dena Land Use Framework. 2010.

<https://kaskadenacouncil.com/download/kaska-dena-management-practices-kaska-dena-land-use-framework-dena-kayeh-institute-2010/?wpdmdl=1647&masterkey=>

Specific offsetting measures include

- fish habitat replacement
 - pond and pool habitat in Geona Creek
 - flow/spawning habitat in Geona Creek
- habitat re-connection in Finlayson Creek

Offsetting measures that require construction activities could affect fish and fish habitat during construction. Specific mitigation measures developed to minimize further effects include:

- erosion and sediment control
- fish salvage
- in-stream construction timing windows, and
- geochemical control of construction materials for in-stream work

SEDIMENT AND EROSION CONTROL PLAN

A conceptual sediment and erosion control plan has been proposed (Section 18.6 of the Project proposal) to control runoff; minimize erosion on exposed slopes and substrates; and prevent input of silt or sediment into watercourses during all phases of the Project. The proposed sediment and erosion control management strategies generally follow good operating practices and federal guidance for activities where the *Fisheries Act* applies. Introduction of sediment into downstream environments will be mitigated through minimizing the generation of sediment at the source; minimizing the volume of contact runoff capable of transporting contaminants; and collecting and treating the contact runoff, as required, therefore meeting downstream water quality requirements.

SURFACE WATER MANAGEMENT PLAN

A conceptual water management plan has been proposed (Section 18.4 of the Project proposal) for all Project phases. The Proponent acknowledges that the Project will have a positive water balance. Therefore, active water management including water treatment and discharge to the receiving environment will be required. To minimize the volume of contact water requiring management, the Project's water management strategy includes diverting clean water around the Project footprint and reusing water to the maximum practicable extent.

In the conceptual water management plan, the Proponent proposes that

water will be discharged to both Geona Creek and Finlayson Creek at established water quality discharge standard concentrations and at discharge volume ratios no less than 3:1 (receiving water volume: effluent volume) for Geona Creek at KZ-37 and 2:1 for Finlayson Creek at KZ-15 to meet water quality objectives in the receiving environment. Energy dissipation structures such as rip rap channels will be constructed below the discharge locations to both Geona and Finlayson Creeks.⁶⁹

⁶⁹ YOR Document 2017-0083-050-1.

Water quality predictions for all Project phases are provided in the 2018 Water Quality Model Report. The 2018 report was prepared to include revised WQOs following comments from Environment Yukon stating that the original data upon which the WQOs were derived were short term or otherwise inadequate.⁷⁰ Also, in response to comments from Environment Yukon⁷¹ and EcoMetrix⁷² that modelled concentrations of any COPI which exceed a proposed WQO should be considered as posing a significant risk to aquatic health in the receiving environment, the Project's water quality model was revised to incorporate the following mitigations as part of the water management plan:

- Very low-permeability covers for Class A and B storage facilities, and a growth medium cover for the Class C storage facility to reduce precipitation and runoff infiltration to waste rock and reduce potential contaminant loading to the receiving environment;
- In-situ treatment of the ABM lake;
- CWTS to passively treat surface flow from the ABM lake; and
- Active treatment of collected drain-down and runoff water from the Class A and B storage facilities during the active closure and transition phases of the Project.

Water quality predictions were provided for three scenarios: annual mean precipitation, one in 50 [1/50] wet year and one in 10 [1/10] dry year, for all Project phases. Water quality predictions were provided for key locations in the receiving environment including South Creek (KZ-13), Geona Creek (KZ-37) and upper and lower Finlayson Creek (KZ-15 and KZ-26, respectively) for all Project phases.

Despite uncertainties, the water quality modelling suggests that the ABM lake water will have elevated concentrations of antimony, arsenic, cadmium, copper, lead, selenium, uranium and zinc due to contaminants entering solution from the pit floor and walls. To achieve WQOs in Geona Creek, the Proponent is proposing in-situ treatment of ABM lake to lower the concentrations of these contaminants. In addition, CWTSs will be established down-gradient of the ABM pit in the area of the decommissioned pit rim pond, and further down-gradient in the area of the WMPs.

CONSIDERATION OF ACCIDENTS AND MALFUNCTIONS

During consultations, summarized in Section 2 of the Project proposal, the Proponent heard concerns about possible effects on fish and wildlife that could be caused by a catastrophic collapse of a tailings dam, which occurred at the Mount Polley mine site in BC. The Proponent responded that KZK will use a dry-stack tailings method, where the tailings are pressed dry and placed on the hillside above the creek in a progressively reclaimed facility that conforms to the existing hillside slope.

The Proponent's water management plan includes the construction and operation of two WMPs, upper and lower (UWMP and LWMP, respectively), which have a total storage capacity of

⁷⁰ YOR Document 2017-0083-265-1.

⁷¹ Ibid.

⁷² YOR Document 2017-0083-247-1.

750 000 m³. The ponds will be functional during operations and, at closure, the UWMP will be removed and the LWMP will be converted to a CWTS for site water discharge. The Proponent evaluated potential effects on fish habitat in Geona Creek and Finlayson Creek due to a catastrophic collapse of the UWMP and LWMP dams⁷³ in response to YESAB's R274,⁷⁴ R2-124⁷⁵ and R3-14⁷⁶. The dam breach study considered a hypothetical catastrophic failure of both WMPs, where the failure of the upstream UWMP dam caused the subsequent failure of the downstream LWMP dam. The 2018 assessment extended downstream from the ponds to include Geona Creek and the Finlayson River to about 50 km from the LWMP dam.

MONITORING PROGRAMS

The proposed aquatic effects monitoring programs incorporate monitoring requirements under the Yukon *Waters Act* and the MDMER made under the federal *Fisheries Act*. The overall aquatic monitoring program would include monitoring sediment (particle size, metals and pH) on a two-year cycle; monitoring benthic invertebrates (tissue quality, with concurrent habitat characterization and water quality monitoring) on a two-year cycle; monitoring fisheries (health and catch metrics and concurrent habitat characterization) annually; and monitoring fish tissue (slimy sculpin, metals and selenium) on a two-year cycle. Routine monitoring will also serve to monitor the success of the offsetting measures, and support EEM requirements which occur on a three-year cycle.

FISH HABITAT OFFSET MONITORING REQUIREMENTS RELATED TO A POTENTIAL FISHERIES ACT AUTHORIZATION

Following construction of habitat offsetting features, sampling will be conducted in order to monitor the success of the developed pond habitat in Geona Creek and at the proposed Finlayson Creek fish passage system located at the RCH. The offset habitat monitoring plan could include grayling spawning surveys, assessment of overwintering success in constructed ponds and metrics related to the proposed fish passage system at RCH. However, final offset habitat design and associated monitoring and success criteria, will require DFO review of the Proponent's application for a *Fisheries Act* authorization, in addition to consultation with RRDC and LFN.

ENVIRONMENTAL EFFECTS MONITORING REQUIREMENTS UNDER THE METAL AND DIAMOND MINING EFFLUENT REGULATIONS (FISHERIES ACT)

A metal mine becomes subject to MDMER if it deposits deleterious substances in any water or place referred to in s. 36(3) of the *Fisheries Act*. Effluents at volumes greater than 50 m³/day are anticipated during operation of the KZK mine. The Proponent will be required to submit a study design for undertaking an EEM program to ECCC, which is the lead department responsible for the administration and enforcement of the *Fisheries Act*. The purpose of EEM is to confirm that healthy fish populations and benthic invertebrate communities are being maintained through the demonstration of no statistically significant difference in measurable parameters between

⁷³ YOR Document 2017-0083-341-1.

⁷⁴ YOR Document 2017-0083-200-1, pg.282.

⁷⁵ YOR Document 2017-0083-231-1, pg.333.

⁷⁶ YOR Document 2017-0083-293-1, pg.51-52.

exposure and reference areas and/or baseline data. The study design will follow guidance provided by the *Metal Mining Technical Guidance for Environmental Effects Monitoring*.⁷⁷

Grayling has been selected as the sentinel fish species for monitoring the health of fish populations, with catch per unit effort (CPUE) and condition factor results being used as measurements to assess the difference in fish population health between reference and exposure populations. For benthic invertebrate community health, metrics of taxon richness, mean invertebrate density (average number of organisms per m²), Simpson's Evenness Index and Bray-Curtis Index of Dissimilarity will be used. Periphyton community indicators and chlorophyll α concentrations will be used to evaluate spatial and temporal changes due to nutrient enrichment and metal toxicity, and other Project-related effects.

ACUTE LETHALITY TESTING UNDER THE METAL AND DIAMOND MINING EFFLUENT REGULATIONS (FISHERIES ACT)

In addition to monitoring the fish and benthic communities every three years, the EEM program also requires undertaking an effluent characterization program and sub-lethal toxicity testing on two plant species, an invertebrate and fish embryos throughout each year of operation. The purpose of mine effluent toxicity testing is to prevent the release of sub-lethally toxic mine-affected water to the environment by demonstrating that releases meet standard toxicological tests for aquatic biota.

Effects Characterization

THE PROJECT WILL RESULT IN DESTRUCTION OF FISH HABITAT

The Project will permanently remove a portion of Geona Creek at the immediate mine site and will isolate the upper reach from the lower reach, primarily for development of the open pit and construction of water management structures (WMPs and constructed wetlands) (see Figure 12 for additional detail). The reach of the Geona Creek that will be removed is known to support grayling during all seasons and is potential spawning habitat. The Project is estimated to result in the loss of approximately 5.4 km of fish habitat in Geona Creek, covering an area of 15.35 km², and an additional 4.85 ha of wetland/pond habitat in the headwaters of Geona Creek.⁷⁸

The Proponent has proposed to address the adverse effects caused by destruction of fish habitat in Geona Creek by implementing an offsetting plan. Once constructed, the conceptual offsetting measures are intended to replace spawning and pond habitat in lower Geona Creek, and reconnect previously isolated fish habitat in Finlayson Creek. Habitat reconnection in Finlayson Creek is intended to improve connectivity for grayling between the lower reaches of Finlayson Creek and its upper drainage, which includes Geona Creek. A further intention is to improve access to the upper Finlayson Creek drainage for slimy sculpin that are currently

⁷⁷ Environment Canada. Metal Mining Technical Guidance for Environmental Effects Monitoring. 2012. [https://www.ec.gc.ca/eseee-eem/AEC7C481-D66F-4B9B-BA08-A5DC960CDE5E/COM-1434---Tec-Guide-for-Metal-Mining-Env-Effects-Monitoring_En_02\[1\].pdf](https://www.ec.gc.ca/eseee-eem/AEC7C481-D66F-4B9B-BA08-A5DC960CDE5E/COM-1434---Tec-Guide-for-Metal-Mining-Env-Effects-Monitoring_En_02[1].pdf)

⁷⁸ YOR Document 2017-0083-292-1, pg.31-34.

absent from that area. The proponent's preliminary offsetting plan proposes ways to monitor the success of these measures.

Works, undertakings or activities that are likely to result in the harmful alteration, disruption or destruction of fish habitat may not proceed without Ministerial authorization. The proponent's application for a *Fisheries Act* authorization will be assessed by DFO, when submitted, according to the applicable legislation at that time. Because the proponent's conceptual FOP was prepared prior to changes to the *Fisheries Act* that came into force on August 28, 2019, it will need to be revised to incorporate new legislation, policies and guidance.

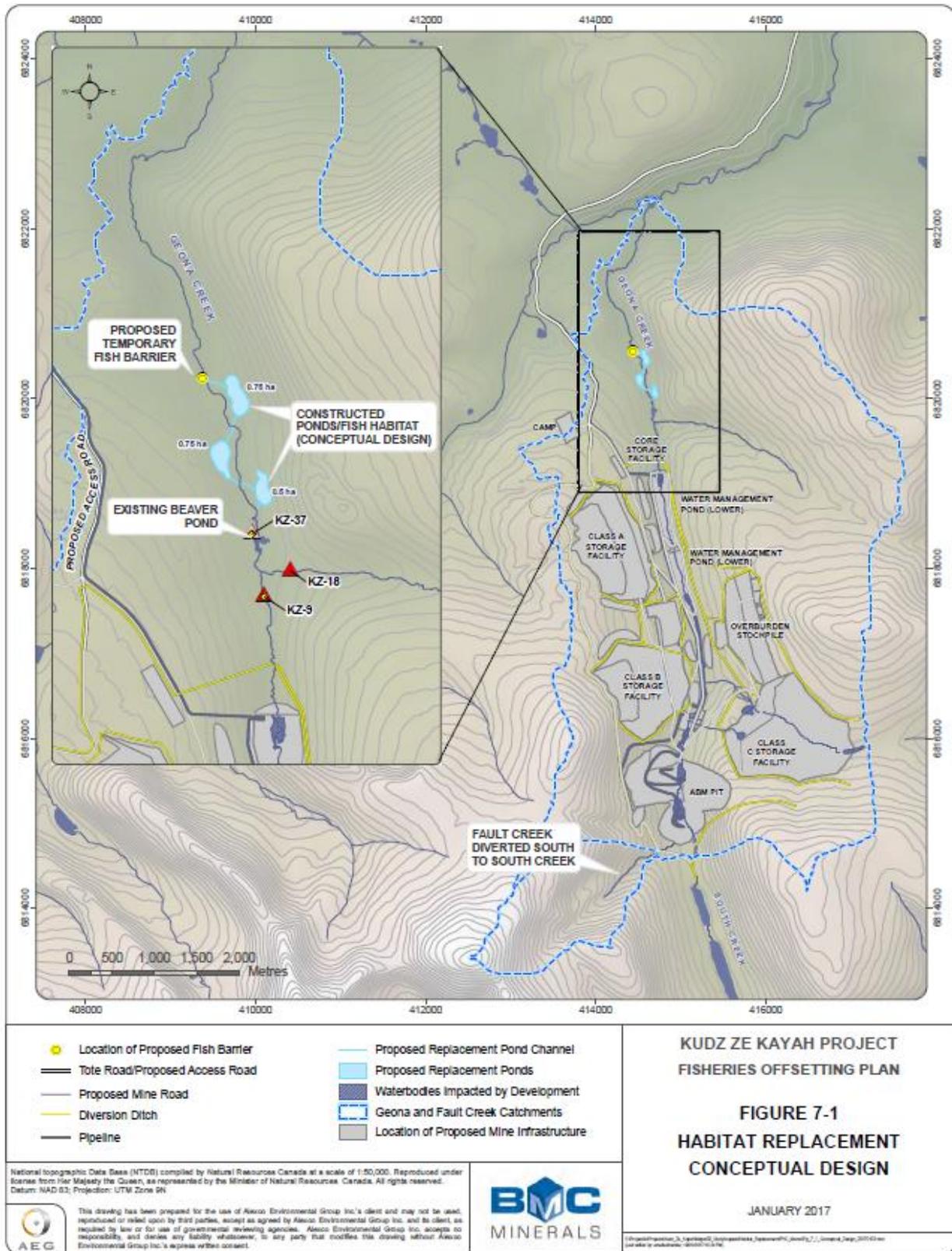


Figure 12: Fisheries offsetting plan from the project proposal

THE PROJECT WILL TEMPORARILY DIVERT PART OF FAULT CREEK TO THE SOUTH CREEK DRAINAGE

Fault Creek upgradient of the proposed open pit mine will be temporarily diverted to the headwater lakes area of the South Creek drainage. Fault Creek, which is a headwater tributary to Geona Creek, is not known to support any fish community, but diversion could affect the fish and fish habitat in the South Creek drainage due to changes in flow and water chemistry. Grayling, slimy sculpin and burbot have been observed in the headwater lakes of South Creek (KZ-13), upstream of the North River system and in the North River system.

The Proponent has modelled potential changes to water quantity and quality in South Creek for all Project phases. Flow to the South Creek drainage from the diversion will be affected by changes to natural groundwater flows caused by dewatering and filling of the ABM pit. The combined flow effects were considered in the Proponent's 2018 water balance model, which predicted that, compared to baseline, flow in South Creek (KZ-13) will increase (approximately 50 percent, or 35 L/s, on an average annual basis) during construction and operations and decrease by (5 percent, or -5 L/s) during active closure and postclosure. Future water quality in the South Creek drainage for all Project phases was assessed in the Proponent's 2018 water quality model report which takes into consideration the 2018 water balance results.

Water quality for the portion of Fault Creek diverted to the South Creek drainage is considered to be unaffected by mine activities. Changes to water quality in the South Creek drainage were anticipated because of natural differences in the baseline chemistry of the two water courses. Low-, median- and high-flow water quality predictions were produced for South Creek (KZ-13) to estimate potential changes in water quality resulting from diversions, including Fault Creek, into the South Creek drainage. The model results indicated that the Fault Creek diversion will result in increased estimated selenium, cadmium and zinc concentrations in South Creek (KZ-13) compared to baseline, but that concentrations will remain below proposed WQOs for all flow scenarios during construction and operations, and will return to baseline levels during active, transition and postclosure.

THE PROJECT WILL RESULT IN CHANGES TO FISH HABITAT IN GEONA AND FINLAYSON CREEKS

Changes to fish habitat in Geona and Finlayson creeks are anticipated due to the combined effects of changes to surface water flow and quality, resulting from on-site water management and the release of mine-affected water to Geona Creek and Finlayson Creek via the LWMP during operations and to Geona Creek via the constructed wetland post-closure.

Flow impacts were considered in the Proponent's 2018 water balance model which predicted that, compared to baseline, flow would be lower during construction and operations due to the diversion of Fault Creek, dewatering of the pit, underground work and other water management activities, and during active and transitional closures due to ABM pit filling. The Fault Creek basin will be redirected to the ABM pit during filling, allowing hydrology in Geona Creek to return to near baseline conditions when the outflow of ABM lake begins to contribute flow to Geona Creek. Post-closure flow in Geona Creek is expected to be near to, but higher than, baseline flow due to permanent changes to the groundwater regime, which will cause inter-basin groundwater flow from the South Creek catchment to the Geona Creek catchment. Variations in

hydrology compared to the baseline are expected to be less than 5 percent during all Project phases in Finlayson Creek at KZ-26, upstream of the RCH crossing.

The combined effects of changes to water quantity and quality were considered in the Proponent's 2018 water quality model report. Specific mitigation measures that were considered in the 2018 water quality model report include

- very low-permeability covers for Class A and B storage facilities, and a growth medium cover for the Class C storage facility, to reduce precipitation and runoff infiltration to waste rock, and reduce potential contaminant loading to the receiving environment;
- in-situ treatment of the ABM lake;
- CWTS to passively treat surface flow from the ABM lake; and
- active treatment of collected drain-down and runoff water from the Class A and B storage facilities during the active closure and transition phases of the Project.

Water quality predictions were compared to proposed WQOs at three downstream locations: Geona Creek (KZ-37) and upper and lower Finlayson Creek (KZ-15 and KZ-26, respectively). The EC has considered that exceeding a proposed WQO poses a significant risk to aquatic health. With all the proposed mitigations considered, predicted concentrations of all contaminants of potential interest were below their proposed WQOs at the receiving environment locations, with some exceptions. The exceptions included intermittent exceedances for nitrate during active closure, and for copper during transition closure. In the case of copper, exceedances are characterized in the 2018 water quality model report as infrequent (one or two months of the year), with a maximum concentration of 1.5 times the proposed WQO during the transition closure phase in Geona Creek in all precipitation scenarios. Elevated copper levels in surface water during the transition phase were attributed to seepage loadings from the Class A storage facility, and assumed to be from liner defects. Concentrations of copper decrease post-closure when water from the ABM lake flows to Geona Creek adding extra dilution to the system.

DAM FAILURE

Potential effects to fish habitat in Geona and Finlayson Creeks due to a catastrophic collapse of the upper and lower WMP dams were evaluated in the *Dam Breach and Fish Impact Assessment*.⁷⁹ The study considered a hypothetical catastrophic failure of both WMPs, where the failure of the upstream UWMP dam caused the subsequent failure of the downstream LWMP dam. The assessment concluded that the peak water discharge from the failure would cause adverse effects on the downstream channel morphology due to the erosional force from the discharge, and fish mortalities would be expected in Geona Creek in particular, with fish flushing and stranding.

Significance Determination

The EC has determined that additional mitigations are required to minimize significant adverse effects to aquatic life. The effects characterization for aquatic life primarily considers effects on fish and fish habitat. The effects characterization is based on the premise that mitigation

⁷⁹ YOR Document 2017-0083-241-1

measures proposed by the Proponent are consistent with best practices, will function as proposed and the modelling used to support the effects characteristics is sufficiently robust.

DESTRUCTION OF FISH HABITAT – GEONA CREEK

EFFECTS ARE LIKELY

The Project will permanently remove a portion of Geona Creek at the immediate mine site and isolate the upper reach from the lower reach, primarily for development of the open pit and construction of water management structures (upper and lower WMPs, constructed wetlands). The part of Geona Creek that will be removed is known to support grayling during all seasons and is potential spawning habitat. The Project is estimated to result in the loss of approximately 5.4 km of fish habitat in Geona Creek, covering an area of 15.35 km², and an additional 4.85 ha of wetland/pond habitat in the headwaters of Geona Creek.⁸⁰

EFFECTS ARE ADVERSE

In relation to aquatic life, the effects of fish habitat destruction, and in this case complete loss of the aquatic environment and ecosystem, are adverse.

EFFECTS ARE NOT SIGNIFICANT

The Proponent has made numerous commitments that would reduce and compensate for the effects to aquatic life due to destruction of fish habitat, rendering effects insignificant. These include implementing:

- a conceptual fish and aquatic habitat management plan
- site specific WQOs
- the FOP
- an erosion control plan
- a surface water management plan
- fish habitat monitoring

Works, undertakings or activities that are likely to result in the harmful alteration, disruption or destruction of fish habitat may not proceed without Ministerial authorization. The proponent's application for a *Fisheries Act* authorization will be assessed by DFO, when submitted, according to the applicable legislation at that time. Because the proponent's conceptual FOP was prepared prior to changes to the *Fisheries Act* that came into force on August 28, 2019, it will need to be revised to incorporate new legislation, policies and guidance for the diversion of Fault Creek to South Creek drainage.

DESTRUCTION OF FISH HABITAT – SOUTH CREEK

EFFECTS ARE LIKELY

Changes to aquatic resources in the South Creek drainage are likely to occur primarily due to increased stream flows during operation. The combined effects on flow are predicted to increase (approximately 50 percent, or 35 L/s, on an average annual basis) in South Creek (at

⁸⁰ YOR Document 2017-0083-292-1, pg.31-34.

KZ13) during construction and operations, and decrease (by 5 percent, or -5 L/s) during active closure and post-closure.

EFFECTS ARE NOT ADVERSE

In relation to aquatic life, the effects are not considered adverse as the Project is not expected to improve or deteriorate fish health and habitat to an extent that will be measurable. Monitoring of water quantity, quality, and fish and fish habitat will be conducted during operations to validate assumptions used in this determination.

EFFECTS ARE NOT SIGNIFICANT

Effects to aquatic life in the South Creek drainage are not significant as effects are not considered adverse, and the affected area is spatially limited to the headwater lake area of the South Creek drainage. In addition, effects will be reversible since fish habitat conditions are expected to return to near baseline conditions post-closure.

CHANGES TO FISH HABITAT IN GEONA AND FINLAYSON CREEKS

EFFECTS ARE LIKELY

Effects to aquatic life in relation to fish habitat in Geona and Finlayson creeks are likely to occur. Changes to fish habitat in Geona and Finlayson creeks are anticipated due to the combined effects of changes to surface water flow and quality, resulting from on-site water management, and release of mine-affected water to Geona Creek via the LWMP during operations and the constructed wetland post-closure.

EFFECTS ARE ADVERSE

Based on the assumptions assessed in the 2018 water balance and water quality models, the effect on aquatic life and fish and fish habitat from changes to hydrology and water quality is not adverse. However, there is sufficient uncertainty in the water quality predictions related to loadings from WRSRA A (covers performance, capturing seepage under WRSRA A and B and the potential for acid generation in WRSRA A and B), and efficiency of in-pit treatment and constructed wetland treatments that affect both the water balance and water quality models. If assumptions are incorrect, and water balance and water quality predictions are not accurate, the effects to aquatic life will be adverse.

EFFECTS ARE SIGNIFICANT

Effects to aquatic life in relation to fish habitat in Geona and Finlayson creeks are permanent. However, the magnitude and extent of effects for both water quantity and quality vary over the life of the Project. The geographic extent for changes to water quantity in Geona Creek is local and duration is long-term as changes could occur over all Project phases. Site hydrology will return to near baseline conditions only when ABM lake begins to flow to Geona Creek.

Based on the assumptions used in water quality modelling, water quality will generally be below WQOs and consequently will frequently result in minimal effects. However, the EC considers the predicted intermittent exceedances to present a significant effect to aquatic life.

Further, there is sufficient uncertainty in the water quality predictions related to loadings from WRSRA A (covers performance, capturing seepage under WRSRA A and B and the potential for

acid generation in WRSA A and B) and the efficiency of in-pit treatment and constructed wetland treatments, which affect both the water balance and water quality models. If assumptions are incorrect, and water balance and water quality predictions are not accurate, the effects to aquatic life will increase.

Mitigations are required during operations to improve understanding of the proposed WRSA covers and liners during detailed design, and water quality/seepage monitoring should be conducted during operations to validate geochemical studies and water balance and water quality model results. The proposed monitoring programs will allow the Proponent to confirm whether or not the proposed mitigations perform as expected.

Effluent quality standards should be derived to achieve WQOs in the downstream receiving environment, consistent with the modelling that was used to support the assessment. There are some uncertainties in the WQOs that should be addressed during the water licence process, and the WQOs revised as necessary. For example, WQOs that are dependent on other constituents in water such as ammonia (which is dependent on fluctuations in temperature and pH) and some metals (which are dependent on fluctuations in hardness) may vary over time. In addition, the proposed SSWQO for arsenic was an interim value and the Proponent indicated that it would be updated in the fall of 2018, and some WQOs have been or may be revised before the Project is licensed (since the WQOs were revised in 2018, BCMOE has updated the WQO for copper). As copper was identified as the contaminant with the greatest potential for adverse effects, it is important that the proposed WQO be based on the most recent available information.

DAM FAILURE

EFFECTS ARE NOT LIKELY

Potential effects to aquatic life in Geona and Finlayson Creeks due to a catastrophic collapse of the upper and lower WMP dams are unlikely. The hypothetical catastrophic failure of both WMPs was considered in a rainy-day scenario, where the failure of the upstream UWMP dam caused the subsequent failure of the downstream LWMP dam. The likelihood of this series of events occurring to produce this scenario is considered to be extremely low.

EFFECTS ARE ADVERSE

Effects to aquatic life due to a catastrophic failure are adverse. A failure would cause peak water discharge to change the downstream channel morphology due to the discharge's erosional force, and fish mortality would be expected in Geona Creek in particular, with fish being flushed downstream and potentially stranded.

EFFECTS ARE NOT SIGNIFICANT

The effects of dam failure to aquatic life are not significant. The Proponent has made numerous commitments that would reduce the likelihood of catastrophic collapse of the upper and lower WMPs. In addition, the conditions where failure would occur is considered to be extremely low. The effects to the fish and fish habitat downstream of the WMPs are considered temporary as the outflow from the failure may continue for 1.5 hours before most of the stored water and sediment is released. Downstream fish habitat has a high natural restoration potential from

natural flows that would start to stabilize the channel fish habitat once the initial flood wave has passed.

Recommended Mitigations

- 5) The Proponent shall revise WQOs as necessary to ensure they are based on the most recent toxicological information and guidance from CCME and BCMOE.
- 6) The Proponent shall establish effluent quality standards for the Project based on achieving WQOs in the receiving environment in Geona Creek (KZ-37) and in Finlayson Creek (KZ-15).
- 7) The Proponent shall conduct ongoing investigations into WRSA liners and cover systems to ensure that the performance objectives used in the water quality model are achieved during all Project phases.
- 8) The Proponent shall commit to ongoing geochemical studies for WRSA A and B, and studies to optimize the performance of the proposed CWTS to address the potential for acidic conditions to develop in the future.
- 9) The Proponent shall ensure the WTP remains operational until it has been demonstrated that surface water from the site meets WQOs for the receiving environment in Geona Creek (KZ-37) and in Finlayson Creek (KZ-15).

Recommended Monitoring

Due to uncertainties regarding aquatic life and in relation to water quality, the EC recommends, under s.110 of YESAA, that monitoring take place.

SEEPAGE MONITORING

As there will be a delay before any effects of affected drainage/seepage in surface water (WMPs during operation and CWTS at closure) will be observed, the EC recommends

- B. The Proponent shall develop and implement adaptive management measures based on monitoring for the onset of acidic conditions that allows for early detection, management, and mitigation of acidic conditions and/or ML developing on-site.

This monitoring requires establishing water quality triggers for drainage/seepage from the WRSA A associated with adaptive management measures to mitigate potential adverse effects to fish and fish habitat in the downstream receiving environment.

6. Wildlife

6.1 Finlayson Caribou Herd

Summary & Conclusion

The EC has determined that the Project will result in significant adverse effects to the FCH. The project area hosts key habitat for the FCH, as noted in the project's name, Kudz Ze Kayah, which means "land of the Caribou" in Kaska Dena language. The area is known by Kaska elders as a "place of plentiful".⁸¹ The Project will displace caribou from these preferred and key habitats while also interfering with seasonal caribou movement. In the context of a declining population where concerns exist about the herd's sustainability, these effects are significant and adverse. Consequently, the EC has recommended mitigations to reduce, control, or eliminate those effects, while also recommended monitoring to evaluate the effectiveness of those mitigations, and ensure that project and herd management can remain responsive to changes in the FCH composition and movement.

Importance of Caribou

IMPORTANT CULTURAL SPECIES

Caribou are a highly valued cultural species in Yukon and Canada. Within Yukon, caribou are one of the most prominent symbols of wilderness and nature. More tangibly, caribou are important from a subsistence, traditional and spiritual standpoint. For the Kaska, caribou are a "cultural keystone species for hunting and cultural purposes."⁸² As a species central to "the stories that define and describe the people we know ourselves to be", caribou are an important aspect of the intimate relationship between Kaska people and the land.⁸³

The cultural importance of caribou has also been expressed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC): "Caribou have symbolic value to Canadians, particularly to Aboriginal groups that coexisted with caribou for centuries. They are a symbol of wilderness areas and are almost mystical because most Canadians have never seen one."⁸⁴

⁸¹ YOR Document 2017-0083-6888; YOR Document 2017-0083-9750

⁸² YOR Document 2017-0083-040-1., pg 13-2.

⁸³ YOR Document 2017-0083-6888

⁸⁴ Committee on the Status of Endangered Wildlife in Canada, COSEWIC Status Report on the Woodland Caribou *Rangifer Tarandus* Caribou in Canada. 2002, pg. xi.

UMBRELLA SPECIES

Caribou are a k-selected,⁸⁵ interior⁸⁶ species dependent on late successional and climax state vegetation and large, undisturbed landscapes.⁸⁷ These characteristics make caribou an excellent species for examining effects to ecosystems as a whole: caribou are slow to reproduce, need large areas of habitat and require vegetation cover that takes considerable time to develop after disturbance.⁸⁸ These factors also make caribou relatively vulnerable, especially when compared to other cervids (members of the deer family).

As a charismatic⁸⁹ species highly valued for subsistence and cultural purposes, caribou can shape public policy and conservation measures. The biological limitations of caribou and the social values associated with caribou also make caribou an umbrella species; measures to protect caribou from adverse effects may also help shield other species from those effects.⁹⁰

Legislative & Management Setting**POPULATION OF SPECIAL CONCERN**

Woodland caribou are a subspecies of caribou. The FCH consists of a sub-type (ecotype) of woodland caribou, the northern mountain caribou. COSEWIC has determined that the northern mountain caribou population is of special concern.⁹¹ COSEWIC identifies the primary threats and limiting factors for the northern mountain caribou ecotype:

In the Northern Mountain [designatable unit], major threats include altered predator-prey dynamics due to habitat change. Human disturbance and habitat loss (including functional habitat loss due to avoidance) have resulted from the cumulative effects of forest harvesting, mineral exploration and development and associated access, motorized and non-motorized recreational activities, changes in forest structure due to

⁸⁵ A k-selected species is generally one with relatively low reproductive rates and slow reproductive cycles. Reproductive rates are limited to one calf per cow per year, at most, unlike other ungulates such as moose which may vary their reproductive rates.

Monte Hummel and Justina C. Ray, *Caribou and the North*, Dundurn Press, Toronto: 2008, pg. 233; Steven H. Ferguson, Alan R. Bisset and Francois Messier, "The Influences of Density on Growth and Reproduction in Moose", *Wildlife Biology*, 6:1 (2000), pg. 32.

⁸⁶ An interior species is one which avoids edges of habitat types. Alberta Sustainable Resource Development and Alberta Conservation Association. Status of the Woodland Caribou in Alberta, Update 2010, Alberta Sustainable Development, Wildlife Status Report 30, 2010, pg. 14, 20.

⁸⁷ Climax stage vegetation is vegetation that has developed over time to best fit the physical landscape: the vegetation is in equilibrium with its surroundings and without disturbance will remain largely unchanged over time. Climax stage vegetation follows earlier stages of vegetation that occur after a disturbance.

⁸⁸ C. Ronnie Drever et al., "Conservation through co-occurrence: Woodland caribou as a focal species for boreal biodiversity", *Biological Conservation*, April 2019.

⁸⁹ J.S. Boates and MB Fenton, "Flagship Species – Flagship Problems: recovery of species at risk and the conservation of biodiversity in Canada", *Canadian Journal of Zoology*, 89:5 (2011).

⁹⁰ C. Ronnie Drever et al., "Conservation through co-occurrence: Woodland caribou as a focal species for boreal biodiversity"

⁹¹ A species of special concern is "A wildlife species that may become threatened or endangered because of a combination of biological characteristics and identified threats." The two other populations of mountain caribou are less secure endangered.

COSEWIC. COSEWIC wildlife species status categories and definitions. 2016.

Mountain Pine Beetle infestations and/or associated salvage logging, and impacts from climate change.⁹²

EARLY SUBJECT OF CARIBOU RECOVERY PROGRAMS

Concern for the FCH's sustainability led to intensive conservation efforts by Government of Yukon beginning in the 1980s. With the herd exhibiting unsustainable population trends, YG instituted a wolf management plan in 1982 with the intent of removing wolves to reduce predation of caribou. From 1983 to 1989, the relevant wolf population was reduced by 451 individuals, leading to a decline of wolf populations by roughly 85 percent from 1982 to 1989. Twenty-nine wolves were known to have survived the program.⁹³ The removal of wolves increased caribou populations from approximately 2 000 individuals to 6 000 individuals, and moose populations also tripled.⁹⁴

In tandem with removing wolves, YG also restricted licensed harvest to one male caribou from the previous limit of one caribou of either sex from August 1 to October 10. Simultaneously, "First Nations residents of Ross River and Watson Lake also voluntarily restricted their caribou harvest and it is believed that First Nation harvest was significantly reduced during the recovery program."⁹⁵

Despite short-term gains in population, wolf populations quickly rebounded and caribou populations resumed declining. The plan is considered a failure: "The [plan's] failure was largely owing to the lack of a comprehensive long-term management plan endorsed by the Yukon public—one that limited human harvest and land-use activities."⁹⁶

LONG-TERM MANAGEMENT UNDER PERMIT HUNT AUTHORIZATION

In order to address declining populations after the wolf management plan had concluded, a permit hunt authorization (PHA) regime was created in Yukon which introduced a lottery and overall harvest limits for licensed hunting. This regime was instituted in 1998. First Nations voluntarily adopted restrictions as well.

The rationale for the institution of such measures was due to substantial population declines in the 1990s, "Human harvest levels became non-sustainable as wolves fully recovered and greatly accelerated the caribou population decline until 1998, when strong conservation measures (outfitter quotas, permit hunt for licensed resident hunters and First Nation voluntary compliance) were put in place to reduce these effects."⁹⁷

⁹² COSEWIC. COSEWIC assessment and status report on the Caribou *Rangifer tarandus*, Northern Mountain population, Central Mountain population and Southern Mountain population in Canada, 2014.

⁹³ Rick Farnell. Three decades of caribou recovery program's in Yukon. Environment Yukon. 2009, pg. 1.

⁹⁴ YOR Document 2017-0083-133-1, pg. 12.

⁹⁵ Ibid.

⁹⁶ Farnell. Three decades of caribou recovery program's in Yukon, pg. 1.

⁹⁷ Ibid.

The PHA regime for the FCH remained in place from 1998 to 2018, and was one of four Yukon caribou herds with PHAs. PHAs are implemented to “responsibly manage overall species populations and improve hunt quality. Where it is required to control the number of animals harvested, permit hunts limit the number of animals harvested for specific species and areas.”⁹⁸

REMOVAL OF PERMIT HUNT AUTHORIZATION

In 2018, YG reduced licensed harvest of the FCH to zero. Outfitter harvest was reduced to zero in 2019. Currently no outfitter or licensed FCH harvest is permitted.

RRDC IMPLEMENTATION OF PERMIT SYSTEM

In 2018, and in response to concerns about caribou and moose populations, the RRDC stated it would require non-Kaska hunters to apply for a permit from RRDC to harvest moose and caribou.⁹⁹ RRDC stated it would be issuing 15 permits for caribou.¹⁰⁰ While stating that the laws of general application would still apply for harvest in the range of the Finlayson Herd, YG encouraged compliance with RRDC requests for a shorter moose and caribou season and reduced hunting in certain areas.¹⁰¹

Context

CARIBOU REQUIRE EXTENSIVE SPACE AND A VARIETY OF HABITATS TO PERSIST

The FCH undergoes seasonal migrations, occupying different, but intermeshed and overlapping, ranges throughout the year. Seasonal movements include elevation changes and altered habitat preferences. These traditional movements are considered a strategy to minimize predation, exploit forage resources on seasonal ranges, and avoid deep snow.¹⁰² Seasonal ranges must be connected by lands that facilitate caribou movement and need to provide some forage, security from human disturbance, and a low risk of predation.¹⁰³ Areas of occupancy within caribou ranges may vary over time with changing environmental conditions, and these collective needs translate into a requirement for large, contiguous landscapes to support caribou persistence.

During calving (late May to early June), pregnant northern mountain caribou may disperse into high mountainous terrain to increase calf survival by reducing habitat overlap with other ungulates (principally moose in the Yukon), and their shared predators (wolves and bears). However, this strategy may reduce the amount and quality of forage available to female caribou during calving, leading to some females calving at lower elevations and assuming greater

⁹⁸ Department of Environment. Government of Yukon. About Permit Hunt Authorizations. 2018.

⁹⁹ Yukon News. June 22, 2018. RRDC to require non-Kaska hunters in Ross River area to get special permit. Yukon News <https://www.yukon-news.com/news/rrdc-to-require-non-kaska-hunters-in-ross-river-area-to-get-special-permit/>

¹⁰⁰ Ibid; YOR Document 2017-0083-3398.

¹⁰¹ Yukon Government. News Release. 2018-2019 Hunting season in Ross River Area. July 31, 2018.

<https://www.yukon-news.com/news/non-kaska-hunters-respectful-of-rrdc-hunting-rules-says-councillor/>

¹⁰² Environment Yukon. 2016. Science-based guidelines for management of Northern Mountain caribou in Yukon. Yukon Fish and Wildlife Branch Report MR-16-01. Whitehorse, Yukon, Canada.

¹⁰³ Environment Canada. 2014. Recovery Strategy for the Woodland Caribou, Southern Mountain population (*Rangifer tarandus caribou*) in Canada [Proposed]. Species at Risk Act Recovery Strategy Series. Environment Canada, Ottawa. viii + 68 pp.

predation risk.¹⁰⁴ In the Yukon, some calving sites and areas are used repeatedly across years, but for many populations, specific sites have not been identified because calving females are widely dispersed and solitary at this time of year.¹⁰⁵

From the post-calving period through the rut,¹⁰⁶ caribou also tend to use relatively higher elevation areas as a continued anti-predator strategy. Caribou also use snow patches at higher elevations during summer to avoid insects. During this time, caribou diet is more varied and also includes willow leaves, sedges, grasses, forbs, and fungi.¹⁰⁷ There is increasing evidence that summer post-calving range may be key for some northern mountain caribou herds in the Yukon, with cows and their calves congregating in areas of high quality forage to support the growth and development of calves before winter.¹⁰⁸

Since its quantity is fixed, higher elevation areas provide a constraint on the availability of suitable habitat from post-calving through the rut. As well, high elevation subalpine and alpine ranges are typically climax-type ecosystems that experience infrequent fire or other natural disturbance events, and are therefore considered less tolerant to habitat alteration. For this reason, all high elevation range is considered critical habitat for mountain caribou.¹⁰⁹

WINTER HABITAT MAY ALSO BE LIMITING

In some parts of the Yukon, caribou winter habitat may be limiting¹¹⁰. For the FCH: “considering winter range, there is a much higher density of animals and proportion of the total population occupying that range; the relative importance of this range is therefore higher according to its seasonal use for critical life functions.”¹¹¹

During winter, daily caloric costs are higher, as snow increases the amount of effort needed for movement and foraging. Colder temperatures require more energy to maintain body temperature, and additional energy demands are made of pregnant cows. Habitat quality, in the face of these energy demands, is particularly important.¹¹²

CARIBOU VULNERABLE TO DISTURBANCE

Factors such as forage availability, weather and predation, and their interactions with habitat, represent natural limits to northern mountain caribou populations. Within natural systems,

¹⁰⁴ Environment Canada. 2012 Management Plan for the Northern Mountain Population of Woodland Caribou.

¹⁰⁵ Environment Yukon. 2016. Science-based guidelines for management of Northern Mountain caribou in Yukon.

¹⁰⁶ Calving takes place in May and potentially into early June with post-calving surveys taking place in June. Rut surveys take place during October.

¹⁰⁷ Boertje, R. D. 1984. Seasonal diets of the Denali caribou herd, Alaska. *Arctic* 37:161-165;

Klein, D .R. 1990. Variation in quality of caribou and reindeer forage plants associated with season, plant part, and phenology. *Rangifer Special Issue 3*:123-130.

¹⁰⁸ Pettorelli, N. P., R. B. Weladji, Ø. Holand, A. Mysterud, H. Breie, and N. C. Stenseth. 2005. The relative role of winter and spring conditions: linking climate and landscape-scale plant phenology to alpine reindeer performance. *Biology Letters*;

Environment Yukon. 2016. Science-based guidelines for management of Northern Mountain caribou in Yukon.

¹⁰⁹ Environment Canada. 2014. Recovery Strategy for the Woodland Caribou, Southern Mountain population (Rangifer tarandus caribou) in Canada [Proposed].

¹¹⁰ Environment Yukon. 2016. Science-based guidelines for management of Northern Mountain caribou in Yukon.

¹¹¹ YOR Document 2017-0083-6443, pg. 2.

¹¹² YOR Document 2017-0083-083-1.

caribou populations fluctuate but remain viable. However, human activity, such as hunting and disturbance, may compound the effects of these factors and compromise the persistence of populations.¹¹³

Habitat alteration (loss and fragmentation) can result in direct effects on forage availability and predation through changes in the amount and distribution of different habitat types. Habitat alteration can also result in indirect effects associated with avoidance of preferred habitats due to sensory disturbances and increased predation risk associated with human infrastructure, including roads, and associated human activities. Linear disturbances can also facilitate increased access and movement rates of predators, leading to increased caribou mortality. Consequently, effects of alterations to caribou habitat may have a spatial extent greater than that of a project's direct footprint; they extend across a zone of influence.

A “zone of influence” is the difference between an activity's spatial footprint and the extent of the activity's effects on surrounding habitat and wildlife populations.¹¹⁴

Zone of influence depends on activity (e.g., a road may have a different zone of influence than an airstrip or a campsite), as well as habitat context (e.g., sensory disturbances may extend further in some habitats than others). Caribou, including northern mountain caribou, are sensitive to human disturbances compared with many other species; however, literature provides a diverse set of estimates for the zone of influence for caribou, both within and between caribou subspecies and ecotypes (i.e. boreal, mountain and barren-ground caribou). The Proponent has selected a 3 km zone of influence to apply to the Project footprint. This prediction is on the lower end of zone of influence estimates for similar projects and infrastructure¹¹⁵, although consistent with one of the few studies of zone of influence in northern mountain caribou (note, however, that mines in this study were mainly placer, and operated in summer only).¹¹⁶ In contrast, a study of migratory woodland caribou in Quebec determined an ore mine and its unpaved road reduced seasonal habitat use by up to 23 km (19-23 km) and 8

¹¹³ Environment Canada. 2012 Management Plan for the Northern Mountain Population of Woodland Caribou (*Rangifer tarandus caribou*) in Canada. Species at Risk Act Management Plan Series. Environment Canada, Ottawa;

Cheryl A. Johnson, et al, “Science to inform policy: Linking population dynamics to habitat for a threatened species in Canada”, *Applied Ecology*, Volume 57, Issue 7, 2020.

Frances Stewart et al, “Boreal Caribou Can Coexist with Natural but Not Industrial Disturbances”, *Journal of Wildlife Management*, 2020.

¹¹⁴ Steven F. Wilson. “Recommendations for Applying Management Buffers to Mitigate Zone-of-Influence Impacts from Oil and Gas Activities on Terrestrial Wildlife and Habitats in British Columbia” BC Oil and Gas Commission. 2016.

¹¹⁵ Sabrina Plante et al, “Human disturbance effects and cumulative habitat loss in endangered migratory caribou”, *Biological Conservation*, Volume 224, 2018.

¹¹⁶ Polfus, JL, Hebblewhite, M., Heinemeyer, K. “Identifying Indirect Habitat Loss and Avoidance of Human Infrastructure by Northern Mountain Woodland Caribou.” *Biological Conservation*, 144. 2011.

km (0-8 km), respectively, dependent on year. The road also presented a strong barrier to movement in all years.¹¹⁷

It is important to note that an absence or reduced avoidance of disturbances may not indicate the absence of adverse effects, but could suggest that animals do not perceive risks associated with such areas (described as ecological traps), or that they are forced to use disturbed areas due to life history requirements, regardless of increased risk.¹¹⁸

LANDSCAPE CONNECTIVITY IS KEY FOR CARIBOU

Northern mountain caribou exhibit strong seasonal variation in use of areas within their range, and the ability to move between these is critical to fulfilling their life cycle requirements. Connectivity is a measure of how effectively a landscape is in providing this function, and is also recognized as one of the most important attributes in facilitating adaptation to changing conditions, including climate change. Human disturbances can disrupt connectivity, either through physical changes to landscapes that cause direct loss and fragmentation of habitats, or through indirect or functional changes in species dynamics and behavioural responses of individuals to disturbance. Landscape connectivity features heavily in management objectives for northern mountain caribou in BC, where it is an explicit management objective for northern mountain caribou; further, connectivity habitats are considered vulnerable elements in assessment and mitigation of land-use activities.¹¹⁹

CARIBOU REPRODUCTIVE RATES RELATIVELY FIXED COMPARED TO OTHER UNGULATES

Caribou are a “classic k-selected species” – meaning that they have both a relatively rigid and low reproductive capacity. Reproductive rates are essentially limited to one calf per cow per year – which represents a lower capacity for reproduction, or fecundity, than many other species. When compared with moose, caribou have both a later breeding age and lower fecundity. Therefore, it can take considerable time for populations to recover from declines.

CARIBOU RECRUITMENT AND ADULT SURVIVAL BOTH INFLUENCE POPULATION GROWTH

Most calf mortality occurs within the first month of life, largely due to predation. In addition to habitat factors, climate may also influence predation rates, as cows may be unable to reach higher elevations to calve in years with deep snow.¹²⁰ Recruitment rates in northern mountain caribou (calves surviving their first year) are highly variable, with averages of 20-25 calves per

¹¹⁷ Sabrina Plante et al, “Human disturbance effects and cumulative habitat loss in endangered migratory caribou”, *Biological Conservation*, Volume 224, 2018.

¹¹⁸ J.A Gill, Norris, K., Sutherland, W.J., 2001. Why behavioural responses may not reflect the population consequences of human disturbance. *Biological Conservation*. 97, 265–268.
M. Leblond et al., 2011. Assessing the influence of resource covariates at multiple spatial scales: an application to forestdwelling caribou faced with intensive human activity. *Landscape Ecology* 26, 1433–1446.

C.M. Prokopenko, C.M., Boyce and M.S., Avgar, T., “Extent-dependent habitat selection in a migratory large herbivore: road avoidance across scales.” *Landscape Ecology*. 32. 2017.

¹¹⁹ Environment Canada. 2014. Recovery Strategy for the Woodland Caribou, Southern Mountain population (*Rangifer tarandus caribou*) in Canada [Proposed].

B.C. Ministry of Environment. 2014. Science update for the South Peace Northern Caribou (*Rangifer tarandus caribou* pop. 15) in British Columbia. Victoria, BC. 43 pp

¹²⁰ Hegel, Troy M., et al, “Interacting Effect of Wolves and Climate on Recruitment in a Northern Mountain Caribou Population.” *Oikos*, 119. 2010.

100 cows considered necessary to sustain populations in the Yukon. Within this range, high adult female survival is required to maintain a stable population.¹²¹

Although recruitment of caribou calves to the breeding population is important to population growth, adult female survival exerts a stronger influence on population trends.¹²² Small increases in mortality of adult female caribou (2 percent annually) can lead to a 30 percent population decline over 10 years.¹²³ Mortality rates may also vary seasonally. Adult female woodland caribou occupying an undisturbed range in the southern Northwest Territories exhibited peaks in mortality during pre-calving and late autumn periods, corresponding to intervals of increased movement and predation risk, and an additional peak mid-summer, related to higher incidences of starvation due to poor body condition post-calving.¹²⁴ Such effects could be exacerbated by human disturbance during these vulnerable periods.

CARIBOU VULNERABLE TO INCREASED PREDATION IN AREAS WITH MORE ROADS AND TRAILS

Wolves often use roads and trails where they exist for some of the same reasons that human use them. The primary reason being ease of movement, especially when cleared of snow, or when snow has been compacted. Roads increase the chances of caribou-wolf interaction both by facilitating the movement of wolves and by providing corridors with good visibility. As such, the development of linear infrastructure can increase the likelihood of predator-prey encounters, including wolf-caribou encounters, and therefore wolf predation of caribou.

Existing Conditions and Trends

AVAILABLE DATA AND INFORMATION

The EC notes that the available information and clarity of management objectives regarding the FCH is poor as compared with herds such as the Klaza or Southern Lakes caribou, despite the existence of the Wolverine Mine and the potential for development of the Kudz Ze Kayah project, both intersecting key habitat of the FCH.

Beyond broad boundaries of seasonal ranges and general descriptions of habitat, quantification of habitat use is largely limited to coarse-scale habitat modelling done by the Proponent based on limited data. However, the relative importance of some areas can be inferred from population survey information, and local knowledge. There have been no collaring efforts focussed on the FCH since the 1980's.

The EC also has little information on other sources of potential mortality due to predation, subsistence harvest, poaching, disease, or terrain hazards. Government of Yukon acknowledges, "there is an information gap regarding mortality, and more specifically, adult mortality."¹²⁵

¹²¹ Environment Yukon. 2016. Science-based guidelines for management of Northern Mountain caribou in Yukon.

¹²² Environment Yukon. 2016. Science-based guidelines for management of Northern Mountain caribou in Yukon.; Cheryl A. Johnson, et al, "Science to inform policy: Linking population dynamics to habitat for a threatened species in Canada".

¹²³ Environment Yukon. 2016. Science-based guidelines for management of Northern Mountain caribou in Yukon.

¹²⁴ Alicia Kelly, "Seasonal patterns of mortality for boreal caribou (*Rangifer tarandus caribou*) in an intact environment", 2020.

¹²⁵ YOR Document 2017-0083-6443.

Despite a relative low level of precision in describing existing conditions and trends, the EC is still able to sufficiently describe existing conditions and conclude that the herd is in decline, that habitat is limited for the FCH, and that the project intersects movement corridors, key habitats, and specific areas of high importance for multiple life stages of the FCH.

HABITAT

Seasonal habitats are distributed throughout the FCH range, with a unique confluence of environmental conditions that provide the full suite of habitats necessary for all life requisites, including seasonal movement corridors, in the region surrounding the Project area (Figure 13).

CALVING HABITAT DISPERSED BUT OCCUPIED

No modelling or mapping of calving habitat has been completed, and thus no quantitative estimate of calving habitat is available. However, multiple sources indicate that suitable calving habitat exists at higher elevations throughout the Project area, and that calving sites are present and occupied. The proximity of suitable and occupied post-calving habitat further supports this.

LIMITED POST-CALVING AND RUTTING HABITAT AVAILABLE FOR THE FINLAYSON CARIBOU HERD

The FCH range has a fixed amount of suitable habitat for post-calving and rutting. The Project is proposed in an area that consists of large patches of suitable post-calving and rutting habitat that have been consistently used by caribou for many generations (i.e. there is high fidelity to these traditional sites) (see Figures 14, 15). While site fidelity may not indicate strict dependence on a specific site, it does indicate presence of preferred habitats. Long-term records of proportionally high observations of caribou surrounding the Project area during rut illustrates this pattern (see Table 18).

Table 18: Table 5-1 from Information Request 6

Distance from the Project	Area of ring (km ²)	Number of data points from 1982 to 2019 per km ² ; note this is not a density of individuals in any given year and not evenly distributed)	Percent of Groups of the FCH	Percent of Individuals of the FCH	Mean Group Size
Project to 1 km	24.9	20.5	1%	1%	15.5
1 km to 2 km	22.9	33.5	2%	2%	21.3
2 km to 3 km	29	44.2	2%	3%	21.7
3 km to 5 km	76.6	24.8	3%	4%	25.6
5 km to 10 km	301.2	16.6	10%	12%	21.4
10 km to 15 km	458.1	7.7	9%	8%	16.8

Note: Density of actual animals in any given year cannot be inferred from these data. Data points are a culmination of observations in the database over the period from 1982 to 2019.

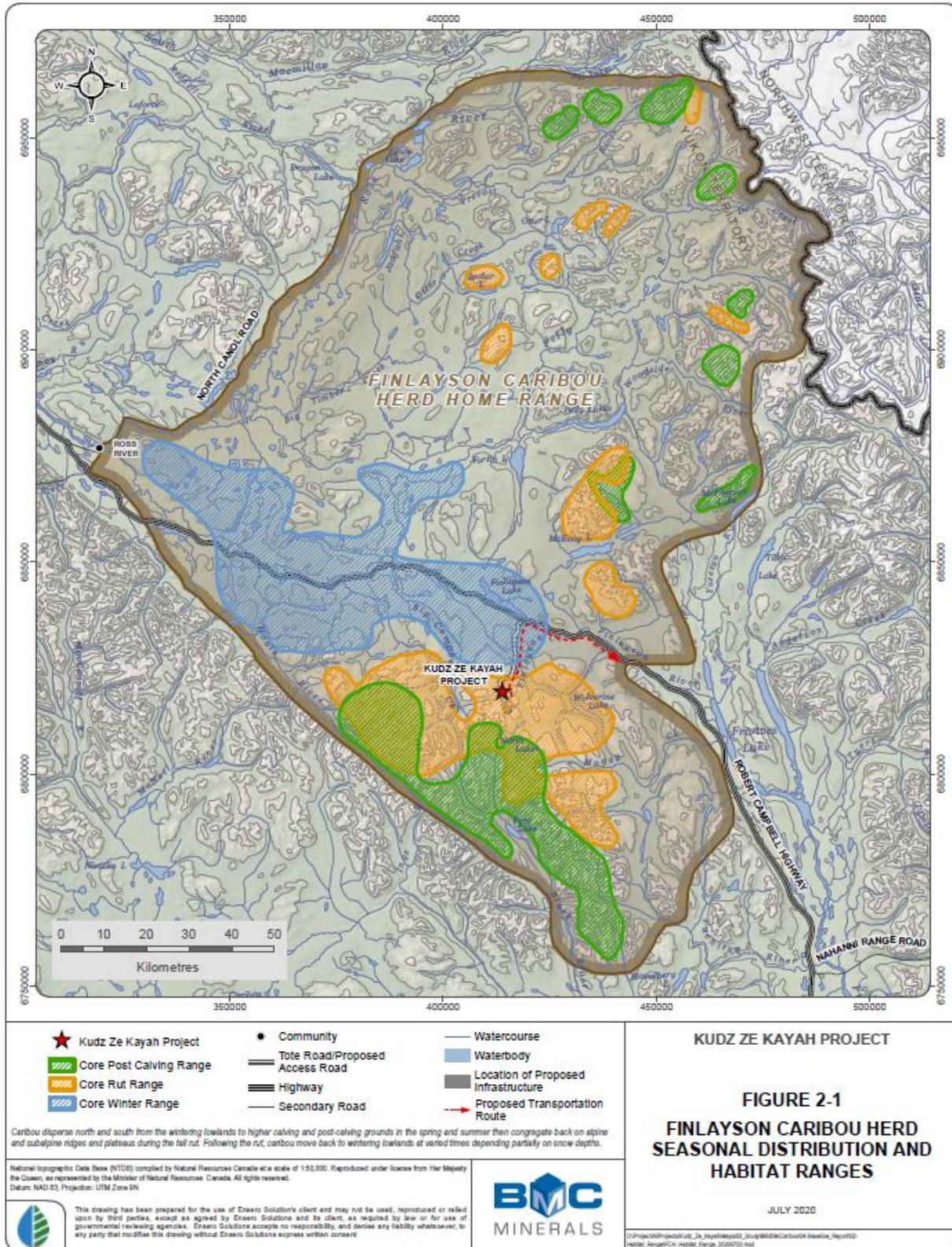


Figure 13: Finlayson Caribou Herd Seasonal Distribution and Habitat Ranges (figure 2-1 from the response to Information Request 6).

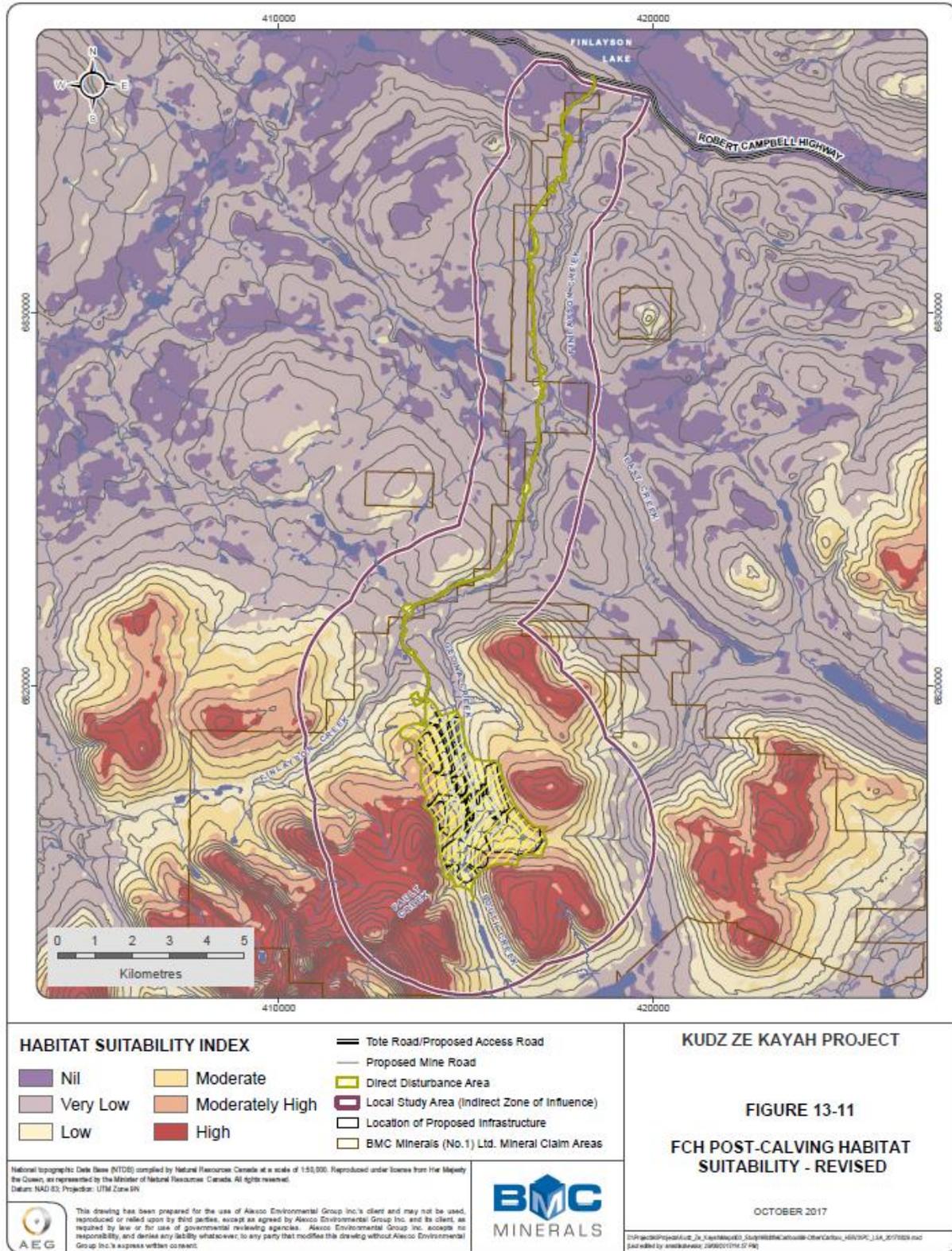


Figure 15 Finlayson Caribou Herd Suitable Habitat Post Calving – From IR2 Response

PROJECT AREA ADJACENT TO WINTER HABITAT OF THE FINLAYSON CARIBOU HERD

The areas to the north of the Project site, in lower, flatter terrain around the RCH and up towards Ross River, provide winter habitat for the FCH (see Figure 13). Late winter habitat use appears to have been shifting, with greater occupation of areas around Finlayson Lake in recent years, immediately north of and overlapping the Project area (Figure 16).

SEASONAL MOVEMENT CORRIDORS

Large scale migratory use of the Project area between late winter and calving periods, and post-rut and early winter periods, is well documented. A migration corridor extending approximately 4 km above and below the confluence of Geona Creek and Finlayson Creek was described during 1995 surveys, with additional signs of high use noted down the East Creek Valley.¹²⁶ Kaska knowledge holders recognize the area as a “caribou crossing”, and an important portal to critical calving areas in the mountains to the south.¹²⁷

FINLAYSON CARIBOU HERD RANGE CONDITION

Within the range of the FCH, the RCH, the Wolverine Mine and mineral exploration are most likely the largest sources of habitat loss and disturbance for the herd. Many historical and current exploration projects, which include trenching, drilling, and bulk sampling programs, dot the range of the FCH, but the highest concentration of known (mapped) human disturbance is in the region surrounding the Project.¹²⁸

The RCH cuts through key winter habitat, providing a means of access to the herd and facilitating harvest, and also fragmenting habitat. The community of Ross River also lies on the edge of the FCH’s range. Functional habitat loss through avoidance may also exist around outfitting, trapping, camp or tourism infrastructure.

Wildfire is also an important influence of caribou range condition, and fire history records for the FCH range indicate that approximately 12 percent of the range has burned in the last 50 years. Most fires are restricted to lower elevation areas, with forested winter range most susceptible to burning.

Despite these sources of disturbance, the FCH’s range is relatively undisturbed when compared with other northern mountain caribou herds in Yukon, such as the Southern Lakes, or Klaza herds, and much less disturbed than ranges in BC. This conditions suggests that a relatively high degree of landscape connectivity currently exists within the range.

¹²⁶ YOR Document 2017-0083-132-1.

¹²⁷ YOR Document 2017-0083-5077.

¹²⁸ YOR Document 2017-0083-0984. (Figure 7.1)

RECRUITMENT AND SURVIVALHISTORY OF POPULATION DECLINE

Rut surveys conducted by YG over the last twenty years since the cessation of the wolf control program show an average calf to cow ratio of approximately 20 calves per 100 cows (Figure 17), which is at the low range of that considered sustainable for northern mountain caribou in Yukon (20-25 calves per 100 cows).¹²⁹ For the FCH, a fall calf:cow ratio of about 26 calves per 100 cows has been suggested as generally consistent with a stable herd, where recruitment of young balances natural adult mortality.¹³⁰

Rut surveys may overestimate cow:calf ratios, as calf mortality may occur through the winter. Years in which observed recruitment is over 26 calves per 100 cows are uncommon, occurring only seven times from 1990 to 2014. Overall, observed ratios suggest a population that may be hovering around sustainable thresholds, as long as adult survival is high. However, observed declines suggest adult survival was not sufficient to offset relatively low long-term recruitment.

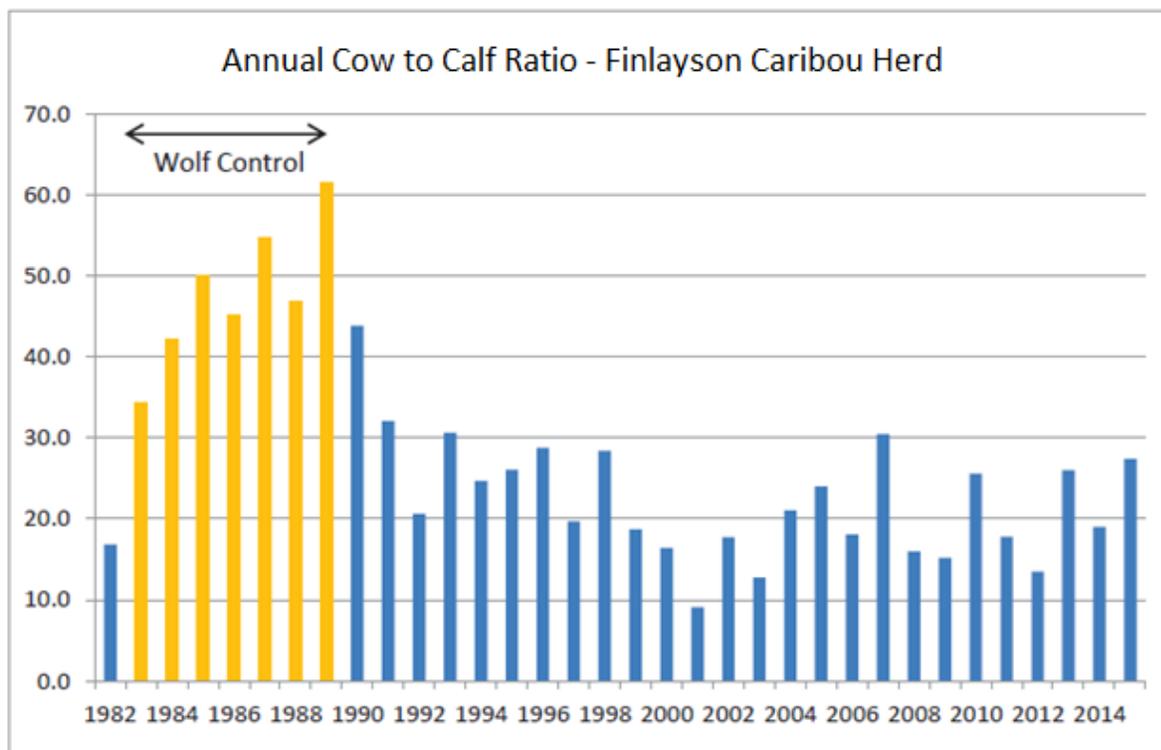


Figure 17: Calves per 100 cows based on fall rut surveys, after most calf mortality is likely to have occurred – recruitment during the wolf control period is highlighted

¹²⁹ Environment Yukon. 2016. Science-based guidelines for management of Northern Mountain caribou in Yukon.

¹³⁰ YOR Document 2017-0083-133-1, pg. 13. Adamczewski, J., R. Florkiewicz, R. Farnell, C. Foster, and K. Egli. 2010. Finlayson caribou herd late-winter population survey, 2007. Yukon Fish and Wildlife Branch Report SR-10-01. Whitehorse, Yukon, Canada.

Sex ratios, however, were likely sustainable. Aerial surveys in 2015 estimated a sex ratio of 31.2 bulls per 100 cows, while another in 2016 estimated the ratio of bulls to cows at 39 per 100, respectively. A minimum sustainable sex ratio based on Yukon Caribou Management Guidelines is 30 bulls per 100 cows.¹³¹

RECENT SURVEY DATA REVEAL CONTINUING DECLINE

Over the ten years from 2007 through 2017, YG estimates that the FCH has declined by approximately 12 percent, with the 2017 survey estimating a population of ~2700 animals.¹³² Government of Yukon states that over a period of 10 years, “the full variability in observed annual recruitment rates has typically occurred.”¹³³ This suggests that factors beyond natural, inter-annual variability in recruitment are responsible for this persistent population decline. These factors could be affecting either recruitment or adult survival.

LITTLE KNOWN ABOUT FACTORS AFFECTING ADULT SURVIVAL

Some detail of historical harvest is available. The PHA appears to have been relatively stable at 30 permits for bulls annually, though indigenous harvester success rates are not known.¹³⁴ Amongst Game Management Subzones (GMS) 10-06, 10-07, 10-08 and 10-09 (Figure 18), which overlap and surround the Project, approximately seven caribou were harvested annually, on average, by licence from 1995 through 2016.¹³⁵

¹³¹ Department of Environment. Government of Yukon. Science-based Guidelines for Management of Northern Mountain Caribou in Yukon. 2016. Pg. iv.

¹³² YOR Document 2017-0083-6443.

¹³³ Department of Environment. Government of Yukon. Science-based Guidelines for Management of Northern Mountain Caribou in Yukon. Pg iv.

¹³⁴ Ross River Dena Council v Yukon (Government of), 2015 YKSC 45. Paragraph 30.

¹³⁵ YOR Document 2017-0083-134-1, pg. 35.

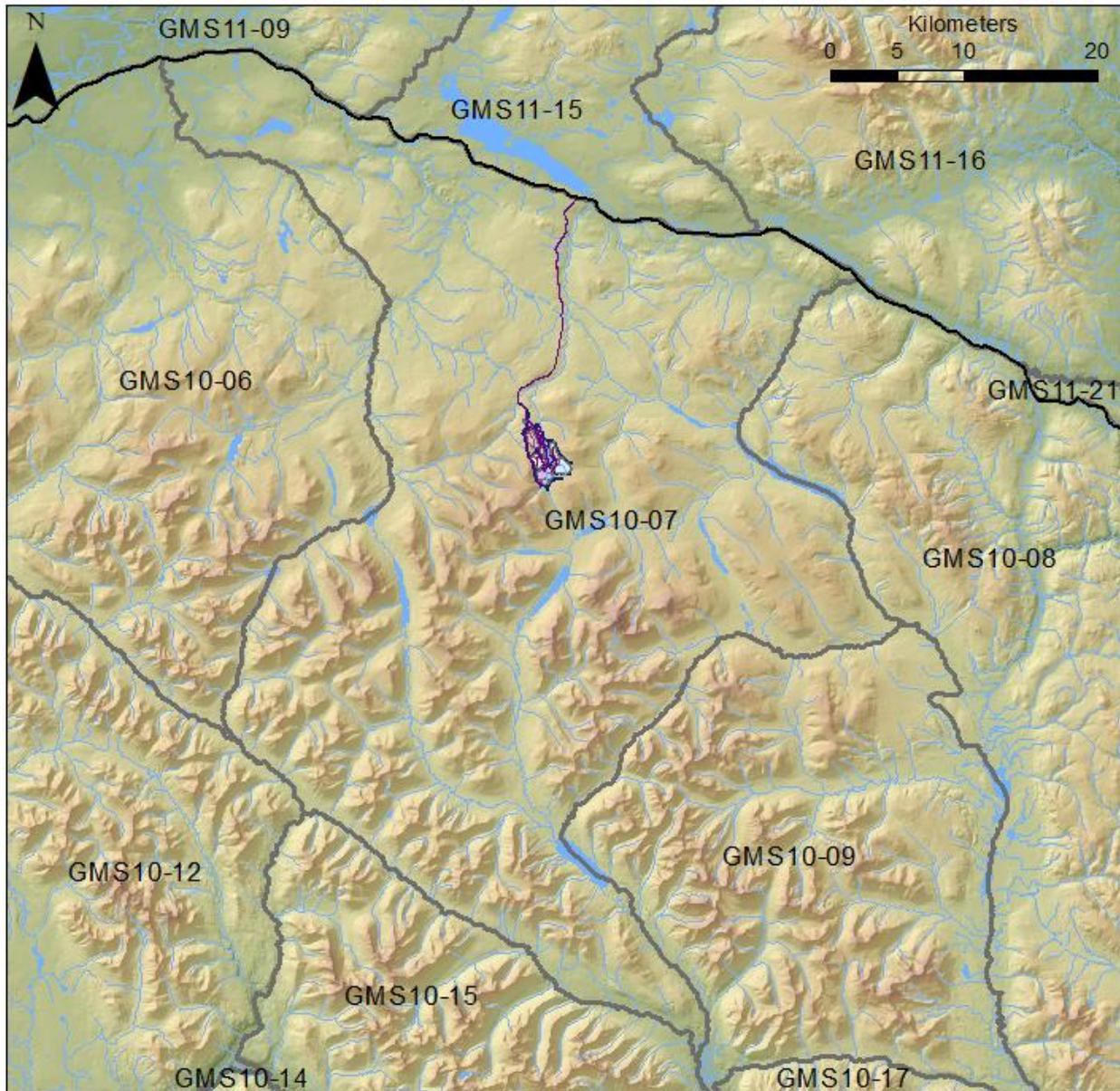


Figure 18: Game Management Subzones near and overlapping the Project. The Project footprint is seen in GMS 10-07.

LOW LEVEL OF WILDLIFE-VEHICLE COLLISION MORTALITY

Known wildlife-vehicle collisions have accounted for little FCH mortality historically. Government of Yukon data show that along the entire RCH, from 2003 to 2014, only one collision between caribou and vehicles occurred.¹³⁶ Planned upgrades to RCH may increase traffic volumes and speed of travel, and resultant risk of collisions leading to increased caribou mortality.

¹³⁶ Yukon Government's Preventing Wildlife Collisions Interdepartmental Working Group. "Large Mammal-Vehicle Collisions: Overview of mitigations and analysis of collisions in Yukon." Government of Yukon. 2015.

INFLUENCE OF MORTALITY VERSUS HABITAT

Though Government of Yukon notes that the herd “should be stable or increasing” based on rut surveys, it has concerns about mortality, stating, “In the case of the Finlayson herd, Environment Yukon suspects mortality (including harvest) likely influences population demographics more than habitat availability.”¹³⁷ However, YG recognizes that “as a declining herd, effects on habitat within the annual range should be minimized and closely monitored”, and also notes that, should the herd’s population increase, the relative importance of habitat as a limiting factor to herd population would also increase.¹³⁸

Government of Yukon also notes that some changes to habitat may alter harvest and mortality, “for example, new and/or improved access routes may facilitate harvest and/or result in increased mortality”, and that “habitat avoidance due to disturbance in key areas of concentration (e.g., winter range) adds complexity in determining the relative contribution of harvest and development to the declining status of the herd.”¹³⁹ Further, there is recognition that “effects of habitat loss, fragmentation, and reduced habitat effectiveness are often more difficult to quantify at the population level as impacts may be indirect and act cumulatively over time”.¹⁴⁰

HARVESTING OPPORTUNITIES LIMITED

Guidelines for management of northern mountain caribou indicate that all adult cow mortality (including harvest mortality) should be minimized in a declining herd, but that a declining herd *may* be able sustain a bull harvest of up to 1 percent of total population size, dependent on available, herd-specific information.¹⁴¹

SPECIES INTERACTIONS IMPORTANT

Caribou exist in a multi-species predator-prey system. The FCH range overlaps with populations of moose, wolves and bears, and the distribution and dynamics of these species influence caribou distribution and demography. All these species have been observed in the Project area, and use of the access road by wolves has been noted.

Project Design

The Proponent has proposed a number of design features, policies and mitigation measures to address potential effects on habitat and survival of the FCH. These appear in the Project proposal, the Wildlife Protection Plan, responses to information requests (most recently in Table 6-1 of Response Report 5), and have been summarized in relation to seasonal considerations for caribou (Figure 19). Many of these are general mitigation measures proposed to address Project effects on all wildlife species. Note that an additional measure specific to caribou, included in the Project proposal, but not represented in Figure 19, is to minimize activities in alpine areas during the calving period (May 1 to May 31).¹⁴²

¹³⁷ YOR Document 2017-0083-6443.

¹³⁸ If management objectives to increase or stabilize the herd’s population are realized, reduction in habitat would become a more important factor in limiting herd size relative to predation.

¹³⁹ YOR Document 2017-0083-6443.

¹⁴⁰ YOR Document 2017-0083-6443.

¹⁴¹ Environment Yukon. 2016. Science-based guidelines for management of Northern Mountain caribou in Yukon.

¹⁴² YOR Document 2017-0083-2366.

Kudz Ze Kayah Project – Mitigation Measures to Protect the Finlayson Caribou Herd

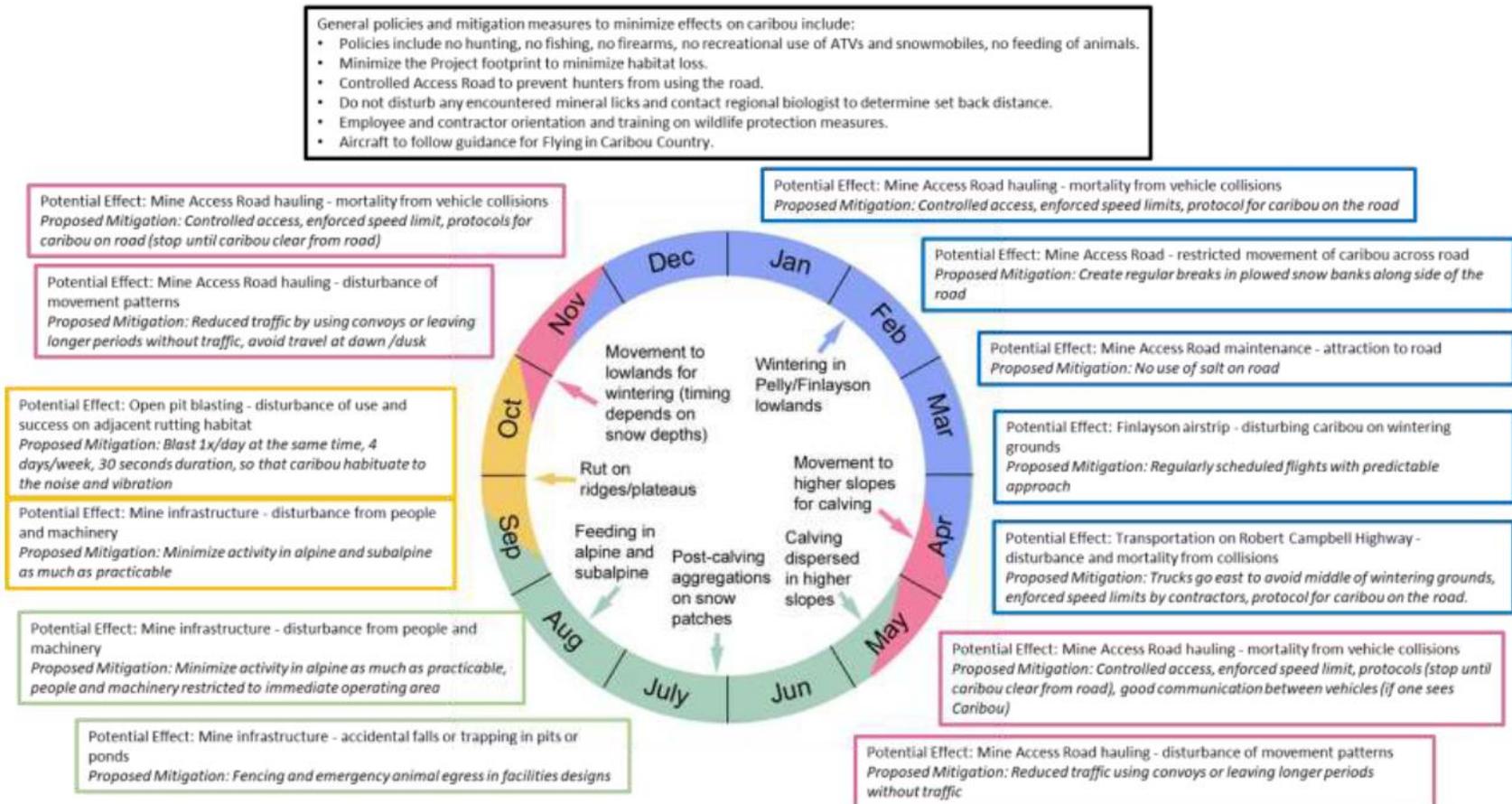


Figure 19: Proponent Mitigation Measures as Listed in the Response to Information Request 6.

HABITAT

The proposed Project includes an open pit mine and associated infrastructure in areas with high-quality caribou habitat. The Project footprint was designed to cover as little area as practicable to minimize habitat loss. To address some of the more temporary effects of constructing the mine, the Proponent proposes to reduce habitat degradation through sensory disturbance by scheduling construction activities during periods when the FCH will be less reliant on habitat in close proximity to the Project (where practicable). Indirect effects on habitat are also proposed to be addressed by minimizing activities in subalpine and alpine areas during sensitive periods as much as practicable. Recreational use of off-road vehicles by employees would be prohibited. Effects of the nearby Finlayson airstrip are proposed to be addressed through regularly scheduled flights with a predictable approach, as well as following guidelines for Flying in Caribou Country. Disruption of the core winter range west of the mine access road will be reduced by trucks travelling east.

RECRUITMENT AND MORTALITY***HARVEST***

The proposed Project includes maintaining access management controls on an existing road to the mine site. As such, no new road access will be created by the Project, and new road development will remain limited to the mine site itself. While restricting access along the mine access road, the Proponent will also not allow employees, contractors, or camp residents to use recreational off-road vehicles and will institute a no hunting policy. These measures will limit the potential for mortality via increased harvest due to the Project.

COLLISIONS

Speed limits are proposed by the Proponent on the mine access road to limit the potential for wildlife-vehicle collisions. Travel on the RCH will be east from the mine access road to avoid the wintering grounds, speed limits will be enforced and a protocol for caribou on the road established.

MOVEMENT

Effects of the access road on caribou movement are proposed to be addressed through reduced traffic using convoys, or leaving longer periods without traffic, and creating regular breaks in plowed snow banks in winter.

Effects Characterization***PROJECT-RELATED HABITAT LOSS***

The Project is uniquely situated at the intersection of late winter, calving, post-calving, rut, and early winter habitats and the seasonal movement corridors that connect them (Figure 13). Direct and indirect effects of habitat loss and degradation in the Project area will influence all components of the annual life cycle of the FCH.

The Proponent predicts that the Project will predominantly result in the loss of post-calving habitat and rutting habitat. Through habitat modelling (Figures 14, 15) and application of a 3 km buffer around the mine site and 1.5 km buffer around the access road, the project will result in:

- A removal of five percent of moderately high- and high-quality rutting habitat in the core of the FCH's range during rutting; and
- A removal of four percent of moderately high- and high-quality post-calving habitat in the core of the FCH's range during post-calving.

Late winter habitat models provided by the Proponent further suggest¹⁴³:

- A removal of less than one percent of moderate to high suitability late winter habitat in the core winter range in association with both the Access Road and the Finlayson Lake Airstrip; and
- A high proportion of high quality late winter habitat adjacent to the RCH, west of the Project area.

Effects to winter habitat are due primarily to increased use of the Finlayson airstrip, increased use of the mine access road and increased use of the RCH. This increase in the intensity of road and airstrip use will result in an increased zone of influence around the airstrip and affected road segments.

Effects to calving habitat and movement corridors are very likely, but models were not available to quantify effects. This is a significant knowledge gap. Early winter habitat likely overlaps rut and movement areas. A full, quantitative assessment of the additive effects of direct and indirect habitat loss due to Project infrastructure and activities was not completed by the Proponent.

The region in which the Project is situated is disproportionately important to the FCH. In late winter, two thirds of the herd travels south of the RCH, moving through the lowlands in which the access road and mine are located, to occupy seasonal ranges in montane areas in and surrounding the Project area. Disruptions in movement will impact a significant proportion of the population both directly, and through reduced landscape connectivity. During rut, a large proportion of the population congregates in areas adjacent to the mine site, making it vulnerable to disturbances that could affect many individuals. The Project-level consequences of direct and indirect loss of habitat to the population are therefore expected to be higher than suggested by the methodology applied by the Proponent.

Project-related changes in habitat predicted for moose and grizzly bears (loss and displacement, section 6.3) and wolves (enhanced movement) will increase predation pressure on caribou.

Direct habitat effects may be reduced after mine operations are complete, if reclamation successfully restores habitat function. Habitat loss due to the mine's footprint, including its open pit, waste storage facilities and WMPs, will be permanent and irreversible. Beyond direct reductions in habitat loss, the effectiveness of most mitigation measures at reducing habitat disturbance during operations is largely unknown. Population consequences of residual effects from habitat loss and degradation could affect both recruitment and adult survival, but

¹⁴³ YOR Document 2017-0083-0984.

recruitment effects are predicted to be stronger.¹⁴⁴ Long-term declines are likely if community dynamics are disrupted.

RANGE-LEVEL HABITAT CONDITIONS

Herds are the basic unit for caribou management in Yukon and elsewhere, and conditions across a herds range contribute to its population status.¹⁴⁵ Habitat disturbance is used as a proxy in status assessments, when population data are not available, given its well substantiated relationship with both calf recruitment and adult female survival.¹⁴⁶ It can also inform interpretation of population trends. The relevant measure includes human disturbances that can be mapped (the “human footprint”), with a buffer to account for a zone of influence, and area burned by wildfire within the last 40-50 years.

The Proponent reports that the existing human footprint in the FCH range is approximately 12 percent, including mineral properties, roads and the town of Ross River, all buffered by 2 km. The Project and associated claims account for 2 percent of the total. Fires within the last 50 years contribute an additional 12 percent to range disturbance, and as most do not overlap human disturbances, resulting in a total range disturbance of approximately 24 percent. This places the Project in a regional context that contributes to a high potential magnitude of effect on caribou abundance, based on the thresholds established by the Proponent.¹⁴⁷

The Proponent suggests that the measure of human footprint is overly conservative given it includes mineral claim blocks, and magnitude of effect should be considered low.¹⁴⁸ However, the result illustrates that substantial risk exists, and the continued decline of the FCH suggests caution is warranted with respect to cumulative effects, particularly given much of the present development, additional claims, and a major road, exist in close proximity to the Project. As well, caribou may be naïve to predation risk associated with human footprint in undisturbed landscapes, magnifying negative demographic effects associated with development.¹⁴⁹

Government of Yukon notes the importance of preserving winter habitat in relation to this Project (winter habitat will remain largely unaltered), and of avoiding habitat alterations that may increase accessibility.¹⁵⁰ Government of Yukon also notes that: “the draft WPP lists many mitigation measures and monitoring programs associated with the FCH that ENV feels are

¹⁴⁴ Cheryl A. Johnson, et al, “Science to inform policy: Linking population dynamics to habitat for a threatened species in Canada”.

¹⁴⁵ Environment Yukon. 2016. Science-based guidelines for management of Northern Mountain caribou in Yukon; Environment Canada 2011 - Recovery Strategy for the Woodland Caribou, Boreal population (*Rangifer tarandus caribou*) in Canada [Proposed].

¹⁴⁶ Cheryl A. Johnson, et al, “Science to inform policy: Linking population dynamics to habitat for a threatened species in Canada”; Environment Canada. 2014. Recovery Strategy for the Woodland Caribou, Southern Mountain population (*Rangifer tarandus caribou*) in Canada [Proposed]; Environment Canada. 2012 Management Plan for the Northern Mountain Population of Woodland Caribou (*Rangifer tarandus caribou*) in Canada; Environment Canada 2011 - Recovery Strategy for the Woodland Caribou, Boreal population (*Rangifer tarandus caribou*) in Canada [Proposed].

¹⁴⁷ YOR Document 2017-0083-043-1.

¹⁴⁸ YOR Document 2017-0083-043-1.

¹⁴⁹ Cheryl A. Johnson, et al, “Science to inform policy: Linking population dynamics to habitat for a threatened species in Canada”

¹⁵⁰ YOR Document 2017-0083-6443.

important in reducing significant adverse affects to the FCH as a result of habitat degradation and increased mortality.”¹⁵¹ .

LIMITED OPPORTUNITY FOR INCREASED MORTALITY BY HARVEST

No new access roads will be developed, but the existing one will be upgraded. The Project proposes to maintain year-round access restrictions on the existing access road, and reclaim it on Project completion. Restrictions will also be placed on the use of recreational vehicles and hunting by employees and contractors. Increased access to caribou habitat for hunting should be minimized if these measures are successfully enforced. Comments submitted by Yukon Environment note the challenges in successfully decommissioning access roads unless there is an effective pinch point along the route where a necessary structure is removed (e.g. a bridge). They suggest that there would likely be residual effects from increased hunting due to increased access in the short- and long-term.¹⁵²

VEHICLE COLLISIONS WITH CARIBOU WILL REMAIN RARE

Collisions involving caribou on the RCH are rare occurrences. As noted above, only one collision has been recorded along the entirety of RCH over a period of 12 years, ending in 2014. While the Project proposes substantially increased traffic, including 52 HDVs travelling the access road daily during operations, collisions involving caribou are likely to remain rare, with effective implementation of traffic control, monitoring, and adaptive management measures by the Proponent.

INCREASED PREDATION OF CARIBOU IS LIKELY

No new access roads are proposed, but the access road will be cleared in winter. This will allow easier movement for wolves, increased encounter rates with caribou in the vicinity of the road, and facilitate access to subalpine areas in the Project area, all which will lead to increased wolf predation. Alteration of habitat for other species in the Project area (moose and grizzly bears), may also increase overlap with caribou and lead to increased predation, particularly on calves.

PROJECT LIKELY TO RESULT IN DECREASED POPULATION OF FCH

Given the sensitive nature of caribou to disturbance and human activity, caribou will alter their behavior due to project activities. Barriers to caribou movement and displacement of caribou from preferred habitats, in addition to sensory disturbance from Project activities, are likely to result in poorer body condition, and reduced adult survival during critical periods, as well as lower overall reproductive successfecundity of the herd due to parental effects on pregnancy rates and calf survival. Congregation of large numbers of caribou in and around the Project area during the fall breeding season compounds these effects. The potential for additional direct mortality via predator use of cleared roads or increased accessibility post operations will further place downward pressures on the FCH.

The EC considers that in the event the Project proceeds, the FCH population will likely decline, and certainly be lower than in the event the Project does not proceed.

¹⁵¹ YOR Document 2017-0083-3398.

¹⁵² YOR Document 2017-0083-265-1. Martin Weinstein. “The Ross River Dena: A Yukon Aboriginal Economy”. Royal Commission on Aboriginal Peoples Aboriginal Economy Case Study Project. 1993.

Significance Determination

EFFECTS ARE LIKELY

The Project will cause disturbance to and removal of key habitat and movement corridors for the FCH. This presence is likely to cause effects at the population level for the FCH.

EFFECTS ARE ADVERSE

The EC has predicted that the project is likely to reduce the FCH population, this effect is adverse as the herd's ideal population is higher than currently.

EFFECTS ARE SIGNIFICANT

The EC considers the effects to be significant given the context in which the effects occur, the herd is highly valued, the herd is declining, and that the herd's sustainability may be at risk. The project is likely to reduce or place downward pressure on the herd's population as it takes place in key habitat – *Kudz Ze Kayah* – for multiple life stages of caribou while also increasing potential for direct mortality.

Recommended Mitigations and Monitoring

RECOMMENDED MONITORING

The EC requires monitoring under s.110 of YESAA due to the high level of importance placed in the FCH and the need for ongoing data collection to both inform future mitigation strategies and herd management planning. The availability of additional data will strengthen the proposed mitigations, which include herd management planning and the responsive implementation of numerous mitigation strategies.

Government of Yukon also argues for monitoring, considering both a declining population and uncertainty regarding the sustainability of the FCH, that surveys should be completed to monitor:

- Caribou distribution during the post-calving period to inform understandings of Project effects on habitat use
- FCH composition and distribution during the rut to inform understandings of Project effects on population and habitat use
- Caribou distribution during the late winter and spring to inform understandings of Project effects on habitat use and movement between wintering grounds and calving, post-calving and rutting ranges
- More information is required to confirm the effectiveness of both the mitigations and monitoring programs proposed in the Draft Screening Report.¹⁵³

Such monitoring is not only beneficial to future assessments, but essential to understanding effects and to allow adaptive management to be properly conducted in respect of the Project. As any such surveys could lead to management implications, and as RRDC and LFN have demonstrated deep concern regarding the management of caribou within their Traditional Territory, the EC recommends, under s.110 of YESAA:

- C. The proponent shall implement, in collaboration with Government of Yukon, a survey program to monitor:
 - b. Caribou distribution in the Project area during the post-calving.
- D. Government of Yukon shall implement a range wide survey program to monitor:
 - d. Caribou herd composition and distribution during the rut period.
 - e. Caribou distribution during late winter.
 - f. Caribou distribution and movement in spring.

Survey programs shall be designed in consultation with LFN and RRDC in determining appropriate methods. Results of surveying efforts shall be summarized in an annual report

¹⁵³ YOR Document 2017-0083-264-1

distributed to LFN, RRDC, and the Proponent. Survey programs shall build on the baseline surveys conducted in 2015 and 2016, and late winter ungulate surveys.

RECOMMENDED MITIGATIONS

The EC recommends two mitigations in respect of the FCH.

The first of these mitigations requires the implementation of an oversight body, and is intended to address the variability in herd behavior and demographics and how that variability requires any mitigation to have an adaptive and flexible implementation. The mitigation also attempts to address Government of Yukon concerns that mitigations must be both measurable and enforceable. This mitigation acknowledges uncertainty in the effectiveness of individual actions that may be taken to reduce, control, or eliminate effects to caribou by providing a framework for effects' mitigation and monitoring. The implementation of these actions within the wildlife management plan will ensure that the proposed actions will be regulated within the context of the QML.

The second of these mitigations is directed at Government of Yukon. The EC recognizes that the range of the FCH extends beyond the Project area and that it is necessary to address cumulative concerns on the FCH range while considering both the effects of the Project, and the effectiveness of proposed Project-specific mitigation measures, on habitat and population concerns.

The FCH has a history of strong, but sporadic, management decisions. The herd continues to decline without agreed upon management objectives regarding harvest and land-use, and insufficient knowledge to identify range-level drivers and associated management thresholds.

The EC recommends the following two mitigations to reduce, control, or eliminate significant adverse effects to the FCH.

- 10) Government of Yukon shall oversee the establishment and maintenance of an oversight body, financed by the Proponent, comprised of participants representing the Proponent, Government of Yukon, LFN, and RRDC.

The proponent will be required to include in the wildlife management plan (a component of the QML, any outputs and actions agreed to by the oversight body. These components of the plan will be updated as required based on the seasonal nature of the outputs or actions.

The oversight body shall require the implementation of mitigations, and monitoring of their effectiveness, considering the following mitigation and management strategies:

- a. In general:
 - vii. When and how to apply mitigation measures pertaining to caribou referred to in Appendix A (Proponent commitments).
 - viii. The prioritization of methods for reducing sensory disturbance.

- ix. The establishment of objectives, methods and prioritization for effectiveness monitoring.
 - x. The identification of triggers and corrective actions within the adaptive management plan.
 - xi. The identification of additional mitigations that may be necessary to reduce adverse effects based on new knowledge.
 - xii. Educational and outreach activities regarding caribou in relation to the project.
- b. On a seasonal or shorter duration basis:
- ix. The implementation of daily timing windows for or temporary¹⁵⁴ suspensions of blasting and crushing
 - x. The implementation of daily timing windows for or temporary suspensions of truck transportation
 - xi. The limiting of speeds on the access road
 - xii. Restrictions on flights based on daily timing windows
 - xiii. Modification of flight paths
 - xiv. Suspension of helicopter use
 - xv. The use of convoys for transportation
 - xvi. The intervals between and location of breaks in snow berms on the access road.

As the movement of caribou and the herd's status are not fixed, responsiveness is of high importance when requiring the application of a mitigation measure in part B. The use of geographic buffers may be appropriate in the evaluating if a mitigation is appropriate at a given time.

In requiring application of the above measures, the oversight body shall consider input from appropriate caribou experts, both in terms of traditional knowledge and western scientific thought.

11) Government of Yukon shall, in collaboration with affected First Nations and communities, develop a comprehensive long-term range management plan for the FCH based on the following principles:

- Be informed by best available scientific and traditional knowledge
- Acknowledge and be guided by people's relationship with caribou
- Help to promote the social, economic, and cultural well-being of people in Yukon
- Promote transparency in decisions made during the range planning process

¹⁵⁴ By "daily timing windows" the Executive Committee means regular hours consistent from day to day when conditions warrant. By "temporary" the Executive Committee means irregular periods of time, whether the duration is less than or more than one day, also when conditions warrant.

- Respect the need for a collaborative process for co-management of resources with affected First Nations.
- Recognize the potential for and encourage local community engagement and involvement in implementing the range plan

The plan should include the following sections in relation to the FCH:

- k. **Management principles and goal:** Identification of the principles underlying the planning process and the management goal.
- l. **Current conditions:** Best available information will be used to identify the health, trend and condition of the population and its habitat.
- m. **Limiting factors:** Best available information will be used to identify the factors limiting the population including: habitat, predation, climate, and human activities (harvest and land-use).
- n. **Future conditions:** Identify scenarios and projections of likely sources and locations of future impacts from development, wildfire, and climate, and their implications for the population and its habitat, including consideration of predation.
- o. **Management objectives and thresholds:** Identify specific management objectives related to population and habitat, and thresholds of change in population and habitat related to achieving these objectives.
- p. **Management tools and actions:** Identify specific population and habitat management tools and actions (voluntary and non-voluntary) required to achieve objectives, and the relationship of these tools and actions to community-based, regulatory and land-use planning processes.
- q. **Implementation:** Describe how the plan will be implemented in a collaborative and timely manner.
- r. **Monitoring:** Identify ongoing monitoring needs including outstanding questions and uncertainties faced in developing and implementing the range plan, and develop time-bound learning plans to address key uncertainties.
- s. **Adaptive management and review:** Identify how monitoring results and new knowledge will be incorporated into revisions to the plan.
- t. **Communication:** Establish methods of ongoing communication to ensure that advice, guidance, feedback, monitoring results, and implementation results can be shared easily and widely with communities and decision makers.

6.2 Moose

Summary and Conclusion

The EC determined that the Project will not result in significant adverse effects to moose as it will primarily displace moose in an area where there is abundant habitat.

The Project is proposed in an area of high-value moose habitat. Little information is known about moose populations in this area, though harvest rates may be limiting. High-quality habitat appears to be abundant, and mortality rates are likely the primary limiting factor of local populations. Consequently, habitat lost due to the Project is unlikely to have a notable effect on moose populations.

In addition, the Project is unlikely to increase mortality rates through harvest, collisions or predation, and the Project is unlikely to degrade or remove habitat sufficiently to alter population dynamics. Therefore, the EC has determined that the Project will not result in significant adverse effects to moose.

Importance of Moose

IMPORTANT CULTURAL SPECIES

Moose are the second most abundant large mammal species in the Project area, and are a highly valued cultural and subsistence species in Yukon. As the largest member of the deer family, moose can stand over 2 m at the shoulder and weigh over 500 kg. Moose are an economically important species, with economic benefits including the sale of equipment and supplies for moose harvesting, outfitting revenue and as draw for wildlife viewing.

Moose are an important part of the traditional economy for RRDC and part of their special relationship to the wilderness.

Legislative and Management Setting

MOOSE MANAGEMENT UNITS

For the purpose of managing moose populations, YG has created 67 Moose Management Units (MMU) across the territory. The Project is proposed at the boundary of MMU 43 (the Frances Lake MMU) and MMU 42 (the Pelly River MMU). YG dedicates survey efforts to MMUs where harvest is concentrated and/or where moose populations are declining. No surveys have been conducted in the Project area since 1996. Survey efforts are generally focused on MMUs where there is greater conservation concern.

YG has indicated that the Pelly River MMU, where the Project is located, has an estimated moose density of 241 moose/1000 km².¹⁵⁵ According to the science-based guidelines for moose management in Yukon, allowable harvest is recommended to be no more than “a bull only

¹⁵⁵ YOR Document 2017-0083-6124.

harvest rate of 3 percent of total estimated population size.”¹⁵⁶ The annual licensed harvest from 2014 through 2018 has been 0.8 percent.¹⁵⁷

NO PERMIT HUNT AUTHORIZATION INSTITUTED

PHAs are implemented to “responsibly manage overall species populations and improve hunt quality. Where control of the number of animals harvested is required, permit hunts limit the number of animals harvested for specific species and areas.”¹⁵⁸

YG has not instituted a PHA in the Project area, suggesting that YG does not have information to suggest moose populations require such a measure. However, the EC believes that the threshold for implementing a PHA is quite high and therefore not a great indicator of moose population sustainability. The EC notes that proposed changes to the *Wildlife Regulation* be designed to allow easier implementation of conservation measures and allow for the implementation of a range of conservation measures.

While not a PHA, within the Faro area, reporting requirements have been instituted in order to limit harvest in this area. Licensed moose harvest in the Faro area is closed once licensed hunters have harvested 15 moose in this region. This region does not overlap the Project area.

RRDC IMPLEMENTATION OF PERMIT SYSTEM

In 2018, the RRDC stated it would require non-Kaska hunters to apply for a permit from them for moose and caribou harvest, in response to concerns about caribou and moose populations.¹⁵⁹ RRDC stated it would be issuing 43 permits for moose within its Traditional Territory.¹⁶⁰ While stating that YG legislation would still apply for harvest within the RRDC Traditional Territory, YG encouraged compliance with RRDC requests for a shorter moose and caribou season, and reduced hunting in certain areas.¹⁶¹

While RRDC concerns regarding moose harvest appear to be particularly concentrated along the North Canol Road,¹⁶² there is no reason to suggest that similar concerns do not apply to the Project area.

¹⁵⁶ Environment Yukon. “Scientific-based guidelines for the management of moose in Yukon”. Government of Yukon. 2016, pg. v.

¹⁵⁷ YOR Document 2017-0083-6124.

¹⁵⁸ Environment Yukon. About Permit Hunt Authorizations. 2018. Accessed March 2019.

¹⁵⁹ Yukon News. June 22, 2018. RRDC to require non-Kaska hunters in Ross River area to get special permit.

Yukon News <https://www.yukon-news.com/news/rrdc-to-require-non-kaska-hunters-in-ross-river-area-to-get-special-permit/>

¹⁶⁰ Ibid.

¹⁶¹ Yukon Government. News Release. 2018-2019 Hunting season in Ross River Area.

<https://yukon.ca/en/news/2018-19-hunting-season-in-ross-river-area>

¹⁶² CBC News. September 28, 2018. ‘It’s our way of life’: Ross River Dena defend hunting permit plans.

<https://www.cbc.ca/news/canada/north/ross-river-dena-hunting-permits-1.4841907>.

Context

HABITAT

Moose are generalist species that forage largely on deciduous browse. Such browse can be found in a wide variety of habitats, from riparian areas and floodplains to disturbed ground with early successional growth and subalpine late-successional willow stands.¹⁶³ Moose consume “large quantities of a wide variety of plant material of a relatively low nutritional value.”¹⁶⁴ Consumption of food can be as high as roughly 20 kg of forage per day for a 450 kg animal.¹⁶⁵

The distribution of deciduous browse throughout the Project region means that moose also are present throughout the region; however, they are generally less likely to be found in alpine areas.¹⁶⁶ In the South Canol MMU, moose have been primarily observed within 500 m of elevation from valley bottoms.¹⁶⁷ Moose prefer shrub-dominated habitat, with riparian and wetland habitats being particularly well-suited for moose.

Shrubs, including willows, are early successional stage plants that grow quickly after disturbances such as forest fires; because of this, disturbed areas can quickly be established as moose habitat.

The Proponent indicates that Traditional Knowledge relating to habitat requirements shows that moose use the area around Finlayson Lake for overwintering. Further, the Proponent notes that greater snow depth is correlated with greater forage effort and increased predation.¹⁶⁸

MORTALITY AND RECRUITMENT

Wolves often use roads, where they exist, for some of the same reasons that humans use them. The primary reason being ease of movement, especially when cleared of snow. Roads increase the chances of moose–wolf interaction, both by facilitating the movement of wolves and by providing corridors with good visibility. As such, the development of linear infrastructure, for instance roads, can increase the likelihood of predator–prey encounters, which will likely increase the chance of wolf–moose encounters and result in increased wolf predation of moose.

Existing Conditions and Trends

HABITAT

PROJECT OVERLAPS HIGH-VALUE WINTER HABITAT

The Project overlaps high-quality winter habitat for moose in the region. The lower elevations around Finlayson Lake, including much of the access road, the RCH and the Finlayson airstrip all overlap this high-quality habitat (Figure 20).

¹⁶³ Environment Yukon. “Scientific-based guidelines for the management of moose in Yukon”.

¹⁶⁴ HR Timmermann and JG McNichol. “Moose Habitat Needs”. The Forestry Chronical. June 1988, pg. 1.

¹⁶⁵ Alice M. McCulley. “Ranges and movements of moose in Yukon.” Alces 53 (2017)

¹⁶⁶ YOR Document 2017-0083- 134-1, pg. 39. However, large bulls are more likely to remain all summer in the sub alpine and alpine areas.

¹⁶⁷ Alice M. McCulley. “Ranges and movements of moose in Yukon.” Alces 53 (2017)

¹⁶⁸ YOR Document 2017-0083-040-1, pg. 13-19. Increased snow depth means increased forage effort and increased predation.

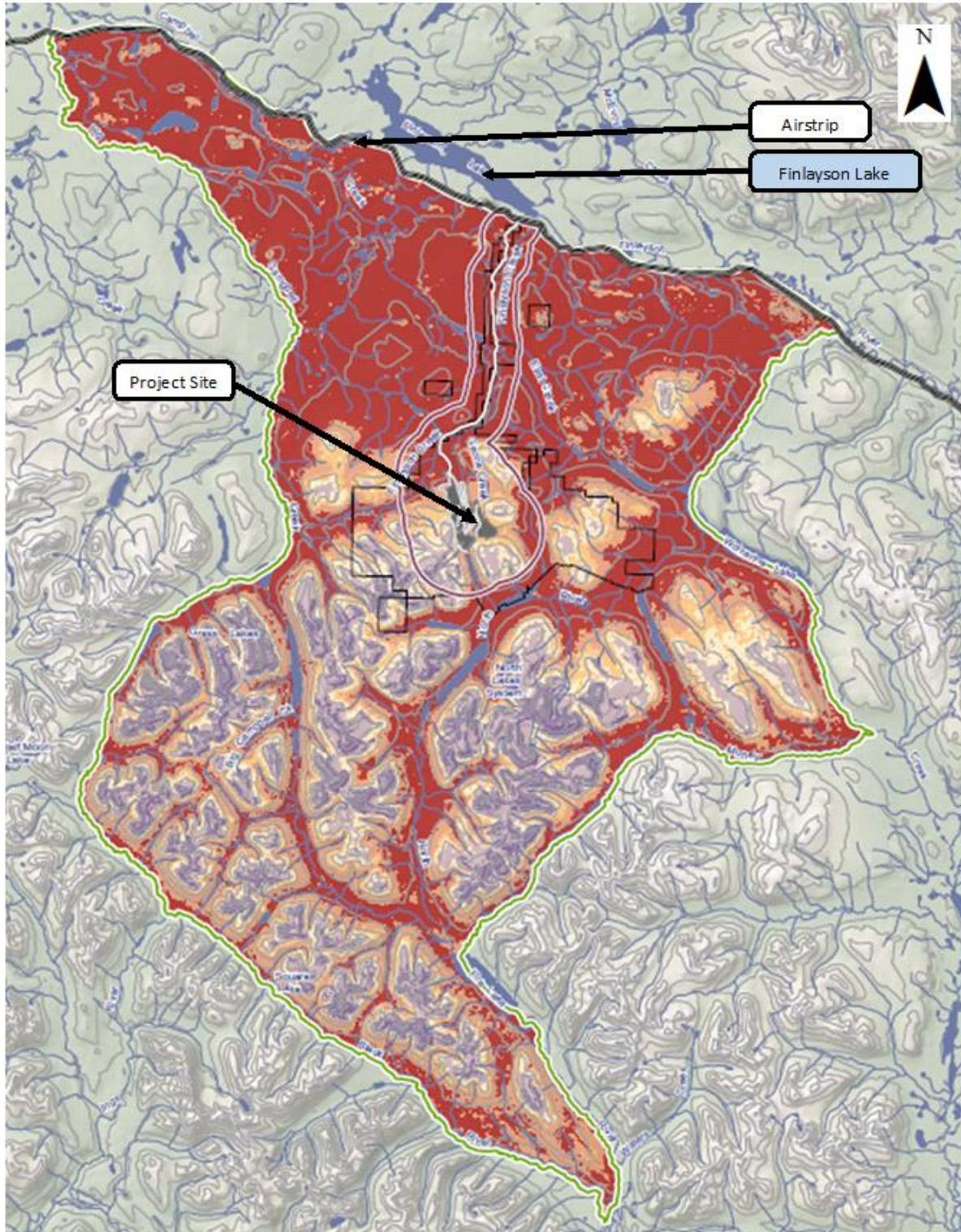


Figure 20: Winter habitat modelling in Game Management Subzone 10-7. Red indicates high-quality winter habitat, blue indicates low-quality. The purple line represents a 3 km buffer around the Project.

Winter habitat is abundant around the Project footprint. However, in GMS 10-7, where the Project is located, winter habitat is limited by alpine areas, which overlap the mine site itself.

The Proponent's habitat modelling suggests that approximately 69 percent of GMS 10-7 consists of moderately high- or high-quality winter habitat.

PROJECT OVERLAPS HIGH-VALUE POST-RUTTING HABITAT

High-quality post-rutting habitat extends above winter habitat into the subalpine and alpine. The Project area overlaps some of the largest patches of high-quality post-rutting moose habitat in Game management sub-zone 10-7 (Figure 21). The Proponent's habitat modelling suggests that approximately 50 percent of Game management sub-zone 10-7 consists of moderately high- or high-quality post-rutting habitat.

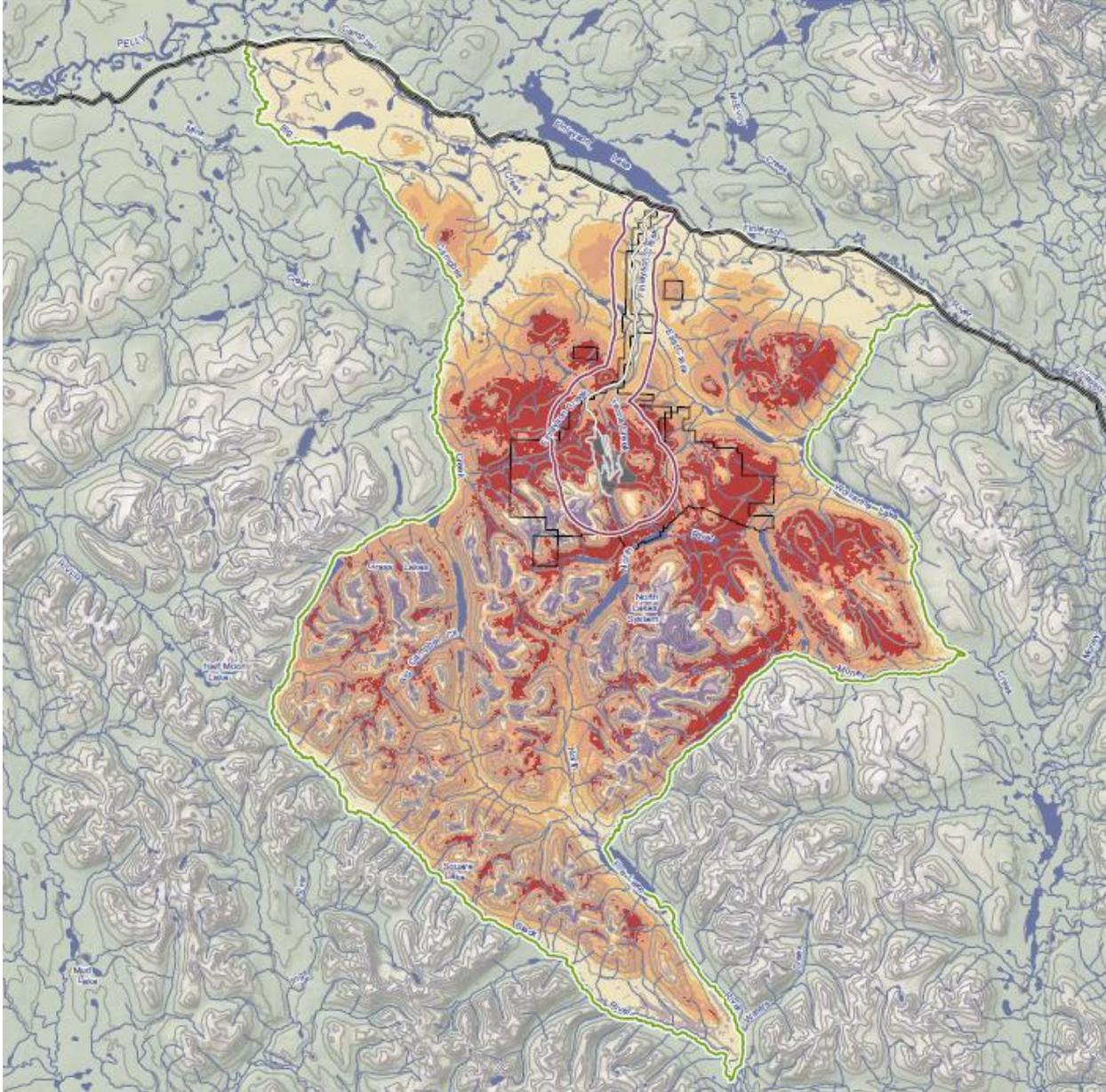


Figure 21: Post-rutting habitat modelling in Game Management Subzone 10-7. Red indicates high-quality habitat, blue indicates low-quality. The purple outline represents a 3km buffer around the Project.

AFFECTED MMUS RELATIVELY UNDISTURBED

Within the affected MMUs, the RCH and mineral extraction form the largest sources of habitat loss for local populations of moose. The Wolverine Mine, for example, is located near the proposed Project. Many historical and current exploration projects, including trenching, drilling and bulk sampling programs, exist within the Project region.

The RCH cuts through key winter habitat, providing a means of access to moose that facilitates harvest, but also fragmenting habitat. Limited habitat-loss through disturbance may also exist

around outfitting, trapping, camp or tourism infrastructure. Despite these sources of disturbance, the Project region is relatively undisturbed when compared with many MMUs.

HABITAT NOT LIMITING

Based on the abundance of late-winter and post-rutting habitat, suitable habitat does not appear to be a limiting factor for moose in the region. This is supported by EDI, whom the EC retained to assist in evaluating proposal materials and characterizing effects. In their technical memo, they state that, “Considering the information presented, habitat is not the limiting factor for moose in GMS 10-07. It appears that mortality (e.g. by predation, hunting) has a demonstrable effect on moose populations and appear to be key limiting factors on moose populations in GMS 10-07.”¹⁶⁹

RECRUITMENT AND MORTALITY

LITTLE KNOWN ABOUT MOOSE DEMOGRAPHICS IN PROJECT REGION

Licensed harvest data suggest roughly an average of nine moose harvested per year within GMSs 10-6, 10-7, 10-8 and 10-9. Wildlife–vehicle collision data collected by YG indicate that vehicles struck five moose along the entire RCH over a period of 12 years ending in 2014. However, little other data exist in terms of moose population levels, recruitment or mortality in the region.

YG indicates that moose population levels are estimated at 241 moose/1 000 km² of moose habitat.¹⁷⁰ Levels appear to be relatively high in Yukon, which has populations that tend to be between 100 and 250 moose per 1 000 km² of moose habitat.¹⁷¹

Project Design

HABITAT

The proposed Project includes an open pit mine and associated infrastructure located in moose habitat. To reduce the temporal duration of habitat degradation, the Proponent proposes progressive reclamation.

RECRUITMENT AND MORTALITY

HARVEST

The proposed Project includes maintaining access management controls on an existing road to the mine site. As such, no new road access will be created by the Project, while new roads around the mine site itself will remain limited to the Project site. While restricting access along the mine access road, the Proponent will also not allow employees, contractors or camp residents to use recreational all-terrain vehicles and will institute a no hunting policy. These measures will limit or eliminate the potential for mortality via increased harvest as a result of the Project.

¹⁶⁹ YOR Document 2017-0083-0950.

¹⁷⁰ YOR Document 2017-0083-6124.

¹⁷¹ Environment Yukon. “Scientific-based guidelines for the management of moose in Yukon”, pg. iii.

COLLISIONS

Speed limits are proposed by the Proponent on the mine access road to limit the potential for wildlife–vehicle collisions.

ACCIDENTAL DEATH

To avoid mortality through animal entrapment in Project infrastructure (e.g. HDPE lined facilities) and to prevent moose entrance into the pit area, fencing will be installed to prevent access to these facilities. The proposed fence will be electrified.

Effects Characterization**HABITAT**PROJECT-RELATED HABITAT LOSS

Within the moose RSA (GMS 10-7), the Project proposes to remove or affect

- 1 percent of moderately high- to high-quality post-rutting moose habitat due to Project infrastructure footprint (9.4 km²)
- 2 percent of moderately high- to high-quality late-winter moose habitat due to Project infrastructure footprint (8.4 km²)
- 16 percent of moderately high- to high-quality moose habitat, if applying a 3 km zone of influence around the Project footprint¹⁷²
- 12 percent of moderately high- to high-quality moose habitat, if applying a 3 km zone of influence around the Project footprint

However, zone of influence effects do not result in the removal of this habitat but rather its progressive degradation as one gets closer to the Project infrastructure. Further, alternative habitat appears to be available for both post-rut and late-winter habitat in GMS 10-7, and within adjacent Game GMSs. The availability of alternative habitat, however, does not mean that displacement will be without effect.

The Proponent notes that reclamation will result in the removal of most zone of influence effects because human presence will be diminished after closure and reclamation. Reclamation efforts can reverse reductions in habitat resulting from ground disturbance, as early successional growth can provide effective moose habitat.

HABITAT LOSS AND DEGRADATION UNLIKELY TO RESULT IN POPULATION DECLINE

Given the amount of available alternative habitat in the affected MMU, moose do not appear to be limited by habitat and the Project's effect on habitat is unlikely to lead to a population decline. This is supported by EDI, whom the EC retained to assist in characterizing Project effects in relation to moose populations. EDI reported that any effects to moose populations would be

¹⁷² A Zone of Influence is "the difference between an activity's spatial footprint and the extent of the activity's effects on surrounding habitat and wildlife populations". Steven F. Wilson. "Recommendations for Applying Management Buffers to Mitigate Zone-of-Influence Impacts from Oil and Gas Activities on Terrestrial Wildlife and Habitats in British Columbia" BC Oil and Gas Commission. 2016.

limited and that for population level effects, “adult mortality would have to increase and/or calf recruitment decrease.”

RECRUITMENT AND MORTALITY

LIMITED OPPORTUNITY FOR INCREASED HARVEST

As no new access roads will be developed and the Project proposes to maintain access restrictions on the existing access road, the proposed Project will not increase access to moose habitat. Combined with restrictions on the use of recreational vehicles and hunting by employees and contractors, the Project is unlikely to result in increased mortality due to harvesting.

LIMITED POTENTIAL FOR VEHICLE COLLISIONS WITH MOOSE

Collisions involving moose on the RCH are rare occurrences. As noted above, five collisions have been recorded along the entire RCH over a period of 12 years ending in 2014. While the Project proposes increased traffic, collisions involving moose are likely to remain rare events and unlikely to result in measurable changes to moose populations.

LIMITED POTENTIAL FOR INCREASED PREDATION OF MOOSE

No new access roads are proposed, but the access road will be cleared in winter. This will allow easier movement for wolves. Roads provide good sightlines, so a cleared road will allow for increased wolf predation. The limited extent of cleared road in winter habitat suggests that the effect of increased predation will be limited. The regular presence of HDV will also push moose away from the road, further limiting opportunities for moose–wolf interaction.

Significance Determination

HABITAT

EFFECTS ARE LIKELY

The Project will remove habitat available for moose in the Project region. Habitat removal will take place through both the Project footprint and the creation of a zone of influence that will displace moose from parts of their range.

EFFECTS ARE ADVERSE

The removal of habitat from the range of moose is adverse as habitat is required to support moose populations.

EFFECTS ARE NOT SIGNIFICANT

Effects to habitat can result in population effects. While the Project will produce adverse effects to habitat, these effects are not significant as they are unlikely to produce a noticeable change in moose populations within the Project region.

No evidence available to the EC suggests that the proposed effects to habitat will lead to decreased recruitment or increased mortality of moose.

RECRUITMENT AND MORTALITYEFFECTS ARE LIKELY

While the Project is unlikely to increase mortality through harvest or collisions, the Project is likely to increase mortality through predation as wolves take advantage of the cleared access road during winter.

EFFECTS ARE ADVERSE

Effects that increase mortality or decrease recruitment are adverse as such events can reduce the sustainability of moose populations.

EFFECTS ARE NOT SIGNIFICANT

The Project is not predicted to lead to measurable changes in regional moose populations. Predation increases, which are likely, will be moderated by the limited portion of the access road which crosses moose winter habitat, and high levels of traffic. Based on the Project design and proposed mitigation measures, notable changes to existing mortality rates is unlikely. As notable changes are unlikely, the EC has determined that the effects of the Project are not significant.

Recommended Monitoring

Due to uncertainties regarding the regional moose populations and because the project takes place within core rutting habitat, the EC recommends, under s.110 of YESAA, that monitoring take place.

MOOSE MONITORING

YG states that annual surveys should be completed during construction and that surveys be conducted every two years during operations to better understand the changes to late-winter moose distribution.¹⁷³ Such a monitoring program could prove beneficial in future assessments related to the Project or the implementation of adaptive management plans. As any such surveys could lead to management implications, and as RRDC and LFN have demonstrated deep concern regarding the management of moose within their Traditional Territory, the EC recommends, under s.110 of YESAA

- E. That a survey program be instituted to monitor moose during late winter from construction through closure stages of the project. This survey program shall be designed through collaboration with affected First Nations.

¹⁷³ YOR Document 2017-0083-264-1

6.3 Grizzly Bears

Summary and Conclusion

The Project is not likely to result in significant adverse effects to grizzly bears. The assessment considered the potential for the Project to result in direct and indirect habitat loss, as well as the potential to increase grizzly bear mortality. Project design elements and mitigation measures committed to by the Proponent, as well as compliance with applicable legislation and regulations, are sufficient to mitigate the Project's adverse effects.

Importance of Grizzly Bears

Grizzly bears are an iconic species, a common symbol of Canadian wilderness. They are important from a cultural, ecological and economic perspective, and are vulnerable to human disturbance. Between 6 000 and 7 000 grizzly bears are estimated to live in Yukon, representing about one quarter of Canada's population. While Yukon's grizzly bear population is considered healthy, populations are known to be declining in the southern extent of their Canadian range. Grizzly bears are slow to reproduce, making it difficult for the population to recover from human disturbances and mortalities.

Throughout the course of the assessment, RRDC Elders identified the grizzly bear as an important cultural species that may be adversely affected by the Project. The Proponent explains that many Yukon First Nations avoid killing or eating grizzly bears because they believe they possess great spiritual powers and have ascribed human attributes to them.¹⁷⁴ The Yukon Conservation Plan for Grizzly Bears also indicates that

Indigenous cultures in Yukon and transboundary communities are diverse, and their relationships with grizzly bears mirror this diversity. While these relationships varied across the territory, Indigenous people consistently spoke of how people should behave in a respectful manner towards grizzly bears.¹⁷⁵

In addition to their cultural importance, bears are also harvested by Yukoners and non-residents, and provide an important source of revenue for guide outfitters throughout the territory. Yukon harvest trends from 1980 to 2014 show that, on average, licensed hunters purchase 995 grizzly bear seals each year in Yukon.¹⁷⁶ Of these, 64 percent are obtained by resident hunters; however, only four percent (annual average) of resident hunters are

¹⁷⁴ YOR Document 2017-0083-135-1.

¹⁷⁵ Department of Environment. Government of Yukon. Draft Conservation Plan for Grizzly Bears in Yukon. June 2018. <https://yukon.ca/sites/yukon.ca/files/env/engage-draft-conservation-plan-grizzly-bears.pdf>

¹⁷⁶ Department of Environment. Government of Yukon. Licensed Harvest Trends in Yukon 1980 – 2014. 2018. <https://yukon.ca/sites/yukon.ca/files/env/env-licensed-harvest-trends-yukon.pdf>

successful in harvesting a grizzly bear.¹⁷⁷ Comparatively, on average 15 percent of non-resident hunters are successful. Hunters harvest an average of 76 grizzly bears annually.¹⁷⁸

Grizzly bears are often considered a flagship or umbrella species for conservation planning, which means that protections put in place for grizzly bears help safeguard other species in their habitat. For this assessment, methods undertaken to avoid interactions with grizzly bears should also help avoid interactions with black bears. As such, a separate effects assessment for black bears was not undertaken.

Legislative and Management Setting

The following legislative and regulatory framework helps to moderate effects to grizzly bears by controlling attractants and reducing exposure to harmful substances:

Yukon *Wildlife Act*

- s. 92(1) prohibits the harassment of wildlife
- s. 93(2) and s. 93(3) prohibit a person from encouraging wildlife to become a public nuisance. This includes the prohibition of feeding wildlife or leaving food or garbage in places where potentially dangerous wildlife (including grizzly bears) may have access to it. Reasonable precautions must be taken to prevent wildlife from accessing garbage and/or any other attractants in the area

Yukon *Environment Act*

- s. 94 and s. 95 prohibit the disposal of solid wastes and special wastes contrary to the *Solid Waste Regulations* and *Special Waste Regulations*
- s. 135 requires that spills that are abnormal in quantity or above reportable thresholds (as specified in the *Spills Regulations*) are effectively dealt with (i.e. confined, removed and sites rehabilitated)

Context

CONSERVATION STATUS

The western population of grizzly bear is designated a species of special concern by COSEWIC, and was added to Schedule 1 of the federal *Species at Risk Act* (SARA) in 2018.¹⁷⁹ Special concern status refers to a species with special characteristics that make it particularly sensitive to human activities or natural events. Under SARA, a management plan for grizzly bears will be required by 2021 and will aim to identify conservation measures to preserve the species and avoid population decline.¹⁸⁰ The COSEWIC assessment and status report for grizzly bears identifies human-caused mortalities as the main factor affecting grizzly bear

¹⁷⁷ Ibid.

¹⁷⁸ Ibid.

¹⁷⁹ Government of Canada. Species at Risk Act: order amending Schedule 1 (volume 152, number 12, June 13, 2018). <https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/orders/amend-schedule-1-volume-152-number-12-june-2018.html>

¹⁸⁰ Ibid.

distribution and abundance (i.e. from direct mortality, such as collisions and killing in protection of human life, as well as from functional habitat loss).¹⁸¹

In Yukon, the grizzly bear has a conservation status of S3-Vulnerable as they are vulnerable to threats, which have resulted in their population declines elsewhere, and have low reproductive rates, making it difficult for them to recover from population declines.

HABITAT CONCERNS

Grizzly bears are omnivores and habitat generalists (i.e. they can live in many different environments and have varied diets), and require large, intact and relatively undisturbed ecosystems. Their habitat use and distribution typically follows available food sources, ranging from ground squirrels and marmot in alpine areas, to berries in shrublands and/or following moose and caribou.¹⁸² Grizzly bears are major predators to moose and caribou calves. Habitat selection is governed by forage availability and changes with seasons to make use of seasonal foods. Dens are primary habitat for grizzly bears. They can spend up to eight months of the year in their dens and typically return to the same denning areas each year (though only ~25 percent are reused).¹⁸³ Bears normally select dens in high-elevation areas that are sloped and have dry, stable soil conditions that remain frozen during winter.

One area of concern for grizzly bear conservation is activities that result in direct and functional habitat loss throughout their range. Bears may avoid areas of high habitat value due to human activities, such as resource extraction, residential development and transportation corridors.¹⁸⁴ Increased resource extraction in the northern part of the grizzly bear's North American range, which is relatively undisturbed compared to parts in the southern range, is also causing increased concern for cumulative effects to grizzly bears.¹⁸⁵

MORTALITY RISK

Grizzly bears have higher rates of mortality in human-dominated landscapes which can affect their distribution and abundance throughout their range.¹⁸⁶ Human-caused grizzly bear mortality may occur as a result of human–bear conflicts (where bears are killed in defence of property or life, often as result of poor attractant-management practices), harvesting and vehicle collisions. The Proponent reports that grizzly bear mortality in Yukon from human–bear conflict ranges from 10 to 15 bears annually.¹⁸⁷

¹⁸¹ Committee on the Status of Engendered Wildlife in Canada. COSEWIC Assessment and Status Report on the Grizzly Bear *Ursus arctos* Western Population Ungava Population in Canada. 2012. https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/cosewic/sr_ours_grizz_bear_1012_e.pdf

¹⁸² YOR Document 2017-0083-200-1.

¹⁸³ Mining and Petroleum Environmental Research Group. Guidelines for Industrial Activity in Bear Country, for the mineral exploration, placer mining and oil & gas industries. 2008. http://www.bearsmart.com/docs/Guidelines_for_Industrial_Activity_in_Bear_Country.pdf

¹⁸⁴ Committee on the Status of Engendered Wildlife in Canada. COSEWIC Assessment and Status Report on the Grizzly Bear *Ursus arctos* Western Population Ungava Population in Canada. 2012. https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/cosewic/sr_ours_grizz_bear_1012_e.pdf

¹⁸⁵ Ibid.

¹⁸⁶ Ibid.

¹⁸⁷ YOR Document 2017-0083-083-1.

In Yukon, hunting of grizzly bears is permitted for residents and non-residents. Grizzly bear harvest management in Yukon “is guided by the objective of maintaining grizzly bear populations while providing sustainable harvest opportunities.”¹⁸⁸ Harvest across the territory is managed within 29 Bear Management Units (BMU), and the Project overlaps the Cassiar BMU. GMSs are also used to manage wildlife species; these are areas within which authorities can make specific regulations for managing large wildlife for harvesting purposes. The Project overlaps GMS 10-07.

To ensure a sustainable harvest, YG tracks grizzly bear mortalities from hunting and non-hunting activities, but does not track First Nations’ harvest. The total sustainable mortality rate is four percent of the grizzly bear population in a given BMU, which can include up to two percent of the female population and six percent of the male. This encompasses all sources of recorded mortality, including harvest, road kills, and defence of life or property kills.¹⁸⁹

Existing Conditions and Trends

GRIZZLY BEAR HABITAT

Grizzly bears are known to occupy the subalpine valleys and alpine plateaus of the RSA¹⁹⁰ and Local Study Area (LSA).¹⁹¹ Results of the Proponent’s baseline studies (i.e. review of recorded observations since 1995 and aerial surveys in 2015 and 2016) show that grizzly bears are denning within a 5 km radius of the Project footprint, and multiple grizzly bears (including females with cubs) are using the LSA for foraging and as a movement corridor to access other habitats.¹⁹² In addition to recorded sightings, the Proponent undertook habitat modelling to better understand the distribution of important grizzly bear habitat within the Project area. The habitat modelling was used to characterize the baseline grizzly bear habitat potential in the area, which will then be used to measure Project-induced changes (i.e. direct and indirect habitat loss). The types of models run and key results (before the Project effects are considered) are presented here:

Denning habitat suitability model: The purpose of this model is to identify areas of low, moderate and high denning habitat suitability within the RSA. The results show that approximately 10 percent of the RSA contains high denning habitat suitability, 30 percent is moderate habitat suitability and 59 percent is low habitat suitability.¹⁹³

Cumulative effects model: This modelling comprises three separate habitat models and considers existing human disturbances within the Grizzly Bear Study Area (GBSA). The GBSA encompasses GMS 10-07 and extends beyond land height to include entire valley systems, which is more relevant to bear habitat-use than the GMS divisions (see Figure 22 for GBSA boundaries). The GBSA was further divided into seven Bear Assessment Units (BAU), each approximately the size of a female grizzly bear’s average

¹⁸⁸ Department of Environment. Government of Yukon. Draft Conservation Plan for Grizzly Bears in Yukon. June 2018. <https://yukon.ca/sites/yukon.ca/files/env/engage-draft-conservation-plan-grizzly-bears.pdf>

¹⁸⁹ Ibid.

¹⁹⁰ The RSA is GMS 10-07.

¹⁹¹ The LSA is 3 km buffer surrounding the Project footprint and 1.5 km buffer around the Tote Road.

¹⁹² YOR Document 2017-0083-137-2.

¹⁹³ YOR Document 2017-0083-135-1.

range. The boundaries of the GBSA and BAU relative to the Project location are shown in Figure 22: Bear Assessment Units (BAU) in relation to the Project

The Proponent noted that disturbances are generally limited within the GBSA and are attributed primarily to the Wolverine Mine, exploration activities at Fyre Lake, the Finlayson airstrip, the highway pull-off and a few residences near Finlayson Lake. The models and results, before Project effects are considered, are as follows:

Habitat effectiveness model: This model measures the potential habitat available to grizzly bears and quantifies the extent of landscape available to them. Overall, the habitat effectiveness of the GBSA was 96.6 percent for all seasons. Within BAU 5, which overlaps the Project, 98 percent is predicted to be effective habitat for all seasons before the Project is applied (i.e. the majority of BAU 5 provides quality foraging habitat for grizzly bears).

Security areas model: This model identifies and quantifies areas where female grizzlies can forage for 24 to 48 hours without being disturbed by human activity. Results showed that 83 percent of the GBSA is considered secure for foraging bears.

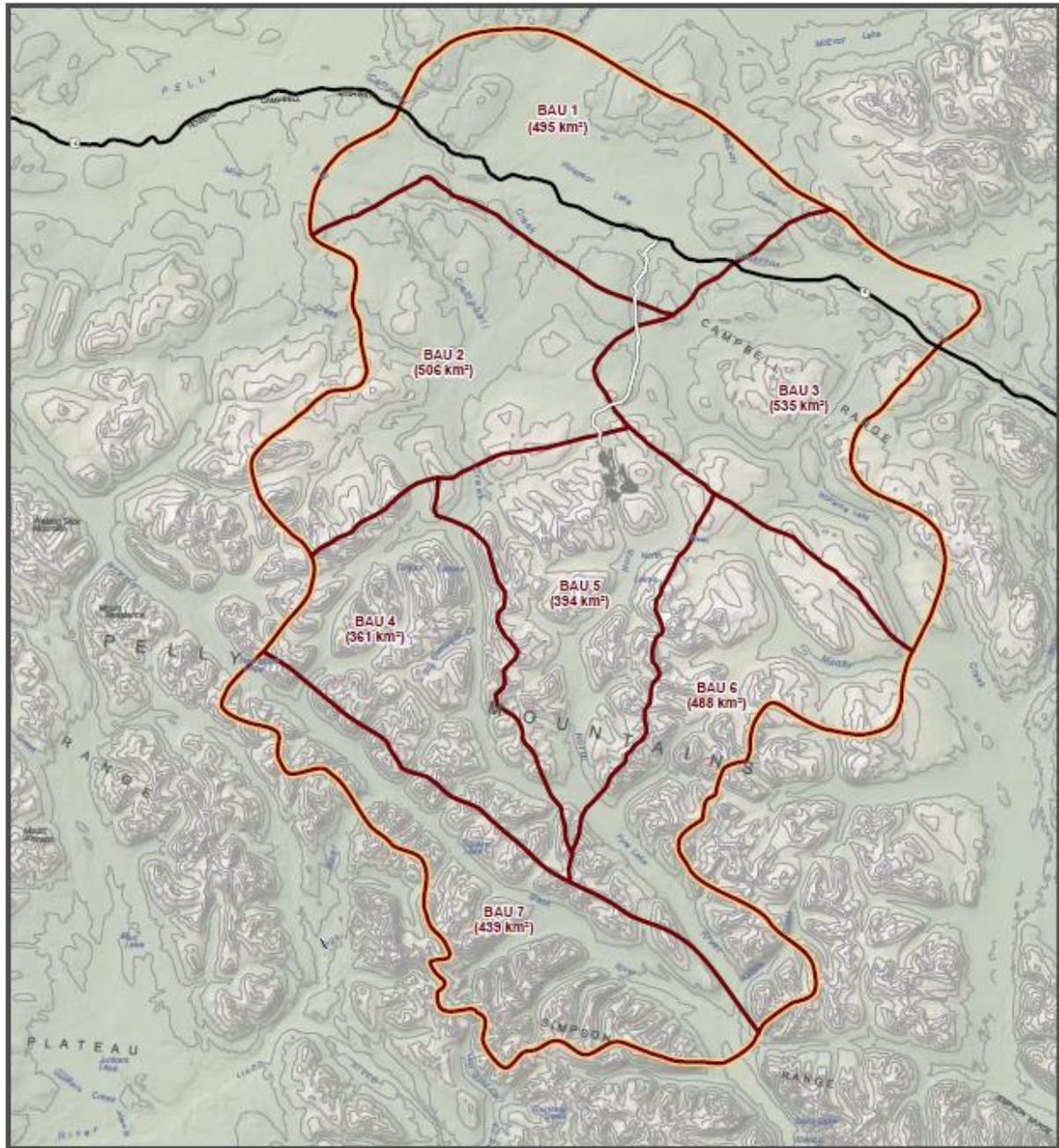
Linkage zones model: This model assesses the availability of movement corridors in valley bottoms by identifying and quantifying areas of potential grizzly crossing and use in mountainous environments. The output of this model is the ability for grizzlies to move through the landscape in danger-score classes (high, moderate, low and minimal). The areas with low or minimal danger-scores are potential movement areas or linkage zones. The results of modelling show that 73 percent of the GBSA is considered low danger for travelling grizzlies.

Denning habitat modelling conducted by the Proponent was subject to review by assessment participants. The cumulative effects monitoring was submitted following the public comment phase, and was not subject to the same level of scrutiny as the denning model. However, the Proponent indicated that the modelling approach and methods were developed in consultation with Environment Yukon. The EC is satisfied that modelling conducted by the Proponent represents a suitable basis upon which to measure the Project's effects.

GRIZZLY BEAR MORTALITY

Specific population data was provided to the Proponent by Environment Yukon for the Cassiar BMU, the GMSs overlapping and surrounding the Project, and the BAUs. See Table 19 for current population estimates and Figure 22 for delineation of the various grizzly BAUs. The estimated density of grizzly bears in the Cassiar BMU is roughly 14.1 bears/1000 km².¹⁹⁴

¹⁹⁴ YOR Document 2017-0083-292-1.



- Grizzly Bear Assessment Unit (BAU)
- Grizzly Bear Study Area (GBSA)
- Location of Proposed Infrastructure

- Robert Campbell Highway
- Tote Road/Proposed Access Road

KUDZ ZE KAYAH PROJECT
GRIZZLY BEAR HABITAT MODELS REPORT

GRIZZLY BEAR STUDY AREA AND
BEAR ASSESSMENT UNITS

Figure 22: Bear Assessment Units (BAU) in relation to the Project

Table 19: Estimated population of grizzly bears in various management units

Management Unit	Estimated Population
Cassiar BMU	502
GMS 10-06 to 10-09, 10-12, 11-09, and 11-15 to 11-16	191
BAU 1–7	45.4
BAU 5 (overlapping the Project)	5.6

Grizzly bear mortality in the Project area is currently influenced by harvesting activities, and non-harvesting activities such as vehicle collisions and human protection or property. The Proponent has indicated that there have been no adverse grizzly bear interactions during the Proponent's exploration work on the KZK Project.¹⁹⁵

Bear mortality data from 1995 to 2017 was provided to the Proponent by Environment Yukon for the Cassiar BMU and the GMSs that overlap and are in close proximity to the Project. Bear mortality includes harvest and non-harvest data, but does not account for First Nations harvest. As previously mentioned, sustainable harvest rates established for grizzly bears are two percent for females and up to six percent for males, or four percent of the total population within the Cassiar BMU.

The mortality data from 1995 to 2017 for the Cassiar BMU shows that mortality is 0.6 percent for females and 1.2 percent for males, with an average number of 4.6 bears killed per year. This is below the sustainable harvest threshold identified by Environment Yukon. There was a total of 106 bears killed during this period of time; 89 of these were from harvesting and 17 were non-harvesting mortalities. In GMS 10-07, which overlaps the Project area, there was a total of 17 grizzly bear deaths, averaging 0.7 bears killed per year. The mortality ratio was 1.8 percent for females and 3.3 percent for males, which is below, but approaching, the sustainable mortality ratio for females. GMS 10-07 had the highest mortality pressure compared to other GMSs surrounding the Project area.¹⁹⁶

Project Design

The Proponent has proposed a number of Project design features and mitigation measures that will reduce potential habitat loss and mortality-related effects to grizzly bears. These are primarily found in the Project proposal, the Wildlife Management Plan, the Waste Management Plan and other company policies. Key measures or Project design features the Proponent

¹⁹⁵ YOR Document 2017-0083-200-1.

¹⁹⁶ YOR Document 2017-0083-292-1.

committed to that eliminate, reduce or control the adverse effects to grizzly bears include the following:

Best practices implementation:

- Guidelines for Industrial Activity in Bear Country
- How You Can Stay Safe in Bear Country, and
- Proponent's guide: Assessing and Mitigating the Risk of Human–Bear Encounters

For minimizing direct and indirect habitat loss:

- The Project footprint was designed to cover as little area as practicable to minimize habitat loss and disturbance.
- Pre-denning monitoring will take place. If bear activity indicates they may be preparing to den in an area that could be disturbed by mining activity, the YG conservation officer and RRDC land stewards will be consulted to determine measures to prevent the bear from denning too close to the pit.
- A preconstruction survey will be undertaken for bear dens and appropriate setback distances from the construction area will be applied until the bears leave the den.
- Progressive and final reclamation of disturbed areas.
- Wildlife will be given the right-of-way.
- Activities will be halted if ungulates, bears or wolverines are encountered during Project activities until the animal has left the area, unless halting activities would be unsafe.
- Flight path routes will be determined to best avoid disturbing wildlife.
- Appropriate measures to carry out blasting activities at the mine, in a manner that avoids disturbing wildlife during critical life-cycle activities, will be established in consultation with the regional biologist.
- A policy will be developed that prohibits use of recreational all-terrain vehicles and snowmobiles.
- Machinery and personnel will be required to remain in the defined Project area and along defined roads.

Mortality reduction:

- A no hunting policy will be implemented.
- There will be no feeding or harassment of wildlife by employees, contractors and visitors.
- A staffed gate will be installed to prevent road access by hunters until it is decommissioned.
- To reduce wildlife collisions, vehicle speed limits for employees and contractors will be enforced, and radios will be used to report wildlife sightings on roads.
- The Proponent will provide bear awareness training to all employees and contractors.
- All waste will be stored in bear-proof containers until it is removed from Project area or incinerated. Food waste will be incinerated daily.
- All food and cooking supplies will be stored securely in containers or removed from the site when the camp is closed.

- Camp kitchens will contain stack scrubbers in the venting system to reduce cooking odours.
- The waste management facility will be enclosed by an electrified fence. Ancillary facilities including waste storage, camp, upper and lower WMPs, and all water collection ponds with engineered liners will be surrounded by wildlife-proof fences or emergency egress ramps.
- Personal wildlife deterrents (e.g. air horns, bear spray, bear bangers) and radios will be issued and carried by all field personnel.
- Drill sites built near the gravel tote road will be revegetated with non-palatable plants to avoid attracting wildlife to the roadside.

Effects Characterization

THE PROJECT RESULTS IN DIRECT AND INDIRECT GRIZZLY BEAR HABITAT LOSS

Grizzly bears are known to den within 4 to 5 km of the Project boundary and use the LSA for foraging and movement between habitats. Project activities, such as land clearing and earthworks, will directly remove grizzly bear habitat from the area. Indirectly, the Project may result in the loss of a much greater area (functional habitat loss) if bears are displaced as a result of auditory and visual disturbances, including during key life cycles such as growing/feeding and denning. Disturbances to bears from Project activities can displace them from preferred habitat types into less desirable habitats, and impact growing efforts and overwintering success. Repeated disturbances during denning can result in den abandonment which, for females and their cubs in particular, can lead to cub mortality. Bears tend to den in the same areas as previous years but typically do not reuse dens, so den locations are not static. Grizzly bears might avoid selecting dens closer to Project activities as a result of human disturbances or may be pushed further from existing denning locations.

Habitat modelling undertaken by the Proponent serves to quantify potential habitat loss resulting from the Project. Modelling showed that less than one percent of highly suitable denning habitat and four percent of moderately suitable denning habitat will be lost from the RSA. The results of habitat effectiveness modelling showed an overall change of 0.6 percent in the GBSA once the Project was applied to the model. Within BAU 5, which overlaps the Project area, the predicted loss was three percent for summer and fall habitat, but no change for spring. For security areas (areas of sufficient size, and without disturbances, to allow relatively uninterrupted animal behaviour), there was a predicted loss of one percent in the GBSA, and for BAU 5, unsecured areas (due to human presence) increased from one percent to five percent once the Project was applied to the model. Linkage modelling showed no changes once the Project was applied, but for BAU 5, the Project resulted in a reduction of safe linkage zones (areas where bears can safely travel) of two percent. Overall, the results of this modelling suggest that there are extensive areas of high-quality habitat that is considered safe for bears to forage undisturbed and to travel without being affected by human activities, both within the GBSA and the individual BAUs. Predicted habitat loss from the Project are all under 10 percent of the overall habitat available, which the Proponent characterized as a low magnitude effect (greater than 15 percent would represent a high magnitude effect). The Proponent has provided adequate justification for the selection of habitat loss thresholds and the EC accepts these conclusions.

Overall, the majority of the habitat loss effects are reversible once mining ceases and disturbed areas are rehabilitated, though some loss is permanent (e.g. the open pit). Permanent loss, however, represents only a very small portion of overall grizzly bear habitat in the area.

THE PROJECT MAY RESULT IN INCREASED GRIZZLY BEAR MORTALITY

The Proponent indicates that the Project aims to prevent grizzly bear mortalities.¹⁹⁷ The death of one bear is not likely to affect population, but due to the low reproductive rates of grizzly bears and their limited distribution within the Cassiar BMU, the death of multiple bears, especially females, can result in the sustainable mortality threshold, established by Environment Yukon, being exceeded. The Proponent indicates that up to 5 females and 15 males (assuming a 50:50 sex ratio) can be killed every year in the Cassiar BMU while still maintaining a sustainable bear population.¹⁹⁸ While the sex ratio is not likely to be 50:50, the expected Project-related mortality rate is expected to be far below the thresholds of 5 female and 15 male bears. Nevertheless, the Project may result in increased grizzly bear mortality as a result of human–bear conflict and vehicle collisions, as discussed below.

Project development and increased human presence may result in increased grizzly bear deaths beyond the sustainable threshold. To reduce the potential for increased harvest in the area, the Proponent will implement a no-hunting policy for its employees, contractors and visitors. Furthermore, access to the site is controlled at the gatehouse and the access road will be decommissioned once reclamation is complete. Comments submitted by Environment Yukon note the challenges in successfully decommissioning access roads unless there is an effective pinch point along the route where a necessary structure is removed (e.g. a bridge).¹⁹⁹ They suggest that there would likely be residual effects from increased hunting due to greater access in the short- and long-term.²⁰⁰

The Project involves the generation and storage of wildlife attractants such as food, waste and fuel. The presence of attractants in the Project area may increase the probability of bear visitations. Improperly handled garbage and debris will further attract bears and other wildlife to the Project area and increase the risk of human–bear encounters, ultimately resulting in bear mortalities. The probability of bears repeatedly visiting the Project site is directly linked to their ability to obtain food or garbage resulting from inadequate garbage management, and the deterrents put in place. Bears constantly assess risk-and-reward situations and when adequate deterrents are applied, bears will usually stay away from camps.

The measures the Proponent has committed to, as well as the applicable regulatory and legislative requirements around waste management and spills, will reduce the likelihood that bears will be attracted to the site.

Another source of grizzly mortality is the risk of increased vehicle collisions as a result of more traffic at the mine site. The Proponent has committed to using non-palatable vegetation along roads to reduce grizzly bear attraction to these areas. Wildlife will be given the right-of-way and

¹⁹⁷ YOR Document 2017-0083-137-2.

¹⁹⁸ YOR Document 2017-0083-292-1.

¹⁹⁹ YOR Document 2017-0083-265-1.

²⁰⁰ Ibid.

speed limits will be enforced on Project roads. These measures will reduce the likelihood of collisions.

Project design features, Proponent mitigation, and applicable legislation and regulations will reduce the likelihood of bear mortalities. Regardless of best efforts, there remains a risk of grizzly bear mortality from human–bear encounters, increased harvest and vehicle collisions. The risk of mortality is greatest during construction and operations, but may continue following closure if decommissioning of access roads is not effective. Within GMS 10-07, which overlaps the Project area, female grizzly bear mortality may be approaching the sustainable harvest limit, suggesting that further death of female grizzly bears within GMS 10-07 could result in local population declines. However, with Project design features and commitments made by the Proponent, it is unlikely that the Project will exceed the sustainable mortality thresholds within the Cassiar BMU.

Significance Determination

HABITAT LOSS

EFFECTS ARE LIKELY

Habitat loss is considered a likely effect of the Project. Earthworks and land clearing activities will result in the direct removal of grizzly bear habitat, and the Project may result in the functional (indirect) loss of habitat as a result of habitat avoidance (due to human activity). Modelling undertaken by the Proponent confirms habitat loss (denning and seasonal foraging habitat) as a result of the Project.

EFFECTS ARE ADVERSE

The effects of habitat loss to grizzly bears are adverse. Habitat loss and disruptions during critical life cycles, such as feeding and denning, can impact grizzly bear health, reduce overwintering success and result in grizzly bear mortalities.

EFFECTS ARE NOT SIGNIFICANT

The effects of the Project on habitat loss are not significant. Overall, predicted habitat loss is below identified significance thresholds (i.e. less than 10 percent). Furthermore, habitat effectiveness, security and linkage modelling suggest that sufficient important habitat will be maintained in the GBSA during all Project phases, even when considering other human disturbances in the area. The Proponent has committed to a number of measures which will ensure sensitive (e.g. denning) habitat is avoided and habitat loss is minimized. Overall, habitat loss is low and is mostly reversible upon cessation of Project activities.

MORTALITY*EFFECTS ARE NOT LIKELY*

There is a low likelihood that the Project will result in grizzly bear mortalities. The Proponent has designed the Project to prevent grizzly bear mortalities. No-hunting policies and access restrictions will ensure that the Project will not result in increases in grizzly bear harvest in the area. The Proponent's mitigation measures for waste and other attractants will reduce the likelihood that a bear will be killed in defence of life or property. Limiting traffic speeds and providing wildlife with the right-of-way on roads will also reduce the likelihood of vehicle–bear collisions.

EFFECTS ARE ADVERSE

Grizzly bear mortalities are adverse. Grizzly bears have high cultural, ecological and economic value.

EFFECTS ARE NOT SIGNIFICANT

The Proponent has made numerous commitments that will reduce the likelihood of grizzly bear mortalities arising from the Project. It is impossible, however, to completely eliminate all risk that a bear will be harvested, killed in defence of life or killed from vehicles collisions. Any such mortalities are unlikely to exceed the sustainable mortality threshold within the Cassiar BMU.

6.4 Birds**Summary and Conclusion**

The EC has determined that the Project will not result in significant adverse effects to birds due to Proponent mitigations, the limited removal of generic habitat types within the wider region and the limited risk of mortality due to the Project. Effects to birds will still include mortality, interrupted nesting and reduced habitat availability. However, within the context of individual bird species populations, these effects are not significant, nor are effects significant within the context of the Bird Conservation Region (BCR) 4, within which the Project is located.

Effects will be most pronounced during construction, as clearing may disrupt nesting and cause mortality. During operations, birds will be displaced from the Project area, minimizing risk of Project-related mortality. Water management features will potentially lead to contamination concerns post-operations.

Importance of Birds***IMPORTANT CULTURAL SPECIES GROUP***

Birds hold symbolic values across a wide range of cultures, including cultures found in Yukon. In addition to symbolic values, within Yukon and Canada, birds form an important spiritual, ceremonial and subsistence species group.²⁰¹ In addition, Yukon First Nations continue to use

²⁰¹ Martin Weinstein. "The Ross River Dena: A Yukon Aboriginal Economy". Royal Commission on Aboriginal Peoples Aboriginal Economy Case Study Project. 1993.

birds for a wide variety of purposes, from food to clothing and bags to pillows.²⁰² Birds figure prominently in First Nations mythology and ways of knowing.

BIRDS AN IMPORTANT TARGET OF CONSERVATION EFFORTS

Birds, as a diverse species group, represent a wide range of biological niches. The wide diversity of the species group, in terms of habitat, food and migration patterns means that there is also a wide variety of factors that may affect bird populations. Certain species, especially specialists, can be important environmental indicators. These factors make birds an important environmental indicator.

The importance of birds in terms of both culture and conservation is seen through the popularity of birding, or bird watching, in Yukon. Birds draw large numbers of birders to Yukon and birding is one of the more organized wildlife viewing activities in Yukon.²⁰³ In addition, high cultural value with high conservation concern is reflected in the Society of Yukon Bird Observatories, which maintains three observatories and conducts considerable banding, educational and observation activities.

Legislative and Management Context

PROJECT TAKES PLACE IN BIRD CONSERVATION REGION

The Project takes place in BCR No. 4, which is home to 211 regularly occurring species.²⁰⁴ ECCC note a number of conservation concerns specific to this BCR.

FEDERAL PROHIBITIONS

Legislation to protect and manage bird populations further supports the importance of birds as a highly valued species group. The *Migratory Birds Convention Act*, first passed in 1917, originated in response to concerns over substantial population declines, including species extinction. The Act protects 170 of 211 bird species found in BCR No. 4,²⁰⁵ the region in which the Project takes place. *The Migratory Birds Regulations*, under the Act, specifically prohibit, unless authorized,²⁰⁶

- the disturbance, destruction or taking of a “nest, egg, nest shelter, eider duck shelter or duck box of a migratory bird;”
- the possession of a “live migratory bird, or a carcass, skin, nest or egg of a migratory bird.”²⁰⁷

²⁰² Pamela H. Sinclair et al. *Birds of the Yukon Territory*. UBC Press, 2003. 40,41.

²⁰³ eBird.org holds records of over 45 000 bird viewing checklists (bird watching session summaries) submitted online or by mobile app by users in Yukon. Yukon also has three bird banding stations.

²⁰⁴ Environment and Climate Change Canada. “Bird Conservation Strategy for Bird Conservation 4 in Canada: Northwestern Interior Forest.” Government of Canada. 2013, pg. 7.

²⁰⁵ Ibid.

²⁰⁶ Subsistence harvest is not prohibited under the MBCA

²⁰⁷ Government of Canada. May 30, 2018. *Migratory Birds Regulations*, C.R.C., c.1035. https://lois-laws.justice.gc.ca/eng/regulations/C.R.C.,_c._1035/page-2.html#h-5

ECCC considers the “inadvertent harming, killing, disturbance or destruction of migratory birds” as “incidental take.”

Under certain circumstances, incidental take of a migratory bird, nest or egg has the potential to result in investigation and potentially prosecution under the general prohibitions of the Act and its regulations. This possibility is elevated if no reasonable attempt was made to avoid or reduce the risk of impact when the action or decision that led to the incidental take was carried out with reasonable knowledge of the potential harm, and/or with reasonable knowledge of the potential presence of migratory birds, nests and eggs in the area to which the action or decision is applied.²⁰⁸

In addition to the *Migratory Birds Convention Act* and the *Migratory Birds Regulations*, a small number of species also are protected under the SARA. Five species of bird found in Yukon are listed as threatened under SARA:

- bank swallow
- barn swallow
- Canada warbler (range does not overlap with Project)
- common nighthawk
- olive-sided flycatcher

For these species, SARA prohibits

- the killing, harming, harassing, capturing, or taking of an individual;
- the damaging or destruction of a residence of an individual.²⁰⁹

TERRITORIAL PROHIBITIONS

Territorial legislation—the *Wildlife Act*—prohibits the harassment of wildlife, and specifically prohibits the capturing, handling or manipulation of wildlife and the operation of any vehicle in a manner that might harass wildlife, including birds.

In addition, the *Wildlife Act* regulations name the peregrine falcon, gyrfalcon and trumpeter swan as specially protected wildlife; this status includes prohibitions against the possession and killing of these species. These species occur within the Project area.

²⁰⁸ Environment and Climate Change Canada. Avoiding Harm to Migratory Birds. <https://www.canada.ca/en/environment-climate-change/services/avoiding-harm-migratory-birds/overview.html>. Accessed March 6, 2018.

²⁰⁹ With the exception of subsistence harvest.

PRESENCE OF BIRD CONSERVATION STRATEGIC PLAN

ECCC has led in the development of bird conservation strategies in BCR No. 4. ECCC states that “these integrated all-bird conservation strategies will serve as a basis for implementing bird conservation.”²¹⁰

The Bird Conservation Strategy for BCR No. 4 notes that the region has low levels of disturbance to natural habitats, but that this “also means that available information ... is very limited.” The strategy states that development from mining and energy production²¹¹ are collectively of low magnitude, as compared with residential and commercial development, agriculture, biological resource use,²¹² human intrusions and disturbance,²¹³ natural systems modifications,²¹⁴ and climate change and severe weather.²¹⁵

The strategy identifies 77 priority species in BCR No. 4. These species are used to “focus implementation efforts on the issues of greatest significance for Canadian avifauna.”²¹⁶ Tables 20 and 21 list identified objectives and associated recommended actions in relation to mines and transportation corridors:

²¹⁰ Environment and Climate Change Canada. “Bird Conservation Strategy for Bird Conservation 4 in Canada: Northwestern Interior Forest.”, pg. iii.

²¹¹ Placer mining, specifically.

²¹² Biological resource use refers to the hunting of birds, logging, etc.

²¹³ Human intrusions and disturbance refers to, recreational activities, work and other activities leading to disturbance at nest sites.

²¹⁴ Natural systems modifications refers to fire and fire suppression.

²¹⁵ Climate change and severe weather refers to: habitat shifting and alteration due to climate change (loss of spruce forest), bird vulnerability to increasing severity of temperatures.

²¹⁶ Environment and Climate Change Canada. “Bird Conservation Strategy for Bird Conservation 4 in Canada: Northwestern Interior Forest.”, pg. 9.

Table 20: Conservation Strategy for Bird Conservation Region No. 4 recommended actions related to mining

Recommended Actions Due to Threats from Mining ²¹⁷			
Threats Addressed	Objectives	Recommended Actions	Priority Species Affected
Encroachment on/degradation of breeding habitat from mining	Maintain the quantity and quality of wetland and lake/pond habitat within BCR 4 for nesting waterbirds	Incorporate exclusion zones into mining plans to protect habitat.	<ul style="list-style-type: none"> American Wigeon Barrow’s goldeneye blue-winged teal bufflehead Canada goose canvasback common goldeneye greater white-fronted goose green-winged teal lesser scaup long-tailed duck mallard northern pintail northern shoveler surf scoter trumpeter swan (Pacific coast) trumpeter swan (Rocky Mountain) white-winged scoter
		Incorporate habitat recovery into post-mining site clean-up	
Habitat degradation from mining	Maintain the quantity and quality of alpine streams and associated riparian habitat within BCR 4 for nesting birds	Incorporate exclusion zones into mining plans to protect habitat.	<ul style="list-style-type: none"> harlequin duck wandering tattler
		Incorporate habitat recovery into post-mining site clean-up	
Habitat degradation from mining	Maintain the quantity and quality of alpine tundra habitat within BCR 4 for nesting birds	Incorporate habitat recovery into post-mining site clean-up	<ul style="list-style-type: none"> white-tailed ptarmigan

²¹⁷ Excluding placer, which contains additional provisions for Rusty Blackbird. Extracted from: Environment and Climate Change Canada. “Bird Conservation Strategy for Bird Conservation 4 in Canada: Northwestern Interior Forest.”.

Table 21: Conservation Strategy for Bird Conservation Region No. 4 recommended actions related to transportation

Recommended Actions Due to Transportation and Service Corridors ²¹⁸			
Threats Addressed	Objectives	Recommended Actions	Priority Species Affected
Mortality from collisions with vehicles	Reduce vehicle collision mortality of birds	Increase public awareness of birds and vulnerability to high-speed traffic	<ul style="list-style-type: none"> • northern shrike • short-eared owl • common nighthawk • Bohemian waxwing • northern hawk owl • pine grosbeak • white-winged crossbill
Degradation of habitat from road construction	Maintain the quantity and quality of wetland habitat within BCR 4 for nesting waterbirds	Limit construction of roads in and near wetland areas	<ul style="list-style-type: none"> • lesser yellowlegs
	Maintain the quantity and quality of forested wetland habitat within BCR 4 for nesting birds		
	Maintain the quantity and quality of dwarf shrub tundra and riparian shrub habitat within BCR 4 for nesting birds	Limit construction of roads in alpine areas	<ul style="list-style-type: none"> • white-tailed ptarmigan
Reclaim old unused roads			
Limit construction of roads in and near wetland areas		<ul style="list-style-type: none"> • American wigeon • blue-winged teal • Canada goose • greater white-fronted goose • green-winged teal • lesser scaup • lesser yellowlegs • mallard 	

²¹⁸ Environment and Climate Change Canada. "Bird Conservation Strategy for Bird Conservation 4 in Canada: Northwestern Interior Forest."

			<ul style="list-style-type: none"> • northern pintail • northern shoveler • surf scoter • white-winged scoter
	Maintain the quantity and quality of alpine tundra habitat within BCR 4 for nesting birds	Limit construction of roads in alpine areas	<ul style="list-style-type: none"> • white-tailed ptarmigan

Context

REGION HAS SMALL HUMAN FOOTPRINT

The Project area occurs within a large area of minimal industrial development. The Bird Conservation Strategy for BCR No. 4 states, “The human population is very small, and many parts of the region are remote and difficult to access.”²¹⁹ The most notable footprints in the region which reduce bird habitat through disturbance include

- the RCH (also a source of collision mortality)
- the Faro Mine site
- the Wolverine Mine site
- the communities of Ross River, Faro and Watson Lake

BREEDING GROUNDS UNLIKELY TO BE LIMITING

Migratory birds in the Project area either migrate through the Project area to breeding grounds or use the Project area to breed. Data suggest that migratory bird population changes are related to where birds overwinter, specifically how far south birds migrate. Bird species that migrate to other parts of Canada have been trending upwards, and bird species that migrate to South America have been faring poorly compared with birds that migrate to other destinations (Figure 23).

²¹⁹ Environment and Climate Change Canada. “Bird Conservation Strategy for Bird Conservation 4 in Canada: Northwestern Interior Forest.”, pg. 1.

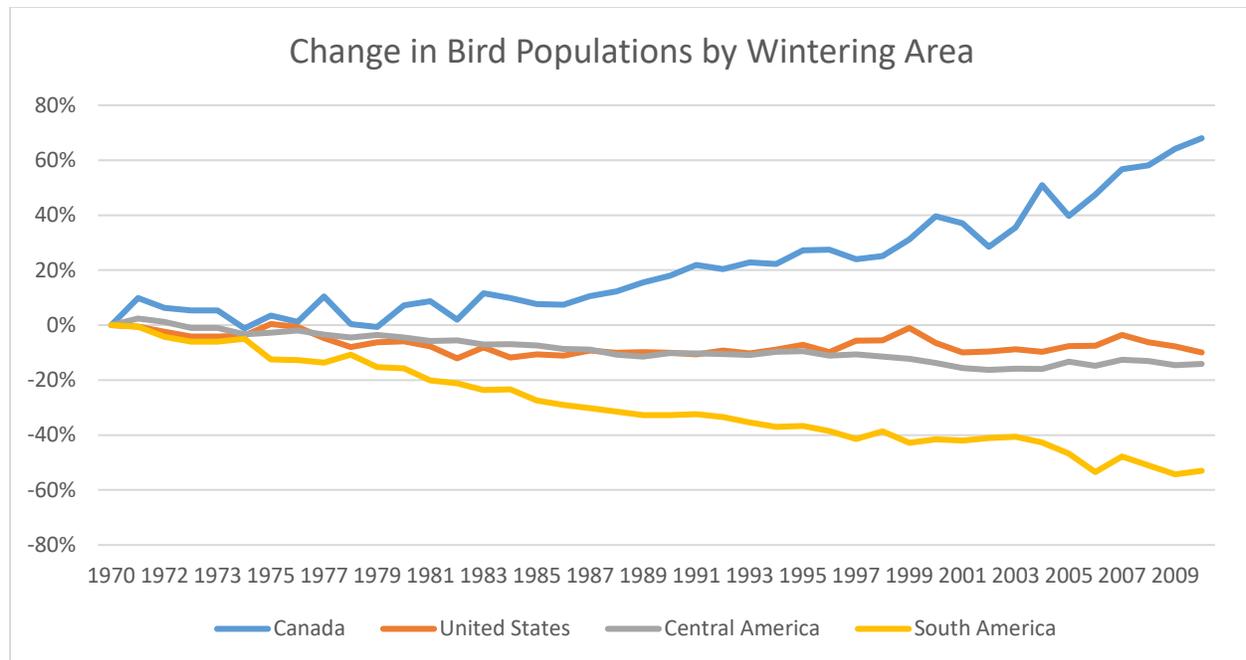


Figure 23: State of the birds. Graph showing the (percentage) change in bird populations since 1970 for groups of species, grouped by where species overwinter

It is likely that the reasons for their decline in the south, indicated by the yellow line in Figure 23 are linked to the following:

- habitat loss
- pollution
- incidental take
- uncontrolled hunting
- climate change

The low level of industrial development in BCR No. 4, and near the Project itself, suggests minor impacts from cumulative effects. Further, bird population trends based on overwintering destinations suggest that the human footprint in Canada is not a major factor in limiting bird populations, in general.²²⁰ However, this is not necessarily true for specialist species. Habitat types used by specialists are not abundant within the Project area.²²¹

BIRD POPULATIONS DECLINING

Despite overall population increases in birds that both breed and overwinter in Canada, populations in that group declined between 1970 and 2010 by, on average, 12 percent.²²² Certain species have suffered major population declines, including specialist grassland birds,

²²⁰ Populations of birds that overwinter in Canada are increasing as a group.

²²¹ While populations of birds that overwinter in Canada are generally increasing, specialist species may follow different trajectories as their environmental niches are more restricted and are therefore more sensitive to certain types of disturbance.

²²² North American Bird Conservation Initiative Canada. The State of Canada's Birds, 2012. Environment Canada, Ottawa, Canada. 2012.

aerial insectivores and shorebirds. Other groups, such as waterfowl and raptors, are generally increasing in population.

Existing Conditions and Trends

PROJECT ADJACENT TO TINTINA TRENCH

The Project is approximately 30 km from the Tintina Trench, a “critical bird migration corridor for many species of songbirds and waterfowl.” The Tintina Trench is a northern extension of the Rocky Mountain Trench.

PROJECT AREA HOSTS DIVERSE SPECIES ACROSS DIVERSE HABITATS

The Project area includes five major habitat types including riparian, wetland, boreal forest, subalpine forest and alpine.²²³ With such diverse habitats, a wide range of species are expected, including both habitat specialists and generalists.

The Proponent conducted breeding bird surveys in 2015 and 2016 within the Project area and at nearby reference sites, observing a total of 67 species, including five species of concern:

- olive-sided flycatcher (threatened)²²⁴
- bank swallow (threatened)
- barn swallow (threatened)
- red-necked phalarope (special concern)²²⁵
- rusty blackbird (special concern)

The olive-sided flycatcher was the most observed of the above, with four observations in 2015 and nine in 2016.

Several species of raptor, including golden eagle and gyrfalcon, have been documented in the Project area, including two active raptor nests in close proximity to the mine site. There is also limited capacity for shorebirds and waterfowl in the small lakes and wetlands within the Project area.

FINLAYSON LAKE SUPPORTS A WIDE VARIETY OF SPECIES

The Proponent notes that a North American Breeding Bird Survey route exists for Finlayson Lake, which is about 30 km north of the mine site itself, near the northern terminus of the access road. From 1992 to 2014, 70 species were recorded, with an average of 37 species observed in any given year.

PROJECT AREA DOES NOT INCLUDE WILDLIFE KEY AREAS OR MAJOR WETLANDS

Despite the presence of diverse species within the Project area, YG has not identified any wildlife key areas for bird species in the Project area. This may indicate limitations of data as

²²³ YOR Document 2017-0083-140-1, pg. 116.

²²⁴ A “threatened” species is “A wildlife species that is likely to become endangered if nothing is done to reverse the factors leading to its extirpation or extinction,” where “endangered” refers to “A wildlife species facing imminent extirpation or extinction.”

²²⁵ A “special concern” species is “A wildlife species that may become threatened or endangered because of a combination of biological characteristics and identified threats.”
COSEWIC. COSEWIC wildlife species status categories and definitions. 2016.

opposed to unexceptional habitat values. National Topographic System data also does not indicate the presence of large wetland complexes in the Project area, though the Proponent has indicated the presence of wetland habitats in the area.

PROJECT AREA DOES NOT CONTAIN UNIQUE HABITAT TYPES IN REGION

The Project area does not contain locally unique habitat types. Surrounding areas host a wide variety of habitat, including those found overlapping with the Project. Habitat within the Project footprint is typical of the wider region.

Project Design

Mitigations proposed by the Proponent include a variety of actions. The most relevant, and one of the more effective mitigation measures, requires nest surveys prior to any clearing during the nesting season. The Proponent notes that this is required by the *Migratory Birds Convention Act*. Bird surveys will

- be led by qualified and experienced individuals, including “involvement from Kaska representatives identified by RRDC;”²²⁶
- communicate results to the on-site construction manager and clearing contractors;
- establish buffer zones around active nests with buffer distances ranging from 30 m to 200 m.

If no nests are found during surveys, clearing activities will be completed within one week of survey conclusion. ECCC notes that it “does not recommend the use of active nest searches, including those proposed by the Proponent. It is well known that active nest searches have a low success of detection and may disturb nesting birds.”²²⁷ However, ECCC also notes that, “Non-intrusive methods are unlikely to result in the discovery of nests.”²²⁸

Project Effects

HABITAT

REDUCTION IN RIPARIAN AND WETLAND HABITAT

Approximately 4 km of the Geona Creek valley will be removed and replaced with mine infrastructure, with much of it located near or overlapping Geona Creek. The Project will remove riparian and wetland habitat. Fault Creek will be diverted around the mine site and other diversions will affect other water courses, further reducing riparian habitat.

The removal of natural riparian and wetland habitat areas will reduce suitable habitat for species that rely on these habitat types. However, adjacent areas host similar, unaltered habitat types, which will reduce the impact of wetland and riparian habitat removal in the Project area.

²²⁶ YOR Document 2017-0083-043-1, pg 13-68.

²²⁷ YOR Document 2017-0083-281-1, pg. 23.

²²⁸ Ibid. pg. 24.

CONTAMINATION RISK IN MINE WATERBODIES

Seven WMPs will be constructed during operations, and all will have varying levels of water quality. If the ponds are used by birds, there is risk of contamination in the WMPs.

The Proponent notes that “wildlife is unlikely to access the water management and water collection ponds due to fencing around ponds with unsuitable water quality, as well as a general deterrence from general human and equipment activity around the ponds.”²²⁹ However, fencing is unlikely to be successful in preventing bird access.

The Proponent notes that if water quality falls below drinking water guidelines for livestock, the Proponent will implement adaptive management plan actions; however, these actions have not yet been drafted and consequently cannot be considered as mitigating effects for this assessment.

During operations, the WMPs are unlikely to be used widely as habitat, given the intensive human presence. During closure the pit will likely remain poor habitat, though it may be used for short durations by migrating birds.

MORTALITY AND REPRODUCTIVE SUCCESSEXTENSIVE VEGETATION CLEARING

The Project requires the clearing of vegetation for mine infrastructure across a wide range of habitat types: subalpine, wetland, riparian and, to a limited extent, boreal forest. Land clearing undertaken during bird nesting can result in nest abandonment, mortality or loss of eggs, all of which reduce species productivity. Disturbance during nesting can also affect the health of the individual. Although the Proponent’s proposal to conduct surveys prior to clearing will help mitigate negative effects, the extent of clearing required for the Project will likely lead to some nest abandonment, mortality and loss of eggs. These effects will be exacerbated by the territorial nature of most nesting species in the Project area.²³⁰

VEHICLE-BIRD COLLISIONS

The Project will also lead to increased risk of mortality for birds along the RCH and the access road. In addition, and to a more limited extent, there will be risk from aircraft servicing the mine.

²²⁹ YOR Document 2017-0083-043-1, pg 13-73.

²³⁰ Most species that overlap with the Project are territorial: during nesting a territory will typically host only one nesting pair.

Significance Determination

HABITAT

EFFECTS ARE LIKELY

The Project will result in habitat loss through the removal of wetlands, riparian areas and watercourses in the Project area.

EFFECTS ARE ADVERSE

Habitat reduction can harm bird populations, and is in general associated with bird population decline across North America and beyond.

EFFECTS ARE NOT SIGNIFICANT

The mine site is in an area with a small human footprint, in a bird conservation area that is amongst the most undisturbed. Breeding birds do not appear to be limited by a lack of breeding habitat. The Project site does not contain important colonial nesting sites, migration staging areas or special habitat types (such as tors or expansive wetlands). In addition, the habitat types available at the Project site currently are present in areas adjacent to the Project. The Project is also largely in line with the strategic plan for BCR No. 4, as it

- incorporates exclusion zones into mining plans to protect habitat;
- incorporates habitat recovery into post-mining site clean-up; and
- limits construction of roads in and near wetland areas.

Consequently, the removal of habitat at the Project site will not result in significant adverse effects to birds.

MORTALITY AND REPRODUCTIVE SUCCESS

EFFECTS ARE LIKELY

Clearing for Project infrastructure and an expanded access road, despite the provided mitigation to conduct bird surveys, is likely to interrupt nesting. Collisions with vehicles are also likely to occur given the reliance on long-distance transportation along the RCH and frequent flights.

EFFECTS ARE ADVERSE

Land clearing affects bird breeding and can result in bird mortality through incidental take. Reduction in bird productivity is adverse as it limits or reduces bird populations, especially at a time when many bird species are declining considerably.

Water contamination is adverse as it reduces bird health and fitness. Pollution, including contamination, is also a contributing factor to bird population declines in North America.

EFFECTS ARE NOT SIGNIFICANT

With surveys conducted prior to clearing, bird mortality and nesting effects will be largely averted. The territorial nature of most nesting birds in the Project area will also reduce the extent of potential effects, as bird densities for territorial species are naturally limited during

nesting. Clearing will primarily pose a risk of mortality and reduced reproductive rates during the bird-nesting season (spring through summer), and only when clearing occurs during that time.

As residency times of migrating birds is expected to be low within the pit lake, and due to the territorial nature of many Yukon birds during nesting, exposure to contaminants is expected to be minimal.

Collisions are a major cause of bird mortality in North America; however, speed limits and mine site supply of 52 trucks per day are unlikely to be a notable source of mortality.

The Project is unlikely to result in significant effects to birds through mortality or reduced nesting success as it will likely result in unobservable population changes of affected bird species

6.5 Furbearers

Project effects to furbearer species are considered in Section 7, Traditional Land Use.

7. Traditional Land Use

Summary and Conclusion

The Project is likely to result in significant adverse effects to traditional land uses based on the information available to the EC throughout the assessment. Traditional land use in this section includes traditional harvest, trapping, cultural continuity and passing on Traditional Knowledge. It was determined that the significant adverse effects to traditional land uses can be adequately reduced or controlled through adhering to relevant legislation and applying mitigative measures committed to by the Proponent throughout this report, in addition to YESAB's recommended terms and conditions.

The EC recognizes that land uses, both historically and currently, are carried out by non-First Nations people in the Project area as well. However, the emphasis of this section is to examine the traditional land use activities of RRDC and LFN citizens in their Traditional Territories within which the Project is located. Measures identified to eliminate, control or reduce significant effects to RRDC and LFN citizens are likely to address significant effects to other land users as well.

Importance of Traditional Land Use

The Project occurs in the Traditional Territories of the RRDC and LFN, both of whom have a long history of land and resource management within their territories, according to their own customs and traditions. Knowledge of the area and associated cultural practices have been passed down through the generations. RRDC's and LFN's cultural traditions and identities are deeply connected to the landscape and the continuance of traditional land uses. Land and resource development within the Traditional Territories has altered traditional land use patterns

and has changed First Nations' relationship with the landscape over time. Despite this, RRDC and LFN still have a strong reliance on the land and its resources for sustenance, economic gain and the continuation of their cultural identity and wellbeing. The Liard Aboriginal Women's Society (LAWS) highlights a Kaska goal to "Get back to the Land. Get back to teaching young people about Kaska traditions, culture, language. Teach the Kaska Laws so that the community can become whole again."²³¹

Comments and information provided during the course of the assessment, either by the Proponent or through comment submissions, identify the potential for the Project to affect important ecological and cultural values within the Project area that are of historical and contemporary importance to both RRDC and LFN. Important values identified include hunting and harvesting of culturally important species (such as caribou from the FCH, moose and other wildlife), trapping of fur-bearers, fishing, and collecting culturally important plants, materials and medicines. The ability to travel through the Project area for cultural purposes and to camp at preferred locations has been identified as well. Concerns raised included the potential for long-term disruptions to traditional land uses within a culturally important area and the potential for cumulative effects to traditional land uses as a result of other closed or abandoned mines and other activities in RRDC's and LFN's Traditional Territories.

In considering effects to traditional land uses, the EC considered the effects assessment to components of the biophysical environment (e.g. wildlife, water quality, fish) presented in this report, as effects to these components are inextricably linked to traditional land uses. The EC also considered traditional land use information submitted by the Proponent, RRDC and LFN. The results of LFN's Kaska-centric Independent Peer Review of the Project, which aimed to collect Traditional Knowledge and traditional land use information through a "Kaska-lens", were unfortunately not available at the time this report was prepared. Additionally, the Proponent has noted that the collection of Traditional Knowledge from RRDC and LFN is ongoing (and confidential) and will be incorporated through the regulatory phase and Project implementation as it is received. The EC acknowledges that this assessment would have benefited from additional first-hand accounts of potential Project effects from RRDC and LFN to further clarify the important values and traditional land uses associated with the area.

For the purposes of this assessment, the EC considers traditional harvest, trapping, cultural continuity and passing on Traditional Knowledge as components of traditional land use which may be adversely affected by the Project.

Legislative and Management Setting

There is no specific legislation that would directly mitigate effects to traditional land use. There are, however, several laws and regulations which manage and regulate elements that are components of, or important to, traditional land use. Some examples, relevant to the components of traditional land use examined in this report include, but are not limited to:

²³¹ YOR 2017-0083-5830

Traditional Harvest

ENVIRONMENT ACT AND REGULATIONS

- provide a general framework for the protection and wise management of natural resources including fish, wildlife and vegetation;
- the Regulations under the Act (e.g. *Solid Waste Regulations*, *Special Waste Regulations*, *Spills Regulations*) also prohibit the release of contaminants to the environment, which protects the soil, water and vegetation upon which traditionally harvested resources (e.g. plants and wildlife) depend.

WILDLIFE ACT AND WILDLIFE REGULATION

- provide the regulatory framework for licensed harvest of wildlife in Yukon and prescribe rules related to licensing and permitting, hunting activities, reporting and care of wildlife.

MIGRATORY BIRDS CONSERVATION ACT AND THE MIGRATORY GAME BIRD HUNTING REGULATIONS

- provide frameworks for the protection of migratory birds, nests and their eggs;
- the Regulations identify limits for possession of bird species, methods and restrictions on hunting, and associated permits.

FISHERIES ACT AND REGULATIONS

- provide a framework for protecting and managing fish and fish habitat in Canada;
- the *Yukon Territory Fishery Regulations* outline closed fisheries, sport fishing and associated prohibitions. They further elaborate on specific waterbodies (e.g. special management waters), and discuss specific species and associated restrictions such as closed areas or harvest limits. Environment Yukon, in conjunction with the Yukon Fish and Wildlife Management Board and local First Nations, enacted these Regulations.²³²

WATERS ACT

- provides a framework for the protection and management of water, including water quality and quantity in Yukon waterbodies upon which fish and other aquatic resources depend.

Trapping

WILDLIFE ACT AND TRAPPING REGULATIONS

- establish the regulatory requirements and measures for trapping in Yukon;
- the Act and the supporting *Trapping Regulations* and *Trapping Concession Area Boundary Regulations* establish and manage Registered Trapping Concessions (RTCs) for individuals and groups across the territory. As s. 62 of the Act outlines, the holder of a trapline concession is reserved the “exclusive opportunity” to “trap fur bearing animals in the area described in the trapping concession.” It should be noted that s. 126 of the *Wildlife Act* states that a concession, in this case a trapping concession, “is not and does not operate as a demise, lease or transfer of any title to or interest in land or wildlife.”

²³² Government of Yukon. 2019. Yukon fishing regulations summary 2019-2020. <https://yukon.ca/en/yukon-fishing-regulations-summary>

Traditional Knowledge and Cultural Continuity

The above regulatory frameworks also help to maintain Traditional Knowledge and cultural continuity with relation to harvest and trapping. In addition, the following legislation are also relevant:

HERITAGE RESOURCES ACT AND ARCHAEOLOGICAL SITES REGULATIONS

- prohibit the alteration or destruction of heritage resources.

CONSTITUTION ACT (1982)

- s. 35 provides constitutional protection for Aboriginal rights and treaty rights. Neither RRDC nor LFN have a land claim agreement in place, and harvesting and traditional activities by citizens of RRDC and LFN are based on the exercise of Aboriginal rights.

Context

The Kaska Dena Nation

The Kaska Traditional Territory spans BC, Yukon and the Northwest Territories (Figure 24). The Kaska Dena Nation is comprised of First Nation communities located in Yukon and BC. The Project falls within the overlapping Traditional Territories of the RRDC and LFN in Yukon.

During the comment period on the Draft Screening Report, a letter was received from the Pelly Banks First Nation²³³ who explained that they were recognized as an Indian Band in the early 1900s, and were amalgamated alongside the Pelly Lakes and Frances Lake Bands with the RRDC and LFN in 1956²³⁴. A letter was also received from the Kaska Dena Council²³⁵, a society that was formed in 1981 to advance the interests of Kaska individuals in treaty negotiations with BC and Canada. For clarity, the EC has focussed its consideration of project effects on RRDC and LFN, whose Traditional Territories overlap the Project and whose citizens and communities are most likely to be adversely affected by the Project; this includes members of the Pelly Banks First Nation. The EC, however, acknowledges that there are BC Kaska citizens who may also have an interest in the Project and a connection to the Project area given the movement of citizens between communities within the Kaska Traditional Territory; some of the discussion and conclusions may be relevant to these citizens.

²³³ YOR 2017-0083-1194

²³⁴ YOR 2017-0083-1194

²³⁵ YOR 2017-0083-2271

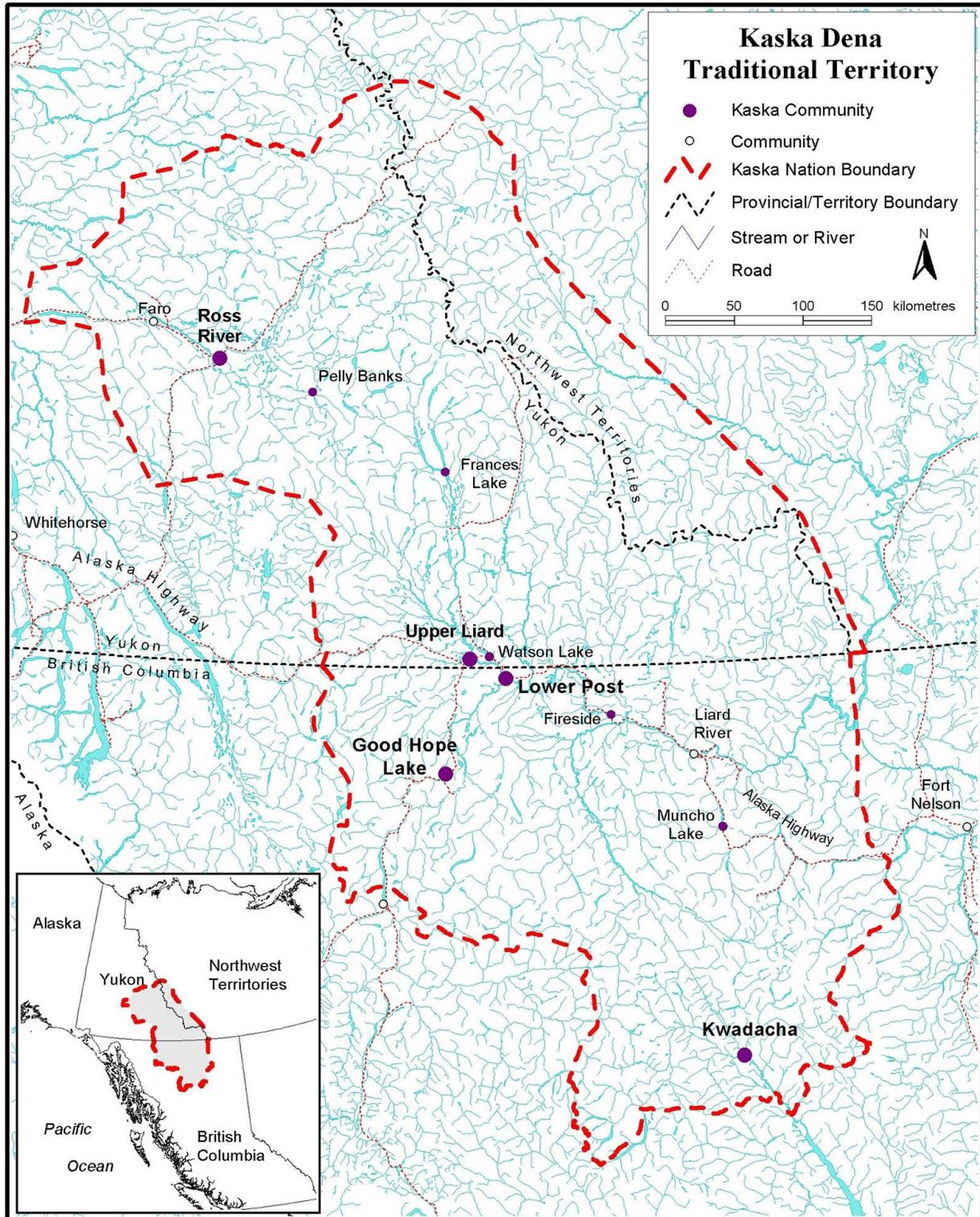


Figure 24: Traditional Territory of the Kaska Dena²³⁶

²³⁶ Accessed from: <https://kaskadenacouncil.com/our-land/>, September 11, 2020

Kaska Way of Life

RRDC and LFN have occupied and used the lands, waters and resources within their Traditional Territories throughout history. Traditionally, the Kaska people were semi-nomadic and followed seasonal movements and availability of wildlife, fish and plants; summers and winters were spent by lakes with plentiful fish resources, and fall and spring were spent in the mountains hunting larger wildlife, drying meat and collecting berries for winter.²³⁷ Trapping and trading were important components of the traditional economy between families and with other First Nations. The knowledge of movements and about the abundance of wildlife and other important seasonal resources was the result of many years of observations by the Kaska people, and has been passed down through generations. Subsequently, RRDC and LFN cultures and traditions are deeply rooted in the landscape of their Traditional Territories, and their cultural identity is largely defined by this relationship.

The Heritage Resource Protection Plan for the Wolverine Mine notes that,

Elders teach respect for the land through Kaska traditional law, known as “aiee.” The laws teach one how to conduct and respect themselves, others, and the land that sustains them. These teachings build and strengthen the ties between the Kaska, the land, the water, the plants, the animals, and the spirits of the Kaska Dena before them.²³⁸

To understand the potential Project effects to traditional land use, one must understand how the Kaska view their Traditional Territory: as a whole with distinct yet interdependent parts.²³⁹ As explained in documents pertaining to previous land claim negotiations,

It is difficult to view the lands used by the Kaska Dena as being in some way divisible. Rather, the image that comes across most clearly is that the Yukon area harvested by the Kaska Dena form as a whole an integral and integrated part of the resource base upon which their sociocultural integrity relies (HDC, 1982:58 in Exhibit 3).²⁴⁰

Within RRDC and LFN Traditional Territories, land uses and cultural practices have significantly shifted over the years. The influx of Europeans to the area (beginning in the 1820s), establishment of trading posts, gold rushes, development of roads (RCH, Alaska Highway),

²³⁷ YOR Document 2017-0083-157-1.

²³⁸ Yukon Zinc Corporation. 2007. Wolverine Project Heritage Resource Protection Plan. Version 2007-01, pg. 1. http://www.emr.gov.yk.ca/mining/pdf/mml_wolverine_heritage_resource_protection_plan_version_2007_01.pdf

²³⁹ YOR Document 2017-0083-157-1.

²⁴⁰ YOR Document 2017-0083-157-1.

collapse of the fur trade, entry of First Nation citizens into the labour market, the creation of *Indian Act* bands and reserves, and introduction of residential and day schools pushed Kaska people into more permanent settlements, affecting traditional land use patterns.²⁴¹ Regardless, RRDC and LFN citizens still maintain deep connections to traditional areas and continue to rely heavily on harvesting for subsistence, cultural and economic purposes.

Harvesting, within one's traditional territory is an Aboriginal right. The *Constitution Act*,²⁴² specifically s. 35, provides the foundational legislative framework for which Aboriginal rights and treaty rights are recognized.

Traditional Harvest

There is a long-standing history of harvest in the Traditional Territories of RRDC and LFN. The harvesting of large and small animals has been and continues to be a traditional subsistence and economic activity, particularly in the informal economy of trading and bartering, for citizens of RRDC and LFN. It has been identified as essential to the way of life and the cultural identity of the Kaska people: "In general, despite substantial outside pressures and influences to shift away from subsistence hunting, this is still an integral part of Kaska way of being and connecting to the land. They have done so more than other Aboriginal groups across Yukon."²⁴³

A number of species have been identified as important staples to the diet and subsistence of the Kaska, including moose, caribou, sheep and waterfowl. More specifically, Kaska land management practices identify caribou and moose as culturally important species, both having high cultural value for the Kaska First Nations.²⁴⁴

Fish are also a staple in the RRDC and LFN diet. Ethnographic work carried out by the Proponent identifies culturally important species including grayling, lake trout, jackfish (pike), whitefish, suckers²⁴⁵ and salmon.²⁴⁶ This work also identified important regional and Project-specific sites related to fishing, which include Frances Lake, Frances River, Hoole Canyon (on the Pelly River), Finlayson Creek, Money Creek and Wolverine Lake, the latter three being within the Project area.²⁴⁷

Plants are also important to the RRDC and LFN diet. Plants are harvested for food and medicinal purposes, and are used for tools or products (e.g. firewood). They are also culturally and spiritually important for ceremony and health/healing practices. Icton (2019)²⁴⁸

²⁴¹ Ibid.

²⁴² Government of Canada. Constitution Act. Part II S. 35 Rights of the Aboriginal Peoples of Canada. <https://laws-lois.justice.gc.ca/eng/const/page-16.html#docCont>

²⁴³ YOR Document 2017-0083-9170, pg. 3-16, this cites (43):

M. Morrell. Indian Land use in the Ketz River Valley and the impact of the Ketz River Mine. Ross River Dena Council, 1992.

²⁴⁴ YOR Document 2017-0083-040-1, Table 13-1.

²⁴⁵ YOR Document 2017-0083-157-1

²⁴⁶ Weinstein, M. 1993. The Ross River Dena: A Yukon Aboriginal Economy. Royal Commission on Aboriginal Peoples, Aboriginal Economy Case Study Project.

²⁴⁷ YOR Document 2017-0083-157-1, pg. iii.

²⁴⁸ YOR Document 2017-0083-5717;

YOR Document 2007-0083-4777;

YOR Document 2017-0083-9170.

demonstrates that these uses occurred historically, and comments received from LFN indicate that there continues to be contemporary use and reliance on plants.²⁴⁹ Plants identified as culturally important to Kaska include blueberries, raspberries, strawberries, currants, salmonberries, cranberries, soapberries, wild rhubarb, rose petals, spruce, birch and willow.²⁵⁰

In general, local wild food remains important to First Nations and contributes to healthy communities.²⁵¹ The Project proposal states that,²⁵²

Yukon Indian people continue to depend heavily upon traditional foods, especially moose, caribou, salmon and berries as shown by the high frequency of household consumption. This is particularly so in remote and traditional villages, where wage opportunities are few, and marketed food costs are extremely high; however, hunting and fishing remain important social and economic activities in all Yukon Indian communities.

Trapping

Trapping is an integral traditional subsistence and economic activity for RRDC and LFN citizens. The Proponent acknowledges the value of trapping, stating, “for Kaska citizens, trapping is not just an effort to earn part of an individual’s income. It also plays an important role in continuing the individual and collective connection to, and stewardship of, the land.”²⁵³ Prior to the registration of traplines in Yukon, traplines were traditionally family areas, wherein ancestral values, cultural practices and a stewardship way of life were shared through the generations.

The nineteenth century saw a change in fur trading activities as the Hudson’s Bay Company established trading posts across Yukon, including a number in RRDC and LFN Traditional Territories (e.g. trading posts at Frances Lake and Pelly Banks). Reliance on the growing fur trade saw some changes in First Nations’ land use with a greater focus on trapping, which continued to evolve into the twentieth century. Fluctuations in fur prices during the middle to late twentieth century led to economic challenges. Trapping by Yukon First Nations continued throughout market fluctuations for subsistence, for production of handicrafts and clothing, as well as for trade and sale. In the mid to latter part of the century, many trading posts closed as highways were constructed and changing transportation patterns resulted in locally available services and supplies disappearing from communities. Trapping, nevertheless, remained an important way of life, both for subsistence and economic purposes.

Registered traplines were introduced into the trapping economy during the mid-twentieth century. The early 1950s saw Yukon create RTCs, and in the early 1960s RRDC was

²⁴⁹ YOR Document 2017-0083-282-1.

²⁵⁰ YOR Document 2017-0083-157-1, pg. 3-9.

²⁵¹ Wein, E.E. and Freeman, M.R. Frequency of Traditional Food Use by Three Yukon First Nations Living in Four Communities. *Arctic* 48(2): 161-171, 1995. <http://pubs.aina.ucalgary.ca/arctic/Arctic48-2-161.pdf>

²⁵² Ibid.

²⁵³ YOR Document 2017-0083-046-1, pg. 15-30.

successful in establishing a group trapline (RTC 405). This group trapline was an amalgamation of the registered RRDC family traplines within the territory.

Statistics from 2012²⁵⁴ identify that 42 percent of Indigenous youth (aged 15 to 24) and 55 percent of Indigenous adults (aged 25 to 54) were participating in some form of traditional activity such as hunting, fishing and trapping. While this statistic is territory-wide, it demonstrates a correlation between traditional trapping and land use activities, and community connectivity and cultural history across generations. Information presented in the 2015 Minto Mine Socio-Economic Monitoring Program Annual Report²⁵⁵ also identified a high percentage of participation of Selkirk First Nation citizens (aged 16 and over) in traditional land use activities for the previous year (88 percent hunting, 86 percent fishing, 32 percent trapping) which underscores the importance of traditional harvesting and trapping activities for rural First Nation communities in particular. Trapping for subsistence and economic purposes continues in RRDC and LFN Traditional Territories.

Traditional Knowledge and Cultural Continuity

Culture and Traditional Knowledge are the accumulated teachings of ancestors. For First Nations, they connect a person or people to their community and ancestors, and to the land.²⁵⁶ This traditional and cultural knowledge is transmitted and continued through language, customs, norms, ways of life, traditional activities (e.g. sewing, harvesting, fishing, gathering, trapping, dancing, storytelling and games), values and other social interactions.²⁵⁷

Research shows that culture is an important factor in the wellbeing of First Nations communities, especially in conditions of rapid social change.²⁵⁸ First Nations need access to certain factors to transmit their knowledge and culture, such as trails;²⁵⁹ culturally important sites;²⁶⁰ time to pursue traditional and cultural activities and be on the land; physical space to

²⁵⁴ Statistics Canada. Yukon: Beautiful, Complex, and Changing. Statistics Canada, 2018. <https://www150.statcan.gc.ca/n1/pub/11-631-x/11-631-x2018006-eng.htm>;

Statistics Canada. Aboriginal Peoples Survey, 2012. Statistics Canada, 2015. <https://www150.statcan.gc.ca/n1/en/daily-quotidien/150330/dq150330g-eng.pdf?st=G394ReOW>

²⁵⁵ Selkirk First Nation, Yukon Government and Minto Exploration Ltd. 2018. Minto Mine Socio-Economic Monitoring Program Annual Report 2015. http://selkirkfn.com/files/2115/3419/3625/MintoMine_Socio-EconReport-2015_FINAL_July_30_2018.pdf

²⁵⁶ National Collaborating Centre for Aboriginal Health. 2016. Culture and Language as Social Determinants of First Nations, Inuit and Metis Health. <https://www.ccsa-nccah.ca/docs/determinants/FS-CultureLanguage-SDOH-FNMI-EN.pdf>;

Government of Canada. Yukon Environmental and Socio-economic Assessment Act. S. 2(1), 2019. <https://laws-lois.justice.gc.ca/PDF/Y-2.2.pdf>

²⁵⁷ National Collaborating Centre for Aboriginal Health. Culture and Language as Social Determinants of First Nations, Inuit and Metis Health, 2016. <https://www.ccsa-nccah.ca/docs/determinants/FS-CultureLanguage-SDOH-FNMI-EN.pdf>

²⁵⁸ Angell, A.C. and Parkins, J.R. Resource Development and Aboriginal Culture in the Canadian North. 2010. *Polar Record* 47(240), pg. 67-79;

Chandler, M.J and Lalonde, C. Cultural Continuity as a Hedge against Suicide in Canada's First Nations. *Transcultural Psychiatry*, 1998;

Duhaime, et al. Social Cohesion and Living Conditions in the Canadian Arctic: From Theory to Measurement. *Social Indicators Research* 66(3), 2004;

Notzke, C. Aboriginal peoples and natural resources in Canada. North York: Captus Press Inc, 1994.

²⁵⁹ Includes, but not limited to: walking, hiking, hunting, harvesting, and travelling trails.

²⁶⁰ Includes, but not limited to: harvesting areas, ceremonial and/or spiritual sites, campsites, traplines, and cabins.

pursue activities; freedom from industrial sounds and sights while on the land; and healthy wildlife, fish, berries and plants that are free of toxins. The loss or degradation of culture and Traditional Knowledge can be “experienced as a form of trauma that extends across generations”.²⁶¹ Its loss can also contribute to the breakdown of health and wellbeing.²⁶² The ability to continue traditional land uses practices, such as harvesting, is therefore an integral part of transferring Traditional Knowledge and culture, and preserving cultural identity.

The RRDC and LFN Traditional Territory (in Yukon) has been subject to several major mineral developments that are now in closure or have been abandoned, including the Faro Mine, Ketza River Mine, Wolverine Mine, Se Dena Hes Mine and the Cantung Mine. Unplanned closures and/or abandoned mines, in particular, have left a legacy of mistrust and traditional land use effects. These experiences help with understanding how RRDC and LFN may be affected by the proposed Project, either through actual or perceived effects.

Weinsten (1993), in his retrospective report on the effects of the Faro Mine to the traditional economy of the RRDC, notes that although the RRDC and other Kaska people value employment and economic benefits from mines, “each new development results in a shrunken subsistence land base.”²⁶³ The report specifies that the overall effects of the Faro mine shifted RRDC’s land use further east from the Anvil Range to Ross River and beyond, including the area in and around the proposed Project. Also noted in Weinsten (1992), on the loss of traditional lands as a result of the Faro mine,

The camp and harvesting areas in the valley were no longer available. Families used to camping in this area returned to a scene of devastation on habitually used lands. The loss was (and still remains) heartfelt.²⁶⁴

Morell (1992)²⁶⁵ examined the effects of the Ketza River Mine on RRDC land use,

Many people are not willing to drink the water [from Cache Creek and the Ketza River, approximately 90 km west of the Project]. None of the interviewees has fished in the system since the mine has been in operation, although many did so in the past. Several interviewees expressed concern

²⁶¹ National Inquiry into Missing and Murdered Indigenous Women and Girls. 2019. Reclaiming Power and Place: Executive Summary of the Final Report. https://www.mmiwg-ffada.ca/wp-content/uploads/2019/06/Executive_Summary.pdf, pg.23.

²⁶² Angell, A.C. and Parkins, J.R. Resource Development and Aboriginal Culture in the Canadian North. 2010. *Polar Record* 47(240), 2011.

²⁶³ Weinsten, M. The Ross River Dena: A Yukon Aboriginal Economy. Royal Commission on Aboriginal Peoples, Aboriginal Economy Case Study Project. 1993. pg. 66-67;

Dreyer, D. Impact and Benefits Agreements; Do the Ross River Dena Benefit from Mineral Projects? University of Northern British Columbia, 2004.

²⁶⁴ YOR Document 2017-0083-157-1.

²⁶⁵ Morrell, M. Indian land use in the Ketza River Valley and the impact of the Ketza River Mine. Prepared for the Ross River Dena Council, 1992.

that the health of the game animals may be threatened by contaminated water or food, and some people worried that the game meat may be hazardous to human health.²⁶⁶

The Proponent provided an analysis of how unplanned mine closure affects certain values, including those of First Nations, in response to IR No. 4B. In reviewing this information, LFN noted,

The history of mining in Kaska territory ... treats each development in a singular fashion. There is no analysis included of the ways the interactions of multiple developments have resulted in a larger impact on Kaska communities, limited potential resiliency, created a traumatized population or limited the Traditional Land Uses that are essential to both Kaska health and cultural sustainability (land-based education).²⁶⁷

In relation to mine-related industrial traffic on the RCH, LFN notes,

Reference is made [in proposal information] to roads increasing access to Traditional Land Use activities. LFN's experience is the opposite. Increased industrial traffic has resulted in reduced use of roads by LFN citizens wanting to exercise Kaska rights due to their justified fear of motor vehicle accidents ... many of those roads have exploited the presence of existing, ancient Kaska trails resulting in specific displacement.²⁶⁸

The above information demonstrates how development, mines in particular, has influenced traditional land use patterns in the past. This information shows how traditional land uses, and subsequently the transfer of Traditional Knowledge and culture, may have already been affected by past developments, and how they may be further affected in the future. Comments submitted by LFN note: "For Kaska, it is exceptionally difficult to separate the cumulative and intergenerational impacts from mining, and the potential or likely impacts from KZK, from the colonialism, residential schools, and earlier construction of the highway Given the profound, intimate, and unique connection Kaska people have with their land, the natural environment, and all living things that depend upon a healthy environment, the devastating environmental effects of failed mines also contributes to harm to health and well-being. This is the Kaska

²⁶⁶ YOR Document 2017-0083-157-1.

²⁶⁷ YOR Document 2017-0083-3867.

²⁶⁸ YOR Document 2017-0083-3867.

context for the KZK Project, and it is critical to recognize that a baseline from which to assess significance of impact of this project under YESAB's mandate is very complex."²⁶⁹

Existing Conditions and Trends

Traditional Harvest

Specific information about the locations, timing, intensity and nature of contemporary land uses in and around the Project area is limited. However, the EC is satisfied that sufficient information has been received to confirm that the Project area is traditionally important, and that RRDC and LFN citizens continue to exercise their harvesting rights, including hunting, trapping, fishing, and gathering of plants, in the project area. Harvesting occurs throughout all seasons and coincides with Project activities. As mentioned, RRDC and LFN citizens are reliant on subsistence harvesting as part of their livelihoods, the continuation of which they have identified as essential to their way of life.

In its comments from March 2018,²⁷⁰ LFN further demonstrates this when it notes that, "along with other Kaska people, LFN citizens continue to use and occupy their traditional lands, including those lands in and around the Project Area. The exercise of their seasonal harvesting activities, include hunting, trapping and fishing, gathering plant foods and medicines, both in the immediate Project Area and in the surrounding area at Frances Lake, Finlayson Lake and Wolverine Lake." RRDC, as noted in the Project proposal, has requested that its hunters be allowed to use the access road,²⁷¹ which is also an indication of contemporary harvest in the Project area. The access road has been inaccessible to non-mining traffic—a condition of the lease and a measure to reduce hunting pressure on caribou.

LFN and RRDC consistently articulate the importance of the FCH, and caribou in general, in comment submissions to YESAB. Most recently, LFN identified "deep concerns about the impacts of the Project on all of their traditional harvesting rights, and in particular on the FCH, on which they have traditionally relied and which they understand has been in significant decline for the last three decades."²⁷² LFN further "asserts a Kaska right to hunt the FCH for food, social, ceremonial purposes and for a moderate livelihood", also noting, "The specific connection to caribou in this area is critically important in terms of LFN's constitutionally protected right to harvest a preferred species in a preferred location..."²⁷³ RRDC refers to the Elders' concerns for caribou "...FCH makes this area special and important traditional hunting area and their habitat will be significantly altered by this project..."²⁷⁴

Moose are also a highly valued species harvested by RRDC and LFN. Concerns about over-harvesting within the Traditional Territories have cause RRDC to impose permits for all non-

²⁶⁹ YOR Document 2017-0083-9556

²⁷⁰ YOR Document 2017-0083-282-1.

²⁷¹ YOR Document 2017-0083-010-1.

²⁷² YOR Document 2017-0083-282-1, pg. 3.

²⁷³ YOR Document 2017-0083-7338, pg.10

²⁷⁴ YOR Document 2017-0083-1434

Kaska hunters, and LFN has declared a hunting ban for all non-Kaska and non-local hunters (other than residents in communities in Kaska territory, for certain areas).²⁷⁵

Little information exists that speaks to the contemporary harvest of waterfowl and fish in the immediate Project area. The Proponent identified grayling in Geona Creek, which is within the Project footprint. Grayling are also found in associated drainages including South Creek, North River, Finlayson Creek and East Creek.²⁷⁶ “Other harvested fish species identified in the regional area include burbot and lake trout.”²⁷⁷ It is reasonable to assume that fish are harvested from the watershed to some degree, or may be in the future.

Chapter 12 of the Project proposal discusses vegetation composition throughout the site. There are a number of different ecosites throughout the Project site, of which a number appear to support harvestable plants, such as blueberry, cloudberry, Labrador tea, lowbush cranberry and willow. Little information is available regarding harvesting areas for plants that specifically exist in the Project area. RRDC Elders, however, did identify large berry patches as well as a number of medicinal plants at the Project site,²⁷⁸ suggesting that the site has good plant harvest potential. The Proponent however cited that specific harvest sites, and medicinal plants, were not presented to YESAB due to confidentiality agreements with RRDC.²⁷⁹ It is unclear if contemporary plant harvest occurs at the site.

The project area has experienced significant mineral exploration and past mining development, and the ability to harvest by RRDC and LFN has already been affected from industrial activity through removal of harvestable areas; changes to wildlife movement from disturbances and habitat loss; and avoidance of harvesting areas due to fear or perceptions of contamination.

Trapping

The Project overlaps with RTC 405 and RTC 250. RTC 405 is the RRDC group trapline and RTC 250 is an individual trapline, held by two RRDC citizens. RTC 405 is a large trapline representing an amalgamation of several family trapping areas. The Project area overlaps the Dick family trapping area, as shown on a map from the 1950's²⁸⁰. The Proponent indicates that LFN citizens are not known to hold any traplines in the broader Project region.²⁸¹ There is no available primary data related to trapping activities for the Project site and the broader RSA. It is clear from comments received from LFN,²⁸² and through public information sessions held in the communities of Ross River²⁸³ and Watson Lake,²⁸⁴ that traditional use activities, including trapping, by both LFN and RRDC citizens has occurred historically, and continues to occur, across their Traditional Territories. Specifically, RRDC citizens benefit economically from trapping within the proposed Project site.

²⁷⁵ <https://www.yukon-news.com/news/liard-first-nation-declares-hunting-ban-for-non-kaska-non-locals/>

²⁷⁶ YOR Document 2017-0083-031-1, pg.10-12.

²⁷⁷ Ibid.

²⁷⁸ YOR Document 2017-0083-046-1, pg. 15-57.

²⁷⁹ YOR Document 2017-0083-356-1, pg. 50.

²⁸⁰ Icetone 2019. YOR 2017-0083-5717, pg. 25.

²⁸¹ YOR Document 2017-0083-356-1 inclusive through YOR Document 2017-0083-360-1.

²⁸² YOR Document 2017-0083-282-1 and YOR Document 2017-0083-3867.

²⁸³ YOR Document 2017-0083-277-1.

²⁸⁴ YOR Document 2017-0083-275-1.

Observational data collected by the Proponent, through field surveys, camp log recordings and incidental observations, identified a variety of furbearing species inhabiting the Project site and in surrounding areas, including weasel, American marten, red fox, red squirrel, lynx, ermine, muskrat and beaver. While there are a variety of furbearing species within the RSA, grey wolf and wolverine were used as indicator species by the Proponent. These species have broad habitat ranges, specific habitat requirements and are more vulnerable to disturbance than other species. Tracking, modelling and understanding the Project in relation to these species will serve as a proxy for other furbearing species found in the Project area.

Trapping areas have been affected from existing and past mineral exploration and development in the Project area, though the EC has not received primary data detailing these effects.

Traditional Knowledge and Cultural Continuity

The Project occurs in an area of traditional and cultural importance to both the RRDC and LFN. Archaeological evidence, discussed in Section 11, indicated prehistoric use of the Project footprint and access road. Information submitted during the assessment—including the ethnographic overview of the Project, the independent studies of LFN and RRDC traditional land uses commissioned by the Proponent, as well as the independent study of traditional land uses along the RCH—provide well-documented accounts of traditional land uses within a 100 km buffer of the Project and along the RCH. These uses include, but are not limited to, hunting, trapping, trading, fishing, plant and medicine harvesting, camping, and cultural and spiritual uses.

Culturally important areas (e.g. Money Peak, North Lakes, Wolverine Lake, Finlayson Lake, Frances Lake), as well as the extensive network of trails between these and other traditional use areas, occur within 100 km of the Project. There are two main routes to the proposed Project area, including from the east starting at Frances Lake along Money Creek, as well as from the north at Pelly Banks through Finlayson Creek.²⁸⁵ In addition, there are several Kaska cabins in the region, including at nearby locations along North Lakes, Money Peak and Wolverine Lake, with more distant locations along Frances Lake, Pelly Banks and Money Creek.²⁸⁶

RRDC and LFN have interim protected lands (RRDC-R-15A, RRDC-S-127B and LFN-S-103B, as well as others along the route of the RCH), which were selected for various reasons by the First Nations. Reasons for selection vary but can be represented by the following: the presence of existing structures or sites of importance, development potential, a family- or Elder-recommended selection, and harvesting uses. RRDC-R-15A occurs immediately adjacent/south of the proposed Project site. Category A lands include subsurface rights and are excluded from licensed hunting.

The contemporary uses of the Project area for traditional purposes are not well understood by the EC (e.g. the intensity of use of the Project area, types of use and locations). However, the transfer of Traditional Knowledge and culture may be affected in areas of particular significance

²⁸⁵ YOR Document 2017-0083-275-1.

²⁸⁶ YOR Document 2017-0083-046-1, pg. 15-11.

to First Nations, even where/if traditional land use activities are not currently being practised there. As discussed above in the harvesting and trapping sections, a variety of traditional land uses have occurred and likely are continuing to occur in the Project region. Thus, while limited first-hand land-use information was available for the assessment, sufficient information was presented to determine that the Project region has high cultural significance for RRDC and LFN, and that a variety of land uses still occur to this day.

The preservation of traditional use areas for future generations has also been identified by both First Nations as an important consideration for this Project. A comment by LAWS notes that Kaska experience has shown that much of the damage to land, water and habitat of past mines is irrevocable and requires treatment in perpetuity²⁸⁷ and this experience has resulted in an abandonment of traditional land uses in some areas (e.g. Faro Mine) that continues to this day.

Project Design

The Proponent has proposed a number of Project design features and mitigation measures that will reduce potential impacts to traditional harvesting. These are primarily found in the Project proposal, Wildlife Management Plan, Fish and Aquatic Habitat Management Plan and other company policies. Key measures or Project design features committed to by the Proponent that eliminate, reduce or control the adverse effects to wildlife, fish and plant harvest include the following:

GENERAL PRACTICES AND COMMITMENTS FOR MINIMIZING EFFECTS TO HARVESTING

- Rock management facilities have been sighted and placed away from waterbodies, watercourses and associated water collection ponds in order to manage contamination. These facilities will be capped at their end of life to further reduce contaminants from entering watercourses.
- A closure plan has been developed which contains a key objective to “Return the mine site and affected areas to viable and, wherever practicable, self-sustaining ecosystems that are compatible with a healthy environment and with traditional land use activities.”²⁸⁸

SPECIFIC MITIGATIONS AND PROJECT DESIGN THAT MINIMIZE EFFECTS TO WILDLIFE

- The access road will see continued access controls, as has been ongoing since the 1990s. Use of the road “during Project operations to access recreational areas for ATV and snowmobile use will be strictly prohibited.”²⁸⁹
- A staffed gate will be installed to prevent road access by hunters until it is decommissioned.
- There will be no-feeding, harassment or hunting of wildlife by employees, contractors and visitors.
- A no hunting and no fishing policy will be instated for all employees.
- A Proponent–Kaska environmental, cultural and heritage management program for the Project will be developed. The goal is for the Project area post-closure to be “compatible

²⁸⁷ YOR Document 2017-0083-5830

²⁸⁸ YOR Document 2017-0083-356-1, pg. 55.

²⁸⁹ Ibid. pg. 127.

with a healthy environment and with traditional land use activities”. The Proponent indicates that, “therefore, there will be no contamination of the land that will prevent the land users from returning to the KZK Project area in post-closure.”²⁹⁰

- A co-management plan developed for fish and wildlife, wherein “it is anticipated that RRDC will collaboratively design, collect, report, manage and communicate the results of the wildlife monitoring program to RRDC citizens. This program would be active through all Project phases and would collaboratively ensure any impacts to the traditional use animals are minimised.”²⁹¹
- Construction of water management and treatment ponds, as well as fish habitat compensation ponds (constructed wetlands), both of which are also expected to provide habitat for waterfowl species.

A SUITE OF FISH AND FISH HABITAT MITIGATIONS TO AVOID AND OFFSET EFFECTS TO FISH AND THEIR HABITAT

The list below highlights some of the key fish and fish habitat mitigations, however it is not an exhaustive list. More specific details are laid out in Section 5.3 – Project Design.

- Water management facilities will be operated throughout the life of the mine and into the closure period, until long-term constructed wetlands are developed and functional.
- A dry-stack tailings facility has been sited outside of creek alignment in order to mitigate effects to water quality and fish habitat.
- The Proponent commits to developing a FOP. Aspects of this plan include
 - construction windows that mitigate effects to key life-cycle phases for fish populations and sensitive ecosystems;
 - development of a water conveyance system that redirects non-contact water, to ensure ongoing water quality,
 - Establishment of sediment and erosion control measures and associated structures throughout all phases of the Project;
 - development of spawning habitat for grayling;
 - reconnection of fish habitat in Finlayson Creek through passage enhancements under the RCH, as it currently serves as a fish passage barrier;
 - fish habitat compensation in the form of three constructed wetlands, in order to address fish habitat effects resulting from the Project.
- The Project has been designed to ensure that open pit placement does not cross the watershed divide and that, upon mine closure, the pit water would continue to flow north and not into North Lakes, in an effort to avoid effects to surface water quality and ground water quality in the watershed south of the Project.
- A co-management plan, as part of the broader Proponent–Kaska environmental, cultural and heritage management program, has been developed for fish and wildlife, wherein, “it is anticipated that RRDC will collaboratively design, collect, report, manage and communicate the results of the fish monitoring program to RRDC citizens. This program

²⁹⁰ YOR Document 2017-0083-356-1, pg. 18.

²⁹¹ Ibid. pg. 55.

would be active through all Project phases and it is anticipated that it will provide a forum to incorporate culturally relevant mitigation measures to the fish and aquatic resources monitoring and adaptive management programs.”²⁹²

A PROGRAM AIMED TO MINIMIZE EFFECTS TO PLANTS AT THE SITE AND FUTURE HARVEST

- A reclamation research program initiated in 2017 by the Proponent, involving RRDC Elders, is to become a component of the Proponent’s co-management program, seeing the research continue through all phases of the Project. “The program will ensure that the vegetation used in reclamation is culturally appropriate and/or is approved by RRDC.”²⁹³

TRAPPING COMMITMENTS

The Proponent has proposed a number of design components and mitigation measures that will reduce potential effects to furbearers and trapping. These are found throughout the Project proposal, the Wildlife Management Plan, and company policies, and include the following:

- The Project footprint was designed to cover as little area as practicable to minimize habitat loss and disturbance.
- Ensuring progressive and final reclamation to disturbed areas.
- Appropriate measures to carry out blasting activities at the mine in a manner that avoids wildlife disturbance during critical life-cycle stages will be established in consultation with the Yukon regional biologist.
- A company policy that restricts the recreational use of all-terrain vehicles and snowmobiles.
- Machinery and personnel will be required to remain within the Project site and roadways and along defined roads.
- A company policy that feeding, harassment or hunting of wildlife by employees, contractors and visitors is prohibited.
- Enforcement of vehicle speed limits and the use of radios to report wildlife on roads to reduce collisions.
- Ensuring minimum traffic levels are maintained along the access road and the application of vehicle convoys to reduce periods of sensory disturbance.
- A winter wildlife monitoring program for wolves, wolverines and other furbearers, which requires that information regarding animal presence and denning locations be collected.
- Engaging all local trappers well in advance of any activities taking place in their trapline area(s) and working with them to resolve any concerns raised.
- As part of the Socio-economic Participation Agreement (SEPA), the Proponent has agreed to pay a land use interruption supplement to mitigate the Project effects on RRDC citizens who hold trapping rights under the RTC group trapline (RTC 405) and operated traplines (RTC 250) within the Project area.

²⁹² YOR Document 2017-0083-356-1, pg. 35.

²⁹³ Ibid. pg. 52.

Effects Characterization

Overview

The consideration of effects to traditional land use must take into account the views of RRDC and LFN regarding how existing land uses and industrial developments have already affected the ability of Kaska citizens to engage in traditional land uses throughout their Traditional Territories. This consideration forms an important context for how RRDC and LFN view the incremental effects of the Project on their nations. These First Nations have consistently maintained that the Project has the potential to significantly effect the exercise of their Aboriginal rights within the Project area. Uncertainty around potential effects has been attributed (by LFN) to a lack of meaningful consultation and First Nation involvement in project design and proposal development, as well as in the assessment process, and a lack of availability and inclusion of Traditional Knowledge and primary data collected in culturally appropriate ways. Very little primary data on traditional land use, in particular relating to contemporary land uses, has been made available to the EC. The Proponent has recognized the importance of the area for traditional land uses and has supported the efforts of RRDC and LFN to collect additional Traditional Knowledge and traditional land use information about the Project area for assessment, regulatory and Project monitoring purposes. This information—to the extent that it has been made available to the Proponent so far, as well as past traditional land use studies and desktop reviews of publicly available information—has informed the Proponent’s assessment of the effects to traditional land uses through an analysis of the individual valued components that traditional land uses rely upon (e.g. wildlife, water, plants, vegetation).

The Proponent also considered the effect of mine employment on the ability of workers to pursue traditional harvesting activities. The Proponent concluded that with the various measures proposed to mitigate effects to each of the valued components, the compensation measures identified in the SEPA, as well as First Nation involvement in monitoring and adaptive management plans, are sufficient to ensure that traditional land uses are not significantly affected.

The EC considered the potential effects of the Project on traditional land uses through examination of effects to traditional harvest, trapping, and the transmission of Traditional Knowledge and cultural continuity. In making a determination about whether the Project would result in significant adverse effects to traditional land uses, the EC considered the information and analysis presented by the Proponent, the views and information presented by RRDC and LFN, as well as information and conclusions provided in other sections of this report.

Traditional Harvest

OVERVIEW

Comments received as part of this assessment from LFN highlight concerns with Project effects to traditional harvest, “Many LFN concerns with the Project are around impacts on caribou and moose, although we are also concerned about impacts on fur-bearing species and medicinal

plants, and spiritual relationships with all of those things.”²⁹⁴ At community engagement workshops hosted by LAWS, caribou and fish were identified as “fundamental to Kaska community life and traditional practices.”²⁹⁵ As traditional harvesting is an integral component of RRDC’s and LFN’s culture and socio-economic needs, the assessment must consider not only the effects to the accessibility of harvestable goods, but also the continued ability to fulfill these needs.

This section considers how RRDC and LFN traditional harvesting activities, including hunting, fishing and plant harvesting, may be adversely affected by the Project. For each traditionally harvested resource discussed below, the EC considered how the Project would affect the

- availability of the resource;
- quality of the resource;
- access to the resource; and
- the experience in practicing the harvesting of the resource.

The harvestable resources considered include caribou, moose, waterfowl, fish and plants. While these do not represent the entire suite of items that may be harvested for traditional purposes, they were specifically identified in comments received during the assessment and are considered representative of the potential effects experienced with other harvestable resources.

AVAILABILITY OF HARVESTABLE RESOURCES

CARIBOU

The potential for the Project to affect the FCH and the traditional harvest of this species has been a central concern identified throughout the assessment by RRDC and LFN. A key concern noted is the added effects of project activities on an already declining caribou herd, and uncertainties around how this might affect the harvest of this culturally important species by Kaska citizens in the long term.

The potential effects of the Project on caribou habitat and abundance are discussed in detail in Section 6.1 of this report. The EC made the determination that the effects to caribou are significant and recommended terms and conditions to mitigate potential significant adverse effects. The EC is satisfied that with the implementation of recommended terms, in addition to the measures proposed by the Proponent, that the FCH population will not be significantly affected. From a traditional harvesting perspective, this should ensure that the Project does not significantly alter the availability of caribou for traditional harvesting purposes overall.

From a local-level perspective, harvest of caribou in a preferred hunting area may be disrupted as a result of caribou avoidance of the project area. If caribou are present, harvest success may be affected due to animals fleeing incidental disturbances from project activities (e.g. blasting) when they overlap with harvest activities. The effects to traditional harvest of caribou from a resource-availability perspective will be greatest during the construction and operation phases, and may persist even longer depending on the time it takes for caribou to recolonize the area

²⁹⁴ YOR Document 2017-0083-3867, pg. 9.

²⁹⁵ YOR Document 2017-0083-2838, pg. 1

after mining ceases. While the overall availability of caribou is not expected to change as result of the Project, their distribution further away from the project site means that traditional harvesters will likely have to go elsewhere (i.e. beyond the zone of influence of disturbance from the Project) to encounter and successfully harvest caribou. It is anticipated that harvesters access and harvest caribou from various locations within the region and the herd's range. However, given the cultural significance of harvesting caribou from the specific project site and in consideration of disruptions to caribou harvest areas from additional developments within its range, the loss (or reduced abundance) of caribou for harvesting from the project site is considered a high-magnitude effect. The effect of loss/avoidance of the area may persist beyond mine reclamation and decommissioning.

MOOSE

As previously discussed, moose are a highly valued harvested species by RRDC and LFN. Section 6.2 of this report discusses the potential effects of the Project on moose habitat and abundance, and concludes that the Project is unlikely to significantly affect moose populations (through mortality or habitat loss). As such, the Project is also unlikely to significantly affect the overall availability of moose for traditional harvesting.

No information was submitted during the assessment that indicated that the Geona Creek valley is a preferred moose harvesting area, though moose have been, and continue to be, harvested for traditional purposes in the general project area. Moose availability will be limited in the immediate project footprint until mining ceases and habitat is restored; thus, the Project does contribute to location-specific reduction in moose availability. Excellent moose habitat exists in the project area and moose are expected to be ubiquitous throughout the area. As such, the reduction in moose availability within the project footprint relative to the available moose in the region is considered minor and reversible in the long term once the site has been reclaimed.

WATERFOWL

While little primary data is available with respect to waterfowl hunted and preferred by RRDC and LFN, ethnographic studies suggest that waterfowl are an important component of the subsistence diet. Information provided by the Proponent suggest that the water and wetlands of Geona Creek have been identified as important habitat for wildlife that RRDC rely on. The EC considers that potential waterfowl harvesting areas will be lost as a result of the Project, thereby reducing waterfowl availability within the Project footprint. Waterfowl are adaptable species with generalist habitat requirements; however, habitat loss will occur during all phases of the Project, albeit there will be suitable habitat readily available elsewhere within the Project's vicinity. Waterfowl habitat is specifically enhanced in later phases of the Project (to achieve closure objectives) through the creation of constructed wetlands. The overall loss of waterfowl availability, relative to the abundance of waterfowl habitat in the region is considered relatively minor given habitat-enhancement measures proposed.

FISH

Fish availability will be permanently altered for traditional harvesting within the Project footprint. Section 5.3 identifies that grayling habitat will be locally and permanently affected in upper Geona Creek. However, fish impact offsetting measures will see habitat replacement in lower

Geona Creek and reconnection of fish habitat in Finlayson Creek, resulting in limited impacts to fish and fish habitat overall. The Proponent indicated that Geona Creek is not likely an important fishing site given the low densities of fish found in the creek. Outside of the Project site, there is a low risk of effects to fish and fish habitat due to Project design, water quality management and treatment, and fish impact offsetting commitments made by the Proponent. Within the Project area, fish harvest areas will be permanently removed; this, however, represents a relatively small area of available fish habitat in the region.

PLANTS

The Project footprint will result in the clearing and loss of vegetation. The Proponent indicates that a number of culturally important plants (both berries and medicinal plants) have been identified by RRDC Elders in the Project area. Ecosites supporting harvestable plants (e.g. berries) will be cleared during the construction, operation and closure phases of the Project. In addition, the Project site will be inaccessible during the life of the mine, eliminating accessibility to vegetation communities and harvestable plants. However, the Project footprint is relatively small, and vegetation communities that comprise the Project site are common throughout the regional area, suggesting readily available potential for harvestable plants outside of the Project area. Furthermore, commitments for progressive rehabilitation and site reclamation through the co-management plan, with the identified goal of returning the site to “viable ... self-sustaining ecosystems ... compatible with traditional land use activities,”²⁹⁶ indicate that harvestable plants loss will be limited in geographic extent, of a low magnitude and reversible.

ACCESS TO HARVESTABLE RESOURCES

Access to harvesting any of the above resources may be limited as a result of the Project from increased mine-related traffic along the RCH and the associated fear of collision, which has been noted in several submissions during the assessment. RRDC explains the “Campbell Highway is too narrow for haul trucks and trucks that haul heavy equipment. This becomes hazardous for local people to be driving and meeting on-coming traffic. There will be accidents, some may be fatal.”²⁹⁷ Citizens may avoid accessing areas of traditional harvest that require travel along the highway due to the perception of increased safety risk. The Proponent has committed to minimizing the number of vehicles travelling along the highway to the extent possible and travel speeds will be strictly adhered to. Trucks may travel in convoys when possible so as to cluster times of highway use; this strategy may also pose additional risks and would be tested for its effectiveness. These strategies, however, may do very little to quell fears around potential highway collisions. The increase in traffic will be experienced on the southern portion of the RCH, from Watson Lake to the Project site, thus access to harvesting area may be restricted for some outside of the Project area and extending the magnitude of the effect. The duration of the effect will be medium term, greatest during construction and operations.

Access within the Project footprint will be prohibited for harvesters for the duration of construction, operation and parts of closure for safety reasons. Citizens may also limit their access around the Project site due to perceptions of increased use by mine personnel. However, the Proponent will institute policies limiting recreational ATV use in the project area

²⁹⁶ YOR Document 2017-0083-356-1, pg. 55.

²⁹⁷ Example: YOR Document 2017-0083-1434 pg. 7

and mine-related traffic will be contained within the roads and trails in the project footprint. As long as the Proponent policies are implemented and enforced, perceptions of increased trail use by mine workers will be minor, short term and reversible.

QUALITY OF HARVESTABLE RESOURCES

Harvest of resources may also be adversely affected as a result of perceptions of contamination of ground, air, water and plants. These aspects of contamination are discussed elsewhere in this report, and significant, lasting contamination is not a likely effect of the Project. However, there may be perceptions of resource contamination from this and other projects within the Traditional Territories that deter Kaska citizens from harvesting the resources. For fishing or other harvesting activities that require water use, perceptions of contaminated water quality, and therefore fish resources, can result in the disruption to harvesting downstream from the mine site for some distance. Such perceptions could be long lasting and potentially irreversible for some. LFN notes, "LFN does not know of any closed mine in Kaska territory where the re-uptake of traditional activities has occurred - not one. Instead, the land base on which we exercise our rights has been whittled away piece by piece."²⁹⁸

EXPERIENCE OF TRADITIONAL HARVESTING

RRDC and LFN citizens may be affected by a reduced experience while undertaking traditional harvesting activities as a result of the Project. The EC understands that harvesting is not simply about sustenance, but also as a means to connect with ancestors, to carry on traditional practices, to feel connected to the landscape and to reinforce cultural identity, among other things. Alterations to the landscape, noise from equipment, the influx of people to the area, fear for personal safety and perceptions of contamination all have the potential to reduce harvesting experiences. These negative experiences, over time, can discourage citizens from harvesting in the area, which is a high-magnitude effect and potentially irreversible. While effects to the experiences of traditional harvesters will be greatest during construction and operations, some may be longer term, such as those resulting from a permanently altered landscape.

TRAPPING

The Project may affect traditional trapping activities in the Project area. Mine construction and operations, coupled with habitat loss, will alter furbearer land use and movement patterns, and may alter furbearer numbers throughout the LSA and RSA, as described in the Project proposal. The Project will result in direct and indirect effects to all furbearing species. Habitat disturbance, fragmentation and loss will occur, as the Project footprint will remove suitable furbearer habitat and this could hinder trapping success. The majority of habitat loss will be interim, occurring for the lifespan of the Project and until reclamation has been achieved. A small portion of habitat loss will occur in perpetuity, specifically with the creation of the pit and waste rock storage facility.

Increased road density in the Project area may result in increased mortality of furbearing species generally, potentially leading to local population declines for some species, which could negatively affect trapping. An analysis of the effects to wolverines and wolves showed that predicted road density for the Project falls within the bottom range of the low-to-moderate

²⁹⁸ YOR Document 2017-0083-3377

magnitude threshold of 0.3 to 0.6 km/km². EDI, whom the EC retained, has identified that because effects are predicted to be low to moderate in magnitude and may only adversely impact a limited number of individuals, “these effects are expected to not affect the regional population of furbearer species.”²⁹⁹

Trapping will be affected by access restrictions around the mine site. Noise, dust and mine site activities may also directly and indirectly affect trapping, as individuals may not wish to trap in areas that have been altered, affected by mining activities or perceived to no longer be healthy environments. As a result, the ability for RRDC group trapline members to carry out their trapping in this area will be affected during all phases of the Project. The Dick family, who historically trapped in the area overlapping the Project, will likely be disproportionately impacted compared to others within the group trapline.

To compensate for lost trapping opportunities, the Proponent has committed to providing the holders of RTC 405 and RTC 250 with a land use interruption supplement. The details of the SEPA are confidential and not known by the EC. No information was received during the assessment that would suggest that trappers had any outstanding concerns with the Project.

Traditional Knowledge and Cultural Continuity

For the purposes of this section, the effects to Traditional Knowledge and cultural continuity consider the effects to land-based activities, practices and traditions, as well as the associated cultural identity of RRDC and LFN. The sections above on traditional harvest and trapping discuss the potential for the Project to adversely affect those specific traditional land uses. This section provides a more holistic overview of how the incremental effects to those land uses, as well as to other lands uses and other First Nation values, interact to affect the transmission of Traditional Knowledge and cultural continuity.

As previously noted, existing developments within RRDC and LFN Traditional Territories, namely the operation and closure of several mines as well the construction of roads within the Traditional Territories, have affected RRDC and LFN traditional land use patterns. Effects from these developments, real or perceived, have shifted land uses away from mine sites for fear of contamination; have resulted in increased non-First Nations presence accessing traditional resources and culturally important sites; and has increased industrial traffic on roads with, in particular, a fear of collisions among traditional land users. These activities, as well as other land and resource developments within the Traditional Territories, have already altered the relationship with the landscape and provide important context for how RRDC and LFN perceive the effects of the proposed Project; there is very little tolerance for “another mine” affecting traditional land uses. Both RRDC and LFN have expressed concern for the ability to continue with traditional land use into the future as a result of this Project.

The proposed Project overlaps a culturally important area within the RRDC and LFN Traditional Territories and these First Nations maintain a deep connection to the land. For this Project, the

²⁹⁹ YOR Document 2017-0083-0950.

EC considers that the transfer of Traditional Knowledge and culture may be adversely affected by the following:

- The removal of the Project area and access road from traditional land use, including hunting, trapping, fishing, plant harvesting and cultural/spiritual practices, for the lifespan of the Project. This is combined with effects from on-site exploration activities that have occurred, and continue to occur, as well as other major developments (mines, road construction) in the Traditional Territories.
- Indirectly, traditional land use areas and important cultural sites may be avoided around the Project footprint due to industrial noise and/or human disturbance, which might interfere with enjoyment and connection to the area, and result in disturbances that result in displacement of wildlife.
- Avoidance of traditional land use areas could also result from real or perceived contamination of water quality, plants, fish and wildlife in the Project area.
- Physical alteration of the region's natural character, such that the memory of the former landscape and its use is eventually lost.
- Destruction or degradation of unprotected culturally important sites (e.g. trails, graves, gathering sites, hunting areas, undiscovered heritage resources) are discussed in Section 11).
- Reduced access to traditional use areas due to fear of collisions with mine traffic, restricting First Nations citizens' "ability to move freely and safely about [their] lands."³⁰⁰
- Compromised ability for current citizens and future generations to be effective stewards of the lands and resources within the Project area.
- Reduced opportunities for transfer of Traditional Knowledge and culture related to the Project area as a result of reduced opportunities to meaningfully engage with traditional, spiritual or cultural ceremonies over the lifespan of the mine and beyond.
- Reduced opportunities for Kaska employees of the Project to meaningfully engage in traditional land use activities due to work commitments.

All of the above considerations can negatively alter how First Nations feel about and use the area for generations to come, adversely affecting both individual and collective relationships with the land, the knowledge of the land and transmission of that knowledge. Such effects are difficult, and in many cases, impossible to quantify. Effects to Traditional Knowledge transmission and cultural continuity are most likely to occur during the construction and operation phases of the Project, when activity at the site and along the RCH will be greatest. However, the long-term presence of mine infrastructure during the closure phase, as well as any negative experiences while undertaking traditional land uses, may extend the effects. In addition, should there be concerns, real or perceived, about contamination of waterways or the area from mining activities, land use may be reduced or abandoned altogether. In this scenario, effects to Traditional Knowledge and cultural continuity related to the area would continue into the future.

³⁰⁰ YOR Document 2017-0083-282-1, pg. 9.

LFN notes that it “has determined that the greatest risk to the Kaska at this point is the lack of certain critical information.”³⁰¹ Despite being in an assessment process for three years, and consultations between the Proponent and First Nations having occurred prior to that and continuing to this day, First Nations remain uncertain about how their traditional land uses will be affected by the Project. LFN attributes this uncertainty to a lack of meaningful Kaska engagement early on in project development. LFN explains, “The intensity of significant impacts to Kaska traditional land use, has yet to be adequately determined due to the lack of traditional use evidence presented by the proponent in support of its proposal. As a result, we don’t know how bad adverse changes are going to be, and we have little confidence that if the Project proceeds as planned, these impacts will be reduced to acceptable levels.”³⁰² This uncertainty, combined with a lack of confidence in assessment and regulatory processes, can feed perceptions that the Project may cause more harm to First Nations’ values than is likely to occur, and instill more fear/concern in citizens if the Project goes ahead. These fears and concerns can undermine the ability of the First Nations to engage in traditional practices and can become prevalent within communities.

Uncertainty is inherent in assessment processes. One method to deal with that uncertainty is through the development and implementation of monitoring plans and adaptive management plans. The Proponent has proposed the development of wildlife management and monitoring plans, and has committed to working with RRDC and LFN on many of these. LFN has not received the same assurances from the Proponent: “In no case do they [Wildlife Management Plans] include binding commitments for LFN involvement, and if anything, those commitments avoid LFN involvement.”³⁰³ While the Proponent has indicated they would continue to engage LFN through the regulatory process and Project implementation, they have not specifically included LFN in the Proponent–Kaska environmental, cultural and heritage management program, and subsequent management plans that will be developed as part of this Program. The EC is of the opinion that meaningful involvement of all potentially affected First Nations in monitoring and adaptive management is a critical means of building confidence that First Nation concerns will be appropriately dealt with. LFN has been clear that only they can represent their interests in this Project

In addition to involving First Nations in monitoring and adaptive management plans, the Proponent has proposed to manage potential effects to traditional land uses largely through compensation as provided for in the SEPA. While RRDC Chief and Council have expressed that they look forward to a renewed SEPA, LFN has indicated that the SEPA is outdated and does not represent their interests. Additional measures to offset effects to traditional land uses is therefore warranted.

Experience with past mines in the Traditional Territories indicate that disruptions to land use, and therefore cultural continuity, are considered likely. Whether these effects are experienced on an individual or collective basis will depend on how well-informed First Nations are about the mine’s operations and Project effects to the land (or how effects are being successfully

³⁰¹ YOR Document 2017-0083-3377

³⁰² Ibid

³⁰³ Ibid

managed). The magnitude of the effects will vary depending on the number of people affected, and may be disproportionate if, for example, several members of one family are disrupted (e.g. due to avoidance by one family of an area it typically uses). The duration of these effects can be long term, as previously reinforced by LFNs comments that traditional land uses have not continued on any of the other existing mine sites in Kaska territory.

Significance Determination

Wildlife Harvest

EFFECTS ARE LIKELY

The Project is likely to result in adverse effects to the availability of, access to, quality of, and experience in harvesting traditional resources. While the Project is not likely to adversely affect the availability of harvestable resources from the level of population or landscape, local-level changes will occur, namely the loss of availability of resources from the Project footprint and a greater area where disturbances from Project activities are likely to disrupt the movement and availability of wildlife or deter harvesters.

Access to harvesting areas is also likely to be limited for some as a result of increased traffic on the RCH and fear of collisions, as well as within the immediate Project area as a result of perceptions of increased use by mine employees.

While the quality of harvestable resources is not likely to be affected, perceptions around contaminated resources is considered likely. Additionally, alterations to the landscape, noise from equipment, the influx of people to the area and fear for personal safety all are considered likely to interfere with the experience while harvesting resources.

EFFECTS ARE ADVERSE

The effects to traditional harvesting activities are adverse. Traditional harvesting is known to occur in the Project area. As traditional harvesting is an integral component of RRDC and LFN culture and socio-economic needs, the loss of harvestable resources and disruptions to harvesting practices are adverse.

EFFECTS ARE SIGNIFICANT

The EC considers the effects to traditional harvesting to be significant. The overall availability of harvestable resources is not expected to be significantly altered as a result of the Project. The mine site and surrounding area, however, will have reduced availability for the duration of the Project, until reclamation has been completed or perhaps longer. Information submitted during the assessment has clearly demonstrated that the Project area has been used for traditional harvesting historically and is used currently, though frequency of use and specific locations used by harvesters are not well understood by the EC

Disruptions to traditional harvest via access limitations (real or perceived), fear of contamination of harvestable resources and/or a reduced harvesting experience are likely adverse effects of the Project. Some harvesting activities may already be disrupted due to existing exploration activities on-site as well as other mineral exploration nearby. However, the scale and intensity of

a fully operating mine will increase the magnitude of any such effects experienced. These effects are in addition to other disruptions to traditional harvesting activities as a result of other abandoned mines and land developments within RRDC and LFN Traditional Territories.

Many of the significant adverse effects to traditional harvesting are related to intangible effects of the Project, for which it is difficult to confidently predict and identify suitable mitigation. Good communication between the Proponent and all potentially-affected First Nations, as well as meaningful involvement in Project management plans will help to identify concerns relating to traditional harvest as they come up, and identify suitable solutions to address any concerns. Key aspects will be demonstrating how the Project is protecting the quality and integrity, as well as access to, the harvestable resources in the Project area on an ongoing basis.

Trapping

EFFECTS ARE LIKELY

The Project is likely to affect the ability to carry out traditional trapping within the Project footprint and the surrounding region. The ability for RRDC members to carry out trapping in this area will be affected for the lifespan of the Project, including during reclamation and road decommissioning. There is also a moderate likelihood that trapping will be adversely affected as a result of changes to furbearer habitat and distribution within and surrounding the Project footprint, including the access road.

EFFECTS ARE ADVERSE

Trapping is an important traditional economic activity for First Nations. Loss of trapping area, and the associated effects to furbearers for the duration of the Project, is an adverse effect.

EFFECTS ARE NOT SIGNIFICANT

Progressive rehabilitation and road decommissioning will result in reversing, controlling and eliminating habitat loss and mortality resulting from the Project. Reclamation will return much of the Project site, including the access road, to suitable furbearer habitat. In addition, following closure, human disturbance will be limited in the area, resulting in the site returning to furbearers. A small portion of the site, specifically the pit and the waste rock storage facility, will be perpetually altered due to the permanence of that infrastructure. However, those structures occupy a relatively small area, and as a result habitat loss will not be significant. Due to the abundance of furbearers in the Project area, it is not anticipated that trapping will be significantly affected in the long term. Furthermore, the Proponent has negotiated a land use supplement with RRDC, which will compensate for disruptions to the trapline holders overlapping the Project area. As such, the Project is not anticipated to result in significant adverse effects to trapping.

Traditional Knowledge and Cultural Continuity

EFFECTS ARE LIKELY

The Project is likely to result in effects to activities that support the transfer of Traditional Knowledge and culture continuity. The Project will result in the removal of the Project footprint from traditional land use activities, including traditional harvesting, as discussed above. First Nations are also likely to avoid areas surrounding the Project footprint due to a desire to avoid

industrial activity (e.g. increased mine traffic along the RCH or areas where noise from mine operations are perceptible). It is also likely that some First Nations will avoid the area for traditional pursuits in the long term due to the perception of contamination. This is due to experience with past mines, and associated long-term effects to traditional land use within RRDC and LFN Traditional Territories. Structures left on-site following mine closure will be permanent physical reminders of industrial development, and that association is likely to persist through generations.

It is likely that many RRDC and LFN members will be employed by the mine, removing a significant portion of Traditional Knowledge holders and traditional land users from communities. This will likely result in individual effects, such as reduced opportunities to carry out traditional activities, and collective effects, such as fewer people transferring Traditional Knowledge to others. Collectively, these effects can disrupt cultural practices into the future.

EFFECTS ARE ADVERSE

Continuation of cultural practices, described above, supports the transfer of Traditional Knowledge between generations and cultural continuity, which is essential to the identity of RRDC and LFN. The disruption to the transmission of Traditional Knowledge and cultural continuity is thus considered adverse.

EFFECTS ARE SIGNIFICANT

There has been sufficient information provided during the assessment to confirm that the region has both historical and contemporary importance, that traditional land use occurs to some extent in the Project area and that there is value placed on the ability to continue these practices in the future. As discussed above, the effects to traditional harvesting, which is an integral component of cultural continuity, were determined to be significant.

Past mine closures and other land developments within RRDC and LFN Traditional Territories have disrupted traditional land use activities; those disruptions continue today and are prevalent in the mindset of citizens. The proposed Project will increase the level of disruption to traditional land uses, which is likely to interfere with the transmission of Traditional Knowledge and cultural continuity; these effects are considered significant. The project area itself holds special value to Kaska citizens; the integrity of the Traditional Knowledge in the Project area and continuance of cultural pursuits are likely to be undermined as a result of the Project and may persist for generations.

Longer-term avoidance of the area, due to perceptions of land and resource effects, is a very real possibility. The magnitude of this effect will largely depend on the relationship developed between the Proponent and First Nations, and whether there is open, regular and meaningful sharing of information (regarding operations, effects and response), and a willingness to address concerns raised by RRDC and LFN. Comments provided to the EC suggest that these communication structures are not fully in place with LFN, and are still developing (e.g. a modernized SEPA) with RRDC.

Furthermore, the EC believes that with the rotational work schedule of two weeks in/one week out and four weeks of vacation leave per year (this amounts to 2 one-month breaks), First

Nation employees will not have sufficient time to attend culturally important events and/or partake in traditional land use activities. This, in turn, affects the ability of these employees to learn and experience activities on the land and to partake in culturally important events, thus negatively affecting their ability to both share and learn Traditional Knowledge. This is particularly significant to both RRDC and LFN as traditional land use activities and the teaching/learning of this knowledge is one of the most important determinants of cultural transmission and indicators of a healthy culture, potentially having negative implications to the communities, to cultural continuity, and to individuals' mental health and physical wellbeing.

Recommended Mitigations

The following mitigations address the likely adverse and significant effects to traditional harvesting, Traditional Knowledge transmission and cultural continuity as a result of the loss of a culturally significant area from traditional land uses, disruptions to land uses, as well as loss of opportunities for First Nation mine workers to engage in traditional land use activities.

- 12) The Proponent shall ensure that LFN and RRDC have opportunities to participate in and influence the development of environmental and socio-economic management plans and closure objectives developed for the Project to ensure that potentially affected First Nations can collaboratively design, collect, report, manage and communicate the results of the monitoring programs to their citizens.
- 13) The Proponent shall ensure that LFN has the opportunity to be part of the Proponent–Kaska environmental, cultural and heritage management program.
- 14) The Proponent shall sponsor on-the-land culture activities that promote sharing of Traditional Knowledge and practices in the Project area for the duration of construction and operation of the mine. The camp details, location and structure will be developed by potentially affected First Nations and span construction, operational and closure phases of the Project.
- 15) The Proponent shall provide allowance for up to 14 days of unpaid leave to all Yukon First Nation employees to allow for the exercising of Aboriginal rights related to:
 - b. the pursuit of traditional land use activities; this will be 14 days to allow sufficient time on the land; and
 - c. attending culturally important events (potlaches, dances, ceremonies, culture camps).

The EC recommends that the Proponent consult the *Canada Labour Code*, p. 262 entitled “Leave for Traditional Aboriginal Practices” when drafting this policy.

8. Economy

8.1 Tourism

Summary and Conclusion

The EC has determined that the effects of the Project on tourism are not significant. The assessment identified that there is limited spatial overlap between tourism activities in the region and Project activities. Furthermore, several measures were committed to by the Proponent which are considered adequate to eliminate, reduce or control the adverse impacts of the Project on tourism.

Importance of Tourism

Tourism is a significant economic driver in Yukon. The Yukon Bureau of Statistics reports that \$117.2 million (or 4.4 percent) of Yukon's total gross domestic product was attributable to tourism in 2016.³⁰⁴ In 2015, there were approximately 3 500 jobs in the tourism industry, which is equivalent to approximately 13.5 percent of the territory's jobs.³⁰⁵ However, the relative importance of tourism within the Yukon economy is likely to be dampened over the short to mid term due to Covid-19, which has seen international arrivals and air passenger traffic down by 96 and 97 percent respectively.³⁰⁶ It is unclear how long the effects of the pandemic will remain; however, the EC considers tourism an important sector of the economy, one currently facing considerable stress.

Much of Yukon's tourism is based on its vast landscapes, wildlife viewing opportunities and its rich culture. Many tourism operators within Yukon are fully dependent on tourism for their livelihoods. Comments submitted by the YG Tourism Branch as well as by a business offering wilderness tours in the Pelly River area identified concerns that the Project could negatively affect tourism in the area.

Legislative and Management Setting

There is no regulatory framework that deals directly with protecting tourism in Yukon. Indirectly, legislation exists that helps protect and preserve air quality, water quality, fish, wildlife and heritage upon which tourism in Yukon is often based. These are described in Sections 5, 6, 7 and 11 of this report.

Tourism involves all levels of government and various tourism-based associations. The *Yukon Tourism Development Strategy (2018 to 2028)* was prepared by a multi-stakeholder steering committee and outlines the goals, values and strategic actions to achieve the sustainable tourism vision in Yukon over a 10-year period. The goals of the strategy are to:

1. double revenue to Yukon businesses from tourism to \$525 million in 2028;

³⁰⁴ Department of Tourism. Government of Yukon. Tourism statistics and reports. 2019. <https://yukon.ca/en/tourism-statistics#economic-impact-of-tourism-in-yukon>

³⁰⁵ Ibid.

³⁰⁶

2. establish a framework within two years that measures the sustainability of tourism development;
3. ensure at least 80 percent of Yukoners have a positive attitude towards tourism.³⁰⁷

These goals are broadly considered in the effects of the Project on tourism.

Yukon is experiencing a yearly growth in its number of visitors.³⁰⁸ The majority of visitors (78 percent) travel to Yukon in the summer months, between June and September.³⁰⁹ A comparison of the 2017–18 and the 2012 Visitor Exist Surveys shows a tourism increase of 25 percent. A selection of the top activities completed by visitors in 2017–2018 are provided in Table 22 below.³¹⁰

Table 22: Selected top activities completed by all visitors

Activity	Number of activities completed
Visiting a Visitor Information Centre	278 300
Visiting a historic site, park or building	267 900
Wildlife viewing or birdwatching without a guide	205 500
Camping without a guide	169 100
Visiting a cultural centre	103 500

Tourism growth and development over the next nine years will be largely guided by the *Yukon Tourism Development Strategy (2018 to 2028)*.

Existing Conditions and Trends

The Project is accessible by the RCH, which provides a scenic alternate route from Watson Lake to Whitehorse—although much of the road surface is gravel and conditions can be poor. The Project overlaps the Robert Campbell Tourism Region, which includes the communities of Faro and Ross River. According to the Tourism Branch, popular activities in this region include canoeing, hiking, sport fishing, hunting and wildlife viewing.³¹¹ The Tourism Branch also identifies the following tourism infrastructure in proximity to the Project: fishing on Finlayson Lake (30 km from the Project), Frances Lake and Frances Lake Lodge (50 km from the Project)

³⁰⁷ Department of Tourism. Government of Yukon. Yukon Tourism Development Strategy. *Sustainable Tourism. Our Path. Our Future. 2018-2018*. 2018. yukon.ca/sites/yukon.ca/files/tc/tc-yukon-tourism-development-strategy.pdf

³⁰⁸ Yukon Bureau of Statistics. Government of Yukon. Visitor Exit Survey 2017/18. 2017. <https://yukon.ca/sites/yukon.ca/files/tc/tc-visitor-exit-survey-2017-18.pdf>

³⁰⁹ Ibid.

³¹⁰ Ibid.

³¹¹ YOR Document 2017-0083-264-1.

and McEvoy Lake and Inconnu Lodge (40 km from the Project).³¹² Additionally, there are several smaller lakes and rivers with canoe put-in locations throughout the region.

As well, wilderness tourism operators may be operating in the area, though none were specifically identified during the assessment. The Wilderness Tourism Association of the Yukon identifies 20 registered wilderness tourism companies that offer services in the Campbell Region.³¹³

There are two YG-run campgrounds on the RCH (between the Project site and Watson Lake, the area of heaviest expected mine-related vehicle traffic): Simpson Lake (km post 81) and Frances Lake (km post 171). North of the project on the RCH (near Ross River), is the Lapie Canyon Campground (km post 364).

The Project also overlaps Outfitting Concession #20, owned by Yukon Big Game Outfitters, which is the largest outfitting concession in Yukon, covering 5.7 million ha. The outfitter offers guided hunting for sheep, moose, caribou, grizzly and black bear, and wolf and wolverine. Guided hunts usually occur between the start of August and the end of October, though some spring (bear) and winter (wolf) hunts may also occur. During the summer months, the outfitter also offers non-hunting trips, including multi-day backpacking trips, day hikes, lake-side cabin rentals, river trips (canoe or rafting), lake canoeing, horseback safaris and ATV tours.³¹⁴ Within their own areas, outfitters maintain hunting camps, airstrips, float plane bases, horse grazing areas, trails and corrals that are necessary to provide a quality guided hunting service. The Tourism Branch notes that the outfitter has a number of leases and camps in the surrounding area.³¹⁵

Project Design

The Proponent has designed the Project and made additional commitments to reduce effects to air quality, water quality, heritage, wildlife and soil quality, and to reduce effects from noise. These are outlined in their respective sections in this assessment (Sections 5, 6, 7 and 10). Generally, these measures and design features serve to reduce effects to tourism, which relies on clean air and water, healthy wildlife populations, and a quiet environment, free from industrial noise.

The Proponent has included Yukon Big Game Outfitters in their Consultation and Engagement Plan and has committed to including Inconnu Lodge and Frances Lake Lodge in the plan. The Proponent will work with these parties to resolve any concerns, should they be raised.

Effects Characterization

THE PROJECT MAY RESULT IN REDUCED VISITOR EXPERIENCE AND TOURISM IN THE PROJECT AREA

Tourism in the Campbell Region is largely dependent on undisturbed landscapes and healthy wildlife populations. An increase in people, traffic and noise in the area during construction and

³¹² Ibid

³¹³ Wilderness Tourism Association of the Yukon (WTAY). 2019. https://wtay.com/regions/campbell-region/?wtay_activity

³¹⁴ Yukon Big Game Outfitters (YBGO). 2013. <http://yukonbiggame.com/wilderness-adventures.php>

³¹⁵ YOR Document 2017-0083-264-1.

operation, or a reduction in air and water quality as a result of the Project have the potential to negatively affect visitor experience, which in turn could result in reduced tourism opportunities in the area and adversely affect those who depend on it for their livelihood.

Vehicle traffic along the RCH is expected to increase by 52 HDV and 21 LDV per day during the operations phase (10 years). Of these, 46 HDV per day will travel between the Project and Watson Lake and could disrupt campground users at the Frances Lake and Simpson Lake campgrounds, which are located approximately 1.7 km and 1.4 km from the highway, respectively. The remainder of traffic is expected to travel north and west of the Project on the RCH, potentially affecting those camping at Lapie Canyon. Those travelling the highway for scenic views may also have a reduced experience due to the increase in industrial traffic on the highway. However, overall traffic volumes are still relatively low due to poor road conditions, and vegetation buffers between the highway and campgrounds should minimize noise-related disturbances to campground users.

Noise generated from the Project, including blasting, ore processing, heavy-equipment use and aircraft overflights may disturb those who are seeking a remote wilderness experience in the surrounding Project area, either on their own, as part of a guided wilderness tour or when occupying nearby lodges. Noise modelling undertaken by the Proponent (discussed in Section 9.2) predicted that noise is mainly limited to the Project footprint. Some disturbances from aircraft flyovers might be experienced; however, excepting outfitting, there are no known wilderness tourism operations that overlap the Project footprint, and any use is expected to be infrequent and short term. The closest lodge is located 30 km away on McEvoy Lake, which is far enough from the Project that there should be no perceptible noise-related effects.

The Yukon Big Game Outfitter, however, has a number of leases and camps in the surrounding area that have a greater potential to overlap with noise generated from the Project. In addition to disrupting wilderness experiences of visitors, Project activities that displace or disturb wildlife can affect the success of guided hunts or wilderness viewing opportunities. The Proponent has indicated that they have been in regular communication with the outfitter and will continue to provide them with Project updates with a view to minimizing interference with the outfitter's business. However, the outfitter has noted frustration in its relationship with the company, indicating also noise from helicopter operations has caused clients to be disappointed with their experience.³¹⁶

The Project also has the potential to affect air, water and wildlife. Effects to these valued components are discussed in Sections 9.3, 5 and 6, respectively. Negative impacts to the environment could alter the pristine landscape that tourists are seeking to experience, affecting the numbers of visitors travelling to the area. The Lynx Track Farm, located close to Faro along the Pelly River, noted concerns regarding potential water contamination and the resulting negative effects to their wilderness business.³¹⁷ However, with Proponent mitigation measures

³¹⁶ YOR Document 2017-0083-9753

³¹⁷ YOR Document 2017-0083-267-1.

and measures addressed in this report, it is unlikely that the Project will affect air, water, soil and vegetation quality such that wilderness experiences will be altered.

Significance Determination

EFFECTS ARE LIKELY

The Project is likely to result in some disturbances to campground users, highway travellers and those seeking a wilderness experience in the area over the life cycle of the Project. Effects are most likely to occur during the construction phase (two years) and operation phase (10 years) when workers, equipment and vehicles will be most active.

EFFECTS ARE ADVERSE

Visitors to the region are looking for remote wilderness experiences, including enjoying pristine landscapes and wildlife viewing and harvesting opportunities. Project activities that interfere with visitor experience have the potential to reduce tourism in the area, negatively affecting the economic viability of local businesses that rely on tourism.

EFFECTS ARE NOT SIGNIFICANT

Tourism effects are primarily limited to visitor experience effects along the RCH (campground users and highway travellers), and those enjoying the landscape, lakes and rivers for hiking, fishing, canoeing and guided hunts closer to the Project area. There are generally low volumes of traffic on the RCH, and campgrounds are located sufficiently far away from the Project area that noise will be minimal for campers. There are no known wilderness tourism operators in the local Project area other than the local outfitter, and use of the area for wilderness tourism is expected to be infrequent.

In general, there are limited tourism activities that overlap with the Project footprint. As a result, any disruptions are expected to be infrequent and short term. Any effects to tourism are also reversible once construction and operations cease (12 years). As such, the effects to tourism are not considered significant.

8.2 Impacts of Mine Closure

This section was named "Financial Security" in the Draft Screening Report, it has been renamed "Impacts of Mine Closure" to reflect that its scope is greater than that of the regulatory process where financial security matters are concerned with environmental liabilities. This section of the assessment considers both environmental and social costs associated with mine closure.

Summary and Conclusion

The EC has determined that the Project is likely to result in significant adverse effects, in the event of a unscheduled mine closure, in terms of both financial liability for government and

social costs for workers in Watson Lake and Ross River. These risks can be controlled, reduced or eliminated through application of the recommended mitigations.

By “unscheduled closure” the EC means an unexpected or sudden cessation of or significant reduction in active mining, whether or not any resulting closure is temporary or permanent. For clarity, the EC considers less than 12 months notice to be sudden in the context of a mine proposed with a 10-year operational life.

Importance of Mine Closure

The closure of a mine can result in unforeseen costs to governments, while mine closure also results in community impacts due to the loss of economic activity. For governments, appropriate approaches to mine closure are important as it ensures that mining can be undertaken in a responsible way, minimizing the extent to which government underwrites the risks of mine closure. The absence of appropriate financial security can lead to large and long-term liabilities for governments. For communities, a planned and scheduled closure reduces economic shocks, whereas a sudden closure can cause financial distress for employees, business, and communities in general.

Legislation and Regulatory Setting

QUARTZ MINING ACT

Under the QMA, the *Security Regulation* stipulates requirements for financial security. Security requirements are determined considering a number of factors:

- the risk of any significant adverse environmental effects resulting from development and production;
- the estimated cost to implement a plan addressing reclamation of the site during and post-development and production, approved pursuant to issuance of a licence;
- the costs that would be incurred by YG if it were required to reclaim the site of development and production, including costs associated with post-closure measures, monitoring and ongoing maintenance to address mitigation of any significant adverse environmental effects from development and production; and
- any security furnished or deposited pursuant to the *Waters Act* or other Yukon enactment.

This regulation requires that regulators set financial security requirements to cover potential environmental costs of reclaiming mine sites. These regulatory requirements do not allow for consideration of potential social impacts due to mine closure.

The Yukon Conservation Society notes that the method for determining security requirements is “not transparent nor does it provide an opportunity for stakeholders (or members of the public) to provide input”.³¹⁸

Context

Following mining operations, certain closure requirements exist to reduce or eliminate environmental and socio-economic liabilities associated with the cessation of operations. YG requires a financial assurance (security) from mine operators to ensure that closure activities are funded in the event that market or other factors force a mine operator into bankruptcy. Even if financial assurance is provided, closure may cost more than anticipated, as was the case with the Wolverine Mine (2015).

Without sufficient financial security, long-term financial liabilities may be passed onto governments. Any delay between an unscheduled closure and commencement of reclamation activities may also increase financial liabilities.

To reduce environmental effects, extensive measures must be undertaken in a mine’s closure phase. Closure measures must achieve chemical containment and physical stability of land or any infrastructure left behind. Chemical containment generally includes efforts to separate either water or air from contaminants, and often involves moving large amounts of rock. Physical stability is required to ensure integrity of chemical containment. Landforms left during closure must be stable over the very long term. Loss of physical stability generally results in chemical leaching, and either event will result in additional costs.

Mine closure results in social effects. While workers often expect the mine will eventually close, many are unprepared when it does.³¹⁹ Social impacts can include:

- stress and anxiety to mine workers and their families;
- fluctuations in housing prices, which may leave some workers owing more on their mortgage than the asset is worth;
- the non-payment of accounts owing to local businesses in the event of unscheduled closure;
- large reductions in community populations and abandonment of houses; and
- a longer-term and persistent locally depressed economy.

Closure activities which address social impacts are generally not as prominent in closure plans, though they are likely most pronounced when closure is unscheduled.

Current Conditions and Trends

HISTORY OF EARLY MINE CLOSURES

Yukon has a history of unexpected mine closures due to shifting economic conditions or other factors. Examples of such closures include:

³¹⁸ 2017-0083-0979

³¹⁹ Conference Board of Canada. “Future of Mining in Canada’s North”. January 2013, pg. 66.

- Wolverine Mine (2015)
- Bellekeno (2013) (temporary closure due to commodity prices)
- Brewery Creek (2001) (early closure due to commodity prices)
- Mount Nansen Mine (1999) (bankruptcy)
- Faro (1998) (bankruptcy)
- Faro (1993) (bankruptcy)
- Sa Dena Hes (1992) (closure due to commodity prices)
- Ketzta (ceased commercial mining 1990, abandoned 2015)
- Elsa (1989) (closure due to commodity prices)
- Whitehorse Copper Mines (closure due to commodity prices)
- Faro (1982) (temporary closure due to commodity prices)³²⁰

Many of these mines have resulted in long-term liabilities, as evidenced in the designation of Type 1 and Type 2 mines in the Devolution Transfer Agreement, which outlines the responsibilities for abandoned mine sites in Yukon. The most notorious liability is that of the Faro Mine, where costs have already exceeded \$500 million and major reclamation works have not yet begun.³²¹ The EC is currently assessing the government-funded closure plan for the Faro Mine, which is expected to cost a considerable amount and take decades to implement. However, the EC notes that most of these mines were developed under previous regulatory regimes, which in many cases did not have security requirements.

The Wolverine Mine is the most relevant project for this assessment in considering security requirements. Its security requirements were reviewed approximately every two years during operations, in March 2015 security was approximately \$10 million. By 2018, increasing liabilities had led to a reassessment of security requirements, which resulted in an increase of security requirements by approximately \$25 million. However, in 2015, the mine had been put into care and maintenance, and the additional security requirements were never fulfilled.³²² The mine is still undergoing care and maintenance, and is in a state of closure.

Regardless of operational plans, economics appears to have been the major driver of mine lifespans in Yukon. Changes in our understanding of geology may also be a large factor in prolonging or shortening a mine's life. The EC acknowledges that the Proponent intends to operate the Project as scheduled, but that other factors make alterations to the Project lifespan and design likely.

³²⁰ While not within Yukon, but closely linked and within the Traditional Territories of LFN and RRDC, the Cantung Mine is also an example of a mine with an unexpected closure, closing in 2015.

³²¹ Whitehorse Star. "Cost of Faro Project Forecast to Exceed \$500 Million This Year". May 23, 2019. <https://www.whitehorsestar.com/News/cost-of-faro-project-forecast-to-exceed-500-million-this-year>

³²² Yukon (Government of) v. Yukon Zinc Corporation, 2019 YKSC 2019. Paras 8-17.

LIMITED SOCIAL SUPPORTS IN AFFECTED COMMUNITIES

Despite historical colonial effects,³²³ high crime rates³²⁴ and issues with substance use,³²⁵ the communities of Ross River and Watson Lake have few governmental social services available – including services to support community members managing the impact of a sudden job loss as a result of a mine closure. This sudden job loss may result in financial difficulties, mental health challenges and substance abuse. In Ross River, a few resources exist to address substance use, with detox programs only available in Whitehorse, a five-hour drive away. Furthermore, with the collapse of the Many Rivers Counselling Services in 2018, there are fewer counselling services in the community, with one YG mental wellness and substance use counsellor and one YG child and youth counsellor.³²⁶ Lastly, a Christian safe house has existed since 2004, but no funds exist to offer programs³²⁷ such as a soup kitchen or recreational programs for women; as well LAWS³²⁸ has inconsistent funding.³²⁹

The community of Watson Lake also has a finite amount of resources available, with no local detox services (the closest are in Whitehorse) and fewer counselling options due to the closure of the government-funded Many Rivers Counselling Service, leaving the community with YG's two mental wellness and substance use counsellors, a clinical counsellor, a mental health nurse, and a child and youth counsellor.³³⁰ Along with services provided by LAWS, Help and Hope for Families offers transition home services and shelter.³³¹

Project Design

The Project proposal estimates reclamation and closure liability at roughly \$90.5 million. This is a high-level estimate for closure costs following operations. This figure covers predicted environmental reclamation activities only. Details of predicted closure costs are highlighted in the proposal in Appendix H-1 CRCP.

Yukon Conservation Society notes that “YCS is impressed that the Proponent has arrived at a financial security figure that is somewhere in the realms of reality for a Yukon mining operation.”³³²

³²³ Within this section, “colonial impacts” refers to the following: residential school legacies, effects of displacement and disenfranchisement from the Indian Act, and the Sixties Scoop.

³²⁴ Yukon Bureau of Statistics. Government of Yukon. *Police-reported Crime Statistics in Yukon 2016*. August 2017. http://www.eco.gov.yk.ca/stats/pdf/crime_2016.pdf

³²⁵ YOR Document 2017-0083-046-1, pg.15-10;

Hrenchuk, Charlotte. *Strong Women's Voices Rural Choices*, Report on the Northern Women's Issues Through a Rural Lens Project, Whitehorse: Yukon Status of Women Council, 2004, pg. 16.

³²⁶ Department of Health and Social Services. Government of Yukon. *Mental Wellness and Substance Use Services across Yukon*. 2019. http://www.hss.gov.yk.ca/mwsu_communities.php

³²⁷ Ibid.

³²⁸ The Liard Aboriginal Women's Society (LAWS) provides services to both Ross River and Watson Lake.

³²⁹ Ibid.

³³⁰ Department of Health and Social Services. Government of Yukon. *Mental Wellness and Substance Use Services across Yukon*. 2019. http://www.hss.gov.yk.ca/mwsu_communities.php

³³¹ Help and Hope for Families Society (HHFS). Help and Hope for Families Society, HHFS, s.d.. <http://www.helpandhopeforfamilies.ca/>.

³³² YOR Document 2017-0083-265-1.

Effects Characterization

SCHEDULED CLOSURE

The proposed security (financial assurance) appears to be considerable and reasonable when compared with the closure costs of other projects within Yukon. While this level of security will likely ensure funding for chemical containment and physical stability, social effects were not, and are typically not, considered in the estimating security requirements. Scheduled closure will likely result in social effects to Ross River and Watson Lake as the mine will play a disproportionate role in local economies when compared to Whitehorse.

Closure in general is expected to possibly “have significant adverse effects on local economies, contribute to impoverishment, trigger the loss of key services, and lead to out-migration. Poorly managed closure processes exacerbate these impacts and can damage corporate reputations, where operators are held responsible for the impacts that they have left behind.”³³³

UNSCHEDULED CLOSURE

Unscheduled closure is likely to be more disruptive than a scheduled closure, and its effects likely more adverse than those of scheduled closure.

In the event of unscheduled closure, the costs of achieving chemical containment and physical stability may be different than the predicted closure costs after scheduled operations. However, social impacts will likely be much greater than during scheduled closure—unexpected job losses, business losses and changes to local economies are likely to be disruptive and lead to adverse social effects.

As unscheduled closure is often linked to depressed economic conditions, and often overlaps periods where government finances are stretched more thinly, the government’s ability to address the social impacts of mine closure is reduced.

Significance Determination

EFFECTS ARE LIKELY

The Project’s financial security estimate does not include the costs of addressing social effects. If financial security does not include consideration of all possible closure costs, negative effects are likely. In the case of this Project, those effects would be either social or related to public expenditure.

Further, the Project’s financial security does not consider different closure scenarios, such as unscheduled closure due to adverse economic conditions. As unscheduled closures are common, effects due to unscheduled closure are likely.

EFFECTS ARE ADVERSE

Where closure costs are borne by the public or closure plans do not address the social effects of closure, effects are adverse.

³³³ Nicholas A. Bainton and Sarah E Holcombe. “A critical review of the social aspects of mine closure”. Resources Policy, September 2018.

EFFECTS ARE SIGNIFICANT*SOCIAL COSTS*

The social effects of mine closure are considerable in communities that are heavily tied to mining projects. The magnitude of effects is amplified in communities with a lack of social support services and lower levels of economic opportunity, such as Ross River and Watson Lake. In these communities the social effects of closure are likely to be significant, especially if those effects are not incorporated into closure planning and financing. These significant adverse effects will be exacerbated in the event of unscheduled closure, especially if the government is unable to provide funding to assist with adverse effects.

REMEDATION COSTS

The scale of modern mines means that any gap between predicted cost of environmental liabilities and actual liabilities is likely to be significant. These liabilities may be long lived and are very sensitive to many factors, as seen in the tripling of liability estimates for Wolverine Mine between 2015 and 2018.

Recommended Mitigations

The significant effects of the Project, with respect to financial security and the impacts of unscheduled mine closure, can be reduced, controlled or eliminated through the application of the following mitigations:

- 16) Proponent shall maintain in trust a transition fund with sufficient funds to ensure, in the event of an unscheduled closure:
 - d. Funds for education and retraining;
 - e. Maintenance of the employee assistance program (EAP); and
 - f. Payment of back wages and severance

for affected employees from Watson Lake and Ross River employed by the project at time of closure. The amount of funds and their administration shall be conducted by a suitable party. The administrator shall have a local representative in either Ross River or Watson Lake to aid in ensuring the fund meets its objectives.

- 17) Shall ensure staff have access to money management and budgeting information and resources through on-line tools.
- 18) Recruitment for care and maintenance positions shall be done with preference for former qualified mine employees by the body overseeing care and maintenance.
- 19) The setting of security shall take into account the potential for care and maintenance costs required to maintain environmental protections over a period between a temporary closure and decommissioning.
- 20) Security requirements shall take into consideration the potential for early unscheduled closure and the need for care and maintenance requirements to maintain environmental safeguards prior to decommissioning.

8.3 Business Environment

Summary and Conclusion

The EC considered potential Project effects in relation to Yukon's economic diversity. By economic diversity, the EC means a level of economic vibrancy that allows for the provision of a diverse range of goods and services, an environment that fosters business activity, and a lack of reliance on a single sector of the economy. YG predicts that the Project "will be a catalyst for economic growth that will provide a wide range of opportunities."³³⁴ The EC agrees in that the Project will likely provide a wide range of opportunities in which there is unlikely to be a resulting decrease of economic diversity.

This section has been updated since the Draft Screening Report was issued to include consideration of Covid-19 and its effects on the economy.

Importance of Economic Diversity

Economic diversity is important for a number of reasons. A diverse economy is more resilient to economic changes and fosters a wider range of businesses, which provide important services and meet cultural and social demands. Consequently, economic diversification can provide better buffers against economic downturns, and contributes to a community's vibrancy.

Yukon Unemployment Rate Increasing

Prior to the Covid-19 pandemic, Yukon's unemployment rate was extremely low, less than three percent, the lowest in Canada. Combined with a high participation rate (the highest in Canada), Yukon had a very tight labour market.³³⁵ These rates are below theorized unemployment rates expected during full employment.³³⁶ Yukon businesses reported difficulties in recruiting and maintaining sufficient numbers of staff.³³⁷ This challenge was particularly pronounced in the low-skilled service industry labour market.³³⁸

Where unemployment levels are very low, the sudden introduction of a large employer may cause disruption to businesses as labour costs increase and labour becomes scarce.

Within the current context of a global pandemic, however, unemployment in Yukon has risen to 8 percent, and when counting those who have ceased looking for work since February, the unemployment rate would be 12.5 percent.³³⁹ These rates are 10.2 and 13 percent nationally.

³³⁴ YOR #2017-0083-3387

³³⁵ Yukon Bureau of Statistics. "Survey of Employment, Payrolls, and Hours 2018." Government of Yukon. 2019.

³³⁶ As there will always be people switching jobs, economic sectors contracting while others expand, the "full employment unemployment rate" is generally predicted to be over 3 percent.

Summers, L.H. 1986. Why is the unemployment rate so very high near full employment? Brookings Papers, Harvard University. https://www.brookings.edu/wp-content/uploads/1986/06/1986b_bpea_summers_abraham_wachter.pdf

Hall, R.E. 1970. Why is the unemployment rate so high at full employment? Massachusetts Institute of Technology. <http://www.web.stanford.edu/~rehall/Why-Is-BPEA-1970.pdf>

³³⁷ Yukon Bureau of Statistics, "Labour Demand Survey, 2018". Government of Yukon. 2019; City of Whitehorse. "Downtown Retail and Entertainment Strategy". 2016.

³³⁸ In Yukon, accommodations and food services have the highest rates of job vacancy of all industries. Yukon Bureau of Statistics, "Labour Demand Survey, 2018". Government of Yukon. 2019.

³³⁹ Yukon Bureau of Statistics "Yukon Employment, August 2020", Government of Yukon, 2020.

Rates are expected to gradually improve upon resolution of the pandemic and the associated economic turbulence, which is likely to occur during the operations phase of the Project.

Unemployment Rates Higher Outside Whitehorse, Among First Nations Citizens

While unemployment rates have recently been exceptionally low in Yukon, First Nations unemployment rates remain higher. This is likely attributable in part to higher unemployment in communities outside of Whitehorse—communities with greater First Nations populations—and to historic and systemic marginalization.

While unemployment data is not available at the community level, employment rates are lower outside of Whitehorse. Prior to Covid-19, in Watson Lake, the employment rate was under 60 percent compared with over 70 percent in Whitehorse.³⁴⁰

Pre-Pandemic Whitehorse Business Environment Healthy

Despite challenges prior to the pandemic, small independent retailers, service providers and food vendors in Whitehorse appeared to be doing well. Retail spending per capita is 25 percent higher than in the rest of Canada.³⁴¹ Further, for 2018, Whitehorse was named the most entrepreneurial city in Canada by the Canadian Federation of Business.³⁴² The City of Whitehorse, in its 2016 *Downtown Retail Strategy*, notes that “Main Street is healthy, showing a reasonable level of vacancy (particularly given the downturn in mining activity that has occurred since 2012) and offering a strong mix of specialty retail, restaurant, recreation, arts/cultural and service uses.” Whitehorse residents enjoy a wide diversity of service offerings for a city of its size, despite residents valuing retail and services as less important than any other factor in relation to the decision to reside in Whitehorse.³⁴³

Project Will Require Large Workforce

The Project will require a large number of workers, mostly skilled, but some low skilled. While many of these workers will be sourced from outside the territory, some will be recruited from the territorial labour force. As Project employment will largely be full time, many in the territorial labour force may be unable or unwilling to work on this Project.³⁴⁴ This additional source of demand in the labour market may increase pressure on businesses if the available labour force does not grow in step with the number of jobs available.

Using the Minto Mine’s Socio-economic Monitoring Program as an example:

- underground workers appear to be almost wholly recruited from outside the territory;
- the surface mining workforce is mostly recruited from within the territory; and

³⁴⁰ Statistics Canada. Yukon: Beautiful, Complex, and Changing. 2018 <https://www150.statcan.gc.ca/n1/pub/11-631-x/11-631-x2018006-eng.htm>

³⁴¹ Statistics Canada. “Retail Trade Sales by Province and Territory”. Government of Canada. 2019.

³⁴² Canadian Federation of Business. “Canada’s Top Cities for Entrepreneurship: Whitehorse, Winkler and Victoriaville lead the Way”. April 3, 2019. <https://www.cfib-fcei.ca/en/media/canadas-top-cities-entrepreneurship-whitehorse-winkler-and-victoriaville-lead-way>

³⁴³ City of Whitehorse. “Downtown Retail and Entertainment Strategy”. 2016.

³⁴⁴ Many part time workers chose to or cannot work full time hours. Yukon Bureau of Statistics, “Labour Demand Survey, 2018”. Government of Yukon. 2019

- the camp contractor workforce is mostly recruited from within the territory, and largely from First Nations populations.³⁴⁵

While the mining workforce largely comprises skilled labourers, the camp workforce is typically lower-skilled labourers, with lower rates of pay.

Project Unlikely to Result in Reduced Economic Diversity

It is reasonable to expect a similar pattern of hiring for the Project as compared with the Minto Mine; therefore, many jobs are likely to be filled by First Nations citizens. The EC notes, despite uncertainties regarding its effectiveness, that the Proponent has committed to giving preference in hiring to the following (in order):

- RRDC citizens
- Other Kaska citizens
- Other Yukon First Nation citizens
- Other Yukon residents
- Others³⁴⁶

As most work associated with the mine will be full time and fly-in/fly-out (FI/FO), the EC does not expect the Project to reduce labour availability of part-time workers. Many part-time workers do so because other considerations reduce the potential for full-time work.

Given that the Project will likely commence during a period of higher unemployment, it will not provide the shock to labour markets in Yukon that it would if commenced during a period of full employment. In the face of increasing unemployment levels, the Project is also unlikely to stress existing businesses. Rather, the Project is likely to aid existing and new businesses by creating demand for local services and increasing disposable income in a time of economic uncertainty.

Using the Minto Mine socio-economic monitoring data, expected levels of local recruitment for the Project are not expected to be large enough to disrupt local businesses. The EC predicts that the Project will positively affect economic diversity and the business environment in Yukon.

9. Human Health and Safety

9.1 Respiratory Health

Summary and Conclusion

The EC has determined that the Project is not likely to result in significant adverse effects to the respiratory health of off-duty workers and local land users. Air contaminant modelling identified the potential for air contaminant concentrations to increase above applicable territorial and/or federal standards intermittently during the life of the Project. Project design and measures

³⁴⁵ Minto Explorations Ltd, Selkirk First Nation and Yukon Government. 2015. Minto Mine Socio-Economic Monitoring Program – Annual Report 2015. Minto Mine Socio Economic Monitoring Plan. http://www.selkirkfn.com/files/2115/3419/3625/MintoMine_Socio-EconReport-2015_FINAL_July_30_2018.pdf

³⁴⁶ YOR Document 2017-0083-046-1.

committed to by the Proponent, however, will effectively eliminate, reduce or control the adverse respiratory health effects of the Project.

Importance of Respiratory Health

The Proponent identifies air quality as an affected VESEC, stating that, “[air] quality was selected as a Valued Component due to its importance to the health and wellbeing of humans, wildlife, vegetation and other biota. The atmosphere provides a pathway for the transport of contaminants to the biophysical environment.”³⁴⁷

The World Health Organization (WHO) suggests that air pollution presents the biggest environmental risk to human health.³⁴⁸ The Government of Canada estimates that 14 600 premature deaths per year in Canada can be linked to air pollution from fine particulate matter, nitrogen dioxide and ozone.³⁴⁹ The total economic value of the health effects attributable to air pollution in Canada is \$114 billion per year.³⁵⁰

Mining and associated activities can introduce a suite of chemicals and fugitive dust into the environment which can have potential effects on human health. Comments received during the assessment expressed concern that the Project’s air emissions may result in adverse health effects to workers. Therefore, the EC has examined the potential effects to respiratory health, a component of human health, as it relates to changes to air quality resulting from the Project.

Legislative and Management Setting

ENVIRONMENT ACT AND AIR EMISSIONS REGULATIONS

Part 9(1) of Yukon’s *Environment Act* prohibits the release of a contaminant in a manner contrary to the Act or Regulations. Yukon’s *Air Emission Regulations* prohibit the release of emissions for certain industrial activities unless authorized by a permit. Section 6 of the Regulations prohibits the release of any air contaminant that may, “(a) cause or be likely to cause irreparable damage to the natural environment; or (b) [...] cause actual or imminent harm to public health or safety.”³⁵¹

AIR QUALITY STANDARDS

Canadian Ambient Air Quality Standards (CAAQS) have been developed which establish standards specifying maximum desirable, acceptable and tolerable concentration levels for specified contaminants in the air.³⁵² They are part of a larger joint federal/provincial/territorial air quality management system which aims to ensure the CAAQS are not treated as pollute-up-to levels. CAAQS are reviewed every five years to ensure they are stringent enough to protect

³⁴⁷ YOR Document 2017-0083-021-1 pg.6-1

³⁴⁸ Canadian Council of Ministers of the Environment. Air Quality. 2019. <http://airquality-qualitedelair.ccme.ca/en/>

³⁴⁹ Government of Canada. Health Effects of Air Pollution. 2019. <https://www.canada.ca/en/health-canada/services/air-quality/health-effects-indoor-air-pollution.html>

³⁵⁰ Ibid.

³⁵¹ Yukon Government. Air Emission Regulations O.I.C 1998/20. Environment Act. 1998. http://www.gov.yk.ca/legislation/regs/oic1998_207.pdf

³⁵² Wood, J. Canadian Environmental Indicators – Air Quality. Studies in Environmental Policy. Fraser Institute. January 2012. <https://www.fraserinstitute.org/sites/default/files/canadian-environmental-indicators-air-quality-2012.pdf> pg. 10/72

human health. CAAQS currently exist for fine particulate matter (PM_{2.5}), ozone (O₃), sulphur dioxide (SO₂) and nitrogen dioxide (NO₂).

Provinces and territories have also established air quality standards that take into account their own specific circumstances. The Yukon Ambient Air Quality Standards (YAAQS) were most recently updated in 2014 and identify standards for SO₂, O₃, NO₂, carbon monoxide (CO), fine particulate matter (PM_{2.5} and PM₁₀) and TSPs.

The CAAQS and YAAQS have been used as a threshold for significance in this effects analysis.

OCCUPATIONAL HEALTH AND SAFETY ACT AND REGULATIONS

The *Occupational Health and Safety Act* and Regulations contain specific provisions related to worker health and safety. Sections 3 to 11 of the Act outline the duties of employers and workers with respect to health and safety in the workplace. Sections 1.25 to 1.33 of the Regulations specify the protective equipment and clothing required for workers when they may be exposed to an air contaminant, and require that proper ventilation systems and testing/inspections of protective equipment are in place.

Context

CRITERIA AIR CONTAMINANTS

Mining and associated activities can introduce a suite of chemicals and fugitive dust into the environment, which can negatively affect human health.³⁵³ These contaminants can lead to short-term effects as well as chronic disease. Table 23 identifies CACs that were selected for the Project-effects analysis, as they are known to be associated with human health effects, and have measurable parameters linked to Yukon and Canadian air quality standards.

³⁵³ Health Canada. Supplemental Guidance on Human Health Risk Assessment of Air Quality, Version 2.0. Federal Contaminated Site Risk Assessment in Canada. Government of Canada. March 2017.

Table 23: Criteria Air Contaminants

CAC	Source	Health Effects
Sulphur dioxide (SO ₂) ³⁵⁴	Emitted when fossil fuels or raw materials containing sulphur are burned or used in industrial processes	Reduced lung function, respiratory problems and airway inflammation
Nitrogen dioxide (NO ₂) ³⁵⁵	Formed primarily through the burning of fossil fuels	Reduced lung function, respiratory problems, airway inflammation, allergic responses, asthma and increased susceptibility to respiratory infections
Total suspended particulates (TSP) ³⁵⁶	TSP refers to all airborne solid and liquid particles (except water) that are microscopic in size, and can be suspended in the air momentarily or indefinitely. TSP can result from natural and human sources (e.g. industrial emissions, agriculture, forest fire smoke, dust)	Respiratory tract effects, asthma, bronchitis and heart attacks
Coarse particulate matter less than 10 microns (PM ₁₀) ³⁵⁷	PM ₁₀ is predominantly a result of unpaved-road dust, construction activities, mining and quarrying	Upper respiratory tract effects, such as cough, phlegm, rhinitis, and asthma ³⁵⁸
Fine particulate matter, less than 2.5 microns (PM _{2.5})	PM _{2.5} originates primarily from combustion processes: transportation, industrial processes and burning ³⁵⁹	Increased frequency of asthma attacks, chronic bronchitis and heart attacks ³⁶⁰
CO	The greatest sources of CO to outdoor air are cars, trucks and other vehicles or machinery that burn fossil fuels	Reduced oxygen, chest pain, dizziness and confusion

The Proponent modelled air quality changes during the various phases of the Project, specific to the above contaminants.

³⁵⁴ Canadian Council of Ministers of the Environment. Air Quality. 2019. <http://airquality-qualitedelair.ccmec.ca/en/>

³⁵⁵ Ibid.

³⁵⁶ Alberta Environment and Parks. Alberta Government. Air Data – Total Suspended Particulates (TSP). <http://airdata.alberta.ca/aepContent/Pollutants/TotalSuspendedParticulates.aspx>

³⁵⁷ Health Canada. Human Health Risk Assessment for Coarse Particulate Matter. January 2016. http://publications.gc.ca/collections/collection_2016/sc-hc/H144-30-2016-eng.pdf

³⁵⁸ Ibid.

³⁵⁹ Ibid.

³⁶⁰ Canadian Council of Ministers of the Environment. Air Quality. 2019. <http://airquality-qualitedelair.ccmec.ca/en/>

LAND USE CONTEXT

The Project site is located within the Traditional Territories of RRDC and LFN. The Project proposal identifies traditional activities in the area, and cabins have been identified near the Project boundary at North Lakes, Wolverine Lakes, Money Peak, Frances Lake, Pelly Banks and Money Creek.³⁶¹ Traditional land use activities, such as hunting, fishing and trapping may occur in the vicinity of the proposed Project. These land users may be exposed to CACs or other air quality disturbances resulting from construction, operation and closure of the mine. The Proponent's air dispersion model examined effects within an area of 1 600 km², centred around the mine footprint (i.e. the RSA). The assessment considered how respiratory health of land users could be affected by the Project.

OFF-DUTY WORKER CONTEXT

The *Occupational Health and Safety Act* applies to workplaces. Section 3(1) of the Act states that the employer shall ensure that workplace, machinery, equipment and processes under the employer's control are safe and pose no risk to health. The ways in which this requirement would be achieved should be outlined in the company's health and safety policies.

The EC has assumed that off-duty workers are not subject to the same personal protective equipment (PPE) requirements as on-duty workers, despite being in the workplace while on-shift but off-duty. The PPE requirements clearly apply to "workers" as defined by the Proponent: "shift workers will work 12 hour shifts while on-site and will not be permitted access to the mine site when off-shift for recreational purposes."³⁶² With respect to the schedules of off-duty workers, the Proponent notes that "workers are not expected to be continuously present at the camp (i.e. 2 weeks on and 1 week off and only present during non-shift hours where they will spend the majority of their time in the camp sleeping rather than outside in the camp yard) such that this further ameliorates these marginal exceedances."³⁶³ It is unclear what the schedules will be for off-duty workers, but the EC assumes that workers will remain at the project site, whether at work or off-duty, for the full two weeks of their rotation. Because 24-hour exceedances are being examined, it is reasonable to expect that off-duty workers will be outside at times, and may therefore be exposed to air contaminants.

Existing Conditions and Trends

Little data is available for the existing air quality regime in the Project area. The Proponent expects that air contaminant concentrations would be low, given the remote Project location and minimal sources of air pollution.³⁶⁴ The Proponent did not collect baseline air quality data for the Project.

The proposed Casino Mine Project collected baseline air quality data, which the Proponent used as a proxy for their baseline conditions since the Casino Mine Project is also in a remote

³⁶¹ YOR Document 2017-0083-046-1.

³⁶² YOR Document 2017-0083-295-1, pg. 95.

³⁶³ YOR Document 2017-0083-255-1, pg. 99

³⁶⁴ YOR Document 2017-0083-021-1 pg. 6-8

area of Yukon with minimal air contaminants expected. Table 24 outlines the Proponent's assumed CAC baseline concentrations for the KZK Project site.³⁶⁵

Table 24: Assumed air contaminants baseline concentrations

Contaminant	Unit	Baseline Concentration	
		24-hour Maximum	Mean Annual
TSP	µg/m ³	7	1
PM ₁₀	µg/m ³	6	1
PM _{2.5}	µg/m ³	4	1
CO	ppm	0	0
SO ₂	ppbv	0	0
NO ₂	ppbv	0	0

The EC is comfortable using the baseline values from the Casino Mine Project as a proxy for baseline conditions at the proposed KZK site. The EC concurs with the reasonable assumption that the KZK Project has low air contaminants at baseline; ergo, the respiratory health of current land users is unaffected by the natural environment. These baseline conditions will be used to characterize the potential effects of the Project on respiratory health by identifying contaminant concentrations in relation to baseline and comparing concentrations against the CAAQS and YAAQS thresholds.

Project Design

The Project proposal identifies a number of mitigation measures that aim to reduce the effects to air quality (through minimizing and controlling the release of CACs), which will also help control potential adverse effects to respiratory health. Table 25 summarizes the Proponent's proposed mitigation measures to reduce Project ambient air contaminant concentrations.³⁶⁶

³⁶⁵ Ibid. pgs 6-9.

³⁶⁶ YOR Document 2017-0083-021-1, pg. 6-28.

Table 25: Proposed mitigation measures for air quality

Potential Effect	Project Phase	Proposed Mitigation Measures
Increase in ambient concentrations of particulate matter (TSP, PM ₁₀ , PM _{2.5}) at receptor	Operations	Crusher enclosure, material handling and transfers at the process plant facility occurring indoors
		Cover over the coarse ore stockpile
	Construction, operations, closure	Progressive reclamation of disturbed areas
		Watering roads and exposed surfaces
	Operations	Use of dust collectors and proper chute design to prevent air entrainment of dust
		Dust extraction with conveyance to and processing in dust collectors
		Covering or enclosure of conveyors or conveyor galleries
		Installation of water sprays at conveyor transfers
	Construction, operations, closure	Minimizing land-clearing activities (i.e. waste storage facilities will be cleared progressively through the Project Construction and Operations phases)
		Construction of the access road and site roads with low silt-content material
		Low speed limits for all mobile equipment
		Orientation of material stockpiles so that the length is parallel with prevailing winds where practicable

		Revegetate WRSA as early as is practicable
		Construction of wind breaks or stationary misters
		Visual inspection to identify and address potential dust emission
Increase in ambient concentrations of CACs (TSP, PM ₁₀ , PM _{2.5} , CO, NO ₂ , SO ₂) at receptor	Operations	Use filters, scrubbers and other pollution-control devices at processing facilities
	Construction, operations, closure	Ensure vehicles and equipment are maintained according to manufacturers' guidelines
		Use catalytic control systems on diesel engines
		Waste reduction at source and recycling
		Waste segregation
		Incinerator operation for optimum combustion
		Regular inspection and maintenance of incinerator

Furthermore, the Proponent has proposed an air quality management plan that outlines the (above) dust abatement and emission control measures, as well as contingency measures for air quality. In addition to dry or windy weather conditions, triggers for contingency dust-abatement (or other) measures may include complaints or reduced visibility, and will be based on physical observations and professional judgement. No air quality monitoring has been proposed.

Effects Characterization

THE PROJECT WILL RESULT IN AIR QUALITY STANDARD EXCEEDANCES FOR TSP, PM₁₀ AND NO₂

The Proponent undertook air dispersion modelling for the following CACs: SO₂, TSP, CO, PM_{2.5}, PM₁₀ and NO_x. Estimated emission rates were combined with meteorological and terrain data to produce ambient concentration predictions during the construction, operation and closure

phases of the Project. The Proponent selected the camp as the receptor because the ambient concentrations at camp would be representative of exposure to off-duty workers and serve as a proxy for land users (on-duty workers would be subject to the *Occupational Health and Safety Act* and *Occupational Health and Safety Regulations* requirements).

Potential sources for the contaminants modelled include stationary and mobile sources of air contaminants and fugitive dust. During the construction and operations phases of the Project, the main contributors to fugitive dust and contaminant emissions include open pit extraction operations (e.g. blasting and drilling); rock crushing; fossil fuel combustion emissions (e.g. generators and vehicle exhaust); vehicle traffic on access and mine site roads; wind erosion of waste rock stockpiles; and road maintenance activities (e.g. grading).

Project design activities aimed at reducing fugitive dust were also factored into air dispersion modelling, including the crusher enclosure, indoor material transfers, covering the coarse ore stockpile, progressive reclamation, and road and exposed surfaces watering. The results of the Proponent's air dispersion modelling are presented in Table 26. Generally, overall CAC concentrations will increase at the receptor site (camp) during construction, operations and closure, and will exceed YAAQS for TSP and PM₁₀ during operations for the 24-hour average threshold. Comparison of the Proponent's predicted concentrations with CAAQS also shows an exceedance of the one-hour average NO₂ threshold for 2020 throughout the Project's lifetime.

Table 26: Comparison of predicted CAC concentration with ambient air quality guidelines

CAC	YAAQS	CAAQS 2015	CAAQS 2020	Baseline	Predicted Concentrations		
					Construction	Operations	Closure
SO₂ (pub)							
1-hr avg	172		70		<1	<1	<1
24-hr avg	5			0	<1	<1	<1
Annual mean	11		5	0	<1	<1	<1
TSP (µg/m³)							
24-hr avg	120			7	43	148	8
Annual mean	60			1	2	15	1
CO (ppm)							
1-hr avg	13				<1	<1	<1
8-hr avg	5				<1	<1	<1
24 hr				0			
Annual mean				0			
PM_{2.5} (µg/m³)							
24-hr avg	28	28	27	4	4	6	4
Annual mean	10	10	8.8	1	<1	<1	<1
PM₁₀ (µg/m³)							
24-hr avg	50			6	15	67	5
Annual mean				1	1	5	1
NO₂ (ppbv)							
1-hr avg	213		60		161	120	149
24-hr avg	106			0	56	14	56
Annual mean	32		17	0	5	1	2

The Proponent notes that predicted ambient concentrations for TSP and PM₁₀ are conservative in that these concentrations assume the simultaneous operation of all non-continuous sources, and represent the worst-case meteorological and operational conditions. These short-duration (24 hour) exceedances are expected to occur less than one percent of the time (i.e. three to four days every year).

The Proponent's ambient air quality modelling results for nitrogen oxides (NO_x) are likely not representative of actual predicted results for NO₂. Modelled NO₂ concentrations were measured against YAAQS "to provide a conservative estimate and to enable comparison with the YAAQS, a 100 percent conversion ratio from NO_x to NO₂ was assumed."³⁶⁷ The results presented in Table 26 are for NO_x, of which NO₂ represents only a small fraction. Since no exceedances of YAAQS were found, no further refinement of the NO_x to NO₂ conversion factor was carried out by the Proponent (the Proponent did not compare results to CAAQS, which have a much more restrictive NO₂ threshold for 2020). The Proponent further notes that actual NO₂ concentrations are expected to be well below concentrations predicted for NO_x, and could range from 5 percent (within 1 km of the source) to 37 percent (at 7 km from the source) of NO_x concentrations.³⁶⁸ Using this information, 37 percent of the maximum predicted NO_x concentration (i.e. 1-hour average for the construction phase, or 161 ppbv) would result in a maximum predicted NO₂ concentration of 59.57 ppbv, which is just below the 2020 CAAQS for NO₂ (60 ppbv). Proponent mitigation measures aimed at reducing air contaminants will also likely contribute to a further reduction of the predicted value. Given this, the EC does not believe that the Project will result in exceedances of YAAQS or CAAQS 2020 standards for NO₂.

AIR QUALITY STANDARD EXCEEDANCES ARE LIKELY TO RESULT IN HUMAN RESPIRATORY HEALTH EFFECTS

Off-duty workers and land users may experience adverse effects to respiratory health when CACs are inhaled. The degree to which respiratory effects are experienced depends on the concentration and type of CAC present, the duration of exposure and any pre-existing respiratory issues of the affected person(s). Health Canada highlights that NO₂, PM_{2.5} and PM₁₀ are non-threshold contaminants and are therefore harmful at any concentration.³⁶⁹ While some individuals may experience adverse respiratory issues at concentrations below established standards, the YAAQS and CAAQS represent the thresholds where CACs will typically affect the health of an average individual.

The Proponent's air quality modelling indicates that short-duration concentrations of TSP and PM₁₀ will exceed YAAQSs. Correspondingly, off-duty workers and land users may experience short-term respiratory health issues (such as cough, phlegm, rhinitis, bronchitis and asthma) from contaminant inhalation if they are present within the affected area when exceedances occur. This is considered a likely scenario for off-duty workers occupying camp, and less likely for land users who use the affected areas intermittently and may even avoid the area due to the presence of industrial activity.

³⁶⁷ YOR Document 2017-0083-021-1 pg 6-22.

³⁶⁸ Ibid.

³⁶⁹ YOR Document 2017-0083-266-1.

While short-term respiratory effects are likely to occur for off-duty workers in particular, the effects will be infrequent. Exceedances in TSP and PM₁₀ are predicted to occur less than one percent of the time and likely less frequently given that modelling results were for the worse-case scenario. Any effects experienced will be temporary and reversible once the exposure level has been reduced.

The Proponent has proposed a suite of mitigation measures and an air quality management plan, which serve to control and reduce concentrations of CACs, some of which were included in air dispersion modelling. These will also serve to minimize exposure to off-duty workers and other land users.

Significance Determination

EFFECTS ARE LIKELY

The Project is likely to result in short-term effects to the respiratory health of off-duty workers when ambient concentrations of TSP and PM₁₀ exceed YAAQS. There is a lower likelihood that land-based users would be adversely affected since there is low likelihood that their land use activities in the Project area would overlap temporally and spatially with TSP and PM₁₀ exceedances, predicted to occur three to four days per year.

EFFECTS ARE ADVERSE

The effects to off-duty workers are adverse. The inhalation of air contaminants that are above air quality standards can have short-term effects on human respiratory health, such as increased respiratory irritation and cough, and long-term effects, such as chronic disease.

EFFECTS ARE LIKELY NOT SIGNIFICANT

The Project will likely not result in significant effects to the respiratory health of off-duty workers. While exceedances of TSP and PM₁₀ are likely to result in short-term respiratory effects to workers through contaminant inhalation, exceedances are predicted to occur only one percent of the time (i.e. three to four days per year), and this estimation is based on conservative modelling undertaken by the Proponent. Exposure to contaminants will thus be infrequent and short in duration (e.g. 24 hours). Effects are reversible once contaminant concentrations are reduced.

9.2 Noise

Summary and Conclusion

The EC has determined that the Project will not result in significant adverse effects to human health resulting from an increase in ambient noise generated by the Project. The Proponent's noise prediction modelling showed that noise levels are not predicted to exceed set standards. Project design elements and mitigation measures proposed by the Proponent will further reduce the significance of any noise-related effects.

Importance of Ambient Noise Conditions

Elevated noise levels have been shown to lead to a variety of health issues, including hearing loss, sleep disturbance, interference with communication and annoyance.³⁷⁰ In the worst-case scenario, reduced concentration and communication from noise can lead to serious workplace accidents and injuries.

During the 10 years of proposed Project operations, mining activities such drilling, blasting, excavating, crushing, loading/unloading and vehicular traffic will occur 24-hours per day for the Project's lifespan. In the Project's remote setting, workers are particularly susceptible to the repeated effects of noise, specifically the off-duty workers residing at camp due to their proximity to mining operations (on-duty workers will be equipped with appropriate PPE). This section therefore examines the health effects to workers from the generation of elevated and sustained noise from Project activities.

Legislative and Management Setting

OCCUPATIONAL HEALTH AND SAFETY ACT AND REGULATIONS

The *Occupational Health and Safety Regulations* (Part 1 General, s. 1.25) requires workers to wear appropriate hearing protection devices when they are required to work in an area where the noise level cannot be controlled below the permissible values established in the *Occupational Health Regulations*. The *Occupational Health Regulations* (s. 4 Noise Control) set limits for maximum daily exposure to various noise levels and require that workers be provided with appropriate hearing protection, signage be posted in areas with elevated noise, and every worker who is exposed to excessive noise be given hearing tests.

NOISE STANDARDS

No noise standards have been developed for Yukon. As such, the Proponent referred to the standards of the BC Oil and Gas Commission (BC OGC)³⁷¹ and the Energy Resource Conservation Board (ERCB)³⁷² for maximum, permissible daytime and nighttime noise levels, which are 50 decibels, a-weighted (dBA) during the day and 40 dBA at night.

Health Canada (2017) recommends using the WHO Guidelines for Community Noise (1999) for estimating the likelihood of sleep disturbance on any given night, which is an indoor sound level of no more than 30 dBA L_{eq} ³⁷³ for continuous noise during the sleeping period.³⁷⁴

The Proponent evaluated noise from blasting (as modelled for the site) against the Ontario Ministry of the Environment (MOE) 1978 noise pollution control (NPC) guidelines *NPC-119*

³⁷⁰ Health Canada. Guidance for Evaluating Human Health Impacts in Environmental Assessment: Noise. Government of Canada. January 2017. http://publications.gc.ca/collections/collection_2017/sc-hc/H129-54-3-2017-eng.pdf

³⁷¹ BC Oil and Gas Commission. British Columbia Noise Control Best Practices Guidelines. Version 2.1. December 2018. <https://www.bcogc.ca/node/11095>

³⁷² Alberta Energy Regulator. Directive 038: Noise Control. February 16, 2017. <https://www.aer.ca/documents/directives/Directive038.pdf>

³⁷³ Leq: is the equivalent continuous sound levels in decibels; the total sound energy measured over a period of time.

³⁷⁴ Health Canada. Guidance for Evaluating Human Health Impacts in Environmental Assessment: Noise. Government of Canada. January 2017. http://publications.gc.ca/collections/collection_2017/sc-hc/H129-54-3-2017-eng.pdf

Blasting, which specify a cautionary limit of 120 decibels (dB). Environment Canada's 2009 *Environmental Code of Practice for Metal Mines* suggests that mines should design their blasts so that concussion noise of a maximum of 128 dB is not exceeded at or beyond the boundaries of the mine property. The MOE guidelines, while dated, remain relevant, were re-evaluated in 2013 and continue to be considered appropriate guidelines for blasting.

The EC is satisfied with the standards applied by the Proponent and has used the above standards as thresholds by which to measure the significance of effects on human health, as it relates to noise.

Context

Noise adds energy to the air in the form of acoustic waves.³⁷⁵ Guidance prepared by Health Canada indicates that noise can cause potential health effects (such as noise-induced hearing loss, sleep disturbance and/or long-term high annoyance), which can be indicators of potential health effects (i.e. if the noise is experienced over a long period of time, it could potentially increase the risk of negative health effects).³⁷⁶ The effects of sleep disturbance have been shown to include increased fatigue, irritability, and decreased concentration and performance. Other effects may also exist. Furthermore, ongoing sleep disturbance has been linked to a wide variety of health effects, including cardiovascular issues, mental health issues and accidents (WHO 2009; Zaharna and Guilleminault 2010).³⁷⁷ YG's Health and Social Services highlights that the loss of concentration associated with disturbed sleep may put workers at greater risk of accident and injury.³⁷⁸

The Project involves activities that increase ambient noise levels in the Project area for the duration of the Project, with most noise being generated during operations (expected to last a minimum of 10 years). Sources of noise, during the life of the Project, include (but are not limited to) drilling, blasting, crushing, heavy equipment use, material transfer, generators and fans.

The Proponent identified the camp as the sensitive receptor for its noise prediction modelling scenarios. The camp is located near mine infrastructure and is a minimum of 4 km from blasting locations. The mine will be active 24 hours per day during operations, and thus workers will be sleeping during the day and night in camp. On-duty workers who are exposed to excessive noise are required to wear appropriate hearing protection devices as per the *Occupational Health and Safety Act* and Regulations. Thus, the assessment focuses on potential effects to off-duty workers from ongoing and elevated noise levels over the life of the Project.

Existing Conditions and Trends

The Project is located in a remote area of Yukon where baseline noise levels are expected to be low and dominated by natural sounds (wind, wildlife and creeks).³⁷⁹ The Proponent did not collect baseline sound level data for the Project. Instead, the Proponent used the average

³⁷⁵ Ibid.

³⁷⁶ Ibid.

³⁷⁷ Health Canada. Guidance for Evaluating Human Health Impacts in Environmental Assessment: Noise.

³⁷⁸ YOR Document 2017-0083-264-1, pg.29

³⁷⁹ YOR 2017-0083-022-1

ambient sound level for rural areas as established by the ERCB (2007) and the BC OGC (2007), since no ambient sound levels exist for Yukon. The baseline ambient sound levels are 45 dBA L_{eq} for daytime (07:00 to 22:00) and 35 dBA L_{eq} for nighttime (22:00 to 07:00), according to both BC OGC and the ERCB.

To verify whether these ambient noise levels were appropriate to use as the Project’s baseline, the Proponent compared them to measured noise levels from the Casino Mine Project, which is in a remote setting comparable to the KZK Project. Noise monitoring was carried out for the Casino Mine Project in August 2011, and the average ambient sound levels were found to be just below the values of 45 dBA and 35 dBA established by the BC OGC and the ERCB for daytime and nighttime, respectively. The EC is therefore satisfied that the use of values recommended by the ERBC and BC OGC as baseline sound levels for this assessment are appropriate.

Project Design

The measures in Table 27 have been incorporated into the Project design and/or have been committed to, and will eliminate, reduce or control noise generated by the Project, and subsequently any adverse health effects from noise.

Table 27: Proponent mitigation measures for noise

Potential Effect	Project Phase	Proposed Mitigation
Increase in daytime and nighttime noise level at camp receptor	Construction, operations, closure	Noise dampening enclosures for boiler, generators and compressor
	Operations	Crusher, grinding mills, conveyor shielding (in an enclosed building)
	Construction, operations, closure	Equipping all vehicles and internal combustion engines with appropriate muffler systems
		Ensuring regular equipment maintenance including lubrication
		Keeping noisy equipment inside buildings or sheds and/or near ground level whenever possible
		Imposing speed limits for all vehicles (30 km/hr on internal roads and 50 km/hr for mine access roads)
Maintaining natural cover (vegetation) between noise sources and sensitive receptors (camp)		

		Maintaining the Project roads regularly to minimize vehicle noise associated with vibration
Blasting noise perceptible at camp receptor	Operations	Adhering to the Proponent's blasting plan, which implements controlled blasting procedures, optimizes blasting operations and minimizes non-productive noise

Effects Characterization

THE PROJECT WILL NOT RESULT IN AN INCREASE IN AMBIENT NOISE LEVELS ABOVE RELEVANT STANDARDS

The Proponent undertook noise prediction modelling to assess the potential noise effects of the Project using applicable ambient noise standards from other jurisdictions. Noise modelling examined the predicted daytime and nighttime noise levels at the sensitive receptor (i.e. camp) throughout the Project's construction, operation and closure phases. Modelling took into account meteorological data, terrain data and sound pressure values from anticipated noise sources. Modelling was undertaken for the worst-case scenario, where all equipment expected to be in operation on an as-needed or non-continuous basis was assumed to operate at the same time. Modelling also took into account the first two mitigation measures proposed by the Proponent, listed in Table 27 (i.e. shielding and enclosure). Separate modelling was undertaken for blasting noise predictions, with the worst-case scenario factoring in peak blasting activity occurring during open pit development at ground level (as the pit progresses, the bench walls would act as a sound barrier).

The results of the Proponent's modelling showed that the Project would not exceed BC OGC and ERCB standards at the camp (i.e. 45 dBA and 35 dBA for daytime and nighttime noise, respectively) during any phase of the Project. Furthermore, modelling showed that noise from blasting will be below the limit of 120 dB established by the MOE.

INCREASE IN AMBIENT NOISE LEVELS IS NOT LIKELY TO SIGNIFICANTLY AFFECT HUMAN HEALTH

Modelling results showed that ambient noise levels are not expected to exceed the applicable BC OGC and ERCB guidelines. The Proponent notes that "under the loudest scenarios, daytime and nighttime noise levels differ from baseline by more than 1 dBA over a maximum extent of approximately 4 km in the east-west direction and 8 km in the north-south direction centered on the Project footprint. One dBA is the lower end of the typical threshold for an increase in sound level that is considered to be 'barely perceptible' by the human ear (Health Canada, 2011)."³⁸⁰ As such, there is a low likelihood that changes in ambient noise level will cause hearing loss, annoyances or interfere with speech comprehension.

To measure the potential for noise to result in sleep disturbance to off-duty workers, the Proponent applied a building attenuation factor to the predicted outdoor noise levels, as recommended by Health Canada's *Guidance for Evaluating Human Health Impacts in Environmental Assessment: Noise* (2017). The results show that for night shift workers sleeping

³⁸⁰ YOR Document 2017-0083-022-1.

during the daytime, the maximum indoor noise level would be slightly above the 30 dBA standard recommended by WHO (0.4 dBA and 0.6 dBA for construction and operations phases, respectively). However, the Proponent notes that a 0.4 to 0.6 dBA change in noise level is not perceptible to the human ear. Furthermore, since modelling took into account the worst-case scenario, predicted values are more likely to fall below the 30 dBA standard. As such, noise generated from the Project is not likely to result in sleep disturbance to off-duty workers.

While blasting noise modelling fell below the MOE standard of 120 dB, YG's Health and Social Services notes that sleep disturbances may occur if blasting frequency is greater than 10 to 15 times when camp workers are trying to sleep. In response, the Proponent clarified that blasting would occur on average once every two days and at the end of the day shift, prior to the night shift. For underground blasting, which will occur more frequently (up to two times per day), blasting will be scheduled at the end of each shift. The blasting schedule overall will avoid periods when workers are sleeping, and thus has a low likelihood of disturbing the sleep of off-duty workers.

Significance Determination

EFFECTS ARE NOT LIKELY

Overall, noise prediction modelling showed changes in ambient noise levels of just over one dBA for all phases of the Project, which is considered barely perceptible to the human ear. No ambient noise standard exceedances were expected. As a result, adverse effects, such as hearing loss, sleep disturbance and interference with speech comprehension, are not anticipated.

EFFECTS ARE ADVERSE

Effects from elevated noise, including disturbance to sleep and interference with speech comprehension, can result in adverse effects to the health of workers, and also potentially result in accidents or injury.

EFFECTS ARE NOT SIGNIFICANT

While the Project will result in a slight increase in noise from Project activities, the predicted increase in ambient noise levels will not exceed applicable standards and are not likely to cause sleep disturbance, hearing loss or annoyance. The Proponent has proposed additional measures which could further reduce any negative effects.

9.3 Personal Safety

Summary and Conclusion

This section examines effects to personal safety, with respect to violence against women and gender and sexual minorities³⁸¹. Violence against women and gender and sexual minorities is likely to also result in effects to families and children. By mitigating negative effects to women and gender and sexual minorities, related effects to families and children may also be addressed.

³⁸¹ The term "minorities" is used in the context of the current socio-cultural norm.

The EC has determined that the Project is likely to result in significant adverse effects to personal safety with respect to workplace harassment and community violence (the term “violence” is inclusive of harassment and all types of abuse) against women and gender and sexual minorities within the project site and within nearby communities (Ross River, Watson Lake and Whitehorse). These effects can be reduced, controlled or eliminated through the application of the recommended mitigation measures.

This section focuses on two themes:

- community effects, focusing on abuse towards women and the effects to families and community wellbeing; and
- workplace effects, focusing on harassment and abuse towards women and gender and sexual minorities (2SLGBTQIA³⁸²).

With regards to community effects, case studies of similar resource extraction projects have demonstrably linked industrial camps and projects with violence (inclusive of abuse) against women.³⁸³ The potential effects are wide ranging as this violence affects not only the individuals themselves, but also children and communities, sometimes resulting in intergenerational trauma. Case studies also suggest that communities that are geographically close to resource extraction projects are highly vulnerable to violence against women, and particularly against Indigenous women.

Second, with respect to workplace effects, studies and news articles have shown that women and gender and sexual minorities disproportionately experience workplace violence such as harassment and assault.³⁸⁴ It is important to note that despite a lack of data regarding the effects of natural resource development on gender and sexual minorities, research shows that this population is particularly vulnerable to abuse, harassment and discrimination in most contexts.³⁸⁵ Consequently, gender and sexual minorities have been addressed in this section.

The Project contains no notable provisions to prevent the pattern of violence against women and gender and sexual minorities that occurs consistently with other resource extraction projects in Canada’s North. Given that the communities of Ross River and Watson Lake have low levels of social support, low incomes, high rates of substance use and low trust in law

³⁸² See definition on following page.

³⁸³ Bowes-Lyon, L.-M., Richards, J.P., and McGee, T.M. “Socio-Economic Impacts of the Nanisivik and Polaris Mines, Nunavut, Canada.” In *Mining, Society, and a Sustainable World*, by J. P. Richards, 371-396. London; New York: Springer, 2009;

Gibson, G. and Klinck, J. “Canada’s Resilient North: The Impact of Mining on Aboriginal Communities.” *Pimatisiwin: A Journal of Aboriginal and Indigenous Community Health* 3(1) (2005): 116-139.

³⁸⁴ Gibson, G. and Klinck, J. “Canada’s Resilient North: The Impact of Mining on Aboriginal Communities.”, p. 133; Gibson, G. and Scoble, M. ““Regenderneering” the mining industry: A survey of women’s career experiences in mining.”;

Tallichet, S.E. “Barriers to Women’s Advancement in Underground Coal Mining.” *Rural Sociology* 65(2) (2000): 234-252.

³⁸⁵ Statistics Canada. Government of Canada. “Violent victimization of lesbians, gays and bisexuals in Canada, 2014”, Statistics Canada, 2014. <https://www150.statcan.gc.ca/n1/pub/85002-x/2018001/article/54923-eng.htm>.

enforcement,³⁸⁶ potential Project effects are likely to be magnified. Moreover, social tolerance for violence against women and gender and sexual minorities is low. Therefore, the expected effects of a large resource extraction project, combined with the vulnerable nature of affected communities, indicates that effects will likely be significant and adverse.

Definitions for terms used within this section:

2SLGBTQIA (referred to in this section as “gender and sexual minorities”): Two-Spirit, lesbian, gay, bisexual, transgender, queer, questioning, intersex and asexual

Abuse: includes physical, domestic, sexual and psychological abuse

Harassment: “a form of discrimination. It includes any unwanted physical or verbal behaviour that offends or humiliates you. Generally, harassment is a behaviour that persists over time. Serious one-time incidents can also sometimes be considered harassment”³⁸⁷

Personal safety: the condition of being safe from physical harm and also psychological harm. It “involves freedom from worry about physical safety as well as being victimized by hostility, aggression, and harassment.”³⁸⁸

Vulnerable populations: Women, gender and sexual minorities (2SLGBTQIA), children and seniors

Importance of Personal Safety

Personal safety focuses on the value and importance of a person's freedom from violence and harassment in all aspects of their life. Sexualized violence, sexism, racism, harassment, and bullying of and against vulnerable populations and all people is unacceptable. Society has demonstrated low tolerance for such behaviour through legislation, such as the Canadian *Criminal Code* and the Yukon *Human Rights Act*. In addition, academic literature has shown a trend of resource extraction projects, similar to this Project, resulting in sexualized violence and abuse towards women.³⁸⁹ Recently, non-academic organizations, such as The Firelight Group,

³⁸⁶ Hrenchuk, Charlotte. Strong Women's Voices Rural Choices, Report on the Northern Women's Issues Through a Rural Lens Project, p. 14; p.16.

³⁸⁷ Canadian Human Rights Commission. Canadian Human Rights Commission. s.d. <https://www.chrc-ccdp.gc.ca/en/content/what-harassment-1>.

³⁸⁸ Thomson Rivers University (TRU). Personal Safety. TRU, 2019. <https://www.tru.ca/safety/workinglearningsafely/personal.html>

³⁸⁹ National Inquiry Into Missing and Murdered Indigenous Women and Girls (MMIWG). Reclaiming Power and Place: The Final Report of the National Inquiry into Missing and Murdered Indigenous Women and Girls, Volume 1a. National Inquiry Report, MMIWG, 2019. https://www.mmiwg-ffada.ca/wp-content/uploads/2019/06/Final_Report_Vol_1a-1.pdf, pg. 593; Bowes-Lyon, L.-M., Richards, J.P., and McGee, T.M. “Socio-Economic Impacts of the Nanisivik and Polaris Mines, Nunavut, Canada.”; Gibson, G. and Klinck, J. “Canada's Resilient North: The Impact of Mining on Aboriginal Communities;

the Missing and Murdered Indigenous Women and Girls (MMIWG) Inquiry, Amnesty International, MiningWatch Canada and the National Aboriginal Health Organization (NAHO) have released reports specifically addressing this issue.³⁹⁰ The MMIWG report went as far as to recommend the following, “We call upon all resource-extraction and development industries to consider the safety and security of Indigenous women, girls, and 2SLGBTQQIA people.”³⁹¹ In its comment submission³⁹² during the Draft Screening Report comment period, LAWS noted that their “concerns align with the calls for action from the [MMIWG] Inquiry and the Truth and Reconciliation Commission”³⁹³. Lastly, during this Project's Seeking Views and Information phase, the EC received comments from LFN³⁹⁴ and YG³⁹⁵ outlining concerns that women's personal safety will be negatively affected by this Project. LFN stated, “LFN cannot consent to a project that will place Kaska women at further risk of violence and trauma; our community has seen enough of such violence.”³⁹⁶

Stockwell, A. M. “Capturing Vulnerability: Towards a Method for Assessing, Mitigating, and Monitoring Gendered Violence in Mining Communities in British Columbia.”, Master’s thesis, University of British Columbia, 2012; Shandro, J. A., Marcello, M. V., Shoveller, J., Scoble, M., and Koehoorn, M. “Perspectives on community health issues and the mining boom-bust cycle”, *Resources Policy* 36 (2011): 178-186.

³⁹⁰ National Inquiry into Missing and Murdered Indigenous Women and Girls (MMIWG). *Calls for Justice*. Inquiry Report, MMIWG Inquiry, 2019. https://www.mmiwg-ffada.ca/wp-content/uploads/2019/06/Calls_for_Justice.pdf; National Inquiry Into Missing and Murdered Indigenous Women and Girls (MMIWG). *Reclaiming Power and Place: The Final Report of the National Inquiry into Missing and Murdered Indigenous Women and Girls, Volume 1a*; National Aboriginal Health Organization (NAHO). *Resource Extraction and Aboriginal Communities in Northern Canada, Cultural Considerations*. NAHO, 2008. https://www.saintelizabeth.com/getmedia/7efe95d2-e85b-4908-add65dca7bf850bf/Cultural_EN.pdf.aspx;

Gibson, G., K. Yung, L. Chisholm, and H. Quinn with Lake Babine Nation and Nak’azdli Whut’en. *Indigenous Communities and Industrial Camps: Promoting healthy communities in settings of industrial change*. Victoria, B.C.: The Firelight Group, 2017.

Amnesty International. *Out of Sight, Out of Mind: Gender, Indigenous Rights, and Energy Development in Northeast British Columbia, Canada*. London: Amnesty International, 2016. <https://www.amnesty.ca/sites/amnesty/files/Out%20of%20Sight%20Out%20of%20Mind%20EN20FINAL%20web.pdf>;

CCGS Associates. *Overburdened: Understanding the Impacts of Mineral Extraction on Women’s Health in Mining Communities*. Ottawa: MiningWatch Canada, 2004. https://miningwatch.ca/sites/default/files/Overburdened_0.pdf.

³⁹¹ APTN News. “Read the national MMIWG’s inquiry Calls for Justice here”, APTN National News, June 3, 2019. <https://aptnnews.ca/2019/06/03/read-the-national-mmiwg-inquiries-callsfor-justice-here/>, pg.13.1.

³⁹² YOR Document 2017-0083-8333, pg. 1

³⁹³ Ibid.

³⁹⁴ YOR Documents 2017-0083-3867; 2017-0083-282-1.

³⁹⁵ YOR Document 2017-0083-264-1.

³⁹⁶ YOR Document 2017-0083-282-1, pg. 9-10.

Legislative and Regulatory Setting

YUKON HUMAN RIGHTS ACT

The Act specifies that harassment, including sexual harassment, is prohibited in Yukon:

- 14(1) No person shall
- (a) harass any individual or group by reference to a prohibited ground of discrimination;
 - (b) retaliate or threaten to retaliate against an individual who objects to the harassment.

In s. 14(2) “harass’ means to engage in a course of vexatious conduct or to make a demand or a sexual solicitation or advance that one knows or ought reasonably to know is unwelcome”.³⁹⁷

YUKON’S OCCUPATIONAL HEALTH AND SAFETY ACT

The Act defines “occupational injury” as “an illness, disease, disablement or physical or **psychological** injury, arising out of and in the course of employment.”³⁹⁸ [emphasis added] It goes on to state that employers are required to ensure a safe workplace.

- 3(1) Every employer shall ensure, so far as it is reasonably practicable, that
- (a) the workplace, machinery, equipment, and processes under the employer’s control are safe and without risks to health; [emphasis added]
 - (c) workers are given necessary instruction and training and are adequately supervised, taking into account the nature of the work and the abilities of the workers.³⁹⁹

Furthermore, employers must make employees aware of workplace hazards.

- 3(2) Without limiting the generality of subsection (1), every employer shall, so far as is reasonably practicable,

³⁹⁷ Human Rights Act (RSY). C.116, 2002. http://www.yukonhumanrights.ca/documents/YHRA_current.pdf, pg.7.

³⁹⁸ Occupational Health and Safety Act (RSY). C.159, 2002. http://www.gov.yk.ca/legislation/acts/ochesa_c.pdf, pg.

2.

³⁹⁹ Ibid. pg 5.

- (a) ensure that workers are made aware of any hazard in the work [...];
- (b) cooperate with and assist safety and health representatives and committee members in the performance of their duties;
- (c) ensure that workers are informed of their rights, responsibilities, and duties under this Act; and
- (d) make reasonable efforts to check the well-being of a worker when the worker is employed under conditions that present a significant hazard of disabling injury, or when the worker might not be able to secure assistance in the event of injury or other misfortune.⁴⁰⁰

FEDERAL CRIMINAL CODE

With regards to personal safety, the federal *Criminal Code* specifies that the following acts are unlawful: assault,⁴⁰¹ crimes of a sexual nature (e.g. sexual assault),⁴⁰² uttering threats,⁴⁰³ murder,⁴⁰⁴ manslaughter,⁴⁰⁵ disorderly conduct (i.e. indecent acts including nudity, causing disturbance, indecent exhibition, loitering, etc.),⁴⁰⁶ offences against private property (i.e. theft, robbery, extortion, breaking and entering, etc.),⁴⁰⁷ and criminal harassment.⁴⁰⁸

YUKON EMPLOYMENT STANDARDS ACT

No provisions exist within this Yukon Act regarding harassment prevention within the workplace. The section on “sex discrimination”⁴⁰⁹ focuses solely on the right of men and women to equal pay for similar work performed.

Context

IN COMMUNITIES

Victims of abuse often have great difficulty seeking help and speaking out. Abuse is often unreported, which increases the likelihood of its continuation. In Yukon communities that have larger than average numbers of people living with trauma related to colonialism⁴¹⁰ and fewer social services and police resources, the culture of silence and lack of trust in law enforcement further affect victims’ ability to receive help. Factors such as substance use have also been

⁴⁰⁰ Occupational Health and Safety Act (RSY). C.159, pg.5-6.

⁴⁰¹ Criminal Code, R.S., c. C-34, s.1.

⁴⁰² Ibid.

⁴⁰³ Ibid.

⁴⁰⁴ Ibid.

⁴⁰⁵ Ibid.

⁴⁰⁶ Criminal Code, R.S., c. C-34, s.1.

⁴⁰⁷ Ibid.

⁴⁰⁸ Ibid.

⁴⁰⁹ ⁴⁰⁹ Occupational Health and Safety Act (RSY). C.159, pg. 28-29.

⁴¹⁰ Within this section, “trauma related to colonialism” and “colonialism” refer to the following: residential school legacies, effects of displacement and disenfranchisement from the Indian Act⁴¹⁰, and the Sixties Scoop.

found to increase or exacerbate abuse⁴¹¹ and case studies have found an increase in substance use linked to natural resource development.⁴¹² Furthermore, victims of domestic abuse generally struggle to leave their abuser due to (but not limited to) financial reliance, fear of retribution, a lack of a support network, a fear of losing children, a lack of adequate housing options, and religious or cultural beliefs. Additional barriers exist for women in small, remote communities where they have limited or no access to support services. Likewise, perpetrators of violence have limited access to support services to work on addressing violent behaviour.

A workforce at the proposed mine that is likely to be largely male, will potentially increase women's financial dependence on men. Couples with children are unlikely to have both parents working at the mine. This results in the male partner being the most likely to work at the mine, which may lead to an imbalance of household income distribution. This imbalance may create a situation where the control of income is detrimental to the female partner. An influx of income can lead to increases in substance use, which in turn, increases the risk of violence. Financial dependence also makes it difficult for a victim of abuse to leave.

In Whitehorse, a temporary increase in the presence of men without ties to a Yukon community may increase chances of violent interactions with vulnerable populations, including sex workers.⁴¹³

AT THE WORKPLACE

Mines create industrial camps that tend to have a unique hyper-masculine and sexist culture that is apathetic towards self-care.⁴¹⁴ These camps are male dominated and may foster unhealthy work environments for women. Indigenous women are particularly vulnerable to negative interactions as they are disproportionately represented as victims of crime⁴¹⁵ due to

⁴¹¹ CCGS Associates. *Overburdened: Understanding the Impacts of Mineral Extraction on Women's Health in Mining Communities*, pg. 32;

Byford, J. One day rich: community perceptions of the impact of the Placer Dome Gold Mine, Misima Island, Papua New Guinea. In: Macdonald I, Rowland C, eds. *Tunnel Vision: Women, Mining, and Communities*. Victoria, Australia: Oxfam Community Aid Abroad, 2002: 30–35;

Downing, T.E. *Avoiding New Poverty: Mining-Induced Displacement and Resettlement*. International Institute for Environment and Development and World Business Council for Sustainable Development, 2002.

<https://pubs.iied.org/pdfs/G00549.pdf>;

Simatauw, M. The polarization of people and the state on interests of the political economy and women's struggle to defend their existence: a critique of mining policy in Indonesia. In: Macdonald I, Rowland C, eds. *Tunnel Vision: Women, Mining, and Communities*. Victoria, Australia: Oxfam Community Aid Abroad; 2002: 35–40;

World Health Organization (WHO). *Violence against women*. WHO, 2017. <https://www.who.int/news-room/fact-sheets/detail/violence-against-women>;

Eckford, C. and Wagg, J. *The Peace Project: Gender Based Analysis of Violence against Women and Girls in Fort St. John*. Status of Women Canada and Fort St. John Women's Resource Society, 2014. https://thepeaceprojectfsj.files.wordpress.com/2014/03/the_peace_project_gender_based_analysis_amended.pdf

⁴¹² Bowes-Lyon, L.-M., Richards, J.P., and McGee, T.M. "Socio-Economic Impacts of the Nanisivik and Polaris Mines, Nunavut, Canada.", pg. 384.

⁴¹³ Gibson, G. and Klinck, J. "Canada's Resilient North: The Impact of Mining on Aboriginal Communities.", pg. 124.

⁴¹⁴ Eckford, C. and Wagg, J. *The Peace Project: Gender Based Analysis of Violence against Women and Girls in Fort St. John*.

⁴¹⁵ Department of Justice. Government of Canada. "Victims of Crime Research Digest No. 3, Aboriginal Victimization in Canada: A Summary of the Literature", Department of Justice, 2014. <https://www.justice.gc.ca/eng/rp-pr/cj-jp/victim/rd3-rr3/p3.html>

legacies of colonization and patriarchy. Research has shown that women are more likely to face workplace sexism and have limited career advancement within the mining industry.⁴¹⁶

AT BOTH THE WORKPLACE AND IN COMMUNITIES

Violence against women is persistently a major issue with large-scale natural resource development activities,⁴¹⁷ with Indigenous women being particularly vulnerable.⁴¹⁸ In the Final Report of the National Inquiry into MMIWG, Indigenous women, girls, and gender and sexual minorities are outlined as being “targeted by colonial violence embedded within institutions, structures, and systems, as well as interpersonal violence, where these encounters occur”.⁴¹⁹ The report goes on to note that Indigenous women are specific targets of violence due to “Canada’s colonial legacy [which] has forced Indigenous women and girls into dangerous and precarious social and economic conditions, which in turn has made them more vulnerable to different kinds of violence”.⁴²⁰

It is important to note that although there is little data regarding gender and sexual minorities, it is assumed that a similar situation exists for this population. Research has shown that rotational schedules—FI/FO—disrupt family and community life, adding stressors that may contribute to the initiation or continuation of violence against women.⁴²¹

In both the workplace and communities, harassment, abuse, assault and bullying can cause physical and psychological harm with long-term effects. People identifying as Aboriginal make up 23.3 percent of Yukon’s population⁴²² and First Nations make up the majority of people living in most communities outside of Whitehorse. Many First Nations people experience higher levels of socio-economic vulnerability as a result of direct or indirect trauma experienced through residential schools and other colonial legacies.⁴²³

⁴¹⁶ Gibson, G. and Klinck, J. "Canada's Resilient North: The Impact of Mining on Aboriginal Communities.", pg. 133; Gibson, G. and Scoble, M. "'Regenderneering' the mining industry: A survey of women's career experiences in mining."; Tallichet, S.E. "Barriers to Women's Advancement in Underground Coal Mining."

⁴¹⁷ National Inquiry Into Missing and Murdered Indigenous Women and Girls (MMIWG). Reclaiming Power and Place: The Final Report of the National Inquiry into Missing and Murdered Indigenous Women and Girls, Volume 1a.

⁴¹⁸ Eckford, C. and Wagg, J. The Peace Project: Gender Based Analysis of Violence against Women and Girls in Fort St. John.

⁴¹⁹ National Inquiry Into Missing and Murdered Indigenous Women and Girls (MMIWG). Reclaiming Power and Place: The Final Report of the National Inquiry into Missing and Murdered Indigenous Women and Girls, Volume 1a, pg. 124.

⁴²⁰ National Inquiry Into Missing and Murdered Indigenous Women and Girls (MMIWG). Reclaiming Power and Place: The Final Report of the National Inquiry into Missing and Murdered Indigenous Women and Girls, Volume 1a, pg. 565.

⁴²¹ CCGS Associates. Overburdened: Understanding the Impacts of Mineral Extraction on Women's Health in Mining Communities, pg. 10; Archibald, L., Crnkovich, M., and Canada, G. If Gender Mattered: A Case Study of Inuit Women, Land Claims and the Voisey's Bay Nickel Project, 1999. <http://publications.gc.ca/collections/Collection/SW21-39-1999E.pdf>, pg. 13; Eckford, C. and Wagg, J. The Peace Project: Gender Based Analysis of Violence against Women and Girls in Fort St. John.

⁴²² Statistics Canada. Government of Canada. Focus on Geography Series, 2016 Census. Government of Canada, 2016. <https://www12.statcan.gc.ca/census-recensement/2016/as-sa/fogs-spg/Facts-PR-Eng.cfm?TOPIC=9&LANG=Eng&GK=PR&GC=60>

⁴²³ National Inquiry Into Missing and Murdered Indigenous Women and Girls (MMIWG). Reclaiming Power and Place: The Final Report of the National Inquiry into Missing and Murdered Indigenous Women and Girls, Volume 1a;

Current Conditions and Trends

Reported crime statistics from 2016 show that Yukon experienced violent crime and criminal traffic offences causing death or bodily harm at three times the national rate. Furthermore, the majority of victims are women (82 percent).⁴²⁴

ROSS RIVER

The community of Ross River has a population of 290 residents with a median age of 40.5 years.⁴²⁵ Its population is largely First Nations people, who account for 83 percent of residents,⁴²⁶ most of whom are members of RRDC. Consequently, the community continues to experience the effects of historical colonialism, such as residential schools,⁴²⁷ industrial development, displacement and disenfranchisement as a result of the *Indian Act*⁴²⁸ and the Sixties Scoop.⁴²⁹

Statistics show a high crime rate in Ross River relative to the rest of the territory, with 52 instances of violent crime in 2016.⁴³⁰ In comparison, Dawson City experienced a similar number of violent crimes, among a much larger population of 1 375.⁴³¹ In addition, the Project proposal notes that there is a high rate of substance use within the Ross River community.⁴³²

In 2004, the Yukon Status of Women Council (YSWC) interviewed women in Ross River (in what was the last study conducted) on the wellbeing of women in remote Yukon communities. Some respondents stated that they “do not feel safe and protected,” and showed a distrust of law enforcement.⁴³³ Furthermore, interviewees requested that new RCMP members receive

Eckford, C. and Wagg, J. The Peace Project: Gender Based Analysis of Violence against Women and Girls in Fort St. John.

⁴²⁴ Statistics Canada. Government of Canada. Victims of police reported violent crime in Yukon, 2016. Government of Canada, 2016. <https://www150.statcan.gc.ca/n1/pub/85-002-x/2018001/article/54960/s12-eng.htm>

⁴²⁵ Yukon Bureau of Statistics. Government of Yukon. Ross River, Population by Sex and Age Group Census 2016. Government of Yukon, 2016. http://www.sewp.gov.yk.ca/data?regionId=YK.RR&subjectId=POPCOM&groupId=POPCOM.POP&dataId=CENSU_2016_POP_AGE&tab=region

⁴²⁶ Yukon Bureau of Statistics. Government of Yukon. Ross River, Aboriginal Population Census 2016. Government of Yukon, 2016. http://www.sewp.gov.yk.ca/data?regionId=YK.RR&subjectId=POPCOM&groupId=POPCOM.ABOR&dataId=CENSUS_2016_ABOR_POP&tab=region

⁴²⁷ National Inquiry Into Missing and Murdered Indigenous Women and Girls (MMIWG). Reclaiming Power and Place: The Final Report of the National Inquiry into Missing and Murdered Indigenous Women and Girls, Volume 1a.

⁴²⁸ Hrenchuk, Charlotte. Strong Women’s Voices Rural Choices, Report on the Northern Women’s Issues Through a Rural Lens Project, pg. 14

⁴²⁹ The “Sixties Scoop” marks a period between the late 1950s and 1990, in which a large-scale amount of Indigenous children were removed from their homes and adopted into predominantly non-Indigenous, middle-class families across Canada and the United States. Source: National Inquiry Into Missing and Murdered Indigenous Women and Girls (MMIWG). Reclaiming Power and Place: The Final Report of the National Inquiry into Missing and Murdered Indigenous Women and Girls, Volume 1a, pg. 280.

⁴³⁰ Yukon Bureau of Statistics. Government of Yukon. Police-reported Crime Statistics in Yukon 2016. Government of Yukon, 2017. http://www.eco.gov.yk.ca/stats/pdf/crime_2016.pdf

⁴³¹ Statistics Canada. Dawson, T [Census subdivision], Yukon and Nova Scotia [Province] (table). Census Profile. 2016 Census. Statistics Canada Catalogue no. 98-316-X2016001. Ottawa. Released November 29, 2017. <https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/index.cfm?Lang=E>

⁴³² YOR Document 2017-0083-046-1, pg.15-10.

⁴³³ Hrenchuk, Charlotte. Strong Women’s Voices Rural Choices, Report on the Northern Women’s Issues Through a Rural Lens Project, p. 14.

cross-cultural training specific to Yukon and Ross River Dena,⁴³⁴ acknowledging the importance of understanding context in policing in Ross River.

Despite historical colonial effects, high crime rates and issues of substance use, Ross River has few social services within the community. Few resources exist to address substance use, with detox programs only available in Whitehorse, a five-hour drive away. Furthermore, with the collapse of the Many Rivers Counselling Services in 2018, there are fewer counselling services in the community, with one YG mental wellness and substance use counsellor and one YG child and youth counsellor.⁴³⁵ Lastly, a Christian safe house has existed since 2004, but no funds exist to offer programs⁴³⁶ such as a soup kitchen or recreational programs for women; as well funding for LAWS is inconsistent.⁴³⁷

WATSON LAKE

The community of Watson Lake has a population of 1 100 residents and a median age of 44.1 years.⁴³⁸ Its population is largely First Nations people, who account for 54 percent of residents,⁴³⁹ most of whom are members of LFN. Similar to Ross River, Watson Lake experiences the effects of historical colonialism such as residential schools,⁴⁴⁰ displacement resulting from the *Indian Act* (Bill C-31)⁴⁴¹ and the Sixties Scoop.

Statistics show a high crime rate relative to the rest of the territory, with 126 instances of violent crime in 2016.⁴⁴² For comparison purposes, Dawson City, with a similar population, experienced less than half as many instances of violent crime.⁴⁴³ Research by Hrenchuk (2004)⁴⁴⁴ found women in Watson Lake reported that young women were being preyed upon by older, violent and abusive men.⁴⁴⁵ They added that there was a high rate of substance use in the community.⁴⁴⁶

⁴³⁴ Ibid.

⁴³⁵ Department of Health and Social Services. Government of Yukon. Mental Wellness and Substance Use Services across Yukon. 2019. http://www.hss.gov.yk.ca/mwsu_communities.php

⁴³⁶ Ibid.

⁴³⁷ LAWS provides services to both Ross River and Watson Lake.

⁴³⁸ Yukon Bureau of Statistics, Government of Yukon. Whitehorse (City of), Population by Sex and Age Group Census 2016. Government of Yukon, 2016. http://www.sewp.gov.yk.ca/data?regionId=YK.WH&subjectId=POPCOM&groupId=POPCOM.POP&dataId=CENSUS_2016_POP_AGE&tab=region

⁴³⁹ Yukon Bureau of Statistics. Government of Yukon. Watson Lake, Aboriginal Population Census 2016. Government of Yukon. 2016. http://www.sewp.gov.yk.ca/data?regionId=YK.WLR&subjectId=POPCOM&groupId=POPCOM.ABOR&dataId=CENSUS_2016_ABO_POP&tab=region

⁴⁴⁰ National Inquiry Into Missing and Murdered Indigenous Women and Girls (MMIWG). Reclaiming Power and Place: The Final Report of the National Inquiry into Missing and Murdered Indigenous Women and Girls, Volume 1a.

⁴⁴¹ Hrenchuk, Charlotte. Strong Women's Voices Rural Choices, Report on the Northern Women's Issues Through a Rural Lens Project, pg. 14.

⁴⁴² Yukon Bureau of Statistics. Government of Yukon. Police-reported Crime Statistics in Yukon 2016. Government of Yukon, 2017. http://www.eco.gov.yk.ca/stats/pdf/crime_2016.pdf

⁴⁴³ Statistics Canada. Dawson, T [Census subdivision], Yukon and Nova Scotia [Province] (table).

⁴⁴⁴ It is important to note that this section relies heavily on a 15 year old study. Though it may be dated, no substantial changes have taken place within Ross River nor Watson Lake that would alter the validity of the findings within this study.

⁴⁴⁵ Hrenchuk, Charlotte. Strong Women's Voices Rural Choices, Report on the Northern Women's Issues Through a Rural Lens Project, pg. 16.

⁴⁴⁶ Ibid.

Similar to Ross River, female residents of Watson Lake have previously outlined a distrust of law enforcement, stating in Hrenchuk's 2004 study that women "feel insecure with the RCMP and do not feel comfortable calling [police] in instances of family violence,"⁴⁴⁷ and that First Nations women feel that they are treated differently by police.⁴⁴⁸ Interviewees also discussed the lack of transportation options, which results in a reliance on hitchhiking.

Like Ross River, the community of Watson Lake also has few social services despite high crime rates, historical colonial legacies and substance use issues. A limited number and variety of resources are available. Detox services are available only in Whitehorse and there are fewer counselling services since the closure of the YG-funded Many Rivers Counselling Service. The community has two mental wellness and substance use counsellors, one clinical counsellor, one mental health nurse and one child and youth counsellor.⁴⁴⁹ Along with services provided by LAWS, Help and Hope for Families offers transition home services and shelter.⁴⁵⁰

WHITEHORSE

As of 2020, the City of Whitehorse has a population of 29 000 residents. When including the surrounding area, the population of Whitehorse is 32 000.⁴⁵¹ As of the last census, Whitehorse had a median age of 37.4 years.⁴⁵² Its population is highly varied with the largest immigrant population in Yukon. First Nations people make up a smaller portion of the population with 18 percent of people self-identifying as First Nations in the 2016 Census.⁴⁵³ Unlike Ross River and Watson Lake, which each have a population largely composed of people from one First Nation, the urban centre of Whitehorse has First Nations people who have moved to Whitehorse from other Yukon communities. Though historical colonial factors⁴⁵⁴ are still present, the overall effects are reduced due to the larger, heterogeneous nature of the city and the availability of a wider range of social services.

As the largest community in Yukon, Whitehorse has the most services available and acts as a hub for other communities. The city has a larger police presence with more resources available than smaller Yukon communities. There are many public transit options and affordable flights to destinations outside Yukon. Furthermore, Whitehorse has many social services, such as Victoria Faulkner Women's Centre,⁴⁵⁵ the Whitehorse Emergency Shelter, Betty's Haven

⁴⁴⁷ Ibid.

⁴⁴⁸ Ibid.

⁴⁴⁹ Department of Health and Social Services. Government of Yukon. Mental Wellness and Substance Use Services across Yukon. 2019. http://www.hss.gov.yk.ca/mwsu_communities.php

⁴⁵⁰ Help and Hope for Families Society (HHFS). Help and Hope for Families Society.

⁴⁵¹ Yukon Bureau of Statistics. Population Report, Q1 2020.

⁴⁵² Yukon Bureau of Statistics. Government of Yukon. Ross River, Aboriginal Population Census 2016. Government of Yukon, 2016. http://www.sewp.gov.yk.ca/data?regionId=YK.RR&subjectId=POPCOM&roupld=POPCOM.ABOR&dataId=CENSUS_2016_ABOR_POP&tab=region

⁴⁵³ Yukon Bureau of Statistics. Government of Yukon. Ross River, Aboriginal Population Census 2016.

⁴⁵⁴ National Inquiry Into Missing and Murdered Indigenous Women and Girls (MMIWG). Reclaiming Power and Place: The Final Report of the National Inquiry into Missing and Murdered Indigenous Women and Girls, Volume 1a

⁴⁵⁵ Victoria Faulkner Women's Centre (VFWS). The Victoria Faulkner Women's Centre. VFWS, 2019. <http://www.vfwomenscentre.com/>

Second Stage Housing,⁴⁵⁶ Kaushee's Place Women's Shelter,⁴⁵⁷ Skookum Jim Friendship Centre,⁴⁵⁸ Yukon Legal Services Society⁴⁵⁹ and access to more mental health and counselling services.

At the same time, Whitehorse has the largest homeless population in the territory and there is a documented sex work industry within the capital.⁴⁶⁰ The city's transient population also creates a sense of anonymity, with many residents lacking community ties (partially due to mineral development activities and construction projects). Whitehorse acts as a transfer point for FI/FO workers.

Project Design

The Project would establish a large camp with mainly male workers located 160 km from the community of Ross River. It proposes to build a worker camp for 80 to 350 people over 15 years (this includes the construction, operations and active closure phases).⁴⁶¹ During construction, the Proponent estimates their workforce will be made up of 10 to 30 people from Ross River, 35 to 55 people from Watson Lake and 200 to 250 people from Whitehorse, with the remainder hired from outside the territory.⁴⁶² It is not clear the gender composition of the workforce; however, similar mining projects suggest it will be male-dominated. The Proponent has not proposed an approach to hiring that would change this outcome.

The Project operates on a FI/FO rotational model, whereby employees work two weeks followed by one week off. Employees have a maximum of four weeks of annual holiday available after the first year of employment and Yukon First Nation employees have a maximum of two weeks of unpaid leave to pursue traditional activities and to attend culturally important events.⁴⁶³ Employees will be transported to the Finlayson airstrip by chartered plane from Whitehorse (approximately 255 km) and by bus from Watson Lake (235 km) and from Ross River (135 km). Many employees will be third party workers (e.g. truckers, caterers, contractors) and may be subject to different disciplinary and harassment policies.

PROPOSED PROPONENT MITIGATIONS

The Proponent proposes

- a dry camp, with no drug or alcohol use on-site, and with drug testing of all new employees and random testing thereafter;⁴⁶⁴

⁴⁵⁶ Kobayashi + zedda (KZ). Betty's Haven Second Stage Housing. Kobayashi + Zedda, 2019. <https://kza.yk.ca/projects/bettys-haven-second-stage-housing/>

⁴⁵⁷ Women's Transition Home (WTH). Emergency Shelter. WTH, n.d. <https://www.womenstransitionhome.ca/kaushees-place/>

⁴⁵⁸ Skookum Jim Friendship Centre (SJFC). Skookum Jim Friendship Centre. SJFC, n.d.. <https://skookumjim.com/>

⁴⁵⁹ Yukon Legal Services Society (YLSS). Yukon Legal Services Society. YLSS, 2019. <https://legalaid.yk.ca/>

⁴⁶⁰ Yukon Status of Women Council (YSWC). Our Publications. YSWC, 2019.

<https://www.yukonstatusofwomen.org/index.php/publications>

⁴⁶¹ YOR Document 2017-0083-012-1, pg. 4-4; 4-7; and 4-129.

⁴⁶² YOR Document 2017-0083-046-1

⁴⁶³ Ibid.

⁴⁶⁴ YOR Document 2017-0083-046-1.

- an “Extensive screening of employees before hire to gauge their suitability for shift work and to help educate them on its potential effects;”⁴⁶⁵
- education and assistance through an employee assistance program (EAP) available to all employees and their families as required.⁴⁶⁶ Examples of EAP counselling services include
 - drug and alcohol counselling (including time off for employees who need treatment);
 - relationship counselling
- a mentor program for First Nations employees, to be expanded into a more general support program for all site personnel. The program will be a personnel management feedback loop as the mentor is often the first point of contact for local personnel experiencing difficulties at work or at home. Mentors can propose mitigation measures.⁴⁶⁷

Effects Characterization

IN WHITEHORSE, ROSS RIVER AND WATSON LAKE

Based on case studies of similar projects,⁴⁶⁸ the EC reasonably predicts an increased likelihood of violence towards vulnerable populations, specifically women (especially First Nations women) and gender and sexual minorities. Furthermore, the Project shares similarities with other case studies, such as increases in employees’ average income, which can lead to negative effects. The Proponent assumes an average annual income of \$82 730 for each employee,⁴⁶⁹ which would be a large increase from the 2015 median one-person household annual incomes⁴⁷⁰ in Ross River (\$21 867), Watson Lake (\$39 552) and Whitehorse (\$47 019). Consequently, based on findings from similar studies,⁴⁷¹ the EC foresees an increase in violent crimes.⁴⁷²

IN ROSS RIVER AND WATSON LAKE

The EC predicts that the sudden increase in income for employees from Ross River and Watson Lake, coupled with previous legacies and current social issues, may lead to or exacerbate substance use, income disparities within communities and households, and cause

⁴⁶⁵ YOR Document 2017-0083-046-1.

⁴⁶⁶ Ibid.

⁴⁶⁷ YOR Document 2017-0083-200-1

⁴⁶⁸ Bowes-Lyon, L.-M., Richards, J.P., and McGee, T.M. “Socio-Economic Impacts of the Nanisivik and Polaris Mines, Nunavut, Canada.”; and Gibson, G. and Klinck, J. “Canada’s Resilient North: The Impact of Mining on Aboriginal Communities.”

⁴⁶⁹ YOR Document 2017-0083-046-1.

⁴⁷⁰ Yukon Bureau of Statistics (YBS), Government of Yukon. Income Census 2016. YBS, 2016.

<http://www.eco.gov.yk.ca/stats/pdf/Income.pdf>

⁴⁷¹ Bowes-Lyon, L.-M., Richards, J.P., and McGee, T.M. “Socio-Economic Impacts of the Nanisivik and Polaris Mines, Nunavut, Canada.”;

Gibson, G. and Klinck, J. “Canada’s Resilient North: The Impact of Mining on Aboriginal Communities.”

⁴⁷² “Violent Criminal Code Violations” include: homicide, attempted murder, sexual assault, assault, robbery, forcible confinement or kidnapping, abduction, extortion, criminal harassment, uttering threats, threatening or harassing phone calls, etc.

financial stress. It is also anticipated that FI/FO rotational work will lead to or exacerbate substance use, social disconnection (especially for families with one parent away for long periods of time), cultural alienation and mental health issues. This predicted onset of or increase in issues of substance use, income disparity and social disconnection, along with current social issues and historical legacies is likely to increase domestic abuse, most likely affecting women and children.⁴⁷³

With regards to domestic abuse, it is reasonable to predict an increase in women's financial dependency on men (especially in Ross River and Watson Lake, where unemployment levels are high). Mine workforces are predominantly male and, in families with children, women are less likely to secure or sustain employment if their male spouse is working a FI/FO rotational shift because of childcare demands. This financial dependency is likely to reduce victims' ability to leave abusive relationships, which increases the risk of longer-term household violence. Domestic abuse has physical and emotional effects on spouses and their children, and also has emotional effects on the extended family and negative effects on community dynamics. Stopping and reversing these effects is difficult in the context of limited social services and the historical legacies within communities, as well as the remoteness and small size of the population. The effects persist long after violence has taken place, and may lead to intergenerational trauma and greater risk of violence in the future (beyond the lifespan of the mine). The limited social services in Ross River and Watson Lake exacerbate these problems.

IN WHITEHORSE

From findings in similar studies,⁴⁷⁴ the EC predicts that an increase in violent crime within Whitehorse is likely. An increase in crime occurs hand-in-hand with an increase in the solicitation of sex workers which has been shown to exist in Whitehorse.⁴⁷⁵ Sex workers are particularly vulnerable to assault and even murder, and are less likely to reach out to police due to the nature of their work. They are often vulnerable women who have experienced childhood trauma and become sex workers out of necessity. Though Whitehorse has greater access to social supports than Ross River and Watson Lake, and therefore more societal resilience, this still remains a high-magnitude effect.

AT THE WORKPLACE

The Project workforce is likely to be predominantly men, which can easily breed a toxic male culture within the camp.⁴⁷⁶ Considering case studies of similar projects, there is a high likelihood of sexual harassment and abuse against women and gender and sexual minorities. Moreover, due to insufficient mitigations proposed by the Proponent—for example, their high-level Employment & Anti-Discrimination Policy states, "Managers and staff at every level of the organisation shall ensure they and the people around them do not engage in discriminatory

⁴⁷³ Gibson, G. and Klinck, J. "Canada's Resilient North: The Impact of Mining on Aboriginal Communities.", p. 131.

⁴⁷⁴ Bowes-Lyon, L.-M., Richards, J.P., and McGee, T.M. "Socio-Economic Impacts of the Nanisivik and Polaris Mines, Nunavut, Canada.";

Gibson, G. and Klinck, J. "Canada's Resilient North: The Impact of Mining on Aboriginal Communities."

⁴⁷⁵ Hrenchuk, Charlotte. Not Your Fantasy 101. Yukon Status of Women Council, 2018.

⁴⁷⁶ Vella, H. "#MeTooMining: tackling sexual misconduct in the mining industry." *Mining Technology*, April 30, 2018. <https://www.mining-technology.com/features/metoomining-tackling-sexual-misconduct-mining-industry/>

behaviour⁴⁷⁷—it is likely that these negative effects will occur and persist. In addition, the Personnel Management Policy⁴⁷⁸ and the Fitness for Work Policy⁴⁷⁹ are both high-level, stating general visions without providing processes or tangible actions. Within the workplace, the effects are likely to be less violent than in communities, though low reversibility effects and long-term emotional effects would still result. The effects are likely to occur over the mine's lifespan and are likely to continue post-closure.

Significance Determination

IN COMMUNITIES

EFFECTS ARE LIKELY

Recent case studies in similar northern, remote contexts have demonstrated that natural resource extractive operations lead to negative effects for women,⁴⁸⁰ and in particular Indigenous women.⁴⁸¹ Specific effects include an increase in sexual assault, domestic violence, and other forms of abuse. Based on the insufficient mitigations put forward by the Proponent in the Project proposal (noted above), it is likely that negative effects will occur.

EFFECTS ARE ADVERSE

Domestic violence, sexual assault, and other forms of abuse often lead to negative effects—such as anxiety, post-traumatic stress disorder (PTSD), substance use, major depression, panic disorder, physical injury⁴⁸²—that affect women, children and broader family networks. The effects are generally long-term (sometimes lasting multiple generations) and can be irreversible.

EFFECTS ARE SIGNIFICANT

The EC has determined that the Project's effects are significant within communities because they occur in locations with social issues and current high levels of violence, which are likely to lead to additional violence against women and gender and sexual minorities. Given low social tolerance for sexual crimes and violence against women and gender and sexual minorities, this predicted increase in violence is significant, especially considering existing conditions. This

⁴⁷⁷ YOR Document 2017-0083-056-1

⁴⁷⁸ YOR Document 2017-0083-0060-1

⁴⁷⁹ YOR Document 2017-0083-058-1

⁴⁸⁰ Bowes-Lyon, L.-M., Richards, J.P., and McGee, T.M. "Socio-Economic Impacts of the Nanisivik and Polaris Mines, Nunavut, Canada."; and Gibson, G. and Klinck, J. "Canada's Resilient North: The Impact of Mining on Aboriginal Communities."

⁴⁸¹ National Inquiry Into Missing and Murdered Indigenous Women and Girls (MMIWG). Reclaiming Power and Place: The Final Report of the National Inquiry into Missing and Murdered Indigenous Women and Girls, Volume 1a; Gibson, G., K. Yung, L. Chisholm, and H. Quinn with Lake Babine Nation and Nak'azdli Whut'en. Indigenous Communities and Industrial Camps: Promoting healthy communities in settings of industrial change; Stockwell, A. M. "Capturing Vulnerability: Towards a Method for Assessing, Mitigating, and Monitoring Gendered Violence in Mining Communities in British Columbia."

⁴⁸² World Health Organization (WHO). Violence against women; Public Health Agency of Canada. The Chief Public Health Officer's Report on the State of Public Health in Canada 2016: A Focus on Family Violence in Canada. Government of Canada. October 2016. <https://www.canada.ca/content/dam/canada/public-health/migration/publications/departement-ministere/state-public-health-family-violence-2016-etat-sante-publique-violence-familiale/alt/pdf-eng.pdf>; and Wathen, N. Health Impacts of Violent Victimization on Women and their Children. Research and Statistics Division, Department of Justice Canada, 2012. https://www.justice.gc.ca/eng/rp-pr/cj-jp/fv-vf/rr12_12/rr12_12.pdf

determination is supported by a large body of research which suggests that the likelihood of effects is high and that effects on individuals are negative, long-term and often irreversible.⁴⁸³ These long-term effects to individuals are likely to weaken communities, culture, and social connections while creating conditions that are conducive to future violence. LFN's comment submission singling out women's personal safety as one of their key concerns adds to the significance of this VESEC.

AT THE WORKPLACE

EFFECTS ARE LIKELY

Academic studies, news articles and reports show a 50-year history of women being the targets of harassment, assault and inappropriate advances within the mining workplace.⁴⁸⁴ Based on the lack of targeted, tangible mitigations put forward by the Proponent in the Project proposal (as described in Effects Characterization, At the Workplace, above), it is likely that negative effects will occur.

EFFECTS ARE ADVERSE

Workplace bullying, sexual assault, harassment, inappropriate and unhealthy workplace behaviours have long-term negative effects. Sexual violence can have psychological, emotional and physical effects that can negatively affect a person's future. Effects within the workplace may lead to women quitting and/or altering career paths and may reduce the number of women working in the mining sector.⁴⁸⁵

EFFECTS ARE SIGNIFICANT

The EC has determined that the Project's effects are significant at the workplace because the effects of sexualized violence or harassment on individuals can be lifelong and, for some victims, irreversible without suitable counselling and supports. In addition, there are no substantial mitigations in place which will help this Project reduce workplace sexual violence and harassment. These effects also leave women with negative work experiences, which are then shared with others and act as disincentives to working in mining for other women. This results in fewer women working in mining in the short- and long-term.

⁴⁸³ Public Health Agency of Canada. The Chief Public Health Officer's Report on the State of Public Health in Canada 2016: A Focus on Family Violence in Canada; and Wathen, N. Health Impacts of Violent Victimization on Women and their Children.

⁴⁸⁴ Gibson, G. and Klinck, J. "Canada's Resilient North: The Impact of Mining on Aboriginal Communities.", pg. 133; Gibson, G. and Scoble, M. "'Regenderneering' the mining industry: A survey of women's career experiences in mining."; Tallichet, S.E. "Barriers to Women's Advancement in Underground Coal Mining."

⁴⁸⁵ Gibson, G. and Klinck, J. "Canada's Resilient North: The Impact of Mining on Aboriginal Communities.", pg. 133; Gibson, G. and Scoble, M. "'Regenderneering' the mining industry: A survey of women's career experiences in mining."; Tallichet, S.E. "Barriers to Women's Advancement in Underground Coal Mining."

Recommended Mitigations

AT THE WORKPLACE

- 21) The Proponent shall develop mandatory, regular harassment prevention training in consultation with a qualified expert, to be delivered to all the Proponent's employees, contractors and consultants working at the site.

The EC suggests that the training program include training specific to employees in a supervisory role, teaching preventative approaches and providing tools to address issues that may arise. In addition, the EC suggests that all employees be educated on the appropriate policies and be empowered with tools to address any harassment or abusive behaviours which may take place around them or towards them. As First Nations women and gender and sexual minorities are more likely than others to experience negative effects within the workplace and outside of the workplace with respect to personal safety, it is important that supervisory training pay special attention to this.

- 22) The Proponent shall ensure that human resource staff complete training to enable them to effectively support employees who disclose workplace harassment. In order to increase reporting of sexual harassment and assault, human resource staff shall provide all new staff with information about ways in which they may best record and provide evidence of harassment or bullying and what happens after they make a disclosure of workplace harassment and how they will be protected from reprisals.

- 23) Proponent shall modify their proposed Mentor program for Yukon First Nations employees⁴⁸⁶ to:

- ensure that women have access to a mentor or supervisor who regularly checks in to address any negative experiences related to the male-dominated work environment, and who pays special attention to potential cases of abuse;
- develop a formal feedback process to ensure that enquiries are regularly made to First Nations employees to ensure that they are able to voice concerns and have addressed any negative experiences; and
- involve both LFN and RRDC in further developing this Program to ensure that it meets the needs of First Nation employees.

- 24) The Proponent shall, in consultation with a qualified expert and both LFN and RRDC, develop gender appropriate and gender- and sexuality-specific policies and processes which promote a safe, respectful and inclusive environment for women and gender and sexual minorities.

⁴⁸⁶ YOR Document 2017-0083-200-1.

- 25) The Proponent shall develop, with a qualified expert, an Anti-Harassment and Bullying Policy that outlines processes and actions to address any harassment or bullying which may take place within the Project's scope.
- 26) The Proponent shall ensure that the on-site First Aid Technician or Emergency Medical Technician is trained in Mental Health First Aid and/or has formal mental health training to provide short-term or crisis support at the mine site, referrals to other mental wellness supports or navigation to other systems⁴⁸⁷.
- 27) The Proponent shall ensure that on-site employees have the ability to utilize the EAP services available (i.e. ensure that a private phone line or Internet is available to discretely reach EAP services).

BOTH AT THE WORKPLACE AND IN COMMUNITIES

- 28) To address and mitigate impacts to employees who are or become victims of domestic abuse, the Proponent must create a policy that:
- outlines clear procedures for the workplace to work with affected employees and provide appropriate resources and support;
 - plans for and addresses safety concerns that affected employees may have while at work to ensure all workers are safe from threats of domestic violence; and
 - includes a personal safety plan for employees suffering from domestic violence.

To aid in the development of this policy, see: www.worksafefbc.com/domesticviolence.

- 29) The Proponent shall inform all BMC employees' that their eligible dependents have access to the Employee Assistance Plan (EAP).
- 30) The Proponent shall develop standards for behavior at work and codes of conduct against sexual harassment and gender-based violence on the job site and in the broader community, including standards/codes of conduct in relation to the sex trade, and shall distribute education and awareness campaign materials on gender-based violence.

OTHER

The EC recognizes the Proponent's limitations with respect to its ability to adequately mitigate the Project's social impacts to communities. However, Government of Yukon plays an integral role in developing and adding to a community's resilience as the provider of social services and supports. Consequently, to effectively mitigate and control negative social impacts of the Project, the EC strongly suggests that YG allocate additional resources in the following areas within Ross River and Watson Lake: childcare, rehab/detox services, counselling services,

⁴⁸⁷ Examples of Mental First Aid courses can be found at the following websites: <https://www.mhfa.ca/en/course-types> and <https://www.redcross.ca/training-and-certification/course-descriptions>.

shelters for victims of abuse, medical services, etc. This includes providing resources to perpetrators of abuse who require help in order to end cycles of abuse.

Recommended Monitoring

The assessment of the Kudz Ze Kayah Mine Project is YESAB's first to consider a Project's effects to the VESEC of "Personal Safety". As such, the EC acknowledges that there is inherent uncertainty in its predictions of effects. Consequently, the EC requires that effects be monitored under s.110 of YESAA to better inform predictions of effects in future assessments and to allow for adaptation of resources and services to mitigate effects as they become known.

- F. The Government of Yukon or a delegate body shall establish a monitoring program, after consulting with LFN, RRDC, LAWS, and Yukon Status of Women Council (YSWC) to measure potential project effects against pre-project baseline data. This program shall determine the extent to which the Project's effects are associated with violence against women (with special consideration for Indigenous women) and gender and sexual minorities in Ross River, Watson Lake, and Whitehorse. The development of the monitoring program should consider currently known effects but should also remain flexible so that unforeseen effects can be incorporated. The results of the monitoring shall be shared with LFN, RRDC, LAWS, and YSWC.

9.4 Project Engineering and Infrastructure

Summary and Conclusion

The EC has determined that the Project will not result in significant adverse effects to human health and safety due to project engineering and infrastructure. The term "project engineering and infrastructure" refers to project design in relation to human safety and geohazards.

While there is always some risk associated with an open pit, an underground mine, the storage of tailings and waste rock, and the construction of water impoundments and diversion channels, the adverse effects of the Project will be controlled by contemporary engineering infrastructure design, engineered mitigations, adaptive management during operations, and instrumentation and monitoring committed to by the Proponent. Additionally, there will be the application of regulatory safety legislation by way of inspections and enforcement.

Importance of Effects of the Project Engineering and Infrastructure on Worker Safety and the Environment

Health and safety and protection of the environment are primary guiding principles of all levels of government and are key priorities for citizens. There is an expectation that mining companies work continually to improve their health and safety practices and to minimize their effects on the environment from design through operations to closure. Accidents, injuries, fatalities, disease and releases to the environment are considered unacceptable by government, the public and industry.

Legislative and Management Setting

The *Occupational Health and Safety Regulations* (Part 15 – Surface and Underground Mines or Projects) requirements include:

- that drawings, plans, specifications and other information required for an engineering review be provided to the director prior to mining, alterations to mining methods, construction of tailings dams, construction of a mine or mining plant, etc. (s.15.03);
- a design report shall be prepared and maintained assessing ground stability of active and proposed workings, include engineered drawings and plans, based on geotechnical engineering practices that assess geology and stability and specify measures and designs. The report must be updated and assessed at least annually and before alterations are made which could affect stability (s. 15.06);
- tailings, dams and stacked tailings must be designed in good engineering practice, constructed in accordance with the engineer's design, and maintained so that the structure is stable against static and dynamic loading such as earthquakes (s. 15.07);
- excavation of soils has specifications for heights and slopes and worker access to ensure safety (s. 15.39 and s. 15.40);
- open pit benches and faces have safety and access and requirements (s. 15.41);
- mine haul roads require specified widths, safety berms and runaway lanes (s. 15.43);
- dump areas and dumping have specifications and dumping procedures to promote worker safety (s. 15.44 and 15.45);
- underground mining is also regulated in regards to managing water, drilling of holes, support of the rock (i.e. steel support, casing, lining, rock bolts, etc.), inspections by competent persons, suppressing dust, etc. (s. 15.48);
- procedures and specifications for haulage underground and operation of equipment and vehicles, managing fuel, providing safety stations, etc. (s. 15.53 through 15.63).

The Proponent will need to comply with Yukon Minerals Branch requirements ordered by their inspectors and officers, the Yukon *Occupational Health and Safety Regulations* as described above, and mining associations' and Canadian Dam Association's guidelines and best practices.

Context

The operation of an open pit and underground mine is a significant undertaking that involves the construction of large excavations and stockpiles of earth materials along with impoundment of water and management of watercourses. These facilities and infrastructure can pose a risk to human health and safety for workers and to the receiving environment. Clearly, any substantive failures arising from design, operation or closure can adversely impact the safety and health of site workers, visitors and nearby members of the public as well as result in releases that damage the environment.

Mining projects in Yukon have resulted in accidents that have injured or killed workers. The sector has a reputation for being relatively hazardous, owing to the large scale of equipment, slopes, material volumes and environmental working conditions. Open pit and underground mining accidents, failures of embankments and impoundments, and vehicle collisions are

examples of incidents. Some incidents are caused by design flaws or by operational problems or by human error.

Mining requires clearing of vegetation and soils; it can affect permafrost regimes, typically with degradation of permafrost which may or may not already be occurring at a site. Thawing of permafrost weakens its host soil or bedrock which could affect its ability to resist loading by rock and soil if not accounted for in design or removed from a foundation.

Stockpiles of tailings and waste rock and soil, dams holding back fluids and tailings, and water diversion channels have failed due to construction practices or design flaws or environmental loads such as extreme weather events. Frequently, a combination of these factors contributes to failures. These events can result in coverage of the landscape, waterbodies, even roads and buildings by flows and landslides carrying mining waste and natural soils and rock. The consequences include injuries and mortality to humans, wildlife and plants along with damage to water quality and availability.

Regulatory agencies, professional practice associations, industry associations and other organizations have implemented legislation, regulations, operating procedures and guidelines for most aspects of designing, building, operating, monitoring and closing mine sites. Numerous studies and research have contributed to understanding the causation and consequences of past incidents, and to analyzing the issues, impacts and mitigation strategies for managing the risks of mining. Yukon is a developed jurisdiction for regulation and oversight of mining, where a high standard of care is required for engineering, operation, monitoring and continual improvement.

Existing Conditions and Trends

The Project area has not yet been developed into a mine site and has been largely undisturbed with the exception of exploration and development activities. There is some discontinuous permafrost within the Project footprint, along with forests, tundra and waterbodies. Some of the terrain is presently subject to geohazards, such as slope deformation, both in permafrost and thawed conditions.

Discontinuous, localized permafrost was encountered in the Project area. It was generally observed to be degrading due to past and current climate change patterns. The location of the Project is relatively south of the zone of continuous permafrost. Very little, if any, permafrost was identified by the Proponent within the majority of the areal footprints of the proposed rock and soil storage facilities and the open pit. Evidence of thawing and degrading permafrost was observed during terrain hazard and terrain/soil baseline mapping assessments.

The permafrost encountered was generally observed to be in a state of thaw and degradation. Very little, if any, permafrost was identified within the footprints of the proposed rock and soil storage facilities. Thawing permafrost results in a moisture-rich soil or rock having lower strength. This condition results in slope instability in some natural slopes; a common type of permafrost-related slope movement is known as solifluction, where ice-rich terrain (both in stable and thawing permafrost) moves slowly downslope at rates of a few millimeters to

centimeters per year. The Proponent noted that solifluction is widespread and active on the valley sides and in the upper basins above the proposed mine site.

Recent debris floods have affected an active alluvial fan at Fault Creek in the proposed open pit location.

The Proponent and predecessor mining companies have completed pre-feasibility studies and subsurface soil and rock investigations as part of mineral exploration and preliminary design of open pit and underground mining. The characteristics of the bedrock and surficial geology are partially understood.

Project Design

Geohazard, terrain, earthquake and failure issues are expected to be managed through the engineering design work completed to date, along with planned future detailed design which will be used to develop increasingly comprehensive operation and mitigation plans. Mitigations have been proposed such as engineering design for increased safety factors, monitoring during construction and operations, and adaptive management during operations.

PROPOSED MINE FACILITIES AND UNDERTAKINGS

The Project plan includes construction of storage facilities for waste rock and dried tailings, and overburden and salvaged topsoil. There will be an open pit, potential future underground mine, WMPs and channels, and other mine infrastructure such as buildings, paste backfill plant, landfill and staging areas. There will be a Class A storage facility for waste rock having higher acid generating potential, which will be encapsulated within filtered tailings; Class B waste with mild acid generating potential will be stored in a separate pile; Class C material that has none to low acid generating potential will be stored in its own stockpile.

The Proponent included statements in the application documents about ongoing and supplementary investigations to be undertaken to refine geotechnical and engineering designs to the waste storage facilities, and the open pit and underground mining, including continuing investigations of the foundation soil conditions for the Class A and B storage facilities.

CLASS A STORAGE FACILITY

The Class A storage facility is underlain by localized glaciolacustrine (lake-bed) clay deposits; no permafrost was observed in test pits or thermistor instruments. Glaciolacustrine sediments can be sensitive to changes in applied stress.

- The Proponent plans to remove all soils overlying bedrock to mitigate potential slope instability related to foundation soils.
- Overall slope angle of the pile's face is 25 percent.
- As well, a rock-fill-supporting toe buttress is proposed at the downslope limit of the storage facility to improve its stability; and the interface of the Class A facility with the underlying bedrock incorporates a drainage bedding layer to reduce the chance of water build-up in the foundation and in the Class A material.
- The Class A material will be compacted as it is placed to increase its strength.

CLASS B STORAGE FACILITY

The Class B storage facility is proposed in an area originally thought to be underlain by some permafrost; however, recent drilling did not encounter permafrost. Permafrost presence or absence is not yet verified in the upper zones of the proposed footprint of this fill storage area. Localized glaciolacustrine sediments are expected to exist.

- A design face angle of 33 percent has been proposed.
- The Proponent plans additional permafrost exploration and mapping.
- The Proponent plans to remove the overburden down to bedrock.

CLASS C STORAGE FACILITY

This facility is proposed in an area underlain by glaciofluvial (river deposits) and colluvium. Permafrost was encountered in the northern area of the footprint, below a depth of 3 m. The depth to bedrock ranged from 3 m in the south portion to 19 m in the north portion.

- A design face angle of 33 percent has been proposed.
- The facility is to be located in a confined valley with a shallow basing grade.

OVERBURDEN STOCKPILES AREA

It was determined that this area is underlain by glaciofluvial sediments containing permafrost at least 1 to 2 m deep and the depth to bedrock was typically 3 to 5 m with groundwater levels 10 to 19 m deep.

- A design face angle of 45 percent has been proposed.

A, B AND C STORAGE FACILITIES AND OVERBURDEN STOCKPILE

Stability modelling was performed using industry standard software; the results indicated adequate factors of safety against failure in both the static situation and the scenario involving a severe design earthquake with a 1:2 475-year annual exceedance probability.

The Class B and C and overburden stockpiles would be founded on coarse grained sand and gravel soils which would compress at the same rate approximately as permafrost thaw would occur and retain most of their strength through the process.

OPEN PIT

The Proponent assumed a minimum design bench width of 5 m. No advanced numerical analysis has been performed to evaluate the adequacy of the bench width or pit slope. The Proponent indicated that since the project is in pre-feasibility study level, such analysis may not yet be required and will be done at the feasibility study level. In a feasibility study, it is anticipated that the Proponent would likely use the laboratory test results presented in its current submission and update its slope stability evaluation. Therefore, final bench configurations may be slightly different than proposed.

PROPOSED PROPONENT MITIGATIONS*FAULT CREEK DEBRIS FLOOD*

The Proponent plans to mitigate the risk of a worsening debris flood by constructing a diversion of Fault Creek and a deflection berm to protect the open pit and a local road.

SLUMPING

A berm has been proposed to for construction, between the rim of the open pit and the excavation limits of overburden soils, to prevent soft and wet slumping soils from entering the pit.

UNDERGROUND MINING

Underground mining plans have been designed on a preliminary basis using a relatively limited amount of subsurface information at this time. However, a number of commitments such as the use of remote-controlled mucking help provide a bound to project effects. Preliminary opening widths and heights and lengths have been proposed for stopes. The Proponent is planning to support the rock underground using techniques such as rock bolting and shotcrete. As well, paste backfill (cemented tailings returned underground from surface) is proposed to be placed in mined out openings and stopes to fill voids and stabilize the ground. Ventilation, safety refuge, haulage and other aspects of underground mining operation have been planned, and the Proponent acknowledges the specifications and requirements of the *Occupational Health and Safety Regulations*.

WATER MANAGEMENT

Water management facilities include seven ponds and connecting diversion channels, which have been designed to accommodate a 1:200-year return period flood event during operation. The ponds were designed to maintain a 1 m freeboard. Five of the ponds were designed to accommodate precipitation and runoff resulting from a 1:200-year return period, 24-hour duration storm event. Two of the ponds (Class C storage facility runoff pond and overburden stockpile pond) were designed to accommodate the 1:10-year return period 24-hour duration storm event, freshet inflow and 30 days of storage capacity. The ponds were designed with 2H:1V slope angles on the impounding dykes, which are to be constructed using zones of angular waste rock and compacted soils having impermeable properties. The two largest ponds will contain greater volumes of water and have flatter design slope angles of 2.5H:1V along with synthetic liners and impermeable soil types.

The water management facilities were designed to convey and store runoff from typical and severe flood events. Dam safety is accounted for in design of the facilities with anticipated construction methods and quality control. During operation, routine and event-driven surveillance will be undertaken. Facilities will be managed by adhering to operations, maintenance and surveillance manuals that prescribe procedures and training requirements for personnel. Deficiencies would be identified for mitigation and repair or upgrades.

TOTE ROAD

The existing tote road will be upgraded for the main access to the mine. The Proponent proposed a conventional unfrozen road-building design for the access road widening and

upgrades. The Proponent provided a list of hazards and mitigation opportunities for 21 separate segments along the route. Road performance and damage due to permafrost can be minimized by various techniques, many of which are proposed to be employed. The present conceptual designs and mitigation option proposals appear to satisfactorily manage the geotechnical hazards, based on the available information.

SITE INFRASTRUCTURE

Buildings for the mine operation will require stable foundations. Geotechnical investigations were completed for key buildings such as the processing plant. Suitable foundation conditions were encountered and preliminary designs created. The Proponent plans to complete supplementary geotechnical work as part of final design of buildings. If permafrost were to be encountered below a building in upcoming supplementary design or construction, the Proponent plans to remove it to avoid thaw settlement processes.

Effects Characterization

THE PROJECT IS NOT EXPECTED TO HAVE A LONG-TERM INCREMENTAL EFFECT ON PERMAFROST

The KZK mine site is located in the discontinuous permafrost zone and a small portion of the footprint is presently hosting permafrost. Where permafrost has been observed, the terrain is exhibiting signs of active thawing and degradation.

In cases where permafrost material is present at the foundation of structures and fills, where it may not be degrading or the onset will be delayed, long-term creep could be anticipated, if the permafrost is left in place. Thawing permafrost has a reduced ability to support the weight of embankments, although this effect is prevalent in silt and clay soils but less problematic in clean gravel and sand soils. Without mitigation or removal of the degrading permafrost under a structure or fill deposit, there could be a failure in foundation or slope stability modes.

As mentioned, thawing permafrost can also result in solifluction, which the Proponent identified as being widespread and active throughout parts of the site. The site roads will be constructed through natural slopes in the geography, which can also be affected by and promote solifluction. This is triggered typically through nuisance maintenance requirements and repairs. Mitigation techniques are available to reduce the effects for locations where solifluction can cause greater road damage.

Additionally, the presence of permafrost material within the tote road corridor can pose risks of cut and fill slope failures. The Proponent acknowledged that glaciofluvial sand and gravel covers over ice-rich till along the central to northern portion of the access corridor, giving the appearance at surface of stable, permafrost-free ground, but it cannot fully buffer the effects of ground disturbance. Disturbance of the permafrost material or its covering soil layers can alter its regime (i.e. trigger or accelerate thawing) and its behaviour and lead to possible slope movements or subgrade failure. Such damage is normally not very catastrophic and has a low consequence to safety; however, access can be temporarily cut off, resulting in repair and maintenance requirements, operations shutdowns, inconvenience and potential blockages to site evacuation.

The Fault Creek debris flood is another area where the situation may worsen by alteration in the permafrost regime as it degrades and thaws. A debris flood is normally a catastrophic, short-duration incident rather than a long-term hazard. It could have a major effect to the workers and equipment in the open pit if debris and floodwaters were to spill down the pit walls, and might not be easily captured by instrumentation and monitoring. Mitigations proposed by the proponent to establish a diversion and berm are expected to be effective measures to address effects.

Based on current climate patterns and anticipated climate change, no reversal of permafrost degradation overall is expected. Some of the proposed activities include complete removal of permafrost-hosted soils and stockpiling the material in overburden storage for use in progressive reclamation during mining and at closure. The purpose of the permafrost removal is to improve stability and reduce the risk of damaging failures of waste rock and tailings storage facilities and water impoundments. As well, some buildings may have permafrost first removed before construction so as to prevent thaw settlement from occurring.

In the short term, excavation of permafrost material will remove permafrost faster than is presently occurring; however, in the longer term this permafrost will be lost as part of background warming trends. Elsewhere on the site, outside the footprints of storage facilities, road prisms, buildings and the open pit, any pockets of permafrost are expected to degrade at similar rates as is occurring regionally.

THE PROJECT'S ENGINEERED INFRASTRUCTURE AND EXCAVATIONS MAY RESULT IN ADVERSE EFFECTS TO WORKER SAFETY AND THE ENVIRONMENT

Accidents and malfunctions are credible in most components of the proposed mining Project.

Operation of open pits and underground mining can be dangerous working environments owing to the uncertainty of rock behaviour and the use of heavy equipment, and the large scale of slopes and walls. Worker injuries and fatalities occur annually at mine sites worldwide.

OPEN PIT HAZARDS

The potential for slumping of soils over bedrock at the crest of the open pit can be caused by thawing permafrost. The Proponent acknowledged this process could result in material moving over the rim of the pit wall to areas below. Inadequate bench-width can also increase the risk of slope failure, toppling and other structural failure that can affect the safety of workers and equipment in the mine. The failure in open pit slopes can be catastrophic if occurring in large scale. The magnitude and extent of failures is difficult to predict and depends on unique zones in the open pit along with how the mining is conducted. Hence, in mining projects a detailed instrumentation program is needed to monitor slope movement. As well, individual benches are inspected upon exposure, and if potential instability is identified in specific locations, stabilization efforts such as drilled drains, rock bolts, slope mesh and other methods would be applied.

Additionally, the Proponent observed that a recent debris flood affected an active fan at Fault Creek in the proposed open pit site area. The situation may worsen by alteration in permafrost regime as it degrades and thaws. A debris flood is normally a catastrophic, short-duration failure

rather than a long-term hazard. It can have a significant impact to the workers and equipment, specifically in the open pit if debris and floodwaters were to spill down the pit walls. Such remediation can bring the likelihood of debris flood to low or negligible.

The EC understands the project design is at a pre-feasibility study level; consequently, there is a degree of uncertainty in predicting Project effects. However, the EC notes that Project effects are likely not to be substantial as knowledge of geology improves and mine plans move through the regulatory process. In a feasibility study, it is anticipated that the Proponent would likely use the laboratory test results presented in its current submission and update its slope stability evaluation. Therefore, the final results may adjust the currently proposed bench configurations.

UNDERGROUND MINING HAZARDS

Water could flood the tunnel and underground openings rapidly if such zones were encountered during the mining. Water flooding into the tunnel can occur in varying rates going from low flow to flood, depending on the permeability of the water-bearing layer(s). Flooding underground may pose a risk to personnel and equipment working underground. Other rock stability hazards may also pose a risk to safety if not mitigated in design and operation.

Similar to the open pit slopes, it is understood that the underground mining design is at the pre-feasibility level and the decision on performing an underground excavation is a process that will actually be concluded at a later stage of the open pit excavation/production. Additionally, the presence of deep groundwater in the bedrock is only partially understood. Water can seep from open pit walls, and seep into or flood underground tunnels and openings. Water inflow can pose risks to workers and cause rock failures. It is anticipated that as the open pit excavation proceeds more information becomes available to assist the decision-making process and also clarify the anticipated geotechnical risks such as weak zones or high groundwater flow regions.

Stored waste rock and filtered, dried tailings, along with water impoundments are capable of failing due to design flaws, operational practices, unforeseen events and circumstances, other factors or a combination of these elements. If a worker is situated in an impact zone downstream, they can be injured or killed. Releases of soil, rock and water can damage the environment, including covering over the landscape or waterbodies and affecting water quality. Some environmental damage can be partially or fully reversed and repaired, while it can also be irreversible and permanent. With respect to tailings storage, the Project plan includes a dry-stack method of tailings that does not involve storage of saturated tailings behind a dam. The effects of a failure of dry-stacked tailings is generally lower than that of a tailings dam.

Significance Determination

EFFECTS ARE LIKELY

The Project's effects on human health and safety are likely and its effects on the environment related to accidents and malfunctions of infrastructure, roads, water management facilities, waste storage facilities, open pit mine are also likely.

There is a broad spectrum of effects from minor to severe; however, virtually every mining operation experiences some injuries or even deaths to workers during the life of the mine. As

well, it is not uncommon to experience even small incidents of accidental releases of sediment, or an open pit bench slope to fail, or small underground break-out to occur. The overall probability of various incidents occurring may well be low, facilitated by undertaking quality designs and operating with excellence; however, the probability is non-zero.

EFFECTS ARE ADVERSE

The effects to human health and safety are adverse; society places very high value on worker safety and wellbeing. The effects to the environment are adverse; degradation of habitat resulting from malfunctions and accidental releases can disrupt plant and wildlife success.

EFFECTS ARE NOT SIGNIFICANT

The Project is not likely to result in significant adverse effects to human health and safety or the environment in relation to the assumed safe design, construction and operation of mine infrastructure. The mitigations and design parameters proposed by the Proponent will eliminate, reduce or control the effects of terrain stability, geohazards and failures on human health and safety. It is important to consider that the low significance of effects is predicated on ensuring that:

- ongoing detailed engineering designs will be competent and adhere to standards and guidelines;
- construction will be performed in accordance with designs;
- engineering input and quality control during construction will occur;
- management plans and operations, maintenance and surveillance manuals will all be produced and adhered to during the life of the Project;
- unforeseen, extreme events or loadings beyond those anticipated in the designs will not occur; and,
- the application of the *Occupational Health and Safety Regulations* will be inspected and enforced.

10. Community Wellbeing

10.1 Emergency Services

The EC considered the potential for effects to community wellbeing within Ross River and Whitehorse due to increased demand on emergency services. Industrial accidents can place additional stress on emergency medical, rescue, fire and law enforcement services.

The Proponent predicts no net effect on the emergency services of Ross River, Faro or Watson Lake, unless there is a considerable influx of new residents. The EC agrees that population levels for these communities are unlikely to change to the point where emergency services are stressed. In the event of medical emergencies at the Project site, health facilities in Ross River, Faro or Watson Lake would generally not be used, as patients would be evacuated to Whitehorse by air, although in some cases the Watson Lake hospital may be used in the event of non-air transport. The EC does not foresee effects to emergency services resulting from the Project.

10.2 Traffic

Effects of traffic and their potential to cause disruption to traditional land use activities is considered in Section 7 Traditional Land Use.

The EC considered the potential for traffic-related effects to community wellbeing in Watson Lake. Traffic can decrease livability and safety within communities. Most traffic will be routed via Watson Lake, with up to 52 trucks per day (52 one-way trips, or 26 round trips) travelling between the mine site and Watson Lake, and beyond.

The EC notes that speed limits in communities are generally 50 km/h, although in Watson Lake the RCH passes through a school zone with a 30 km/h speed limit. Based on both low overall daily traffic levels and current speed limits, the EC does not foresee traffic-related effects to community wellbeing in Watson Lake.

10.3 Housing

Summary and Conclusion

The EC has considered potential effects to housing from the perspective of housing availability in Whitehorse. Based on information available to the EC, the Project is unlikely to adversely affect housing availability within Whitehorse.

Whitehorse Primarily Affected

The Project is expected to result in net migration to Whitehorse as the FI/FO hub for Project employees. Workforce requirements are expected peak at 350 during construction and 345

during operations. A small portion of the workforce is expected to consist of new Whitehorse residents.⁴⁸⁸

Population Increases, Vacancy Rates and Rents

The City of Whitehorse has experienced considerable growth over the previous decade, growing by 21.2 percent, or 7 363 residents, since March 2010.⁴⁸⁹

In spring of 2010, Whitehorse's rental housing market had a vacancy rate of approximately 0.5 percent.⁴⁹⁰

Since March 2010, the City of Whitehorse has created two new neighbourhoods and increased population density in the downtown core.⁴⁹¹ Ingram, an infill neighbourhood was developed starting in 2011, with room for 226 housing units. The Whistle Bend neighbourhood, an ongoing project, is intended to create housing for up to 8 000 residents.⁴⁹²

As of March 2020, the vacancy rate in Whitehorse has crept up to 3.8 percent (3.7 percent for buildings with three or more rental units). For Canada's primary urban centres, a vacancy rate of 3 percent is considered to be in equilibrium—at this rate, rents are stable, indicating a balance of demand and supply.⁴⁹³ In Yukon, median rents have remained relatively stable over the last 18 months at approximately \$1 000.⁴⁹⁴ Across Yukon, median rents and average rents for all housing units are \$1 100 and \$1 294 respectively.

In comparing vacancy rates, Yukon compares favourably against national and provincial levels. In cities of 10 000 residents or more, vacancy rates for rental housing average 2.4 percent. BC and Ontario feature vacancy rates below 2 percent, and in some local markets, at or below 1 percent.⁴⁹⁵ However, average rents are notably lower in the rest of Canada, with *average* rents for a two-bedroom unit slightly over \$1 000, whereas in Yukon, two-bedroom units rent for a *median* value of \$1 200.⁴⁹⁶ However, average incomes in Yukon are also higher than per household average incomes nationally, by a similar proportion.⁴⁹⁷

In Whitehorse, vacancy rates are highest for bachelor suits (11 percent vacancy), followed by one- and two-bedroom apartments with vacancy rates of 3.9 and 3.8 percent respectively.⁴⁹⁸

⁴⁸⁸ YOR Document 2017-0083-019-1.

⁴⁸⁹ Yukon Bureau of Statistics, "Population Report, First Quarter, 2020", Government of Yukon. July 28 2020, online, <https://yukon.ca/en/population-report-q1-2020>, pg. 1.

⁴⁹⁰ Yukon Bureau of Statistics, "Yukon Rent Survey, April 2020", Government of Yukon. August, 2020, online, <https://yukon.ca/en/yukon-real-estate-report-q1-2020>, pg. 1. For buildings with 4+ rental units.

⁴⁹¹ City of Whitehorse, "City of Whitehorse Planning and Development Services Newsletter", October 2008, issue 18.

⁴⁹² City of Whitehorse, "Phasing, Zoning, Subdivision", Whistle Bend Master Plan.

⁴⁹³ Royal Bank of Canada, "Big city rental blues: a look at Canada's rental housing deficit," Focus on Canadian Housing, September 25, 2019,

⁴⁹⁴ Yukon Bureau of Statistics, "Yukon Rent Survey, April 2020", pg 1. For buildings with 3 or more rental units.

⁴⁹⁵ Canada Mortgage and Housing Corporation "Rental Market Report Data Tables", 2020.

⁴⁹⁶ *Ibid.*, Yukon Bureau of Statistics, "Yukon Rent Survey, April 2020", pg 2. Median rents tend to be below average rents.

⁴⁹⁷ Statistics Canada, "Income Highlight Tables, 2016 Census", Government of Canada.

⁴⁹⁸ *Ibid.*, Yukon Bureau of Statistics, "Yukon Rent Survey, April 2020", pg 4.

No Adverse Effects Anticipated

Considering an increasing vacancy rate over the long term⁴⁹⁹ and additional housing stock expected to become available through projects such as the Whistle Bend neighbourhood, the EC considers additional housing demand of the scale proposed by the Project is unlikely to alter a residential rental market that appears to be balanced.

11. Heritage Resources

Summary and Conclusion

The Project will not result in significant adverse effects to heritage resources. While cultural materials and archaeological sites have been found in the LSA, the adverse effects of the Project will be adequately eliminated, reduced or controlled through the application of relevant legislation and mitigation measures committed to by the Proponent.

Importance of Heritage Resources

For the purposes of this assessment, the EC used the definition of heritage resources from YESAA,⁵⁰⁰ though other definitions exist in the Umbrella Final Agreement (UFA) and the Yukon *Historic Resources Act*.

Heritage resources exist throughout the Yukon landscape in all terrains. They provide a link between the past and the present; for many, this is a vital cultural link pertinent to a society and its future. The recording of heritage resources helps improve an individual's understanding of the relationship between people, the land and other resources.

The Project area falls within the Traditional Territories of LFN and RRDC. Heritage resources within these Traditional Territories are unique and irreplaceable and important to the identity of these First Nations.

Heritage resources are fragile and may be difficult to locate. They are susceptible to the impact of mining development, particularly from land clearing and earthmoving. As such, the EC will assess the potential Project effects on heritage resources.

Legislative and Regulatory Setting

The following legislation includes provisions which mitigate potential significant adverse effects to heritage resources:

- *Historic Resources Act*:

⁴⁹⁹ There was a period in 2013-2014 with higher vacancy rates – though the trend since 2010 appears to be towards higher vacancy rates in the residential rental market.

⁵⁰⁰ (a) a moveable work or assembly of works of people or of nature, other than a record only, that is of scientific or cultural value for its archaeological, palaeontological, ethnological, prehistoric, historic or aesthetic features; (b) a record, regardless of its physical form or characteristics, that is of scientific or cultural value for its archaeological, palaeontological, ethnological, prehistoric, historic or aesthetic features; or (c) an area of land that contains a work or assembly of works referred to in paragraph (a) or an area that is of aesthetic or cultural value, including a human burial site outside a recognized cemetery.

- Section 25(1) prohibits undertaking an activity that will alter a historic site without a permit
- Section 64 prohibits the destruction or alteration of a historic object
- *Archaeological Sites Regulation:*
 - Section 4 prohibits activities that may affect an archaeological object or site
 - Section 11 controls effects to archaeological resources through stipulations around the reporting of work undertaken with permits
- *Quartz Mining Land Use Regulation, Schedule 1, under the Quartz Mining Act:*
 - Section E(8) establishes a 30 m buffer surrounding known archaeological or palaeontological sites, requiring all activities to cease upon the discovery of a site
 - Section E(9) requires that any findings be immediately marked, protected, then reported

Context

Heritage resources exist throughout Yukon's landscape. The value of a heritage resource is based on its physical and material properties, as well as its symbolic attributes. The heritage resources in the project area may include movable or immovable resources above ground or buried, on land or in water.

Heritage resources are vulnerable to destruction in earthmoving operations, an activity that is necessary throughout the mining process. Conversely, land-altering activities can lead to the discovery of new heritage sites. The locations of heritage resources are often difficult to predict, making avoidance of them challenging. Avoiding damage or destruction of heritage resources before they can be properly recorded/protected is a key management strategy used to protect the value of heritage resources. This is generally accomplished through the conduct of heritage resource overview assessments and heritage resource impact assessments, whereby heritage resources are identified prior to land clearing activities taking place.

Current Conditions and Trends

The Project area falls within the Traditional Territories of RRDC and LFN. As a result, this area could contain heritage resources from one or both of these First Nations.

Various heritage investigations have taken place within the Project's LSA over the years (in 1995, 1996, 2015, and 2016). The LSA encompasses the development footprints of all Project infrastructure, including the access road. Heritage resources were found at two test shovel sites during the 2015 heritage resource impact assessment, both of which consisted of prehistoric, subsurface lithic scatters. These archaeological sites have been recorded as JiTp-1 and JjTp-1. Both sites were recommended for avoidance, and if avoidance was not feasible, systematic data recovery consisting of additional shovel testing and test unit excavation was required.

The 2015 heritage resource impact assessment also found three ice patch areas containing wood fragments in high-elevation areas planned for exploration activities. Two wood fragments were recovered and a third, which contained a wire attachment similar to a snare, was left in place as no work was proposed that would threaten it.

Follow-up assessments at JiTp-1 were undertaken in 2016 based on the recommendations made during the 2015 assessment, since this site overlapped the Class B storage facility footprint. Three additional shovel tests were positive for heritage resources, and the excavation blocks yielded 88 lithic artifacts. Data recovery was completed, and the adverse effects to site JiTp-1 have been mitigated. No new additional heritage sites were found during the 2016 heritage assessment.

Project Design

The Proponent has submitted a Heritage Resources Management Plan which identifies a number of actions the Proponent will take in terms of managing known heritage resources on site (e.g. reflagging sites, when necessary) and potentially undiscovered heritage resources (e.g. ceasing all work in the immediate area), as well as communication protocols (i.e. who to contact if a heritage resource is found). Of critical importance for the management of adverse effects to heritage resources, the Proponent has committed to undertaking heritage resource impact assessments prior to undertaking any and all ground-disturbing activities in areas that were not previously subject to heritage investigations.

Effects Characterization

LAND CLEARING ACTIVITIES MAY RESULT IN ADVERSE EFFECTS TO HERITAGE RESOURCES

Five heritage sites have been recorded within the LSA. Heritage resources within those areas have either been recovered in accordance with the *Heritage Resources Act* or will not be affected by any proposed development, and have been flagged for buffering purposes. There remains the potential, however, for unrecorded/unknown heritage resources to be present in the Project area, in particular should the proposed development footprint expand or change from revisions to the Project. For example, the proposed borrow pits or improvements along the tote road have not been the subject of past heritage resource investigation efforts but will be subject to a heritage resource impact assessment prior to any and all ground-disturbing activities.

Land-clearing activities and earthworks to be carried out as part of the Project may result in inadvertent effects to heritage resources in areas of unknown heritage potential. Project activities may result in the alteration and/or loss of a resource (all or part of a resource), isolation from its natural setting, or the introduction of physical, chemical or visual elements that are out of character with the heritage resource and its setting. The effects to heritage resources are irreversible; once damaged or lost, the value of a heritage resource cannot be determined. The effects of such a loss are permanent.

The Proponent has prepared a Heritage Resource Management Plan and has committed to undertaking heritage resource impact assessments in areas for planned ground-disturbance that have not previously been subject to heritage investigations. This, combined with the requirements of the *Historic Resources Act* and *Archaeological Site Regulation* will reduce the likelihood that heritage resources will be adversely affected by the Project.

Determination of Significance

EFFECTS ARE NOT LIKELY

The Project is not likely to result in effects to heritage resources. Previous heritage resource impact assessments identified five heritage resource sites that were recovered under the *Heritage Resources Act* or were identified and buffered for protection. While there may still be undocumented heritage resources in areas that may be disturbed by the project, the Proponent's commitment to undertaking additional heritage resource impact assessments where necessary, coupled with the requirements of applicable legislation, will reduce or mitigate effects to heritage resources.

EFFECTS ARE ADVERSE

Effects to heritages resources are adverse. Land clearing and earth moving can alter or destroy unknown heritage resources, and the value of such resources can never be determined.

EFFECTS ARE NOT SIGNIFICANT

The Project will not result in significant adverse effects to heritage resources. The current territorial legislation and regulations, combined with the Proponent's Heritage Resources Management Plan and commitment to undertaking additional heritage resource impact assessments, reduce the risks of significant adverse effects to heritage resources.

12. Climate

12.1 Overview

In assessing the Project, the EC considered climate, specifically, climate change, in two primary ways:

- effects of climate change on the Project
- the Project's effect on climate

The former is considered within VESECs where appropriate, this is primarily in relation to longer term effects predictions, such as those around long-term water quality where the potential for effects persists well beyond the operational life of the Project. The latter is briefly discussed in this section.

12.2 Project's Effects on Climate Change

In this section, the term "climate change" refers to anthropogenic climate change, which is primarily due to the human-caused (directly or indirectly) emission of GHGs.

Immediately prior to releasing these recommendations, YG released a climate strategy, *Our Clean Future*, which may allow adoption of a local context regarding the acceptability of the effects of emissions. The EC has not had the opportunity to properly evaluate how

this strategy may relate to the assessment of projects where activities resulting in emissions are proposed.

YESAB intends to develop policy guidance, in which it will consider this strategy, regarding climate change and emissions.

Despite the considerations below, the EC encourages the Proponent to take actions to minimize emissions where possible given that the consequences of climate change are both widespread and of high magnitude.

Requests for Improvements to the Project

In addition to comments noting an absence of consideration of the Project's contribution to climate change,⁵⁰¹ a number of comments received by the EC speak to possible use of renewable energy sources or other means of reducing emissions. The Yukon Conservation Society, for example, requests that the EC "include a section in the Draft Screening Report to discuss onsite renewable energy options in an effort to reduce Greenhouse Gas Emissions."⁵⁰²

Under YESSA, the EC is unable to make recommendations to a Decision Body that improve a project, no matter the simplicity or sensibleness of the improvement, unless it determines that the project is likely to result in significant adverse effects. As the EC is unable to characterize the Project's effects as significant at this time, it cannot apply, nor consider, the suggested mitigations. Nonetheless, the EC encourages the Proponent to reduce carbon emissions where possible, such as through the use of renewable energy generation.

Global context required to gauge effect

Climate change is a global issue with a global context. Emissions alter climate at a global scale—the effects of project-specific emissions are not confined to their locales but distributed globally. This reduces the usefulness of jurisdictional metrics; the extent to which a project contributes to climate change is independent of its jurisdiction or that jurisdiction's emissions. A project's act of emitting can be notable within a jurisdiction; however, the EC must assess the *effect* of that specific act, which is global in context. Climate change is dependent on global emissions totals, not jurisdictional totals.

Global context and potential for project-specific significant effects

The EC must characterize and determine the significance of individual projects' effects. In the context of climate change, the EC has considered the effects of the action of emitting GHGs due to the Project. As noted, the effects of emitting GHGs act cumulative on a global basis within a global context.

The Project is unlikely to produce more than 1 Mt carbon dioxide (CO₂) equivalent over its lifespan, while world emissions are roughly 45 000 Mt annually. The Project therefore can be

⁵⁰¹ YOR Document 2017-0083-3377; 2017-0083-9445

⁵⁰² YOR Document 2017-0083-9445

expected to contribute one part in 500 000 to climate change during operations over its operational lifetime of about a decade. Consequently, the EC considers the Project's contribution to GHGs adverse. However, the Project's contribution to the effects of climate change, due to GHG emissions, is likely not measurable. The EC consequently cannot consider the project as likely leading to significant adverse effects.

Planning, Policy and Assessment

EC ACKNOWLEDGES THREATS OF CLIMATE CHANGE

The EC acknowledges that climate change is a global threat, and is a concern particularly in northern Canada where its effects will be, and are already, disproportionate. The EC also notes that its considerations could be seen as unsatisfactory because, by extension, it could be used to present *most every* individual contribution to climate change as insignificant.

GOVERNMENTAL ROLE

The EC, and YESAB as a whole, assess individual projects that result in a fraction of Yukon's emissions. Even in the event that YESAB found *every* project it assessed to be significantly contributing to climate change, recommended mitigations would be patchwork affecting a small portion of emissions territorially. Given that society as a whole contributes to climate change, policies that address society as a whole are required, and this is a role best suited for government.

ACCEPTABILITY AND SIGNIFICANCE

The social licence, or acceptability, of an *activity* is not assessed by the EC. Acceptability is considered as a contextual factor for *effects*—not activities. However, an effect of an individual project could be considered significant if its effects, regardless of magnitude, exceeded clear objectives or was sufficiently unacceptable.

Given the absence of clear policy objectives and targets for mining projects, it is not clear to what degree project effects would be unacceptable, especially as public policy contemplates competing economic and environmental factors—factors that are both relevant to this Project.

GENERAL IMPORTANCE OF PLANS WHEN CONTEXT IS PRIMARILY CUMULATIVE

Much like land use planning—where the EC may be told a project, or activity, is unacceptable and be unable to integrate that sentiment into a determination of significance—the presence of policy, legislation or management objectives on societal challenges is instrumental in setting thresholds for significance, localizing, contextualizing and describing effects. Such policy, legislation or management objectives allow better placement of an individual project into a context where cumulative factors have a dramatically larger scale than individual projects.

Part C

13. Conclusion of the Assessment

13.1 Assessment Outcome

Under s. 58(1)(b) of the *Yukon Environmental and Socio-economic Assessment Act*, the EC recommends to the Decision Bodies, YG, DFO and NRCan, that the Project be allowed to proceed, subject to the specified terms and conditions. The EC has determined that the project will have significant adverse environmental and socio-economic effects in or outside Yukon, but that those effects can be mitigated by the specified terms and conditions. These mitigations are listed in section 13.2 of this report.

The EC additionally recommends, under s.110 of the *Yukon Environmental and Socio-economic Assessment Act*, that recommends that effects monitoring be conducted in respect of the project. Recommended monitoring requirements are listed in section 13.3 of this report.

13.2 Recommended Mitigations

- 1) The proponent shall update the geochemical modelling during operations to inform detailed design of the cover systems, with the aim of reducing acid production and COPI loadings from storage facilities.
- 2) The proponent shall advance development of the WTP design and confirm expected performance for all relevant COPIs during licensing to optimize design and ensure timely implementation.
- 3) The proponent shall conduct pilot studies for in-situ pit treatment and the CWTS during operations to confirm their expected performance for all relevant COPIs, optimize their respective designs and ensure timely implementation.
- 4) The Proponent shall implement additional treatment options if the proposed CWTS cannot be demonstrated to reduce COPI concentrations to background levels consistently.
- 5) The Proponent shall revise WQOs as necessary to ensure they are based on the most recent toxicological information and guidance from CCME and BCMOE.
- 6) The Proponent shall establish effluent quality standards for the Project based on achieving WQOs in the receiving environment in Geona Creek (KZ-37) and in Finlayson Creek (KZ-15).
- 7) The Proponent shall conduct ongoing investigations into WRSA liners and cover systems to ensure that the performance objectives used in the water quality model are

achieved during all Project phases.

- 8) The Proponent shall commit to ongoing geochemical studies for WRSA A and B, and studies to optimize the performance of the proposed CWTS to address the potential for acidic conditions to develop in the future.
- 9) The Proponent shall ensure the WTP remains operational until it has been demonstrated that surface water from the site meets WQOs for the receiving environment in Geona Creek (KZ-37) and in Finlayson Creek (KZ-15).
- 10) Government of Yukon shall oversee the establishment and maintenance of an oversight body, financed by the Proponent, comprised of participants representing the Proponent, Government of Yukon, LFN, and RRDC.

The proponent will be required to include in the wildlife management plan (a component of the QML, any outputs and actions agreed to by the oversight body. These components of the plan will be updated as required based on the seasonal nature of the outputs or actions.

The oversight body shall require the implementation of mitigations, and monitoring of their effectiveness, considering the following mitigation and management strategies:

- b. In general:
 - xiii. When and how to apply mitigation measures pertaining to caribou referred to in Appendix A (Proponent commitments).
 - xiv. The prioritization of methods for reducing sensory disturbance.
 - xv. The establishment of objectives, methods and prioritization for effectiveness monitoring.
 - xvi. The identification of triggers and corrective actions within the adaptive management plan.
 - xvii. The identification of additional mitigations that may be necessary to reduce adverse effects based on new knowledge.
 - xviii. Educational and outreach activities regarding caribou in relation to the project.
- b. On a seasonal or shorter duration basis:
 - xvii. The implementation of daily timing windows for or temporary suspensions of blasting and crushing
 - xviii. The implementation of daily timing windows for or temporary suspensions of truck transportation
 - xix. The limiting of speeds on the access road
 - xx. Restrictions on flights based on daily timing windows
 - xxi. Modification of flight paths
 - xxii. Suspension of helicopter use

- xxiii. The use of convoys for transportation
- xxiv. The intervals between and location of breaks in snow berms on the access road.

11) Government of Yukon shall, in collaboration with affected First Nations and communities, develop a comprehensive long-term range management plan for the FCH based on the following principles:

- Be informed by best available scientific and traditional knowledge
- Acknowledge and be guided by people's relationship with caribou
- Help to promote the social, economic, and cultural well-being of people in the Yukon
- Promote transparency in decisions made during the range planning process
- Respect the need for a collaborative process for co-management of resources with affected First Nations.
- Recognize the potential for and encourage local community engagement and involvement in implementing the range plan

The plan should include the following sections in relation to the FCH:

- u. **Management principles and goal:** Identification of the principles underlying the planning process and the management goal.
- v. **Current conditions:** Best available information will be used to identify the health, trend and condition of the population and its habitat.
- w. **Limiting factors:** Best available information will be used to identify the factors limiting the population including: habitat, predation, climate, and human activities (harvest and land-use).
- x. **Future conditions:** Identify scenarios and projections of likely sources and locations of future impacts from development, wildfire, and climate, and their implications for the population and its habitat, including consideration of predation.
- y. **Management objectives and thresholds:** Identify specific management objectives related to population and habitat, and thresholds of change in population and habitat related to achieving these objectives.
- z. **Management tools and actions:** Identify specific population and habitat management tools and actions (voluntary and non-voluntary) required to achieve

- objectives, and the relationship of these tools and actions to community-based, regulatory and land-use planning processes.
- aa. **Implementation:** Describe how the plan will be implemented in a collaborative and timely manner.
 - bb. **Monitoring:** Identify ongoing monitoring needs including outstanding questions and uncertainties faced in developing and implementing the range plan, and develop time-bound learning plans to address key uncertainties.
 - cc. **Adaptive management and review:** Identify how monitoring results and new knowledge will be incorporated into revisions to the plan.
 - dd. **Communication:** Establish methods of ongoing communication to ensure that advice, guidance, feedback, monitoring results, and implementation results can be shared easily and widely with communities and decision makers.
- 12) The Proponent shall ensure that LFN and RRDC have opportunities to participate in and influence the development of environmental and socio-economic management plans and closure objectives developed for the Project to ensure that potentially affected First Nations can collaboratively design, collect, report, manage and communicate the results of the monitoring programs to their citizens.
- 13) The Proponent shall ensure that LFN has the opportunity to be part of the Proponent–Kaska environmental, cultural and heritage management program.
- 14) The Proponent shall sponsor on-the-land culture activities that promote sharing of Traditional Knowledge and practices in the Project area for the duration of construction and operation of the mine. The camp details, location and structure will be developed by potentially affected First Nations and span construction, operational and closure phases of the Project.
- 15) The Proponent shall provide allowance for up to 14 days of unpaid leave to all Yukon First Nation employees to allow for the exercising of Aboriginal rights related to:
- d. the pursuit of traditional land use activities; this will be 14 days to allow sufficient time on the land; and attending culturally important events (potlaches, dances, ceremonies, culture camps).
- 16) Proponent shall maintain in trust a transition fund with sufficient funds to ensure, in the event of an unscheduled closure:
- g. Funds for education and retraining;
 - h. Maintenance of the employee assistance program (EAP); and
 - i. Payment of back wages and severance
- for affected employees from Watson Lake and Ross River employed by the project at time of closure. The amount of funds and their administration shall be conducted by a

suitable party. The administrator shall have a local representative in either Ross River or Watson Lake to aid in ensuring the fund meets its objectives.

- 17) Shall ensure staff have access to money management and budgeting information and resources through on-line tools.
- 18) Recruitment for care and maintenance positions shall be done with preference for former qualified mine employees by the body overseeing care and maintenance.
- 19) The setting of security shall take into account the potential for care and maintenance costs required to maintain environmental protections over a period between a temporary closure and decommissioning.
- 20) Security requirements shall take into consideration the potential for early unscheduled closure and the need for care and maintenance requirements to maintain environmental safeguards prior to decommissioning.
- 21) The Proponent shall develop mandatory, regular harassment prevention training in consultation with a qualified expert, to be delivered to all the Proponent's employees, contractors and consultants working at the site.
- 22) The Proponent shall ensure that human resource staff complete training to enable them to effectively support employees who disclose workplace harassment. In order to increase reporting of sexual harassment and assault, human resource staff shall provide all new staff with information about ways in which they may best record and provide evidence of harassment or bullying and what happens after they make a disclosure of workplace harassment and how they will be protected from reprisals.
- 23) Proponent shall modify their proposed Mentor program for Yukon First Nations employees⁵⁰³ to:
 - ensure that women have access to a mentor or supervisor who regularly checks in to address any negative experiences related to the male-dominated work environment, and who pays special attention to potential cases of abuse;
 - develop a formal feedback process to ensure that enquiries are regularly made to First Nations employees to ensure that they are able to voice concerns and have addressed any negative experiences; and
 - involve both LFN and RRDC in further developing this Program to ensure that it meets the needs of First Nation employees.
- 24) The Proponent shall, in consultation with a qualified expert and both LFN and RRDC, develop gender appropriate and gender- and sexuality-specific policies and processes

⁵⁰³ YOR Document 2017-0083-200-1.

which promote a safe, respectful and inclusive environment for women and gender and sexual minorities.

- 25) The Proponent shall develop, with a qualified expert, an Anti-Harassment and Bullying Policy that outlines processes and actions to address any harassment or bullying which may take place within the Project's scope.
- 26) The Proponent shall ensure that the on-site First Aid Technician or Emergency Medical Technician is trained in Mental Health First Aid and/or has formal mental health training to provide short-term or crisis support at the mine site, referrals to other mental wellness supports or navigation to other systems⁵⁰⁴.
- 27) The Proponent shall ensure that on-site employees have the ability to utilize the EAP services available (i.e. ensure that a private phone line or Internet is available to discretely reach EAP services).
- 28) To address and mitigate impacts to employees who are or become victims of domestic abuse, the Proponent must create a policy that:
 - outlines clear procedures for the workplace to work with affected employees and provide appropriate resources and support;
 - plans for and addresses safety concerns that affected employees may have while at work to ensure all workers are safe from threats of domestic violence; and
 - includes a personal safety plan for employees suffering from domestic violence.
- 29) The Proponent shall inform all BMC employees' that their eligible dependents have access to the Employee Assistance Plan (EAP).
- 30) The Proponent shall develop standards for behavior at work and codes of conduct against sexual harassment and gender-based violence on the job site and in the broader community, including standards/codes of conduct in relation to the sex trade, and shall distribute education and awareness campaign materials on gender-based violence.

⁵⁰⁴ Examples of Mental First Aid courses can be found at the following websites: <https://www.mhfa.ca/en/course-types> and <https://www.redcross.ca/training-and-certification/course-descriptions>.

13.3 Recommended Monitoring

- A. The Proponent shall implement water quality monitoring of COPIs as early as possible beneath storage facilities and beneath their respective covers. Monitoring shall continue through operations and closure phases.
- B. The Proponent shall develop and implement adaptive management measures based on monitoring for the onset of acidic conditions that allows for early detection, management, and mitigation of acidic conditions and/or ML developing on-site.
- C. The Proponent shall implement, in collaboration with Government of Yukon, a survey program to monitor:
 - a. Caribou distribution in the Project area during the post-calving.
- D. Government of Yukon shall implement a range wide survey program to monitor:
 - a. Caribou herd composition and distribution during the rut period.
 - b. Caribou distribution during late winter.
 - c. Caribou distribution and movement in spring.
- E. That a survey program be instituted to monitor moose during late winter from construction through closure stages of the project. This survey program shall be designed through collaboration with affected First Nations.
- F. The Government of Yukon or a delegate body shall establish a monitoring program, after consulting with LFN, RRDC, LAWS, and Yukon Status of Women Council (YSWC) to measure potential project effects against pre-project baseline data. This program shall determine the extent to which the Project's effects are associated with violence against women (with special consideration for Indigenous women) and gender and sexual minorities in Ross River, Watson Lake, and Whitehorse. The development of the monitoring program should consider currently known effects but should also remain flexible so that unforeseen effects can be incorporated. The results of the monitoring shall be shared with LFN, RRDC, LAWS, and YSWC.

14. Signatory Page



Laura Cabott, Executive Committee

October 21, 2020

Date



Lawrence Joe, Executive Committee

October 21, 2020

Date



Bryony McIntyre, Executive Committee

October 21, 2020

Date

15. References

- Adamczewski, J.Z., Florkiewicz, R.F., and Loewen, V. "Habitat Management in the Yukon Winter Range of the Little Rancheria Caribou Herd". Department of Environment (Yukon). 2003.
- Adamczewski, J., R. Florkiewicz, R. Farnell, C. Foster, and K. Egli. 2010. "Finlayson caribou herd late-winter population survey", 2007. Yukon Fish and Wildlife Branch Report SR-10-01. Whitehorse, Yukon, Canada.
- Alberta Energy Regulator. Directive 038: Noise Control. February 16, 2017.
<https://www.aer.ca/documents/directives/Directive038.pdf>
- Alberta Environment and Parks. Alberta Government. Air Data – Total Suspended Particulates (TSP).
<http://airdata.alberta.ca/aepContent/Pollutants/TotalSuspendedParticulates.aspx>
- Alberta Sustainable Resource Development and Alberta Conservation Association. Status of the Woodland Caribou in Alberta, Update 2010, Alberta Sustainable Development, Wildlife Status Report 30, 2010.
- Amnesty International. *Out of Sight, Out of Mind: Gender, Indigenous Rights, and Energy Development in Northeast British Columbia, Canada*. London: Amnesty International, 2016.
amnesty.ca/sites/amnesty/files/Out%20of%20Sight%20Out%20of%20Min%20EN20FINAL%20web.pdf
- Angell, A.C. and Parkins, J.R. Resource Development and Aboriginal Culture in the Canadian North. 2010. *Polar Record* 47(240).
- APTN News. "Read the national MMIWG's inquiry Calls for Justice here", APTN National News, June 3, 2019.
<https://aptnnews.ca/2019/06/03/read-the-national-mmiwg-inquirys-callsfor-justice-here/>
- Archibald, L., Crnkovich, M., and Canada, G. *If Gender Mattered: A Case Study of Inuit Women, Land Claims and the Voisey's Bay Nickel Project*, 1999.
<http://publications.gc.ca/collections/Collection/SW21-39-1999E.pdf>.
- Bainton, Nicholas A. & Sarah E Holcombe. "A critical review of the social aspects of mine closure". *Resources Policy*, September 2018.
- BC Oil and Gas Commission. British Columbia Noise Control Best Practices Guidelines. Version 2.1. December 2018.
<https://www.bcogc.ca/node/11095>
- Boates, JS & Fenton, MB. "Flagship Species – Flagship Problems: recovery of species at risk and the conservation of biodiversity in Canada". *Canadian Journal of Zoology*, 89:5 (2011).
- Boertje, R. D. 1984. Seasonal diets of the Denali caribou herd, Alaska. *Arctic* 37:161-165

Bøving, Pernille S. and Post, Eric. "Vigilance and Foraging Behavior of Female Caribou in Relation to Predation Risk." *Rangifer*, 17:2. 1997.

Bowes-Lyon, L.-M., Richards, J.P., and McGee, T.M. "Socio-Economic Impacts of the Nanisivik and Polaris Mines, Nunavut, Canada." In *Mining, Society, and a Sustainable World*, by J. P.

Bradshaw, Corey and Boutin, Stan A. "Energetic Implications of Disturbance Caused by Petroleum Exploration to Woodland Caribou," *Canadian Journal of Zoology*, 76. 1998.

British Columbia Ministry of Environment. *British Columbia Approved Water Quality Guidelines: Aquatic Life, Wildlife and Agriculture Summary Report*. 2017.

---. *Working Water Quality Guidelines for British Columbia*. 2017.

Byford, J. *One day rich: community perceptions of the impact of the Placer Dome Gold Mine, Misima Island, Papua New Guinea*. In: Macdonald I, Rowland C, eds. *Tunnel Vision: Women, Mining, and Communities*. Victoria, Australia: Oxfam Community Aid Abroad; 2002: 30–35.

Canada Mortgage and Housing Corporation (CMHC). *Housing Market Information: Northern Housing Report*. Government of Canada, 2018.

---. "Rental Market Report Data Tables", 2020.

<https://www.cmhc-schl.gc.ca/en/data-and-research/data-tables/rental-market-report-data-tables>

Canadian Council of Ministers of the Environment. Air Quality.

<http://airquality-qualitedelair.ccme.ca/en/>

---. Environment. Resources – AQMS.

<https://www.ccme.ca/en/resources/air/aqms.html>

---. Canadian Environmental Quality Guidelines, Water quality Guidelines for the Protection of Aquatic Life. 2018.

---. *Guidance on the Site-Specific Application of Water Quality Guidelines in Canada: Procedures for Deriving Numerical Water Quality Objectives*. Canadian Water Quality Guidelines for the Protection of Aquatic Life – Site Specific Guidelines. 2003.

Canadian Federation of Business. "Canada's Top Cities for Entrepreneurship: Whitehorse, Winkler and Victoriaville lead the Way". April 3, 2019.

cfib-fcei.ca/en/media/canadas-top-cities-entrepreneurship-whitehorse-winkler-and-victoriaville-lead-way

CBC News. "Housing affordability in Yukon 'a significant concern' says author of living wage report." CBC News, October 31, 2019.

<https://www.cbc.ca/news/canada/north/2019-living-wage-report-yukon-1.5341937>

- . October 20, 2019. "Housing in Yukon: An election issue with no clear solution".
<https://www.cbc.ca/news/canada/north/yukon-housing-affordability-election-1.5327251>
- . September 28, 2018. 'It's our way of life': Ross River Dena defend hunting permit plans.
<https://www.cbc.ca/news/canada/north/ross-river-dena-hunting-permits-1.4841907>.
- CCGS Associates. Overburdened: Understanding the Impacts of Mineral Extraction on Women's Health in Mining Communities. Ottawa: MiningWatch Canada, 2004.
https://miningwatch.ca/sites/default/files/Overburdened_0.pdf
- Chandler, M.J and Lalonde, C. "Cultural Continuity as a Hedge against Suicide in Canada's First Nations". Transcultural Psychiatry. 1998
- City of Whitehorse. *City of Whitehorse, 2010 Official Community Plan*. City of Whitehorse, 2018.
<https://www.whitehorse.ca/home/showdocument?id=10347>
- . "City of Whitehorse Planning and Development Services Newsletter", October 2008, issue 18.
- . "Downtown Retail and Entertainment Strategy". 2016.
<https://www.whitehorse.ca/home/showdocument?id=9180>
- . "Phasing, Zoning, Subdivision", Whistle Bend Master Plan.
<https://www.whitehorse.ca/departments/planning-sustainability-services/plans-in-process/whistle-bend-master-plan/phasing-zoning-subdivision>
- Clyde River (Hamlet) v. Petroleum Geo-Services Inc. 2017, SCC 40.
- Coffin, Alisa W. "From Roadkill to road ecology: A review of the ecological effects of roads." *Journal of Transport Geography*, 15. 2007.
- Coldwater Indian Band v. Canada, FCA 34.
- Committee on the Status of Endangered Wildlife in Canada. COSEWIC Status Report on the Woodland Caribou *Rangifer Tarandus* Caribou in Canada. 2002.
- . 2014. COSEWIC assessment and status report on the Caribou *Rangifer tarandus*, Northern Mountain population, Central Mountain population and Southern Mountain population in Canada.
- . COSEWIC Assessment and Status Report on the Grizzly Bear *Ursus arctos* Western Population Ungava Population in Canada. 2012.
- . COSEWIC wildlife species status categories and definitions. 2016.
- Conference Board of Canada. "Future of Mining in Canada's North". Conference Board of Canada. January 28, 2013.
<https://www.conferenceboard.ca/e-library/abstract.aspx?did=5306>

- Courtois, Rehaume, et al., "Demographic and Behavioural Response of Woodland Caribou to Forest Harvesting", *Canadian Journal of Forest Resources*, 38 (2008).
- Dena Kayeh Institute. Kaska Dena Management Practices: Kaska Dena Land Use Framework. 2010.
<https://kaskadenacouncil.com/download/kaska-dena-management-practices-kaska-dena-land-use-framework-dena-kayeh-institute-2010/?wpdmdl=1647&masterkey=>
- Dau, J.R. and Cameron, R.D. "Effects of a road system on caribou distribution during calving". *Rangifer*, Special Issue No. 1, 1986.
- Downing, T.E. *Avoiding New Poverty: Mining-Induced Displacement and Resettlement*. International Institute for Environment and Development and World Business Council for Sustainable Development, 2002.
<https://pubs.iied.org/pdfs/G00549.pdf>
- Drever, C. Ronnie et al. "Conservation through co-occurrence: Woodland caribou as a focal species for boreal biodiversity". *Biological Conservation*. 232, April 2019.
- Dreyer, D. 2004. Impact and Benefits Agreements; Do the Ross River Dena Benefit from Mineral Projects? University of Northern British Columbia.
- Duhaime, et al. "Social Cohesion and Living Conditions in the Canadian Arctic: From Theory to Measurement". *Social Indicators Research*, Vol. 66, No. 3. 2004.
- Eckford, C. and Wagg, J. *The Peace Project: Gender Based Analysis of Violence against Women and Girls in Fort St. John. Status of Women Canada and Fort St. John Women's Resource Society*, 2014.
thepeaceprojectfsj.files.wordpress.com/2014/03/the_peace_project_gender_based_analysis_amended.pdf
- Ecological Monitoring Committee of the Lower Athabasca, "Assessing the Influence of Industrial Development on Caribou in the Lower Athabasca Planning Region of Alberta", Alberta Biodiversity Monitoring Institute, 2011.
- Environment and Climate Change Canada. "Avoiding Harm to Migratory Birds." Accessed March 6, 2018.
canada.ca/en/environment-climate-change/services/avoiding-harm-migratory-birds/overview.html .
- . "Bird Conservation Strategy for Bird Conservation 4 in Canada: Northwestern Interior Forest." Government of Canada. 2013.
- Environment Canada. Management Plan for The Northern Mountain Population of Woodland Caribou in Canada (proposed). Species at Risk Act Management Plan Series. Environment Canada. 2011.
- . 2012 Management Plan for the Northern Mountain Population of Woodland Caribou (*Rangifer tarandus caribou*) in Canada. Species at Risk Act Management Plan Series. Environment Canada, Ottawa

- . Canada. Recovery Strategy for the Woodland Caribou, Southern Mountain population (*Rangifer tarandus caribou*) in Canada [Proposed]. Species at Risk Act Recovery Strategy Series. Environment Canada, Ottawa. 2014.
- . Metal Mining Technical Guidance for Environmental Effects Monitoring. 2012.
[https://www.ec.gc.ca/esee-eem/AEC7C481-D66F-4B9B-BA08-A5DC960CDE5E/COM-1434---Tec-Guide-for-Metal-Mining-Env-Effects-Monitoring_En_02\[1\].pdf](https://www.ec.gc.ca/esee-eem/AEC7C481-D66F-4B9B-BA08-A5DC960CDE5E/COM-1434---Tec-Guide-for-Metal-Mining-Env-Effects-Monitoring_En_02[1].pdf)
- Farnell, Rick .Three decades of caribou recovery program's in Yukon. Environment Yukon. 2009.
- Ferguson, Steven H. et al. "The Influences of Density on Growth and Reproduction in Moose". *Wildlife Biology*, 6:1 (2000).
- Fisher, Jason T, and Lisa Wilkinson, "The Response of Mammals to Forest Fire and Timber Harvest in the North American Boreal Forest", *Mammal Review*, 35 (2005).
- Fisheries and Oceans Canada Department of Fisheries and Oceans, 2019. Fish and Fish Habitat Protection Policy Statement. August 2019.
- Galloway, Jennifer M. et al. "Diet and habitat of mountain woodland caribou inferred from dung preserved in 5000-year-old alpine ice in the Selwyn Mountains, Northwest Territories, Canada." *Arctic* 65 Suppl. 1 (2012).
- Gibson, G., K. Yung, L. Chisholm, and H. Quinn with Lake Babine Nation and Nak'azdli Whut'en. *Indigenous Communities and Industrial Camps: Promoting healthy communities in settings of industrial change*. Victoria, B.C.: The Firelight Group, 2017.
- Gibson, G. and Klinck, J. "Canada's Resilient North: The Impact of Mining on Aboriginal Communities." *Pimatisiwin: A Journal of Aboriginal and Indigenous Community Health* 3(1) (2005).
- Gibson, G. and Scoble, M. "'Regenderneering' the mining industry: A survey of women's career experiences in mining." *CIM Bulletin* (2004): 54-60.
- Gill, J.A., Norris, K., Sutherland, W.J., 2001. Why behavioural responses may not reflect the population consequences of human disturbance. *Biological Conservation*. 97, 265–268.
- Government of Canada. "Canada's National Housing Strategy: A place to call home." Government of Canada, n.d.
placetocallhome.ca/-/media/sf/project/placetocallhome/pdfs/canada-national-housing-strategy.pdf
- . Health Effects of Air Pollution. 2019.
<https://www.canada.ca/en/health-canada/services/air-quality/health-effects-indoor-air-pollution.html>
- . Glossary of Terms: National Pollutant Release Inventory.
canada.ca/en/environment-climate-change/services/national-pollutant-release-inventory/glossary-terms.html

- . Glossary of Terms: National Pollutant Release Inventory.
canada.ca/en/environment-climate-change/services/national-pollutant-release-inventory/glossary-terms.html
- . Migratory Birds Regulations, C.R.C., c.1035.
https://lois-laws.justice.gc.ca/eng/regulations/C.R.C.,_c._1035/page-2.html#h-5
- . Species at Risk Act: order amending Schedule 1 (volume 152, number 12, June 13, 2018)
Government of Yukon. 1996 Moose Survey Summary: North Canol, Frances Lake, and Wolverine Lake.
- . About Permit Hunt Authorizations. Environment Yukon. 2018.
- . “Apply for social housing.” YG, 2019.
<https://yukon.ca/en/housing-and-property/tenant-supports/apply-social-housing>
- . Constitution Act. Part II S. 35 Rights of the Aboriginal Peoples of Canada.
- . Draft Conservation Plan for Grizzly Bears in Yukon. June 2018.
<https://yukon.ca/sites/yukon.ca/files/env/engage-draft-conservation-plan-grizzly-bears.pdf>
- . *Employment Standards Act*, RSY, c.72, 2002.
http://www.gov.yk.ca/legislation/acts/emst_c.pdf
- . Finlayson Caribou Herd Late-Winter Population Survey, 2007.
- . “Five-Year Capital Plan – March 2019”, YG, 2009.
<https://yukon.ca/sites/yukon.ca/files/fin/fin-budget-2019-20-five-year-capital-plan.pdf>
- . Licensed Harvest Trends in Yukon 1980 – 2014. 2018.
<https://yukon.ca/sites/yukon.ca/files/env/env-licensed-harvest-trends-yukon.pdf>
- . Mental Wellness and Substance Use Services across Yukon. 2019.
http://www.hss.gov.yk.ca/mwsu_communities.php
- . Moose Survey, South Canol Moose Management Unit, Early Winter, 2013.
http://www.env.gov.yk.ca/publications-maps/documents/south_canol_early_winter_2013.pdf
- . News Release. 2018-2019 Hunting season in Ross River Area. July 31, 2018.
<https://yukon.ca/en/news/2018-19-hunting-season-in-ross-river-area>
- . Occupational Health and Safety Act (RSY). C.159, 2002.
http://www.gov.yk.ca/legislation/acts/ochesa_c.pdf
- . “Scientific-based guidelines for the management of moose in Yukon”. 2016.
- . Science-based Guidelines for Management of Northern Mountain Caribou in Yukon. 2016.
- . Tourism statistics and reports. 2019.
<https://yukon.ca/en/tourism-statistics#economic-impact-of-tourism-in-yukon>
- . Water for Nature, Water for People. Yukon’s Water Strategy and Action Plan. 2014.

- . Waters Act. 2007.
- . Wildlife Act. 2019.
- . Yukon fishing regulations summary 2019-2020.
<https://yukon.ca/en/yukon-fishing-regulations-summary>
- . Yukon Mine Site Reclamation and Closure Policy. 2006.
- . Yukon Tourism Development Strategy. Sustainable Tourism. Our Path. Our Future. 2018-2018. 2018.
<https://yukon.ca/sites/yukon.ca/files/tc/tc-yukon-tourism-development-strategy.pdf>
- Grant, J. and Perrott, K. 2011. Where is the Café? The Challenge of Making Retail Uses Viable in Mixed-use Suburban Developments. *Urban Studies*, 48(1) 177-195.
- Hall, Robert E. "Why is the Unemployment Rate So High at Full Employment." Massachusetts Institute of Technology, 1970: 369-410.
<http://www.web.stanford.edu/~rehall/Why-Is-BPEA-1970.pdf>
- Health Canada. Human Health Risk Assessment for Coarse Particulate Matter. January 2016.
http://publications.gc.ca/collections/collection_2016/sc-hc/H144-30-2016-eng.pdf
- Health Canada. Supplemental Guidance on Human Health Risk Assessment of Air Quality, Version 2.0. Federal Contaminated Site Risk Assessment in Canada. Government of Canada. March 2017.
- Hegel, Troy M., et al. "Interacting Effect of Wolves and Climate on Recruitment in a Northern Mountain Caribou Population." *Oikos*, 119. 2010.
- Hegel, T. M. et al. "Seasonal effects of Pacific-based climate on recruitment in a predator-limited large herbivore." *Journal of Animal Ecology*, 79. 2010.
- Help and Hope for Families Society (HHFS). Help and Hope for Families Society, HHFS.
<http://www.helpandhopeforfamilies.ca/>.
- Housing Action Plan Implementation Committee (HAPIC). *Ours To Build On, Housing Action Plan for Yukon, Progress Report, April 2018-March 2019*. Whitehorse: HAPIC, 2019.
- Hrenchuk, Charlotte. *Not Your Fantasy 101*. Yukon Status of Women Council, 2018.
- . Strong Women's Voices Rural Choices, Report on the Northern Women's Issues Through a Rural Lens Project. Whitehorse: Yukon Status of Women Council, 2004.
- Human Rights Act (RSY)*. C.116, 2002.
http://www.yukonhumanrights.ca/documents/YHRA_current.pdf
- Hummel, Monte & Ray, Justina C. *Caribou and the North*, Dundurn Press, Toronto: 2008, 233.

- James, Adam R.C., and Stuart-Smith, A. Kari. "Distribution of Caribou and Wolves in Relation to Linear Corridors." *Journal of Wildlife Management*, 64:1, 2000.
- Johnson, Cheryl et al. "Science to inform policy: Linking population dynamics to habitat for a threatened species in Canada". *Applied Ecology*, (57) no. 7, 2020.
- Johnson, Chris J., Parker, Katherine L., and Heard, Douglas C. "Feeding Site Selection by Woodland Caribou in North-Central British Columbia." *Rangifer*, 12. 2000.
- . "Foraging across a variable landscape: behavioral decisions made by woodland caribou at multiple spatial scales," *Oecologia*, 127. 2001.
- Joly, Kyle et al. "Winter Habitat Use by Female Caribou in Relation to Wildlife Fires in Interior Alaska." *Canadian Journal of Zoology*, 81 (2003).
- Joly Kyle, Chapin III, F. Stuart., and Klein, David R. "Winter Habitat Selection by Caribou In Relation to Lichen Abundance, Wildfires, Grazing and Landscape Characteristics in Northwest Alaska." *Ecoscience*, 17:3. (2010).
- Kelly, Allicia. "Seasonal patterns of mortality for boreal caribou (*Rangifer tarandus caribou*) in an intact environment". 2020. Unpublished Masters Thesis, University of Alberta.
- Kinley, TA. "Characteristics of Early-Winter Caribou, *Rangifer tarandus caribou*, Feeding Sites in the Southern Purcell Mountains, British Columbia". *Canadian Field Naturalist*. 117, no. 3 (2003).
- Klein, D .R. 1990. Variation in quality of caribou and reindeer forage plants associated with season, plant part, and phenology. *Rangifer Special Issue 3*:123-130.
- Kobayashi + zedda (KZ). Betty's Haven Second Stage Housing. Kobayashi + Zedda, 2019. <https://kza.yk.ca/projects/bettys-haven-second-stage-housing/>
- Kwanlin Dün First Nation (KDFN). Kwanlin Dün First Nation: Traditional Territory Land Vision. KDFN, 2017. http://www.kwanlindun.com/images/uploads/KDFN_Land_Vision_FINAL_June_2017.pdf
- Leblond, M. et al., 2011. Assessing the influence of resource covariates at multiple spatial scales: an application to forestdwelling caribou faced with intensive human activity. *Landscape Ecology* 26, 1433–1446.
- McCulley, Alice M. "Ranges and movements of moose in Yukon." *Alces* 53 (2017).
- Mental Health Commission of Canada (MHCC). *National Final Report: Cross-Site At Home/Chez Soi Project*. MHCC, 2014. mentalhealthcommission.ca/sites/default/files/mhcc_at_home_report_national_cross-site_eng_2_0.pdf
- Mining and Petroleum Environmental Research Group. Guidelines for Industrial Activity in Bear Country, for the mineral exploration, placer mining and oil & gas industries. 2008.

- Minto Explorations Ltd, Selkirk First Nation and Yukon Government. 2015. Minto Mine Socio-Economic Monitoring Program – Annual Report 2015. Minto Mine Socio Economic Monitoring Plan.
selkirkfn.com/files/2115/3419/3625/MintoMine_Socio-EconReport-2015_FINAL_July_30_2018.pdf
- Morrell, M. Indian Land use in the Ketzá River Valley and the impact of the Ketzá River Mine. 1992. Ross River Dena Council.
- Morrill, Natasha et al. "Site Fidelity in Forest-Dwelling Woodland Caribou Nursery Habitat in Wabakimi Provincial Park and Woodland Caribou Signature Site". PRFO Proceedings. 2005.
- National Aboriginal Health Organization (NAHO). *Resource Extraction and Aboriginal Communities in Northern Canada, Cultural Considerations*. NAHO, 2008.
https://www.saintelizabeth.com/getmedia/7efe95d2-e85b-4908-add65dca7bf850bf/Cultural_EN.pdf.aspx
- National Collaborating Centre for Aboriginal Health. 2016. Culture and Language as Social Determinants of First Nations, Inuit and Metis Health.
<https://www.ccsa-nccah.ca/docs/determinants/FS-CultureLanguage-SDOH-FNMI-EN.pdf>
- National Inquiry into Missing and Murdered Indigenous Women and Girls (MMIWG). *Calls for Justice. Inquiry Report*, MMIWG Inquiry, 2019.
https://www.mmiwg-ffada.ca/wp-content/uploads/2019/06/Calls_for_Justice.pdf.
- National Inquiry into Missing and Murdered Indigenous Women and Girls. 2019. Reclaiming Power and Place: Executive Summary of the Final Report.
https://www.mmiwg-ffada.ca/wp-content/uploads/2019/06/Executive_Summary.pdf
- . Reclaiming Power and Place: The Final Report of the National Inquiry into Missing and Murdered Indigenous Women and Girls, Volume 1a. National Inquiry Report, MMIWG, 2019.
https://www.mmiwg-ffada.ca/wp-content/uploads/2019/06/Final_Report_Vol_1a-1.pdf
- North American Bird Conservation Initiative Canada. *The State of Canada's Birds*, 2012. Environment Canada, Ottawa, Canada. 2012.
- Notzke, C. 1994. *Aboriginal peoples and natural resources in Canada*. North York: Captus Press Inc
- Pettorelli, N. P., R. B. Weladji, Ø. Holand, A. Mysterud, H. Breie, and N. C. Stenseth. 2005. The relative role of winter and spring conditions: linking climate and landscape-scale plant phenology to alpine reindeer performance. *Biology Letters* 1:24–26.
- Plante, Sabrina et al. Human disturbance effects and cumulative habitat loss in endangered migratory caribou. *Biological Conservation*. Volume 224, 2018.
- Polfus, Jean Lieppert. "Assessing Cumulative Human Impacts on Northern Woodland Caribou with Traditional Ecological Knowledge and Resource Selection Functions," Unpublished Masters Thesis. University of Montana, 2010.

- Polfus, J.L., Hebblewhite, M., Heinemeyer, K. "Identifying Indirect Habitat Loss and Avoidance of Human Infrastructure by Northern Mountain Woodland Caribou." *Biological Conservation*, 144. 2011.
- Poole, Kim G, & Kari Stuart Smith, "Winter Habitat Selection by Female Moose in Western Interior Montane Forests," *Canadian Journal of Zoology*, 84 (2006), 1829.
- Price, W.A. 2009. Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials. Mine Environment Neutral Drainage Program (MEND) Report No.1.20.1. Natural Resources Canada. December 2009.
- Prokopenko, C.M., Boyce, M.S., Avgar, T. "Extent-dependent habitat selection in a migratory large herbivore: road avoidance across scales." *Landscape Ecology*. 32, 313–325, 2017.
- Public Health Agency of Canada. The Chief Public Health Officer's Report on the State of Public Health in Canada 2016: A Focus on Family Violence in Canada. Government of Canada. October 2016.
<https://www.canada.ca/content/dam/canada/public-health/migration/publications/department-ministere/state-public-health-family-violence-2016-etat-sante-publique-violence-familiale/alt/pdf-eng.pdf>
- Research Northwest and Morrison Hershfield. 2017. Yukon 'State of Play': Analysis of Climate Change Impacts and Adaptation. November 14, 2017.
- Rettie, W. James, & Francois Messier, "Hierarchical Habitat Selection by Woodland Caribou: Its Relationship to Limiting Factors," *Ecography*, 23 (2000), 467.
- Ross River Dena Council v Yukon (Government of), 2015 YKSC 45.
- Seip, Dale R. "Factors Limiting Woodland Caribou Populations with Wolves and Moose in Southeastern British Columbia," *Canadian Journal of Zoology*, 70 (1992).
- . "Mountain Caribou Interactions with Wolves and Moose in Central British Columbia." *Alces*, 44. 2008.
- Shandro, J. A., Marcello, M. V., Shoveller, J., Scoble, M., and Koehoorn, M. "Perspectives on community health issues and the mining boom-bust cycle", *Resources Policy* 36 (2011): 178-186.
- Simatauw, M. *The polarization of people and the state on interests of the political economy and women's struggle to defend their existence: a critique of mining policy in Indonesia*. In: Macdonald I, Rowland C, eds. *Tunnel Vision: Women, Mining, and Communities*. Victoria, Australia: Oxfam Community Aid Abroad; 2002: 35–40.
- Sinclair, Pamela H. et al. *Birds of the Yukon Territory*. UBC Press, 2003.
- Skookum Jim Friendship Centre (SJFC). Skookum Jim Friendship Centre. SJFC, n.d..
<https://skookumjim.com/>

- Soans, Ranon. "Towards Vibrancy: Overcoming Path Dependence to Revitalize Traditional Retail Areas in Edmonton.", Master's thesis, University of Alberta, 2018.
<https://era.library.ualberta.ca/items/903101e8-77df-4e6a-8794-7c70ebed799b>
- Statistics Canada. 2015. Aboriginal Peoples Survey, 2012.
<https://www150.statcan.gc.ca/n1/en/daily-quotidien/150330/dq150330g-eng.pdf?st=G394ReOW>
- . "Income Highlight Tables, 2016 Census", Government of Canada.
<https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/hlt-fst/inc-rev/Table.cfm?Lang=Eng&T=101&S=99&O=A>
- . "Retail Trade Sales by Province and Territory". Government of Canada. 2019.
- . "Violent victimization of lesbians, gays and bisexuals in Canada, 2014", Statistics Canada, 2014.
<https://www150.statcan.gc.ca/n1/pub/85002-x/2018001/article/54923-eng.htm>
- . Yukon: Beautiful, Complex, and Changing. 2018.
<https://www150.statcan.gc.ca/n1/pub/11-631-x/11-631-x2018006-eng.htm>
- Stewart, Francis et al, "Boreal Caribou Can Coexist with Natural but Not Industrial Disturbances", *Journal of Wildlife Management*, 2020.
- Stockwell, A. M. "Capturing Vulnerability: Towards a Method for Assessing, Mitigating, and Monitoring Gendered Violence in Mining Communities in British Columbia.", Master's thesis, University of British Columbia, 2012.
- Summers, Lawrence H. "Why is the Unemployment Rate so very High near Full Employment". *Brookings Papers on Economic Activity*, 1986: 339-396.
- Tallichet, S.E. "Barriers to Women's Advancement in Underground Coal Mining." *Rural Sociology* 65(2) (2000): 234-252.
- Thomas, DC et al. "The diet of woodland caribou populations in west-central Alberta." *Rangifer* 16, no. 4 (1996).
- Timmermann, HR & JG McNichol. "Moose Habitat Needs". *The Forestry Chronical*. June 1988.
- Vella, H. "#MeTooMining: tackling sexual misconduct in the mining industry." *Mining Technology*, April 30, 2018.
<https://www.mining-technology.com/features/metoomining-tackling-sexual-misconduct-mining-industry/>
- Victoria Faulkner Women's Centre (VFWS). The Victoria Faulkner Women's Centre. VFWS, 2019.
<http://www.vfwomenscentre.com/>
- Wathen, N. *Health Impacts of Violent Victimization on Women and their Children*. Research and Statistics Division, Department of Justice Canada, 2012.
https://www.justice.gc.ca/eng/rp-pr/cj-jp/fv-vf/rr12_12/rr12_12.pdf

- Weinstein, Martin. "The Ross River Dena: A Yukon Aboriginal Economy". Royal Commission on Aboriginal Peoples Aboriginal Economy Case Study Project. 1993.
- Wein, E.E. and Freeman, M.R. 1995. Frequency of Traditional Food Use by Three Yukon First Nations Living in Four Communities. *Arctic*, Vol. 48, No. 2, P.161-171.
<http://pubs.aina.ucalgary.ca/arctic/Arctic48-2-161.pdf>
- Whitehorse Star. "Cost of Faro Project Forecast to Exceed \$500 Million This Year". May 23, 2019.
<https://www.whitehorsestar.com/News/cost-of-faro-project-forecast-to-exceed-500-million-this-year>
- . "Home prices continue to reach record highs." Tobin C., October 15, 2019.
<https://www.whitehorsestar.com/News/home-prices-continue-to-reach-record-highs>
- Wilderness Tourism Association of the Yukon (WTAY). 2019.
https://wtay.com/regions/campbell-region/?wtay_activity
- Wilson, Steven F. "Recommendations for Applying Management Buffers to Mitigate Zone-of-Influence Impacts from Oil and Gas Activities on Terrestrial Wildlife and Habitats in British Columbia" BC Oil and Gas Commission. 2016.
- Women's Transition Home (WTH). Emergency Shelter. WTH, n.d.
<https://www.womenstransitionhome.ca/kaushees-place/>
- Wood, J. Canadian Environmental Indicators – Air Quality. Studies in Environmental Policy. Fraser Institute. January 2012.
<https://www.fraserinstitute.org/sites/default/files/canadian-environmental-indicators-air-quality-2012.pdf>
- Worksafe BC. Basic Noise Calculations. April 2007.
- World Health Organization (WHO). *Intimate partner violence and alcohol*. Geneva: World Health Organization, 2006.
https://www.who.int/violence_injury_prevention/violence/world_report/factsheets/fs_intimate.pdf
- . World Health Organization (WHO). *Violence against women*. WHO, 2017.
<https://www.who.int/news-room/fact-sheets/detail/violence-against-women>
- Yukon Anti-Poverty Coalition (YAPC). "2019 Living Wage calculation for Whitehorse released." YAPC, 2019.
<https://yapc.ca/news/entry/175>
- Yukon Big Game Outfitters (YBGO). 2013.
<http://yukonbiggame.com/wilderness-adventures.php>
- Yukon Bureau of Statistics. . Income Census 2016. YBS, 2016.
<http://www.eco.gov.yk.ca/stats/pdf/Income.pdf>
- . Inter-jurisdictional Employees, 2015. 2019.
http://www.eco.gov.yk.ca/stats/pdf/inter_jurisdictionalemployees2015.pdf

- . Labour Demand Survey 2016. 2017.
http://www.eco.gov.yk.ca/stats/pdf/2016_Labour_Demand_Survey_Reportr.pdf
 - . Labour Demand Survey 2018. 2019.
http://www.eco.gov.yk.ca/stats/pdf/2018_Labour_Demand_Survey_Report.pdf
 - . Police-reported Crime Statistics in Yukon 2016. August 2017.
http://www.eco.gov.yk.ca/stats/pdf/crime_2016.pdf
 - . Population Report, Q1, '18, 2018.
http://www.eco.gov.yk.ca/stats/pdf/populationQ1_2018.pdf
 - . Population Report, Q1 '19. 2019.
http://www.eco.gov.yk.ca/stats/pdf/populationQ1_2019_R.pdf
 - . Population Report, Q1, 2020. July 28 2020.
<https://yukon.ca/en/population-report-q1-2020>
 - . Population Report, Q2 '18. 2018.
http://www.eco.gov.yk.ca/stats/pdf/populationQ2_2018_R.pdf
 - . Population Report, Q3 '18. 2018.
http://www.eco.gov.yk.ca/stats/pdf/populationQ3_2018_R.pdf
 - . Population Report, Q4, '18. 2019.
http://www.eco.gov.yk.ca/stats/pdf/populationQ4_2018_R.pdf
 - . "Ross River, Aboriginal Population Census 2016. Government of Yukon, 2016.
http://www.sewp.gov.yk.ca/data?regionId=YK.RR&subjectId=POPCOM&groupId=POPCOM.ABOR&dataId=CENSUS_2016_ABOR_POP&tab=region
 - . "Ross River, Population by Sex and Age Group Census 2016". Government of Yukon, 2016.
[sewp.gov.yk.ca/data?regionId=YK.RR&subjectId=POPCOM&groupId=POPCOM.POP&dataId=CENSUS_2016_POP_AGE&tab=region](http://www.sewp.gov.yk.ca/data?regionId=YK.RR&subjectId=POPCOM&groupId=POPCOM.POP&dataId=CENSUS_2016_POP_AGE&tab=region)
 - . Visitor Exit Survey 2017/18. 2017.
<https://yukon.ca/sites/yukon.ca/files/tc/tc-visitor-exit-survey-2017-18.pdf>
 - . Watson Lake, Aboriginal Population Census 2016. Government of Yukon. 2016.
http://www.sewp.gov.yk.ca/data?regionId=YK.WLR&subjectId=POPCOM&groupId=POPCOM.ABOR&dataId=CENSUS_2016_ABO_POP&tab=region
 - . Watson Lake, Population by Sex and Age Group Census 2016. Government of Yukon, 2016.
http://www.sewp.gov.yk.ca/data?regionId=YK.WLR&subjectId=POPCOM&groupId=POPCOM.POP&dataId=CENSUS_2016_POP_AGE&tab=region
- White River First Nation V Government of Yukon, YKSC 66.
- . Whitehorse (City of), Population by Sex and Age Group Census 2016. Government of Yukon, 2016.

http://www.sewp.gov.yk.ca/data?regionId=YK.WH&subjectId=POPCOM&groupId=POPCOM.POP&dataId=CENSUS_2016_POP_AGE&tab=region

---. Yukon Employment and Skills Survey, 2018. April, 2019.

http://www.eco.gov.yk.ca/stats/pdf/2018_Yukon_Employment_Skills_Survey_Report.pdf

---. Yukon Employment Annual Review, 2018. 2019.

http://www.eco.gov.yk.ca/stats/pdf/2018_Yukon_Employment_Skills_Survey_Report.pdf

---. Yukon Employment Report, Sep '19. 2019.

http://www.eco.gov.yk.ca/stats/pdf/employment_Sep19.pdf

---. Yukon Real Estate Report: First Quarter, 2019. Government of Yukon, 2019.

http://www.eco.gov.yk.ca/stats/pdf/real_estate_q119_R.pdf

---. Yukon Rent Survey, April 2020. 2020

<https://yukon.ca/en/yukon-rent-survey-april-2020>

----. Yukon Employment, August 2020. Government of Yukon. 2020.

<https://yukon.ca/en/yukon-employment-august-2020>

Yukon College, "Scholarship program supports student success in caribou country". November 15, 2018.

yukoncollege.yk.ca/blog/routes/2018-11/scholarship-program-supports-student-success-caribou-country

Yukon Government's Preventing Wildlife Collisions Interdepartmental Working Group. "Large Mammal-Vehicle Collisions: Overview of mitigations and analysis of collisions in Yukon." Government of Yukon. 2015.

Yukon (Government of) v. Yukon Zinc Corporation, 2019 YKSC 2019.

Yukon Legal Services Society (YLSS). Yukon Legal Services Society. YLSS, 2019.

<https://legalaids.yk.ca/>

Yukon News. "RRDC to require non-Kaska hunters in Ross River area to get special permit." June 22, 2018. Whitehorse.

---. "Whitehorse council prepares to zone the last phase of Whistle Bend." Waddell, S., July 19, 2019.

----. "Yukon government pressured to do more to solve Ross River housing woes."

Yukon News, November 2, 2017. Joannou, A.

www.yukon-news.com/news/yukon-government-pressured-to-do-more-to-solve-ross-river-housing-woes/

Yukon Status of Women Council (YSWC). Our Publications. YSWC, 2019.

<https://www.yukonstatusofwomen.org/index.php/publications>

Yukon Zinc Corporation. 2007. Wolverine Project Heritage Resource Protection Plan. Version 2007-01.

www.emr.gov.yk.ca/mining/pdf/mml_wolverine_heritage_resource_protection_plan_version_2007_01.pdf

Appendix A

Proponent Mitigations

Table 6-1: Summary of Proposed Mitigations for Environmental Valued Components

Valued Component	Proposed Mitigation	Source
Air Quality	Crusher enclosure, and material handling and transfers at the process plant facility will occur indoors	Project Proposal Chapter 6 (BMC, 2017a)
Air Quality	Cover over the live portion of coarse ore stockpile	Project Proposal Chapter 6 (BMC, 2017a) and BMC Response on Draft Screening Report (BMC, 2020)
Air Quality	Progressive reclamation of disturbed areas	Project Proposal Chapter 6 (BMC, 2017a)
Air Quality	Road and exposed surfaces watering, as required	Project Proposal Chapter 6 (BMC, 2017a)
Air Quality	Use of dust collectors and proper chute design to prevent air entrainment of dust	Project Proposal Chapter 6 (BMC, 2017a)
Air Quality	Dust extraction with conveyance to and processing in dust collectors	Project Proposal Chapter 6 (BMC, 2017a)
Air Quality	Cover or enclosure of conveyors or conveyor galleries.	Project Proposal Chapter 6 (BMC, 2017a)
Air Quality	Installation of water sprays at conveyor transfer points as required (unless not practicable or safe to do so due to sub-zero temperatures.)	Project Proposal Chapter 6 (BMC, 2017a) and BMC Response on Draft Screening Report (BMC, 2020)
Air Quality	Minimize land clearing activities (i.e. waste storage facilities will be cleared progressively through the Project construction and operations phase).	Project Proposal Chapter 6 (BMC, 2017a)
Air Quality	Construction of the Access Road and site roads with low silt content material.	Project Proposal Chapter 6 (BMC, 2017a)
Air Quality	Appropriate speed limits for all mobile equipment.	Project Proposal Chapter 6 (BMC, 2017a)
Air Quality	Orientation of material stockpiles so that the length is parallel with prevailing winds where practicable.	Project Proposal Chapter 6 (BMC, 2017a)
Air Quality	Re-vegetate waste rock storage areas final surfaces early where practicable.	Project Proposal Chapter 6 (BMC, 2017a)
Air Quality	Construction of wind breaks or stationary misters (if required).	Project Proposal Chapter 6 (BMC, 2017a) and BMC Response to Draft Screening Report (BMC, 2020)
Air Quality	Visual inspections to identify and address potential dust emissions.	Project Proposal Chapter 6 (BMC, 2017a)
Air Quality	Use filters, scrubbers, and other pollution control devices at processing facilities.	Project Proposal Chapter 6 (BMC, 2017a)
Air Quality	Avoid engine idling.	Project Proposal Chapter 6 (BMC, 2017a)
Air Quality	Ensure vehicles and equipment are maintained according to manufacturers' guidelines.	Project Proposal Chapter 6 (BMC, 2017a)
Air Quality	Use catalytic control systems on diesel engines.	Project Proposal Chapter 6 (BMC, 2017a)
Air Quality	Waste reduction at source and recycling.	Project Proposal Chapter 6 (BMC, 2017a)
Air Quality	Waste segregation.	Project Proposal Chapter 6 (BMC, 2017a)
Air Quality	Incinerator operation for optimum combustion.	Project Proposal Chapter 6 (BMC, 2017a)
Air Quality	Regular inspection and maintenance of incinerator.	Project Proposal Chapter 6 (BMC, 2017a)
Noise	Noise dampening enclosures for boilers, generators, and compressors.	Project Proposal Chapter 7 (BMC, 2017a)
Noise	Crusher, grinding mills, conveyor shielding (enclosed building).	Project Proposal Chapter 7 (BMC, 2017a)
Noise	Equip all vehicles and internal combustion engines with appropriate muffler systems.	Project Proposal Chapter 7 (BMC, 2017a)
Noise	Ensure regular equipment maintenance including lubrication.	Project Proposal Chapter 7 (BMC, 2017a)
Noise	Keep noisy equipment inside buildings or sheds and/or near ground level whenever possible.	Project Proposal Chapter 7 (BMC, 2017a)
Noise	Impose speed limits for all vehicles.	Project Proposal Chapter 7 (BMC, 2017a)
Noise	Avoid engine idling.	Project Proposal Chapter 7 (BMC, 2017a)
Noise	Maintain natural cover (vegetation) between noise sources and the camp.	Project Proposal Chapter 7 (BMC, 2017a)
Noise	Maintain the Project roads regularly to minimize vehicle noise associated with vibration.	Project Proposal Chapter 7 (BMC, 2017a)
Noise	Maintain a noise control standard when procuring equipment.	Project Proposal Chapter 7 (BMC, 2017a)
Noise	Adhere to BMC's blasting plan that implements controlled blasting procedures, optimizes blasting operations, and minimizes non-productive noise.	Project Proposal Chapter 7 (BMC, 2017a)
Surface Water Quality and Quantity	The following conceptual management plans (presented in the Project Proposal) outline mitigation measures to minimize potential effects to surface water from Project activities: <ul style="list-style-type: none"> ○ Waste Management Plan (Section 18.2); ○ Hazardous Materials Management Plan (Section 18.3); 	Project Proposal (BMC, 2017a)

Valued Component	Proposed Mitigation	Source
	<ul style="list-style-type: none"> ○ Surface Water Management Plan (Section 18.4); ○ Spill Response Plan (Section 18.5); ○ Sediment and Erosion Control Plan (Section 18.6); ○ Waste Rock Management (Section 4.9); and ○ Conceptual Reclamation and Closure Plan (Appendix H-1). 	
Surface Water Quality	Water quality objectives have been established and will be incorporated into the adaptive management plan to mitigate potential effects to surface water quality.	Project Proposal Chapter 8 (BMC, 2017a)
Surface Water Quality	Effluent quality standards will be established during the Water Use Licencing to mitigate potential effects and the Project will be subject to effluent standards under Metal and Diamond Mine Effluent Regulations.	Project Proposal Chapter 8 (BMC, 2017a)
Surface Water Quality	Manage ABM open pit development water in Pit Rim Pond to settle Total Suspended Solids and aerate water.	Project Proposal Chapter 8 (BMC, 2017a)
Surface Water Quality	Line Fault Creek diversion ditch.	Project Proposal Chapter 8 (BMC, 2017a)
Surface Water Quality	Energy dissipation structure at Fault Creek diversion outlet to South Creek catchment.	Project Proposal Chapter 8 (BMC, 2017a)
Surface Water Quality	Construction of Water Treatment Plant which will remain on site until the closure objectives are met in the receiving environment.	Project Proposal Chapter 8 (BMC, 2017a) and BMC Response on Draft Screening Report (BMC, 2020)
Surface Water Quality	Discharge at minimum dilution ratios to Geona Creek and Finlayson Creek.	Project Proposal Chapter 8 (BMC, 2017a)
Surface Water Quality	Class A and B Storage Facilities will be constructed with very low permeability composite liner and cover systems.	Response Report 3A (BMC, 2018a) and BMC Response on Draft Screening Report (BMC, 2020)
Surface Water Quality	Upper Water Management Pond, Lower Water Management Pond, Pit Rim Pond, Class A and B Storage Facilities Water Collection Ponds will be constructed with a high-density polyethylene liner.	Project Proposal Chapter 8 (BMC, 2017a)
Surface Water Quality	ABM lake treatment with lime and carbon source as it fills (as required).	Project Proposal Chapter 8 (BMC, 2017a)
Surface Water Quality	Constructed wetland treatment system at closure.	Project Proposal Chapter 8 (BMC, 2017a)
Surface Water Quantity and Quality	Fault Creek and other small portions of the upper Geona Creek catchment which would drain to the ABM open pit will be diverted into South Creek to mitigate the volume of water becoming contact water in Geona Creek during the Construction and Operations phases of the Project.	Project Proposal Chapter 8 (BMC, 2017a)
Surface Water Quantity and Quality	Diversions around all other Project infrastructure will drain to the north of the Lower Water Management Pond to reduce the volume of contact water and help maintain natural runoff regimes in the receiving environment.	Project Proposal Chapter 8 (BMC, 2017a)
Groundwater	Class A and B Storage Facilities will be constructed with very low permeability composite liner and cover systems.	Project Proposal Chapter 9 (BMC, 2017a) and BMC Response on Draft Screening Report (BMC, 2020)
Groundwater	Upper and Lower Water Management Ponds, Pit Rim Pond, and Class A and B Facility Water Collection Ponds will be constructed with an impermeable synthetic (high-density polyethylene) liner.	Project Proposal Chapter 9 (BMC, 2017a)
Groundwater	Waste Management Facility will be constructed and operated in accordance with applicable regulations and guidelines (e.g., Land Treatment Facility will be constructed in accordance with the Yukon Contaminated Sites Regulation).	Project Proposal Chapter 9 (BMC, 2017a)
Groundwater	Sewage disposal system will be constructed and operated in accordance with applicable regulations (<i>Waters Act</i> , <i>Waters Regulation</i> and <i>Sewage Disposal Systems Regulation</i>) and guidelines (<i>Design Specifications for Sewage Disposal Systems</i>) which includes considerations for protection of the environment.	Project Proposal Chapter 9 (BMC, 2017a)
Groundwater	Dewatering system will be designed to minimize the required groundwater extraction and associated drawdown of the groundwater table.	Project Proposal Chapter 9 (BMC, 2017a)
Groundwater	Re-divert Fault Creek into Geona Creek watershed and the ABM lake to accelerate the filling of the ABM open pit during Closure.	Project Proposal Chapter 9 (BMC, 2017a)
Groundwater	Safe practices will be applied when handling explosives and during blasting to reduce undetonated explosive residues to a minimum and to minimize impacts to groundwater from ammonia, nitrite, and nitrate.	Project Proposal Chapter 9 (BMC, 2017a)
Groundwater	<p>If acid generating conditions are identified in the underground mine, based on the severity and how widespread they are, various mitigative measures would be investigated and implemented accordingly.</p> <p>Such measures may include cement grouting of bolts, use of chemical or mechanical anchors, use of galvanized steel bolts or mesh instead of ungalvanized, replacement of friction bolts with point anchor or full contact solid steel bolts, use of non-metal ground support materials such as shotcrete or many other common practices.</p>	Response Report #1 (BMC, 2017b)
Aquatic Ecosystems and Resources	<p>The following conceptual management plans (presented in the Project Proposal) outline mitigation measures to minimize potential effects to Aquatic Ecosystems and Resources from Project activities:</p> <ul style="list-style-type: none"> ○ Fish Offsetting Plan (Appendix E-4); ○ Waste Management Plan (Section 18.2); ○ Hazardous Materials Management Plan (Section 18.3); ○ Surface Water Management Plan (Section 18.4); ○ Spill Response Plan (Section 18.5); ○ Sediment and Erosion Control Plan (Section 18.6); 	Project Proposal (BMC, 2017a)

Valued Component	Proposed Mitigation	Source
	<ul style="list-style-type: none"> ○ Waste Rock Management (Section 4.9); and ○ Conceptual Reclamation and Closure Plan (Appendix H-1). <p>The detailed management plans will be submitted to the appropriate licensing agencies and will become conditions of the respective licenses.</p>	
Aquatic Ecosystems and Resources	All mitigation measures described above to mitigate impacts to the Surface Water Quality and Quantity Valued Component will also mitigate impacts to the Aquatic Ecosystems and Resources Valued Component.	Project Proposal Chapter 10 (BMC, 2017a)
Aquatic Ecosystems and Resources	Develop a fish salvage strategy to minimize salvage requirements.	Project Proposal Chapter 10 (BMC, 2017a)
Aquatic Ecosystems and Resources	Adhere to instream construction timing windows (instream construction will be avoided, when practicable, during grayling spawning and incubation period mid-May to late June).	Project Proposal Chapter 10 (BMC, 2017a)
Aquatic Ecosystems and Resources	Geochemical control of construction materials for in-stream works.	Project Proposal Chapter 10 (BMC, 2017a)
Aquatic Ecosystems and Resources	<p>BMC will protect aquatic and riparian habitat by:</p> <ul style="list-style-type: none"> ○ Other than at the site of the ABM open pit and construction of water management infrastructure, keeping machines out of, and avoiding work in 15 m of the ordinary high water mark adjacent to non-fish bearing waterbodies and 30 m adjacent to fish bearing waterbodies, where practicable; ○ Using existing roads where practicable; ○ Establishing lay-down and storage areas at least 15 m from the ordinary high water mark adjacent to non-fish bearing water bodies and 30 m adjacent to fish bearing water bodies, where practicable; ○ Preventing deleterious substances and other debris from entering watercourses; and ○ Screening pump intakes in accordance with the <i>Fisheries Act</i>. 	Project Proposal Chapter 18 (BMC, 2017a)
Aquatic Ecosystems and Resources	<p>Specific mitigation measures BMC will adhere to during any in-water works will include:</p> <ul style="list-style-type: none"> ○ Avoiding in-stream construction in fish-bearing watercourses whenever practicable, and respecting the work timing windows described in Fish Offsetting Plan when avoidance is not practicable; ○ Completing water crossings and in-water works in accordance with approvals and permits; ○ Diverting streams and isolating work activities wherever practicable; ○ Installing water diversion pump intakes in a manner that prevents entrainment of sediments; ○ Installing water diversion discharge points in a manner that prevents erosion of the downstream substrates; and ○ Removing temporary structures and restoring the area when such structures become redundant, wherever possible. 	Project Proposal Chapter 18 (BMC, 2017a)
Aquatic Ecosystems and Resources	<p>BMC will relocate and/or salvage fish in the ABM open pit area before the start of construction activities in accordance with the Fish Offsetting Plan (Appendix E-4 of the Project Proposal). Specific measures will include:</p> <ul style="list-style-type: none"> ○ Excluding fish in advance of works using a temporary fish barrier and/or stop-nets (or similar) well downstream of the construction area; ○ Maintaining fish barriers during in-stream works; ○ Capturing fish using seining or trapping in isolated areas; ○ Electrofishing after seining or trapping; ○ Using alternate approaches, such as capturing fewer mobile populations or life stages, or backpack or boat electrofishing, in areas where exclusion is not expected to be feasible, such as the ponds located over the proposed ABM open pit; and ○ Relocating fish downstream of the Project area. <p>BMC will carry out fish salvage activities in accordance with fish collection permits to be issued by Federal Department of Fisheries and Oceans and the <i>Fisheries Act Authorization</i>. During release of captured fish, BMC will consider habitat suitability and capacity.</p>	Project Proposal Chapter 18 (BMC, 2017a)
Aquatic Ecosystems	<p>BMC will manage aquatic and other invasive species. Specific measures will include:</p> <ul style="list-style-type: none"> ○ Cleaning equipment (at its point of shipment) before transport to site; 	Project Proposal Chapter 18 (BMC, 2017a)

Valued Component	Proposed Mitigation	Source
and Resources	<ul style="list-style-type: none"> ○ Unloading equipment away from watercourses; ○ Environmental staff will inspect all equipment to ensure that it is free of soil and vegetation during unloading; ○ Inspection results will be documented on an equipment inspection form; and ○ Contaminated equipment will either be rejected or cleaned, and any material that may contain invasive species will be properly disposed. 	
Terrain and Soils	<p>Several approaches will be used to mitigate potential effects of the Project on terrain stability. Many of them are related to mine design to help eliminate risks and include approaches such as:</p> <ul style="list-style-type: none"> ○ Remove all unsuitable (from a geotechnical perspective) soils overlying bedrock from Project facilities; ○ Progressive construction of a low permeability liner system below the Class A and B Storage Facilities with collection conveyance systems constructed below the liners; ○ Grading waste storage facilities to collect and convey water away from each facility; ○ Construction of a buttress at Class A Storage Facility for confinement at the downstream slope of the facility; ○ Assessing the volume of material on waste rock storage facilities to not affect stability; ○ Construction of storage facilities with nominal final design slopes of 3H:1V (Class B and Class C Storage Facilities) for long-term physical stability and to allow for recontouring for closure reclamation; ○ Construction of the Class A Storage Facility with a nominal final design slope of 4:1; ○ Planning of progressive reclamation to help ensure slope stability; ○ Reduction of catchment areas by decreasing the lateral extents of each facility along the valley slopes; ○ Containment of Class C waste rock volume in the side-valley northeast of the ABM open pit, confining the pile along the northeast and south slopes; ○ Utilizing the guidelines for the Dump Stability Rating scheme, a semi-quantitative method for assessing the relative potential pile stability and recommending the appropriate level of pile investigation and design; and ○ Cover systems on waste storage facilities such to promote stability and prevent erosion. <p>Construction and operational approaches may also include:</p> <ul style="list-style-type: none"> ○ Identification of temporary run-off and erosion controls for construction (such as run-off collection channels, settlement ponds, and sediment control devices such as silt fences); and ○ Trial sections in the field during the initial stages of development to monitor rock fill pile stability and foundation performance. 	<p>Project Proposal Chapter 11 (BMC, 2017a)</p> <p>Response Report #1 (BMC, 2017b)</p> <p>BMC Response on Draft Screening Report (BMC, 2020)</p>
Terrain and Soils	Procedures in the Sediment and Erosion Control Plan (Section 18.6 of the Project Proposal) will aid in terrain stability.	Project Proposal Chapter 11 (BMC, 2017a)
Terrain and Soils	Mitigation measures listed above for the Air Quality Valued Component will also mitigate the potential for impacts to soil quality.	Project Proposal Chapter 11 (BMC, 2017a)
Terrain and Soils	Reclamation methods that reduce equipment traffic during soil redistribution and placement will be utilized to lessen compaction of soil in stockpiles and reclaimed areas. For example, where practicable, instead of a dozer, a backhoe will be used to distribute topsoil cover in the reclaimed areas. Ripping will be used in areas where surficial soils are excessively compacted.	Project Proposal Chapter 11 (BMC, 2017a)
Terrain and Soils	During salvage operations, mitigation against soil degradation by having multiple topsoil storage areas, will focus on minimizing the number of times the soil is moved, reducing vehicle traffic over the stockpile surface, and avoiding handling soils when they are too dry or too wet.	Project Proposal Chapter 11 (BMC, 2017a)
Terrain and Soils	Reduction of topsoil stockpile erosion will be accomplished by covering topsoil stockpiles with plastic sheeting or tarps, or establishing vegetative cover, to prevent erosion (as per the Sediment and Erosion Control Plan) (Section 18.6 of the Project Proposal).	Project Proposal Chapter 11 (BMC, 2017a)
Terrain and Soils	Minimize land clearing to the areas necessary for Project Footprint.	Project Proposal Chapter 11 (BMC, 2017a)
Terrain and Soils	Risks associated with increased gully erosion of the Class A, B and C Waste Storage Facilities will be mitigated through the inclusion of benches to reduce the length of the overall slope. The benches will be sloped appropriately to minimize down slope flow, while the slopes will be contoured to minimize the potential for erosion. The upper terraces of the facilities will be graded to a slope of 2% to convey water at a reduced velocity and reduce ponding water. Concurrent reclamation and revegetation will minimize the areas susceptible to erosion during operations and the majority of the longer steeper slopes will be revegetated prior to the active closure phase. This design concept is commonly used for reducing the potential for gully erosion and has become accepted practice throughout the mining industry.	Response Report #1 (BMC, 2017b)

Valued Component	Proposed Mitigation	Source
	If gully erosion is observed in areas on the storage facilities it will be remedied by a combination of some or all of: armoring, backfilling, recontouring, and revegetation.	
Terrain and Soils	For the Upper and Lower Water Management Ponds BMC will pre-strip all overburden with permafrost (to bedrock or competent, ice-free material) within the pond and dam footprints, and extend stripping long the pond perimeter/berm, including the immediate upslope area. Ensure the dam foundation is keyed into competent, ice-free material. Monitor and manage (as required) the stripped areas above the pond perimeter/berm for deposition of localized mass movements. Where required, implement spur road construction techniques specifically designed for ice-rich permafrost.	Response Report #3 (BMC, 2017c)
Vegetation Cover and Composition	An alternatives assessment was conducted for tailings and waste rock management. The preferred alternative is for the major storage facilities to avoid permanently flooding the Geona valley (which was the original design by Cominco) in order to reduce the permanent loss of wetland and riparian ecosystems. This change in design has substantially reduced the effects to wetland and riparian ecosystems that would have occurred under the previously approved Cominco design.	Project Proposal Chapter 12 (BMC, 2017a)
Vegetation Cover and Composition	Fish Offsetting Plan includes (in part) the construction of wetland and riparian habitat in the fish habitat offsetting ponds, this will offset impacts to wetlands.	Project Proposal Chapter 12 (BMC, 2017a) and BMC Response on Draft Screening Report (BMC, 2020)
Vegetation Cover and Composition	The alignment for the Access Road upgrade was designed to minimize new disturbance, which also minimizes disturbance of old growth forest.	Project Proposal Chapter 12 (BMC, 2017a)
Vegetation Cover and Composition	A chance find procedure will be implemented with particular attention in likely areas of rare plant occurrence during the construction phase and clearing activities during operations. If equipment operators (or anyone else) encounters a potential rare plant, clearing in that area will stop immediately, the plant and surrounding vegetation will be cordoned off, and the site environmental officers will be notified. The environmental officers will then have the identification confirmed by a qualified person. If the plant is determined not to be rare, then the environmental officers will give approval to continue work in that area. If the plant is confirmed to be rare, the Environmental Manager will contact Yukon Environment and the designated RRDC environmental contact to determine the appropriate mitigation measures to be taken if the area cannot be avoided.	Project Proposal Chapter 12 (BMC, 2017a) Project Proposal Chapter 18 (BMC, 2017a)
Vegetation Cover and Composition	Invasive Species Management Plan, which includes: <ul style="list-style-type: none"> ○ Minimize disturbance of the natural vegetation and exposure of soils around the Project Footprint; ○ Allow disturbed and reclaimed areas to revegetate naturally to the extent practicable to reduce the risk of introducing invasive plant species to the area; ○ Re-use salvaged soil for reclamation to promote successful regeneration of the natural seed bank; ○ Collection and use of local seeds for reclamation; ○ If necessary, procurement of seeds will be done from reputable seed suppliers with quality control programs; ○ Transplant seedling to disturbed ground to encourage quick regeneration of ground cover and reduce likelihood of invasive species colonization; ○ If concerns of an invasive species infestation are immediate, establish a vegetation cover as soon as practicable after ground disturbance using a native grass seed mix; ○ Where practicable, limit vehicle use to existing roads and trails (included in BMC's ATV policy) to limit additional ground disturbance and therefore potential introduction of invasive species; ○ Ensure equipment, vehicles, and personnel clothing are free of invasive plants prior to entering the Project by way of a check station at the Access Road gatehouse. Check station will include information on invasive species, instructions for proper disposal, and a disposal bin; ○ All new equipment/vehicles entering Project area, will need to be weed free prior to site access; ○ Ensure employees are briefed on proper invasive species prevention strategies during induction; and ○ Use of Yukon recommended invasive plant management methods. 	Project Proposal Chapter 12 (BMC, 2017a)
Vegetation Cover and Composition	If preventative measures are unsuccessful at stopping the spread of invasive plants to the Project operations area, BMC will take action to control the spread and removal of the invasive species. BMC commits to using Yukon recommended invasive plant management methods for the control of invasive plants. Non-chemical methods for controlling the spread and removal will include hand pulling and digging out the root system, followed by revegetation. All plants and seeds removed will be placed in bags and incinerated. Following the control effort, the areas will be monitored to assess the efficiency and condition of the site and revegetation success. BMC will continue to carry out follow-up inspections and efforts to minimize invasive plants. Furthermore, BMC will remain responsive, and if one method or attempt is not successful, another will be selected. For example, if	Project Proposal Chapter 18 (BMC, 2017a)

Valued Component	Proposed Mitigation	Source
	<p>hand-pulling and digging are not effective, other methods can be applied, such as controlled burns (in consultation with Yukon Environment), matting or mowing.</p> <p>BMC will engage the Territorial Highways and Public Works Department regarding their maintenance and weed control on the Robert Campbell Highway right-of-way (if required).</p> <p>Control methods used to treat an infestation and the date and location of the control effort will be recorded in the invasive plant log. Tracking the level of success in the application of different control methods used in battling invasive plant infestations will assist in developing an effective control program.</p>	
Vegetation Cover and Composition	Mitigation measures listed above for the Air Quality Valued Component will also mitigate the potential for impacts to vegetation quality.	Project Proposal Chapter 12 (BMC, 2017a)
Wildlife and Wildlife Habitat	<p>The Wildlife Protection Plan is the primary document that BMC will use to implement wildlife and wildlife habitat protection. In addition, the following conceptual management plans (presented in the Project Proposal) outline mitigation measures to further minimize impacts on the Wildlife and Wildlife Habitat Valued Component:</p> <ul style="list-style-type: none"> ○ Waste Management Plan (Section 18.2); ○ Spill Contingency Plan (Section 18.5); ○ Hazardous Materials Management (Section 18.3); ○ Traffic and Access Management Plan (Section 18.12); ○ Noise Management Plan (Section 18.10); and ○ Air Quality Management Plan (Section 18.11). <p>The detailed management plans will be submitted to the appropriate licensing agencies and will become conditions of the respective licenses.</p>	<p>Project Proposal Chapter 13 (BMC, 2017a)</p> <p>A Draft Detailed Wildlife Protection Plan was submitted as Appendix R2-J of Response Report 2 (BMC, 2017c).</p>
Wildlife and Wildlife Habitat	<p>BMC's main policies related to wildlife protections include:</p> <ul style="list-style-type: none"> ○ Environment Policy (Appendix A-4); ○ No Firearms Policy (Appendix A-8); and ○ No Feeding of Animals Policy (Appendix A-9). 	Project Proposal (BMC, 2017a)
Wildlife and Wildlife Habitat	<p>The following are general mitigation measures to reduce or eliminate Project effects on all wildlife species during all Project phases:</p> <ul style="list-style-type: none"> ○ The Project Footprint was designed to cover as little area as practicable to minimize habitat loss and disturbance; ○ Clearing will be kept to a minimum and only include areas needed to safely construct and operate the Project; ○ Adhere to the policy of no feeding, harassment, or hunting of wildlife by employees and contractors; ○ Present a wildlife protection component in employee, contractor, and visitor orientation/induction program to communicate wildlife policies, safety, and protection measures; ○ Avoid construction in and around sensitive areas, such as calving grounds, raptor nesting sites, den sites, or mineral licks during important seasonal periods (where practicable; the only known nearby mineral licks are south of the Project Footprint as noted in the ethnographic summary in Appendix F-3 of the Project Proposal); ○ Sensory disturbances will be minimized where practicable throughout the year; ○ Fugitive dust will be controlled using water sprays or approved dust suppressant (environmentally-benign that do not contain salts that would attract wildlife) to minimize the Project's zone of influence over the surrounding landscape (including passerine habitat); ○ Regularly scheduled blasting; ○ Progressive reclamation; and ○ Reclaim the Project areas at closure to return the area to existing habits (where practicable) (Appendix H-1 of the Project Proposal). 	Project Proposal Chapter 13 (BMC, 2017a)

Valued Component	Proposed Mitigation	Source
Wildlife and Wildlife Habitat	<p>The following are general mitigation measures to reduce or eliminate Project effects on all wildlife species resulting from use of the Access Road during all Project phases:</p> <ul style="list-style-type: none"> ○ Keep snowbanks less than one-metre high and provide wildlife passageways through banks along the Access Road and around site roads; ○ Breaks in snowbanks will be placed every 50 m to 100 m on both sides of the Access Road to enable passage of large mammals; ○ Road embankments will be low profile to prevent the road acting as a barrier to, or channel for, wildlife movement; ○ Enforce vehicle speed limits on employees and contractors and use radios to report wildlife on roads to reduce the incidence of collisions; ○ Travel speeds along the road will be restricted to a maximum of 50 km/h for daytime travel, and reduced during night-time or hazardous weather conditions (as appropriate); ○ Radio controlled Access Road; ○ Minimum traffic levels will be maintained along the Access Road to the extent practical. Convoys of 2 or 3 vehicles will travel together along the Access Road to reduce periods of sensory disturbance, when practicable; ○ Clearing vegetation from right-of-way; ○ Implement protocol for vehicle-ungulate encounters; ○ Signage will be posted in high collision risk areas (e.g., blind or obstructed turns, water and wildlife crossings; current known areas are present in Figure 18-5 of the Project Proposal). Road travel speeds will be reduced to 30 km/h in these areas. The signs will instruct drivers to reduce speed, remain alert, stop for wildlife, and wait for wildlife to move away (Figure-18-6 of the Project Proposal). Wildlife will have the right-of-way along the road; ○ Individual or groups of animals standing on the road will be allowed to move off the road unalarmed; ○ Wildlife incidents (e.g., collisions) will be reported within 24 hours or as soon as practicable, and an investigation will try to identify the cause and remedial actions; ○ A guard at the gatehouse on the Access Road is in place to prevent public and hunter access. The gatehouse will continue to be guarded throughout the Project phases to restrict hunter access to the Project area; ○ Decommission and reclaim Access Road; and ○ All other requirements currently included in the existing Tote Road Licence. 	Project Proposal Chapter 13 (BMC, 2017a)
Wildlife and Wildlife Habitat	Minimize activities in alpine and subalpine during caribou rut period (September 28 to October 31).	Project Proposal Chapter 13 (BMC, 2017a)
Wildlife and Wildlife Habitat	Minimize activities in alpine during the caribou calving period (May 1 to May 31).	Project Proposal Chapter 13 (BMC, 2017a)
Wildlife and Wildlife Habitat	Fencing or provision of egress ramps from high-density polyethylene lined facilities.	Project Proposal Chapter 13 (BMC, 2017a)
Wildlife and Wildlife Habitat	Clearing of the Overburden Stockpile, Class A, B, and C Facilities will be progressive, to minimize total area of disturbance at any given time.	Project Proposal Chapter 18 (BMC, 2017a)
Wildlife and Wildlife Habitat	Class A Storage Facility will be progressively reclaimed, to minimize total area of disturbance at any given time.	Project Proposal Chapter 18 (BMC, 2017a)
Wildlife and Wildlife Habitat	Buttresses will be reclaimed following construction; to minimize total area of disturbance at any given time.	Project Proposal Chapter 18 (BMC, 2017a)
Wildlife and Wildlife Habitat	Equipment laydown areas will be distant from known wildlife trails or wildlife road crossings. The distance will be finalized during final design on a case-by-case basis depending on the specific trail, topography, and borrow material location.	Project Proposal Chapter 18 (BMC, 2017a) Response Report #1 *BMC, 2017b)
Wildlife and Wildlife Habitat	Ancillary facilities including Waste Management Facility, Upper and Lower Water Management Ponds, and all water collection ponds with engineered liners will be surrounded by wildlife proof fences and emergency egress ramps will also be installed. If conditions are warranted, the camp shall be enclosed with wildlife proof fencing. Warranted conditions will be developed in consultation with the Conservation Officer and include site-specific bear activity.	Project Proposal Chapter 18 (BMC, 2017a) and BMC Response to Draft Screening Report (BMC, 2020)

Valued Component	Proposed Mitigation	Source
Wildlife and Wildlife Habitat	Construction of new roads will be minimized (e.g., Tote Road will be upgraded to Access Road largely in the existing alignment).	Project Proposal Chapter 18 (BMC, 2017a)
Wildlife and Wildlife Habitat	Leave haul road in pit to provide egress from ABM lake.	Project Proposal Chapter 13 (BMC, 2017a)
Wildlife and Wildlife Habitat	Follow designated flight and landing route for flights to Finlayson Lake airstrip during winter that stay 1.5 km away from animals and maximize height above ground if practicable at landing and takeoff.	Project Proposal Chapter 13 (BMC, 2017a)
Wildlife and Wildlife Habitat	Install permanent wildlife barrier around ABM lake.	Project Proposal Chapter 13 (BMC, 2017a)
Wildlife and Wildlife Habitat	<p>The following are general mitigation measures for waste management for the Project to reduce human-bear conflicts (Waste Management Plan is presented in Section 18.2 of the Project Proposal):</p> <ul style="list-style-type: none"> ○ BMC will provide bear awareness training to all employees and contractors; ○ Site personnel will not attempt to handle nuisance or problem wildlife without specific direction from the Conservation Officer (district office in Faro 867-994-2862 or Watson Lake 867-536-3210); ○ Wildlife interactions (e.g., traffic accidents) and nuisance or problem animals will be reported to the Environmental Manager immediately. Observations of wildlife behaving abnormally will be reported in 24 hours; ○ The harassment of wildlife is prohibited under the <i>Yukon Wildlife Act</i>. Attempts to chase, catch, divert, follow, or otherwise harass wildlife by on-road or off-road vehicles, boats, aircraft, or on foot will not be permitted at any time; ○ Personal wildlife deterrents (e.g., air horns, bear spray, bear bangers) will be issued and carried by all field personnel, as well as functioning radios. Training on wildlife deterrents will be completed prior to issuance and use. Workers will follow scheduled check-in times; ○ BMC will be responsible for the regular collection and disposal of all waste material generated during the course of the Project; ○ BMC will establish regular clean-up and disposal programs to prevent the unnecessary accumulation of wastes; ○ Procedures will be adopted to promptly collect and remove any accumulated debris; ○ BMC will ensure these wastes are stored in suitable containers until such time as they are removed from Project or incinerated; ○ All waste removed from Project will be disposed of at an approved disposal facility, in compliance with applicable legislation and regulations; ○ All food waste and domestic garbage from all Project areas will be collected and placed in an appropriate receptacle daily, and will be disposed of in an appropriate and safe manner; ○ All food wastes will be stored and disposed of in a manner that does not attract nuisance animals, and will be incinerated daily; and ○ The waste management facility will be surrounded by a wildlife barrier. 	<p>Project Proposal Chapter 13 (BMC, 2017a)</p> <p>Project Proposal Chapter 18 (BMC, 2017a)</p>
Wildlife and Wildlife Habitat	At closure, the ABM lake will be batch treated to maintain water quality within acceptable guidelines for wildlife protection.	Project Proposal Chapter 13 (BMC, 2017a)
Wildlife and Wildlife Habitat	Prevent creation of new nest sites (i.e. during the nesting season inspect for old nests including (including but not limited to) inspection of tall inactive equipment (i.e. crane booms) and building ledges under eaves.	Project Proposal Chapter 13 (BMC, 2017a)
Wildlife and Wildlife Habitat	<p>As much as possible, land clearing will occur outside the nesting season. If land clearing is to be conducted during the nesting season, breeding bird surveys will be conducted prior to clearing and active nests will be buffered. This is required to ensure compliance with the <i>Migratory Birds Convention Act 1994</i>, which prohibits the disturbance or destruction of migratory bird nests and eggs in Canada.</p> <p>The following items will be applied while conducted breeding bird surveys:</p> <ul style="list-style-type: none"> ○ Surveys will be led by qualified and experienced individuals (including involvement from Kaska representatives identified by RRDC); ○ Survey results will be communicated to the on-site construction manager and clearing contractors, including any nests found and ensuing buffer zones; ○ Any nest found will be protected with a buffer zone. Buffer zones vary depending on the species and the type of disturbance and will be determined by the expert contracted for 	Project Proposal Chapter 13 (BMC, 2017a)

Valued Component	Proposed Mitigation	Source
	<p>clearing. Buffer zones are species dependent and are presented in the Wildlife Protection Plan. The buffers can be removed after the young have permanently left the nest;</p> <ul style="list-style-type: none"> ○ If no nests are found, clearing activities will be completed within a 3-day window of survey conclusion; and ○ A summary of results and proposed mitigation are to be provided to RRDC for their input and feedback. 	
Wildlife and Wildlife Habitat	The Yukon standard for the no disturbance buffer for cliff-nesting raptors is 300 m. In Yukon, cliff-nesting raptors occupy nests around the 15th of March to the 31st of April. If helicopter flights are necessary near cliff-nesting raptor nests between this period, BMC will avoid repeat aerial disturbance, where practicable. Routine flights during this period will be as far away as are safe and practical. In addition, approach to nests would be along a tangential visible path to avoid approaching cliff nests from behind.	Response Report #1 (BMC, 2017b)
Wildlife and Wildlife Habitat	The diversion of Fault Creek during construction and at closure will be scheduled to minimize fluctuations during nesting periods as much as practicable (ideally during the late fall or through the winter).	Response Report #3A (BMC, 2018a)
Wildlife and Wildlife Habitat	The transportation route goes through the range of the Little Rancheria and Horseranch caribou herds in southeast Yukon and northern BC near Watson Lake, Alaska Highway, and the north end of the Stewart-Cassiar Highway. Mitigation measures are already in place in high collision areas and include cautionary signage at high incidence areas along the road that ask motorists to slow down and stay alert during key seasons of caribou use. Training of transport contractors by BMC will include information and procedures to alert drivers to the higher potential for caribou and to maintain slower speeds in winter in these key areas. Driver training and information specific to the Little Rancheria and Horseranch Caribou Herds is included in the Wildlife Protection Plan.	Response Report #2 (BMC, 2017c)
Heritage Resources	Implementation of the Heritage Resource Management Plan (Appendix F-2 of the Project Proposal) and then site by site management Plan.	Project Proposal Chapter 14 (BMC, 2017a)

Table 6-2: Summary of Proposed Mitigations and Enhancement Measures for Socio-economic Valued Components

Valued Component	Proposed Mitigation and Enhancement Measures	Source
Economy and Sustainable Livelihood (Traditional Economic Activities – hunting, fishing, trapping, food gathering)	<p>BMC will implement several mitigation measures to reduce any adverse effects of the Project on traditional economic activities, including:</p> <ul style="list-style-type: none"> ○ All firearms are prohibited unless otherwise authorized by BMC management (Appendix A-8 of the Project Proposal); ○ All hunting of wildlife or recreational shooting by employees, contractors and visitors is strictly prohibited, as outlined in the No Firearms Policy (Appendix A-8); this policy will be communicated to all employees and contractors during the site orientation; ○ Recreational use of all-terrain vehicles (ATVs) and snowmobiles are prohibited (Appendix A-11 of the Project Proposal); ○ Access and use of the Tote Road has been strictly controlled since the 1990s and there will be ongoing access control to the mine site, as per the requirements of the Tote Road Licence. Use of the Access Road during Project operations to access recreational areas for ATV and snowmobile use will be strictly prohibited; ○ Implementation of the Traffic and Access Management Plan (see Section 18.12 of the Project Proposal) will mitigate the adverse effect of increased traffic on area wildlife; ○ As part of the Socio-economic Participation Agreement, BMC has agreed to pay a land use interruption supplement to mitigate the effects of the Project on the RRDC citizens who hold trapping rights under the registered group trapline, and operated trap lines within the Project area; and ○ Two x four-week periods of annual vacation/time off plus regular time off on rotation. 	Project Proposal Chapter 15 (BMC, 2017a)
Economy and Sustainable Livelihood (Economic Growth)	<p>The point of hire for the Project will be Yukon (i.e., Whitehorse, Ross River, Faro and Watson Lake). This will help ensure that the Project's residual effects on economic growth are beneficial. In order to achieve the requirements of the Community Relations Policy (Appendix A-2) and further support local participation, BMC will:</p> <ul style="list-style-type: none"> ○ Encourage the participation of local communities, local Indigenous Peoples and associated businesses in its projects wherever practicable; and ○ Develop and implement community relations management procedures and strategies that includes business alliances, employment and training initiatives on safety in the workplace and practical operating skills. 	Project Proposal Chapter 15 (BMC, 2017a)
Economy and Sustainable Livelihood (Diverse and Stable Economy)	BMC's plans for continued exploration on the KZK property and nearby properties to delineate further ore reserves and extend the mine life.	Project Proposal Chapter 15 (BMC, 2017a)
Economy and Sustainable Livelihood (Diverse and Stable Economy)	BMC will continue to communicate openly with Yukon Big Game Outfitters and provide regular updates on our proposed plans for development at KZK.	Response Report #1 (BMC, 2017b)
Economy and Sustainable Livelihood (Employment)	<p>The point of hire for the Project will be Yukon.</p> <p>BMC will continue to honour the terms of the Socio-economic Participation Agreement by working with the Kaska to fill openings at the Project (for both BMC and its contractors) for qualified persons, and to the extent permitted by law, give preference to qualified job applicants in the following priority:</p> <ul style="list-style-type: none"> ○ Ross River Dena Council citizens; ○ Other Kaska citizens; ○ Other Yukon First Nation citizens; ○ Other Yukon residents; and ○ Others. 	Project Proposal Chapter 15 (BMC, 2017a)
Economy and Sustainable Livelihood (Employment)	<p>In the event of an unplanned closure, BMC will give as much advance notice as practicable so that employees will know well in advance that the closure will be taking place and can start looking for new employment. The period from a decision to close to cessation of activity to only Care & Maintenance would be no less than 6 months and could be as high as 18 months under some circumstances.</p> <p>During operations of the Project, BMC will implement a health and well-being program for all mine employees. This program in part will include training programs (e.g., trades, apprenticeships, management) to promote progression in employee careers but also to promote transferable skills to enable employees to be more employable, which will facilitate any transitions from working on the Project to another mine or even a different industry. Also, as part of the health and well-being program, all BMC employees will have the opportunity to take financial management training, which will teach employees about the importance of saving as well as debt avoidance.</p> <p>In addition, if an unplanned closure is required, BMC will help all employees prepare resumes, practise interviews and facilitate in the job search, with the intent that employees would transition quickly to new employment.</p>	Project Proposal Chapter 17 (BMC, 2017a)
Economy and Sustainable Livelihood (Employment)	In the case of a temporary or unplanned closure, the Employee Assistance Program will still be in place and will be funded by the company (and in certain circumstances by the company's insurer). This program will provide emotional and mental health support for those that are in need of it. This program will be supplemented by the provision of externally managed outplacement services for all personnel employed by the company at the Project. Typically, these programs run from between 3 to 12 months from the cessation of employment (but can run longer if required) and are designed to help employees to either obtain other employment in the same field or to prepare for and subsequently obtain employment if a different field if that is their wish.	Response Report #2 (BMC, 2017c)
Economy and Sustainable	During the last one to two years of the operational phase of the Project, mining activity will reduce steadily.	Response Report #3A (BMC, 2018a)

Valued Component	Proposed Mitigation and Enhancement Measures	Source
Livelihood (Employment)	<p>At some point during the Active Closure period the company will offer voluntary redundancy packages to general employees. Employees with critical skills that are required for the Active, Transitional and Passive closure periods will not be offered termination packages. In this way the company expects to reduce employees on site to those number required for the next stage of closure (i.e. Transitional or Passive).</p> <p>The company will consider the unique circumstances of every employee and will give retention preference to locally based employees. This will not preclude locally based employees from requesting a termination package if they wish to take advantage of another employment opportunity elsewhere.</p> <p>Redundancy packages typically include the following elements:</p> <ul style="list-style-type: none"> ○ Relocation/transfers into other roles within the company (for example into exploration or environmental monitoring roles); ○ Retention bonus so that employees finish their employment at a time that suits the company's operational needs; ○ Retraining allowances to help the employees upskill to fit their future desired roles; ○ Employment outsourcing support, where the company pays for third party support for new employment roles. The degree of this support will vary depending upon the level of employment activity that is prevalent in the Yukon and Canada at the time but typically these packages are provided for 3-12 months. Outsourcing support typically includes assistance with preparing resumes, letters of application, career counselling and advice, sourcing of opportunities and coaching for interviews. It can be as comprehensive as the employee needs; ○ References will be provided for all employees; and ○ Termination redundancy payments will vary depending upon circumstances but typically these payments will vary from 1-6 months of the average annual wage of the employee. 	
Economy and Sustainable Livelihood (Employability – Education, Training and Experience)	<p>The Project's employability enhancement measures include:</p> <ul style="list-style-type: none"> ○ BMC's Kaska Education Scholarship Program (initiated in 2016); ○ BMC's Mentor Program; ○ General workplace training for employees; ○ Trades apprenticeships; and ○ Summer employment for Kaska students. 	Project Proposal Chapter 15 (BMC, 2017a)
Economy and Sustainable Livelihood (Broad Participation in Economic Development)	<p>BMC will continue to apply its Kaska hiring preference and will continue to honour its Socio-economic Participation Agreement commitments to Kaska business.</p> <p>BMC will rigorously apply its Employment and Anti-Discrimination Policy (Appendix A-3 of the Project Proposal).</p>	Project Proposal Chapter 15 (BMC, 2017a)
Economy and Sustainable Livelihood (Business Opportunities)	<p>As part of the Socio-economic Participation Agreement, Kaska companies will be offered the right to submit a first proposal on the following contracts for goods and services:</p> <ul style="list-style-type: none"> ○ Winter road construction; ○ Site clearing for the permanent access road; ○ Access road security; ○ Miscellaneous "civil" work (e.g., backhoe, cat hauling); ○ Camp catering; ○ Reclamation work such as re-seeding; ○ Janitorial services; ○ Laundry and linen services; ○ Line-cutting; ○ Concentrate haulage; ○ Expediting; and ○ Mine site fuel supply. <p>The list is not to be considered exhaustive. In addition, the Socio-economic Participation Agreement statement includes the provision that BMC shall ensure that all its sub-contract tender documents contain a "local benefits" component and that BMC shall give the local benefits component meaningful consideration when evaluating tender bids. This will benefit both Kaska and non-Kaska businesses.</p> <p>All of BMC's contractors will also be required to honour the letter and the spirit of the Socio-economic Participation Agreement.</p>	Project Proposal Chapter 15 (BMC, 2017a)
Human Health and Well-being (Individual Health)	<p>To help employees and their families maintain good health, BMC will negotiate on behalf of all employees for favourable arrangements with suppliers of life and property insurance to significantly reduce the costs of these products and offer a dental and health plan for employees.</p> <p>BMC will also support the provision of information regarding health and wellness education programs and will initiate an Employee Assistance Program to ensure that access to counselling services will be made available to all employees and employee families as required.</p>	Project Proposal Chapter 15 (BMC, 2017a)
Human Health and Well-being (Family Stress)	<p>BMC will mitigate possible family stress of its employees through:</p> <ul style="list-style-type: none"> ○ Extensive screening of employees before hire to gauge their suitability for shift work and to help educate them on its potential effects; 	

Valued Component	Proposed Mitigation and Enhancement Measures	Source
	<ul style="list-style-type: none"> ○ Point of hire being in Yukon reduces travel time of employees to get back to their families; ○ Provide assistance and education through its Employee Assistance Program to all employees and their families as required including: <ul style="list-style-type: none"> ○ Financial management training; ○ Drug and alcohol counselling (including time off for employees who need treatment); ○ Marriage counselling; and ○ Healthy living education (i.e., benefits of diet and exercise); ○ BMC will host annual family days at the mine site to show spouses and children of the employees the mine and associated facilities (BMC's experience is that families are more comfortable with their spouses being away if they have seen the site and facilities firsthand); ○ Communications at the site will be via microwave (to maximize bandwidth) and individual connections in each room to ensure that employees can easily communicate via Skype/Facetime etc. with their spouses and children in the privacy of their room rather than in a communal area; ○ BMC will provide recreational facilities at the site and all meal times will have healthy food options, to promote health and well-being of employees while on-shift (with the intent that this would also extend to off-shift healthy living); ○ Training of employees (e.g., trades, apprenticeships, management) to promote progression in their careers (which may enhance job satisfaction); ○ Bereavement leave will be available to all employees; and ○ The 2 week in and 1 week out shift rotations, when combined with the four weeks of annual holiday available after the first year of employment, will allow employees to take one month off twice per year. 	
Human Health and Well-being (Family Stress)	If BMC becomes aware that lack of available day care becomes a disincentive to employment at Kudz Ze Kayah, it will engage with community and First Nation input to develop appropriate solutions. However, it should not be assumed that single parent families without strong family support will see the proposed mine as an employer of choice. BMC expects that many parents in such circumstances may not wish to work away from their family at all.	Response Report #2 (BMC, 2017c)
Human Health and Well-being (Reducing Alcohol and Drug Abuse)	<p>The camp will be dry through all phases of the Project; no alcohol or recreational drugs will be permitted.</p> <p>BMC will follow the industry standard and institute mandatory drug and alcohol testing for potential new employees and random testing thereafter (see BMC's Fitness for Work Policy in Appendix A-5 of the Project Proposal);</p> <p>BMC will also support the provision of information regarding health and wellness education programs and access to counselling services will be made available to all employees and employee families through its Employee Assistance Program, as required.</p>	Project Proposal Chapter 15 (BMC, 2017a)
Human Health and Well-being	BMC will also support the provision of information regarding health and wellness education programs, and access to counselling services will be made available to all employees and their families through its independent Employee Assistance Program. The presence of an Employee Assistance Program service provider operating in the local communities offers other community members access to these services. Employee Assistance Program support is offered on a confidential basis and is subject to normal patient – doctor privilege. However, the company will be advised monthly on a nonspecific basis, as to the quantity, general nature and cost of the support that has been provided by the Employee Assistance Program to our employees and contractors. Experience on other mining projects has shown that significant changes in the level of demand and the type of demand for support services is a useful indicator as to the effectiveness or otherwise of company policies and management tools. If required these tools can then be modified to provide better support for employees and thereby better outcomes.	Response Report #1 (BMC, 2017b)
Human Health and Well-being	The company currently has in place a Mentor program for First Nation personnel employed at the Kudz Ze Kayah project. The initial purpose of this program was to support potential First Nations employees to become 'job ready' and to support them in successfully applying for, preparing for and maintaining employment on the project site. However, this program will be expanded to become a more general support program for all site personnel. While it is not specifically discussed in the Project Proposal, this program will act as a useful personnel management feedback loop for the company since the Mentor is often the first point of contact for local personnel experiencing difficulties at work or at home. Where "at risk" circumstances are identified the opportunity for corrective actions by the Company exists and can be acted upon such as engaging with the Employee Assistance Program. The mentor also has the capacity to propose to the Senior Site executive mitigation measures based on his or her special knowledge of the matter at issue, the person and the immediate family/social situation.	Response Report #1 (BMC, 2017b)
Human Health and Well-being	<p>The company will provide general training to site supervisors and managers that will enable them to be better prepared to recognize the signs and symptoms of employees that may be either at risk of, or be suffering from, substance abuse either directly or indirectly. Once identified, support mechanisms can be initiated.</p> <p>BMC has stated that its intended employment point will be local communities within the Yukon including Ross River, Faro, Watson Lake and Whitehorse. The company will seek to avoid wherever practicable, employment of personnel outside the Yukon on long fly-in fly out commutes. The practical effect of this will be that company supervisors and managers will be embedded into the local community and will therefore be more aware of local issues and social stresses that may lead to unintended social outcomes either for the community or for individual family groups within the community. Our experience is that social networking will provide a level of information flow that might not be available in workplaces that operate in a predominantly longer distance fly-in-fly out structure.</p>	Response Report #1 (BMC, 2017b)

Valued Component	Proposed Mitigation and Enhancement Measures	Source
	BMC has a strong relationship with Ross River Dena Council and is seeking to establish similarly strong relationships with local governments of Watson Lake, Liard First Nation, Faro and Whitehorse. These relationships will be supported by regular meetings between company representatives and government bodies. It is anticipated that unintended social and community issues including drug and alcohol abuse will be a routine topic in those discussions and will be a valuable source of feedback information for the company.	
Human Health and Well-being (Gathering Traditional Medicine)	Due to the Tote Road licence requirements and BMC's commitment to public health and safety the operating area of the Project will continue to not be available for collection of traditional medicines however the Company will work with local elders to find a way to allow collection in other areas where safety will not be compromised. As part of the progressive reclamation and final reclamation planning, BMC has committed to working with RRDC in identifying the species that will be used for the reclamation purposes and developing a seed collection program and seed bank in Ross River. Therefore, the potential effects on traditional medicines will be in part mitigated through this program.	Project Proposal Chapter 15 (BMC, 2017a)
Human Health and Well-being (Public Health and Safety – Increase Traffic, Hazardous Material Transport, Waste Disposal)	<p>The impacts of the increased truck transportation due to concentrate haulage will be mitigated in part through the Traffic and Access Management Plan (Section 18.12 of the Project Proposal). This plan includes BMC's commitment to contracting a qualified trucking firm that will:</p> <ul style="list-style-type: none"> ○ Use only experienced, professional drivers; ○ Equip all trucks with two-way radio communications; and ○ Implement design, safety and operating procedures proven by similar trucking systems utilized in Yukon and Canada. <p>Risks from hazardous materials and from spills will be mitigated through the application of the Hazardous Materials Management Plan (Section 18.3 of the Project Proposal) and Spill Contingency Plan (Section 18.5 of the Project Proposal).</p> <p>To ensure public health is protected, BMC will follow all relevant regulations concerning potable water, food safety, and the disposal of sewage and garbage under the oversight of the Environmental Health Services Branch of Yukon Government.</p>	Project Proposal Chapter 15 (BMC, 2017a)
Human Health and Well-being (Public Health and Safety – Increase Traffic, Hazardous Material Transport, Waste Disposal)	<p>Any school bus zones that occur along the truck route will be identified as part of driver orientation and training program prior to the first trip of any new drivers.</p> <p>New driver orientation sessions will also include briefings on known high incidence areas of wildlife crossings along the route, which will be updated with new sightings as they occur as part of the Wildlife Management Plan.</p>	Response Report #1 (BMC, 2017b)
Human Health and Well-being (Public Health and Safety – Increase Traffic, Hazardous Material Transport, Waste Disposal)	Additional mitigation measures for public health and safety due to increased traffic on the Robert Campbell highway are presented below for the Valued Component "Infrastructure and Services (Transportation Infrastructure – Roads and Airports).	
Human Health and Well-being (Workplace Health and Safety)	<p>The company will rigorously follow all applicable safety laws and regulations in all aspects of its operations.</p> <p>All employees will receive the safety training they require to do their jobs properly and safely. A rigorously enforced dry camp will also improve workplace safety.</p> <p>There will be a fully trained nurse and Emergency Medical Technician/Paramedic on site at all times along with all required medical supplies and equipment. Included in that equipment will be a properly equipped vehicle dedicated for medical evacuations, if necessary. In addition, helicopter medevacs will be available when needed.</p> <p>Underground mining can pose its own unique workplace safety risks. The planned approach to the underground portions of the Project is to have a specialized underground mining contractor do the work. BMC may alternatively choose to employ suitably qualified and experienced personnel to manage and undertake underground mining operations BMC will ensure that the contractor and/or personnel rigorously follows all applicable safety laws and regulations for the underground operations.</p> <p>Implementation of BMC's Occupational Health and Safety Policy (Appendix A-6) and Safety, Health, and Emergency Response Plan (conceptual level detail of the plan provided in Section 18.15 of the Project Proposal).</p>	<p>Project Proposal Chapter 15 (BMC, 2017a)</p> <p>Response Report #3A (BMC, 2018a)</p>
Human Health and Well-being (Workplace Health and Safety)	During operations ABM open pit blasting will occur approximately 4 times a week or on average once every 2 days. The blasts will occur at shift change at the end of Day Shift prior to Night Shift starting work, nominally this will be between 4 and 6 pm. Due to the proposed blasting schedule being at shift change there will be no adverse sleep related effects for employees. Day Shift employees will be coming off shift while Night Shift employees will be preparing to go on shift and there will be no personnel attempting to sleep at the time of the blasts.	Response Report #3 (BMC, 2018)
Human Health and Well-being (Workplace Health and Safety)	The drinking water filtration and disinfection (i.e., Ultraviolet units) equipment is and will continue to be National Sanitation Foundation/American National Standards Institute certified and is/will be tested monthly and serviced according to manufacturer's guidelines. Note this system includes a solenoid shutoff valve that is triggered by malfunction of the ultraviolet sterilizer unit.	Response Report #3 (BMC, 2018a)
Community Vitality	BMC will continue to provide local communities (Ross River, Watson Lake and Faro) with employment and business opportunities, especially through its Socio-economic Participation	Project Proposal Chapter 15 (BMC, 2017a)

Valued Component	Proposed Mitigation and Enhancement Measures	Source
(Healthy Local Business Sector)	Agreement with the Kaska.	
Community Vitality (Traditional Land Use)	Air Quality - All of the mitigation measures described in Section 6.4.2 (Mitigation Measures) and Section 18.11 (Conceptual Air Quality Management Plan) of the Project Proposal are aimed at minimizing the potential air quality effects that could subsequently effect water, soil, vegetation, wildlife and people (i.e. people on the land conducting traditional land use activities outside of the Project footprint). These mitigation measures are presented in this Response Report in Table 6-1 for the air quality Valued Component.	Response Report #4A (BMC, 2018b)
Community Vitality (Traditional Land Use)	Noise Levels - All of the mitigation measures described in Section 7.4.2 (Mitigation Measures) and Section 18.10 (Conceptual Noise Management Plan) of the Project Proposal are aimed at minimizing the potential effects from increased noise to wildlife and people (i.e. people on the land conducting traditional land use activities outside of the Project footprint). These mitigation measures are presented in this Response Report in Table 6-1 for the noise Valued Component.	Response Report #4A (BMC, 2018b)
Community Vitality (Traditional Land Use)	Surface Water – All of the mitigation measures presented in Table 6-1 for the surface water valued component will minimize effects from changes in water quality and quantity in traditional land users.	Response Report #4A (BMC, 2018b)
Community Vitality (Traditional Land Use)	Groundwater - All the mitigation measures presented in Table 6-1 for the groundwater valued component will minimize effects from changes in groundwater in traditional land users.	Response Report #4A (BMC, 2018b)
Community Vitality (Traditional Land Use)	Aquatic Ecosystems and Resources: <ul style="list-style-type: none"> ○ Fish Offsetting Plan will facilitate the removal of the fisheries passage barrier at the Robert Campbell Highway. This will result in Finlayson Creek being able to be used again for fishing as the fish will move back into the creek. ○ Mitigations to ensure traditional fishing activities are not impacted due to Project activities include not constructing any of the Project facilities outside of the Geona Creek Valley (i.e. the Project will not affect the ability of RRDC/Liard First Nation (LFN) Kaska to fish in North Lakes, lower Finlayson Creek and other traditional land use waterbodies in the region). Additional mitigation measures to protect the aquatic ecosystems to the south is the pit crest height design of the ABM open pit, which will ensure all groundwater and surface water from the pit will flow north (i.e. no long term impacts to the South Lakes watershed). ○ Fish tissue monitoring results will be communicated to RRDC and LFN citizens (likely by the RRDC/LFN Kaska citizen or consultant who participates in or leads the monitoring program). will to help ensure that the community is re-assured that the mitigation measures are in fact protecting fish health and that the fish can safely be consumed by the traditional land users. 	Response Report #4A (BMC, 2018b)
Community Vitality (Traditional Land Use)	Terrain and Soils - BMC has established No Recreational Use of ATVs and Snowmobiles Policy. This policy will (in part) ensure that terrain in the region of the Project (which is used for traditional activities) is not impacted by BMC employees or contractors. This policy is included in Section 1.2.2 of the Project Proposal.	Response Report #4A (BMC, 2018b)
Community Vitality (Traditional Land Use)	Vegetation Cover and Composition - BMC has established a No Recreational Use of ATVs and Snowmobiles Policy. This policy will (in part) ensure that vegetation in the regional area of the Project (used for traditional berry and medicinal collection purposes) is not impacted by BMC employees or contractors. This policy is included in Section 1.2.2 of the Project Proposal.	Response Report #4A (BMC, 2018b)
Community Vitality (Traditional Land Use)	Vegetation Cover and Composition - Through BMC’s cross-cultural awareness training program provided to BMC by two RRDC Elders (one of which is one of the traditional land stewards for the Project area) and several of the site tours with the Elders, BMC has learned a lot about the culturally important plants at KZK. Re-establishment of these plants during progressive and final reclamation will be critical to the success of the proposed Reclamation and Closure Plan (details are presented in Appendix H-1 of the Project Proposal), with the ultimate goal of “Return the mine site and affected areas to viable and, wherever practicable, self sustaining ecosystems that are compatible with a healthy environment and with traditional land use activities”. In 2017 BMC’s Kaska Environmental Scientists (LFN and RRDC) initiated a revegetation research program which (in part) is evaluating which culturally important species are amenable for use in reclamation. This research is ongoing and in 2018 Elders from LFN and RRDC were on site to help with this research. BMC has committed to ongoing collaboration with both RRDC and LFN in continuing this research program in order to ensure that the land used for traditional hunting, trapping, and gathering which will be temporarily lost during mine operations will be restored through revegetation and reclaiming wildlife habitat at closure.	Response Report #4A (BMC, 2018b)
Community Vitality (Traditional Land Use)	Vegetation Cover and Composition - Invasive species are known to spread extensively, rapidly and can outcompete indigenous species resulting in decreased biodiversity. This in turn can have impacts on the abundance of culturally important plants used for food and medicines. In order to ensure invasive species don’t cause such adverse effects, BMC has implemented an invasive species management program for exploration, and this will continue throughout all the proposed Project Phases. Details of this plan are presented in Section 18.8.1 of the Project Proposal (Invasive Plant Management Plan).	Response Report #4A (BMC, 2018b)
Community Vitality (Traditional Land Use)	Vegetation Cover and Composition - BMC has proposed a rare plant chance find procedure (Section 18.8.2 of the Project Proposal). If one of the plants listed in the procedure are confirmed to be at site, the protocol will be to contact Yukon Environment and the designated RRDC/LFN Kaska environmental contact to determine the appropriate mitigation measures to be taken if the area cannot be avoided. In this way RRDC/LFN Kaska can make the determination if the rare plant is considered culturally important and can help determine the best course of action.	Response Report #4A (BMC, 2018b)
Community Vitality (Traditional Land Use)	Vegetation Cover and Composition - The RRDC Elders have had concerns that the vegetation that is planted or re-established on the Class A Facility will accumulate metals from the tailings below the cover and subsequently the vegetation would not be safe to use for food or medicines. BMC has	Response Report #4A (BMC, 2018b)

Valued Component	Proposed Mitigation and Enhancement Measures	Source
Land Use)	designed the covers (high-density polyethylene liner, 3 meters of clean waste rock, overburden and organic soil) to ensure that there is no possibility for the roots of any of the plants on the Class A Facility to encounter the tailings. The Class B facility has been designed the same. Therefore, in post closure the traditional use activities (i.e. berry picking, traditional medicine gathering, and hunting can safely resume). BMC has committed to monitoring the vegetation in collaboration with RRDC/LFN Kaska. Preliminary berry trigger levels are presented in response to YESAB's information request R3-27 (BMC, 2018a). Collaboration by both parties in monitoring, reporting and communicating will to help ensure that the community is re-assured that the design measures are in fact protecting vegetation and that is can safely be consumed by the traditional land users. This strategy is aimed at promoting traditional land use activities in post closure.	
Community Vitality (Traditional Land Use)	Wildlife and Wildlife Habitat - BMC has established Environmental, No Hunting / No Fishing, No Firearms, No Recreational Use of ATVs and Snowmobiles, and No Feeding of Animals policies. These policies will (in part) ensure that traditionally harvested wildlife in the Project area are not impacted by BMC employees or contractors. These policies are included in Section 1.2.2 of the Project Proposal.	Response Report #4A (BMC, 2018b)
Community Vitality (Traditional Land Use)	Wildlife and Wildlife Habitat - In order to minimize the effects on wildlife and wildlife habitat, BMC has minimized the Project footprint so that all Project infrastructure is confined to one watershed. By minimizing the impact to the habitat, the effects on the land users who use the land base for hunting the wildlife are also reduced.	Response Report #4A (BMC, 2018b)
Community Vitality (Traditional Land Use)	Wildlife and Wildlife Habitat - During one of the RRDC Elders Oversight Committee Meetings, one of the Elders indicated that wildlife (moose and caribou) could be at risk of falling in the ABM open pit at closure, based on this knowledge BMC committed to constructing a bund around the highwall edges of the open pit to prevent inadvertent access by wildlife and people (Section 7.2.1 Appendix H-1 of the Project Proposal). In more recent discussions with RRDC Elders it was determined that a second bund would reduce this risk even further. Subsequently, BMC has committed to construct a second bund to ensure protection of wildlife and people (i.e. traditional land users).	Response Report #4A (BMC, 2018b)
Community Vitality (Traditional Land Use)	Wildlife and Wildlife Habitat - Potential impacts to the Finlayson Caribou Herd during their annual migration route to their winter range has been raised as one of the main concerns of the RRDC Elders Oversight Committee. The primary risk is the potential for vehicle collisions along the Access Road when the animals are migrating. Mitigation measures to reduce this potential effect are: <ul style="list-style-type: none"> ○ Wildlife will have the right-of-way along the entire Access Road; ○ If caribou are encountered on the road, the equipment and/or activity is to be halted until the wildlife has left the immediate area; ○ Radio communication among road users will be required to communicate information such as sightings of caribou; ○ The road will be plowed so that snowbanks are less than 1 m in height; ○ All wildlife observations on access road will be reported; ○ Breaks in snowbanks will be placed on both sides of the road to enable passage of large mammals; and ○ Gravel and/or sand will be used on compacted snow or ice to improve road safety. Salt will not be used as it is a wildlife attractant. Additional mitigation measures to reduce the potential effects on this important traditionally harvested species is included in the Wildlife Protection Plan (Appendix R2-J of Response Report #2) (BMC, 2017c).	Response Report #4A (BMC, 2018b)
Community Vitality (Traditional Land Use)	Wildlife and Wildlife Habitat - It is understood that game birds are an important food source for the RRDC traditional land users. During construction BMC will avoid clearing during the breeding bird window (May 1st to August 15th), where practicable. This avoidance measure will ensure the populations of game birds used for traditional purposes are not impacted from Project activities. If construction during the breeding bird window cannot practicably be avoided, BMC has proposed nest surveys to be completed prior to clearing and if nests are identified (by the qualified and experienced person in collaboration with an RRDC/LFN Kaska representative) an avoidance buffer will be placed around the nest (buffer area will depend on the species) and no clearing will take place until the young have permanently left the nest. A summary of the survey results and proposed mitigation are to be provided to RRDC/LFN Kaska for their input and feedback. This mitigation measure will ensure the populations of game birds used for traditional purposes are not impacted from Project activities. More detailed information is presented in Section 13.4.2 of the Project Proposal and in the Wildlife Protection Plan (Appendix R2-J of Response Report #2) (BMC, 2017c).	Response Report #4A (BMC, 2018b)
Community Vitality (Traditional Land Use)	Wildlife and Wildlife Habitat - Increased hunting pressure has been raised as one of the key factors impacting RRDC's ability to harvest caribou and moose in their traditional territory. The most important mitigation measure that BMC will continue to implement is the operation of the manned gate to prevent hunter access to the Project (as per the lease requirements for the road). This is a proven mitigation measure which will continue for the life of the Project until the road is decommissioned and reclaimed. With this mitigation measure the KZK project will prevent overhunting and subsequent impacts to traditional land use activities.	Response Report #4A (BMC, 2018b)
Community Vitality (Traditional Land Use)	Wildlife and Wildlife Habitat -BMC's wildlife monitoring program will focus on identifying changes to wildlife use and movement patterns resulting from Project development and operations. Traditional knowledge and scientific research will be integrated as it becomes available to help in the interpretation of ongoing monitoring data. In general, where possible and interest exists, one to two RRDC/LFN Kaska Land Stewards and/or Traditional Knowledge Team with RRDC/LFN Traditional Knowledge Kaska regarding wildlife will be contracted to participate in ongoing surveys of the wildlife monitoring programs. RRDC/LFN involvement will ensure their understanding of the effects of the mine on wildlife, especially culturally important species, and to ensure consideration and/or integration of RRDC/LFN Kaska TK into the monitoring program. RRDC/LFN Land Stewards and/or Traditional Knowledge Team will review their contributions to the programs as part of the annual report before it goes to regulators. More detailed information is presented in Section 13.6 of the Project Proposal and in the Wildlife Protection Plan (Appendix R2-J of Response Report #2) (BMC, 2017c).	Response Report #4A (BMC, 2018b)
Community Vitality (Reducing	The mitigation measures for this subcomponent are BMC's policies on alcohol and drug abuse and provision of counselling as required.	Project Proposal Chapter 15 (BMC, 2017a)

Valued Component	Proposed Mitigation and Enhancement Measures	Source
Crime)		
Community Vitality (Reducing Discrimination and Racism)	<p>BMC will attempt to have a beneficial effect of reducing discrimination and racism by doing all it can to eliminate all forms of discrimination and racism in the workplace. The company's Employment and Anti-Discrimination Policy (Appendix A-3) reads, in part:</p> <p><i>"All employment processes and ongoing employee performance evaluation shall be merit based, without regard to other factors such as sex, marital status, pregnancy, parental status, age, race, impairment, religion, political belief, social origin, lawful sexual activity, social preference and family responsibilities.</i></p> <p><i>Managers and staff at every level of the organization shall ensure they and the people around them do not engage in discriminatory behaviour. All employees will be held responsible for the implementation of this policy and relevant programs within their area of responsibility."</i></p> <p>BMC will strictly enforce its Employment and Anti-Discrimination Policy prohibiting any form of discrimination or racism in the workplace. Complaints will be treated seriously and dealt with immediately. In addition to the community mentors providing a conduit to the Kaska, every department manager will have a specific requirement to maintain direct contact with the local communities.</p> <p>All BMC directors, supervisors and managers will have mandatory, ongoing (annual) cultural awareness training. The higher the level of employee within the company, the greater the degree of training required.</p> <p>In its Community Relations Policy (Appendix A-2) BMC states: <i>"We will strive for the improvement of cross-cultural awareness through the induction, training and education of our personnel in local Indigenous Peoples culture and workplace relationships."</i></p> <p>BMC commits to hiring two Kaska citizens (one from LFN and one from RRDC) as community mentors. The mentors will be responsible, in part, for building and maintaining Kaska employee's workplace relationships and assisting with Kaska employee retention.</p>	Project Proposal Chapter 15 (BMC, 2017a)
Community Vitality (Community Events and Volunteerism)	BMC will continue to support community events and projects as the Project proceeds.	Project Proposal Chapter 15 (BMC, 2017a)
Community Vitality (Community Events and Volunteerism)	As the Project proceeds, BMC will consider making donations to community recreation projects on a case-by-case basis.	Project Proposal Chapter 15 (BMC, 2017a)
Infrastructure and Services (Housing and Land Availability)	<p>In order to mitigate impacts on housing availability BMC has adopted a position of preferential hire for local people. The point of hire for most personnel is expected to be in the Yukon. The three closest towns to the Project are Ross River, Faro and Watson Lake. BMC notes that the definition of a "local hire" is somebody that already lives locally. BMC considers it unlikely that new employees will relocate to the towns of Ross River and Watson Lake due to current housing supply constraints.</p> <p>The town of Faro is different from Watson Lake and Ross River since the number of available houses in Faro outnumbers that number of residents likely to seek employment with BMC. BMC has purchased three apartment complexes in Faro, containing approximately fifteen 2 to 3 bedroom dwellings. These dwellings will be renovated and available for relocating staff as required. Excess dwellings will be made available to locals requiring accommodation.</p> <p>BMC is committed to working with the towns of Faro, Ross River, Watson Lake and Whitehorse as well as RRDC and LFN Chiefs and Councils to ensure that employment opportunities and housing outcomes for locally employed BMC employees are optimised.</p> <p>No additional mitigation is proposed for the City of Whitehorse given the programs adopted by the Whitehorse Council in relation to housing and the councils publicly stated housing targets.</p>	<p>Project Proposal Chapter 15 (BMC, 2017a)</p> <p>Response Report #3A (BMC, 2018a)</p>
Infrastructure and Services (Transportation Infrastructure – Roads and Airports)	BMC may need to clear the Finlayson Lake airstrip in the winter (if Yukon Transportation is unable to clear it in a timely fashion).	Project Proposal Chapter 15 (BMC, 2017a)
Infrastructure and Services (Transportation Infrastructure – Roads and Airports)	Prior to construction and operations BMC commits to discuss with the local communities BMC's preliminary plans and request any suggestions on ways to assist with managing the increased traffic to maximize safety and minimize disruptions that they may have.	Response Report #3A (BMC, 2018a)

Valued Component	Proposed Mitigation and Enhancement Measures	Source
Infrastructure and Services (Transportation Infrastructure – Roads and Airports)	<p>BMC will have some control over the actions of certain portions of the traffic using the highway such as the haulage trucks, supply trucks, and light vehicles driven by employees, and contractors, of BMC. However, BMC has no control over other users of the roads and must rely on these users to abide by Yukon’s road rules and to drive in a manner that takes into consideration road conditions. With this limited control it may be possible to mitigate some of the potential safety concerns:</p> <ul style="list-style-type: none"> ○ Communications: All Project related heavy traffic on the Robert Campbell Highway will be equipped with radio communication. The radios will be used to advise of relative positions on the highway and advise others about oncoming traffic and road conditions. These radios can also be used to call for assistance if there have been mechanical or road problems. This communication network could also be of advantage to non-company users of the road in cases where assistance is needed, and no communication is available due to the lack of cell coverage on the highway. ○ There are limited locations where vehicles can pass traffic going in the same direction safely, as the road has numerous blind curves and is generally too narrow for safe overtaking. Prior to construction and operations, the locations of safe passing zones will be identified, and drivers associated with the Project will be advised of these locations. A list will be provided and appropriate actions to take at the passing areas will be outlined. These actions may include reducing speed, or even stopping, to allow traffic to pass at these locations. ○ Dust can be reduced by limiting the speeds of vehicles travelling the road however this also could lead to unsafe passing by traffic travelling in the same direction. Vehicles will be advised to allow other users to pass as early as it is safe to do. Yukon Highways can help limit this problem by judicious use of chemical sealants. Chemical sealants may also decrease the overall cost of road maintenance if applied correctly. ○ Traffic travelling on the Robert Campbell Highway will have to pass approximately 4 Project related heavy vehicles travelling in the opposite direction when driving on the stretch of the highway under discussion. Radio communications will warn the trucks of oncoming traffic however there will be no warning for private vehicles and other road users. Prior to construction and operations, it is suggested that BMC travels a number of times to the local communities and asks for their suggestions on ways to assist with managing the increased traffic to maximize safety. ○ One possible way to limit encounters on the highway is for the trucks to travel in convoys rather than individually. This, however, can also lead to increased safety issues both for opposing traffic and passing traffic. This is an area where community input will be requested and where there may need to be trials to evaluate the effectiveness of each strategy. ○ Increased traffic will degrade road conditions more rapidly than at present. The worsening can be minimized by reducing the speed that traffic uses the road and using proper driving techniques such as; minimizing the use of brakes and selecting appropriate gears on sections with steep grades. The company and contract drivers using the road will have appropriate skillsets and training on handling large vehicles on gravel roads. ○ Yukon Highways, and contractors working for them, are continually upgrading and maintaining the highway and BMC realizes that communications with the various work crews is essential. BMC commits to maintaining communications with Yukon Highways at all stages of the Project and working with them to minimize disruption to their projects. This will mean informing Highways of trucking schedules and may mean scheduling trucking to certain times of the day to minimize effects on the various activities. ○ Winter driving: In winter the drivable width of the highway may be decreased due to high snow amounts and the associated snow plowing activities by the Highways Department. This will increase the risk to all travel on the highway. There will be less non Project related traffic on the highway however the decreased road widths will mean that extra restrictions may have to be implemented. This could include speed restrictions applied to company traffic as well as more frequent mapping of potential passing zones. 	Response Report #3A (BMC, 2018a)
Infrastructure and Services (Transportation Infrastructure – Roads and Airports)	<p>The Robert Campbell Highway is prone to washouts during high rainfall events and ice “glaciers” during the spring melt. The glaciers will occur during the highway weight restriction period and during this period there will be less site specific traffic and thus less potential risk for vehicles passing at specific icy locations. Potential washouts can be identified by company traffic prior to actual road closure. If this information is forwarded to Yukon Highways, then there is the possibility that the potential problem may be resolved prior to the washout causing a highway closure. High rainfall events will be monitored and if there is a chance of road closures then company traffic will be restricted from highway use. In the event of a highway closure, due to washouts or other causes, BMC will provide any assistance required and will advise all company users of the closure and prevent all Project related traffic from entering the affected stretch.</p>	Response Report #3A (BMC, 2018a)
Infrastructure and Services (Transportation Infrastructure – Roads and Airports)	<p>Additional mitigations include:</p> <ul style="list-style-type: none"> ○ BMC will keep records of all traffic entering and exiting the mine and will request that the Transportation and Engineering Branch resume the traffic counts at km 110 of the Robert Campbell Highway such that the daily and annual traffic on the Highway can be presented along side with the safety stats for comparison purposes. These reports will be publicly available through the Yukon Government’s Department of Energy Mines and Resources website and will be presented at community meetings in Ross River and Watson Lake and meetings with LFN and RRDC; ○ BMC will work with Yukon Government’s Department of Highways and Public Works.to increase the frequency of brushing from km 114 to 232; ○ BMC will also work with Yukon Government’s Department of Highways and Public Works.to identify areas where additional spot improvements could enhance usability and visibility from km 114 to 232; 	Response Report #4B (BMC, 2019)

Valued Component	Proposed Mitigation and Enhancement Measures	Source
	<ul style="list-style-type: none"> BMC will also work with Yukon Government's Department of Highways and Public Works to identify locations for pullout construction between km 190 to 232; and BMC will propose the creation of a road user interest group that can act as a focal point for the raising of any ongoing issues or suggestions for improvement of the road or BMC's use of the road. This group would be made up of representatives of RRDC, LFN, Town of Watson lake, RCMP and Yukon Government's Department of Highways and Public Works. 	
Infrastructure and Services (Municipal Services – Water, Sewer, Solid Waste)	<p>The Project will not use the solid waste disposal facilities at Watson Lake, Ross River or Faro at any stage of construction, operations or closure. Waste disposal for the Project will be as outlined in Section 18.2 (of the Project Proposal), the conceptual Waste Management Plan:</p> <ul style="list-style-type: none"> All combustible waste will be incinerated on site; Incinerator ash will be landfilled on site; Hazardous and special wastes will be shipped to licensed recycle or disposal facility on regular basis; Waste oil will be burned to provide heat for buildings on site; and Treated grey water will be diverted to an on-site septic field while bio-solids will be dried and deposited in the on-site landfill. 	Project Proposal Chapter 15 (BMC, 2017a)
Infrastructure and Services (Health Care Services)	BMC will ensure that the level of primary and emergency care available on site is maximized to the extent feasible and appropriate. There will be a fully trained nurse and Emergency Medical Technician/Paramedic on site at all times along with all required medical supplies and equipment.	Project Proposal Chapter 15 (BMC, 2017a)
Infrastructure and Services (Child Care)	If BMC becomes aware that lack of available day care becomes a disincentive to employment at Kudz Ze Kayah, it will engage with community and First Nation input to develop appropriate solutions. However, it should not be assumed that single parent families without strong family support will see the proposed mine as an employer of choice. BMC expects that many parents in such circumstances may not wish to work away from their family at all.	Response Report #2 (BMC, 2017c)
Culture, History and Heritage (Language preservation and restoration)	<p>BMC will strictly enforce its Employment and Anti-Discrimination Policy (Appendix A-3) and its Community Relations Policy (Appendix A-2) BMC states: <i>We will strive for the improvement of cross-cultural awareness through the induction, training and education of our personnel in local Indigenous Peoples culture and workplace relationships.</i></p> <p>BMC is committed to hiring Kaska citizens through the Socio-economic Participation Agreement. BMC will also be hiring two community mentors to assist Kaska employees while on-shift and off-shift. Through these measures, BMC intends that Kaska employees will be comfortable and supported to speak Kaska while at work.</p>	Project Proposal Chapter 15 (BMC, 2017a)
Culture, History and Heritage (Traditional Knowledge and Practice – Preservations and Restoration)	The work rotations will be such that at least some traditional knowledge practises can still be undertaken. The opportunity for most shift workers at the Project to two four-week periods off each year will also help mitigate the effect.	Project Proposal Chapter 15 (BMC, 2017a)
Culture, History and Heritage (Heritage and Historic Sites)	<p>Implementation of the Heritage Resource Management Plan (Appendix F-2) and then site by site management plan. This plan includes (but is not limited to):</p> <ul style="list-style-type: none"> Effects to known heritage resources will be avoided, and if they cannot be avoided, they will be minimized where possible, or mitigated through systematic data recovery efforts. The existing Project chance find procedure and the proposed Heritage Resource Management Plan requires that RRDC be notified of a chance find and that the assessment of potential significance of the materials will be assessed by a qualified archaeologist in collaboration with the YG Archaeology Department and RRDC Representative(s) and mitigative options will be identified. BMC will work with RRDC to ensure that any further action needed is taken. These procedures will be updated to also include LFN representatives. <p>The confidential Traditional Knowledge Protocol with RRDC has provisions for management/mitigations of heritage resources that may be identified during the Traditional Knowledge study.</p> <p>The confidential Traditional Knowledge Protocol with LFN will also contain provisions for heritage resources (currently under negotiation).</p>	<p>Project Proposal Chapter 15 (BMC, 2017a)</p> <p>Response Report #4A (BMC, 2018a)</p>

As part of project proposal submissions, YESAB requires conceptual management plans. These plans were provided in Chapter 18 of the Project Proposal (BMC, 2017a) and comprised the key management plans for quartz mining projects required for assessment and licensing processes. Revised versions will be submitted during licensing to the Yukon Water Board, Yukon Government's Department of Energy Mines and Resources and other regulatory agencies. Several of the conceptual management plans are not specific to a Valued Component; however, they have numerous mitigation measures which will reduce the overall environmental and socio-economic impacts of the Project. Therefore, the mitigation measures from the conceptual management plans that are not specific to a Valued Component are presented in Table 6-3. Mitigation measures contained in the management plans that are specific to a Valued Component were previously included in Table 6-1 and Table 6-2 of this Response Report. Table 6-3 also includes additional mitigation measures that are not specific to a Valued Component that BMC has committed to as part of the ongoing environmental assessment for the Project.

Table 6-3: Summary of Proposed Mitigations that are not Specific to a Valued Component

Category	Proposed Mitigation	Source
Waste Management	To ensure that the handling, storage, transportation, and disposal of all wastes (i.e., solids, liquids, and Special Wastes) generated by the Project are conducted in such a manner as to reduce potential adverse	Project Proposal Chapter 18 (BMC, 2017a)

Category	Proposed Mitigation	Source
	<p>environmental effects associated with waste materials, thereby ensuring that disposal is a last resort when no practicable alternatives exist. To achieve this objective, BMC will:</p> <ul style="list-style-type: none"> ○ Provide proper training for staff and contractors on policies and operations; ○ Comply with all applicable territorial and federal waste management regulations; ○ Minimize waste generation; ○ Where practicable, reuse and recycle materials; and ○ Transfer wastes in a safe and responsible manner. 	
Waste Management	<p>The following presents some of the measures BMC will take to manage general (non-hazardous) wastes:</p> <ul style="list-style-type: none"> ○ BMC will be responsible for the regular collection and disposal of all waste material generated during the course of the Project; ○ BMC will take precautions to ensure waste is not inadvertently dumped into watercourses or in environmentally sensitive areas; ○ BMC will establish regular clean-up and disposal programs so as to prevent the unnecessary accumulation of wastes. Procedures will be adopted to promptly collect and remove any accumulated debris; ○ BMC will ensure these wastes are stored in suitable containers until such time as they are removed from site or incinerated; ○ BMC will take the necessary precautions to ensure no loss of waste materials during transport from site; and ○ All waste removed from site will be disposed of at an approved disposal facility, in compliance with applicable legislation and regulations. 	Project Proposal Chapter 18 (BMC, 2017a)
Waste Management	<p>All food waste and domestic garbage from all Project areas will be collected and placed in an appropriate receptacle in a timely manner with specific frequency depending on the material and quantity. Food waste and domestic garbage will be disposed of in an appropriate and safe manner. All food wastes will be stored and disposed of in a manner that does not attract nuisance animals. Food waste will be incinerated daily.</p>	Project Proposal Chapter 18 (BMC, 2017a)
Hazardous Materials Management	<p>BMC's general management policies related to hazardous waste include the following requirements:</p> <ul style="list-style-type: none"> ○ Store, handle, and transport hazardous materials to avoid loss and to allow containment and recovery in the event of a spill in accordance with all applicable legislation, including, but not limited to the National Fire Code of Canada and the <i>Transportation of Dangerous Goods Act</i>; ○ Designate areas for the transfer and limited temporary storage of hazardous materials and wastes. The area(s) shall be located at least 15 m from the ordinary high water mark of any non-fish bearing water body and 30 m for fish bearing water bodies, clearly labelled and appropriately controlled; ○ Adequately train site personnel in the handling and transportation of hazardous materials; ○ Dispose of hazardous wastes generated during construction in compliance with the <i>Environmental Protection Act</i>; ○ Where Project activities involve the handling, storage, and removal of hazardous wastes, BMC will maintain the following records: <ul style="list-style-type: none"> ○ Inventories of types and volumes of wastes generated, stored, or removed; ○ Manifests identifying licensed waste haulers and disposal destinations; and ○ Disposal certification documents. 	Project Proposal Chapter 18 (BMC, 2017a)
Hazardous Materials Management	<p>The Waste Management Facility will be enclosed by an animal proof fence.</p>	Project Proposal Chapter 18 (BMC, 2017a)
Hazardous Materials Management	<p>Full inventory of dangerous goods and hazardous materials will be maintained at the mine site and will list all chemicals on site, including Material Safety Data Sheets (MSDS) and WHMIS information on the products to ensure that Project personnel have all the necessary information for their safe transportation, use, and disposal.</p> <p>The full inventory will be provided as an appendix to the Hazardous Materials Management plan and maintained and updated by site's safety manager or Environmental Manager. Before any chemical is brought to the site, the supplier or contractor will supply an MSDS for the product, and the chemical will be added to the inventory and master table. MSDS sheets for the Project will be kept with the Hazardous Materials Management plan.</p>	Project Proposal Chapter 18 (BMC, 2017a)
Hazardous Materials Management	<p>All process reagents will be stored in the reagent area with the exception of quick lime which will be stored in a silo adjacent to the Process Plant. The reagent storage tanks will be equipped with volume level indicators and instrumentation to ensure that spills do not occur during operation. The reagent mixing and distribution area has been designed as a wet area, with sloped concrete floors draining to sumps for containment. In addition, appropriate ventilation and fire and safety protection will be provided.</p>	Project Proposal Chapter 18 (BMC, 2017a)
Hazardous Materials Management	<p>Transportation of dangerous goods and materials to the Project will comply with the <i>Transportation of Dangerous Goods Act</i> and Transportation of Dangerous Goods Regulations. Transportation of dangerous goods is regulated under the <i>Dangerous Goods Transportation Act</i>, which requires transporters to have a certified contractor and a spill response plan for all goods to be transported. The transporter will be required to ensure:</p> <ul style="list-style-type: none"> ○ MSDSs accompany all goods and materials; ○ Non-compatible materials will be transported in separate shipments; ○ Fire extinguisher and fire prevention materials will be adequate and appropriate for the material being transported; ○ Containers will be appropriate for the material being shipped; ○ Containers will be properly secured; ○ Containers and trucks will be properly marked, labelled, and placarded; ○ Manifests will be maintained in accordance with federal, territorial (Yukon), and provincial (BC) regulations; ○ Spill response materials will be adequate and appropriate for the materials being transported; and ○ Drivers will be adequately trained and equipped for spill first response, containment, and communication. 	Project Proposal Chapter 18 (BMC, 2017a)

Category	Proposed Mitigation	Source
Hazardous Materials Management	<p>Hazardous materials will be stored in appropriate containers in suitably contained areas and will comply with WHMIS. A figure outlining all hazardous material storage locations at the site will be provided in the final plan as part of Licensing.</p> <p>General handling and storage measures that will be implemented to avoid, control, and mitigate risk include:</p> <ul style="list-style-type: none"> ○ Manufacturers will provide safe packaging and labelling for packaged materials, as a condition of purchase agreements; ○ Storage areas will be appropriately climate-controlled, dry, and well-ventilated; ○ Containers holding the materials will remain sealed to prevent accidental leakage and/or spillage; ○ Incompatible chemicals will be stored separately to prevent deleterious chemical reactions and cross contamination; ○ Chemical storage areas will be designated as non-smoking areas and located away from food storage areas; ○ All personnel handling dangerous goods will be trained and provided with appropriate personal protective equipment; and ○ All bulk chemical storage sites will be outfitted with concrete or lined floors and walls capable of containing 110% of the volume of the largest vessel in the area or as stipulated by appropriate legislation or permits. 	Project Proposal Chapter 18 (BMC, 2017a)
Hazardous Materials Management	<p>All employees (and contractors) involved with handling hazardous materials will receive training on safe and appropriate use as per WHMIS from the Regulations of the <i>Occupational Health and Safety Act</i> (Yukon Government, 2003). All employees will follow <i>Occupational Health and Safety Act</i> Regulations and use appropriate personal protective equipment as well as proper handling procedures when using hazardous materials. All new employees will receive an induction and appropriate training before being required to work with hazardous materials.</p> <p>All employees will be required to wear the appropriate company supplied personal protective equipment prior to being permitted to handle hazardous materials. Employees will be trained in proper use of personal protective equipment, as required. In the event of accidental exposure to the hazardous substance, first aid will be administered as directed in the MSDS and dependent on the severity of the exposure. Emergency response procedures are detailed further in the Health, Safety and Emergency Response Plan (Section 18.15 of the Project Proposal).</p>	Project Proposal Chapter 18 (BMC, 2017a)
Hazardous Materials Management	BMC will adhere to its Cyanide Management Plan which was provided to YESAB as Appendix R3-G of Response Report #3A.	Response Report 3A (BMC, 2018a)
Spill Management	<p>Any spill that occurs at the Project will be reported through the internal reporting chain of command and will follow the procedures for assessment, prevention, containment, and clean-up, and will be reported using BMC's Spill Report Form.</p> <p><i>For each specific chemical, the spill response procedure is based on the product type, quantity, and environmental and safety conditions. MSDS will be available at the mine site in the Hazardous Materials Management Plan. The MSDS sheets will be referenced during any spill response to ensure that proper personal protective equipment is worn, that the chemical or product is handled safely, and that proper emergency and first aid procedures are adhered to. BMC's Emergency Response team will be properly trained on clean-up and disposal methods of each chemical and product used at the Project.</i></p>	Project Proposal Chapter 18 (BMC, 2017a)
Spill Management	<p>The general spill response procedure is outlined below. Upon discovering a spill, the following actions will be undertaken immediately:</p> <ul style="list-style-type: none"> ○ Identify the substance spilled and hazards to human health, if possible (MSDS); ○ Protect yourself and notify any others in the vicinity immediately; ○ If safe to do so, turn off any potential sources of ignition and attend to any injuries. Leave the area if it is not safe to be there; ○ Stop the discharge of the substance, if it is safe to do so; ○ Contain the spilled substance; ○ Inform management of the spill; and ○ Report the spill following the established reporting procedure. 	Project Proposal Chapter 18 (BMC, 2017a)
Spill Management	Wastewater treatment infrastructure will be designed to limit the potential for wastewater entering a body of freshwater and to capture potential leaks in a containment structure.	Project Proposal Chapter 18 (BMC, 2017a)
Spill Management	The Health, Safety and Emergency Response Plan (Section 18.15 of the Project Proposal) will be in place to coordinate a response to an explosives-related emergency. This plan will be registered with Transport Canada under the <i>Transportation of Dangerous Goods Act</i> and <i>Transportation of Dangerous Goods Regulations</i> (Government of Canada, 1992; 2015). The emergency procedures developed will inform control measures for any explosives-related environmental releases, including storage tank failure, spills from product delivery trucks, spills from raw material delivery trucks, process spills, and fire.	Project Proposal Chapter 18 (BMC, 2017a)
Spill Management	Reagents will be transported to the Project in appropriate containers by contracted suppliers. The reagent mixing area on site will be a fully contained area equipped with sumps and sump pumps to return any spills to the appropriate stock tank. The reagent containment area will be designed to accommodate 110% of the volume of a spill from the largest stock tank or mix tank in the area. All reagent mixing and stock tanks will be equipped with level sensors to prevent overfilling. Any reagent spills on site will be responded to as per the MSDS and will be based on the product type, quantity, and environmental and safety conditions.	Project Proposal Chapter 18 (BMC, 2017a)
Spill Management	<p>Spill kits will be located at the following locations throughout the Project area (including but not limited to):</p> <ul style="list-style-type: none"> ○ Fuel Storage Areas; ○ Machine Shop; ○ Mining Operations; ○ Process Plant; ○ Paste Plant; ○ Explosives Facility; 	Project Proposal Chapter 18 (BMC, 2017a)

Category	Proposed Mitigation	Source
	<ul style="list-style-type: none"> ○ Camp; ○ Reagent mixing area; and ○ Vehicles carrying hazardous materials including fuel. 	
Spill Management	<p>Spill Response kits will include a yellow pack container labelled “Spill Kit” and placed at all previously noted locations. Additional smaller kits will be required in all site vehicles/equipment (where practicable, for instance some underground equipment do not have room for spill kits). Spill kits will all include at a minimum:</p> <ul style="list-style-type: none"> ○ Spill Instruction Sheet; ○ Laminated List of Contents; ○ Absorbent Pads (oil, gas, grease); ○ Universal Absorbent Pads; ○ Linkable oil booms; ○ Oil Gator Absorbent; ○ Absorbent socks; ○ Leak repair putty; ○ Heavy duty disposal bags; ○ Protective Clothing – Gloves (Chemical Master Gloves), Coveralls (Tyvek splash suits); and ○ Eye Protection. 	Project Proposal Chapter 18 (BMC, 2017a)
Spill Management	<p>Additional spill equipment will be available at the mine site for larger spills and will include:</p> <ul style="list-style-type: none"> ○ Heavy equipment and machinery (e.g., dozer, loader, excavator, Bobcat, grader, and dump truck); ○ Shovels, rakes, axes; ○ Pails and drums; ○ Pumps and hoses; ○ Emergency flagging and triangular reflectors; and ○ Breathing Apparatus (as required). 	Project Proposal Chapter 18 (BMC, 2017a)
Spill Management	<p>BMC will develop a detailed training program to ensure all employees and contractors are aware of their responsibilities and appropriate practices that everyone on site must adhere to. The emergency response team will receive training as necessary for immediate spill response. Spill response employees will be trained in:</p> <ul style="list-style-type: none"> ○ Workplace Hazardous Materials Information System; ○ Transportation of Dangerous Goods; ○ Spill Training (Spill Responder); ○ Site specific spill orientation including site procedures, location of spill kits and type of substances stored and used on site; ○ Safety orientation including reference to the location of the MSDS sheets and to proper chemical handling and storage procedures; and ○ <i>Occupational Health and Safety Act</i> and regulations and use of appropriate personal protective equipment and chemical/product handling procedures. 	Project Proposal Chapter 18 (BMC, 2017a)
Sediment and Erosion Control	<p>Sediment control measures will be as follows:</p> <ul style="list-style-type: none"> ○ Control runoff and manage stormwater (e.g., rainfall or snow melt) and direct it away from construction areas where excavation, soil placement, and staging activities occur; ○ Develop site-specific measures to reduce changes to the existing hydraulic balance and downstream wetland functions (if applicable), prior to construction of the Project access and site roads; ○ Silt fences, berms, swales, ditches, check dams, settling ponds, and other sediment and erosion control facilities will be installed prior to construction at site-specific locations, as required; and ○ Contingency supplies of sediment and erosion control materials will be maintained, and workers will be sufficiently trained in their appropriate installation and maintenance. 	Project Proposal Chapter 18 (BMC, 2017a)
Sediment and Erosion Control	<p>Sediment and erosion control measures will be:</p> <ul style="list-style-type: none"> ○ Inspected regularly at a frequency commensurate with the risk, nature, location, and seasonality of the work; ○ Adapted or revised, as appropriate; ○ Repaired as necessary in a timely manner, commensurate with the risk, nature, location, and seasonality of the work; ○ Maintained until construction is completed and the affected areas are sufficiently stabilized and revegetated so there is minimal risk of erosion or sedimentation at the site as a result of construction activities; ○ Storage and disposal of construction wastes, overburden, soil, or other substances in such a manner as to reduce the potential for entry into any streams or watercourses; ○ Stockpiles of materials will be located at least 15 m from the ordinary high water mark of any non-fish bearing water body or wetland, and 30 m for fish bearing water bodies, unless otherwise deemed to pose a low risk of sediment entry into any water body; ○ Cover stockpiles of erodible materials such as soil with plastic sheeting or tarps, or establish vegetative cover, to prevent erosion; ○ Manage equipment production rates (if required) to reduce the amount of sediment generated; ○ Isolate in-stream work areas from flowing water to prevent sediment from entering the downstream environment; and ○ Use clean rock materials for riprap construction to reduce the amount of sediment that is introduced into the aquatic environment. 	Project Proposal Chapter 18 (BMC, 2017a)
Sediment and Erosion Control	<p>Erosion control measures are as follows:</p> <ul style="list-style-type: none"> ○ Control site runoff by ditching, grading, sedimentation ponds, check dams, or effective alternatives; ○ Stabilize slopes by maintaining ground cover or using materials such as geotextiles/erosion control cloth; 	Project Proposal Chapter 18 (BMC, 2017a)

Category	Proposed Mitigation	Source
	<ul style="list-style-type: none"> ○ Manage vegetation and soil stripping, taking into consideration slope stability and the proximity to sensitive habitats such as wetlands or fish habitat, maintaining 30 m riparian buffers adjacent to fish bearing waterbodies and 15 m riparian buffers adjacent to non-fish bearing waterbodies, where practicable; ○ Identify natural drainages that occur in cleared areas and incorporate appropriate sediment and erosion control measures into site planning; ○ Incorporate perimeter channels, as required, to catch and transport site runoff from new construction sites and equipment staging areas; ○ Install water bars to direct road surface runoff away from access and site roads in a safe manner; ○ Where required, install appropriately sized culverts to reduce road failure through erosion and to manage hydrological balance and wetland function; ○ Maintain ditches along access and site roads, as required, to control surface runoff and sediment transport; ○ Operate machinery on land above the high water mark in a manner that reduces disturbance to the banks of watercourses; ○ Remove sediment control measures, such as plastic sheeting and silt fencing, when no longer required; ○ Salvage and stockpile clean surface soils for site restoration; ○ Establish and maintain vegetative cover on the soils stockpiled to prevent erosion; and ○ Restore disturbed areas to a stable vegetated condition as soon as possible. 	
Sediment and Erosion Control	<p>The general measures BMC will use to minimize suspended sediment generation due to surface erosion from overland surface water runoff include:</p> <ul style="list-style-type: none"> ○ Avoiding work where possible, in 15 m of the ordinary high water mark of non-fish bearing watercourses, and 30 m from fish bearing watercourses; ○ Using existing roads where practicable; ○ Establishing lay-down and storage areas at least 15 m from the ordinary high water mark of non-fish bearing watercourses, and 30 m from fish bearing watercourses; ○ Using clean riprap and construction materials; ○ Diverting runoff around disturbed work areas and collecting runoff in sediment ponds for settling and testing prior to discharge to the downstream environment; ○ Using erosion-resistant cover material including compacted granular material on steeper slopes in ditches to increase resistance to erosion; ○ Vegetating exposed surfaces where possible to provide long-term erosion resistance in accordance with the Reclamation and Closure Plan; ○ Vegetating and/or installing erosion control matting on disturbed areas, where possible; and ○ Installing and maintaining silt fencing and sediment control structures (e.g., straw wattles) to minimize sediment transport. 	Project Proposal Chapter 18 (BMC, 2017a)
Sediment and Erosion Control	<p>Sedimentation ponds are structures incorporated into the base of a decline to collect runoff from areas of high sedimentation potential during construction. Sediment collected in the ponds can be allowed to settle and the less turbid water naturally overflows to the surrounding environment or can be pumped to other areas for further settling or, if necessary, treatment prior to discharge. During the early phases of construction, sedimentation ponds will be constructed in several areas to allow water to settle prior to discharge into the surrounding environment.</p>	Project Proposal Chapter 18 (BMC, 2017a)
Sediment and Erosion Control	<p>Specific measures BMC will follow during any in-water works (including but not limited to draining ponds over the proposed ABM open pit and the diversion of Fault Creek) will include:</p> <ul style="list-style-type: none"> ○ Diverting streams/seeps and isolating work activities wherever practicable; ○ Operating equipment in a manner that minimizes sediment release where work areas cannot be isolated; ○ Instream sediment control structures (e.g., silt curtains); ○ Installing water diversion pump intakes in a manner that prevents entrainment of sediments; and ○ Installing water diversion discharge points in a manner that prevents erosion of the downstream substrates. 	Project Proposal Chapter 18 (BMC, 2017a)