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5.5 **Summary of Assessment of Environmental Effects**

The Valued Components (VCs) assessed for environmental effects are split into three assessment categories—Atmospheric and Acoustic Environment, Aquatic Environment, and Terrestrial Environment. **Table 5.5-1** presents the summary of the assessment for each environmental effects VC, including the potential effects, key mitigation measures, and the evaluation of significance of the each assessment. Mitigation measures are also discussed in **Sections 10** (Accidents or Malfunctions), **12** (Summary of Proposed Environmental and Operational Management Plans), and **13** (Follow-up Monitoring and Compliance Reporting).

Atmospheric and Acoustic Environment comprises three VCs: Noise and Vibration, Climate Change, and Air Quality. Aquatic Environment includes eight VCs: Surface Water Flow, Surface Water Quality, Sediment Quality, Groundwater Flow, Groundwater Quality, Wetlands, Fish, and Fish Habitat. Terrestrial Environment considers 14 VCs: Physiography and Topography, Surficial Geology and Soil Cover, Soil Quality, Ecosystem Composition, Plants Species and Ecosystems at Risk, Amphibians, Waterbirds, Forest and Grassland Birds, Moose, Caribou, Grizzly Bear, Furbearers, Bats, and Invertebrates.

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Table 5.5-1: Summary of Assessment of Potential Environmental Effects

Valued Components (Identify Phase of Project)	Potential Effects	Key Mitigation Measures	Evaluation of Significance of Residual Effects (Summary Statement)
<p>Noise and Vibration (C, O, CL)</p>	<p>Changes above noise and vibration baseline</p>	<p>Federal and provincial environmental regulators require that a noise impact assessment must be completed for any new permanent facilities where there is a reasonable expectation of a continuous noise source. The assessment evaluated if the noise levels from the facility at the nearest receptors meet applicable noise criteria using noise propagation modelling. Noise and vibration objectives are specified in Environment Canada's (EC) Environmental Code of Practice for Metal Mines (EC, 2009). This section lists the key mitigation used in the assessment process. A full list of mitigation used in the assessment is discussed in Section 5.2.2.</p> <ul style="list-style-type: none"> • During maintenance, check that noise abatement devices are in good order (e.g., brakes, exhaust mufflers, engine hoods). • Select vehicles and equipment with industry standard noise abatement technology, including exhaust and compressor/fan noise. • Use a noise-attenuating jacket around jackhammers. • Position noisy equipment in sheltered or enclosed locations if practicable. • Maintain equipment in good working condition. • Turn equipment off when not in use if practicable. • Operate equipment within specifications and capacities (i.e., do not overload machines). • Equipment maintenance: maintain equipment on a regular basis; perform regular inspections and maintenance of material-handling vehicles and equipment, ensuring that noise abatement components are working as intended, worn parts replaced, and lubricants applied, so that manufacturers' noise output specifications continue to be met. • Set up the camp in a distant location to minimize noise disturbance by road traffic, mine equipment, and airstrip. • Implement speed limits as appropriate for noise and vibration, fugitive dust, and safety reasons. • Place the main crusher and other aggregate handling equipment in sheltered or enclosed locations. • Minimize the height from which material drops from plant and machinery where practicable. • Operate utilities and provide services in adherence to relevant standards and guidelines (e.g., pump stations, wastewater treatment plant, fuelling station). • Assemble the camp's prefabricated modular structure using metal-clad walls with thick thermal insulation (based on evaluation of typical camp structures at mine sites). • Undertake adequate site reconnaissance and rock face surveys in advance of blast design. • Ensure that blast design incorporates the appropriate burden, spacing, and stemming of holes to control the direction of the energy to minimize the wall damage for long-term stability. • Ensure the correct blasting ratio is obtained (the blasting ratio is a measure of the amount of work expected per unit volume of explosives (e.g., tonnes per kilogram (t/kg))). • Conduct blasting on day shift. • Use downhole initiation with short delay detonators. • Minimize the maximum instantaneous charges (MICs). • Avoid low altitude flights except on final approach and take off. • Use smaller aircraft (e.g., Dash 8-100) instead of larger (Boeing 737) whenever possible. • Limit taxiing time. • Use low-noise supporting ground equipment (e.g., power generator with muffler). 	<p>The results of the noise modelling showed that noise levels during construction and operations will be below 45 decibels (dBA) (night time permissible sound pressure level) along the Project boundary. The only exceptions were blasting and aircraft noise. However, they would have a negligible impact on equivalent sound pressure level (daytime PSL is 55 dBA), due to their very short duration. The determination of significance is Not Significant (Minor or Negligible) with high likelihood and medium confidence.</p>
<p>Climate Change (C, O, CL)</p>	<p>Greenhouse Gas (GHG) emissions</p>	<p>Climate Change was identified in the issue scoping process. The Project will produce GHG emissions from the combustion of fossil fuels by the mine fleet that produce carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O). The GHG emissions from the Project were estimated and compared to total GHG emissions for BC and Canada. The Project has been designed to minimize GHG emissions on-site by connecting to the BC Hydro energy grid rather than having on-site diesel generators.</p>	<p>The residual effects of GHG emissions on climate change were determined to be Not Significant (Negligible). Effects of the Project on the study area are anticipated to be indistinguishable from the natural range of variability.</p>

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<p>Air Quality (C, O, CL)</p>	<p>Changes in concentrations of the substances in the Local Study Area (LSA)</p>	<p>Air quality has intrinsic importance to the health and well-being of humans, wildlife, vegetation, and other biota. The assessment of the potential effect of Project-related atmospheric emissions on air quality compares levels predicted by air quality modelling to relevant provincial and federal ambient air quality criteria. This section lists the key mitigation used in the assessment process. A full list of mitigation used in the assessment is discussed in Section 5.2.4.</p> <ul style="list-style-type: none"> • Implement engine emission controls to mitigate for sulphur dioxide (SO₂), NO₂, and CO, as those substances are entirely generated as combustion by-products. Ensure that off-road vehicles (such as the mine fleet) will meet the most recent and stringent emission standards, commonly referred to as Tier 4. • Require use of ultra-low sulphur diesel (15 ppm maximum) for all off-road vehicles, as required under the above-noted EC regulation. • Implement a combination of administrative, design, and emission control strategies to mitigate for particulate matter (PM) emissions occurring from vehicle travel on non-paved road (e.g., mine haul roads) and from materials handling (bulldozers, graders, truck dumping). • Use administrative control to mitigate for road dust emissions that are directly related to vehicle speed throughout the mine site. • Design haul road surfaces constructed of coarse aggregate with very low silt content to mitigate for road dust emissions that are directly related to road silt content. • Wet unpaved road surfaces as needed to control dust emissions when conditions are not wet or frozen. The wetting agent may include a chemical to extend and improve dust control over using water alone. The specific chemical has not yet been selected, and it is anticipated that a number of chemicals will be tried to ensure optimum performance. This is common practice at mine sites, and chemical selection will be informed by experiences at other mines in similar climate. Wetting with dust suppressant chemical addition is anticipated to reduce road dust emission by 90%. • Control PM emissions related to materials handling (dumping, bulldozing, grading) by wetting the material before handling. Much of the material coming from the pit is saturated as it is excavated from below the water table, and a 50% reduction in material handling PM emissions is anticipated due to material wetting prior to handling. • Develop and implement the AQEMP that describes dust control measures including watering haul roads when required, maintaining TSF beaches in a wet condition, implementing progressive reclamation on waste rock dumps, and installing dust control systems for the crusher as described in the Application. 	<p>The significance determination is Not Significant (Minor) since the effects are local, reversible. The likelihood is high and confidence is moderate since the modelling tends to provide over-predictions of effects due conservative assumptions in methodology.</p>
<p>Surface Water Flow (C, O, CL, PC)</p>	<p>Change in the surface water flows of monthly and annual flows, peak flows, low flows, and lake levels</p>	<p>Surface Water Flow was identified in the issue scoping process and has importance to the health and well-being of humans, wildlife, vegetation, and other biota. Effects on surface water flow were assessed using hydrological modelling including watershed models for baseline and each major phase of mine development.</p> <p>Where applicable, surface water mitigation measures for the proposed Project will follow guidelines outlined in the Environmental Code of Practice for Metal Mines (EC, 2009). The proposed Project Mine Water Management Plan (MWMP) for the site contains aspects such as the Tailings Storage Facility (TSF) operation, on-site water management, and surface water diversions. This section lists the key mitigation used in the assessment process. A full list of mitigation used in the assessment is discussed in Section 5.3.2.</p> <ul style="list-style-type: none"> • Plan for construction through controlling sediment, timing based on fisheries needs, isolating work area, and capturing water • Minimize water use, manage contact water, and recycle • Avoid surface water discharge during operations by containing contact water and using a water supply pipeline for environmental needs • Plan for closure through re-establishing, where possible, drainage areas and flow patterns and using a temporary pumping system to meeting IFN in Davidson Creek 	<p>When all of the residual effects significance rating metrics are considered, the residual impacts of the Project (after mitigation that includes meeting IFN in Davidson Creek) on the potentially affected watersheds are expected to be Not Significant (Negligible, Minor or Moderate). In addition, as surface water flow is an intermediate component in the effects pathway, the results herein are carried forward into other aquatics-related VCs such as fish and fish habitat.</p>

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<p>Surface Water Quality (C, O, CL, PC)</p>	<p>Changes in baseline surface water quality</p>	<p>Surface Water Quality was identified in the issue scoping process and has importance to the health and well-being of humans, wildlife, vegetation, and other biota. Potential effects on water quality were assessed using source models (e.g. pit lake, TSF supernatant, and waste dump drainage), site water balance, and watershed models with respective results incorporated into a GoldSim model to predict receiving water quality. This section lists the key mitigation used in the assessment process. A full list of mitigation used in the assessment is discussed in Section 5.3.3.</p> <ul style="list-style-type: none"> • Design the sediment control ponds according to applicable BC guidelines to remove suspended sediment. • Construct the transmission line, water supply pipeline, new road alignment, and airstrip following best management practices (BMPs), so that erosion and sedimentation into receiving waters will be strictly controlled and that no significant effects from these activities will result. • Monitor construction activities and address any erosion at source and/or control near source with silt fences, hay bales, or other mitigation measures, as appropriate. • Prevent impacts to Davidson Creek water quality employing a no-surface-water-discharge design for the TSF. During the approximate 18 years closure phase, water management will essentially be the same as during operations. No surface water will be discharged from the TSF, and all site contact surface water will be captured. • Ensure maintenance of water quality during post-closure discharge. At approximately Year 35, the TSF will discharge to Davidson Creek. At that time pit lake water will mix with supernatant water in the TSF. Surface water at the time of discharge from the TSF is expected to be very near receiving environment background quality and to meet provincial and federal guidelines or site-specific objectives. • Construct wetlands in Pond C, Pond D, Environmental Control Dam (ECD), and water reservoir during the closure period and to polish seepage from the TSF. As a contingency, should it be required, construct an additional wetland downstream of the ECD and water reservoir. • Develop and implement the SECP that includes constructing sediment control facilities such as diversion and collection ditches and sediment control ponds and implementing BMPs prior to surface disturbance as described in the Application. Establish flocculent addition systems as contingency measures for sediment ponds that will discharge directly to surface waters prior to operating the ponds. 	<p>There are limited residual effects predicted for water quality after mitigation, since mitigation is built into the design of the Project. Residual effects relate to potential exceedances of water quality guidelines and are parameter-specific. While there are exceedances predicted according to the water quality model, they are almost all driven by background concentrations above guidelines and are therefore not considered residual. The possible exception is sulphate. Given natural attenuation of sulphate the probability of guideline exceedance is low. The significance uncertainty is low for sulphate, because concentrations are well above the detection limit and the magnitude of predicted exceedances is low. During post closure the significance determination is Not Significant (Minor) with a moderate to high likelihood.</p>
<p>Sediment Quality (C, O, CL, PC)</p>	<p>Changes in sediment quality</p>	<p>Sediment Quality was identified in the issue scoping process and has importance to the health and well-being of humans, wildlife, vegetation, and other biota. This section lists the key mitigation used in the assessment process. A full list of mitigation used in the assessment is discussed in Section 5.3.4.</p> <ul style="list-style-type: none"> • Limit sediment export during all phases and surface water discharge during operations and closure and this inherent in design. • Develop and implement the SECP that includes constructing sediment control facilities such as diversion and collection ditches and sediment control ponds and implementing BMPs prior to surface disturbance as described in the Application. Establish flocculent addition systems as contingency measures for sediment ponds that will discharge directly to surface waters prior to operating the ponds. • Post-closure, ensure water discharged from the TSF meets BC FWG or site-specific water quality objectives. Implement any additional mitigation in response to monitoring and integrate such mitigation into adaptive management practices at the site. 	<p>Any effects on sediment metal loadings from the Project are expected to be minor and therefore Not Significant (Minor).</p>
<p>Groundwater Quantity (C, O, CL, PC)</p>	<p>Changes in groundwater flow</p>	<p>Groundwater Flow was identified in the issue scoping process and has importance to the health and well-being of humans, wildlife, vegetation, and other biota. Potential effects were assessed using spreadsheet-based 2D (e.g. SEEP/W) and 3D (e.g. MODFLOW) groundwater flow models. Mitigation methods include construction and operation of measures to reduce the potential impact of the mine site on its surrounding environment. This section lists the key mitigation used in the assessment process. A full list of mitigation used in the assessment is discussed in Section 5.3.5.</p> <ul style="list-style-type: none"> • Cluster facilities around TSF for surface water and groundwater capture. • Employ collection and diversion ditches for surface water and groundwater capture. • Employ TSF dam cut-off wall and downstream seepage collection ditches. • Design and implement ECD and pump back systems. • Construct a hydraulic barrier (West Dam – Creek 705). • Construct wetlands in TSF Site C and D after closure as part of water treatment. • Construct a wetland at the ECD site after closure as part of seepage water treatment. • Design water reservoir and Tatelkuz Lake pumping system to maintain surface and groundwater flows in Davidson Creek. • Engineer a liner under the low grade and temporary ore stockpiles and seepage collection systems. • Construct waste rock dump drains and seepage collection systems (e.g. East Dump collection ditch). • Construct pit groundwater depressurization system and pit water sumps/recovery system. • Design and implement groundwater wells and seepage monitoring system. • As a contingency, and if required, construct a wetland in the water reservoir area below the ECD on closure if further polishing of TSF discharge water and seepage is required. 	<p>Limited residual effects are predicted for groundwater flow given mitigation is built into the design of the Project. Residual effects relate to very localized changes in groundwater flow, and are TSF-specific. While there are changes predicted according to the groundwater modelling work, they are minor residual effects and Not Significant. The significance uncertainty is low for groundwater flow, and the magnitude of predicted effects is low or negligible.</p>

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<p>Groundwater Quality (C, O, CL, PC)</p>	<p>Changes in groundwater quality</p>	<p>Groundwater Quality was identified in the issue scoping process and has importance to the health and well-being of humans, wildlife, vegetation, and other biota. The assessment was based on consideration of source quality (e.g., TSF seepage and waste dump drainage), predicted travel times and flow paths, and the potential for attenuation of metals in subsurface materials. Mitigation measures related to the protection of groundwater flow also apply to groundwater quality. This section lists the key mitigation used in the assessment process. A full list of mitigation used in the assessment is discussed in Section 5.3.6.</p> <ul style="list-style-type: none"> • Naturally drain and route seepage from mine sources to the TSF by gravity or collection systems. • Minimize seepage releases from mine sources to the environment to the extent possible. • Reduce and maintain low concentrations of contaminants in mine source interstitial water and seepage through effective effluent treatment and waste management. • Close facilities to reduce seepage flow and improve seepage quality. • Implement potentially acid generating/metal leaching (PAG/ML) tailings and waste rock segregation and submerged co-disposal in TSF. • Implement non-acid generating (NAG) waste rock segregation and disposal into East and West dumps. • Process low grade ore (LGO) and temporary ore stockpile material by the end of operations. • Implement rapid assisted filling of pit lake at closure to minimize exposure of PAG walls and protect pit lake quality. • Treat process plant tailings, LGO, and temporary ore drainage prior to discharge to the TSF, if required. • Facilitate natural attenuation and source long-term contaminant reduction (e.g. natural degradation of contaminants in TSF supernatant while filling pit lake, not included in effects modelling). 	<p>The Project effects on overall groundwater quality are predicted to be Not Significant (minor). The significance uncertainty is low for groundwater quality, and the magnitude of predicted effects is low.</p>
<p>Wetlands (C, O, CL, PC)</p>	<p>Potential effects on wetlands include loss of extent, loss of wetland functions, and degraded wetland ecological, hydrological, biochemical, and habitat functions</p>	<p>Wetlands were selected as a Project VC because wetlands are valued by local communities; Aboriginal groups; and local, provincial, and federal governments for the values and functions wetlands provide for society and the environment. Potential Project effects on wetlands and the functions wetlands were quantitatively and qualitatively assessed. This section lists the key mitigation used in the assessment process. A full list of mitigation used in the assessment is discussed in Section 5.3.7.</p> <ul style="list-style-type: none"> • During operations, design mitigating features, including the freshwater supply system, seepage collection trenches, the TSF, and wetland creation around the TSF (Pond 1). • During closure and reclamation, create wetlands around the TSF (Pond 2) and in the converted freshwater reservoir. • Avoid wetlands and the loss of wetland functions through effective pre-construction planning and design. • Avoid impacts to individual wetlands within the mine footprint by relocating other facilities not as constrained by mine engineering and operations. • Design the linear Project components to avoid wetlands to the maximum extent possible during the planning process by siting the individual components outside of wetlands within the surveyed corridors. • Implement the Wetland Management Plan (WMP), embedded Project design features, and on-site habitat creation. The WMP provides information on wetland monitoring, establishing wetland buffers, and following standard BMPs that protect wetland functions. • Where possible during construction, preserve a 30-metre (m) vegetated buffer around mapped wetlands in the mine site that would not be directly impacted by mine site infrastructure. On a case-by-case basis, as necessary, light activities with temporary impacts will be allowed on the wetland buffer zone—such as temporary access routes, invasive plant species management, sediment and erosion controls, and targeted vegetation clearing. Wherever possible, no additional permanent features will be allowed within the 30 m wetland buffer zones, including buildings or main roads that may be identified as necessary during the operations phase. • Minimize the potential residual Project effects of lost (309 hectares (ha)) wetland extent and functions through wetland habitat creation during operations and closure phases. The following wetland habitat creation actions are proposed for the reclamation plan: <ul style="list-style-type: none"> - Create 63 ha of swamp and marsh wetland habitat will be created around Pond 1 at of TSF at Year 4 of the operations phase; - Create 231 ha of swamp and marsh wetland habitat will be created around Pond 2 of the TSF Site D at post-closure; - Restore 11 ha of riparian swamp wetland habitat by converting the freshwater reservoir to wetlands at post-closure; and - Create 2 ha of riparian swamp wetland as contingency for water quality treatment if necessary. 	<p>This effect will occur intermittently, and the likelihood and confidence are high because loss of wetland extent due to mine development is certain. The significance determination is rated Not Significant (Moderate) because the magnitude is medium, geographic extent is local, frequency is intermittent, and the duration long-term. The level of confidence is high because the extent of direct wetland loss is well understood.</p> <p>At post-closure, the magnitude and levels of confidence in likelihood and significance change. The magnitude of the effect becomes low at post-closure since there will be a less than 1% reduction in wetland cover in the mine site from baseline conditions. The significance determination is rated Not Significant (Minor) because the magnitude is low, geographic extent is local, frequency is intermittent, and the duration long-term. The likelihood and significance rating changes to moderate confidence levels because the success of wetland creation during reclamation has been proven elsewhere (Hamaguchi et al., 2008). The moderate confidence levels and associated risk can be addressed through monitoring during all four phases of the Project to ensure the success of created wetlands.</p>

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<p>Fish (C, O, CL, PC)</p>	<p>Loss of fish habitat in upper Davidson Creek Watershed as a result of development of the mine site</p> <p>Changes in flows in Davidson Creek, Creek 661, and Creek 705</p> <p>Changes in water quality in Davidson Creek, Creek 661, and Creek 705</p> <p>Potential disruption of homing by rainbow trout and kokanee spawners to Davidson Creek as a result of flow augmentation with water pumped from Tatelkuz Lake</p> <p>Potential Effects on Fish of Diversion of Lake 01682LNRS to Lake 01538UEUT</p> <p>Changes in water temperature of Davidson Creek</p>	<p>The social, cultural, and recreational value of fish to people as expressed during consultations with the public, federal and provincial regulators and Aboriginal groups resulted in Fish as a VC. Fish have ecological importance in the maintenance of healthy aquatic ecosystems and as a food source for people and wildlife species. The Project has the potential to affect fish directly (i.e., mortality from blasting, stranding, or impingement on intake screens) or indirectly due to changes in fish habitat quantity and quality (i.e., water quality (including water temperature), and abundance and composition of primary and secondary producer communities). This section lists the key mitigation used in the assessment process. A full list of mitigation used in the assessment is discussed in Section 5.3.8. Where instream construction is required, isolate work areas and complete fish salvage and relocation prior to starting work. Perform instream construction during the Reduced Risk Timing Window for rainbow trout (15 July to 15 April of the following year) to avoid interruptions to spawning migrations and egg mortalities.</p> <ul style="list-style-type: none"> • Restrict instream construction to outside the Reduced Risk Timing Window if fish have already been removed by salvaging. • Salvage fish using electrofishing as it is a low-impact technique of salvaging fish. Other gears will be used if required by habitat conditions. • Complete fish salvages for all stream areas that will be impacted by the mine footprint. • Ensure protection of fish by staged construction of the Lake 01682LNRS diversion and dam construction to ensure that no fish are stranded during construction. • Prior to blasting, perform fish salvages and isolation of mine site streams to ensure that no fish are present. • Divert Lake 01682LNRS and Reach 12 of Davidson Creek into Lake 01538UEUT of the Creek 705 Watershed to ensure downstream connectivity for these waterbodies. • Keep an emergency spill response kit on site during construction. • Ensure that fuel storage and refuelling are conducted outside of riparian areas at all times. • Ensure that machinery that arrives on site is in a clean condition and is maintained free of fluid leaks. • Install a seepage management system consisting of seepage collection ponds, a seepage collection trench, and an ECD to prevent surface water discharges during operations and closure or sediment contributions to downstream receiving environments. • Implement a seepage management system to ensure negligible seepage discharge. • Design ECD and water reservoir treatment wetlands to capture and process downstream seepage from the TSF. • At Lake 01682LNRS and the diversion channel, strip areas to be flooded of all vegetation and topsoil up to the high water line to reduce potential for mobilization of mercury and uptake by aquatic plants and animals, including fish. Employ erosion and sediment control measures, based on the Erosion and Sediment Control Plan, to protect erodible soils and minimize erosion of soils within the mine site. • Locate Tatelkuz Lake FSS intake at a depth that will produce temperatures appropriate for Davidson Creek. • Operate a Temperature and Flow Control System (TFCS). • Prohibit machinery from fording the stream at any time. Use temporary single span bridges for all temporary crossings. • Install deflectors at bridge sites to minimize the amount of sediment entering watercourses. • Implement Fisheries and Oceans Canada's (DFO's) <i>Measures to Avoid Causing Harm to Fish and Fish Habitat</i> (DFO, 2013). • Implement <i>Fish-Stream Crossing Guidebook</i> (BC Ministry of Forests, Lands and Natural Resource Operations (BC MFLNRO), 2012). • Ensure that loss of habitat upstream from the dam is included in the Fisheries Mitigation and Offsetting Plan (FMOP). • Employ erosion and sediment control measures, including rip-rap armouring, erosion control matting, and hydro seeding, to protect erodible soils around the dam and the freshwater reservoir. • Design outlet pipes so that fish cannot enter them. • Install open-bottom structure to replace improperly installed closed-bottom culvert at the single fish-bearing stream along the airstrip access road. • Establish and implement a Fish Salvage Plan and an Aquatic Effects Monitoring Plan (AEMP) appropriate for each phase of mine development, including reporting to BC MOE, DFO, and designated Aboriginal groups. 	<p>Loss of fish on the mine site: This effect of mine site development on fish is assessed as Not Significant (Minor) for rainbow trout, largely because the lost habitat will be replaced by new fish habitat, as described by the FMOP. (There are no kokanee on the mine site.)The likelihood of this determination is high because the FMOP is based on proven concepts that have been used successfully in other offsetting plans for mines in BC. Confidence in this assessment is high.</p> <p>Disruption of salmonid homing to Davidson (Rainbow Trout & Kokanee): The likelihood of some disruption of homing in both indicator species is high, although it is difficult to predict the magnitude of that disruption. Confidence in this assessment is moderate due to the presence of Davidson Creek water in the augmented creek and because there is an absence of precedents for the effects on salmonid homing of pumping water between adjacent watersheds.</p> <p>The residual Project effect of flow augmentation using Tatelkuz Lake water on homing behaviour is assessed as Not Significant (moderate) for both rainbow trout and kokanee because it is assessed as unlikely and capable of being managed should it occur. A moderate qualifier is attached to that assessment of non-significance because the effect is of low context, medium magnitude, local extent, medium-term in duration, reversible, and continuous.</p> <p>Mercury mobilization in Lake 01682LNRS: The effect is reversible because mercury concentrations are expected to fall back to baseline concentrations in the post-closure period. This potential residual effect is predicted to be Not Significant (Minor) because it is low in magnitude, local in extent, medium-term in duration, and reversible. The likelihood of this residual effect occurring is high, but confidence in this assessment is moderate. Although the phenomenon of mercury mobilization in new reservoirs has been observed repeatedly throughout North America over the last 50 years, particularly in the hydroelectric reservoirs of Quebec and BC, it remains difficult to reliably predict the degree of mercury mobilization above baseline (Azimuth, 2012) and hence the concentration of mercury in fish tissues.</p> <p>Changes in water temperature in Davidson Creek (Rainbow Trout & Kokanee): This potential residual effect is predicted to be Not Significant (Minor) because it is low in magnitude and local in extent, even though it is chronic in duration and irreversible. A Minor qualifier is attached to this assessment because the modified temperature regime is just as likely to produce positive effects on fish growth, survival, and reproduction as negative effects. The likelihood of temperature change in Davidson Creek as a result of Project activities is high, but confidence in this assessment is moderate because of limitations in the data and in the model used to predict water temperatures in all phases.</p> <p>Reduction in littoral fish habitat of Tatelkuz lake (Rainbow Trout & Kokanee): All potential residual effects are reversible once pumping ceases at the end of the closure phase. Once the pit has been filled with water and the FSS removed, then WSE of Tatelkuz Lake will return to baseline conditions. Frequency of the potential residual effects is continuous because pumping will be continuous throughout the mine life and will only cease at the end of closure. Likelihood is high that there will be reductions in the number of HU in the upper one metre of Tatelkuz Lake because pumping water from Tatelkuz Lake will reduce total volume compared to the non-pumping scenario, even if the volume pumped is a very small proportion of total lake volume and total inflow to the lake. The adverse residual effects on fish due to changes in WSE of Tatelkuz Lake are considered Not Significant (Negligible) for both indicator fish species. A Negligible qualifier is attached to that assessment because the effect is of negligible magnitude, local, reversible, but continuous during the pumping period.</p>

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<p>Fish Habitat (C, O, CL, PC)</p>	<p>Loss of fish habitat in upper Davidson Creek Watershed</p> <p>Changes in flows in Davidson Creek, Creek 661, and Creek 705</p> <p>Changes in water quality in Davidson Creek, Creek 661, and Creek 705</p> <p>Changes in water temperature of Davidson Creek</p>	<p>Fish Habitat was selected as a VC because of the ecological importance of fish habitat for maintaining fish populations that have social, cultural, and recreational value within Project areas. The issue scoping process also identified the social, economic and scientific value of fish habitat as expressed during consultations with the public, federal and provincial regulators and Aboriginal groups. The Project has the potential to affect fish habitat directly (e.g., loss due to reduction in flows) or indirectly (e.g., loss due to changes in water quality or temperature or abundance and composition of primary and secondary producer communities). Potential effects to fish habitat were assessed qualitatively and quantitatively. This section lists the key mitigation used in the assessment process. A full list of mitigation used in the assessment is discussed in Section 5.3.9.</p> <ul style="list-style-type: none"> • Minimize the spatial extent of the overall Project footprint by clustering the TSF, open pit, waste rock dumps, stockpiles, and all other mine site facilities as closely together as possible. • Minimize the number of watersheds potentially affected by locating the TSF and all mine site facilities within the headwaters of Davidson Creek and Creek 661. • Avoid and protect kokanee spawning habitat. • Where no mitigation is possible, construct replacement habitat in Davidson Creek and other watersheds as described in the FMOP. • Pump water from Tatelkuz Lake via the FSS to augment flows in Davidson Creek. • Divert the Davidson Creek Watershed area upstream of the TSF Site C West Dam into the adjacent Creek 705 Drainage. • Prohibit surface water discharge from mine site during operations and closure. • Implement a seepage management system to ensure negligible surface discharge. • Construct sediment control ponds, erosion and sediment control measures, based on the Erosion and Sediment Control Plan, to protect erodible soils and minimize erosion of soils within the mine site. • Locate intake pipes at depth in Tatelkuz Lake to produce temperatures in Davidson Creek most similar to baseline. • Implement erosion and sediment control measures, including rip-rap armouring, erosion control matting, and hydro seeding, to protect erodible soils. • Install deflectors at bridges to minimize the amount of sediment entering streams. • Ensure grader operators follow guidelines to prevent sediment deposition in accordance with the road grading environmental management plan. • Prohibit machinery from fording the stream at any time. Use temporary single span bridges for all temporary crossings. • Avoid placing rip-rap within the active channel. • Maintain an emergency spill response kit on site. • Ensure that fuel storage and refuelling are conducted outside of riparian areas at all times. • Ensure that machinery arrives on site in a clean condition and is maintained free of fluid leaks. • Construct passive intake screen that admits water at a low, uniform velocity. • Place intake away from critical littoral habitat. • Minimize disturbance to riparian vegetation. Stabilize, vegetate, and/or seed disturbed areas as soon as possible after construction. • Locate crossings at straight sections of stream, perpendicular to banks whenever possible. • Design trenching at appropriate depth to prevent pipeline exposure due to natural scouring of the stream bed. Backfill the trench so that the first layer excavated is the last to be replaced. • Restore original streambed contours. • Consult the FMOP for offsets for loss of fish habitat upstream from the dam. • Ensure periphyton and benthic macroinvertebrate BMI community density and biomass stabilized by flushing flows. • Replace any existing culverts with correctly sized and installed closed-bottom culverts on non-fish-bearing streams as necessary. • Implement DFO's Measures to Avoid Causing Harm to Fish and Fish Habitat (DFO, 2013). • Minimize disturbance to riparian vegetation within a 15 m wide buffer strip around fish-bearing streams. • Prune or top trees growing near the transmission line cable, while leaving the stumps and root wads in place. • Stabilize, vegetate, and/or seed with native species as soon as possible after disturbance. • Implement the Fisheries Mitigation and Offsetting Plan (FMOP) as defined in authorizations issued by DFO under section 35(2)(b) of the <i>Fisheries Act</i> for the replacement of lost fish habitat in Davidson Creek and other watersheds. Report progress annually to DFO, BC MOE, and designated Aboriginal groups until requirements in authorizations are met. 	<p>Fish Habitat of the Mine Site Footprint: These losses of fish habitat will be offset with fish habitat restoration, enhancement, and creation. Two overwintering and rearing ponds will be constructed near the mid-reaches of Davidson Creek. Additional fish habitat will be created elsewhere in the LSA, the Regional Study Area (RSA), and in the larger region to offset this loss because the abovementioned ponds will not replace the entire amount of fish habitat that will be lost in Davidson Creek.</p> <p>This effect is assessed as Not Significant (Minor) for rainbow trout, largely because the lost habitat will be replaced by new fish habitat, as described by the FMOP. (There are no kokanee on the mine site.) The likelihood of this determination is high because the FMOP is based on proven concepts that have been used successfully in other offsetting plans for mines in BC. Confidence in this assessment is high.</p> <p>Changes in Stream Flows and Stream Habitat: Changes to the flow regime in Davidson Creek are a design feature of the Project and are certain to occur. The potential effects of these changes on rainbow trout and kokanee are assessed as Not Significant (Moderate) for construction, operations, closure, and post-closure. Likelihood of effect is high because it is certain that flows will change in Davidson Creek downstream of the Project. The assessment of non-significance was qualified as Moderate because effects are local, with low or medium magnitude and context, are short to long-term, and occur continuously.</p> <p>Due to the low magnitude of flow changes in lower Chedakuz Creek, no physical effects on fish habitat are anticipated. Changes in peak flows will be negligible (Section 5.3.2). Changes are certain to occur to the flow regime in Chedakuz Creek. These were assessed as Not Significant (Moderate) for construction, operations, closure, and post-closure phases.</p> <p>Changes to the flow regime in Creek 661 are certain to occur and are assessed as Not Significant (Moderate).</p> <p>Changes in minimum overwintering flows will be small (i.e., 1 to 2 litres per second) and represent a 13% reduction from baseline at post-closure. (This stream section provides overwintering habitat.) Due to the magnitude of effects, particularly at post-closure, the assessment conservatively assumes that all fish habitat downstream of the Project in Creek 505659 will be lost. The magnitude of effect is therefore high, and the effect is not reversible; 100% of the habitat in Creek 505659 is included in the FMOP (Appendix 5.1.2.6C) as a Project effect requiring offsetting measures.</p> <p>This approach is conservative because habitat in the stream section will remain and fish will continue to use it, despite changes in flow. Because 100% of the habitat that will be potentially lost is included in offsetting requirements for the Project and because proposed offsetting measures are based on proven concepts with high confidence in success, the potential effect is assessed as Not Significant.</p> <p>Changes to the flow regime in Creek 705 are certain to occur and are assessed as Not Significant (Moderate) for construction, operations, closure, and post-closure phases.</p> <p>Mercury Mobilization in Lake 01682LNRS: This potential residual effect is predicted to be Not Significant (Minor) because it is low in magnitude, local in extent, medium-term in duration, and reversible. The likelihood of this residual effect occurring is high, but confidence in this assessment is moderate. Although the phenomenon of mercury mobilization in new reservoirs is global, and has been observed in the hydroelectric reservoirs of Quebec, Manitoba, and BC, it remains difficult to reliably predict the increase in mercury concentrations (Azimuth, 2012).</p> <p>Changes in Water Temperature in Davidson Creek: This potential residual effect is predicted to be Not Significant (Minor) because it is low in magnitude and local in extent, even though it is chronic in duration and irreversible. The likelihood of temperature change in Davidson Creek as a result of Project activities is high, but confidence in this assessment is moderate because of limitations in the data and in the model used to predict water temperatures in all phases.</p> <p>Reduction in littoral fish habitat of Tatelkuz Lake: This residual effect is assessed as not significant (Negligible). The likelihood and confidence in this assessment is high because the overall change from baseline conditions does not exceed 5%.</p>

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<p>Physiography and Topography (C, O, CL, PC)</p>	<p>Alteration of baseline landscape Terrain stability and accelerated erosion</p>	<p>Physiography and Topography were selected as a Project VC because physiography and topography are valued by local communities; Aboriginal groups; and local, provincial, and federal. Potential direct or indirect effects for physiography and topography are carried forward in the effects assessment. This section lists the key mitigation used in the assessment process. A full list of mitigation used in the assessment is discussed in Section 5.4.2.</p> <ul style="list-style-type: none"> • A clearly defined, compact Project footprint will minimize the overall impact on terrain and landscape features. Specific key measures incorporated into the Project include: <ul style="list-style-type: none"> - Optimize facility location by grouping facilities in centralized areas and develop a functional Project footprint, especially for the TSF. - Use overburden and NAG/low ML waste rock from the open pit as construction material on the mine site. - Source aggregate for construction within areas of anticipated disturbance where possible during development of additional Project activities or components. - Use existing disturbance areas (access roads) as a foundation for expansion of new facilities. • Maintain exposed slopes to prevent accelerated erosion of soils and surficial materials until permanent vegetation is established. • Incorporate erosion control measures into Project design. These include stable slope gradients, contouring of the surface to discourage concentrated water flow, and engineering structures to reduce surface water velocities. As a secondary approach, implement sediment controls, including both temporary and permanent sediment control structures. Control erosion by revegetating open areas, including soil stockpiles, and applying erosion control mats and similar materials as required. • Continue to implement BMPs and industry standards for mining closure and reclamation activities into overall design, closure plan, and Environmental Management System (EMS). The RCP outlines the intended reclamation activities, accounts for allocation of materials, and identifies targets for reclamation. Adaptive management techniques may be implemented during the life of the Project to respond to reclamation requirements. 	<p>The ecological context of the alteration of baseline landscapes is rated Medium, as changes to physiography and topography directly influence the development of habitats and ecological niches through variability. The effect is considered local in geographic extent, and non-reversible. This Project effect on physiography and topography is rated as Not Significant (Moderate) for the residual effect.</p> <p>The residual effect for the alteration of baseline landscape was evaluated to be Not Significant (Moderate). Functionality of the landscape is expected to be consistent with baseline conditions, resulting in an overall direction of neutral. Nevertheless, the change in form and the addition of new landscape features (e.g., reject piles, TSF) is permanent, and the Not Significant (Moderate) rating is therefore assigned. This rating was applied as the geographic extent is local (within the LSA), medium in context and magnitude, non-reversible, and chronic in duration. For the post-closure phase, the rating is Not Significant (Moderate), because the main activity that could cause landscape alteration involves application of erosion control measures, which are site-specific, very small in extent, and readily mitigated.</p> <p>The residual effect for terrain stability and accelerated erosion is rated as Not Significant (Negligible), because effects will be site-specific, and mitigation measures are expected to be highly successful.</p>
<p>Surficial Geology and Soil Cover (C, O, CL, PC)</p>	<p>Disturbance and redistribution of surficial materials and soil</p>	<p>Surficial Geology and Soil Cover were selected as a Project VC because of the valued by local communities; Aboriginal groups; and local, provincial, and federal identified in the issues scoping process. This section lists the key mitigation used in the assessment process. A full list of mitigation used in the assessment is discussed in Section 5.4.3. Minimize disturbance to surficial deposits by minimizing the aerial extent of the Project footprint, utilizing areas of disturbance, and incorporating Project design features.</p> <ul style="list-style-type: none"> • Salvage the surface organic layers and top 50 centimetres (cm) of mineral soil where possible for use in reclamation of the site. • Salvage organic matter for use as a soil amendment. • Salvage as much reclamation material as possible throughout the Project footprint within areas defined as containing viable soil. • Collect and store surface materials in ways that will maximize their effectiveness for use during reclamation as a growth medium to the extent feasible. • Implement the Sediment and Erosion Control Plan SECP developed for the Project to mitigate the effects that erosion may have on other terrestrial VCs, as well as on the loss of surface materials needed for reclamation. • Continue to incorporate BMPs and industry standards for mining closure and reclamation activities into the Project's overall design, EMS, and RCP. The RCP outlines the intended reclamation activities, accounts for allocation of materials, and identifies targets for reclamation. • Implement adaptive management techniques during the life of the Project to respond to reclamation requirements. • Strip and stockpile topsoil for later use in reclamation as described in the RCP in the Application. Conduct progressive reclamation of the West Dump, TSF Site C and topsoil stockpiles when feasible as described in the RCP. 	<p>Direct effects of Project are expected to occur on the Surficial Geology and Soil Cover VC through the construction to decommissioning/closure phases of the Project. The salvage and storage of soil and overburden materials during the construction and operations phases, development of a compact Project footprint, and the eventual reclamation of the site will reduce the overall effect. The original distribution of baseline surficial materials and soil types will not be re-established; however, upon reclamation, a functional and equivalent landscape will be developed to support the reclamation goals. The anticipated significance of those residual effects is rated as Not Significant (Negligible).</p>

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<p>Soil Quality (C, O, CL, PC)</p>	<p>Soil contamination Terrain stability and accelerated erosion Dust deposition Soil disturbance Soil redistribution</p>	<p>Issues identification and scoping identified soil quality as a VC. Five key issues relating to soil quality: soil contamination, terrain stability and accelerated erosion, dust deposition, soil disturbance, and soil redistribution were also identified by local communities; Aboriginal groups; and local, provincial, and federal agencies. This section lists the key mitigation used in the assessment process. A full list of mitigation used in the assessment is discussed in Section 5.4.4. Reduce or eliminate the effect of soil contamination by the implementation of some interrelated EMPs.</p> <ul style="list-style-type: none"> • Implement mitigation measures discussed for the Physiography and Topography VC, including footprint minimization and techniques to prevent or minimize erosion. • Implement dust suppression techniques, such as watering, for dust control. • Minimize disturbances through optimization of the Project footprint and design features and through conformance to the Landscape, Soils and Vegetation Management and Restoration Plan LSVMRP. These considerations are incorporated into the Project design. • Wherever feasible, collect the upper 50 cm of soil and overburden prior to the installation of site facilities and store in a manner to prevent erosional loss or other degradation. • Implement monitoring programs to verify that the redistributed soil functions as a growth medium and to identify any persistent quality issues and ameliorative measures. • Salvage organic material, where available, as part of the overall reclamation material salvage. Where needed, add fertilizers to the reclaimed site to improve the nutrient content of the soil to support vegetation regrowth. At the time of closure, review fertilizer and seeding techniques to ensure adherence to applicable guidelines. • Minimize vehicle and heavy equipment use on reclaimed lands. • Minimize traffic to reduce potential for spills and leaks. • Rip compacted soils to alleviate compaction issues during reclamation activities. • Continue to implement BMPs and industry standards for mining closure and reclamation activities and incorporate these practices into the Project's overall design and EMP. • Redistribute, grade, and contour salvaged reclamation material as part of reclamation activities. Commence progressive reclamation during the operations phase to reclaim those facilities no longer required as part of the Project. 	<p>The implementation of the RCP, along with the other identified mitigation measures, will effectively limit the potential for residual effects related to the Soil Quality VC. All Project effects related to soil quality will either be directly addressed at the time of occurrence or addressed within the final closure plan of the Project. Mitigation measures will minimize the overall effect that the redistribution of surficial materials will have on the landscape. Therefore, upon completion of mitigation measures, residual effects for the Soil Quality VC are considered to be Not Significant (Negligible).</p>

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<p>Ecosystem Composition (PC)</p>	<p>Ecosystem loss, dust deposition, nitrogen deposition, and spread of invasive species</p>	<p>The Ecosystem Composition (VC) and five corresponding indicators were selected for inclusion taking into consideration the baseline study findings, conservation status, and inputs from local stakeholders, Aboriginal groups, government agencies, and regulators. Indicator selection was based on ecosystems that have intrinsic ecological or social value, are representative of overall ecosystem conditions, and are sensitive to Project activities. Potential effects were assessed qualitatively and quantitatively. Mitigation measures to reduce or eliminate potential effects of the Project on ecosystem composition were identified for each phase of the Project. These include mitigation measures already included in the Project Description and EMPs. This section lists the key mitigation used in the assessment process. A full list of mitigation used in the assessment is discussed in Section 5.4.5, Section 12 and Section 2.6.</p> <ul style="list-style-type: none"> • Minimize the mine footprint: the mine footprint design has taken into account minimizing the mine footprint where possible, and thus areas to be cleared of vegetation. • Minimize the clearing of linear ROWs and access: the planning and design phase of linear features has taken into account ways to minimize the area to be cleared for each ROW. For example, the use of existing roads, clearings, and disturbance areas for constructing new or upgraded ROWs and access roads. • Minimize areas of disturbance outside or adjacent to areas targeted for clearing (i.e. movement of machinery and equipment, or extent of grubbing and stripping). • In areas requiring clearing only (e.g. the transmission line), retain the topsoil and vegetation root mat whenever and wherever possible. • Dust effects will be mitigated using a combination of administrative, design, and emission control strategies: refer to Air Quality, (Section 5.2.4). • Reduce vehicle emissions through enforcing speed limits, fuel selection, using vehicles that meet emission standards, and regular vehicle and equipment maintenance. • Ensure the incinerator and other emissions sources meet all relevant Canadian emission requirements. • Limit vehicle and equipment idling. • Prevent the initial introduction of invasive plants. • Minimize all soil disturbances (roads and machinery activity). • Reclaiming re-establishing appropriate vegetation on disturbed areas as soon as possible. • Use weed-free seed for reclamation, and weed-free hay bales for erosion control. • Clean earth moving vehicles prior to entering the mine site area. • Early Detection and Rapid Response: determine the priority invasive plant species within the operating area and maintain awareness of species new to the area. • Ensuring environmental monitors are able to identify species of concern. • Include well-demarcated no-work zones and management work zones (with restrictions such as no heavy machinery etc.) and setbacks in accordance with <i>Forest and Range Practices Act</i> (Government of BC, 2002b). BMPs for linear Project components, such as the transmission line, mitigating loss and degradation of riparian areas. • Implement construction BMPs to mitigate for altered hydrology (e.g., installing appropriate culverts where required and maintaining functioning water tables and drainage throughout all phases from construction to post-closure). • Follow the Approved Work Practices for Managing Riparian Vegetation (BC Hydro, 2003) for transmission line construction. • Implement BMPs designed by BC Timber Sales (Zielke et al., 2010) to minimize windthrow in the forested areas of the road alignment. Minimizing windthrow includes appropriately designing boundaries, conducting edge stabilization treatments (e.g. topping, and pruning and feathering edges), and follow-up monitoring to address any necessary adaptive management techniques. • Implementing reforestation measures described in the RCP. These should include promptly reforesting the reclaimed mine site with tree species appropriate for site conditions and traditional use plant species habitat in reclamation prescriptions. • Strip and stockpile topsoil for later use in reclamation as described in the RCP in the Application. Conduct progressive reclamation of the West Dump, TSF Site C and topsoil stockpiles when feasible as described in the RCP. 	<p>Assessment of the significance of potential residual effects of ecosystem loss has the probability of occurrence and degree of certainty is high, as the effect of clearing is well known. The significance of the residual effect is rated Not Significant (Moderate), because the site will remain cleared until the end of operations, and reclamation success is uncertain. The level of confidence is moderate.</p> <p>Nitrogen deposition will have the ecological context rated as low, as there is a high resilience of native ecosystems to the effects of N deposition. The magnitude is low, and the geographic extent is local. The effect is still considered long-term, as it is uncertain how long excess nitrogen will persist in affected areas. The effect of nitrogen deposition is expected to be reversible over time. Nitrogen deposition will cease after operations. The likelihood of occurrence is moderate and the confidence is moderate, as the amount and distribution of nitrogen deposited is based on modelling. The significance determination is rated as Not Significant (Minor). The level of confidence is moderate.</p> <p>Assessment of the significance of the spread of invasive plants has the ecological context rated as low because there is overlap with plant or ecosystems at risk (Section 5.4.6.3.6.3). The magnitude is low because less than 10% of the area is affect. The geographic extent is regional because invasive plants are known to occur in the RSA. The duration is long-term given the potential for spread of invasive plants will continue well into closure until native vegetation is restored. With the implementation of mitigation measures the spread of invasive plants is reversible. The significance determination is Not Significant (Minor). The level of confidence for this determination is moderate.</p>

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<p>Plant Species and Ecosystems at Risk (PC)</p>	<p>Ecosystem loss; Dust deposition; Nitrogen deposition; Spread of invasive species; and Whitebark pine regeneration.</p>	<p>The Plant Species and Ecosystems at Risk (VC) and indicators were selected for inclusion taking into consideration the baseline study findings, conservation status, and inputs from local stakeholders, Aboriginal groups, government agencies, and regulators. Indicator selection was based on ecosystems that have intrinsic ecological or social value, are representative of overall ecosystem condition, and are sensitive to the Project activities. Potential effects were assessed qualitatively and quantitatively</p> <p>Mitigation proposed for whitebark pine is a blend of approaches aimed at offsetting the loss of trees at the site while supporting provincial initiatives to support the species. This takes into account the conservation status of the tree as well as its biology for slow maturation and its inability to compete with other tree species as it is a relatively shade-intolerant tree. Threats to whitebark pine extend beyond project related effects including blister rust, climate change and mountain pine beetle. Therefore mitigation will include a range of strategies including avoiding loss through project design, replanting, progressive reclamation and supporting research. Further discussion with regulatory agencies is anticipated to refine the research components to ensure the maximum benefit is derived from the work.</p> <p>Commitments include: increasing awareness, population inventory, rust screening, cone collection, reclamation trials, off-site transplanting and stand enhancement. Monitoring will be on-going through the life of the mine. This section lists the key mitigation used in the assessment process. A full list of mitigation used in the assessment is discussed in Section 5.4.6.</p> <ul style="list-style-type: none"> • For workers involved with project components and activities likely to have potential for effecting white bark pine (e.g., land clearing and waste dump construction) a specific orientation will be conducted. The orientation program will support mitigation actions to identify and protect/transplant individual trees during clearing, as well as ensure awareness of the importance of other mitigation actions as they are implemented (e.g., reclamation trials). • During construction, an inventory following standards identified by the whitebark pine committee will be conducted on the mine site prior to overburden stripping. Areas of potential non-direct effects (e.g., dust deposition) and areas where other mitigation might be applied (e.g., cone collection, transplanting or stand enhancement) will also be identified and inventoried. The inventory will include transects to assess tree health and identify the level of infection by blister rust. The white bark pine population inventory results will include estimates of rust infection rates in white bark pine near Mt. Davidson. On site inventories are expected to be updated every 3 -5 years throughout mine operations. • Commitment to supporting the research into other factors affecting the viability of whitebark pine during the Project's construction and operations phases. There are a number of approaches to rust screening to obtain an effective and applicable screening program aligned with provincial priorities. New Gold will work with regulatory agencies and First Nations in supporting research initiatives related to rust screening. • Early detection and rapid response (EDRR)—determine the priority invasive plant species within the operating area, and maintain awareness of species new to the area. • Implement the ISMP (Section 12) to control any invasive plant colonizing the mine site Project component. • Monitor and apply appropriate control measures as described in the ISMP (Section 12). • Reducing vehicle emissions by enforcing speed limits, by fuel selection, use of vehicles that meet emission standards, and vehicle and equipment maintenance. • Ensuring the incinerator and other sources of emissions meet all relevant Canadian emission requirements. • Limit vehicle and equipment idling. • Minimize the extent of grubbing, stripping, and the removal of shrubs and herbaceous species within the mine site area, and along Project-related linear features. • In areas requiring clearing only (e.g., the transmission line), retain the humus layer and vegetation root mat whenever and wherever possible. • Incorporation of mine-related landforms into the landscape and re-establishment of natural landforms to become baseline ecosystems in the remaining sites. • Mine-related landforms (i.e., open pit, tailing storage facilities (TSF), waste rock dumps) will be reclaimed into rocky slopes, slopes with upland beach, wetlands, and permanent ponds. • Natural landforms will have characteristics and relief similar to pre-mining conditions and following reclamation and sufficient time are expected to return to conditions similar to baseline. • Where feasible decommission and reclaim any roads. • Salvage topsoil and store for use during the closure phase. • Re-plant with native species with value for wildlife, traditional use, and species at risk, specifically whitebark pine for reclamation. • Develop and submit Whitebark Pine Management Plan to BC MOE and designated Aboriginal groups prior to clearing in whitebark pine habitat. Implement the Whitebark Pine Management Plan and report process at least every three years to the BC MOE and designated Aboriginal groups. 	<p>The geographic extent Ecosystem Loss is local, as effects are limited to the LSA. The duration is chronic, as it is uncertain how long it will take to restore whitebark pine populations, but most definitely greater than 35 years until whitebark pine trees become cone producing. The frequency of loss will be once because construction clearing occurs on one occasion. The probability of occurrence and degree of certainty are ranked as moderate. Overall the effect is ranked as Not Significant (Moderate) with a moderate level of confidence given the unknown related to transplanting whitebark pine trees and reclaiming the portion of the population lost.</p> <p>The ecological context of Nitrogen deposition is high, as residual N in the soil may continue to impact whitebark pine or its habitat. The magnitude is low and geographic scale local. The duration of the effect is long-term, lasting from construction through operations to closure and reclamation, but is expected to be reversible over time with the cessation of N deposition. The likelihood is moderate as the persistence of N in ecosystems is well documented and the confidence is medium. Significance is Minor because the effect may remain through Post-closure. The confidence level is medium.</p> <p>The ecological context of Whitebark Pine Regeneration at Post-closure is high because the Project may result in long-term to permanent effects on a SARA-listed species. The magnitude is medium because there is an 11% reduction of the original population. Geographic extent is local as effects are likely limited to the local whitebark pine population. The duration is chronic, as it will take up to 80 years to restore seed-producing whitebark pine populations. The reversibility is highly dependent on reclamation with rust-resistant trees, but is considered reversible. The frequency of the loss will be once. The probability of occurrence and degree of certainty are ranked as moderate. The significance of the residual effect is rated Not Significant (Moderate) because successful reclamation will likely foster Clark's nutcracker populations. The level of confidence is low, as the response of Clark's nutcrackers to reduced whitebark pine numbers is likely negative (Barringer, 2012).</p>

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<p>Amphibians (C, O, CL, PC)</p>	<p>Habitat loss and alteration Change in amphibian populations Change in amphibian dynamics Mortality risk Change in amphibian movement patterns Change in amphibian health</p>	<p>The issue scoping process identified amphibians as an item of concern. Western toad was selected as an indicator for amphibian health due to its listing as a <i>SARA</i> species of special concern and its link to wetland habitats and terrestrial habitats required by amphibians. Below lists the key mitigation measures used in the environmental assessment. A full list of mitigation used in the assessment is discussed in Section 5.4.7.</p> <ul style="list-style-type: none"> • Mitigation for loss and degradation of adjacent riparian wildlife habitats will occur by designating well demarcated no-work zones, management work zones (with restrictions, such as no heavy machinery), and setbacks in accordance with the <i>Forest and Range Practices Act</i> BMPs (BC MFLNRO, 2014) where feasible. • Restricting the clearing of terrestrial amphibian breeding habitats to periods outside the amphibian breeding season (1 May to 31 August) or conduct pre-construction and pre-clearing surveys and amphibian salvage if during the breeding season. • Clearing of transmission line ROWs, reclamation will provide suitable habitat for amphibians. • When possible, road design using existing roads and cleared areas and proposed access roads and transmission lines and poles located away from wetland areas and riparian areas or spanning wetlands. • Applying erosion and sediment control measures. • Modifying the timing of wetland draining where feasible would allow amphibians to move to other wetlands, otherwise conduct pre-construction and pre-clearing surveys and amphibian salvage if during the breeding season. • Implementing progressive reclamation using local native vegetation wherever possible, or appropriate commercially grown, weed-free native species (LSVMRP, ISMP, RCP and WLMP). • Implementing invasive plant management techniques as defined in the ISMP; including developing and implementing detailed construction and operational plans of invasive plant prevention and detection strategies, and an action protocol if invasive plants are detected. Management techniques will include annual monitoring for invasive plants. Based on current data from baseline reports, the invasive species identified within the LSA do not pose a risk to amphibians within the LSA or RSA. • To improve visibility, dust on the mine access road and site roads will be controlled during dry periods as needed, as per the Air Quality and Emissions Management Plan (AQEMP) (Section 12.2.1.18.4.9). • Posting signs warning drivers of the possibility of amphibian crossings in areas of high wildlife activity, such as potential toad crossings near breeding sites. If amphibian mortality on roadways is identified along the mine access road or the FSR, adaptive management measures will be implemented. • Conducting pre-clearing and pre-construction surveys and salvage of amphibians. • Selecting revegetation species that minimize attraction of wildlife to roadsides. • Implementing adaptive management, as described in the WLMP. • Following BMPs as described in the WLMP (BC MFLNRO, 2014) to reduce potential dust contamination of amphibian habitats. • Ensuring surface water quality parameter levels as described in the ARMP. 	<p>Mine Site. There is a low likelihood of a residual habitat loss effect occurring, and it is with high confidence that it will be a Not Significant (Negligible) residual effect based on magnitude, geographical extent, frequency, and reversibility of the effect. Loss and degradation of moderate to high value amphibian habitat will occur during the construction phase and these effects will be evident through the operations phase.</p> <p>Proposed Access Road and Kluskus FSR. There is a low likelihood of a residual habitat effect occurring; however, it is with high confidence that it will be a Not Significant (Negligible) residual effect based on the magnitude, geographical extent, frequency, and reversibility of the effect. Loss and degradation of amphibian habitat and potential for loss due to mortality will occur along roads associated with the Project. The loss and degradation of amphibian habitat will occur during the construction phase and these adverse effects will be evident through the operations phase.</p> <p>Airstrip, Transmission Line, and Freshwater Supply Pipeline. There is a low likelihood of a residual effect occurring, and it is with high confidence that it will be a Not Significant (Negligible) residual effect based on the magnitude, geographical extent, frequency, and reversibility of the effect. Loss and alteration of amphibian habitat will occur within the airstrip, transmission line, and freshwater supply pipeline areas and these adverse effects will be evident over short-term duration.</p> <p>Project Area. There is a low likelihood of a residual habitat loss effect occurring. It is with high confidence that it will be a Not Significant (Negligible) residual effect based on the magnitude, geographical extent, frequency, and reversibility of the effect. Loss and degradation of moderate to high value amphibian habitat will occur during the construction phase, primarily in the mine site area, and these effects will be evident through operations.</p>

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<p>Waterbirds (C, O, CL, PC)</p>	<p>Habitat loss and alteration Change in waterbird population dynamics mortality risk Change in water bird movement patterns Change in water bird health</p>	<p>The issue scoping process identified waterbirds as an item of concern. Below is a list of the key mitigation measures used in the environmental assessment. A full list of mitigation used in the assessment is discussed in Section 5.4.8.</p> <ul style="list-style-type: none"> • Mitigating for loss and degradation of adjacent riparian wildlife habitats such as well demarcated no-work zones and management work zones (with restrictions, such as no heavy machinery, etc.) and setbacks in accordance with the <i>Forest and Range Practices Act</i> BMPs (BC MFLNRO, 2014) where feasible. • Applying erosion and sediment control measures. • Restoring disturbed habitats at mine closure or development of habitats capable of supporting waterbirds as defined in the RCP and WLMP. • Implementing pre-clearing nest surveys of areas to be cleared during the bird breeding seasons (March to August) to identify any nests or listed species to allow avoidance or adaptive management such as delayed clearing until after the least-risk window for any species found. • Implementing invasive plant management techniques as defined in the ISMP. • Minimizing sensory disturbance due to noise and light to areas adjacent to the mine area and airstrip, as stated in the Noise and Vibration Mitigation Measures. • Posting speed limits along roads for Project related vehicles, as well as implementation of BMPs of road surface maintenance. • Water quality monitoring and adaptive management (Decommissioning and Closure Activities, RCP, and Follow-up Program). • Water quality monitoring and adaptive management (Decommissioning and Closure Activities, RCP, and Follow-up Program). • Restoring disturbed habitats at mine closure or development of habitats capable of supporting waterbirds as defined in the RCP). • Mitigating for loss and degradation of adjacent riparian wildlife habitats such as well demarcated no-work zones and management work zones (with restrictions, such as no heavy machinery, etc.) and setbacks in accordance with the <i>Forest and Range Practices Act</i> BMPs (BC MFLNRO, 2014) where feasible. • Implementing invasive plant management techniques as defined in the ISMP. • Minimizing sensory disturbance due to noise and light to areas adjacent to the mine area and airstrip, as stated in the Noise and Vibration Mitigation Measures. 	<p>Mine Site. The residual effects of habitat loss are rated as Not Significant (Minor) with high confidence, due to the magnitude, geographical extent, reversibility, frequency, and likelihood of an effect occurring. Loss and degradation of a maximum of 6 ha of water bird habitat will occur during the construction phase, and these effects will be evident through the operations and closure phases. Wetland compensation works will begin in early operations.</p> <p>Mine Site. The residual effects for mortality risk are rated as Not Significant (Negligible) with high confidence due to the negligible magnitude and site-specific and intermittent nature of the risk within the mine site. Early development of wetland compensation areas will reduce risk of additional mortality related to habitat loss.</p> <p>Mine Site. The residual effects for changes related to predator-prey dynamics are rated as Not Significant (Negligible) with high confidence due to the negligible magnitude and site-specific and intermittent nature of the risk within the mine site. Traffic and access control, as well as early compensation works and mitigation measures, will mitigate any risk of additional mortality.</p> <p>Access Road and Kluskus FSR. The residual effects of habitat loss are rated as Not Significant (Minor) with high confidence, due to the magnitude, geographical extent, resilience, frequency, and likelihood of an effect occurring.</p> <p>Access Road and Kluskus FSR. The residual effects for changes related to predator-prey dynamics are rated as Not Significant (Negligible) with high confidence due to the negligible magnitude, site-specific and intermittent nature of the risk, and the site-specific and limited increase in access above baseline conditions. Traffic and access management as well as early wetland compensation works will mitigate risk of additional mortality.</p> <p>Airstrip, Transmission Line, and Freshwater Supply Pipeline. The residual effects for habitat loss are rated as Not Significant (Minor) with high confidence, due to the magnitude, geographical extent, frequency, reversibility, and likelihood of an effect occurring.</p> <p>Airstrip, Transmission Line, and Freshwater Supply Pipeline. As with the mine site, the residual effects for mortality risk are rated as Not Significant (Negligible) with high confidence due to the negligible magnitude, site-specific and intermittent nature of the risk within the airstrip, transmission line, and freshwater supply pipeline. Early compensation works will reduce risk of additional mortality.</p> <p>Airstrip, Transmission Line, and Freshwater Supply Pipeline. The residual effects for changes related to predator-prey dynamics are rated as Not Significant (Negligible) with high confidence due to the negligible magnitude, and site-specific and intermittent nature of the risk within the airstrip, transmission line, and freshwater supply pipeline. Access control as well as early compensation works and mitigation measures will mitigate any risk of additional mortality.</p> <p>Project Area. The residual effects for changes related to mortality risk and changes in predator-prey dynamics are rated as Not Significant (Negligible) with high confidence due to the negligible magnitude and site-specific and intermittent nature of the risk within the Project footprint. Access control as well as early compensation works and mitigation measures will mitigate any risk of additional mortality.</p>

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<p>Forest and Grassland Birds (C, O, CL, PC)</p>	<p>Habitat loss and alteration Change in forest and grassland bird populations Change in forest and grassland bird dynamics Mortality risk Change in forest and grassland bird movement patterns Change in forest and grassland bird health</p>	<p>The issue scoping process identified Forest and Grassland Birds as an area of concern. Forest and grassland birds are a well-known group of birds with respect to taxonomy, ecology, biology, and conservation status and include songbirds, raptors, and upland game birds. They are commonly grouped together as forest and grassland birds due to shared habitat requirements and predator-prey relationships. The olive-sided flycatcher and red-tailed hawk (<i>Buteo jamaicensis</i>) were selected as indicators for forest and grassland birds due to their representative habitat found within the study areas. The conservation of these two species and associated protective actions help preserve other forest and grassland birds in the Project area, including several other species of conservation concern that use similar habitat. Habitat suitability mapping for a third species selected as an indicator, Clark's nutcracker (<i>Nucifraga columbiana</i>), was completed due to the limited habitat availability of whitebark pine in the Project area. In the area of Mount Davidson, whitebark pine is the only coniferous tree species from which Clark's nutcracker harvests cones and caches seeds for winter use (Tomback, 1998). Below lists the key mitigation measures used in the environmental assessment. A full list of mitigation used in the assessment is discussed in Section 5.4.9.</p> <ul style="list-style-type: none"> • Mitigation for loss and degradation of adjacent riparian forest bird habitats by designating well demarcated no-work zones and management work zones (with restrictions, such as no heavy machinery, etc.) and setbacks in accordance with the <i>Forest and Range Practices Act</i> BMPs (BC MFLNRO, 2014) where feasible. • Restoring disturbed habitats at mine closure or development of habitats capable of supporting forest and grassland birds as defined in the Reclamation and Closure Plan (Section 2.6) and Wildlife Management Plan (Section 12.2.1.18.4.6). • Minimizing sensory disturbance due to noise and light to areas adjacent to the mine area and airstrip, as stated in the Noise and Vibration Mitigation Measures (Section 5.2.2). • Implementing pre-clearing nest tree surveys of areas to be cleared during the bird breeding seasons (February to August) to identify any nests or listed species to allow avoidance or adaptive management such as delayed clearing until after the least-risk window for any species found or pre-clearing surveys and contacting regulators if exceptions arise. • Restoring disturbed habitats at mine closure or development of habitats capable of supporting a diversity of wildlife species, using local native vegetation wherever possible or appropriate such as replanting conifer forest and especially whitebark pine in suitable sites. • Managing waste from the Project to prevent wildlife from accessing food and waste from mine camp, roads, and airstrip (Industrial and Domestic Waste Management Plan (IDWMP) (Section 12.2.1.18.4.11). • To improve air quality and visibility, dust generation on the mine access road and on-site roads will be mitigated as per the Air Quality and Emissions Management Plan (AQEMP) (Section 12.2.1.18.4.9). • Implementing invasive plant management techniques as defined in the Invasive Species Management Plan (ISMP) (Section 12.2.1.15.5). • Applying erosion and sediment control measures (Sediment and Erosion Control Plan) (SECP) (Section 12.2.1.18.4.1). • Installing appropriate culverts where required and maintaining water tables and drainage as per the Wetlands Management Plan (WMP) (Section 12.2.1.18.4.3). • Follow-up monitoring is proposed for the Clark's nutcracker to confirm its presence in the Project Area. Details of the follow-up monitoring proposed are presented in Section 13. 	<p>Mine Site. The residual effects of habitat loss and degradation of forest and grassland bird habitat (not including Clark's nutcracker) are rated as Not Significant (Minor) with high confidence, due to the magnitude, geographical extent, frequency, and reversibility of the effect occurring. Loss will occur during the construction phase, and these effects will be evident through the closure and post-closure phases and are rated chronic in duration.</p> <p>Mine Site. For Clark's nutcracker, the residual effects of habitat loss are rated as Not Significant (Moderate) with low confidence, due to the magnitude, geographical extent, frequency, and reversibility. The effects will occur during the construction phase and will be evident in the closure and post-closure phases.</p> <p>Access Road and Kluskus FSR. The residual effects of habitat loss for forest and grassland birds (not including Clark's nutcracker) are rated as Not Significant (Minor) with high confidence, due to the magnitude, geographical extent, frequency, and reversibility of the effect occurring.</p> <p>Access Road and Kluskus FSR. No whitebark pine ecosystems are found within the LSA near the proposed access roads and the Kluskus FSR; therefore, it is with high confidence that the residual effect is rated as Not Significant (Negligible) for Clark's nutcracker.</p> <p>Airstrip, Transmission Line, and Freshwater Supply Pipeline. The residual effects of habitat loss for forest and grassland birds (not including Clark's nutcracker) are rated as Not Significant (Minor) with high confidence, due to the magnitude, geographical extent, frequency, and reversibility of the effect occurring.</p> <p>Airstrip, Transmission Line, and Freshwater Supply Pipeline. No whitebark pine ecosystems are found within the LSAs of the proposed access roads and the Kluskus FSR; therefore, the residual effect is rated as Not Significant (Negligible) with high confidence for Clark's nutcracker.</p>

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<p>Moose (C, O, CL, PC)</p>	<p>Habitat loss and alteration Change in moose population dynamics Mortality risk Change in moose movement patterns Change in moose health</p>	<p>The issue scoping process identified moose as an item of concern. Moose were selected as a representative ungulate VC because of their ecological and social importance. Below lists the key mitigation measures used in the environmental assessment. A full list of mitigation used in the assessment is discussed in Section 5.4.10.</p> <ul style="list-style-type: none"> • Minimizing ground disturbance and damage to vegetation in areas adjacent to footprints by flagging or fencing of sensitive habitats thereby reducing potential loss of moose habitat as described in the Wildlife Management Plan (Section 12.2.1.18.4.6). • Applying soil erosion and sediment control measures as described in the Sediment and Erosion Control Plan (Section 12.2.1.18.4.1). • Implementing dust control measures as defined in the Air Quality and Emissions Management Plan (Section 12.2.1.18.4.9), including watering roads and avoiding use of road salts for dust control during summer and winter to reduce attractants to wildlife that might draw moose close to roads. • Restoring disturbed habitats at mine closure or development of habitats capable of supporting moose as defined in the Reclamation and Closure Plan (Section 2.6) and Landscape, Soils and Vegetation Management and Restoration Plan (Section 12.2.1.18.4.4). • Implementing a Wetlands Management Plan (Section 12.2.1.18.4.3) and a Wetlands Compensation Plan (Appendix 5.3.7A) as defined in other sections of the Application including the creation of offsetting habitat. • Implementing invasive plant management techniques as defined in the Invasive Species Management Plan (Section 12.2.1.18.4.5); including developing and implementing detailed construction and operational plans of invasive plant prevention and detection strategies, and an action protocol if invasive plants are detected (management techniques will include annual monitoring for invasive plants, although recognizing that current data from baseline reports on invasive species identified within the LSA do not pose a risk to moose within the LSA or RSA). • Minimizing sensory disturbance due to noise adjacent to the mine area and airstrip, as stated in the Noise and Vibration Mitigation Measures (Section 5.2.2.3). • Posting speed limits along roads for Project related vehicles, as well as implementation of BMPs of road surface maintenance. • Implementing water quality monitoring and adaptive management (Compliance Monitoring and Follow-up Program (Section 13)). • Selecting revegetation species that minimize attraction of wildlife to roadsides to reduce potential vehicle collisions and predation of many species. • Implementing a no hunting and no firearms policy, as stated in the Wildlife Management Plan (Section 12.2.1.18.4.6). • Providing breaks in snow banks along the access road to allow wildlife escape (Wildlife Management Plan (Section 12.2.1.18.4.6)). • Removing carrion along the road to reduce the risk of attractants that may bring predators into moose habitat, as described in the Wildlife Management Plan (Section 12.2.1.18.4.6). • Posting road signs warning drivers of speed limits and of the possibility of moose sensitive areas such as migration routes and seasonal feeding areas. • Reporting and documenting wildlife observations and incidents/accidents along access roads as described in the Wildlife Management Plan (Section 12.2.1.18.4.6). • Restricting and controlling road access to ensure no unauthorized traffic use of the road. All traffic flow on the FSR will be monitored and controlled via radio communications. Reporting observations of wildlife along the road to environmental staff. • Implementing adaptive management (Wildlife Management Plan) (Section 12.2.1.18.4.6). • Including moose awareness information into regular safety and environmental inductions performed by the mine. • Implementing BMPs for road surface maintenance to allow good vehicle line of sight and control to help reduce potential collisions with moose. • Selecting revegetation species that minimize attraction of wildlife to roadsides to reduce potential vehicle collisions, as well as help reduce changes in prey-predator densities and distribution. • Clearing road ROWs of brush to assist in reducing foraging attractants. • Implementing adaptive management, as described in the Wildlife Management Plan. • Minimizing sensory disturbance due to noise and light at the mine area and airstrip as stated in the Noise and Vibration Mitigation Measures (Section 5.2.2.3). • Removing carrion along the road to reduce the risk of attracting predator species, as described in the Wildlife Management Plan (Section 12.2.1.4.18.6). • Implementing adaptive management to manage alternate prey habitat, wolf access or other similar measures, as described in the Wildlife Management Plan (Section 12.2.1.4.18.6). 	<p>Mine Site. The residual effects of habitat loss are rated as Not Significant (Negligible) with high confidence, due to the magnitude, geographical extent, frequency, and reversibility of the effect occurring. The loss and alteration of moose habitat will occur once during the construction phase and these adverse effects will be evident through the post-closure phase.</p> <p>Mine Site. The residual effects of mortality are rated as Not Significant (Minor) with moderate confidence, due to the magnitude, geographical extent, frequency, and reversibility of the effect occurring. Changes in mortality will occur intermittently from the construction phase through the closure phase.</p> <p>Mine Site. The residual effects of a change in movement patterns are rated as Not Significant (Minor) with high confidence, due to the magnitude, geographical extent, frequency, and reversibility of the effect occurring. Changes in movement patterns will occur intermittently from the construction phase through the closure phase.</p> <p>Mine Site. The residual effects of a change in population dynamics are rated as Not Significant (Minor) with high confidence, due to the magnitude, geographical extent, frequency, and reversibility of the effect occurring. Changes in population dynamics will occur intermittently from the construction phase through the closure phase.</p> <p>Access Road and Kluskus FSR. The residual effects of habitat loss are rated as Not Significant (Negligible) with high confidence, due to the magnitude, geographical extent, frequency, and reversibility of the effect occurring. The loss and alteration of moose habitat will occur once during the construction phase and these adverse effects will be evident through the post-closure phase.</p> <p>Access Road and Kluskus FSR. The residual effects of a change in mortality are rated as Not Significant (Minor) with high confidence, due to the magnitude, geographical extent, frequency, and reversibility of the effect occurring. Changes in mortality will occur intermittently from the construction phase through the closure phase.</p> <p>Access Road and Kluskus FSR. The residual effects of a change in movement patterns are rated as Not Significant (Minor) with high confidence, due to the magnitude, geographical extent, frequency, and reversibility of the effect occurring. Changes in movement patterns will occur intermittently from the construction phase through the closure phase.</p> <p>Access Road and Kluskus FSR. The residual effects of a change in population dynamics are rated as Not Significant (Minor) with high confidence, due to the magnitude, geographical extent, frequency, and reversibility of the effect occurring. Changes in population dynamics will occur intermittently from the construction phase through the closure phase.</p> <p>Airstrip, Transmission Line, and Freshwater Supply Pipeline. The residual effects of habitat loss are rated as Not Significant (Negligible) with high confidence, due to the magnitude, geographical extent, frequency, and reversibility of the effect occurring. The loss and alteration of moose habitat will occur once during the construction phase and these adverse effects will be evident through the post-closure phase.</p> <p>Airstrip, Transmission Line, and Freshwater Supply Pipeline. The residual effects of a change in mortality are rated as Not Significant (Minor) with high confidence, due to the magnitude, geographical extent, frequency, and reversibility of the effect occurring. Changes in mortality will occur intermittently from the construction phase through the closure phase.</p> <p>Airstrip, Transmission Line, and Freshwater Supply Pipeline. The residual effects of a change in movement patterns are rated as Not Significant (Minor) with high confidence, due to the magnitude, geographical extent, frequency, and reversibility of the effect occurring. Changes in movement patterns will occur intermittently from the construction phase through the closure phase.</p> <p>Airstrip, Transmission Line, and Freshwater Supply Pipeline. The residual effects of a change in population dynamics are rated as Not Significant (Minor) with high confidence, due to the magnitude, geographical extent, frequency, and reversibility of the effect occurring. Changes in population dynamics will occur intermittently from the construction phase through the closure phase.</p> <p>Project Area. Changes in availability of moose habitat, moose mortality, movement patterns, and wildlife population dynamics will occur from Project construction to closure. Mortality risk may increase along newly cleared sections of the Project components, in particular areas along the access roads, Kluskus FSR, and transmission line. These effects will be evident over the long term and will occur intermittently, resulting in a Not Significant (Minor) rating.</p> <p>Project Area. Changes in movement patterns may result from changes in habitat availability and sensory disturbance. Sensory disturbance will have a higher likelihood of occurring at the mine site, access road, and Kluskus FSR, and changes in habitat availability will potentially occur at all</p>
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			<p>Project components. These effects will be evident over the long term and will occur intermittently, resulting in a Not Significant (Minor) rating.</p> <p>Project Area. Changes in wildlife population dynamics may result from changes in habitat availability and increased access for predators. Changes in habitat availability will potentially occur at all Project components and these may result in changes to the local moose individuals. Clearing vegetation and creating linear corridors may allow for easier predator access to areas of moose habitat; in turn, increases in predator access may result in an increase in predator risk for moose. These effects will be evident over the long term and will occur intermittently, resulting in a Not Significant (Minor) rating.</p>

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<p>Caribou (C, O, CL, PC)</p>	<p>Habitat loss and alteration Change in caribou population Mortality risk Changes in caribou movement patterns, including possible sensory disturbance and consequent avoidance of habitats Changes in caribou health, including possible chemical hazards and attractants for wildlife</p>	<p>The issue scoping process identified caribou as a wildlife species of concern. Caribou was selected as a VC because of declining subpopulations in the region as well as caribou's sensitivity to disturbance, wide-ranging distribution, and cultural and management status to First Nations and other BC residents. The Southern Mountain population of caribou (<i>Rangifer tarandus caribou</i>) is protected under SARA (Government of Canada, 2002), and the Caribou Recovery Strategy (EC, 2014) identifies critical habitat necessary to achieve the population and distribution objectives for the recovery and survival of this species. Below lists the key mitigation measures used in the environmental assessment. A full list of mitigation used in the assessment is discussed in Section 5.4.11.</p> <ul style="list-style-type: none"> • A range of habitat mitigation measures was adapted and applied to the Project as described in the Wildlife Management Plan (Section 12.2.1.18.4.6). • Prior to mine operation, define the Proponent's contribution to regional management initiatives for ongoing research and monitoring of the Tweedsmuir-Entiako Northern Caribou subpopulation and their habitat use near the mine. Report on progress at least every three years through the operation of the mine in implementing the Proponent's contribution to regional initiatives and how the initiatives have influenced mine activities, undertakings, or works to the BC MOE and designated Aboriginal groups. • Protecting high elevation caribou range as identified in the Caribou Recovery Strategy (Environment Canada, 2014) by discontinuing the use of existing mine access roads within UWR and re-routing the mine site access outside of caribou winter range. • Activities that will occur outside of the caribou "least risk window" (as defined by the BC MOE Least Risk window to wildlife) will incorporate mitigation measures and an adaptive management approach, including stopping work if caribou are observed and combined with monitoring to ensure that displacement and impacts are reduced or avoided. • Developing a compact site (minimize disturbance footprint) to reduce overall habitat loss and limit potential adverse effects related to sound emissions to the extent practical. • Implementing progressive reclamation using local native vegetation wherever possible, or appropriate commercially grown, weed-free native species (Landscape, Soils, and Vegetation Management and Restoration Plan (Section 12.2.1.18.4.4), Invasive Species Management Plan (Section 12.2.1.18.4.5), Reclamation and Closure Plan (Section 2.6), and Wildlife Management Plan (Section 12.2.1.18.4.6)). • Restoring disturbed habitats at mine closure or developing habitats capable of supporting caribou to contribute to Recovery Strategy objectives of maintaining a minimum of 65% undisturbed habitat and by contributing to habitat that does not enhance alternate prey and increased wolf densities. • Implementing caribou awareness and protocols in regular safety and environmental orientations performed by the mine. Workers and contractors will be made aware of seasonal changes in caribou behaviour or presence near the mine. • Implementing invasive plant management techniques as defined in the Invasive Species Management Plan (Section 12.2.1.18.4.5), including developing and implementing detailed construction and operational plans of invasive plant prevention and detection strategies, and an action protocol if invasive plants are detected. Management techniques will include annual monitoring for invasive plants. • Implementing dust control measures as defined in the Air Quality and Emissions Management Plan (Section 12.2.1.18.4.9), and avoiding use of road salts to reduce attractants that might draw caribou close to roads. • Posting signs warning drivers of the possibility of caribou encounters in areas of high wildlife activity. • Implementing BMPs for road surface maintenance to allow good vehicle line of sight and control to help reduce potential collisions with caribou. Selecting revegetation species that minimize attraction of wildlife to roadsides to reduce potential vehicle collisions, as well as help reduce changes in prey-predator densities and distribution. • Enforcing speed limits along mine access roads to reduce potential wildlife collisions. • Restricting and controlling mine road access to ensure no unauthorized traffic use of the road. All traffic flow on the FSR will be monitored and controlled via radio communications. Reporting observations of wildlife along the road to environmental staff. • Implementing a no hunting and no firearms policy, as stated in the Wildlife Management Plan (Section 12.2.1.18.4.6). • Removing carrion along the road to reduce the risk of attractants that may bring predators into caribou habitat, as described in the Wildlife Management Plan (Section 12.2.1.18.4.6). <p>The following habitat mitigation measures apply to caribou and are specific to the potential effects of changes in caribou population dynamics such as predator-prey dynamics carried through the assessment:</p> <ul style="list-style-type: none"> • Placing natural cover such as rock piles and woody debris piles in open areas to reduce predator efficiency and create temporary visual cover for caribou, as part of the Closure and Reclamation Plan. • Placing woody debris on the surface of the upland slopes and between rocks and along the slopes, parallel and perpendicular with the slopes, to provide habitat features for security of caribou and to foster habitats not suitable for alternate prey species. 	<p>Mine Site. The residual effects of habitat loss are rated as Not Significant (Moderate) with high confidence, due to the magnitude, geographical extent, frequency, and reversibility of the effect occurring.</p> <p>Mine Site. The residual effects of mortality are rated as Not Significant (negligible) with high confidence, due to the magnitude, geographical extent, frequency, and reversibility of the effect occurring.</p> <p>Mine Site. The residual effects of a change in population dynamics are rated as Not Significant (minor) with high confidence, due to the magnitude, geographical extent, frequency, and reversibility of the effect occurring.</p> <p>Proposed Access Road and Kluskus FSR. The residual effects of habitat loss are rated as Not Significant (Minor) with high confidence, due to the magnitude, geographical extent, frequency, and reversibility of the effect occurring.</p> <p>Proposed Access Road and Kluskus FSR. The residual effects of mortality are rated as Not Significant (negligible) with high confidence, due to the magnitude, geographical extent, frequency, and reversibility of the effect occurring.</p> <p>Proposed Access Road and Kluskus FSR. The residual effects of a change in population dynamics are rated as Not Significant (minor) with high confidence, due to the magnitude, geographical extent, frequency, and reversibility of the effect occurring.</p> <p>Airstrip, Transmission Line, and Freshwater Supply Pipeline. The residual effects of habitat loss are rated as Not Significant (Minor) with high confidence, due to the magnitude, geographical extent, frequency, and reversibility of the effect occurring.</p> <p>Airstrip, Transmission Line, and Freshwater Supply Pipeline. The residual effects of mortality are rated as Not Significant (negligible) with high confidence, due to the magnitude, geographical extent, frequency, and reversibility of the effect occurring.</p> <p>Airstrip, Transmission Line, and Freshwater Supply Pipeline. The residual effects of a change in population dynamics are rated as Not Significant (negligible) with high confidence, due to the magnitude, geographical extent, frequency, and reversibility of the effect occurring.</p> <p>Project Area. For the Project as a whole, the residual effects of habitat loss are rated as Not Significant (Moderate) with high confidence, due to the magnitude, geographical extent, frequency, and reversibility of the effect. The loss and degradation of moderate to high value caribou habitat will occur during the construction phase primarily in the mine site area, and these effects will be evident in the closure and post-closure phases due to slow anticipated recovery of lichens.</p> <p>Project Area. The residual effects of mortality for the Project are rated as Not Significant (Negligible) with high confidence, due to the magnitude, geographical extent, frequency, and reversibility of the effect occurring.</p> <p>Project Area. The residual Project effects of a change in population dynamics are rated as Not Significant (Minor) with high confidence, due to the magnitude, geographical extent, frequency, and reversibility of the effect occurring.</p>

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<p>Grizzly Bear (C, O, CL, PC)</p>	<p>Habitat loss and alteration Change in grizzly bear population Change in grizzly bear dynamics Mortality risk Change in grizzly bear movement patterns Change in grizzly bear health</p>	<p>The issue scoping process identified grizzly bear as an item of concern. Grizzly bear (<i>Ursus arctos</i>) was selected as a VC due to its potential sensitivity to human development, its low density in the Project area, its need for large home ranges, and conservation concerns regionally, provincially, and nationally. Grizzly Bear also has cultural, spiritual, recreational, and ecological importance for a wide variety of people. Below lists the key mitigation measures used in the environmental assessment. A full list of mitigation used in the assessment is discussed in Section 5.4.12.</p> <ul style="list-style-type: none"> • Applying soil erosion and sediment control measures, as described in the Landscape, Soils and Vegetation Management and Restoration Plan (Section 12.2.1.18.4.4). • Restoring disturbed habitats at mine closure or development of habitats capable of supporting grizzly bears, as defined in the Reclamation and Closure Plan (Section 2.6) and WLMP (Section 12.2.1.18.4.6). • Implementing invasive plant management techniques, as defined in the Invasive Species Management Plan (Section 12.2.1.18.4.5). Based on current data from baseline reports, the invasive species identified within the LSA do not pose a risk to grizzly bear within the LSA or RSA. • Minimizing sensory disturbance due to noise and light to areas adjacent to the mine area and airstrip, as stated in the Noise and Vibration Mitigation Measures (Section 5.2.2.3). • Conducting pre-clearing surveys to identify grizzly bear activity within potential denning habitat during sensitive periods as described in the Wildlife Management Plan (WLMP) (Section 12.2.1.18.4.6). • Reporting and documenting wildlife observations and incident/accidents along access roads, as stated in the WLMP to identify any crossing corridors. • Posting signs warning drivers of the possibility of wildlife encounters in areas of high wildlife activity. • Implement a bear awareness program as described in the WLMP. • Selecting revegetation species that minimize attraction of wildlife to roadsides will reduce potential vehicle collisions and hunting of bears, as well as help reduce changes in prey-predator densities and distribution. • Restricting and controlling road access to ensure no unauthorized traffic use of the road. All traffic will be radio controlled. Reporting observations of wildlife along the road to environmental staff. • Implementing a no hunting and no firearms policy, as stated in the WLMP. • Removing carrion along the road to reduce the risk of attractants, as described in the WLMP. • Implementing adaptive management, as described in the WLMP. • Implement domestic waste management measures as described in the Industrial and Domestic Waste Management Plan (Section 12.2.1.18.4.11). 	<p>Mine Site. The residual effects of habitat loss are rated as Not Significant (Minor) with high confidence, due to the magnitude, geographical extent, reversibility, frequency, and likelihood of an effect occurring. Loss and degradation of a maximum of 1,945 ha of moderate to high value spring grizzly bear habitat, 2,505 ha of moderate to high value summer grizzly bear habitat, and 2,740 ha of moderate to high value late summer/fall grizzly bear habitat will occur during the construction phase, and these effects will be evident through the operations and closure phases.</p> <p>Access Roads and Kluskus FSR. The residual effects of habitat loss are rated as Not Significant (Negligible) with high confidence, due to the magnitude, geographical extent, reversibility, frequency, and likelihood of an effect occurring. Loss and degradation of a maximum of 13 ha of moderate value late summer/fall grizzly bear habitat will occur during the construction phase, and these effects will be evident through the operations and closure phases.</p> <p>Access Roads and Kluskus FSR. The residual effects of mortality are rated as Not Significant (Minor) with high confidence, due to the magnitude, geographical extent, reversibility, frequency, and likelihood of an effect occurring. An additional 2.3 km of road will be built during the construction phase and will likely increase the mortality risk within the access road and Kluskus FSR study area, and these effects will be evident through the operations and closure phases.</p> <p>Airstrip, Transmission Line, and Freshwater Supply Pipeline. The residual effects of habitat loss from these facilities are rated as Not Significant (Minor) with high confidence, due to the magnitude, geographical extent, reversibility, frequency, and likelihood of an effect occurring. Loss and degradation of a maximum of 2,831 ha of moderate to high value spring, 3,033 ha of moderate to high value summer, and 3,027 ha of moderate to high value late summer/fall grizzly bear habitat. These effects will occur during the construction phase and will be evident through the operations and closure phases.</p> <p>Airstrip, Transmission Line, and Freshwater Supply Pipeline. The residual effects of mortality are rated as Not Significant (Minor) with high confidence, due to the magnitude, geographical extent, reversibility, frequency, and likelihood of an effect occurring. A total of 72 km of road will be built during the construction phase, which will likely increase the mortality risk within the airstrip, transmission line, and pipeline study area, and these effects will be evident through the operations and closure phases.</p> <p>Project Area. The loss and alteration of grizzly bear habitat will occur during the construction phase and these adverse effects will be evident in the closure and post-closure phases. All three GBPUs are above the linear density threshold of 0.6 km/km² at baseline conditions. Within the RSA, the overall effect of the Project on grizzly bears will likely be a small reduction in area of suitable habitat, affecting a maximum 1% to 3% of suitable grizzly bear spring and summer habitat and 1% to 4% of suitable fall habitat before mitigation. The habitat effect will occur once and will be reversible in the long term during operations through closure. Habitat loss within each GBPU will range from 0.1 to 0.3%, therefore, the loss of habitat attributed to the Project is conservatively considered Not Significant (Minor).</p>

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<p>Furbearers (C, O, CL, PC)</p>	<p>Habitat loss and alteration Change in furbearer population Change in furbearer dynamics Mortality risk Change in furbearer movement patterns Change in furbearer health</p>	<p>The issue scoping process identified furbearers and beaver as items of concern. Furbearers are year-round residents in the Project area and are indicative of the winter mammal carrying capacity and habitat connectivity of the landscape. The American marten (<i>Martes americana</i>) is a representative species of furbearer that is distributed across the entire Project area. Beaver (<i>Castor canadensis</i>) was also selected as an additional indicator species for furbearers due to its economic importance to First Nations and local trappers and due to its representative habitat within wetlands and other waterbodies in the Project area. Below lists the key mitigation measures used in the environmental assessment. A full list of mitigation used in the assessment is discussed in Section 5.4.13.</p> <ul style="list-style-type: none"> • Mitigating for loss and degradation of adjacent riparian wildlife habitats such as well demarcated no-work zones and management work zones (with restrictions, such as no heavy machinery, etc.) and setbacks in accordance with the Forest and Range Practices Act BMPs (BC MFLNRO, 2014) where feasible. • Minimizing sensory disturbance due to noise and light to areas adjacent to the mine area and airstrip, as stated in the Noise and Vibration Mitigation Measures (Section 5.2.2). • Restoring disturbed habitats at mine closure or development of habitats capable of supporting furbearers as defined in the RCP and WLMP. • Minimizing ground disturbance and damage to vegetation. • Applying erosion and sediment control measures. • Implementing invasive plant management techniques as defined in the ISMP. • Implementing progressive reclamation using local native vegetation wherever possible, or appropriate commercially grown, weed-free native species LSVMRP, ISMP, RCP. • Installing appropriate culverts where required, and maintaining functioning water tables and drainage throughout all phases from construction to decommissioning will maintain wetland function. Mitigation of existing road areas and wetland crossings are predicted to maintain or restore wetland function along the proposed access roads and transmission line. • Posting speed limits along roads for Project related vehicles, as well as implementation of BMPs of road surface maintenance. • Water quality monitoring and adaptive management (Decommissioning and Closure Activities, RCP, and Follow-up Program). • Selecting revegetation species that minimize attraction of wildlife to roadsides will reduce potential vehicle collisions and predation of many species. • Revegetate linear corridors and discourage predator access by controlling line-of-sight. • Implementing a no hunting and no firearms policy, as stated in the WLMP. • Providing breaks in snow banks along the access road to allow wildlife escape as described in the WLMP. • Removing carrion along the roads to reduce the risk of attracting predator species as described in the WLMP. • Posting road signs to alert drivers of wildlife sensitive areas such as migration routes and seasonal feeding areas; • Reporting and documenting wildlife observations and incidents/accidents along access roads as described in the WLMP. • Restricting and controlling road access to ensure no unauthorized traffic use of the road. All traffic flow on the FSR will be monitored and controlled via radio communications. Reporting observations of wildlife along the road to environmental staff. • Trapper harvest is managed through FLNRO and increased access is not expected to alter overall harvest levels. • Implementing adaptive management as described in the WLMP. • Including beaver awareness information into regular safety and environmental inductions performed by the mine. 	<p>Mine Site. The residual effects of habitat loss and degradation of furbearer habitat (except beaver) are rated as Not Significant (Minor) with high confidence, due to the magnitude, geographical extent, frequency, and reversibility of the effect occurring. Loss and degradation of moderate to high value furbearer habitat will occur once during the construction phase and these effects will be evident in the closure and post-closure phases.</p> <p>Mine Site. For beaver, the residual effects of habitat loss and degradation of habitat are rated as Not Significant (Negligible) with high confidence, due to magnitude, geographic extent, frequency, and reversibility of the effect occurring. Loss and degradation of beaver habitat will occur once during the construction phase and will be evident through the closure and post-closure phases.</p> <p>Mine Site. The residual effects of beaver mortality are rated as Not Significant (Minor) with high confidence, due to the magnitude, geographic extent, frequency, and reversibility of the effect occurring. Mortality of beaver may occur intermittently from the construction phase through to closure.</p> <p>Mine Site. The residual effects of beaver health are rated as Not Significant (Negligible) with high confidence, due to the magnitude, geographic extent, frequency, and reversibility of the effect occurring. Beaver health may be affected intermittently from the construction phase through to closure, due to the potential for disease outbreaks within the population (e.g., tularemia disease), although this would likely occur naturally.</p> <p>Access Roads and Kluskus FSR. The residual effects of habitat loss and degradation of furbearer habitat (except beaver) along the access roads and Kluskus FSR are rated as Not Significant (Minor) with high confidence, due to the magnitude, geographical extent, frequency, and reversibility of the effect occurring. Loss and degradation of moderate to high value furbearer habitat, adverse sensory disturbance, and potential for loss due to predation related to changes in predator-prey dynamics will occur along roads associated with the Project.</p> <p>Access Roads and Kluskus FSR. For beaver, the residual effects of habitat loss and degradation of habitat are rated as Not Significant (Negligible) with high confidence, due to the magnitude, geographic extent, frequency, and reversibility of the effect. Loss and degradation of beaver habitat will occur once during the construction phase and will be evident through the closure and post-closure phases.</p> <p>Access Roads and Kluskus FSR. The residual effects of beaver mortality are rated as Not Significant (Minor) with high confidence, due to the magnitude, geographic extent, frequency, and reversibility of the effect occurring. Mortality of beaver may occur intermittently from the construction phase through to closure phase.</p> <p>Access Roads and Kluskus FSR. The residual effects of beaver health are rated as Not Significant (Negligible) with high confidence, due to the magnitude, geographic extent, frequency, and reversibility of the effect occurring. Beaver health may be affected intermittently from the construction phase through to closure, due to the potential for natural disease outbreaks within the population.</p> <p>Airstrip, Transmission Line, and Freshwater Supply Pipeline. The residual effects of habitat loss and degradation of furbearer habitat (except beaver) at these facilities are rated as Not Significant (Minor) with high confidence, due to the magnitude, geographical extent, frequency, reversibility, of the effect occurring. Loss and degradation of furbearer habitat will occur during construction and will be evident through operations and closure phases of the airstrip, transmission line, and freshwater supply pipeline areas.</p> <p>Airstrip, Transmission Line, and Freshwater Supply Pipeline. For beaver, the residual effects of habitat loss and degradation of habitat are rated as Not Significant (Negligible) with high confidence, due to the magnitude, geographic extent, frequency, and reversibility of the effect occurring. Loss and degradation of beaver habitat will occur once during the construction phase and will be evident through the closure and post-closure phases.</p> <p>Airstrip, Transmission Line, and Freshwater Supply Pipeline. The residual effects of beaver mortality are rated as Not Significant (Minor) with high confidence, due to the magnitude, geographic extent, frequency, and reversibility of the effect occurring. Mortality of beaver may occur intermittently from construction phase through to closure phase.</p> <p>Airstrip, Transmission Line, and Freshwater Supply Pipeline. The residual effects of beaver health are rated as Not Significant (Negligible) with high confidence, due to the magnitude, geographic extent, frequency, and reversibility of the effect occurring. Beaver health may be affected intermittently from the construction phase through to closure, due to the potential for disease outbreaks within the population.</p> <p>Project Area. The residual effects of habitat loss and degradation of furbearer habitat (except beaver) are rated as Not Significant (Minor) with high confidence, due to the magnitude,</p>
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			<p>geographical extent, frequency, and reversibility of the effect occurring. Loss and degradation of moderate to high value furbearer habitat will occur during the construction phase primarily in the mine site area and these effects will be evident through operations.</p> <p>Project Area. For beaver, the residual effects of habitat loss and degradation of habitat are rated as Not Significant (Negligible) with high confidence, due to the magnitude, geographical extent, frequency, and reversibility of the effect occurring. Loss and degradation of moderate to high value beaver habitat will occur during the construction phase primarily along the transmission line area and these effects will be evident through construction.</p> <p>Project Area. The residual effects of beaver mortality are rated as Not Significant (Minor) with high confidence, due to the magnitude, geographical extent, frequency, and reversibility of the effect occurring. Changes in beaver mortality may occur during all phases of the Project, and beaver populations are able to recover from mortality events relatively quickly, giving it a low magnitude. The duration of the mortality effect will be long-term throughout operations.</p> <p>Project Area. The residual effects of beaver health are rated as Not Significant (Negligible) with high confidence, due to the magnitude, geographical extent, frequency, and reversibility of the effect. Beaver health may be affected during any phase of the Project and, therefore, the duration of the health effect will be long-term. However, beaver populations are able to recover quickly from disease or indirect mortality.</p>
<p>Bats (C, O, CL)</p>	<p>Habitat loss and alteration Change in bat population Change in bat dynamics Mortality risk Change in bat movement patterns Change in bat health</p>	<p>The issue scoping process identified bats as an item of concern. The little brown myotis (<i>Myotis lucifugus</i>) was selected as a representative bat VC because of its ubiquitous distribution through central BC and its federal designation of Endangered (Committee on the Status of Endangered Wildlife in Canada (COSEWIC), 2014). It is also a Yellow-listed species in BC (BC Conservation Data Centre (BC CDC), 2014). The forests within the Project area provide suitable habitat for little brown myotis, which is the most far-ranging bat species in BC and is found in a variety of habitats. The conservation status of little brown myotis will act to protect other bat species in the area. Below lists the key mitigation measures used in the environmental assessment. A full list of mitigation used in the assessment is discussed in Section 5.4.14.</p> <ul style="list-style-type: none"> Mitigating for loss and degradation of adjacent riparian wildlife habitats will occur by designating well demarcated no-work zones, management work zones (with restrictions, such as no heavy machinery), and setbacks in accordance with the <i>Forest and Range Practices Act</i> BMPs (BC MFLNRO, 2014). Clearing of transmission line ROWs may leave suitable habitat for bats or reclaimed to provide habitat that will also be suitable for bats. Designing roads and transmission lines and poles away from wetland areas and riparian areas, or spanning wetlands. Implementing progressive reclamation using local native vegetation wherever possible, or appropriate commercially grown, weed-free native species (LSVMRP, ISMP, RCP). Discharging effluent that will meet guidelines for protection of aquatic life so that no adverse water quality affects to bats and their forage species are predicted. Implementing invasive plant management techniques as defined in the ISMP. Minimizing sensory disturbance due to noise in areas adjacent to the mine site and airstrip, as stated in the Noise and Vibration Mitigation Measures (Section 5.2.2). Implementing adaptive management if bat roosts are discovered during Project operations. During summer, as part of the reclamation program, bat breeding and roost boxes may be placed in suitable habitat to mitigate potential residual Project effects of lost living habitat for some species of bats. Implementing progressive wetland restoration during construction to achieve no-net-loss of wetlands to prevent potential high quality habitat loss. 	<p>Mine Site. The residual effects of habitat loss and mortality risk are rated as Not Significant (Negligible) with high confidence, due to the magnitude, geographical extent, reversibility, frequency, and likelihood of an effect.</p> <p>Access Roads and Kluskus FSR. The residual effects of habitat loss and degradation are rated as Not Significant (Negligible) with high confidence, due to the magnitude, geographical extent, frequency, and reversibility of the effects.</p> <p>Airstrip, Transmission Line, and Freshwater Supply Pipeline. The residual effects of habitat loss from these components are rated as Not Significant (Negligible) with high confidence, due to the magnitude, geographical extent, frequency, and reversibility of the effect.</p> <p>Project Area. The loss and alteration of bat habitat will occur during the construction phase, will result in the removal of less than 1% of moderate and high value habitat after mitigation, and is considered Not Significant (Negligible) and negligible in magnitude.</p>

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Invertebrates (C, O, CL, PC)	Habitat loss and alteration Change in invertebrate population Change in invertebrate dynamics Mortality risk Change in invertebrate movement patterns Change in invertebrate health	<p>The issue scoping process identified invertebrates as an item of concern. There is an interaction between invertebrates and project activities. Butterflies and odonates (dragonflies and damselflies) represent the invertebrate groups considered for inventory in the study areas. They are representative invertebrates that the BC CDC lists as potentially occurring in similar ecosystems (Vanderhoof, Quesnel, and Chilcotin Forest Districts) as occurs in the study areas. There are no published records of any species at risk in these two invertebrate groups in the study areas (BC CDC, 2013).</p> <p>Two species of invertebrates were selected as indicators due to their representative habitat requirements found within the study areas and relative potential for impacts from the Project: the Blue-listed butterfly jutta arctic (<i>Oeneis jutta chemocki</i>), which requires black spruce bog wetlands as habitat, and the dragonfly American emerald (<i>Cordulia shurtleffii</i>), which requires open wetland and riparian habitats for breeding and aquatic life. As a result, this study focuses on potential impacts to invertebrates because of wetland loss and disturbance. Below lists the key mitigation measures used in the environmental assessment. A full list of mitigation used in the assessment is discussed in Section 5.4.15.</p> <ul style="list-style-type: none"> • Mitigating for loss and degradation of adjacent riparian wildlife habitats such as well demarcated no-work zones and management work zones (with restrictions, such as no heavy machinery, etc.) and setbacks in accordance with the Forest and Range Practices Act BMPs (BC MFLNRO, 2014). • Clearing of transmission line ROWs may leave suitable habitat for invertebrates. • Applying erosion and sediment control measures (SECP). • Implementing progressive reclamation using local native vegetation wherever possible, or appropriate commercially grown, weed-free native species (LSVMRP (Section 12), ISMP (Section 12), RCP (Appendix 2.6) and WLMP (Section 12)). • Discharging effluent that will meet guidelines for protection of aquatic life so that no adverse water quality effects to invertebrates are anticipated (Water Quality and Liquid Discharges Management Plan (WQLDMP)). • Implementing progressive wetland restoration during construction to achieve no-net-loss of wetlands will prevent potential high quality habitat loss (RCP). • Implementing invasive plant management techniques as defined in the ISMP. • Implementing dust control measures outlined in the Air Quality and Emissions Management Plan (AQEMP) (Section 12) include watering roads during the dry, high fugitive dust risk season and avoiding use of road salts during winter to reduce invertebrate habitat suitability. • Reducing physical and chemical attractants, especially salts whenever practical, during construction and operations. Non-chemical dust suppression with water will reduce dust impacts to vegetation near roads and the mine site. • Installing appropriate culverts where required and maintaining functioning water tables and drainage throughout all phases from construction to decommissioning will maintain wetland function to prevent changes in hydrology. • Maintaining black spruce and sedge meadow wetlands wherever feasible, openings near wetlands may enhance dragonfly and butterfly populations. 	<p>Mine Site. The residual effects of habitat loss and alteration are rated as Not Significant (Minor) with moderate confidence and Not Significant (Negligible) for invertebrate mortality risk and health, based on the magnitude, geographic extent, frequency, and reversibility of the effect. Loss and degradation of invertebrate habitat will occur during the construction phase, and these effects will be evident until post-closure.</p> <p>Mine Site. The residual effects for mortality risk are rated as Not Significant (Negligible) with high confidence due to the negligible magnitude, and site-specific and intermittent nature of the risk within the mine site.</p> <p>Mine Site. The residual effects for changes related to invertebrate health are rated as Not Significant (Negligible) with high confidence due to the negligible magnitude, and site-specific and intermittent nature of the risk within the mine site.</p> <p>Access Roads and Kluskus FSR. The residual effects of habitat loss and alteration are rated as Not Significant (Minor) with moderate confidence and Not Significant (Negligible) for invertebrate mortality risk and health, based on the magnitude, geographic extent, frequency, and reversibility of the effect. Loss and degradation of invertebrate habitat will occur during the construction phase, and these effects will be evident beyond the post-closure phase. The existing Kluskus FSR may be widened, with additional clearing area for borrow pits and laydown areas (to be progressively reclaimed throughout the life of the mine), until the access road is closed and reclaimed.</p> <p>Access Roads and Kluskus FSR. The residual effects for mortality risk are rated as Not Significant (Negligible) with high confidence due to the negligible magnitude, and site-specific and intermittent nature of the risk within the mine site. Early development of wetland compensation areas will reduce risk of additional mortality related to habitat loss. Traffic and access control, as well as early compensation works and mitigation measures, will mitigate any risk of additional mortality.</p> <p>Access Roads and Kluskus FSR. The residual effects for changes related to invertebrate health are rated as Not Significant (Negligible) with high confidence due to the negligible magnitude, and site-specific and intermittent nature of the risk within the mine site.</p> <p>Airstrip, Transmission Line, and Freshwater Supply Pipeline. The residual effects of habitat loss and alteration are rated as Not Significant (Minor) with moderate confidence and Not Significant (Negligible) for invertebrate mortality risk and health, based on the magnitude, geographic extent, frequency, and reversibility of the effect. Loss and degradation of invertebrate habitat will occur during the construction phase in the airstrip, transmission line, and freshwater supply pipeline areas, and these effects will be evident beyond the post-closure phase. The effect has a low magnitude rating because much of the area is already disturbed, and mitigation measures will minimize the majority of effects; however, the effects will remain indefinitely.</p> <p>Airstrip, Transmission Line, and Freshwater Supply Pipeline. The residual effects for mortality risk are rated as Not Significant (Negligible) with high confidence due to the negligible magnitude, and site-specific and intermittent nature of the risk within the mine site. Early development of wetland compensation areas will reduce risk of additional mortality related to habitat loss. Traffic and access control, as well as early compensation works and mitigation measures, will mitigate any risk of additional mortality.</p> <p>Airstrip, Transmission Line, and Freshwater Supply Pipeline. The residual effects for changes related to invertebrate health are rated as Not Significant (Negligible) with high confidence due to the negligible magnitude, and site-specific and intermittent nature of the risk within the mine site.</p> <p>Project Area. The residual effects of habitat loss and alteration are rated as Not Significant (Minor) with moderate confidence and Not Significant (Negligible) for invertebrate mortality risk and health, based on the magnitude, geographic extent, frequency, and reversibility of the effect. Loss and degradation of invertebrate habitat will occur during the construction phase and these effects will be reversible.</p> <p>Project Area. The residual effects for mortality risk are rated as Not Significant (Negligible) with high confidence due to the negligible magnitude, and site-specific and intermittent nature of the risk within the mine site. Early development of wetland compensation areas will reduce risk of additional mortality related to habitat loss. Traffic and access control, as well as early compensation works and mitigation measures, will mitigate any risk of additional mortality.</p> <p>Project Area. The residual effects for changes related to invertebrate health are rated as Not Significant (Negligible) with high confidence due to the negligible magnitude, and site-specific and intermittent nature of the risk within the mine site.</p>

Note: C = construction; O = operations; CL = closure; PC = post-closure