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5.4.14 Bats

5.4.14.1 Introduction

This section assesses the potential effects of the Project on the bats Valued Component (VC). The indicator species is the little brown myotis (*Myotis lucifugus)*. The assessment is described in the subsections below and will be conducted for this species. This Introduction describes the information sources of the assessment and the applicable regulatory framework for the assessment of the VC (**Section 5.4.14.1.1**). The spatial, temporal, administrative, technical boundaries and assessment approach is describes in (**Section 5.4.14.3**).

Bats are an indicator of forest ecosystem health, feeding in areas with insect populations and roosting in areas with mature trees. Some bat species are year-round residents in British Columbia (BC) and are indicative of the habitat connectivity of the landscape, while other bats are migratory and spend much of the year further south of Canada. The little brown myotis (*Myotis lucifugus)* was selected as a representative bat Valued Component (VC) because of its ubiquitous distribution through central BC and its federal designation of an Endangered species (Committee on the Status of Endangered Wildlife in Canada (COSEWIC), 2013). It is also a Yellow-listed species in BC (BC Conservation Data Centre, 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.

5.4.14.1.1 Regulatory Considerations

To assess potential effects, a number of regulatory requirements were considered (**Table 5.4.14-1**) that apply to bats and different phases of Project development, mitigation, and reclamation. Bats are subject to the BC *Wildlife Act* (Government of BC, 1996), and species at risk that occur in the region are afforded protection under the *Species at Risk Act* (*SARA*) (Government of Canada, 2002). In 2012, an emergency assessment by COSEWIC examined the status of a group of bats, including little brown myotis and northern myotis (*Myotis septentrionalis*), and both species were designated as Endangered. In BC, both bat species are considered species at risk: little brown myotis is Yellow-listed and northern myotis is Blue-listed (BC Conservation Data Centre (CDC), 2014). When also listed federally, provincially listed species are subject to *SARA* and/or COSEWIC. Management of bat habitat and populations is considered under the BC *Forest and Range Practices Act* (Government of BC, 2002), BC Conservation Framework, and the Vanderhoof Land and Resource Management Plan (LRMP) (ILMB, 1997) in the context of forest management.

Table 5.4.14-1: Regulatory Considerations Regarding Bats

Regulation/ Guideline	Brief Description or Requirements	Data Required to Meet Regulation/Guideline	Timeframe (pre/post-Application Submission)
Canada *Species at Risk Act*	Species at risk may require federal permits for handling or habitat destruction.	Occurrence and abundance/ distribution data from surveys.	Ongoing monitoring of mitigation measures, wildlife management plan for exploration, construction and operation potentially affecting listed bats.
BC *Wildlife Act*	Pertains to all wildlife species and their management. Permits are required for handling and surveys of wildlife that may harass animals.	Abundance and distribution data from BC CDC records and surveys, wildlife habitat suitability.	Wildlife management plans, wildlife permits for surveys and collection or handling.
BC *Forest and Range Practices Act*	Riparian areas, wetlands, and old-growth management areas require special management, and retain habitat valuable to bats.	Impact assessment and proposed mitigation/offsets required to assess habitat loss to old-growth and wetland areas, both of which include important habitat for bats.	Wildlife management plans and permitting for exploration.
Vanderhoof Land and Resource Management Plan	Identifies important species within individual RMZs and sets objectives for species of concern.	Supporting scientific research opportunities (e.g. monitoring and comparing vegetation succession and wetland function; periodically inventorying bat populations; assessing high-quality wetland habitat from destruction.	Wildlife management plans, wetland management plans and permitting for exploration.
BC Conservation Data Centre	Bat species are provincially Yellow-, Blue- or Red-listed.	Habitat and population data related to the Project.	Ongoing

Note: BC CDC = British Columbia Conservation Data Centre

5.4.14.2 Valued Component Baseline

There are no previously published records of bat species of conservation concern within the Project area (BC CDC, 2014). Bats require a variety of habitats for most of their lifecycle, including subterranean areas for roosting and hibernating, forested areas for roosting and foraging, open areas, including those above wetlands, and open water for feeding. Bats may utilize all of these habitat types within the Project area; however, all habitat types may not be used equally.

Baseline surveys for bats took place within the mine site and airstrip LSAs, and wildlife RSA in areas identified as having potential for higher bat usage and had suitable survey sites. Areas within the Kluskus FSR, transmission line, and mine site access road LSAs were not surveyed because they did not fit these criteria (Figure 2.1-26 in **Appendix 5.1.3.4A**). Surveys are considered complete since they focused on the presence/non-detection of species within the LSAs and RSA,

and all potential species were identified during the surveys (**Appendix 5.1.3.4A**, Section 3.5.2.4, Table 3.5-1).

Within the Project area, nine species of bats were detected, including three species of conservation concern: eastern red bat (*Lasiurus borealis*), northern myotis, and little brown myotis (**Figure 5.4.14-1**). All three species of conservation concern were detected within the mine site, freshwater supply pipeline, and airstrip areas, which represents the Local Study Area (LSA), and within the Regional Study Area (RSA). Detections occurred within small waterbodies and lakes, as well as within a regenerating lodgepole pine forest. The majority of little brown myotis detections were within a wetland in the headwaters of Davidson Creek at an elevation just below the mine site and upstream of the proposed tailings storage facility (**Appendix 5.1.3.4A**).

Little brown myotis was detected in all study areas and was the most frequently detected species, with many individuals detected at each site and in various types of forested and wetland habitats. Northern myotis was also detected in all study areas and was the second most frequently detected species, with many individuals detected at each site. The provincially Red-listed eastern red bat (*Lasiurus borealis*) was detected in all study areas and was the third most frequently detected species.

5.4.14.2.1 Past, Present, or Future Project Activities

The project or activities considered in the assessment are in the Project Inclusion List (PIL). The PIL identifies those projects or human activities that may overlap spatially or temporally with the Project summarized in (**Table 4.3-11**). **Appendix 4C** presents the detailed Project Inclusion List and descriptions of various projects and activities used for assessing potential environmental effects**.**

Pre-existing habitat loss and fragmentation due to logging and road development has altered the habitat within the Project area. The mountain pine beetle (MPB) infestation has affected large areas of mature pine forest in the region including the LSA and RSA, some of which was harvested, while remaining stands are in various stages of degeneration. Mineral exploration in the area increased the number of access roads. Bat baseline information was collected in the LSA and portions of the RSA that have been altered by these past and present activities. The future activities in the RSA are expected to include similar activities.

Forest fire and forest insects are the primary natural disturbances in low elevation habitat. Fire directly alters habitat through loss of mature conifer stands, which are important roosting areas.

5.4.14.2.2 Traditional Ecological and Community Knowledge

Community and traditional knowledge did not specifically identify bats. **Section 3** contains comments and issues raised by the public and Aboriginal groups, and tracking tables for the Project. **Section 14** through **Section 16** provide a summary of the Aboriginal background, rights, and interests for the Project

5.4.14.3 Potential Effects of the Project and Proposed Mitigation

This subsection identifies and analyzes potential adverse effects on the bats VC resulting from the proposed Project's construction, operations, closure and post-closure phases.

It first describes the features of the study area, temporal, administrative, and technical boundaries. (**Section 5.4.14.3.1 to Section 5.4.14.3.4**).

Then, **Section 5.4.14.3.6** details the assessment approach used in the assessment followed by **Section 5.4.14.3.8** Mitigation Measures.

The assessment considers the following:

- Terrestrial habitat, including the quality and quantity of any lost habitat for relevant species;
- Feeding, hibernation, or breeding habitats;
- Any wetland habitat alteration or loss;
- Barriers to wildlife, including the roads developed as part of the mine and their potential effects on wildlife movements;
- Disturbance of daily or seasonal wildlife movements (e.g., migration and home ranges), which would include potential hazards and conflicts associated with mine access and travel corridors of bats;
- Any species that are rare, vulnerable, endangered, threatened, or of special concern as listed under provincial Blue and Red lists, *SARA*, COSEWIC, as well as, any species of international significance (**Section 5.4.14.1.1**);
- Direct and indirect wildlife mortality from the mine operations and traffic;
- Wildlife habitat is being rated for suitability as a surrogate for wildlife productivity; and
- Implications of the proposed Project acting as an attractant for particular species.

A range of potential effects on bats can be associated with a project involving a mine and linear features including roads, pipelines and transmission line. Assessment boundaries define the scope or limits of the assessment. The boundaries encompass the areas and time periods during which the Project is expected to interact with bats (spatial and temporal boundaries), any constraints placed on the assessment of those interactions due to political, social, and/or economic realities (administrative boundaries), and any limitations in predicting or measuring changes (technical boundaries). Each of these boundaries is defined in the subsections below.

Activities occurring during each phase of the proposed Project could potentially interact with bats. Habitat loss, features that act as attractants to some species, potential mortality, changes in habitat availability, noise disturbance (displacement), and disruptions of movement are the predicted key and moderate interactions of the proposed Project related to bats. Taking a conservative approach, both key and moderate interactions are combined and considered jointly in assessment of project and cumulative effects.

5.4.14.3.1 Study Area Boundaries

Two geographic scales were defined for considering the Project effects on bats and bat habitat in the Project area, as shown on **Figure 5.4.14-1** and described below. These areas were used for collecting baseline information. Past, present, and future activities that may affect bats within these areas were identified and assessed within the RSA. The Project area is defined as all aspects of the Project infrastructure considered in this application and includes the mine site, mine access road, Kluskus Forest Service Road (FSR), airstrip, freshwater pipeline, and transmission line.

Local Study Area: The AIR describes the LSA as follows (**Table 4.3-1** of **Section 4**):

- Mine Site: Approximate 500 m buffer around the proposed mine site facilities; and
- Transmission line, mine access road, airstrip, freshwater supply pipeline, and Kluskus FSR: approximately 250 m buffer from each side of the linear component boundary.

The rationale for the LSA is as follows (**Table 4.3-1** of **Section 4**):

- The LSA includes the entire mine site where habitat will be removed and considers a buffer to take into account sensory disturbance; and
- The LSA includes all linear components and a buffer to take into account sensory disturbance. The buffer along the linear corridors varies because activities along those corridors varies from an access road that may have greater sensory disturbance to a transmission line with limited human activity or traffic after construction.

The LSA for the purpose of the bats VC comprises 22,509 ha and includes 7,032 ha for the Project footprints (**Table 5.4.14-2**). The LSA includes the proposed mine site area (the mine site footprint plus a 500 m buffer), and all linear components areas (linear components with 250 m buffer on each side of linear component boundary, except for the airstrip which is 300 m buffer on each side). The linear component boundary, also referred to as the footprint, is comprised of the feature's right-of-way (ROW) and an additional buffer. The linear component boundary widths are as follows: existing Kluskus FSR is 20 m (20 m ROW with no buffer), proposed mine access road is 120 m (20 m ROW with 50 m buffer each side), proposed transmission line is 140 m (40 m ROW with 50 m buffer on each side), proposed freshwater supply pipeline is 110 m (10 m ROW with 50 m buffer on each side), proposed airstrip is 200 m (100 m ROW with 50 m buffer each side), and the proposed airstrip access road is 10 m (10 m ROW, with no buffer). The FSR re-alignment and Transmission Line access roads are included in the LSA area for these features. The transmission line includes a mainline route and two potential re-routes, the Mills Ranch and Stellako options. The final location of the transmission line access roads will be determined during the detailed engineering and permitting stage, and will consider traditional knowledge and traditional use information provided by Aboriginal groups as appropriate. Its design will follow the same principles of using existing roads avoiding sensitive habitat to the extent possible.

320000 360000 400000 440000

6000000 5960000 5920000 5880000

Tchesinkut Lake
François Lake
Cheslatta Carrier
Danskin
Skin Tyee
Endako
Stellako
Fraser Lake
Nadleh Whuten
Fort Fraser
Engen
Nechako River
Vanderhoof
Weneez
Sinkut River
Saik'uz
Nulki
Mapes
Stuart River Park
Stuart River
Francois Lake
Uncha Mountains Red Hills Park
Francois Lake Park
Uncha Lake
Takysie Creek
Binta Lake
Nithi River
Smith Creek
Tachick Lake
Stony
Nulki Lake
Cluculz Lake
Cluculz Creek
Khai
Sinkut River
Tahultzu Lake
Hallett Lake
Cheslatta River
Cheslatta Lake
Knapp Creek
Cheslatta
Targe Creek
Corkscrew
Bird Creek
Nechako Canyon Protected Area
Meridian Road (Vanderhoof) Ecological Reserve
Kluskus FSR
Lucas Lake
Lucas Creek
Knewstubb Lake
Big Bend Creek
Finger Lake
Tatuk Lake
Finger Tatuk Park
Chilako River Ecological Reserve
Chilako River
Natalkuz Lake (Nechako Reservoir)
Tetachuck River
Entiako River
Chedakuz Creek
Taluk Creek
Batnuni Lake
Euchiniko River
Nataniko Creek
Euchiniko
Entiako Park
Entiako Lake
Kluskus-Ootsa FSR
Proposed Mine Access Road
Proposed Fresh Water Pipeline
Tatelkuz Lake
Top Lake
Fawnie Creek
Laidman Lake
Johnny Lake
Tweedsmuir Park
Kluskus-Blue FSR
Kluskoil Lake Park
Nazko
Euchiniko Lakes
Moose Lake
Blackwater River
Kluskus
Kushya
Tsacha Lake
Baezaeko
Nazko

N

Legend

- Populated Place
- Highway
- Kluskus FSR
- Kluskus-Blue FSR
- Kluskus-Ootsa FSR
- Existing Transmission Line
- Stream
- Waterbody
- Parks & Protected Areas

Project Components

- Exploration Road
- Proposed Mine Site Access Road
- Proposed Transmission Line
- Proposed Transmission Line (Mills Ranch Reroute)
- Proposed Transmission Line (Stellako Reroute)
- Proposed Freshwater Pipeline
- Proposed Airstrip Access Road
- Proposed Airstrip
- Proposed Mine Site

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area

Scale: 1:500,000

0 5 10 20

Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold™

PROJECT: Blackwater Gold Project

Regional Study Area Boundaries for Bats and Associated Habitat

DATE:	ANALYST:	**Figure** 5.4.14-1
September, 2015	MY	
JOB No: VE52277	QA/QC: MB	PDF FILE: 04-03-001_study_area_5.4.14-1.pdf
GIS FILE: 04-03-001_study_area_5.4.14-1.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	amec

O:\Blackwater\Mapping\04_wildlife\03_EA\04-03-001_study_area_5.4.14-1.mxd

Table 5.4.14-2: Project Component Footprint Areas

Component	Area (ha)
Mine Site	4,430
Access Road	95
Existing Kluskus Forest Service Road	253
Airstrip	50
Freshwater Pipeline	132
Main Transmission Line	1,806
Mills Ranch Transmission Line	202
Stellako Transmission Line	62
Total Project Footprint	**7,032**

Note: ha = hectare

Regional Study Area: The AIR describes the RSA as follows (**Table 4.3-1** of **Section 4**):

- Mine Site: Includes ungulate winter range established for the Tweedsmuir-Entiako caribou herd (U-7-012). The western and southern edges of the RSA outline these winter ranges. The southwestern boundary follows the Upper Blackwater Management Zone where the RSA then follows the Blue Road until it reaches the Ootsa – Kluskus FSR and follows this north until it reaches the Nechako Reservoir. The northern boundary of the RSA follows the shoreline of the Nechako Reservoir. The northern boundary of the RSA follows the shoreline of the Nechako Reservoir; and
- Transmission Line and Kluskus FSR. Approximate 1 km buffer from the linear component boundary.

The rationale for the RSA is as follows (**Table 4.3-1** of **Section 4**):

- Extends beyond the mine site LSA to consider natural barriers for wildlife such are large water bodies or watershed divides.

The RSA for the purpose of the bats VC; comprises 291,714 ha and is large enough to assess the seasonal home range movements and important seasonal habitats of most bat species considered, some of which have long distance movement patterns. The RSA was selected to include a wide variety of habitat types also found in the LSA, allowing the assessment of relative abundance of habitat within the LSA relative to the greater region within which the Project is situated.

5.4.14.3.2 Temporal Boundaries

Temporal boundaries of the Project, which are contingent on permitting, include four primary phases:

- **Construction phase:** The construction phase of the Project will occur over 2 years and will likely start following receipt of the required permits;
- **Operations phase:** The operations phase of the Project will extend for approximately 17 years;
- **Closure phase:** The closure phase is estimated to last approximately 18 years (ending in Year 35); and
- **Post-closure phase**: The post-closure phase starts in Year 35.

In terms of duration of effects, the following terms are used in this effects assessment: Short-term—Effect occurs during the construction phase; Long-term—Effect occurs throughout operations and closure; and Chronic—Effect extends into post-closure or beyond.

5.4.14.3.3 Administrative Boundaries

The Vanderhoof LRMP identifies smaller Resource Management Zones (RMZs) that have different resource development and conservation objectives. Each RMZ has a selection of species of management concerns and objectives to guide land use decisions and management. The mine site and associated infrastructure including the roads and transmission line are located within the following RMZs: Nechako Valley, Nechako West, Upper Nechako River, Vanderhoof South, Crystal Lake, Kluskus, Chedakuz, Davidson Creek, and Laidman Lake. These RMZs have objectives that are considered for each species effects assessment if relevant. The Project is located within five Wildlife Management Units (WMUs): 5-12, 5-13, 6-1, 7-11, and 7-12. Each WMU is the primary designation tool for conservation lands under section 4 of the *Wildlife Act*.

5.4.14.3.4 Technical Boundaries

Technical boundaries for the assessment are established by the accuracy of the wildlife habitat model predictions used in the effects assessment. There is an uncertainty/margin of error associated with the use of habitat suitability models; however, Resources Information Standards Committee (RISC) standards for ratings and suitability classes were followed (RISC, 1999). Therefore, these are considered acceptable levels of uncertainty for an assessment. Surveys were completed within portions of the LSA and RSA.

5.4.14.3.5 Potential Project Effects

The named projects from the PIL in **Table 4.3-11** that represent present and future projects will not have interactions with the Project however the listed activities from the list will. Pre-existing habitat loss and fragmentation due to logging and road development has altered the habitat within the Project area. The mountain pine beetle (MPB) infestation has affected large areas of mature

pine forest in the region including the LSA and RSA, some of which was harvested, while remaining stands are in various stages of degeneration. Mineral exploration in the area increased the number of access roads. Bat baseline information was collected in the LSA and portions of the RSA that have been altered by these past and present activities. The future activities in the RSA are expected to include similar activities. Forest fire and forest insects are the primary natural disturbances in low elevation habitat. Fire directly alters habitat through loss of mature conifer stands, which are important roosting areas.

The assessment of potential Project effects on bats within the RSA included habitat effects, mortality risk, changes in population dynamics, changes in movement patterns, and changes in bat health, as well as potential cumulative effects. Many threats to bats and their habitat are related and may interact. Cumulative impacts may not be evident when threats are examined individually.

Project effects consider both the key and moderate interactions defined in identified in **Section 4, Table 4.3-2** (Project Component and Activity Interaction Matrix). In order to conservatively assess interactions of the project with bats and bat habitat, both key and moderate interactions were combined and included in modeling and effects assessment. The interactions are further identified using a ranking table (**Table 5.4.14-3**) to identify potential interactions with different Project activities. Impacts were considered based on whether the resulting effect can be managed to acceptable levels through standard operating practices and the application of best management practices (BMPs) or codified practices or if the resulting effect may exceed acceptable levels without implementation of specified mitigation. The table is used to guide specific mitigation and monitoring needed for this VC.

Table 5.4.14-3: Potential Interaction of Project Activities with Bats

Project Activities	Potential Key and Moderate Interactions
Construction of Mine, Airstrip, Access Roads, Freshwater Supply Pipeline, and Transmission Line	
Clearing and grubbing	2
Open pit preparation	1
General earthworks (moving surface soil)	2
Equipment operation	1
Road upgrading and construction	2
Borrow pit excavation	2
Road and airstrip use	1
Operations of Mine, Airstrip, Access Roads, Freshwater Supply Pipeline, and Transmission Line	
Open pit mining	1
Process plant	1
Transportation system preparation	2
Temporary waste rock stockpiles	1
Tailings storage facility	1
Camp	1

Project Activities	Potential Key and Moderate Interactions
Road use	2
Water collection pond	2
Decommissioning Closure and Post-Closure Mine, Airstrip, Access Roads, Freshwater Supply Pipeline, and Transmission Line	
Roads	2
Reclamation	2

Note: 0 = No interaction.
1 = Moderate Interaction occurs; however, based on past experience and professional judgment, the resulting effect can be managed to acceptable levels through standard operating practices and/or through the application of best management or codified practices.
2 = Key Interaction occurs. The resulting effect may exceed acceptable levels without implementation of mitigation. Further assessment and monitoring is warranted.Several measurable categories of assessment for Project effects were defined; **Table 5.4.14-4** presents the rationale for the selection of each category of assessment.

Table 5.4.14-4: Categories of Assessment for Bats

Category of Assessment	Notes or Rationale for Selection
Habitat Loss and Alteration	Effects on population abundance and distribution are directly affected by habitat availability and displacement from effective habitat. Vegetation clearing for the Project and sensory disturbance from Project activities during construction and operations may affect habitat availability and quality. This analysis included ranking habitat quality for bats, so that the relative quantitative and qualitative loss of moderate to high quality versus lower quality habitat was assessed in relation to the local and regional availability of suitable habitat measured as percentage and hectares lost.
Changes in Bat Population Dynamics	Competition and predation may be affected by changes in prey abundance/habitat availability, and changing population sizes, resulting in differential mortality of some bat species. The Project may indirectly alter predator–prey relationships among some species and contribute to cumulative landscape changes. This relies on provincial data and potential monitoring data of bat populations and distribution over the life of the Project, including species, features, and occurrences based on field surveys and BC CDC records. For bats, the focus is on relative abundance and distribution in areas of potential impact and measures of known mortality.
Mortality Risk	Risk is based on a qualitative assessment of the potential impacts of roads, pits, and other structural features on direct mortality. The assessment includes potential effects of direct mortality from vehicles. This relies on provincial data and potential monitoring bat mortality related to the Project area. This is a qualitative estimate based on risk of vehicle collisions with a threshold of multiple mortality (e.g., >10 at any specific location) triggering adaptive management.
Changes in Bat Movement Patterns	Changes in movement patterns may affect species breeding and survival rates and may increase predation/mortality.

Category of Assessment	Notes or Rationale for Selection
	Qualitative discussion is based on information from habitat mapping, existing knowledge on wildlife movement patterns, and characteristics and context of Project components.
Changes in Bat Health	Contaminant loading may affect wildlife health. The potential effects of identified contaminants of potential concern on wildlife feeding, migration and movement, reproductive behaviour and success, and direct mortality were assessed. Introduction and spread of white-nose syndrome is a conservation concern for many bat species. This is a qualitative measure that relies on reporting of animal health and provincial data.

Note: Includes input from consultation with regulators, Aboriginal organizations, affected stakeholders and the public, as well as EA guidelines, other regulatory drivers, policies and/or programs.

Evidence suggests that, below certain thresholds of habitat cover, some species may decline more rapidly than would be expected from habitat loss alone. When remaining functional habitat is greater than 10% to 30% in a region, species are still affected by habitat loss (Andrén, 1994; Fahrig, 1997; Swift and Hannon, 2010) but are not necessarily at risk of regional extirpation. For instance, higher thresholds have been reported for some species (e.g., Gibbs, 1998; Homan et al., 2004), which may reflect sensitivity to fragmentation after only moderate habitat loss. Depending on the taxa and landscape, residual habitat thresholds ranging from 10% to as high as 60% may be required to avoid rapid population declines (Bennett and Ford, 1997; Villard et al., 1999; Swift and Hannon, 2010). However, most evidence supports a minimum 30% residual habitat threshold at a landscape level to avoid rapid declines that may lead to regional extirpation (Swift and Hannon, 2010). For this assessment, precautionary thresholds were identified for species for which specific thresholds do not exist. A precautionary threshold is defined as the point before which a resource would be expected to undergo an unacceptable change from an ecological, regulatory, or social perspective. This definition allows the Proponent and regulators to enact mitigation measures with sufficient time to prevent the particular resource from reaching or exceeding the true ecological threshold. The following precautionary thresholds are used in this assessment: 70% residual habitat (30% loss) for species not identified as a conservation concern; and 80% residual habitat (20% loss) for species of conservation concern (e.g., little brown myotis and northern myotis). For bats, the precautionary threshold of 20% loss is used for assessment of the effects within the RSA because little brown myotis and northern myotis are both federally listed as Endangered by COSEWIC.

The next step was to assess each of these relative interactions of the Project phases and activities with bats to examine which categories of assessment may be expected in different areas and times (**Table 5.4.14-5**).

Table 5.4.14-5: Potential Interactions with Categories of Assessment for Bats

Project Activities	Category of Assessment				
	Habitat Loss or Alteration	**Changes in Bat Population Dynamics**	**Changes in Bat Mortality Risk**	**Changes in Bat Movement Patterns**	**Changes in Bat Health**
Construction of Mine, Airstrip, Access Roads, Freshwater Supply Pipeline, and Transmission Line					
Clearing and grubbing	2	1	1	2	0
Open pit preparation	1	1	1	1	0
General earthworks (moving surface soil)	2	0	0	2	1
Equipment operation	1	1	1	1	1
Road upgrading and construction	2	1	2	2	1
Borrow pit excavation	2	2	1	2	1
Road and airstrip use	1	1	1	1	1
Operations of Mine, Airstrip, Access Roads, Freshwater Supply Pipeline, and Transmission Line					
Open pit mining	1	1	1	1	1
Process plant	1	1	1	1	1
Transportation system preparation	2	1	1	2	1
Temporary waste rock stockpiles	1	1	1	1	1
Tailings storage facility	1	1	1	1	1
Camp	1	1	1	1	1
Road use	2	1	1	2	1
Water collection pond	2	2	2	2	2
Decommissioning Closure and Post-Closure Mine, Airstrip, Access Roads, Freshwater Supply Pipeline, and Transmission Line					
Roads	2	1	1	2	2
Reclamation	2	2	1	2	1

Note: 0 = No interaction.
1 = Moderate Interaction occurs; however, based on past experience and professional judgment, the resulting effect can be managed to acceptable levels through standard operating practices and/or through the application of best management or codified practices.
2 = Key Interaction occurs. The resulting effect may exceed acceptable levels without implementation of mitigation. Further assessment and monitoring is warranted.

Potential key and moderate interactions are linked to the temporal scale of the Project phases and vary in the time needed to return to baseline conditions (**Table 5.4.14-6**). For instance, sensory disturbance effects tend to be very short-lived and transient, and effects may be related to frequency of disturbance and duration, but recovery may be very quick once disturbances stop. Conversely, habitat loss due to Project construction may require greater amounts of time to recover to baseline conditions.

Table 5.4.14-6: Temporal Boundaries

Category of Assessment	Temporal Boundary
Habitat Loss and Alteration	Construction through closure
Changes in Bat Population Dynamics	All phases after clearing and during construction
Mortality Risk	Construction and operations
Changes in Bat Movement Patterns	Construction and operations
Changes in Bat Health	Construction and operations

Anticipated Project effects include habitat loss (i.e., cleared vegetation, changes to wetland quantity and quality) and some potential degradation (**Table 5.4.14-7**). The construction of the mine site, access roads, transmission line, freshwater supply pipeline, and airstrip expansion will require the removal of vegetation. A small amount of this vegetation will be lost permanently (greater than 100 years), while the majority of other areas will be reclaimed progressively or during closure.

Table 5.4.14-7: Overview of Potential Project Effects on Bats

Category of Assessment	Description	Project Phases	Project Components
Habitat Loss and Alteration	Areas cleared of vegetation for Project infrastructure (e.g., facility direct footprint, road surface, and cut/fill, borrow areas, etc.) result in temporary to long-term habitat loss.	Construction, Operations, Closure	Mine site, access roads, transmission lines, freshwater supply pipeline, and airstrip
Mortality Risk	Direct mortality from physical exposure to traffic or attractants. Disrupted movements and displacement from areas used for reproduction or feeding.	Construction, Operations	Mine site, access roads, transmission lines, freshwater supply pipeline, and airstrip
Bat Health	Changes to bat health because of dust or light attractants that may affect bat feeding, migration and movement, denning and refuge, reproductive behaviour and success, and direct mortality/health. Handling bats (if capture surveys are conducted) may introduce or spread white-nose syndrome.	Construction, Operations	Mine site, access roads, transmission lines, freshwater supply pipeline, and airstrip

In addition to direct habitat loss, activities on the mine site, airstrip, and road may reduce functional use of habitat. Road use may result in direct mortality from vehicle collisions and displacement from suitable habitat from sensory disturbance (e.g., noise, visual disturbance from mine-related activity). Mitigation may help reduce the incidence of vehicle mortality; however, it is not expected to eliminate the effect. Dust and attractants such as artificial lights may potentially affect bats that frequent the mine site, airstrip, transmission line, or access road areas.

Three of the five potential categories of assessment, habitat loss and alteration, change in bat mortality risk, and change in bat health, are considered to have potential measurable residual effects and, therefore, carried through the effects assessment.

The other two potential effects considered in the assessment, changes in population dynamics and changes in movement patterns, will not be considered further in the assessment. This rationale is based on the conclusions of the atmospheric effects assessment and the surface water quality effects assessment, and the mitigation measures of the Wildlife Management Plan (WLMP) (**Section 12.2.1.18.4.6**), Landscape, Soils, and Vegetation Management and Restoration Plan (LSVMRP) (**Section 12.2.1.18.4.4**), Invasive Species Management Plan (ISMP) (**Section 12.2.1.18.4.5**), Wetlands Management Plan (WMP) (**Section 12.2.1.18.4.3**), Sediment and Erosion Control Plan (SECP) (**Section 12.2.1.18.4.1**), Reclamation and Closure Plan (RCP) (**Section 2.6**), and the Aquatic Resources Management Plan (ARMP) (**Section 12.2.1.18.4.2**). The noise and vibration effects assessment states that no meaningful changes to ambient noise levels can be expected beyond the Project boundary; therefore, residual effects are negligible. The only exceptions will be blasting and aircraft noise; however, they will have an insignificant impact on equivalent sound pressure levels due to their very short duration. Consequently, changes in bat movement patterns due to noise disturbance are not considered further but are included in habitat alteration considerations through LSA buffering and downgrading habitat suitability classes near infrastructure.

5.4.14.3.6 Assessment Approach for Measuring Potential Effects

Quantitative and qualitative approaches were used for the assessment of potential Project effects on bats. A quantitative habitat approach was used for determining the potential loss and alteration of habitat within the RSA.

5.4.14.3.6.1 Habitat Suitability Model Assumptions

Habitat suitability modeling is based on assumptions related to TEM and PEM habitat interpretations, professional judgement and experience related to bats and bats habitat, literature and traditional knowledge. Assumptions include the quantitative rating of TEM and PEM units for value to bats during different life history stages and seasons and are based on similar models used and tested throughout BC and assessed over time through population estimates and research. Specific assumptions related to habitat quality are described in each sub-model. Habitat suitability value is assumed to reflect the current value of habitat and not the future value.

Assumptions related to mortality, disturbance, displacement, predation and health are described in the effects sections related to these categories of assessment. Habitat ratings were interpreted

to represent potential reductions in habitat quality and effectiveness related to mine infrastructure. Models assumed that all suitable habitat could be used and that habitat was included in calculations of habitat impacted by the Project.

5.4.14.3.6.2 Habitat Loss and Alteration

To identify the most critical habitats for bats, ratings tables were created to complete habitat suitability mapping and calculate potential areas affected by Project component footprints (**Appendix 5.4.14B**). Terrestrial Ecosystem Mapping (TEM) or Predictive Ecosystem Mapping (PEM) was the basis for habitat polygons (**Figure 5.4.14-1**) rated in the LSA and RSA. The focal species, little brown myotis, was the only bat species detected in the higher elevations near the mine site. The habitat of the little brown myotis provides a representative assessment of the range for bats in the Project area.

5.4.14.3.6.3 Bat Growing Season Habitat Suitability Model

Habitat suitability mapping was completed for the growing season (i.e., spring, summer, and fall) when bat activity in the Project area comprises feeding, breeding, and summer roosting, which is collectively referred to as living habitat. The specific life requisites and habitat for little brown myotis were identified and mapped within the LSA and RSA using a four-class habitat suitability ranking system (RISC, 1999). A 15 m buffer was placed on the edge of streams (greater than 2nd order) as well as wetlands and lakes where the habitat rating, if needed, was increased to moderate value in order to quantify wetland habitats predicted as important for feeding. The waterbody was rated as moderate habitat because bats fly over the surface to forage. There was no evidence of winter hibernacula, and site-specific features such as caves would be difficult to identify through modelling given the available data.

Moderate and high value habitat consists of mixed deciduous and coniferous forest with structural stage 6 or 7 and cliffs for diurnal or maternal roosting and waterbodies for feeding. Nursery roosts require the site to have stable hot (30°C to 55°C) temperatures; therefore, lower elevation areas of the Project area may be more suitable for this type of roost.

A detailed species account for little brown myotis is provided in **Appendix 5.4.14A**.

5.4.14.3.6.4 Mortality Risk

There are no measureable parameters for the assessment of changes in mortality due to increased access into an area resulting in collisions with vehicles or the transmission line; therefore, the assessment is qualitative.

5.4.14.3.6.5 Bat Health

Bat health was carried through the residual assessment as a preventative measure. There are no measurable parameters for the assessment of wildlife health from the Project other than the potential introduction of white-nose syndrome; therefore, the assessment is qualitative. While abundant in BC, little brown myotis has shown catastrophic declines (94% to 99%) in eastern North America in populations exposed to white-nose syndrome. Discovered in 2006, this emerging disease is caused by a fungus and has been spreading at rates between 200 km/year and 400

km/year. This species could become functionally extirpated in the near future if white-nose syndrome spreads to BC (Government of Canada, 2013). Currently, the westernmost extent of white-nose syndrome in Canada has been recorded in Ontario (Canadian Wildlife Federation, 2014).

There are no predicted residual effects from water quality, and management plans including the LSVMRP (**Section 12.2.1.18.4.4**), ISMP (**Section 12.2.1.18.4.5**), WMP (**Section 12.2.1.18.4.3**), SECP (**Section 12.2.1.18.4.1**), RCP (**Section 2.6**), and the ARMP (**Section 12.2.1.18.4.2**). Tinclude measures to keep bats from potentially harmful chemicals.

5.4.14.3.7 Model Results for Quantification of Potential Project Effects on Habitat

The potential overlap of Project component footprints on the habitats of focal bat species is tabulated in **Table 5.4.14-8** and illustrated on **Figure 5.4.14-2**. The areas shown represent the maximum potential habitat affected and do not account for existing disturbance or mitigation measures.

Table 5.4.14-8: Moderate and High Valued Bat Living Habitat Area Affected Within Footprints, LSAs, and RSA

	Project Component	Bat Habitat Area (ha)	Total Area (ha)	Habitat % of Total Area	% RSA Habitat by Footprint Component
Footprint or Corridor	Access Road	81	95	85	<1
	Airstrip	42	50	84	<1
	Kluskus FSR	83	253	33	<1
	Mine Site	2,705	4,430	61	1
	Freshwater Supply Pipeline	85	132	64	<1
	Transmission Line – Main	1,220	1,806	68	1
	Transmission Line - Mills Ranch	173	202	86	<1
	Transmission Line - Stellako	45	62	72	<1
	Total	4,434	7,032	63	2
LSA	Access Road	312	363	86	<1
	Airstrip	394	465	85	<1
	Kluskus FSR	3,961	6,574	60	2
	Mine Site	3,734	6,123	61	2
	Freshwater Supply Pipeline	550	731	75	<1
	Transmission Line - Main	5,534	8,068	69	3
	Transmission Line – Mills Ranch	820	924	89	<1
	Transmission Line – Stellako	255	306	83	<1
	Total	15,560	23,554	66	8
RSA		205,901	291,714	71	-
Area	Footprint % RSA	2	-	-	-
	Footprint % LSA	30	-	-	-

	Project Component	Bat Habitat Area (ha)	Total Area (ha)	Habitat % of Total Area	% RSA Habitat by Footprint Component
Habitat	Footprint % RSA habitat	2	-	-	-
	Footprint % LSA habitat	28	-	-	-

Note: FSR = forest service road; ha = hectare; % = percent; LSA = Local Study Area; RSA = Regional Study Area

5.4.14.3.7.1 Habitat Loss and Alteration

The habitat loss and alteration category of effects is a method to account for areas of vegetation and wetland removal and/or ground disturbance due to placement of infrastructure and edge effects. To simplify the effects assessment, all lost areas are combined regardless of how long they are lost (even though the Project area will be reclaimed, except for some small features) to represent a worst-case scenario. Clearing of vegetation associated with footprints or corridors will reduce available potential habitat within the Project area. Effects of direct habitat loss are assessed relative to the amount of similar habitat available within the RSA and to the threshold of magnitude set to determine significance.

Moderate and high value living habitat consists of mature and old-growth forests that provide an optimal mix of foraging and security/thermal habitats. In the RSA, 71% (205,901 ha) was rated as moderate and high value living habitat during the growing season. Footprint components overlap approximately 2% of suitable moderate and high value habitat in the RSA.

Within the footprint, higher elevation infrastructure associated with the mine site is located in areas ranging from low to high value to bats. The mine site is predicted to overlay a maximum 2,705 ha (1% of available moderate and high value habitat in the RSA). Clearing of vegetation associated with footprints or corridors will reduce the amount of thermal cover, which can be limiting; however, these newly cleared areas can be used as movement corridors through the forest to foraging sites. The potential direct habitat loss for bats associated with clearing for the mine access road and the freshwater supply pipeline is predicted to overlap with a mosaic of all three rankings of habitats; however, 53% of the mine access road and 86% of the FSR is already along a cleared corridor. The different forest structural stages in these areas are due to timber harvesting. Habitat requirements for maternal roosting areas indicate that these areas are likely not used during this life stage. Most potential impacts for bats are anticipated to be associated with the clearing of mature and old-growth forests along the transmission line. The footprint of the transmission line (including re-route options) is predicted to overlay a maximum 1,220 ha (1% of available moderate and high value habitat in the RSA); however, 39% of the transmission route is along existing corridors (not including re-route options). Potential habitat in areas where there has been heavy timber harvesting is likely less suitable for bat living; however, wetlands in these areas can be used as foraging sites.

360000 370000 380000 390000

5910000 5900000 5890000

Proposed Transmission Line

Proposed Transmission Line (Mills Ranch re-route)

Chedakuz Creek

Proposed Mine Access Road

Proposed Airstrip

Proposed Fresh Water Pipeline

Kluskus-Ootsa FSR

Proposed Airstrip Access Road

Tatelkuz Lake

Snake Lake

Top Lake

Davidson Creek

Exploration Road

Kuyakuz Lake

Kluskus-Blue FSR

N

Legend

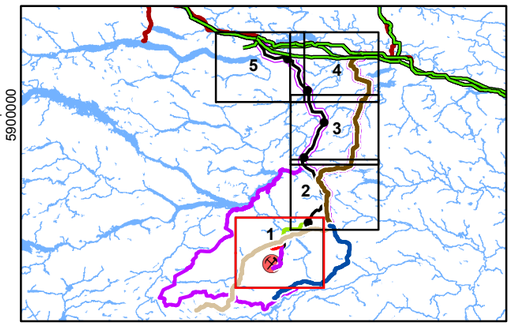
- Existing Road
- Kluskus-Blue FSR
- Kluskus-Ootsa FSR
- Exploration Road
- Proposed Airstrip Access Road
- Proposed Mine Access Road
- Proposed Fresh Water Pipeline
- Proposed Transmission Line
- Proposed Transmission Line (Mills Ranch re-route)
- Proposed Airstrip
- Proposed Site Facilities
- Stream (>=2nd Order)
- Waterbody (>= 4 Ha)
- Wetlands (within RSA)

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area

Wildlife Habitat Rating

- 1 - High
- 2 - Moderately High
- 3 - Moderate
- 4 - Low
- 5 - Very Low
- 6 - Nil



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Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold™		
PROJECT: Blackwater Gold Project		
Little Brown Myotis Habitat Suitability, Map 1 of 5		
DATE: September, 2015	ANALYST: MY	**Figure** 5.4.14-2
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PROJECTION: UTM Zone 10	DATUM: NAD83	

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390000 400000 410000 420000

5940000 5930000 5920000

Chief Gray Lake
Hobson Lake
Nechako Reservoir
Vivian Lake
Provist Lake
Willington Lake
Finnie Lake
Andros Lake
Duten Lake
Finger Lake
Otter Lake
Stefiuk Lake
Tatuk Lake
FINGER TATUK PARK
Lavoie Lake
Turff Lake
Hay Lake
Cory Lake
Klunchatistli Lake
Goose Lake
Brewster Lakes
Brewster Lakes
Brewster Lakes
Kluskus FSR
Proposed Transmission Line
Chutanli Lake

N

Legend

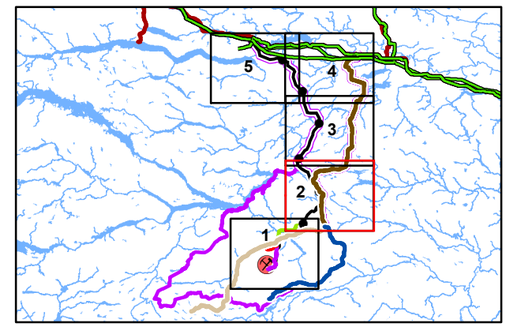
- Existing Road
- Kluskus FSR
- Kluskus-Blue FSR
- Kluskus-Ootsa FSR
- Proposed Transmission Line
- Proposed Transmission Line (Mills Ranch re-route)
- Stream (>=2nd Order)
- Waterbody (>= 4 Ha)
- Wetlands (within RSA)
- Parks and Protected Areas

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area

Wildlife Habitat Rating

- 1 - High
- 2 - Moderately High
- 3 - Moderate
- 4 - Low
- 5 - Very Low
- 6 - Nil



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Reference

BC Government GeoBC Data Distribution

CLIENT: newgold™

PROJECT: Blackwater Gold Project

Little Brown Myotis Habitat Suitability, Map 2 of 5

DATE: September, 2015	ANALYST: MY	**Figure** 5.4.14-2b
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PROJECTION: UTM Zone 10	DATUM: NAD83	amec

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5960000 5950000 5940000

Hallett Lake
Tahultzu Lake
Proposed Transmission Line
True Triangle Lake
Triangle Lake
Lorne Lake
Bungalow Lake
Nechako River
Welch Lake
Kluskus FSR
Paddle Lake
Crystal Lake
Home Lake
Boomerang Lake
Johnson Lake
Secord Lake
Gluten Lake
Duten Lake
Vivian Lake
Chief Gray Lake

N

Legend

- Existing Road
- Kluskus FSR
- Proposed Transmission Line
- Stream (>=2nd Order)
- Waterbody (>= 4 Ha)
- Wetlands (within RSA)

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area

Wildlife Habitat Rating

- 1 - High
- 2 - Moderately High
- 3 - Moderate
- 4 - Low
- 5 - Very Low
- 6 - Nil

Scale: 1:120,000

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Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold™

PROJECT: Blackwater Gold Project

Little Brown Myotis Habitat Suitability, Map 3 of 5

DATE: September, 2015	ANALYST: MY	**Figure** 5.4.14-2c
JOB No: VE52277	QA/QC: MB	PDF FILE: 04-03-031_WHR_MYLU_5.4.14-2.pdf
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PROJECTION: UTM Zone 10	DATUM: NAD83	amec

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5990000 5980000 5970000

DRYWILLIAM LAKE ECOLOGICAL RESERVE

BEAUMONT PARK

Fraser Lake
Nadleh Whuten
Fort Fraser
16
Seas Lake
Drywilliam Lake
Ronson Lake
Stag Lake
Klez Lake
Theda Lake
Rock Lake
Foster Lakes
Joseph Lake
Marten Lake
Engen
Leg Lake
Proposed Transmission Line
Chowsunkut Lake
Centre Lake
Milligan Lake
Kluskus FSR
Limit Lake
Tachick Lake
Dorman Lake
Nulki Lake
Tahultzu Lake
Welch Lake

N

Legend

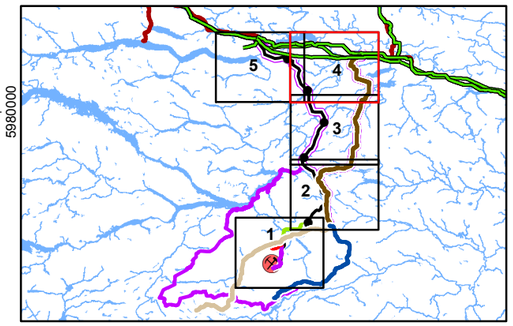
- Existing Transmission Line
- Highway
- Existing Road
- Kluskus FSR
- Proposed Transmission Line
- Stream (>=2nd Order)
- Waterbody (>= 4 Ha)
- Wetlands (within RSA)
- Parks and Protected Areas

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area

Wildlife Habitat Rating

- 1 - High
- 2 - Moderately High
- 3 - Moderate
- 4 - Low
- 5 - Very Low
- 6 - Nil



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Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold™		
PROJECT: Blackwater Gold Project		
Little Brown Myotis Habitat Suitability, Map 4 of 5		
DATE: September, 2015	ANALYST: MY	**Figure** 5.4.14-2d
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PROJECTION: UTM Zone 10	DATUM: NAD83	

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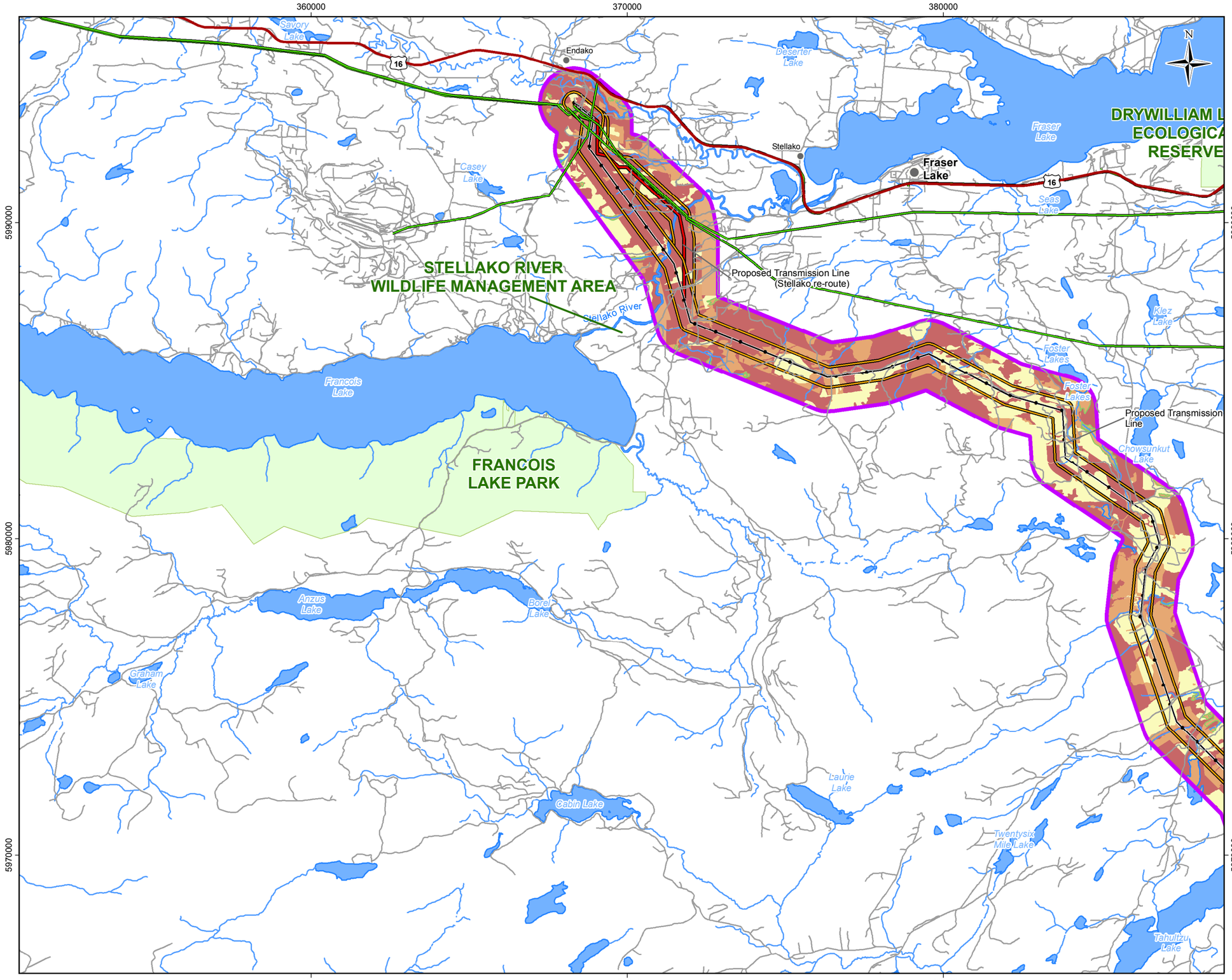


Legend

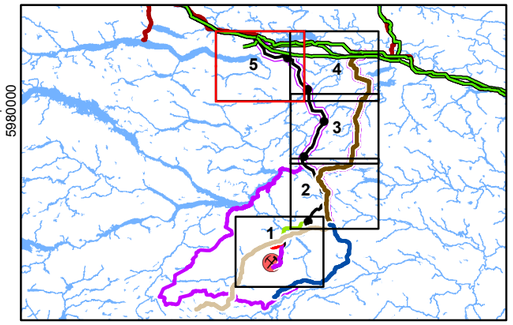
- Populated Place
- Existing Transmission Line
- Highway
- Existing Road
- Proposed Transmission Line
- Proposed Transmission Line (Stellako re-route)
- Stream (>=2nd Order)
- Waterbody (>= 4 Ha)
- Wetlands (within RSA)
- Parks and Protected Areas

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area

Wildlife Habitat Rating

- 1 - High
- 2 - Moderately High
- 3 - Moderate
- 4 - Low
- 5 - Very Low
- 6 - Nil



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Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold™

PROJECT: Blackwater Gold Project

Little Brown Myotis Habitat Suitability, Map 5 of 5

DATE:	ANALYST:	**Figure** 5.4.14-2e
September, 2015	MY	
JOB No: VE52277	QA/QC: MB	PDF FILE: 04-03-031_WHR_MYLU_5.4.14-2.pdf
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PROJECTION: UTM Zone 10	DATUM: NAD83	amec

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The total maximum extent of the Project footprint (within clearing limits) is 7,032 ha; 4,430 ha of which is attributed to the mine site, 95 ha to the access roads (including borrow areas), 50 ha to the airstrip, 132 ha to the freshwater supply pipeline, and 2,070 ha to the transmission line (all options included). The clearing limits equal maximum potential lost area, and include previously disturbed area. As a conservative estimate, this does not include restored areas after reclamation. Use of the existing Kluskus FSR and Stellako transmission line option would have negligible additional impact, and the main transmission line and mine site represent 6,236 ha of potential maximum clearing.

5.4.14.3.7.1.1 Mortality Risk

Many bat species are attracted to forest openings for foraging; therefore, the mine site, access road, freshwater supply pipeline, airstrip, transmission line, and Kluskus FSR may act as openings and potential attractants for bats. Given that bats use echolocation to identify obstacles, it is unlikely that there will be collisions with the transmission line. Similarly, the expected traffic increase is not predicted to cause a measureable increase in vehicle collisions. Effects will potentially occur from the start of Project construction to the end of closure.

5.4.14.3.7.1.2 Bat Health

Currently, white-nose syndrome is not present in BC. The disease, which typically spreads from bat to bat and during handling, kills bats during hibernation. A newly discovered fungus, *Pseudogymnoascus destructans*, causes white-nose syndrome, which shows as a white fungus appearing on the muzzles and other body parts of the bats. Bats with the syndrome exhibit uncharacteristic behaviour such as flying outside during the day during the winter months.

5.4.14.3.8 Mitigation Measures

A range of habitat mitigation measures was adapted and applied to the Project as described in the WLMP (**Section 12.2.1.18.4.6**), LSVMRP (**Section 12.2.1.18.4.4**), Water Quality and Liquid Discharges Management Plan (WQLDMP) (**Section 12.2.1.18.4.10**), and WMP (**Section 12.2.1.18.4.3**). The following habitat mitigation measures apply to all bats and are specific to the potential effects carried through the assessment.

5.4.14.3.8.1 Habitat Loss and Alteration

A range of mitigation measures was adapted for the Project. The following mitigation measures will help reduce or eliminate habitat loss and alteration. Avoiding and/or mitigating loss and degradation effects to bats and bat habitat begins with the Project design. The Kluskus FSR is an existing road for most of its footprint. Some mitigation measures already in place include:

- Road design using existing roads and cleared areas when possible, and, when not avoidable, locating proposed access roads and transmission lines away from wetland and riparian areas or spanning wetlands; and

- Movement of the facilities and topsoil piles within the mine site area away from wetlands, and/or minimizing ground disturbance footprint, and minimizing clearance of riparian forest and mature forest.

To meet provincial and federal regulatory requirements for wildlife, vegetation, and aquatic resources relating to the conservation of species and ecosystems at risk, the following plans will be implemented: LSVMRP (**Section 12.2.1.18.4.4**), ISMP (**Section 12.2.1.18.4.5**), WMP (**Section 12.2.1.18.4.3**), SECP (**Section 12.2.1.18.4.1**), RCP (**Section 2.6**), and the ARMP (**Section 12.2.1.18.4.2**). These plans are designed to control invasive plant species, protect wildlife habitat, and protect in-stream resources. Implementing these management plans, including the wildlife and wetland specific BMPs, will protect and minimize the potential effects of the Project on bat habitat not directly affected by the Project.

Mitigation for unavoidable loss of bat habitat will be limited to the Project footprint area and will include:

- 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 *Forest and Range Practices Act* 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; and
- Implementing progressive wetland restoration during construction to achieve no-net-loss of wetlands to prevent potential high quality habitat loss.

The Project development is unlikely to affect local bat populations, due to lower suitability of the mine site for living and the lack of any detected large communal roosting habitat in the mine footprint area. Clearing of vegetation for the transmission line is unlikely to affect bat populations,

because wetlands associated with bat feeding areas will likely be spanned by power poles, thereby lessening any direct habitat loss. Because the Project will not be altering cave habitat, potential communal roosting areas will likely remain unaffected. The overall effect of the development on bats will likely be a small reduction in the amount of suitable living habitat during the growing season. Creation of open areas with local water pooling may create additional feeding habitat for bats.

5.4.14.3.8.2 Mortality Risk

Mitigation measures to reduce the potential for direct and indirect mortality include:

- Minimizing sensory disturbance due to noise and light at the mine site and airstrip, as stated within the Noise and Vibration Mitigation Measures (**Section 5.2.2**); and
- Reporting and documenting bat observations and mortalities along access roads and implementing adaptive management according to the WLMP.

5.4.14.3.8.3 Bat Health

Any incidences of handling bats associated with the Project will follow the most up-to-date decontamination protocols to avoid an introduction of white-nose syndrome (White-nose Syndrome Decontamination Team, 2012).

5.4.14.3.8.4 Effectiveness of Mitigation

Table 5.4.14-9 provides ratings for effectiveness of mitigation measures to avoid or reduce potential effects on bats during mine site development. Mitigation measures will be based on site-specific information and construction engineering and are therefore preliminary at this stage.

Table 5.4.14-9: Mitigation Measures and Effectiveness of Mitigation to Avoid or Reduce Potential Effects on Bats during Mine Site Development

Likely Environmental Effect	Project Phase	Mitigation/Enhancement Measure	Effectiveness of Mitigation Rating
Habitat Loss and Alteration	Construction, Operations, Closure, Post-Closure	Road design using existing roads and cleared areas when possible, and, when not avoidable, locating proposed access roads and transmission lines away from wetland and riparian areas or spanning wetlands	High
		Movement of the facilities and topsoil piles within the mine site area away from wetlands, and/or minimizing ground disturbance footprint, and minimizing clearance of riparian forest and mature forest	High
		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 *Forest and Range Practices Act* BMPs (BC MFLNRO, 2014)	High
		Clearing of transmission line ROWs may leave suitable habitat for bats or reclaimed to provide habitat that will also be suitable for bats	High
		Designing roads and transmission lines and poles away from wetland areas and riparian areas, or spanning wetlands	High
		Implementing progressive reclamation using local native vegetation wherever possible, or appropriate commercially grown, weed-free native species (LSVMRP, ISMP, RCP)	Moderate
		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	Moderate
		Implementing invasive plant management techniques as defined in the ISMP	Moderate
		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**)	High
		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	High

Likely Environmental Effect	Project Phase	Mitigation/Enhancement Measure	Effectiveness of Mitigation Rating
		Implementing progressive wetland restoration during construction to achieve no-net-loss of wetlands to prevent potential high quality habitat loss	High
Mortality Risk	Construction, Operations, Closure, Post-Closure	Minimizing sensory disturbance due to noise and light at the mine site and airstrip, as stated within the Noise and Vibration Mitigation Measures (**Section 5.2.2**)	High
		Reporting and documenting bat observations and mortalities along access roads and implementing adaptive management according to the WLMP	Moderate
Changes in Bat Health	Construction, Operations, Closure, Post-Closure	Any incidences of handling bats associated with the Project will follow the most up-to-date decontamination protocols to avoid an introduction of white-nose syndrome (White-nose Syndrome Decontamination Team, 2012)	High

Note: BC MFLNRO = British Columbia Ministry of Forests, Lands and Natural Resource Operations; BMP = Best Management Practice; FSR = Forest Service Road; ISMP = Invasive Species Management Plan; LSVMRP = Landscape, Soils and Vegetation Management and Restoration Plan; RCP = Reclamation and Closure Plan; WLMP = Wildlife Management Plan

The mitigation/offsetting success ratings shown in **Table 5.4.14-9** are incorporated into the confidence ratings defined in **Section 4.3.5** and summarized in **Table 5.4.14-11**. In summary, low success rating means mitigation has not been proven successful, moderate success rating means mitigation has been proven successful elsewhere, and high success rating means mitigation has been proven effective.

In the case of bats on the mine site, mitigation/offsetting success rating is classified as high overall because most mitigation measures are consistent with those proposed by BC MFLNRO for protection of bat populations, and demonstrated as moderate to high in effectiveness in other locations.

5.4.14.4 Residual Effects and their Significance

Table 5.4.14-10 presents a summary of the potential residual effects after mitigation, as well as management strategies by Project phase and component.

Potential residual effects on bats are characterized in terms of the effect's magnitude or severity, geographic extent, duration, and reversibility, the context/resilience of bats or bat habitat, probability of the effect's occurrence, and confidence in the conclusions (**Table 5.4.14-11**).

Thresholds are based on the ability to likely detect change in local populations because of Project effects. Threshold effects levels to bats were selected to reflect the ability of surveys to detect quantitative and qualitative changes (**Table 5.4.14-12**).

Table 5.4.14-13 presents a summary of the residual effects assessment summary for bats, based on the categorization of effects.

Table 5.4.14-10: Summary of Categories of Assessment and Mitigation Measures – Bats

Project Phase	Project Component	Category of Assessment	Mitigation and Management of Effects	Potential for Residual Effect?
Construction, Operations, Closure, and Post-Closure	Mine site, access roads, freshwater supply pipeline, airstrip and transmission line	Habitat Loss and Alteration	LSVMRP, progressive reclamation with appropriate species.	Yes
Construction, Operations, Closure, and Post-Closure	Mine site, access roads, freshwater supply pipeline, airstrip and transmission line	Mortality Risk	Follow wildlife management plan to reduce potential mortality effects on bats and their habitat. Restrict access to only individuals working directly for the Proponent; gate site access points and road closure after mine closure (Transportation and Access Management Plan [TAMP] [**Section 12.2.1.18.4.14**]).	Yes
Construction, Operations, Closure, and Post-Closure	Mine site, access roads, freshwater supply pipeline, airstrip and transmission line	Changes in Bat Health	Prevent introduction or spread of white-nose syndrome by bat researchers. Follow specific decontamination procedures if bats are handled or habitat is visited.	No

Table 5.4.14-11: Characterization of Residual Environmental Effects for Bats

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Magnitude	The amount of change in a measurable parameter or variable relative to baseline case	Negligible—Effects are not measurable Low—A measurable change but within the range of expected natural variation based on species life history Medium—A measurable change but less than high High[(1)]— A >20% change of density, abundance or distribution for listed species and >30% change of density, abundance or distribution for all other species
Geographical Extent	The geographic area in which an environmental, economic, social, heritage, or health effect of a defined magnitude occurs	Local: Within the LSA—Effect is prevalent in the LSA Regional: Within the RSA—Effect extends beyond the LSA into the RSA
Frequency	When the effect occurs and the number of times during the project or a specific project phase that an environmental effect may occur	Once—Effect occurs on one occasion Intermittent—Effect occurs several times Continuous—Effect occurs continuously
Duration	The period of time required until bats return to its baseline condition, or the effect can no longer be measured or otherwise perceived	Short-term— Less than two years (i.e., effects happens during the construction phase only) Long-term— From more than 17 to less than 35 years (i.e., effect happens during construction, operations and closure) Chronic— More than 35 years and beyond (i.e., effect happens from construction through to post closure and beyond)
Reversibility	The likelihood that a measurable parameter will recover from an effect	Yes—Effect is reversible within part of a whole generation after the impact ceases No—Effect is not reversible over the time scales listed
Context	Resilience to stress due to ecological fragility and degree of disturbance of area in which the Project is located	Low—Bat has high resilience to stress; have not been affected by other projects or activities or natural changes. No listed species or ecosystems identified Medium—Bat has moderate resilience to stress, the VC has been affected by other projects or activities, or natural changes but still has capacity to assimilate more changes. Presence of blue-listed species or ecosystems High—Bat has weak resilience to stress, the VC has been severely affected by other projects or activities, or natural changes. Presence of red-listed or SARA-listed species or ecosystems
Likelihood of Effect	The likelihood that a residual effect will occur	Low—Low likelihood a residual effect will occur Moderate—Moderate likelihood a residual effect will occur High—High likelihood a residual effect will occur
Significance	Expectation of a residual effect on the bat that is above the suggested threshold	Not Significant (negligible)—Effects are point-like or local in geographic extent, have a low context rating, have a negligible magnitude, are short-term, are reversible, and have a low frequency (once or intermittent) Not Significant (minor)—Effects are local in geographic extent, have a low magnitude, have a low context rating, are short-term to chronic, are reversible, and have a low frequency (once or intermittent) Not Significant (moderate)—Effects are local to regional in geographic extent, are medium in magnitude, have medium context rating, are medium-term to chronic, are reversible, and occur at all frequencies Significant—Effects occur to bats with a medium to high context, and high context rating, have high magnitude, are regional in geographic extent, are long-term to chronic, are non-reversible, and occur at all frequencies
Confidence Level	Confidence in the residual effects prediction	Low—Project-bat interaction is not well understood; mitigation has not been proven effective Moderate—Bat interaction is understood in similar ecosystems and effects documented in the larger regional area or in the literature; mitigation proven effective elsewhere High—Project-bat interaction is well understood; mitigation has proven effective

Note: LSA = Local Study Area; RSA = Regional Study Area; *SARA* = *Species at Risk Act*
(1) High: A threshold of 20% change or loss is proposed for high magnitude. This is a general environmental practitioner approach, which has been used and supported in the past for resource development projects, including the Joint Review Panel Report on the Jackpine Mine Expansion Project which decision statement was made under *CEAA 2012*.

Table 5.4.14-12: Threshold(s) for Determining Significance of Residual Bat Effects

Category of Assessment	Threshold of Environmental Effect
Habitat Loss and Alteration	>20% reduction in relative bat habitat abundance or habitat areas with a moderate to high suitability ratings (e.g., >20% change in amount of bat moderate to high suitable habitats within the RSA, as estimated in suitability model). Evidence of lack of use or displacement due to sensory disturbance may be included as lost habitat if evident.
Mortality Risk	Qualitative measure of direct risk within the RSA because of Project effects, primarily traffic (no set threshold).

Note: RSA = Regional Study Area

Table 5.4.14-13: Residual Effects Assessment Summary for Bats

Project Phase	Project Component	Category of Assessment	Mitigation and Management	Potential for Residual Effect?	Residual Effect	Context	Magnitude	Geographic Extent	Duration	Reversibility	Frequency	Likelihood Determination	Level of Confidence for Likelihood	Significance Determination	Level of Confidence for Significance
Construction through to Closure	Mine site, airstrip, transmission line, freshwater supply pipeline, and access roads	Habitat Loss and Alteration	LSVMRP, RCP, and WLMP, bat boxes for roosting and maternal colonies	Yes	Unavoidable loss of habitat	Low	Negligible	Local	Short-term	Reversible	Once	High	High	Not Significant (negligible)	High
Construction through to Closure	Mine site, airstrip, transmission line, freshwater supply pipeline, and access roads	Mortality Risk	WLMP, monitor and respond to any site-specific traffic mortality locations (speed limits, signage); protocols to prevent introduction or spread of disease.	Yes	Unavoidable mortality	Low	Negligible	Local	Short-term	Reversible	Intermittent	Low	High	Not Significant (negligible)	High

5.4.14.4.1.1 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 occurring. The loss and alteration of bat habitat (less than 2% of RSA before mitigation) will occur during the construction phase and these effects will be evident through closure. Within the mine site, the effect is rated as negligible because a small fraction of available habitat will be affected and the sensitivity to recovery for these ecosystems is high. Regionally, these moderate and high value habitats are widespread and relatively common. Less than 2% of available moderate and high value habitat will be affected at the higher elevations near the mine site. The clearing of trees from forested habitats will generally make the habitat unsuitable for bats, as trees are an essential component of their habitat. Wetland compensation works will begin in early operations, creating potential foraging habitat. The effects of changes in bat mortality are rated as negligible due to the mitigation measures that will be in place to ensure road mortality is minimized, and people working on the Project do not introduce white-nose syndrome to the Project area. The disease is not currently known in BC but has spread in other areas of North America. If any future work is conducted on bats in the Project area, disease transmission by researchers will not occur if protocols for research and monitoring are applied (i.e., no introduction of disease from contaminated equipment used for bat monitoring and research).

The duration of the habitat loss effect will be chronic, although the creation of compensatory wetlands and the preventative measure of erecting maternal breeding boxes will help to reduce adverse effects. As part of the reclamation and closure plan, the bat hibernacula houses are to be placed in the areas between upland slope and the undisturbed surroundings to create new breeding or roosting sites.

The habitat effects will occur once, with potential alteration occurring on a continuous basis, but will be reversible in the long term. The mortality risk will occur intermittently but will be reversible during closure. Bat mortality risk will be reduced during closure when areas are deactivated and reclaimed. There is a high likelihood that permanent loss of less than 1% moderate to high value habitat will occur after reclamation and closure. Project activities are not predicted to affect the viability of bats or bat habitat in the RSA, due to the widespread observed extent of bats and their habitat within already disturbed areas of the RSA.

5.4.14.4.1.2 Access Roads and Kluskus Forest Service Road

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 occurring. Loss and alteration of bat habitat will occur during construction along newly cleared areas of the mine access road. There will be negligible loss of bat habitat associated with the existing Kluskus FSR due to the minimal road work required. Regionally, these moderate and high value habitats are widespread and relatively common, and a small percentage of the available moderate and high value habitat will be affected relative to habitats where bats occur near the access road and FSR.

The residual effects of mortality risk are rated as Not Significant (negligible) with high confidence, due to the magnitude, geographical extent, frequency, and reversibility of the effect occurring. Mortality risk is mostly restricted to the mine footprint; however, roads are typically used by bats as movement corridors between forage and roosting sites. The duration of mortality risk will be long-term, and is expected to decrease during closure with reduced traffic levels. Traffic and access control, as well as early compensation works and mitigation measures will reduce any risk of additional mortality.

Project activities are not predicted to affect the viability of bats or bat habitat in the RSA, due to the widespread observed extent of bats and their habitat within already disturbed areas of the RSA.

5.4.14.4.1.3 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 occurring. Loss and alteration of 1,565 ha of bat habitat will occur during construction along newly cleared areas of the transmission line and freshwater supply line. The site of the airstrip is currently a regenerating pine clearcut without water features and has the least amount of high to moderate value habitat for all of the Project features. Regionally, these moderate and high value habitats are widespread and relatively common, and a small percentage of the available moderate and high value habitat will be affected relative to habitats where bats occur near these Project components. The clearing of trees from forested habitats will make the habitat generally unsuitable for bats, as trees are an essential component of all or a portion of their habitat.

The residual effects of habitat loss from the airstrip and freshwater supply pipeline are rated as negligible because much of the area is already disturbed by logging and much of the mitigation practices, including the closure and reclamation plan, will minimize the majority of effects. Bats may use the transmission line as a movement corridor through the forest to forage and roosting sites.

The transmission line, including re-routes, is expected to cross wetland habitats. However, no loss or change of these habitats is expected, since these are not forested habitats that would otherwise require vegetation clearing and maintenance during construction. Footings for the transmission pole structures will be placed outside of these wetland habitats to the maximum extent practicable. The airstrip and freshwater supply pipeline are not expected to directly impact wetland marsh, shallow water, or pond habitats.

The residual effects of mortality risk are rated as Not Significant (negligible) with high confidence, due to the magnitude, geographical extent, and intermittent nature of the effects within these linear components. Traffic and access control as well as early compensation works and mitigation measures will reduce any risk of additional mortality.

Habitat loss and mortality risk of the Project for the airstrip, transmission line, and freshwater supply pipeline are not predicted to affect the regional viability of bats due to the widespread observed extent of bats and suitable bat habitat within the RSA.

5.4.14.4.1.4 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 negligible in magnitude. Wetland compensation works and placement of bat breeding and roosting boxes will be implemented in the operations phase and continue until closure. The context is high for habitat and mortality effects because some bats are designated species at risk, such as the Endangered little brown myotis and northern myotis (COSEWIC, 2014). The Project is unlikely to affect the overall habitat supply for bats within the RSA due to the large amount of available habitat.

Mortality risk will potentially increase during construction along newly cleared sections of the access road and transmission line, and these effects will be evident over the long term, occurring intermittently. The magnitude of the mortality risk effect is considered negligible due to the widespread observed extent of bats in the RSA and the mitigative measures to reduce any risk of additional mortality. The effect may occur continuously but will be reversible in the long term.

5.4.14.5 Cumulative Effects

With the implementation of the proposed mitigation measures, the residual effects of the Project are predicted to be Not Significant (negligible), therefore no cumulative effects are expected.

5.4.14.6 Limitations

The key limitation of this assessment is the limited surveys conducted in the study areas to quantify the summer resident bat species presence over time. Bats are difficult to survey due to their nocturnal activity and roosting behaviour, and not all bats detected are easily identified. Regional abundance and habitat use are based mainly on habitat suitability models and professional judgment.

5.4.14.7 Conclusion

Bat populations and habitats will not be significantly affected through habitat loss or increases in mortality during the life of the Project. The potential Project residual effects include habitat loss and degradation of 4,434 ha of moderate to high value habitat for bats. There will be a temporal loss and alteration effect, including forest and wetland loss due to clearing and construction. There is a high probability that lost habitat will return to near baseline conditions upon closure. The residual effects of mortality increases are considered not significant (negligible) after implementing mitigation measures. Mitigation and adaptive management plans will avoid and mitigate the majority of adverse effects. Where it is not possible to mitigate completely, the effects will be minimized to keep the magnitude of effects to a negligible level. Mitigation measures include implementing a reclamation and closure plan (**Section 2.6**), and following management plans to reduce noise and vibration, improve air quality, minimize invasive species, and avoid spills (**Section 12**).

Mitigation measures to minimize residual effects on bats and bat habitat include:

- Maintain quantity and quality of wetlands and forest cover;
- Include provisions for wildlife in transportation and access management;
- Close and decommission access roads and trails after mine closure and reclamation where feasible;
- Conduct habitat restoration of existing disturbed habitats, transmission line, and including closure and decommissioning spur roads/trails; and
- Establish bat breeding and roosting boxes in suitable habitat to mitigate potential residual Project effects of lost living habitat for some species of bats.