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## **5.4.12 Grizzly Bear (*Ursus arctos*)**

### **5.4.12.1 Introduction**

This section assesses the potential effects of the Project on the grizzly bear Valued Component (VC). The indicator species is grizzly bear (*Ursus arctos*). The assessment is described in the subsections below. This introduction describes the information sources of the assessment and the applicable regulatory framework for the assessment of the VC (**Section 5.4.12.1.1**). The spatial, temporal, administrative, technical boundaries and assessment approach is describes in (**Section 5.4.12.3**).

Grizzly bear (*Ursus arctos*) was selected as a Valued Component (VC) due to its potential sensitivity to human development, low densities in the Project area, its need for large home ranges, and conservation concerns regionally, provincially, and nationally (**Appendix 5.4.12A**). Grizzly bear also has cultural, spiritual, recreational, and ecological importance for a wide variety of people.

Grizzly bear is a provincially Blue-listed species (British Columbia Conservation Data Centre (BC CDC), 2014) and federally designated as a species of Special Concern (Committee on the Status of Endangered Wildlife in Canada (COSEWIC), 2002) but is not listed under the *Species at Risk Act* (SARA) (Government of Canada, 2002). Grizzly bears inhabit all forested and non-forested regions of British Columbia (BC), except Haida Gwaii and outer coastal islands. They are found within all biogeoclimatic (BGC) zones, except the Coastal Douglas Fir zone, and occupy a wide variety of habitats ranging from coastal estuaries to alpine meadows (Cowan and Guiguet, 1965; Hatler, 2008).

Grizzly bears occupy large territories with a variety of habitats needed to acquire large amounts of food resources throughout the year, particularly in resource-poor areas (Gardner, 2010; Apps et al., 2004). Habitat use by grizzly bears and home range size are influenced primarily by food availability, the presence of suitable resting and denning sites, the presence of other bears, and human development (Macey, 1979).

Home ranges vary greatly in size depending on the age and sex of the bear, seasonal and annual availability of food, reproductive status of females, habitat types, and population densities (Nietfeld et al., 1985). Mature males generally have the largest home ranges, which may be several times as large as those of females, and may also overlap more than those of females (MacHutchon et al., 1993; Himmer and Gallagher, 1995) but may be as small as 24 km<sup>2</sup> in rich, coastal habitats (LeFranc et al., 1987; MacHutchon et al., 1993). However, in the BC interior, home ranges are typically between 300 km<sup>2</sup> and 500 km<sup>2</sup> for males, and between 80 km<sup>2</sup> and 200 km<sup>2</sup> for females (Hatler, 2008).

Dens are located predominantly in alpine or subalpine habitat at mid to upper elevations, and typically 1 km to 2 km away from human activities (Ciarniello et al., 2005). Grizzly bears are sensitive to human disturbance and development and may avoid areas within 4 km of roads, and suffer from behavioural disruptions up to 5 km away along highways (Mattson et al., 1987; Mattson and Henry, 1987; McLellan and Mace, 1985; McLellan and Shackleton, 1988). Roads expose

areas of grizzly bear habitat to bear hunting, as well as hunting of potential grizzly bear prey, thereby reducing habitat suitability (McLellan, 1990). Secure habitat is defined as an area of at least 10 km<sup>2</sup> that is more than 500 m from an open motorized access route or trail with levels of non-motorized human use greater than 20 parties per week (Gibeau, 2000).

Food quantity and quality are the primary factors in the grizzly bear habitat suitability models. Grizzly bears are omnivorous and opportunistic in their feeding habits, consuming a great variety of items. They eat primarily vegetation throughout most of the year, and their habitat associations are therefore strongly seasonal, typically reflecting local plant development. In mountainous regions, seasonal migrations to different elevations are typical (COSEWIC, 2002).

While vegetation forms the bulk of their diet, especially in late spring and early summer, grizzly bears also feed on insects, fruits, berries, fish, carrion, and small and large mammals (Craighead and Mitchell, 1982; McNamee, 1997; Stevens and Lofts, 1988; Fuhr and Demarchi, 1990). In early spring, after emerging from their winter dens, grizzly bears require high-protein digestible forage, and feed opportunistically on ungulate carcasses and early-emergent and succulent vegetation in wet meadows, riparian areas, seepage sites, swamps, avalanche chutes, and burns. As snowmelt occurs upslope, bears ascend to follow the emergence of fresh vegetation (COSEWIC, 2002) often on southwest aspects where lush plant sites are typically located (Simpson, 1987). Wetland sites are highly suitable, with grasses, sedges, horsetails, and overwintering berries commonly selected as spring food items.

Throughout spring and summer, grizzly bears will feed on grasses, sedges, dandelions, and other forbs and succulent plants, e.g., cow parsnip (*Heracleum lanatum*) and Indian hellebore (*Veratrum viridae*). In late summer and fall, huckleberries, cranberries, currants, and other berries become an important component of their diet, as well as other sources of high-quality protein such as spawning salmon (Nietfeld et al., 1985; Stevens and Lofts, 1988). Grizzly bear populations with regular access to animal protein, especially salmon, grow to be the largest bears, and produce the largest litters and the highest densities (Hilderbrand et al., 1999).

Human access by motorized vehicle roads is one of the primary threats to grizzly bear persistence (Alberta Sustainable Development, 2008, Graham et al., 2010). In Alberta, nearly all grizzly bear mortalities are caused by humans, and most frequently occur near roads and trails (Roever et al., 2010).

#### **5.4.12.1.1 Regulatory Considerations**

To assess potential effects, applicable regulatory requirements were considered (**Table 5.4.12-1**) that apply to grizzly bears specific to different phases of Project development, mitigation, and reclamation. Grizzly bear is subject to provincial wildlife regulations and is a Blue-listed species (BC CDC, 2014) in BC. The species is provided protection under the BC *Wildlife Act* (Government of BC, 1996a) and additional attention through the BC Grizzly Bear Conservation Strategy (BC MOE, 1995). Management of grizzly bear 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).

**Table 5.4.12-1: Regulatory Considerations Regarding Grizzly Bear**

<b>Regulation/ Guideline</b>	<b>Brief Description or Requirements</b>	<b>Data Required to Meet Regulation/Guideline</b>	<b>Timeframe (Pre-/Post-Application Submission)</b>
Canada <i>Species at Risk Act</i>	Species at risk may require federal permits for handling, harvest or habitat destruction and recovery plans may exist.	Occurrence and abundance / distribution data from surveys.	Ongoing monitoring of mitigation measures, wildlife management plan for exploration, construction and operation potentially affecting listed grizzly bear.
BC <i>Wildlife Act</i>	Pertains to grizzly bears and their management. Permits are required for handling and surveys of wildlife that may harass animals. Limited Entry Hunt authorizations are required for harvest by hunters.	Abundance and distribution data from BC CDC records and surveys, wildlife habitat suitability. Harvest and mortality data provide baseline for mortality risk assessment. Assessment of project related and cumulative impacts to grizzly bear in population units.	Wildlife management plans and permitting for exploration.
BC <i>Forest and Range Practices Act</i>	Old growth management areas and ungulate winter ranges require special management and retain habitat valuable to bears.	Impact assessment and proposed mitigation/offsets required to assess habitat loss to old-growth and ungulate winter range areas, both of which can include important protected habitat for grizzly bears.	Wildlife management plans and permitting for exploration.
BC Conservation Data Centre	Grizzly bear is provincially Blue-listed and considered vulnerable.	Habitat and population data related to Project.	Ongoing
Vanderhoof Land and Resource Management Plan	Identifies important species within individual RMZs and sets objectives for species of concern	Impact assessment and proposed mitigation/offsets required to assess habitat loss of species such as grizzly bear identified as important in some RMZs	Ongoing

**Note:** BC CDC = British Columbia Conservation Data Centre; RMZ = Resource Management Zone

#### **5.4.12.2 Valued Component Baseline**

Grizzly bears are year-round residents within the Project area, and are dependent on mature and old-growth coniferous forests, although deciduous and mixed forests also contribute to their life requisites. Pre-existing habitat loss and fragmentation due to logging and road development has altered the amount of potential grizzly bear habitat within the Project area.

Baseline surveys for grizzly bears focused on kokanee-bearing streams, where there may be an increase in grizzly bear use during the kokanee spawning season. In addition, camera surveys and incidental observations were conducted within the mine site and transmission line LSAs, and wildlife RSA as presented in Figures 2.1-23 and 2.1-24 in **Appendix 5.1.3.4A**. Camera locations were selected based on wildlife habitat features (e.g., game trails). A camera was placed adjacent to the airstrip LSA at the forest clear-cut interface; however, this was not located within the airstrip LSA/RSA due to the lack of suitable placement sites. The freshwater supply

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system and the Kluskus FSR LSAs were considered for the grizzly bear camera study; however, due to the lack of confirmed kokanee spawning streams, no cameras were placed in these study areas. Reconnaissance surveys for dens and sign, wildlife cameras, and incidental detections determined the presence of grizzly bear within the mine site and Kluskus FSR LSAs, and the wildlife RSA (Table 3.2-1 in **Appendix 5.1.3.4A**). Baseline detections and number of individuals of grizzly bears during 2011–2013 surveys of each LSA and the RSA of the Project are presented in Table 3.5-1 (**Appendix 5.1.3.4A**).

Reconnaissance surveys for dens and sign, wildlife cameras, and incidental detections determined the presence of grizzly bear across the Project area. Wildlife cameras along rivers, creeks, games trails, roads, clearcuts, forest edges, and wetlands recorded grizzly bear presence in these areas during summer and early fall (June to September) in 2012 and 2013. Professional judgment of the habitat needs of grizzly bears in the Project area was used to supplement the reconnaissance surveys in the Project area.

During the fisheries investigations of 2011, summer/fall foraging habitat for grizzly bears was identified, which included the spawning locations of prey species Kokanee salmon (*Oncorhynchus nerka*) outside of the Local Study Area (LSA). These areas were mapped as part of the bear-Kokanee work. During sign surveys along Creek 661 and Chedakuz Creek, abundant bear sign included multiple tracks, scats, trampled vegetation, and digging into the river banks. In September 2012, five grizzly bears were recorded walking in front of wildlife cameras established to record bear-Kokanee interactions within the Regional Study Area (RSA). In 2013, wildlife cameras were re-established, and one grizzly bear was recorded in mid-August in the RSA.

Aerial and ground surveys in 2011 for bear dens within the LSA failed to locate any den sites (Avison, 2012). However, in 2012, two historical and non-active bear dens of unknown species, were discovered within the mine site. Both dens were beneath large boulders in a colluvial deposit and appeared to be from different years. In 2013, an additional two potential den sites of unknown bear species were found in close proximity of each other also under colluvial deposits in the LSA.

In May 2012, several incidental grizzly bear sightings were reported along the Kluskus Forest Service Road (FSR) and one sighting was reported along the Vantine FSR, approximately 25 km west-northwest of the LSA (Avison, 2012). One grizzly bear was reported walking past the edge of camp downslope in spring 2013.

Grizzly bear populations across BC are divided into 56 Grizzly Bear Population Units (GBPUs) (BC MFLNRO, 2012). The Project area is located primarily within the Blackwater–West Chilcotin GBPU, but also the western part of the Nulki GBPU and a small south-central area of the Francois GBPU. The Blackwater–West Chilcotin GBPU is designated as provincially Threatened and closed to hunting to prevent range contraction and ensure long-term population viability (BC MFLNRO, 2012). The Threatened status represents a population estimate for the area at 25% to 50% of its minimum habitat capability (Grizzly Bear Recovery Team, 2004). The Blackwater–West Chilcotin GBPU has an estimated population of 53 bears, with a density of less than 3 bears per 1,000 km<sup>2</sup> (BC MFLNRO 2012). The Nulki GBPU, which has a high density of roads,

has an estimated population of 44 bears, with a density of 3 bears per 1,000 km<sup>2</sup>; this population has also been closed to hunting. The Francois GBPU is considered viable with an estimated population of 58 bears and a density of seven bears per 1,000 km<sup>2</sup>; the population is closed to hunting and has a road density greater than the threshold of 0.6 km/km<sup>2</sup> (BC MFLNRO, 2012).

#### **5.4.12.2.1 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 PIL 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 low elevation 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 has been harvested, while remaining stands are in various stages of degeneration. Mineral exploration in the area has increased the number of access roads, which has caused increased habitat fragmentation, but this is relatively small and localized fragmentation compared to existing fragmentation from forestry activities, which occurs across the landscape at a much larger scale. There are no hunting seasons for grizzly bear in the Project area, but there are for other species that share grizzly bear habitats (e.g., moose, black bear). The area is used by recreationalists. Baseline information collected on grizzly bears was conducted in the LSA and portions of the RSA that have been altered by these past and present activities. Future activities in the Project area are expected to include the same activities.

#### **5.4.12.2.2 Traditional Ecological and Community Knowledge**

Protection of grizzly bears is important to local residents and Aboriginal groups. Comments provided during the Project engagement and consultation process offered insight into traditional, ecological, or community knowledge (Section 3). This includes unique knowledge about the local environment, how it functions, and its characteristic ecological relationships.

During interviews with Dakelh/Carrier Elders in May 2013, First Nations described themselves as caretakers of the land. Elders stated, “Animals don’t have voices. First Nations are the voices of the trees and the animals.” The grizzly bear is important to some surrounding groups, although no First Nation representative (to date) described harvesting grizzly bear for consumptive purposes. Elders stated there is no historical record of attacks on Carrier people by bears because there is communication and mutual respect between grizzly bears and First Nations. Part of this respect means ensuring that grizzly bears have access to the land and resources they require for survival. Concerns about potential effects on Kokanee in surrounding creeks and streams and the subsequent effects on bears that feed on the fish was raised as a concern by Ulkatcho First Nation representatives. According to Lhoosk’uz Dene representatives, grizzly bears may use the hillsides of Mount Davidson for denning, particularly the western sides (Lhoosk’z Dene trapline holder pers. comm., 2013).



Guide outfitters, who offer wilderness excursions to customers in the general area, expressed concerns about potential effects on the bear populations.

#### **5.4.12.3 Potential Effects of the Proposed Project and Proposed Mitigation**

This subsection identifies and analyzes potential adverse effects on the grizzly bear 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 5.4.12.3.1** to **Section 5.4.12.3.5**).

Then, **Section 5.4.12.3.6** details the assessment approach used in the assessment followed by **Section 5.4.12.3.8** Mitigation Measures.

The assessment considers the following:

- Terrestrial habitat, including the quality and quantity of any lost habitat for grizzly bear;
- Feeding, security, thermal or denning habitats;
- Any suitable grizzly bear habitat alteration or loss;
- Barriers to grizzly movement, including the roads developed as part of the mine and their potential effects on grizzly movements;
- Disturbance of daily or seasonal grizzly bear movements (e.g., migration and home ranges), which would include potential hazards and conflicts associated with mine access and travel corridors of grizzly bears;
- Grizzly bear are considered Vulnerable and Blue listed provincially, as well as being a species of international significance;
- Direct and indirect mortality from the mine operations and traffic;
- Increased access and indirect mortality of species through increased hunting opportunities;
- Potential implications to predator-prey dynamics from changes in habitat suitability or changes to important seasonal Kokanee salmon spawning areas;
- Grizzly bear habitat is rated for suitability and used as a surrogate for productivity; and
- Implications of the proposed Project acting as an attractant for grizzly bear.

A range of potential effects on grizzly bears can be associated with a project involving a mine site, linear features including roads, water supply pipeline and electrical transmission line. Assessment boundaries define the scope or limits of the assessment. These boundaries encompass the areas and time periods during which the Project is expected to interact with grizzly bears, constraints placed on the assessment of those interactions due to political, social, and/or economic realities (administrative boundaries), and 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 grizzly bears. Habitat loss, features that act as attractants to grizzly bear, 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 grizzly bear.

Taking a conservative approach, both key and moderate interactions are combined and considered jointly in assessment of project and cumulative effects.

#### **5.4.12.3.1 Study Area Boundaries**

Three geographic scales were defined for the study areas considering the Project effects on grizzly bear and grizzly bear habitat, as shown on **(Figure 5.4.12-1)** and described below. Areas used for collection of baseline information include the LSA and parts of the RSA. Past, present, and future activities that may affect grizzly bears within these areas were identified and assessed within the RSA and grizzly bear population unit areas.

The Project is defined as all aspects of the Project infrastructure considered in this application and includes the mine site, mine access road, Kluskus 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 grizzly bear VC comprises 22,509 ha and includes 7,032 ha for the Project footprints **(Table 5.4.12-2)**. 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.

To address potential disturbance from variable levels of activity, buffers were greatest for the mine site in or near grizzly bear habitat and less for the transmission line, freshwater pipeline, airstrip and existing Kluskus FSR in less suitable grizzly habitat.

**Table 5.4.12-2: Project Component Footprint Areas**

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

**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;
- Transmission Line and Kluskus FSR. Approximate 1 km buffer from the linear component boundary; and
- Grizzly bear RSA will also consider effects in the context of the Provincial Grizzly Bear Population Units (GBPUs).

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; and

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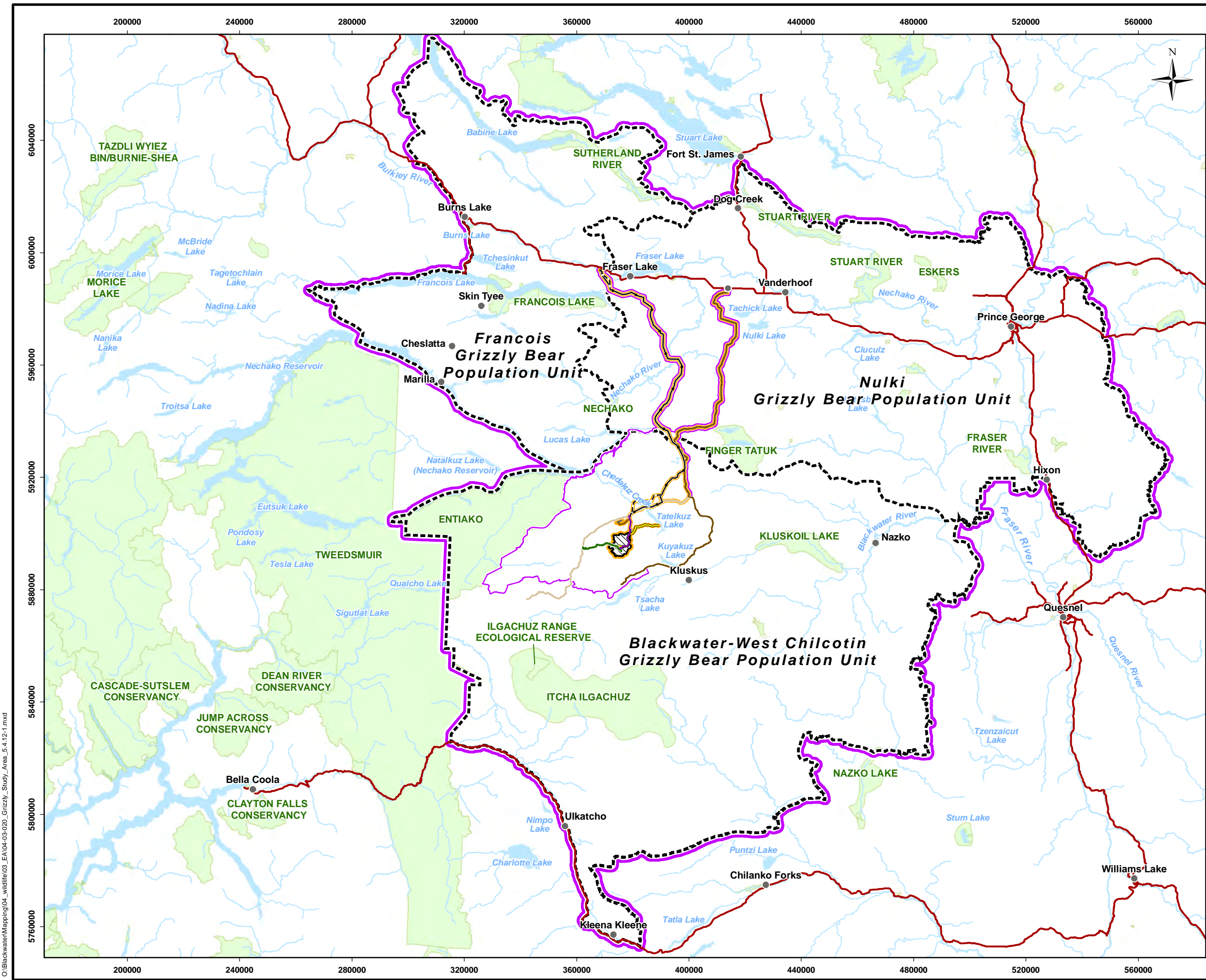
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ASSESSMENT OF POTENTIAL ENVIRONMENTAL EFFECTS



- For grizzly bear, GBPU's overlapping the mine site or in close proximity were considered for cumulative effects assessment due to concerns expressed by Aboriginal Groups and MFLNRO in relation to the potential for cumulative effects. Three Grizzly Bear population units were included in the assessment (i.e., Francois, Nulki and Blackwater West-Chilcotin).

The RSA for the purpose of the grizzly bear VC includes the grizzly bear population units and includes 291,714 ha of habitat in proximity to the project that was modeled for habitat suitability. The RSA is large enough to assess the seasonal home range movements and important seasonal habitats of grizzly bear considered, which may include 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 (**Figure 5.4.12-1**).

**Grizzly Bear Population Units:** The Project area potentially affects the Threatened Blackwater-West Chilcotin GBPU (20,714 km<sup>2</sup>), the western part of the Nulki GBPU (16,785 km<sup>2</sup>), and a small south-central area of the Francois GBPU (8,708 km<sup>2</sup>).



**Legend**

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

**Project Components**

- Exploration Road
- Proposed Transmission Line
- Proposed Transmission Line re-route
- Proposed Mine Access Road
- Proposed Airstrip Access Road
- Proposed Airstrip
- Proposed Mine Site

**Grizzly Bear**

- Grizzly Bear Local Study Area
- Grizzly Bear Regional Study Area
- Areas Used for Habitat Loss and Alteration Analysis
- Grizzly Bear Population Units

Scale: 1:1,300,000

0 10 20 40 60  
Kilometres

**Reference**  
BC Government GeoBC Data Distribution  
Grizzly Bear Population Units are shown only for featured Populations used in analysis

CLIENT: **newgold™**

PROJECT: **Blackwater Gold Project**

**Grizzly Bear Study Areas**

DATE: September, 2015	ANALYST: MY	<b>Figure 5.4.12-1</b>
JOB No: VE52095	QA/QC: MB	
GIS FILE: 04-03-020_Grizzly_Study_Area_5.4.12-1.mxd		<b>amec</b>
PROJECTION: UTM Zone 10	DATUM: NAD83	

C:\Blackwater\mapping\04\_wildlife\03\_EA\04-03-020\_Grizzly\_Study\_Area\_5.4.12-1.mxd

### 5.4.12.3.2 Temporal Boundaries

Preliminary 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 effects occur during the construction phase; Medium-term effects are not applicable for grizzly bear as they were considered long term to provide a conservative assessment; Long-term effects occurs throughout operations and closure; and Chronic effects extend into post-closure or beyond.

### 5.4.12.3.3 Administrative Boundaries

The Blackwater–West Chilcoltin, Nulki, and Francois GBPUs were considered in the effects assessment. GBPUs are selected based on similar behavioral ecotypes and sub-populations of bears. In northern BC, the GBPU boundaries follow natural and ecological boundaries of transition. The GBPU designation allows for population objectives settings and determining allowable human-mortality thresholds, as well as setting land use priorities during strategic land use planning (Hamilton and Austin, 2004).

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 broad objectives that are considered for grizzly bear effects assessment, related to maintaining effective habitat and mitigate potential impacts to grizzly bear. 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*. Conservation and management of fish, wildlife, and their habitats are priority in a WMU and are used to set hunting regulations (BC MFLNRO, 2014).

### 5.4.12.3.4 Technical Boundaries

Technical boundaries for the assessment are established by the validity of the Provincial regional wildlife population estimates and accuracy of the wildlife habitat suitability 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 models

are considered acceptable levels of uncertainty for an assessment. Grizzly bear population surveys were not completed due to the low density near the project and large areas of the GBPUs; however, habitat assessment was completed within the LSA and RSA. Wildlife cameras were used near Kokanee spawning areas and potential movement areas to determine presence / absence of grizzly bear and denning surveys were conducted near the proposed mine site footprint.

#### **5.4.12.3.5 Potential Project Effects**

Pre-existing habitat loss and fragmentation due to logging and road development has altered the low elevation 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 has been harvested, while remaining stands are in various stages of degeneration. Mineral exploration in the area has increased the number of access roads, which has caused increased habitat fragmentation, but this is relatively small and localized fragmentation compared to existing fragmentation from forestry activities, which occurs across the landscape at a much larger scale. There are no hunting seasons for grizzly bear in the Project area, but there are for other species that share grizzly bear habitats (e.g., moose, black bear). The area is used by recreationalists. Baseline information collected on grizzly bears was conducted in the LSA and portions of the RSA that have been altered by these past and present activities. Future activities in the Project area are expected to include the same activities. 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.

The assessment of potential Project effects on grizzly bears within the RSA included habitat loss and alteration, mortality risk, changes in population dynamics, changes in movement patterns, and changes in grizzly bear health, as well as potential cumulative effects.

Habitat fragmentation and linear density of roads contribute to baseline conditions of reduced grizzly bear habitat suitability in the Project area, as do changes in population dynamics that may result in increased mortality risk and displacement of grizzly bears (BC MOE, 2012). These effects were incorporated in the grizzly bear habitat model and effects assessment for mortality risk through downgrading habitat suitability within 500 m of roads within the mine site LSA and consideration of linear corridor density and cumulative effects in the RSA and assessment of mortality risk within the LSA. Many threats to grizzly bears 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 and identified in **Section 4, Table 4.3-2** (Project Component and Activity Interaction Matrix). In order to conservatively assess interactions of the project with grizzly bear and grizzly bear habitat, both key and moderate interactions were combined and included in the modeling and effects assessment. The interactions are further identified using a ranking table (**Table 5.4.12-3**) to identify potential interactions with different Project phases. Additional analysis included determining whether the resulting effect can be managed to acceptable levels through standard operating practices through 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.

Several measurable categories of assessment for Project effects were defined and the rationale for the selection of each category of assessment is provided in **Table 5.4.12-4**.

**Table 5.4.12-3: Potential Interaction of the Project Activities with Grizzly Bear**

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



**Table 5.4.12-4: Categories of Assessment for Grizzly Bear**

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 grizzly bear, 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 Grizzly Bear Population Dynamics	For some species, predation may be affected by changes in prey abundance / habitat availability, resulting in differential mortality of key 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 grizzly bear populations and distribution over the life of the Project. For grizzly bear, the focus is on relative abundance and distribution in areas of potential impact and measures of known mortality.
Mortality Risk	Mortality related to transport options and increased hunter access could alter species abundance. This requires assessment of the potential effects of roads, pits, and other structural features on grizzly bear feeding, migration and movement, reproductive behaviour and success, and direct mortality. This is primarily a qualitative assessment, in the absence of area-specific baseline data and predictive tools, based on characteristics of the species or species group and context of Project components.
Changes in Grizzly Bear Movement Patterns (Sensory Disturbance)	Changes in movement patterns may affect species breeding and survival rates, and may increase predation/mortality. Changes may positively or negatively affect unregulated hunting, which can affect local species abundance and traditional sustenance use. This is a qualitative discussion based on information from habitat mapping, existing knowledge on grizzly bear movement patterns, and characteristics and context of Project components.
Changes in Grizzly Bear Health	Contaminant loading may affect grizzly bear health. Assessment of the potential effects of identified contaminants of potential concern on grizzly bear feeding, migration and movement, reproductive behaviour and success, and direct mortality. This is a qualitative measure that relies on reporting of animal health and provincial data. Assessment of health of black bear kills may provide a surrogate measure of health. Some Human Health and Ecological Risk Assessment sampling and risk assessment address part of this concern.

**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, species may decline more rapidly than would be expected from habitat loss alone (Andr n, 1994). When remaining functional habitat is less than 10% to 30% in a region, species are still affected by habitat loss (Andr n, 1994; Fahrig, 1997; Swift and Hannon, 2010) but are not necessarily at risk of regional extirpation. Depending on 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 threshold 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 a resource would be expected to undergo an unacceptable change, either 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 federally designated as a species of conservation concern and 80% (20% loss) for species of conservation concern. The precautionary threshold of 20% loss is used for assessment of the effects within the RSA because grizzly bear is a federally listed species.

The next step was to assess each of these relative interactions of Project phases and activities with grizzly bears to examine which categories of assessment may be expected in different areas and times (**Table 5.4.12-5**).

Potential key and moderate interactions are linked to the temporal scale of the Project phases and vary for the time needed to return to baseline conditions (**Table 5.4.12-6**). For instance, sensory disturbances 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.

Anticipated Project effects include habitat loss (e.g., cleared vegetation, changes to habitat quantity and quality) and some potential degradation (**Table 5.4.12-7**). The construction of the mine site, access roads, transmission line, freshwater supply pipeline, and airstrip will require the removal of vegetation.

**Table 5.4.12-5: Potential Key and Moderate Interactions with Categories of Assessment for Grizzly Bear**

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

**Note:** 0 = No interaction.  
 1 = Moderate Interaction may occur; 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.

**Table 5.4.12-6: Temporal Boundaries**

Category of Assessment	Temporal Boundary (Project Phases)
Habitat Loss and Alteration	Construction through post-closure
Change in Grizzly Bear Population Dynamics	All phases after clearing and during construction
Mortality Risk	Construction and operations
Change in Grizzly Bear Movement Patterns	Construction and operations
Change in Grizzly Bear Health	Construction and operations

**Table 5.4.12-7: Overview of Potential Project Effects on Grizzly Bear**

Category of Assessment	Description	Project Phases	Project Components
Habitat Lost or Altered	Areas that will be 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, site, transmission line, 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, closure	Mine site, access roads, site, transmission line, freshwater supply pipeline, and airstrip

In addition to direct habitat loss, activities on the mine site, airstrip, and access roads 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. Chemical hazards and attractants (e.g., oils and petroleum products) have a small potential to affect grizzly bear that frequent the mine site, airstrip, transmission line, or access road areas.

Two of the five potential categories of assessment, habitat loss and alteration, and change in grizzly bear mortality risk, are considered to have potential measurable residual effects and, therefore, carried through the effects assessment. These two categories of assessment are considered the most important effects on grizzly bear (Gyug et al., 2004; BC MOE, 2012) and influence the habitat effectiveness of an area. The habitat effectiveness of an area, through modelling, considers the habitat suitability of an area and further accounts for impacts similar to habitat displacement and fragmentation effects that reduce the ability or willingness of grizzly bears to use a habitat (Grizzly Bear Recovery Team, 2004).

The other three potential effects considered in the assessment, changes in wildlife health, population dynamics, and movement patterns, will not be considered further in the assessment. This is based on the rationale of the species account for grizzly bear as a wide-ranging species, the low density of grizzly bears using the Project area, and the effects assessment and mitigation measures of the Wildlife Management Plan, (WLMP) (**Section 12.2.1.18.4.6**) Noise and Vibration Mitigation Measures (**Section 5.2.2.3**), and Air Quality and Emissions Management Plan (AQEMP) (**Section 12.2.1.18.4.9**). Grizzly bears are opportunistic feeders and the Project is not expected to significantly increase mortality of prey species; therefore, no residual effects are predicted. The mitigation measures identified in **Section 5.2.2.3** will minimize the extent of noise-related alterations. Results of the noise modelling indicate that noise levels during construction and operations will be below 45 dBA (night time permissible sound pressure level) along the Project boundary. The only exceptions are blasting and aircraft noise. Noise from Project construction, operations, and camp may displace grizzly bears from using habitats within 500 m of the mine site during operations on a relatively continuous basis; therefore, noise is considered an impact and

included in the effects assessment. Changes in grizzly bear movement patterns due to noise disturbance are included in habitat alteration considerations through incorporation into habitat suitability ratings based on distance to noise source.

Wildlife health is not carried forward due to the conclusions of the atmospheric effects assessment and the surface water quality effects assessment. The atmospheric effects assessment determined that overall, potential effects of the Project on air quality were assessed as Not Significant as adverse residual effects are not predicted to result from the construction, operations, or decommissioning of the Project. The surface water quality effects assessment expects that residual effects relate to parameter-specific potential exceedances of specific water quality guidelines that are almost all driven by background concentrations above guidelines, not as a result of Project effects, and therefore are not considered to be a result of Project-related effects and not expected to increase or create health effects on grizzly bear different from the baseline condition.

#### **5.4.12.3.6 Assessment Approach for Measuring Potential Effects**

Both quantitative and qualitative approaches were used for the assessment of potential Project effects on grizzly bears. A quantitative habitat approach was used for determining the potential loss and alteration of habitat within the RSA and a qualitative approach was used for assessing an increase in mortality risk within the GBPU. Terrestrial Ecosystem Mapping (TEM) or Predictive Ecosystem Mapping (PEM) formed the basis for habitat polygons rated in the LSA and portions of the RSA. Habitat data were not available for the entire grizzly bear population units; however, road density and cumulative impacts from MPB infestation, forestry, and wildfires on an area basis for the GBPU were assessed as a qualitative measure of mortality risk, changes to wildlife population dynamics, and semi-quantitative measure of habitat loss and alteration. Impacts from MPB infestation were considered as future habitat loss and alteration, and overlap with the areas currently burning in the 2014 wildfires near the proposed project.

##### *5.4.12.3.6.1 Habitat Suitability Model Assumptions*

Habitat suitability modeling is based on assumptions related to TEM and PEM habitat interpretations, professional judgement and experience related to grizzly bear and grizzly bear habitat, literature and traditional knowledge. Assumptions include the quantitative rating of TEM and PEM units for value to grizzly bear 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. Although recent data did not indicate frequent use or use by many grizzly bear in the RSA, models assumed that all suitable habitat could be used and that habitat was included in calculations of habitat impacted by the Project.

#### 5.4.12.3.6.2 *Grizzly Bear Rating Assumptions for Habitat Suitability Models*

Grizzly bear habitat suitability ratings include:

- Riparian areas and other ecosystems with preferred sedges, grasses, and herbs are rated high (up to Class 1) in spring, as these areas provide abundant, new, succulent forage, and potential movement corridors;
- Units with preferred species of herbs and berry-producing shrubs are rated high in summer and fall (up to Class 1). Structural Stages 2 and 3 may provide abundant forage and have good spring and summer values (up to Class 1). Clearcuts on rich, moist sites provide moderate to high summer forage (Classes 3 to 1). Structural Stages 4 and 5 stands generally have poor, year-round feeding value (up to Class 4);
- Structural Stage 1 (non-vegetated) provides no significant food and is rated Class 6;
- Structural Stages 6 and 7 (mature forest to old forest) provide optimal security and are rated up to Class 1;
- Structural Stages 3a and 3b are rated up to Class 3 for security cover;
- Structural Stage 5 (young forest) provides poor security and is generally rated low (Class 4 or lower); and
- Structural Stages 1 and 2 (non-vegetated and herbaceous) provide no significant security and are rated Class 6.

Suitability ratings incorporate road activity; effectiveness of the habitat is decreased near busy roads.

#### 5.4.12.3.6.3 *Ratings Adjustments*

Habitat suitability maps incorporate landscape heterogeneity and connectivity, including habitats adjacent to anthropogenic disturbance regimes (e.g., roads, settlements), and interspersions of different structural stages within the landscape. Adjustments increase or decrease suitability value by a single class. Habitats within 500 m of high activity roads and infrastructure are considered to have greater potential displacement and mortality risk. Polygons identified in the field with Kokanee spawning or high berry potential values were increased in their ratings either one or two classes. Interspersions of structural stages and habitat connectivity were not directly modelled, but assessed through changes in relative habitat suitability at the different study area scales.

#### 5.4.12.3.6.4 *Habitat Suitability Model Development*

As part of the environmental assessment, grizzly bear habitat loss originating from the Project was assessed using habitat suitability modelling.

Suitable grizzly bear habitat exists within the LSA. TEM surveys were done to document important habitat within the LSA and PEM from adjacent areas of the RSA were used to validate habitat suitability ratings developed for grizzly bear. The den surveys were conducted within the mine LSA and TEM wildlife habitat assessments were used to determine which TEM and PEM ecological

units are rated as high value as a potential source of grizzly habitat. The ecological units within the Project area that were identified as having high value were then increased in value in the ratings table.

Three seasons of habitat use - spring, summer and late summer / fall (growing) - were evaluated for habitat suitability mapping. The life requisites rated included Feeding, Security, and Thermal habitats for the specified seasons. The ratings were primarily driven by the feeding habitat suitability, and security and thermal values were used to adjust this value in areas identified as low feeding value but high for security or thermal resulting in a value for living. For grizzly bear, the habitat value was downgraded within 500 m of disturbance and roads in the mine LSA and upgraded a class near berry producing ecosystem units. Due to the availability of information about specific life requisites for grizzly bear, a six-class rating scheme habitat model was applied (Resources Information Standards Committee (RISC), 1999).

#### 5.4.12.3.6.5 *Habitat Loss and Alteration*

To identify the most critical habitats for grizzly bear, ratings tables were developed (**Appendix 5.4.12B**) to model the moderate to high value grizzly bear habitats (ratings values 1-3) in the Project area using a six-class system for the spring, summer, and fall periods (RISC, 1999). Potential areas affected by Project component footprints were calculated. Terrestrial Ecosystem Mapping (TEM) or Predictive Ecosystem Mapping (PEM) was the basis for habitat polygons (**Figure 5.4.12-1**) rated in the LSA and RSA. Habitat data was not available for the GBPUs.

#### 5.4.12.3.6.6 *Mortality Risk*

Changes in mortality risk can be due to increased access into an area resulting in vehicle collisions, increased hunting/poaching, lethal control of problem wildlife, or reduction of habitat security due to fragmentation. A linear feature density analysis of baseline conditions was calculated and compared during Project construction and operations within the three GBPUs. A semi-quantitative and qualitative analysis was performed on the increase of traffic on already existing roads use based on the transportation effects assessment (BC MOE, 2012).

The measureable parameter for the assessment of increased direct mortality risk associated with the transmission line and mine access road is a calculation of linear feature density. A road density of 0.6 km/km<sup>2</sup> is cited as a threshold for grizzly bears, which is known to have a negative effect on grizzly bear habitat use in BC, and when densities are higher than 1.0 km/km<sup>2</sup> effects become even larger (BC MOE, 2012; BC MWLAP, 2004; USFWS, 1993). These linear densities are incorporated in the qualitative mortality risk for grizzly related to habitat fragmentation and poaching as well as a measure of overall effectiveness of habitat for grizzly in the GBPU and RSA.

Quantitative measures of magnitude for bear-vehicle mortality on the mine access road during the life of the Project (construction through closure) are as follows:

- Low – no grizzly bear vehicle-mortality collisions during the life of the Project;
- Moderate – one grizzly bear vehicle-mortality collision during the life of the Project; and
- High – more than one grizzly bear vehicle-associated mortality during the life of the Project.

### **5.4.12.3.7 Model Results for Quantification of Potential Project Effects on Habitat**

The potential overlap of Project component footprints on moderate to high value grizzly bear habitats is tabulated in **Table 5.4.12-8** (spring), **Table 5.4.12-9** (summer), and **Table 5.4.12-10** (late summer / fall), and shown on **Figure 5.4.12-2** (spring), **Figure 5.4.12-3** (summer), and **Figure 5.4.12-4** (late summer / fall). The areas shown represent the maximum potential habitat affected, and do not account for existing disturbance or mitigation measures.

#### *5.4.12.3.7.1 Habitat Loss and Alteration*

The habitat loss and alteration category of effects is a method to account for areas of vegetation removal and/or ground disturbance due to placement of infrastructure. 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 within the study areas will result in a decrease of 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 related to the threshold of magnitude set to determine significance.

Due to potential sensitivity of grizzly bears, noise from Project construction, operations, and camp may displace grizzly bears from using habitats within 500 m of the mine site during operations on a relatively continuous basis; therefore, noise is considered an impact and included in the effects assessment. The proposed access road and airstrip may also temporarily displace grizzly bears from using habitats close to the road or airstrip during periods of frequent traffic. Effective habitat loss from potential degradation of grizzly bear habitat considers habitat alteration through displacement from sensory disturbance and increased mortality risk.

The potential effects on ecosystems and vegetation within the LSA are assessed to estimate potential alteration of grizzly bear habitat. A distance of 250 m from the edge of infrastructure is used to estimate the potential area of alteration of grizzly bear habitat (Gyug et al., 2004). This distance is based on the various types of alteration and the professional judgement of potential effects on grizzly bear. The combination of these effects is one potential 'alteration' effect for a simplified approach as a worst-case scenario assessment.

High quality grizzly bear habitat consists of security protection and adjacent high value feeding, particularly in spring and fall. These habitats are characterized by late-successional coniferous forests, riparian forests, and wetlands that are proximate to openings rich in food species (i.e., those with a well-developed shrub understory). High quality habitat of mature and old-growth forests provide an optimal mix of denning, foraging, and security/thermal habitats.



**Table 5.4.12-8: Potential Grizzly Bear Spring Suitability Habitat Area Affected Within Footprints, LSAs, and RSA**

	Project Component	Grizzly Bear Moderate Habitat Area (ha)	Total Area (ha)	Moderate Habitat % of Total Area	% of RSA Habitat by Footprint Component	Grizzly Bear Moderately High Habitat Area (ha)	Total Area (ha)	Moderately High Habitat % of Total Area	% of RSA Habitat by Footprint Component	Grizzly Bear High Habitat Area (ha)	Total Area (ha)	High Habitat % of Total Area	% of RSA
<b>Footprint or Corridor</b>	Access Road	3	95	3	6	0	95	0	0	0	95	0	0
	Airstrip	0	50	0	0	0	50	0	0	0	50	0	0
	Kluskus FSR	7	253	3	<1	0	253	0	0	0	253	0	0
	Mine Site	1,945	4,430	44	2	0	4,430	0	0	0	4,430	0	0
	Freshwater Supply Pipeline	5	132	4	<1	0	132	0	0	0	132	0	0
	Transmission Line - Main	398	1,806	22	<1	17	1,806	1	<1	0	1,806	0	0
	Transmission Line - Mills Ranch	123	202	61	<1	8	202	4	<1	0	202	0	0
	Transmission Line - Stellako	27	62	43	<1	1	62	2	<1	0	62	0	0
<b>Total</b>	<b>2,507</b>	<b>7,032</b>	<b>36</b>	<b>3</b>	<b>26</b>	<b>7,032</b>	<b>&lt;1</b>	<b>1</b>	<b>0</b>	<b>7,032</b>	<b>0</b>	<b>0</b>	
<b>LSA</b>	Access Road	54	363	15	0	0	363	0	0	0	363	0	0
	Airstrip	14	465	3	0	0	465	0	0	0	465	0	0
	Kluskus FSR	1,540	6,574	23	2	120	6,574	2	3	0	6,574	0	0
	Mine Site	2,721	6,123	44	3	0	6,123	0	0	0	6,123	0	0
	Freshwater Supply Pipeline	124	731	17	0	0	731	0	0	0	731	0	0
	Transmission Line - Main	2,052	8,068	25	2	119	8,068	1	3	0	8,068	0	0
	Transmission Line - Mills Ranch	533	924	58	1	38	924	4	1	0	924	0	0
	Transmission Line - Stellako	125	306	41	0	5	306	2	0	0	306	0	0
<b>Total</b>	<b>7,164</b>	<b>23,554</b>	<b>30</b>	<b>9</b>	<b>281</b>	<b>23,554</b>	<b>1</b>	<b>6</b>	<b>0</b>	<b>23,554</b>	<b>0</b>	<b>16</b>	
<b>RSA</b>		83,649	291,714	29	-	4,665	291,714	2	-	2	291,714	<1	-
<b>Area</b>	Footprint % RSA	2	-	-	-	2	-	-	-	2	-	-	-
	Footprint % LSA	30	-	-	-	30	-	-	-	30	-	-	-
<b>Habitat</b>	Footprint % RSA Habitat	3	-	-	-	1	-	-	-	0	-	-	-
	Footprint % LSA Habitat	35	-	-	-	9	-	-	-	0	-	-	-

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

**Table 5.4.12-9: Potential Grizzly Bear Summer Suitability Habitat Area Affected Within Footprints, LSAs, and RSA**

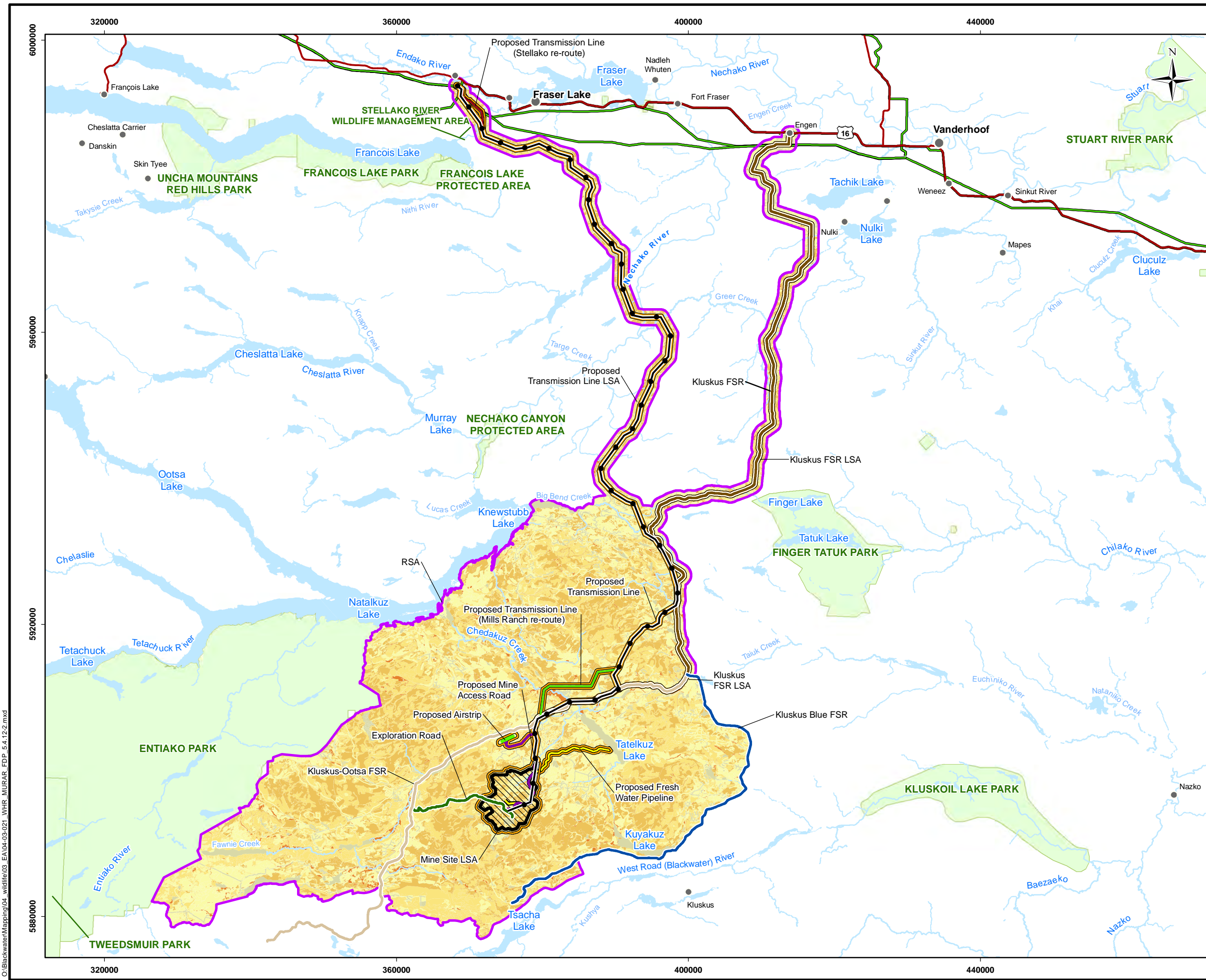
	Project Component	Grizzly Bear Moderate Habitat Area (ha)	Total Area (ha)	Moderate Habitat % of Total Area	% of RSA Habitat by Footprint Component	Grizzly Bear Moderately High Habitat Area (ha)	Total Area (ha)	Moderately High Habitat % of Total Area	% of RSA Habitat by Footprint Component	Grizzly Bear High Habitat Area (ha)	Total Area (ha)	High Habitat % of Total Area	% of RSA Habitat
<b>Footprint or Corridor</b>	Access Road	7	95	7	<1	0	95	0	0	0	95	0	0
	Airstrip	2	50	4	<1	5	50	10	<1	0	50	0	0
	Kluskus FSR	18	253	7	<1	0	253	0	0	0	253	0	0
	Mine Site	2,505	4,430	57	2	0	4,430	0	0	0	4,430	0	0
	Freshwater Supply Pipeline	7	132	5	<1	0	132	0	0	0	132	0	0
	Transmission Line - Main	595	1806	33	1	97	1806	5	1	3	1,806	0	1
	Transmission Line - Mills Ranch	145	202	72	<1	0	202	0	0	1	202	0	<1
	Transmission Line - Stellako	27	62	43	<1	19	62	30	<1	1	62	2	<1
<b>Total</b>		<b>3,306</b>	<b>7,032</b>	<b>47</b>	<b>3</b>	<b>121</b>	<b>7,032</b>	<b>2</b>	<b>1</b>	<b>5</b>	<b>7,032</b>	<b>0</b>	<b>1</b>
<b>LSA</b>	Access Road	71	363	19	0	0	363	0	0	0	363	0	0
	Airstrip	27	465	6	0	36	465	8	0	0	465	0	0
	Kluskus FSR	1,938	6,574	29	2	199	6,574	3	1	5	6,574	0	2
	Mine Site	3,390	6,123	55	3	0	6,123	0	0	0	6,123	0	0
	Freshwater Supply Pipeline	144	731	20	0	0	731	0	0	1	731	0	0
	Transmission Line - Main	2,957	8,068	37	3	439	8,068	5	2	13	8,068	0	4
	Transmission Line - Mills Ranch	645	924	70	1	0	924	0	0	6	924	1	2
	Transmission Line - Stellako	128	306	42	0	65	306	21	0	8	306	3	2
<b>Total</b>		<b>9,299</b>	<b>23,554</b>	<b>39</b>	<b>9</b>	<b>739</b>	<b>23,554</b>	<b>3</b>	<b>4</b>	<b>33</b>	<b>23,554</b>	<b>0</b>	<b>10</b>
<b>RSA</b>		107,355	291,714	37	-	17,770	291,714	6	-	344	291,714	<1	-
<b>Area</b>	Footprint % RSA	2	-	-	-	2	-	-	-	2	-	-	-
	Footprint % LSA	30	-	-	-	30	-	-	-	30	-	-	-
<b>Habitat</b>	Footprint % RSA Habitat	3	-	-	-	1	-	-	-	1	-	-	-
	Footprint % LSA Habitat	36	-	-	-	16	-	-	-	15	-	-	-

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

**Table 5.4.12-10 Potential Grizzly Bear Late Summer / Fall Suitability Habitat Area Affected Within Footprints, LSAs, and RSA**

	Project Component	Grizzly Bear Moderate Habitat Area (ha)	Total Area (ha)	Moderate Habitat % of Total Area	% of RSA Habitat by Footprint Component	Grizzly Bear Moderately High Habitat Area (ha)	Total Area (ha)	Moderately High Habitat % of Total Area	% of RSA Habitat by Footprint Component	Grizzly Bear High Habitat Area (ha)	Total Area (ha)	High Habitat % of Total Area	% of RSA Habitat by Footprint Component
<b>Footprint or Corridor</b>	Access Road	7	95	7	<1	0	95	0	0	0	95	0	0
	Airstrip	2	50	4	<1	5	50	10	<1	0	50	0	0
	Kluskus FSR	6	253	2	<1	0	253	0	0	0	253	0	0
	Mine Site	2,499	4,430	56	2	230	4,430	5	1	11	4,430	0	3
	Freshwater Supply Pipeline	5	132	4	<1	0	132	0	0	0	132	0	0
	Transmission Line - Main	581	1,806	32	1	64	1,806	4	<1	3	1,806	0	1
	Transmission Line - Mills Ranch	145	202	72	<1	0	202	0	0	1	202	0	0
	Transmission Line - Stellako	37	62	60	<1	1	62	1	<1	1	62	2	0
	<b>Total</b>	<b>3,283</b>	<b>7,032</b>	<b>47</b>	<b>3</b>	<b>300</b>	<b>7,032</b>	<b>4</b>	<b>1</b>	<b>16</b>	<b>7,032</b>	<b>0</b>	<b>4</b>
<b>LSA</b>	Access Road	71	363	19	0	0	363	0	0	0	363	0	0
	Airstrip	27	465	6	0	36	465	8	0	0	465	0	0
	Kluskus FSR	1,920	6,574	29	2	160	6,574	2	1	5	6,574	0	1
	Mine Site	3,375	6,123	55	3	320	6,123	5	1	21	6,123	0	6
	Freshwater Supply Pipeline	141	731	19	0	0	731	0	0	1	731	0	0
	Transmission Line - Main	2,837	8,068	35	3	306	8,068	4	1	13	8,068	0	3
	Transmission Line - Mills Ranch	639	924	69	1	0	924	0	0	6	924	1	2
	Transmission Line - Stellako	167	306	55	0	3	306	1	0	8	306	3	2
	<b>Total</b>	<b>9,176</b>	<b>23,554</b>	<b>39</b>	<b>8</b>	<b>826</b>	<b>23,554</b>	<b>4</b>	<b>3</b>	<b>54</b>	<b>23,554</b>	<b>0</b>	<b>15</b>
<b>RSA</b>		108,745	291,714	37	-	27,550	291,714	9	-	369	291,714	<1	-
<b>Area</b>	Footprint % RSA	2	-	-	-	2	-	-	-	2	-	-	-
	Footprint % LSA	30	-	-	-	30	-	-	-	30	-	-	-
<b>Habitat</b>	Footprint % RSA Habitat	3	-	-	-	1	-	-	-	4	-	-	-
	Footprint % LSA Habitat	36	-	-	-	36	-	-	-	30	-	-	-

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



**Legend**

- Populated Place
- ⬮ Highway
- Kluskus FSR
- Kluskus-Blue FSR
- Kluskus-Ootsa FSR
- Existing Transmission Line
- Exploration Road
- Proposed Transmission Line
- Proposed Transmission Line (Mills Ranch re-route)
- Proposed Transmission Line (Stellako re-route)
- Proposed Fresh Water Pipeline
- Proposed Mine Site Access Road
- Proposed Airstrip
- Proposed Mine Site
- Stream (>= 4th Order)
- Waterbody (>= 100 Ha)
- 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

Scale: 1:500,000  
0 5 10 20 Kilometres

**Reference**  
BC Government GeoBC Data Distribution

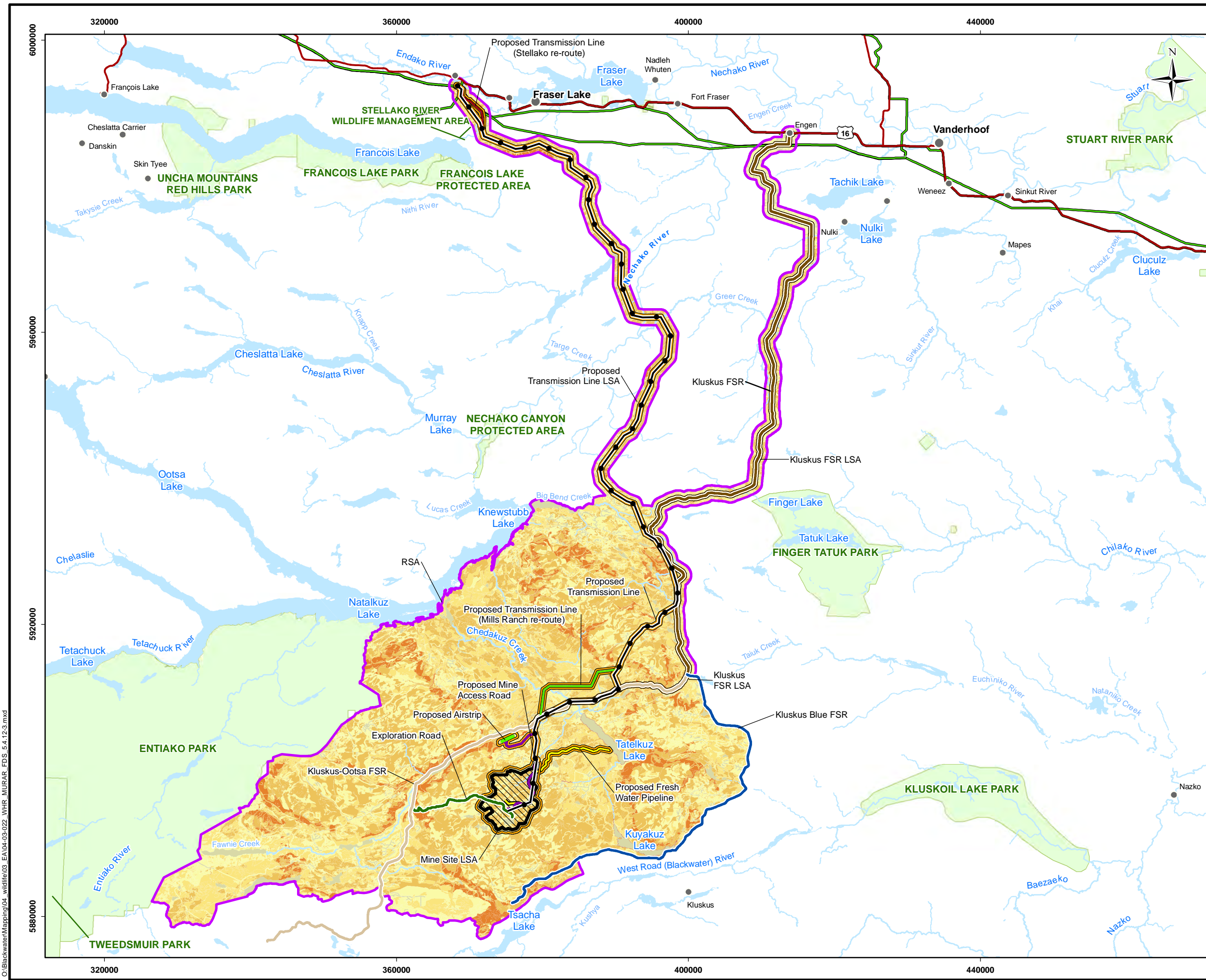
CLIENT:  
**newgold™**

PROJECT:  
Blackwater Gold Project

**Wildlife Habitat Rating**  
Grizzly Bear - FDP, Overview  
Life Stage/Season: Food (FD)/ Spring (P)

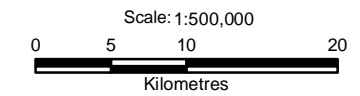
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PROJECTION: UTM Zone 10	DATUM: NAD83	

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**Legend**

- Populated Place
- Highway
- Kluskus FSR
- Kluskus-Blue FSR
- Kluskus-Ootsa FSR
- Existing Transmission Line
- Exploration Road
- Proposed Transmission Line
- Proposed Transmission Line (Mills Ranch re-route)
- Proposed Transmission Line (Stellako re-route)
- Proposed Fresh Water Pipeline
- Proposed Mine Site Access Road
- Proposed Airstrip
- Proposed Mine Site
- Stream (>= 4th Order)
- Waterbody (>= 100 Ha)
- Parks and Protected Areas
- Wildlife and Wildlife Habitat
- Local Study Area
- Regional Study Area



**Reference**  
BC Government GeoBC Data Distribution

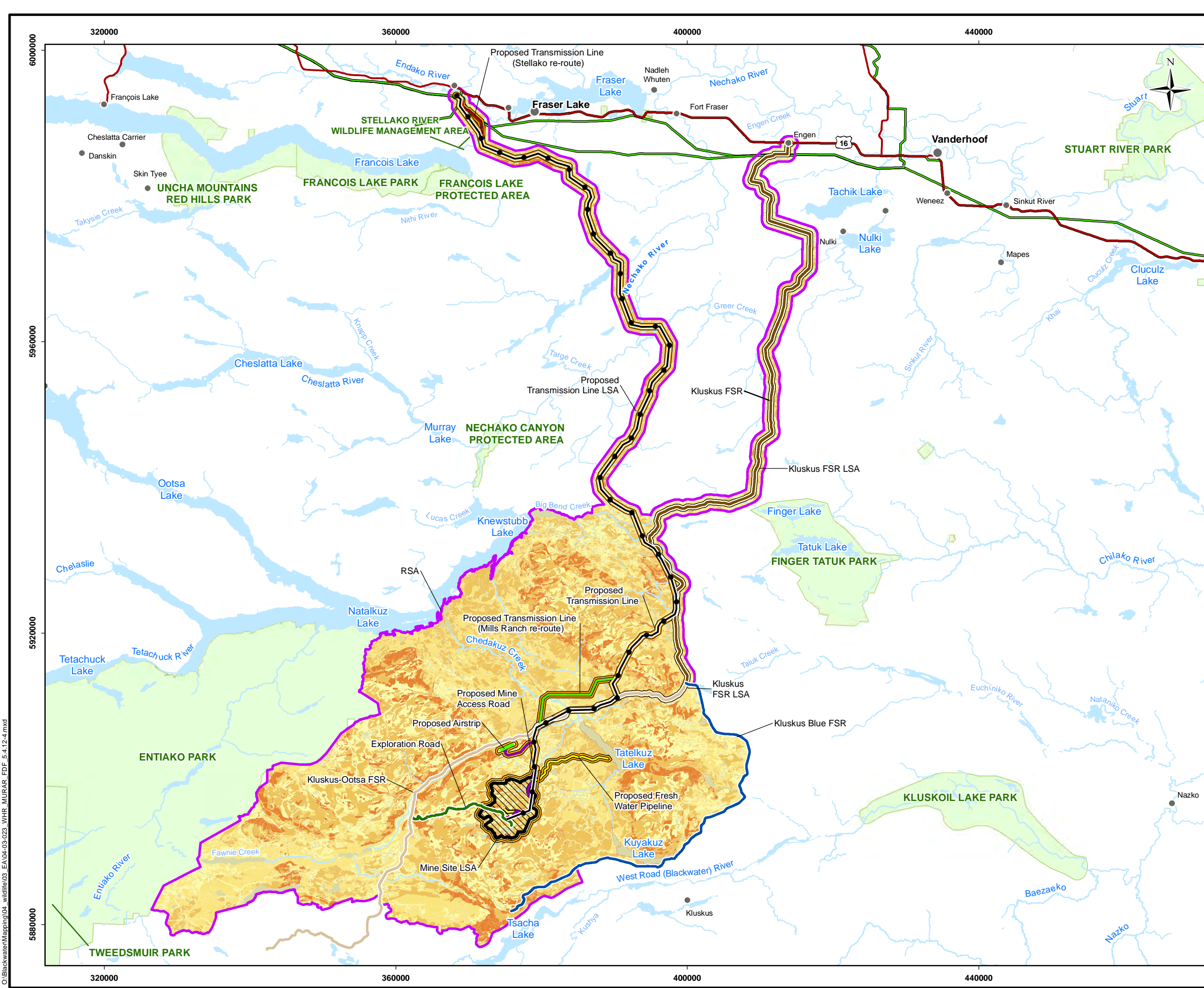
CLIENT:

PROJECT:  
Blackwater Gold Project

**Wildlife Habitat Rating**  
Grizzly Bear - FDP, Overview  
Life Stage/Season: Food (FD)/ Summer (S)

DATE: September, 2015	ANALYST: MY	<b>Figure 5.4.12-3</b>
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GIS FILE: 04-03-022_WHR_MURAR_FDS_5.4.12-3.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	

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**Legend**

- Populated Place
- Ⓜ Highway
- Kluskus FSR
- Kluskus-Blue FSR
- Kluskus-Ootsa FSR
- Existing Transmission Line
- Exploration Road
- Proposed Transmission Line
- Proposed Transmission Line (Mills Ranch re-route)
- Proposed Transmission Line (Stellako re-route)
- Proposed Fresh Water Pipeline
- Proposed Mine Site Access Road
- Proposed Airstrip
- Proposed Mine Site
- Stream (>= 4th Order)
- Waterbody (>= 100 Ha)
- 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

Scale: 1:500,000  
0 5 10 20 Kilometres

**Reference**  
BC Government GeoBC Data Distribution

CLIENT:  
**newgold™**

PROJECT:  
Blackwater Gold Project

**Wildlife Habitat Rating**  
Grizzly Bear - FDP, Overview  
Life Stage/Season: Food (FD)/ Fall (F)

DATE: September, 2015	ANALYST: MY	<b>Figure 5.4.12-4</b>
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PROJECTION: UTM Zone 10	DATUM: NAD83	

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## BLACKWATER GOLD PROJECT

APPLICATION FOR AN  
ENVIRONMENTAL ASSESSMENT CERTIFICATE /  
ENVIRONMENTAL IMPACT STATEMENT  
ASSESSMENT OF POTENTIAL ENVIRONMENTAL EFFECTS



Of the grizzly bear spring habitat in the RSA, 29% (83,649 ha) was rated as moderate value, 2% (4,665 ha) was rated as moderately high value, and less than 1% (2 ha) was rated as high value (**Table 5.4.12-8**). Of the suitable spring RSA habitat, Project footprint components overlap approximately 3% of moderate, 1% of the moderately high, and 0% of high value habitat (**Table 5.4.12-8**). The potential direct habitat loss for grizzly bear associated with new access roads and the proposed freshwater supply pipeline are predicted to only overlap with moderate value habitat and no high value habitat. The habitat surrounding these areas was heavily harvested and areas of mature and old-growth forest are limited. Most potential effects on grizzly bear spring habitat are anticipated to be associated with clearing of moderate value forests along the transmission line and at the mine site. The transmission line footprint (including re-route options) is predicted to overlay a maximum 548 ha of moderate value habitat, 26 ha of moderately high value habitat, and 0 ha of high value habitat (**Table 5.4.12-8**). Potential habitat in areas where heavy timber harvesting has occurred are less suitable for grizzly bear spring habitat.

Of the grizzly bear summer habitat in the RSA, 37% (107,355 ha) was rated as moderate value, 6% (17,770 ha) was rated as moderately high value, and less than 1% (344 ha) was rated as high value (**Table 5.4.12-9**). Of the suitable summer RSA habitat, Project footprint components overlap approximately 3% of moderate, 1% of the moderately high, and 1% of high value habitat (**Table 5.4.12-9**). The potential direct habitat loss for grizzly bear associated with new access roads and the proposed freshwater supply pipeline is predicted to only overlap with moderate value habitat and no high value summer habitat. The habitat surrounding these areas was heavily harvested and areas of mature and old-growth forest are limited. Most potential effects on grizzly bear summer habitat are anticipated to be associated with clearing of moderate value habitat in forests along the transmission line and at the mine site. The transmission line footprint (including re-route options) is predicted to overlay a maximum 767 ha of moderate value habitat, 116 ha of moderately high value, and 5 ha of high value habitat (**Table 5.4.12-9**). Potential habitat in areas where heavy timber harvesting has occurred are less suitable for grizzly bear summer habitat.

Of the grizzly bear late summer / fall habitat in the RSA, 37% (108,745 ha) was rated as moderate value habitat, 9% (27,550 ha) was rated as moderately high value, and less than 1% (369 ha) was rated as high value (**Table 5.4.12-10**). Of the suitable late summer / fall RSA habitat, Project footprint components overlap approximately 3% of moderate, 1% of the moderately high, and 4% of high value habitat (**Table 5.4.12-10**). The potential direct habitat loss for grizzly bear associated with the mine site is predicted to overlap with 11 ha of high value habitat (**Table 5.4.12-10**). The transmission line footprint (including re-route options) is predicted to overlay a maximum 763 ha of moderate value habitat, 65 ha of moderately high value habitat, and 5 ha of high value habitat (**Table 5.4.12-10**). Potential habitat in areas where heavy timber harvesting has occurred are less suitable for grizzly bear fall habitat.

Within the RSA, the overall effect of the Project on grizzly bear will likely be a small reduction in area of suitable habitat, affecting 1% to 3% of suitable grizzly bear spring and summer habitat and 1% to 4% of suitable late summer / fall habitat (**Table 5.4.12-10**). The Project is unlikely to affect the overall habitat supply for grizzly bear within the RSA, due to the large amount of available habitat present within this area and the amount of habitat returned after reclamation.

#### 5.4.12.3.7.2 *Mortality Risk within the Grizzly Bear Population Units*

The mine site access road, Kluskus FSR, and transmission corridor may increase the potential for direct mortality risk related to vehicle collisions and effects related to increased access. The three GBPU's located within the Project area are the Blackwater–West Chilcotin GBPU, the Nulki GBPU, and the Francois GBPU. Currently there is no hunting in any of the three GBPU's within the Project area. The Kluskus FSR is a permanent feature on the landscape; however, traffic is expected to increase during Project operations causing a potential limited increase in direct mortality risk related to vehicle collisions.

In the Blackwater–West Chilcotin GBPU, mortality records between 1976 and 2011 indicate known hunter and animal control kills of 113 bears over a 36-year period, which is an average of 3 bears per year or 6% harvest rate, which is well above the sustainable harvest rate of 3.8% set by BC MFLNRO. In 2003, the baseline road density was estimated to be greater than 0.6 km/km<sup>2</sup> in more than 30% of the area (BC MFLNRO, 2012). The baseline linear density calculated for the effects assessment determined that in 2014 the density within this GBPU is 0.63 km/km<sup>2</sup>. This baseline calculation included all linear features in the GBPU (e.g., roads, transmission lines, pipelines, and railways). These linear features were included due to the potential for access by highway and off-road vehicles to bring people in contact with grizzly bears. The Project will add an additional 28 km of new linear features (e.g., transmission line, airstrip, and access roads) within this GBPU, which is an increase in 0.2% in linear density. The distances included in the analysis of new linear features include areas of the footprints that have not yet been cleared (e.g., not including current forestry roads that will be used). The distance used for the transmission line includes the length of the mainline and not the two potential re-route options.

In the Nulki GBPU, mortality records between 1976 and 2011 indicate known kills of 110 bears over a 36-year period, which is an average of 3 bears per year or 7% harvest rate, which is well above the sustainable harvest rate. In 2003, the road density was estimated to be greater than 0.6 km/km<sup>2</sup> in more than 62% of the area (BC MFLNRO, 2012). The baseline linear density calculated for the effects assessment determined that in 2014 the density within this GBPU is 1.63 km/km<sup>2</sup>. The Project will add an additional 28 km of new linear features (transmission line) within this GBPU, which is an increase in 0.1% in linear density. There will be no Project roads created during the construction of the Project within this GBPU apart from access roads along the transmission line.

In the Francois GBPU, mortality records between 1976 and 2011 indicate known kills of 81 bears over a 36-year period, which is an average of 2.25 bears per year or 3.8% harvest rate. In 2003, the road density was estimated to be greater than 0.6 km/km<sup>2</sup> in over 43% of the area (BC MFLNRO, 2012). The baseline linear density calculated for the effects assessment determined that in 2014 the density within this GBPU is 0.92 km/km<sup>2</sup>. The Project will add an additional 0.3 km of new linear features (transmission line) within this GBPU, which is a minimal increase in linear density (**Table 5.4.12-11**).

There will be no roads created during the construction of the Project within this GBPU apart from access roads along the transmission line.



**Table 5.4.12-11: Baseline and Project-Related Linear Densities within the GBPUs**

Feature	Francois GBPU			Nulki GBPU			Blackwater–West Chilcotin GBPU		
	Existing (km)	Project Related (km)	Increase (%)*	Existing (km)	Project Related (km)	Increase (%)	Existing (km)	Project Related (km)	Increase (%)
Access Road	7,761	0	0	26,139	0	0	13,134	4	0
Transmission Line	103	0.4	0.4	662	29	4	0	22	-
Pipeline	93	0	0	255	0	0	0	2	-
Railway	3	0	0	2	0	0	0	0	0
Total (km)	7,960	0.4	0	27,059	29	0	13,134	28	0
Area (km <sup>2</sup> )	8,701		-	16,786		-	20,714		-
Density (km/km <sup>2</sup> )	0.9	0	0	1.6	0	0.1	0.6	0	0.2

**Note:** GBPU = Grizzly Bear Population Unit; km = kilometre

Fifty one kilometres (51 km) of existing roads will be used to construct the new 130 km transmission line, for a total of 39% of the route. The linear distance of new clearing required for the transmission line will be 22 km for within the Blackwater–West Chilcoltin GBPU, 28 km within the Nulki GBPU, and 0.3 km within the Francois GBPU (**Table 5.4.12-12**). 2014 wildfires are impacting available moderate to high quality habitat within the GBPUs and are considered in cumulative effects assessment.

**Table 5.4.12-12: Additional Project-Related Roads within the GBPUs**

Feature	New Roads Length (m)		
	Blackwater – Chilcotin GBPU	Nulki GBPU	Francois GBPU
Airstrip	1,702	N/A	N/A
Airstrip Access Road	0	N/A	N/A
Mine Site Access Road	2,348	N/A	N/A
Transmission Line - Main	22,115	28,6	361
Transmission Line - Mills Ranch	15,294	N/A	N/A
Transmission Line - Stellako	N/A	232	2,027
Water Pipeline	1,713	N/A	N/A

**Note:** GBPU = Grizzly Bear Population Unit; m = metre; N/A = not applicable

The volume of traffic on the roads is considered relevant to the mortality risk to grizzly bears. The busier a road, the more risk there is to bears that are crossing the roads to be involved in vehicle collisions. The transportation effects assessment recorded baseline road traffic conditions in 2012 and 2013. Baseline conditions include 4.8 vehicles per hour on the Kluskus and Kluskus-Ootsa FSRs, which is expected to increase to 9.5 vehicles per hour during Project construction and operation. There will be a peak in vehicle movement during the main months of construction to 12.5

vehicles per hour; however, this peak will occur during the denning months from January to April. There will be limited travel to the mine site during the closure and post-closure phases starting at a weekly level (**Section 7.2.5**). No historical bear-vehicle accident data are available in the Project area because the Wildlife Accident Reporting System (WARS) database does not include most FSRs. Any thresholds of traffic volumes on grizzly bears in scientific literature are related to avoidance of habitat and not to corresponding mortality risk.

Effects will potentially occur from the start of Project construction to the end of closure, followed by reduced effects during post-closure.

#### **5.4.12.3.8 Mitigation Measures**

A range of habitat mitigation measures was adapted and applied to the Project as described in the WLMP and the Reclamation and Closure Plan (RCP) (**Section 2.6**). The following habitat mitigation measures are specific to the potential effects carried through the assessment.

##### *5.4.12.3.8.1 Habitat Loss and Alteration*

Avoiding and/or mitigating loss and degradation effects on grizzly bear and grizzly bear habitat begins with the Project design. The design of the roads, transmission line, and mine site footprints include avoidance of high value, habitat-suitable riparian and wetland areas, with several iterative changes in the mine site and access road components already completed. The Kluskus FSR is an existing road for most of its footprint. Mitigation measures already in place include road design using existing roads and cleared areas, and locating access roads and transmission lines away from wetland and riparian areas or spanning wetlands.

To meet provincial and federal regulatory requirements for wildlife, vegetation, and aquatic resources relating to the conservation of species and ecosystems at risk, the WLMP will be implemented, as well as the 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**), Wetland Management Plan (**Section 12.2.1.18.4.3**), Sediment and Erosion Control Plan (SECP) (**Section 12.2.1.18.4.1**), RCP (**Section 2.6**), and the Aquatic Resources Management Plan (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 grizzly bear habitat not directly affected by the Project.

Mitigation for unavoidable loss of grizzly bear habitat is limited to that of the footprint and adjacent areas and includes avoiding disturbance to grizzly bear habitat through:

- Applying soil erosion and sediment control measures, as described in the LSVMRP (**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 RCP (**Section 2.6**) and WLMP (**Section 12.2.1.18.4.6**);

- Implementing invasive plant management techniques, as defined in the ISMP (**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**); and
- Mitigation measures for altered hydrology will include implementation of BMPs for construction. For example, 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 access roads and transmission line. Participating in regional land use and planning initiatives related to grizzly bear management will help mitigate existing landscape level impacts to grizzly bear.

#### 5.4.12.3.8.2 *Mortality Risk*

Measures to reduce grizzly bear mortality and displacement during Project construction, operation, and decommissioning and closure include:

- Conducting pre-clearing surveys to identify grizzly bear activity within potential denning habitat during sensitive periods as described in the 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; and
- Implement domestic waste management measures as described in the Industrial and Domestic Waste Management Plan (IDWMP) (**Section 12.2.1.18.4.11**).

5.4.12.3.8.3 *Effectiveness of Mitigation*

**Table 5.4.12-13** provides ratings for effectiveness of mitigation measures to avoid or reduce potential effects on grizzly bear during mine site development. Mitigation measures will be based on site-specific information and construction engineering and are therefore preliminary at this stage.

**Table 5.4.12-13: Mitigation Measures and Effectiveness of Mitigation to Avoid or Reduce Potential Effects on Grizzly Bear 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	Applying soil erosion and sediment control measures, as described in the LSVMRP ( <b>Section 12.2.1.18.4.4</b> )	Moderate
		Restoring disturbed habitats at mine closure or development of habitats capable of supporting grizzly bears, as defined in the RCP ( <b>Section 2.6</b> ) and WLMP ( <b>Section 12.2.1.18.4.6</b> )	High
		Implementing invasive plant management techniques, as defined in the ISMP ( <b>Section 12.2.1.18.4.5</b> ), 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	Moderate
		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 ( <b>Section 5.2.2.3</b> )	High
		Mitigation measures for altered hydrology will include implementation of BMPs for construction. For example, installing appropriate culverts where required, and maintaining functioning water tables and drainage throughout all phases from construction to decommissioning will maintain wetland function	Moderate
		Participating in regional land use and planning initiatives related to grizzly bear management will help mitigate existing landscape level impacts to grizzly bear	Moderate
Grizzly Bear Mortality	Construction, Operations, Closure, Post-Closure	Conducting pre-clearing surveys to identify grizzly bear activity within potential denning habitat during sensitive periods as described in the WLMP ( <b>Section 12.2.1.18.4.6</b> )	High
		Reporting and documenting wildlife observations and incident/accidents along access roads, as stated in the WLMP to identify any crossing corridors	Moderate

Likely Environmental Effect	Project Phase	Mitigation/Enhancement Measure	Effectiveness of Mitigation Rating
		posting signs warning drivers of the possibility of wildlife encounters in areas of high wildlife activity	Moderate
		Implement a bear awareness program as described in the WLMP	High
		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	Moderate
		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	High
		Implementing a no hunting and no firearms policy, as stated in the WLMP	High
		Removing carrion along the road to reduce the risk of attractants, as described in the WLMP	High
		Implementing adaptive management, as described in the WLMP	High
		Implement domestic waste management measures as described in the IDWMP ( <b>Section 12.2.1.18.4.11</b> )	High
Change in Grizzly Bear Health	Construction, Operations, Closure, Post-Closure	Implementing IDWMP and WQLDMP	High
Change in Grizzly Bear Movement Patterns	Construction, Operations, Closure, Post-Closure	Minimizing Project footprint	High
		Implementing the Noise and Vibration Mitigation Measures (to reduce disturbance of grizzly bears)	Moderate
		Management of waste that may act as an attractant for grizzly bear as per the IDWMP	High
Changes in Predator-Prey Dynamics	Construction, Operations, Closure, Post-Closure	Implementing vegetation management as per the LSVMRP	Moderate

**Note:** BMP = Best Management Practice; FSR = Forest Service Road; ISMP = Invasive Species Management Plan; LSA = Local Study Area; LSVMRP = Landscape, Soils and Vegetation Management and Restoration Plan; RCP = Reclamation and Closure Plan; ROW = right-of-way; RSA = Regional Study Area; WLMP = Wildlife Management Plan; WQLDMP = Water Quality and Liquid Discharge Management Plan

The mitigation/offsetting success ratings shown in **Table 5.4.12-13** are incorporated into the confidence ratings defined in **Section 4.3.5** and summarized in **Table 5.4.12-15**. 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 grizzly bear on the mine site, mitigation/offsetting success rating is classified as moderate overall because most mitigation measures are consistent with those proposed by BC MFLNRO for protection and recovery of populations, and demonstrated as moderate to high in effectiveness in other locations.

#### 5.4.12.4 Residual Effects and their Significance

**Table 5.4.12-14** summarizes the residual effects after mitigation, as well as management strategies by Project phase and component.

**Table 5.4.12-14: Summary of Categories of Assessment and Mitigation Measures – Grizzly Bear**

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	Vegetation Management Plan, progressive reclamation with appropriate species. Primary areas of concern are mature and old-growth forests in the mine site and the transmission line. Avoid clearing and development of berry and Kokanee areas where feasible. Wetland compensation measures are expected to increase highly suitable habitat for grizzly bear prior to mine development.	Yes
Construction, Operations, Closure, and Post-Closure	Mine site, access roads, freshwater supply pipeline, airstrip and transmission line	Grizzly Bear Mortality	Follow Wildlife Management Plan to reduce potential effects on grizzly bears and their habitat. Enforce speed limits on access roads. 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). No hunting policy as stated in Wildlife Management Plan. Implement Bear Awareness Program as described in the Wildlife Management Plan (WLMP).	Yes

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	Change in Grizzly Bear Health	Implementing Industrial and Domestic Waste Management Plan (IDWMP) and Water Quality and Liquid Discharges Management Plan (WQLDMP).	No
Construction, Operations, and Closure	Mine site, access roads, freshwater supply pipeline, airstrip, and transmission line	Change in Grizzly Bear Movement Patterns	Minimizing Project footprint, as outlined in existing Project Description. Implementing the Noise and Vibration Mitigation Measures (to reduce disturbance of grizzly bears). Management of waste that may act as an attractant for grizzly bear as per the Industrial and Domestic Waste Management Plan (IDWMP).	No
Construction, Operations, Closure and Post-Closure	Mine site, access roads, freshwater supply pipeline, airstrip, and transmission line	Changes in Predator-Prey Dynamics	Implementing vegetation management as per the Landscape, Soils and Vegetation Management and Restoration Plan (LSVMRP).	No

Residual effects on grizzly bears are characterized in terms of the effect's magnitude or severity, geographic extent, duration, and reversibility, the context/resilience of grizzly bear populations or grizzly bears habitat, probability of the effect's occurrence, and confidence in the conclusions (Table 5.4.12-15).

**Table 5.4.12-15: Characterization of Residual Environmental Effects for Grizzly Bear**

Characterization (Effect Attribute)	Description	Quantitative Measure or Definition of Qualitative Categories
Magnitude	The amount of change in a measurable parameter or variable relative to baseline case.	<p>Negligible—Effects are not measurable</p> <p>Low—A measurable change but within the range of expected natural variation based on species life history</p> <p>Medium—A measurable change but less than high</p> <p>High—A measurable change of density, abundance, or distribution.</p> <p>Thresholds of 20% habitat loss/alteration of habitat and 0.6 km/km<sup>2</sup> linear density are used</p> <p>A linear density over the 0.6 km/km<sup>2</sup> threshold within the GBPUs is identified by MFLNRO (2012). Qualitative measure of risk within the RSA because of Project effects (e.g., road density and relative frequency of use of the area by grizzly bear). Magnitude for the transmission line effect is expressed quantitatively as a linear feature density (as km/km<sup>2</sup> and percent change) within the GBPUs. Magnitude for the access road effect is defined as: Low—no grizzly bear are killed during the life of the Project as the result of collisions with Project-related traffic; Medium - one grizzly bear is killed during the life of the Project as the result of collisions with Project-related traffic; and High - more than one grizzly bear is killed during the life of the Project as the result of collisions with Project-related traffic. Increased direct mortality</p>

<b>Characterization (Effect Attribute)</b>	<b>Description</b>	<b>Quantitative Measure or Definition of Qualitative Categories</b>
		risk for grizzly bear associated with the transmission line and along the access road is predicted to be negligible.
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 the VC returns 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) Medium-term—Not applicable for grizzly bear 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—Grizzly bear population has high resilience to stress Medium - Grizzly bear population has medium resilience to stress High—Grizzly bear population has low resilience to stress
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 VC that is above the suggested threshold.	Not Significant (negligible)—Effects are point-like or local in geographic extent, with a low context rating, and a negligible magnitude, short-term, reversible, and with a low frequency (once or intermittent) Not Significant (minor)—Effects are local in geographic extent, with a low magnitude, and low context rating, short-term to chronic, reversible, and with a low frequency (once or intermittent) Not Significant (moderate)—Effects are local to regional in geographic extent, and medium in magnitude, medium context rating, medium-term to chronic, reversible, and occur at all frequencies Significant—Effects occur with a medium to high context, and high context rating, high magnitude, regional in geographic extent, long-term to chronic, non-reversible, and occur at all frequencies
Confidence Level	Confidence in the residual effects prediction.	Low—Project-grizzly bear interaction is not well understood, Mitigation has not been proven effective Moderate—Grizzly bear interaction is understood in similar ecosystems and effects documented in the larger regional area or in the literature, mitigation proven effective elsewhere High—Project-grizzly bear interaction is well understood, Mitigation has been proven effective

The thresholds (**Table 5.4.12-16**) provide the ability to likely identify change in grizzly bear relative use and mortality risk as a result of Project effects.



**Table 5.4.12-16: Threshold(s) for Determining Significance of Residual Grizzly Bear Habitat and Population Effects in the RSA**

Category of Assessment	Threshold of Environmental Effect
Habitat Loss and Alteration	>20% reduction in relative species habitat abundance or habitat areas with a moderate to high suitability ratings (e.g., >20% change in amount of grizzly bear 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	A linear density over the 0.6 km/km <sup>2</sup> threshold within the GBPUs is identified by MFLNRO (2012). Qualitative measure of risk within the RSA because of Project effects (e.g., road density and relative frequency of use of the area by grizzly bear). Magnitude for the transmission line effect is expressed quantitatively as a linear feature density (as km/km <sup>2</sup> and percent change) within the GBPUs. Magnitude for the access road effect is defined as: Low - no grizzly bear are killed during the life of the Project as the result of collisions with Project-related traffic; Medium - one grizzly bear is killed during the life of the Project as the result of collisions with Project-related traffic; and High - more than one grizzly bear is killed during the life of the Project as the result of collisions with Project-related traffic. Increased direct mortality risk for grizzly bear associated with the transmission line and along the access road is predicted to be negligible.

**Note:** RSA = Regional Study Area

**Table 5.4.12-17** presents a residual effects assessment summary for grizzly bear, based on the categorization of effects.

**Table 5.4.12-17: Residual Effects Assessment Summary for Grizzly Bear for Habitat Loss within the RSA and the Mortality Risk within the GBPUs**

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	Vegetation Management Plan, progressive reclamation with appropriate species, maintain forest function and vegetation cover, and reduce sensory disturbance as per the Wildlife Management Plan.	Yes	Unavoidable loss of habitat	Low	Low	Local	Chronic	Reversible (mine site, transmission line, freshwater supply pipeline and access road) Irreversible (Forest Service Road)	One time	High	High	Not Significant (minor)	High
Construction through to Closure	Mine site, airstrip, transmission line, freshwater supply pipeline and access roads	Mortality Risk	Access management and firearm / hunting control measures to reduce mortality from roads, air traffic and operations. Hunting regulations are in place to manage regulated harvest. Traffic and speed control (Transportation Management Plan)	Yes	Unavoidable mortality of grizzly bears	Low	Low	Local	Long term	Reversible	Continuous	High	High	Not Significant (minor)	High
Construction through to Post-Closure	Mine Site, Airstrip, Transmission Line, Freshwater Supply Pipeline, and Access Roads	Grizzly Movement Patterns	Noise and Light Management Plan (to reduce displacement from roads, air traffic and operations). Wildlife Management Plan measures to reduce disturbance.	No	Unavoidable displacement from habitats near mine site, access road or airstrip	Low	Negligible	Local	Short-term	Reversible	Intermittent	Low	High	Not Significant (negligible)	High
Construction through to Post-Closure	Mine Site, Airstrip, Transmission Line, Freshwater Supply Pipeline, and Access Roads	Changes in Grizzly Population Dynamics	Vegetation management	No	Change in predator-prey dynamics	Low	Negligible	Local	Short-term	Reversible	Intermittent	Low	High	Not Significant (negligible)	High
Construction through to Post-Closure	Mine Site, Airstrip, Transmission Line, Freshwater Supply Pipeline, and Access Roads	Grizzly Health	Manage chemical hazards and attractants	No	Change in grizzly health	Low	Negligible	Local	Short-term	Reversible	Intermittent	Low	High	Not Significant (negligible)	High

**Note:** GBPU = Grizzly Bear Population Unit; RSA = Regional Study Area

#### **5.4.12.4.1 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.

Within the mine site, the effect is rated with low to moderate magnitude because a small fraction of regionally available habitat will be affected. Regionally, these moderate to high value habitats are widespread and available throughout the RSA. A small percentage (1% to 4%) of available moderate to high value habitat will be affected relative to habitats where grizzly bears occur in the RSA and is well below the 20% threshold. The clearing of trees from forested habitats will generally make the habitat less suitable for grizzly bears, as trees are an essential component of their habitat. The habitat impacts have an effect specific to the Project footprint and the sensory disturbance has a local effect limited to the LSA. The duration of the habitat effect will be chronic until areas are reclaimed post-closure; however, some areas will be revegetated before closure reducing the time the habitat is lost. Once the habitat effect occurs during construction, it will be approximately 17 years before closure and then at least 80 or more years for the forested ecosystems to reach maturity (i.e., structural Stage 6) similar to near baseline conditions, therefore extending the duration to chronic.

The habitat effects will occur once, with potential alteration occurring on a continuous basis, and will be reversible in the long term and chronic in post-closure. The sensory disturbance may occur continuously and be reversible in the long term due to the moderate recovery time of habitat disturbance. There is a high probability that loss of some moderate to high value habitat will occur and that there will be some sensory displacement and alteration of habitat. Project activities are not expected to affect the viability of this species, due to the widespread though low density extent of grizzly bears and their habitat within the RSA. The current access road will be retained for emergency access but will not be used regularly. There is a potential mortality risk due to camp; however, mitigative measures in the Waste Management Plan and the WLMP will reduce the risk. The mortality risk was assessed in the context of the GBPU of which the mine site is located within the Blackwater–West Chilcotin GBPU. There is a high likelihood of a residual effect occurring; however, it is with high confidence that it will be Not Significant (minor) based on the magnitude and geographical extent at the mine site and the mitigative measures within the WLMP.

#### **5.4.12.4.2 Access Roads and Kluskus Forest Service Road**

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.

The loss and alteration of grizzly bear habitat will occur along roads associated with the Project. Habitat effects will potentially occur within a 250 m buffer from the edge of the footprint into the LSA. All of the FSR is existing and a small fraction of available habitat will be affected relative to habitats where grizzly bears occur frequently.

The duration of the habitat effect will be long term until areas are reclaimed post-closure; however, some areas will be revegetated before closure reducing the time the habitat is lost. Once the habitat effect occurs during construction, it will be approximately 17 years before closure and then at least 80 or more years for the forest ecosystems to reach maturity (i.e., structural Stage 6) to near baseline conditions.

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 slightly 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. The change in mortality risk due to increases in traffic volumes and the number of access points is moderate in magnitude and speed limits are controlled as mitigative measures is controlled access into the mine site as well as mitigative measures undertaken by the Project to reduce the number of vehicles to primarily transport vehicles and delivery trucks on the FSR. The effects assessment on transportation states that Project-related residual effects on regional transportation will be negative, minor in magnitude, regional, continuous, and reversible. The residual effects of Project-related traffic on road and air infrastructure, incremental traffic, potential safety of other road users, potential road deterioration, and motor vehicle collisions with grizzly bear during construction and operations is expected to be Not Significant (minor). The effects will have a local effect and the duration will be long-term as traffic will decrease during the closure phase and further decrease during post-closure.

#### **5.4.12.4.3 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.

Habitat effects will potentially occur within a 250 m buffer from the edge of the site-specific footprint into the LSA. The loss and alteration of grizzly bear habitat will occur during the construction phase and these effects will be evident in the closure and post-closure phases. Within the airstrip, transmission line, and freshwater pipeline, the effect is rated as moderate magnitude because a small fraction of available habitat will be affected relative to habitats where grizzly bears may occur. Regionally, these moderate to high value ecosystems are widespread and relatively common. A small fraction of available moderate and high value habitat (1% to 4%) within the RSA will be affected relative to habitats where grizzly bears occur and is well below the 20% threshold. The clearing of trees from forested habitats will generally make the habitat unsuitable for grizzly bears, as trees are an essential component of their habitat.

The duration of the habitat effect will be long term until areas are reclaimed post-closure; however, some areas will be revegetated before closure reducing the time the habitat is lost. Once the habitat effect occurs during construction, it will be approximately 17 years before closure and then at least 80 or more years for the forest ecosystems to reach maturity (i.e., structural Stage 6) to near baseline conditions.

The habitat effect will occur once, with potential alteration occurring on a continuous basis, and will be reversible in post-closure. The sensory disturbance may occur continuously and be reversible in the long term due to the moderate recovery time of habitat disturbance. There is a high probability that loss of some moderate and high value habitat will occur and that sensory displacement or alteration of habitat will occur. Project activities are not expected to affect the viability of this species, due to the widespread and common extent of grizzly bears and their habitat within the RSA.

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. The change in mortality risk due to increases in traffic volumes and the number of access points is moderate in magnitude as one of the mitigative measures is controlled access into the Project area as well as mitigative measures undertaken by the Project to reduce the number of vehicles. The effects assessment on transportation states that Project-related residual effects on regional transportation will be negative, minor in magnitude, regional, continuous, and reversible. The residual effects of Project-related traffic on road, rail, and air infrastructure, incremental traffic, potential safety of other road users, potential road deterioration, and motor vehicle collisions with wildlife and livestock during construction and operations is expected to be Not Significant (minor). The effects will have a local effect and a duration of long-term as traffic will decrease during the closure phase and further decrease during post-closure.

#### **5.4.12.4.4 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 GBPU are above the linear density threshold of 0.6 km/km<sup>2</sup> 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) and carried forward to the CEA.

Mortality risk will increase along roads, airstrip, transmission line, and freshwater supply pipeline, and these effects will be evident over the long term. The highest mortality risk will be associated with the transmission line, Kluskus FSR, and the mine access road. Habitat effects will potentially occur within a 50 m buffer from the edge of the mine footprint into the LSA, whereas increased

mortality risk will potentially occur within 250 m of the edge of clearings and roads. Therefore, the mortality risk is conservatively considered Not Significant (minor) and carried forward to the CEA.

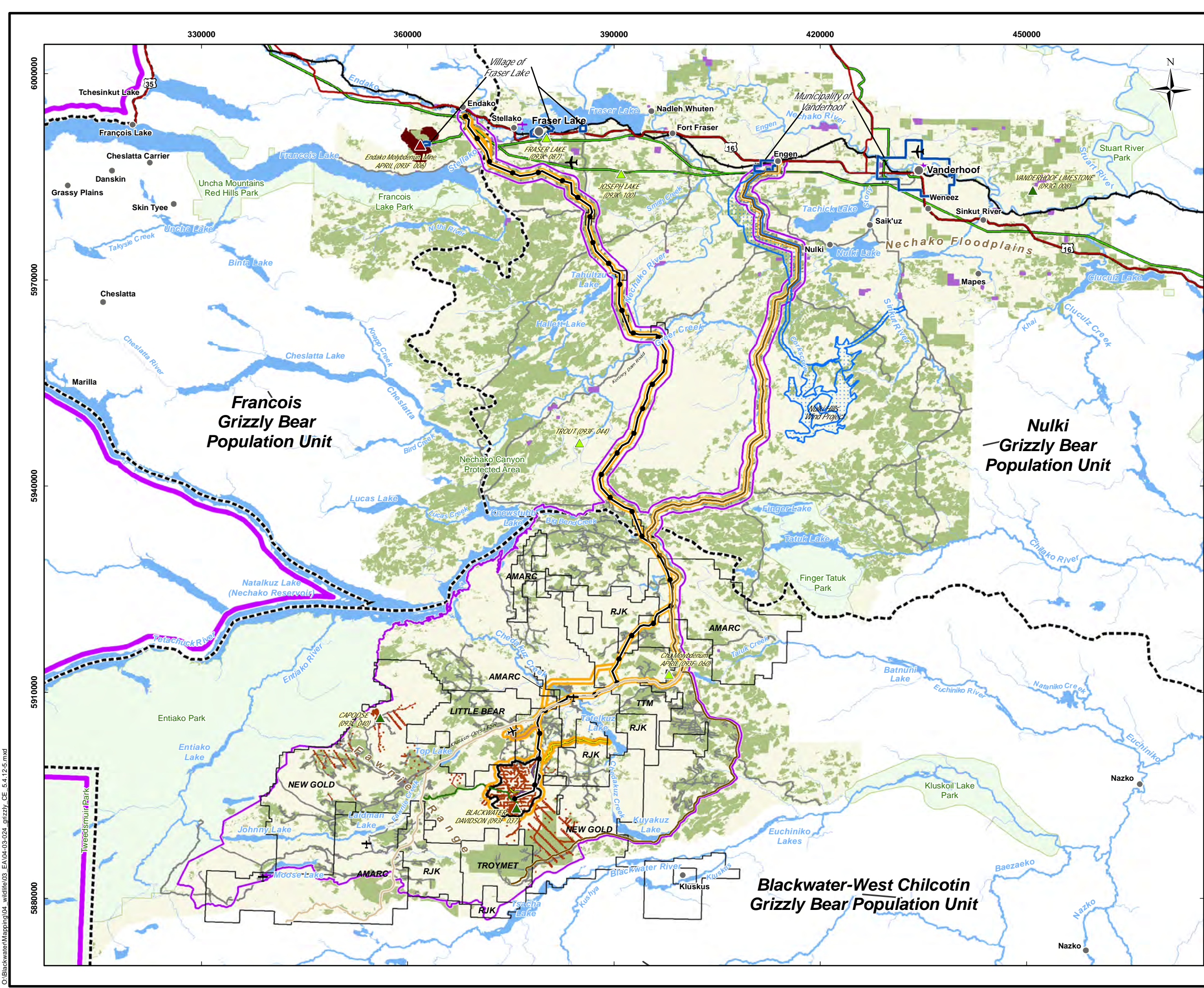
#### 5.4.12.5 Cumulative Effects

A Cumulative Effects Assessment (CEA) for the grizzly bear VC is necessary because the Project is conservatively predicted to have a Not Significant (minor) residual adverse effect on grizzly bear habitat loss and Not Significant (minor) residual adverse effect on grizzly bear risk of mortality. Residual effects on grizzly bear have valid links with the effects of other past, present, or future activities within the RSA. Logging activities have caused loss of habitat within the RSA and, combined with loss of habitat due to wildfire and MPB infestation, a substantial amount of suitable habitat has been or will be negatively affected for grizzly bear populations. A primary consideration in the assessment of grizzly bear is the density of linear development. Several existing features overlap the wildlife cumulative effects areas relative to the GBPUs. Residual effects on grizzly bear habitat loss and risk of mortality that could arise from other projects or activities in the region are assessed to fully understand the context of the residual adverse effects on the grizzly bear habitat loss and risk of mortality by the Project. The spatial boundary for this assessment is the RSA. The temporal boundaries include historical, present, and certain and reasonably foreseeable projects within the RSA and GBPUs (**Figure 5.4.12-5**). Rationale for carrying forward into the CEA is shown in **Table 5.4.12-18**.

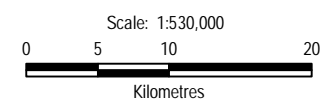
**Table 5.4.12-18: Project Related Residual Effects; Rationale for Carrying forward into the CEA**

Project Component	Project Phase	Residual Effect	Rationale	Carried Forward to Cumulative Effects Assessment
Mine site, airstrip, transmission line, freshwater supply pipeline and access roads	Construction through to Closure	Habitat Loss	Change in habitat availability from baseline conditions	Yes
Mine site, airstrip, transmission line, freshwater supply pipeline and access roads	Construction through to Closure	Mortality Risk	Change in mortality	Yes

For the CEA of habitat loss for grizzly bear, the most relevant land uses in the RSA that could potentially interact include recreation, forestry, Aboriginal land use, hunting and guide outfitting, mining, and agriculture activities and are listed in the project inclusion list (PIL) (**Section 4**). Identified interactions between past, present, and future projects and land uses in the RSA for the CEA are presented in **Table 5.4.12-19**.



- Legend**
- Populated Place
  - Highway
  - Forest Service Roads
  - Parks
  - Municipal Boundaries
- PROJECT COMPONENTS**
- ✈ Proposed Airstrip
  - Exploration Road
  - Proposed Transmission Line
  - - - Proposed Re-routes (Stellako, Mills Ranch)
  - Proposed Freshwater Supply System
  - Proposed Airstrip Access Road
  - Proposed Airstrip Extent
  - Proposed Mine Site
- FORESTRY**
- Forest Cutblocks
- INFRASTRUCTURE**
- ✈ Airport
  - ✈ Airstrip
  - ⊕ Waterdome
  - Nulki Hills Wind Project
- MINING**
- Mineral Deposits**
- ▲ Producer
  - ▲ Developed Prospect
  - ▲ Prospect
- Mining Activities**
- Active Mining
  - Current Prospecting
  - Quarries (Tenure Purpose)
- Mineral Tenures**
- Currently prospecting
- Grizzly Bear**
- Grizzly Bear Local Study Area
  - Grizzly Bear Regional Study Area
  - Area Used for Habitat Loss and Alteration Analysis
  - Grizzly Bear Population Units



**Reference**  
 BC Government GeoBC Data Distribution  
 NRCAN Geobase  
 Ministry of Forests, Lands and Natural Resource Operations

CLIENT: 		
PROJECT: Blackwater Gold Project		
<b>Cumulative Effects: Grizzly Bear Mining, Forestry and Infrastructure</b>		
DATE: September, 2015	ANALYST: MY	<b>Figure 5.4.12-5</b>
JOB No: VE52277	QA/QC: MB	PDF FILE: 04-03-024_grizzly_CE_5.4.12-5.pdf
GIS FILE: 04-03-024_grizzly_CE_5.4.12-5.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	

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**Table 5.4.12-19: Key and Moderate Interactions between Grizzly Bear Residual Effects and other Past, Present, and Future Projects/Activities**

Project Phase	Residual Effect	Historical Land Use				Representative Current and Future Land Use and Ecological Effects							Reasonably Foreseeable Projects		Carried Forward into CEA
		Recreational (trails, fishing and lodges)	Forestry (cutblocks and woodlots)	Aboriginal Traditional Use	Hunting and Guide outfitting	Mining (active, current prospecting, quarries)	Recreational (sites, trails, fishing and lodges)	Forestry (cutblocks and woodlots)	Aboriginal Traditional Use	Hunting and Guide outfitting	Agriculture (Present)	Natural Disturbance (fire, MPB and blister rust)	Nulki Hills Wind Project	Agriculture (pending range tenures)	
Construction, Operations, and Closure	Habitat Loss	KI	KI	I	I	KI	KI	KI	I	I	KI	KI	I	KI	Yes
Construction, Operations, and Closure	Mortality Risk	KI	I	I	I	KI	KI	KI	I	I	I	I	I	I	Yes

**Note:** CEA = cumulative effects assessment; I = interaction, KI = key interaction, MPB = mountain pine beetle; NI = no interaction



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Recreation-related activities within the RSA will potentially degrade but not remove grizzly bear habitat through increased human use of these areas. Activities that may affect grizzly bear habitat include hunting, snowmobiling, off-road vehicle use, and camping. There is no hunting in the Project area; however, the area is used by recreationalists who may impact grizzly bears by disturbance, displacement, and defence of life and property kills of grizzly bear.

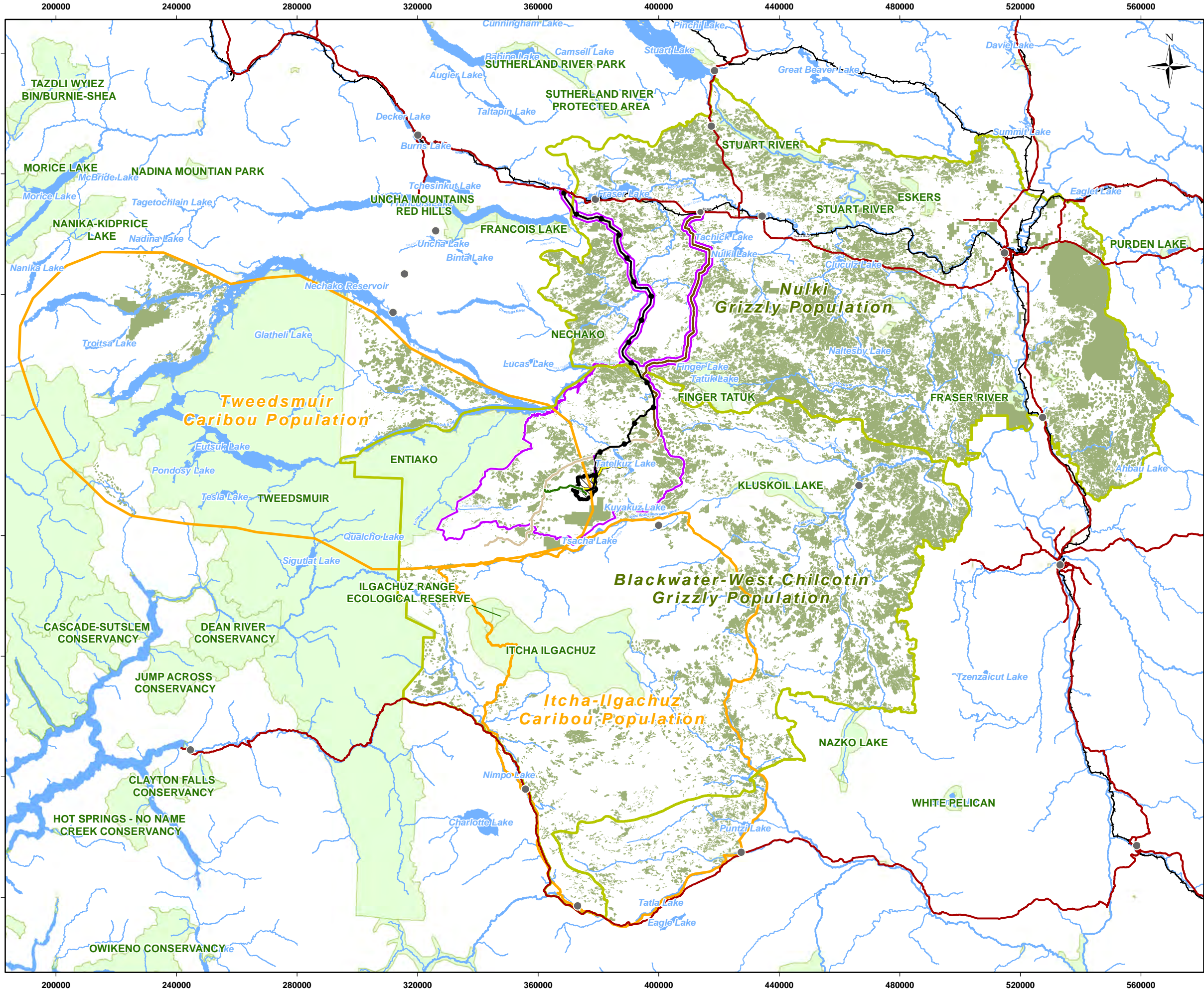
Hunting and guide outfitting may cause disturbance. Due to grizzly bear avoidance of areas of human activity, hunting and guiding may result in the temporary degradation of grizzly bear habitat; however, the duration of these effects is expected to be short-term and negligible.

Forestry-related activities in the GBPU will potentially temporarily alter habitat availability through habitat conversion, noise pollution, erosion and sedimentation, invasive species introduction, and road avoidance (**Figure 5.4.12-6** and **Figure 5.4.12-7**). Forestry activities typically result in the removal of forested habitats. Wetland and riparian habitats are not usually removed; however, removal of forest surrounding these areas may cause degradation of these habitats.

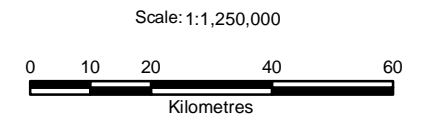
The MPB infestation has affected large areas of mature pine forest in the region, which may result in a loss of grizzly bear habitat if areas are accessed and logged. Some MPB-killed pine forest has been harvested while remaining forests are in various stages of degeneration due to the MPB.

Natural disturbances, such as the MPB infestation, have contributed to the declining health of lodgepole pine forests within the GBPU and increased access for logging. Further degradation of moderate and high value grizzly habitat may occur with a 58% loss of pine forest overlapping moderate to high value late summer / fall habitat and 63% loss of pine forest overlapping moderate to high value summer habitat in the RSA (**Figure 5.4.12-8**). Fire has affected 7.6% (22,230 ha) of the RSA, and is expected to affect grizzly habitat in the future. Fire and MPB both contribute to an increase in forest canopy openings that result in an increase in shrubs and forbs until forests regenerate, creating suitable feeding habitat for grizzly bears. The main concern for grizzly bear habitat is the maintenance of security and thermal cover, typically mature forest, near good feeding areas.

Agriculture is prevalent in the northern portion of the cumulative effects area and considered a major limitation to grizzly bears. Agricultural activities in the RSA will potentially degrade wetland and riparian habitat. Cattle grazing can alter wetland and riparian vegetation cover in emergent habitats, and potentially introduce invasive vegetation species. Trampling can compact wetland soils and cause erosion in riparian areas resulting in sedimentation of surface waters. Mechanical harvesting of wetland vegetation can cause rutting and soil displacement. Farms and other agricultural operations can result in reduced water quality in wetlands. Agricultural activities typically result in the loss of grizzly bear habitat as a result of habitat alteration and increased mortality due to conflicts with cattle ranching.



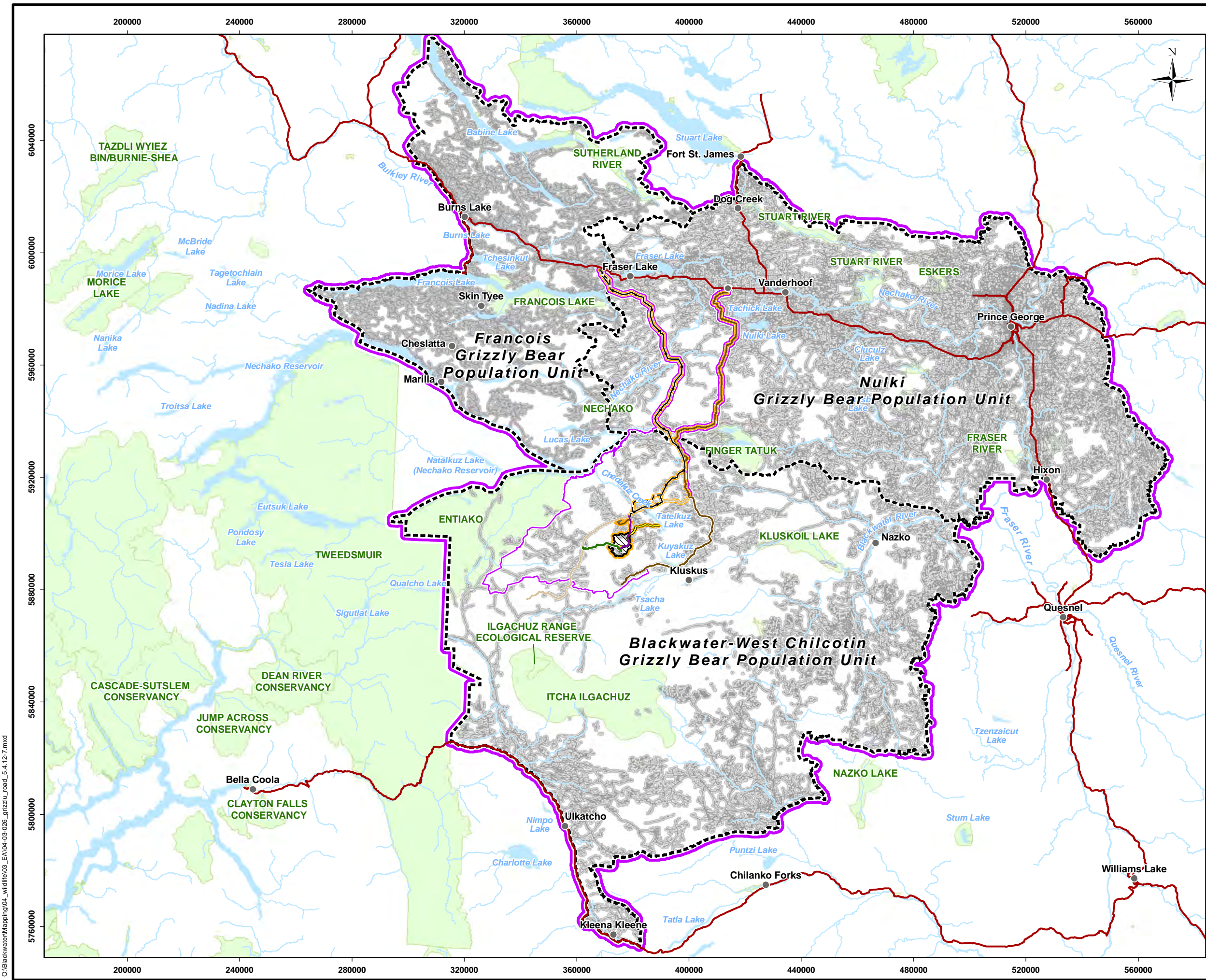
- Legend**
- Populated Place
  - Highway
  - Railway
  - Kluskus FSR
  - Kluskus-Ootsa FSR
  - Exploration Road
  - Proposed Transmission Line
  - ▭ Proposed Mine Site
  - Stream
  - Waterbody
  - Parks and Protected Areas
  - Forest Cutblocks
- Wildlife and Wildlife Habitat**
- ▭ Regional Study Area
  - ▭ Grizzly Bear Populations
  - ▭ Cariboo Herd Populations



**Reference**  
 BC Government GeoBC Data Distribution  
 Grizzly Population and Herd Boundaries are shown only for featured Populations/Herds used in analysis

CLIENT: 		
PROJECT: Blackwater Gold Project		
<b>Cumulative Effects: Caribou and Grizzly Populations Forest Cutblocks</b>		
DATE: September, 2015	ANALYST: MY	<b>Figure 5.4.12-6</b>
JOB No: VE52095	QA/QC: MB	PDF FILE: 04-03-025_grizzly_cutblock_5.4.12-6.pdf
GIS FILE: 04-03-025_grizzly_cutblock_5.4.12-6.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	

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**Legend**

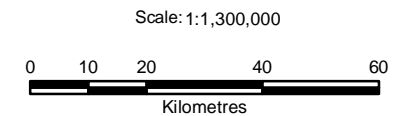
- Populated Place
- Highway
- Existing Transmission Line
- Railway
- Kluskus FSR
- Kluskus Blue FSR
- Kluskus-Ootsa FSR
- Stream
- Waterbody
- Roads - Footprint
- Roads - 500 m Buffer
- Parks and Protected Areas

**Project Components**

- Exploration Road
- Proposed Transmission Line
- Proposed Transmission Line re-route
- Proposed Mine Access Road
- Proposed Airstrip Access Road
- Proposed Airstrip
- Proposed Mine Site

**Grizzly Bear**

- Grizzly Bear Local Study Area
- Grizzly Bear Regional Study Area
- Areas Used for Habitat Loss and Alteration Analysis
- Grizzly Bear Population Units



**Reference**  
 BC Government GeoBC Data Distribution  
 Grizzly Bear Population Units are shown only for featured Populations used in analysis

CLIENT: 		
PROJECT: Blackwater Gold Project		
Cumulative Effects: Grizzly Bear Road Features		
DATE: September, 2015	ANALYST: MY	<b>Figure 5.4.12-7</b>
JOB No: VE52095	QA/QC: MB	PDF FILE: 04-03-026_grizzly_road_5.4.12-7.pdf
GIS FILE: 04-03-026_grizzly_road_5.4.12-7.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	

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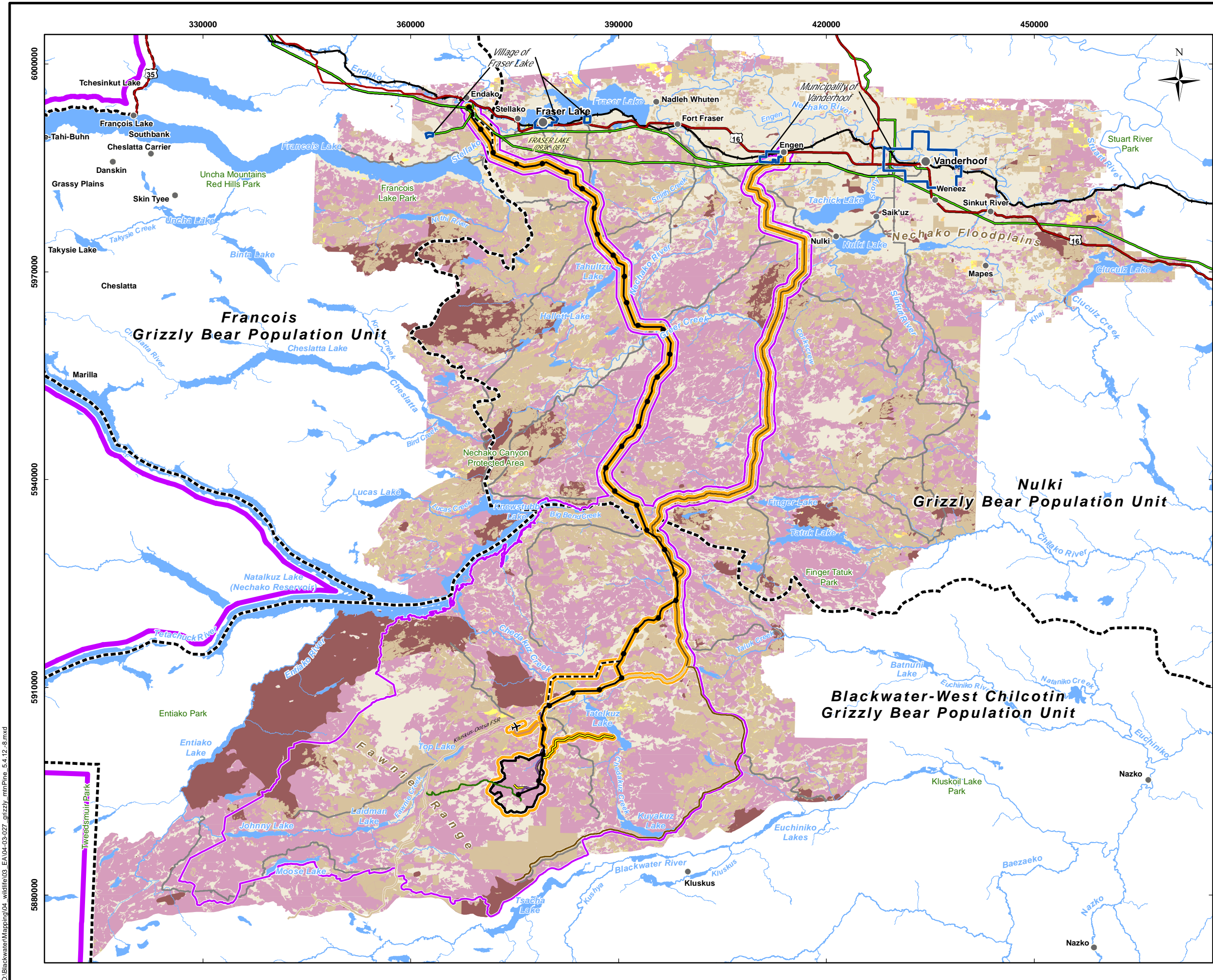
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Mining activities (e.g., current prospecting, exploration) occur southeast and northwest of the mine site and are likely to continue into the future. Mineral prospecting can result in degraded grizzly bear habitat through noise pollution, vegetation removal, and invasive species. Mineral exploration in the area has increased the number of access roads, which have caused increased habitat fragmentation and road access for people. Increased traffic may result in vehicle collisions with grizzly bear.

Some of these activities are quantified for habitat loss and alteration and include mining activities (e.g., quarries and prospecting), forestry activities (e.g., cutblocks and woodlots), and forestry roads. The RSA is a total of 291,714 ha, of which 90,177 ha interacts these other activities and 160,462 ha interacts with natural disturbances (**Table 5.4.12-20**).

The activities included in **Table 5.4.12-20** were overlaid with the habitat rated moderate to high for grizzly bear in spring (**Table 5.4.12-21**), summer (**Table 5.4.12-22**), and late summer/fall (**Table 5.4.12-23**).



**Legend**

- Populated Place
- 16 Highway
- Other FSRs
- Municipal Boundaries

**PROJECT COMPONENTS**

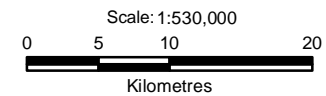
- ✈ Proposed Airstrip
- Exploration Road
- Proposed Transmission Line
- - - Proposed Re-routes (Stellako, Mills Ranch)
- Proposed Fresh Water Pipeline
- Proposed Airstrip Access Road
- Proposed Airstrip Extent
- Proposed Mine Site
- Fire Extent - 1960 to 2014

**MPB Attack Severity (% of Stand Affected)**

- Severe
- Moderate
- Low
- Forest Cutblocks

**Grizzly Bear**

- Grizzly Bear Local Study Area
- Grizzly Bear Regional Study Area
- Areas Used for Habitat Loss and Alteration Analysis
- - - Grizzly Bear Population Units



**Reference**  
 BC Government GeoBC Data Distribution  
 NRCAN Geobase  
 Ministry of Forests, Lands and Natural Resource Operations

CLIENT: **newgold™**

PROJECT: **Blackwater Gold Project**

**Cumulative Effects: Grizzly Bear Forest Fire and Mountain Pine Beetle Attack Severity**

DATE: September, 2015	ANALYST: MY	<b>Figure 5.4.12-8</b>
JOB No: VE52277	QA/QC: MB	PDF FILE: 04-03-027_grizzly_mtnPine_5.4.12-8.pdf
GIS FILE: 04-03-027_grizzly_mtnPine_5.4.12-8.mxd		<b>amec</b>
PROJECTION: UTM Zone 10	DATUM: NAD83	

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**Table 5.4.12-20: Spatial Overlap of Grizzly Bear RSA by Source of Habitat Loss**

Disturbance	Spatial Overlap with RSA	Temporal Overlap with RSA	Amount of Overlap (ha)
Nulki Hills Wind Project	Yes	Yes	2,896
Mining Activity	Yes	Yes	491 <sup>(1)</sup>
Forestry (cutblocks and woodlots) – past, present, and future	Yes	Yes	82,161
Forestry Roads	Yes	Yes	3,497
Fire	Yes	Yes	22,230
Mountain Pine Beetle <sup>(3)</sup>	Yes	Yes	149,472
<b>Total</b>			<b>249,507<sup>(2)</sup></b>

**Note:** (1) Current prospecting = 221 ha and Quarries = 202 ha  
 (2) The total does not equal the sum of the Projects because of overlap  
 (3) Mountain pine beetle infestations of  $\geq 10\%$ ; ha = hectare; RSA = Regional Study Area

**Table 5.4.12-21: Cumulative Effects Spatial Overlap by Grizzly Bear Spring Season Habitat**

Disturbance	Amount of Overlap with Moderate to High Habitat in RSA (ha)	Total Moderate to High Habitat in RSA (ha)	Amount of Overlap with Moderate to High Habitat in RSA (%)
Nulki Hills Wind Project	265	88,316	<1
Mining Activity	149	88,316	<1
Forestry (cutblocks and woodlots) past, present, and future	13,902	88,316	16
Forestry Roads (50 m)	563	88,316	<1
Forestry Roads (100 m)	3,601	88,316	4
Fire	3,110	88,316	4
Mountain Pine Beetle	54,571	88,316	62

**Note:** ha = hectare; m = metre; RSA = Regional Study Area

**Table 5.4.12-22: Cumulative Effects Spatial Overlap by Grizzly Summer Season Habitat**

<b>Disturbance</b>	<b>Amount of Overlap with Moderate to High Habitat in RSA (ha)</b>	<b>Total Moderate to High Habitat in RSA (ha)</b>	<b>Amount of Overlap with Moderate to High Habitat in RSA (%)</b>
Nulki Hills Wind Project	264	125,469	<1
Mining Activity	173	125,469	<1
Forestry (cutblocks and woodlots) past, present, and future	24,492	125,469	20
Forestry Roads (50 m)	1,181	125,469	1
Forestry Roads (100 m)	6,429	125,469	5
Fire	4,927	125,469	4
Mountain Pine Beetle	79,556	125,469	63

**Note:** ha = hectare; m = metre; RSA = Regional Study Area

**Table 5.4.12-23: Cumulative Effects Spatial Overlap by Grizzly Late Summer / Fall Season Habitat**

<b>Disturbance</b>	<b>Amount of Overlap with Moderate to High Habitat in RSA (ha)</b>	<b>Total Moderate to High Habitat in RSA (ha)</b>	<b>Amount of Overlap with Moderate to High Habitat in RSA (%)</b>
Nulki Hills Wind Project	297	136,664	<1
Mining Activity	214	136,664	< 1
Forestry (cutblocks and woodlots) past, present, and future	25,750	136,664	19
Forestry Roads (50 m)	1,241	136,664	1
Forestry Roads (100 m)	6,590	136,664	5
Fire	5,120	136,664	4
Mountain Pine Beetle	79,556	136,664	58

**Note:** ha = hectare; m = metre; RSA = Regional Study Area

Approximately 16% of the moderate to high value spring season habitat within the RSA overlaps with forestry and mining activities in addition to the potential Project effects. There is a 32% overlap in moderate to high suitable summer habitat in the RSA and a 30% overlap of moderate to high suitable late summer / fall habitat within the RSA. MPB overlaps approximately 62% of the moderate to high value spring habitat within the RSA, as well as 63% of the summer habitat and 58% of the late summer / fall habitat and may result in habitat degradation if logged. Wildfires (including 2014) have impacted 88,998 ha (5%) of grizzly bear habitat within the Nulki population unit, 273,444 ha (13%) of grizzly bear habitat within the Blackwater population unit and 35,186 ha (4%) within the Francois population unit, including 1190 ha (5%) of habitat within the LSA and 22,230 ha (8%) of the RSA.

**Table 5.4.12-25** summarizes the residual effect, extent, and duration of the historical, current, and future land use effects.

A WLMP was prepared for the Project to identify mitigation measures and options for all components and phases of the Project. Other management plans (e.g., Vegetation Management and Restoration, Sediment and Erosion Control) also provide other relevant mitigation measures. The Proponent is committed to following mitigation measures provided in the management plans to minimize adverse Project effects. If forestry, agricultural, and mineral prospecting practitioners in the RSA follow this guidance, potential effects of increased mortality, and changes in wildlife movement patterns and population dynamics resulting from these activities can be successfully mitigated through avoidance and minimization.

#### *5.4.12.5.1.1 Cumulative Mortality Risk*

Baseline linear feature densities in the three GBPUs are currently above the threshold of 0.6 km/km<sup>2</sup>. The linear features include all road and transmission lines within the GBPU and were selected based on their accessibility by highway and off-road vehicles. Increases to densities from the Project are less than 0.3% increase; therefore, all three GBPUs will effectively remain at baseline densities.

#### **5.4.12.5.2 Residual Cumulative Effects and Mitigation Measures**

Recreation-related activities within the RSA will potentially degrade but not remove grizzly bear habitat, through increased human use of these areas and decreased bear use. Activities that may affect grizzly bear habitat include hunting, snowmobiling, off-road vehicle use, and camping.

Forestry-related activities in the GBPUs will potentially temporarily alter habitat availability through habitat conversion, noise pollution, erosion and sedimentation, invasive species introduction, and road avoidance (**Figure 5.4.12-6** and **Figure 5.4.12-7**). Forestry activities typically result in the removal of forested habitats. Wetland and riparian habitats are not usually removed; however, removal of forest surrounding these areas may cause degradation of these habitats.

Forestry-related activities in the Project area will degrade and remove high to moderate value grizzly bear habitat for all seasons. Suggested mitigation measures for forestry-related activities include:

- Following forest harvest guidelines, including cutblock and road design;
- Avoiding harvesting in wetland and riparian areas;
- Maintaining drainage pathways and wetland hydrology by installing appropriately sized culverts for stream and wetland crossings;
- Minimizing soil erosion and maximizing reforestation;
- Replanting with native vegetation to expedite succession;
- Implementing invasive plant control measures and monitoring systems; and
- Participation in regional initiatives to restore grizzly bear habitat and reduce mortality.



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The MPB infestation has affected large areas of mature pine forest in the region, which may result in a loss of grizzly bear habitat if areas are accessed and logged. Some MPB-killed pine forest has been harvested while remaining forests are in various stages of degeneration due to the MPB. Mineral exploration in the area has increased the number of access roads, which have caused increased habitat fragmentation and road access for people. There is no hunting season in the Project area; however, the area is used by recreationalists who may impact grizzly bears by disturbance, displacement, and defence of life and property kills of grizzly bear. Agriculture is prevalent in the northern portion of the cumulative effects area and considered a major limitation to grizzly bears. Grizzly bear baseline information was collected in the LSA and portions of the RSA that were altered by these past and present activities. Current land and resource use activities in the Project Area are expected to continue in the future.

Agricultural activities in the RSA will potentially degrade wetland and riparian habitat. Cattle grazing can alter wetland and riparian vegetation cover in emergent habitats, and potentially introduce invasive vegetation species. Trampling can compact wetland soils and cause erosion in riparian areas resulting in sedimentation of surface waters. Mechanical harvesting of wetland vegetation can cause rutting and soil displacement. Farms and other agricultural operations can result in reduced water quality in wetlands. Similar to forestry activities, agricultural activities do not typically result in the loss of grizzly bear habitat but may result in temporary habitat alteration.

Agriculture-related activities in the Project area will degrade and remove high to moderate value grizzly bear habitat for all seasons. Suggested mitigation Best Management Practice measures for agricultural-related activities include:

- Establishing cattle exclusion zones to limit grazing to uplands, thereby minimizing erosion and sedimentation;
- Minimizing pesticide and fertilizer use around aquatic resources and before precipitation events to limit chemical runoff from entering wetlands;
- Establishing protected riparian areas prior to clearing; and
- Controlling invasive species.

Natural disturbances, such as the MPB infestation, have contributed to the declining health of lodgepole pine forests within the GBPUs and increased access for logging. Further degradation of moderate and high value grizzly habitat may occur with a 58% loss of pine forest overlapping moderate to high value late summer / fall habitat and 63% loss of pine forest overlapping moderate to high value summer habitat in the RSA (**Figure 5.4.12-8**). Fire has affected 7.6% (22,230 ha) of the RSA, and is expected to affect grizzly habitat in the future. Fire and MPB both contribute to an increase in forest canopy openings that result in an increase in shrubs and forbs until forests regenerate, creating suitable feeding habitat for grizzly bears. The main concern for grizzly bear habitat is the maintenance of security and thermal cover, typically mature forest, near good feeding areas.

Wildfires have impacted 22,230 ha (8%) of the RSA and 1190 ha (5%) of the LSA of grizzly bear range. MPB has impacted over 60% of suitable grizzly bear habitat in the RSA. The named projects from the project inclusion list in **Table 4.3-11** that represent present and future projects will not

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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 higher suitability low elevation habitat within the Project area (see **Table 5.4.12-24**). The mountain pine beetle has infested large areas of mature pine forest in the region including the LSA and RSA, some of which was harvested while remaining forests are in various stages of regeneration. Logging and mineral exploration in the area increased the number of access roads. Grizzly bear baseline information was collected in the study areas that have been altered by these past and present activities. Wildfire in 2014 has recently altered large portions of the MPB infested areas of the RSA and reduced overall suitable habitat. The future activities in the RSA are expected to include similar activities. With the increase of industrial and agricultural activities, loss of effective habitat may result in less suitable areas for grizzly bear.

**Table 5.4.12-24: Potential Adverse Effects Resulting from Past, Present and Future Projects and Activities**

Project/Land Use	Description/Status	Location relative to Blackwater Project	Timing Relative to Blackwater Project	Potential Adverse Effect to grizzly bear and grizzly bear Habitat
Mining – exploration	Two developed prospects, exploration programs, and numerous mineral claims and tenures; includes several New Gold mining exploration projects, such as Van Tine, Capoose, Fawnie, Emma, and Auro.	In LSA and RSA	Ongoing	Alteration or destruction of terrestrial habitats due to exploration activities.
Forestry – logging	Various historical, active, and pending logging tenures and woodlot licences; private forest lands.	In LSA and RSA	Ongoing	Alteration or destruction of terrestrial habitats and due to forest harvesting and silviculture activities. Increased hunter access.
Agriculture	69 active range tenures within the RSA.	Location relative to Blackwater Project	Timing Relative to Blackwater Project	Alteration to vegetation communities due to livestock activities including introduction of invasive plants. Compaction of soil due to livestock. Problem wildlife kills of bears.
Transportation	Traffic associated with recreation and other activities along the Kluskus FSR. Several airports, airstrips, and aerodromes for fixed wing and seaplanes.	Intersects transmission line LSA	Future	Alteration of suitable habitat. Direct road mortality and indirect displacement from suitable habitat near roads. Increased hunter access and efficiency.

**Table 5.4.12-25: Assessment of Spatial and Temporal Overlap between the Project and Other Projects and Human and Ecological Actions with Ecosystem Composition**

	Interaction	Residual Environmental Effect	Extent	Duration	Rationale	Cumulative Effect (Contribution from Project or Overlap)
Historical Land Use	Forestry Activities	Change in baseline ecosystems	Regional	Chronic	Forestry companies operate within the RSA , habitat change and loss of security cover	Yes
	Recreation	Disturbance	Regional	Chronic	Trails and other access routes in the RSA, incidental mortality of grizzly	Yes
	Trapping and Guiding	Disturbance and mortality	Regional	Chronic	There is a moratorium on hunting in all three of the GBPU within the RSA*	No
	Traditional Land Use	Change in baseline ecosystems	Regional	Chronic	Aboriginal groups are present within the RSA	Yes
Representative Current and Future Land Use	Forestry Activities	Change in baseline ecosystems following forestry	Regional	Chronic	Forestry companies will continue to pursue logging operations including MPB salvage	Yes
	Traditional Land Use	Change in baseline ecosystems	Regional	Chronic	A reclamation plan for revegetation is in place	Yes
	Mining	Change in baseline ecosystems	Regional	Chronic	Mining projects will continue in the RSA	Yes
	Recreation	Disturbance	Regional	Chronic	Recreation will continue in the RSA	Yes
	Mountain Pine Beetle	Change in baseline ecosystems	Regional	Chronic	Infestation reduces the number of healthy trees that provide security and thermal cover (minor proportion of dead trees)	Yes
Fire	Change in baseline ecosystems following forestry	Regional	Chronic	Fire will remove potential security habitat	Yes	

**Note:** GBPU = Grizzly Bear Population Unit; MPB = mountain pine beetle; RSA = Regional Study Area

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Mining-related activities in the Project area will degrade and remove high to moderate value grizzly bear habitat for all seasons. Suggested mitigation measures for mineral exploration and prospecting, which are typical permit conditions under the *Mines Act* (Government of BC, 1996b), will include:

- Pre-planning to avoid wetlands and minimizing stream crossings for access roads;
- Avoiding work during critical breeding and rearing seasons for grizzly bear;
- Limiting the production of excess drilling fluids;
- Avoiding discharges of drilling fluids into wetland and riparian habitat; and
- Given the adherence to these measures, the loss of baseline ecosystem composition is expected to be low after revegetation and recovery of the affected sites to near baseline conditions is predicted to occur post-closure.

Broad regional collaborative measures may include:

- Maximizing reforestation particularly in MPB and wildfire-affected areas;
- Developing and implementing operating guidelines for industrial development and access within grizzly bear habitat;
- Participating in land-use planning to identify areas within grizzly bear habitat where grizzly bear conservation is prioritized;
- Maintaining hunting closures and restrictions in areas that remain open to hunting;
- Reducing speed zones on road sections in important grizzly bear habitat;
- Developing cooperative stewardship agreements, memoranda of understanding, and activities to support the engagement of Aboriginal organizations, recreational stakeholders, and other stakeholders in the monitoring, management, and conservation of grizzly bears;
- Preparing and providing outreach materials relating to grizzly bear and distribution to interest groups, recreational organizations, and the general public, including education on how to avoid disturbing grizzly bears; and
- Supporting ongoing research relating to grizzly bear habitat, ecology, and limiting factors.

### 5.4.12.5.3 Significance of Residual Cumulative Effects

The significance of the Project's contribution to cumulative effects in the RSA was determined at the post-closure phase for this assessment as habitat mitigation and compensation will occur primarily during closure. Logging activities in the RSA have increased grizzly bear mortality and generated loss of habitat; however, application of BMPs (BC MFLNRO, 2014) will reduce the potential for any future increases in grizzly bear mortality and protect key habitats. Although Project effects and the effects of other activities in the RSA may be cumulative, the Project is not expected to affect the viability of this species due to the widespread and common extent of grizzly bears and their habitat within the RSA. Cumulative effects for habitat loss and alternation are anticipated to be Not Significant (minor).

Baseline levels of linear disturbance are currently above the threshold (i.e., >0.6 km/km<sup>2</sup>) identified by BC MFLNRO (2012), on this basis alone the existing effects on grizzly bears within these three GBPUs may be considered Significant (**Table 5.4.12-26**). Due to the minimal increase in mortality associated with forestry, agricultural, and mineral exploration activities, and the implementation of mitigation measures by the Proponent to minimize potential effects of the Project on bear mortality, the overall cumulative effects remain unchanged with the addition of the Project. Because the Project is predicted to increase linear density by no more than 0.1 to 0.3% in the GBPUs, its contribution to cumulative effects is conservatively rated as Not Significant (minor). The level of confidence is moderate due to the implementation of the grizzly bear mitigation measures.

**Table 5.4.12-26: Post-Closure Residual Cumulative Effects Assessment on Grizzly Bear Mortality and Loss of Grizzly Bear Habitat**

Effect Attribute	Current/Future Cumulative Environmental Effect(s) without Project	Current/Future Cumulative Environmental Effect(s) with the Project	Contribution to Cumulative Environmental Effects
<b>Habitat Loss and Alteration</b>			
Context	Medium	Medium	Low
Magnitude	High	High	Low
Geographic Extent	Regional	Regional	Local
Duration	Chronic	Chronic	Chronic
Reversibility	Yes	Yes	Yes
Frequency	Continuous	Continuous	Continuous
Likelihood Determination	High	High	Moderate
Level of Confidence for Likelihood	High	High	High
Significance Determination	Not Significant (minor)	Not Significant (minor)	Not Significant (minor)
Level of Confidence for Significance	Moderate	Moderate	Moderate
<b>Mortality Risk</b>			
Context	Medium	Medium	Low
Magnitude	High	High	Low
Geographic Extent	Regional	Regional	Regional
Duration	Chronic	Chronic	Chronic
Reversibility	Yes	Yes	Yes
Frequency	Continuous	Continuous	Intermittent
Likelihood Determination	High	High	Moderate
Level of Confidence for Likelihood	High	High	High
Significance Determination	Significant	Significant	Not Significant (minor)
Level of Confidence for Significance	Moderate	Moderate	Moderate

#### 5.4.12.6 Limitations

The effects assessment for grizzly bear is based on the information presented within the current Project Description. The Project footprint, mine site facilities, and areas disturbed were assumed

based on the current Project designs. The key limitation of this assessment is the limited surveys to quantify the presence of grizzly bears within the RSA as they occur at low densities and have large home ranges. This limitation was offset with extensive grizzly surveys over three years for the Project (2011 through 2013). Calculation of estimated impacts on habitat in areas outside of the LSA is limited due to lack of detailed habitat data for PEM and areas in the GBPUs. Regional abundance is not known beyond habitat suitability models and professional judgment.

#### **5.4.12.7 Conclusion**

Grizzly bears will be adversely affected through loss and alteration of habitat and increased mortality during the life of the Project, but adverse effects will be largely reversed during post-closure once closure and reclamation measures are implemented.

The potential Project residual effects include habitat loss and degradation of a small amount of moderate to high value habitat for grizzly bear, and increased mortality caused by an increase in road density and vehicle traffic along the Kluskus FSR. These effects will be caused primarily by the construction and widening of roads, the development of the airstrip, freshwater pipeline, and mine site, and the clearing for the transmission line. Mortality risk is considered Not Significant (minor), primarily due to the limited extent and low magnitude of Project activity that overlaps baseline grizzly bear habitats. Mitigation measures to address these effects include monitoring of Kokanee spawning streams, restoration of habitats following closure, and adaptive management, such as signage, speed limits, and temporary avoidance of areas where bears are active to minimize risk of collisions due to the Project. After considering mitigation measures, the temporal loss of grizzly bear habitat remains a residual effect rated as Not Significant (minor), as there will be a 2% to 4% reduction in habitat at post-closure within the mine site.

The cumulative effects of forestry, agriculture, mineral exploration, and the Project on grizzly bear habitat loss and mortality was assessed for the RSA. The contribution of the Project to cumulative effects on grizzly bear habitat loss and mortality is predicted to be Not Significant (minor) within the RSA as a result of mitigation measures such as BMPs (BC MFLNRO, 2014).