Appendix 5.1.3.4A
Wildlife and Wildlife Habitat 2011-2013 Baseline Report

Blackwater Gold Project

Wildlife and Wildlife Habitat
2011-2013 Baseline Report

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Version A

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ACRONYMS

Abbreviations and Units of Measure	Definition
AMEC	AMEC Environment & Infrastructure
Application (the)	Environmental Assessment Certificate / Environmental Impact Statement
ASRDACA	Alberta Sustainable Resource Development and Alberta Conservation Association
Avison	Avison Management Services Ltd.
BAFA	Boreal Altai Fescue Alpine
BAFAun	Boreal Altai Fescue Alpine Undifferentiated subzone
BC	British Columbia
BC CDC	British Columbia Conservation Data Centre
BC EAO	British Columbia Environmental Assessment Office
BC ILMB	British Columbia Integrated Land Management Bureau
BC MFLNRO	British Columbia Ministry of Forests, Lands and Natural Resource Operations
BC MOE	British Columbia Ministry of Environment
BC MWLAP	British Columbia Ministry of Water, Land and Air Protection
BGC	biogeoclimatic
CCLUP	Cariboo-Chilcotin Land Use Plan
CDF	Coastal Douglas Fir
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CPS	call playback survey
CWD	coarse woody debris
dbh	diameter at breast height
DU	designatable unit
Ecofor	Ecofor Natural and Cultural Resource Consultants
ESSF	Engelmann Spruce – Subalpine Fir
ESSFmv1	Engelmann Spruce – Subalpine Fir Moist Very Cold Nechako variant
ESSFmvp	Engelmann Spruce – Subalpine Fir Moist Very Cold Nechako Parkland variant
FSJFD	Fort St. James Forest District
FSR	Forest Service Road
GBPU	grizzly bear population unit
ha	hectare
ICH	Interior Cedar-Hemlock
IUCN	International Union for Conservation of Nature
km	kilometre
km^2	square kilometres
km/h	kilometres per hour
LRMP	Land and Resource Management Plan
LSA	Local Study Area
m	metre
masl	metres above sea level
MPB	mountain pine beetle

Abbreviations and Units of Measure	Definition
MSxv	Montane Spruce Very Dry Very Cold variant
NCFD	North Coast Forest District
NFD	Nadina Forest District
NIFR	North Interior Forest Region
%	percent
PC	point count
PEM	Predictive Ecosystem Mapping
PGFD	Prince George Forest District
PGTSA	Prince George Timber Supply Area
New Gold	New Gold Inc.
Project (the)	proposed Blackwater Gold Project
RISC	Resource Inventory Standards Committee
RMZ	Resource Management Zone
ROW	right-of-way
RSA	Regional Study Area
SARA	*Species at Risk Act*
SBPSmc	Sub-Boreal Pine – Spruce Moist Cold variant
SBS	Sub-Boreal Spruce
SBSdk	Sub-Boreal Spruce dry cool variant
SBSdw3	Sub-Boreal Spruce dry warm Stuart variant
SBSmc2	Sub-Boreal Spruce Moist Cold Babine variant
SBSmc3	Sub-Boreal Spruce Moist Cold Kluskus variant
TEM	Terrestrial Ecosystem Mapping
UNBC	University of Northern British Columbia
US	United States
USFWS	United States Fish and Wildlife Service
UWR	Ungulate Winter Range
VFD	Vanderhoof Forest District
VRI	Vegetation Resource Inventory
WMU	Wildlife Management Unit

EXECUTIVE SUMMARY

The Wildlife and Wildlife Habitat Baseline Report describes the wildlife community present within the study area of the proposed Blackwater Gold Project, as defined in 2013. In 2011, a review of existing studies and field surveys revealed that 21 species of conservation concern could potentially occur within the Project study area and that an ungulate winter range (U-7-012) designated for caribou was located immediately west of the study area.

Field surveys were conducted in 2011, 2012, and 2013 according to modified Resource Inventory Standards Committee (RISC) protocols for forest and grassland songbirds, diurnal and nocturnal raptors, waterbirds, common nighthawks, sharp-tailed grouse, pond-breeding amphibians, ungulates, furbearers, bats, butterflies, and dragonflies. In 2011, overall weather conditions were wet and cool, creating poor conditions for conducting field surveys and likely creating poor breeding conditions for wildlife. Additional surveys conducted in 2012 and 2013 provided a more detailed understanding of the wildlife community present within the study area.

Surveys confirmed the presence of 122 bird species, including 18 raptors, 81 forest and grassland birds, and 23 waterbirds, in the Project study areas, along with 45 butterfly, 40 dragonfly, 32 mammal, 4 amphibian, and 1 reptile species. Eighteen species of conservation concern were confirmed to occur in the study area.

1.0 INTRODUCTION

This baseline report presents the results of wildlife literature and regulatory review and wildlife field studies conducted in 2011, 2012, and 2013 as part of a three-year study program.

This report identifies wildlife study objectives, methods, and wildlife species that occur within the proposed Project study area. The report focuses on the following wildlife communities: amphibians and reptiles, birds, mammals, and invertebrates.

1.1 Setting

The proposed Project is located on the North Central Interior Plateau near the geographical centre of BC (**Figure 1.1-1**). The Project is in the Central Interior Ecoprovince, the Fraser River Plateau Ecoregion, and more specifically the Nazko Upland Ecosection, which includes the following biogeoclimatic (BGC) units found near the Project (**Figure 1.1-2**):

- Sub-Boreal Spruce Dry Cool variant (SBSdk);
- Sub-Boreal Spruce Dry Warm Stuart variant (SBSdw3);
- Sub-Boreal Spruce Moist Cold Babine variant (SBSmc2);
- Sub-Boreal Spruce Moist Cold Kluskus variant (SBSmc3);
- Engelmann spruce – Subalpine Fir Moist Very Cold Nechako variant (ESSFmv1);
- Engelmann Spruce – Subalpine Fir Moist Very Cold Parkland variant (ESSFmvp);
- Boreal Altai Fescue Alpine Undifferentiated subzone (BAFAun);
- Sub-Boreal Pine – Spruce Moist Cold variant (SBPSmc); and
- Montane Spruce Very Dry Very Cold variant (MSxv).

Most BGC units are geographically specific or elevationally dependent.

The Project occurs within the BC Ministry of Forests, Lands and Natural Resource Operations (BC MFLNRO) North Interior Forest Region (NIFR) and the Vanderhoof Forest District (VFD). The forestry designation for the Project is within the Prince George Timber Supply Area (PGTSA), a part of the Northern Central Interior Region, administered by the VFD as well as the Prince George Forest District (PGFD) and the Fort St. James Forest District (FSJFD). Active forestry operations adjacent to the Project are conducted by L&M Lumber who has developed a road system in the Davidson Creek drainage to access low site productivity pine stands.

320000 360000 400000 440000

6000000 5960000 5920000 5880000

François Lake
Cheslatta Carrier
Danskin
Skin Tyee
Takysie Creek
Endako River
Fraser Lake
Fraser Lake
Nadleh Whuten
Nechako River
Fort Fraser
Engen Creek
Engen
16
Vanderhoof
Stuart
Francois Lake
Proposed Transmission Line
(Stellako re-route)
Nithi River
Tachik Lake
Weneez
Sinkut River
Nulki
Nulki Lake
Mapes
Cluculz Creek
Cluculz Lake
Nechako River
Greer Creek
Knapp Creek
Cheslatta Lake
Cheslatta River
Targe Creek
Transmission Line LSA
Kluskus FSR
Sinkut River
Khai
Murray Lake
Kluskus FSR LSA
Ootsa Lake
Big Bend Creek
Lucas Creek
Knewstubb Lake
Finger Lake
Tatuk Lake
Chelaslie
RSA
Proposed Transmission Line
Natalkuz Lake
Proposed Transmission Line
(Mills Ranch re-route)
Chedakuz Creek
Chilako River
Tetachuck Lake
Tetachuck River
Taluk Creek
Euchiniko River
Nataniko Creek
Proposed Mine
Access Road
Proposed Airstrip
Kluskus Blue FSR
Exploration Road
Tatelkuz Lake
Kluskus-Ootsa FSR
Proposed Water
Pipeline Route
Nazko
Kuyakuz Lake
Fawnie Creek
Mine Site LSA
West Road (Blackwater) River
Entiako River
Baezaeko
Kluskus
Tsacha Lake
Kushiya
Nazko

N

Legend

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

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area

Scale: 1:500,000

0 5 10 20

Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold

PROJECT: Blackwater Gold Project

Wildlife and Wildlife Habitat Study Areas

DATE:	ANALYST:	**Figure** 1.1-1
October, 2013	MY	
JOB No: VE52095	QA/QC: MB	PDF FILE: 11-100-011_v6_study_area_study_area.pdf
GIS FILE: 11-100-011_v6_study_area.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	amec

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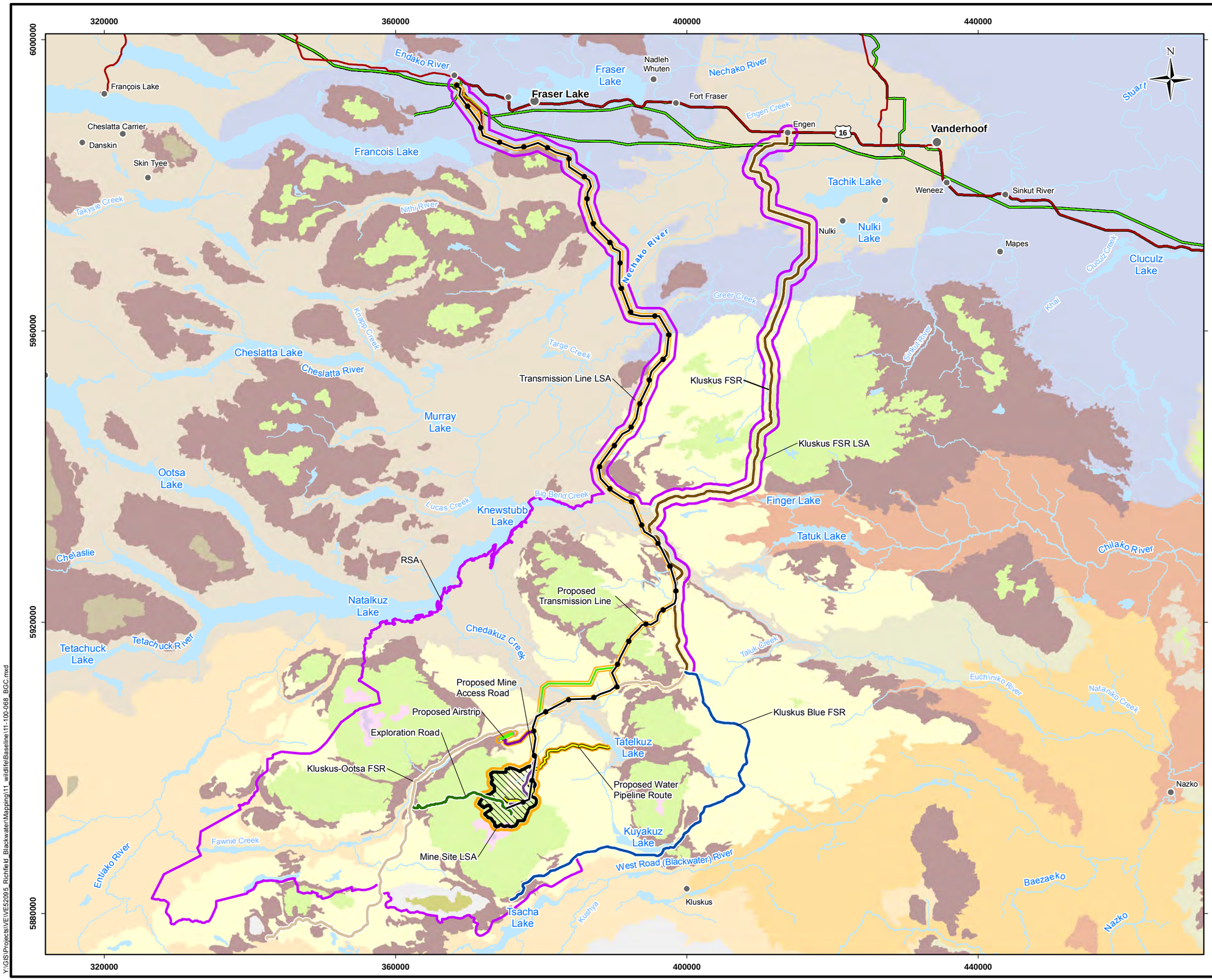

Legend

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

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area

Biogeoclimatic Zone

- BAFAun
- ESSFmc
- ESSFmv 1
- ESSFmvp
- ESSFxv 1
- MSxv
- SBPSdc
- SBPSmc
- SBPSmk
- SBS dk
- SBS dw 2
- SBS dw 3
- SBS mc 2
- SBS mc 3

Scale: 1:500,000

0 5 10 20

Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold

PROJECT: Blackwater Gold Project

Wildlife Habitat Study Areas and Biogeoclimatic Zones

DATE:	ANALYST:	
October, 2013	MY	**Figure** 1.1-2
JOB No: VE52095	QA/QC: MB	PDF FILE: 11-100-068_BGC_study_area.pdf
GIS FILE: 11-100-068_BGC.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	

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1.2 Scope of Work

The wildlife field surveys focused on identifying the presence of wildlife species, the habitats occupied by these species, the relative abundance by wildlife family group, and the use of the area by amphibians and reptiles, birds, mammals, and invertebrates. Tasks included:

- Completion of background literature and information reviews for wildlife species associated with the study area and their potential habitat;
- Site reconnaissance visits to develop the wildlife study areas;
- Investigation and confirmation of the presence of environmentally sensitive wildlife species or areas identified during the background searches;
- Completion of wildlife field habitat mapping as part of the vegetation Terrestrial Ecosystem Mapping (TEM) program (changes in wildlife productivity were inferred based on TEM and suitability modelling);
- Collection of baseline data on wildlife groups, photo-documentation, and other pertinent information;
- Species groups and species-specific surveys for amphibians, birds, mammals, and invertebrates, including:
  - Amphibian (western toad) and reptile surveys;
  - Birds (forest and grassland songbirds, common nighthawk, sharp-tailed grouse, Clark's nutcrackers, raptors, and water birds);
  - Mammals (furbearer, caribou, bear);
  - Invertebrates (butterfly, dragonfly, damselfly); and
- Surveys of important wildlife habitats, including:
  - Wetlands for water birds and waterfowl surveys (breeding and fall migration);
  - Kokanee salmon spawning streams for black and grizzly bears;
  - Bear denning survey for black and grizzly bears;
  - Caribou forage lichen survey;
  - Winter tracking of ungulates and furbearers;
  - Sharp-tailed grouse lek sites;
  - Yellow rail surveys;
  - Common nighthawk;
  - Whitebark pine ecosystem for Clark's nutcrackers (second and third year of surveys).

2.0 METHODS

2.1 Methods for Data Collection and Data Analysis

The wildlife study areas for the mine site and the linear features (transmission line, mine access road, Kluskus forest service road (FSR), water pipeline, and airstrip) each comprise a primary area—the Local Study Area (LSA)—and all are within one larger Regional Study area (RSA).

2.1.1 Local Study Area

The Project component is defined as a site, corridor, or right-of-way (ROW) surrounded by an LSA, which is defined as a buffer area surrounding a zone of potential direct Project-specific effects (**Figure 1.1-1**). Six LSAs are defined for the Project:

- Proposed mine site;
- Proposed transmission line, including two possible reroute options—Mills Ranch reroute and the Stellako reroute;
- Proposed mine access road;
- Kluskus FSR;
- Proposed water pipeline; and,
- Proposed airstrip (**Figure 1.1-1**).

For the remainder of the report all of the LSAs will be refered to without the term “proposed.”

2.1.2 Regional Study Area

The RSA is defined as the spatial area within which cumulative effects are assessed (i.e., extending a distance from the LSA in which both direct and indirect effects are anticipated to occur). Species information, including home range sizes, habitat use, and seasonal movement patterns, are considered when selecting the RSA boundaries. Other ecological factors, such as existing land uses, management units, and heights of land, which can act as a barrier to movement, are also considered when delineating the boundaries. All of the LSAs are encompassed within the defined RSA boundary.

Any references on the general description of the project area in this baseline report include all LSAs and the RSA. Grizzly bears are assessed within the RSA, and the larger provincial grizzly bear population units (GBPUs) and caribou will be assessed within the RSA and the larger herd area as part of the Environmental Assessment.

2.1.3 Literature Reviews

The focus of the literature reviews for wildlife was to determine the habitats present in the study area, applicable regulations and guidelines (**Annex 1**), potential presence of wildlife species in general, and potential presence of rare or threatened wildlife species of conservation concern (referred to as species at risk) in particular as listed by:

- Committee on the Status of Endangered Wildlife in Canada (COSEWIC) (January 2013);
- Schedule 1 of the federal *Species at Risk Act (SARA)* (Government of Canada, 2002); and,
- BC Conservation Status Centre (BC CDC) on its Red and Blue lists (BC CDC, 2013).

The background review included identifying species at risk that were documented as occurring within the study area. Other wildlife species identified from the background searches were recorded to create a comprehensive list of species that may occur within the study area. As part of the literature review process, life history accounts were developed for species at risk and are found in the beginning of the Results section for each species group (i.e., birds, mammals, etc.).

2.1.4 Field Surveys

Field surveys were conducted throughout the LSA and RSA for the mine site, transmission line, mine access road, Kluskus FSR, water pipeline, and airstrip. Field surveys were conducted by AMEC, and additional support was provided by Ecofor Natural and Cultural Resource Consultants (Ecofor) and Avison Management Services Ltd. (Avison) under the direction (oversight, guidance, supervision) of AMEC. Ecofor conducted surveys on raptors, sharp-tailed grouse, invertebrates, caribou lichen, and winter tracking. Bear den surveys and the first year of bear-Kokanee interaction surveys were conducted by Avison. In addition to the data collected during field surveys following established protocols, all incidental detections based on wildlife signs and direct observations of species were included in this baseline report. A summary of the survey effort undertaken within each LSA and the RSA is described in **Table 2.1-1**. The descriptors used in this table document which areas received sufficient survey effort in any given study year, which areas received only partial survey coverage, and which could not be surveyed in a given year.

Table 2.1-1: Summary of Survey Effort Completed for Each LSA and the RSA in 2011, 2012, and 2013 for the Project

Survey Group	Target Group	Survey Type	Mine Site			Transmission Line			Mine Access Road			Kluskus FSR			Pipeline			Airstrip
			2011	2012	2013	2011	2012	2013	2011	2012	2013	2011	2012	2013	2011	2012	2013	2013
Amphibians	Amphibians	Visual Encounter Surveys	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	Amphibians	Roadside Surveys	○	●	◖	○	◖	●	○	◖	●	○	◖	◖	○	●	●	●
Birds	Songbirds	Point Counts	●	●	●	○	◖	●	○	◖	●	○	◖	◖	○	○	◖	●
		Clark's Nutcracker Survey	○	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○
	Waterbirds	Aerial Breeding Waterbird Survey	●	●	○	○	○	●	○	○	◖	○	○	◖	○	○	○	○
	Waterbirds	Migratory Waterbird Survey	○	○	◖	○	○	●	○	○	○	○	○	○	○	○	○	○
		Yellow Rail Survey	○	○	●	○	○	●	○	○	●	○	○	◖	○	○	●	○
	Sharp-tailed Grouse	Point Counts	○	●	●	○	○	●	○	○	●	○	○	◖	○	○	●	●
	Raptors	Call Playback Survey	◖	●	○	○	◖	●	○	◖	●	○	◖	◖	○	◖	●	○
		Roadside Surveys	◖	●	○	○	◖	○	○	◖	○	○	◖	○	○	◖	○	○
		Stand watch	◖	●	◖	○	◖	●	○	○	●	○	○	◖	○	○	○	○
Mammals	Bats	Acoustic Bat Survey	○	●	●	○	○	●	○	◖	●	○	◖	○	○	○	●	●
	Ungulates / Furbearers	Aerial Winter Tracking Survey	●	○	◖	○	○	○	◖	○	○	◖	○	○	○	○	○	○
	Ungulates / Furbearers	Ground Winter Tracking Survey	○	●	○	○	○	○	○	○	○	○	○	○	○	●	○	○
	Bears	Bear Den Survey	○	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○
		Remote Camera Survey	○	●	●	○	○	○	○	○	○	○	○	○	○	○	○	●
	Caribou	Caribou Forage Lichen	○	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○
Invertebrates	Butterflies	Transect	●	●	○	○	◖	●	○	◖	○	○	◖	○	○	◖	○	●
	Dragonflies	Transect	●	●	○	○	◖	●	○	◖	○	○	◖	○	○	◖	○	●

Note: ◖ = partial coverage (not completed for total area in one year); ● = survey coverage complete; ○ = area not covered

2.1.5 Amphibian and Reptile Community

Inventory methods used in 2011, 2012, and 2013 followed protocols for the determination of the presence or non-detection of species, as described in the Inventory Methods for Pond Breeding Amphibians and Painted Turtle (RISC, 1998b). Based on the habitat structure of the study area and the life requisites of amphibians and reptiles, field surveys focused on the identification status (i.e., presence/not-detection) of all potentially occurring species. As defined in RISC, any method that detects a species can be used for determining its presence. However, failure to detect presence does not necessarily confirm absence (RISC, 1998b). All surveys occurred during late mornings and afternoons and avoided heavy rain events, strong winds >3 Beaufort scale), or cold temperatures (<5°C).

Suitable survey areas were chosen based on the potential for amphibian breeding habitat, including the western toad. A review of aerial photographic information as well as on-the-ground reconnaissance was used to determine the potential for breeding habitat. Breeding habitat was defined as any water body with an open canopy and a muddy substrate, including stream riparian areas, wetlands, and vernal pools.

Two types of inventory surveys were employed during the breeding season to determine the presence of breeding amphibians and reptiles within the study areas: visual encounter surveys and road-based surveys of suitable habitats according to RISC protocols (**Figure 2.1-1** to **Figure 2.1-8**. The species, number of individuals, age, sex, and location were noted for each encounter. Amphibians and reptiles incidentally observed during fisheries and other field surveys are included in the results of this report as incidental observations.

Road Surveys

Road surveys were the only survey method utilized in 2012 and 2013. Surveys occurred along the existing road infrastructure, which acted as encounter transects within the LSAs and the RSA. Surveys followed RISC (1998b) methodology and involved identifying and surveying roads within the study area adjacent to potential amphibian breeding habitat and searching for water bodies with adults, eggs, or juveniles (tadpoles) present. The methods were modified because surveys for tadpoles and larvae were conducted in the daytime.

Surveys occurred in June and July after breeding was initiated by the western toad, the last species of amphibian to commence breeding for the area, thus ensuring that all potential amphibians would be present in their breeding habitat.

360000 370000 380000 390000

5910000 5900000 5890000

Proposed Transmission Line

Proposed Transmission Line (Mills Ranch re-route)

Proposed Airstrip

Kluskus-Ootsa FSR

Proposed Airstrip Access Road

Water Pipeline Route

Tatelkuz Lake

Snake Lake

Top Lake

Proposed Mine Access Road

Exploration Road

Kuyakuz Lake

Kluskus-Blue FSR

N

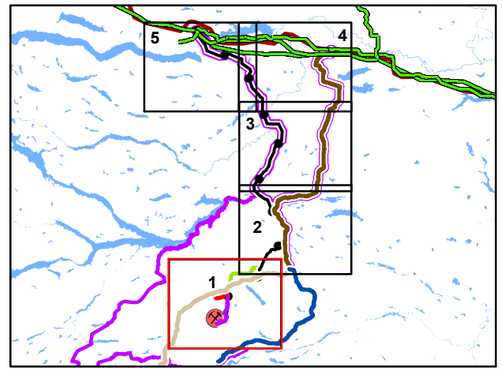
Legend

Amphibian Surveys

- Visual Encounter Survey Locations
- Amphibian Road Survey Transect
- Exploration Road
- Proposed Mine Access Road
- Existing Road
- Proposed Transmission Line
- Water Supply Pipeline
- Proposed Transmission Line (Mills Ranch re-route)
- Kluskus-Blue FSR
- Kluskus-Ootsa FSR
- Proposed Airstrip Access Road
- Stream (>= 2nd Order)
- Waterbody (>= 4 Ha)
- Wetland
- Proposed Airstrip
- Proposed Mine Site

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area



Scale: 1:120,000

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Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold

PROJECT: Blackwater Gold Project

Road-Based and Visual Encounter Amphibian Survey Locations

Map 1 of 5

DATE: October, 2013	ANALYST: AA	**Figure** 2.1-1
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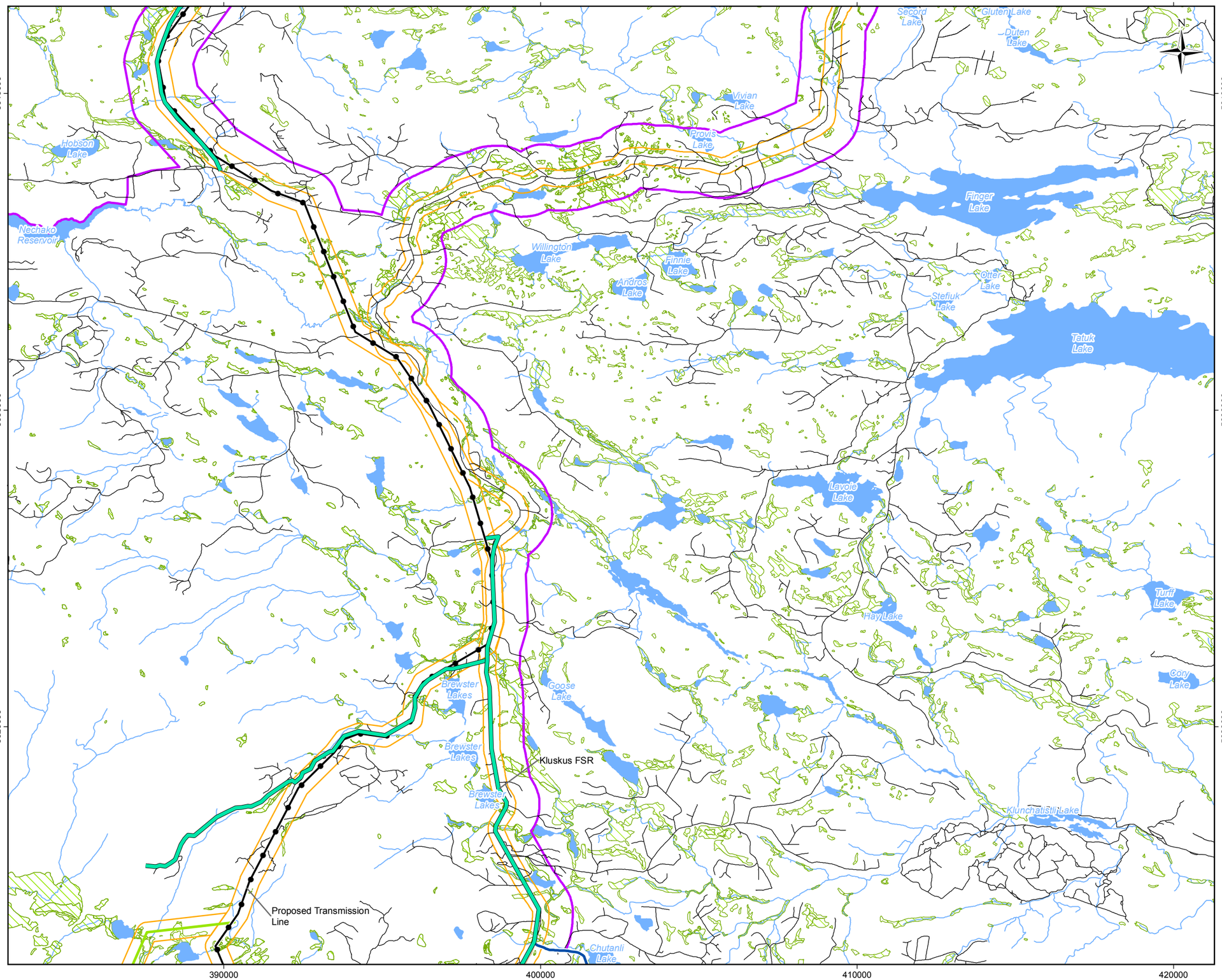

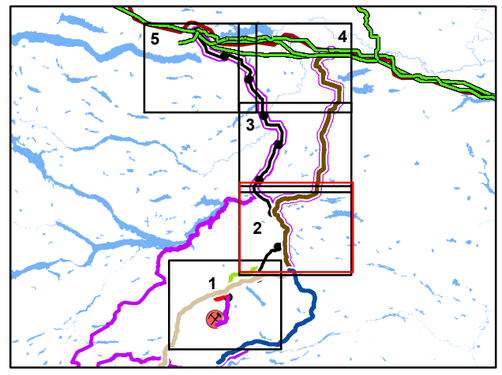

Legend

- Amphibian Road Survey Transect
- Existing Road
- Proposed Transmission Line
- Proposed Transmission Line (Mills Ranch re-route)
- Kluskus-Blue FSR
- Kluskus-Ootsa FSR
- Stream (>= 2nd Order)
- Waterbody (>= 4 Ha)
- Wetland

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area

Scale: 1:120,000

0 1 2 4 6

Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold

PROJECT: Blackwater Gold Project

Road-Based and Visual Encounter Amphibian Survey Locations

Map 2 of 5

DATE: October, 2013	ANALYST: AA	**Figure** 2.1-2
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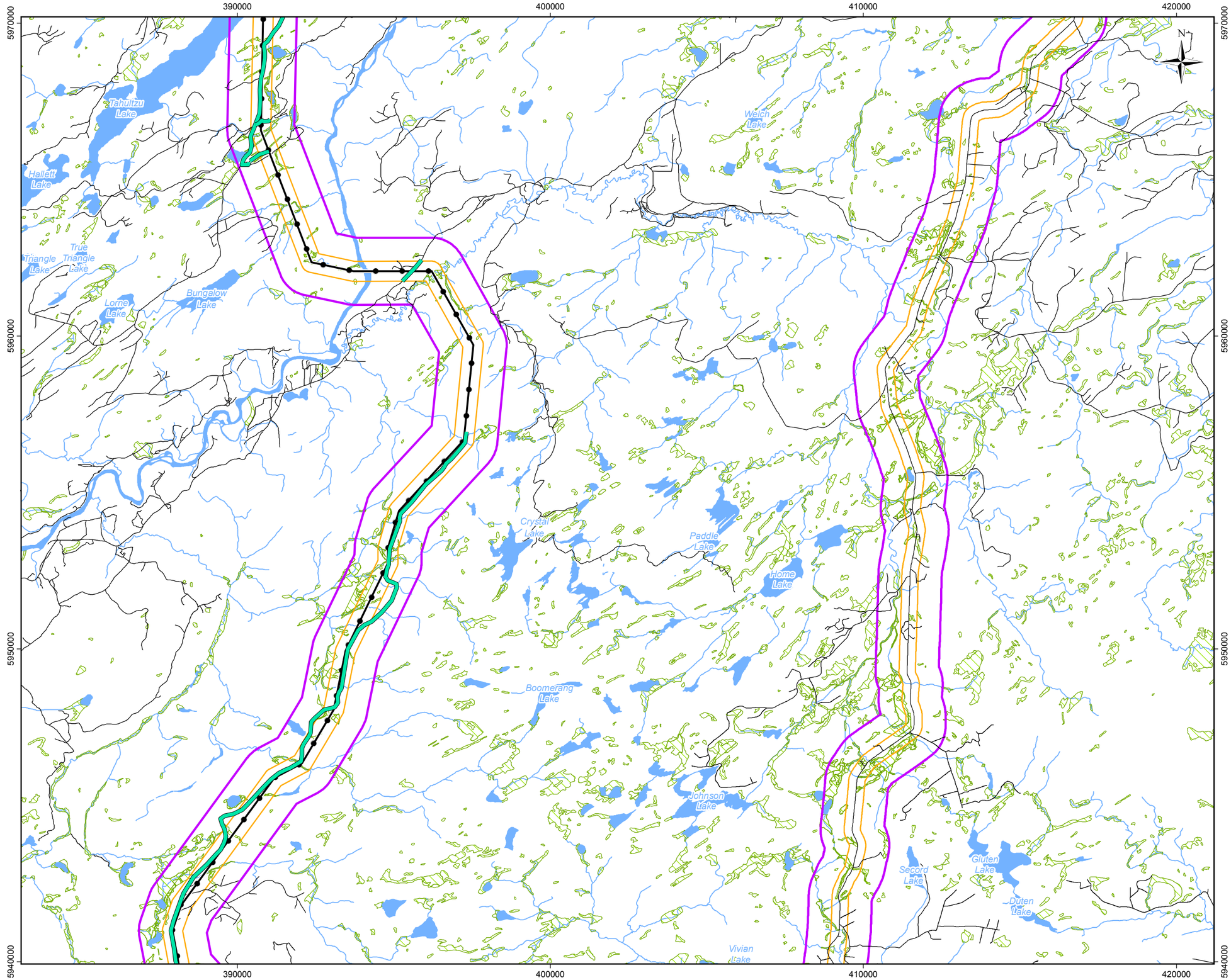
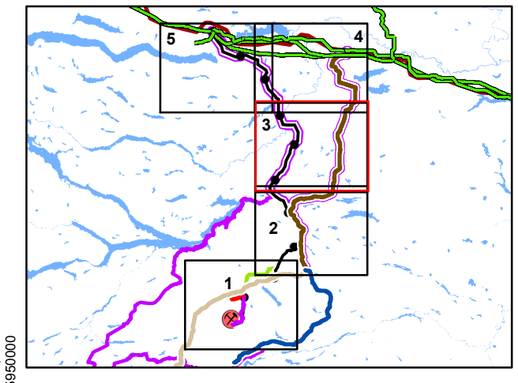


Legend

- Amphibian Road Survey Transect
- Existing Road
- Proposed Transmission Line
- Stream (>= 2nd Order)
- Waterbody (>= 4 Ha)
- Wetland

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area



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Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold

PROJECT: Blackwater Gold Project

Road-Based and Visual Encounter Amphibian Survey Locations

Map 3 of 5

DATE: October, 2013	ANALYST: AA	**Figure** 2.1-3
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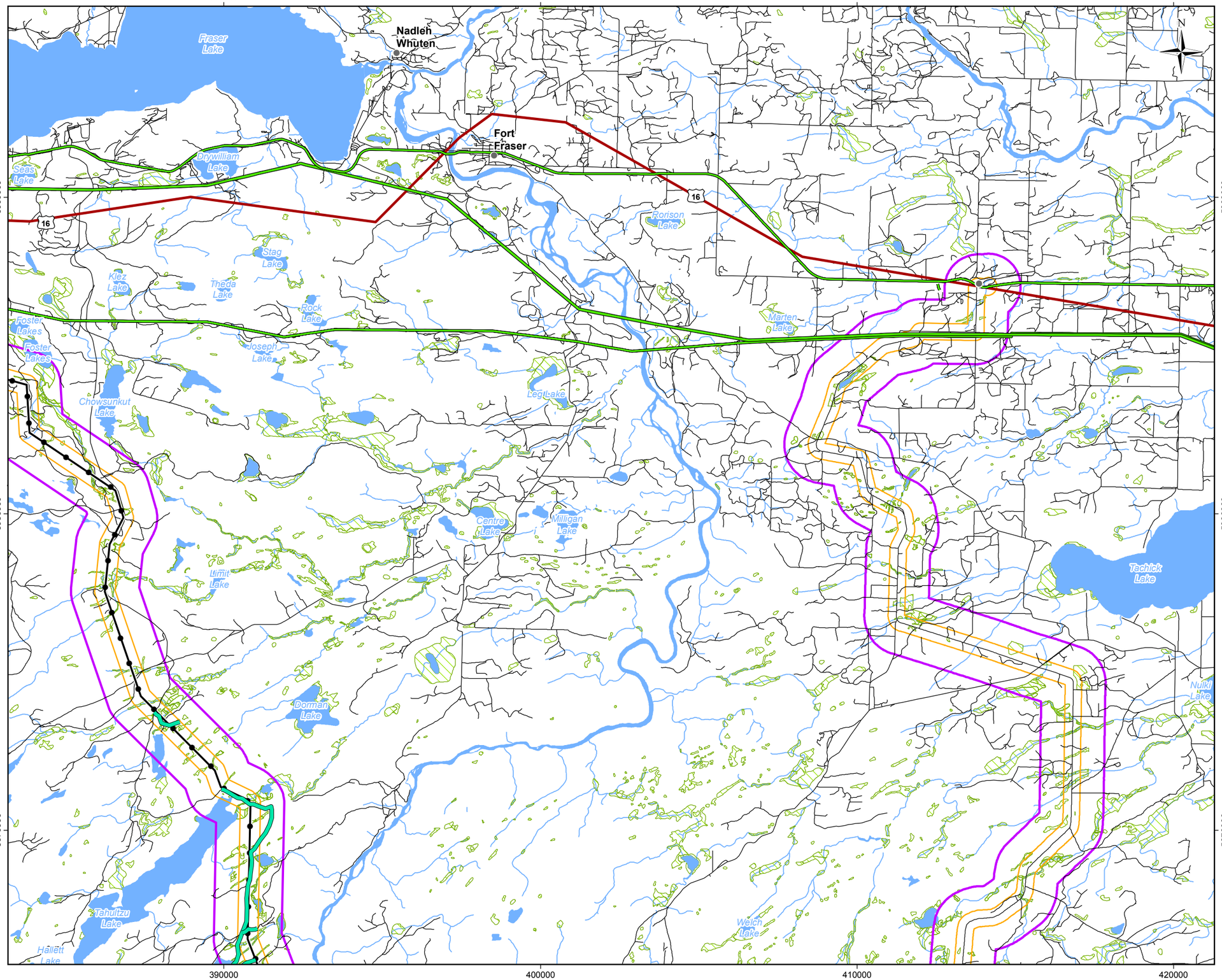

Legend

- Amphibian Road Survey Transect
- Populated Place
- Existing Road
- Proposed Transmission Line
- Existing Transmission Line
- Highway
- Stream (>= 2nd Order)
- Waterbody (>= 4 Ha)
- Wetland

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area

Scale: 1:120,000

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Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold

PROJECT: Blackwater Gold Project

Road-Based and Visual Encounter Amphibian Survey Locations

Map 4 of 5

DATE: October, 2013	ANALYST: AA	**Figure** 2.1-4
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360000 370000 380000 390000

5990000 5980000 5970000

Savory Lake
Endako
Deserter Lake
Stellako
Fraser Lake
Fraser Lake
Casey Lake
Seas Lake
Drywilliam Lake
16
Proposed Transmission Line
(Stellako re-route)
Klez Lake
Theda Lake
Foster Lakes
Foster Lakes
Joseph Lake
Francois Lake
Chowsunkut Lake
Borel Lake
Anzus Lake
Graham Lake
Limit Lake
Cabin Lake
Laurie Lake
Twentysix Mile Lake
Tahultzu Lake

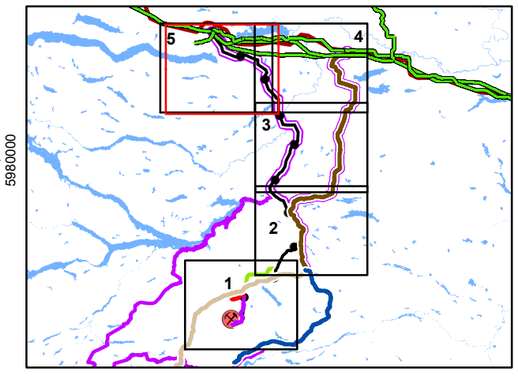
N

Legend

- Amphibian Road Survey Transect
- Existing Road
- Proposed Transmission Line
- Proposed Transmission Line (Stellako re-route)
- Existing Transmission Line
- Highway
- Stream (>= 2nd Order)
- Waterbody (>= 4 Ha)
- Wetland

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area



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Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold

PROJECT: Blackwater Gold Project

Road-Based and Visual Encounter Amphibian Survey Locations
Map 5 of 5

DATE: October, 2013	ANALYST: AA	**Figure** 2.1-5
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Visual Encounter Surveys

Visual encounter survey methodology was the only survey method employed in 2011 and was used as a preliminary approach to surveying and followed RISC methodology (1998b). The survey involved walking while searching the margins of wetlands identified as potentially suitable breeding habitat during June and July. Incidental sightings of any amphibians noted during fisheries surveys were included.

2.1.6 Bird Community

Several types of bird surveys were conducted in the study area, including breeding bird surveys and specific bird species surveys to determine the presence of species of conservation concern and potentially suitable habitat.

2.1.6.1 Forest and Grassland Songbird Survey

To determine the terrestrial bird species presence, abundance, and diversity within the study area, methods followed the Point Count (PC) protocol described in the inventory methods for forest and grassland songbirds (RISC, 1999a), which enables identification of a wide range of bird species along transects (Ralph et al., 1995) (**Figure 2.1-6** to **Figure 2.1-10**).

Surveys were conducted during the breeding season window of 01 June to 15 July (Campbell et al., 2001) and began 0.5 hours before sunrise and ended no later than 4.5 hours after sunrise. The surveys were not conducted when wind speed exceeded approximately 20 kilometres per hour (km/h) (>4 on the Beaufort scale) or during rain or snowstorms. Transects were placed within the different representative BGC zones present in the study area (**Figure 1.1-2**).

During the PC surveys, all birds seen or heard during each five-minute count period that were within 200 metres (m) of the PC station were identified and recorded, and those detected further than 200 m, between stations, or before/after the count period were recorded as incidental sightings. Data collected at each station included weather conditions, species, number of individuals, sex, age, and distance and direction of each detection. In addition, terrestrial birds detected during other surveys were recorded as incidental observations.

Species accumulation curves were calculated to provide information on the number of species recorded for an area relative to the effort needed. Typically, once an asymptote in a graph is approached, most species present within an area are believed to have been identified.

360000 370000 380000 390000

5910000 5900000 5890000

Proposed Transmission Line

Proposed Transmission Line (Mills Ranch re-route)

Proposed Airstrip

Kluskus-Ootsa FSR

Proposed Airstrip Access Road

Proposed Water Pipeline Route

Tatelkuz Lake

Snake lake

Top Lake

Proposed Mine Site Access Road

Exploration Road

Kluskus-Blue FSR

Kuyakuz Lake

N

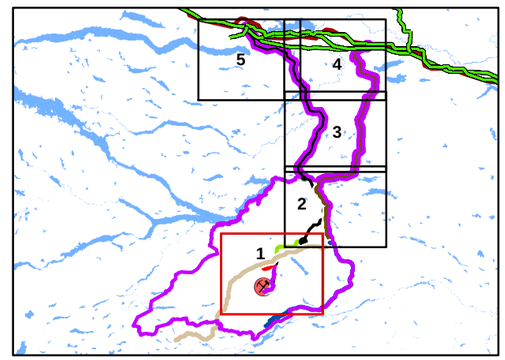
Legend

Breeding Bird Survey Locations

- Breeding Bird Survey Locations
- Common Nighthawk Stations
- Sharp-tailed Grouse Stations
- Clark's Nutcracker Transect
- Exploration Road
- Proposed Mine Site Access Road
- Proposed Transmission Line
- Proposed Water Supply Route
- Proposed Transmission Line (Mills Ranch re-route)
- Proposed Airstrip Access Road
- Kluskus-Blue FSR
- Kluskus-Ootsa FSR
- Existing Road
- Proposed Airstrip
- Streams (>= 2nd Order)
- Waterbody (>= 4 Ha)
- Wetland
- Proposed Mine Site

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area



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0 1 2 4 6

Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold

PROJECT: Blackwater Gold Project

Forest and Grassland Songbird Survey Locations (2011 - 2013), Map 1 of 5

DATE:	ANALYST:	**Figure** 2.1-6
October, 2013	AA	
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390000 400000 410000 420000

5940000 5930000 5920000

Chief Gray Lake
Hobson Lake
Nechako Reservoir
Willington Lake
Vivian Lake
Provis Lake
Finger Lake
Duten Lake
Finnie Lake
Andros Lake
Otter Lake
Stefiuk Lake
Tatuk Lake
Lavoie Lake
Turrif Lake
Hay Lake
Cory Lake
Brewster Lakes
Goose Lake
Klunchatistli Lake
Chutanli Lake

Kluskus FSR

Proposed Transmission Line

N

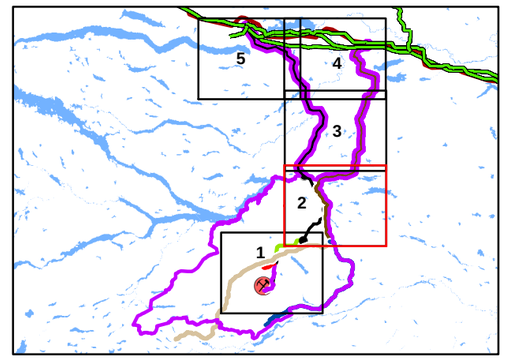
Legend

Breeding Bird Survey Locations

- Breeding Bird Survey Locations
- Sharp-tailed Grouse Stations
- Proposed Transmission Line
- Proposed Transmission Line (Mills Ranch re-route)
- Kluskus FSR
- Kluskus-Blue FSR
- Kluskus-Ootsa FSR
- Existing Road
- Streams (>= 2nd Order)
- Waterbody (>= 4 Ha)
- Wetland

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area



Scale: 1:120,000

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Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold

PROJECT: Blackwater Gold Project

Forest and Grassland Songbird Survey Locations (2011 - 2013), Map 2 of 5

DATE:	ANALYST:	**Figure** 2.1-7
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PROJECTION: UTM Zone 10	DATUM: NAD83	amec

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390000 400000 410000 420000

5960000 5950000 5940000

Proposed Transmission Line

Kluskus FSR

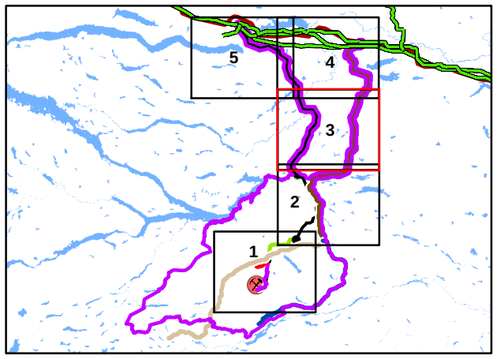
N

Tahultzu Lake
Hallett Lake
True Triangle Lake
Triangle Lake
Lorne Lake
Bungalow Lake
Welch Lake
Crystal Lake
Paddle Lake
Home Lake
Boomerang Lake
Johnson Lake
Secord Lake
Gluten Lake
Duten Lake
Chief Gray Lake
Vivian Lake

Legend

Breeding Bird Survey Locations
- Breeding Bird Survey Locations
- Sharp-tailed Grouse Stations
- Proposed Transmission Line
- Kluskus FSR
- Existing Road
- Streams (>= 2nd Order)
- Waterbody (>= 4 Ha)
- Wetland

Wildlife and Wildlife Habitat
- Local Study Area
- Regional Study Area



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Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold

PROJECT: Blackwater Gold Project

Forest and Grassland Songbird Survey Locations (2011 - 2013), Map 3 of 5

DATE: October, 2013	ANALYST: AA	**Figure** 2.1-8
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390000 400000 410000 420000

5990000 5980000 5970000

Fraser Lake
Nadleh Whuten
Fort Fraser
Drywilliam Lake
Seas Lake
Stag Lake
Klez Lake
Theda Lake
Rock Lake
Foster Lakes
Joseph Lake
Chowsunkut Lake
Legl Lake
Marten Lake
Rorison Lake
Centre Lake
Milligan Lake
Limit Lake
Dorman Lake
Tahultzu Lake
Welch Lake
Tachick Lake
Nulki Lake
16

Proposed Transmission Line

Kluskus FSR

N

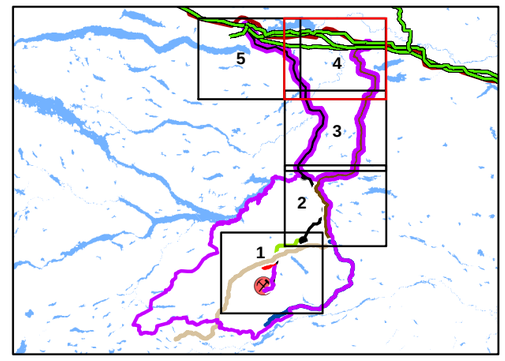
Legend

Breeding Bird Survey Locations

- Breeding Bird Survey Locations
- Sharp-tailed Grouse Stations
- Populated Place
- Proposed Transmission Line
- Existing Transmission Line
- Highway
- Kluskus FSR
- Existing Road
- Streams (>= 2nd Order)
- Waterbody (>= 4 Ha)
- Wetland

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area



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Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold

PROJECT: Blackwater Gold Project

Forest and Grassland Songbird Survey Locations (2011 - 2013), Map 4 of 5

DATE: October, 2013	ANALYST: AA	**Figure** 2.1-9
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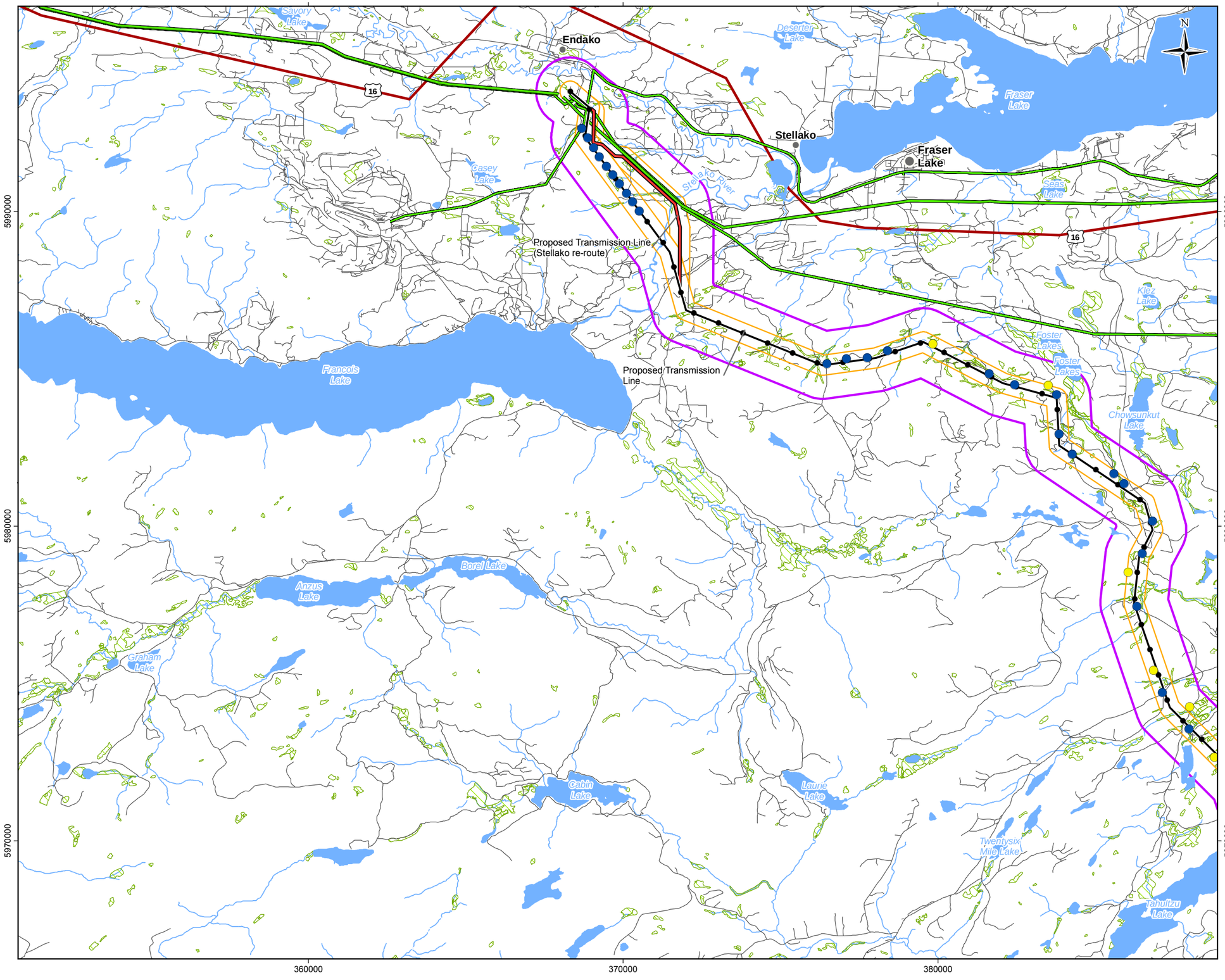

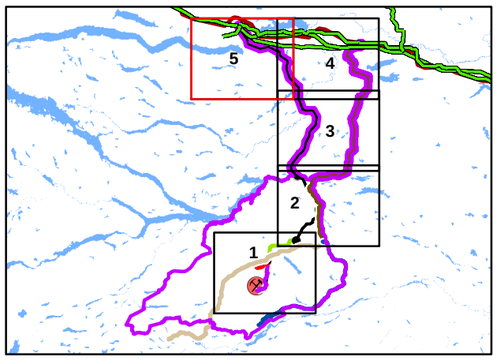

Legend

Breeding Bird Survey Locations

- Breeding Bird Survey Locations
- Sharp-tailed Grouse Stations
- Populated Place
- Proposed Transmission Line
- Proposed Transmission Line (Stellako re-route)
- Existing Transmission Line
- Highway
- Existing Road
- Streams (>= 2nd Order)
- Waterbody (>= 4 Ha)
- Wetland

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area

Scale: 1:120,000

0 1 2 4 6

Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold

PROJECT: Blackwater Gold Project

Forest and Grassland Songbird Survey Locations (2011 - 2013), Map 5 of 5

DATE:	ANALYST:	**Figure** 2.1-10
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PROJECTION: UTM Zone 10	DATUM: NAD83	amec

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2.1.6.2 Common Nighthawk Survey

Common nighthawk (*Chordeiles minor*) surveys to determine presence/non-detection also used PC stations and followed the methodology specified in the RISC standards for inventorying nighthawks and poorwills (RISC, 1998c). The methods are similar to those used for the breeding bird surveys; however, the surveys were timed to coincide with peak nighthawk activity around dusk (**Figure 2.1-6**). Surveys started at sunset and after a one-minute quiet period all birds were then recorded for a five-minute period. Surveys were continued for an hour so as to stay within the crepuscular survey period, which is defined as primarily during twilight and includes dawn and dusk. Common nighthawks were recorded incidentally at the song meter recording stations established for the yellow rail.

2.1.6.3 Clark's Nutcracker Survey

Transect surveys followed the methodology in the draft protocol for monitoring Clark's nutcracker (*Nucifraga columbiana*) populations as described by Tomback (2005) and recommended by BC MFLNRO. Transects were walked each year in late July when nutcrackers had moved to subalpine elevations, and then again during late August or early September when whitebark pine cones were typically ripe (**Figure 2.1-6**). Following this protocol along each transect, nutcracker sightings were counted along the transects, which varied from 1 km to 2 km. Every bird observed was noted, regardless of distance, as well as its location and activity (flying, on tree branch, on cone, taking seeds, etc.). Surveys began one hour after sunrise.

2.1.6.4 Sharp-Tailed Grouse Lek Survey

Inventory studies of sharp-tailed grouse (*Tympanuchus phasianellus columbianus*) are designed to identify the location of individual leks where individual grouse can be counted. Surveys followed the RISC standardized methodologies for upland game birds (RISC, 1997). Leks can be revisited in subsequent years to track population trends (RISC, 1997). To search for leks, PC stations were established in areas that best matched habitat requirements using the RISC standards for sharp-tailed grouse as a guideline (RISC, 1997). Potential habitats are large (500 m width), young cutblocks with regeneration reaching less than full canopy closure. One of the main management considerations for maintaining sharp-tailed grouse habitat is to prevent forest encroachment (Ritcey and Jury, 2004).

Surveys occurred from 0.5 hours before sunrise to two hours after sunrise. At each site, a cool-down period of two minutes was followed by the recommended three minutes of listening time for a total of five minutes at each survey site. If grouse calls were detected, a search on foot would follow to locate the potential lek site. Although sharp-tailed grouse surveys were conducted according to RISC methodology, in 2012 additional surveys were conducted outside of the expected season and timing windows to determine the presence across the landscape near the mine site (**Annex 2**). In areas of continuous potential habitat, an interstation distance of 800 m was used (**Figure 2.1-6**). In 2013, the same amount of

time was spent at the each survey site and surveys were completed within the designated RISC seasonal timing windows; stations were spaced 800 m apart in suitable habitat. In 2013, surveys were expanded from near the mine-site to survey suitable habitat along the transmission line and Kluskus FSR.

2.1.6.5 Raptors

Raptors include both diurnal birds of prey and nocturnal birds of prey. Due to differences in their behaviour, separate surveys were conducted during the day and night for diurnal and nocturnal raptors, respectively, as indicated in the RISC inventory methods for raptors (RISC, 2001) and RISC inventory methods for owl surveys (RISC, 2006). Due to the heavy timber harvest in sections of the LSAs, surveying effort for raptors during the breeding season focused on forested areas that provide breeding habitat for most species present. Incidental observations of raptors and raptor nests were recorded throughout the LSAs and the RSA during all surveys.

Raptors, although active at the same time, vary in detectability due to their behaviours. Some species, such as the red-tailed hawk (*Buteo jamaicensis*), are often seen soaring over open fields or cutblocks while others tend to be cryptic in nature and are more difficult to reliably detect. Inconspicuous raptors were targeted for inventory purposes using call playback survey (CPS) as described below, and other more conspiciuous raptors were detected with more passive methods such as stands watches and incidental sightings.

Call Playback Survey

During the breeding season, birds use calls and songs to establish and defend territories, attract mates, and communicate with young. Some raptors, however, are generally silent even during the breeding season, which decreases their detectability using passive monitoring methods. Playing raptor calls is frequently used as a means to detect raptors during the breeding season (RISC, 2001; RISC, 2006). The nocturnal and diurnal raptor surveys used pre-recorded calls, or call-playbacks, to simulate the presence of an intruder (as identified by a raptor) in an already claimed territory and elicit a defensive response in the raptor species. Survey effort for diurnal raptors was focused on forested habitats due to their potential as breeding habitat. For nocturnal raptors, survey efforts were primarily directed toward mature forests that contained a riparian community (**Figure 2.1-11** to **Figure 2.1-15**).

In 2012, CPS for raptors used an interstation distance of 400 m for the first shift of surveys, which was increased to 800 m in final surveys to allow a greater area to be covered within the restricted time (**Annex 2**). Calls were played on a Johnny Stewart wildlife caller. The caller volume was set to a level that ensured distortion did not affect the calls; the caller speaker was rotated during each species call such that each call was broadcast in many directions.

Recordings of northern saw-whet owl, boreal owl, long-eared owl, barred owl, and great horned owl were used for nocturnal raptor surveys. Merlin, sharp-shinned hawk, Cooper's hawk, northern goshawk, and great horned owl calls were used for the diurnal raptor surveys (RISC, 2001). A total of 15 minutes was spent at each survey station. This period consisted of a two-minute silent period before commencing with a 20-second broadcast of the first raptor species, a 30-second silent period, a second 20-second call broadcast, followed by one-minute of silence before broadcasting the next species. At the end of the survey, a two-minute silent period was used to detect additional raptors. For both groups, species calls were played in order from the smallest to the largest species to minimize the chance of small owls being silenced by the call playback of a larger species that could be a potential predator. Surveys took place during the breeding season for the species involved and avoided inclement weather.

In 2013, CPS for nocturnal raptors used an interstation distance of 800 m and a Foxpro Firestorm wildlife caller to play the calls of the northern saw-whet owl, boreal owl, barred owl, and great horned owl within the LSAs of the transmission line and Kluskus FSR. The calls of the northern saw-whet and boreal owl were played together on the first visit to a station where feasible, due to the possibility of the larger owl species confounding the response of the smaller owls. The calls of the barred owl and great horned owl were played the following night. After arrival at the CPS, the calls of the first owl were played for one minute with a four-minute listening period. This was repeated two more times for a total of a 15-minute sampling period per species per station. The second visit followed the same protocol. For stations with difficult access, all four species were surveyed in one night.

360000
370000
380000
390000
5910000
5900000
5890000

Proposed Transmission Line
Proposed Transmission Line (Mills Ranch re-route)
Proposed Airstrip
Kluskus-Ootsa FSR
Proposed Airstrip Access Road
Proposed Water Pipeline Route
Tatelkuz Lake
Top Lake
Snake Lake
Proposed Mine Site Access Road
Exploration Road
Kuyakuz Lake
Kluskus-Blue FSR

N

Legend

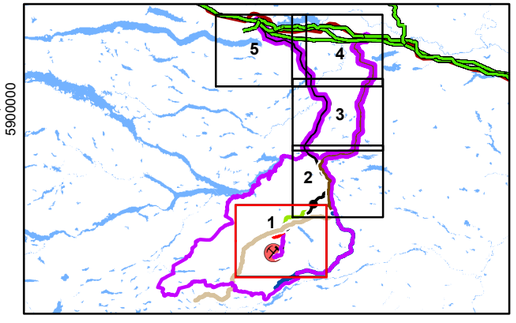
Raptor Survey Locations

- Call Playback Station - Day
- Call Playback Station - Night
- Stand Watch - Day
- Stand Watch - Night
- Raptor Road Survey Transect

- Kluskus-Blue FSR
- Kluskus-Ootsa FSR
- Exploration Road
- Existing Road
- Proposed Mine Site Access Road
- Proposed Transmission Line
- Proposed Water Supply Route
- Proposed Transmission Line (Mills Ranch re-route)
- Proposed Airstrip Access Road
- Proposed Airstrip
- Stream (>= 2nd Order)
- Waterbody (>= 4 Ha)
- Wetland
- Proposed Mine Site

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area



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Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold

PROJECT: Blackwater Gold Project

Raptor Survey Locations (2011-2013) Map 1 of 5

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390000 400000 410000 420000

5940000 5930000 5920000

Chief Gray Lake
Hobson Lake
Nechako Reservoir
Willington Lake
Vivian Lake
Provis Lake
Duten Lake
Finger Lake
Finnie Lake
Andros Lake
Otter Lake
Stefiuk Lake
Tatuk Lake
Lavoie Lake
Turff Lake
Hay Lake
Cory Lake
Brewster Lakes
Goose Lake
Klunchatistli Lake
Chutanli Lake

Kluskus FSR

Proposed Transmission Line

N

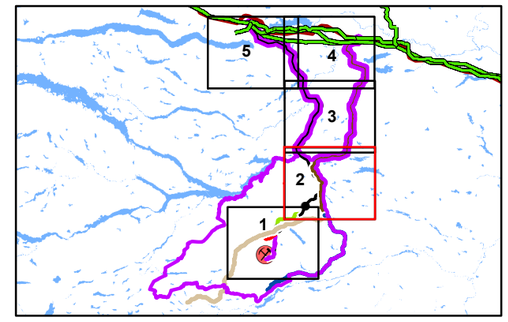
Legend

Raptor Survey Locations

- Call Playback Station - Day
- Call Playback Station - Night
- Stand Watch - Day
- Stand Watch - Night
- Raptor Road Survey Transect
- Kluskus FSR
- Kluskus-Blue FSR
- Kluskus-Ootsa FSR
- Existing Road
- Proposed Transmission Line
- Proposed Transmission Line (Mills Ranch re-route)
- Stream (>= 2nd Order)
- Waterbody (>= 4 Ha)
- Wetland

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area



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Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold

PROJECT: Blackwater Gold Project

Raptor Survey Locations (2011-2013) Map 2 of 5

DATE:	ANALYST:	**Figure** 2.1-12
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PROJECTION: UTM Zone 10	DATUM: NAD83	amec

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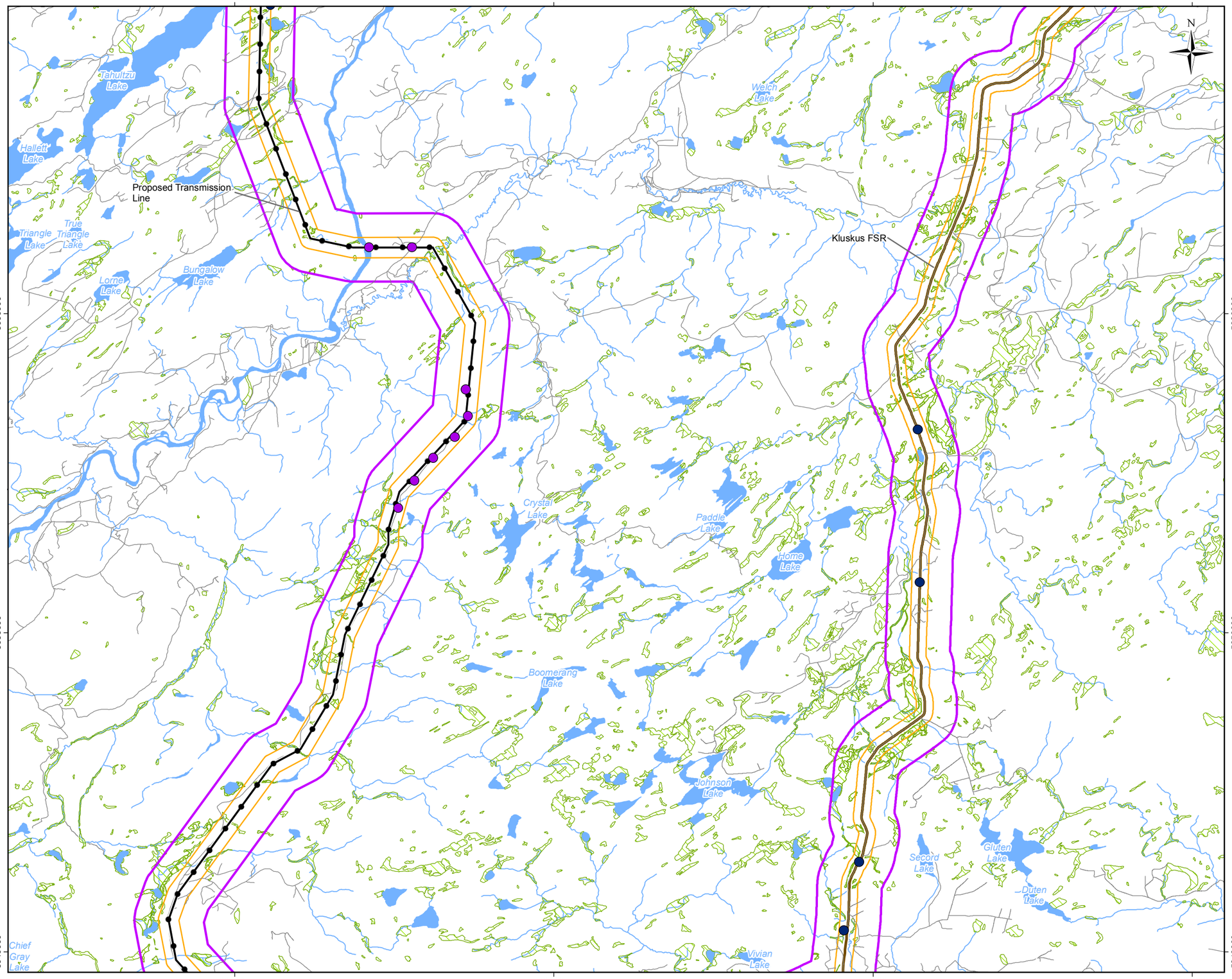


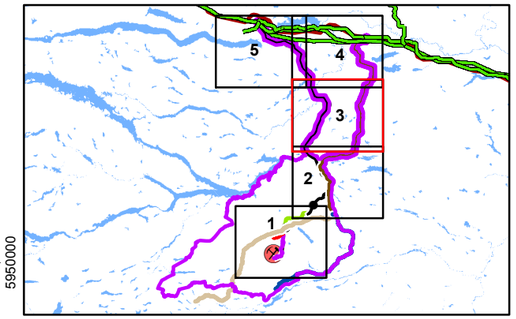
Legend

Raptor Survey Locations

- Call Playback Station - Day
- Call Playback Station - Night
- Stand Watch - Day
- Stand Watch - Night
- Raptor Road Survey Transect
- Kluskus FSR
- Existing Road
- Proposed Transmission Line
- Stream (>= 2nd Order)
- Waterbody (>= 4 Ha)
- Wetland

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area



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Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold

PROJECT: Blackwater Gold Project

Raptor Survey Locations (2011-2013) Map 3 of 5

DATE: October, 2013	ANALYST: KA	**Figure** 2.1-13
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390000 400000 410000 420000

5990000 5980000 5970000

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

N

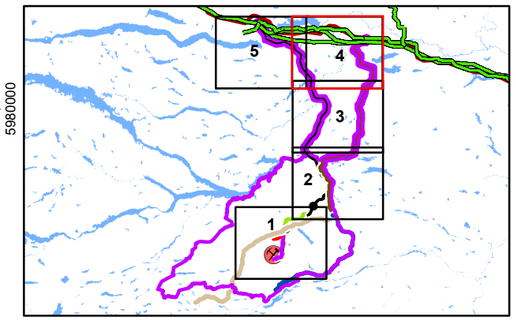
Legend

Raptor Survey Locations

- Call Playback Station - Day
- Call Playback Station - Night
- Stand Watch - Day
- Stand Watch - Night
- Raptor Road Survey Transect
- Populated Place
- Existing Transmission Line
- Highway
- Kluskus FSR
- Existing Road
- Proposed Transmission Line
- Stream (>= 2nd Order)
- Waterbody (>= 4 Ha)
- Wetland

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area



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Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold

PROJECT: Blackwater Gold Project

Raptor Survey Locations (2011-2013) Map 4 of 5

DATE: October, 2013	ANALYST: KA	**Figure** 2.1-14
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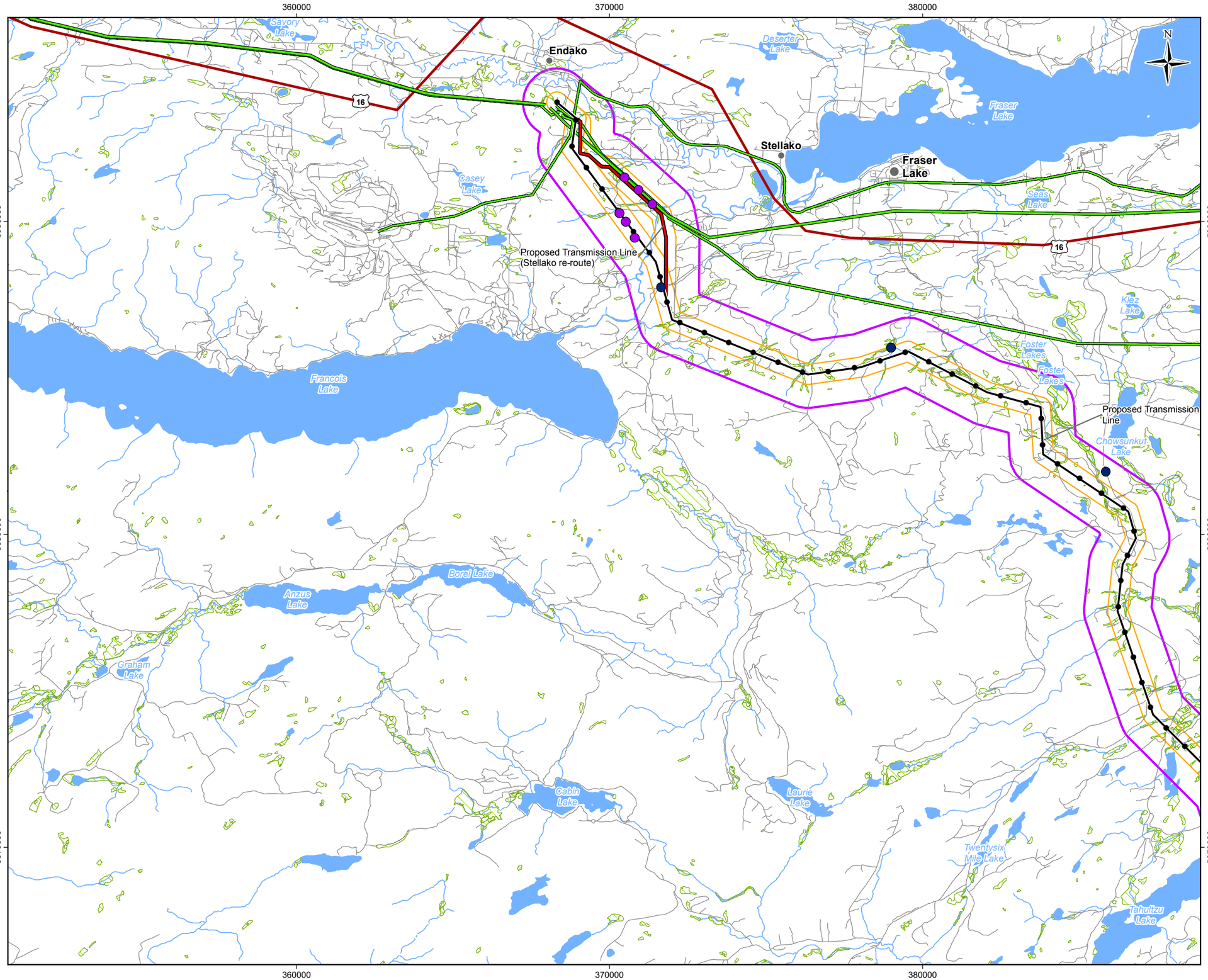

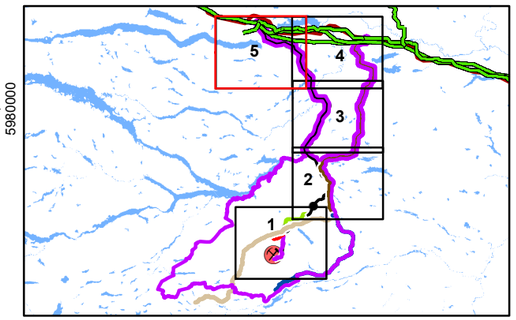

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Kilometres

Reference

BC Government GeoBC Data Distribution

Legend

Raptor Survey Locations

- Call Playback Station - Day
- Call Playback Station - Night
- Stand Watch - Day
- Stand Watch - Night
- Raptor Road Survey Transect
- Populated Place
- Existing Transmission Line
- Highway
- Existing Road
- Proposed Transmission Line
- Proposed Transmission Line (Stellako re-route)
- Stream (>= 2nd Order)
- Waterbody (>= 4 Ha)
- Wetland

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area

CLIENT: newgold

PROJECT: Blackwater Gold Project

Raptor Survey Locations (2011-2013) Map 5 of 5

DATE: October, 2013	ANALYST: KA	**Figure** 2.1-15
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PROJECTION: UTM Zone 10	DATUM: NAD83	amec

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The RISC recommended method for surveying the northern goshawk is call playback during the breeding season. The Foxpro Firestorm wildlife caller was used in 2013 to play the call of the northern goshawk during the daytime in habitat suitable for this raptor. The alarm call was played as the survey occurred during the nestling period (15 May to 01 July) and this call elicits the highest detection rates from northern goshawk adults. Calls were played for 20 seconds with a 30-second listening period three times after an initial two-minute quiet time. After the last call, surveyors waited five minutes before moving onto the next station, which was spaced 400 m away.

For any response, the time, species, sex, age, and type of response (visual/aural) were recorded. In addition, the estimation of initial distance and direction to the bird from the CPS station and direction of departure (if a bird was observed) were recorded as these provide clues to the proximity and direction of a nest.

Stand Watch Surveys

Stand watch surveys were used for both nocturnal and diurnal raptors. Surveys at dusk and dawn were used to survey for the short-eared owl, and surveys during daylight hours were used to monitor all diurnal raptor species (**Figure 2.1-11** to **Figure 2.1-15**). Stand watches took place in open wetlands and fields or areas with views overlooking mature forest. All raptors detected and survey weather conditions were recorded. In 2012, the watches included a 10–15-minute passive count; in 2013, the watch increased in time to 30 minutes, specifically to survey for the short-eared owl.

Roadside Surveys

Roadside surveys were used in conjunction with CPS to survey for diurnal raptors in 2012 (**Annex 2**). As ground was covered by vehicle or foot between the areas surveyed, surveyors were constantly vigilant for conspicuous raptors. Driving speed was kept slow during the survey to facilitate detections.

2.1.6.6 Waterbird Surveys

Wetland birds or waterbirds include groups such as diving and dabbling ducks, loons, geese, swans, shorebirds, and gulls. The term waterfowl specifically refers to species of dabbling and diving ducks, geese, and swans in the family *Anatidae,* while shorebirds refers to sandpipers and plovers. Waterbird is used as an umbrella term to encompass those species that use wetlands for foraging, breeding, or staging during the year.

Yellow Rail Surveys

SM2 song meters were placed in wetlands with suitable habitat for the yellow rail (**Figure 2.1-16**) from 6 June to 27 June, 2013. The meters turned on half an hour before sunset and recorded all territorial calls until half an hour before sunrise.

Breeding Waterbird Surveys

Aerial breeding waterbird surveys were conducted using the aerial transect survey methodology (RISC, 1999c) for surveying broods. Wetlands and other water bodies were identified prior to surveys, and transects were flown in the study area (**Figure 2.1-16** to **Figure 2.1-20**). The surveys were completed with two observers using a Jet Ranger 206 helicopter flying from 100 m to 250 m elevation and at speeds from 5 km/h to 30 km/h. Surveys took place in July of 2011, 2012, and 2013 to increase the likelihood of detecting potential breeding waterbirds in the LSAs and RSA. All waterbirds encountered during these surveys were identified by species; when possible, the age, sex, and number of individuals were recorded. Additional wildlife species observed during these surveys were recorded as incidental observations. All open water areas within the LSAs were surveyed and any large open water bodies within the adjacent portion of the RSA were also included.

Migratory Waterbird Surveys

An aerial survey of migratory waterfowl was completed on 10 September 2013 following the RISC standards for aerial transect survey methodology (RISC, 1999c) for migrating waterfowl. The transect followed the same routing as the earlier aerial waterfowl survey for broods in July 2013 (**Figure 2.1-16** to **Figure 2.1-20**). The surveys were completed with two observers using a Bell Long Ranger 206B helicopter flying from 60 m to 90 m elevation and at speeds from 60 km/h to 80 km/h.

360000 370000 380000 390000

5910000 5900000 5890000

Proposed Transmission Line

Proposed Transmission Line (Mills Ranch re-route)

Proposed Airstrip

Kluskus-Ootsa FSR

Proposed Airstrip Access Road

Proposed Water Pipeline Route

Tatelkuz Lake

Top Lake

Snake Lake

Exploration Road

Proposed Mine Site Access Road

Kuyakuz Lake

Kluskus-Blue FSR

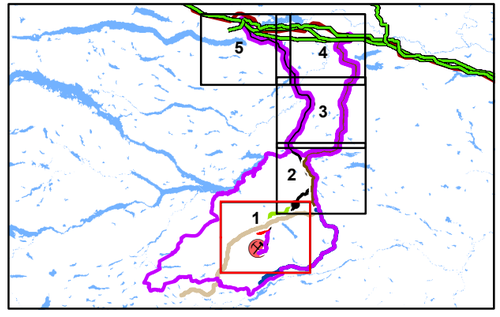
N

Legend

- Waterbird Survey Locations
- Bird Songmeter Station
- Existing Road
- Kluskus-Blue FSR
- Kluskus-Ootsa FSR
- Exploration Road
- Proposed Mine Access Road
- Proposed Water Supply Route
- Proposed Transmission Line
- Proposed Transmission Line (Mills Ranch re-route)
- Proposed Airstrip Access Road
- Proposed Airstrip
- Stream (>= 2nd Order)
- Waterbody
- Wetlands
- Proposed Mine Site

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area



Scale: 1:120,000

0 1 2 4 6

Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold

PROJECT: Blackwater Gold Project

Waterbird Survey Locations

Map 1 of 5

DATE: October, 2013	ANALYST: KA	**Figure** 2.1-16
JOB No: VE52277	QA/QC: MY	PDF FILE: 11-100-039_waterbird_station_v4.pdf
GIS FILE: 11-100-039_waterbird_station_v4.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	amec

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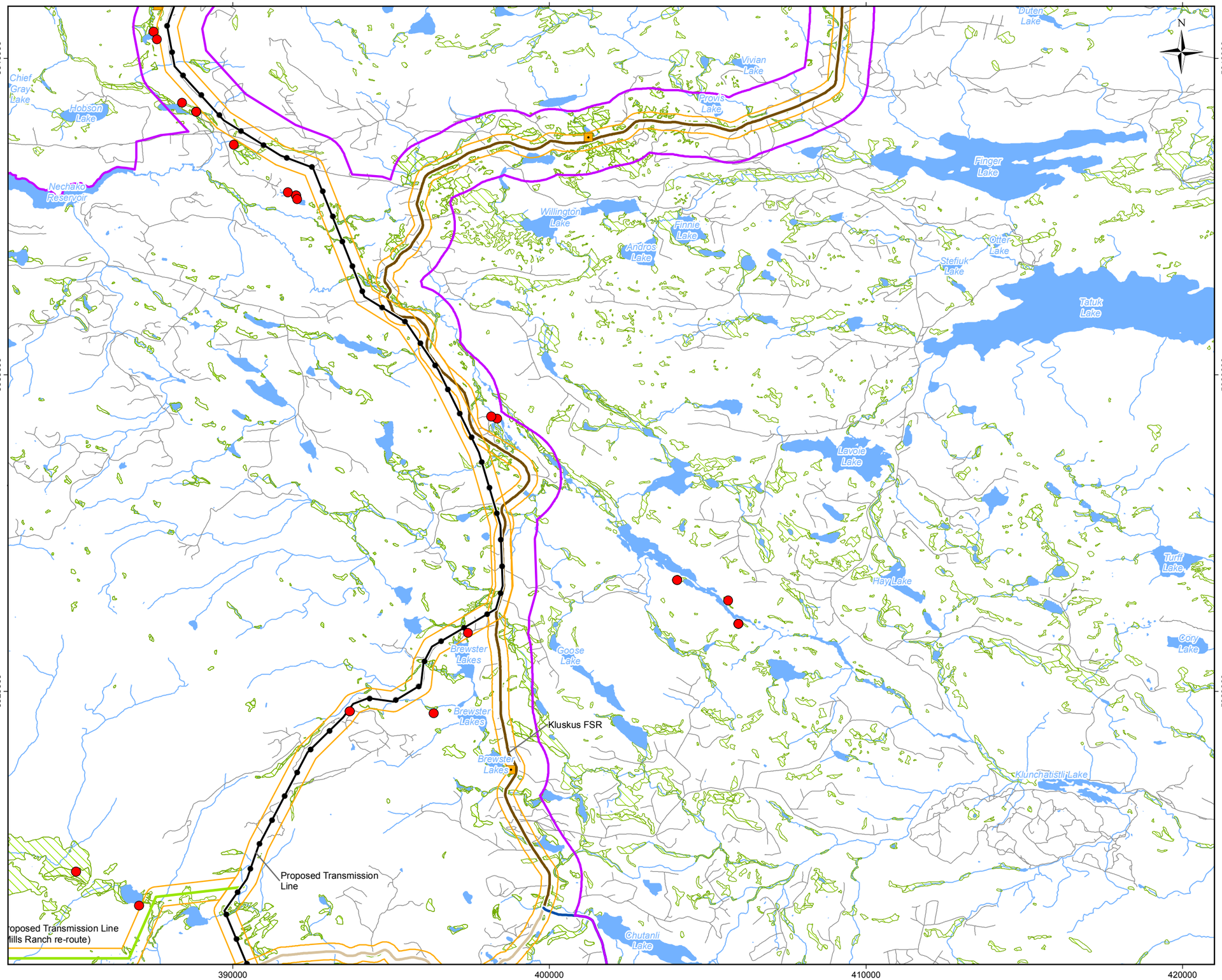
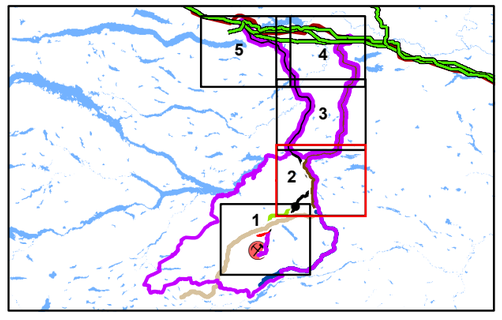


Legend

- Waterbird Survey Locations
- Bird Songmeter Station
- Existing Road
- Kluskus FSR
- Kluskus-Blue FSR
- Kluskus-Ootsa FSR
- Proposed Transmission Line
- Proposed Transmission Line (Mills Ranch re-route)
- Stream (>= 2nd Order)
- Waterbody
- Wetlands

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area



Scale: 1:120,000

0 1 2 4 6

Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold

PROJECT: Blackwater Gold Project

Waterbird Survey Locations

Map 2 of 5

DATE: October, 2013	ANALYST: KA	**Figure** 2.1-17
JOB No: VE52277	QA/QC: MY	PDF FILE: 11-100-039_waterbird_station_v4.pdf
GIS FILE: 11-100-039_waterbird_station_v4.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	amec

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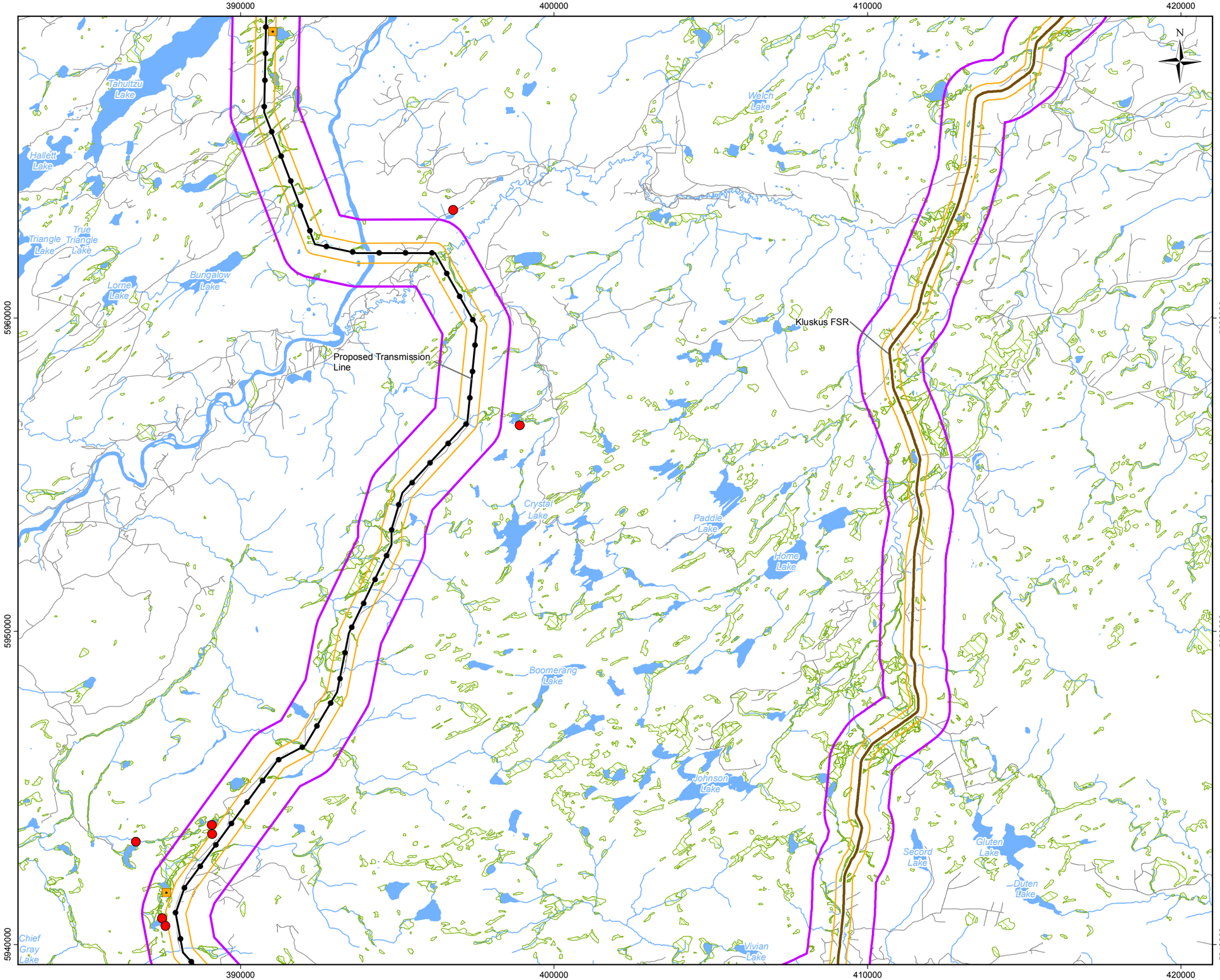
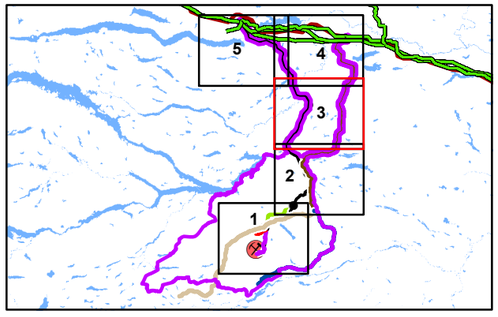


Legend

- Waterbird Survey Locations
- Bird Songmeter Station
- Existing Road
- Kluskus FSR
- Proposed Transmission Line
- Stream (>= 2nd Order)
- Waterbody
- Wetlands

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area



Scale: 1:120,000

0 1 2 4 6

Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold

PROJECT: Blackwater Gold Project

Waterbird Survey Locations

Map 3 of 5

DATE: October, 2013	ANALYST: KA	**Figure** 2.1-18
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GIS FILE: 11-100-039_waterbird_station_v4.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	amec

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390000 400000 410000 420000

5990000 5980000 5970000

Fraser Lake
Nadleh Whuten
Fort Fraser
Drywilliam Lake
Seas Lake
Stag Lake
Klez Lake
Theda Lake
Rock Lake
Foster Lakes
Foster Lakes
Joseph Lake
Rorison Lake
Marten Lake
Legl Lake
Proposed Transmission Line
Chowsunkut Lake
Centre Lake
Milligan Lake
Limit Lake
Dorman Lake
Tahultzu Lake
Weich Lake
Tachick Lake
Kluskus FSR
16

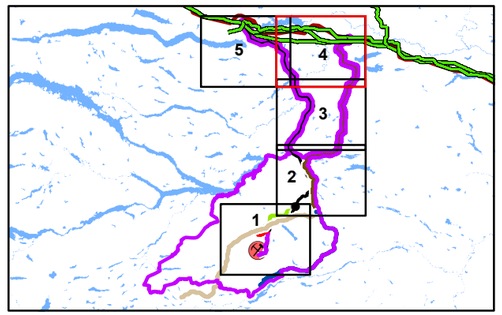
N

Legend

- Waterbird Survey Locations
- Bird Songmeter Station
- Existing Road
- Highway
- Kluskus FSR
- Populated Place
- Existing Transmission Line
- Proposed Transmission Line
- Stream (>= 2nd Order)
- Waterbody
- Wetlands

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area



Scale: 1:120,000

0 1 2 4 6
Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold

PROJECT: Blackwater Gold Project

Waterbird Survey Locations

Map 4 of 5

DATE: October, 2013	ANALYST: KA	**Figure** 2.1-19
JOB No: VE52277	QA/QC: MY	PDF FILE: 11-100-039_waterbird_station_v4.pdf
GIS FILE: 11-100-039_waterbird_station_v4.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	amec

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360000 370000 380000

5990000 5980000 5970000

Savory Lake
Endako
Deserter Lake
Fraser Lake
Stellako
Fraser Lake
Casey Lake
Seas Lake
16
Proposed Transmission Line (Stellako re-route)
Francois Lake
Kiez Lake
Foster Lakes
Foster Lakes
Proposed Transmission Line
Chowsunkut Lake
Anzus Lake
Borel Lake
Graham Lake
Cabin Lake
Laurie Lake
Twentysix Mile Lake
Tahultzu Lake

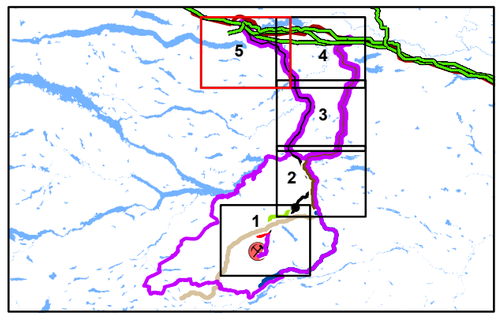
N

Legend

- Waterbird Survey Locations
- Existing Road
- Highway
- Existing Transmission Line
- Proposed Transmission Line
- Proposed Transmission Line (Stellako re-route)
- Stream (>= 2nd Order)
- Waterbody
- Wetlands

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area



Scale: 1:120,000

0 1 2 4 6

Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold		
PROJECT: Blackwater Gold Project		
Waterbird Survey Locations Map 5 of 5		
DATE: October, 2013	ANALYST: KA	**Figure** 2.1-20
JOB No: VE52277	QA/QC: MY	PDF FILE: 11-100-039_waterbird_station_v4.pdf
GIS FILE: 11-100-039_waterbird_station_v4.mxd		amec
PROJECTION: UTM Zone 10	DATUM: NAD83	

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2.1.7 Mammal Community

Several field survey methodologies were used to assess the presence/non-detection of mammal communities. The focus of the winter mammal surveys was to compile an overview assessment of winter ungulate and furbearer use of the study areas, with particular attention focused on the collection of data for the Tweedsmuir-Entiako caribou herd.

Additional surveys took place during the summer and focused on foraging and denning habitat for bears, foraging habitat for caribou, and general wildlife use. Wildlife cameras were set up in areas alongside creeks, logging roads, and game trails during the summer of2012 and 2013 to capture species moving in the area. Small mammal surveys, other than for bats, were not conducted, as no rare species were expected within the study areas.

2.1.7.1 Winter Mammal Tracking Surveys

Aerial Survey

Aerial reconnaissance winter track surveys were conducted in March 2011 to determine the spatial distribution of the local ungulates and furbearer populations within the study area following a RISC encounter transect method as indicated in the inventory methods for medium-sized territorial carnivores (RISC, 1999b; RISC, 2002) (**Annex 3**). The methodology followed reconnaissance or distribution survey methodology; no systematic surveys were undertaken during 2011–13. In 2013, a reconnaissance flight of a larger area flew several lines over the Project within the context of a larger survey area (**Figure 2.1-21).** All significant groupings of ungulates and furbearers encountered, as evidenced by scat, tracks, or direct observations of animals during the overview flight, were recorded. Transects were flown in a Bell Long Ranger helicopter at an average altitude of 110 m above tree level and at a cruising speed of 37 km/h.

Ground Survey

Wildlife track count surveys were established on the ground in March 2012 to determine the presence and distribution of terrestrial furbearer and ungulate species, including the winter presence and distribution of northern caribou (**Figure 2.1-22**, **Annex 4**).

360000
370000
380000
390000
5910000
5900000
5890000

Proposed Transmission Line
Proposed Transmission Line (Mills Ranch re-route)
Proposed Airstrip
Kluskus-Ootsa FSR
Proposed Airstrip Access Road
Proposed Water Pipeline Route
Top Lake
Tatelkuz Lake
Shake lake
Aerial Transect (2013)
Exploration Road
Proposed Mine Site Access Road
Aerial Transect (2011)
Kuyakuz Lake
Kluskus-Blue FSR

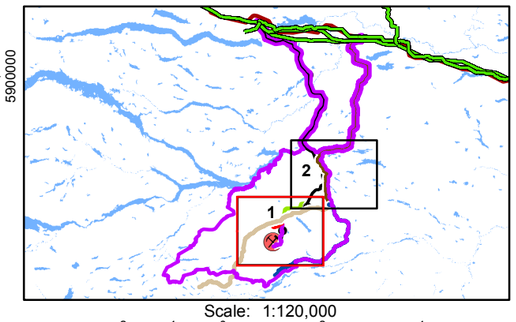
N

Legend

- Aerial Transects (2011)
- Aerial Transects (2013)
- Exploration Road
- Proposed Mine Site Access Road
- Proposed Transmission Line
- Proposed Water Supply Pipeline
- Proposed Transmission Line (Mills Ranch Reroute)
- Kluskus-Blue FSR
- Kluskus-Ootsa FSR
- Existing Road
- Proposed Airstrip Access Road
- Stream (>= 2nd Order)
- Waterbody (>= 4 Ha)
- Wetlands
- Proposed Airstrip
- Proposed Mine Site

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area



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2 1 0 2 4

Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold		
PROJECT: Blackwater Gold Project		
Aerial Ungulate and Furbearer Surveys		
DATE: October, 2013	ANALYST: AA	**Figure** 2.1-21
JOB No: VE52277	QA/QC: MY	PDF FILE: 11-100-052_aerial_survey_v3.pdf
GIS FILE: 11-100-052_aerial_survey_v3.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	amec

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360000 370000 380000 390000

5910000 5900000 5890000

Proposed Transmission Line

Proposed Transmission Line (Mills Ranch re-route)

Proposed Airstrip

Proposed Airstrip Access Road

Kluskus-Ootsa FSR

Top Lake

Tatelkuz Lake

Proposed Water Pipeline Route

Snake lake

Proposed Mine Site Access Road

Exploration Road

Kuyakuz Lake

Kluskus-Blue FSR

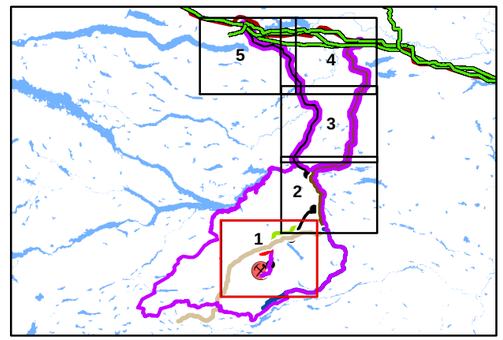
N

Legend

- Wildlife Survey Locations
- Exploration Road
- Proposed Mine Site Access Road
- Proposed Transmission Line
- Proposed Water Supply Route
- Proposed Transmission Line (Mills Ranch re-route)
- Proposed Airstrip Access Road
- Kluskus-Blue FSR
- Kluskus-Ootsa FSR
- Existing Road
- Stream (>= 2nd Order)
- Waterbody (>= 4 Ha)
- Wetland
- Proposed Airstrip
- Proposed Mine Site

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area



Scale: 1:120,000

2 1 0 2 4

Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold

PROJECT: Blackwater Gold Project

Ungulate and Furbearer Winter Ground Transects

Map 1 of 5

DATE:	ANALYST:	**Figure** 2.1-22
October, 2013	AA	
JOB No: VE52277	QA/QC: MY	PDF FILE: 11-100-050_winter_tracking_v2.pdf
GIS FILE: 11-100-050_winter_tracking_v2.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	amec

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Snowmobiles were used where possible; snowshoe transects were employed when motorized access was not possible. The survey area was stratified into four broad forest cover categories: immature coniferous, mature coniferous, mature coniferous Sw (white spruce leading), and mature coniferous Bl (subalpine fir leading). Track surveys were then conducted through each forest type; transects often included more than one forest type, including one transect through the alpine. Surveyors identified mammals visually and by sign (e.g., tracks, scat) along each transect and recorded the geographical location, forest type, and time/date information of each detection.

Wildlife cameras were set up during the summer of 2013 along games trails, roads, clearcut forest interphases, and wetlands through the Project area (**Figure 2.1-23** and **Figure 2.1-24**). The cameras were used to record species presence in these areas during the summer and early fall. Incidental sightings of mammals and their sign were also recorded to determine presence and distribution of species in the Project area.

360000 370000 380000 390000

5910000 5900000 5890000

N

Proposed Transmission Line

Proposed Transmission Line (Mills Ranch Reroute)

WC14a WC5a WC1a WC6a 12 13

Proposed Airstrip

WC11a

WC7a

Proposed Water Pipeline Route

Tatelkuz Lake

Kluskus-Ootsa FSR

WC16

Top Lake

Proposed Airstrip Access Road

WC3a

Shake lake

WC2a 14 10 2 9 3 1 WC4a 4 6 5 WC10a 7 8

WC13a 11

WC9a

WC15a

WC8

Proposed Mine Site Access Road

Exploration Road

Den 1 Den 2 Den 3 WC12

Kuyakuz Lake

Kluskus-Blue FSR

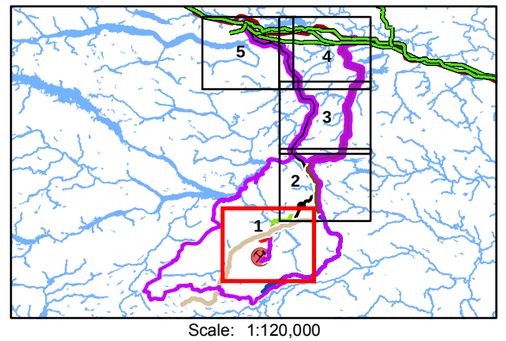
360000 370000 380000 390000

Legend

- Bear Den
- Wildlife Camera
- Bear Camera Survey locations 2012
- Bear Camera Survey locations 2013
- Bear Den Survey Transects (2012)
- Exploration Road
- Proposed Mine Site Access Road
- Proposed Transmission Line
- Proposed Water Supply Pipeline
- Proposed Transmission Line (Mills Ranch re-route)
- Proposed Airstrip Access Road
- Kluskus-Blue FSR
- Kluskus-Ootsa FSR
- Existing Road
- Stream (>= 2nd Order)
- Waterbody (>= 4 Ha)
- Wetland
- Proposed Airstrip
- Proposed Mine Site

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area



Scale: 1:120,000

2 1 0 2 4

Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold

PROJECT: Blackwater Gold Project

Wildlife Camera Locations 2013 and 2013 Transects (Map 1 of 2)

DATE:	ANALYST:	**Figure** 2.1-23
October, 2013	AA	
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GIS FILE: 11-100-044_bear_survey_v2.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	amec

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360000 370000 380000

5990000 5980000 5970000

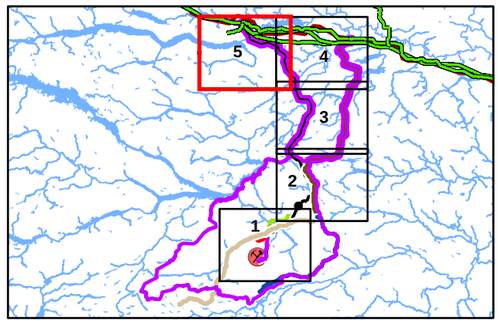
Savory Lake
Deserter Lake
Endako
Fraser Lake
Stellako
Fraser Lake
Casey Lake
Seas Lake
WC21
WC20
Proposed Transmission Line (Stellako re-route)
Klez Lake
Foster Lakes
Foster Lakes
Chowsunkut Lake
Proposed Transmission Line
Francois Lake
Anzus Lake
Borel Lake
Graham Lake
Cabin Lake
Laurie Lake
Twentysix Mile Lake
Tahultzu Lake
16
16
N

Legend

- Wildlife Camera
- Populated Place
- Proposed Transmission Line
- Proposed Transmission Line (Stellako re-route)
- Existing Transmission Line
- Highway
- Existing Road
- Stream (>= 2nd Order)
- Waterbody (>= 4 Ha)
- Wetland

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area



Scale: 1:120,000

2 1 0 2 4

Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold

PROJECT: Blackwater Gold Project

Wildlife Camera Locations 2012 and 2013 Transects (Map 2 of 2)

DATE:	ANALYST:	**Figure** 2.1-24
October, 2013	AA	
JOB No: VE52277	QA/QC: MY	PDF FILE: 11-100-044_bear_survey_v2.pdf
GIS FILE: 11-100-044_bear_survey_v2.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	amec

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2.1.7.2 Bear Surveys

Bear – Kokanee Survey

The BC MFLNRO expressed an interest in assessing how and to what extent Kokanee (*Oncorhynchus nerka*) spawning attracts bears to creeks in the Project area. Motion-activated cameras were installed to monitor bear activity along Kokanee spawning streams in the RSA. Camera stations were established in areas identified during the 2011 Kokanee fisheries surveys, and cameras were placed primarily along stream banks to capture videos of bears and other wildlife.

Sign survey transects along stream banks were used to identify bear and other fish-eating wildlife in areas that were selected based on the numbers of Kokanee and spawning sites (redds) observed in the 2011 fisheries surveys. These surveys examined various parts of Davidson Creek, Creek 661, Chedakuz Creek upstream of Tatelkuz Lake in 2012 (**Annex 5**; **Figure 2.1-23** to **Figure 2.1-24**). All bear scat found during sign surveys of 2012 were collected, labelled, and frozen. Scats were washed and hard parts were dried and identified at a coarse scale (i.e., vegetation, hair, and fish) to provide information on the diet of bears in the Project area.

Bear – Denning Survey

An initial aerial survey was conducted to identify potential denning habitat; these habitats were later ground truthed by walking transects (**Annex 6**; **Figure 2.1-23**).

At potential den sites, notes were taken to describe general landscape (e.g., slope, aspect, tree composition) and soil characteristics (e.g., texture, soil depth). Each site was classified to the site series level of the BGC system, and each den was identified as either an excavated soil den, natural rock cavity den, or tree cavity den.

2.1.7.3 Caribou Lichen Survey

Due to the importance of lichens as forage for the Tweedsmuir-Entiako caribou herd, especially in winter, BC MFLNRO requested a lichen survey. The purpose of the survey was to evaluate the abundance of forage lichens in the Project area and to identify areas of potentially high lichen production.

The forage lichen survey was separated into two survey components: arboreal and terrestrial lichens. In 2012, existing spatial data were used to map high and moderate potential areas of terrestrial lichen using Vegetation Resource Inventory (VRI) and Predictive Ecosystem Mapping (PEM) data (**Annex 7**). Areas identified as high potential were the same in each dataset; however, the datasets for moderate potential differed between VRI and PEM and all areas rated as moderate were selected.

Ground transects surveys in 2013 for terrestrial lichen used the results of the 2012 model to design the survey and established transects in areas identified with the potential for high and moderate lichen abundance. The transects for terrestrial lichen followed the methodology in Lance and Eastland (2000) and were distributed throughout the mine site and LSA and a small area in the RSA (**Figure 2.1-25**).

Transect surveys were established to survey arboreal lichen following the methodology in Stevenson et al. (1998) (**Figure 2.1-25**). Transects for arboreal lichens in 2012 were placed in areas adjacent to ungulate winter ranges that had been identified as being areas less likely to have abundant terrestrial lichens (**Figure 2.1-25** and **Annex 7**). In 2013, the transects were placed throughout the mine site, LSA and RSA. Lichen class and general habitat types were recorded, and photographs of each tree measured were taken.

370000
380000
5910000
5900000
N
Proposed Airstrip
Kluskus-Ootsa FSR
Proposed Airstrip
Access Road
Top Lake
Tatelkuz
Lake
Water Pipeline Route
Snake
lake
Proposed Mine Site
Access Road
Exploration Road

Legend

Survey Type
- Arboreal
- Terrestrial

Lichen Rating
- High
- Moderate
- Low

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

Scale: 1:80,000
2 1 0 2
Kilometres

Reference
BC Government GeoBC Data Distribution

CLIENT: newgold

PROJECT: Blackwater Gold Project

Caribou Forage Lichen Transects
(Map 1 of 1)

DATE: October, 2013	ANALYST: AA	**Figure** 2.1-25
JOB No: VE52277	QA/QC: MY	PDF FILE: 11-100-049_Caribou_Lichen_v4.pdf
GIS FILE: 11-100-049_Caribou_Lichen_v4.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	amec

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2.1.7.4 Bats

Bats are typically surveyed either through capture or through analysis of their sound recordings. Ultrasonic calls that bats use for echolocation can be analyzed for species identification; however, identification is often limited to species groups due to the similarity in bat calls between species.

Bat surveys in 2011 and 2012 used an Anabat II detector to record bat calls, which were sent to a regional bat biologist for identification (**Figure 2.1-26**). Inventory methods adhered to modified RISC standards (RISC, 1998a). An Anabat II detector was placed at various locations for short periods of time (less than a week) within the study area, with a focus on the mine site LSA during summers of 2011 and 2012. The detector had an automatic timer that was set to start recording at sunset and stop at sunrise.

Ultrasonic microphones were attached to SM2 song meters in 2013 and left out at different locations throughout the mine site LSA and the transmission line LSA. Inventory methods adhered to RISC standards (RISC, 1998a) and calls from all years were sent to a regional bat biologist for identification.

The majority of the survey sites were selected based on their potential to provide foraging habitat, typically wetlands or other similarly open habitat that may attract flying insects. A smaller number of survey sites was placed along potential travel corridors such as roads used to find and catch food and to commute between feeding areas. Location, weather conditions, and time of operation were recorded at each survey site. Surveys did not take place during inclement weather as defined in the RISC standards, such as high winds or precipitation.

360000 370000 380000 390000

5910000 5900000 5890000

Proposed Transmission Line

Proposed Transmission Line (Mills Ranch re-route)

Proposed Airstrip

Kluskus-Ootsa FSR

Proposed Airstrip Access Road

Proposed Water Pipeline Route

Top Lake

Tatelkuz Lake

Snake lake

Proposed Mine Site Access Road

Exploration Road

Kuyakuz Lake

Kluskus-Blue FSR

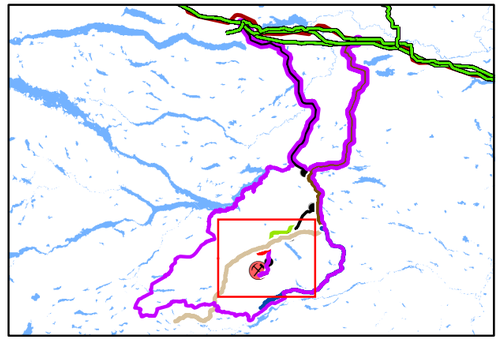
N

Legend

- Bat Detector System
- Existing Road
- Kluskus-Blue FSR
- Kluskus-Ootsa FSR
- Exploration Road
- Proposed Mine Site Access Road
- Proposed Transmission Line
- Proposed Transmission Line (Mills Ranch re-route)
- Proposed Water Supply Route
- Proposed Airstrip Access Road
- Proposed Airstrip
- Stream (>= 2nd Order)
- Waterbody (>= 4 Ha)
- Wetlands
- Proposed Mine Site

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area



Scale: 1:120,000

0 1 2 4 6

Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold

PROJECT: Blackwater Gold Project

Acoustic Bat Survey Locations (2011 - 2013)

DATE:	ANALYST:	**Figure** 2.1-26
October, 2013	AA	
JOB No: VE52277	QA/QC: MY	PDF FILE: 11-100-043_bat_survey_20131016.pdf
GIS FILE: 11-100-043_bat_survey_20131016.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	amec

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2.1.7.5 Trapping and Hunting

Trapping and hunting information is only available from the years 2000 through 2010 within Wildlife Management Units provided additional information on the ungulate, furbearer, and other carnivore populations for the LSAs and within the Project area (**Figure 2.1-27**). Data were collected from the provincial government to determine the species and individuals that have been trapped or hunted within these WMUs, as well as the number of trappers, tags available for ungulate and carnivore hunting, and open and close dates for hunting and trapping seasons.

320000 360000 400000 440000

6000000 5960000 5920000 5880000

6-4 6-1 7-12 7-13 7-11 7-15 5-13 5-12

François Lake
Cheslatta Carrier
Danskin
Skin Tyee
Francois Lake
Takysie Creek
Nithi River
Endako River
Fraser Lake
Nadleh Whuten
Nechako River
Fort Fraser
Engen Creek
Engen
16
Vanderhoof
Stuart
Tachiki Lake
Weneez
Sinkut River
Nulki
Nulki Lake
Mapes
Cluculz Creek
Cluculz Lake
Khal
Greer Creek
Sinkut River
Knapp Creek
Cheslatta Lake
Cheslatta River
Murray Lake
Ootsa Lake
Lucas Creek
Knewstubb Lake
Big Bend Creek
Finger Lake
Tatuk Lake
Chilako River
Chelaslie
Natalkuz Lake
Tetachuck River
Tetachuck Lake
Chedakuz Creek
Taluk Creek
Euchiniko River
Nataniko Creek
Fawnie Creek
Entiako River
Kuyakuz Lake
West Road (Blackwater) River
Baezaeko
Kushya
Tsacha Lake
Kluskus
Nazko

Transmission Line LSA
Kluskus FSR
Kluskus FSR LSA
Proposed Transmission Line
Proposed Mine Access Road
Proposed Airstrip
RSA
Exploration Road
Kluskus-Ootsa FSR
Kluskus-Blue FSR
Tatelkuz Lake
Proposed Water Pipeline Route
Mine Site LSA

N

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

Legend

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

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area

Wildlife Management Unit

- Cariboo
- Omineca
- Skeena

Reference
BC Government GeoBC Data Distribution

CLIENT: newgold

PROJECT: Blackwater Gold Project

Wildlife Management Units Associated with the Study Area

DATE: October, 2013	ANALYST: MY	**Figure** 2.1-27
JOB No: VE52095	QA/QC: MY	PDF FILE: 11-100-060_WMU.pdf
GIS FILE: 11-100-060_WMU.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	amec

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2.1.8 Invertebrate Community

Inventories for Odonata (dragonflies and damselflies) and Lepidoptera (butterflies and skippers) generally followed RISC protocols as indicated in the methodology for the inventory for terrestrial arthropods (RISC, 1998d) The invertebrate survey locations are shown in **Figure 2.1-29** through **Figure 2.1-32**). Areas were visually searched for adult butterflies and dragonflies along transects through selected habitat patches. The habitat patches selected represented both undisturbed and disturbed areas. In the study area, transects were established in non-forested areas (including roadsides, clearcuts, wetlands, and rock outcrops) and forested areas (open upland forest and open forested) where habitat was considered suitable for many species of butterflies and dragonflies (**Annex 8** and **Annex 9**).

Surveying occurred on sunny days during the most productive time of day for butterfly and dragonfly inventories—between 10:00 am and 5:00 pm. During warmer days, the surveys started as early as 8:00 am and ended as late as 8:00 pm. During the inventory days in 2011, the weather was often partly cloudy or even entirely cloudy and cool, and the flight seasons for most butterfly species was delayed by up to a month. The weather was generally sunnier in 2012, and the flight seasons were closer to normal.

Sampling generally targeted species-specific habitat and locations and consisted of traversing the habitat noting and/or capturing all invertebrates. Visual observation, unaided or using binoculars, was used to identify species. Individuals not easily identified were captured for use as representative specimens. Upon capture, individuals were identified as to species, age, and sex where possible; location was also recorded. Specimen collection methods are provided in **Annex 8** and **Annex 9**.

Butterfly identification was contracted in the field by provincial expert Mr. Crispin Guppy, with samples collected for laboratory verification and as a permanent voucher collection. The standard identification guides for butterflies in BC include Layberry et al. (1998) and Guppy and Shepard (2001). Dragonfly identification was conducted by Mr. Sydney Cannings and Mr. Guppy in 2011 and by Mr. Guppy in 2012. The standard identification guides for dragonflies and damselflies in BC are Cannings and Stuart (1977) and Cannings (2008).

360000 370000 380000 390000

5910000 5900000 5890000

Proposed Transmission Line

Proposed Transmission Line (Mills Ranch re-route)

Proposed Airstrip

Kluskus-Ootsa FSR

Proposed Airstrip Access Road

Water Pipeline Route

Tatelkuz Lake

Top Lake

Snake Lake

Proposed Mine Site Access Road

Exploration Road

Kuyakuz Lake

Kluskus-Blue FSR

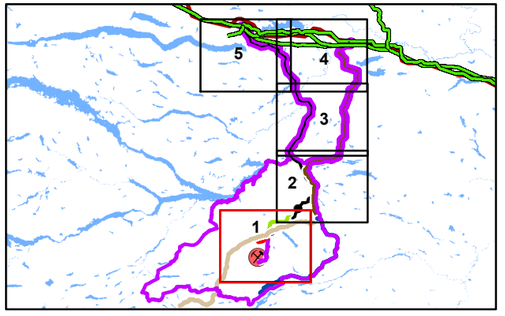
N

Legend

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

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area



Scale: 1:120,000

0 1 2 4 6

Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold

PROJECT: Blackwater Gold Project

Invertebrate Survey Locations

Map 1 of 5

DATE: October, 2013	ANALYST: KA	**Figure** 2.1-28
JOB No: VE52277	QA/QC: MY	PDF FILE: 11-100-053_Invertebrate_Survey_v2.pdf
GIS FILE: 11-100-053_Invertebrate_Survey_v2.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	amec

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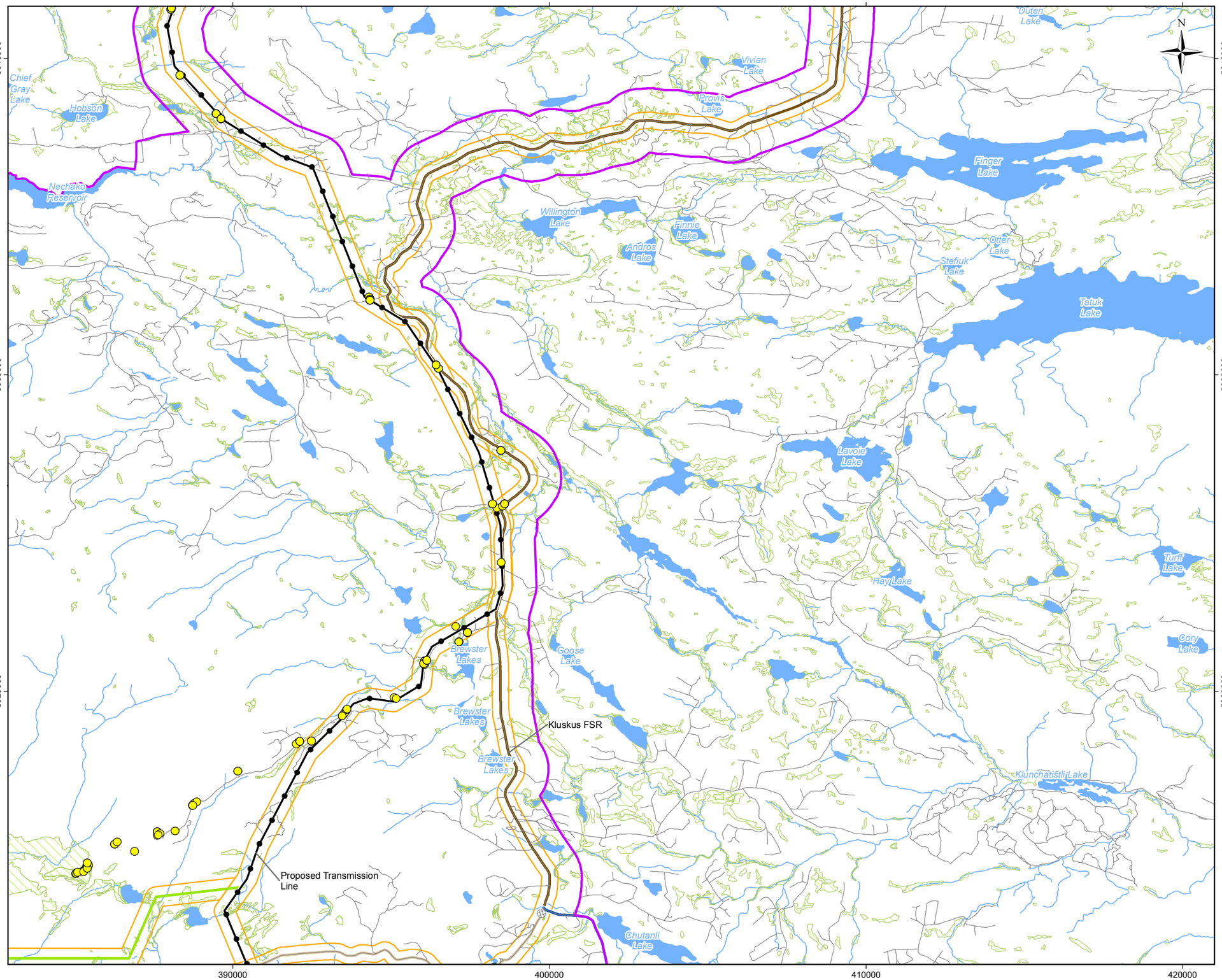
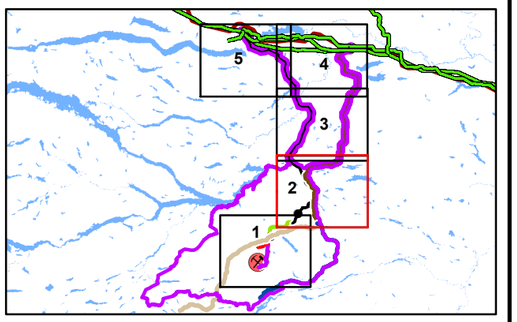


Legend

- Invertebrate Detection Locations
- Existing Road
- Kluskus FSR
- Kluskus-Blue FSR
- Kluskus-Ootsa FSR
- Proposed Transmission Line
- Proposed Transmission Line (Mills Ranch re-route)
- Stream (>= 2nd Order)
- Waterbody (>= 4 Ha)
- Wetlands

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area



Scale: 1:120,000

0 1 2 4 6

Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold

PROJECT: Blackwater Gold Project

Invertebrate Survey Locations

Map 2 of 5

DATE: October, 2013	ANALYST: KA	**Figure** 2.1-29
JOB No: VE52277	QA/QC: MY	PDF FILE: 11-100-053_Invertebrate_Survey_v2.pdf
GIS FILE: 11-100-053_Invertebrate_Survey_v2.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	amec

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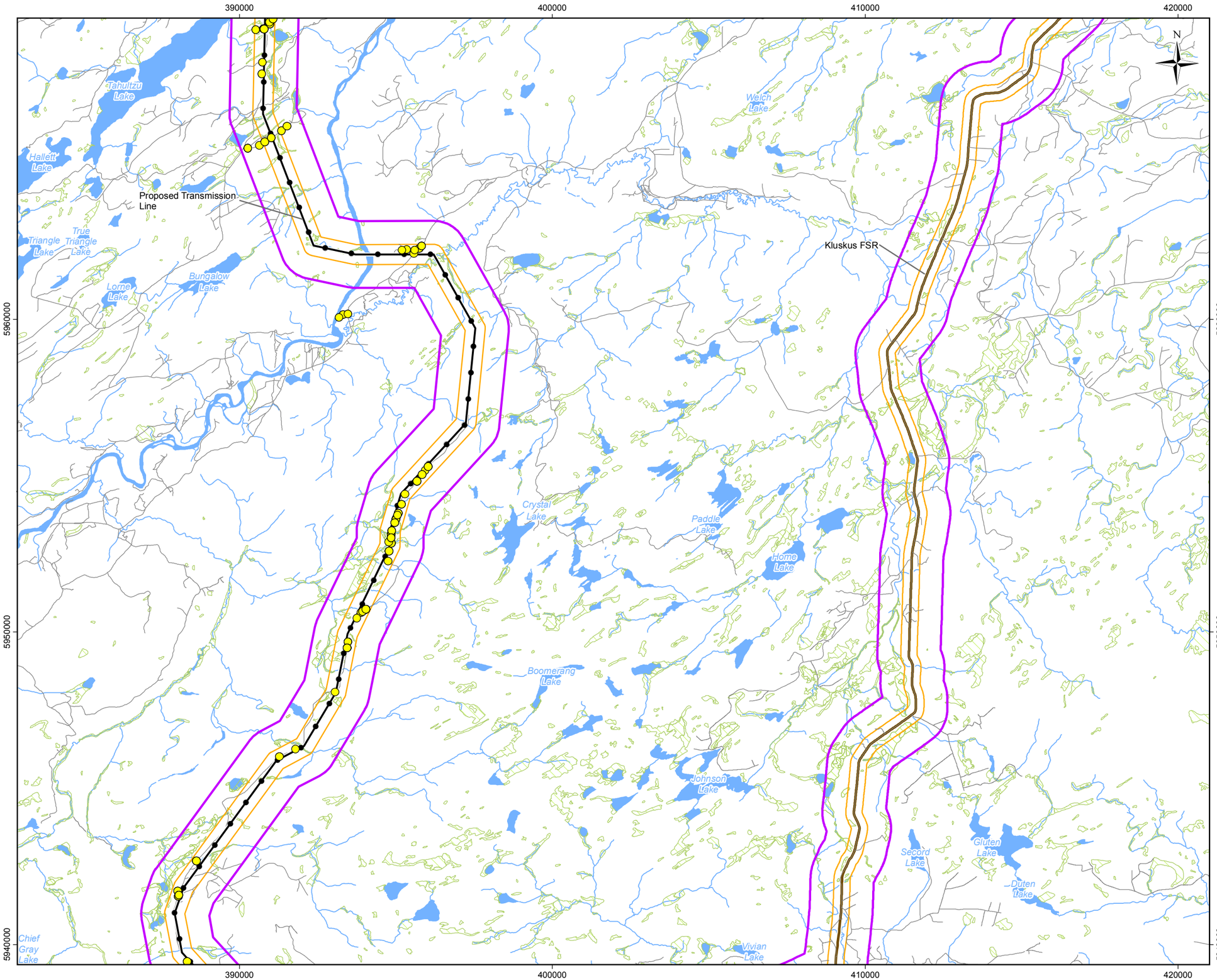
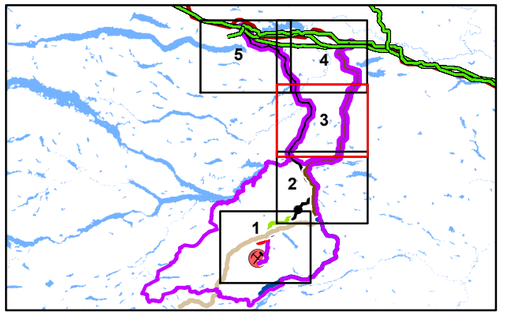


Legend

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

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area



Scale: 1:120,000

0 1 2 4 6

Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold

PROJECT: Blackwater Gold Project

Invertebrate Survey Locations
Map 3 of 5

DATE: October, 2013	ANALYST: KA	**Figure** 2.1-30
JOB No: VE52277	QA/QC: MY	PDF FILE: 11-100-053_Invertebrate_Survey_v2.pdf
GIS FILE: 11-100-053_Invertebrate_Survey_v2.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	amec

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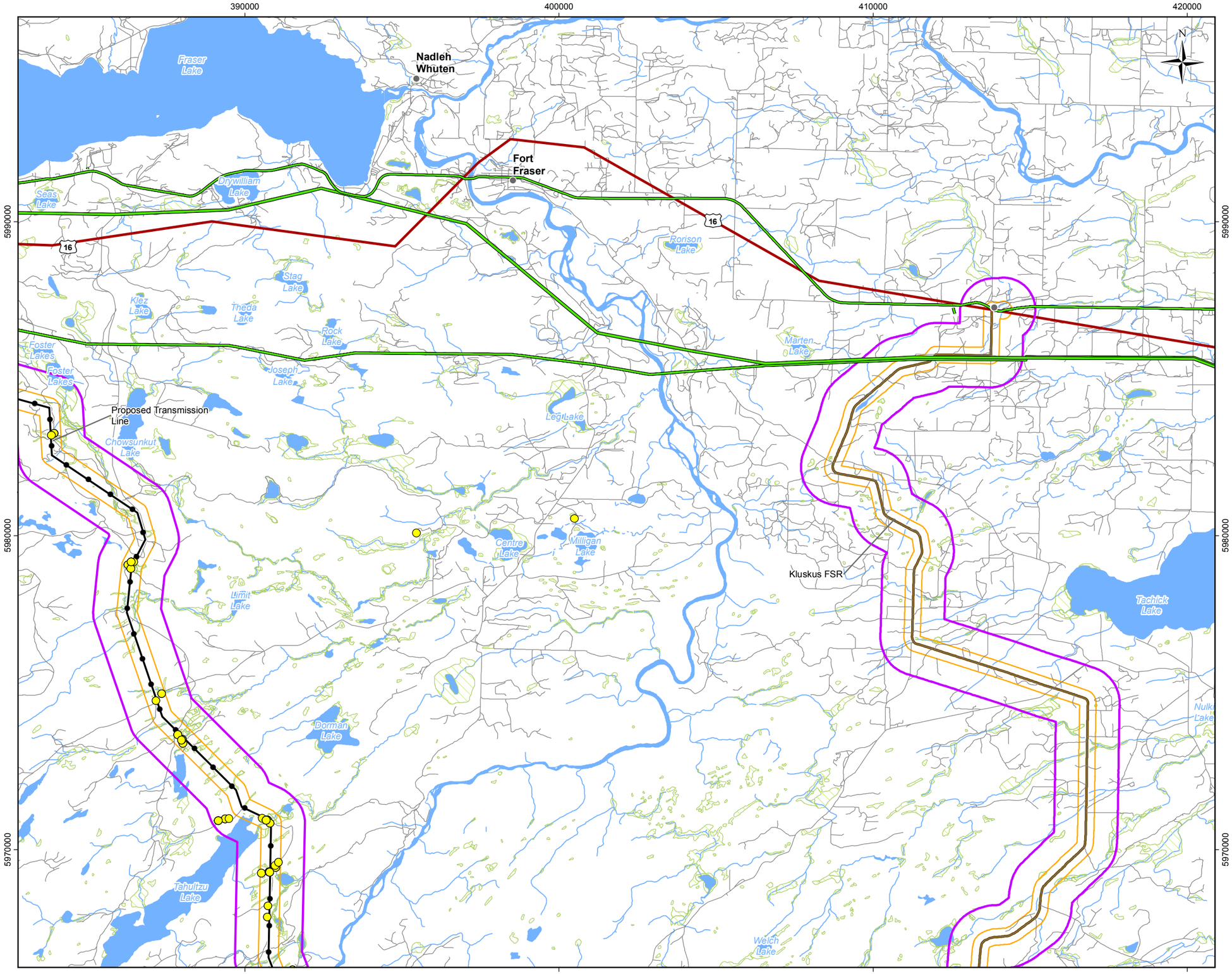

Legend

- Invertebrate Detection Locations
- Populated Place
- Existing Road
- Kluskus FSR
- Proposed Transmission Line
- Existing Transmission Line
- Highway
- Stream (>= 2nd Order)
- Waterbody (>= 4 Ha)
- Wetlands

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area

Scale: 1:120,000

0 1 2 4 6

Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold

PROJECT: Blackwater Gold Project

Invertebrate Survey Locations

Map 4 of 5

DATE: October, 2013	ANALYST: KA	**Figure** 2.1-31
JOB No: VE52277	QA/QC: MY	PDF FILE: 11-100-053_Invertebrate_Survey_v2.pdf
GIS FILE: 11-100-053_Invertebrate_Survey_v2.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	amec

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360000 370000 380000

5990000 5980000 5970000

Savory Lake
Endako
Deserter Lake
Fraser Lake
Stellako
Fraser Lake
Casey Lake
Seas Lake
16
Proposed Transmission Line (Stellako re-route)
Klez Lake
Foster Lakes
Foster Lakes
Francois Lake
Proposed Transmission Line
Chowsunkut Lake
Anzus Lake
Borel Lake
Graham Lake
Cabin Lake
Laurie Lake
Twentysix Mile Lake
Tahultzu Lake

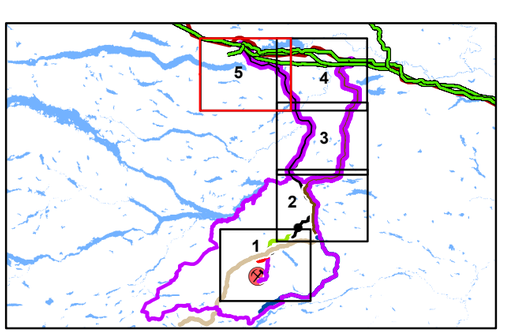
N

Legend

- Invertebrate Detection Locations
- Populated Place
- Existing Road
- Proposed Transmission Line
- Proposed Transmission Line (Stellako re-route)
- Existing Transmission Line
- Highway
- Stream (>= 2nd Order)
- Waterbody (>= 4 Ha)
- Wetlands

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area



Scale: 1:120,000

0 1 2 4 6

Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold

PROJECT: Blackwater Gold Project

Invertebrate Survey Locations
Map 5 of 5

DATE:	ANALYST:	**Figure** 2.1-32
October, 2013	KA	
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GIS FILE: 11-100-053_Invertebrate_Survey_v2.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	amec

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2.1.9 Wildlife Habitat Rating / TEM

Wildlife habitat assessment plots were used to determine the value of TEM polygons for some of the species of conservation and management concern associated with the Project area (**Figure 2.1-33** through **Figure 2.1-37**). These results are used in habitat modelling in the environmental assessment.

360000 370000 380000 390000

5910000 5900000 5890000

Proposed Transmission Line

Proposed Transmission Line (Mills Ranch re-route)

Proposed Airstrip

Kluskus-Ootsa FSR

Proposed Airstrip Access Road

Proposed Water Pipeline Route

Tatelkuz Lake

Top Lake

Snake Lake

Proposed Mine Site Access Road

Exploration Road

Kuyakuz Lake

Kluskus-Blue FSR

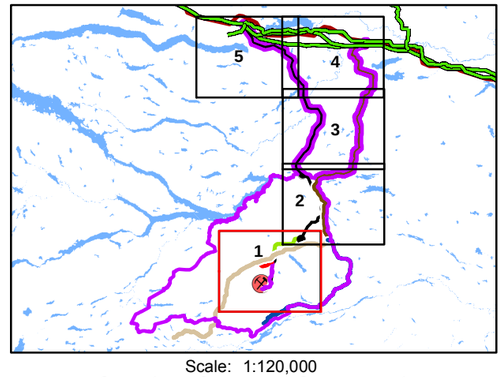
N

Legend

- Wildlife Habitat Rating Plot
- Exploration Road
- Proposed Mine Site Access Road
- Proposed Transmission Line
- Proposed Water Supply Route
- Proposed Transmission Line (Mills Ranch re-route)
- Proposed Airstrip Access Road
- Kluskus-Blue FSR
- Kluskus-Ootsa FSR
- Existing Road
- Stream (>= 2nd Order)
- Waterbody (>= 4 Ha)
- Wetland
- Proposed Airstrip
- Proposed Mine Site

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area



Scale: 1:120,000

2 1 0 2 4

Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold

PROJECT: Blackwater Gold Project

Terrestrial Ecosystem Mapping
Plot Locations
Map 1 of 5

DATE:	ANALYST:	**Figure** 2.1-33
October, 2013	AA	
JOB No: VE52277	QA/QC: MY	PDF FILE: 11-100-064_TEM_locations_v2.pdf
GIS FILE: 11-100-064_TEM_locations_v2.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	amec

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390000 400000 410000 420000

5940000 5930000 5920000

Chief Gray Lake
Hobson Lake
Nechako Reservoir
Willington Lake
Finnie Lake
Andros Lake
Vivian Lake
Provis Lake
Duten Lake
Finger Lake
Otter Lake
Stefiuk Lake
Tatuk Lake
Lavoie Lake
Turff Lake
Hay Lake
Cory Lake
Brewster Lakes
Goose Lake
Klunchatistli Lake
Chutanli Lake

Kluskus FSR

Proposed Transmission Line

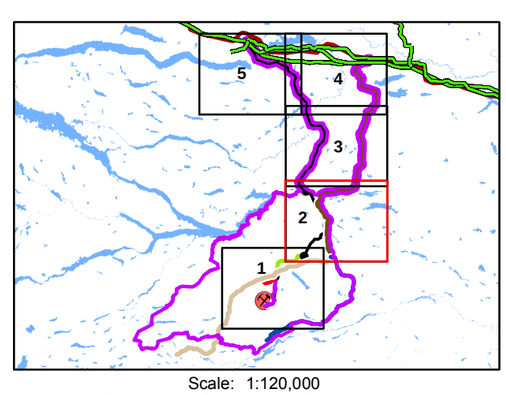
N

Legend

- Wildlife Habitat Rating Plot
- Proposed Transmission Line
- Proposed Transmission Line (Mills Ranch re-route)
- Kluskus FSR
- Kluskus-Blue FSR
- Kluskus-Ootsa FSR
- Existing Road
- Stream (>= 2nd Order)
- Waterbody (>= 4 Ha)
- Wetland

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area



Scale: 1:120,000

2 1 0 2 4

Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold

PROJECT: Blackwater Gold Project

Terrestrial Ecosystem Mapping
Plot Locations

Map 2 of 5

DATE:	ANALYST:	**Figure** 2.1-34
October, 2013	AA	
JOB No: VE52277	QA/QC: MY	PDF FILE: 11-100-064_TEM_locations_v2.pdf
GIS FILE: 11-100-064_TEM_locations_v2.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	amec

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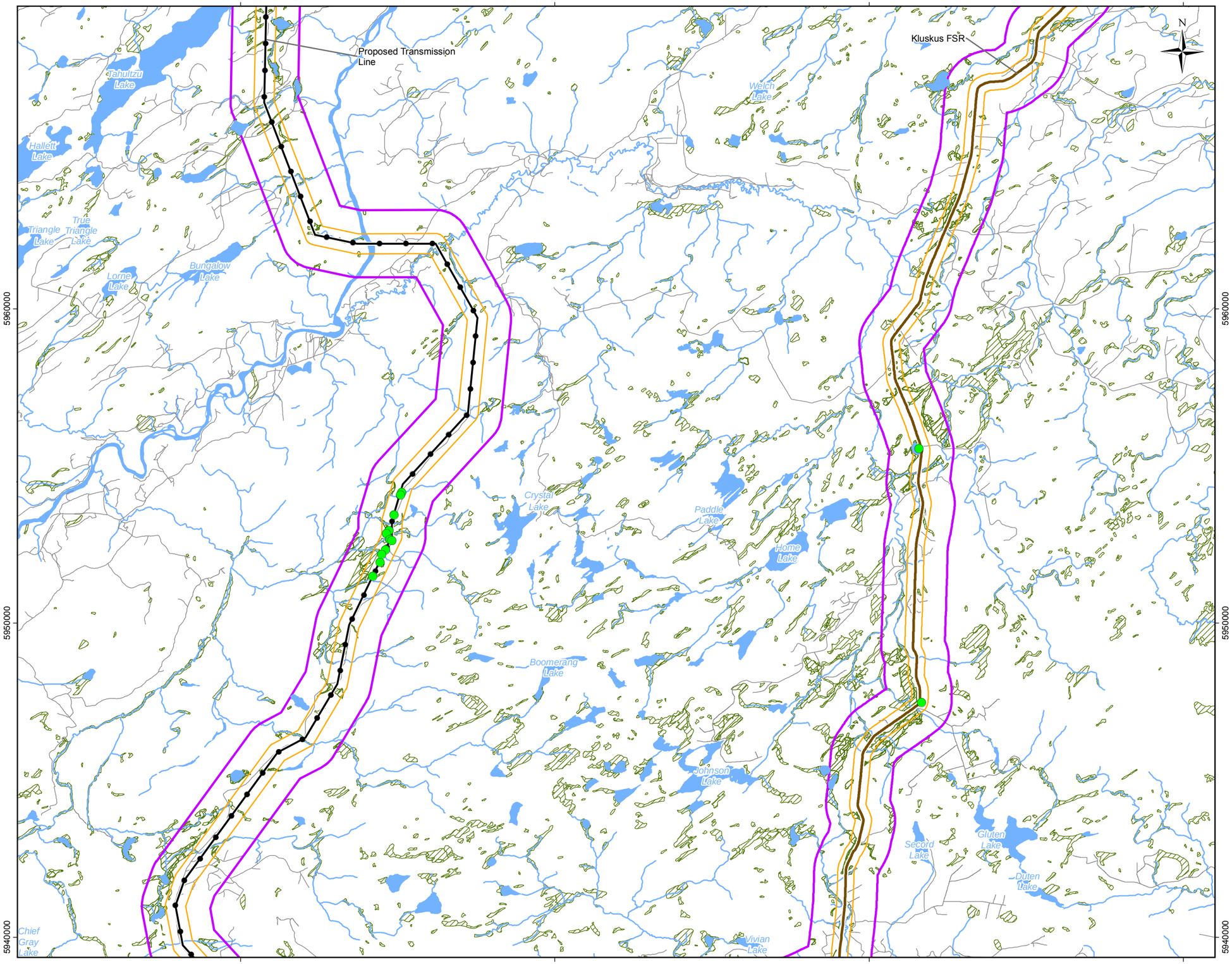
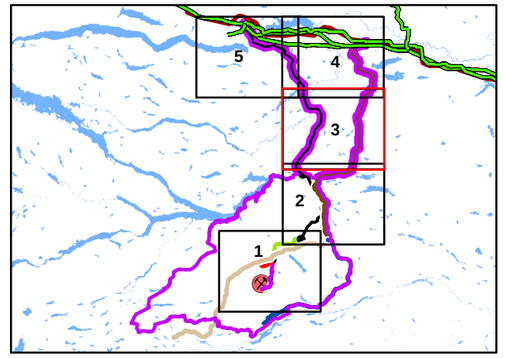


Legend

- Wildlife Habitat Rating Plot
- Proposed Transmission Line
- Kluskus FSR
- Existing Road
- Stream (>= 2nd Order)
- Waterbody (>= 4 Ha)
- Wetland

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area



Scale: 1:120,000

2 1 0 2 4

Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold

PROJECT: Blackwater Gold Project

Terrestrial Ecosystem Mapping
Plot Locations

Map 3 of 5

DATE: October, 2013	ANALYST: AA	**Figure** 2.1-35
JOB No: VE52277	QA/QC: MY	PDF FILE: 11-100-064_TEM_locations_v2.pdf
GIS FILE: 11-100-064_TEM_locations_v2.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	amec

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390000 400000 410000 420000

5990000 5980000 5970000

Fraser Lake
Nadleh Whuten
Fort Fraser
Drywilliam Lake
Seas Lake
Stag Lake
Klez Lake
Theda Lake
Rock Lake
Foster Lakes
Joseph Lake
Chowsunkut Lake
Legl Lake
Marten Lake
Rorison Lake
Centre Lake
Milligan Lake
Limit Lake
Dorman Lake
Tahultzu Lake
Weich Lake
Tachick Lake
Nulki Lake
16

Proposed Transmission Line

Kluskus FSR

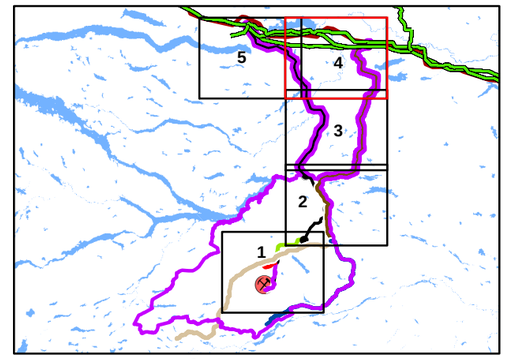
N

Legend

- Wildlife Habitat Rating Plot
- Proposed Transmission Line
- Existing Transmission Line
- Highway
- Kluskus FSR
- Existing Road
- Stream (>= 2nd Order)
- Waterbody (>= 4 Ha)
- Wetland

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area



Scale: 1:120,000

2 1 0 2 4
Kilometres

Reference
BC Government GeoBC Data Distribution

CLIENT: newgold

PROJECT: Blackwater Gold Project

Terrestrial Ecosystem Mapping
Plot Locations
Map 4 of 5

DATE:	ANALYST:	**Figure** 2.1-36
October, 2013	AA	
JOB No: VE52277	QA/QC: MY	PDF FILE: 11-100-064_TEM_locations_v2.pdf
GIS FILE: 11-100-064_TEM_locations_v2.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	amec

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360000 370000 380000

5990000 5980000 5970000

Endako
Stellako
Fraser Lake
16
Savory Lake
Casey Lake
Deserter Lake
Fraser Lake
Seas Lake
Klez Lake
Foster Lakes
Chowsunkut Lake
Francois Lake
Proposed Transmission Line (Stellako re-route)
Proposed Transmission Line
Anzus Lake
Borel Lake
Graham Lake
Cabin Lake
Laurie Lake
Twentysix Mile Lake
Tahultzu Lake

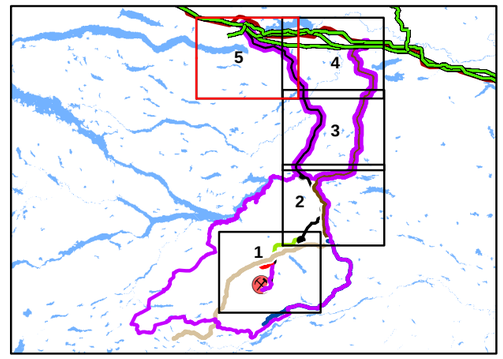
N

Legend

- Wildlife Habitat Rating Plot
- Populated Place
- Proposed Transmission Line
- Proposed Transmission Line (Stellako re-route)
- Existing Transmission Line
- Highway
- Existing Road
- Stream (>= 2nd Order)
- Waterbody (>= 4 Ha)
- Wetland

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area



Scale: 1:120,000

2 1 0 2 4
Kilometres

Reference
BC Government GeoBC Data Distribution

CLIENT: newgold

PROJECT: Blackwater Gold Project

Terrestrial Ecosystem Mapping
Plot Locations
Map 5 of 5

DATE:	ANALYST:	**Figure** 2.1-37
October, 2013	AA	
JOB No: VE52277	QA/QC: MY	PDF FILE: 11-100-064_TEM_locations_v2.pdf
GIS FILE: 11-100-064_TEM_locations_v2.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	amec

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3.0 RESULTS/DISCUSSION

3.1 Limitations of the Data

Weather reduced observations of many species in 2011; however, survey work was extended into 2012 and 2013 to cover the range of habitat suitabilities for species surveyed. Areas associated with the transmission line and water pipeline LSAs were surveyed for habitat and wildlife value during TEM plot surveys. As for all biological data, presence/absence surveys conducted over a limited time frame of 1 to 3 years may not represent the full range of species occurrence and habitat use and these limitations are factored into the species ratings tables and habitat suitability models used in the effect assessment for the EA.

3.2 Species of Conservation Concern and Management Concern (Potential Valued Components)

As described in **Section 2**, the BC CDC Animal Tracking List for the VFD was searched to determine which species were potentially present in the area for all or a part of their life requisites, based on available habitat (**Table 3.2-1**).

Twenty-eight wildlife species at risk (i.e., species of conservation concern) were identified as having the potential to occur in the mine site and its LSA for either breeding and/or foraging (refer to **Annex 1** for a description of the provincial, federal, and international conservation ratings).

Within the mine site and LSA, there were seven potential species listed under the federal Schedule 1 list (one amphibian species, five bird species, and one mammal species). Field surveys and incidental sightings resulted in five species listed under the federal Schedule 1 occurring within the mine site and its LSA, five species occurring within the LSA of the linear features, and four species occurring within the RSA.

A search of the BC CDC website resulted in 22 provincially listed species (including four Red and 18 Blue) that could occur within the mine site and its LSA. During field work, two Red- and eight Blue-listed species were recorded within the mine site and its LSA (**Table 3.2-1**). Twenty-three provincially listed species (including four Red and 19 Blue) have the potential to occur within the transmission line ROW and its LSA; one Red- and five Blue-listed species were detected within the transmission line corridor and LSA. Twenty-two provincially listed species have the potential to occur along the Kluskus FSR ROW and LSA. No Red and six Blue-listed species were recorded. Within the water pipeline corridor and LSA, 19 provincially listed species (three Red and 16 Blue) have the potential to occur; one Red- and four Blue-listed species were detected. Within the airstrip corridor and LSA two Red-listed species and 13 Blue-listed species had potential to occur; two Red-listed and two Blue-listed species were detected. Finally within the RSA, 24 provincially listed species have the potential to occur. Three Red-listed and 13 Blue-listed species were detected during

field work. The details on the locations and habitat of these species, as well as the survey effort utilized in each LSA and in the RSA, are discussed in the respective species group summaries below.

Table 3.2-1: Federally and Provincially Listed Species Potentially Occurring and Recorded in the Biogeoclimatic Zones within the Project LSAs and the RSA

Common Name	Scientific Name	COSEWIC Status	*SARA* Status	Provincial Status	Mine Site and LSA		Transmission Line and LSA		Kluskus FSR and LSA		Mine Access Road and LSA		Water Pipeline and LSA		Airstrip and LSA		RSA	
					Potential Presence	Recorded Presence	Potential Presence	Recorded Presence	Potential Presence	Recorded Presence	Potential Presence	Recorded Presence	Potential Presence	Recorded Presence	Potential Presence	Recorded Presence	Potential Presence	Recorded Presence
Western toad	*Anaxyrus boreas*	Special Concern	Special Concern	Blue	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No	Yes	No	Yes	Yes
Olive-sided flycatcher	*Contopus cooperi*	Threatened	Threatened	Blue	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Rusty blackbird	*Euphagus carolinus*	Special Concern	Special Concern	Blue	Yes	Yes	Yes	Yes	Yes	No	Yes	No	Yes	Yes	No	No	Yes	Yes
Barn swallow	*Hirundo rustica*	Threatened	N/A	Blue	Yes	Yes	Yes	Yes	Yes	Yes		No	No	No	No	No	Yes	Yes
Bank swallow	*Riparia riparia*	Threatened (May 2013)	N/A	Yellow	Yes	No	Yes	No	Yes	No	No	No	No	No	No	No	Yes	No
Common nighthawk	*Chordeiles minor*	Threatened	Threatened	Yellow	Yes	Yes	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Sharp-tailed grouse *columbianus* subspecies	*Tympanuchus phasianellus columbianus*	N/A	N/A	Blue	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	Yes
Short-eared owl	*Asio flammeus*	Special Concern	Special Concern	Blue	Yes	No	Yes	No	Yes	Yes	Yes	No	Yes	No	No	No	Yes	No
Great blue heron	*Ardea herodias herodia*	N/A	N/A	Blue	No	No	Yes	No	Yes	No	Yes	No	Yes	No	No	No	Yes	Yes
American white pelican	*Pelecanus erythrorhynchos*	N/A	N/A	Red	No	No	Yes	No	No	No	No	No	No	No	No	No	Yes	No
Long-billed curlew	*Numenius americanus*	Special Concern	Special Concern	Blue	No	No	Yes	No	Yes	No	No	No	No	No	No	No	Yes	No
American bittern	*Botaurus lentiginosus*	N/A	N/A	Blue	Yes	No	Yes	No	Yes	No	Yes	No	No	No	No	No	Yes	No
American golden plover	*Pluvialis dominica*	N/A	N/A	Blue	Yes	No	No	No	No	No	Yes	No	No	No	No	No	Yes	No
Horned grebe	*Podiceps auritus*	Special Concern	N/A	Yellow	Yes	No	Yes	No	Yes	No	Yes	No	No	No	No	No	Yes	No
Yellow rail	*Coturnicops noveboracensis*	Special Concern	Special Concern	Red	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	No	No	Yes	No
Fisher	*Martes pennanti*	N/A	N/A	Blue	Yes	No	Yes	No	Yes	Yes	Yes	No	Yes	No	Yes	No	Yes	No
Wolverine	*Gulo gulo luscus*	Special Concern	N/A	Blue	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	Yes
Grizzly bear	*Ursus arctos*	Special Concern	N/A	Blue	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Yes	No	Yes	No	Yes	Yes
Caribou	*Rangifer tarandus pop. 15*	Threatened	Threatened	Red	Yes	Yes	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	Yes
Eastern red bat	*Lasiurus borealis*	N/A	N/A	Red	Yes	Yes	Yes	No	Yes	No	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Little brown myotis	*Myotis lucifugus*	Endangered	N/A	Yellow	Yes	Yes	Yes	No	Yes	No	Yes	No	Yes	No	Yes	Yes	Yes	Yes
Northern myotis	*Myotis septentrionalis*	Endangered	N/A	Blue	Yes	Yes	Yes	No	Yes	No	Yes	No	Yes	No	Yes	Yes	Yes	Yes
Assiniboine skipper	*Hesperia assiniboia*	N/A	N/A	Red	Yes	Yes	Yes	Yes	Yes	No	Yes	No	Yes	No	Yes	Yes	Yes	Yes
Jutta Arctic *chermocki* subspecies	*Oeneis jutta chermocki*	N/A	N/A	Blue	Yes	Yes	Yes	Yes	Yes	No	Yes	No	Yes	No	Yes	No	Yes	Yes
Hagen's bluet	*Enallagma hageni*	N/A	N/A	Blue	Yes	Yes	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	Yes
Kennedy's emerald	*Somatochlora kennedyi*	N/A	N/A	Blue	Yes	No	Yes	No	Yes	n/a	Yes	No	Yes	No	Yes	No	Yes	No
Forcipate emerald	*Somatochlora forcipata*	N/A	N/A	Blue	Yes	No	Yes	No	Yes	n/a	Yes	No	Yes	No	Yes	No	Yes	No
Beaverpond baskettail	*Epitheca canis*	N/A	N/A	Blue	Yes	No	Yes	No	Yes	n/a	Yes	No	Yes	No	Yes	No	Yes	No

Note: COSEWIC = Committee on the Status of Endangered Species in Canada; N/A = not applicable; *SARA* = *Species at Risk Act*

3.3 Amphibian and Reptile Community

Background information searches did not identify any historical surveys for amphibians or reptiles completed in any of the six LSAs or the RSA. However, surveys for amphibians and reptiles in the PGFD were completed in 1996–1997 to study the regional distribution and abundance of amphibians and reptiles in the area (Kinsey and Law, 1998).

In these studies, the largest variants of the Sub-boreal spruce (SBS) and Engelmann spruce – subalpine fir (ESSF) BGC zones were selected for surveying. Only the SBSdw3 variant from these studies occurs within the Project area and is found along the proposed transmission line, the Kluskus FSR, and the RSA. The SBSdw3 contained four species of amphibian: the *SARA*-listed and Blue-listed western toad (*Anaxyrus boreas*); the Columbia spotted frog (*Rana luteiventris*); the wood frog (*Lithobates sylvatica*); and the long-toed salamander (*Ambystoma anabystoma)*. The common garter snake (*Thamnophis sirtalis*) is the only reptile known to occur in the PGFD and was found in the SBSdw3. Although not detected during the Kinsey and Law (1998) surveys, the western garter snake (*Thamnophis elegans*) can also potentially occur within any of the Project LSAs and the RSA (Matsuda et al., 2006).

3.3.1 Species of Conservation Concern Life History Accounts

The life history accounts were determined during the literature review in order to design the field programs, which included surveying for environmentally sensitive species defined as species of conservation concern.

3.3.1.1 Western Toad

The western toad occurs throughout BC, except in the northeast corner of the province (BC Ministry of Environment (BC MOE), 2013a). The western toad is ranked as secure globally (G4) and nationally (N4) in both the United States (US) and Canada (NatureServe, 2012). Globally, it is on the International Union for Conservation of Nature (IUCN) Red List as near threatened, reflecting declines and extirpations over parts of its distribution in the US. COSEWIC assessed it as a Special Concern species (COSEWIC, 2002c) and it is listed as such under the *SARA* Schedule 1, List of Wildlife Species at Risk (Government of Canada, 2002). It is ranked as S3 (vulnerable) S4 (apparently secure) in BC. Many factors have been proposed to have caused or contributed to the decline in populations, including habitat loss and degredation, introduced predators, UV radiation, and disease; however, none have been confirmed (COSEWIC, 2002c).

Western toads are explosive spring and summer breeders once daily minimum temperatures have reached 10°C (Gyug, 1996). Areas used for breeding include wetlands, vernal pools, roadside ditches, and lake margins; however, the primary requirements of breeding habitat are warm, predator (fish)-free, still water areas with muddy bottoms (COSEWIC, 2002c). They are highly philopatric; most males return to breeding sites annually whereas females return every one to three years (Davis, 2000). Females travel

farther from breeding sites, moving 400 m to 600+ m upland to summer ranges; occasional long distance excursions of up to 7.2 km have been noted (Jones 1999). Summer home ranges are distinct and approximately 3 hectares (ha) to 7 ha in size (BC EAO, 2013a).

Non-breeding habitat for adult toads typically comprises forests, riparian areas, meadows and other areas with dense shrub cover that provide thermal and predatory cover (COSEWIC, 2002c). Riparian areas are also frequently used by newly emerged western toads prior to dispersal from wetlands (Richter, 1997). High value habitat for the growing season is a moist, shaded terrestrial site with abundant leaf litter and coarse woody debris (CWD), generally adjacent to forested communities (COSEWIC, 2002c).

While primarily nocturnal, toads are known to be diurnal in areas with shorter growing seasons (BC MWLAP, 2013). During winter, the species hibernates underground in contact with water (Campbell, 1970). The species is also frequently found in both forests and harvested areas; however, unfragmented habitat connectivity for migration between wetlands and uplands is important in maintaining populations (COSEWIC, 2002).

Western toad tadpoles feed primarily on algae, aquatic plant matter, and organic detritus, whereas adults feed primarily on insects and other invertebrates (Leonard et al., 1993; Sullivan, 1994; Stebbins, 1985; Verner and Boss, 1980). Western toads are vulnerable to moisture and temperature changes and avoid open water outside of the breeding season (COSEWIC, 2002c).

3.3.2 Mine Site and LSA

Four amphibian species are found within the mine site and LSA: western toad; Columbia spotted frog (wood frog and long-toed salamander (**Table 3.3-1**; **Figure 3.3-1**). Visual encounter surveys were used to search wetlands in the mine site and LSA. Surveys were first stratified for areas of suitable habitat within the LSA. A total of 10 km of road was surveyed in the mine site and 3 km in the mine site LSA. All road survey detections occurred in roadside ditches where evidence of breeding, usually tadpoles, was found for all four species. The number of detections per kilometre for all amphibians was 1.4 amphibians and was 0.4 for toads within the mine site. Sites were surveyed once and occurred within the survey periods of June and July in 2011, 2012, and 2013. Visual encounter surveys for all LSAs and the RSA were conducted in 2011 during 18–23 June and 18–23 July, and road surveys occurred during 12–17 June in 2012 and on 8 June 2013.

Table 3.3-1: Number of Detection Sites and Number of Individuals of Amphibians Detected during 2011–2013 Surveys of each LSA and the RSA of the Project

		Mine Site		Mine LSA		Transmission Line Corridor		Transmission Line LSA		Mine Access Road Corridor		Mine Access Road LSA		Kluskus FSR ROW		Kluskus FSR LSA		Water Pipeline Corridor		Water Pipeline LSA		Airstrip Corridor		Airstrip LSA			
Species	**Age**	**No.**	**Sites**	**No.**	**Sites**	**No.**	**Sites**	**No.**	**Sites**	**No.**	**Sites**	**No.**	**Sites**	**No.**	**Sites**	**No.**	**Sites**	**No.**	**Sites**	**No.**	**Sites**	**No.**	**Sites**	**No.**	**Sites**	**No.**	**Sites**
	A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Long-toed sala-mander	J	7	1	15	1	2	2	3	1	0	0	0		117	5	40	1	0	0	0	0	0	0	0	0	280	7
	A	2	1	4	2	0	0	1	1	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	1	6	5
Columbia spotted frog	J	0	0	15	1	20	1	170	2	0	0	0	0	65	2	0	0	0	0	0	0	0	0	0	0	59	3
	A	2	1	4	1	0	0	0	0	2	1	0	0	0	0	1	1	8	6	4	2	1	1	0	0	38	13
Wood frog	J	0	0	100	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	123	3
	A	4	4	1	1	5	1	14	6	0	0	0	0	2	2	0	0	2	2	0	0	0	0	0	0	7	6
Western toad	J	0	0	2	1	0	0	530	5	0	0	0	0	20	1	0	0	100	1	200	1	0	0	0	0	2761	10
Subtotal	A	8	6	9	4	5	1	15	7	2	1	0	0	2	2	1	1	11	9	4	2	1	1	1	1	51	24
Subtotal	J	7	1	132	4	22	3	703	8	0	0	0	0	202	8	40	1	100	1	200	1	0	0	0	0	2683	20
Total		**15**	**7**	**141**	**8**	**27**	**4**	**718**	**15**	**2**	**1**	**0**	**0**	**204**	**10**	**41**	**2**	**111**	**10**	**204**	**3**	**1**	**1**	**1**	**1**	**2734**	**44**

Note: No. = Number; LSA = Local Study Area; RSA = Regional Study Area, A = Adult, J = Juvenile; FSR = Forestry Service Road

360000 370000 380000 390000

5910000 5900000 5890000

Proposed Transmission Line

Proposed Transmission Line (Mills Ranch re-route)

Proposed Airstrip

Kluskus-Ootsa FSR

Proposed Airstrip Access Road

Proposed Water Pipeline Route

Tatelkuz Lake

Top Lake

Snake Lake

Proposed Mine Site Access Road

Exploration Road

Kluskus-Blue FSR

Kuyakuz Lake

N

Legend

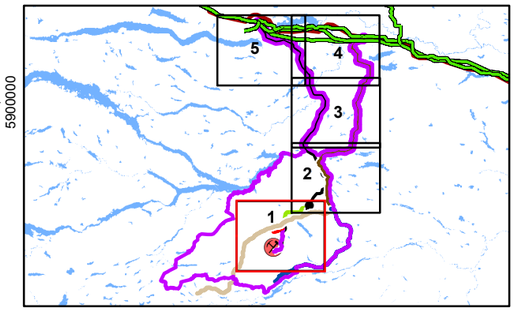
Amphibian and Reptile Detections

- Columbia Spotted Frog
- Long-toed Salamander
- Western Toad
- Wood Frog

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

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area



Scale: 1:120,000

0 1 2 4 6

Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold

PROJECT: Blackwater Gold Project

Amphibian and Reptile Detections

Map 1 of 5

DATE: October, 2013	ANALYST: AA	**Figure** 3.3-1
JOB No: VE52277	QA/QC: MY	PDF FILE: 11-100-047_amphibian_locations_v2.pdf
GIS FILE: 11-100-047_amphibian_locations_v2.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	amec

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Western toads were detected at six locations within the mine site and LSA. A detection of an adult toad in the ESSFmv1 at 1,434 m was the highest elevation for any amphibian found in the Project area. The toad was found in a well of a recently fallen tree upslope of an exploration road near the headwaters of Davidson Creek within the mature lodgepole pine forest. Two other detections, including one of breeding, in the ESSFmv1 were also within mature lodgepole pine forest. Three detections within the SBSmc3 subzone were all adults found in a mosaic of mature and young forest. Additional detections also occurred in the riparian areas along Davidson Creek. All detections occurred within lodgepole pine leading forest with 40–60% crown closure.

Wood frogs were found breeding in the mine site. Based on this species' habitat requisites, the mine site LSA may also contain breeding habitat (**Table 3.3-2**). The majority of available potential breeding habitat for amphibians in the mine site and the LSA was found in anthropogenic water bodies. It is expected that small late ephemeral pools in the study area may provide breeding habitat for all amphibians (**Figure 3.3-1**). Sections of the Project area within the BAFA zone likely do not represent high quality habitat for this species (**Table 3.3-2**).

Table 3.3-2: Amphibian Species of the Biogeoclimatic Zones*

Species	BGC Zone	Boreal Altai Fescue Alpine Undifferentiated (BAFA)		Engelmann Spruce - Subalpine Fir (ESSF)				Sub-Boreal Spruce (SBS)			
	BGC Subzone	Undifferentiated (un)		Moist-Very Cold (mv1)		Moist-Very Cold-Parkland (mvp)		Moist-Cold (mc)		Dry-Cool (dk)	
	Age	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites
long-toed salamander	Adult	0	0	0	0	0	0	0	0	0	0
	Juvenile	0	0	0	0	0	0	499	15	1	1
Columbia spotted frog	Adult	0	0	0	0	0	0	12	9	0	0
	Juvenile	0	0	5	1	0	0	184	4	80	2
wood frog	Adult	0	0	0	0	0	0	60	27	0	0
	Juvenile	0	0	0	0	0	0	223	4	0	0
western toad	Adult	0	0	3	3	0	0	27	18	1	5
	Juvenile	0	0	112	4	0	0	3,001	12	0	0
Subtotal	Adult	0	0	3	3	0	0	99	54	1	5
Subtotal	Juvenile	0	0	117	5	0	0	3907	35	81	3
Total		**0**	**0**	**120**	**8**	**0**	**0**	**4006**	**89**	**82**	**8**

Note: BGC = biogeoclimatic; No. = number
* Amphibian Species found in the Project Area, 2011-2013

3.3.3 Linear Features and the Corresponding LSAs

3.3.3.1 Transmission Line Corridor and LSA

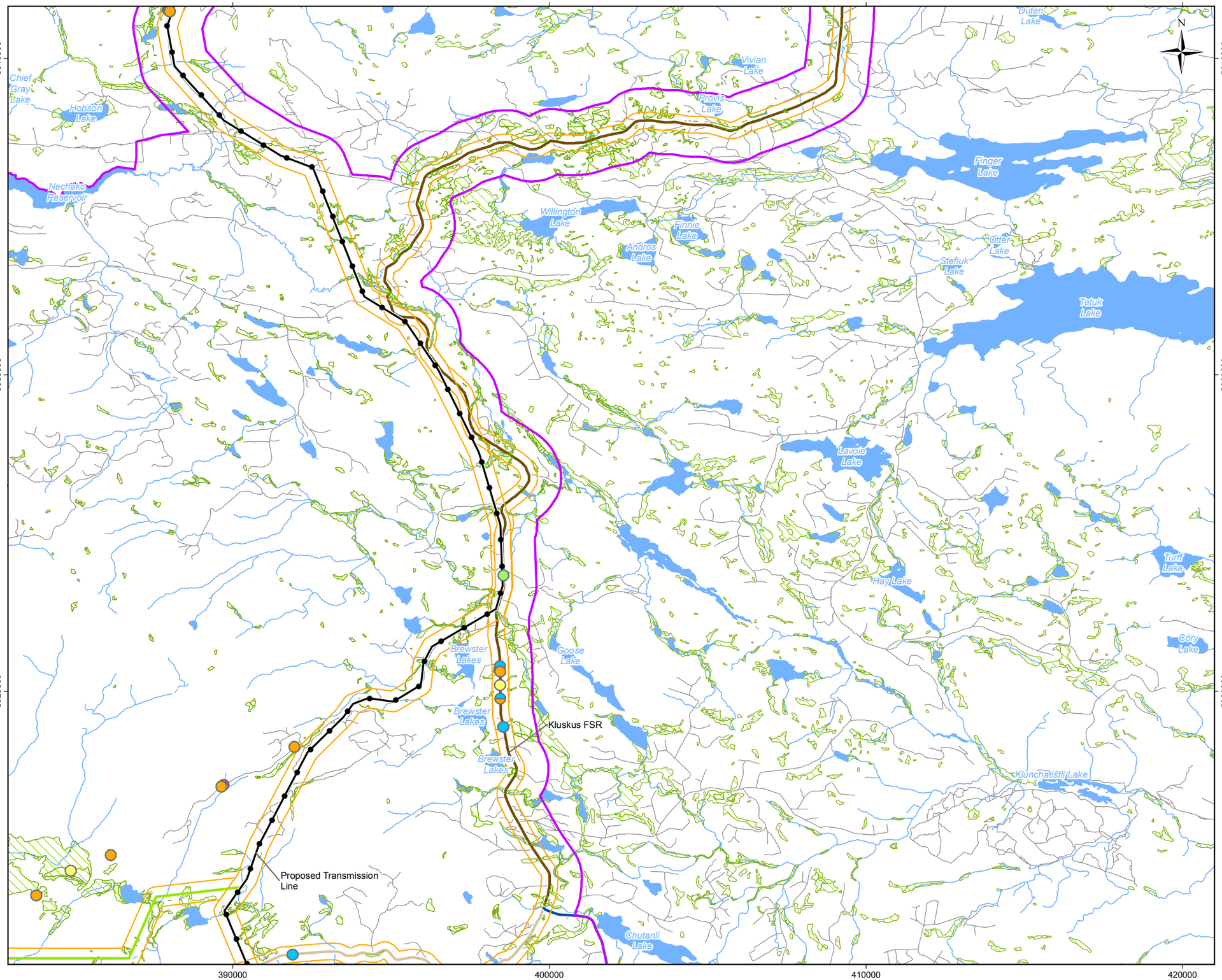
During 2012 and 2013, 36 km of roads within the the transmission line corridor and 23 km within the LSA were surveyed (**Figure 3.3-1** and **Figure 3.3-2**). All three species of amphibians were detected in the transmission line corridor and LSA—the western toad, Columbia spotted frog, and long-toed salamander (**Table 3.3-1**). Out of the nine sites where the western toad was detected, seven were found within the SBSmv1 subzone, and the other two were within the SBSmc2 and the SBSdk subzones, all between 936 m and 1,050 m in elevation. All of the surrounding forests had some spruce component to the forest and detections occurred in forest aged from pole sapling (1–20 years) to old growth (>140 years). A large number of juvenile western toads (>20) were found within a wetland and an adjacent regenerating clearcut along the transmission line along the middle section of the line, south of the Nechako River and north of the 500 Road (**Figure 3.3-3**).

3.3.3.2 Mine Access Road Corridor and LSA

The wood frog was the only species of amphibian detected in the mine access road corridor and LSA. It was not detected breeding; however, due to the proximity of all four amphibian species breeding in the mine site and LSA, it is possible that breeding may occur in suitable habitat for this and the other three species (**Table 3.3-1**). In 2012 and 2013, 0.7 km of roads within the mine access corridor and LSA were surveyed; a lack of roads within this area prevented a higher level of search effort.

3.3.3.3 Kluskus FSR ROW and LSA

During 2012 and 2013, 13 km of roads within the Kluskus FSR ROW and 23 km within the LSA were surveyed (**Figure 3.3-2** to **Figure 3.3-5**). Of the four species of amphibians detected within the ROW and LSA, breeding was confirmed for the western toad, Columbia spotted frog, and long-toed salamander (**Table 3.3-1**). One of the three sites where western toads were detected was within young lodgepole pine forest in the ESSFmv1 subzone. The other two sites occurred in lodgepole forest aged from pole sapling (1 to 20 years) to old growth (>140 years) within the SBSmc3, all between the elevations of 1,110 m and 1,207 m. The surrounding forest at the old growth site was a mixture of lodgepole pine and white spruce; the other sites were mostly lodgepole pine. All adult and juvenile toads detected were in roadside locations. Tadpoles were detected at one site within the LSA in a roadside ditch. The long-toed salamander was the only species of amphibian detected along the northern portion of the route; however, a lack of suitable breeding habitat found along roadsides resulted in few detections in this area. All four of the species may be present in suitable natural water bodies away from the road. The only reptile detected was a common garter snake, which was found dead on the Kluskus FSR.



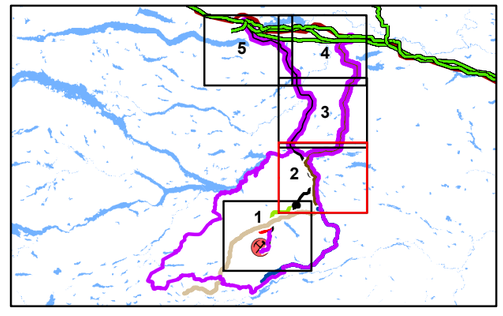
Legend

Amphibian and Reptile Detections

- Columbia Spotted Frog
- Common Gartersnake
- Long-toed Salamander
- Western Toad
- Wood Frog
- Kluskus FSR
- Kluskus-Blue FSR
- Kluskus-Ootsa FSR
- Existing Road
- Proposed Transmission Line
- Proposed Transmission Line (Mills Ranch re-route)
- Wetlands
- Waterbody (>= 4 Ha)
- Stream (>= 2nd Order)

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area



Scale: 1:120,000

0 1 2 4 6

Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold

PROJECT: Blackwater Gold Project

Amphibian and Reptile Detections

Map 2 of 5

DATE: October, 2013	ANALYST: AA	**Figure** 3.3-2
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GIS FILE: 11-100-047_amphibian_locations_v2.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	amec

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390000
400000
410000
420000
5960000
5950000
5940000

Tahultzu Lake
Hallett Lake
True Triangle Lake
Triangle Lake
Lorne Lake
Bungalow Lake
Welch Lake
Crystal Lake
Paddle Lake
Home Lake
Boomerang Lake
Johnson Lake
Vivian Lake
Chief Gray Lake
Secord Lake
Gluten Lake
Duten Lake

Proposed Transmission Line

Kluskus FSR

N

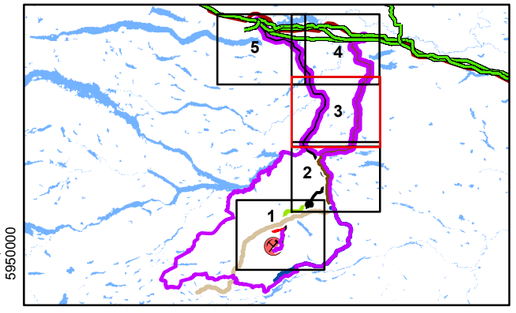
Legend

Amphibian and Reptile Detections
- Columbia Spotted Frog
- Long-toed Salamander
- Western Toad

Kluskus FSR
Existing Road
Proposed Transmission Line

Wetlands
Waterbody (>= 4 Ha)
Stream (>= 2nd Order)

Wildlife and Wildlife Habitat
Local Study Area
Regional Study Area



Scale: 1:120,000

0 1 2 4 6
Kilometres

Reference
BC Government GeoBC Data Distribution

CLIENT: newgold

PROJECT: Blackwater Gold Project

Amphibian and Reptile Detections

Map 3 of 5

DATE: October, 2013	ANALYST: AA	**Figure** 3.3-3
JOB No: VE52277	QA/QC: MY	PDF FILE: 11-100-047_amphibian_locations_v2.pdf
GIS FILE: 11-100-047_amphibian_locations_v2.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	amec

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390000 400000 410000 420000

5990000 5980000 5970000

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

N

Legend

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

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area

Scale: 1:120,000

0 1 2 4 6

Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold

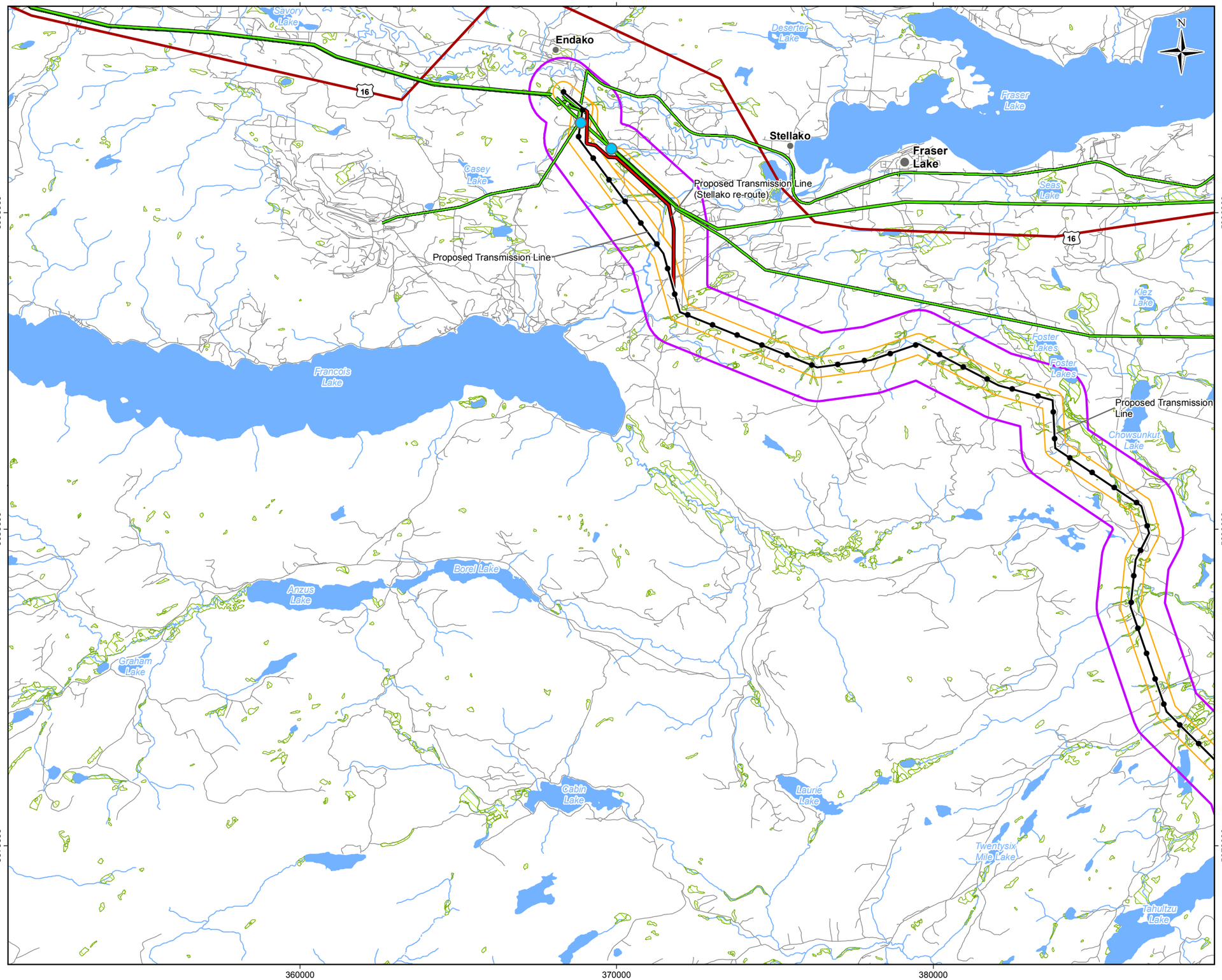
PROJECT: Blackwater Gold Project

Amphibian and Reptile Detections

Map 4 of 5

DATE: October, 2013	ANALYST: AA	**Figure** 3.3-4
JOB No: VE52277	QA/QC: MY	PDF FILE: 11-100-047_amphibian_locations_v2.pdf
GIS FILE: 11-100-047_amphibian_locations_v2.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	amec

Y:\GIS\Projects\VE\VE52095_Richfield_Blackwater\Mapping\11_wildlife\Baseline\11-100-047_amphibian_locations_v2.mxd



Legend

Amphibian and Reptile Detections
- Long-toed Salamander

- Existing Road
- Highway
- Proposed Transmission Line
- Proposed Transmission Line (Stellako re-route)
- Existing Transmission Line
- Wetlands
- Waterbody (>= 4 Ha)
- Stream (>= 2nd Order)

Wildlife and Wildlife Habitat
- Local Study Area
- Regional Study Area

Scale: 1:120,000

0 1 2 4 6

Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold

PROJECT: Blackwater Gold Project

Amphibian and Reptile Detections

Map 5 of 5

DATE: October, 2013	ANALYST: AA	**Figure** 3.3-5
JOB No: VE52277	QA/QC: MY	PDF FILE: 11-100-047_amphibian_locations_v2.pdf
GIS FILE: 11-100-047_amphibian_locations_v2.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	amec

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3.3.3.4 Water Pipeline Corridor and LSA

Amphibian time-constrained surveys conducted in 2011 surveyed five small ponds in a clearcut along the centre portion of the proposed pipeline. Road surveys in 2012 and 2013 searched 10 km of road in the corridor and LSA.

Three species of amphibians were detected within the water pipeline corridor and LSA: western toad, Columbia spotted frog, and wood frog (**Table 3.2-1**, **Figure 3.3-1**). Breeding evidence was only detected for the western toad. Adult wood frog and Columbia spotted frogs were found in roadside ditches in 2012 and 2013.

Western toads were found in several water bodies within the water pipeline corridor and LSA at the approximate mid-point of the proposed pipeline. The detections occurred in small mud-bottomed ephemeral pools with thousands of tadpoles along a road within a recently harvested area and in road tracks that had filled with water. The areas were located within the SBSmc3 variant and between the elevations of 1,036 m and 1,060 m (**Figure 3.3-1**).

3.3.3.5 Airstrip Corridor and LSA

Six kilometres of roads through the area consisting of regenerating pine clear cuts with no observed standing areas of water or ditches were surveyed. An adult wood frog and Columbia spotted frog were found within the corridor and LSA of the airstrip (**Table 3.3-1**). No evidence of breeding was found for any of the four amphibian species. The east and west ends of the airstrip LSA include Turtle Creek and surrounding wetlands; however, this area was not searched for amphibians (**Figure 3.3-1**). The western toad was detected less than 2 km downstream on Turtle Creek.

3.3.3.6 Mills Creek Ranch and Stellako Reroute Options on Transmission Line

No amphibians were detected within the proposed Mills Creek Ranch Reroute option; however, adult western toads, wood frog, and Columbia spotted frog were found in adjacent areas of the RSA (**Figure 3.3-1** and **Figure 3.3-5**).

3.3.4 RSA

Forty-three kilometres of road were surveyed within the RSA of the Project and detections were made at 44 sites. All four species of amphibians were found in adult and tadpole stages, except for long-toed salamander, for which only tadpoles were detected (**Table 3.3-1**). Western toads were detected at 16 sites within the RSA. Three detections occurred within the ESSFmv1 subzone between 989 m 1,290 m in elevation. Two of these detections were of tadpoles in adjacent pools within a pole/sapling spruce forest (1 to 20 years old) and the other detection was of an adult toad in a pole/sapling pine forest stand. Twelve detections of western toad occurred within the SBSmc3 variant. Three of the nine detections were in mature spruce forest, one was in regenerating spruce forest, four were in

lodgepole pine forest that varied from pole/sapling to mature forest, and three were in wetlands. The habitat surrounding the areas where adult toads were found was a mix of forest, open meadow/shrubs, and permanent water, which corresponds with other studies that have found similar mixes required for adult non-breeding habitat (COSEWIC, 2002c). Within the ESSFmv1 sites breeding was found in a pole/sapling forest surround by mature forest. Within the SBSmc3, breeding was found in mature forest/old growth forest, with adjacent pole/sapling forest, and also in wetlands. The largest number of tadpoles detected occurred at Snake Lake where thousands of toad tadpoles were seen within the shallow sedgy edges of the western shore in 2013. The long-toed salamander was detected breeding at seven sites, and the Columbia spotted frog and wood frog were both detected breeding at three sites within the RSA.

3.3.5 Summary

All four amphibian species expected to occur within the region were detected in the mine site, transmission line corridor, their LSAs, and the RSA. All four species were detected in the SBS BGC zone; however, only two species—the western toad and Columbia spotted frog—were found in the ESSF zone. Although all four species were not found in all of the study areas, potential habitat does exist and all of the species have the potential to occur. Water bodies within any of the study areas that provide a suitable breeding habitat for amphibians could be used by the western toad for breeding.

3.4 Bird Community

3.4.1 Species of Conservation Concern Life History Account

3.4.1.1 Common Nighthawk

The common nighthawk is listed by *SARA* and COSEWIC as Threatened but is not provincially listed (BC CDC, 2013. It is a summer resident across BC, typically arriving in early June and departing by the end of August (Campbell et al., 1997). It prefers open habitat, typically along river valleys, but also clearcuts, burnt forest, gravel roads, grasslands, and mountain tops (Brigham et al., 2011, Poulin, et al., 1996)). Birds typically forage along areas with higher insect abundance, such as wetlands, rivers, and wet meadows, but also occasionally in urban and rural areas around light sources that attract insects Brigham et al., 2011, Poulin, et al., 1996). Higher densities of nighthawks may occur in areas where suitable nesting habitat occurs alongside high quality foraging habitat; however, the availability of suitable nesting habitat may ultimately decide nesting densities (COSEWIC, 2007a).

The exact causes of long-term population declines noted across Canada are not known (COSEWIC, 2007a). It is thought that the loss of suitable breeding habitat, through changes in forestry practices, fire suppression, and the intensification of agriculture, and declines in

aerial insect populations caused by the widespread use of insecticides, may be two of the most likely factors (COSEWIC, 2007a).

This species was detected once incidentally along the camp access road in between nighthawk survey stations in 2011. In 2013, two detections were recorded incidentally during the yellow rail auditory survey at wetlands within the mine site LSA. It may potentially breed in all study areas due to the availability of nesting habitat.

3.4.1.2 Olive-Sided Flycatcher

The olive-sided flycatcher (*Contopus cooperi*) is listed by *SARA* and COSEWIC as Threatened and is provincially Blue-listed (BC CDC, 2013). It is a breeding species across the province, with the exception of Haida Gwaii, with most birds arriving by late May and departing by late August (Campbell et al., 1997). Olive-sided flycatchers are typically found along the edges of natural forest openings, such as wetlands or burns, but they will also readily utilize clearcuts (Altman and Sallabanks, 2000). Mixed or coniferous forests adjacent to muskegs, bogs, or swamps are the preferred habitat, and the presence of snags and isolated tall trees in open areas are considered to be an essential requirement for nesting habitat (Altman and Sallabanks, 2000). In western Canada, it occurs most frequently in young forest recovering from fire or young forest adjacent to clearcuts with residual snags and trees (COSEWIC, 2007b). Residual tall trees and snags, 1.4 times taller than the surrounding canopy, are required for foraging, and nests are typically placed in trees slightly shorter than the surrounding canopy (Wright, 1997).

Olive-sided flycatchers have been listed as Threatened in Canada as a result of declines of 78% between 1968 and 2006, and 29% between 1996 and 2006 (COSEWIC, 2007b). Factors causing the declines are not known, but it is thought that habitat loss and change and declines in aerial insect availability may be responsible (Nebel et al., 2010). Clearcuts have recently been found to act as population sinks, with birds nesting in these areas having half the breeding success of those nesting in natural areas (Robertson and Hutto, 2007). It has been speculated that widespread use of insecticides is responsible for declines and changes in aerial insect composition over the last 100 years (COSEWIC, 2007b).

This species was the most frequently detected listed species, with 90 detections during surveys or incidentally in all of the study areas. Most detections (63) were in or adjacent (<100 m) to harvested areas, and the remaining observations were located in forest adjacent to wetlands. Examination of the locations revealed that the 90 detections could represent 79 territories: Nine detections were repeated observations of territorial males at the same point they had previously been detected. Nesting was not confirmed due to the lack of specific surveys; however, due to the large number of territorial males, this species likely nests across all study areas.

3.4.1.3 Barn Swallow

The barn swallow (*Hirundo rustica*) is listed as Threatened by COSEWIC and is provincially Blue-listed (BC CDC, 2013). It breeds across the province and is found throughout the year, being most abundant between April and September (Campbell et al., 1997). It is strongly associated with anthropogenic features, preferring open areas such as meadows, wetlands, and agricultural fields for foraging and buildings or other human structures for nesting (Brown and Brown, 1999). It has occasionally been found nesting on cliffs or caves in natural settings, where anthropogenic features are lacking (Campbell et al., 1997). It commonly reuses old nests and usually returns to the same nesting area in successive years (Brown and Brown, 1999).

Declines for barn swallows have been noticed across Canada through breeding bird surveys and atlases, with a decline of 30% noted from 1999 to 2009 (COSEWIC, 2011). Declines have been attributed to both loss of nesting habitat and declines in aerial insect populations (Nebel et al., 2010). The replacement of wood farm structures, such as barns, with metal structures less suitable for nesting has been suggested to be a cause of losses in nesting habitat (COSEWIC, 2011). The extent that this may be a factor is unclear, as many buildings formerly used now sit empty, and population declines do not match well with changes in the availability of nest sites. Declines in aerial insects have been noted over recent decades, and these changes along with changes in emergence phenology may be important factors in the recent declines in barn swallow populations (Nebel et al., 2010).

Barn swallows were detected at seven locations within the study areas, and breeding was confirmed at three locations. All locations, except one, were associated with anthropogenic features that would provide suitable nesting habitat. In 2011, barn swallows were observed flying at camp but were not found nesting; however, they were detected nesting at a bridge on the Kluskus FSR 14 km west of camp. In 2012, one pair was confirmed nesting in a building across from the core shacks, and in 2013 one pair was confirmed breeding on the main residence building. Barn swallows were also detected nesting under a bridge near the Tatelkuz Ranch at kilometre 118 in the Kluskus FSR ROW. Barn swallows may also nest at other locations within the study areas, such as under other bridges, but were not detected during the baseline surveys.

3.4.1.4 Bank Swallow

The bank swallow (*Riparia riparia*) is listed by COSEWIC as Threatened due to a persistent, long-term decline (BC CDC, 2013). While it may be considered abundant in some areas, overall populations are thought to have declined by 98% over the past 40 years. Within the Central Interior Ecoprovince it is considered to be a common migrant and breeding bird in appropriate habitat (Campbell et al., 1997).

Bank swallows may be found in BC from April until October, with nesting occurring between May and August (Campbell et al., 1997). Colonies may range in size from a single nest to

over 3,000; however, most colonies range between 15 and 75 nests (Campbell et al., 1997). Colonies are typically located in banks and cliffs with sand soil found along rivers, streams, lakes, as well as in sand/gravel pits and quarries (Garrison, 1999).

It is speculated that the long-term declines are related to changes in aerial insect populations, habitat changes, and use of pesticides; however, no true causes have been verified (Garrison, 1999). This species has low potential as a possible breeder within the mine site and LSA but may breed within the RSA. Cliffs adjacent to the proposed transmission line crossing at the Nechako River represent potential nesting habitat, but they did not contain nesting bank swallows in 2013.

3.4.1.5 Rusty Blackbird

The rusty blackbird (*Euphagus carolinus*) is listed by *SARA* and COSEWIC as Special Concern and is provincially Blue-listed (BC CDC, 2013). It is a breeding resident across the north and central interior regions of the province and may occasionally winter in southwest BC (Campbell et al., 2001). Breeding habitat is primarily muskeg and boreal forest, with birds typically found in bogs, riparian areas, and edges of ponds and lakes (Avery, 1995). Beaver ponds, especially those with downed trees and emergent vegetation, provide higher quality habitat (COSEWIC, 2006). This species has also been known to nest colonially in higher quality habitat, although in BC most nest sites involve single pairs (Campbell et al., 2001).

Factors that have impacted rusty blackbird populations appear to be largely habitat related. Much of their wintering habitat (80%) has been destroyed over the last 150 years, and blackbirds wintering in these areas have also been taken incidentally through bird control programs, but overall numbers taken are not known (COSEWIC, 2006). Approximately 5% of breeding habitat across the southern part of the Canadian breeding range has been lost due to human pressures, and an additional 4% is anticipated to be lost over the next 50 years (COSEWIC, 2006).

Rusty blackbirds were detected at nine locations within 5.3 km of Snake Lake. Two sites were within transmission line LSA, three were within the water pipeline LSA, and an additional four sites were within the RSA. Birds were detected within a wetland or within 300 m of a wetland that was surrounded by a mixture of old forest and recently harvested areas in either the SBSmc or SBSdk subzones. All of the birds detected in or adjacent to wetlands were potentially breeding; this included one bird observed carrying food at the north end of Snake Lake.

3.4.1.6 Sharp-tailed Grouse

The sharp-tailed grouse *columbianus* subspecies is not listed by *SARA* or COSEWIC but is provincially Blue-listed (BC CDC, 2013). This subspecies uses two different habitat types: Grouse in southern BC are found primarily in climax grasslands, and grouse in central BC use large openings in forests such as sedge meadows, burns, and large clearcuts (Leupin

and Chutter, 2007). This species performs a unique breeding display in leks during early spring, which typically occurs in large clearings with a reduced grass and forb layer (Connelly et al., 1998). In central BC, breeding displays usually occur in areas that have been recently logged, and these areas may continue to be used until forest height has reached 4 m (Leupin, 2003). Nesting usually occurs in open pine forests in areas with tall grass cover; however, brood rearing and over-wintering usually take place in riparian areas or areas with higher shrub cover (Leupin, 2003).

Habitat loss is thought to be the main factor in causing sharp-tailed grouse populations to be extirpated from 22% of its range and declining in an additional 19% of its range (Leupin, 2003). Conversion of grasslands to agriculture, encroachment of forests into clearings, and changes in logging practices are all thought to contribute to habitat losses (Connelly et al., 1998; Leupin, 2003).

One individual was detected incidentally in a large clearcut south of Snake Lake during surveys in 2011 and five other individuals were detected in 2012. Clearcuts within the Project area would be ideal for this species; however, no other observations or leks have been noted. The 2012 Sharp-tailed grouse lek surveys were conducted late in the breeding season within the RSA (**Annex 2**). In 2013, lek surveys were conducted at stations along the transmission line ROW and Kluskus FSR, as well as a second year of surveys within the RSA. No leks were detected within any of the years of surveys; however, sharp-tailed grouse are present in the area.

3.4.1.7 Long-Billed Curlew

The long-billed curlew (*Numenius americanus*) is listed as a Species of Concern under COSEWIC and *SARA* and is provincially Blue-listed (BC CDC, 2013; COSEWIC, 2002b). It is a breeding resident of the central and southern interior and a rare wintering resident along southern coastal BC. Its nesting habitat is primarily short- and mid-grass prairie, particularly moderately to heavily grazed areas with grass less than 20 cm to 30 cm in height. In BC, they are primarily found in grasslands located within dry valleys, where 65% are found nesting in pasture or agricultural areas. Nesting typically takes place in May and June. Once young have hatched, family groups typically disperse from nesting territories and adults will instead defend an area around the young (Allen, 1980).

Habitat loss is thought to have caused population declines across Canada. No population trends are available nationally, but continental populations have declined at 1.7% per year (COSEWIC, 2002b). Populations in BC are thought to be vulnerable due to the conversion of valley bottoms into agricultural and urban areas, but populations are thought to be relatively stable overall. There is low potential for this species to breed within the LSAs of the linear features and the RSA.

3.4.1.8 Clark's Nutcracker

The Clark's nutcracker is not listed as a species of concern under provincial or federal regulations (BC CDC, 2013). However, it has evolved an obligate mutualist relationship with the Blue-, COSEWIC-, and *SARA*- listed whitebark pine (*Pinus albicaulis*), and as a result it has been considered important for maintaining whitebark pine (Tomback, 1998). It is considered to be a resident or partially migratory of most of southern BC, from the southeastern slopes of the Coast Mountains east to the Alberta border and north through the Caribou Mountains (Campbell et al., 1997). It is uncommon to locally fairly common (occasionally common) in appropriate habitat (Campbell et al., 1997). The whitebark pine is the most important tree species in determining the distributional limits of the nutcracker in BC. In this province, whitebark pine, ponderosa pine, and Douglas fir are considered to be the species upon which Clark's nutcrackers are dependent (Campbell et al., 1997; Tomback, 1998).

Nutcrackers usually nest early in the year, typically in March or April, and are dependent on seeds cached the previous year (Campbell et al., 1997). Adults and fledglings continue to make use of caches until the following summer when cone crops from whitebark and ponderosa pine ripen and become available (Tomback, 1998). These cone crops are typically variable, and as a result many populations are irruptive and may fly considerable distances to find food sources (Vander Wall et al., 1981; Peterson, 1988). When a cone crop is found, birds may cache up to 98,000 seeds in a single season, and caches may be located up to 32.6 km from the seed source (Lorenz et al., 2011). Nutcrackers, however, that travelled more than 11 km to cache seeds did not breed the following year, potentially due to energetic reasons related to retrieving cached seeds (Lorenz et al., 2011). Caches are typically located in low-elevation forests due to a shallower snow pack. When caching at high elevations, seeds are usually placed in above-ground micro-sites (Tomback, 1998).

Clark's nutcrackers have been reported incidentally within the ESSF at Mount Davidson in 2011, 2012, and 2013. No nutcrackers were located during surveys in 2012, which corresponded with a low whitebark pine cone crop. Transects in 2013 noted nutcrackers at various locations around Mount Davidson, including several within whitebark pine stands; however, larger numbers were not observed until late July. These observations included a group of seven seen flying towards Mount Davidson at 2 km along the current mine access road on 22 July 2013. Five nutcrackers were also noted on the north slope of Mount Davidson in the last week of July 2013, and single birds were noted in early and mid September. A single nutcracker was detected on Mount Davidson in early June.

3.4.1.9 Short-Eared Owl

The short-eared owl (*Asio flammeus*) is listed as a species of Special Concern under COSEWIC and is provincially Blue-listed although not listed under *SARA* (BC CDC, 2013). It is a breeding resident across the entire province and may be found in winter across

southern BC. It is primarily found in open areas with short vegetation, such as meadows and sedge marshes, but may also be found in pastures, tundra, and forest clearings (Campbell et al., 1990b). Nest site selection is primarily driven by prey availability (e.g., small rodents) in appropriate habitats. This species has an extended breeding season, with nests recorded from March through September and over half found between late April and early June (Campbell et al., 1990b). Nests generally consist of simple scrapes on the ground lined with grasses and feathers, typically placed at the base of or adjacent to vegetation (e.g., grass clumps, shrubs) and located on elevated ground in wet areas (Wiggins et al., 2006).

Habitat loss and degradation has been implicated in many of the declines across Canada, although harvesting of crops during the nesting season has been a source of nest mortality (COSEWIC, 2008). Collisions with vehicles and utility lines have contributed to adult mortality (Wiggins et al., 2006). Populations appear to have been relatively stable for the last 30 years, which contrasts starkly with the abundant populations reported prior to the 1980s (COSEWIC, 2008). Overall declines of 3% to 4% per year have been noted for both the breeding and wintering grounds (COSEWIC, 2008). Populations in BC, in particular, had undergone significant declines after 1975 and then stabilized around 1990 (Campbell et al., 1990b). A short-eared owl was detected during a stand watch in an agricultural field and grassland on the Tatelkuz Ranch next to the Kluskus FSR and Tatelkuz Lake. Due to the timing of the observation it is likely that the owl was breeding in the area.

3.4.1.10 American Bittern

The American bittern (*Botaurus lentiginosus*) is provincially Blue-listed but is not listed under *SARA* or COSEWIC. Typical nesting habitat includes marshes and fens, where dense emergent wetland vegetation is present. Breeding records in the province have been confirmed up to 1,300 m, with breeding records to the north and east of the LSA and RSA (Campbell et al., 1990a; Bird Studies Canada, 2012). American bitterns are usually solitary nesters and build concealed nests as platforms on small mounds of plant material in standing water within wetlands. Minimal nesting habitat is present within the mine site LSA; however, marshes present in the RSA and the LSAs of the linear features may provide appropriate nesting habitat. No American bitterns were recorded during any of the field surveys between 2011 and 2013.

3.4.1.11 American Golden Plover

The American golden plover (*Pluvialis dominica)* is provincially Blue-listed but is not listed under *SARA* or COSEWIC. The plover is found only as a locally rare breeder on alpine plateau along the Coast Mountains, with one recent confirmed breeding site on the Itcha Mountains (Bird Studies Canada, 2012). It is unlikely that the American golden plover breeds within the mine site LSA and RSA: Breeding habitat is not found within the LSAs of the linear features or RSA, and no plovers were recorded during any of the field surveys between 2011 and 2013.

3.4.1.12 American White Pelican

The American white pelican (*Pelecanus erythrorhynchos*) is Red-listed provincially but is not listed under COSEWIC or SARA (BC CDC, 2013). Only one pelican colony is known within BC, which is located on Stum Lake near Williams Lake. However, pelicans have been observed during the breeding season on various lakes south of Vanderhoof for several decades, with a high count of 77 birds in 2000 (Campbell et al., 2001). During the summer of 2013, AMEC biologists noted a group of 77 pelicans on Stoney Creek in the Saikuz Reserve on 7 June. Pelicans were also seen throughout the summer either flying over the Kenney Dam Road or on Nulki Lake. Pelicans typically nest on isolated, non-vegetated islands with little natural or human disturbance. Foraging may take place up to 65 km away from a breeding colony on shallow, fish-bearing lakes, ponds, or other slow-moving bodies of water (Knopf and Evans, 2004). Several pelicans were detected on Nulki Lake in 2012, 3.5 km east of the access road study area; however, the breeding status of these birds was not determined (Harper, 2004).

3.4.1.13 Great Blue Heron

The great blue heron (*Ardea Herodias herodia*) is listed by *SARA* and COSEWIC as Special Concern, and it is Blue-listed provincially (BC CDC, 2013). It is a summer resident across the interior of BC, and a year-round resident along coastal BC and the south Okanagan valley (Campbell et al., 1997). Most birds arrive at the breeding colonies in March and April, and birds begin dispersing away from these areas in July and August (Campbell et al., 1990). Colonies typically include several dozen nests; however, single nests have been recorded and the largest colony was of 400 nests (Vennesland and Butler, 2004). Dispersing birds may cover large distances away from breeding colonies, including birds dispersing up to 260 km and into the interior from coastal colonies (Campbell et al., 1990a).

Nesting may occur from sea level up to 1,100 m, and colonies are generally located in mature trees, typically in forests free from disturbance and within 10 km of foraging habitat (Campbell et al., 1990a; COSEWIC, 2008). Most colonies are located near suitable foraging areas; including marshes, slow-moving rivers, islands, and lakes (Vennesland and Butler, 2011). Colony use may change annually, as factors such as disturbance may cause birds to abandon certain areas, however, reoccupation of these areas post-disturbance has also been documented (COSEWIC, 2008). Increases in the number of nesting colonies in the interior of the province has been documented; however, breeding has yet to be confirmed for the Peace region or north of Williams Lake (Bird Studies Canada, 2012). Non-breeding habitat is quite varied and may include rivers, lakes, ponds, estuaries, mudflats, wetlands, and fields (Vennesland and Butler, 2011).

Human disturbance and predation by bald eagles are considered to be the two main threats to great blue herons (COSEWIC, 2008). Human disturbance (e.g., habitat destruction, vehicle use, human activity) has been linked to the abandonment of several colonies and to reduced productivity. Bald eagles are the primary predator of great blue herons, and increasing bald

eagle populations are thought to have increased the amount of predation on herons, particularly nestlings (Butler et al., 1995). The presence of bald eagles and repeated harassment has also been documented as the cause of the abandonment of at least one colony.

Two detections, likely of the same bird, were made incidentally in the RSA during the grizzly bear and Kokanee survey, where a heron was photographed feeding in Davidson Creek just north of Tatelkuz Lake on 10 August and 13 August 2013.

3.4.1.14 Horned Grebe

The horned grebe (*Podiceps auritus*) is listed as Special Concern under COSEWIC but is not listed under *SARA* or provincially listed (BC CDC, 2013). Horned grebes rely on freshwater marshes, either on small ponds or lake borders that contain a mix of open water and emergent vegetation (COSEWIC, 2009a). Breeding occurs throughout the interior of the province and has been confirmed within 40 km of the LSA. The species is a possible breeder in small ponds or lakes within all study areas; however, no grebes were recorded during any of the field surveys between 2011 and 2013.

3.4.1.15 Yellow Rail

The yellow rail (*Coturnicops noveboracensis*) is listed as Special Concern under COSEWIC and *SARA* and is Red-listed provincially. Nesting primarily occurs in wet sedge or grass marsh areas with little or no standing water (COSEWIC, 2001). Most populations are found east of the Rocky Mountains in the Peace Region; however, one population was found 80 km south of the LSA (Campbell et al., 1990a; Bird Studies Canada, 2012). Due to the lack of large sedge fens or grass meadows required for breeding, it is unlikely that the yellow rail breeds within the LSA, but it may breed in the LSAs of the linear features or the RSA. No rails were recorded at any of the song meter stations established in habitat most suitable for yellow rails in June of 2013.

3.4.2 Mine Site and LSA

3.4.2.1 Forest and Grassland Songbird Survey

Historical bird surveys were completed in the SBS zone, but did not take place directly in the Project area. As part of a monitoring program, Manning, Cooper and Associates (2008) established PC stations, which included the VFD and the PGTSA, to determine a list of songbirds and woodpeckers that may be present. Woodpecker survey transects were undertaken by Buckland and Martin (1998) as part of a study on CWD. Birds and small mammals in the VFD were recorded as part of this study. A summary of their findings indicates that the VFD has lower songbird abundance and diversity than the FSJFD. Moist sites and pine-dominated forests contain the highest diversity of bird species. For drier sites, non-pine-dominated stands contain the greatest bird diversity.

Breeding bird surveys using PCs were conducted within the mine site and LSA (**Figure 3.4-1**); additional observations were also made during other surveys. A total of 95 breeding bird point count stations were established within the mine site and the mine site LSA between 2011 and 2013 (**Table 3.4-1**; **Figure 3.4-1**). Breeding bird surveys occurred between 18 June and 20 July 2011 (8 days); between 13 June and 11 July 2012 (19 days); and between 7 June and 27 June 2013 (14 days). Incidental observations occurred between 19 June 2011 and 3 October 2012 and 5 June and 12 September 2013.

Table 3.4-1: Total Number of Point Count Stations for Each Survey in Mine Site Study Areas for 2011, 2012, and 2013

Survey Type	Mine Site	Mine Site LSA
Breeding bird survey	76	19
Sharp-tailed grouse survey	3	0
Common nighthawk survey	1	0

Note: LSA = Local Study Area; RSA = Regional Study Area

Surveys detected 55 bird species within the mine site and mine site LSA **Table 3.4-2** and **Annex 10**. Overall, the number of species per station detected was low within the mine site and LSA (4.20 species per point count). Of the three stations with the highest number of species detected (one with 10 species and two with 9 species), two were located within 250 m of a wetland and both included mature forest consisting of lodgepole pine and subalpine fir (121–250 years). The third station was located in a matrix of mature and old growth (121–250+ years) subalpine fir forest, with mature (101 to 120 years) white spruce forest and young and mature (61–100 years) lodgepole pine forest. All of the stations were located within the ESSFmv.

Two species of conservation concern, olive-sided flycatcher and barn swallow, were detected within the mine site and mine site LSA. Three olive-sided flycatchers were detected within the mine site and LSA at elevations ranging from 1,199 m to 1,416 m (**Table 3.4-2**). One was detected within mature pine forest with 60% canopy closure adjacent to younger forest in the ESSFmv1 subzone (**Table 3.3-2**) (**Table 3.4-3**). The two other detections were in recently harvested areas within the SBSmc3 subzone. Overall, olive-sided flycatchers appeared to prefer areas with a mosaic of mature lodgepole pine stands and recently harvested areas through the mine site. All barn swallows detected within the mine site study areas were seen around the mine exploration camp. Two individuals were seen in 2011 flying around camp, a pair was detected in 2012, and two pairs were seen in 2013; pairs nested on buildings in camp in both 2012 and 2013. Barns swallows are typically associated with anthropogenic features, and it is unlikely they would have been found nesting within the mine site before the camp was built.

Table 3.4-2: Number of Detection Sites and Number of Individuals of Forest and Grassland Species of Conservation Concern during 2011, 2012, and 2013 Surveys for each LSA and the RSA of the Project

Species	Mine Site		Mine Site LSA		Transmission Corridor		Transmission Line LSA		Mine Access Road Corridor		Mine Access Road LSA		Kluskus FSR ROW		Kluskus FSR LSA		Water Pipeline Corridor		Water Pipeline LSA		Airstrip Corridor		Airstrip Corridor		RSA	
	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites
Barn swallow	17	4	0	0	1	1	2	1	1	1	0	0	4	1	2	2	0	0	0	0	0	0	0	0	2	2
Common nighthawk	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	6	6
Olive-sided flycatcher	2	2	1	1	18	18	12	12	2	2	1	1	11	11	5	5	4	4	5	5	4	4	2	2	19	19
Rusty blackbird	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	4	3	2	0	0	0	0	0	0
Sharp-tailed grouse	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	4
Total Individuals	**21**		**1**		**19**		**14**		**3**		**1**		**15**		**7**		**8**		**9**		**4**		**2**		**33**	
Total Species	**5**		**3**		**11**		**4**		**1**		**4**		**0**		**3**		**0**		**0**		**0**		**0**		**0**	

Table 3.4-3: Biogeoclimatic Zones where Forest and Grassland Species of Conservation Concern were Detected at the Project from 2011–2013

BGC Zone BGC Sub-Zone Species	Boreal Altai Fescue Alpine (BAFA)		Engelmann Spruce - Subalpine Fir (ESSF)				Sub-Boreal Spruce (SBS)					
	Undifferentiated (un)		Moist-Very Cold (mv1)		Moist-Very Cold-Parkland (mvp)		Moist-Cold (mc)		Dry-Cool (dk)		Dry-Warm (dw)	
	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites
Barn swallow	0	0	17	4	0	0	9	5	2	2	0	0
Common nighthawk	0	0	1	1	0	0	5	5	2	2	1	1
Olive-sided flycatcher	0	0	5	5	0	0	69	69	12	12	4	4
Rusty blackbird	0	0	0	0	0	0	18	12	1	1	0	0
Sharp-tailed grouse	0	0	0	0	0	0	6	4	0	0	0	0
Total Individuals	**0**		**23**		**0**		**107**		**17**		**5**	
Total Species	**0**		**3**		**0**		**5**		**4**		2	

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370000
380000
390000
5910000
5900000
5890000

Proposed Transmission Line

Proposed Transmission Line (Mills Ranch re-route)

Proposed Airstrip

Proposed Airstrip Access Road

Kluskus-Ootsa FSR

Proposed Water Pipeline Route

Tatelkuz Lake

Snake Lake

Top Lake

Proposed Mine Access Road

Exploration Road

Kluskus-Blue FSR

Kuyakuz Lake

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Legend

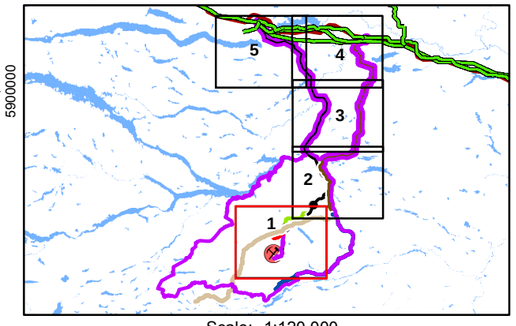
Landbird Species of Conservation Concern

- Barn Swallow
- Common Nighthawk
- Great Blue Heron
- Olive-sided Flycatcher
- Rusty Blackbird
- Sharp-tailed Grouse ssp. columbianus
- Short-eared Owl

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

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area



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2 1 0 2 4

Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold

PROJECT: Blackwater Gold Project

2011, 2012, and 2013 Locations of Landbird Species of Conservation Concern (Map 1 of 5)

DATE: October, 2013	ANALYST: AA	**Figure** 3.4-1
JOB No: VE52277	QA/QC: MY	PDF FILE: 11-100-038_landbird_SCC_v2.pdf
GIS FILE: 11-100-038_landbird_SCC_v2.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	amec

3.4.2.2 Common Nighthawk

Three common nighthawk PCs were conducted within the mine site study area, and one nighthawk was detected in between stations during this survey (**Figure 3.4-1**). A second bird was detected during the yellow rail auditory survey at wetlands within the mine site LSA. Both detections were in the ESSFmv at 1,261 m and 1,355 m in elevation, with one bird seen flying over mature forest near the mine site, and the second recorded on a song meter in a listed wetland community that included bog, swamp, and fen components. The surrounding forest was a young pine-dominated forest. This bird was recorded calling, which given the time of year indicates a territorial display. This species prefers open areas, such as clearcuts and wetlands, and may be found in lower elevations within this study area.

3.4.2.3 Clark's Nutcracker

One Clark's nutcracker survey took place in 2012 and three took place in 2013. Surveys took place on Mount Davidson on 18 September 2012 and 9 June, 22 July, and 10 September 2013. Eight permanent transects, each 1 km to 2 km long, were established through whitebark pine stands near the top of Mount Davidson, and one additional longer transect was established through both whitebark pine stands and lodgepole pine stands at lower elevations (**Figure 2.1-2**). Two to four surveyors completed the transects in an eight-hour period in 2012 and 2013. No nutcrackers were detected during the 2012 surveys; however, a previous site visit by whitebark pine experts noted that 2012 was a poor cone crop year for whitebark pine and minimal cones were produced. Transects in June of 2013 noted one nutcracker in the whitebark pine located on the south side of Mount Davidson in early June before the cones has ripened (**Figure 3.4-2**). In early July, five nutcrackers were detected flying around within the whitebark pine. On the last transect of 2013 in September, one nutcracker was detected flying over Mount Davidson. Nutcrackers have also been detected incidentally within the mine site LSA during 2011, 2012, and 2013. Five nutcrackers were detected within the mine site and LSA. One of the detections was within the ESSFmvp subzone and the other four within the ESSFmv and between 1,325 m and 1,646 m in elevation. Out of the detections in the ESSFmv, three were in old growth alpine fir forest and two were in mature pine forest. The one detection in the ESSfmvp was in old growth alpine fir.

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N

Proposed Transmission Line

Proposed Transmission Line (Mills Ranch re-route)

Proposed Airstrip

Water Pipeline Route

Tatelkuz Lake

Kluskus-Ootsa FSR

Proposed Airstrip Access Road

Snake Lake

Top Lake

Proposed Mine Site Access Road

Exploration Road

Kuyakuz Lake

Kluskus-Blue FSR

Euchiniko Lakes

Legend

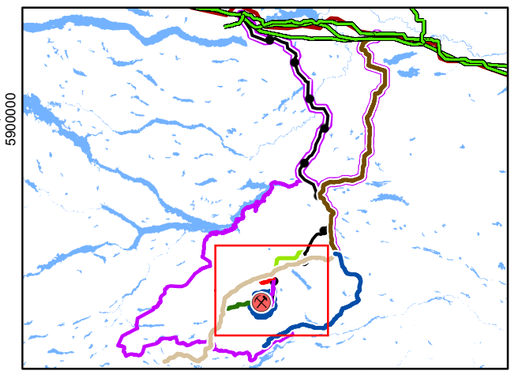
- Whitebark Pine Distribution Extent
- Whitebark Pine Outlying Points

Clark's Nutcracker Detection

- 2011
- 2012
- 2013
- Kluskus-Blue FSR
- Kluskus-Ootsa FSR
- Existing Road
- Exploration Road
- Proposed Transmission Line
- Proposed Transmission Line (Mills Ranch re-route)
- Proposed Mine Site Access Road
- Proposed Airstrip Access Road
- Water Supply Pipeline
- Proposed Airstrip
- Stream (>= 2nd Order)
- Waterbody (>= 4 Ha)
- Proposed Mine Site

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area



Scale: 1:120,000

0 1 2 4 6

Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold

PROJECT: Blackwater Gold Project

Clarks's Nutcracker

DATE: October, 2013	ANALYST: AA	**Figure** 3.4-2
JOB No: VE52277	QA/QC: MY	PDF FILE: 11-100-053_Clarks_Nutcracker_v2.pdf
GIS FILE: 11-100-053_Clarks_Nutcracker_v2.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	amec

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3.4.2.4 Sharp-Tailed Grouse Lek

Two sharp-tailed grouse lek surveys were completed within the mine site and LSA in June of 2012 and May of 2013 (**Figure 3.4-1**). Lek PC stations were established in potential lek habitat: large (>25 ha) open areas, which typically were fairly young cutblocks with regeneration not having full canopy closure. No detections of leks or individual birds were made in the mine site or LSA during 2011–2013.

3.4.2.5 Raptors

Aerial surveys for bald eagle (*Haliaeetus leucocephalus*) and osprey (*Pandion haliaetus*) in the VFD were completed in 1997; however, no other diurnal raptor surveys were found to have taken place within the VFD (Poole, 1998). The surveys indicated that the highest concentration of productive nests was located within the VFD when compared to the adjacent FSJFD. The aerial surveys focused on the Dry-Cool, Dry-Warm, and Moist-Cold subzones of the SBS zone. The SBSdk is found within the transmission line, Kluskus FSR, and water pipeline; the SBSmc subzones are found within all six LSAs and the RSA; and the SBSdw subzone is only found within the transmission line and the access route study areas. Bald eagle nests were most frequently found (65%) in live deciduous trees located in coniferous-dominated stands. Ospreys were found to nest primarily in dead coniferous trees located in coniferous-dominated stands. Surveys took place entirely within the SBS BGC zone. Overall, nest sites were most frequently found within the SBSdk (59.6% = 84 nests), followed by the SBSdw (22.0% = 31 nests), and SBSmc (18.4% = 26 nests) subzones.

Northern goshawk (*Accipiter gentilis*) studies have been completed within the Nadina Forest District (NFD), which identified nesting locations and nest productivity (Mahon, 2009). Nest productivity was found to have declined over the 10-year study period, and the magnitude of change was similar between the SBS and Interior Cedar-Hemlock (ICH) BGC zones. As a result, it was thought that the current mountain pine beetle (MPB) epidemic or the related salvage logging operations were not the cause of the productivity declines.

The majority (86%, n = 84) of nest areas within the SBS BGC zone were located in pine-leading stands, with varying minor components of spruce, subalpine fir, and trembling aspen. Characteristics similar to most (87%) nest areas were zonal sites (01 site series), stand age >120 years, crown closure greater than 50%, and sparse herb and shrub development in the understory. Goshawks also appeared to avoid edges of road ROWs and clearcuts, with 87% (n = 85) of nest sites greater than 100 m from forest edges.

Buckland and Martin (1998) completed nocturnal CPSs to determine owl species diversity within the VFD, using presence/non-detection methodology. Four species of owl were found within the SBSmc2 and SBSmc3 subzones, including boreal owl (*Aegolius funereus*), barred owl (*Stix varia*), northern saw-whet owl (*Aegolius acadiucs*), and great-horned owl (*Bubo virginianus*). Boreal owl was the only owl species detected in the ESSFmv1 subzone.

Raptor surveys within the mine site and mine site LSA involved using CPS, stand watches, and roadside surveys (**Figure 2.1-11**). During the ten days of surveying in 2012 and 2013 within the mine site and LSA, four days were spent on Diurnal raptors and six days on nocturnal raptors. No data were collected in 2011 other than incidental observations.

Table 3.4-4: Surveying Dates for Raptors within the Mine Site and LSA in 2012 and 2013

Survey Type	Mine Site		Mine Site LSA	
	2012	2013	2012	2013
CPS – Diurnal	2, 3, 4 May; 6 June	n/a	2. 4 May; 6 June	n/a
CPS – Nocturnal	11,18 April; 4 May	10 June	19 April; 5 May	n/a
Stand watch – Diurnal	2 May	n/a	n/a	
Stand watch – Nocturnal	11 April	n/a	n/a	

Note: LSA = Local Study Area; N/A = not applicable; RSA = Regional Study Area

Six species of raptors were detected within the mine site and LSA during the 2011, 2012, and 2013 fieldwork (**Table 3.4-5**, **Figure 3.4-3**). The most frequently detected raptor was the red-tailed hawk (*Buteo jamaicensis*), followed by the northern goshawk.

Four red-tailed hawks were detected at three sites within the mine site at elevations between 1,325 m and 1,491 m within ESSFmv1 forest (**Table 3.4-5**). The detections were all within pine-leading forest aged 61–121+ years within the northern portion of the mine site and LSA.

Five other diurnal raptor species were detected within the mine site and mine site LSA (**Table 3.4-3**). Three northern goshawks were detected at three sites within the mine site, where potential nesting habitat was also located. This habitat consisted of lower elevation mixed wood stands along the northern part of the mine site LSA associated with the major creek drainages (Ecofor, 2012c). Probable nesting locations, identified through territorial and agitated behavior, were also found for sharp-shinned hawk (*Accipiter striatus*) and red-tailed hawk within the mine site and LSA; however, actual nest sites were not found. Most sightings occurred within the mine site and LSA, where preferred old-growth pine and pine-spruce stands were found. No owls were detected within the mine site or LSA.

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Proposed Transmission Line

Proposed Transmission Line (Mills Ranch re-route)

Proposed Airstrip

Kluskus-Ootsa FSR

Proposed Airstrip Access Road

Proposed Water Pipeline Route

Tatelkuz Lake

Snake Lake

Top Lake

Proposed Mine Site Access Road

Exploration Road

Kuyakuz Lake

Kluskus-Blue FSR

N

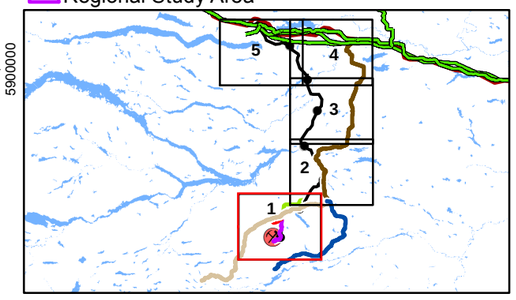
Legend

- American Kestrel
- Bald Eagle
- Barred Owl
- Boreal Owl
- Cooper's Hawk
- Great Gray Owl
- Great Horned Owl
- Long Eared Owl
- Merlin
- Northern Goshawk
- Northern Harrier
- Northern Pygmy Owl
- Northern Saw-whet Owl
- Osprey
- Owl Species
- Red-tailed Hawk
- Sharp-shinned Hawk
- Short-eared Owl

- Exploration Road
- Proposed Mine Site Access Road
- Proposed Transmission Line
- Proposed Water Supply Route
- Proposed Transmission Line (Mills Ranch re-route)
- Kluskus-Blue FSR
- Kluskus-Ootsa FSR
- Existing Road
- Proposed Airstrip Access Road
- Stream (>= 2nd Order)
- Waterbody (>= 4 Ha)
- Wetland
- Proposed Airstrip
- Proposed Mine Site

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area



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2 1 0 2 4

Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold

PROJECT: Blackwater Gold Project

Raptor Detections

Map 1 of 5

DATE:	ANALYST:	**Figure** 3.4-3
October, 2013	AA	
JOB No: VE52277	QA/QC: MY	PDF FILE: 11-100-041_Raptor_Detections_v2.pdf
GIS FILE: 11-100-041_Raptor_Detections_v2.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	amec

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Table 3.4-5: Number of Detection Sites and Number of Individuals of Raptors during 2011, 2012 and 2013 Surveys for each LSA and the RSA of the Project

Species	Mine Site		Mine Site LSA		Transmission Corridor		Transmission Line LSA		Mine Access Road Corridor		Mine Access Road LSA		Kluskus FSR ROW		Kluskus FSR LSA		Water Pipeline Corridor		Water Pipeline LSA		Water Pipeline RSA		Water Pipeline RSA		Airstrip Corridor		Airstrip Corridor LSA		RSA	
	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites
Bald eagle	1	1	1	1	1	1	1	1	0	0	0	0	3	3	1	1	0	0	0	0	0	0	0	0	0	0	0	0	6	5
Northern harrier	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0	1	1	0	0	0	0	0	0	0	0	0	0	5	5
Sharp-shinned hawk	1	1	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3
Cooper's hawk	1	1	0	0	0	0	1	1	0	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Northern goshawk	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Rough-legged hawk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Red-tailed hawk	4	3	0	0	2	2	4	4	1	1	1	1	13	12	2	2	2	2	2	1	0	0	0	0	1	1	0	0	16	14
American kestrel	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1	1	4	4
Merlin	1	1	0	0	0	0	2	2	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	3	3
Osprey	0	0	0	0	1	1	2	2	0	0	0	0	3	3	1	1	0	0	0	0	0	0	0	0	0	0	0	0	5	3
Great horned owl	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0	0	0	0	0	0	0	0	0	0	6	6
Northern pygmy-owl	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Short-eared owl	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Long-eared owl	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Barred owl	0	0	0	0	3	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	2	2
Northern saw-whet owl	0	0	0	0	4	2	1	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2
Boreal owl	0	0	0	0	1	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2
Great gray owl	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Individuals	**10**	**10**	**1**	**1**	**15**	**11**	**15**	**15**	**1**	**1**	**1**	**1**	**25**	**23**	**7**	**7**	**8**	**8**	**2**	**1**	**0**	**0**	**0**	**0**	**1**	**1**	**1**	**1**	**57**	**52**
Total Species	**7**		**2**		**8**		**8**		**1**		**1**		**7**		**6**		**5**		**1**		**0**		**0**		**1**		**1**		**14**	

Note: LSA = Local Study Area; RSA = Regional Study Area

Table 3.4-6: Biogeoclimatic Zones where Raptors Species were found at the Project during 2011–2013

BGC Zone BGC Sub-Zone Species	Boreal Altai Fescue Alpine (BAFA)		Engelmann Spruce - Subalpine Fir (ESSF)				Sub-Boreal Spruce (SBS)					
	Undifferentiated (un)		Moist-Very Cold		Moist-Very Cold-Parkland		Moist-Cold		Dry-Cool		Dry-Warm	
	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites
Bald eagle	0	0	3	3	1	1	3	3	5	4	0	0
Northern harrier	0	0	1	1	1	1	6	6	0	0	0	0
Sharp-shinned hawk	0	0	2	2	0	0	4	4	0	0	0	0
Cooper's hawk	0	0	1	1	0	0	0	0	2	1	1	1
Northern goshawk	0	0	2	2	0	0	*2*	*2*	0	0	0	0
Rough-legged hawk	0	0	0	0	0	0	*1*	*1*	0	0	0	0
Red-tailed hawk	0	0	3	3	0	0	30	26	11	11	2	2
American kestrel	0	0	0	0	0	0	7	7	0	0	1	1
Merlin	0	0	0	0	0	0	5	5	1	1	0	0
Osprey	0	0	1	1	0	0	4	4	3	3	0	0
Great horned owl	0	0	1	1	0	0	8	8	0	0	0	0
Northern pygmy owl	0	0	0	0	0	0	1	1	0	0	1	1
Short-eared owl	0	0	0	0	0	0	0	0	1	1	0	0
Long-eared owl	0	0	1	1	0	0	0	0	0	0	0	0
Barred owl	0	0			0	0	2	2	0	0	4	2
Northern saw-whet owl	0	0	1	1	0	0	1	1	4	2	3	3
Boreal owl	0	0	2	2	0	0	0	0	0	0	2	2
Great gray owl					0	0	1	1	0	0	0	0
Total Individuals	**0**		**11**		**2**		**74**		**27**		**14**	
Total Species	**0**		**9**		**2**		**14**		**7**		**7**	

Note: BGC = biogeoclimatic

3.4.2.6 Waterbirds

Background information searches did not identify any historical surveys completed within any of the study areas.

Aerial breeding waterbird surveys using RISC standards protocols were used to search three water bodies in the mine site and the LSA (**Figure 3.4-4**). Additional observations of waterbirds were made incidentally during other surveys. Aerial surveys were conducted on 17 July 2011, 7 July 2012, and 22 July 2013. Incidental observations occurred between 19 June 2011 and 24 July 2013.

Eight waterbird species were found within the mine site and its LSA (**Table 3.4-7**) from aerial surveys and wetland visits during the breeding season of the summers of 2011 through 2013 at a total of 10 different sites. Wilson's snipe (*Gallinago gallinago*) was the most commonly detected waterbird within the mine site and LSA (eight individuals at eight sites). This species requires open areas for nesting, and frequently uses harvested areas as well as wetlands. A large number of the detections during the wildlife surveys were of males displaying from harvested areas, which are widespread across the study areas at lower elevations. The majority of the detection occurred within the ESSFmv1 and SBSmc BGC subzones.

Within the mine site and LSA, the wetland within the SBSmc subzone had the highest diversity of species (n = 14) and number of individuals, followed by ESSFmv1 subzone (n = 11) (**Table 3.4-8**). Twelve of the 16 species detected during the breeding season had the highest number of detection sites within the SBSmc, compared with the other BGC subzones present. Two species, Barrow's goldeneye (*Bucephala islandica)* and Wilson's snipe, had slightly higher numbers of detections within the ESSFmv1 zone.

Table 3.4-7: Detections and Number of Individuals of Waterbirds during the Breeding Surveys of 2011–2013 Surveys of each LSA and RSA of the Project

Species	Mine Site		Mine Site LSA		Transmission Line Corridor		Transmission Line LSA		Mine Access Road Corridor		Mine Access Road LSA		Kluskus FSR ROW		Kluskus FSR LSA		Water Pipeline Corridor		Water Pipeline LSA		Airstrip Corridor		Airstrip LSA		RSA	
	No. Individ.	Sites	No. Individ.	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites
Barrow's goldeneye	0	0	5	1	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	22	12
Belted kingfisher	0	0	0	0	2	2	2	2	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Bonaparte's gull	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	14	2	0	0	0	0	9	5
Bufflehead	1	1	0	0	0	0	6	3	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	38	19
Canada goose	0	0	0	0	32	1	0	0	1	1	0	0	0	0	32	1	1	1	0	0	0	0	0	0	57	7
Common goldeneye	0	0	0	0	12	1	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0
Common loon	2	2	0	0	3	3	3	3	0	0	0	0	3	3	0	0	0	0	3	1	0	0	0	0	19	15
Common merganser	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	22	3
Greater yellowlegs	2	2	2	2	3	3	4	4	1	1	0	0	6	5	2	2	4	4	2	2	0	0	0	0	18	15
Greater white-fronted goose	0	0	0	0	20	1	0	0	0	0	0	0	0	0	20	1	0	0	0	0	0	0	0	0	0	0
Green-winged teal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	5
Herring gull	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Hooded merganser	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2
Killdeer	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Lesser yellowlegs	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Mallard	0	0	0	0	13	2	0	0	0	0	0	0	21	2	13	2	0	0	0	0	0	0	0	0	14	7
Northern shoveler	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0
Ring-necked duck	0	0	0	0	0	0	21	5	0	0	0	0	0	0	5	1	0	0	0	0	0	0	0	0	49	12
Red-breated merganser	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Sandhill crane	0	0	1	1			2	1	0	0	0	0	1	1	0	0	2	1	0	0	3	2	0	0	28	3
Solitary sandpiper	3	2	0	0	1	1	0	0	0	0	0	0	0	0	1	1	0	0	2	1	0	0	0	0	9	9
Spotted sandpiper	1	1	0	0	2	2	0	0	0	0	0	0	2	2	1	1	0	0	0	0	0	0	0	0	2	2
Unknown duck species	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Wilson's snipe	7	7	1	1	11	11	3	3	1	1	0	0	5	5	2	2	2	1	0	0	1	1	1	1	18	17
Total Individuals	**16**		**10**		**101**		**41**		**3**		**0**		**43**		**79**		**10**		**21**		**4**		**1**		**320**	
Total Species	**6**		**5**		**12**		**7**		**3**		**0**		**10**		**11**		**5**		**4**		**2**		**1**		**19**	

Note: LSA = Local Study Area; RSA = Regional Study Area

Table 3.4-8: Sites and Numbers of Individuals of Breeding Waterbirds Detected at the Project in 2011-2013 by Biogeoclimatic Subzone

BGC Zone BGC Sub-Zone Species	ESSF				SBS			
	Moist-Very Cold (mv1)		Moist-Very Cold-Parkland (mvp)		Moist-Cold (mc)		Dry-Cool (dk)	
	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites
Barrow's goldeneye	10	3	0	0	5	1	1	1
Bonaparte's gull	0	0	0	0	19	7	0	0
Bufflehead	14	1	0	0	14	10	0	0
Canada goose	0	0	0	0	6	4	0	0
Common loon	4	4	0	0	14	9	2	1
Common merganser	1	1	0	0	0	0	2	2
Greater yellowlegs	7	4	0	0	21	19	0	0
Green-winged teal	2	1	0	0	8	3	0	0
Herring gull	0	0	0	0	1	1	0	0
Hooded merganser	1	1	0	0	1	1	0	0
Mallard	10	1	0	0	8	2	8	2
Ring-necked duck	12	1	0	0	7	3	1	1
Sandhill crane	0	0	0	0	31	5	2	2
Solitary sandpiper	2	2	1	1	13	10	0	0
Spotted sandpiper	1	1	0	0	5	4	0	0
Unknown duck species	0	0	0	0	1	1	0	0
Wilson's snipe	26	19	0	0	18	16	1	1
Total Individuals	**90**		**1**		**148**		**16**	
Total Species	**12**		**1**		**16**		**7**	

Note: BGC = biogeoclimatic; ESSF = Engelmann Spruce - Subalpine Fir; SBS = Sub-Boreal Spruce

360000 370000 380000 390000

5910000 5900000 5890000

Proposed Transmission Line

Proposed Transmission Line (Mills Ranch re-route)

Proposed Airstrip

Kluskus-Ootsa FSR

Proposed Airstrip Access Road

Water Pipeline Route

Tatelkuz Lake

Snake Lake

Top Lake

Proposed Mine Site Access Road

Exploration Road

Kuyakuz Lake

Kluskus-Blue FSR

N

Legend

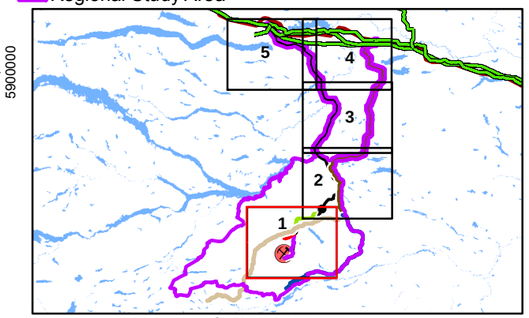
Waterbird Detections

- Goldeneye Species
- Bald Eagle
- Spotted Sandpiper
- Bonaparte's Gull
- Herring Gull
- Barrow's Goldeneye
- Bufflehead
- Common Loon
- Common Merganser
- Hooded Merganser
- Red-breasted Merganser
- Green-winged Teal
- Mallard
- Ring-necked Duck
- Unknown Duck Species
- Greater Yellowlegs
- Lesser Yellowlegs
- Wilson's Snipe
- Belted Kingfisher
- Red-winged Blackbird
- Rusty Blackbird

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

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area



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Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold		
PROJECT: Blackwater Gold Project		
Breeding Waterbirds Detections (Map 1 of 5)		
DATE: October, 2013	ANALYST: AA	**Figure** 3.4-4
JOB No: VE52277	QA/QC: MY	PDF FILE: 11-100-048_waterbird_detections_v3.pdf
GIS FILE: 11-100-048_waterbird_detections_v3.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	amec

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3.4.3 Linear Features and Corresponding LSAs

3.4.3.1 Transmission Line Corridor and LSA

Forest and Grassland Songbird Survey

Fifty-two species of birds were detected within the transmission line corridor and LSA (**Table 3.4-7**, **Annex 10**). A total of 69 point counts were established along the transmission line corridor, and an additional 39 were established within the transmission line LSA (**Table 3.4-9**, **Figure 2.1-6** to **Figure 2.1-10**). Additional observations were made incidentally during other surveys. Breeding bird surveys occurred from 19 June to 20 July in 2011, 18 June to 11 July in 2012, and 7 June to 26 June in 2013. Incidental observations occurred between 19 June 2011 and 11 September 2013.

Table 3.4-9: Total Number of Point Count Stations in the Transmission Line Corridor and LSA for 2011, 2012, and 2013

Survey Type	Transmission Line Corridor	Transmission Line LSA
Breeding bird survey	69	39
Sharp-tailed grouse survey	0	7

Note: LSA = Local Study Area; RSA = Regional Study Area

A total of 30 olive-sided flycatchers were detected within the transmission line corridor and the transmission line LSA (**Table 3.4-2**, **Figure 3.4-1** and **Figure 3.4-5** to **Figure 3.4-8**). The majority of the detections were located in lodgepole pine forest within the SBS BGC zone, except for one that was in an old pine forest within the ESSFmv subzone; most were located within the SBSmc (n = 15) subzone followed by the SBSdk (n = 10), and SBSdw (n = 4) (**Table 3.4-3**). All of the detections occurred between 715 m and 1,343 m in elevation. Eleven of the 30 detections were within 300 m of wetlands, and most of the flycatchers were detected within a matrix of recently harvested areas and mature forest or within mature forest that was adjacent to a recently harvested area or young forest.

Two detections of rusty blackbirds occurred within the transmission line LSA; one each in the SBSmc and dk subzones (**Table 3.4-2**, Table 3.4-3, **Figure 3.4-2** and **Figure 3.4-5** to **Figure 3.4-8**). Both of the birds were found in stands of old white spruce forest surrounding wetlands with recently harvested areas nearby and located at 827 m and 1,112 m in elevation. Rusty blackbirds typically nest in wetlands and riparian areas, and these individuals were likely foraging at this location and may have been nesting nearby.

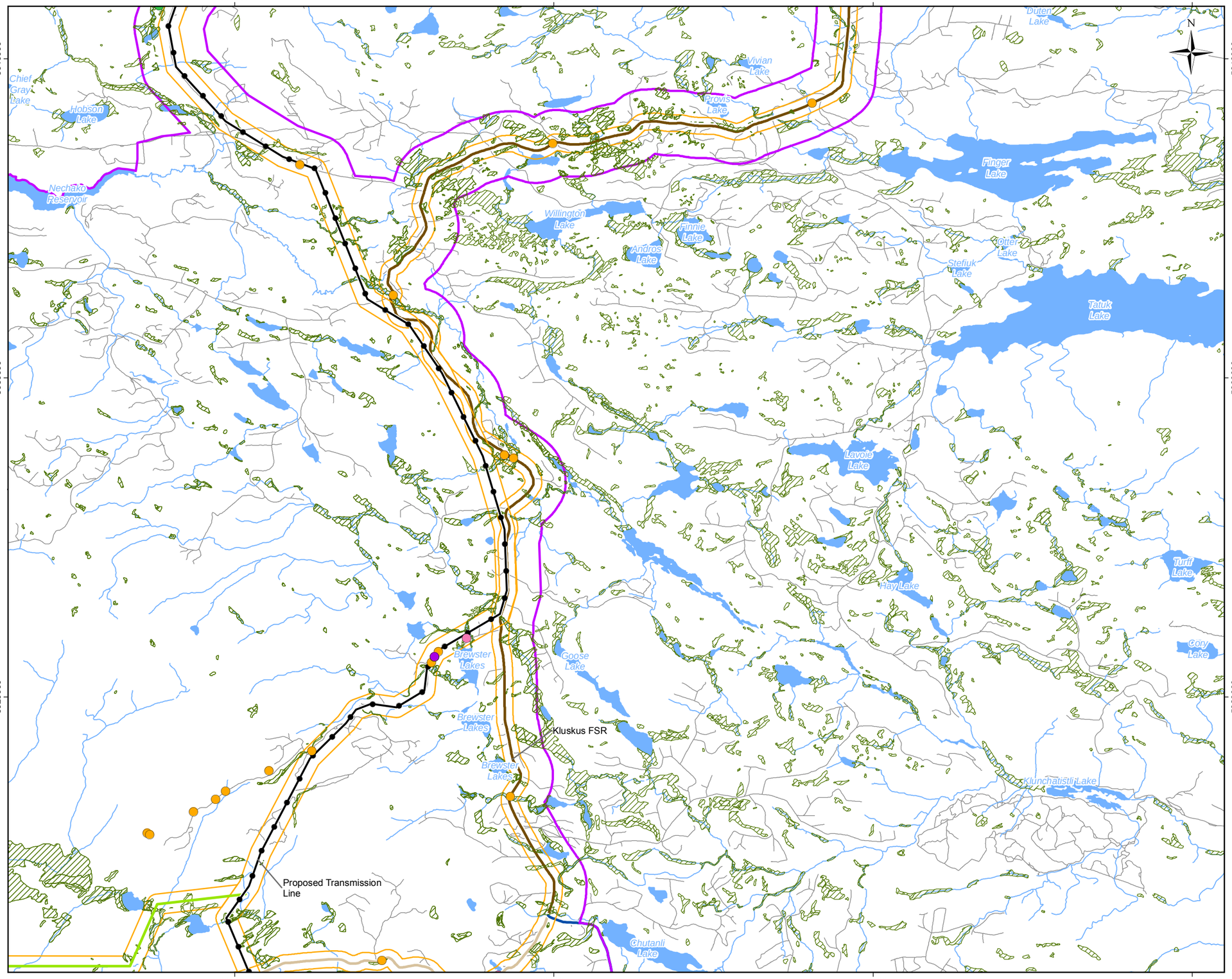
Barn swallow, a species of conservation concern, was detected at two locations within the transmission line LSA: one along a road 300 m north of Brewster Lake and one at Big Bend Meadows Recreation Site (**Table 3.4-2**, **Figure 3.4-2** and **Figure 3.4-5** to **Figure 3.4-8**). The detection at Big Bend Meadows was a pair nesting in an outhouse. The detection north of Brewster Lake was an individual foraging in a natural setting. Barn swallows are typically

associated with anthropogenic features, and many areas along the transmission line study areas contain potential nesting locations.

The transmission line corridor and LSA had the second highest number of species detected per point count (7.53), including six stations with more than 15 species detected. Four of the point counts with the highest number of species detected were located within 4.2 km of each other. All four of these stations were located adjacent to wetlands and spruce and aspen forest, and three also included mature and old growth (121+ years) lodgepole pine forest and recently harvested areas. The remaining two stations included one within a recently harvested area and one within a wetland complex of willow swamp and fen. All of the stations were within the SBSdk subzone

Sharp-tailed Grouse Lek Surveys

A total of seven sharp-tailed grouse lek PCs were conducted in May of 2012 and 2013 within the transmission line corridor and LSA (**Figure 3.4-1** and **Figure 3.4-5**). No sharp-tailed grouse were detected.



Legend

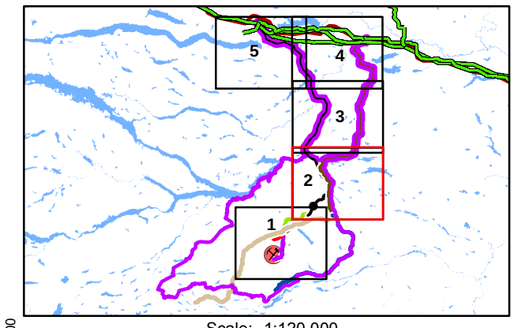
Landbird Species of Conservation Concern

- Barn Swallow
- Olive-sided Flycatcher
- Rusty Blackbird

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

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area



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Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold

PROJECT: Blackwater Gold Project

2011, 2012, and 2013 Locations of Landbird Species of Conservation Concern (Map 2 of 5)

DATE: October, 2013	ANALYST: AA	**Figure** 3.4-5
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GIS FILE: 11-100-038_landbird_SCC_v2.mxd		
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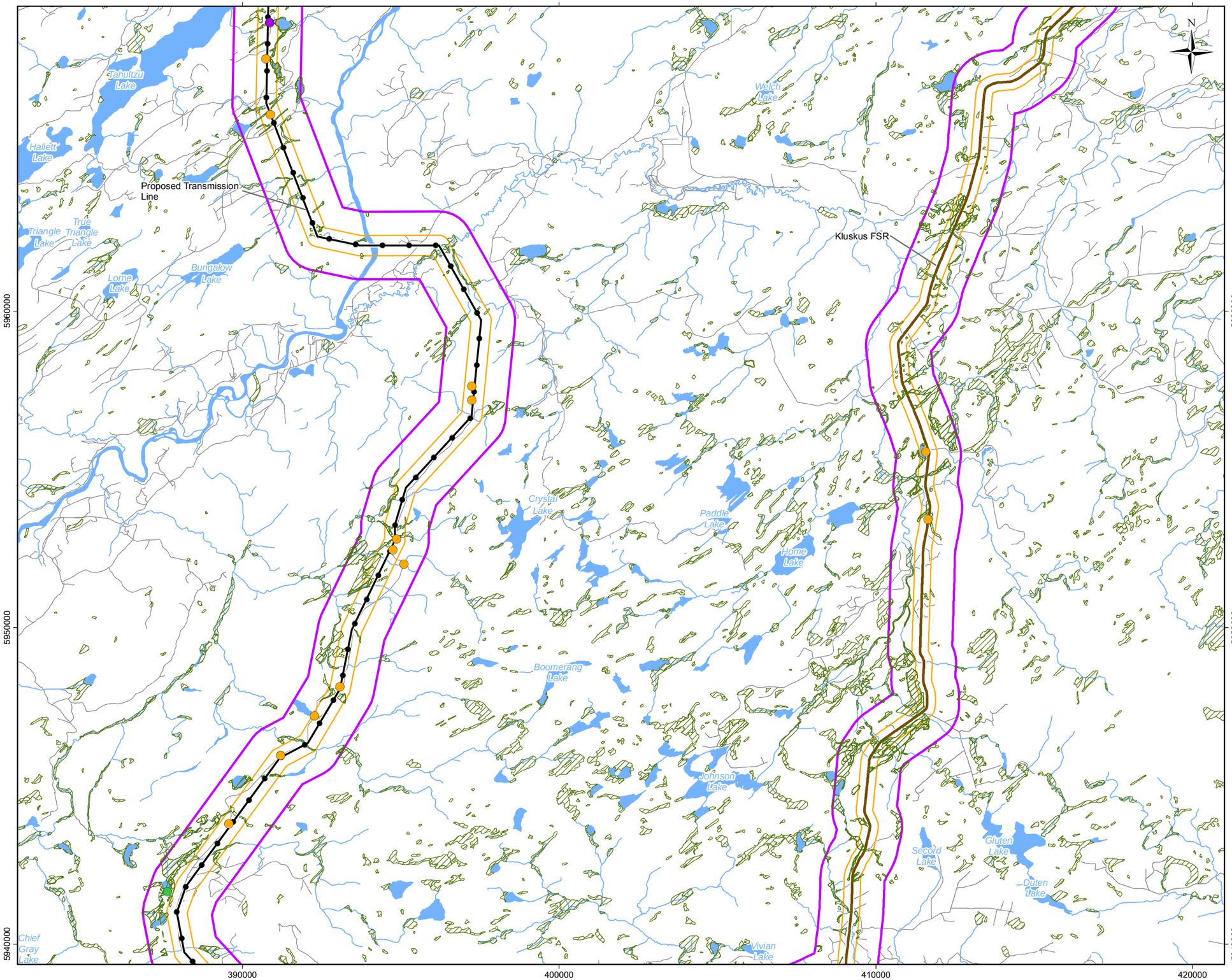


Legend

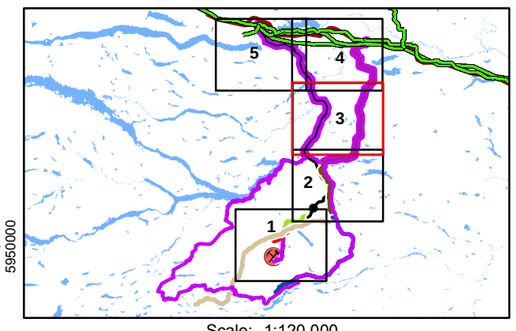
Landbird Species of Conservation Concern

- Olive-sided Flycatcher
- Rusty Blackbird

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

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area



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Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold		
PROJECT: Blackwater Gold Project		
2011, 2012, and 2013 Locations of Landbird Species of Conservation Concern (Map 3 of 5)		
DATE: October, 2013	ANALYST: AA	**Figure** 3.4-6
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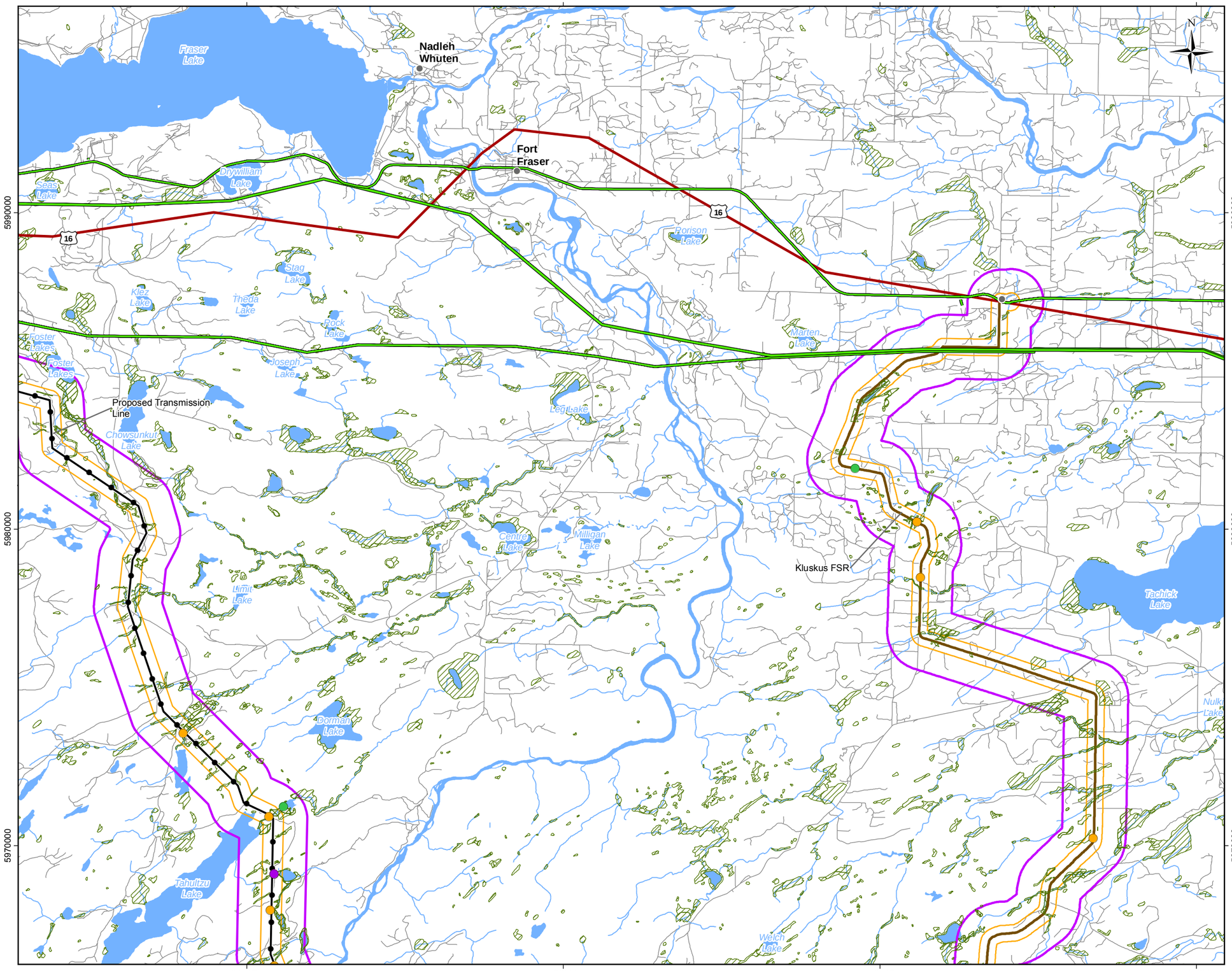


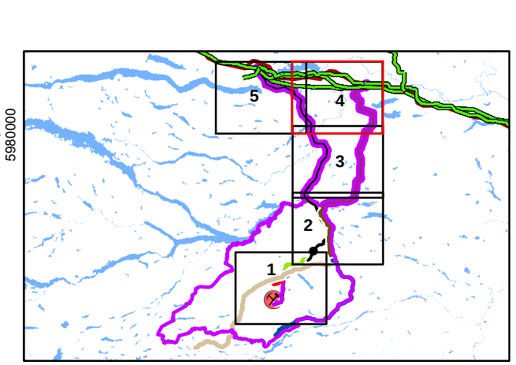
Legend

Landbird Species of Conservation Concern

- Common Nighthawk
- Olive-sided Flycatcher
- Rusty Blackbird
- Populated Place
- Proposed Transmission Line
- Kluskus FSR
- Existing Road
- Existing Transmission Line
- Highway
- Stream (>= 2nd Order)
- Waterbody (>= 4 Ha)
- Wetlands

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area



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Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold

PROJECT: Blackwater Gold Project

2011, 2012, and 2013 Locations of Landbird Species of Conservation Concern (Map 4 of 5)

DATE:	ANALYST:	**Figure** 3.4-7
October, 2013	AA	
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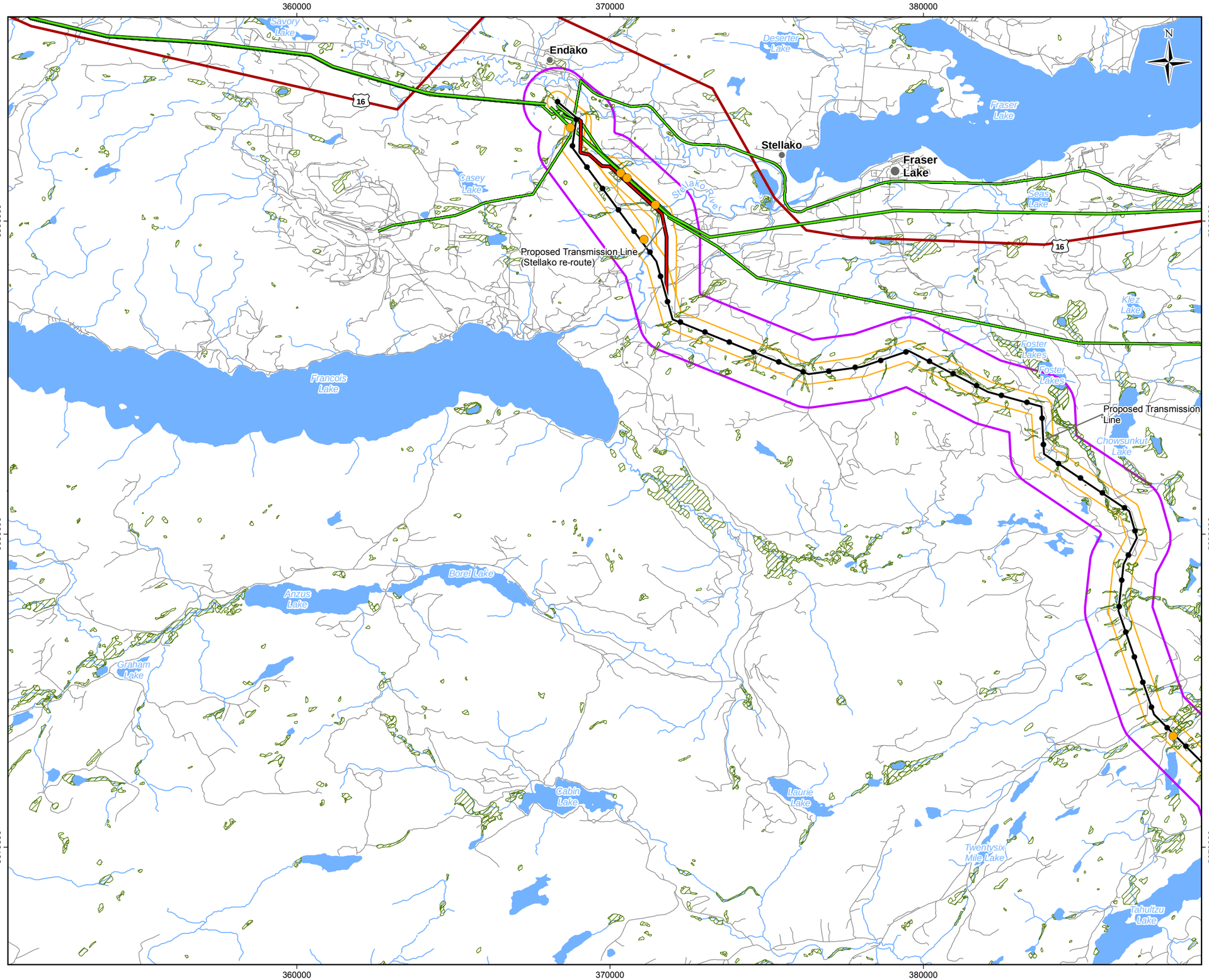


Legend

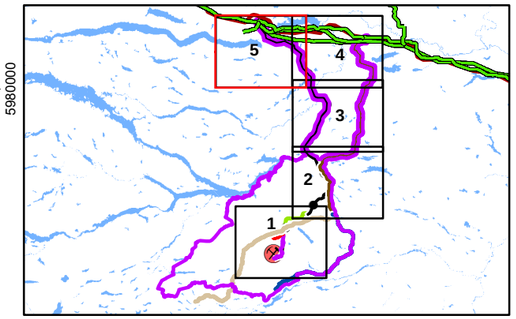
Landbird Species of Conservation Concern

- Olive-sided Flycatcher

- Proposed Transmission Line
- Proposed Transmission Line (Mills Ranch re-route)
- Existing Road
- Existing Transmission Line
- Highway
- Stream (>= 2nd Order)
- Waterbody (>= 4 Ha)
- Wetlands

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area



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Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold	
PROJECT: Blackwater Gold Project	
2011, 2012, and 2013 Locations of Landbird Species Conservation Concern (Map 5 of 5)	
DATE: October, 2013	ANALYST: AA
JOB No: VE52277	QA/QC: MY
GIS FILE: 11-100-038_landbird_SCC_v2.mxd	
PROJECTION: UTM Zone 10	DATUM: NAD83

Figure 3.4-8

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Raptors

Twelve species of raptors were recorded at 26 sites within the transmission line corridor and LSA (**Table 3.4-5**) and **Figure 3.4-3** and **Figure 3.4-9** to **Figure 3.4-12**. Two recently fledged bald eagles were detected repeatedly on the East Swanson FSR near the southern portion of the transmission line during the point count survey in early June 2013; however, it is unknown if they are the offspring of a nest site within any of the study areas.

All four detections of red-tailed hawks were within a mix of mature pine and spruce forest with young forest or a recently harvested area nearby. Two of the detections were in the SBSmc subzone and the other two within the SBSdk, and all were between 1325 m and 1491 m in elevation.

Most owls were detected nocturnally. During the CPS, however, two northern pygmy owls were detected calling in the early morning during breeding bird surveys. In 2013, a short-eared owl was detected during a stand watch in an agricultural field and grassland on the Tatelkuz Ranch next to the Kluskus FSR and Tatelkuz Lake. Due to the timing of the observation, the owl may be potentially breeding in the area.

During the nine days of surveying in 2012 and 2013 within the corridor and LSA, six days were spent on diurnal raptors and 3 days on nocturnal raptors (**Table 3.4-10**).

Table 3.4-10: Surveying Dates for Raptors within the Transmission Line Corridor and LSA during 2012 and 2013

Survey Type	Transmission Line Corridor		Transmission Line LSA	
	2012	2013	2012	2013
CPS – Diurnal	6 May, 7 June	7,11,13,21 June	n/a	13, 21 June
CPS – Nocturnal	n/a	6, 7 May	n/a	6, 7 May
Stand watch – Diurnal	n/a	n/a	n/a	n/a
Stand watch – Nocturnal	n/a	6 May	n/a	8 May

Note: CPS = call playback survey; LSA = Local Study Area; N/A = not applicable

390000 400000 410000 420000

5940000 5930000 5920000

Chief Gray Lake
Hobson Lake
Nechako Reservoir
Vivian Lake
Provis Lake
Duten Lake
Finger Lake
Willington Lake
Finnie Lake
Andros Lake
Potter Lake
Stefiuk Lake
Tatuk Lake
Lavoie Lake
Turff Lake
Play Lake
Cory Lake
Brewster Lakes
Goose Lake
Klunchatistli Lake
Chutanli Lake

Kluskus FSR

Proposed Transmission Line

N

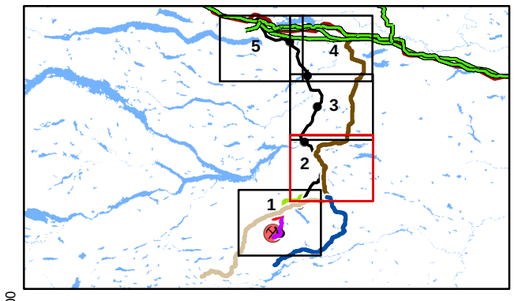
Legend

- American Kestrel
- Bald Eagle
- Barred Owl
- Boreal Owl
- Cooper's Hawk
- Great Gray Owl
- Great Horned Owl
- Long Eared Owl
- Merlin
- Northern Goshawk
- Northern Harrier
- Northern Pygmy Owl
- Northern Saw-whet Owl
- Osprey
- Owl Species
- Red-tailed Hawk
- Sharp-shinned Hawk
- Short-eared Owl

- Proposed Transmission Line
- Proposed Transmission Line (Mills Ranch re-route)
- Kluskus FSR
- Kluskus-Blue FSR
- Kluskus-Ootsa FSR
- Existing Road
- Stream (>= 2nd Order)
- Waterbody (>= 4 Ha)
- Wetland

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area



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Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold

PROJECT: Blackwater Gold Project

Raptor Detections
Map 2 of 5

DATE:	ANALYST:	**Figure** 3.4-9
October, 2013	AA	
JOB No: VE52277	QA/QC: MY	PDF FILE: 11-100-041_Raptor_Detections_v2.pdf
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PROJECTION: UTM Zone 10	DATUM: NAD83	amec

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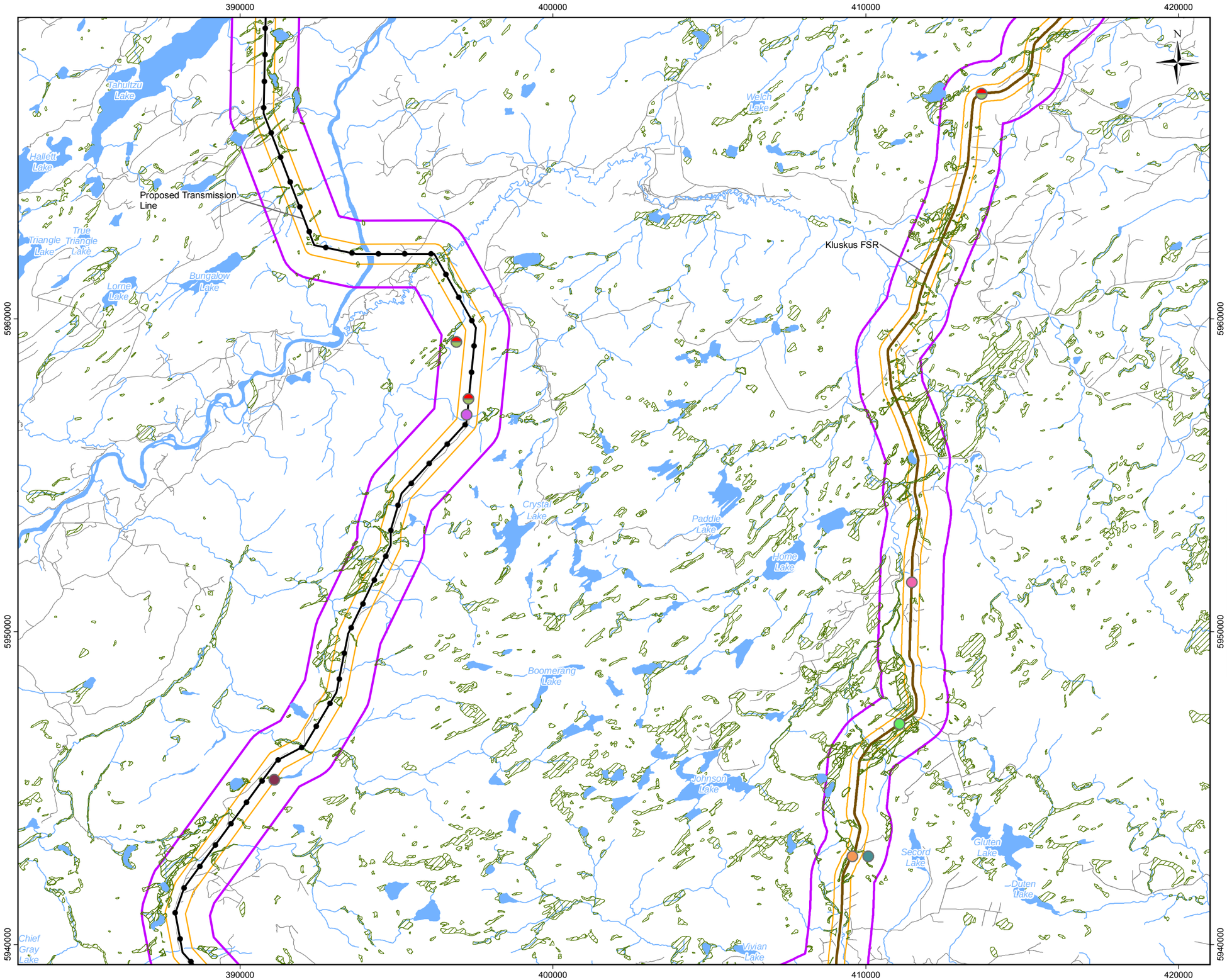
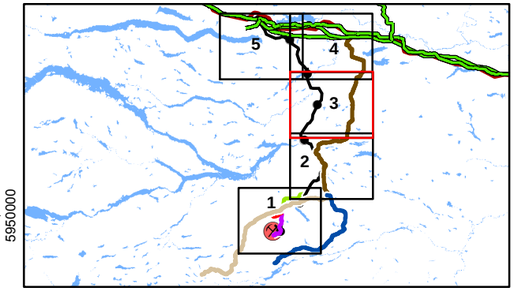


Legend

- American Kestrel
- Bald Eagle
- Barred Owl
- Boreal Owl
- Cooper's Hawk
- Great Gray Owl
- Great Horned Owl
- Long Eared Owl
- Merlin
- Northern Goshawk
- Northern Harrier
- Northern Pygmy Owl
- Northern Saw-whet Owl
- Osprey
- Owl Species
- Red-tailed Hawk
- Sharp-shinned Hawk
- Short-eared Owl
- Proposed Transmission Line
- Kluskus FSR
- Existing Road
- Stream (>= 2nd Order)
- Waterbody (>= 4 Ha)
- Wetland

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area



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2 1 0 2 4

Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold

PROJECT: Blackwater Gold Project

Raptors Detections
Map 3 of 5

DATE:	ANALYST:	**Figure** 3.4-10
October, 2013	AA	
JOB No: VE52277	QA/QC: MY	PDF FILE: 11-100-041_Raptor_Detections_v2.pdf
GIS FILE: 11-100-041_Raptor_Detections_v2.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	amec

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390000 400000 410000 420000

5990000 5980000 5970000

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

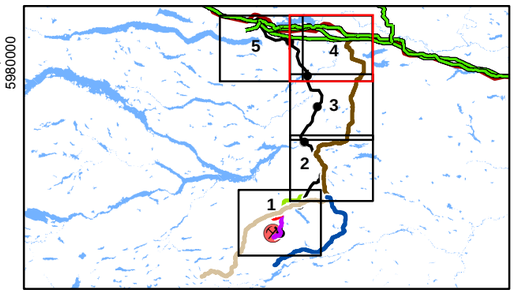
N

Legend

- American Kestrel
- Bald Eagle
- Barred Owl
- Boreal Owl
- Cooper's Hawk
- Great Gray Owl
- Great Horned Owl
- Long Eared Owl
- Merlin
- Northern Goshawk
- Northern Harrier
- Northern Pygmy Owl
- Northern Saw-whet Owl
- Osprey
- Owl Species
- Red-tailed Hawk
- Sharp-shinned Hawk
- Short-eared Owl
- Populated Place
- Proposed Transmission Line
- Kluskus FSR
- Existing Road
- Existing Transmission Line
- Highway
- Stream (>= 2nd Order)
- Waterbody (>= 4 Ha)
- Wetland

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area



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Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold

PROJECT: Blackwater Gold Project

Raptors Detections
Map 4 of 5

DATE:	ANALYST:	**Figure** 3.4-11
October, 2013	AA	
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GIS FILE: 11-100-041_Raptor_Detections_v2.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	amec

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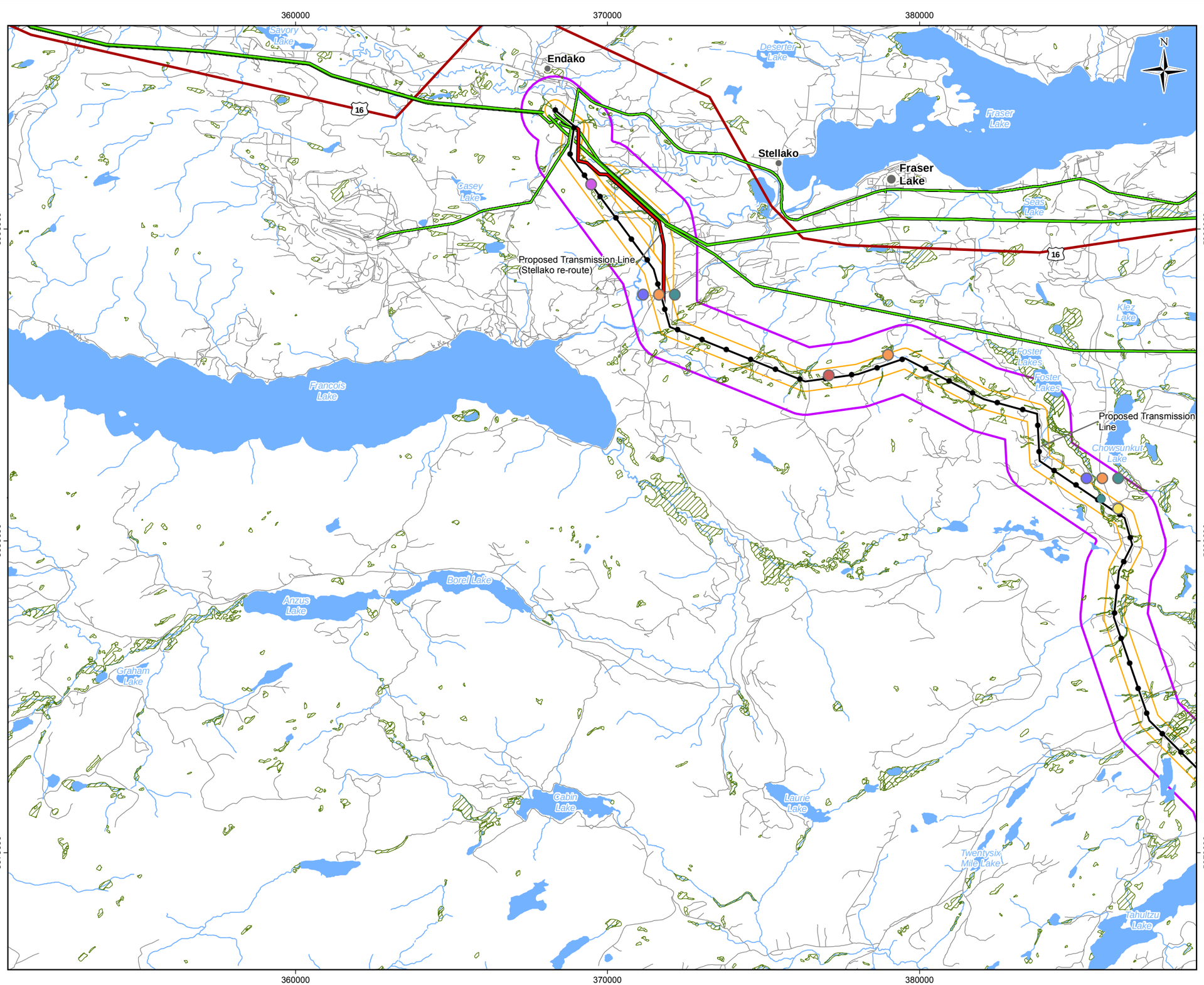
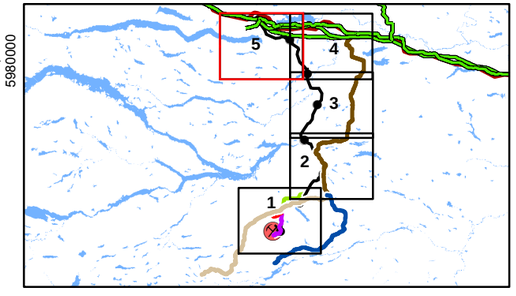


Legend

- American Kestrel
- Bald Eagle
- Barred Owl
- Boreal Owl
- Cooper's Hawk
- Great Gray Owl
- Great Horned Owl
- Long Eared Owl
- Merlin
- Northern Goshawk
- Northern Harrier
- Northern Pygmy Owl
- Northern Saw-whet Owl
- Osprey
- Owl Species
- Red-tailed Hawk
- Sharp-shinned Hawk
- Short-eared Owl
- Proposed Transmission Line
- Proposed Transmission Line (Mills Ranch re-route)
- Existing Road
- Existing Transmission Line
- Highway
- Stream (>= 2nd Order)
- Waterbody (>= 4 Ha)
- Wetland

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area



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Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold

PROJECT: Blackwater Gold Project

Raptors Detections

Map 5 of 5

DATE:	ANALYST:	
October, 2013	AA	**Figure** 3.4-12
JOB No: VE52277	QA/QC: MY	PDF FILE: 11-100-041_Raptor_Detections_v2.pdf
GIS FILE: 11-100-041_Raptor_Detections_v2.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	amec

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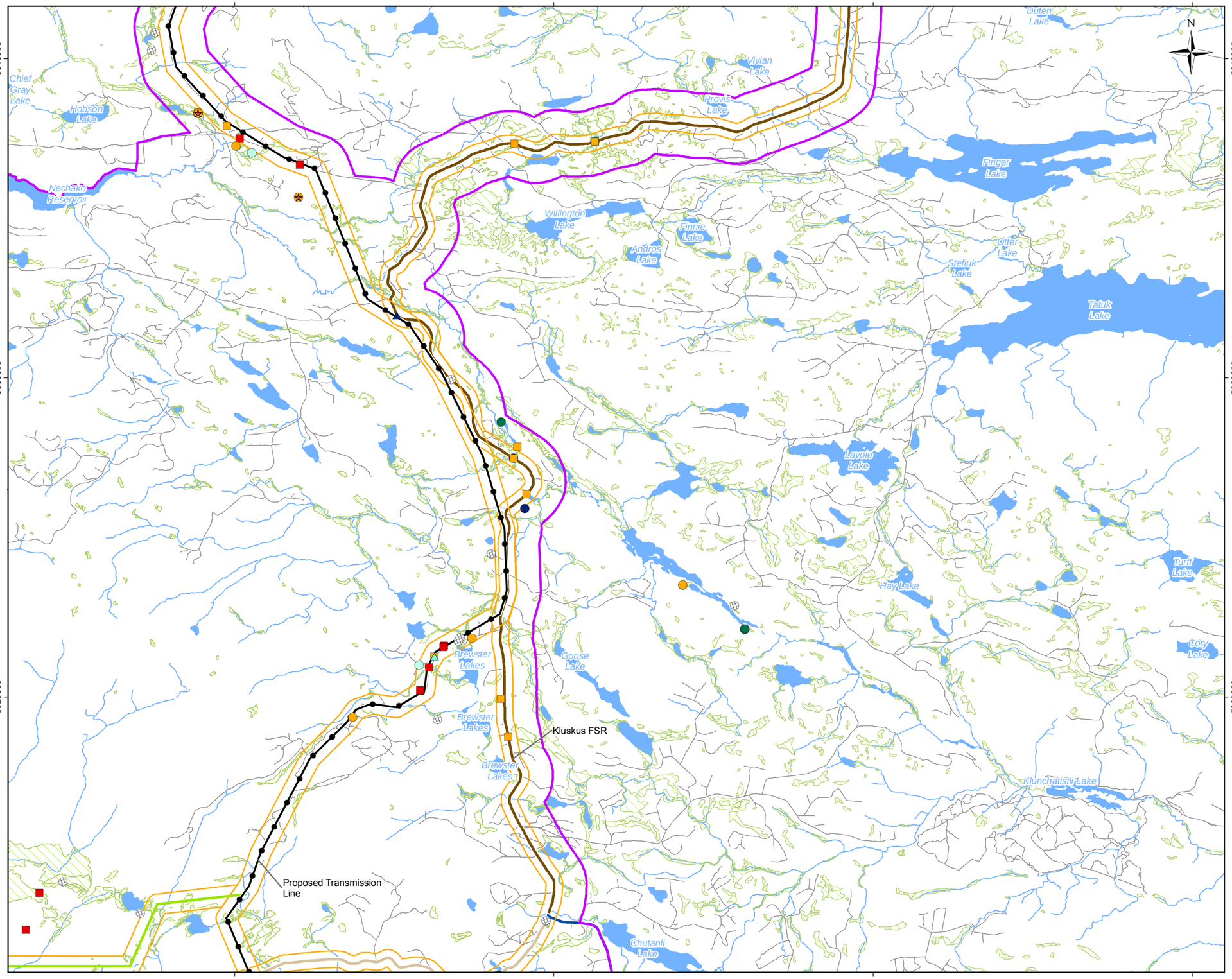
Waterbirds

An aerial waterbird brood survey was used to search four water bodies within the most southern portion of the transmission line LSA in 2012. In 2013 an aerial transect for breeding waterfowl for the entire alignment of the transmission line corridor and LSA was conducted, commencing at Tatelkuz Lake and ending near the Endako Mine—an approximate distance of 150 km. In 2013, three water bodies were surveyed within the corridor and 13 within the LSA. Additional observations of waterbirds were made incidentally during other surveys. Aerial surveys on all or part of the transmission line occurred on 7 July 2012 and 22 July 2013, and a fall migratory survey took place on 10 September 2013 from Tatelkuz Lake north to Endako Mine. Incidental observations occurred between 19 June 2011 and 24 July 2013.

Fifteen species of waterbirds were detected within the transmission line corridor and LSA, during the breeding season; most water bodies hosted only one or two species (**Figure 3.4-4** and **Figure 3.4-13** to **Figure 3.4-16**, **Table 3.4-5**. The most frequently detected waterbird, the greater yellowlegs, were detected at five wetlands during the breeding season; all were territorial birds likely indicating breeding at all detection locations. Twenty-one ring-necked ducks (*Aythya collaris*) were detected on one wetland within the transmission line corridor and LSA, including a group of two broods with a total of 14 young. This wetland was approximately 1.78 ha in size and within the SBSdk subzone at 1,170 m. Breeding was also confirmed within the transmission line corridor and LSA for mallard (*Anas platyrhynchos*) and bufflehead (*Bucephala albeola*).

A migratory waterbird survey took place on 10 September 2013 to survey four water bodies within the transmission line LSA (**Table 3.4-11**, **Figure 3.4-17** to **Figure 3.4-21**). Four common mergansers at two locations were the only waterbirds detected within the transmission line corridor and LSA during the survey and were detected in the SBS BGC zone (**Table 3.4-12**).



Legend

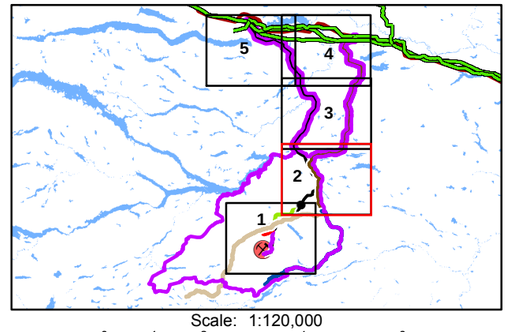
Waterbird Detections

- Scaup Species
- Barrow's Goldeneye
- Common Goldeneye
- Bufflehead
- Common Loon
- Common Merganser
- Mallard
- Ring-necked Duck
- Greater Yellowlegs
- Wilson's Snipe
- Belted Kingfisher
- Rusty Blackbird

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

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area



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0 1 2 4 6

Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold

PROJECT: Blackwater Gold Project

Breeding Waterbird Detections (Map 2 of 5)

DATE: October, 2013	ANALYST: AA	**Figure** 3.4-13
JOB No: VE52277	QA/QC: MY	PDF FILE: 11-100-048_waterbird_detections_v3.pdf
GIS FILE: 11-100-048_waterbird_detections_v3.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	amec

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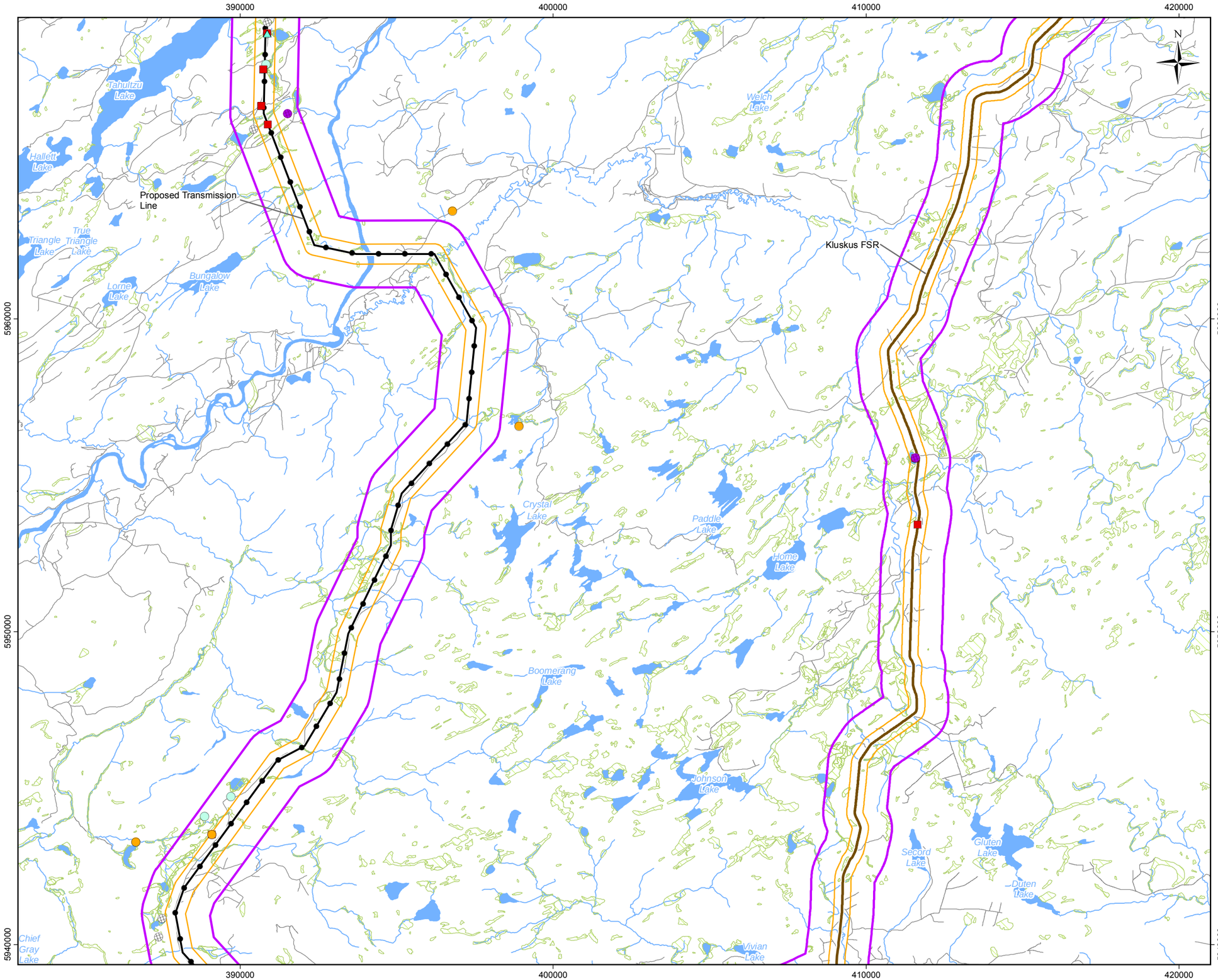


Legend

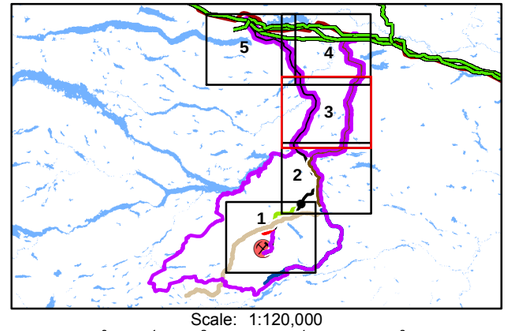
Waterbird Detections

- Bonaparte's Gull
- Barrow's Goldeneye
- Bufflehead
- Common Loon
- Common Merganser
- Ring-necked Duck
- Greater Yellowlegs
- Wilson's Snipe
- Red-winged Blackbird
- Rusty Blackbird

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

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area



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Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold

PROJECT: Blackwater Gold Project

Breeding Waterbird Detections (Map 3 of 5)

DATE: October, 2013	ANALYST: AA	**Figure** 3.4-14
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GIS FILE: 11-100-048_waterbird_detections_v3.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	amec

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390000 400000 410000 420000

5990000 5980000 5970000

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

N

Legend

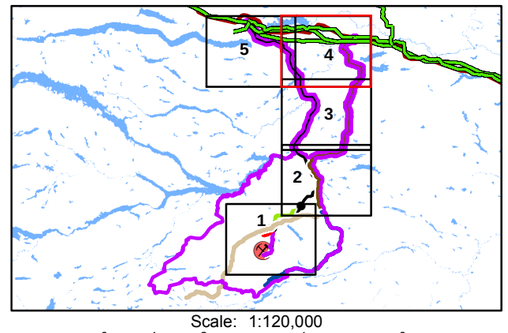
Waterbird Detections

- Bonaparte's Gull
- Barrow's Goldeneye
- Bufflehead
- Common Loon
- Common Merganser
- Mallard
- Ring-necked Duck
- Greater Yellowlegs
- Wilson's Snipe
- Belted Kingfisher
- Red-winged Blackbird
- Rusty Blackbird

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

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area



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Kilometres

Reference
BC Government GeoBC Data Distribution

CLIENT: newgold

PROJECT: Blackwater Gold Project

Breeding Waterbird Detections
(Map 4 of 5)

DATE: October, 2013	ANALYST: AA	**Figure** 3.4-15
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360000 370000 380000

5990000 5980000 5970000

Endako
Stellako
Fraser Lake
Savory Lake
Deserter Lake
Fraser Lake
Casey Lake
Seas Lake
Klez Lake
Foster Lakes
Chowsunkut Lake
Francois Lake
Anzus Lake
Borel Lake
Graham Lake
Cabin Lake
Laurie Lake
Twentysix Mile Lake
Tahultzu Lake
16

Proposed Transmission Line (Stellako re-route)

Proposed Transmission Line

N

Legend

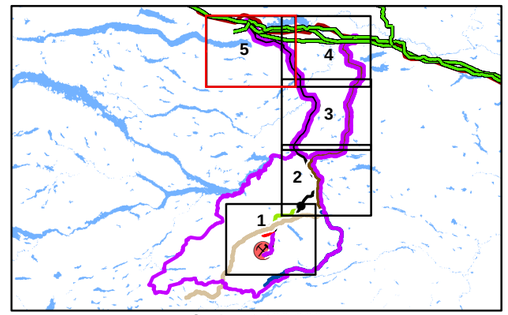
Waterbird Detections

- Barrow's Goldeneye
- Bufflehead
- Common Loon
- Common Merganser
- Mallard
- Greater Yellowlegs
- Wilson's Snipe
- Belted Kingfisher

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

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area



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Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold

PROJECT: Blackwater Gold Project

Breeding Waterbird Detections (Map 5 of 5)

DATE: October, 2013	ANALYST: AA	**Figure** 3.4-16
JOB No: VE52277	QA/QC: MY	PDF FILE: 11-100-048_waterbird_detections_v3.pdf
GIS FILE: 11-100-048_waterbird_detections_v3.mxd		
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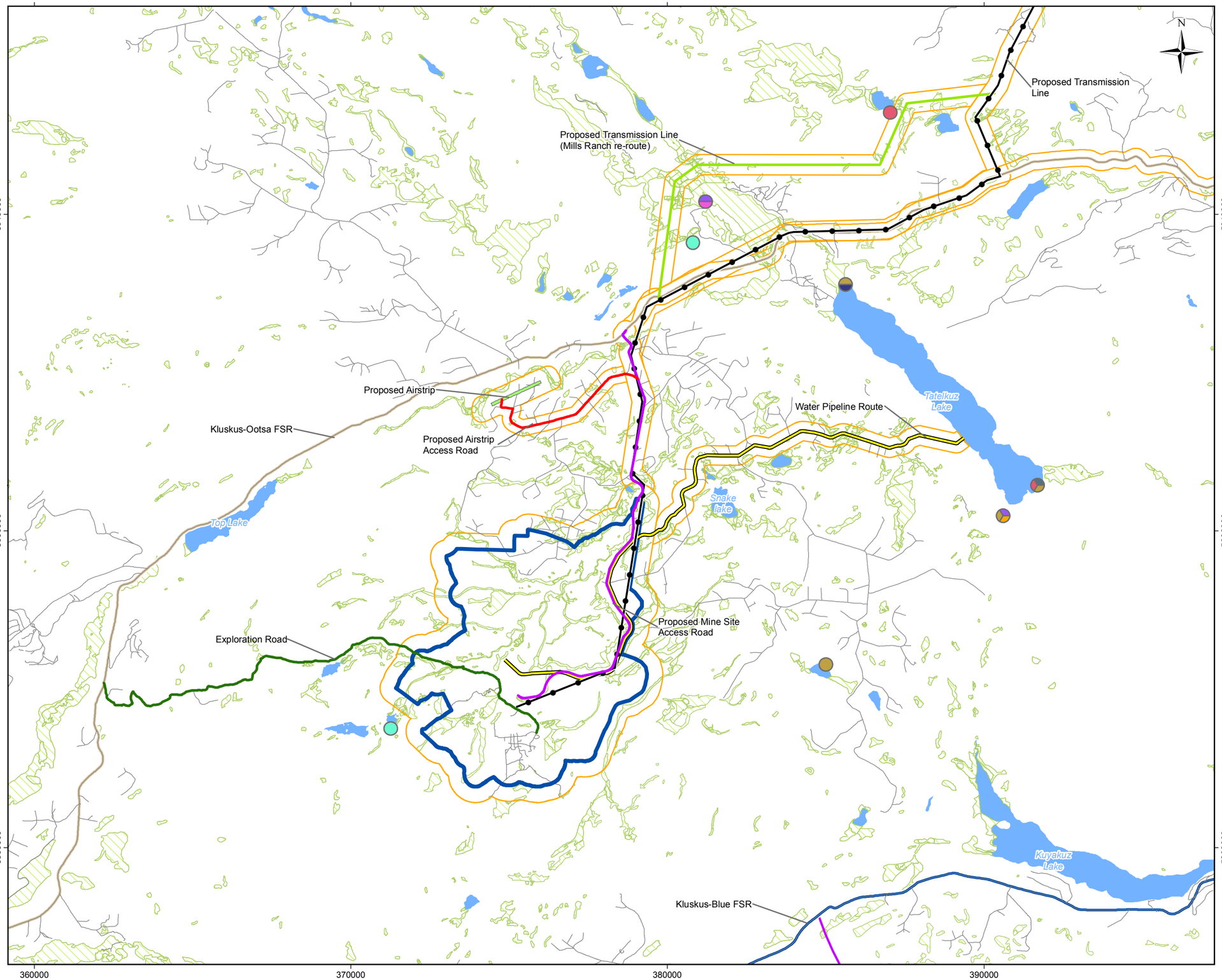
Table 3.4-11: Detections and Number of Individuals of Waterbirds during the Migratory Surveys of 2013 in the Transmission Line LSA and the RSA for the Project

Species	Mine Site		Mine Site LSA		Transmission Corridor		Transmission Line LSA		Mine Access Road Corridor		Mine Access Road LSA		Kluskus FSR ROW		Kluskus FSR LSA		Water Pipeline Corridor		Water Pipeline LSA		Airstrip Corridor		Airstrip LSA		RSA		Stellako Corridor Reroute and LSA		Mill's Ranch Reroute and LSA	
	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites
Canada goose	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	2	0	0	0	0
Common loon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	3	0	0	0	0
Common merganser	0	0	0	0	0	0	4	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	153	9	0	0	0	0
Goldeneye species	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0
Mallard	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	2	0	0	0	0
Scaup species	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	2	0	0	0	0
Spotted sandpiper	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0
Total Individuals	**0**		**0**		**0**		**4**		**0**		**0**		**0**		**0**		**0**		**0**		**0**		**0**		**174**		**0**		**0**	
Total Species	**0**		**0**		**0**		**1**		**0**		**0**		**0**		**0**		**0**		**0**		**0**		**0**		**7**		**0**		**0**	

Note: ROW = right-of-way

Table 3.4-12: Sites and Numbers of Individuals of Migrating Waterbirds Detected at the Project in 2011-2013 by Biogeoclimatic Subzone

BGC Zone BGC Sub-Zone Species	Boreal Altai Fescue Alpine (BAFA)		Engelmann Spruce - Subalpine Fir (ESSF)				Sub-Boreal Spruce (SBS)					
	Undifferentiated (un)		Moist-Very Cold (mv1)		Moist-Very Cold-Parkland (mvp)		Moist-Cold (mc)		Dry-Cool (dk)		Dry-Warm (dw)	
	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites
Canada goose	0	0	0	0	0	0	0	0	5	2	0	0
Common loon	0	0	0	0	0	0	5	2	2	1	0	0
Common merganser	0	0	0	0	0	0	10	3	145	7	2	1
Goldeneye species	0	0	1	1	0	0	0	0	1	1	0	0
Mallard	0	0	0	0	0	0	0	0	3	2	0	0
Scaup species	0	0	0	0	0	0	0	0	3	2	0	0
Spotted sandpiper	0	0	0	0	0	0	0	0	1	1	0	0
Total Individuals	**0**		**1**		**0**		**15**		**160**		**2**	
Total Species	**0**		**1**		**0**		**2**		**7**		**1**	



Legend

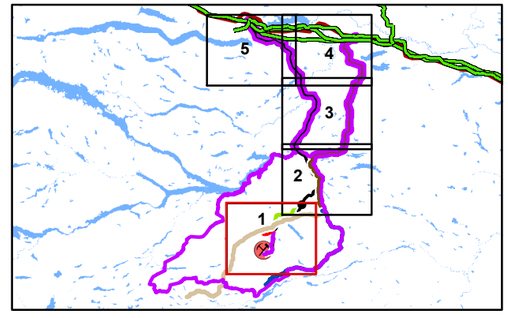
Waterbird Detections

- Barrow's Goldeneye
- Goldeneye Species
- Canada Goose
- Mallard
- Common Loon
- Red-breasted Merganser
- Common Merganser
- Spotted Sandpiper

- Existing Road
- Kluskus-Blue FSR
- Kluskus-Ootsa FSR
- Exploration Road
- Proposed Transmission Line
- Proposed Transmission Line (Mills Ranch re-route)
- Proposed Mine Site Access Road
- Water Supply Pipeline
- Proposed Airstrip Access Road
- Proposed Airstrip
- Waterbody (>= 4 Ha)
- Wetlands
- Proposed Mine Site

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area



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0 1 2 4 6

Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold

PROJECT: Blackwater Gold Project

Migratory Waterbird Detections

Map 1 of 5

DATE: October, 2013	ANALYST: AA	**Figure** 3.4-17
JOB No: VE52277	QA/QC: MY	PDF FILE: 11-100-084_waterbird_detections_fall_20131021.pdf
GIS FILE: 11-100-084_waterbird_detections_fall_20131021.mxd		
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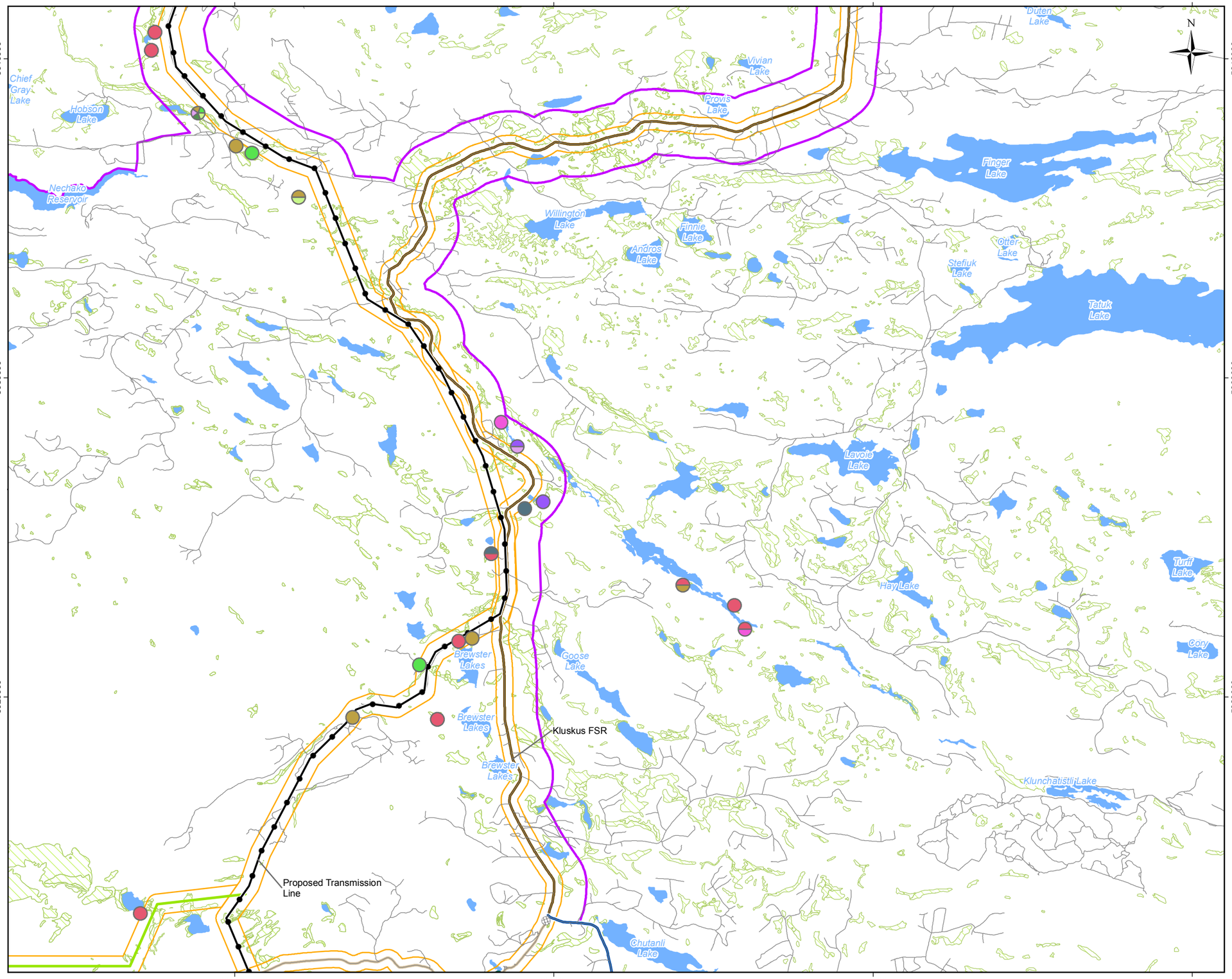


Legend

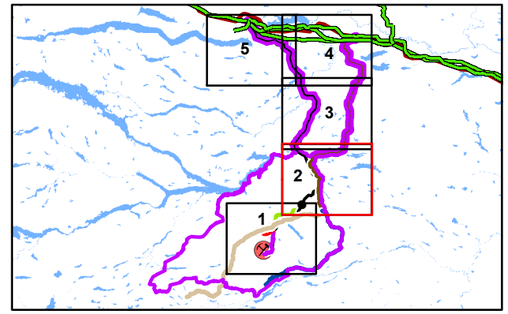
Waterbird Detections

- Barrow's Goldeneye
- Bufflehead
- Canada Goose
- Common Loon
- Common Merganser
- Greater Yellowlegs
- Mallard
- Ring-necked Duck
- Scaup Species

- Existing Road
- Kluskus FSR
- Kluskus-Blue FSR
- Kluskus-Ootsa FSR
- Proposed Transmission Line
- Proposed Transmission Line (Mills Ranch re-route)
- Waterbody (>= 4 Ha)
- Wetlands

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area



Scale: 1:120,000

0 1 2 4 6

Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold

PROJECT: Blackwater Gold Project

Migratory Waterbird Detections

Map 2 of 5

DATE:	ANALYST:	**Figure** 3.4-18
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PROJECTION: UTM Zone 10	DATUM: NAD83	amec

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390000 400000 410000 420000

5960000 5950000 5940000

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

Legend

Waterbird Detections

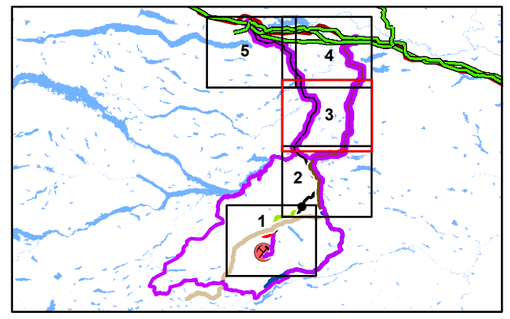
- Bufflehead
- Common Loon
- Common Merganser
- Greater Yellowlegs
- Ring-necked Duck

Existing Road
Kluskus FSR
Proposed Transmission Line

Waterbody (>= 4 Ha)
Wetlands

Wildlife and Wildlife Habitat

Local Study Area
Regional Study Area



Scale: 1:120,000

0 1 2 4 6

Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold

PROJECT: Blackwater Gold Project

Migratory Waterbird Detections

Map 3 of 5

DATE:	ANALYST:	**Figure** 3.4-19
October, 2013	AA	
JOB No: VE52277	QA/QC: MY	PDF FILE: 11-100-084_waterbird_detections_fall_20131021.pdf
GIS FILE: 11-100-084_waterbird_detections_fall_20131021.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	amec

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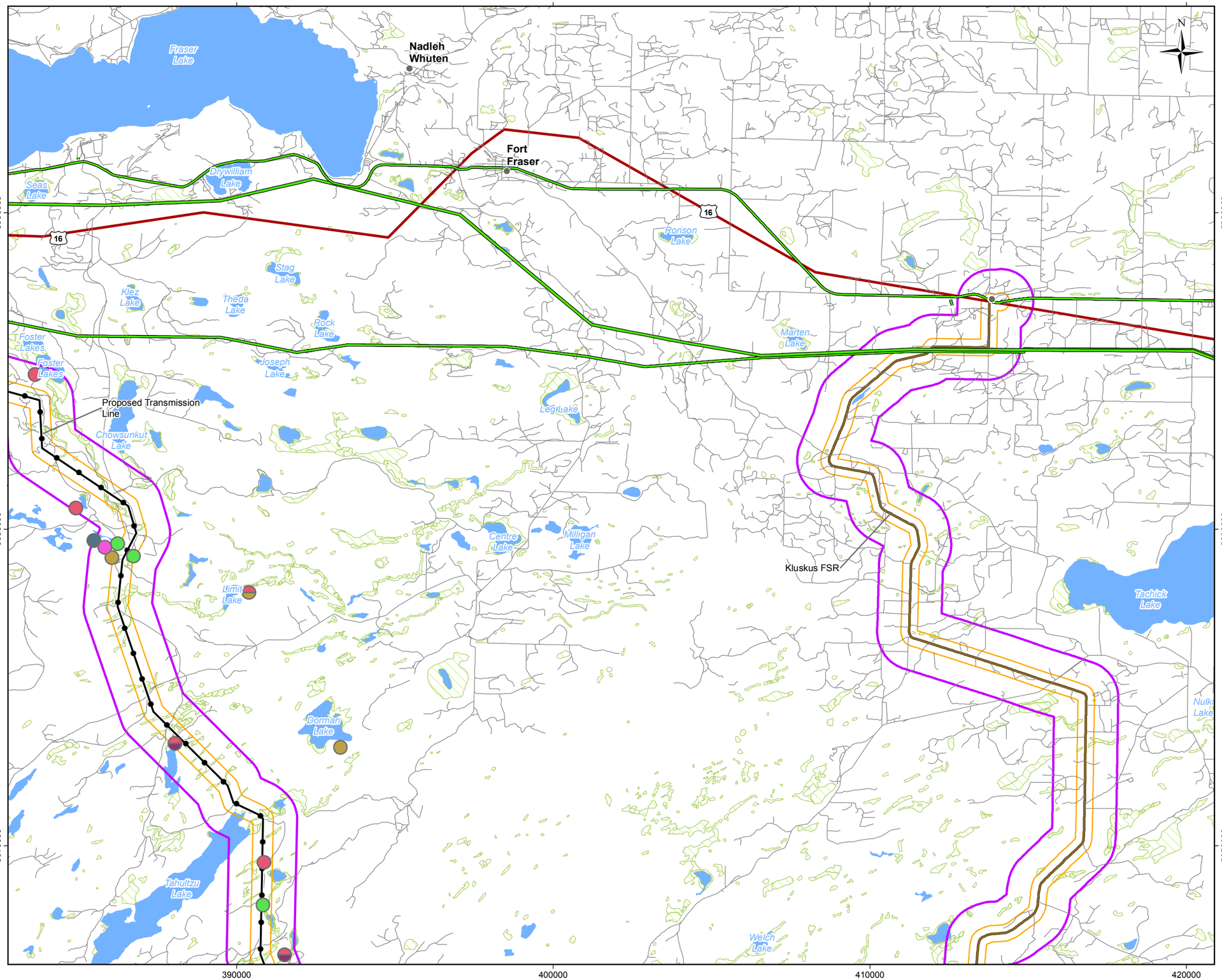


Legend

Waterbird Detections

- Barrow's Goldeneye
- Bufflehead
- Common Loon
- Common Merganser
- Mallard
- Ring-necked Duck
- Sandhill Crane

- Populated Place
- Existing Road
- Kluskus FSR
- Proposed Transmission Line
- Existing Transmission Line
- Highway
- Waterbody (>= 4 Ha)
- Wetlands

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area

Scale: 1:120,000

0 1 2 4 6

Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold

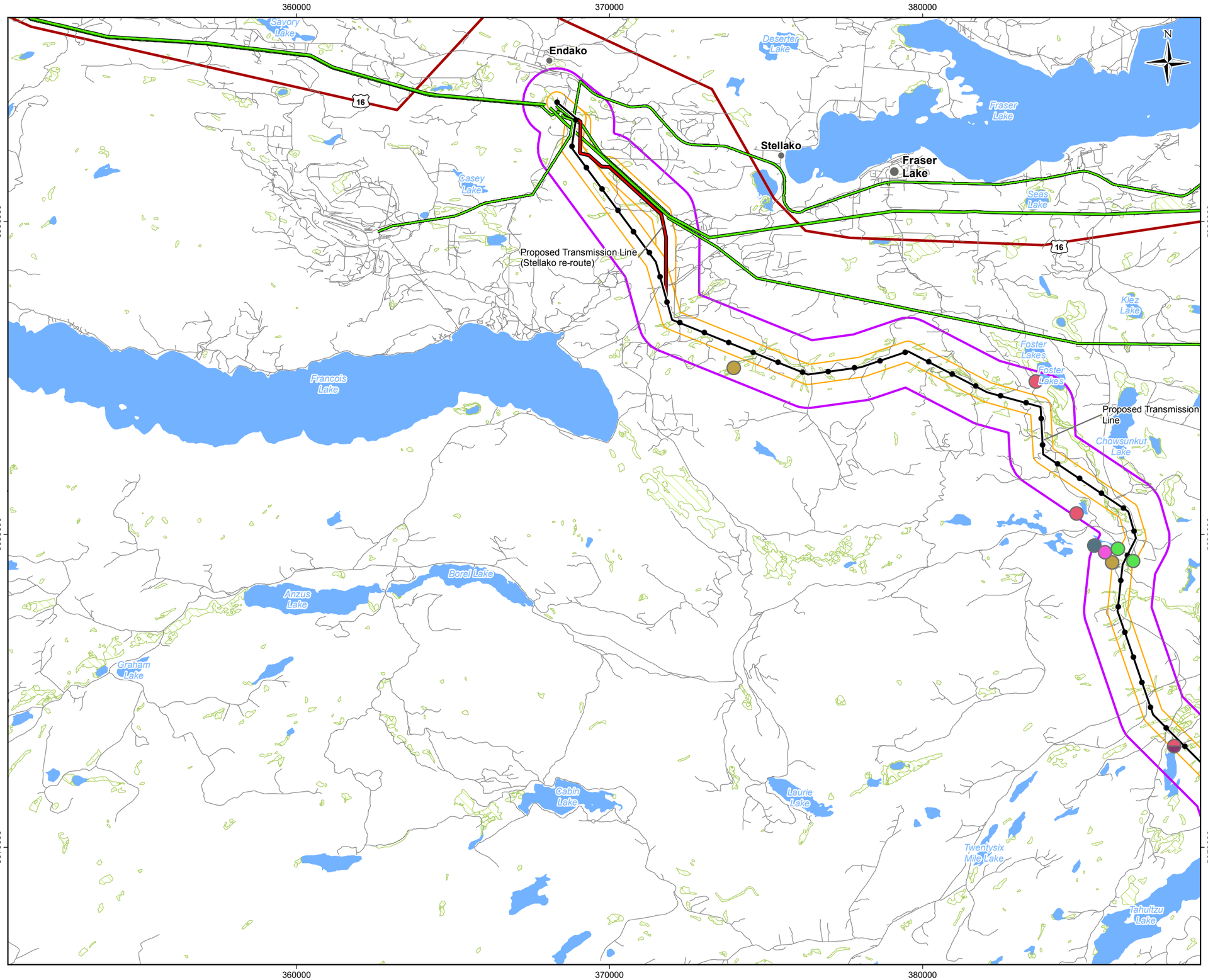
PROJECT: Blackwater Gold Project

Migratory Waterbird Detections

Map 4 of 5

DATE: October, 2013	ANALYST: AA	**Figure** 3.4-20
JOB No: VE52277	QA/QC: MY	PDF FILE: 11-100-084_waterbird_detections_fall_20131021.pdf
GIS FILE: 11-100-084_waterbird_detections_fall_20131021.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	amec

Y:\GIS\Projects\VE\VE52095_Richfield_Blackwater\Mapping\11_wildlife\Baseline\11-100-084_waterbird_detections_fall_20131021.mxd



Legend

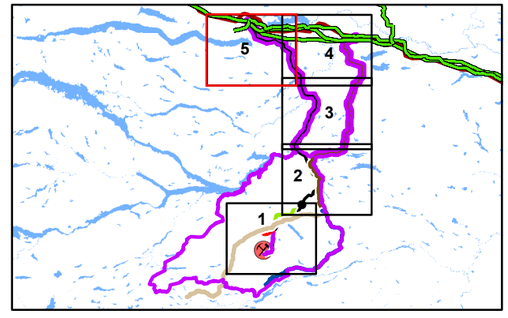
Waterbird Detections

- Barrow's Goldeneye
- Bufflehead
- Common Loon
- Common Merganser
- Mallard
- Sandhill Crane

- Populated Place
- Existing Road
- Proposed Transmission Line
- Proposed Transmission Line (Stellako re-route)
- Existing Transmission Line
- Highway
- Waterbody (>= 4 Ha)
- Wetlands

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area



Scale: 1:120,000

0 1 2 4 6

Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold		
PROJECT: Blackwater Gold Project		
Migratory Waterbird Detections Map 5 of 5		
DATE: October, 2013	ANALYST: AA	**Figure** 3.4-21
JOB No: VE52277	QA/QC: MY	PDF FILE: 11-100-084_waterbird_detections_fall_20131021.pdf
GIS FILE: 11-100-084_waterbird_detections_fall_20131021.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	amec

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3.4.3.2 Mine Access Road Corridor and LSA

Forest and Grassland Songbird Survey

Eleven breeding bird survey point count stations were established in the mine access road corridor and an additional three stations were established within the access road LSA (**Figure 2.1-6**). Additional observations were made incidentally during other surveys. Breeding bird surveys occurred from 19 June to 20 July 2011 and from 13 June to 12 July 2012, and incidental observations occurred between 19 June 2011 and 3 October 2012.

Thirty species of birds were detected within the mine access road corridor and LSA (**Table 3.4-2**). Fewer than 10 species were detected at all of the stations within this study area, and an average of 4.93 species per point count was recorded. Three olive-sided flycatchers, a species of conservation concern, were detected within the mine access road corridor and LSA at three locations between 1,040 m and 1,128 m in elevation (**Table 3.4-2, Figure 3.4-1**). All of the detections were within the SBSmc subzone within habitat consisting of edges of mature and old growth pine forest with recently harvested areas (**Table 3.4-3**).

Sharp-tailed Grouse Lek Surveys

Three sharp-tailed grouse lek PCs were conducted within the mine access road LSA in June of 2012 (**Figure 3.4-1**). No sharp-tailed grouse or leks were detected.

Raptors

During the two days of surveying in 2012 within the mine access road corridor and LSA, two days were spent on diurnal raptors. No surveys were conducted for nocturnal raptors (**Table 3.4-13**).

Table 3.4-13: Surveying Dates for Raptors within the Mine Access Road Corridor and LSA during 2012 and 2013

Survey Type	Mine AccessRoad Corridor	Mine Access Road Corridor LSA
CPS – Diurnal	2, 4 May 2012	2 May 2012
CPS – Nocturnal	n/a	n/a
Stand watch – Diurnal	n/a	n/a
Stand watch – Nocturnal	n/a	n/a

Note: CPS = call playback survey; LSA = Local Study Area; N/A = not applicable; RSA = Regional Study Area

Three detections of the red-tailed hawk occurred within the ESSFmv1 subzone along the mine access road corridor and LSA. All three detections were in pine-leading forest: two in mature forest and one in young forest all between 1,325 m and 1491 m in elevation (**Figure 3.4-3**). No other raptors were detected within the corridor or LSA.

Waterbirds

Aerial waterbird surveys were used to search one water body in the access road and LSA during the breeding season. Additional observations of waterbirds were made incidentally during other surveys. Aerial surveys occurred on 17 July 2011 and 7 July 2012, and incidental observations occurred between 19 June 2011 and 24 July 2013.

Three species of waterbirds were found within the mine access road and LSA during the breeding season (**Figure 3.4-4**, **Table 3.4-7**). Canada geese (*Branta canadensis*), greater yellowlegs (*Tringa melanoleuca*), and Wilson's snipe were the only species detected within the study area. No wetlands were surveyed during the migratory waterbird survey.

3.4.3.3 Kluskus FSR ROW and LSA

Forest and Grassland Songbirds

A total of 38 point count stations were established within the Kluskus FSR ROW, and an additional 24 were established in the Kluskus FSR LSA (**Figure 2.1-6** to **Figure 2.1-10**). Breeding bird surveys occurred from 20 June to 12 July 2012 and on 14 June and 20 June 2013; incidental observations occurred between 19 June 2011 and 3 October 2012.

The highest number of species per point count station (9.10 species) was detected within this study area. More than 15 species were detected at five stations, including the station with the highest number of species detected (23). Two of the stations were located within an agricultural area, with a mixture of habitats present within the point count area including pasture, hay fields, mature-old growth (121+ years) lodgepole pine, spruce, trembling aspen forest, and mature (81 to 100 years) trembling aspen forest. The three other point count stations with the highest species detected were all found within 250 m of wetlands. Two of these wetlands were next to recently harvested areas and young lodgepole pine forest (61 to 120 years), and the third was close to a harvested area and mature-old growth (121+ years) lodgepole pine-white spruce forest. All stations were within the SBSdk subzone.

The olive-sided flycatcher, a species of conservation concern, was detected 16 times, all within the SBS BGC zone (**Table 3.4-2**, **Figure 3.4-1** and **Figure 3.4-5** to **Figure 3.4-8**. Specifically within separate BGC subzones, it was detected in the SBSmc eight times, in the SBSdw once, and dk seven times, and all were between 726 m and 1,140 m in elevation (**Table 3.4-7**). When the habitat of the detections was examined, seven of the detections were within 300 m of a wetland, 12 were in lodgepole pine-leading forest, and four were within spruce-leading forest. All detections were within a matrix of recently harvested areas or agricultural areas and mature forest or within mature forest that was adjacent to a recently harvested areas or young forest.

Barn swallow, another species of conservation concern, was detected at two locations within the access road study areas, both along the Kluskus-Ootsa FSR within the LSA (**Table 3.4-2**, **Figure 3.4-1** and **Figure 3.4-5** to **Figure 3.4-8**). One was at Big Bend Meadows Recreation Site and the other was 2.5 km southwest of the Blue Road. The detection at Big Bend Meadows was of a pair nesting in an outhouse, and the detection at the camp was an individual seen flying around but not confirmed to be nesting. Barn swallows are typically associated with anthropogenic features, and some areas along the Kluskus FSR contain potential nesting locations.

Sharp-tailed Grouse Lek Surveys

Thirteen sharp-tailed grouse lek PCs were conducted within the Kluskus FSR ROW and LSA in May of 2013 (**Figure 3.4-1** and **Figure 3.4-5** to **Figure 3.4-8**). No sharp-tailed grouse or leks were detected.

Raptors

During the nine days of surveying in 2012 and 2013 within the corridor and LSA, six days were spent on diurnal raptors and three days on nocturnal raptors (**Table 3.4-10**).

Table 3.4-14: Surveying Dates for Raptors within the Transmission Line Corridor and LSA during 2012 and 2013

Survey Type	Transmission Line Corridor		Transmission Line LSA	
	2012	2013	2012	2013
CPS – Diurnal	6 May; 7 June	7, 11, 13, 21 June	n/a	13, 21 June
CPS – Nocturnal	n/a	6, 7 May	n/a	6, 7 May
Stand watch – Diurnal	n/a	n/a	n/a	n/a
Stand watch – Nocturnal	n/a	6 May	n/a	8 May

Note: CPS = call playback survey; LSA = Local Study Area; N/A = not applicable

Ten species of raptors were recorded at 15 sites within the Kluskus FSR ROW and LSA (**Figure 3.4-3** and **Figure 3.4-9** to **Figure 3.4-12**) (**Table 3.4-5**). The detection of the short-eared owl (*Asio flammeus*), a species of conservation concern, is summarized in the results section for the transmission line and corridor (**Section 3.10.1.3**). Red-tailed hawk was the most frequently detected species, followed by low numbers of the other nine species.

All thirteen detections of red-tailed hawks were within lodgepole pine or spruce forest that was typically a mix of mature and young forest, at the edge of a mature forest and young forest, or at an area that was recently harvested. Six of the detections were in SBSdk, six were in SBSmc, and one was in the SBSdw subzone' all were between 735 m and 1,320 m elevation.

Waterbirds

In 2013 an aerial transect for waterfowl broods surveyed two wetlands in the Kluskus FSR LSA, with the remaining waterbird detections recorded incidentally. The aerial surveys occurred on 22 July 2013, and incidental observations occurred between 19 June 2011 and 24 July 2013. On 10 September 2013, an aerial transect for migratory waterfowl was also completed along the same route from Tatelkuz Lake north to Endako Mine (**Figure 3.4-17** to **Figure 3.4-21** pdf not yet made).

Sixteen species of waterbirds were detected during the breeding season within the Kluskus FSR ROW and LSA (**Figure 3.4-8** and **Figure 3.4-13** to **Figure 3.4-16**), (**Table 3.4-7**). Most water bodies in the area contained only one or two species, and the two most frequently detected species were greater yellowlegs and Wilson's snipe with each detected at five different sites. All species were territorial birds, potentially indicating breeding at the different locations. Ring-necked ducks were detected five times; all on one wetland that was approximately 7.73 ha in size within the SBSmc subzone at an elevation of 1,120 m. Breeding was also confirmed for mallards at this site. No wetlands were surveyed during the migratory waterbird survey.

3.4.3.4 Water Pipeline Corridor and LSA

Forest and Grassland Songbird Survey

Twenty-two point count stations were established within the water pipeline corridor and an additional three were established in the LSA (**Figure 2.1-6**). Additional observations were made incidentally during other surveys. Breeding bird surveys occurred on 20 June and 19 July 2011, on 15 June and 6 July 2012, and during 24–25 June 2013. Incidental observations occurred between 19 June 2011 and 12 September 2013.

Thirty-one species of birds were detected within the water pipeline corridor and LSA (**Figure 3.4-1**, **Table 3.4-7**). Diversity was low in this study area with an average of 4.81 species per station. The stations with the highest diversity (10 species) were located within a mature white spruce – lodgepole pine stand within 300 m of several water bodies and within a mature-old growth (121+ years) lodgepole pine forest with an adjacent stand of mature (101 to 120 years) pine and black spruce forest, recently harvested area, and a wetland. All stations were within the SBSmc subzone.

Two species of conservation concern were detected within the water pipeline and the LSA: the rusty blackbird and the olive-sided flycatcher (**Table 3.4-2**, **Figure 3.4-1**). The rusty blackbird was detected at three wetlands within the pipeline LSA. All three wetlands were located in the SBS and were surrounded by recently harvested areas and mature black spruce and white spruce forest and at elevations ranging from 1,034 to 1,058 m. Eight of the nine detections of olive-sided flycatcher occurred in pine forest within the SBSmc subzone; the remaining

detection was within a black spruce forest within this subzone. All were near the edge of mature forest and recently cleared areas, and eight were less than 150 m from wetlands.

Common Nighthawk

A common nighthawk was detected incidentally during the yellow rail surveys at a fen wetland adjacent to a forestry road within the LSA of the water pipeline during 24 to 26 June 2013 (**Table 3.4-2**, **Figure 3.4-1**). This wetland was surrounded by mature forest composed of 60% black spruce and 40% pine within the SBSmc subzone (**Table 3.4-3**).

Sharp-Tailed Grouse Lek Surveys

A total of four PCs were completed within the water pipeline corridor and LSA in May and June of 2012 and May of 2013 (**Figure 3.4-1**). No sharp-tailed grouse or leks were detected.

Raptors

During the three days of surveying in 2012 within the water pipeline LSA and RSA, two days were spent on diurnal raptors and one on nocturnal raptors (**Table 3.4-15**).

Table 3.4-15: Surveying Dates for Raptors within the Water Pipeline LSA and RSA during 2012

Survey Type	Water Pipeline LSA	Water Pipeline RSA
CPS – Diurnal	N/A	3–4 May
CPS – Nocturnal	N/A	20 Apr
Stand watch – Diurnal	N/A	N/A
Stand watch – Nocturnal	N/A	N/A

Note: CPS = call playback survey; LSA = Local Study Area; N/A = not applicable; RSA = Regional Study Area

Five species of raptors were recorded at nine sites within the water pipeline and LSA (**Figure 3.4-3**) (**Table 3.4-5**). Great horned owl was the most frequently detected species (three detections at three sites), including detections in or adjacent to mature and old-growth forest and 200 m away from a harvested area and associated regeneration.

The red-tailed hawk was detected at three different sites within the pipeline corridor and LSA; one in old black spruce forest, another in mature pine forest adjacent to young pine forest, and the last in a mix of mature and young forest adjacent to a recently harvested area. The detections ranged in elevation from 1,053 m to 1,128 m and all three of the detections occurred in the SBSmc subzone.

Waterbirds

Aerial waterbird surveys were used to search six water bodies within the water pipeline RSA. Additional observations of waterbirds were made incidentally during other surveys. Aerial surveys were conducted on 17 July 2011 and 7 July 2012, and incidental observations occurred between 19 June 2011 and 24 July 2013.

Seven species of waterbirds were detected within the water pipeline corridor and LSA (**Figure 3.4-4**) (**Table 3.4-6**). Greater yellowlegs were the most frequently detected waterbird with six detections found within the water pipeline and LSA; all were territorial birds, potentially indicating breeding. Breeding was confirmed in the LSA for the common loon. Of the seven species detected, four were found on one small pond (1.05 ha) 1.1 km northwest of Snake Lake: green-winged teal (*Anas crecca*), bufflehead, greater yellowlegs, and solitary sandpiper (*Tringa solitaria*). None were confirmed breeding.

3.4.3.5 Airstrip Corridor and LSA

Forest and Grassland Songbirds

Ten PC stations were established within the airstrip corridor, with an additional three in the airstrip LSA (**Figure 2.1-6**). Breeding bird surveys occurred during 9 to 24 June 2013. Incidental observations occurred during other surveys between 19 June 2011 and 12 September 2013.

The average number of species per station within this study area was 5.38. The stations with the highest number of species (10 and 9 species) were both located at the edge of recently harvested areas and adjacent to mature-old growth (121+ years) lodgepole pine forest; one of the sites was within 300 m of a wetland. All stations were in the SBSmc subzone.

Olive-sided flycatchers were detected at six locations, all of which were within the SBSmc subzone, and all were near the edge of mature pine forest and recently cleared/planted area within 1,082 m and 1,124 m in elevation. All of the detections were within 500 m from wetlands and half were within 300 m (**Table 3.4-2**, **Figure 3.4-2**).

Sharp-Tailed Grouse Lek Surveys

Two lek survey sites were established within the LSA of the airstrip, and no sharp-tailed grouse or lek sites were detected. Much of the area within the airstrip LSA has regenerated beyond use for sharp-tailed grouse.

Raptors

Three diurnal and one nocturnal raptor CPSs were established in the airstrip corridor and LSA. These were surveyed on 8 May and 10 June 2013, with additional incidental observations occurring between 8 May and 11 September 2013.

Only two species of raptor were detected within this study area: the red-tailed hawk and Amercian kestrel (*Falco sparverius*) (**Figure 3.4-3**, **Table 3.4-5**). Both detections were in the SBSmc subzone: the red-tailed hawk was detected at the edge of a mature pine forest adjacent to a recently harvested area at approximately 1,080 m; the kestrel was detected in a recently harvested pine forest at 1,115 m elevation.

Waterbirds

Aerial surveys occurred on 17 July 2011 and 7 July 2012, and incidental observations occurred between 19 June 2011 and 24 July 2013 (**Table 3.4-7**). Additional observations of waterbirds were made incidentally during other surveys. The only waterbird detected during the breeding season in the airstrip corridor and LSA was Wilson's snipe, which was displaying above the regenerating clearcut. The airstrip was not a part of the aerial migratory survey.

3.4.3.6 Mills Creek Ranch and Stellako Reroute Options on Transmission Line

Forest and Grassland Songbirds

There were no PC stations within either of the reroute options. However, incidentally there were three detections of the olive-sided flycatcher within the Stellako reroute option LSA. All were located within a cleared hydro ROW that was surrounded by a mix of young and mature forest within the SBSdw subzone.

Sharp-tailed Grouse Lek Surveys

No sharp-tailed grouse lek surveys were conducted in either of the two reroute options due to the lack of suitable habitat.

Raptors

No raptor stations werewithin either of the study areas, and no raptors were detected incidentally. Habitat modelling within the footprint was used to determine potential habitat in the area.

Waterbirds

Aerial surveys occurred on 22 July 2013, and incidental observations occurred between 19 June 2011 and 24 July 2013 (**Table 3.4-7**, **Figure 3.4-4**). Additional observations of waterbirds were made incidentally during other surveys. A sandhill crane (*Grus canadensis*) was detected in early May, and a common loon (*Gavia immer*) was detected on a water body at the edge of the LSA.

3.4.4 RSA

3.4.4.1 Forest and Grassland Songbirds

A total of 164 point count stations were established within the RSA, which were surveyed between 19 June and 20 July 2011, between 13 June and 12 July 2012, and between 10 and 24 June 2013 (**Figure 2.1-6** to **Figure 2.1-10**). Additional observations were also made incidentally during other surveys between 19 June 2011 and 11 September 2013.

Overall, the number of species per station in the RSA detected (4.74 species per point count) was lower than all other study areas except the mine site LSA. The two stations with the highest number of species (14 and 12 species) were both adjacent to wetlands: One was located on the edge of Snake Lake and included the open water, adjacent fen wetland, surrounding black spruce forest, and nearby recently harvested areas; the other station was located in a mix of recently harvested area with adjacent mature-old growth (121+ years) white spruce and lodgepole pine forest, with a complex of wetlands nearby, including fen, bog, and marsh. All stations were within the SBSmc.

Sixteen of the 19 detections of olive-sided flycatcher detections were located within the SBSmc subzone, while the remainder were within the ESSFmv1 subzone; all were found between 1,032 m and 1,331 m in elevation (**Table 3.4-2**, **Table 3.4-3**, **Figure 3.4-1** and **Figure 3.4-5** to **Figure 3.4-8**). Seventeen of the detections were in lodgepole pine-leading forest, one sighting was in 200+ year subalpine forest, and another was in a regenerating spruce forest. Eighteen were located either in or adjacent to recently cleared areas; one was located 400 m in from the forest edge. Eleven of the detections were near (<270 m) wetlands.

Barn swallows were detected within the RSA in 2011 when a nest was found under a bridge south of where the mine exploration road meets with the Kluskus-Ootsa FSR at approximately the 149 km marker (**Figure 3.4-1** and **Figure 3.4-5** to **Figure 3.4-8**).

Rusty blackbirds were detected at four wetlands centred on Snake Lake, at elevations ranging from 1,028 m to 1,140 m. Three of the four sites were in extensive wetlands surrounded by mature black spruce forest and some recently harvested area, and the additional site was located in a wetland surrounded by pine forest.

3.4.4.2 Common Nighthawk

Six common nighthawks were detected at six sites within the RSA; all were recorded during the yellow rail surveys in June 2013 (**Table 3.4-2**, **Figure 3.4-1**, and **Figure 3.4-6** landbird detections). Four of the six detections were in the SBSmc subzone and the other two were located in the SBSdk subzone; all ranged in elevation from 800 to 1,109 m (**Table 3.4-3**). All of the detections were in wetlands that had open water and fen components and were surrounded by mature black spruce forest. Two of the wetlands also had a regenerating forest adjacent to the wetland and mature forest.

3.4.4.3 Clark's Nutcracker

Clark's nutcrackers were detected at six locations between 2011 and 2013, all centred around Mount Davidson (**Figure 2.1-2**). The largest group of nutcrackers detected was five individuals at KM 2 on the current mine exploration road in July 2013 (**Figure 3.4-2**) Clarks nutcracker detections 2011 to 2013). All other detections ranged from one to three birds. Three detections in RSA were in mature subalpine fir, one was in non-treed alpine, and two were in lodgepole pine forest (a recently harvested area and a 121+year stand). All nutcrackers were detected within the elevation range of 1,292 m to 1,752 m. Reconnaissance surveys for Clark's nutcrackers and whitebark pine were conducted in July of 2013 on two adjacent mountains—Fawnie Nose (22 km away) and Mount Kayakuz (23 km away). No whitebark pine or Clark's nutcrackers were detected at either location.

3.4.4.4 Sharp-Tailed Grouse Lek Surveys

Thirty-one sharp-tailed grouse lek PC stations were established within the RSA (**Figure 3.4-1** and **Figure 3.4-5**). The stations were placed within previously logged lower elevation areas that contained potential lek habitat. Six sharp-tailed grouse were detected within four sites in the RSA, all within the SBSmc3 subzone and at elevations between 1,085 m and 1,145 m. Three detections were located within recently harvested areas, and the fourth was located along a road through a stand of old-growth lodgepole pine.

3.4.4.5 Raptors

Fifty-four raptor call playback stations, 27 nocturnal and 27 diurnal, were established within the RSA to determine species presence between 10 April and 7 June 2012 and on 11 June 2013. Passive roadside surveys and several stand watches were conducted in April 2012 in areas identified as potential nesting habitat—primarily open areas (e.g., meadows, sedge wetlands, forest clearings)—for the Blue-listed short-eared owl in the RSA.

Fourteen raptor species were detected at 52 sites within the RSA between 928 m and 1,164 m, the greatest diversity among any of the LSAs and RSA surveyed (**Table 3.4-5 Figure 3.4-3** and **Figure 3.4-9** to **Figure 3.4-12**). Red-tailed hawks were the most commonly detected species, with 13 individuals detected at 12 sites. Twelve of 14 sites

where red-tails were detected were within in SBSmc subzone, with the remaining two occurring in the SBSdw and SBSmc subzones (**Table 3.4-6**). Most of the detections were in areas of either pine or spruce where young and old forests were in close proximity and where there were nearby recently harvested areas. Northern harriers (*Circus cyaneus*) were detected at multiple locations, primarily foraging in wetlands and clearcuts. Merlins (*Falco columbarius*) and American kestrels were observed in potential nesting habitat in the area between the Kluskus-Ootsa FSR and Tatelkuz Lake. They were recorded at sites near Top Lake on the Kluskus-Ootsa FSR, Snake Lake, Davidson Creek, and Turtle Creek.

Ospreys were observed northeast and northwest of Tatelkuz Lake. A nest was identified on a small lake to the northeast of Tatelkuz Lake, approximately 200 m from the 109 km marker on the Kluskus-Ootsa FSR, and another along Chedakuz Creek; it is likely that other nests may be found within the study area where lakes are present. Osprey and bald eagle detections within the RSA were likely transient and breeding birds moving between the lakes within the area

A provincially Blue-listed rough-legged hawk (*Buteo lagopus*) was detected in a wildlife tree located in a recently planted regenerating clearcut 9 May 2013 (**Figure 3.4-3**). The detection was at 1,165 m in elevation within the SBSmc subzone. Due to the timing of the observation and the distance to its breeding range, this bird was considered a migrant.

Within the RSA, five owl species were detected, with the great-horned owl being the most frequently detected species (**Table 3.4-5**) **Figure 3.4-3**, and **Figure 3.4-9** to **Figure 3.4-12**. No owl species of conservation concern was detected during the surveys within the RSA. Most of the northern saw-whet and boreal owl detections were in the SBS zone with the remainder within the ESSF zone (**Table 3.4-6**).

3.4.4.6 Waterbirds

Aerial breeding waterbird surveys using RISC standards protocols were used to search three water bodies in the RSA (**Figure 3.4-4** and **Figure 3.4-13** to **Figure 3.4-16**). Additional observations of waterbirds were made incidentally during other surveys. Aerial surveys were conducted on 17 July 2011, 7 July 2012, and 22 July 2013. Incidental observations occurred between 19 June 2011 and 24 July 2013.

Eighteen potentially breeding waterbird species were detected within the RSA (**Table 3.4-7**) from aerial surveys and wetland visits during the summers of 2011 through 2013 at a total of 66 different sites. The two most common species detected were bufflehead, which were typically found on small lakes and ponds throughout the study area, and Wilson's snipe, which were found at a variety of cleared areas in both the SBSmc and ESSFmv (**Table 3.4-8**). Common loons were found primarily on larger open bodies of water, Barrow's goldeneye was found primarily on small ponds with little emergent vegetation, and most other waterfowl were detected on ponds with emergent vegetation. Territorial greater yellowlegs and solitary

sandpipers were found in many bogs and sedge-fens; spotted sandpipers were recorded in a variety of aquatic habitats involving both still and moving water.

Forty-nine individual ring-necks were detected at six different locations within the RSA. Breeding was confirmed at three locations within the SBSmc and SBSdk subzones at elevations ranging from 1,037 m to 1,123 m. Adults with and without broods were detected in open-water wetlands or wetland complexes that varied from 0.6 ha to 15.2 ha. The following waterfowl were also confirmed as breeding within the RSA: Barrow's goldeneye, bufflehead, common merganser (*Mergus merganser*), red-breasted merganser (*Mergus serrator*), and mallard.

Breeding was confirmed for the Bonaparte's gull (*Larus philadelphia*), where a nesting colony was found on the southern side of a large pond (20.44 ha) northeast of Snake Lake surrounded by extensive wetlands and at another small lake immediately to the northeast. Both nesting areas were located in old black spruce forest adjacent to the lake. Sandhill cranes were noted during the breeding season in areas of wetlands to the north and northwest of Snake Lake, as well as northwest of Tatelkuz Lake and north of the Kluskus-Ootsa FSR, but were not confirmed breeding. During fall, a flock of 26 sandhill cranes were found in a pasture field at the north end of Tatelkuz Lake. The most diverse area for waterbirds was a wetland complex located 500 m to the northwest of Snake Lake. Six species of waterfowl and two species of shorebirds were found during surveys within this area, including confirmed breeding by bufflehead, ring-necked duck, and mallard.

A migratory waterbird survey took place on 10 September 2013 that surveyed water bodies within the RSA. In total, 174 waterbirds of seven species were detected at 16 water bodies during this survey; no species of conservation concern were detected (**Table 3.4-11**). All water bodies surveyed had at least one species present. A total of 136 of the birds detected were common merganser at three locations; most other water bodies only had a few individuals present.

A Blue-listed great blue heron (*Ardea herodias*) was detected by a wildlife camera feeding on the lower Davidson Creek on 10 and 13 August 2013 during the Kokanee spawning run. No other great blue herons were recorded during any of the wildlife surveys.

3.4.5 Summary

A total of 97 forest and grassland species were detected between all study areas, including five species of conservation concern. Olive-sided flycatchers were usually detected in matrices of old-growth forest and recently harvested areas adjacent to wetlands. Rusty blackbirds were detected in several wetlands primarily around Snake Lake. Barn swallow habitat was largely determined by the presence of anthropogenic features. Species diversity was highest along the Kluskus-Ootsa FSR, where several points located in a mix of wetland, mature forest, and riparian areas had much higher diversity than the rest of the study area.

Twenty-three species of waterbirds were detected across all study areas. The four most frequently detected species were Wilson's snipe, greater yellowlegs, bufflehead, and common loon. Many of the wetlands across the Project area were found to have greater yellowlegs or Wilson's snipe, and most water bodies had bufflehead or common loon present. Diversity was highest in wetlands and water bodies around Snake Lake where a colony of Bonaparte's gulls was found, and breeding was detected for several waterfowl species. A great blue heron was the only species of conservation concern detected within the Project area; however, a group of cranes that are an Identified Wildlife species was also recorded near the Tatelkuz Ranch within the RSA.

Eighteen species of raptors were detected across all study areas. The Blue-listed short-eared owl was the only listed raptor species detected during the baseline surveys. The highest diversity within the areas surveyed occurred within the mine site RSA followed by the mine site. The majority of diurnal raptor sightings were made within the SBSmc2 and SBSmc3 subzones. The greatest diversity of raptors was found within the SBSmc, followed by the ESSFmv subzones. All raptor species detected may potentially nest within the Project area, except the rough-legged hawk.

3.5 Mammal Community

3.5.1 Species of Conservation Concern Life History Account

3.5.1.1 Fisher

The fisher (*Martes pennanti*) is a large member of the weasel family that is globally rated G5. It is provincially Blue-listed but not listed under COSEWIC or *SARA*.

The fisher is widely distributed throughout BC, except on coastal islands. Its range is believed to be primarily in the Boreal Plains, Sub-boreal Interior, Central Interior, and Taiga Plains ecoprovinces (Weir et al, 2009). In 2003, the late-winter population of fishers for the province was estimated to be between 1,113 and 2,759 animals (Weir, 2003).

The fisher is a forest species usually associated with late-successional conifer and mixed conifer/hardwood forests. Optimal habitat for fishers comprises a variety of habitats with mixed-age conifers and shrub cover formed into a complex of riparian zones with many openings (Powell, 1977; Ruggiero et al., 1994). Areas providing these features with forest floor structural complexity support a wide variety of prey species. Riparian areas, especially moist-rich site series within the SBS zone, are of particular importance to fishers, as they provide a combination of whelping, resting, and foraging sites (Johnson, 1984; Jones, 1991; Weir and Almuedo, 2010). Fishers avoid non-forested areas. Large forest openings, open hardwood forests, clearcuts, grasslands, and areas above timberline are infrequently used in the west (Ruggiero et al., 1994).

In summer, fishers may avoid stands with no deciduous component and show a preference for stand types with deciduous canopy closures of 20% to 40% (Weir, 2009). Spruce trees with rust brooms are favoured for resting sites. Fishers will choose the largest-diameter trees available and those with the most rust brooms. Fishers will rest among CWD and slash piles during periods of low temperatures (Weir et al., 2008).

Maternal den site requisites are believed to be more stringent than those used for resting (Weir, 2003). Natal dens (where parturition occurs) and maternal dens (where young are raised) are usually located high in the cavities of living or dead trees. Cottonwood and aspen are favoured trees for den sites.

Of the 19 natal dens reported by Weir (2003), all were tree cavities in large diameter (>40 cm) black cottonwood (*Populus trichocarpa*). In the Williston study area, den trees averaged 108 cm diameter at breast height (dbh) and den cavities were located 15 m to 26 m (average) above ground.

Deep winter snow may limit the distribution of fishers by hindering their movements and causing increased energy output (Aubry and Houston, 1992; Krohn et al., 1997). Fishers on soft snow may use 54% more energy per day than fishers on hard snow (Banci, 1989). Ruggiero et al., (1994) reported that the majority of fishers are found below 1,000 m and Banci (1989) indicated that fishers generally live at middle range elevations, with no change in elevation between seasons.

Fishers are generalized predators, hunting a wide range of small- to medium-sized prey. They mainly hunt on the ground but are adept at climbing trees. Several forest types, in various structural stages, provide the optimum feeding habitat for fishers, since they provide habitat niches for a diverse prey species (Powell and Zielinski, 1994; Weir, 2003).

While some other carnivore species occasionally prey on porcupines, the fisher is the only predator that specializes in porcupine predation. In some parts of the fisher's range, porcupines are a major prey item; however, they do not appear to be as heavily predated in BC. Although fisher diet varies between areas, the most common prey species in BC are snowshoe hares, red squirrels, and red-backed voles (Weir and Harestad, 2005). Fishers will also readily eat carrion (usually ungulates), small rodents, shrews, bird eggs, insects, berries, and other vegetation (Powell, 1977; Arthur et al., 1989; Giuliano et al., 1989; Kuehn, 1989).

The fisher's hunting strategy for porcupines is quite different to that for other prey species. When hunting snowshoe hares, the fisher will meander through the forest on hare pathways in the hope of surprising their prey. However, when hunting porcupines, they will travel in a more direct line (for up to 5 km) to a known porcupine den and foraging site. Smaller preys are taken opportunistically (Powell, 1977).

Fisher populations in Canada cycle in response to, and about three years out of phase from, snowshoe hare populations (Bulmer, 1974; Bulmer, 1975).

Fishers are solitary and territorial animals. In most populations studied, fishers appear to exhibit intrasexual territoriality: home ranges overlap little between members of the same sex but overlap is extensive between members of opposite sexes (Buck et al., 1983; Arthur et al., 1989). Home ranges are smallest during winter and largest during summer. Researchers in two study areas of central BC reported home ranges averaging 169 km² for males and 35 km² for females (Weir et al., 2009). Densities of fishers in BC are estimated to be between one fisher per 65 km² and one fisher per 100 km² in the highest-quality habitats in the province (Weir, 2003).

These ranges were larger than other North American studies reported, particularly for males. The authors speculate that the larger ranges were due to a lower density of resources for fishers in central BC. Tracking data indicate that fishers use those parts of their home ranges with high prey densities (Coulter, 1966; Powell, 1977; Arthur et al., 1989).

In BC, most fishers mate in March or April. On average, two or three young are born during spring following a delayed implantation of the blastocysts (Hall, 1942; Douglas and Strickland, 1987; Weir, 2003). Reported parturition dates for fishers in BC were between 23 March and 10 April (Weir, 2000). The mean date of parturition of radio-tagged fishers in the Williston Reservoir area was 6 April (Weir, 2000).

Breeding and foraging habitat could occur within the mine site and LSA as well as the transmission line LSA; however, the amount of suitable habitat components is limited in the mine site LSA. The provincial benchmark for the species has been defined as the SBSdw subzone which occurs in the transmission line LSA (including the Stellako reroute), Kluskus FSR LSA, and the RSA (Weir, 2003). Due to deep snowpacks, the ESSF zone is of little or no value to fishers. No sign of fishers was identified during any of the surveys in 2011 and 2012. An incidental sighting of a fisher was recorded at approximately KM 80 on the Kluskus-Ootsa FSR in January 2013, within the access road LSA. The detection site was in SBSdk, at an elevation of 970 m, with an old pine forest on one side of the road and a logged area on the other. The fisher was reported running across the Kluskus FSR chasing a snowshoe hare.

3.5.1.2 Wolverine

The wolverine (*Gulo gulo*) is the largest terrestrial member of the weasel family. It is globally rated G4T4, provincially Blue-listed (S3), listed as Special Concern by COSEWIC, but it not listed under *SARA*. In 1987, the wolverine population of BC was estimated at a minimum of 5,000 (Hatler et al., 2008).

The wolverine is an opportunistic omnivore in summer and primarily a scavenger in winter. It depends on large tracts of undisturbed habitat that provide an adequate year-round supply of abundant and diverse food (Darling, 2000). In BC, these habitats include montane forests, subalpine meadows, and alpine tundra.

Food availability is the fundamental factor influencing movement patterns and home range selection by wolverines, although the habitat use patterns of adult males are also influenced by breeding activities (Banci, 1994). During winter, wolverine distribution is determined by the distribution of ungulates, as they cannot survive only on small prey and must rely on the availability of ungulate carrion (COSEWIC, 2003). Excess food items may be cached in snow or soil for later consumption (Magoun, 1985).

Summer diet is more varied, typically consisting of small prey species such as voles, lemmings, tree squirrels, ground squirrels, snowshoe hares, pikas, shrews, birds and their eggs, fish, fruit, and insects. In alpine and subalpine areas, wolverines will dig out marmots and ground squirrels from their burrows (Gardner, 1985; Magoun, 1985). Although primarily scavengers, they are occasionally capable of killing larger prey, including adult deer, caribou, and even moose (*Alces alces) (*Grinnell, 1920; Grinnell, 1926; Burkholder, 1962). In a study in northern BC, Gustine et al. (2006) found that wolverine was the primary predator of caribou calves up to two weeks old.

The wolverine is physically and behaviourally adapted for snow. Its pelage is known for its frost-shedding qualities, and its relatively large feet enable it to travel in deep soft snow more easily than many other species. Wolverines require snow cover for natal dens (Aubry et al., 2007). All natal dens reported have been at sites where snowpacks persist into May, when kits are weaned (Krebs and Lewis, 2000; Lofroth, 2001; Copeland et al., 2010). Natal dens above treeline and in tundra habitats require snow 1 m to 3 m deep (Pulliainen, 1968). The tundra dens are typically snow tunnels up to 60 m long (Pulliainen, 1968; Magoun, 1985).

In forested habitats, dens may be under logs, under roots of upturned trees, among boulders, in tree cavities, in abandoned bear dens, or in abandoned beaver (*Castor canadensis*) lodges (Seton, 1929; Pulliainen, 1968; Rausch and Pearson, 1972). All natal dens in BC have been found at elevations from 1,550 m to 1,800 m (Krebs and Lewis, 2000; Lofroth, 2001).

Wolverines have large home ranges. In North America, they can occupy less than 100 km^2 to more than 900 km^2 (Banci, 1994). Male wolverines tend to have larger home ranges than females and overlap the ranges of several females (Banci, 1987; Krebs and Lewis, 2000; Lofroth, 2001). It is speculated that female home ranges are dictated by the distribution of food and male home ranges by the distribution of females (Sandell, 1989). In BC, home ranges in the Williston Reservoir area were documented as averaging 1,366 km^2 for adult males and 405 km^2 for adult females (Lofroth, 2001). In the Columbia Mountains, ranges averaged 1,005 km^2 for males and 311 km^2 for females (Krebs and Lewis, 2000). Wolverines rely largely on olfactory communication and will devote considerable energy to scent-marking using urine, scat, or scent glands, often deviating from their line of travel to scent-mark objects (Magoun, 1985).

Wolverines have traditionally been thought of as solitary animals, leading a nomadic life and only meeting with other wolverines for breeding. However, research in Montana has

revealed that at least some males will associate with their offspring after they are weaned and that as many as three generations have been observed travelling together (Chadwick, 2010).

Human-caused mortality from trapping and transportation corridors is a large factor in survivorship.

During snow-tracking surveys in the RSA in March of 2012, the tracks of probably one wolverine were found in mature forest stands within the clearcut-dominated lower elevation area (Ecofor, 2012a).

3.5.1.3 Grizzly Bear

The grizzly bear (*Ursus arctos*) is provincially Blue-listed and listed as Special Concern by COSEWIC, but is not listed under *SARA*. Grizzly bears inhabit all forested and non-forested regions of BC, except Haida Gwaii and outer coastal islands. They are found within all BGC zones except the Coastal Douglas Fir (CDF) zone and occupy a wide variety of habitats ranging from coastal estuaries to alpine meadows (Cowan and Guiguet, 1965; Hatler,et al. 2008).

In 2012, the population of grizzly bears in BC was estimated at approximately 15,000 animals (BC MFLNRO, 2012a). Populations across BC are divided into 56 GBPUs (MFLNRO, 2012a). The Project area is located primarily within the Blackwater-West Chilcotin unit, but also the western part of the Nulki unit and south central part of the Francois unit. The Blackwater-West Chilcotin unit has been designated as Threatened by BC MFLNRO to prevent range contraction and ensure long-term population viability, whereas both the Nulki and Francois units have been closed to hunting due to small population sizes. The populations of all three units were similar in 2012, with the Blackwater-West Chilcotin unit having an estimated population of 53 bears, the Nulki unit having 44 bears, and the Francois unit having 58 bears (MFLNRO, 2012a). Assessment of effects on grizzly bear will use the project LSA and RSA to assess habitat effects. Mortality risk and cumulative effects will also be assessed using the larger area GBPUs.

Grizzly bears occupy large territories with a variety of habitats due to their role as predator within the ecosystem (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 typically encompass separate seasonal habitats, and travel routes between and within different habitat types are a necessary requirement for continued use (Jonkel, 1987). Travel corridors are important for young grizzly bears as habitats where they may live and gradually disperse over a period of one to four years (COSEWIC, 2002a). Migrating grizzly bears use travel corridors such as game trails, human trails, shorelines, ridges, creek beds, avalanche chutes, logging roads, sandbars, and river banks.

Grizzly bears are omnivorous and opportunistic in their feeding habits, consuming a great variety of items. They primarily eat vegetation throughout most of the year, and their habitat associations are therefore strongly seasonal, typically reflecting local plant development. In mountainous regions, this may result in seasonal migrations to different elevations (COSEWIC, 2002a). Based on a chemical analysis of their hair, Hobson et al. (2000) calculated that plants comprise 91% of grizzly bears' diet in southeast BC.

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, 1986; Stevens and Lofts, 1988; Fuhr and Demarchi, 1990). In early spring, after emerging from winter dens, grizzly bears require high-protein digestible forage and feed on ungulate carcasses and on early-emergent and succulent vegetation in wet meadows, riparian areas, seepage sites, swamps, avalanche chutes, and burns. As snow melts upslope, bears ascend to follow the emergence of fresh vegetation (COSEWIC, 2002a). The lusher sites are often located on southwest aspects (Simpson, 1987).

Grasses, sedges, horsetails, and overwintering berries (mainly crowberries *Empetrum nigrum* and kinnikinnick *Arctostaphylos uva-ursi*) are the most commonly selected spring food items of bears, mainly due to availability early in the year. Grizzlies will strip bark from conifers such as subalpine fir (*Abies lasiocarpa*) and spruce (*Picea spp*.) in spring and early summer to feed on the cambium layer (Power, D., pers. obs., 2012)

Throughout spring and summer, grizzly bears continue to feed on grasses, sedges, dandelions, and other forbs and succulent plants such as 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 have the largest litters and highest densities (Hilderbrand et al., 2004).

Home ranges vary greatly in size depending on the age and sex of the bear, the seasonal and annual availability of food, the 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 1996) but may be as small as 24 km^2 in rich, coastal habitats (LeFranc et al., 1987; MacHutchon et al., 1993). In the BC interior, home ranges typically cover between 300 km^2 and 500 km^2 for males and between 80 km^2 and 200 km^2 for females (Hatler et al., 2008). In the Parsnip River area, the mean annual home range size was 423 km^2 for males, and 59 km^2 for females (Ciarniello et al., 2003).

Apart from some individual coastal grizzly bears, all grizzly bears in BC hibernate for the winter. In the interior of BC, grizzly bears generally hibernate between October and May, although some bears may emerge from their dens as early as March or April. Pregnant females are the first to enter dens during fall and the last to emerge in spring (Vroom et al., 1980).

The majority of grizzly bear dens are excavated on moderately steep to steep slopes of approximately 41% to 90% (Lentfer et al., 1972; Pearson, 1975; Russell et al., 1979; Vroom et al., 1980; Nagy et al., 1983). Sloped sites are often selected because they facilitate easier digging, and the slope surface is generally stabilized by boulders or by root systems of herbaceous plants and trees. Natural rock caves and cavities under old-growth structures, including large old trees and root balls, also make suitable den sites (Aune, 1994).

Dens are predominantly in alpine or subalpine habitat at mid- to upper-elevations and typically 1 km to 2 km from human activities (Ciarniello et al., 2005). However, grizzly bear dens have also been found at both low (306 masl) and mid-elevations (975 masl) (Hatler, 2008). Although bears along Parsnip River, BC, primarily excavated dens into the sides of slopes, Ciarniello et al. (2005) found grizzly bears using natural caves in mountainous areas for denning and believe that they were especially important as natal den sites.

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 (Mattson et al., 1987; Mattson and Henry, 1987; McLellan and Mace, 1985; McLellan and Shackleton, 1988). In addition, roads also open up areas of grizzly bear habitat to bear hunting and hunting of bear prey, thereby reducing habitat capability (McLellan, 1990).

In May 2012, several grizzly bear sightings were reported along the Kluskus FSR between the 100 and 125 km marker, and one sighting reported along the Vantine FSR, approximately 25 km west-northwest of the LSA (Avison, 2012a). In 2012, five different grizzly bears were recorded in September walking in front of wildlife cameras established to record bear-Kokanee interactions. The bears were detected on the lower reaches of Chedakuz Creek and Creek 661. In 2013, the cameras were re-established and one grizzly bear was recorded in the middle of August in the RSA and one grizzly was reported walking past the edge of camp downslope in the spring.

3.5.1.4 Caribou

All caribou in BC belong to one subspecies of woodland caribou *Rangifer tarandus caribou* of which two different ecotypes used to be recognized, the Northern and the Mountain. The distinction between the two was based on biogeography and habitat use rather than on any morphological differences (Nagorsen, 1990; Cowan and Guiget, 1965).

In 2011, in preparation for upcoming assessments and reassessments on caribou, a report by COSEWIC defined the designatable unit (DU) component as the new process of

identifying populations of caribou in Canada. The DU concept acknowledges that there are spatially, ecologically, or genetically discrete and evolutionarily significant units that are irreplaceable components of biodiversity (COSEWIC, 2011).

The transition between the two different former ecotypes occured between the Fraser River and Highway 97 in the Hart Ranges ecosection and roughly corresponded to the northern limit of the ICH BGC zone in eastern BC (Simpson et al., 1997).

The Mountain caribou ecotype is found in southeast BC and in the east-central regions of the province. It inhabits areas of high snowfall where snow depths make cratering for winter forage difficult so they rely primarily on arboreal lichens (*Bryoria, Alectoria)* for winter food.

The Northern ecotype inhabits areas with low to moderate snow depths in the boreal forests in the north and west-central regions of BC, including the area of Tweedsmuir-Entiako. In these areas, they forage primarily on terrestrial lichens; arboreal lichen use increases as winter progresses or during winters of deep snowpack (Bergerud, 1974a; Seip, 2002).

Woodland caribou (*Rangifer tarandus caribou*) of the Tweedsmuir-Entiako herd were considered part of the threatened Southern Mountain Population by COSEWIC and part of the Blue-listed Northern Ecotype by the BC MOE. The Tweedsmuir-Entiako population and Itcha-Ilgachuz population are now considered to be part of the Northern Mountain Caribou DU7 (COSEWIC, 2011). The Tweedsmuir-Entiako herd consists of approximately 500 animals, which typically spends the summer in high elevation areas and migrates into forested lower elevations for the winter (Cichowski and Banner, 1993). Assessment of effects to the Tweedsmuir-Entiako herd will use the Project LSA and RSA to assess habitat based effects and the herd area to examine mortality related risk and potential cumulative effects.

Caribou are non-territorial except during the rut. The home range of an animal must provide all life requisites for all seasons throughout the life of the animal. Therefore, home range size in a particular area will depend on the degree to which all requisites are provided for. Summer and winter ranges of caribou are often separate and distinct areas linked by migration corridors. Lance and Mills (1996) described the physical and botanical characteristics of spring migration habitats for the Tweedsmuir-Entiako herd. All habitats were characterised by having raised and open aspects, sparse tree cover, free-draining soils, and simple flora with abundant terrestrial lichens.

In winter, the majority of Northern caribou forage predominantly on terrestrial lichens in the lodgepole pine–dominated, mature/old-growth forests of the Montane Spruce zone and Sub-Boreal Pine-Spruce zone. As snowpack deepens in late winter, caribou increase their use of arboreal lichens. A minority of the caribou population winter on windswept subalpine and alpine slopes where they feed mainly on terrestrial lichens supplemented by arboreal lichens on trees near treeline. In late winter, when increased snow depths make cratering for terrestrial lichens difficult, caribou feed increasingly on arboreal lichens. While arboreal lichens occur in all coniferous forests, they are most abundant in the forests of the ESSF zone.

Caribou have a much more varied diet in spring, summer, and fall when, in addition to lichens, they feed on a variety of graminoids, forbs, shrubs, mosses, and fungi in forests, wetlands, subalpine parkland, and alpine tundra.

To avoid contact with predators, caribou use security habitat, where they, if threatened, can escape by fleeing. Seip (1992) attributed major declines in caribou populations of central BC to increases in numbers of moose in the 1920s. The presence of moose supports increased wolf numbers and results in higher predation levels on caribou (Seip, 1992; Seip and Cichowski, 1996). Although grizzly bears, black bears (*Ursus americanus*), lynx (*Lynx canadensis*), and wolverine are known to prey on caribou, wolves are believed to be their major predator through most of their range (Bergerud and Elliot, 1986; Seip, 1992). However, in a study in northern BC, Gustine et al. (2006) found that wolverines are the primary predator of caribou calves up to two weeks of age. Caribou are particularly susceptible to predation as they have slow reproductive rates compared to other ungulates. While moose cows can breed at 1.5 years of age, produce twins and sometimes triplets, caribou do not breed until they are at least 2.5 years and give birth to a single calf.

Rugged, exposed alpine/subalpine terrain provides caribou with the best security habitat where they can distance themselves from other prey species and best detect and avoid predators. Caribou make most use of forests in winter. When caribou use forested habitats they compromise security for foraging needs. Large frozen lakes and wetlands adjacent to forest stands can be used as escape terrain as caribou are better adapted to travel through deep snow than their predators.

To reduce predation levels on calves during parturition, Northern caribou disperse widely throughout rugged, exposed terrain above the treeline. They also use this dispersal strategy in forested habitats (Bergerud et al., 1984; Hatler, 1986; Cichowski, 1993) However, calf survival rates have been found to be higher in rugged, mountainous terrain where cows and calves can distance themselves from other prey species and their predators (Seip and Cichowski, 1996).

In both forested and non-forested habitats, caribou need large tracts of land through which they can disperse to reduce predation levels. This dispersal strategy is particularly important during and immediately after parturition when calves are the most vulnerable to predation (Bergerud et al., 1984).

Thermal habitat is used by caribou to assist them in maintaining a constant body temperature. In summer, most caribou are in subalpine/alpine habitats where they can find relief from solar heat by using forest shade, lingering snowfields, or cool windswept alpine slopes. Thermal habitat is more critical for caribou in winter when they are nutritionally stressed and need to minimize energy expenditures. Caribou are highly adapted, both physiologically and behaviourally, to life in arctic/subarctic winter and show no thermal cover dependency (Edmonds and Bloomfield, 1984). They are relatively insensitive to all but the most severe winter conditions. Russell and Martell (1984) reviewed the literature on caribou

winter activity: Caribou will forage at temperatures as low as -50°C (Henshaw, 1968), although activity may be reduced below -35°C (Roby, 1978). Moderate wind speeds (less than 15 km/h) have little effect on behaviour, but caribou movement increases as the animals begin to lose body heat due to increasingly greater wind speeds (Thomson, 1977). In high winds (greater than 30 to 40 km/h) and in blizzard conditions, caribou will aggregate and eventually bed down to conserve heat (Henshaw, 1968; Baskin, 1970; Thomson, 1977). Winter thermal habitat is provided by mature/old-growth forest, tree-islands in subalpine parkland, krummholz, lee-slopes, and broken terrain that provide shelter from chilling winds.

Summer and winter ranges of caribou are often separate and distinct areas linked by migration corridors. While most caribou range within a discrete area during each winter, they may not return to the same area the following year.

To reduce predation levels on calves during parturition, Northern caribou disperse widely throughout rugged, exposed terrain above the treeline. They also use this dispersal strategy in forested habitats (Bergerud et al., 1984; Hatler, 1986; Cichowski, 1993). However, calf survival rates have been found to be higher in rugged, mountainous terrain where cows and calves can distance themselves from other prey species and their predators (Seip and Cichowski, 1996).

Caribou are primarily grazers. Northern caribou forage principally on terrestrial lichens but will also feed on arboreal lichens on both standing and windblown trees, as well as on litterfall, grasses, sedges, forbs, mosses, and fungi. In spring and summer, caribou feed on a variety of shrubs, forbs, and graminoids that are relatively high in protein at that time of year. Lichens may still be eaten during these seasons but are not preferred (Bergerud, 1972; Rominger and Oldemeyer, 1990).

Lichens are low in protein but high in digestible carbohydrates and are particularly important to caribou in winter when they are the only forage that is abundantly available. However, a winter diet of only lichens can retard digestive processes in the rumen and lead to loss of condition. In early winter, access to non-lichen forage supplements such as evergreen shrubs would be advantageous, especially to pregnant cows, and might delay the potential detrimental effects of a restricted diet in late winter (Russell and Martell, 1984; Rominger and Oldemeyer, 1990).

Snow depth and density can affect the availability of caribou winter forage. Deep snow may prevent cratering for terrestrial lichens, while crusted snow may provide a platform on which to reach arboreal lichens. Yearly variations in snow depth and density may be reflected by changes in patterns of caribou winter range use. Caribou can detect lichens through 15 cm to 18 cm of undisturbed snow cover (Bergerud and Nolan, 1970), but use air vents adjacent to emergent stems of tall shrubs to detect lichens at depths of at least 72 cm (Bergerud, 1974a; Helle, 1981). The critical snow depth for cratering for a solitary forest caribou is 65 cm to 74 cm (Bergerud, 1974b; Helle, 1981) while a herd can crater in 80 cm to 90 cm of snow, provided that the sinking depth is less than 70 cm (Nasimovich, 1955;

Helle, 1981). However, deep, soft snow can temporarily immobilize caribou and restrict them to small pockets of range (Bergerud, 1974b).

Cichowski (1993) reported that caribou of the Itcha Ilgachuz herd in some years would forage extensively during fall in Fescue-Lichen meadows, Altai fescue-Cladonia dry grassland, and Timber oatgrass-Altai fescue cold dry meadow but abandoned them in favour of lichen-forests when snow depths approached 50 cm with caribou sinking depths of 40 cm.

Caribou display two different habitat-use strategies during winter. A minority of the population winter in the mature/old-growth forests of the ESSF zone and on open, windswept alpine habitats with reduced snow accumulation giving access to terrestrial lichens by cratering. The majority of caribou winter at lower elevations in extensive lodgepole pine–dominated, mature/old-growth forests of the Montane Spruce zone and Sub-Boreal Pine-Spruce zone where terrestrial lichens are most abundant.

Arboreal lichens are also of great importance to caribou survival, especially in late winter when snow pack makes cratering for terrestrial lichens difficult. Caribou may shift to feeding on arboreal lichens when snow depths exceed 80 cm and density and hardness are sufficient for support (Nasimovich, 1955). While arboreal lichens occur in all coniferous forests they are most abundant in the more moist forest types, particularly on trees in forested wetlands and on the margins of wetlands and lakes in the ESSF zone (Edwards et al., 1960; Cichowski, 1996).

Caribou eat a wide variety of plant species including graminoids, forbs, mosses, fungi, shrubs, and lichens. Consumption of conifers is believed to be incidental (Rominger and Oldemeyer, 1990). Bergerud (1972) reported caribou food preferences were for greens in the growing season, fungi in summer and fall, and lichens in fall. Lichens become increasingly important in winter due to their abundance, accessibility, and high digestibility.

Terrestrial lichens are the winter forage species of most importance to Northern caribou. In descending order of preference, the lichen species eaten most often are *Cladina* spp., *Cladonia* spp., and *Stereocaulon* spp*. Peltigera* species, although often abundant, are not selected for by caribou (Bergerud, 1972; Holleman and Luick, 1977). The most preferred terrestrial lichen species do not become established and abundant in forested areas until up to 50 years after site disturbance (Ahti, 1977; Cichowski, 1993).

The arboreal lichens of most importance to caribou, particularly in late winter, are *Bryoria* spp. and *Alectoria* spp. The low protein content of lichens is offset by their high digestibility in caribou (Cooperrider et al., 1980; Thomas et al., 1984). Arboreal lichens reach their highest abundance on trees of age classes 7 to 9 (121 to 251+ years) (Edwards et al., 1960).

Caribou are sensitive to human disturbance and development and have been shown to avoid areas up to 4 km from a mine site and suffer from disruptions in behaviour and habitat use up to 6 km away (Weir et al., 2007).

The Vanderhoof Land and Resource Management Plan (LRMP) (BC Integrated Land Management Bureau (BC ILMB), 1997) presents a number of wildlife objectives and strategies for maintaining habitat quality for caribou (and other wildlife), including:

- Supporting scientific research opportunities (e.g., examining predator-prey relationships, monitoring and comparing vegetation succession on controlled burn versus wildfire areas);
- Periodically inventorying wildlife populations;
- Protecting high-quality caribou habitat from destruction (short term); and
- Developing a winter habitat strategy to ensure caribou has wintering grounds over the long-term, utilizing a fire management plan.

A baseline dataset on the Tweedsmuir-Entiako caribou subpopulation was initiated in the mid-1980s. Habitats and movements of the caribou herd by Marshall (1984) and Herbert (1987) were monitored from 1982 to 1984. Cichowski (1989) followed the herd from 1985 to 1988.

Recent historical field work on the Tweedsmuir-Entiako herd occurred from 2006 to 2009, and studies have looked at the effects of the MPB on the distribution of the caribou (Cichowski, 2010). It was determined that seasonal range movements, range use, and habitat of the caribou herd were similar to that recorded prior to the MPB epidemic. The herd uses the Entiako Park during winter and moves to Tweedsmuir Park for the summer. Caribou scat has been identified within the LSA and RSA. They may use the area as part of their wintering habitat during high snowpack years.

No caribou were observed in the RSA during baseline surveys; however, scat was found at eight locations within the mine site LSA, twice along the Davidson Creek corridor, and once in the subalpine of Mount Davidson. No caribou tracks were found during winter track surveys of the Project LSA in 2012 (Ecofor, 2012a).

In addition to baseline studies conducted for the mine environmental assessment, New Gold has been supporting survey work of the Tweedsmuir-Entiako and Itcha-Ilgachuz caribou subpopulations outside of the mine RSA in October 2013 (Hebert, 2013).

In October 2013, fall surveys of the two subpopulations showed low levels of recruitment (**Annex 12**). The Tweedsmuir-Entiako herd had a total of 94 caribou in five groups in the Quanchus Mountains. All caribou were found in the Mt. Wells/Tweedsmuir Peak and Wells Gray Peak mountain blocks. Fall calf survival was 10.6% calves and 16.7 calves/100 cows. The bull cow ratio was 40 bulls/100 cows (**Annex 3**). The low calf recruitment rate supports the Environment Canada (2014) characterization of a declining population trend for this sub-population, which is currently assessed at a minimum viable population size threshold of 300 (Environment Canada 2011).

According to BC MOE caribou survey reports, the Itcha-Ilgachuz population declined by approximately 52% between 2003 and 2010. The October 2013 survey sample of 616

caribou resulted in an age ratio of 3.4 calves/100 cows. Combining the October 2012 fall ratio with the previous recruitment ratios (2003 to 2012) suggests that the Itcha-Ilgachuz population is continuing to decline rapidly. Based on a ratio of 3.4 calves/100 cows in October 2013, the recruitment rate in March to June will likely be close to 0 yearlings/100 cows (D. Hebert, 2013, October 2013 surveys) (**Annex 12**). The proposed Recovery Strategy (Environment Canada, 2014) state that current population trends in both the Tweedsmuir-Entiako and Itcha-Ilgachuz herds are declining, and identifies performance indicators toward achieving population and distribution objectives of the Recovery Strategy.

3.5.1.5 Bats

Two species of myotis bat, little brown myotis (*Myotis lucifugus*) and the northern myotis (*Euderma maculatum*), were listed under COSEWIC and *SARA* as endangered in 2012. Previously, only the northern myotis was provincially Blue-listed. Little brown myotis are habitat generalists, inhabiting a wide range of habitats in BC, including urban, grassland, boreal, and temperate rainforest environments (Nagorsen and Brigham, 1993). Roosting areas include both man-made structures and natural locations (e.g., tree cavities, rock crevices); however, hibernacula are almost always subterranean, using either caves or abandoned mines (Nagorsen and Brigham, 1993). Northern myotis have more specialized habitat requirements, having a preference for mature boreal forest with stands of deciduous trees, typically in interior forest locations (Owen et al., 2002). In addition, almost all foraging is done within forested areas, compared with most other species that utilize wetlands, meadows, and other clearings (Nagorsen and Brigham, 1993). Roosting locations are typically under peeling bark or in crevices and cavities of trees, both live and dead (Owen et al., 2002). Sex-based selection of roosting locations also occurs, with males typically roosting in smaller trees, either deciduous or coniferous, and females preferring larger coniferous trees (Broders and Forbes, 2004). Little is known of hibernacula requirements; however, it is thought they are similar to other myotis species (Alberta Sustainable Resource Development and Alberta Conservation Association (ASRDACA), 2009). It is thought that caves and abandoned mines are used however specific environmental conditions are required (i.e., subterranean areas with high humidity and temperatures above freezing).

Both species were recently listed under COSEWIC due to concerns related to the rapid spread of white-nose syndrome caused by a fungus (*Geomyces destructans*). This syndrome infects hibernating bats, causing premature arousal from hibernation and using up winter fat reserves, and is typified by white fungal growths around the nose of infected bats (Frick et al., 2010). Annual mortality has been estimated between 30% and 99%, with a regional mean of 73% (Frick et al., 2010). In addition, it has been found to be spreading at a rate of 200 to 400 km/y, with the entire Canadian populations expected to be impacted within 11 to 22 years (COSEWIC, 2012). To date, this disease has not been detected west of Ontario (United States Fish and Wildlife Service (USFWS), 2012). Little brown myotis and northern myotis were both confirmed in the mine site, water pipeline LSA, airstrip LSA, and RSA.

The eastern red bat (*Lasiurus borealis*) is a provincially Red-listed species in BC and is at the edge of its western range. In 2010 it was detected near Dawson Creek in northeastern BC. The bat was idendified after it was collected as part of a wind farm mortality survey; due to the time of year it was collected it was assumed to be migrating (Nagorsen and Patterson, 2012). Red bats are considered rare in western Canada; however, recent research determined their range has expanded as far north as Nahanni National Park in Northwest Territories (Kendall, 2013). Not much is known about the biology of the eastern red bat in BC; however, it is assumed to be similar to eastern bats further to the south. The eastern bat is a migratory bat that inhabits forests, roosting primarily beneath clusters of leaves during spring, summer, and fall. It is a solitary rooster and does not use caves (Kentucky Bat Working Group 2013). The calls of the eastern red bat were detected in the mine site, water pipeline LSA, airstrip LSA, and RSA

3.5.2 Mine Site and LSA

3.5.2.1 Ungulates and Furbearers

Aerial, road, and snow tracking surveys for furbearers and ungulates have occurred within the VFD; however, no surveys previous to 2011 included the mine site LSA and RSA. Proulx (2008) summarized aerial, road, and snow tracking surveys for mule deer (*Odocoileus hemionus*) within the SBS zone of the VFD to determine mule deer distribution and habitat associations in late winter. High-quality, late-winter mule deer corresponded with mature, conifer-dominated stands with a canopy closure ≥45%, tree heights ≥23 m, and tree dbh ≥24 cm and located on <60% slopes with south or west aspects or level ground. No other ungulate surveys were found for WMU 6-1 where the mine site LSA and RSA occur. Moose surveys have occurred within WMUs 7-11 and 7-12 and are discussed in the transmission line LSA.

A snow tracking study of wolverine , marten (*Martes americana*), and fisher habitat use in Supply Block F within the PGTSA to the east of the VFD developed winter habitat models for the wolverine, fisher, and marten and inventoried species living in sympatry (Proulx, 2006). This study was geographically closest to the Project area and the information was applied to all LSAs and the RSA. The results indicated that all fisher tracks were located in late-successional, conifer-dominated stands with good canopy closure and relatively high basal area. The tracks were found in open immature stands (22.8%), young stands (12%), and mature old stands (65%). The study showed that marten were more discriminate than fisher in the selection of sites. Pure pine stands with MPB-killed trees were not suitable for marten. According to the predictive model, most of the Supply Block F area was determined to be unsuitable for wolverine due to the lack of ESSF stands and the extensive road network (Proulx, 2006). During the same survey, moose were recorded using excellent and medium-low quality polygons with different cover types and canopy openings; however, they did not prefer pine-dominated stands (Proulx and Kariz, 2005).

The mine site and LSA are located within the central and western portion of the Davidson Creek Resource Management Zone (RMZ) 17, which is an area within the jurisdiction of the

Vanderhoof LRMP. The RMZ describes specific resource values and management objectives that set out the types of activities (e.g., recreation, timber harvesting, trapping etc.) and level of intensity permitted in individual zones. The Vanderhoof LRMP recommends that the BC Environmental Assessments and the federal environmental review processes should recognize the identified values in the RMZ (BC ILMB, 1997). The LRMP provides general direction to conserve wildlife habitats and populations as well as specific recommendations for the management of mule deer, moose, grizzly bear, Woodland caribou, and/or additional wildlife at risk. The plan applies to species at risk that are provincially listed as Red (endangered/threatened) and Blue (sensitive/vulnerable).

320000 360000 400000 440000

5960000 5920000 5880000

Francois North Resource Management Zone (RMZ)
Nechako Valley Resource Management Zone (RMZ)
Stuart River Resource Management Zone (RMZ)
Nechako West Resource Management Zone (RMZ)
Upper Nechako River Resource Management Zone (RMZ)
Crystal Lake Resource Management Zone (RMZ)
Vanderhoof South Resource Management Zone (RMZ)
Lucas Lake Resource Management Zone (RMZ)
Kluskus Resource Management Zone (RMZ)
Chedakuz Resource Management Zone (RMZ)
Davidson Creek Resource Management Zone (RMZ)
Laidman Lake Resource Management Zone (RMZ)
Upper Blackwater Resource Management Zone (RMZ)

François Lake
Cheslatta Carrier
Danskin
Skin Tyee
Takysie Creek
Endako River
Fraser Lake
Fraser Lake
Nadleh Whuten
Nechako River
Fort Fraser
Engen Creek
Engen
16
Vanderhoof
Stuart
Francois Lake
Nithi River
Tachik Lake
Weneez
Sinkut River
Nulki
Nulki Lake
Mapes
Cluculz Creek
Cluculz Lake
Knapp Creek
Cheslatta Lake
Cheslatta River
Greer Creek
Sinkut River
Khal
Kluskus FSR
Murray Lake
Ootsa Lake
Lucas Creek
Knewstubb Lake
Big Bend Creek
Finger Lake
Tatuk Lake
Chilako River
Chelaslie
Natalkuz Lake
Proposed Transmission Line
Tetachuck Lake
Tetachuck River
Tatuk Creek
Euchiniko River
Nataniko Creek
Davidson Creek
Tatelkuz Lake
Kluskus-Ootsa FSR
Proposed Water Pipeline Route
Kluskus-Blue FSR
Nazko
Proposed Mine Access Road
Exploration Road
Kuyakuz Lake
Entiako River
West Road (Blackwater) River
Kluskus
Baezaeko
Nazko

N

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

Legend

- Populated Place
- Highway
- Kluskus FSR
- Kluskus-Blue FSR
- Kluskus-Ootsa FSR
- Exploration Road
- Existing Transmission Line
- Proposed Transmission Line
- Proposed Transmission Line (Mills Ranch Reroute)
- Proposed Transmission Line (Stellako Reroute)
- Stream (>= 4th Order)
- Waterbody (>= 100 Ha)
- Parks & Protected Areas
- Proposed Mine Access Road
- Proposed Water Pipeline Route
- Proposed Mine Site
- Vanderhoof Land and Resource Management Plan Area

Resource Management Zone (RMZ)

- Settlement/Agriculture Zone
- Resource Development Emphasis Zone
- Multi-Value Emphasis Zone
- Special Resource Zone

Wildlife and Wildlife Habitat

- Regional Study Area
- Local Study Area

Reference
BC Government GeoBC Data Distribution

CLIENT: newgold

PROJECT: Blackwater Gold Project

Vanderhoof Land and Resource Management Plan Resource Management Zones

DATE:	ANALYST:	
September, 2013	AA	**Figure** 3.5-1
JOB No: VE52095	QA/QC: MY	PDF FILE: 11-100-059_VLRMPA_v2.pdf
GIS FILE: 11-100-059_VLRMPA_v2.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	amec

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Six aerial reconnaissance transects were flown along the 2011 mine site LSA and RSA near the proposed mine site along the slopes of Mount Davidson on 16 March 2011 (Ecofor, 2011) (**Annex 3**) (**Figure 2.1-21**). Transects were oriented from northwest to southeast with an average length of approximately 16 km each. The northwest limit of the survey was the Top Lake/Fawnie Creek drainage and the southeast limit of survey was the northwest tip of Kuyakuz Lake. Detections of tracks and wildlife were identified where possible and recorded.

During the ground based furbearer and ungulate winter tracking surveys during 12 to 16 March 2012, a total of 15 transects were surveyed in the mine site LSA and portions of the RSA totalling 97.4 km in length (Ecofor, 2012a) (**Annex 4**) (**Figure 2.1-22**).

The preliminary aerial transect surveys confirmed three mammal species, plus additional detections of unidentified ungulates, furbearers, and carnivores, but it did not identify any smaller mammal species. The ground-based winter surveys recorded a total of 1,052 track sets and a total of nine species were identified (**Figure 3.5-2** to **Figure 3.5-5**) (**Annex 4**). The most frequently detected species within the LSA and RSA was moose, followed by snowshoe hare (*Lepus americanus*), lynx, and wolf (*Canis lupus*).

The most frequently detected species were snowshoe hare, red squirrel, weasel species, moose, and lynx. The lower species count and level of detections in 2011 was due to the overview nature of the aerial survey and its inability to pick up tracks of smaller species.

The winter tracking surveys completed at Mount Davidson in 2011 concluded that wildlife and winter wildlife habitat values were considered moderate and the area did not appear to provide any high-value or high-use wintering habitat for ungulates. However, use may be determined by annual snow levels and availability of food each year. The moderate rating was based on the density of tree density, shrubs, forbs, and lichens as well as on depth of snow pack, canopy closure, and availability of wintering habitats. Highest use of ungulates observed was by moose in the lower elevation pine habitat types and cutblocks and along riparian corridors within the RSA. No critical or at risk habitat value areas or wintering areas were identified during the overview flight other than the Ungulate Winter Range (UWR) U-7-012 southwest of the mine site LSA.

Moose sign in the form of scat, beds, rub, and browse were recorded during other wildlife surveys throughout the mine site and LSA in the ESSFmvp, SBSmc2, and SBSmc3 variants (**Table 3.5-1**). Moose use was recorded in a number of locations along the Davidson Creek corridor. Both winter and summer browse sign of this ungulate was recorded in 25% of the TEM plots that occurred within the mine site LSA and RSA. A moose lick recorded within the mine site was filled in and no longer exists.

363000 366000 369000

5901000 5898000 5895000

Kluskus-Ootsa FSR

Top Lake

Exploration Road

N

Legend

Winter Mammal Transects

Winter Mammal Track Location

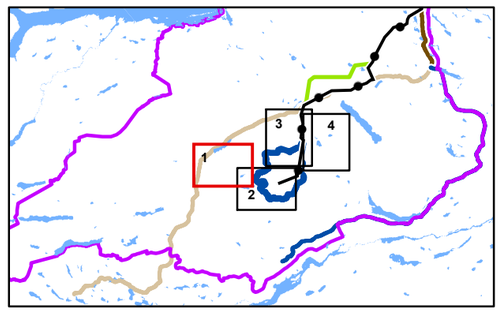
- CL: Lynx
- CO: Coyote
- LW: Least Weasel
- MO: Moose
- PM: Marten
- RF: Red Fox
- RS: Red Squirrel
- SH: Snowshoe Hare
- UU: Unknown Ungulate
- WE: Weasel sp.
- WV: Wolverine

Existing Road
Kluskus FSR
Kluskus-Blue FSR
Kluskus-Ootsa FSR
Exploration Road

Proposed Mine Site
Stream (>= 2nd Order)
Waterbody (>= 4 Ha)

Wildlife and Wildlife Habitat

Local Study Area
Regional Study Area



Scale: 1:35,000

0 0.5 1 2

Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold

PROJECT: Blackwater Gold Project

Ungulate and Furbearer Winter Ground Track Locations (1 of 4)

DATE:	ANALYST:	**Figure** 3.5-2
October, 2013	KA	
JOB No: VE52095	QA/QC: MY	PDF FILE: 11-100-065_winter_track_species_20131016.pdf
GIS FILE: 11-100-065_winter_track_species_20131016.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	amec

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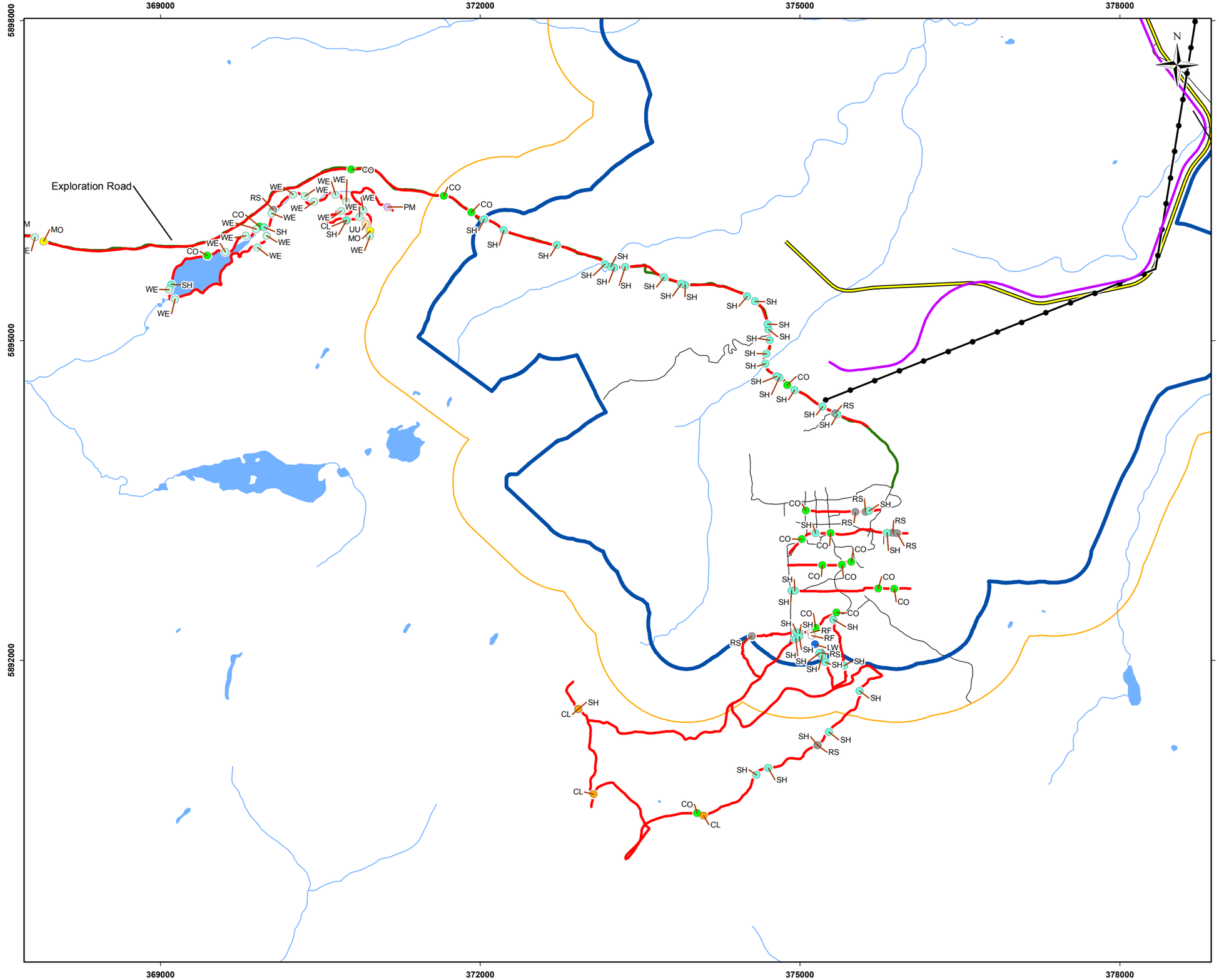


Legend

- Winter Mammal Transects

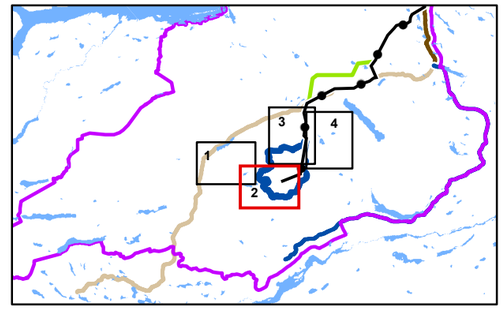
Winter Mammal Track Location

- CL: Lynx
- CO: Coyote
- LW: Least Weasel
- MO: Moose
- PM: Marten
- RF: Red Fox
- RS: Red Squirrel
- SH: Snowshoe Hare
- UU: Unknown Ungulate
- WE: Weasel sp.
- WV: Wolverine

- Existing Road
- Kluskus FSR
- Kluskus-Blue FSR
- Kluskus-Ootsa FSR
- Exploration Road
- Proposed Mine Site Access Road
- Proposed Transmission Line
- Water Supply Pipeline
- Proposed Mine Site
- Stream (>= 2nd Order)
- Waterbody (>= 4 Ha)

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area



Scale: 1:35,000

0 0.5 1 2

Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold

PROJECT: Blackwater Gold Project

Ungulate and Furbearer Winter Ground Track Locations (2 of 4)

DATE: October, 2013	ANALYST: KA	**Figure** 3.5-3
JOB No: VE52095	QA/QC: MY	PDF FILE: 11-100-065_winter_track_species_20131016.pdf
GIS FILE: 11-100-065_winter_track_species_20131016.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	amec

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372000 375000 378000 381000

5904000 5901000 5898000

Proposed Mine Access Road

Davidson Creek

Snake lake

N

Legend

Winter Mammal Transects

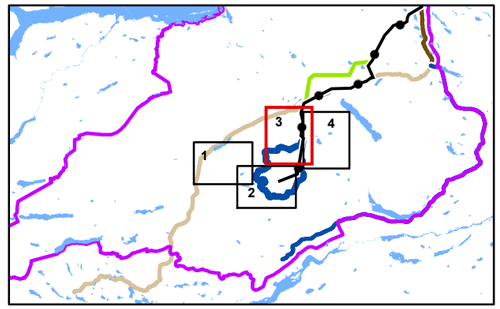
Winter Mammal Track Location

- CL: Lynx
- CO: Coyote
- LW: Least Weasel
- MO: Moose
- PM: Marten
- RF: Red Fox
- RS: Red Squirrel
- SH: Snowshoe Hare
- UU: Unknown Ungulate
- WE: Weasel sp.
- WV: Wolverine

Existing Road
Kluskus FSR
Kluskus-Blue FSR
Kluskus-Ootsa FSR
Proposed Airstrip Access Road
Proposed Mine Site Access Road
Proposed Transmission Line
Water Supply Pipeline
Airstrip Extent
Proposed Mine Site
Stream (>= 2nd Order)
Waterbody (>= 4 Ha)

Wildlife and Wildlife Habitat

Local Study Area
Regional Study Area



Scale: 1:35,000

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Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold

PROJECT: Blackwater Gold Project

Ungulate and Furbearer Winter Ground Track Locations (3 of 4)

DATE: October, 2013	ANALYST: KA	**Figure** 3.5-4
JOB No: VE52095	QA/QC: MY	PDF FILE: 11-100-065_winter_track_species_20131016.pdf
GIS FILE: 11-100-065_winter_track_species_20131016.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	amec

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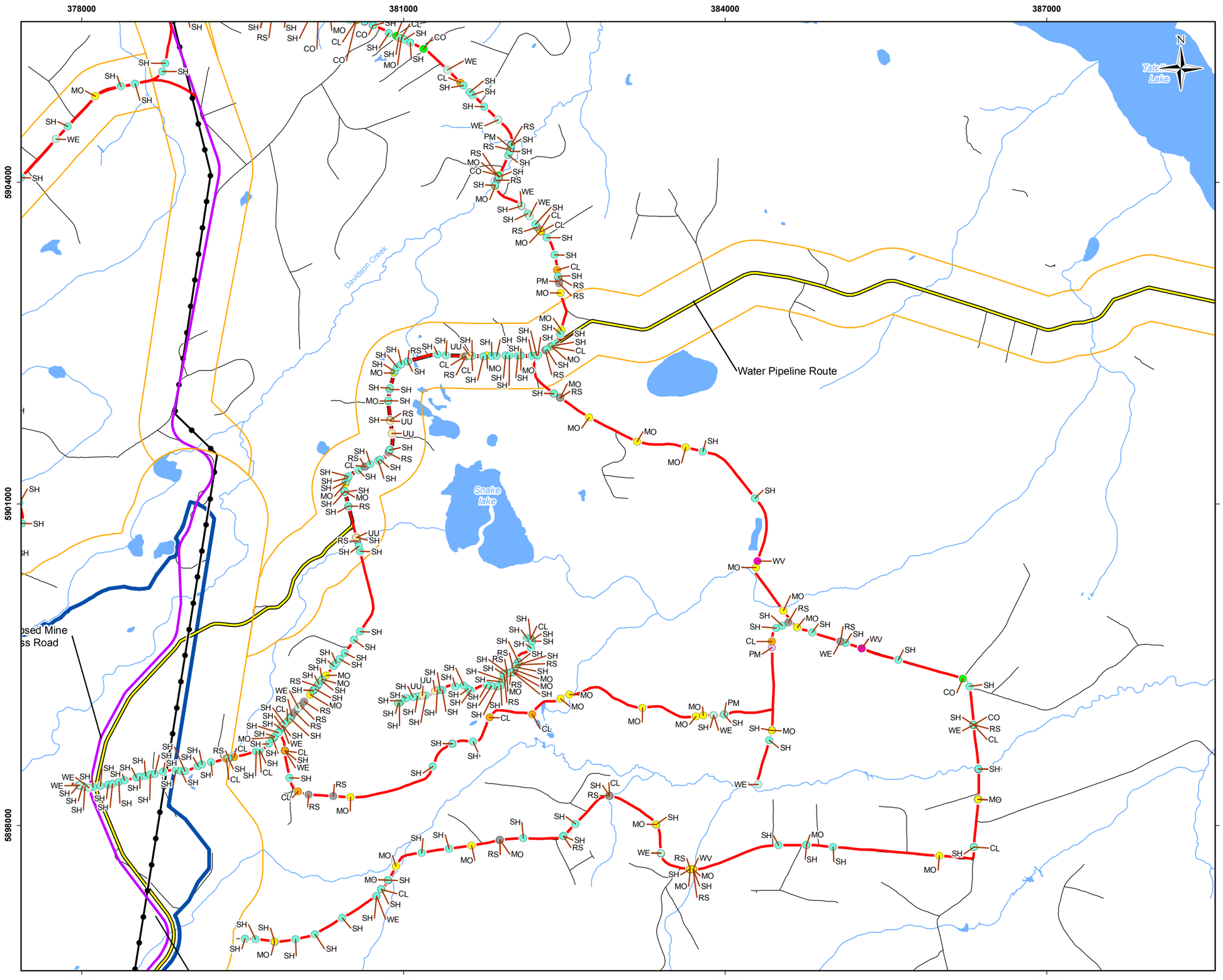

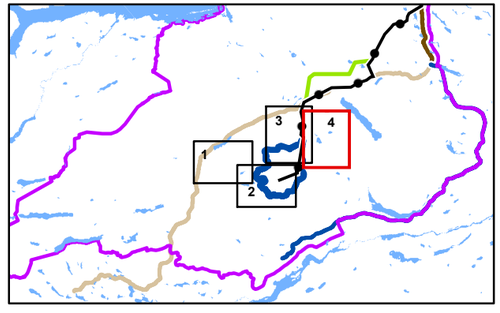

Scale: 1:35,000

0 0.5 1 2

Kilometres

Reference

BC Government GeoBC Data Distribution

Legend

Winter Mammal Transects

Winter Mammal Track Location

- CL: Lynx
- CO: Coyote
- LW: Least Weasel
- MO: Moose
- PM: Marten
- RF: Red Fox
- RS: Red Squirrel
- SH: Snowshoe Hare
- UU: Unknown Ungulate
- WE: Weasel sp.
- WV: Wolverine

Existing Road

Kluskus FSR

Kluskus-Blue FSR

Kluskus-Ootsa FSR

Proposed Airstrip Access Road

Proposed Mine Site Access Road

Proposed Transmission Line

Water Supply Pipeline

Proposed Mine Site

Stream (>= 2nd Order)

Waterbody (>= 4 Ha)

Wildlife and Wildlife Habitat

Local Study Area

Regional Study Area

CLIENT: newgold

PROJECT: Blackwater Gold Project

Ungulate and Furbearer Winter Ground Track Locations (4 of 4)

DATE:	ANALYST:	**Figure** 3.5-5
October, 2013	KA	
JOB No: VE52095	QA/QC: MY	PDF FILE: 11-100-065_winter_track_species_20131016.pdf
GIS FILE: 11-100-065_winter_track_species_20131016.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	amec

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Table 3.5-1: Detections and Number of Individuals of Mammals during 2011–2013 Surveys of each LSA and the RSA of the Project

Species	Mine Site		Mine Site LSA		Transmission Corridor		Transmission Line LSA		Mine Access Road Corridor		Mine Access Road LSA		Kluskus FSR ROW		Kluskus FSR LSA		Water Pipeline Corridor		Water Pipeline LSA		Airstrip Corridor		Airstrip LSA		RSA		Stellako Corridor		Mill's Ranch LSA	
	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites
American beaver	1	1	0	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0	0	0	0
American black bear	0	0	1	1	4	3	6	5	0	0	0	0	3	0	1	1	0	0	0	0	5	5	0	0	7	7	31	3	0	0
American marten	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	14	0	0	0	0
Bat species	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	2	0	0	0	0
Big brown bat	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	1	0	0	1	1	0	0	0	0	0	0
Big brown/silver-haired bat	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Big brown/silver-haired/hoary bat	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0
Bobcat	0	0	0	0	1	1	1	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Canada lynx	9	9	5	5	0	0	1	1	0	0	1	1	0	0	0	0	4	4	0	0	6	2	2	1	35	35	0	0	0	0
Caribou (northern mountain)	9	9	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0
Cougar	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	2	0	0
Coyote	11	11	2	2	1	1	0	0	0	0	1	1	0	0	1	1	0	0	0	0	0	0	0	0	41	26	0	0	0	0
Eastern red bat	46	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	1	0	0	4	1	45	1	0	0	0	0
Elk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
Fisher	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grey wolf	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	3	0	0	0	0
Grizzly bear	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	29	22	0	0	0	0
Hoary bat	5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0	0	1	1	0	0	0	0	0	0
Least weasel	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0
Little brown myotis	144	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	1	0	0	3	1	1721	3	0	0	0	0
Long-legged myotis	11	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	1	0	0	0	0	9	1	0	0	0	0
Moose	1	1	0	0	0	0	3	3	0	0	0	0	1	1	0	0	0	0	0	0	1	1	1	1	12	8	5	2	1	1
Mule deer	0	0	0	0	0	0	1	1	0	0	0	0	0	0	1	1	0	0	0	0	2	1	0	0	13	6	1	2	0	0
Myotis species	17	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	3	0	0	0	0
North American porcupine	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0
North American river otter	0	0	0	0	0	0	6	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	26	3	0	0	0	0
Northern myotis	117	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	63	1	0	0	63	1	26	1	0	0	0	0
Red fox	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0

Species	Mine Site		Mine Site LSA		Transmission		Transmission		Mine Access		Mine Access		Kluskus FSR		Kluskus FSR		Water Pipeline		Water Pipeline		Airstrip		Airstrip		RSA		Stellako		Mill's Ranch	
Red squirrel	19	19	5	5	12	1	6	6	4	4	2	2	12	12	6	6	11	1	1	1	2	1	0	0	75	72	0	0	0	0
Silver-haired bat	6	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	1	0	0	5	1	38	1	0	0	0	0
Snowshoe hare	73	73	2	2	0	0	1	1	3	3	5	5	0	0	1	1	36	36	4	4	18	1	4	1	25	25	3	1	0	0
Striped skunk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
Unknown bear sp.	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Western long-eared bat	35	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	1	0	0	0	0	9	1	0	0	0	0
Western small-footed bat	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
White-tailed deer	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wolverine	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0	0	0	0
Yellow-pine chipmunk	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1	1	0	0	0	0
Total Individuals	**516**		**18**		**20**		**27**		**8**		**9**		**17**		**13**		**51**		**114**		**34**		**84**		**2161**		**45**		**1**	
Total Species	**21**		**7**		**6**		**9**		**3**		**4**		**4**		**8**		**3**		**10**		**6**		**9**		**27**		**7**		**1**	

Table 3.5-2: Biogeoclimatic Zones where Mammal Species were detected in the Project Area in 2011-2013

BGC Zone BGC Sub-Zone Species	Boreal Altai Fescue Alpine (BAFA)		Engelmann Spruce – Subalpine Fir (ESSF)				Sub-Boreal Spruce (SBS)					
	Undifferentiated (un)		Moist-Very Cold		Moist-Very Cold-Parkland		Moist-Cold		Dry-Cool		Dry-Warm	
	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites
American beaver	0	0	1	1	0	0	1	1	6	5	0	0
American black bear	0	0	0	0	0	0	21	17	3	2	38	4
American marten	0	0	8	8	0	0	6	6	0	0	0	0
Bat species	0	0	1	1	0	0	2	2	0	0	0	0
Big brown bat	0	0	0	0	0	0	9	3	0	0	0	0
Big brown/silver-haired bat	0	0	3	3	0	0	1	1	0	0	0	0
Big brown/silver-haired/hoary bat	0	0	0	0	0	0	0	0	0	0	0	0
Bobcat	0	0	0	0	0	0	1	1	0	0	1	1
Canada lynx	0	0	8	8	3	3	52	52	0	0	1	1
Caribou (northern mountain)	0	0	4	4	2	2	5	5	0	0	0	0
Cougar	0	0	0	0	0	0	0	0	0	0	4	2
Coyote	0	0	17	17	3	3	35	35	1	1	0	0
Eastern red bat	0	0	16	3	0	0	139	4	0	0	0	0
Elk	0	0	0	0	0	0	0	0	0	0	1	1
Fisher	0	0	0	0	0	0	0	0	1	1	0	0
Grey wolf	0	0	0	0	1	1	3	3	1	1	4	1
Grizzly bear	0	0	0	0	0	0	28	28	0	0	0	0
Hoary bat	0	0	0	0	0	0	9	3	0	0	0	0
Least weasel	0	0	1	1	1	1	0	0	0	0	0	0
Little brown myotis	0	0	1672	4	0	0	267	7	0	0	0	0
Long-legged bat	0	0	8	2	0	0	20	2	0	0	0	0

BGC Zone	Boreal Altai Fescue Alpine (BAFA)		Engelmann Spruce – Subalpine Fir (ESSF)				Sub-Boreal Spruce (SBS)					
Moose	0	0	2	2	1	1	17	12	1	1	8	4
Mule deer	0	0	0	0	1	1	13	10	3	2	10	2
Myotis species	0	0	3	3	0	0	3	3	0	0	0	0
North American porcupine	0	0	0	0	0	0	1	1	0	0	0	0
North American river otter	0	0	0	0	0	0	1	1	5	1	0	0
Northern myotis	0	0	250	3	0	0	194	3	0	0	0	0
Red fox	0	0	0	0	2	2	1	1	0	0	0	0
Red squirrel	0	0	18	18	3	3	120	119	3	3	0	0
Silver-haired bat	0	0	37	3	0	0	16	4	0	0	0	0
Snowshoe hare	0	0	66	66	15	15	289	289	0	0	3	3
Striped skunk	0	0	0	0	0	0	0	0	0	0	1	1
Unknown bear sp.	0	0	2	2	0	0	0	0	0	0	0	0
Western long-eared bat	0	0	11	2	0	0	40	3	0	0	0	0
White-tailed deer	0	0	0	0	0	0	0	0	1	1	0	0
Wolverine	0	0	0	0	0	0	3	3	0	0	0	0
Yellow-pine chipmunk	0	0	0	0	0	0	2	2	1	1	0	`
Total Individuals	**0**		**2128**		**32**		**1299**		**26**		**71**	
Total Species	**0**		**19**		**10**		**29**		**11**		**10**	

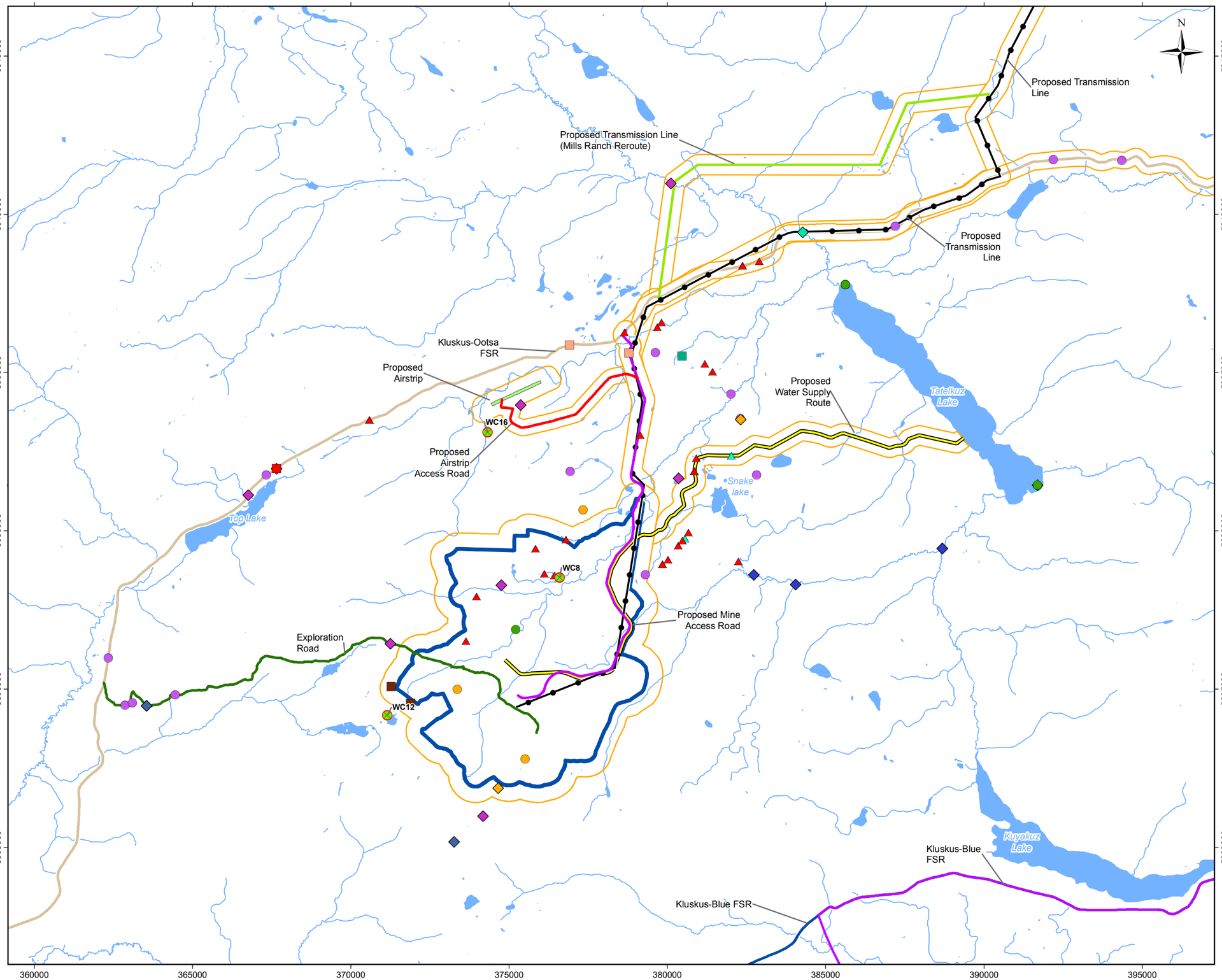
Six species were detected during the ground transects in the higher elevation subalpine fir: snowshoe hare, red squirrel (*Tamiascurus hudsonicus*), weasel spp., marten, coyote (*Canis latrans*), and red fox (*Vulpes vulpes*) (Ecofor, 2012b). Lower detections of furbearers were found in this habitat than the lower elevation transects, partially due to the wind-swept conditions during the 2012 survey and the lack of cover. Of two transects near the exploration access road and mine camp, the timbered transect had the highest numbers of weasel, red squirrel, and marten, and in both cases none of the weasel tracks crossed the road. Scat of bobcat (*Lynx rufus*) or lynx was recorded during summer field work on an ATV trail in the ESSF zone that leads from the camp to the alpine.

In 2013, one wildlife camera was established within the mine site at a wetland adjacent to a pine lichen forest. Wildlife camera 8a was established along a game trail and encountered one snowshoe hare (**Table 3.5-3**) (**Figure 2.1-23**). Camera 12a was adjacent to a small lake at the headwaters of Davidson Creek from 20 July to 11 September, 2013 and recorded one lynx on 4 September.

Table 3.5-3: Number of Detection Events of General Wildlife Captured on Cameras Established in 2013.

Species	Wildlife Camera				
	8a	**12a**	**16a**	**20a**	**21a**
American robin			1		
Black bear			5	4	26
Cougar				2	1
Elk					1
Lynx		1	1		1
Moose			1	2	3
Mule deer			2	1	9
Portager				11	1
Snowshoe hare	1				3
Striped skunk					1
Wolf				1	
Total Number of Species	**1**	**1**	**5**	**6**	**9**

Eight ungulate and furbearer species, not including caribou and bears, were detected within the mine site and LSA (**Table 3.5-1**, **Figure 2.1-23**). Other furbearers detected incidentally within the mine site and LSA include American beaver and least weasel (*Mustela nivalis*) (**Figure 3.5-6**).



Legend

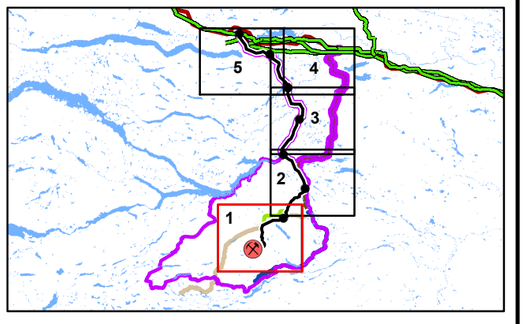
Ungulate and Furbearer Visual and Sign

- American Beaver
- American Black Bear
- American Marten
- Bobcat
- Canada Lynx
- Coyote
- Fisher
- Grey Wolf
- Grizzly Bear
- Least Weasel
- Moose
- Mule Deer
- North American Porcupine
- North American River Otter
- Red Fox
- Red Squirrel
- Snowshoe Hare
- Unknown Bear Sp.
- Wolverine
- Yellow-Pine Chipmunk

- Camera Location
- Kluskus-Blue FSR
- Kluskus-Ootsa FSR
- Exploration Road
- Proposed Transmission Line
- Proposed Transmission Line (Mills Ranch re-route)
- Proposed Mine Access Road
- Proposed Water Supply Route
- Proposed Airstrip Access Road
- Proposed Airstrip
- Proposed Mine Site
- Stream (> = 2nd Order)
- Waterbody

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area



Scale: 1:120,000

0 1 2 4 6

Kilometers

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold

PROJECT: Blackwater Gold Project

Ungulate and Furbearer Incidental Sightings, Spring, Summary and Fall, 2011-2013 (1 of 4)

DATE: October, 2013	ANALYST: AA	**Figure** 3.5-6
JOB No: VE52277	QA/QC: MY	PDF FILE: 11-100-079_Ungulate_Fur_20131016.pdf
GIS FILE: 11-100-079_Ungulate_Fur_20131016.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	amec

Y:\GIS\Projects\VE\VE52095_Richfield_Blackwater\Mapping\11_wildlifeBaseline\11-100-079_Ungulate_Fur_20131016.mxd

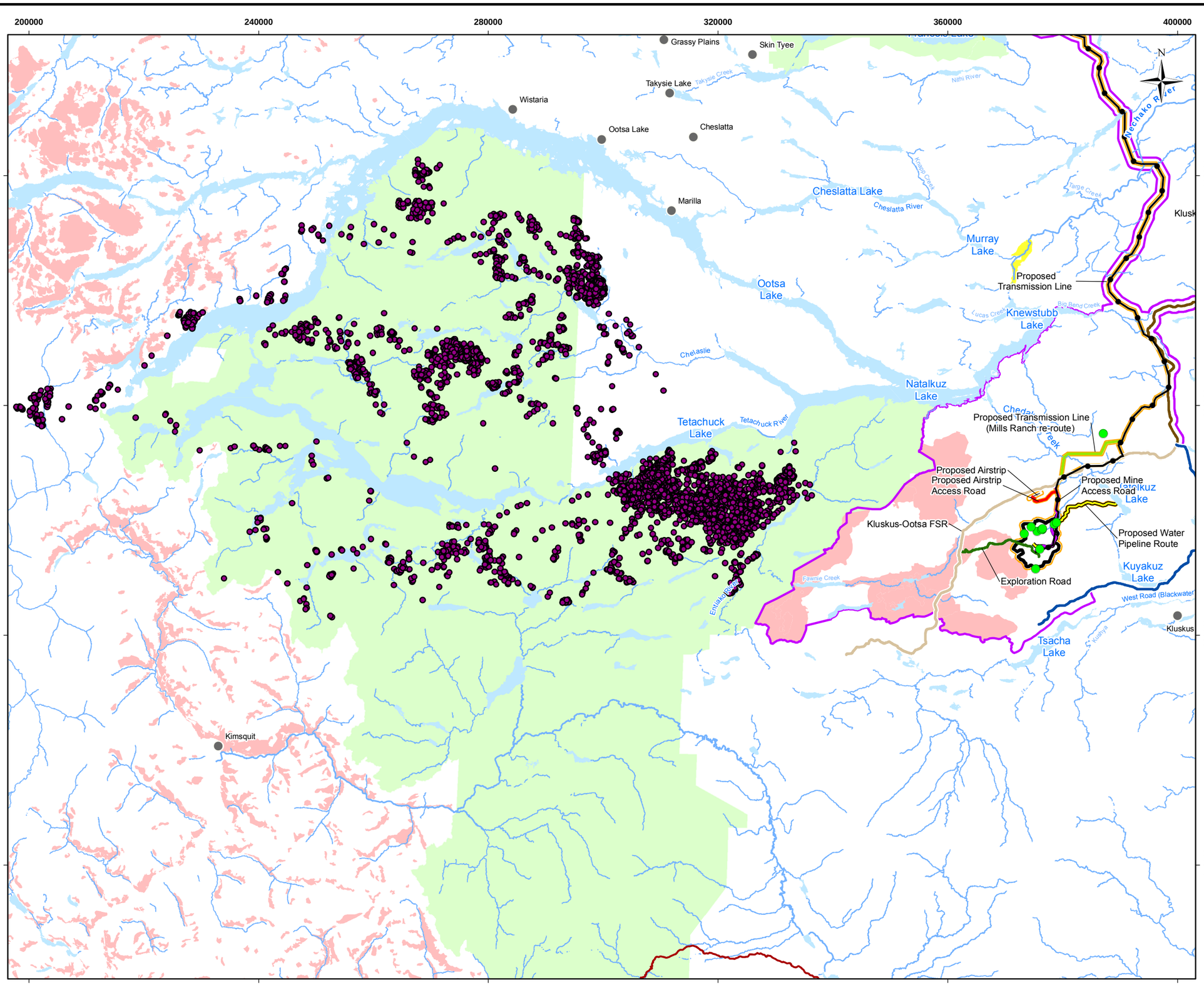
3.5.2.2 Caribou

Historical telemetry data indicate that members of the Tweedsmiur-Entiako caribou herd (Blue-listed provincially and designated as Threatened under Schedule 1 of *SARA* (COSEWIC, 2012) nationally) may occasionally be found on the western edge of the mine LSA, but no tracks were recorded during winter surveys. No caribou were detected during the winter aerial or ground survey. The area is likely confined to incidental late spring, summer, and fall use for foraging and travel to and from wintering grounds.

Caribou scat was identified during field surveys within the mine site and LSA (**Figure 3.5-7**). Caribou scat was detected incidentally during the 2011, 2012, and 2013 field surveys. Eight detections of caribou sign occurred within the mine site. Four were within the ESSFmv subzone with the remaining four in the SBSmc. Within the ESSFmv, the caribou were detected in mostly pine forest with 35% to 50% crown closure. One detection was in young forest and three were within mature forest at elevations 1,285 to 1,420 m. Within the SBSmc, the caribou were also detected in mostly pine forest with 50% crown closure. Three detections were in mature forest and one in old growth forest all between the elevations of 1,170 to 1,250 m.

Preliminary TEM mapping and habitat data indicate that the Davidson Creek corridor contains vegetative polygons with pine-lichen flat areas suitable for caribou foraging. This corridor also contains numerous game trails, especially along the watercourses of the area.

The Tweedsmuir-Entiako herd consists of approximately 500 animals, although recent estimates are as low as 200 animals which typically spend the summer in high elevation areas and migrate into forested lower elevations for the winter (Cichowski and Banner, 1993). Caribou are sensitive to human disturbance and development and have been shown to avoid areas up to 4 km and suffer from disruptions in behaviour and habitat use up to 6 km from a mine site (Weir et al., 2007).



Reference
BC Government GeoBC Data Distribution
British Columbia Ministry of the Environment April 2013.
Caribou radio telemetery points. http://a100.gov.bc.ca/pub/siwe/

CLIENT: newgold

PROJECT: Blackwater Gold Project

Caribou Telemetry Points and Observations

DATE:	ANALYST:	
October, 2013	AA	**Figure** 3.5-7
JOB No: VE52095	QA/QC: MB	PDF FILE: 11-100-070_caribou_telemetry_v2.pdf
GIS FILE: 11-100-070_caribou_telemetry_v2.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	amec

Y:\GIS\Projects\VE\VE52095_Richfield_BlackwaterMapping\11_wildlife\Baseline\11-100-070_caribou_telemetry_v2.mxd

The BC MFLNRO (2011) state the following: “Locally, the Caribou of the Tweedsmuir-Entiako herd are known to spend time on the high elevation ranges, where they feed on arboreal (tree) lichens when snow conditions warrant, or terrestrial lichens on windswept ridges.” The combination of increased blowdown and reduced available cover in low elevation pine-lichen habitats may potentially increase the importance of intact high elevation habitat over time. Any change in use of high elevation winter range, such as on Mount Davidson, is currently unknown.

A large dataset exists on the herd’s winter range and their behaviour relative to current habitat conditions; however, there are uncertainties regarding the impact of various forest management practices on the herd (**Figure 3.5-7**). Up until 2009, no significant alteration had been noted in the seasonal movement, range use, and habitat use during the MPB infestation (Cichowski, 2010). Any future increase in winter mortality risk could jeopardize the long-term survival of the herd, and changes in resource management within the herd’s winter range will have to take this into account. Currently, areas of high habitat suitability for this herd are protected by low and high elevation UWR.

The low elevation and high elevation UWR polygons established for the Tweedsmuir-Entiako herd reflect areas with high habitat suitability. High elevation winter habitat for this herd is limited, and maintenance of this habitat will be important over the long term. The presence of animals in a particular place or type of habitat is not always a reliable indication that they prefer to be there or that it is suitable habitat. They may have been forced there by disturbance elsewhere, by lack of better alternatives, or by competition with their own or other species. In the case of ungulates and other species with large home ranges, individual patches of habitat provide only a part—often a small part—of their life requisites, so that measuring habitat quality in a winter range or other seasonal habitat tells only part of the story for the population.

The Itcha-Ilgachuz caribou herd is found south of the mine site LSA and RSA and inhabits an area approximately 10,042 km^2 in the Itcha–Ilgachuz Provincial Park and surrounding areas in the rain shadow of the Coast Mountains in west-central BC, south of Blackwater River (Cariboo-Chilcotin Land Use Plan (CCLUP) Caribou Strategy Committee, 2002). During summer, the Itcha-Ilgachuz caribou herd is associated with high-elevation, dry, alpine landscape with little vegetation productivity or overstory cover as well as old-growth subalpine fir forest (Apps et al., 2001). During winter, the alpine-dwelling animals were associated with high elevation, dry landscape with little forest cover, while low-elevation animals prefer closed canopy lodgepole pine overstory.

The majority of both telemetry and observation points were located within the Itcha-Ilgachuz Mountains. The telemetry and observation dataset of the herd from 1995 to 1999 show that one out of the 3,261 telemetry points and one out of 722 observation points were north of Blackwater River. The one telemetry point was southwest of the RSA upstream of Tatelkuz Lake, and the one observation point was northwest of Laidman Lake (BC MOE, 2013b). The area utilized by the Itcha-Ilgatchuz herd appears to be increasing based on more recent

telemetry work; however, it is not known whether this would increase the probability of mixing with the Tweedsmuir-Entiako herd (Nicole Freeman, pers. comm., 2013).

The Laidman Lake RMZ, which is located in the western portion of the mine site and the RSA, is described within the Vanderhoof LRMP as containing less high quality terrestrial lichen habitat than the northwest portion of the UWR. However, this RMZ is an integral part of the whole wintering range providing caribou with alternative terrestrial lichen habitat, arboreal lichen habitat, and movement corridors (BC ILMB, 1997).

Lichens are an important source of forage for the Tweedsmuir-Entiako caribou herd especially once the snow has fallen. A study was requested to characterize the abundance of forage lichen in the Project area and identify lichen areas of concern based on high potential areas located through mapping and surveys.

The preliminary terrestrial lichen habitat was identified as part of a GIS exercise using the provincial VRI and PEM data (Ecofor, 2012c). Data from both the provincial vegetation resources information and predictive ecosystem mapping databases were combined to determine areas of high and moderate potential for terrestrial lichens in areas centred around the mine site and adjacent areas to the west. A predicted total of 711.34 ha of high potential for terrestrial lichen is present within the mine site, with an additional 209.95 ha within the mine site LSA and 1,494.68 ha within the RSA. A predicted total of 3,485.48 ha of moderate potential for terrestrial lichen was calculated within the mine site, with an additional 460.28 ha present within the mine site LSA and 6,351.64 ha in the mine site RSA.

Terrestrial lichen ground surveys took place during 20 June and 20 July 2013. Lichen abundance was assessed either by using Annex B in Lance and Eastland (2000) for a visual determination or by using step plots. Visual plots (Annex B of Lance and Eastland, 2000) were used when the area had more than 50% of the area with caribou forage lichen. Step plots involved walking a 30-step transect through the area and recording whether caribou lichen was under the surveyor's foot. Sites with 70% or higher of the steps having caribou lichen underfoot were rated as high, those with 25% to 69% of sites were rated as moderate, and those with <25% were rated as low.

A total of eight transects were walked, identifying 16 areas (plots) of high rated caribou lichen habitat (**Figure 2.1-25**). Five of the high ranked areas were identified through a step test and 11 were identified visually. All of the remaining 23 areas (plots) ranked along the transects, were rated as moderate. Overall, most sites (75%) were located within the ESSFmv, and the remaining sites were located within the SBSmc. Almost all sites (96%) were located within lodgepole pine forest, and one site was located in an alpine fir forest. Crown closure was fairly open (40% to 50%) at most sites (76%); no sites had closure lower than 30% or higher than 60%. Half of the sites were located within forest that was older than 121 years, and the other half of the sites were located within forest between 61 and 100 years of age.

Of the sites that were rated as high, most were located in relatively pure (>85%) lodgepole pine forest, with only one site located in an alpine fir stand with 40% lodgepole pine. Forest age was also clustered into two distinct ages—61 to 80 years and 141 to 250 years—and canopy closure for all sites was between 45% to 55%.

In 2012 the arboreal lichen field surveys were conducted during 15 to 18 October: One transect occurred within the mine site, two within the LSA, and one within the RSA) A total of 600 trees were measured and classified during the lichen survey. Four trees species were encountered during the arboreal lichen ground survey, including subalpine fir, lodgepole pine, Engelmann spruce, and whitebark pine.

Transects located in the ESSFmvp subzone and in northern aspects had the highest abundance of arboreal lichen, and the lodgepole pine drier areas had the lowest. The ESSFmvp subzone is higher in elevation and more open then lower areas on the slope. The presence of mature whitebark pine in this BGC subzone increased the rating of some of the plots due to the abundant surface area of the tree, providing an excellent site for lichen attachment. Lodgepole pine was noted to be a poor lichen host. The most abundant arboreal lichen was *Bryoria spp.,* and there is evidence that caribou prefer *Bryoria* to *Alectoria spp.* if both are available (Rominger et al., 1996).

In 2013, additional surveys for arboreal lichen took place during 18 to 20 July. Five transects were walked with stations located every 64 m, and the five trees closest to the station were rated for their lichen biomass and the branch type series of the trees. The 2012 and 2013 transect rankings were rated by combining the total number of trees rated, and those with more than 50% of the trees rated as class 4 or 5 were given a high rating, those with more than 50% of the trees rated as 3 or 4 were rated as moderate, and the remaining were given a low rating.

Three of the nine transects were rated as moderate, and the remaining six were rated as low (**Figure 2.1-25**). Overall transects were fairly similar in age (141 to 250 years) and BGC subzone (ESSFmv). VRI data were used to determine whether there was any similarity in environmental variables between moderate transects that separated them from low value; however, none could be determined.

3.5.2.3 Bears

Wildlife camera 8a was established within the boundary of the mine site and LSA (**Figure 2.1-23**). No wildlife cameras within the LSA were used to monitor bears and Kokanee because the Kokanee do not spawn that high up the creeks. The cameras established away from the Kokanee spawning habitat were used to detect all wildlife species. No bears were detected on camera 8a and the other wildlife detections are described in **Section 3.14.1** (ungulates and furbearers). All bear sightings in the mine site were detected incidentally.

In the spring of 2013, a grizzly bear was reported walking downslope near the edge of the current camp without incident (**Figure 3.5-8**). The bear was walking through young pine forest with 50% crown closure within the ESSFmv at 1,500 m elevation.

Heard (pers. comm., 2011) indicated that the density of grizzly bears in the area was 0.3 per 1,000 km^2. As mentioned in the life history account for the grizzly bear (**Section 3.5.1.3**), three population units overlap with the Project LSAs and the RSA: Blackwater-West Chilcotin unit has an estimated population of 53 bears, the Nulki unit has 44 bears, and the Francois unit has 58 bears.

Bear den surveys in 2012 searched 30.6 km of potential bear den habitat, characterized as steep, dry slopes or gullied streams (Avison, 2012b). No bear dens were found during the surveys; however, two were located afterwards at the southwest edge of the mine site and LSA (**Figure 2.1-16**). The two dens were located 300 m apart on a gentle slope with several benches leading down to a stream; the supporting structures for both were colluvial deposits (**Figure 2.1-16**).

During 2013 lichen transect surveys in the mine site LSA, two additional potential den sites were found (**Figure 3.5-8**). The first potential den located in June was in a group of four large colluvial deposits approximately 17 m to the southeast of the two found in 2012. A second possible den site was located incidentally in July. All of the three potential den sites were located within mature lodgepole pine forest (141 to 250 years) with a crown closure of 35% to 60% in the ESSFmv subzone. The aspects of the den sites ranged from 105 to 220 degrees and the slope ranged from 1.3 to 21.5 degrees. Two of the potential dens were within the mine site LSA, and the other was within the mine site. No active dens were found within the mine site.

From 2011 to 2013, one black bear was detected incidentally within the mine site and LSA. It was detected in a young pine forest with 70% crown closure within the SBSmc at 1,190 m.

360000 370000 380000 390000

5910000 5900000 5890000

Proposed Transmission Line

Proposed Transmission Line (Mills Ranch re-route)

Proposed Airstrip

Kluskus-Ootsa FSR

Proposed Airstrip Access Road

Proposed Water Pipeline Route

Exploration Road

Proposed Mine Site Access Road

Kluskus-Blue FSR

Top Lake

Snake Lake

Tatelkuz Lake

Kuyakuz Lake

Tatelkuz Creek

N

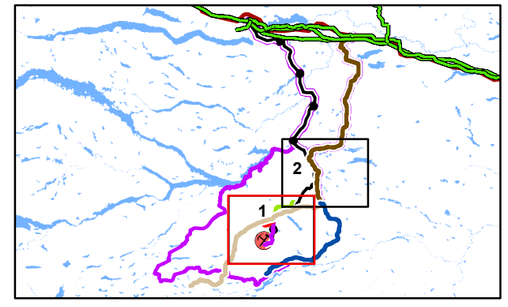
Legend

Mammal Detections

- Caribou
- Eastern Red Bat
- Grizzly Bear
- Little Brown Myotis
- Northern Myotis
- Wolverine
- Bear Den Locations
- Kluskus-Blue FSR
- Kluskus-Ootsa FSR
- Proposed Airstrip Access Road
- Exploration Road
- Proposed Mine Site Access Road
- Proposed Transmission Line
- Proposed Water Supply Route
- Proposed Transmission Line (Mills Ranch re-route)
- Proposed Airstrip
- Proposed Mine Site
- Stream (>= 2nd Order)
- Waterbody (>= 4 Ha)

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area



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Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold		
PROJECT: Blackwater Gold Project		
Detections of Mammal Species of Conservation Concern Map 1 of 2		
DATE: November, 2013	ANALYST: KA	**Figure 3.5-8**
JOB No: VE52277	QA/QC: MY	PDF FILE: 11-100-046_mammal_species_CC.pdf
GIS FILE: 11-100-046_mammal_species_CC.mxd		amec
PROJECTION: UTM Zone 10	DATUM: NAD83	

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3.5.2.4 Bats

Background information searches did not identify any historical surveys completed within any of the study areas.

In 2011 and 2012, Anabat detectors were used to sample acoustic calls of bats at five locations across the mine site, the majority of which were sampled only once. Two of these locations were resampled in 2013 along with one additional location. In 2013, the detector was left out at each site for 10 to 17 days for a cumulative total of 114 nights of surveying; however, rain prevented surveying on several partial or complete nights. Four locations of the detectors were within the ESSFmv subzone, and two were within the SBSmc subzone (**Figure 3.5-8** and **Figure 3.5-9**). Four of six locations were adjacent to wetlands, including fen, bog, and open water; one location was along the C Exploration Road in an old-growth spruce-lodgepole pine forest; and one location was at the mine exploration camp. In 2011 and 2012, only one bat detected within the mine site LSA was identified to species—little brown myotis—which was identified at four sites. The Anabat software was able to identify three species complexes—*myotis spp.*, big brown/silver-haired bat, and big brown/silver-haired/hoary bat—at three sites where detected calls were not identifiable to species.

In 2013, a SM2 song meter was used to sample bat calls at three sites in the mine site. The detector was left out at each site for 10 to 17 days for a cumulative total of 114 nights of surveying; however, rain prevented surveying on several partial or complete nights.

A computer software program (Kaleidoscope) was used to analyze bat call detections using algorithms of known bat calls. The detections were then reviewed by a provincial bat expert to verify the identifications. Using this method, nine species were detected, including three species listed provincially or federally (**Table 3.5-4**). An additional three species, Yuma myotis (*Myotis yumanensis),* California myotis (*Myotis californicus*) and western small-footed bat (*Myotis ciliolabrum*), were also identified; however, due to the low number of detections (one per species) and each species range, these were likely misidentified by the software and are not included in further analysis.

Three species of conservation concern—little brown myotis, northern myotis, and eastern red bat—were detected at all of the 2013 sites within the mine site (**Table 3.5-4**). The bats were found in both the SBSmc and the ESSFmv subzones, at elevations between 1,235 m and 1,415 m (**Table 3.5-5**, **Figure 3.5-8** and **Figure 3.5-9**). All detections were at wetlands, both fens and open water areas; one site was surrounded by old-growth forest and mature pine and spruce forest; and the other two were surrounded by young pine forest. No bat hibernacula were located during any surveys of the LSAs and the RSA.

Table 3.5-4: Number of Detection Sites and Number of Individual Calls of Bats during 2011, 2012, and 2013 Surveys for each LSA and the RSA of the Project

Species	Mine Site		Mine Site LSA		Transmission Corridor		Transmission Line LSA		Mine Access Road Corridor		Mine Access Road LSA		Kluskus FSR ROW		Kluskus FSR LSA		Water Pipeline Corridor		Water Pipeline LSA		Airstrip Corridor		Airstrip Corridor		RSA	
	No. Ind. Calls LSA	Sites	No. Ind. Calls LSA	Sites	No. Ind. Calls LSA	Sites	No. Ind. Calls LSA	Sites	No. Ind. Calls LSA	Sites	No. Ind. Calls LSA	Sites	No. Ind. Calls LSA	Sites	No. Ind. Calls LSA	Sites	No. Ind. Calls LSA	Sites	No. Ind. Calls LSA	Sites	No. Ind. Calls LSA	Sites	No. Ind. Calls LSA	Sites	No. Ind. Calls LSA	Sites
Big brown bat	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	1	0	0	1	1	0	0
Eastern red bat	46	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	60	1	0	0	4	1	77	2
Hoary bat	5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	0	0	1	1	0	0
Silver-haired bat	4	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	1	0	0	5	2	6	2
long-eared/keen's myotis	35	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	1	0	0	0	0	9	2
little brown myotis	120	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	104	1	0	0	3	1	1708	2
northern myotis	117	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	63	1	0	0	4	1	260	2
long-legged myotis	11	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	1	0	0	0	0	9	2
Total Individuals	**343**		**0**		**0**		**0**		**0**		**0**		**0**		**0**		**0**		**253**		**0**		**18**		**2071**	
Total Species	**9**		**0**		**0**		**0**		**0**		**0**		**0**		**0**		**0**		**8**		**0**		**6**		**8**	

Table 3.5-5: Biogeoclimatic Zones where Bats were Detected in the Project Area during 2011–2013

BGC Zone BGC Sub-Zone Species	Boreal Altai Fescue Alpine (BAFA)		Engelmann Spruce – Subalpine Fir (ESSF)				Sub-Boreal Spruce (SBS)					
	Undifferentiated (un)		Moist-Very Cold (mv1)		Moist-Very Cold-Parkland (mvp)		Moist-Cold (mc)		Dry-Cool (dk)		Dry-Warm (dw)	
	No. Ind. Calls LSA	Sites	No. Ind. Calls LSA	Sites	No. Ind. Calls LSA	Sites	No. Ind. Calls LSA	Sites	No. Ind. Calls LSA	Sites	No. Ind. Calls LSA	Sites
Big brown bat	0	0	0	0	0	0	9	3	0	0	0	0
Eastern red bat	0	0	48	3	0	0	139	4	0	0	0	0
Hoary bat	0	0	0	0	0	0	9	3	0	0	0	0
Silver-haired bat	0	0	5	2	0	0	13	5	0	0	0	0
Long-eared/keen's myotis	0	0	11	2	0	0	40	3	0	0	0	0
Little brown myotis	0	0	1671	3	0	0	264	4	0	0	0	0
Northern myotis	0	0	250	3	0	0	194	4	0	0	0	0
Long-legged myotis	0	0	8	1	0	0	20	3	0	0	0	0
Total Individuals	**0**		**1995**		**0**		**689**		**0**		**0**	
Total Species	**0**		**8**		**0**		**9**		**0**		**0**	

390000 400000 410000 420000

5940000 5930000 5920000

Chief Gray Lake
Hobson Lake
Nechako Reservoir
Vivian Lake
Provis Lake
Buten Lake
Finger Lake
Willington Lake
Finnie Lake
Andros Lake
Otter Lake
Stefiuk Lake
Tatuk Lake
Lavoie Lake
Hay Lake
Turri Lake
Cory Lake
Brewster Lakes
Goose Lake
Klunchatistli Lake
Chutanli Lake

Kluskus FSR

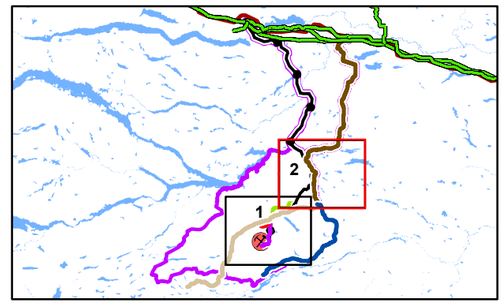
Proposed Transmission Line

N

Legend

Mammal Detections
- Caribou
- Fisher
- Kluskus FSR
- Kluskus-Blue FSR
- Kluskus-Ootsa FSR
- Proposed Transmission Line
- Proposed Transmission Line (Mills Ranch re-route)
- Proposed Mine Site
- Stream (>= 2nd Order)
- Waterbody (>= 4 Ha)

Wildlife and Wildlife Habitat
- Local Study Area
- Regional Study Area



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Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold

PROJECT: Blackwater Gold Project

Detections of Mammal Species of Conservation Concern Map 2 of 2

DATE:	ANALYST:	
November, 2013	KA	**Figure**
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PROJECTION: UTM Zone 10	DATUM: NAD83	amec

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3.5.2.5 Trapping and Hunting

The mine site LSA and RSA fall within the Upper Nechako Region (Region 6), WMU 6-1. **Table 3.5-6** shows the WMUs and RMZs within each LSA and RSA.

Table 3.5-6: List of Wildlife Management Units and Resource Management Zones found within the Project Area

Mine Site LSA and RSA		Proposed Transmission Line and Kluskus FSR Access Road LSA and RSA	
Wildlife Management Unit	**Resource Management Zone**	**Wildlife Management Unit**	**Resource Management Zone**
6-1	Chedakuz	5-12	Nechako Valley
	Davidson Creek	5-13	Nechako West
	Laidman Lake	6-1	Upper Nechako River
		7-11	Vanderhoof South
		7-12	Crystal Lake
			Kluskus
			Chedakuz
			Davidson Creek
			Laidman Lake

Note: FSR = Forestry Service Road; LSA = Local Study Area; RSA = Regional Study Area

Trapping data (**Annex 11**) for number of species and individuals were not available for the Project study area (D. Heard, pers. comm. 2011); however, commonly trapped species include American beaver, black bear, coyote, fisher, red fox, lynx, marten, mink (*Mustela vison*), muskrat (*Ondatra zibethicus*), river otter, red squirrel, weasel, grey wolf, wolverine, bobcat, and striped skunk (*Mephitis mephitis*). Trapping seasons for these furbearers are presented in **Annex 11**. Trapline effort for commercial trapping is influenced by many factors and does not necessarily reflect species abundance. Trapping seasons vary by species and year but generally occur in winter from November to March. For some species, the season extends from fall to spring (i.e., October to April or May). A review of the BC hunting harvest statistics for selected species between 2000 and 2010 identified that moose were the most frequently harvested species. Hunting records for WMU 5-12, 5-13, 6-01, 7-11, 7-12, and 7-13, are presented in **Table 3.5-7**.

The proposed mine site is located within multiple trapline and guide outfitter tenure areas (**Annex 11**).

Table 3.5-7: Available Resident and Non-Resident Hunter Harvest for the Years 2000 to 2010 (BC Ministry of Water, Land and Air Protection 2011) in Wildlife Management Units 5-12, 5-13, 6-01, 7-11, 7-12, and 7-13

WMU	Year	Mule Deer	White-tailed Deer	Elk	Moose	Caribou	Mountain Goat	Big-horned Sheep	Black Bear	Grizzly Bear	Cougar	Grey Wolf
5-12	2000	23	0	0	154	34	0	0	16	1	3	1
	2001	69	0	0	151	32	0	0	19	0	2	0
	2002	117	0	0	145	35	0	0	18	0	1	0
	2003	82	0	0	145	35	0	0	22	0	0	7
	2004	53	0	0	114	36	0	0	7	0	0	19
	2005	54	0	0	155	43	0	0	13	0	0	10
	2006	52	5	0	126	37	0	0	8	0	0	1
	2007	36	0	0	131	29	0	0	13	0	1	1
	2008	66	7	0	134	38	1	0	19	0	0	1
	2009	26	0	0	125	23	0	0	15	0	2	1
	2010	1	0	0	141	18	0	0	22	0	1	23
5-13	2000	357	9	0	325	0	0	0	79	0	0	12
	2001	399	0	0	360	0	0	0	52	0	9	7
	2002	449	3	0	432	0	0	0	80	0	2	0
	2003	569	7	0	430	0	0	0	107	0	4	10
	2004	426	9	0	428	0	0	0	73	0	4	0
	2005	505	10	0	259	0	0	0	80	0	4	23
	2006	440	5	0	300	0	0	0	54	0	3	9
	2007	551	17	0	251	0	0	0	55	0	2	10
	2008	351	5	0	363	0	0	0	77	0	6	0
	2009	182	10	0	270	0	0	0	74	0	8	83
	2010	183	9	0	227	0	0	0	82	0	2	61
6-01	2000	4	0	0	106	0	0	0	6	0	0	0
	2001	25	0	0	141	0	0	0	17	0	0	0
	2002	8	0	0	140	0	0	0	12	0	0	0
	2003	0	0	0	158	0	0	0	7	1	0	0
	2004	5	0	0	163	0	0	0	8	1	0	1

WMU	Year	Mule Deer	White-tailed Deer	Elk	Moose	Caribou	Mountain Goat	Big-horned Sheep	Black Bear	Grizzly Bear	Cougar	Grey Wolf
	2005	11	9	0	121	0	0	0	8	0	0	0
	2006	6	0	0	115	0	0	0	8	0	0	9
	2007	12	0	0	125	0	0	0	15	0	0	0
	2008	0	0	0	89	0	0	0	23	0	0	0
	2009	16	0	0	86	0	0	0	20	0	0	0
	2010	0	0	0	96	0	0	0	13	0	0	0
	2000	63	0	0	170	0	1	0	24	0	0	6
	2001	77	0	0	175	0	0	0	16	0	0	0
	2002	110	0	0	214	0	0	0	16	0	0	0
	2003	180	0	0	230	0	0	0	26	0	0	0
	2004	107	0	0	164	0	0	0	22	0	0	0
7-11	2005	137	4	0	227	0	0	0	22	0	0	0
	2006	142	0	0	204	0	0	0	19	0	0	17
	2007	72	6	0	170	0	0	0	24	0	0	0
	2008	86	7	0	211	0	0	0	42	0	0	0
	2009	132	0	0	164	0	0	0	37	0	0	0
	2010	81	20	0	167	0	0	0	29	0	0	0
	2000	131	10	0	34	0	0	0	63	0	0	6
	2001	179	9	0	32	0	0	0	66	0	0	38
	2002	186	6	0	35	0	0	0	65	0	0	21
	2003	210	24	0	35	0	0	0	112	0	0	14
	2004	198	9	0	36	0	0	0	67	0	0	0
7-12	2005	340	18	0	43	0	0	0	58	0	0	25
	2006	240	4	0	37	0	0	0	51	0	0	9
	2007	153	20	0	29	0	0	0	59	0	0	0
	2008	188	15	2	38	0	0	0	33	1	0	1
	2009	162	15	5	23	0	0	0	64	0	0	21
	2010	88	25	3	18	0	0	0	61	0	0	0

3.5.3 Linear Features and the Corresponding LSAs

3.5.3.1 Transmission Line Corridor and LSA

Ungulates and Furbearers

In recent decades, moose surveys were conducted in the Prince George area, including WMU 7-11 and 7-12, which are a part of the transmission line and access route study areas. Surveys documented a small population decline between 1998 and 2005, and a drop of 50% between 2005 and 2012 (Heard et al., 1999; Heard, 2011; Walker et al., 2006). The early population estimates are relatively high considering the amount of hunting and predatory pressure in the area. However, it is thought that reduced regional wolf densities had allowed for higher moose densities in the area (Heard et al., 1999). The drop in population between 2005 and 2012 is thought to be related to the MPB outbreak. MPB-killed forest has deeper snow cover and increased numbers of downed trees, which reduces foraging efficiency and increases movement difficulty and energetics (Heard, pers. comm.). Increased logging to remove MPB-infected trees is also thought to have allowed for increased hunter access across the region, causing increased hunting pressure on these populations. Moose density has consistently remained higher in younger forest, which provides more browse and easier access compared with older forest (>40 years); however, there was no sexual-based habitat selection (Walker et al. 2006). The ratio of bulls relative to cows has decreased between 1998 (0.43:1.0) and 2005 (0.26:1.0) and remained similar in 2012 (0.3:1.0). The ratio of calves to cows has gradually declined from 1998 (0.38:1.0) to 2012 (0.24:1.0).

The proposed 130 km transmission line runs across eight RMZs (**Figure 3.5-1**).The line initiates at the proposed mine site in the Davidson Creek RMZ and runs north through the following RMZs from south to north: Chedakiz, Kluskus, Crystal Lake, Vanderhoof South, Nechako Valley, Nechako West, and Francois North. Many of these RMZs state that maintaining or enhancing moose and bear habitats are an important part of their management directive.

A total of 11 ungulate and furbearer species, not including caribou and bears, were detected within the transmission line corridor and LSA (**Table 3.5-1**). The mammal that was detected at the most sites was red squirrel (n = 16) followed by the black bear (n = 8). Incidental sightings of ungulates and furbearers were recorded during the spring, summer and fall of 2011-2013 (**Figure 3.5-6** and **Figure 3.5-10** to **Figure 3.5-13**).

385000 390000 395000 400000 405000 410000 415000 420000

5940000 5935000 5930000 5925000 5920000 5915000

Kluskus FSR

Kluskus FSR

Proposed Transmission Line

Kluskus-Blue FSR

Kluskus-Ootsa FSR

Kluskus-Ootsa FSR

N

Legend

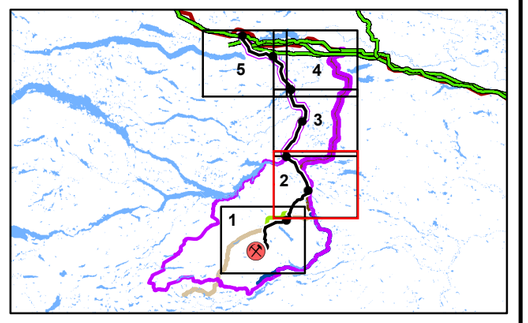
Ungulate and Furbearer Visual and Sign

- American Beaver
- American Black Bear
- American Marten
- Bobcat
- Canada Lynx
- Coyote
- Fisher
- Grey Wolf
- Grizzly Bear
- Least Weasel
- Moose
- Mule Deer
- North American Porcupine
- North American River Otter
- Red Fox
- Red Squirrel
- Snowshoe Hare
- Unknown Bear Sp.
- Wolverine
- Yellow-Pine Chipmunk

- Kluskus FSR
- Kluskus-Blue FSR
- Kluskus-Ootsa FSR
- Proposed Transmission Line
- Proposed Transmission Line (Mills Ranch re-route)
- Stream (> = 2nd Order)
- Waterbody

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area



Scale: 1:120,000

0 1 2 4 6

Kilometers

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold

PROJECT: Blackwater Gold Project

Ungulate and Furbearer Incidental Sightings, Spring, Summer and Fall, 2011 - 2013 (2 of 4)

DATE:	ANALYST:	**Figure** 3.5-10
October, 2013	AA	
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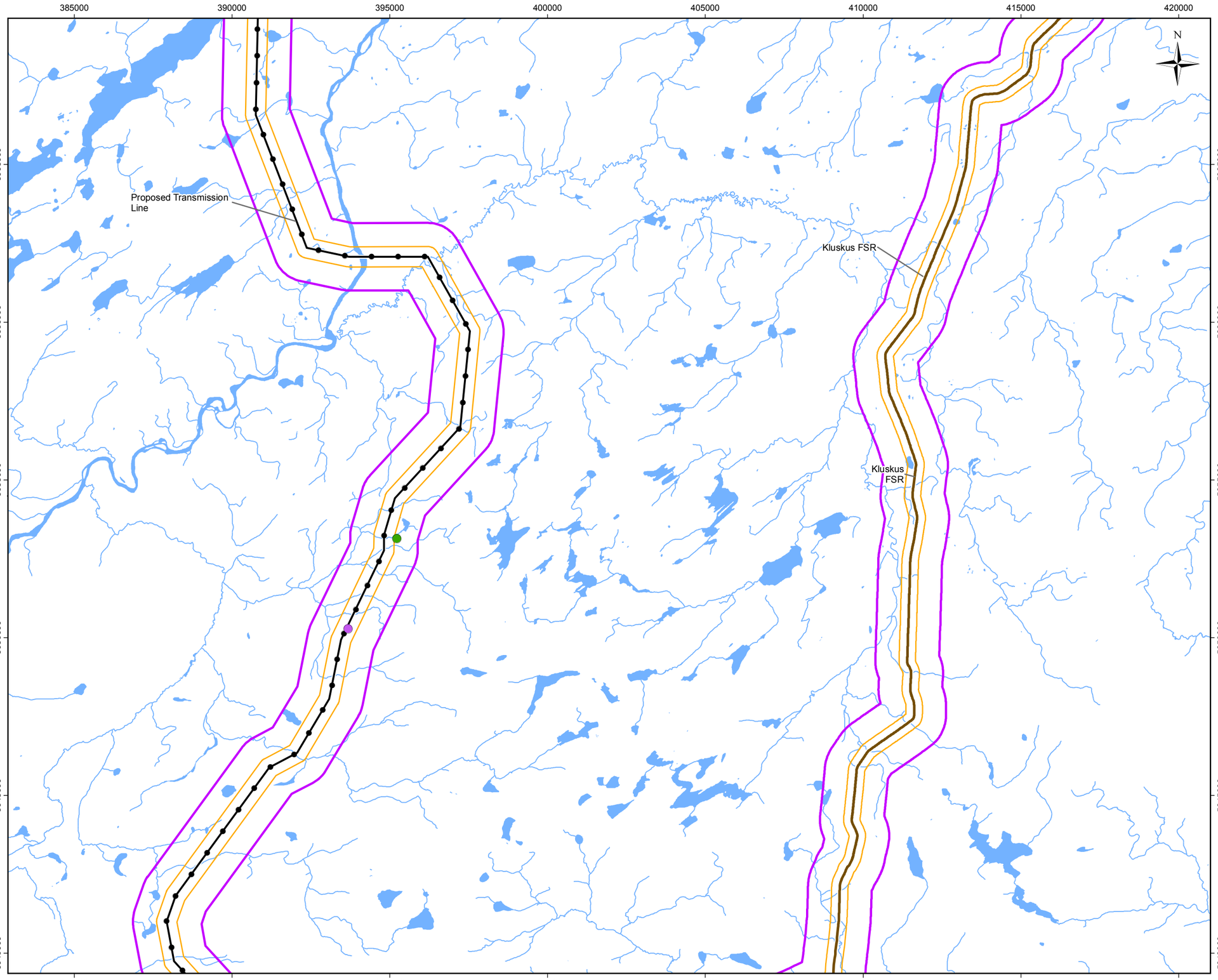


Legend

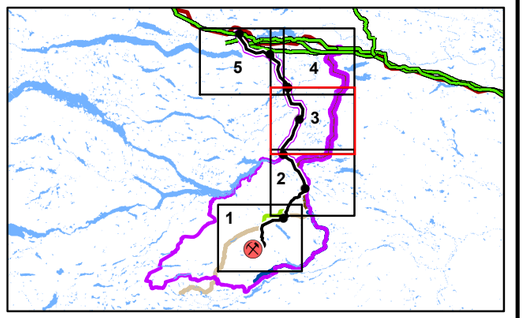
Ungulate and Furbearer Visual and Sign

- American Beaver
- American Black Bear
- American Marten
- Bobcat
- Canada Lynx
- Coyote
- Fisher
- Grey Wolf
- Grizzly Bear
- Least Weasel
- Moose
- Mule Deer
- North American Porcupine
- North American River Otter
- Red Fox
- Red Squirrel
- Snowshoe Hare
- Unknown Bear Sp.
- Wolverine
- Yellow-Pine Chipmunk

- Kluskus FSR
- Proposed Transmission Line
- Stream (> = 2nd Order)
- Waterbody

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area



Scale: 1:120,000

0 1 2 4 6

Kilometers

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold

PROJECT: Blackwater Gold Project

Ungulate and Furbearer Incidental Sightings, Spring, Summer and Fall, 2011-2013 (3 of 4)

DATE: October, 2013	ANALYST: AA	**Figure** 3.5-11
JOB No: VE52277	QA/QC: MY	PDF FILE: 11-100-079_Ungulate_Fur_20131016.pdf
GIS FILE: 11-100-079_Ungulate_Fur_20131016.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	amec

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385000 390000 395000 400000 405000 410000 415000 420000

5995000 5990000 5985000 5980000 5975000 5970000

Nadleh Whuten

Fort Fraser

16

Proposed Transmission Line

Kluskus FSR

Kluskus FSR

N

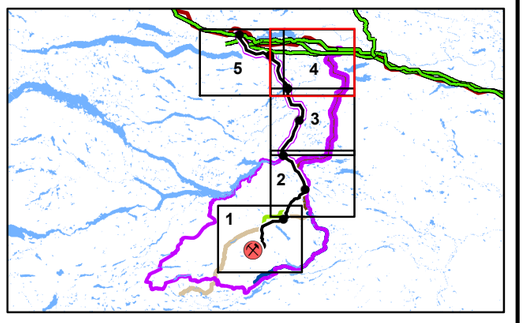
Legend

Ungulate and Furbearer Visual and Sign

- American Beaver
- American Black Bear
- American Marten
- Bobcat
- Canada Lynx
- Coyote
- Fisher
- Grey Wolf
- Grizzly Bear
- Least Weasel
- Moose
- Mule Deer
- North American Porcupine
- North American River Otter
- Red Fox
- Red Squirrel
- Snowshoe Hare
- Unknown Bear Sp.
- Wolverine
- Yellow-Pine Chipmunk
- Populated Place
- Kluskus FSR
- Proposed Transmission Line
- Stream (> = 2nd Order)
- Waterbody

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area



Scale: 1:120,000

0 1 2 4 6

Kilometers

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold

PROJECT: Blackwater Gold Project

Ungulate and Furbearer Incidental Sightings, Spring, Summer and Fall, 2011-2013 (4 of 4)

DATE:	ANALYST:	**Figure** 3.5-12
October, 2013	AA	
JOB No: VE52277	QA/QC: MY	PDF FILE: 11-100-079_Ungulate_Fur_20131016.pdf
GIS FILE: 11-100-079_Ungulate_Fur_20131016.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	amec

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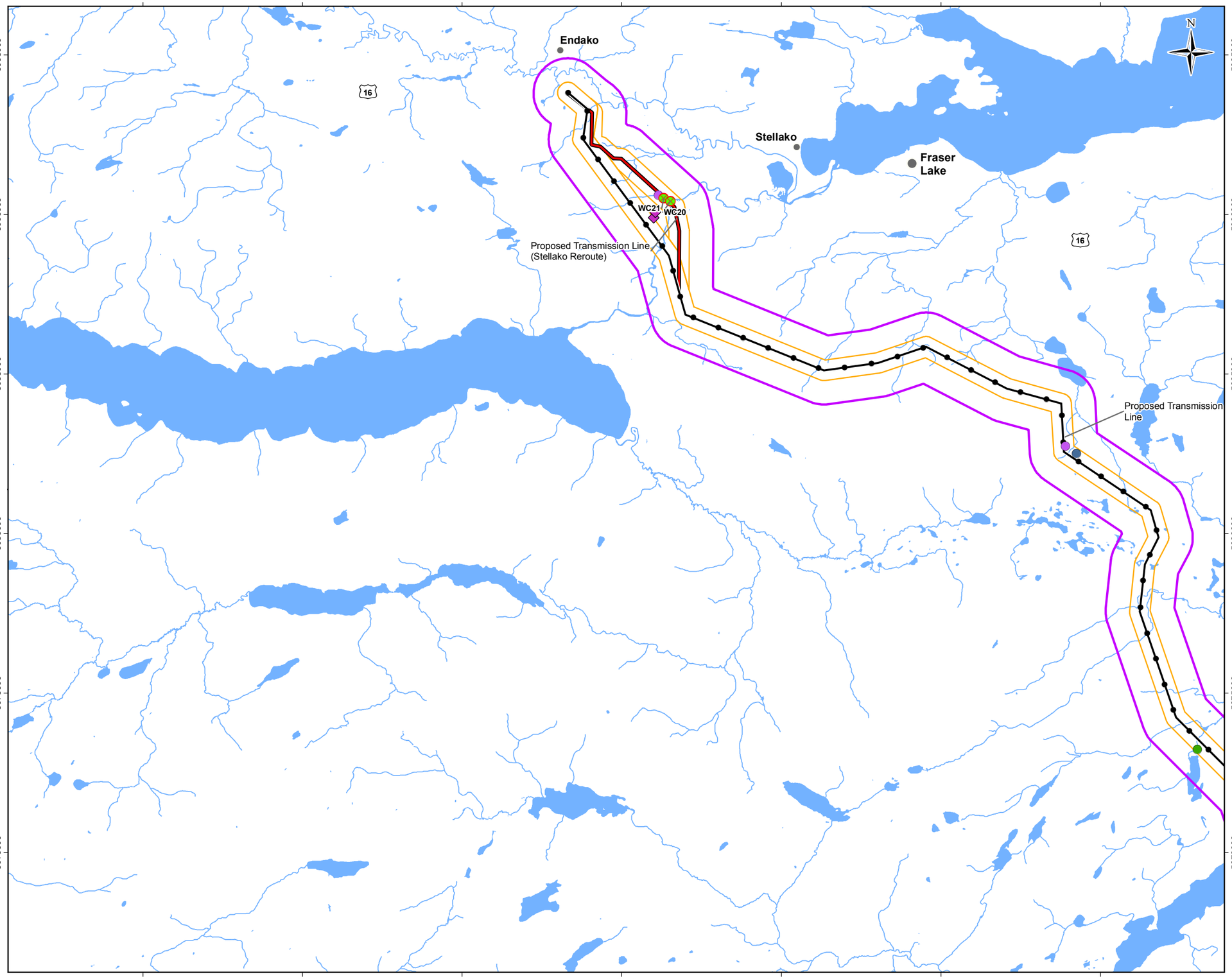


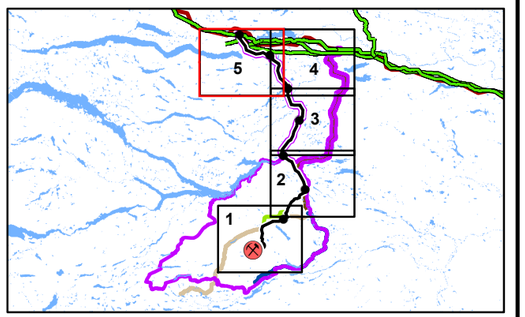
Legend

Ungulate and Furbearer Visual and Sign

- American Beaver
- American Black Bear
- American Marten
- Bobcat
- Canada Lynx
- Coyote
- Fisher
- Grey Wolf
- Grizzly Bear
- Least Weasel
- Moose
- Mule Deer
- North American Porcupine
- North American River Otter
- Red Fox
- Red Squirrel
- Snowshoe Hare
- Unknown Bear Sp.
- Wolverine
- Yellow-Pine Chipmunk
- Camera Location
- Proposed Transmission Line
- Proposed Transmission Line (Stellako re-route)
- Stream (> = 2nd Order)
- Waterbody

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area



Scale: 1:120,000

0 1 2 4 6

Kilometers

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold

PROJECT: Blackwater Gold Project

Ungulate and Furbearer Incidental Sightings, Spring, Summer, and Fall, 2011-2013 (5 of 5)

DATE: October, 2013	ANALYST: AA	**Figure** 3.5-13
JOB No: VE52277	QA/QC: MY	PDF FILE: 11-100-079_Ungulate_Fur_20131016.pdf
GIS FILE: 11-100-079_Ungulate_Fur_20131016.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	amec

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Caribou

No caribou or sign were detected in the transmission line corridor or LSA. Data from ground-based transects for arboreal and terrestrial lichen will be used to model areas of high and moderate potential for caribou forage lichens.

Bears

In 2012, black bears were detected at three locations within the transmission line study area (**Table 3.5-1**). No grizzly bears were detected within either study area. Both black bears were within the SBSmc subzone (**Table 3.5-2**). One detection of a black bear occurred in the transmission line corridor in a recently harvested alpine fir and lodgepole pine forest (<40 years old) within the SBSdw subzone at an elevation of 840 m. A second detection of a black bear in the corridor was in a mostly spruce forest 141 to 250 years old with 45% crown closure within the SBSdk at 1,005 m. A third black bear was detected in the transmission line corridor (also Kluskus FSR ROW) in a pure pine forest stand 81–100 years old within the SBSmc subzone. The crown closure was 35% and the detection was at an elevation of 1,010 m.

In 2013, two wildlife cameras were established beside the Stellako River and encountered black bears; the results are summarized in **Section 3.5.3.6** (Mills Creek and Stellako Reroutes). The Kluskus FSR runs through the Kluskus-Ootsa RMZ, which contains lodgepole pine and spruce-subalpine fir at higher elevations known for its importance to grizzly bear.

Bats

No bat detectors were placed out in the transmission line and LSA. Habitat modelling within the footprint was used to determine potential habitat in the area.

Trapping and Hunting

The proposed transmission line is within the WMU 5-12, 5-13, 6-1, 7-11, and 7-12. Trapping seasons for these furbearers are presented in **Annex 11**.

3.5.3.2 Mine Access Road Corridor and LSA

Ungulates and Furbearers

No winter tracking or wildlife cameras were established within the corridor or surrounding LSA.

Five ungulate and furbearer species, not including caribou and bears, were detected within the mine access road corridor and LSA (**Table 3.5-1**). The mammals that were detected at the most sites were red squirrel (n = 8) and the black bear (n = 8). Red squirrel, snowshoe

hare, and the yellow-pine chipmunk (*Tamias amoenus*) were also incidentally detected during the spring, summer and fall (**Figure 3.5-6**). In addition habitat modelling within the footprint was used to determine potential habitat in the area.

Caribou

No caribou or sign were detected in the mine access road corridor or LSA. Data from ground-based transects for arboreal and terrestrial lichen was used to model areas of high and moderate potential for caribou forage lichens.

Bears

No bears were detected incidentally within the mine access road corridor or LSA.

Bats

No bat detectors were established within the mine access road corridor and LSA. Habitat modelling within the footprint was used to determine potential habitat in the area.

3.5.3.3 Kluskus FWR ROW and LSA

Ungulates and Furbearers

Bear camera 5a was established in July of 2013 alongside Chedakuz Creek within the Kluskus FSR LSA (**Figure 2.1-23**). This camera was removed by a landowner and the data are not yet available. Bear camera 14a which was further downstream on Chedakuz Creek captured two events of moose moving by including one with a calf. A number of cows were detected moving past the camera which was on range land. The same results are likely in bear camera 5 within the Kluskus FSR LSA.

During the October 2012 visit to the Project area, moose hunters were noted camped out beside the Kluskus-Ootsa FSR near the Davidson mainline and the camp at 142 km. Moose were seen strung up beside the road at both sites.

A fisher that was detected reported running across the Kluskus FSR chasing a snowshoe hare was in the SBSdk subzone at an elevation of 970 m, in old pine forest, with a minor amount of spruce (**Figure 3.5-8**). On the opposite side of the road, the forest was logged up until a thin leave strip along the road.

Nine ungulate and furbearer species, not including caribou and bears, were detected within the Kluskus FSR ROW and LSA (**Table 3.5-1**). Other species detected and not previously mentioned were red squirrel (n = 18 sites) and black bear (n = 4 sites), while bobcat, coyote, moose, mule deer, snowshoe hare, white-tailed deer (*Odocoileus virginianus*), and yellow-

pine chipmunk were all detected at one site. Incidental sightings along the Kluskus FSR were recorded from 2011-2013 (**Figure 3.5-6** and **Figure 3.5-10** to **Figure 3.5-13**).

Caribou

No caribou or sign were detected in the mine access road corridor or LSA. Data from ground-based transects for arboreal and terrestrial lichen will be used to model areas of high and moderate potential for caribou forage lichens.

Bears

All black bears detected along the Kluskus ROW and LSA were detected incidentally. One detection was of a bear in a pure pine forest in the Kluskus corridor in SBSmc, 65% crown closure, a mature pine forest (121 to 140 years) at elevation of 1,110 m. Another black bear was detected in an old growth pine-spruce forest in the SBSmc with 25% crown closure at an elevation of 1,100 m. A third black bear was detected in the Kluskus corridor in an old growth pine forest with 50% crown closure and at an elevation of 1,110 m.

Bats

No bat detectors were established within the mine access road corridor and LSA. Habitat modelling within the footprint was used to determine potential habitat in the area.

3.5.3.4 Water Pipeline Corridor and LSA

Ungulates and Furbearears

During the 2012 ground survey, ungulates were not detected on Mount Davidson, and the highest concentration of moose sign was recorded along riparian habitats at lower elevations similar to those found within the LSA/RSA of the water pipeline (e.g., Tatelkuz Lake) (**Figure 3.5-5**). Five ungulate and furbearer species, not including caribou and bears, were detected within the water pipeline corridor and LSA. Lynx was recorded at four sites, red squirrel at 11 sites, and snowshoe hare at 40 sites.

Caribou

No caribou or sign were detected in the mine access road corridor or LSA. Data from ground-based transects for arboreal and terrestrial lichen will be used to model areas of high and moderate potential for caribou forage lichens.

Bears

Black bears were detected at two locations within the water pipeline study area, both within the RSA. No grizzly bears were detected within either study area. Both detections were within the SBSmc subzone. One detection was in a recently harvested area surrounded by old-growth lodgepole pine forest at 1,070 m, and the other was in an old-growth lodgepole pine forest at an elevation of 1,045 m.

Bats

In 2013, a SM2 song meter was used to sample bat calls in the water pipeline corridor and LSA at a location of elevation 1,060 m within the SBSmc. All three species of conservation concern—the little brown myotis, northern myotis, and Eastern red bat—were detected in a fen that was adjacent to an open water wetland surrounded by a small strip of old growth black spruce which was surrounded by a recently harvested pine forest (**Table 3.5-2**, **Figure 3.5-8**).

3.5.3.5 Airstrip Corridor and LSA

Ungulates and Furbearers

Six ungulate and furbearer species not including caribou and grizzly bears were detected within the airstrip corridor and LSA. Black bear was detected at five sites, lynx at three sites, snowshoe hare and moose at two sites, and red squirrel and mule deer at one site.

Caribou

No caribou or sign were detected in the airstrip corridor or LSA. Data from ground-based transects for arboreal and terrestrial lichen will be used to model areas of high and moderate potential for caribou forage lichens.

Bears

No bears were detected within the airstrip corridor or LSA. A nearby wildlife camera (16a) in a regenerating clearcut captured five events of black bears within the RSA close to the LSA of the airstrip (Section 3.16.3 RSA-Bears).

Bats

In 2013, a SM2 song meter was established at two sites in the airstrip LSA within the SBSmc. The detector was initially placed in a clearcut in the western portion of the LSA and did not record any species of conservation concern. The song meter was then moved to the eastern area of the LSA where it detected all three species: little brown myotis, northern myotis, and eastern red bat (**Table 3.5-2**, **Figure 3.5-6**). These species were detected in the eastern portion of a large area of regenerating pine forest at 1,335 m.

3.5.3.6 Mills Creek Ranch and Stellako Reroute Options on Transmission Line

Ungulates and Furbearers

Two wildlife cameras were set up within the LSA of the Stellako Reroute option from 13 June 2013 until 10 September 2013 for a total of 13 weeks. The cameras were deployed for 89 camera capture nights. Camera 20a was established alongside a game trail that ran parallel to the Stellako River and was just west of a hydro ROW. The camera was established on top of a ridge along a game trail that also ran parallel to the river.

Camera 20a captured 10 different wildlife events throughout the entire periods and 11 events capturing daytime recreationalists in July and August. No wildlife was detected between the hours of 10:00 and 19:00; however, this timeframe was the window in which all of the recreationalists were recorded. One mule deer, two moose with calf, two single black bears, two black bear with cubs (both 1 and 2 cubs), four wolves, and two cougars (*Felis concolor*) were recorded on the game trail. The moose and calf were only recorded in the month of June where as the bears were recorded throughout the summer.

Wildlife camera 21a was placed adjacent to a game trail atop of a ridge and captured 45 wildlife events and one encouter with a person. The wildlife encounters occurred mostly during the morning, day, and evening with only two detections between 22:00 and 04:00. Moose, mule deer, and black bear were detected throughout the survey period. A cougar and kit were detected on 23 August, one lynx was detected on 22 August, and an elk (*Cervus elaphus)* was detected on 15 August. A snowshoe hare were detected throughout the survey window.

Eight ungulate and furbearer species not including caribou and bear were also detected within the Stellako Reroute option and one species, a moose, within the Mill's Ranch Reroute option (**Table 3.5-1**).

Caribou

No sign of caribou was detected within either of the reroute options.

Bears

Wildlife camera 20a was set up in a mature trembling aspen forest with 35% crown closure within the SBSdk subzone beside the Stellako River at 700 m elevation (**Figure 2.1-24**). The camera detected black bears throughout the survey window of 13 June 2013 to 10 September 2013. The black bears with cubs appeared in the area in September. Bear sign was detected in the hydro ROW between camera 20a and camera 21a during visits to set up and retrieve the cameras; this included more than 10 detections of bear sign (e.g., scat, forage sign) during both visits providing evidence of frequent bear use. More than 10 scats and forage sign were detected during both visits, indicating that it is an area that is used frequently by bear.

Wildlife camera 21a was setup in an old growth pine / spruce forest with 50% crown closure within the SBSdw at 730 m elevation (**Figure 2.1-24**). At least 16 individual black bears were identified based on size and markings. Of the 26 black bear encounters, 10 bears stopped and rubbed on the two trees were within the field of view, including one sow and cub.

An incidental sighting of a black bear during wildlife surveys occurred within the Stellako Reroute option. The bear was detected within a predominantly mature mixed deciduous forest at an elevation of 760 m.

Bats

No bat detectors were established within either of the reroute options. Habitat modelling within the footprint was used to determine potential habitat in the area.

3.5.3.7 RSA

Ungulates and Furbearers

The RSA near the mine site is located within the Laidman Lake, Davidson Creek, and Chedakuz Creek RMZs (**Figure 3.5-1**). The Davidson RMZ is identified as important habitat for grizzly bear, marten, and moose. Management practices within this RMZ have tried to maintain marten habitat (BC ILMB, 1997). The northeast and east portion of the mine site RSA near the mine site is part of the Chedakuz RMZ 16, which is a plateau area through which Chedakuz Creek flows. This RMZ provides critical habitat for moose and mule deer and important habitat for grizzly bear and black bear. The southern and western portions of the mine site RSA lie within the Laidman Lake RMZ 18. This RMZ is on the eastern tip of the winter range for the Tweedsmuir-Entiako caribou herd and is also important for grizzly bear and moose (BC ILMB, 1997).

The RSA overlaps with seven RMZs (**Figure 3.5-1**). The linear section of the RSA initiates in the Chedakuz RMZ and runs north through the following RMZs: Crystal Lake, Vanderhoof South, Upper Nechako River, Nechako West, and Francois North. Many of these RMZs

state that maintaining or enhancing moose and bear habitats are an important part of their management directive.

Portions of the 2011 reconnaisance aerial winter tracking survey and the 2012 ground-based winter tracking survey covered the RSA. The majority of the aerial sightings were most frequently detected in the lower elevation lodgepole pine forest and cutblocks and along the riparian corridors of the SBSmc subzone within the RSA. During the ground transects, the highest number of tracks were found in immature pine forest, followed by mature pine forest. Mature spruce and subalpine fir forest had relatively few tracks. One alpine survey was undertaken; however, the hard windblown conditions were not suitable for tracking.

In the lower Davidson Creek area within the RSA, eight species of mammal were detected, including snowshoe hare, red squirrel, lynx, a weasel species, marten, coyote, moose, and wolverine. Weasel, red squirrel, and marten numbers were substantially higher and consistent throughout timbered transects. Proulx (2006) did not detect marten within pure pine forest; however, multiple tracks were detected within mature and old-growth pure pine stands. Tracks of the wolverine, which is Blue-listed, an Identified Wildlife species, and listed as nationally of Special Concern by COSEWIC, were detected in mature forest stands near old-growth within the SBSmc subzone within the lower elevation area dominated by clearcuts. The wolverine tracks were likely from a single individual in the area. Wolverine will generally not use areas cleared of forest, although they may hunt in such areas where they are immediately adjacent to mature forest. Snowshoe hare was detected on all transects except one; however, numbers were higher in regenerating cutblocks with canopy closure. Higher numbers of lynx were found in these same areas, as well as in cutblocks; grey wolf was not detected during the winter tracking survey. A number of wolf sightings were detected in the RSA during the 2011 field surveys, and scat was recorded in the ESSFmv1 and the SBSmc3 subzones of the mine site LSA.

Habitat along the lower riparian areas of Mathews Creek, Laidman Lake, Fawnie Creek, and their associated wetlands where well-developed shrub complexes were present is thought to provide higher quality wintering habitat for ungulates. Higher concentrations of moose were also found in 2012 along the lower Davidson road network compared with the higher elevation mine site that had greater snow depths. The Davidson road networks south of the mine site within the mine site RSA had the most significant human impacts with large portions of the area harvested by logging companies as well as a higher concentration of wetlands occurring along stream riparian areas and the large wetland complex surrounding Snake Lake.

Wildlife camera 16a was initially established alongside a non-active road through a clearcut in June of 2013 where it captured two black bears, a mule deer, and a moose. In July the camera was then moved to the forest / clearcut interphase where it captured a lynx and a black bear foraging on a buffalo berry shrub. Wildlife camera 12a was established at a wetland in the headwaters of Davidson Creek. The only wildlife documented was a lynx as it came to take a drink on 4 September 2013.

The tracks of the Blue-listed wolverine were all detected within the SBSmc subzone within the RSA between the mine site and Tatelkuz Lake (**Figure 3.5-5**). The tracks were between 1,071 m and 1,124 m in elevation and found within bands of old growth and mature forest that act as corridors.

There were 14 marten detections within the Project Area and all occurred within the RSA **Table 3.5-1**). Seven of the detections occurred within 150 m of a creek and nine within 250 m of a wetland. All of the detections occurred within mature forest although four were adjacent to a recently harvested area. Eight detections were in pine forest, four in spruce forest, and two in fir forest. Most of the forests had some component of spruce in the forest, which concurs with the habitat supply model in **Section 3.14.1** that states pure pine stands with MPB-killed trees were not suitable for marten. All detections were within 1,035 m to 1,360 m in elevation. Eight detections occurred in the ESSFmv subzone, four were in the SBSmc, and two were right on the border of both of these subzones.

Moose were detected on several of the bear cameras that were established along Kokanee spawning streams within the RSA. Individual moose were recorded at upper Chedakuz Creek (above Tatelkuz Lake) and Creek 661. Moose with calves were recorded on Davidson Creek and lower Chedakuz. Both male and female mule deer were recorded on cameras 2a, 4a, 11a, and 16a, which include Creek 661, upper Chedakuz Creek, and Davidson Creek.

A total of 13 ungulate and furbearer species not including caribou and bears were detected within the RSA. Other species not previously listed are beaver, wolf, least weasel, mule deer, porqupine (*Erethizon dorsatum*), river otter, red fox, and yellow-pine chipmunk many of which were detected incidentally (**Figure 3.5-6** and **Figure 3.5-10** to **Figure 3.5-13**).

Caribou

The furthest north any sign of caribou was detected from Mount Davidson was a caribou scat approximately 2 km north of the LSA of the Mills Ranch Reroute (**Figure 3.5-7**). This detection was in the SBSmc subzone in a mature pine forest with 50% crown closure and at 1,140 m in elevation. The remaining detection event was a scat found a top Mount Davidson in a mature pine forest with 20% Engleman spruce content. The forest had 70% crown closure and the detection was at 1,705 m in elevation.

Bears

Salmon has been shown to be important to both individuals and populations of grizzly and black bears in BC (Belant et al., 2008; Gende and Quinn, 2004; Hilderbrand et al., 2004; Levi et al., 2012). The relationship between salmon and bears is often referred to as a keystone interaction due to the positive impacts of nutrient transport into the terrestrial environment (Helfield and Naiman, 2006; Hilderbrand et al., 2004).

Bears were surveyed through incidental observations and using motion-sensitive cameras and bear-sign searches along Kokanee spawning areas searching for dens (**Figure 2.1-23**). The bear-Kokanee surveys were initiated on 12 September 2012 and continued through 6 November 2012, with up to 14 cameras deployed on Davidson Creek, Creek 661, and Chedakuz Creek (Avison, 2012a). Two cameras were placed on the lower reaches of Davidson Creek, five cameras on Chedakuz Creek (upstream of Tatelkuz Lake), and seven cameras on Creek 661. The majority of the cameras were deployed for eight weeks for a total of 643 camera/capture nights. Bear-sign searches took place on 12, 14, and 19 September 2012 along sections of Chedakuz Creek and Creek 661. Incidental observations occurred between 19 June 2011 and 3 October 2012.

In July 2013, 15 Reconyx Hyper Fire 500 motion-activated cameras were placed along the Kokanee-bearing streams to detect bear use between 16 July and 11 September 2013. The first Kokanee were detected in the lower reaches of Davidson Creek on July 16. Cameras were deployed for nine weeks and captured approximately 870 camera/capture nights. Two cameras were established on Chedakuz Creek within one kilometre downstream of the Kluskus FSR (**Figure 2.1-23**). Five cameras were established on the reaches of Davidson Creek at the outlet into Chedakuz Creek all the way up to the mine site LSA boundary. Four cameras were placed on Creek 661 up to approximately four kilometres upstream from the outlet into Chedakuz Creek. On Chedakuz Creek, upstream of Tatelkuz Lake, two cameras were placed alongside the stream. The cameras were established on different banks of the creeks and either faced upstream or downstream along game trails or suitable Kokanee spawning sites

In 2012, seven detections of five individual grizzly bears were made using the motion-sensitive cameras: three detections of two bears on Creek 661 and four detections of three bears on Chedakuz Creek (**Annex 5**). All grizzly bear detections were made from 13 to 30 September 2012, with six of the seven occurring by 18 September 2012. No detections occurred in October or November. One detection of a sow and cub involved the cub eating a fish, likely a Kokanee, providing evidence that grizzly bears likely use Kokanee within the study area as a food resource. This area lies within the Davidson Creek RMZ 17 and Chedakuz Creek RMZ 16, both of which have been identified as important grizzly bear habitat including known grizzly bear corridors along Chedakuz Creek. In addition, the mine site study area is within the Blackwater-West Chilcotin GBPU, which is listed as threatened and closed to hunting with a population of 53 bears (BC MFLNRO, 2012a). The bear-sign survey found areas of high use along Creek 661 and Chedakuz Creek; however, portions of these creeks, as well as the entire length of Davidson Creek that was searched, were categorized as having low bear activity. Areas of high bear activity included multiple areas with evidence of scat, tracks, digging, and trampling of vegetation.

In 2013, one grizzly was encountered on 14 August on wildlife camera 9a as it walked across Creek 661 (**Table 3.5-8**). No other grizzly bears were recorded on the wildlife cameras in 2013. All of the gizzly bears detected on the wildlife cameras in 2012 and 2013 were within the SBSmc subzone. Most of the detections occurred within pine forest and the

remainder in spruce forest that was next to pine forest. All of the detections were within older forest or at the edges of older forest with recently harvested areas.

Two cameras recorded black bears in 2013 within the Kokanee spawning areas of the creeks; however, it is not known whether the bears were interacting with the Kokanee. On 5 August a black bear was recorded in Davidson Creek in an old growth white spruce forest stand in the SBSdk subzone with 45% crown closure at 1,020 m in elevation. On 19 August, a black bear was recorded beside Creek 661 in an old growth mostly pine forest in the SBSmc subzone with 30% crown closure and at 1,055 m. Wildlife camera 16 set up near the airstrip captured five detection events. The camera was located in a recently harvested pine forest (<40 years) within the SBSmc at 1,120 m. The camera was initially established along an old road within the clearcut and then moved to the forest clearcut border. While along the road, the camera captured at least two different black bears based on size and showed one of the bears foraging under logs. After the camera was moved to the forest edge, it also detected a bear foraging, this time consuming the berries of a buffalo berry bush.

Table 3.5-8: Wildlife Detections of Cameras established as part of the Grizzly Bear – Kokanee Interaction Survey, 2013

Species	Wildlife Camera								
	WC1a	WC10a	WC11a	WC14a	WC15a	WC2a	WC3a	WC4a	WC9a
Bald eagle	0	0	0	0	0	0	0	1	0
Black bear	0	0	1	0	1	0	0	0	0
Great blue heron	3	0	0	0	0	0	0	0	0
Grizzly bear	0	0	0	0	0	0	0	0	1
Moose	0	1	3	2	0	2	0	1	0
Mule deer	0	0	3	0	0	3	0	1	0
Squirrel	0	0	0	0	0	0	2	0	0
Total No. of Species	**1**	**1**	**3**	**1**	**1**	**2**	**1**	**3**	**1**

Ten black bears were detected incidentally in the RSA during wildlife surveys, not including the wildlife camera program. All 10 of the detections occurred within the SBSmc subzone and nine of the 10 were within pine forest with the last one occurring in a spruce forest. Six of the bears were detected within mature or old growth forest and three within recently cleared areas less than 40 years old. The bears were detected between 1,080 m and 1,305 m in elevation.

Bats

In 2011 and 2012, Anabat detectors were used to sample acoustic calls of bats in five locations within the RSA. In 2013, one site was established in the RSA and a SM2 song meter was used to record the calls. All three species of conservation concern—little brown myotis, northern myotis, and Eastern red bat—were detected within the ESSFmv subzone at

1,350 m over a small lake that was surrounded by mature pine forest. Little brown myotis was also detected in wetlands that were either a fen or a mosaic wetland consisting of open water, marsh, bog, and fen and were between 1,335 m and 1,345 m. The surrounding forest for both wetlands consisted of mature pine forest.

3.5.3.8 Summary

The most frequently detected species in the proposed Project Area were snowshoe hare, red squirrel, weasel species, moose, and lynx. The majority of the tracks found were within the mine site RSA at lower elevations and the highest number of tracks was found in immature pine forest, followed by mature pine forest. Mature spruce and subalpine fir forest had relatively few tracks. Higher concentrations of moose were found along the lower Davidson road network compared with the higher elevation mine site that had greater snow depths. The Blue-listed wolverine was detected within old growth forest within the SBSmc subzone.

Grizzly bears were detected infrequently within the Project area; however, black bears were found across several study areas, and are likely present across most areas of the Project. They were most frequently detected within recently harvested areas, where food resources such as berries and new plant growth may be more abundant. Grizzly bears were detected within the mine site RSA along Creek 661, Chedakuz Creek, and southeast of Snake Lake. At least five grizzly bears were identified during the bear-Kokanee surveys in 2012, and the former two creeks appeared to be favoured due to the presence of spawning Kokanee. Several females with cubs were also detected incidentally indicating that breeding takes place within the Project area. In 2013, one grizzly was detected in Creek 661 during Kokanee spawning.

The three species of conservation concern—little brown myotis, northern myotis, and Eastern red bat—were detected in both the SBSmc and the ESSFmv1. These three species were detected within the mine site, water pipeline, airstrip, and RSA. The total number of all bat species detected within the two subzones was almost equal.

3.6 Invertebrate Community

3.6.1 Species of Conservation Concern Life History Account

3.6.1.1 Hagen's Bluet

Hagen's Bluet (*Enallagma hageni)* is a Blue-listed species in BC and not listed under COSEWIC or *SARA*. In BC, it has been found in the lowlands east of the Rocky Mountains and across the central plateau. It is primarily found on open ponds, bogs, marshes, and lakes with waters that are slightly acidic. Their flight period across BC is in June and July.

3.6.1.2 Jutta Arctic

The Blue-listed conservation status of the Jutta Arctic (*Oeneis jutta chemocki)* is primarily due to relatively few records on the species in central BC. The lack of records appears to be due to a lack of butterfly inventory in black spruce wetlands; the subspecies is apparently common and widely distributed in that habitat in central BC (Guppy 2012, pers. comm., in Ecofor, 2012d). It is primarily found in moist peatland forests and open pine forests. Their flight period across BC is in June and July.

3.6.1.3 Assiniboine Skipper

The Assiniboine skipper (*Hesperia assiniboia)* is included on the Blue List due to its uncommonness in a relatively restricted area of BC and because it is difficult to confidently predict where it might be found (Ecofor, 2012d). They are an uncommon inhabitant of marshy, frequently somewhat acid lakes and ponds.

3.6.1.4 Mandan Skipper

BC CDC currently treats the Mandan skipper (Carterocephalus Mandan) as Red-listed, with a provincial rank of S2 equivalent to Threatened under the name "Arctic skipper, *mandan* subspecies, *Carterocephalus palaemon mandan*" (**Annex 9**). No Mandan skippers were detected within any of the LSAs or RSA; however, one was detected approximately one kilometre away from the edge of the LSA of the transmission line.

3.6.2 Mine Site and LSA

Surveys for invertebrates have not previously been conducted within any of the Project area before the surveys of 2011 to 2013. The desktop overview produced very few records of invertebrates within at least a 100 km radius of the proposed mine site LSA; hence, prediction of which species, especially species at risk, are present in the area was very uncertain. The BC CDC lists two butterfly species at risk for the Chilcotin, Quesnel, and/or Vanderhoof Forest Districts: Blue-listed Jutta Arctic and Red-listed Assiniboine skipper. There are four Blue-listed dragonfly/damselfly species at risk listed for the Chilcotin, Quesnel, and/or Vanderhoof Forest Districts: Hagen's Bluet, Beaverpond Baskettail (*Epitheca canis)*, Forcipate Emerald (*Somatochlora forcipata)*, and Kennedy's Emerald (*Somatochlora kennedyi)*.

Butterfly and/or dragonfly inventory observations were made over 34 days in the Project Area, spread over three years. Ten days of surveying took place in 2011 (27 June; 9 and 10 July; 1 to 4, 18, and 19 August) and 12 days (3 to 7 July; 10 to 16 August) in 2012 and 12 days (8 to 19 July, 5 to 9 August) in 2013. A total of 1,055 records of butterfly occurrences (45 species of butterflies) and 612 records of dragonfly and damselfly occurrences (40 species of dragonflies) were made within the Project Area over the three-year study (**Figure 3.6-1**; **Table 3.6-1**).

A total of 39 invertebrate species were detected at 172 sites within the mine site and LSA (**Table 3.6-1**) (**Figure 3.6-1**) **Annex 8** and **Annex 9**). Survey locations in which the invertebrates were recorded are presented in **Annex 8** and **Annex 9**. The highest biodiversity of invertebrates throughout the Project Area was detected within the SBSmc subzone (n = 141) followed by ESSFmv1 (n = 41) subzone. The lowest number of species detected occurred in BAFAun subzone (n = 0) and ESSFmvp (n = 4) (**Table 3.6-2**). The three listed species in the Project study area were mainly found within the two most diverse BGC subzones: SBSmc and ESSFmv.

Twenty-three individuals of the Blue-listed species of damselfly, the Hagen's bluet, were recorded at 23 locations within the mine site, the majority within the SBSmc subzone at an elevation 1,255 m and the remaining in the ESSFmv1 variant (**Figure 3.6-1**). All locations were centred on a wetland located along the north side of the mine site. The wetland was a shore sedge-buckbean-hook moss fen and bog. The wetland was dominated by shore sedge and hummock-hollow patterns with large areas of standing water. This species is Blue-listed in BC due to the uncertainty of its habitat preferences and its relatively restricted range in the province. It is known to be an uncommon inhabitant of marshy, frequently somewhat acid lakes and ponds and could be found within the mine site and LSA in suitable water bodies.

Two butterfly species of conservation concern were detected during the invertebrate surveys: the Assiniboine skipper and the Jutta Arctic. The Assiniboine skipper was detected at one location that was within the SBSmc subzone in a recently harvested area that was regenerating lodgepole pine at an elevation of 1,245 m (**Figure 3.6-1**). The Jutta Arctic was found at one location within the mine site LSA in a wetland in the SBSmc at a site 1,140 m in elevation. This species is biennial and flies primarily in odd-numbered years with only low population densities in even-numbered years in the mine site LSA and RSA (Ecofor, 2012d).

The higher elevation level areas in the mine site and LSA are considered to be unsuitable breeding habitat for all three species.

360000 370000 380000 390000

5910000 5900000 5890000

Proposed Transmission Line

Proposed Transmission Line (Mills Ranch re-route)

Proposed Airstrip

Kluskus-Ootsa FSR

Proposed Airstrip Access Road

Water Pipeline Route

Tatelkuz Lake

Top Lake

Snake lake

Exploration Road

Proposed Mine Site Access Road

Kuyakuz Lake

Kluskus-Blue FSR

Y:\GIS\Projects\VE\VE52095_Richfield_Blackwater\Mapping\11_wildlife\Baseline\11-100-097_Invertebrate_ConsConcern.mxd

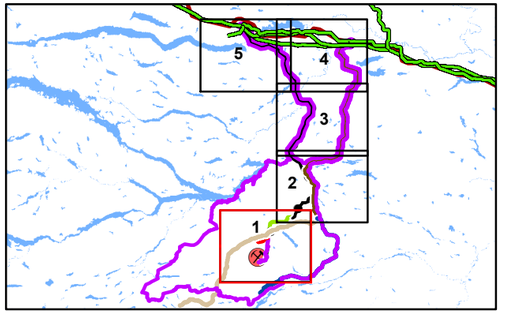
Legend

Species Detection

- Jutta Arctic
- Assiniboine Skipper
- Hagen's Bluet
- Existing Road
- Kluskus-Blue FSR
- Kluskus-Ootsa FSR
- Exploration Road
- Proposed Transmission Line
- Proposed Transmission Line (Mills Ranch re-route)
- Proposed Mine Site Access Road
- Water Supply Pipeline
- Proposed Airstrip Access Road
- Proposed Airstrip
- Proposed Mine Site
- Stream (>= 2nd Order)
- Waterbody (>= 4 Ha)
- Wetlands

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area



Scale: 1:120,000

0 1 2 4 6

Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold

PROJECT: Blackwater Gold Project

Invertebrate Species of Conservation Concern Detections

DATE: October, 2013	ANALYST: KA	**Figure** 3.6-1
JOB No: VE52277	QA/QC: MY	PDF FILE: 11-100-097_Invertebrate_ConsConcern.pdf
GIS FILE: 11-100-097_Invertebrate_ConsConcern.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	amec

Table 3.6-1: Detections and Number of Individuals of Invertebrates during 2011–2013 Surveys of each LSA and the RSA in the Project Area

Species	Mine Site		Mine Site LSA		Transmission Corridor		Transmission Line LSA		Mine Access Road Corridor		Mine Access Road LSA		Kluskus FSR ROW		Kluskus FSR LSA		Water Pipeline Corridor		Water Pipeline LSA		Airstrip Corridor		Airstrip LSA		RSA		Stellako Corridor		Mill's Ranch Corridor	
	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites
Alkali bluet	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0
American emerald	0	0	8	8	3	3	2	2	1	1	1	1	0	0	0	0	0	0	0	0	0	0	1	1	37	37	0	0	0	0
Anise swallowtail	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	8	0	0	0	0
Arctic blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0
Arctic fritillary, grandis subspecies	37	37	9	9	18	18	34	34	10	10	0	0	4	4	0	0	4	4	4	4	5	5	8	8	27	27	0	0	0	0
Arctic jutta	0	0	2	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	13	0	0	0	0
Arctic skipper	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	12	12	0	0	0	0
Assiniboine skipper	1	1	0	0	0	0	5	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	2	0	0	0	0
Atlantis fritillary	2	2	1	1	9	9	7	7	0	0	0	0	2	2	2	2	0	0	0	0	0	0	0	0	1	1	0	0	0	0
Belted whiteface	1	1	1	1	0	0	1	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Black-tipped darner	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1	1	0	0	0	0
Blue-eyed darner	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bog fritillary	2	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0
Boreal bluet	1	1	7	7	10	10	7	7	1	1	1	1	0	0	2	2	2	2	1	1	0	0	0	0	39	39	0	0	0	0
Boreal whiteface	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0
Brush-tipped emerald	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
California darner	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Canada whiteface	0	0	0	0	0	0	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	5	0	0	0	0
Canadian swallowtail	0	0	0	0	1	1	0	0	1	1	2	2	0	0	1	1	1	1	0	0	0	0	0	0	11	11	0	0	0	0
Cherry-faced meadowhawk	4	4	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	1
Clouded sulphur	0	0	0	0	21	21	25	25	6	6	0	0	4	4	0	0	2	2	1	1	0	0	1	1	14	14	0	0	0	0
Compton tortoiseshell	0	0	0	0	3	3	6	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0	0	0	0
Delicate emerald	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0	0	0	0
Dorcas copper	2	2	0	0	2	2	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	7	0	0	0	0
Dreamy dusky wing	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0
Eastern veined white	0	0	0	0	2	2	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0	0	0	0
Emerald spreadwing	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18	18	0	0	0	0
European skipper	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Field crescent	3	3	11	11	0	0	0	0	3	3	3	3	0	0	0	0	2	2	2	2	0	0	0	0	85	85	0	0	0	0
Field crescent ssp. pratensis	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0
Four-spotted skimmer	0	0	0	0	2	2	0	0	2	2	0	0	0	0	0	0	0	0	1	1	0	0	0	0	3	3	0	0	0	0
Freija fritillary	2	2	1	1	0	0	0	0	3	3	1	1	0	0	0	0	1	1	0	0	1	1	0	0	22	22	0	0	0	0
Frigga fritillary	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	6	0	0	0	0
Green comma	0	0	0	0	1	1	8	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0
Greenish blue	2	2	7	7	9	9	7	7	14	14	2	2	1	1	0	0	2	2	1	1	0	0	2	2	22	22	1	1	0	0
Grey comma	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grizzled skipper	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	7	0	0	0	0
Hagen's bluet	23	23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0
Hoary comma	0	0	0	0	4	4	6	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	11	0	0	0	0
Hudsonian emerald	1	1	10	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	9	0	0	0	0
Hudsonian whiteface	14	14	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	60	60	0	0	0	0
Hydaspe fritillary	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Labrador sulphur	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lake darner	0	0	3	3	8	8	8	8	1	1	0	0	0	0	1	1	0	0	0	0	1	1	0	0	8	8	0	0	0	0
Large marble	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	9	0	0	0	0
Mandan skipper	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Margined white	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Species	Mine Site		Mine Site LSA		Transmission		Transmission		Mine Access Road		Mine Access		Kluskus FSR		Kluskus FSR LSA		Water Pipeline		Water Pipeline		Airstrip Corridor		Airstrip LSA		RSA		Stellako Corridor		Mill's Ranch Corridor	
Mariposa copper	2	2	2	2	8	8	9	9	0	0	1	1	0	0	1	1	1	1	1	1	2	2	1	1	17	17	0	0	0	0
Marsh bluet	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0
Meadow fritillary	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Milbert's tortoiseshell	1	1	0	0	2	2	2	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	5	1	1	0	0
Mountain emerald	7	7	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0
Mourning cloak	0	0	0	0	6	6	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	7	0	0	0	0
Northern blue	6	6	7	7	20	20	9	9	2	2	8	8	0	0	0	0	2	2	4	4	9	9	4	4	25	25	1	1	0	0
Northern bluet	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	11	0	0	0	0
Northern crescent	0	0	0	0	27	27	6	6	0	0	0	0	0	0	2	2	0	0	9	9	0	0	0	0	13	13	2	2	0	0
Northern spreadwing	19	19	16	16	4	4	1	1	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0	0	0	0
Northern spring azure	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	1	0	0	0	0
Northwestern fritillary	0	0	4	4	27	27	9	9	1	1	0	0	0	0	1	1	0	0	0	0	3	3	3	3	13	13	0	0	0	0
Paddle-tailed darner	0	0	3	3	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pale snaketail	0	0	0	0	4	4	14	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0
Pink-edged sulphur	1	1	1	1	14	14	4	4	1	1	5	5	0	0	3	3	0	0	1	1	2	2	0	0	6	6	0	0	0	0
Ringed emerald	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Satyr anglewing	0	0	0	0	0	0	7	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0	0	0	0
Sedge darner	6	6	2	2	1	1	2	2	0	0	0	0	0	0	1	1	0	0	0	0	1	1	1	1	5	5	0	0	0	0
Shadow darner	0	0	0	0	21	21	1	1	0	0	0	0	0	0	4	4	0	0	0	0	0	0	0	0	3	3	0	0	0	0
Silver-bordered fritillary	4	4	22	22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	14	0	0	0	0
Spotted spreadwing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0
Stella orange tip	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	5	0	0	0	0
Subarctic bluet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	1	0	0	0	0
Subarctic darner	0	0	0	0	3	3	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taiga bluet	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	14	14	0	0	0	0
Tule bluet	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	5	0	0	0	0
Variable darner	0	0	0	0	13	13	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	8	8	0	0	0	0
Variegated meadowhawk	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	4	0	0	0	0
Western branded skipper	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0
Western pine elfin	2	2	0	0	0	0	0	0	2	2	0	0	0	0	0	0	1	1	0	0	0	0	0	0	5	5	0	0	0	0
Western tailed-blue	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0
White admiral	0	0	3	3	3	3	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	3	3	1	1	0	0
White-faced meadowhawk	3	3	7	7	9	9	7	7	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	12	12	1	1	0	0
Whitehouse's emerald	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zigzag darner	21	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Individuals	**185**		**141**		**263**		**200**		**53**		**30**		**12**		**23**		**18**		**30**		**25**		**23**		**645**		**9**		**1**	
Total Species	**35**		**32**		**35**		**31**		**18**		**14**		**5**		**14**		**10**		**14**		**9**		**10**		**64**		**7**		**1**	

Note: LSA = Local Study Area; RSA = Regional Study Area

Table 3.6-2: Biogeoclimatic Zones where Invertebrate Species were detected in the Project Area in 2011–2013

	Boreal Altai Fescue Alpine (BAFA)		Engelmann Spruce – Subalpine Fir (ESSF)				Sub-Boreal Spruce (SBS)					
	Undifferentiated (un)		Moist-Very Cold (mv1)		Moist-Very Cold-Parkland (mvp)		Moist-Cold (mc)		Dry-Cool (dk)		Dry-Warm (dw)	
BGC ZoneBGC Sub-ZoneSpecies	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites	No. Individuals	Sites
Alkali bluet	0	0	1	1	0	0	1	1	0	0	0	0
American emerald	0	0	1	1	1	1	5	5	1	1	0	0
Anise swallowtail	0	0	5	5	3	3	2	2	0	0	0	0
Arctic blue	0	0	1	1	0	0	0	0	0	0	0	0
Arctic fritillary, grandis subspecies	0	0	18	18	0	0	12	12	21	21	2	2
Arctic jutta	0	0	7	7	0	0	8	8	1	1	0	0
Arctic skipper	0	0	6	6	0	0	7	7	0	0	0	0
Assiniboine skipper	0	0	0	0	0	0	7	7	2	2	0	0
Atlantis fritillary	0	0	2	2	0	0	11	11	9	9	0	0
Belted whiteface	0	0	1	1	0	0	2	2	0	0	0	0
Black-tipped darner	0	0	0	0	0	0	0	0	2	2	0	0
Blue-eyed darner	0	0	0	0	0	0	1	1	0	0	0	0
Bog fritillary	0	0	4	4	0	0	1	1	0	0	0	0
Boreal bluet	0	0	0	0	0	0	58	58	1	1	1	1
Boreal whiteface	0	0	0	0	0	0	3	3	0	0	0	0
Brush-tipped emerald	0	0	1	1	0	0	1	1	0	0	0	0
California darner	0	0	0	0	0	0	0	0	1	1	0	0
Canada whiteface	0	0	0	0	0	0	0	0	4	4	5	5
Canadian swallowtail	0	0	1	1	0	0	15	15	0	0	0	0
Cherry-faced meadowhawk	0	0	0	0	0	0	6	6	1	1	0	0
Clouded sulphur	0	0	1	1	0	0	38	38	3	3	5	5
Compton tortoiseshell	0	0	0	0	0	0	3	3	6	6	3	3
Delicate emerald	0	0	0	0	0	0	3	3	0	0	1	1
Dorcas copper	0	0	0	0	0	0	1	1	1	1	3	3
Dreamy dusky wing	0	0	0	0	0	0	2	2	0	0	0	0

BGC ZoneBGC Sub-ZoneSpecies	Boreal Altai Fescue Alpine (BAFA)		Engelmann Spruce – Subalpine Fir (ESSF)				Sub-Boreal Spruce (SBS)					
Eastern veined white	0	0	2	2	0	0	3	3	2	2	0	0
Emerald spreadwing	0	0	0	0	0	0	22	22	0	0	0	0
European skipper	0	0	0	0	0	0	0	0	0	0	1	1
Field crescent	0	0	13	13	0	0	96	96	0	0	0	0
Field crescent ssp. pratensis	0	0	0	0	0	0	2	2	1	1	0	0
Four-spotted skimmer	0	0	0	0	0	0	6	6	2	2	0	0
Freija fritillary	0	0	6	6	1	1	24	24	0	0	0	0
Frigga fritillary	0	0	3	3	0	0	5	5	0	0	0	0
Green comma	0	0	0	0	0	0	3	3	3	3	5	5
Greenish blue	0	0	4	4	0	0	59	59	5	5	1	1
Grey comma	0	0	0	0	0	0	1	1	1	1	0	0
Grizzled skipper	0	0	1	1	2	2	6	6	0	0	0	0
Hagen's bluet	0	0	2	2	0	0	22	22	0	0	0	0
Hoary comma	0	0	1	1	0	0	11	11	2	2	7	7
Hudsonian emerald	0	0	1	1	0	0	19	19	0	0	0	0
Hudsonian whiteface	0	0	5	5	0	0	72	72	0	0	0	0
Hydaspe fritillary	0	0	0	0	0	0	1	1	0	0	0	0
Labrador sulphur	0	0	4	4	0	0	0	0	0	0	0	0
Lake darner	0	0	1	1	0	0	15	15	14	14	0	0
Large marble	0	0	7	7	0	0	4	4	0	0	0	0
Mandan skipper	0	0	0	0	0	0	0	0	0	0	2	2
Margined white	0	0	0	0	0	0	1	1	0	0	0	0
Mariposa copper	0	0	3	3	0	0	34	34	5	5	3	3
Marsh bluet	0	0	0	0	0	0	1	1	2	2	0	0
Meadow fritillary	0	0	0	0	0	0	1	1	0	0	0	0
Milbert's tortoiseshell	0	0	4	4	0	0	5	5	1	1	2	2
Mountain emerald	0	0	4	4	0	0	6	6	0	0	0	0
Mourning cloak	0	0	0	0	0	0	3	3	7	7	6	6
Northern blue	0	0	4	4	0	0	77	77	0	0	2	2
Northern bluet	0	0	0	0	0	0	12	12	14	14	0	0
Northern crescent	0	0	2	2	0	0	3	3	23	23	4	4
Northern spreadwing	0	0	4	4	0	0	39	39	1	1	1	1

BGC ZoneBGC Sub-ZoneSpecies	Boreal Altai Fescue Alpine (BAFA)		Engelmann Spruce – Subalpine Fir (ESSF)				Sub-Boreal Spruce (SBS)					
Northern spring azure	0	0	0	0	0	0	2	2	0	0	0	0
Northwestern fritillary	0	0	0	0	0	0	29	29	28	28	4	4
Paddle-tailed darner	0	0	0	0	0	0	5	5	0	0	0	0
Pale snaketail	0	0	0	0	0	0	11	11	8	8	5	5
Pink-edged sulphur	0	0	0	0	0	0	26	26	7	7	2	2
Ringed emerald	0	0	0	0	0	0	1	1	0	0	0	0
Satyr anglewing	0	0	0	0	0	0	3	3	1	1	6	6
Sedge darner	0	0	4	4	0	0	1	1	2	2	3	3
Shadow darner	0	0	0	0	0	0	1	1	26	26	2	2
Silver-bordered fritillary	0	0	8	8	0	0	32	32	0	0	0	0
Spotted spreadwing	0	0	0	0	0	0	0	0	0	0	4	4
Stella orange tip	0	0	4	4	0	0	1	1	0	0	0	0
Subarctic bluet	0	0	0	0	0	0	2	2	0	0	0	0
Subarctic darner	0	0	0	0	0	0	0	0	4	4	0	0
Taiga bluet	0	0	2	2	0	0	14	14	0	0	1	1
Tule bluet	0	0	1	1	0	0	5	5	0	0	0	0
Variable darner	0	0	0	0	0	0	5	5	9	9	8	8
Variegated meadowhawk	0	0	2	2	0	0	4	4	0	0	0	0
Western branded skipper	0	0	0	0	0	0	1	1	0	0	0	0
Western pine elfin	0	0	3	3	0	0	7	7	0	0	0	0
Western tailed-blue	0	0	0	0	0	0	0	0	1	1	2	2
White admiral	0	0	0	0	0	0	7	7	1	1	3	3
White-faced meadowhawk	0	0	2	2	0	0	23	23	7	7	8	8
Whitehouse's emerald	0	0	0	0	0	0	1	1	0	0	0	0
Zigzag darner	0	0	14	14	0	0	7	7	0	0	0	0
Total Individuals	**0**		**160**		**7**		**928**		**230**		**102**	
Total Species	**0**		**41**		**4**		**72**		**39**		**30**	

3.6.3 Linear Features and Corresponding LSAs

3.6.3.1 Transmission Line Corridor and LSA

Ten invertebrate species were recorded at 27 sites within the transmission line ROW and LSA (**Table 3.6-1**) **Figure 3.6-1**, **Figure 3.6-2** to **Figure 3.6-5**). Survey effort in 2012 focused on the south portion of the transmission line and surveys in 2013 focused on the northern portion (**Figure 3.6-1**, **Figure 3.6-2** to **Figure 3.6-5**). Five Assiniboine skippers and one Jutta Arctic were detected in 2013. No Hagen's bluets were detected.

The Assiniboine skipper was detected in the SBSdk and SBSmc subzones. Within the SBSdk subzone, the detections were in young pine forest; within the SBSmc subzone, they were detected in mature pine-spruce forest. The Assiniboine skipper is known to colonize clearings in lower elevations and may be found along transmission lines or other linear features.

The single Jutta Arctic detected was within a mature pine-spruce forest within the SBSmc. The Jutta Arctic uses wet forested habitats as an essential component of its habitat even though egg laying and larval-feeding occur on sedges rather than in trees. The Hagen's bluet, which was not detected, uses wetlands for breeding sites and will likely occur in wetlands along the transmission line.

3.6.3.2 Mine Access Road Corridor and LSA

Nineteen invertebrate species were detected at 47 sites within the mine access road corridor and LSA, with the highest biodiversity occurring within the SBSmc subzone (**Table 3.6-1**, **Figure 3.6-1**). No Hagen's bluets, Assiniboine skippers, or Jutta Arctics were found within the corridor or LSA.

All three listed species potentially occur within the mine access road corridor and LSA. Hagen's bluet could be present within black spruce wetlands, the Jutta Arctic could be present in wet forested areas along the study area, and the Assiniboine skipper could be present within cleared areas. Assiniboine skippers are likely to colonize lower elevation clearings, such as the transmission line clearings and roadsides.

3.6.3.3 Kluskus FSR ROW and LSA

Five invertebrate species were recorded at five sites within the Kluskus FSR ROW and LSA (**Table 3.6-1**, **Figure 3.6-1**, **Figure 3.6-2** to **Figure 3.6-5**). The survey effort for the Kluskus FSR did not have complete coverage due to the fact that the road is already established. No Hagen's bluets, Assiniboine skippers, or Jutta Arctics were detected.

390000 400000 410000 420000

5940000 5930000 5920000

Chief Gray Lake
Hobson Lake
Nechako Reservoir
Vivian Lake
Provis Lake
Duten Lake
Finger Lake
Willington Lake
Finnie Lake
Andros Lake
Otter Lake
Stefiuk Lake
Tatuk Lake
Lavoie Lake
Turif Lake
Hay Lake
Cory Lake
Brewster Lakes
Goose Lake
Brewster Lakes
Brewster Lakes
Klunchatistli Lake
Chutanli Lake

Kluskus FSR

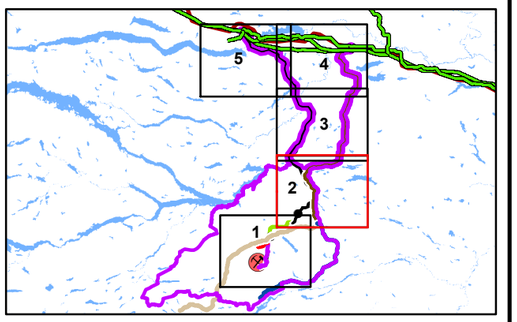
Proposed Transmission Line

N

Legend

Species Detection
- Jutta Arctic
- Existing Road
- Kluskus FSR
- Kluskus-Blue FSR
- Kluskus-Ootsa FSR
- Proposed Transmission Line
- Proposed Transmission Line (Mills Ranch re-route)
- Stream (>= 2nd Order)
- Waterbody (>= 4 Ha)
- Wetlands

Wildlife and Wildlife Habitat
- Local Study Area
- Regional Study Area



Scale: 1:120,000

0 1 2 4 6

Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold

PROJECT: Blackwater Gold Project

Invertebrate Species of Conservation Concern Detections

DATE: October, 2013	ANALYST: KA	**Figure** 3.6-2
JOB No: VE52277	QA/QC: MY	PDF FILE: 11-100-097_Invertebrate_ConsConcern.pdf
GIS FILE: 11-100-097_Invertebrate_ConsConcern.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	amec

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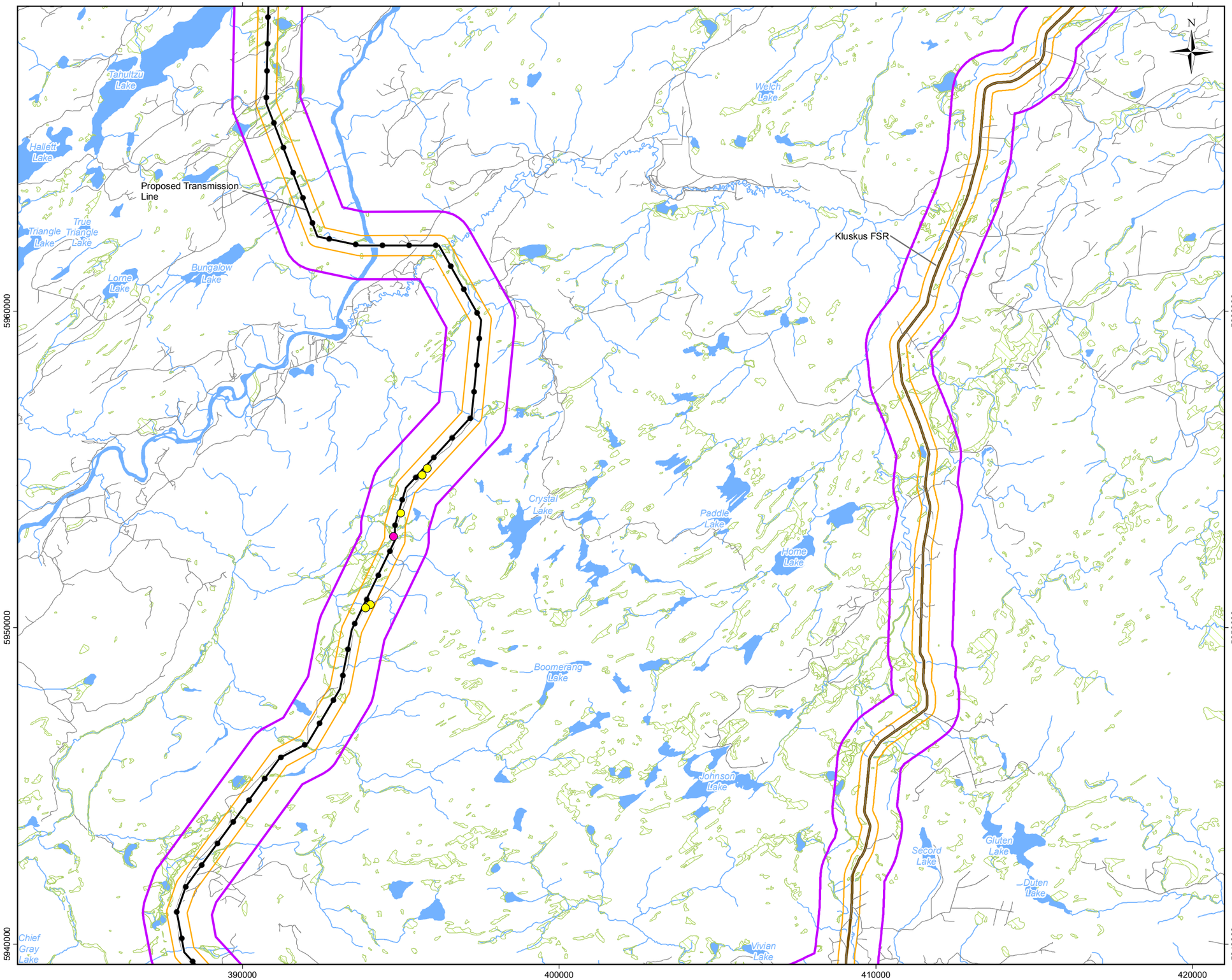
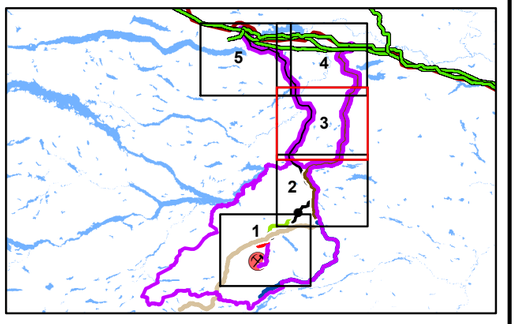


Legend

Species Detection
- Jutta Arctic
- Assiniboine Skipper
- Existing Road
- Kluskus FSR
- Proposed Transmission Line
- Stream (>= 2nd Order)
- Waterbody (>= 4 Ha)
- Wetlands

Wildlife and Wildlife Habitat
- Local Study Area
- Regional Study Area



Scale: 1:120,000

0 1 2 4 6

Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold

PROJECT: Blackwater Gold Project

Invertebrate Species of Conservation Concern Detections

DATE: October, 2013	ANALYST: KA	**Figure** 3.6-3
JOB No: VE52277	QA/QC: MY	PDF FILE: 11-100-097_Invertebrate_ConsConcern.pdf
GIS FILE: 11-100-097_Invertebrate_ConsConcern.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	amec

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390000 400000 410000 420000

5990000 5980000 5970000

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

N

Legend

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

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area

Scale: 1:120,000

0 1 2 4 6

Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold

PROJECT: Blackwater Gold Project

Invertebrate Species of Conservation Concern Detections

DATE: October, 2013	ANALYST: KA	**Figure** 3.6-4
JOB No: VE52277	QA/QC: MY	PDF FILE: 11-100-097_Invertebrate_ConsConcern.pdf
GIS FILE: 11-100-097_Invertebrate_ConsConcern.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	amec

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360000 370000 380000

5990000 5980000 5970000

Savory Lake
Endako
Deserter Lake
Fraser Lake
Stellako
Fraser Lake
Casey Lake
Seas Lake
16
Proposed Transmission Line (Stellako re-route)
Klez Lake
Foster Lakes
Foster Lakes
Francois Lake
Proposed Transmission Line
Chowsunkut Lake
Anzus Lake
Borel Lake
Graham Lake
Cabin Lake
Laurie Lake
Twentysix Mile Lake
Tahultzu Lake

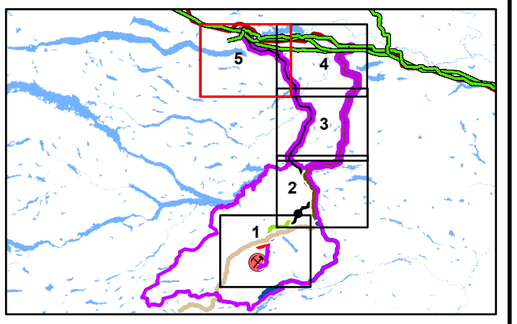
N

Legend

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

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area



Scale: 1:120,000

0 1 2 4 6

Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold

PROJECT: Blackwater Gold Project

Invertebrate Species of Conservation Concern Detections

DATE: October, 2013	ANALYST: KA	**Figure** 3.6-5
JOB No: VE52277	QA/QC: MY	PDF FILE: 11-100-097_Invertebrate_ConsConcern.pdf
GIS FILE: 11-100-097_Invertebrate_ConsConcern.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	amec

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3.6.3.4 Water Pipeline Corridor and LSA

Nine invertebrate species were recorded at 58 sites within the water pipeline corridor and LSA (**Table 3.6-1**, **Figure 3.6-1**). No Hagen's bluets, Assiniboine skippers, or Jutta Arctics were detected. No surveys were conducted in this study area in 2011 or 2013 and survey effort in 2012 focused on the western portion of the water pipeline (**Figure 3.6-1**).

All three listed species potentially occur within the water pipeline study area. Hagen's bluet could be present within black spruce wetlands, the Jutta Arctic could be present in wet forested areas along the study area, and the Assiniboine skipper could be present within cleared areas.

3.6.3.5 Airstrip Corridor and LSA

Surveys were conducted in this study area in 2013. The Assiniboine skipper was detected within the airstrip LSA within a recently harvested pine forest (<40 years) in the SBSmc subzone (**Figure 3.6-1**). No Hagen's bluets or Jutta Arctics were detected.

Hagen's Bluet could be present within black spruce wetlands down in the LSA near Turtle Creek, the Jutta Arctic could be present in wet forested areas in the same area, and the additional Assiniboine Skippers could be present within cleared areas of the regenerating clear cuts.

3.6.3.6 Mills Creek Ranch and Stellako Reroute Options on Transmission Line

No invertebrate species of conservation concern were detected within the LSAs of the Reroute options for the Transmission Line (**Table 3.6-1**).

3.6.4 RSA

Forty-eight individual invertebrate species were detected at 562 sites within the RSA (**Table 3.6-1**, **Figure 3.19-1**, **Figure 3.6-2** to **Figure 3.6-5**). Three species of conservation concern were detected within the RSA: Hagen's bluet, Jutta Arctic, and Assiniboine skipper. The Assiniboine skipper was detected at two locations, both within the SBSmc subzone and between 1,095 and 1,115 m in elevation (**Figure 3.6-1**, **Figure 3.6-2** to **Figure 3.6-5**). Both detections were from recently harvested areas, and one was immediately adjacent to older (121+ years) lodgepole pine forest. The Jutta Arctic was detected at five wetlands, four of which were within the SBSmc and one was in the ESSFmv; all were between 1,060 m and 1,360 m in elevation. Four of the wetlands were surrounded by older (121+ years) lodgepole pine forest, while the higher elevation site was surrounded by older (121+ years) subalpine fir and spruce forest. The single individual Hagen's bluet was detected in the RSA within the SBSmc subzone (**Figure 3.6-1**, **Figure 3.6-2** to **Figure 3.6-5**). The detection was made adjacent to Wetland 33, which was a beaked sedge-water sedge marsh with shallow standing water at an elevation of 1,130 m.

3.6.5 Summary

All three species of conservation concern and listed invertebrate species—Hagen's bluet, Jutta Arctic, and Assiniboine skipper—were detected during the 2011 to 2013 surveys and potentially occur within all six of the LSAs and the RSA. The other three species at risk listed for the Chilcotin, Quesnel, and/or Vanderhoof Forest Districts—beaverpond baskettail, forcipate emerald*)*, and Kennedy's emerald*)*—were not detected within any of the areas surveyed during the three-year study. Their presence within any of the areas not surveyed is unknown. The Red-listed Mandan skipper was detected within one kilometre of the transmission LSA; however, it has not been found within any LSA or the RSA.

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APPENDICES

Annex 1
Regulatory and Management Guidelines

Wildlife and wildlife habitat for the Project are protected under various federal and provincial legislations or regulations. Federal legislation include: the *Migratory Birds Convention Act, 1994* (Government of Canada 1994), the *Species at Risk Act (SARA)* (Government of Canada 2002), and the *Fisheries Act* (Government of Canada 1985). Provincial legislation include: the *Wildlife Act* (Government of BC 1996c), the *Forest and Range Practices Act* (Government of BC 2002b), and the *Water Act* (Government of BC 1996b) (**Table 1**). These acts, along with Best Management Practice (BMP) guidelines and standards help ensure developments are designed and developed in compliance with applicable legislation, and therefore minimizing harm to the natural environment.

Table 1: Relevant Acts or Regulations for Wildlife and Wildlife Habitat

Act or Regulation	Management Requirement
BC *Wildlife Act*	Protects most vertebrate animals from direct harm or harassment except as allowed by regulation by the BC MOE (e.g., hunting or trapping). Additional protection for selected Red- and Blue-listed species and their residences are provided.
	Section 34 specifically protects birds and their eggs from possession, molestation, injury, or destruction; the nests of eagles, peregrine falcons, gyrfalcons, ospreys, herons, and burrowing owls year-round; and the nests of all other birds when the bird or their egg are in the nest.
	Section 9 specifically protects a beaver or muskrat house, den, or dam from disturbance, molestation, or destruction, except in the case of trappers licensed under the Act.
	Alteration or removal of a mammal dam is permitted under the Act “to provide irrigation or drainage under lawful authority for the protection of property” and for drainage purposes with specific restrictions. To remove a beaver dam or muskrat house, the BC MOE must be notified.
Canada *Migratory Birds Convention Act, 1994*	Prohibits the taking or killing of migratory birds, their nests, and eggs, and the deposition of harmful substances in areas frequented by migratory birds.
	Species protected include waterfowl, cranes, rails and coots, shorebirds including gulls and terns, pigeons and doves, most insectivorous songbirds, seabirds, loons, grebes, herons, egrets, and bitterns.
Canada *SARA*	Protects wildlife on federal lands and their critical habitat. Particularly of those species listed on the “List of Wildlife Species at Risk”, and protects all *SARA*-listed migratory birds.
	Section 137 amends the *CEA Act* to clarify, for greater certainty, that EAs must always consider effects to listed wildlife species, their critical habitat, or the residences of individuals of that species.
	Section 79(2) states “the person must identify the adverse effects of the project on the listed wildlife species and its critical habitat and, if the project is carried out, must ensure that measures are taken to avoid or lessen those effects and to monitor them. The measures must be taken in a way that is consistent with any applicable recovery strategy and action plans.”
Canada *Fisheries Act*	Section 32 and 35(1) protect aquatic mammals and their habitat from alteration, disruption, or destruction. Thus, indirectly amphibian and other wildlife habitat are protected if it is considered fish habitat.

Act or Regulation	Management Requirement
Federal Policy on Wetland Conservation	Protection of wetlands through a no-net loss of wetland functions, including providing breeding habitat to wildlife, such as migratory birds and species at risk.
BC *Forest and Range Practices Act*	Section 149.1 authorizes the minister responsible for the *Wildlife Act* to establish one or more of the following: • An area as an ungulate winter range and objectives for the ungulate winter range; • An area as a wildlife habitat area and objectives for the wildlife habitat area; and • A general wildlife measure (i.e., wildlife habitat feature). Section 150.5 authorizes the establishment of riparian reserve zones, riparian management zones, and riparian management areas for different classes of streams, wetlands, and lakes.
BC *Water Act*	Regulates any proposed works in or about a stream and it protects fish and wildlife habitat.
	The Act applies to the quantity and quality (surficially or groundwater) of water on which fish or wildlife depend directly or indirectly to carry out their life processes.
	Under Part 7 of the *Water Act Regulation*, works must meet the standards under section 42 (1) and (2), regardless of the type of work, including: • The timing window or the period(s) of time in the year during which the change can proceed without causing harm to fish, wildlife, or habitat; • The minimum instream flow or the minimum flow of water that must remain in the stream while the change is made; • The removal of material from the stream or stream channel in connection with the change; • The addition of substance, sediment, debris, or material to the stream or stream channel in connection with the change; • The salvage or protection of fish or wildlife during or after the change is made; • The protection of natural materials and vegetation that contribute to habitat or stream channel stability; • The restoration of the worksite after the change has been made; and • The requirement to obtain an approval from the federal DFO in connection with the change.

Note: BC = British Columbia; BC MOE = British Columbia Ministry of Environment; *CEA Act* = *Canadian Environmental Assessment Act;* DFO = Fisheries and Oceans Canada; EA = Environmental Assessment; *SARA* = *Species at Risk Act*

Table 2: Provincial, Federal, and Global Conservation Statuses and Definitions

BC Status	
Status	**Definition**
Red list	List of species that are extirpated, endangered, or threatened
Blue list	List of species that are Special Concern
Yellow list	List of species that are not at risk
Accidental	Species occurring infrequently and unpredictably, outside their usual range. Accidental species are excluded from the Red, Blue and Yellow list.
Exotic	Species that have been moved beyond their natural range as a result of human activity. Exotic species are also known as alien species, foreign species, introduced species, non-indigenous species, and non-native species. Exotic species are excluded from the Red, Blue and Yellow lists.

Provincial Rank (Prov. Rank)		
Rank		**Definition**
S#S#:	Range Rank	A numeric range rank (e.g., S2S3) is used to indicate the range of uncertainty about the status of the species or community.
S?:	Unranked	Province conservation status not yet assessed.
SU:	Unrankable	Currently unrankable because of lack of information or because of substantially conflicting information about status or trends.
S1:	Critically Imperilled	Critically imperilled in the province because of extreme rarity (often five or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the province.
S2:	Imperilled	Imperilled in the province because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the province.
S3:	Vulnerable	Vulnerable in the province due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.
S4:	Apparently Secure	Uncommon but not rare; some cause for long-term concern due to declines or other factors.
S5:	Secure	Common, widespread, and abundant in the province.
SNA:	Not Applicable	A conservation status rank is not applicable because the species is not a suitable target for conservation activities.
Breeding Status Qualifier		
B:	Conservation status refers to the breeding population of the species in the province.	
N:	Conservation status refers to the non-breeding population of the species in the province.	
M:	Migrant species occurring regularly on migration. Conservation status refers to the aggregating transient population of the species in the province.	

COSEWIC		
Status		**Definition**
E:	Endangered	A species facing imminent extirpation or extinction.
T:	Threatened	A species that is likely to become endangered if limiting factors are not reversed.
SC:	Special Concern	A species of Special Concern because of characteristics that make it particularly sensitive to human activities or natural events.
NAR:	Not at Risk	A species that has been evaluated and found to be not at risk.
DD:	Data Deficient	A species for which there is insufficient scientific information to support status designation.
C	Candidate	A species that is on the short-list for upcoming assessment.
SARA		
Schedule		**Definition**
1:		Protected under *SARA* as of proclamation in June 2003. These species were assessed by COSEWIC using the revised assessment criteria. The list classifies the species as being extirpated, endangered, threatened, or Special Concern.
2 and 3:		Assessed before October 1999, and require re-assessment using the revised criteria, following which the Governor in Council may, on the recommendation of the Minister, add the species to the Federal List of Wildlife Species at Risk.
NatureServe (Global rank)		
Rank		**Definition**
G#G#:	Range Rank	A numeric range rank (e.g., G2G3) is used to indicate the range of uncertainty about the status of the species or community.
G2:	Imperilled	At high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors.
G3:	Vulnerable	At moderate risk of extinction due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread.
G4:	Apparently Secure	Uncommon but not rare; some cause for long-term concern due to declines or other factors.
G5:	Secure	Common, widespread, and abundant.
T:	Intraspecific Taxon (trinomial)	The status of intraspecific taxa (subspecies or varieties) are indicated by a "T-rank" following the species' global rank, e.g., the global rank of a critically imperilled subspecies of an otherwise widespread and common species would be G5T1.

Annex 2
Raptor and Sharp-tailed Grouse Surveys in the Blackwater Mine Development Area

ECOFOR
natural and cultural resource consultants

Blackwater Gold Environmental Assessment

Raptor and Sharp-tailed Grouse Surveys

Date: December 7th, 2012

Project No.: 2012-2071-15

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1 INTRODUCTION

1.1 SETTING

The Blackwater Gold Project (Project) of New Gold Inc. is located approximately 160 km south of Vanderhoof, British Columbia. The Project area is focused on the headwaters of Davidson Creek, on the north side of Mount Davidson. To the south of Mount Davidson is the upper Blackwater (West Road) River watershed, with the First Nations village of Kluskus about 35 km to the southeast of the Project. Road access to the Project is from Vanderhoof via the Kenny Dam Road and the Kluskus Forest Service Road (FSR) to 146.1 km by the road markers; the Blackwater Camp road is then an additional 17 km in length. The Project area consists of a predominantly forested subalpine exploration area, with small non-forested wetlands. Lower elevation areas are present in parts of the Local Study Area (LSA) and Regional Study Area (RSA).

1.2 PROJECT SUMMARY

The Project consists of a proposed open pit, hard rock gold mine and associate infrastructure. The mine and much of the infrastructure such as camps and waste sites will be located in the subalpine on the north side of Mount Davidson, with the access road and power transmission line heading north to join Highway 16 near Vanderhoof. The primary effects on raptor and grouse habitat will be loss of habitat in the primary mine development area, access road developments, and the power transmission line.

1.3 ECOSYSTEMS AND VEGETATION

The varied topography of the study area results in a variety of Biogeoclimatic Ecosystem Classification (BEC) subzones and variants being present. Mount Davidson has BAFAun (Boreal Altai Fescue Alpine Undifferentiated subzone) at the highest elevations, which is alpine tundra with scattered patches of stunted conifers. Below that is the BAFAmvp (BAFA moist very cold parkland subzone), which is alpine meadows with some short Engelmann spruce and pine (lodgepole and white-bark) trees. Most of the exploration area is within the ESSFmv1 (Englemann Spruce - Subalpine Fir moist very cold subzone, Nechako variant), which is mostly dense white spruce forest with some lodgepole and white-bark pine. The lower edge of the exploration area is dominated by the SBSmc3 (Sub-boreal Spruce moist cold subzone, Kluskus variant), which is dominated by lodgepole pine and spruce. The transmission line passes through that area and the SBSdk (Sub-boreal Spruce dry cool subzone), which again is dominated by lodgepole pine and spruce forest. The southwest edge of the Project, along the access road has the SBSdw2 (Sub-boreal Spruce dry warm subzone, Blackwater variant), and the SBPSmc (Sub-boreal Pine - Spruce moist cold subzone), both of which are dominated by lodgepole pine and spruce forests (Delong et al 1993).

The topography is generally rolling at lower elevations, with shallow valleys cut by the major streams. The higher elevations are north-aspect moderate to steep slopes within the study area. There are occasional naturally non-forested grass/shrub habitats on southerly aspect steep dry slopes below the ESSF. There are numerous clearcuts in various stages of regeneration in the SBS and SBPS, with an

associated network of forest industry roads. Non-forested wetlands are present, but comprise a low proportion of the landscape.

1.4 OBJECTIVES

Baseline surveys were designed to investigate the presence of raptors and sharp-tailed grouse within and near the Project area (including the proposed transmission line and road options). Specific objectives were to:

- Determine the presence and distribution of raptor species;
- Determine the presence and preferred habitat of sharp-tailed grouse;
- Assess the potential impacts of Project developments on raptor species of conservation concern and sharp-tailed grouse.

1.5 RAPTOR SPECIES

Raptors (also known as birds of prey) are a group of birds comprised of Orders Falconiformes (diurnal birds of prey) and Strigiformes (owls). Some species are at risk due to habitat loss, while others may adapt well to disturbed areas. Inventory of these species is an important component of baseline studies, to determine the presence of species usage of various habitat types that may be affected by Project activities. Due to differences in their behaviour (e.g. nocturnal/diurnal activity), raptors are split into several groups for surveying purposes (Table 1, Resources Inventory Committee 2001).

Table 1: Raptors most likely occurring within the Project area, and their recommended survey techniques (RISC 2001).

English Name	Scientific Name	Active Period	Conspicuous / Inconspicuous	Recommended Survey Type
Sharp-shinned hawk	*Accipiter striatus*	Diurnal	Inconspicuous	Call playback
Cooper's hawk	*Accipiter cooperii*	Diurnal	Inconspicuous	Call playback
Northern goshawk	*Accipiter gentilis*	Diurnal	Inconspicuous	Call playback
Merlin	*Falco columbarius*	Diurnal	Inconspicuous	Call playback
Great-horned owl	*Bubo virginianus*	Nocturnal	Inconspicuous	Call playback
Northern pygmy-owl	*Glaucidium gnoma*	Nocturnal	Inconspicuous	Call playback
Barred owl	*Strix varia*	Nocturnal	Inconspicuous	Call playback
Great-gray owl	*Strix nebulosa*	Nocturnal	Inconspicuous	Call playback
Long-eared owl	*Asio otus*	Nocturnal	Inconspicuous	Call playback
Short-eared owl	*Asio flammeus*	Crepuscular	Inconspicuous	Roadside/foot surveys
Boreal owl	*Aegolius funereus*	Nocturnal	Inconspicuous	Call playback
Northern saw-whet owl	*Aegolius acadius*	Nocturnal	Inconspicuous	Call playback
Osprey	*Pandion halietus*	Diurnal	Conspicuous	Boat survey, aerial nest survey
Bald eagle	*Haliaeetus leucocephalus*	Diurnal	Conspicuous	Boat survey, aerial nest survey
Northern harrier	*Circus cyaneus*	Diurnal	Conspicuous	Roadside survey
Red-tailed hawk	*Buteo jamaicensis*	Diurnal	Conspicuous	Roadside survey
American kestrel	*Falco sparvarius*	Diurnal	Conspicuous	Roadside survey
Peregrine falcon	*Falco peregrines*	Diurnal	Conspicuous	Boat survey, aerial nest survey
Northern hawk owl	*Surnia ulula*	Diurnal	Conspicuous	Roadside survey

1.6 SHARP-TAILED GROUSE

Sharp-tailed grouse are an upland game bird that typically inhabits grassland and shrub habitats. Three subspecies are considered to occur in BC; the Columbian subspecies (ssp. *columbianus*) is the one present in the Project area. This species is a medium-sized, cryptically coloured grouse, and is named for the pointed shape of the birds in flight (and during courtship displays).

Sharp-tailed grouse are the only grouse in BC that exhibit the use of breeding leks. Also known as dancing grounds, leks are areas where, year-after-year, males congregate for territorial courtship displays during the breeding season. In forested areas, leks are typically found in forest openings, greater than 200 m from the forest edge, and vegetated enough to provide some cover yet allow visibility between competing males. Males defend territories within the lek, with the preferred areas being nearest the centre. Territorial defence displays are comprised of foot-stomping and wing-spreading accompanied by variable unearthly cooing and clucking. Females are more likely to mate with males who successfully defend territories near the centre of the lek (Leupin 2003).

Sharp-tailed grouse have been found at elevations from 275 to 2135 m (Campbell et al 1990), encompassing the entire range of elevation found within the Project area. Within SBS and SBPS biogeoclimatic zones, sharp-tailed grouse are associated with sedge meadow/riparian complexes and seral grasslands resulting from forest harvest or wildfires in lodgepole pine forests (Ritcey 1995).

1.7 SPECIES AT RISK

A search of the BC Ministry of Environment Species and Ecosystems Explorer (BC Conservation Data Centre 2012) indicated that no raptor species at risk have been confirmed to breed within the general area of Project (search criteria: Vanderhoof Forest District; ESSF, BAFA, SBS and SBPS biogeoclimatic zones). However, short-eared owls are likely present nearby the Project area, given their very wide distribution and known association with SBS and SBPS biogeoclimatic zones (BC Conservation Data Centre 2012).

Short-eared owls are an Identified Wildlife species in BC, and are on the BC blue-list indicating that it is a species of concern, being particularly sensitive to human activities or natural events (BC Conservation Data Centre 2012). They are listed as Special Concern by the *Committee on the Status of Endangered Wildlife in Canada* (COSEWIC) and the *Species at Risk Act*. This species has experienced a serious population decline over the past 40 years; although no causes are known, habitat loss and degradation have been suggested as contributing factors (COSEWIC 2008).

Sharp-tailed grouse are on the BC blue-list. Historic over-exploitation, habitat loss (due to urban sprawl, herbicide use, hydroelectric dam-related flooding), habitat fragmentation, overgrazing by livestock, and grassland wildfire suppression are suggested causes of the population declines in this species (Leupin 2003).

2 METHODS

Raptors have a variety of habitats and behaviours; multiple survey techniques are required to effectively survey all species. The RISC surveying protocol divides raptors into 'conspicuous' and 'inconspicuous' groups (RISC 2001). Conspicuous raptors often display behaviour (e.g. activity during the day, soaring, perching in conspicuous areas, etc.) which leads to easier detection when using passive survey methods (Table 1). Inconspicuous raptors are active mainly at night, or are more difficult to detect due to their more secretive behaviours. These raptors are best surveyed using call playback surveys; during the night in the case of most owls, and during the day for the diurnal inconspicuous raptors.

2.1 OWL SURVEYS

The majority of owls are nocturnal; therefore surveys to detect them are conducted between dusk and dawn. Surveys for short-eared owls, while not a priority due to the limited habitat present within the Project area, were conducted as passive roadside surveys and several stand watches in areas of potential habitat.

All observations of raptors and sharp-tailed grouse outside of designated surveys were also recorded.

2.1.1 CALL PLAYBACK SURVEYS

Surveys are conducted using call playback to elicit a territorial response from owls during the breeding season. Territorial calls of northern saw-whet owl, boreal owl, long-eared owl, barred owl, and great-horned owls were used. The survey was preceded by two minutes of silent listening ('cooldown time'). Each species call was played for 20 seconds, followed by 30 seconds of silence and then the owl call was played for another 20 seconds. Between species calls, there was one minute of silent listening time, with two minutes of silent listening after the final call. Species calls were purposely ordered from smallest to largest owl species to minimize the chance of small owls being silenced by the call playback of a larger species larger (potential predators).

Each survey took approximately 15 minutes to complete. Any owls detected were recorded on RISC field forms, indicating the owl species, an estimated distance, the direction from which it was heard, and whether it was seen or heard.

Surveys were conducted within areas near potential nesting habitat (forested areas). An interstation distance of 400 m was used for the first shift of surveys; this was increased to 800 m in final surveys to allow greater area to be covered within the restricted time. Calls were played on a Johnny Stewart Wildlife Caller. The caller volume was set to a level that ensured distortion did not affect the calls; the caller speaker was rotated during each species call such that each call was broadcast in all directions. At each survey site the UTM coordinate was recorded in addition to cloud cover, temperature, wind (Beaufort scale) and precipitation levels. In some cases surveys had to be postponed, because the survey protocol does not allow surveying to take place when wind levels are Beaufort 4 or greater or if the precipitation is greater than a light rain (due to reduced bird activity, and reduced ability to detect birds).

2.1.2 STAND WATCHES AND ROADSIDE SURVEYS

Several surveys were conducted targeting short-eared owls. Stand watches were conducted in potential habitat areas (open wetlands) during dusk and dawn when short-eared owls are most active. Stand watches were comprised of 10 – 15 minutes of silent watching and listening. As with the call playback surveys, environmental conditions (wind, cloud cover, precipitation) were recorded.

While not recorded as such, whenever the surveyors were driving roads enroute to surveys (or back towards accommodations) during dusk or dawn, potential habitat was scanned for the presence of short-eared owls.

2.2 DIURNAL RAPTOR SURVEYS

Diurnal raptors, although active during the same period, vary in detectability due to their behaviours. Some, like red-tailed hawks, are often seen soaring over open fields or cutblocks. Others, notably the Accipiters, tend to be cryptic in nature and more difficult to reliably detect. Inconspicuous diurnal raptors are targeted for inventory purposes using call playback surveys, while the other raptors are detected with more passive methods.

2.2.1 CALL PLAYBACK SURVEYS

Call playback surveys are used to enhance detection of inconspicuous raptors by eliciting a territorial response during the breeding season. Methodology was the same as with the owl call playback surveys (Section 2.1.1), except for the calls used. For the diurnal raptor call playback, territorial calls of merlin, sharp-shinned hawk, Cooper 's hawk, northern goshawk and great-horned owls were used. The survey was preceded by two minutes of silent listening ('cooldown time'). Each species call was played 3 times: 20 seconds, followed by 30 seconds of silence before being repeated. Between species calls, there was one minute of silent listening time, with two minutes of silent listening after the final call. As with the owl call playback, species calls were purposely ordered from smallest to largest species. Great-horned owl calls were included in the diurnal raptors surveys, as this call has been known to elicit responses from some inconspicuous raptors (Resources Inventory Committee 1997). Overall, each survey took about 17 minutes to complete.

Call playback surveys were conducted throughout the Project area and proposed transmission line where access permitted and potential habitat was present (e.g. not in harvested areas). In areas of continuous potential habitat, an interstation distance of 800 m was utilized to minimize the overlap of call playback from one survey station to another.

2.2.2 ROADSIDE/FOOT SURVEYS

Roadside surveys were conducted in conjunction with the diurnal raptor call playback surveys. As ground was covered by vehicle or foot between the areas surveyed, surveyors were constantly vigilant for conspicuous raptors. Driving speed was kept slow to facilitate observation. Environmental

characteristics were not recorded due to the length of the survey transects. All raptor observations were recorded, along with habitat and behavior notes at the observed location.

2.2.3 STAND WATCHES

Stand watches were conducted in potential habitat areas (open wetlands, areas with views overlooking mature forest). Stand watches were comprised of 10 – 15 minutes of silent watching and listening. As with the call playback surveys, environmental conditions (wind, cloud cover, precipitation) were recorded.

2.3 SHARP-TAILED GROUSE LEK SURVEYS

Inventory studies of sharp-tailed grouse aim to identify individual leks; individuals can be counted on the leks, and leks can be visited in subsequent years to track population trends (RISC 1997). The RISC survey protocol focuses on surveys in grassland areas; details for surveying sharp-tailed grouse populations in forested areas could be found.

No existing leks are known from the area; no previous studies have been conducted. To search for leks, point counts were conducted in areas that best matched habitat requirements, using the RISC standards for sharp-tailed grouse as a guideline. Potential habitat was considered to be large (500 m width), fairly young cut blocks (those with regen not having full canopy closure); previous sharp-tailed grouse sightings in the area were all in cut block areas.

At each site, a cooldown period of two minutes was followed by the recommended three minutes of listening time, for a total of 5 minutes at each survey site. If grouse calls were detected, a search on foot would follow to locate the lek site. In areas of continuous potential habitat, an interstation distance of 800 m was used. Surveys are recommended to take place from 0.5 hours before sunrise to 2.0 hrs after sunrise. Due to this limited window, surveys were sometimes continued later, in hopes of still hearing grouse, and to allow identification of good potential habitat for future lek surveys.

2.4 TIMELINES

Nocturnal owl surveys were conducted during April (10^{th} – 12^{th}, 18^{th} – 20^{th}) and early May (4^{th} – 5^{th}). Surveying time was limited by poor weather (e.g. rain, windy conditions). Diurnal raptors were surveyed in May (2^{nd} – 6^{th}) and early June (6^{th} – 7^{th}). Sharp-tailed grouse lek surveys took place on May 6^{th}, June 4^{th}, and June 5^{th}.

3 RESULTS

3.1 OWL SURVEYS

Over the surveying period, 46 call playback surveys, and four stand watch surveys were conducted. Five owl species were detected (although one was detected quite far from the Project area). Eight owls (three species) were detected during call playback surveys (Table 2; Appendix 1). Supplementary

observations of three owl species were also recorded. No short-eared owls were detected during stand watches or through supplementary observations.

Wilson's snipe (*Gallinago delicata*) were often heard winnowing during many of the owl surveys. Their winnowing (produced by their tail-feathers in flight) can sometimes be mistaken (especially in the distance) for the calls of boreal owls.

Table 2: Owl species and number of observations during the survey period in and nearby the Project area in 2012.

Species (abbreviation)	Call playback survey	Suppl. observation
Boreal owl (BOOW)	1	
Northern saw-whet owl (NSWO)	1	
Great-horned owl (GHOW)	7	2
Barred owl (BDOW)		1
Great-grey owl (GGOW)		1

3.2 DIURNAL RAPTOR SURVEYS

A total of 64 call playback surveys were conducted, along with four stand watches and 8 roadside surveys. Twenty-one raptor observations (comprising 8 confirmed species) were recorded, including 6 that resulted from supplemental observations (Table 3). In two cases the raptor was too far away for a positive identification. A total of 311.7 km was traveled during the roadside surveys (mean – 39 km; Appendix 3). Not all of the raptors recorded during the call playback surveys had actively responded to the call playback; osprey, northern harrier, red-tailed hawk, and the unknown hawks appeared to be in the locations coincidentally as they hunted or soared.

Table 3: Diurnal raptor species and number of observations during the survey period in and nearby the Project area in 2012.

Species (abbreviation)	Call playback	Stand watch	Roadside survey	Suppl. observation
Osprey (OSPR)	1			
Northern harrier (NOHA)	2			
Red-tailed hawk (RTHA)	1	1	3	3
Northern goshawk (NOGO)	2			1
Sharp-shinned hawk (SSHA)			1	1
Merlin (MERL)			1	
American kestrel (AMKE)			1	
Bald eagle (BAEA)				1
Unknown hawk (UHAW)	2			

The presence of nests nearby was likely in several of the supplemental observations. The birds observed were displaying nest-site behaviors, like repeated aggressive calling, or had food items in their talons. (SSHA, RTHA, NOGO; Appendix 1). In the case of the SSHA and NOGO, the observation occurred later in the year (not during the raptor surveys), so no search was conducted for the nest.

3.3 SHARP-TAILED GROUSE LEK SURVEYS

No sharp-tailed grouse were detected during 37 point counts conducted (Appendix 1). At one survey, a grouse-like call was heard nearby, but the bird called only once, and a thorough search of the area did not result in a sighting. Two other possible sharp-tailed grouse were heard during owl surveys conducted near sunrise on April 20. In these cases, no search for the birds to confirm the species were conducted, since the targeted bird species were owls at the time.

There have been four confirmed sharp-tailed grouse sightings near the Project Area to date (Appendix 1), and several other observations without confirmed geographic coordinates. One of the sightings was by AMEC personnel, the other three by Ecofor during various survey types: Two sharp-tailed grouse were seen in one location after concluding owl surveys on April 20th (5:19AM), one sharp-tailed grouse was seen prior to beginning diurnal raptor surveys on May 4th (9:28 AM), and two were seen in an aspen tree along the Kluskus FSR on May 5th (8:30 AM; see photos in Appendix 2). All of the sightings were in cut blocks, though the extent of the regeneration was somewhat variable.

4 DISCUSSION

4.1 OWLS

Four species of owls were identified in areas within and nearby the Project area, with a fifth species (great-gray owl) observed along the Kluskus FSR to the north. While more mature forest is present in the higher elevation areas nearby the mine footprint, owls were not detected in greater numbers in these areas. No owl species at risk were identified during the surveys.

Great-horned owls were the most detected owls, and were found most often in the lower elevation areas along the Davidson Creek in the northeast section of the study area. These areas also had a larger amount of harvested area and associated regeneration, possibly providing more prey for an adaptable and opportunistic species like the great-horned owl.

The entire footprint of the mine was not able to be surveyed in 2012, due to restrictions in access to parts of the area (Appendix 1). During the 2012 season more trails have been cut throughout the area, allowing for better access, but possible impacting the potential nesting of owl species in the area. Additional surveys throughout the newly accessible areas, and along the proposed transmission line could provide additional baseline data.

4.2 DIURNAL RAPTORS

Surveys for diurnal raptors were completed throughout the Project area and along a portion of the proposed transmission line (Appendix 1). Eight species were recorded during the surveys and through supplemental observations. No raptor species at risk were identified. During the call playback surveys, the only species to respond with a territorial call was the northern goshawk. This response lasted only for two calls, and no visual sighting of the bird was made. Other species recorded during the call playback surveys were likely incidental; many sightings were of birds in the distance.

The majority of diurnal raptor sightings were made in the lower elevation area to the northeast of the Project. Red-tailed hawks were the most common raptor species identified. Red-tailed hawks are an adaptable species, and commonly found near open areas, such as the cut blocks abundant throughout the Davidson Creek area. A pair of red-tails exhibited repeated calling in one area (Appendix 1), likely indicating a nest nearby.

The osprey and eagle sightings were likely birds travelling between the various lakes in the area where these species would be more likely to nest.

Probable nest sites were identified for sharp-shinned hawk and northern goshawk in areas nearby the Project footprint. Nests were not positively located, but the bird behavior indicated a high probability for their presence. If forest clearing is to occur in these areas in the future during the breeding season, nest surveys by qualified biologists are highly recommended to avoid nest disturbance in contravention of the BC *Wildlife Act.*

After the raptor surveys were completed, there were some changes in the location of the proposed transmission line and proposed access roads. Additional surveying along the amended routes is recommended to augment the baseline data collected so far.

4.3 SHARP-TAILED GROUSE

Sharp-tailed grouse are known to occur within the Project area, but no leks were located during the surveys conducted in 2012. One call that was a potential sharp-tailed grouse was heard during a point count while two possible calls were heard during an owl survey conducted just prior to sunrise. A sighting of two grouse occurred the same day (though in a different area) after the owl surveys were completed. As these owl surveys were conducted on April 20th, and the grouse surveys were mainly conducted in May and early June, it is possible that the majority of the activity at the breeding leks occurred earlier in the year in this location.

Several confirmed sightings of sharp-tailed grouse in the area suggest that their habitat preference within the Project area is cut blocks where regeneration has not yet resulted in canopy closure. These habitats are fairly common throughout the lower elevation areas around the Project, and uncommon in the higher elevations closer to the Project were more impacts are likely to occur. Because their habitat does not appear to be limited, and will disappear with time due to canopy closure, it is likely that Project activities will not have a large impact on sharp-tailed grouse; at least in regards to habitat loss, one of its primary conservation concerns (Leupin 2003).

Although sharp-tailed grouse have been confirmed to occur in the Project area, further surveys are recommended. Being blue-listed species, it is important to document the population to determine whether it is a healthy or declining population, especially given the increased development scheduled to occur in the area. Identification of breeding leks should be the first priority, as these locations provide the best location for obtaining counts of individual grouse, and allow for multiple year monitoring. In some areas (often with more grassland), lek surveys have been conducted from fixed wing aircraft; this could be considered to allow for much more ground to be covered. Future surveys should aim to catch the breeding season earlier, most likely prior to April 20th. Given the short daily time window (0.5 hrs

prior to sunrise to 2 hours after), these surveys can be paired with owl surveys from the night previous, or diurnal raptor surveys conducted afterwards.

5 SUMMARY

- Five species of owls were detected; four of these nearby or within the Project area.
- Eight species of diurnal raptors were detected.
    - Increased access with the Project site and changes to the proposed road and transmission line routes mean that additional owl and diurnal raptor surveys could add valuable baseline information.
- Several probable nest sites were identified.
    - Nest surveys by qualified biologist recommended prior to forest clearing in these areas.
- No blue listed raptors were identified.
- Presence of blue-listed sharp-tailed grouse nearby the Project area was confirmed.
    - No lek sites identified during surveys.
    - Further surveys recommended in order identify lek sites and quantify breeding population in the area.
- Project impacts to sharp-tailed grouse are expected to be minimal.

6 LITERATURE CITED

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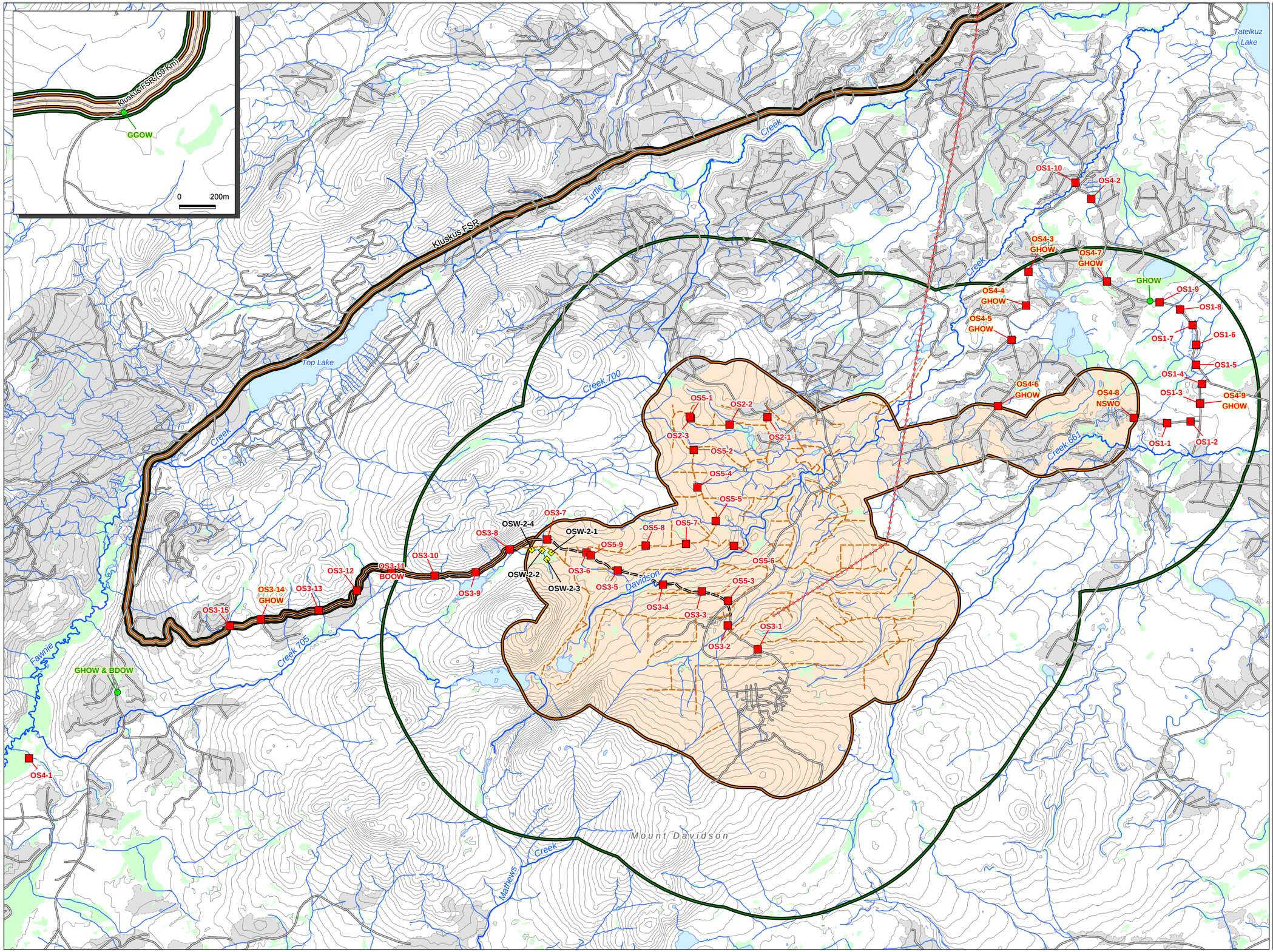
7 APPENDICES

7.1 APPENDIX 1 – MAPPING



BLACKWATER GOLD PROJECT

2012 OWL SURVEY

Projection: NAD 83, UTM Zone 10
Date: December 5, 2012

750 0 750 1500 2250
Meters
Scale: 1:75,000

LEGEND

- Waterbody
- Wetland
- Cutblock
- Regional Study Area
- Local Study Area
- Stream
- Contour
- Road
- Access Trail
- Proposed Transmission Line
- Owl Call Playback Survey Site
- Owl Stand Watch Site
- Other Owl Sighting

Owl Observations

GHOW - Great-horned Owl
GGOW - Great Grey Owl
BDOW - Barred Owl
BOOW - Boreal Owl
NSOW - Northern Saw-Whet Owl

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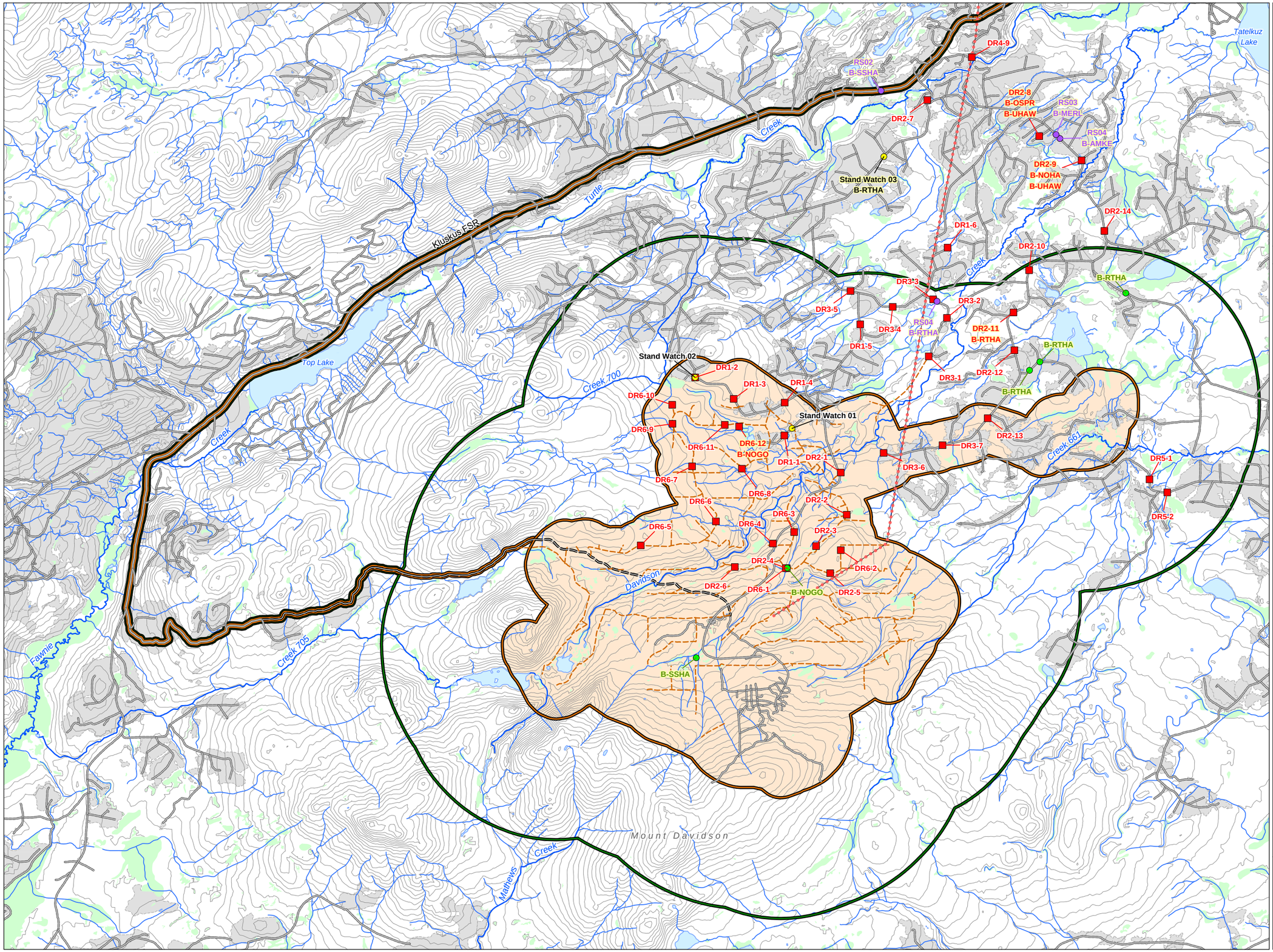

newgold

BLACKWATER GOLD PROJECT

2012 RAPTOR SURVEY MAP 1

Projection: NAD 83, UTM Zone 10
Date: December 5, 2012

N
W E
S

750 0 750 1500 2250
Meters
Scale: 1:75,000

LEGEND

- Waterbody
- Wetland
- Cutblock
- Regional Study Area
- Local Study Area
- Stream
- Contour
- Road
- Access Trail
- Proposed Transmission Line
- Raptor Call Playback Survey Site
- Raptor Stand Watch Site
- Raptor Roadside Survey Sighting
- Other Raptor Sighting

Raptor Observations

B-AMKE - American Kestrel
B-MERL - Merlin
B-NOGO - Northern Goshawk
B-NOHA - Norther Harrier
B-OSPR - Osprey
B-RTHA - Red-tailed Hawk
B-SSHA - Sharp-Shinned Hawk
B-UHAW - Unknown Hawk

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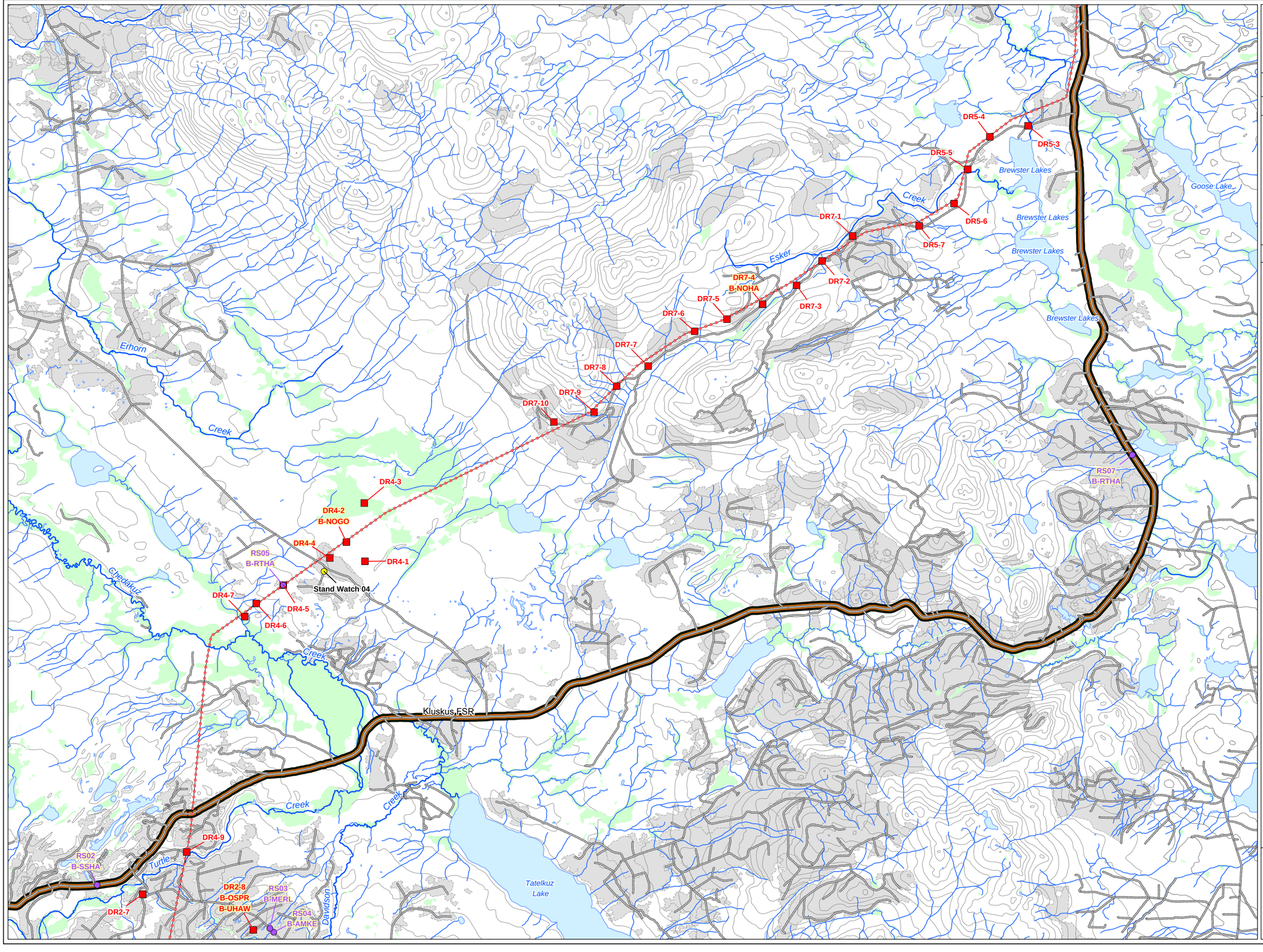

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BLACKWATER GOLD PROJECT

2012 RAPTOR SURVEY MAP 2

Projection: NAD 83, UTM Zone 10
Date: December 5, 2012

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Meters
Scale: 1:75,000

LEGEND

- Waterbody
- Wetland
- Cutblock
- Regional Study Area
- Local Study Area
- Stream
- Contour
- Road
- Access Trail
- Proposed Transmission Line
- Raptor Call Playback Survey Site
- Raptor Stand Watch Site
- Raptor Roadside Survey Sighting
- Other Raptor Sighting

Raptor Observations

B-AMKE - American Kestrel
B-MERL - Merlin
B-NOGO - Northern Goshawk
B-NOHA - Norther Harrier
B-OSPR - Osprey
B-RTHA - Red-tailed Hawk
B-SSHA - Sharp-Shinned Hawk
B-UHAW - Unknown Hawk

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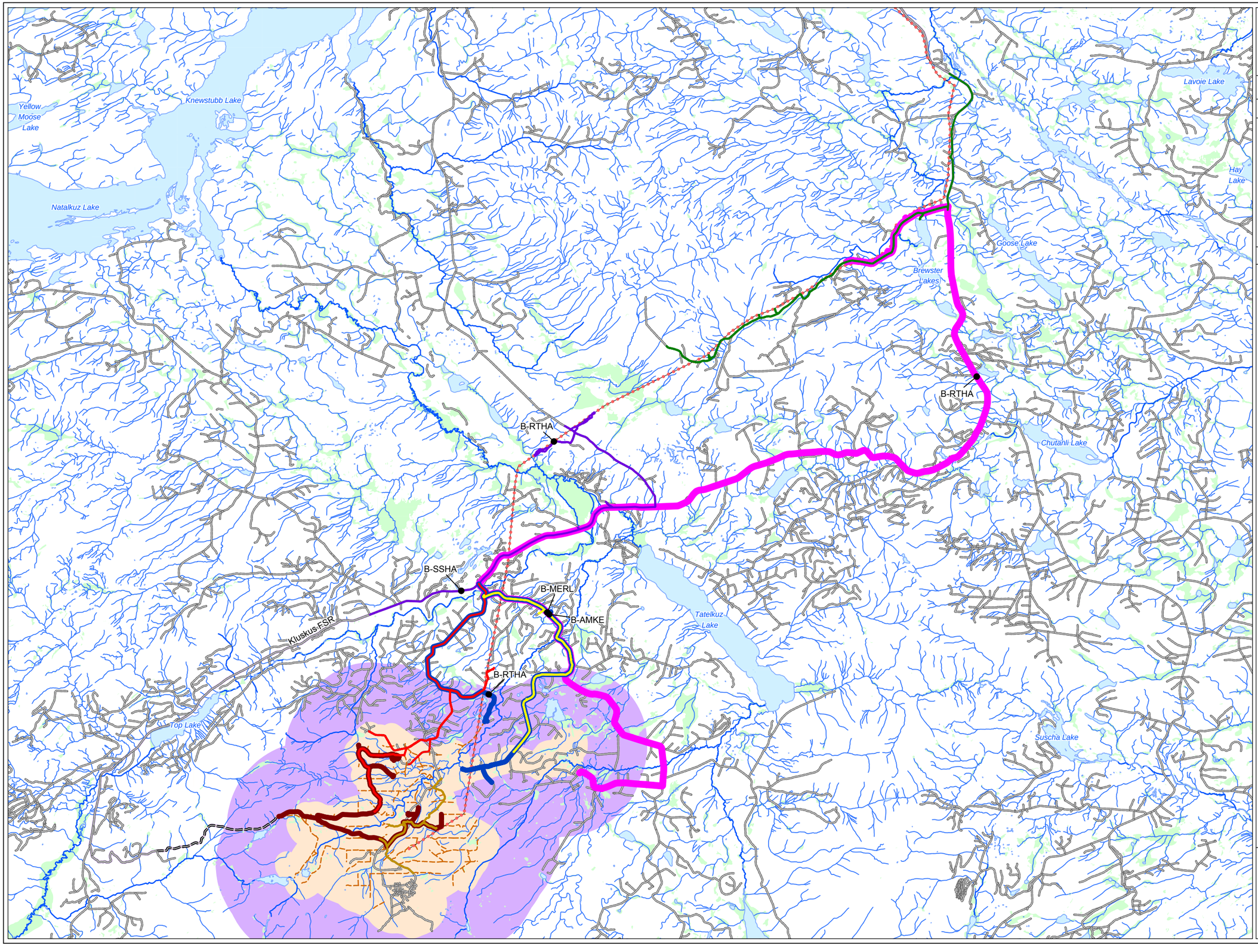

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BLACKWATER GOLD PROJECT

2012 RAPTOR ROADSIDE SURVEY

Projection: NAD 83, UTM Zone 10
Date: December 5, 2012

N
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1.5 0 1.5 3 4.5
Kilometers
Scale: 1:150,000

LEGEND

- Waterbody
- Wetland
- Regional Study Area
- Local Study Area
- Stream
- Road
- Access Trail
- Proposed Transmission Line
- Raptor Roadside Survey Sighting

Raptor Observations

B-AMKE - American Kestrel
B-MERL - Merlin
B-RTHA - Red-tailed Hawk
B-SSHA - Sharp-Shinned Hawk

Roadside Raptor Transects

- RS01
- RS02
- RS03
- RS04
- RS05
- RS06
- RS07
- RS08

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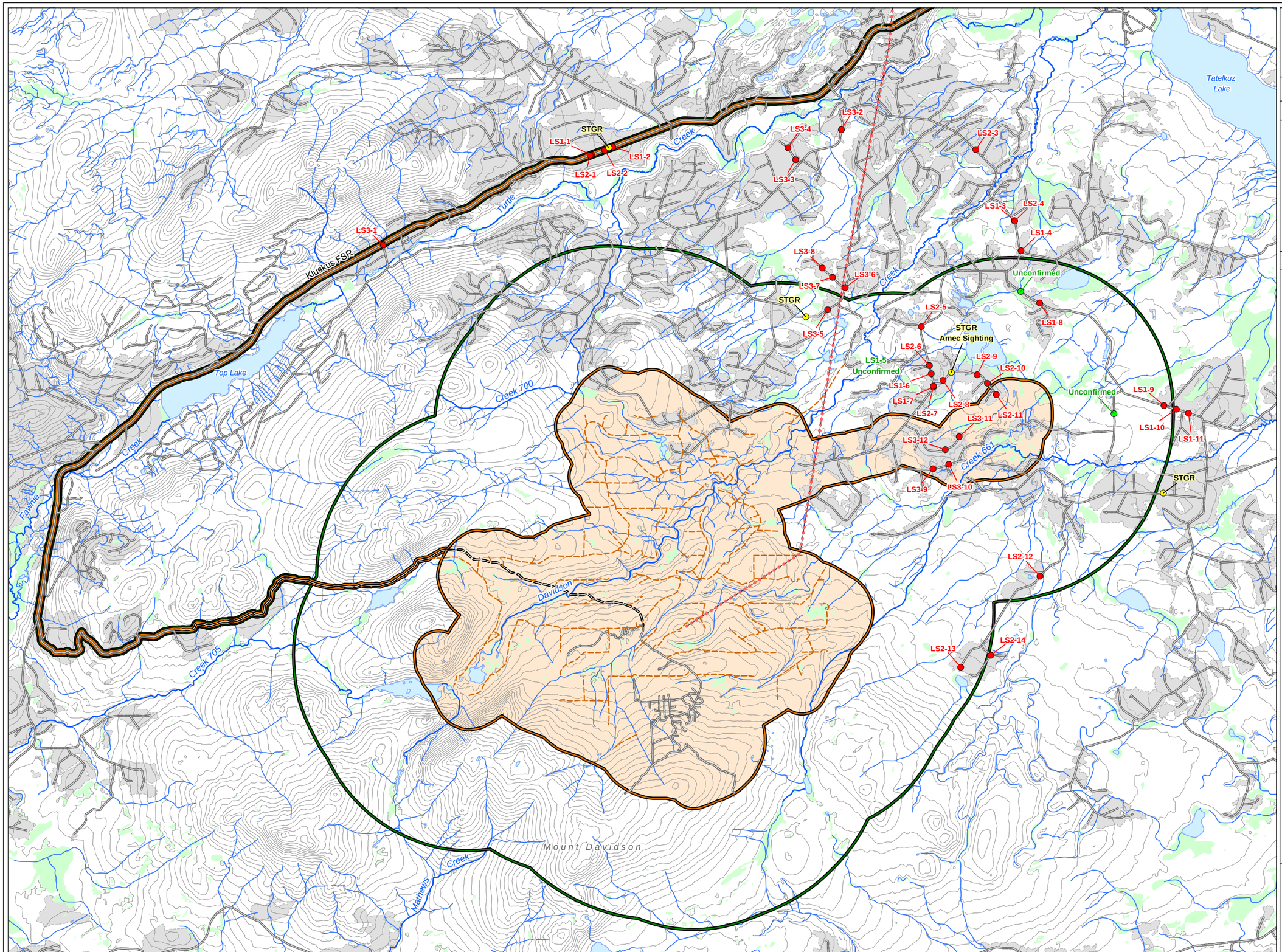

newgold

BLACKWATER GOLD PROJECT

2012 SHARPTAILED GROUSE SURVEY

Projection: NAD 83, UTM Zone 10
Date: December 5, 2012

N
W E
S

750 0 750 1500 2250
Meters
Scale: 1:75,000

LEGEND

- Waterbody
- Wetland
- Cutblock
- Regional Study Area
- Local Study Area
- Stream
- Contour
- Road
- Access Trail
- Proposed Transmission Line
- Sharptailed Grouse Survey Site
- Sharptailed Grouse Sighting
- Unconfirmed Sharptailed Grouse Sighting

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7.2 APPENDIX 2 – PHOTODOCUMENTATION

Blackwater Gold
2012 Owl Surveys

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Date: April 10, 2012
Comments:
Great-horned owl sighting at dusk, prior to beginning owl call playback surveys.

Date: April 12, 2012
Comments:
Great-gray owl sighting in broad daylight along the Kluskus FSR north of the Project site.

Blackwater Gold
2012 Diurnal Raptor Surveys

ECOFOR
natural and cultural resource consultants

Date: May 5, 2012
Comments:
American kestrel perched on a snag in a cut block adjacent a small riparian strip.

Date: May 5, 2012
Comments:
Wildlife caller in spruce wetland area during raptor call playback survey.

Date: May 3, 2012
Comments:
Higher elevation areas had snow into May, while at lower elevations the snow was reduced to patches.

Blackwater Gold
2012 Sharp-tailed Grouse Surveys

ECOFOR
natural and cultural resource consultants

Date: May 5, 2012
Comments:
Two sharp-tailed grouse in an aspen in a cutblock adjacent the Kluskus FSR.

Date: April 20, 2012
Comments:
Two sharp-tailed grouse along the edge of a road through a regenerating cutblock.

Date: May 6, 2012
Comments:
Grassy cutblock along Kluskus FSR where sharp-tailed grouse were previously sighted.

7.3 APPENDIX 3 – SURVEY DATA

Nocturnal owl call playback surveys

Survey #	Zone	Easting	Northing	Date	Time Start	Time End	Wind	Precip	Cloud Cover	Temp (°C)	Owls observed	Direction	Distance	Activity	Comments
OS1-1	10U	383761	5899022	April 10	21:24	21:39	Calm	none	mostly clear	4	none				
OS1-2	10U	384247	5899058	April 10	21:48	22:06	Calm	none	mostly clear	4	none				
OS1-3	10U	384444	5899431	April 10	22:15	22:29	B1	none	mostly clear	4	none				
OS1-4	10U	384485	5899838	April 10	22:38	22:53	Calm	none	mostly clear	4	none				
OS1-5	10U	384361	5900234	April 10	23:17	23:32	Calm	none	partly cloudy	1	none				
OS1-6	10U	384365	5900646	April 10	23:44	23:58	Calm	none	partly cloudy	1	none				
OS1-7	10U	384288	5901054	April 11	0:05	0:20	Calm	none	cloudy	1	none				
OS1-8	10U	384029	5901378	April 11	0:27	0:42	Calm	none	cloudy	1	none				
OS1-9	10U	383606	5901528	April 11	0:56	1:10	Calm	none	cloudy	1	none				
OS1-10	10U	381864	5904004	April 11	1:26	1:40	B1	none	partly cloudy	0	none				
OS2-1	10U	375485	5899147	April 11	20:57	21:12	Calm	light drizzle	overcast	4	none				
OS2-2	10U	374699	5898995	April 11	21:24	21:39	Calm	light drizzle	overcast	4	none				
OS2-3	10U	373898	5899121	April 11	21:48	22:03	Calm	light drizzle	overcast	4	none				
OS3-1	10U	375282	5894340	April 18	21:20	21:35	Calm	none	<10%	1	none				
OS3-2	10U	374662	5894835	April 18	21:54	22:15	Calm	none	<10%	-1	none				2 vehicles passed by survey station during survey. Survey was paused until the vehicle could no longer be heard
OS3-3	10U	374123	5895539	April 18	22:23	22:38	Calm	none	30%	-1	snipe				
OS3-4	10U	373320	5895681	April 18	22:57	23:12	Calm	none	50%	-1	snipe				
OS3-5	10U	372384	5895974	April 18	23:31	23:46	B1	none	<30%	-2	snipe				

Survey #	Zone	Easting	Northing	Date	Time Start	Time End	Wind	Precip	Cloud Cover	Temp (°C)	Owls observed	Direction	Distance	Activity	Comments
OS3-6	10U	371736	5896347	April 18	0:07	0:22	B1	none	<20%	-2	snipe				
OS3-7	10U	370925	5896616	April 19	0:39	0:54	B1	none	<10%	-2	snipe				
OS3-8	10U	370143	5896409	April 19	1:22	1:37	B1	none	<10%	-2	none				
OS3-9	10U	369444	5895936	April 19	1:49	2:03	Calm	none	<20%	-2	snipe				
OS3-10	10U	368594	5895866	April 19	2:14	2:29	Calm	none	<10%	-2	snipe				
OS3-11	10U	367697	5895989	April 19	2:42	2:56	Calm	none	<20%	-2	BOOW	SE	200-300m	calling	
OS3-12	10U	366983	5895556	April 19	3:09	3:23	B1	none	<20%	-2	snipe				
OS3-13	10U	366191	5895150	April 19	3:34	3:49	Calm	none	<20%	-2	snipe				
OS3-14	10U	364991	5894961	April 19	3:59	4:15	Calm	none	<20%	-2	GHOW	SW	>1km	calling	
OS3-15	10U	364348	5894825	April 19	4:31	4:46	Calm	none	<10%	-3	none				
OS4-1	10U	360190	5892085	April 19	20:57	21:12	Calm	none	90%	3	none				heard canada geese
OS4-2	10U	382191	5903669	April 20	0:19	0:35	Calm	none	10%	-2	none				heard snipe calling from 500m to the west. Also heard a weird chirp from the trees next to the station approx 10m west. Saw dark shape fly overhead looked like a bat.
OS4-3	10U	380891	5902158	April 20	1:20	1:35	B1	none	30%	-2	GHOW	SW	>500m	calling	Fresh Black Bear tracks. also heard snipe very far away
OS4-4	10U	380842	5901460	April 20	1:47	2:02	B1- B2 (gusty)	none	<20%	-2	GHOW	SW	<500m	calling	Fresh black bear tracks. heard 2 GHOW at station 4
OS4-5	10U	380540	5900747	April 20	2:13	2:25	B1- B2	none	30%	-2	GHOW	SW	<100m	calling	fresh black bear tracks. heard 2-3 GHOW at station 5 one was close the other was far away
OS4-6	10U	380258	5899378	April 20	2:46	3:02	B1-B2	none	30%	-2	GHOW	North	>500m	calling	Fresh black bear tracks.
OS4-7	10U	382516	5901957	April 20	3:49	4:04	Calm-B2	none	0%	-2	GHOW	west	>500m	calling	heard weird chirping noise twice.
OS4-8	10U	383069	5899134	April 20	4:32	4:47	B1- B3	none	<10%	-2	NSWO	south	500m	calling	got windy during survey
OS4-9	10U	384443	5899429	April 20	5:00	5:15	B1- B3	none	<5%	-2	GHOW	North	300m	calling	heard purring/cooing noise coming from in the trees in multiple locations (at least two). Sounded somewhat grouse like

Survey #	Zone	Easting	Northing	Date	Time Start	Time End	Wind	Precip	Cloud Cover	Temp (°C)	Owls observed	Direction	Distance	Activity	Comments
OS5-1	10U	373876	5899159	May 4	21:30	21:45	B1-B2	none	40%	0	none				COSN heard, snow patches to 30 cm deep
OS5-2	10U	373959	5898469	May 4	21:54	22:11	B1-B3	none	60%	0	none				COSN heard, snow patches to 30 cm deep
OS5-3	10U	374666	5895346	May 4	22:17	22:32	B1-B3	none	20%	0	none				snow patches to 30cm deep
OS5-4	10U	374032	5897692	May 4	22:44	22:59	B2-B3	none	10%	-1	none				gusty winds
OS5-5	10U	374413	5896997	May 4	23:05	23:20	B1-B3	none	30%	-2	none				mud is frozen
OS5-6	10U	374791	5896485	May 4	23:29	23:44	B2-B4	none	20%	-3	none				gusty winds
OS5-7	10U	373797	5896522	May 4	23:55	0:10	B3-B5	none	5%	-3	none				gusty winds
OS5-8	10U	372962	5896490	May 4	0:16	0:31	B3-B6	none	30%	-3	none				gusty winds
OS5-9	10U	371824	5896285	May 4	0:40	0:55	B1-B3	none	10%	-3	none				gusty winds -- decided to call off survey too windy

Stand watches

Survey	Zone	Easting	Northing	Date-Time	Time Start	Time End	Wind	Precip	Cloud Cover	Temp (°C)	Owls observed	Direction	Distance	Activity	Comments
OSW1-1	10U	375131	5898960	April 11	20:05	20:15	1	0	100	0	none				edge of open wetland
OSW2-1	10U	371008	5896344	April 12	6:05	6:15	0	0	100	0	none				open wetland bordered by forest
OSW2-2	10U	370813	5896387	April 12	6:25	6:35	0	0	100	0	none				open wetland bordered by forest
OSW2-3	10U	370914	5896204	April 12	6:45	6:55	0	0	100	0	none				open wetland bordered by forest
OSW2-4	10U	370603	5896403	April 12	7:07	7:17	0	0	100	0	none				open wetland bordered by forest

Diurnal Raptors

Call Playback Surveys

Notes	Zone	Easting	Northing	Date	Time start	Time end	Wind	Precip	CC	Temp	Comments
DR1-1	10U	375834	5898770	2012-05-02	9:10	9:27	1	0	15%	2	
DR1-2	10U	373987	5899970	2012-05-02	10:25	10:42	2	0	80%	3	
DR1-3	10U	374784	5899526	2012-05-02	10:50	11:07	2	0	90%	3	
DR1-4	10U	375841	5899450	2012-05-02	11:22	11:39	2	0	90%	3	
DR1-5	10U	377406	5901070	2012-05-02	11:55	12:12	1-2	lt snow	95%	1	
DR1-6	10U	379215	5902658	2012-05-02	12:35	12:52	1	0	95%	2	
DR2-1	10U	377003	5898002	2012-05-03	8:25	8:42	0	lt snow	100%	0	
DR2-2	10U	377127	5897128	2012-05-03	8:55	9:12	1	lt snow	100%	0	
DR2-3	10U	376490	5896479	2012-05-03	9:17	9:34	0	0	100%	0	
DR2-4	10U	375884	5896020	2012-05-03	10:10	10:27	0	0	95%	0	
DR2-5	10U	376784	5895919	2012-05-03	10:35	10:52	0	lt snow	100%	0	
DR2-6	10U	374809	5896045	2012-05-03	11:05	11:22	0	lt snow	100%	0	
DR2-7	10U	378794	5905716	2012-05-03	13:47	14:04	2	0	75%	4	
DR2-8	10U	381112	5904967	2012-05-03	14:45	15:02	2	0	95%	3	
DR2-9	10U	381989	5904465	2012-05-03	15:17	15:34	3	0	97%	3	
DR2-10	10U	380903	5902192	2012-05-03	16:07	16:24	1	0	99%	2	
DR2-11	10U	380579	5901316	2012-05-03	16:32	16:49	0	lt snow	100%	2	
DR2-12	10U	380598	5900533	2012-05-03	16:58	17:15	2	lt rain	100%	2	
DR2-13	10U	380044	5899126	2012-05-03	17:20	17:37	1	snow	100%	1	
DR2-14	10U	382461	5903004	2012-05-03	17:55	18:12	1	drizzle	90%	1	
DR3-1	10U	378824	5900407	2012-05-04	7:42	7:59	0	0	10%	1	
DR3-2	10U	379200	5901203	2012-05-04	8:25	8:42	1	0	15%	3	
DR3-3	10U	378915	5901588	2012-05-04	8:54	9:11	2	0	30%	2	
DR3-4	10U	378079	5901432	2012-05-04	9:24	9:41	1	0	60%	1	
DR3-5	10U	377205	5901761	2012-05-04	9:43	10:00	0	0	65%	1	

Notes	Zone	Easting	Northing	Date	Time start	Time end	Wind	Precip	CC	Temp	Comments
DR3-6	10U	377889	5898408	2012-05-04	11:02	11:19	3	0	40%	3	
DR3-7	10U	379110	5898568	2012-05-04	11:38	11:55	3	0	40%	3	
DR4-1	10U	383454	5912697	2012-05-05	10:31	10:48	2-5	0	80%	2	gusty-- wind picked up half way through survey
DR4-2	10U	383065	5913100	2012-05-05	11:18	11:35	2-5	0	80%	3	wind in canopy
DR4-3	10U	383440	5913919	2012-05-05	12:08	12:25	1-4	lt snow	90%	4	wind in canopy
DR4-4	10U	382716	5912767	2012-05-05	12:47	13:04	1-3	lt snow	60%	4	some wind but not too bad
DR4-5	10U	381740	5912197	2012-05-05	13:55	14:12	2-4	0	60%	6	some wind but not too bad
DR4-6	10U	381175	5911813	2012-05-05	14:28	14:45	1-3	0	50%	6	some wind but not too bad
DR4-7	10U	380934	5911537	2012-05-05	15:06	15:23	1-4	0	60%	7	some wind but not too bad
DR4-9	10U	379716	5906601	2012-05-05	16:45	17:02	1-4	0	65%	8	some wind but not too bad
DR5-1	10U	383395	5897861	2012-05-06	7:53	8:10	1	0	90%	1	
DR5-2	10U	383763	5897591	2012-05-06	8:15	8:32	1	0	90%	1	
DR5-3	10U	397358	5921830	2012-05-06	9:47	10:04	2	lt drizzle	60%	3	
DR5-4	10U	396558	5921599	2012-05-06	10:11	10:28	0	0	30%	3	
DR5-5	10U	396094	5920918	2012-05-06	10:34	10:51	3	0	30%	3	
DR5-6	10U	395809	5920198	2012-05-06	10:59	11:16	1	0	75%	3	
DR5-7	10U	395075	5919731	2012-05-06	11:40	11:57	1	0	85%	3	
DR6-1	10U	375866	5896022	2012-06-06	8:23	8:40	3	0	100%	1	
DR6-2	10U	377003	5896394	2012-06-06	8:53	9:10	3	0	100%	1	
DR6-3	10U	376037	5896768	2012-06-06	9:28	9:45	2	0	100%	3	
DR6-4	10U	375597	5896533	2012-06-06	9:54	10:11	3	0	100%	3	wetland nearby
DR6-5	10U	372860	5896492	2012-06-06	11:32	11:49	2	0	100%	3	filtered sun
DR6-6	10U	374417	5896990	2012-06-06	11:59	12:16	2	0	80%	3	filtered sun
DR6-7	10U	373924	5898130	2012-06-06	12:24	12:41	3	0	90%	3	filtered sun
DR6-8	10U	374955	5898081	2012-06-06	12:52	13:09	2	0	95%	4	filtered sun
DR6-9	10U	373517	5899010	2012-06-06	13:27	13:44	2	0	80%	5	filtered sun
DR6-10	10U	373513	5899404	2012-06-06	13:53	14:10	1	0	100%	6	filtered sun
DR6-11	10U	374600	5898988	2012-06-06	14:24	14:41	2	0	100%	6	filtered sun

Notes	Zone	Easting	Northing	Date	Time start	Time end	Wind	Precip	CC	Temp	Comments
DR6-12	10U	374897	5898953	2012-06-06	14:51	15:08	2	0	100%	7	filtered sun
DR7-1	10U	393680	5919519	2012-06-07	8:00	8:17	3	0	60%	3	
DR7-2	10U	393040	5918994	2012-06-07	8:28	8:45	2	0	70%	3	
DR7-3	10U	392505	5918485	2012-06-07	9:03	9:20	1	0	70%	4	
DR7-4	10U	391793	5918088	2012-06-07	9:34	9:51	1	0	60%	3	
DR7-5	10U	391046	5917774	2012-06-07	10:22	10:39	1	0	50%	7	
DR7-6	10U	390369	5917520	2012-06-07	11:18	11:35	1	0	50%	10	
DR7-7	10U	389392	5916790	2012-06-07	11:52	12:09	0-3	0	40%	13	gusty winds
DR7-8	10U	388732	5916369	2012-06-07	12:19	12:36	1-3	0	30%	13	gusty winds
DR7-9	10U	388259	5915826	2012-06-07	13:15	13:32	3	0	50%	14	
DR7-10	10U	387416	5915618	2012-06-07	14:08	14:25	2	0	50%	14	

Diurnal Raptor Call Playback Observations

Call Sta	Obs #	Spp	Det dir	Dist to det	V/C	Activity	Sex	Age class	Comments
DR2-8	1	B-OSPR	270	500 m	V	soaring		Adult	soaring over, migrating?
DR2-8	1	B-UHAW	360	>1km	V	soaring			Unknown Buteo, too far for ID, soaring over cutblocks
DR2-9	1	B-NOHA	270	20 m	V	hunting	F	Adult	
DR2-9	2	B-UHAW	270	> 1km	V	soaring			Unknown Buteo, too far for ID
DR2-11	1	B-RTHA	270	75 m	V	flying			poor light but, fairly certain ID
DR4-2	1	B-NOGO	120	150 m	C	territorial response			called twice after the SSHA playback
DR6-12	1	B-NOGO	135	500 m	C	calling			
DR7-4	1	B-NOHA	0	50 m	V	hunting	M	Adult	flew overhead

Diurnal Raptor Stand Watches

Survey	Zone	Easting	Northing	Date	Time start	Time end	Wind	Precip	CC	Temp	Comments
Stand Watch 01	10U	375992	5898915	2012-05-02	9:35	9:50	2	0	40%	3	no raptors
Stand Watch 02	10U	373987	5899970	2012-05-02	10:15	10:40	1	0	45%	4	no raptors
Stand Watch 03	10U	377894	5904544	2012-05-03	17:20	17:35	1	0	80%	2	RTHA
Stand Watch 04	10U	382596	5912486	2012-05-05	13:10	13:35	2-5	lt snow	80%	3	no raptors

Roadside Survey Details

Survey	Date	Surveyors	Length	Start Time	End Time	Raptors Observed
RS01	2012-05-02	MP/DS	47.2	9:05	17:39	
RS02	2012-05-03	MP/DS	18.8	7:50	11:52	B- SSHA
RS03	2012-05-03	MP/DS	24.6	13:45	18:21	B-MERL
RS04	2012-05-04	MP/DS	49.3	6:51	12:55	B-RTHA, B-AMKE
RS05	2012-05-05	MP/DS	33.5	9:40	16:04	B-RTHA
RS06	2012-05-06	MP/DS	64.5	7:45	12:11	
RS07	2012-06-06	MP/SC	34.1	8:12	16:55	B-RTHA
RS08	2012-06-07	MP/SC	39.7	7:37	15:51	

Roadside Survey Observations

Surv Sta	Obs #	Spp	Det dir	Dist to det	V/C	Activity	Sex	Age class	Zone	Easting	Northing	Comments
RS02	1	B-SSHA	90	300	V	soaring	U	U	10U	377837	5905908	sighting- soaring over road
RS03	1	B-MERL	270	300	V	perched	U	U	10U	381460	5904999	
RS04	1	B-RTHA	300	500	V	soaring	U	U	10U	378996	5901548	
RS04	2	B-AMKE	180	200	V	perched	U	U	10U	381541	5904918	
RS05	1	B-RTHA	300	300	V	soaring	U	U	10U	381740	5912197	
RS07	1	B-RTHA	270	250	V	soaring	U	U	10U	399547	5914928	99km on Kluskus

Sharp-tailed Grouse Surveys

Survey	Zone	Easting	Northing	Date	Time of start	End time	Wind	Precip	CC	Temp	Comments
LS1-1	10U	373651	5904776	2012-05-06	5:15	5:20	1-2	0	95	-1	open CB - 5yr regen, lots of grass
LS1-2	10U	374090	5904943	2012-05-06	5:29	5:34	2	0	95	-1	open cutblock, bordered by regen. Much grass, no tree cover.
LS1-3	10U	382383	5903419	2012-05-06	5:53	5:58	1	0	90	0	cutblock with 5-7 yr regen
LS1-4	10U	382524	5902800	2012-05-06	6:02	6:07	1	0	85	0	cutblock with 10 yr regen, grassy and open
LS1-5	10U	380625	5900426	2012-05-06	6:16	6:21	1	0	85	0	cutblock with 10-15 yr old pine planted. POSSIBLE STGR calling--only one call, then silence.
LS1-6	10U	380670	5900256	2012-05-06	6:30	6:35	1	0	75	0	same cutblock as 1-5. 10-15 yr old pine in open cutblock
LS1-7	10U	380714	5899981	2012-05-06	6:40	6:45	1	0	70	0	same cutblock as 1-5. 10-15 yr old pine in open cutblock
LS1-8	10U	382907	5901718	2012-05-06	6:57	7:02	2	0	70	0	cutblock near small lake. Gentle NE-facing slope
LS1-9	10U	385477	5899596	2012-05-06	7:09	7:14	1	0	90	0	cutblock with 5-10 year old regen
LS1-10	10U	385732	5899522	2012-05-06	7:16	7:21	2	0	90	0	cutblock with 5-10 yr old regen. Moss-lichen-grass ground cover
LS1-11	10U	385982	5899441	2012-05-06	7:24	7:29	2	0	90	0	same block as 1-11. cutblock with 5-10 yr old regen. Moss-lichen-grass ground cover
LS2-1	10U	373622	5904766	2012-06-04	4:58	5:03	2	0	95	3	grassy cutblock along Kluskus FSR where STGR previously sighted
LS2-2	10U	373922	5904876	2012-06-04	5:07	5:12	2	lt drizzle	95	3	grassy cutblock along Kluskus FSR where STGR previously sighted
LS2-3	10U	381588	5904888	2012-06-04	5:27	5:32	1	0	95	4	cutblock with 5-10 yr old regen. Lots of bare ground and grass.
LS2-4	10U	382390	5903410	2012-06-04	5:38	5:43	1	0	95	4	very grassy cutblock- 5-7 yr old regen
LS2-5	10U	380463	5901225	2012-06-04	5:53	5:58	1	0	95	4	7-10 yr old regen in cutblock.
LS2-6	10U	380632	5900422	2012-06-04	6:12	6:17	1	0	100	4	7-10 yr old regen in cutblock.
LS2-7	10U	380714	5900001	2012-06-04	6:44	6:49	1	0	100	4	7-10 yr old regen in cutblock.
LS2-8	10U	380911	5900118	2012-06-04	6:57	7:02	1	0	100	4	7-10 yr old regen in cutblock.
LS2-9	10U	381617	5900232	2012-06-04	7:25	7:30	2	lt drizzle	95	5	5 yr old regen in very sparse open cutblock
LS2-10	10U	381827	5900058	2012-06-04	7:35	7:40	2	lt drizzle	95	5	5 yr old regen in very sparse open cutblock
LS2-11	10U	382012	5899825	2012-06-04	7:43	7:48	1	0	100	5	5 yr old regen in very sparse open cutblock

Survey	Zone	Easting	Northing	Date	Time of start	End time	Wind	Precip	CC	Temp	Comments
LS2-12	10U	382915	5896070	2012-06-04	9:52	9:57	3	0	100	5	8-12 year old regen in smaller cutblock. Some grasses and not quite full canopy closure yet.
LS2-13	10U	381277	5894189	2012-06-04	10:45	10:50	4	0	90	7	10 year old regen. Looks like excellent STGR habitat over the whole block. Sparse cover.
LS2-14	10U	381900	5894437	2012-06-04	11:10	11:15	4	0	90	7	10 year old regen. Looks like excellent STGR habitat over the whole block. Sparse cover.
LS3-1	10U	369347	5902918	2012-06-05	4:58	5:03	2	lt drizzle	100	5	grassy cutblock with
LS3-2	10U	378812	5905298	2012-06-05	5:18	5:23	1	lt drizzle	100	5	12-15 yr old regen, but not closed canopy yet.
LS3-3	10U	377866	5904678	2012-06-05	5:27	5:32	1	lt drizzle	100	5	10 year old cutblock, sparse cover; grassy.
LS3-4	10U	377707	5904925	2012-06-05	5:35	5:40	0	lt rain	100	5	rain picking up. Same cutblock.
LS3-5	10U	378527	5901576	2012-06-05	6:47	6:52	0	lt rain	100	5	regen to 2.5 m tall, about 10 yrs old. Sparse cover.
LS3-6	10U	378890	5902034	2012-06-05	7:00	7:05	0	lt drizzle	100	5	regen to 3 m tall, open with some grass
LS3-7	10U	378628	5902247	2012-06-05	7:14	7:19	0	lt drizzle	100	6	regen to 1.5 m tall, sparse cove; grass and shrubs present.
LS3-8		378418	5902441	2012-06-05	7:30	7:35	0	lt drizzle	100	6	regen to 1.5 m tall, sparse cove; grass and shrubs present.
LS3-9	10U	380705	5898290	2012-06-05	10:28	10:33	1	lt drizzle	100	5	regen 1.5-2 m tall, on esker area. Sparse ground cover
LS3-10	10U	381032	5898383	2012-06-05	10:52	10:57	1	lt drizzle	100	5	regen 1.5-2 m tall, on esker area. Sparse ground cover
LS3-11	10U	381245	5898953	2012-06-05	12:05	12:10	0	lt drizzle	100	5	regen < 2 m tall. Fairly wet area with abundnat short willows.
LS3-12	10U	380960	5898685	2012-06-05	12:20	12:25	2	drizzle	100	5	wet area with sparse regen about 1-2 m tall. Alders present in clumps

Annex 3
2011 Winter Caribou/Ungulate Overview Assessment Report

BLACKWATER GOLD PROJECT
2011 WINTER
CARIBOU/UNGULATE OVERVIEW ASSESSMENT
REPORT

DRAFT- VERSION 2.0

APRIL 6ST, 2011

PREPARED FOR

AMEC EARTH AND ENVIRONMENTAL
BURNABY, BC

ECOFOR
natural and cultural resource consultants

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1. Introduction

1.1. Project Description

Baseline wildlife data is required for the proposed Blackwater Gold Project (Project) area to assess potential impacts of the proposed development, as part of the application process for regulatory approval. To support preliminary planning for the Project, AMEC was contracted to obtain baseline information on the wildlife resources of the Project area. Collection of winter baseline information on wildlife is required as part of a commitment to document and describe local and regional wildlife in the area associated with the Project. As a preliminary step to building the wildlife baseline for the Project AMEC and Ecofor Consulting Ltd (Ecofor) conducted a winter overview flight of the Project area in early March 2011. Specific goals were to document any winter ungulate (caribou, moose and deer) and furbearer use of the Project area.

This phase of the baseline study on wildlife included a literature review of available wildlife data in the Project area with specific focus on any historic or current caribou use in the area. In addition to the literature review an overview flight of the Project area around Mt Davison (Appendix I) and the two transmission line routes that are proposed between Vanderhoof and the Project site (Appendix II). All groupings of wildlife tracks encountered during the overview flight were documented and GPS recorded.

The Blackwater Gold Project is located approximately 150km southwest of Vanderhoof, British Columbia along the slopes of Mt Davidson (1861m) in the Fawnie Range of the Interior Plateau (Figure 1).

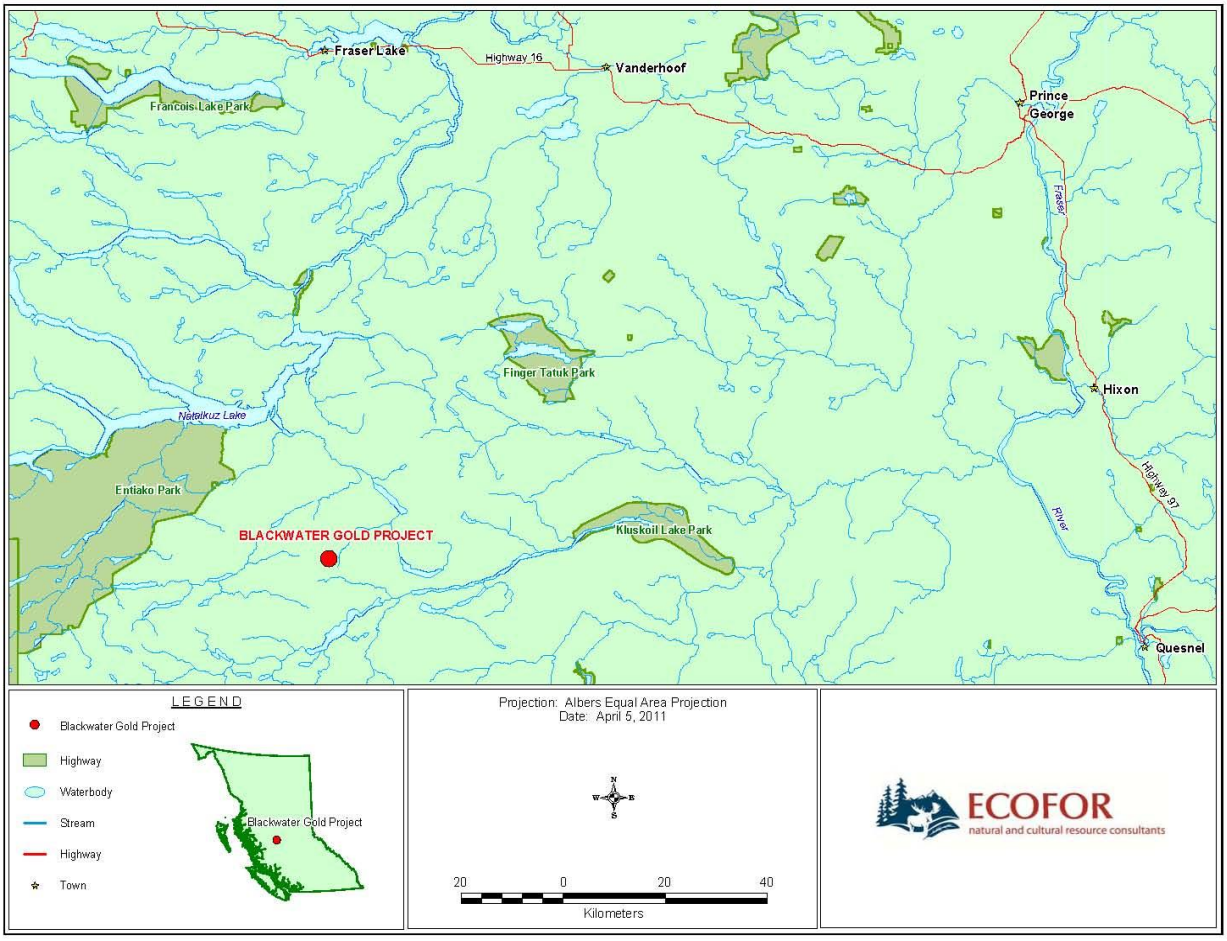

Figure 1. Richfield Ventures Inc Blackwater Gold Project Area Overview.

1.2. Winter Overview Assessment Objectives

The purposes of the overview assessment were to begin the development of a wildlife baseline for the Project area and to help in the development of recommendations for management of key ungulates species such as caribou. The overview was conducted to identify important wildlife values within three study areas associated with the Project: the proposed mine site area along the northern slopes of Mt Davison (Appendix I); the proposed transmission route 1 (Appendix II) and the proposed transmission route 2 (Appendix II). Specifically, the overview was conducted to identify any winter wildlife use of the study areas by ungulate species (caribou, deer and moose) and furbearers and identify any critical wintering habitats that may be impacted by the proposed Project.

The overview assessment included a desk top review for known information on wildlife for the Project area, and included a detailed review of potential species at risk that may be found in the area. In addition to the desktop review a helicopter overview flight was conducted over the three study areas.

The following report presents the findings of the literature review and the overview assessment flight conducted by AMEC and Ecofor biologists on March 16th 2011.

2. Methods

2.1. Literature Review

A desktop review was conducted to compile known data regarding wildlife and species at risk for the Project area prior to the field assessment. Primary sources of information used in the preparation of this report included the following:

- Provincially identified wildlife areas (ungulate winter ranges, habitat areas);
- Information from available wildlife research near the Project area;
- British Columbia hunting statistics for the region;
- Species at Risk (Provincial/Federal);and
- BC Environmental Assessment Office - Project Information Centre (e-PIC).

A listing of species and habitats identified during the literature review are presented in this report.

2.2. Field Assessment

The field assessment was conducted on March 16th, 2011, by AMEC biologist (Libor Michalak) and Ecofor biologists (Kevin Wilson, Mark Pokorski) using a modified encounter transects survey method. The surveys followed modified protocols developed by the British Columbia Resource Inventory Committee (RISC, 1999). The encounter transects were conducted as a simple and direct means of recording the presence of wildlife and their distribution amongst habitat types within the three study areas (proposed mine site and the two proposed transmission lines) for the Project (Appendix I and II). All encounter transects were surveyed using a Bell Long Ranger helicopter provided by Yellowhead Helicopters Ltd. All significant groupings of ungulates and furbearers encountered during the overview flight were recorded. Transect were flown at an average altitude of 110m above tree level and at a cruising speed of 37km/hour with 3 biologist observers and the pilot as an additional observer.

3. Results of Literature Review

3.1. Wildlife and Wildlife Habitats

A desktop review for wildlife and wildlife habitat values within and adjacent to the Project area included a query of the Provincial (BC) wildlife databases for an area of approximately 20km around the Project

area. The identification of any key wildlife habitats, wildlife use, densities and distribution within the Project area was required to adequately evaluate the Project's potential impacts on wildlife.

The key wildlife issues to be addressed were species at risk, provincially (BC) listed species of concern, species of concern to public (hunters, First Nation, guide outfitters, trappers) and species endemic to the Project area. A listing of species with occurrences within the query area is presented in Table 1.

Woodland caribou of the Tweedsmuir-Entiako herd are considered part of the threatened Southern Mountain Population by the Committee on the Status on Endanger Wildlife in Canada (COSEWIC), and part of the blue-listed Northern Ecotype by the BC Ministry of Environment. The herd consists of approximately 500 animals, and typically spends summer months in high elevation areas. For the winter months, the herd migrates into forested lower elevations (Cichowski and Banner 1993). The Vanderhoof Land and Resource Management Plan (LRMP 1996), presents a number of wildlife objectives and strategies for maintaining habitat quality for caribou (and other wildlife) including:

- Supporting scientific research opportunities (e.g. predator-prey relationships, monitoring and comparing vegetation succession on controlled burn versus wildfire areas);
- Periodically inventorying wildlife populations;
- Protecting high-quality caribou habitat from destruction (short term); and
- Developing a winter habitat strategy to ensure the caribou has wintering grounds over the long term, utilizing a fire management plan.

Other species at risk located within the Vanderhoof Forest District are listed in Table 1.

Table 1: Species at risk known for the entire Vanderhoof forest district, rank on BC Red/Blue list, provincial status (S1-S5), and COSEWIC status (Endangered [E], Threatened [T], Special Concern [SC], Not at Risk [NAR]) (BC Conservation Data Centre 2011).

English Name	Scientific Name	BC List	Prov Status	COSEWIC Status
INSECTS				
Beaverpond Baskettail	*Epitheca canis*	Blue	S3	
Kennedy's Emerald	*Somatochlora kennedyi*	Blue	S3S4	
AMPHIBIANS				
Western Toad	*Anaxyrus boreas*	Yellow	S4	SC
BIRDS				
Great Blue Heron, herodias subspecies	*Ardea herodias herodias*	Blue	S3B,S4N	
Olive-sided Flycatcher	*Contopus cooperi*	Blue	S3S4B	T
Rusty Blackbird	*Euphagus carolinus*	Blue	S3S4B	SC
Barn Swallow	*Hirundo rustica*	Blue	S3S4B	
Caspian Tern	*Hydroprogne caspia*	Blue	S3B	NAR
California Gull	*Larus californicus*	Blue	S3B	
Sharp-tailed Grouse, columbianus subspecies	*Tympanuchus phasianellus columbianus*	Blue	S2S3	
Common Nighthawk	*Chordeiles minor*	Yellow	S4B	T
MAMMALS				
Wolverine, luscus subspecies	*Gulo gulo luscus*	Blue	S3	SC
Fisher	*Martes pennanti*	Blue	S2S3	
Grizzly Bear	*Ursus arctos*	Blue	S3	SC

Wolverine	*Gulo gulo*	No Status	S3	SC
Caribou	*Rangifer tarandus*	Blue	S3	T
FISHES				
Bull Trout	*Salvelinus confluentus*	Blue	S3	
Dolly Varden	*Salvelinus malma*	Blue	S3S4	
White Sturgeon (Nechako River population)	*Acipenser transmontanus pop. 3*	Red	S1	E
Coho Salmon	*Oncorhynchus kisutch*	Yellow	S4	E

The Project falls with Provincial (BC) Wildlife Management Unit (WMU) 6 -1 of the Skeena Region. A review of the BC hunting harvest statistics for the years 2000 to 2009 identified 3 mammal species that have been taken within the WMU. Moose are the animals most frequently harvested. The hunting records for management unit 6-01 are presented in Table 2.

Table 2. Available resident and non-resident hunter harvest for the years 2000-2009 (BC Ministry of Water, Land and Air Protection 2011) in management unit 6-01.

	Species		
Year	Moose	Black Bear	Grizzly Bear
2000	106	6	0
2001	141	17	0
2002	140	12	0
2003	158	7	1
2004	163	8	1
2005	121	8	0
2006	115	8	0
2007	125	15	0
2008	67	12	0
2009	82	7	0

4. Results of Field Surveys

4.1. General Site Description

A total of six transects were flown along the study area near the proposed mine site, along the slopes of Mt Davidson (Appendix I). Transects were oriented from northwest to southeast with an average length of approximately 16km. The northwest limit of the survey was the Top Lake-Fawnie Creek drainage and the southeast limit of survey was the northwest tip of Kuyakuz Lake. The extent of the surveys was chosen to capture a general understanding of ungulate wildlife use within the study area and ensure a representative overview of all available habitat types within and adjacent to the Project area. The records of tracks identified along this study area are presented in the wildlife and wildlife habitat sections of this report.

A total of two transmission line routes were also flown during the overview (Appendix II), route option 1 covered a total distance of 130km and route option 2 covered a total distance of 54 km and then connects to option 1. The first 40km (approximate) of Option 1 (eastern route) crosses numerous wetland and riparian areas. The remaining portion of option 1 follows existing road and cut block network.

Option 2 (western route), crosses fewer riparian areas and is predominantly proposed along existing disturbances (clearcuts, farmland). Route 2 is a preferred option from a wildlife habitat perspective because it is much less intrusive on wildlife and wildlife habitat values.

4.2. Wildlife and Wildlife Habitat

A total of five species were confirmed during the assessment and additional groupings of unidentified ungulates and furbearers were noted. A listing of species encountered during the survey is presented in Table 3. The location of all wildlife track groupings identified during the overview flight is presented in Appendix I.

Table 3. Totals of track/sightings for the overview flight for the Proposed Project Mine Site Overview Study Area

Transect	Moose	Lynx	Grouse	Furbearer	Snowshoe Hare	unidentified carnivore	unidentified ungulate
1	3	-	1	1	-	-	-
2	4	-	-	1	1	-	-
3	4	2	1	1	4	-	-
4	3	1	-	3	3	-	-
5	11	1	-	-	-	-	1
6	10	1	-	2	1	1	-
Total	35	5	2	8	9	1	1
%	57.4	8.2	3.3	13.1	14.8	1.6	1.6

Moose Sighting = 1.2 %
Lynx Tracks = 8.0 %
Snowshoe Hare Tracks = 10.3 %
Grouse Sighting = 2.3 %
Unidentified Carnivore Tracks = 2.3 %
Unidentified Furbearer Tracks = 10.3 %
Unidentified Tracks = 3.5%

The main habitats types defined within the Project Study area are:

- Riparian habitats (along Davidson Creek, Mathews Creek, Laidman Lake, Fawnie Creek) and unnamed wetlands with associated water bodies;
- Second growth coniferous cut block areas;
- Open grown sub-alpine habitats along Mt Davidson;
- Mature pine-leading forest areas along the mid to lower slopes below Mt Davidson; and
- Spruce-leading types along riparian and sub-alpine areas.

No caribou tracks were identified during the overview flight and the most frequently encountered ungulate species was moose. Wildlife and wildlife habitat values for ungulates within the proposed mine site area along the slopes of Mt Davidson provide moderate habitat for ungulate species. The assessment of moderate values is based on following:

- Moderate density of shrub and forb communities available for forage;
- Moderate forest stand density;
- Moderate to low biomass capabilities for terrestrial and arboreal lichens;
- Deep snow packs;
- Canopy closure 40-50% (indicative of low to mod thermal cover for wildlife); and
- Moderate to low availability of suitable wintering habitats.

A review of these values would lead us to conclude that the area along the slopes of Mt Davison does not provide the habitat characteristics required to deem the area as critical wintering habitat for ungulates.

The highest concentration of ungulate use (moose) was recorded along riparian habitats where well developed shrub complexes likely provide excellent foraging and thermal/shelter opportunities. All riparian and wetland complexes within the Project area, especially along Fawnie Creek, Top Lake and Kuyakuz Lake are assumed to provide critical winter habitats for ungulates. This assessment of critical winter value is based on the following:

- High density of shrub communities available for forage;
- Coniferous dominant forests with >65% crown closure;
- Moderate to low biomass capabilities for terrestrial and arboreal lichens;
- Lower snow packs;
- High forest stand density;
- Canopy closure>65% (indicative of high thermal cover for wildlife); and
- High availability of suitable wintering habitats.

The habitat values along the proposed transmission line route 2 are considered moderate (as defined in section 4.2), as most of the area has been impacted by logging or farming. Scattered grouping of moose tracks were noted along the route and no critical wintering habitats (as defined in section 4.2) were noted.

The habitat values along the proposed transmission route 1 were deemed more significant that route 2. The habitat values along route 1 provided more riparian/wetland areas and areas of undisturbed mature forest which are values higher by ungulates and other wildlife species. The largest groupings of tracks were noted along the major riparian areas where the highest concentration of moose tracks was noted during the survey. Riparian areas along this route provide excellent shrub complexes and the associated foraging values for ungulate species such as moose.

5.0. Summary

The following provides summary of the preliminary findings of the overview flight:

- No caribou found during the survey;
- One bull moose sighted at the start of Option 2 (western power line area) by the highway near Vanderhoof;
- Ungulate tracks identified mostly along the riparian areas to the west and along the east (Tatelkuz Lake) at lower elevations, areas to the west of the Project site;
- Ungulate use of Mt. Davidson in the winter is expected to be low as they stay along the lower riparian areas of Mathews Creek, Laidman Lake, Fawnie Creek and associated wetlands at the same elevations;
- Numerous furbearer tracks occurred in various low elevation areas (e.g., Lynx and hare) characteristic of their most favored habitats.

The results of winter track surveys and wildlife habitat assessment indicate that there is relatively little winter habitat use by caribou within the Project area. Caribou use of the Project area is likely confined to incidental late spring, summer and fall use for foraging and travel to and from wintering grounds. No critical caribou habitat use is suspected within the Project area. In addition, due to scarcity of tracks in the area, there are very few ungulates that use the Mt. Davidson (Project) area in the winter.

On the winter track surveys, the most common species detected was moose which comprised over 59% of the tracks detected on the surveys. The high abundance of browse shrub species along riparian areas and wetlands accounts for the high occurrences of winter moose use within the study areas.

The next highest abundance of tracks identified during the survey was snowshoe hare, which compromised 15% of the tracks detected during the surveys. The abundance of hare is indicative of a healthy prey base for their predators within the Project area. This conclusion is supported by the occurrences of lynx along the study areas, a total of 6 groupings (8%) of the total tracks noted during the surveys.

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Appendix I – Proposed Project Mine Site (Mt Davidson) Overview Study Area Wildlife Habitat and Track Observations

Description	Transect	zone	Easting	Northing
moose tracks	1	10U	365419	5895677
moose tracks	1	10U	366876	5894880
furbearer tracks	1	10U	371628	5892638
grouse sighting	1	10U	378625	5887854
moose tracks	1	10U	379314	5887427
moose tracks	2	10U	381170	5888793
moose tracks	2	10U	379807	5890398
moose tracks	2	10U	378577	5891003
furbearer tracks	2	10U	376411	5891842
snowshoe hare tracks	2	10U	376137	5891946
moose tracks	2	10U	372579	5894765
snowshoe hare tracks	3	10U	368763	5898751
grouse sighting	3	10U	368942	5898645
snowshoe hare tracks	3	10U	369793	5898185
snowshoe hare tracks	3	10U	370218	5897958
moose tracks	3	10U	372563	5896725
moose tracks	3	10U	376250	5894778
moose and furbearer tracks	3	10U	377103	5894236
lynx and snowshoe hare tracks	3	10U	378875	5892192
lynx tracks	3	10U	379447	5891697
moose tracks	3	10U	382524	5889719
furbearer tracks	4	10U	382215	5891916
lynx tracks	4	10U	378187	5894716
snowshoe hare tracks	4	10U	376863	5895617
furbearer tracks	4	10U	376228	5896018
moose tracks	4	10U	374924	5896829
snowshoe hare tracks	4	10U	372087	5898984
snowshoe hare tracks	4	10U	370852	5900033
moose tracks	4	10U	370485	5900302
furbearer tracks	4	10U	369801	5900495
moose tracks	4	10U	369118	5900689
unidentified ungulate tracks (most likely moose)	5	10U	368505	5902333
moose tracks	5	10U	369904	5902064
moose tracks	5	10U	370306	5901906
moose tracks	5	10U	372147	5900789
lynx tracks	5	10U	374055	5899766
moose tracks	5	10U	375743	5898832
moose tracks	5	10U	380710	5896183

moose tracks	5	10U	380991	5895955
moose tracks	5	10U	381314	5895641
moose tracks	5	10U	381995	5894735
moose tracks	5	10U	382435	5894201
moose tracks	5	10U	382742	5893854
moose tracks	5	10U	384303	5892024
moose tracks	6	10U	385498	5892721
moose tracks	6	10U	384895	5893266
moose tracks	6	10U	384640	5893515
moose tracks	6	10U	384012	5894145
unidentified carnivore (wolf?)	6	10U	381973	5896106
moose tracks	6	10U	381179	5896770
furbearer tracks	6	10U	380681	5897169
lynx tracks	6	10U	380206	5897588
moose tracks	6	10U	379314	5898334
moose tracks	6	10U	379041	5898557
moose tracks	6	10U	378144	5899303
snowshoe hare and furbearer tracks	6	10U	376873	5900418
moose tracks	6	10U	376395	5900851
moose tracks	6	10U	375136	5902038

Appendix II – Proposed Transmission Line Routes Study Area Wildlife Habitat and Track Observations

Description	Transmission line section	zone	Easting	Northing
moose tracks around Sinkut lake	Option 1	10U	434120	5973215
moose tracks	Option 1	10U	433900	5963529
moose tracks in woods and on road	Option 1	10U	416883	5940342
moose tracks in woods and on block road	Option 1	10U	413345	5940564
moose tracks on road	South	10U	408564	5939307
carnivore and moose tracks around lake outflow	South	10U	408539	5936795
ungulate tracks crisscrossing woods and roads	South	10U	406003	5936586
ungulate tracks in woods and on road	South	10U	399709	5930392
lynx tracks	Option 2	10U	411511	5951648
moose tracks	Option 2	10U	411516	5951881
lynx tracks	Option 2	10U	411335	5956640
moose + possible deer tracks	Option 2	10U	412975	5963746
moose tracks – high concentration	Option 2	10U	413168	5964411
moose tracks	Option 2	10U	416833	5970234
moose tracks	Option 2	10U	416820	5971163
moose tracks	Option 2	10U	416858	5973579
moose tracks	Option 2	10U	415222	5975366
moose sighting	Option 2	10U	413703	5975879
moose tracks	Option 2	10U	411795	5976491
moose and furbearer tracks	Option 2	10U	410905	5980418
moose tracks	Option 2	10U	409142	5981984

Annex 4
2012 Furbearer and Ungulate Winter Track Survey

ECOFOR
natural and cultural resource consultants

Blackwater Gold Environmental Assessment
Furbearer and Ungulate Winter Track Survey

Date: December 5th , 2012

Project No.: 2012-2071-16

Prepared for:

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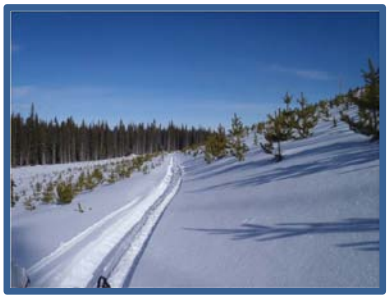

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1 INTRODUCTION

1.1 PROJECT SUMMARY

The Project consists of a proposed open pit, hard rock gold mine and associate infrastructure. The mine and much of the infrastructure such as camps and waste sites will be located in the subalpine on the north side of Mount Davidson, with the access road and power transmission line heading north to join Highway 16 near Vanderhoof. The primary effects on furbearer habitat will be complete removal of habitat in the primary mine development area, a relatively small amount of removal of habitat through access road development, and clearance of forest beside roads and for the power transmission line. The primary effects on ungulate winter habitat will be the removal of trees that provide cover for Moose, and cover and food for Northern Caribou.

1.2 SETTING

The Blackwater Gold Project (Project) of New Gold Inc. is located approximately 160 km south of Vanderhoof, British Columbia. The Project area is focused on the headwaters of Davidson Creek, on the north side of Mount Davidson. To the south of Mount Davidson is the upper Blackwater (West Road) River watershed, with the First Nations village of Kluskus about 35 km to the southeast of the Project. Road access to the Project is from Vanderhoof via the Kenny Dam Road and the Kluskus Forest Service road to 146.1 km by the road markers; the Blackwater Camp road is then an additional 17 km in length. The Project area consists of a predominantly forested subalpine exploration area, with small non-forested wetlands. Lower elevation areas are present in parts of the Local Study Area (LSA) and Regional Study Area (RSA).

1.3 ECOSYSTEMS AND VEGETATION

The varied topography of the study area results in a variety of Biogeoclimatic Ecosystem Classification (BEC) subzones and variants being present. Mount Davidson has BAFAun (Boreal Altai Fescue Alpine Undifferentiated subzone) at the highest elevations, which is alpine tundra with scattered patches of stunted conifers. Below that is the BAFAmvp (BAFA moist very cold parkland subzone), which is alpine meadows with some short white spruce and pine (lodgepole and white bark) trees. Most of the exploration area is within the ESSFmv1 (Englemann Spruce - Subalpine Fir moist very cold subzone, Nechako variant), which is mostly dense white spruce forest with some lodgepole and white bark pine. The lower edge of the exploration area is dominated by the SBSmc3 (Sub-boreal Spruce moist cold subzone, Kluskus variant),which is dominated by lodgepole pine and spruce. The transmission line passes through that area and the SBSdk (Sub-boreal Spruce dry cool subzone), which again is dominated by lodgepole pine and spruce forest. The southwest edge of the Project, along the access road has the

SBSdw2 (Sub-boreal Spruce dry warm subzone, Blackwater variant), and the SBPSmc (Sub-boreal Pine - Spruce moist cold subzone), both of which are dominated by lodgepole pine and spruce forests.

The topography is generally rolling at lower elevations, with shallow valleys cut by the major streams. The higher elevations are north-aspect moderate to steep slopes within the study area. There are occasional naturally non-forested grass/shrub habitats on southerly aspect steep dry slopes below the ESSF. There are numerous clearcuts in various stages of regeneration in the SBS and SBPS, with an associated network of forest industry roads. Non-forested wetlands are present, but comprise a low proportion of the landscape.

1.4 OBJECTIVES

Baseline surveys were designed to investigate the terrestrial and wetland furbearer communities, within and near the Project area. Specific objectives were to:

- Determine the presence and distribution of furbearer species, especially Species at Risk;
- Determine winter presence and distribution of Northern Caribou in the area, and their habitats.
- Assess the potential impacts of Project developments on furbearer Species at Risk and on Northern Caribou.

Baseline track count surveys were done for furbearers and ungulates in March 2012 to achieve these objectives.

1.5 FURBEARER SPECIES

Inventory of furbearers, with emphasis on Species at Risk, is an important component of the baseline studies component of Environmental Assessments, such as for the current Project. The Project area includes the access road, power transmission line, and exploration area. There are historical records for furbearers within the study area, as well as historical trapline data. Special consideration is needed for any any Species at Risk present in the study area. The furbearers potentially in the study area are given in Table 1.

Table 1. Blackwater Winter Furbearers - Potential Species

ENGLISH NAME	SCIENTIFIC NAME	BC CONSERVATION RANKING
Canada Lynx	*Lynx canadensis*	S5
Coyote	*Canis latrans*	S5
Fisher	*Martes pennanti*	S2S3
Grey Wolf	*Canis lupus*	S4
Pine Marten	*Martes americana*	S5
Red Fox	*Vulpes vulpes*	S5
Red Squirrel	*Tamiasciurus hudsonicus*	S5
Snowshoe hare	*Lepus americanus*	S5
Weasel Species	*Mustela spp.*	S5
Wolverine	*Gulo gulo luscus*	S3

Concentrations of furbearers, or lack thereof, are indicators of forest health and diversity. Generally, the greater the diversity of structure and tree species in the forest stand, the greater the diversity of wildlife due to the greater diversity of habitats. The study area footprint is relatively homogenous with respect to wildlife habitats; hence the same species should occur over most of the area. There were no tracks of Fisher, which are a Species at Risk potentially in the area, found; hence it is not discussed further.

Wolverine is the only furbearer Species at Risk with tracks found in the study area. Wolverine have a provincial rank of S3, are on the BC "blue list", are Identified Wildlife in BC, and the western Canada population is listed as nationally of Special Concern by the *Committee on the Status of Endangered Wildlife in Canada* (COSEWIC) [1]. The Wolverine is also listed by the World Conservation Union (IUCN) as being of concern. The conservation rankings indicate that Wolverine are not endangered or threatened, but are of special concern because without appropriate management they may become threatened. Wolverine have extremely large home ranges of 230-1580 km^2 (males) and 50-400 km^2 (females), prefer pristine forest or alpine habitats, and avoid development areas that have high concentrations of humans and major road networks.

1.6 UNGULATE SPECIES

The only ungulates potentially present in the winter in the study area are Northern Caribou, Moose and Mule Deer (Table 2). Of these, only Northern Caribou are a Species at Risk.

Ungulate tracks were recorded during the field work to determine if any Northern Caribou from the Tweedsmuir/Entiako herd were using the area during the winter. Northern Caribou have a provincial rank of S3, are on the BC "blue list", are Identified Wildlife in BC, and the Tweedsmuir/Entiako herd is part of a population listed as nationally Threatened by the *Committee on the Status of Endangered Wildlife in Canada* (COSEWIC) [2]. The herd is part of a larger group of populations that is listed under the national *Species at Risk Act* as Special Concern. This is the extreme eastern edge of the critical winter habitat (designated ungulate winter range) of the Tweedsmuir/Entiako Northern Caribou herd. There is historical telemetry data of a few occurrences of Tweedsmuir/Entiako Caribou on the western edge of the mine footprint, but no sightings or signs of Northern Caribou have been recorded on the Blackwater mine footprint since the start of the environmental assessment in 2011.

[1] COSEWIC. 2003. COSEWIC assessment and update status report on the wolverine *Gulo gulo* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vi + 41 pp.
British Columbia Ministry of Water, Land and Air Protection. 2004. Accounts and Measures for Managing Identified Wildlife. Version 2004. Biodiversity Branch, Identified Wildlife Management Strategy, Victoria, B.C.

[2] COSEWIC. 2002. COSEWIC assessment and update status report on the woodland caribou *Rangifer tarandus caribou* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xi + 98 pp.
British Columbia Ministry of Water, Land and Air Protection. 2004. Accounts and Measures for Managing Identified Wildlife. Version 2004. Biodiversity Branch, Identified Wildlife Management Strategy, Victoria, B.C.
Environment Canada. 2012. Management Plan for the Northern Mountain Population of Woodland Caribou (*Rangifer tarandus caribou*) in Canada. Species at Risk Act Management Plan Series. Environment Canada, Ottawa. vii + 79 pp.

Table 2. Blackwater Winter Ungulate Species - Potential Occurrence

ENGLISH NAME	SCIENTIFIC NAME	BC CONSERVATION RANKING
Moose	*Alces alces*	S5
Northern Caribou	*Rangifer tarandus caribou*	S3 [nationally threatened]
Mule Deer	*Odocoileus hemionus*	S5

2 METHODS

2.1 TRANSECT TRACK SURVEYS

A total of 15 wildlife track count transects were surveyed from March 12 - 16, 2012 by Ecofor Consulting Ltd. (Ecofor). The project study area was classified by four broad forest cover categories -- immature coniferous, mature coniferous Pl (lodgepole pine leading), mature coniferous Sw (white spruce leading), mature coniferous Bl (sub-alpine fir leading). Representative track surveys were conducted through each forest type, with transects often including more than one forest type; for example, the camp road transect crossed four different forest types. Transects were carried out on existing road surfaces, mineral exploration trails and trapline/guiding trails; where necessary snowshoes were used when snowmobile access was not possible. One alpine survey was undertaken -- the hard windblown snowpack did not show tracks well, but tracks were present at lower elevations within forest cover.

Transects were established on the ground at identifiable starting points (usually road junctions) and the survey was conducted to the end of the trail or when the trail left the project study area. Transect start and end points were recorded, as well as the tracks encountered on each transect. Efforts were made to separate individuals amongst each species. The exception to this was with snowshoe hare and red squirrel; both of which were consistently found in high densities throughout the study area. When hare or squirrel tracks were observed in high numbers (i.e. 20-40m apart) they were grouped (i.e. 8 individuals over 30m); if the tracks could not be differentiated between individuals they were recorded as numerous in that area, and six was recorded for that species number entry. If hare or squirrel tracks were in high densities throughout the transect, it was noted in transect notes; window two of the Blackwater Wildlife Transect Excel spreadsheet (Appendix 5-2). If ungulate tracks were too old to identify, then 'unknown ungulate' was recorded in the track notes.

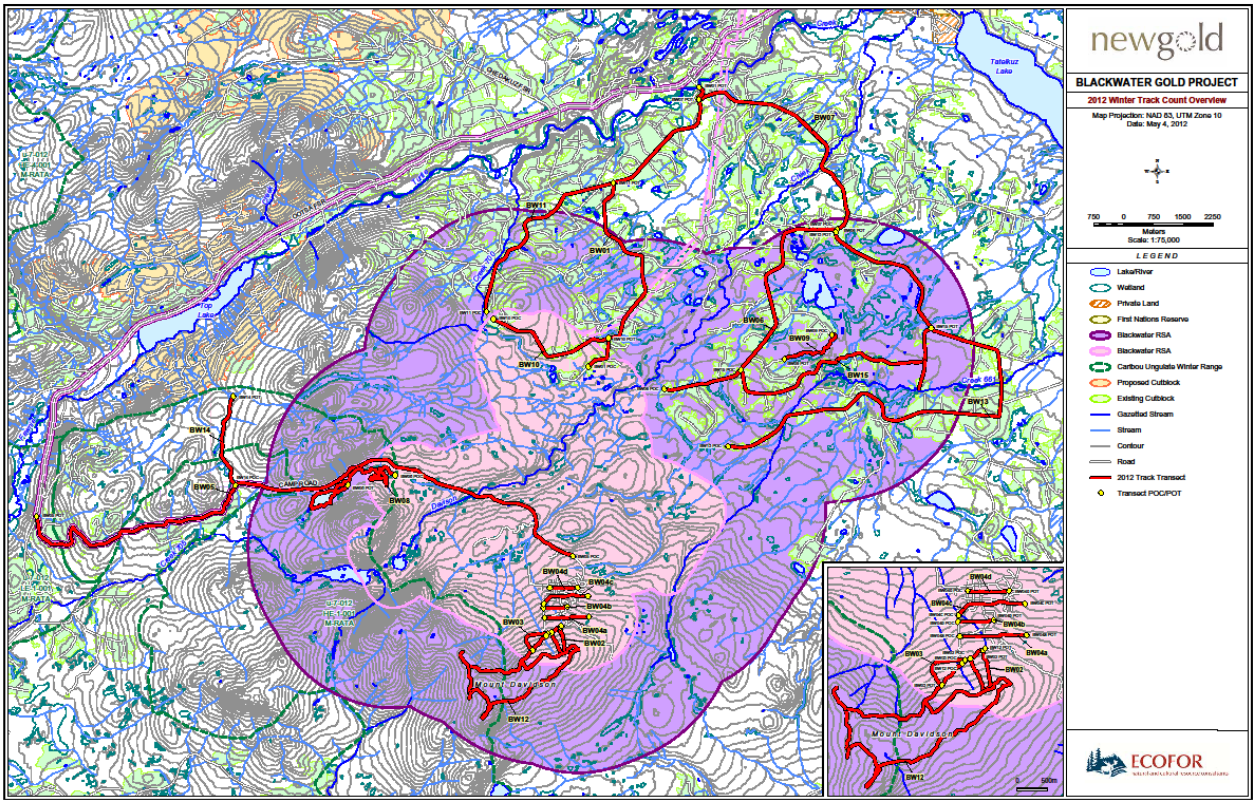
2.2 TIMELINES

There were five field inventory days, or part days, in total – March 12 to 16, 2012. The last day was not a full day, due to demobilization. There were no new snowfalls during this time period; tracking should not be done until at least 24 hours after a snowfall, to provide a time interval that allows animals to

leave tracks while moving around to forage or travel. Snow conditions were good for tracking, other than the high elevation alpine habitat that was wind-blown and quite compact.

Species tracks were recorded in all four leading forest cover types and species records and transect start/end points are geo-referenced and are presented on the winter 2012 survey overview map (Figure 1). Representative photographs for the tracks of each species encountered during the track surveys are provided in the photo documentation section of the report (Appendix 5-1).

Figure 1. Blackwater 2012 Winter Track Survey Overview Map



3 RESULTS AND DISUSSION

There were a total of 15 wildlife track survey transects covering all major habitat types affected by the proposed mine footprint, totaling 97.4 km in length. In the project study area, four broad forest cover categories were surveyed. Mature and immature pine were the largest components, totaling 35.1 km and 34.5 km respectively; mature sub-alpine fir leading totalled 21.3 km; and mature white spruce totalled 6.5 km (Appendix 1). A total of 9 species were identified during the winter tracking surveys. Of the furbearers potentially present (Table 1), no Fisher or Grey Wolf tracks were found. Tracks of Moose were the only ones found of the three ungulates potentially present (Table 2).

A total of 1052 track sets were recorded throughout the mine footprint (Table 3). The most abundant species were Snowshoe Hare, Red Squirrel, Weasel species, Moose, and Canada Lynx. The immature pine forest cover polygon had the highest number of tracks, with mature pine polygon the next highest. The mature spruce and sub-alpine fir habitats had relatively few tracks (Table 3).

Table 3. Winter Track Survey - Habitat Use by Species

Forest Type	Snowshoe Hare	Red Squirrel	Weasel species	Pine Marten	Canada Lynx	Wolverine	Red Fox	Coyote	Moose	Unknown Ungulate	Grouse species	Small Mammal	TOTALS
Immature Coniferous - Pine	510	34	14	1	19	--	--	2	16	7	2	8	613
Mature Coniferous - Pine	188	48	16	7	10	1	--	8	15	5	4	5	307
Mature Coniferous - Spruce	55	14	3	3	2	1	--	2	1	1	2	1	85
Mature Conferous - Sub-alpine Fir	38	7	8	1	4	--	1	3	2	2	--	1	67
TOTALS	791	103	41	12	35	2	1	15	34	15	8	15	1072

The abundance of each species differed between transects, with some species being absent from some transects (Table 4). A total of 6 species (snowshoe hare, red squirrel, weasel spp., coyote and red fox) were recorded along the higher elevation sub-alpine fir transects: BW-02, 03, 12 and BW 4a-d, above the proposed mine footprint on Mount Davidson (transect descriptions found in Transect notes tab; Blackwater Wildlife Transect Notes in Excel Spreadsheet in Appendix 5-2). Generally this higher elevation portion had lower concentrations of furbearers than lower elevation transects. This was partially due to the hard wind-swept snow not showing tracks, and the open topography may not have provided enough cover for some species.

Three transects, BW-05, BW-08 and BW-14 were completed in close proximity to the mine site. The BW-05 transect was done on the camp road, while BW-08 and 14 were carried out in pristine timbered areas. Transect BW-08 was done from snowmobile in the riparian habitat bordering the camp road from approximately 8 km to 10.5 km. Transect BW-14 was done perpendicular to camp road at approximately 6.5 km, this transect was done while snowshoeing a drainage through the forest.

Transect BW-05 had a total of 8 species (snowshoe hare, red squirrel, weasel spp., pine marten, coyote, lynx, moose and unknown ungulate) present along this road transect. Snowshoe hare were the most numerous species present and coyote were present along the whole transect. Coyotes are opportunistic foragers and become quite habituated to human activities, often traveling roadways as they forage. This

is due in part for ease of travel and for any chance scavenging of human refuse or road kills. There was greater sign of ungulates and moose at lower elevations along the road where snow levels were lower and more habitat was available. Transect BW-05 had low numbers of weasel, red squirrel and pine marten, which was likely due to road traffic and the wide road right of way, which would expose them to predators as they crossed. On transects BW-08, BW-14 (timbered transects) weasel, red squirrel and marten numbers were substantially higher and consistent throughout the transect extent. Both of these transects were either close to the road or at right angles to the road with numerous weasel tracks present; which did not cross the camp road at these locations.

Table 4. Winter Track Survey - Transect Use by Species

SPECIES	NUMBERS	TRANSECT ID
Snowshoe hare	791	All transects except BW-04b
Weasel Species	41	BW-01,02, 05, 06, 07, 08, 10, 11, 13, 14 and BW-15
Pine Marten	12	BW-05, 07, 08, 10, 11, 14 and BW-15
Wolverine	1	BW-13
Red Squirrel	103	All transects except BW-04b
Red Fox	1	BW-02
Coyote	15	BW-04a, 4b, 4c, 4d, 05, 07, 08, 12 and BW-13
Canada Lynx	35	BW-05, 06, 07, 08, 09, 10, 11, 12, 13 and BW-15
Moose	37	BW-05, 06, 07, 08, 09, 10, 13 and BW-15
Unknown Ungulate	15	BW-05, 06, 08, 09, 10, 11 and BW-14

The remainder of the transects (BW-06, 07, 09, 10, 11, 13 and 15) were carried out along the Davidson Road networks south of the mine site in the Blackwater RSA. This area has had the most significant human impacts in the study area, with large portions of the area harvested by logging companies. Cut-blocks range in harvested age from 3 years old to > 25 years old, with the majority of the cut-blocks in the 20-25 year old range. These older cut-blocks had dense regenerating pine forests throughout, with some spruce along wetter drainages; roadways were usually intact with regenerating forests encroaching on the road. Mainline roads had wider right of ways (estimate 5-15m), while small roads to isolated blocks or spur roads had a 3-5m right of way as they were quickly being encroached by regenerating forest. All transects except BW-09 were along existing road networks throughout this harvested area. Transect BW-09 is located along a riparian zone in leave strips between existing cut-blocks.

A total of eight species were recorded for the transects in this lower Davidson Creek area. The species with the most abundant tracks were Snowshoe Hare and Red Squirrel, with their predators Canada Lynx, Weasel species, Pine Marten and Coyote. Moose tracks were also common, and Wolverine were present. There were some unidentifiable ungulate tracks recorded.

Snowshoe Hare numbers were consistent throughout the transects except in the fresh cut-blocks where the regenerating growth had not yet established itself. Snowshoe Hare numbers were higher in regenerating cut-blocks where canopy closure had occurred. In areas with high concentrations of hare there was also higher numbers of their Canada Lynx predators. In the dense mosaic of cut-blocks, hare and lynx were present throughout the cut-blocks, while most of the other furbearers and Moose used

the forested leave strips. Cut-blocks only have limited habitat potential for certain species, while the leave strips are the remaining polygons of untouched habitat. Leave strips often follow riparian areas, because these zones are protected from timber harvest. Therefore, the leave strips provide pockets of habitat in this highly impacted cut-block area, as well as acting as travel corridors for furbearers and ungulates as they move between the untouched habitat polygons. In one of these leave strips on transect BW-13, the only occurrence of wolverine tracks was found crossing the transect at three locations.

The lower Davidson road network had higher concentrations of Moose than the higher elevation mine footprint. Several factors may influence these numbers, there is a lower snowpack in this location, lower intensity of human activities, and better habitat potential. This lower elevation area had higher concentrations of wetlands occurring along stream riparian areas and there is a large wetland complex surrounding Snake Lake (centered between transects BW-06, 09, 13 and 15). There were no incidences of Grey Wolf found anywhere in the survey area, generally they will be found in locations where there are high numbers of ungulates present. If they to be found anywhere in the Project area it would have been in this lower Davidson area with the higher Moose numbers.

4 SUMMARY

Tracks of eight furbearer species and one ungulate were found during the Blackwater Gold 2012 winter track surveys. This represents the majority of furbearers potentially present in the area, except for Fisher and Grey Wolf, but only one (Moose) of the three potential ungulates. No tracks of Northern Caribou (ungulate Species at Risk) were found, but tracks of the furbearer Species at Risk, Wolverine, were found. Wolverine is provincially blue-listed and nationally special concern. The Northern Caribou herd is provincially blue-listed and nationally threatened, with the development area being on the eastern edge of an established caribou ungulate winter range.

Wolverine tracks were found in mature forest stands within the lower elevation area dominated by clearcuts (Transect BW13 on Map 4 in Appendix 3). The Wolverine tracks were likely of a single individual hunting in the area. Wolverine will generally not use the areas cleared of forest for the development, although they may hunt in such areas where they are immediately adjacent to mature forest. Use of mature forest in nearby areas may decrease where there is sound disturbance from development activities -- the greatest impacts will be near the mine development and actively used roads, while forests adjacent to much of the transmission line will be undisturbed during the winter.

The Tweedsmuir/Entiako Northern Caribou herd, was historically found in small numbers along western edge of the mine footprint in higher elevation habitats, with a few individual telemetry points recorded along the western edge of the Project area. The vast majority of this herd's designated ungulate winter range is in the area around Entiako Lake to the Nechako Reservoir, with smaller areas around Laidman Lake and the Fawnie Mountain Range. The actual mine footprint does not encroach on this winter range; hence the primary adverse effects will be noise disturbance resulting from the increased industrial activity and traffic associated with the mine. The eastern edge of the winter range is not high quality winter range, which is likely why no winter tracks were found.

5 APPENDICES

5.1 APPENDIX 1. PHOTO-DOCUMENTATION

2012 Blackwater Gold Project
Winter Track Counts

ECOFOR
natural and cultural resource consultants

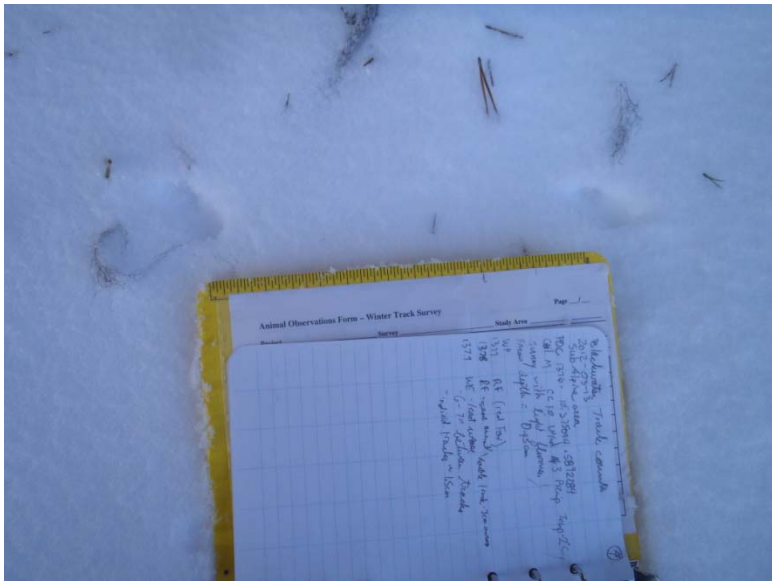
Date: March 13th 2012
Comments:
Sub-alpine habitat below Mount Davidson; habitat was open forest composed of pine , sub-alpine fir and spruce. Transects BW-02, BW-03 and BW-12 were in this habitat type.

Date: March 13th 2012
Comments:
Southwest view of open windswept alpine habitat on top of Mount Davidson.

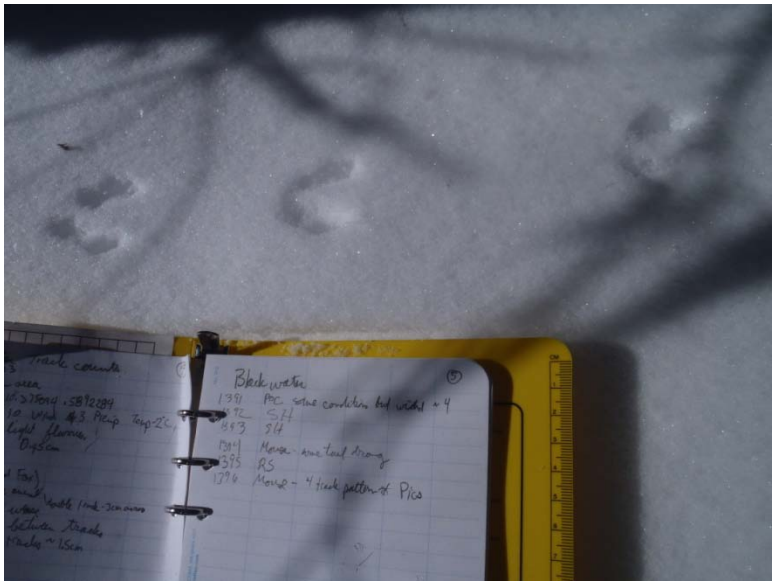
Date: March 13th 2012
Comments:
Northeast view of the alpine habitat from the top of Mount Davidson.

2012 Blackwater Project
Winter Track Counts

ECOFOR
natural and cultural resource consultants



Date: March 13th 2012
Comments:
Weasel tracks (Least weasel) observed in sub-alpine habitat on transect BW-02.



Date: March 13th 2012
Comments:
Small mammal tracks (mouse) observed in sub-alpine habitat on transect BW-02 and BW-03.

Date: March 13th 2012
Comments:
Pine marten tracks observed on transect 5 (camp road). You can see the offset prints of the two feet when they are jumping.

2012 Blackwater Gold Project
Winter Track Counts

ECOFOR
natural and cultural resource consultants

Date: March 14th 2012
Comments:
Moose pellets along a browse area along road margin on transect BW-06. Transect was largely composed of regenerating lodgepole pine cut-blocks with some mature coniferous leave strips interspaced.

Date: March 14th 2012
Comments:
Mature coniferous forested leave strip on transect BW-06.

Date: March 14th 2012
Comments:
Pine marten tracks walking; observed midway along transect BW-07.

2012 Blackwater Gold Project
Winter Track Counts

ECOFOR
natural and cultural resource consultants

Date: March 16th 2012
Comments:
Regenerating lodgepole pine largely composed habitat along transect BW-11. These cutblocks of this age had dense concentrations of hare tracks.

Date: March 16th 2012
Comments:
Start of transect BW-11; some of the cutblocks along this transect were logged in the last few years and were just starting to regenerate. These new cutblocks did not offer much habitat potential for furbearers as they are too open.

Date: March 16th 2012
Comments:
Weasel tracks going into slash pile; slash piles are often utilized for hunting small mammals by this species.

2012 Blackwater Gold Project
Winter Track Counts

ECOFOR
natural and cultural resource consultants

Date: March 16th 2012
Comments:
Snowshoe hare tracks were abundant along the regenerating cutblocks along transect BW-11; lynx tracks were also common as hare are their primary prey.

Date: March 15th 2012
Comments:
Weasel tracks along transect BW-08; there were profuse weasel tracks along this transect that bordered a riparian area.

Date: March 15th 2012
Comments:
Snowshoe hare tracks along riparian habitat on transect BW-08.

2012 Blackwater Gold Project
Winter Track Counts

ECOFOR
natural and cultural resource consultants

Date: March 15th 2012
Comments:
Transect BW-08 included the lake located south of the camp road at approximately 8 km.

Date: March 15th 2012
Comments:
Timbered habitat off wetlands on transect BW-14; this habitat closely resembled habitat on transect BW-08.

Wetlands bordered by upland forests composed of lodgepole pine, white spruce and sub-alpine fir with a limited understory.

Date: March 14th 2012
Comments:
Transect BW-13 habitat was composed of regenerating pine cutblocks and small remnant leave strips composed of white spruce, lodgepole pine. Hare tracks were abundant through cutblock areas, while the remainder of the other furbearers were usually present in the timbered leave strips.

2012 Blackwater Gold Project
Winter Track Counts

ECOFOR
natural and cultural resource consultants

Date: March 14th 2012
Comments:
Weasel tracks crossing road at timbered leave strip on Transect BW-13.

Date: March 14th 2012
Comments:
Moose tracks, beds and browse areas along leave strip on transect BW-13. Red squirrel tracks are present amongst moose tracks (note 4 track pattern when they hop).

Date: March 14th 2012
Comments:
Moose browsing along edge of road at timbered leave strip on transect BW-13. Moose numbers were noted in higher numbers along lower elevations of the Davidson Creek watershed.

2012 Blackwater Gold Project
Winter Track Counts

ECOFOR
natural and cultural resource consultants

Date: March 14th 2012

Comments:

The only occurrence of wolverine tracks were noted on transect BW-13 (most isolated area from mining activities). It first crossed at a creek crossing, then two more tracks were seen at lower elevations on transect BW-13 (likely same individual).

Date: March 14th 2012

Comments:

Wolverine tracks at creek crossing with handheld radio for scale. Red squirrel tracks also present around base of tree.

Date: March 14th 2012

Comments:

Small meadow located north of road on transect BW-13 (lower extent) ; moose tracks crossed road towards meadow.

2012 Blackwater Gold Project
Winter Track Counts

ECOFOR
natural and cultural resource consultants

Date: March 15th 2012

Comments:

Lynx tracks seen near the start of transect BW-15 (note size of track and how rounded the track is ; on canids' the front two toes form more of a point). Lynx tracks were evident where there was high concentrations of snowshoe hare.

Date: March 15th 2012

Comments:

Red fox observed on camp road near transect BW-08; individual was habituated to human contact showing no fear of humans. Canid tracks of both coyote and fox were abundant along roads, as they utilized the roadways for hunting and traveling. Tracks often followed roads for several kilometres.

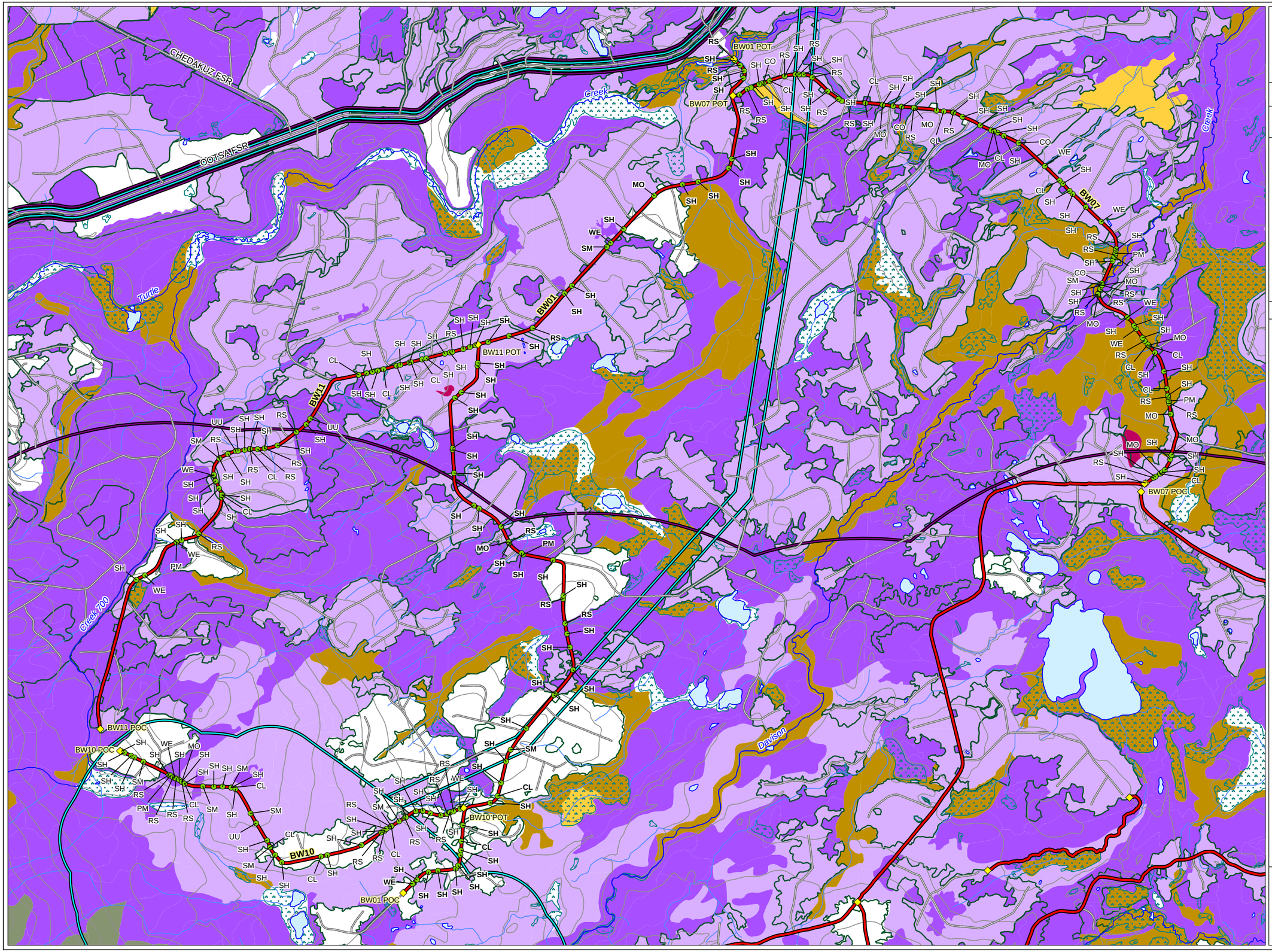
Date: March 15th 2012

Comments:

Snowshoe hare observed along transect BW-09. Hare tracks were by far the most prevalent track noted during the survey.

5.2 APPENDIX 2. WILDLIFE TRACK SURVEY NOTES - SEPARATE EXEL SPREADSHEET

5.3 APPENDIX 2. WILDLIFE TRACK SURVEY TRANSECT MAPS



newgold

BLACKWATER GOLD PROJECT

2012 Winter Track Count Survey
Track Number: BW01, BW07, BW10, BW11

Map Projection: NAD 83, UTM Zone 10
Date: May 4, 2012

300 0 300 600 900
Meters
Scale: 1:30,000

LEGEND

- Lake/River
- Wetland
- Blackwater RSA
- Blackwater LSA
- Caribou Ungulate Winter Range
- Cutblock
- Gazetted Stream
- Stream
- Contour
- Road
- 2012 Track Transect
- Transect POC/POT
- Wildlife Track Point

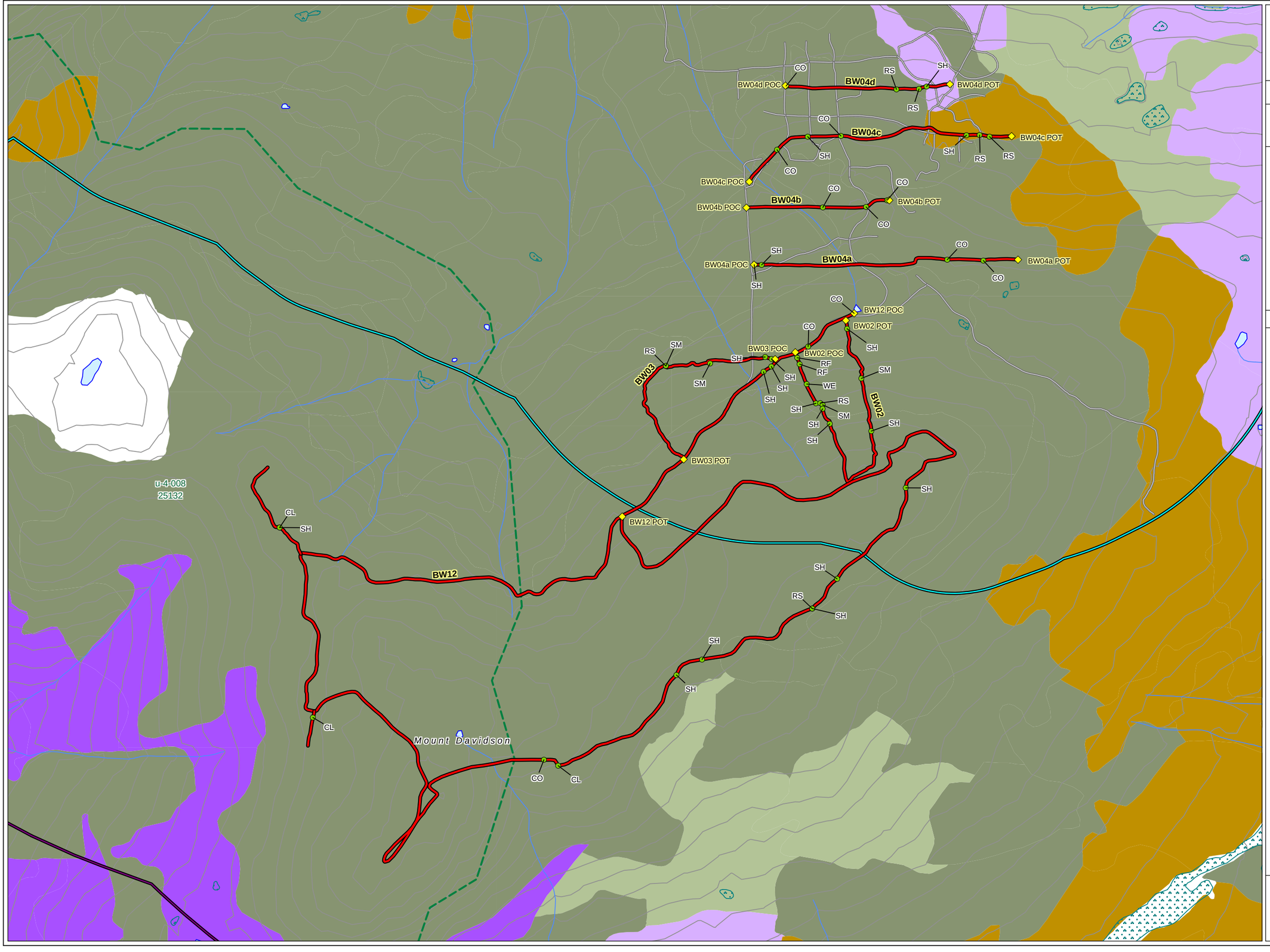
Forest Cover Information

- Immature Coniferous (Pine Leading)
- Immature Coniferous (Fir Leading)
- Immature Coniferous (Spruce Leading)
- Mature Coniferous (Pine Leading)
- Mature Coniferous (Fir Leading)
- Mature Coniferous (Spruce Leading)
- Deciduous Tree Species

Wildlife Identification

PM - Marten
MO - Moose
SM - Small Mammal (Rodents etc)
SH - Snowshoe Hare
RS - Red Squirrel
RF - Red Fox
CO - Coyote
WV - Wolverine
UU - Unknown Ungulate
WE - Weasel sp.
CL - Canada Lynx

ECOFOR
natural and cultural resource consultants



newgold

BLACKWATER GOLD PROJECT

2012 Winter Track Count Survey
Track Number: BW02, BW03, BW04a, BW04b, BW04c, BW04d, BW12

Map Projection: NAD 83, UTM Zone 10
Date: May 4, 2012

N
W E
S

150 0 150 300 450
Meters
Scale: 1:15,000

LEGEND

- Lake/River
- Wetland
- Blackwater RSA
- Blackwater LSA
- Caribou Ungulate Winter Range
- Cutblock
- Gazetted Stream
- Stream
- Contour
- Road
- 2012 Track Transect
- Transect POC/POT
- Wildlife Track Point

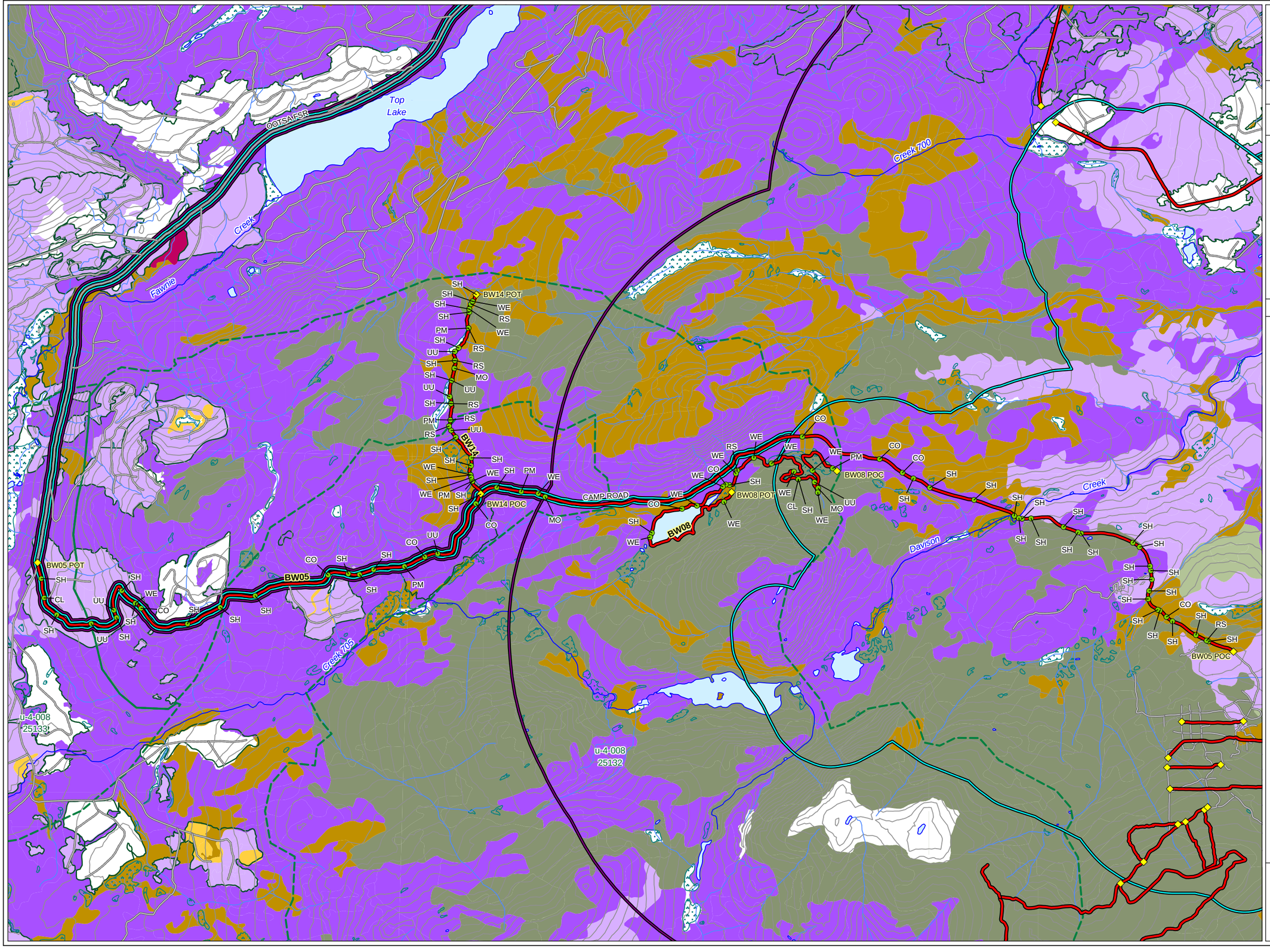
Forest Cover Information

- Immature Coniferous (Pine Leading)
- Immature Coniferous (Fir Leading)
- Immature Coniferous (Spruce Leading)
- Mature Coniferous (Pine Leading)
- Mature Coniferous (Fir Leading)
- Mature Coniferous (Spruce Leading)
- Deciduous Tree Species

Wildlife Identification

PM - Marten
MO - Moose
SM - Small Mammal (Rodents etc)
SH - Snowshoe Hare
RS - Red Squirrel
RF - Red Fox
CO - Coyote
WV - Wolverine
UU - Unknown Ungulate
WE - Weasel sp.
CL - Canada Lynx

ECOFOR
natural and cultural resource consultants



BLACKWATER GOLD PROJECT

2012 Winter Track Count Survey
Track Number: BW05, BW08, BW14

Map Projection: NAD 83, UTM Zone 10
Date: May 4, 2012

400 0 400 800 1200
Meters
Scale: 1:40,000

LEGEND

- Lake/River
- Wetland
- Blackwater RSA
- Blackwater LSA
- Caribou Ungulate Winter Range
- Cutblock
- Gazetted Stream
- Stream
- Contour
- Road
- 2012 Track Transect
- Transect POC/POT
- Wildlife Track Point

Forest Cover Information

- Immature Coniferous (Pine Leading)
- Immature Coniferous (Fir Leading)
- Immature Coniferous (Spruce Leading)
- Mature Coniferous (Pine Leading)
- Mature Coniferous (Fir Leading)
- Mature Coniferous (Spruce Leading)
- Deciduous Tree Species

Wildlife Identification

PM - Marten
MO - Moose
SM - Small Mammal (Rodents etc)
SH - Snowshoe Hare
RS - Red Squirrel
RF - Red Fox
CO - Coyote
WV - Wolverine
UU - Unknown Ungulate
WE - Weasel sp.
CL - Canada Lynx

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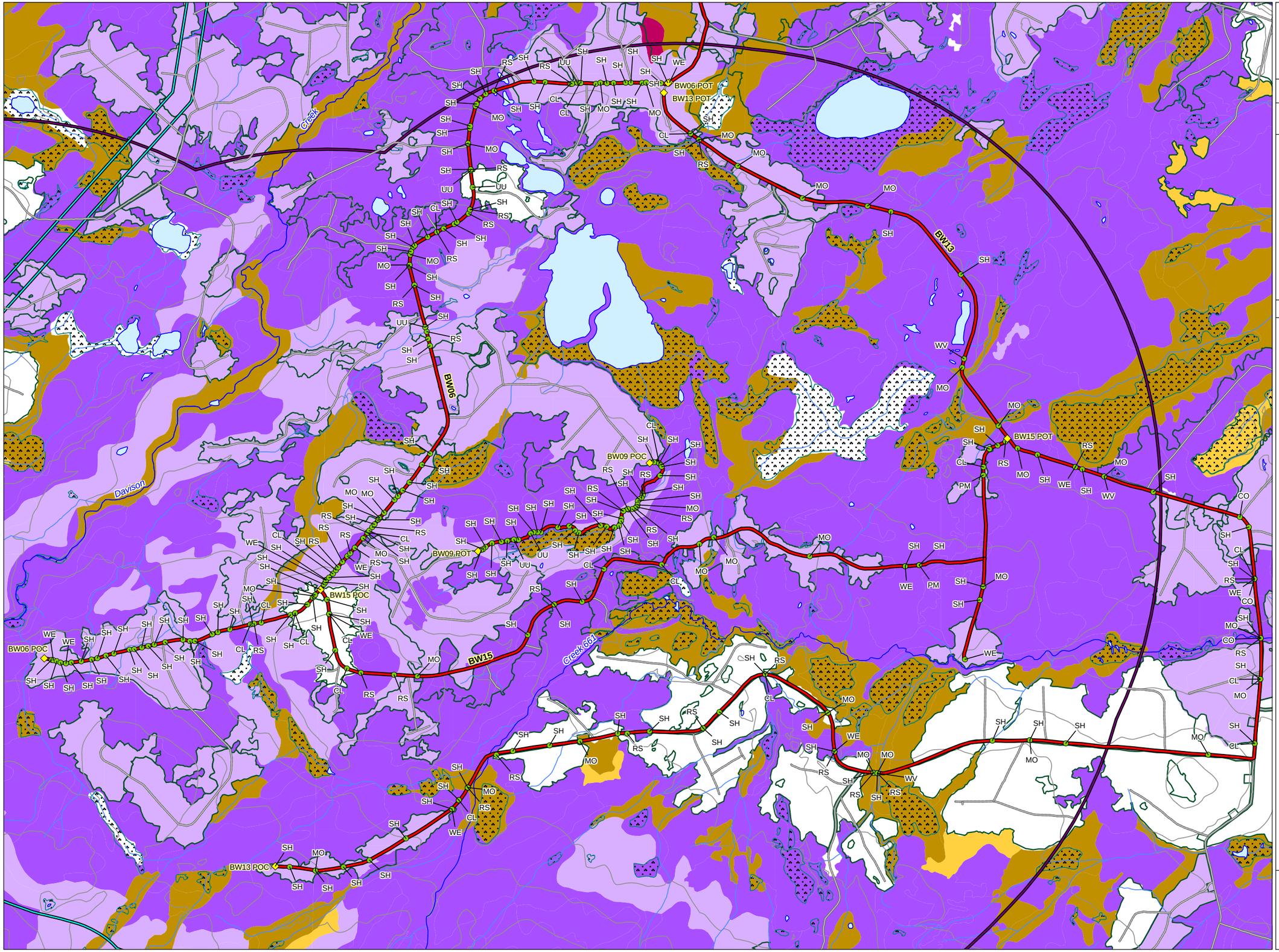

newgold

BLACKWATER GOLD PROJECT

2012 Winter Track Count Survey
Track Number: BW06, BW09, BW13, BW15

Map Projection: NAD 83, UTM Zone 10
Date: May 4, 2012

250 0 250 500 750
Meters
Scale: 1:25,000

LEGEND

- Lake/River
- Wetland
- Blackwater RSA
- Blackwater LSA
- Caribou Ungulate Winter Range
- Cutblock
- Gazetted Stream
- Stream
- Contour
- Road
- 2012 Track Transect
- Transect POC/POT
- Wildlife Track Point

Forest Cover Information

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Wildlife Identification

PM - Marten
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WV - Wolverine
UU - Unknown Ungulate
WE - Weasel sp.
CL - Canada Lynx

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Annex 5
Monitoring the Use of Kokanee Streams by Black and Grizzly Bears in the Blackwater Mine Development Area in 2012

MONITORING THE USE OF KOKANEE SPAWNING STREAMS BY BLACK AND GRIZZLY BEARS IN THE NEW GOLD BLACKWATER MINE DEVELOPMENT AREA

Shannon Crowley and Dexter Hodder
John Prince Research Forest
Ben Pittman
Avison Management Services Ltd.
28 November 2012

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EXECUTIVE SUMMARY

Kokanee (*Oncorhynchus nerka*) are a seasonally abundant food resource for wildlife but little information exists on the degree of use and importance to the diet of black and grizzly bears. The purpose of this document is to summarize results of surveys designed to monitor bear activity along kokanee spawning streams near the New Gold Mt. Davidson Mine Development Area southwest of Vanderhoof, BC. The objective was to determine if bears are feeding on kokanee salmon during the spawning period. Sign surveys were conducted by foot along kokanee spawning streams (Chedakuz Creek, Creek 661, and Davidson Creek) that intersect and are down stream of the proposed mine area. Fourteen remote cameras were deployed on these streams for eight weeks to monitor bear activity. A total of 13 scats were collected during sign surveys to investigate diet.

Our results suggest that grizzly bears in the study area are feeding on kokanee salmon. Numerous and frequent bear and other wildlife signs were observed along sections of Creek 661 and Chedakuz Creek. A total of 7 independent videos of 5 grizzly bears were captured by remote cameras on Creek 661 (2 bears) and Chedakuz Creek (3 bears). There were only small amounts of bear sign observed on Davidson Creek and no bears were captured by remote cameras. Black bears were not captured on video during the entire duration of the survey. Bear and other wildlife video captures decreased throughout the survey with most grizzly bear captures occurring the first week of the survey when kokanee were still present in streams. Kokanee salmon were present in several of the bear scats that were collected along the streams. The large amount of bear signs along streams coupled with the relatively large number of individual bears observed within a small area and short time period suggest that grizzly bears may be keying in on this seasonally abundant and easily accessible food source. Although bear were feeding on kokanee, the late start of our survey after the peak spawning period limits our ability to assess the degree of bear-kokanee interactions. We recommend that additional data be collected next year during the entire spawning period to include pre-, during-, and post-survey efforts.

1.0 PURPOSE

The purpose of this document is to summarize results of surveys designed to monitor bear activity along kokanee spawning streams in the New Gold Mt. Davidson Mine Development Area. This project is in response to a request by the Provincial Government to determine if bears are feeding on Kokanee in creeks located downstream from the proposed New Gold Mine south of Vanderhoof, B.C.

2.0 INTRODUCTION

During spawning, kokanee (*Oncorhynchus nerka*) can be a seasonally abundant food resource for wildlife but little information exists on the degree of use and importance to populations of black and grizzly bears (*Ursus americanus and Ursus arctos*, respectively). Many studies have documented the importance of Pacific salmon to both individuals and populations of grizzly and black bears (Belant et al 2008, Gende and Quinn 2004, Hilderbrand et al 2004, Levi et al 2012). The relationship between pacific salmon and bears is often referred to as a keystone interaction due to the positive impacts of nutrient transport into the terrestrial environment (Helfield and Naiman 2006, Hilderbrand et al 2004). In general, salmon tend to be a predictable, dependable, concentrated, and accessible resource that is high in protein and energy. The timing of salmon spawning is often during an ecologically important time period for bears when they accumulate energy reserves for hibernation and cub production (Hilderbrand et al 2004). Although the use of the smaller kokanee salmon as a food source by bears in not well understood, kokanee share many similar characteristics in their annual life cycle with other salmon species. The use of this food resource by black and grizzly bears in the New Gold Mt. Davidson Mine Development Area is not known. This project aims to monitor the use of kokanee spawning streams as a food resource by both black and grizzly bears in the vicinity of the New Gold Mt. Davidson Mine Development Area.

3.0 METHODS

3.1 STUDY AREA

The study area is located approximately 100 km SSW of Vanderhoof, BC and several kilometers west of Tatelkuz Lake (53°13’56.2 N, 124°40’09.6 W). Surveys were conducted on Davidson Creek, Creek 661, and Chedakuz Creek that flow into Tatelkuz Lake. The survey area is located approximately 12 km NE of the New Gold Mt. Davidson Mine Development Area (Figure 1).

3.2 SURVEYS

Sign surveys were conducted by foot along streams on September 12, 14, and 19, 2012. Sections of Creek 661 and Chedakuz Creek were surveyed on all three dates while sections of Davidson creek were surveyed on September 14 and 19 only. Survey sections were selected based on the results of kokanee spawning surveys conducted in 2011. Stream reaches where the largest numbers of kokanee and redds were observed in the past were prioritized for surveys of bear signs. Bear and other fish-eating wildlife signs were recorded for all stream sections walked. Bear signs recorded included: tracks, scat, compressed vegetation along stream edges, and digging in banks. The presence of Kokanee salmon in the streams was also recorded. Survey crews included Shannon Crowley and Dexter Hodder from the John Prince Research Forest and Ben Pittman and Kristin Rasmus from Avison Management.

Cameras were set along stream banks to capture video of bears and other wildlife. Camera placement was prioritized based on identified kokanee spawning areas and game trails adjacent to the streams. Camera locations likely capture the same bears active along creeks as bears have large ranges and independent sample sites are not as important as covering a cross section of habitat areas used by bears. Cameras used on the survey included Bushnell HD video/still cameras (10 cameras; Model119477) and Moultrie Game Spy video/still cameras (4 cameras; Model I-65). All cameras were set to take 30 seconds of video when tripped. Moultrie cameras also took a still photo coupled with each video. Eight cameras were deployed on September 12th (Creek 661, Chedakuz Creek), 5 cameras on September 14th (Creek 661, Chedakuz Creek, and Davidson Creek), and 1 camera on September 19th (Creek 661). A total of 2 cameras were set on Davidson Creek, 6 cameras on Creek 661, and 6 cameras on Chedakuz Creek (Figures 2 and 3). All cameras were checked on October 4th to download data and change batteries. Cameras on Davidson creek were removed on October 4th due to excessive activity from cows along the creek. All other cameras were checked and removed from the field on November 6th.

All bear scat found during sign surveys were collected, labeled, and frozen. Scats were washed and hard parts were dried and identified at a coarse scale (i.e. vegetation, hair, and fish).

4.0 RESULTS

4.1 SIGN SURVEYS

Numerous and frequent bear as well as other wildlife signs were observed along sections of Creek 661 and Chedakuz Creek (Figure 2). Areas of high bear activity were characterized by multiple observations of tracks, scat, and/or trampling of vegetation. In addition, there were numerous instances of bears digging into the banks near the water line. High activity sections also contained multiple signs of other wildlife species that feed on live and/or dead fish. Other wildlife sign included tracks and scat of coyotes (*Canis latrans*), river otter (*Lontra canadensis*), and mink (*Neovison vison*) as well as scat and feathers of bald eagles (*Haliaeetus leucocephalus*). Besides bear activity, eagle signs along the streams were particularly numerous in sections. Areas of low bear activity contained isolated observations of bear signs and other wildlife. All areas surveyed along Davidson creek as well as portions of Creek 661 and Chedakuz Creek were categorized as low bear activity (Figure 2 and 3). There were less than 20 observations of live or recently dead kokanee in Creek 661 and Chedakuz Creek. No kokanee were observed in Davidson Creek. All kokanee observations were in areas that also had high bear activity.

4.2 REMOTE CAMERAS – BEARS

The majority of cameras were deployed for 8 weeks for a total of 643 camera/capture nights. All video cameras functioned throughout the duration of the survey. However, one camera was intentionally shut off for unknown reasons by a crew conducting a survey unrelated to this study (Camera #9).

A total of 7 independent videos of grizzly bears were captured by remote cameras (Appendix A). Using identifiable characteristics such as size, age, unique markings, and pelage color we were able to identify a minimum of 5 individual bears; lean individual (Video 1, Grizzly Bear 1), cub and sow (Video 2, Grizzly Bears 2 and 3), large brown individual with identifiable mark on hindquarters (Video 3 and 4, Grizzly Bear 4), and dark pelage individual (Video 5 and 6, Grizzly Bear 5). Video 7 is most likely the same individual as Videos 3 and 4 but the quality of the night

video does not allow for a reliable identification. An eighth video of the same sow and cub was also recorded but in immediate succession to the first video capture of this pair and was not considered an independent event. In Video 2, the cub is observed feeding on a fish. The fish is most likely a kokanee salmon given the size as well as fish species known to be present in the stream at the time of the survey.

Six out of 7 videos of grizzly bears were taken within the first week of deploying cameras (Figure 5). The remaining video of a bear was taken during the second week of the camera survey. There were no videos of grizzly bears taken during the third to eighth week of the survey. All videos of bears were from areas that were categorized as high activity measured from sign surveys. There were no videos of black bears taken for the duration of the survey. Videos of bears were on Creek 661 (3 videos, 2 grizzly bears) and Chedakuz Creek (4 videos, 3 grizzly bears).

4.3 REMOTE CAMERA – OTHER WILDLIFE

There were a total of 34 video captures of other wildlife that feed on live/dead fish including; 20 coyote videos, 10 otter videos (total of 26 individual otters observed in videos), and 4 raven videos. Other wildlife captured on video ($\leq$ 2x) included: deer, moose, grouse, wolf, and gray jays. The majority of wildlife video captures occurred earlier in the survey. All fish-eating wildlife sightings (including bear) displayed a decreasing trend as the survey continued from mid-September to early November (Figure 6).

4.4 SCAT - BEARS

A total of 13 bear scat were collected during walking surveys along streams (Figure 4). Four of 13 collected scat contained fish remains. Although fish species were not identified, vertebrae sizes were consistent with spawning kokanee. One scat contained mammal remains (hair and claws) that is most likely the remains of a small bear. The remaining scat contained berries, leaves, and grasses.

5.0 DISCUSSION

Although our intent was to measure changes in bear activity throughout the kokanee spawning season, our survey start date was too late to capture the entire duration of spawning activity. Cameras were not deployed several weeks before the start of the season or during the peak of spawning activity. Surveys started on September 12th at the very end of the kokanee spawning period which allowed us to observe the later stage of the spawning cycle. Although we did miss the peak in kokanee activity, we did observe a decreasing trend in bear and other wildlife activity along streams as time progressed away from mid-September.

There are several lines of evidence from our results to suggest that grizzly bears in the study area are feeding on kokanee salmon that include:

1) An unusually high amount of bear signs were observed in areas along streams where kokanee salmon had spawned in the past and/or observations of kokanee existed from this year (i.e. live fish and/or carcasses). Although surveys a week later (September 19th) detected bear signs along streams, the signs had already started to dissipate indicating

very little new sign was accumulating along streams when kokanee were absent from the stream system.

2) Bear and other wildlife video captures decreased throughout the survey with almost all of the bear captures occurring the first week of the survey when kokanee were still present in the streams.
3) A grizzly bear cub was observed feeding on a fish in the stream; most likely a kokanee salmon given the size as well as species known to be present in the stream at the time of the survey.
4) There were many instances of bears digging into the banks at the stream edge consistent with observations of grizzly bear feeding behavior for salmon species in other areas (pers. obs). Salmon may take cover under submerged bank edges to avoid predation.
5) Kokanee salmon were present in several of the bear scats that were collected along the streams.

The large amount of bear signs along streams coupled with the relatively large number of individual bears observed within a small area and short time period suggest that grizzly bears may be keying in on this seasonally abundant and easily accessible food source. Although black bears are known to be present in the general area of our monitoring efforts, no black bears were detected by video cameras. Several of the tracks observed were suspected to be black bears but could not be confirmed with certainty. Black bears may be displaced from high-quality resources by grizzly bears resulting in spatial segregation of the two species during this time. This situation has been observed in other areas where sympatric populations of the two species exist (Belant et al. 2010).

We recognize that we may have detected the same individuals of other wildlife species (coyotes, otters) on multiple cameras. We were only attempting to measure a general trend in wildlife activity, and multiple observations of the same individual would likely not change the overall pattern of activity that we observed.

5.1 RECOMMENDATIONS

Although our results suggest that bears are feeding on kokanee salmon, it is difficult to assess for how long and to what degree. The peak in kokanee spawning may be as early as mid to late August in this area. We recommend that additional data be collected in late summer/early fall 2013 during the entire spawning period including pre-, during-, and post-survey efforts. The late start of this season limits are ability to assess the degree of bear-kokanee interactions.

6.0 REFERENCES

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Gende, S.M., and Quinn, T.P. 2004. The relative importance of prey density and social dominance in determining energy intake by bears feeding on Pacific salmon. Canadian Journal of Zoology 82:75-85.

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Hilderbrand, G.V., Farley, S.D., Schwartz, C.C., and Robbins, C.T. 2004. Importance of salmon to wildlife: Implications for integrated management. Ursus 15:1-9.

Levi, T., Darimont, C.T., MacDuffee, M., Mangel, M., Paquet, P., and Wilmers, C.C. 2012. Using grizzly bears to assess harvest-ecosystem tradeoffs in salmon fisheries. PLoS Biology 10:e1001303.

Table 1. Wildlife captures by remote camera on Creek 661, Chedakuz Creek, and Davidson Creek from September 13 to November 6, 2012.

Camera#	Video ID#	Date	Time	Species	# Animals	Notes
CAM5	EK000005	16/10/2012	11:16	Bird	1	
CAM3	EK000005	13/09/2012	6:49	Grizzly Bear	1	Young, slim
CAM3	EK000010	15/09/2012	5:55	Grizzly Bear	1	butt patch
CAM4	EK000015	14/09/2012	20:47	Grizzly Bear	1	butt patch
CAM5	EK000004	13/09/2012	6:48	Grizzly Bear	2	Sow and cub- catching fish
CAM5	EK000005	13/09/2012	6:49	Grizzly Bear	1	Sow from previous
CAM5	EK000006	18/09/2012	15:21	Grizzly Bear	1	Black Pelage- Sniffs Cam
CAM6	EK000008	30/09/2012	19:18	Grizzly Bear	1	
CAM7	EK000004	18/09/2012	14:40	Grizzly Bear	1	Black Pelage- Back End
CAM1	EK000004	14/09/2012	2:15	Coyote	1	
CAM1	EK000005	17/09/2012	17:12	Coyote	1	
CAM1	EK000006	22/09/2012	14:13	Coyote	1	
CAM2	EK000004	13/09/2012	11:33	Coyote	1	
CAM2	EK000006	17/09/2012	0:35	Coyote	1	
CAM2	EK000007	17/09/2012	11:45	Coyote	1	
CAM2	EK000009	27/09/2012	10:41	Coyote	1	
CAM3	EK000011	16/09/2012	14:09	Coyote	1	
CAM3	EK000012	17/09/2012	0:11	Coyote	1	
CAM3	EK000013	17/09/2012	11:18	Coyote	1	
CAM3	EK000014	17/09/2012	19:17	Coyote	1	Sniffing camera
CAM3	EK000015	17/09/2012	19:20	Coyote	1	
CAM3	EK000016	20/09/2012	9:40	Coyote	1	
CAM4	EK000014	14/09/2012	1:12	Coyote	1	
CAM4	EK000017	18/09/2012	10:13	Coyote	1	
CAM4	EK000018	18/09/2012	10:19	Coyote	1	
CAM4	EK000019	20/09/2012	9:28	Coyote	1	
CAM4	EK000020	22/09/2012	14:36	Coyote	1	
CAM8	EK000014	19/09/2012	8:59	Coyote	1	
CAM14	EK00002	22/09/2012	14:56	Coyote	1	
CAM4	EK000004	06/10/2012	8:08	Coyote	1	
CAM14	EK000002	06/10/2012	2:08	Mule Deer	2	Doe and Fawn
CAM2	EK000008	20/09/2012	10:02	Gray Jay	1	
CAM8	EK000012	19/09/2012	9:58	Grouse	1	
CAM3	EK000017	25/09/2012	18:45	Moose	1	Adult, bull?, vocalizations
CAM10	PICT0004	08/10/2012	8:17	Moose	1	Young bull
CAM8	EK000022	30/09/2012	7:22	Otter	1	
CAM8	PICT0006	08/10/2012	7:39	Otter	1	In photo, not video
CAM8	PICT0014	27/10/2012	11:09	Otter	1	
CAM8	PICT0018	30/10/2012	12:50	Otter	1	In photo, not video
CAM8	EK000026	03/10/2012	8:20	Otter	2	1 in video but 2 in photo
CAM14	EK000135	27/10/2012	5:28	Otter	2	
CAM3	EK000013	15/10/2012	14:53	Otter	2	
CAM8	EK000020	29/09/2012	8:38	Otter	4	2 in video but 4 in photo
CAM8	EK000016	23/09/2012	9:09	Otter	6	2 in video but 6 in photo
CAM8	PICT0010	15/10/2012	12:09	Otter	6	5 in photo, 1 in video
CAM4	EK000016	16/09/2012	11:33	Raven	1	
CAM8	EK000008	17/09/2012	11:43	Raven	1	
CAM8	EK000010	18/09/2012	10:04	Raven	1	
CAM5	EK000004	08/10/2012	13:01	Raven	1	
CAM13	EK000004	17/09/2012	18:14	Wolf	1	Injured
CAM1	EK000003	10/10/2012	17:05	Wolf	2	

Table 2. Remote camera locations (UTM, NAD 83) on Creek 661, Chedakuz Creek, and Davidson Creek from September 13 to November 6, 2012.

Camera #	Latitude	Longitude	Date Deployed/Collected	Date Removed
CAM1	387165	5899044	12-Sep-12	06-Nov-12
CAM2	386862	5898890	12-Sep-12	06-Nov-12
CAM3	386548	5898612	12-Sep-12	06-Nov-12
CAM4	386445	5898535	12-Sep-12	06-Nov-12
CAM5	388564	5897584	12-Sep-12	06-Nov-12
CAM6	388422	5897821	12-Sep-12	06-Nov-12
CAM7	388385	5898078	12-Sep-12	06-Nov-12
CAM8	388421	5898320	12-Sep-12	06-Nov-12
CAM9	388578	5899410	14-Sep-12	13-Oct-12
CAM10	388938	5899849	14-Sep-12	06-Nov-12
CAM11	383181	5898553	14-Sep-12	06-Nov-12
CAM12	383835	5907269	14-Sep-12	04-Oct-12
CAM13	384047	5907511	14-Sep-12	04-Oct-12
CAM14	387796	5899274	19-Sep-12	06-Nov-12
SCAT 1	386664	5898799	12-Sep-12	06-Nov-12
SCAT 2	386671	5898832	12-Sep-12	06-Nov-12
SCAT 3	386675	5898831	12-Sep-12	06-Nov-12
SCAT 4	386433	5898532	12-Sep-12	06-Nov-12
SCAT 5	386445	5898535	12-Sep-12	06-Nov-12
SCAT 6	388389	5898094	12-Sep-12	06-Nov-12
SCAT 7	387820	5899269	14-Sep-12	06-Nov-12
SCAT 8	387865	5899281	14-Sep-12	06-Nov-12
SCAT 9	388028	5899325	14-Sep-12	06-Nov-12
SCAT 10	388293	5899320	14-Sep-12	06-Nov-12
SCAT 11	388339	5899329	14-Sep-12	06-Nov-12
SCAT 12	386294	5898539	14-Sep-12	06-Nov-12
SCAT 13	386215	5898502	14-Sep-12	06-Nov-12
SCAT 14	386070	5898502	14-Sep-12	06-Nov-12

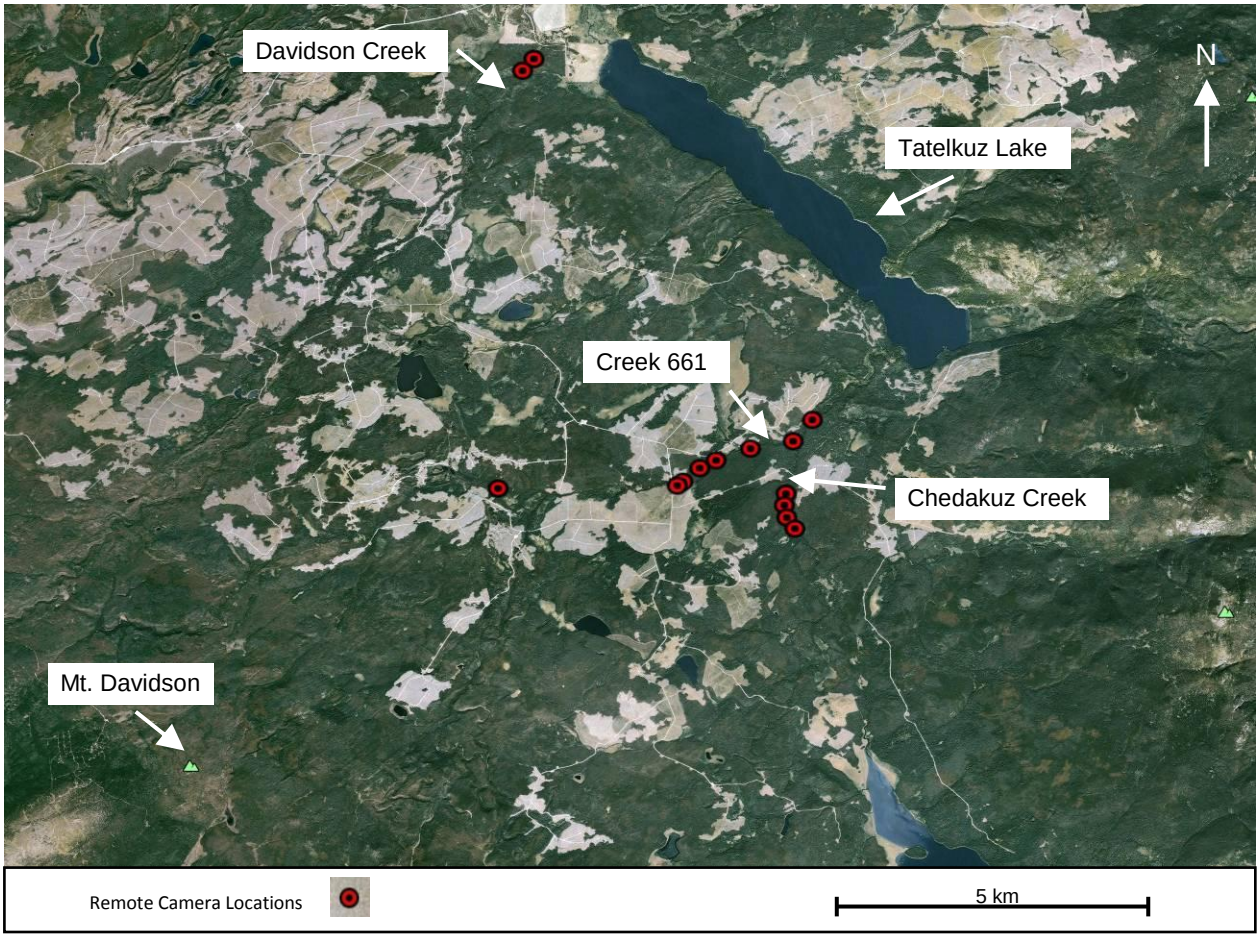

Figure 1. Overview of remote camera survey locations.

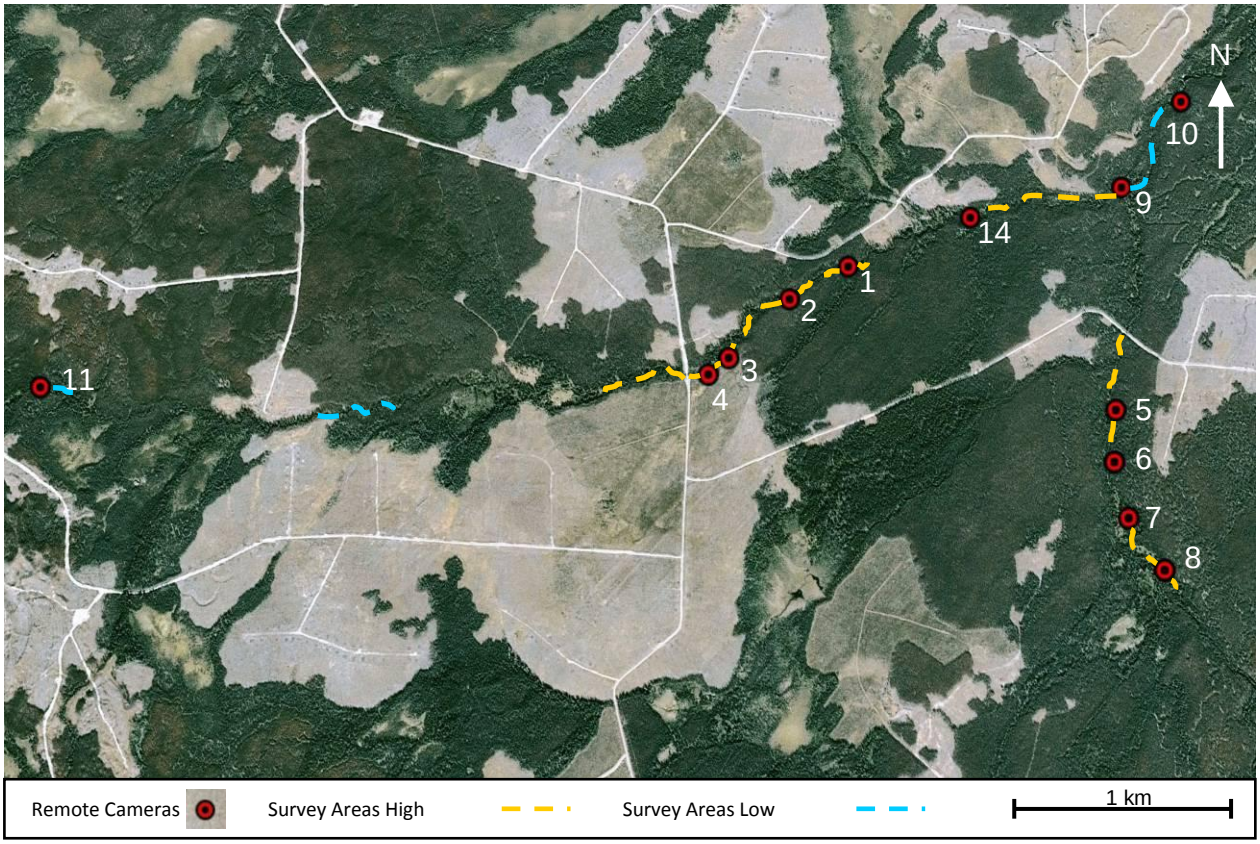

Figure 2. Bear sign survey areas (high and low bear activity) including remote camera locations on Creek 661 and Chedakuz Creek.

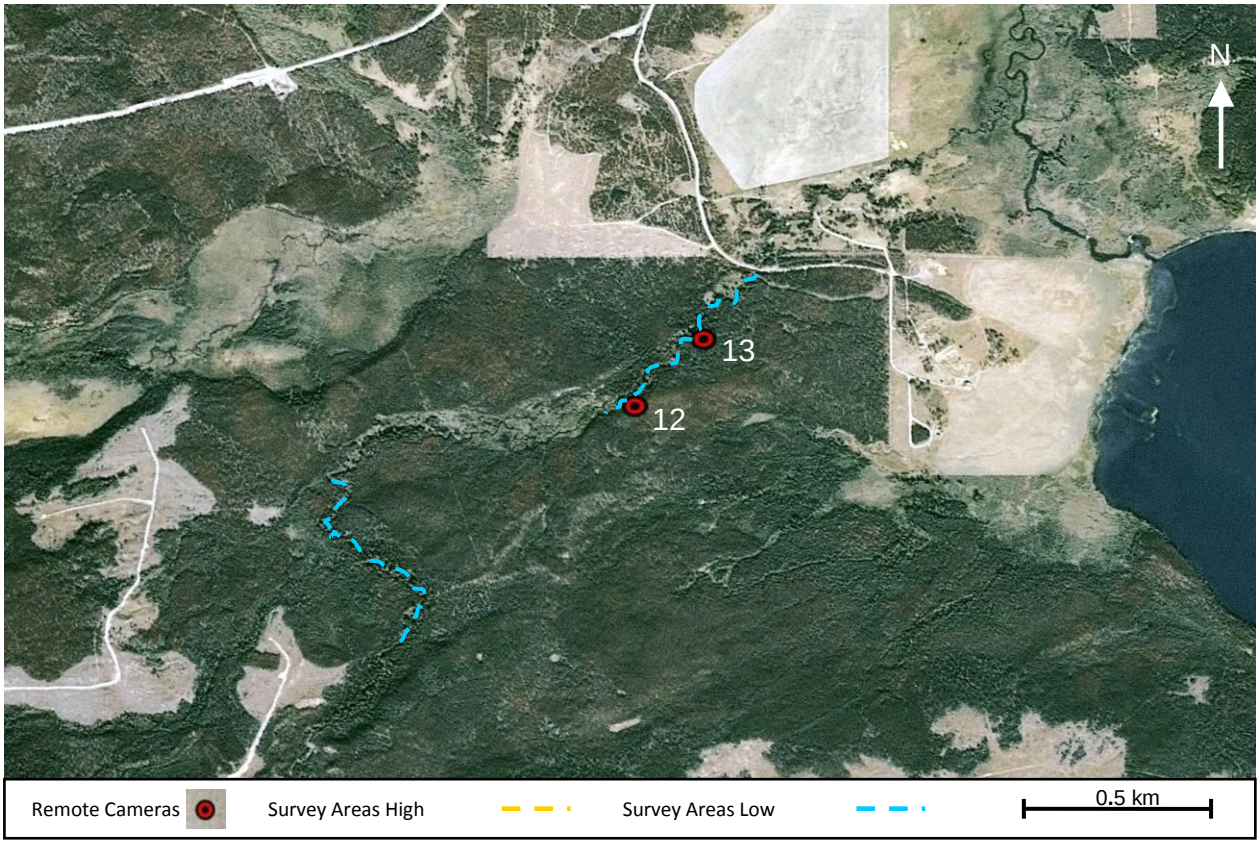

Figure 3. Bear sign survey areas (high and low bear activity) including remote camera locations on Davidson Creek.

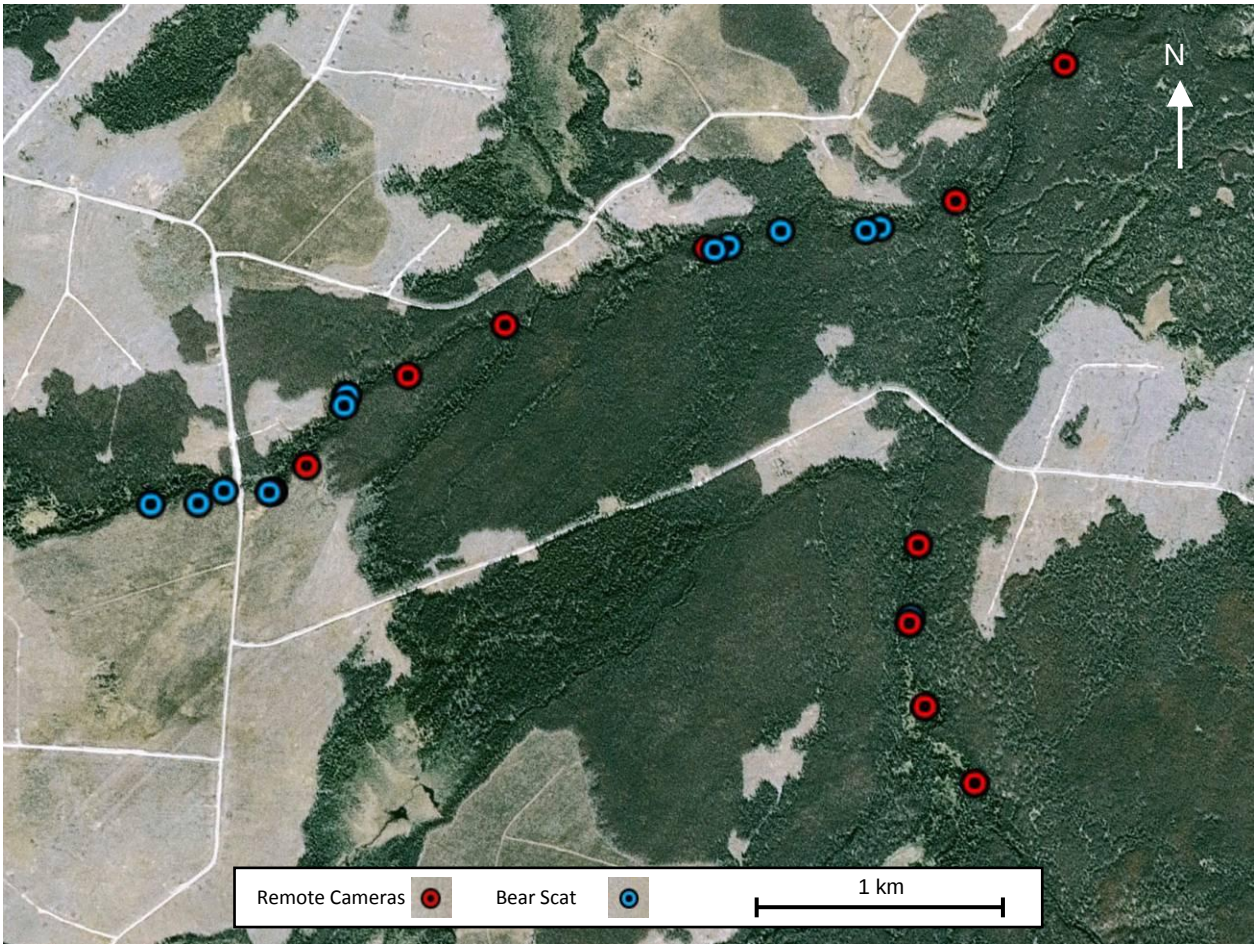

Figure 4. Bear scat collection locations in relation to remote cameras on Creek 661 and Chedakuz Creek.

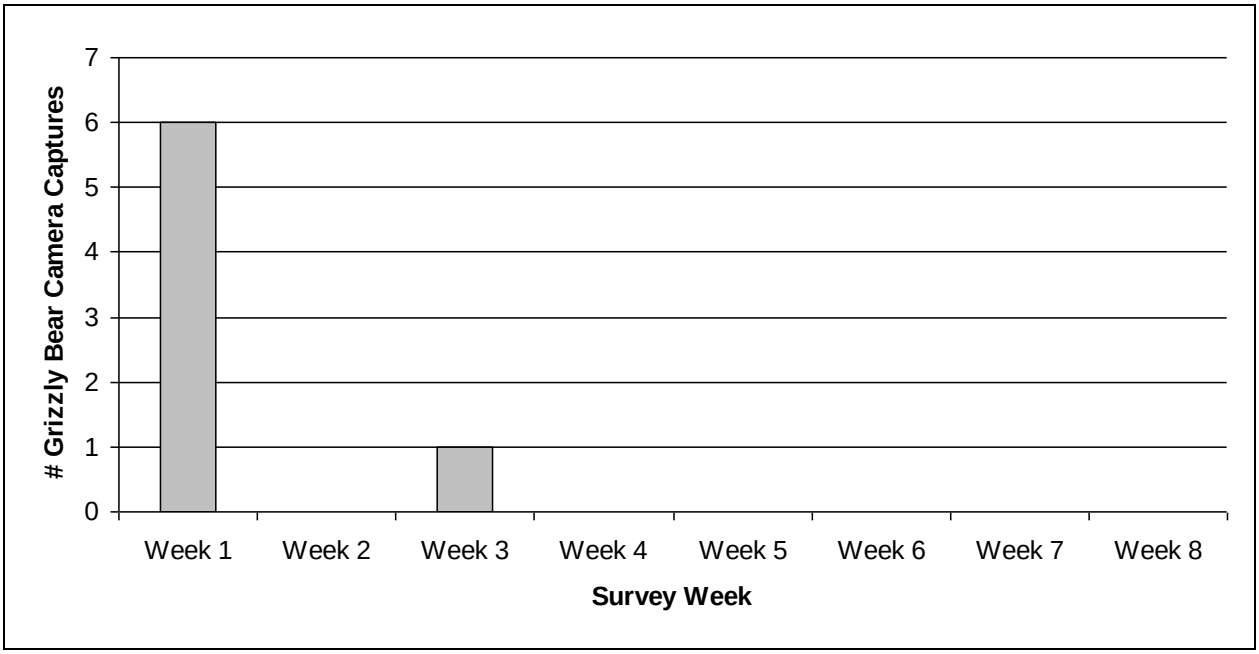

Figure 5. Grizzly bear captures by remote camera on Creek 661 and Chedakuz Creek from September 13 to November 6, 2012

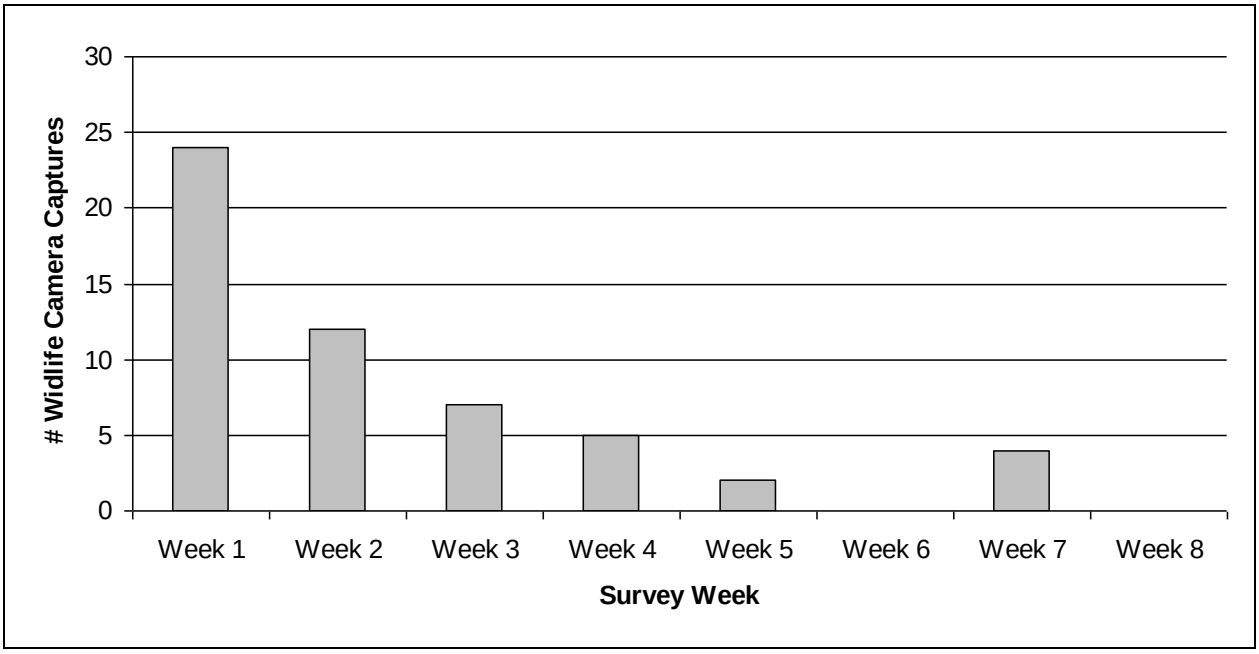

Figure 6. Wildlife captures (grizzly bear, coyote, otter, raven) by remote camera on Creek 661, Chedakuz Creek, and Davidson Creek from September 13 to November 6, 2012

APPENDIX A

Camera 3, Video 1, Grizzly Bear 1: September 13, 2012 – Creek 661

Camera 5, Video 2, Grizzly Bear 2 and 3: September 13, 2012 – Chedakuz Creek

Camera 4, Video 3, Grizzly Bear 4: September 14, 2012 – Creek 661

Camera 3, Video 4, Grizzly Bear 4: September 15, 2012 – Creek 661

Camera 5, Video 5, Grizzly Bear 5: September 18, 2012 – Chedakuz Creek

Camera 7, Video 6, Grizzly Bear 5: September 18, 2012 – Chedakuz Creek

Camera 6, Video 7, Grizzly Bear unknown: September 30, 2012 – Chedakuz Creek

Annex 6
Winter Habitat Survey for Black and Grizzly Bears

Blackwater Mine Project

Winter Habitat Survey for Black and Grizzly Bears

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METHODS

Study Area

The study area is located roughly 100km SSW of Vanderhoof, BC. The site rests in the foothills of Mt. Davidson and spans across three BEC subvariants (a majority of the LSA is in the ESSFmv1 subvariant). Surveys were limited to the LSA as that is the area that dens would be directly impacted by development. All foot surveys were conducted in this subvariant 2-4km NNW of the current camp location (as of December, 2012).

Aerial survey

One survey flight via helicopter was taken in order to identify potential denning habitat within the LSA. Areas with a higher likelihood of containing bear dens were identified for ground truthing.

Acquisition of knowledge on local wildlife

Workers at the mine site were asked to take note of any wildlife sightings and report them. Several wildlife sighting sheets were posted around camp for workers to record their sightings.

Ground survey

Survey transects were taken throughout the LSA, focusing on areas with higher likelihood of containing bear dens as determined from aerial survey. During the survey notes were taken describing general landscape (e.g. slope, aspect, tree composition) and soil characteristics (e.g. texture, soil depth.) All survey transects were tracked using a GPS unit (Garmin GPSmap62.) Every den located was given a site analysis comprising several measurements.

Site analysis for dens

Every den located underwent a site analysis. Basic den information recorded includes the date, time, and UTM location. General landscape measurements include slope, slope position, aspect, den aspect, soil depth, soil texture. Each site was classified down to the site series level of the BEC System. Each den was identified as belonging to one of three types: excavated soil den, natural rock cavity den, or tree cavity den. Measurements were then taken on each den to describe both the den space and associated support structure. All bear sign near located dens was recorded. Photos were taken of each den as well. Potential den habitat for surveys was based on attributes similar to Hodder and Rea (2005). Reference = Hodder, D.P. and R.V. Rea. 2005. Bear den site selection and considerations for forest management in the interior of British Columbia. John Prince Research Forest, UNBC. 13 pp.

RESULTS

Aerial Survey

A 45 minute survey of the LSA did not provide any indication as to potential denning habitat areas. The general topography as observed from the air had little relief, with a majority of slopes located along streams. Exposed bedrock areas were identified and did not have any natural rock cavities observable from the air. No trees seen from the air were large enough to have a cavity suitable for denning.

Acquisition of knowledge on local wildlife

Several wildlife sightings were reported during the study period. Within the LSA, two mule deer (sex undetermined) and a moose cow and calf were reported to have been seen. Several grizzly and black bear sightings were reported along the Kluskuz FSR which runs in an east-west direction approximately 7km NNW of the LSA. Some reports were reported via personal communications and others were observations heard over the radio on the road channel. Several workers reported seeing a grizzly bear, a black bear sow with two cubs, and a grey wolf along the Vantine FSR in an area approximately 25km WNW from the LSA.

Ground survey

Ground surveys were conducted at various locations throughout the LSA with a total transect length of 30,560m (Figure 1). All transects ranged in elevation from 1200m to 1600m ASL. Half of the survey transects were conducted on steep, dry slopes and the other half were conducted along gullied streams.

The steep/dry type areas surveyed did not have any bear dens. Slopes ranged from 40-90% with shallow, rocky soils throughout, and thin organic soil horizons. There were several sections of exposed bedrock found in these transects with occasional small natural rock cavities, but none large enough for a denning bear. The rock exhibited extensive amounts of weathering, and all cavities found contained small, eroded bedrock in them. The dominant tree species found along these transects was Logdepole Pine, *Pinus contorta*. Nest excavations, likely a result of rodent activity, were found under the root systems of some larger pine trees. Moose scat was abundant throughout. The only bear sign found was claw marks in an aspen clone stand.

The transects surveyed along stream gullies did not have any bear dens either. Slopes ranged from 20-80% in the gullied areas along streams, but the surrounding areas outside the influence of fluvial processes had slopes ranging from 5-25%. Overall, soils were shallow and rocky, but occasional patches of deeper and finer textured soils were found (none greater than $4m^2$). Organic soil horizons were thicker than those found in the steep/dry type areas. Lodgepole pine, *Pinus contorta*, and subalpine fir, *Abies lasiocarpa*, were the co-dominant tree species and hybrid white spruce, *Picea glauca x engelmannii*, was the subdominant tree species. Moose scat was abundant throughout. No bear sign was detected along these transects.

Two bear dens were located by forest technicians working in the LSA. These were the only dens found during this survey.

Bear dens

The dens located during this survey were found 300m apart by forest technicians while they were working in the LSA (Figure 1). Site attributes of each den were quite similar (Table 1). Both were excavated dens located in the ESSFmv1/01 BEC zone. The terrain around the dens was gently sloped with several benches leading down to a stream. The support structures for both the dens were large colluvial deposits. The dens were excavated directly under the deposits such that no soil was incorporated into supporting the dens (Figures 2-3). Further inspection of the area around the dens showed that there was a significant amount of large colluvial deposits, spanning approximately 2 ha, adjacent to a wetland complex with open water and a stream running out of it. The excavated spaces in the dens were similar in size while the supporting structures were different in size (Table 2).

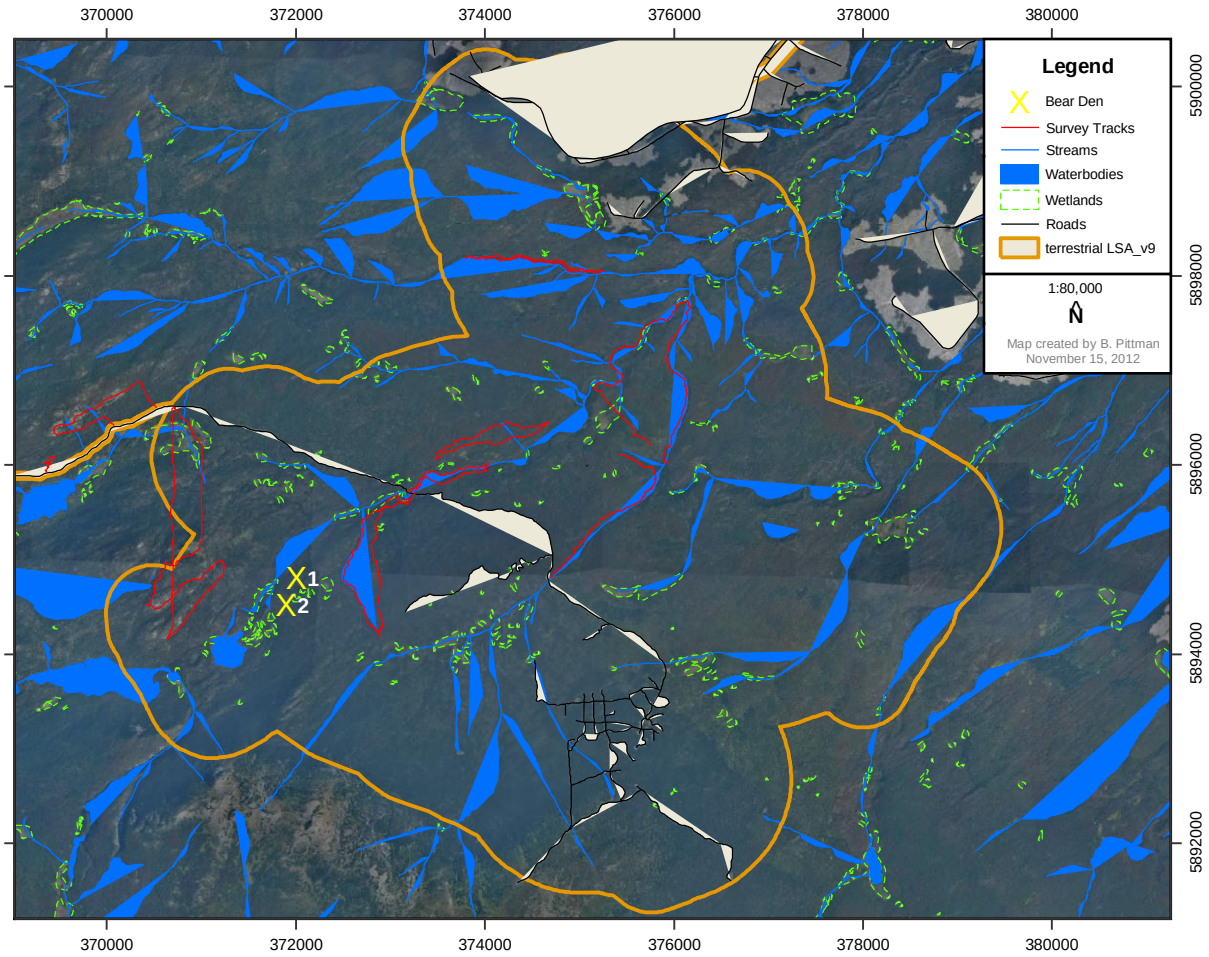

Figure 1: Location map showing bear den locations and tracks from survey transects.

Table 1: Site attributes of bear dens

	UTM	Elevation (m ASL)	Slope	Slope Position	Aspect	Den Aspect	Soil Depth	Soil Texture
Bear Den 1	10U 372002 5894810	1372	25%	mid-slope	240º	168º	10cm	Medium Coarse
Bear Den 2	10U 371895 5894525	1376	18%	mid-slope	228º	184º	10cm	Medium Coarse

Table 2: Dimensions of the den spaces and associated support structures at each denning site.

	Den			Support Structure		
	x axis	y axis	z axis	x axis	y axis	z axis
Bear Den 1	2.3m	2.3m	0.5m	2.5m	2.8m	1.9m
Bear Den 2	2.2m	2.9m	0.5m	4.7m	3.6m	2.2m

Note: Support structures for both dens are colluvial deposits.

Figure 2: Image of bear den #1.

Figure 3: Image of bear den #2.

Figure 3: Bear claw marks found 2m away from bear den 2.

Annex 7
Caribou Forage Lichen Surveys 2012 and 2013

ECOFOR
natural and cultural resource consultants

Blackwater Gold Environmental Assessment
Caribou Forage Lichen Surveys

Date: December 10th, 2012

Project No.: 2012-2071-27

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1 INTRODUCTION

1.1 SETTING

The Blackwater Gold Project (Project) of New Gold Inc. is located approximately 160 km south of Vanderhoof, British Columbia. The Project area is focused on the headwaters of Davidson Creek, on the north side of Mount Davidson. To the south of Mount Davidson is the upper Blackwater (West Road) River watershed, with the First Nations village of Kluskus about 35 km to the southeast of the Project. Road access to the Project is from Vanderhoof via the Kenny Dam Road and the Kluskus Forest Service Road (FSR) to 146.1 km by the road markers; the Blackwater Camp road is then an additional 17 km in length. The Project area consists of a predominantly forested subalpine exploration area, with small non-forested wetlands. Lower elevation areas are present in parts of the Local Study Area (LSA) and Regional Study Area (RSA).

1.2 PROJECT SUMMARY

The Project consists of a proposed open pit, hard rock gold mine and associate infrastructure. The mine and much of the infrastructure such as camps and waste sites will be located in the subalpine on the north side of Mount Davidson, with the access road and power transmission line heading north to join Highway 16 near Vanderhoof. Some loss of caribou foraging habitat may be associated with Project activities where land is cleared, however no development is scheduled to take place in the legally designated caribou ungulate winter range adjacent the Project.

1.3 ECOSYSTEMS AND VEGETATION

The varied topography of the study area results in a variety of Biogeoclimatic Ecosystem Classification (BEC) subzones and variants being present. Mount Davidson has BAFAun (Boreal Altai Fescue Alpine Undifferentiated subzone) at the highest elevations, which is alpine tundra with scattered patches of stunted conifers. Below that is the BAFAmvp (BAFA moist very cold parkland subzone), which is alpine meadows with some short Engelmann spruce and pine (lodgepole and white-bark) trees. Most of the exploration area is within the ESSFmv1 (Englemann Spruce - Subalpine Fir moist very cold subzone, Nechako variant), which is mostly dense white spruce forest with some lodgepole and white-bark pine. The lower edge of the exploration area is dominated by the SBSmc3 (Sub-boreal Spruce moist cold subzone, Kluskus variant), which is dominated by lodgepole pine and spruce. The transmission line passes through that area and the SBSdk (Sub-boreal Spruce dry cool subzone), which again is dominated by lodgepole pine and spruce forest. The southwest edge of the Project, along the access road has the SBSdw2 (Sub-boreal Spruce dry warm subzone, Blackwater variant), and the SBPSmc (Sub-boreal Pine - Spruce moist cold subzone), both of which are dominated by lodgepole pine and spruce forests (Delong et al 1993).

The topography is generally rolling at lower elevations, with shallow valleys cut by the major streams. The higher elevations are north-aspect moderate to steep slopes within the study area. There are occasional naturally non-forested grass/shrub habitats on southerly aspect steep dry slopes below the

ESSF. There are numerous clearcuts in various stages of regeneration in the SBS, with an associated network of forest industry roads. Non-forested wetlands are present, but comprise a low proportion of the landscape.

To the south and west of the Project, there is a designated caribou high-elevation ungulate winter range (UWR; u-7-012) for the Tweedsmuir caribou herd (blue-listed; herd 35). The Project LSA slightly overlaps the UWR, and the camp access road passes through it (Appendix 1). As part of the Caribou Management Plan developed by Ecofor (2011) for the Project, a 500 m buffer was established between Project activities and the UWR (Appendix 1).

1.4 CARIBOU FORAGE LICHENS

Lichens provide an important source of forage to the Tweedsmuir-Entiako caribou herd; especially during seasons when herbs are unavailable. The Tweedsmuir-Entiako herd utilize two different winter habitats, depending upon snow conditions—which alters the availability of food resources (Yaremko and Sulyma 2005). Terrestrial (ground) lichens are utilized in the low elevation winter ranges, early in the winter when the snow is shallow enough for caribou to dig through. When the snow pack gets deeper, or if a snow crust too difficult to dig through forms, caribou move to higher elevation areas, where they target arboreal lichens. Arboreal lichen remains accessible above the snow; deep snow allows caribou to reach lichens higher up on trees (1.5 m above the snow level). Caribou may also utilize terrestrial lichens in high elevation habitat if there are areas windswept of snow that provide easier access for foraging.

The two lichen genera that provide arboreal lichen forage are *Bryoria* (horsehair lichen) and *Alectoria* (witches hair lichen) (see photos in Appendix 2). Both of these lichens are fairly common, widespread and easily identified to genus-level. Both species resemble clumps of hair, hanging from tree trunks and branches. *Alectoria* tends to be light yellow-grey-green while *Bryoria* is a dark brown. These species seem to prefer different combinations of light and moisture levels, therefore different environmental conditions can result in better conditions for one group or the other.

1.5 OBJECTIVES

Baseline surveys were designed to investigate caribou forage lichen abundance the within Project area adjacent to the UWR. Specific objectives were to:

- Characterize the abundance of caribou forage lichen species in the Project area;
- Determine lichen areas of concern based on high potential areas located through mapping and surveys.

2 METHODS

2.1 PRELIMINARY TERRESTRIAL LICHEN HABITAT

Existing spatial data was utilized to map high and moderate potential areas for terrestrial lichen. Provincial vegetation resources information (VRI) and Predictive Ecosystem Mapping (PEM) data were queried through GIS to identify areas having characteristics correlated with abundant terrestrial lichens.

High potential areas were defined as having:

- Forest characteristics:
  - At least 20% lodgepole pine of age class 4 (64 years old) or greater,
  - Crown closure < 50% (Lance and Eastland 2000).
- Biogeoclimatic characteristics: site series (1st 2 deciles) most likely to have dry and nutrient poor conditions that could encourage terrestrial lichen growth:
  - SBSmc3 - Site series 02, 03, 04,
  - SBSmc2 – Site series 01,02,03,04.
  - ESSFmv1 - Site series 01, 02, 03.

Moderate potential areas were identified using the same characteristics, but had only the forest characteristics **or** the biogeoclimatic characteristics (High potential areas were areas where these both overlapped).

2.2 ARBOREAL LICHEN SURVEYS

The UWR polygon adjacent to the Project is a high-elevation winter range, indicating that arboreal lichens should be more important than terrestrial lichens for forage. Arboreal lichen surveys were conducted based on methodology in Stevenson et al (1998). One transect per day was surveyed. Transects for arboreal lichens were placed in areas that were identified as being areas less likely to have abundant terrestrial lichens; typically lacking pine as a dominant canopy component. For each transect, 150 trees were surveyed in plots of 5 trees at randomly located intervals. The first 5 trees having diameters of 7.5 cm or larger encountered within 1 m either side of the transect line comprised the plot. Transect lengths were determined by the amount of ground that could be covered in a day (which increased as the surveyors became more familiar with the survey protocol). Some stations in the first two transects were comprised of 10 trees instead of 5 in an attempt to decrease the amount of time it took to score the trees. Because the increased station size did not result in increased speed, this practice was not continued.

Each tree in the station was identified to species, and the diameter at breast height (DBH) was measured using a diameter tape. Trees were classified according to Armleder et al (1992; Table 1); only portions of the tree under 4.5 m above ground level were considered in the scoring. Trees with multiple trunks were included as one tree if the branch in the trunk was above the ground; the cross-sectional areas of all of the trunks were combined to calculate the DBH.

Table 1: Classification criteria and definitions for arboreal lichen surveys (Stevenson et al 1998).

Criteria	Values
Tree class	A – branches mostly living B – mix of live and dead branches C – branches mostly dead
Lichen class (based on mass of lichens present)	0 – no lichen at all (very uncommon) 1 – up to 5 g 2 – 5 – 50 g 3 – 50 - 250 g 4 – 250 – 625 g 5 – > 625 g
Lichen species	A – *Alectoria* (70% or more) B – *Bryoria* (70% or more) AB – mixture of the two species

2.3 TIMELINES

Arboreal lichen surveys were conducted from Oct 15th – 18th. Snow prevented the addition of terrestrial lichen surveys.

3 RESULTS

3.1 TERRESTRIAL LICHENS

The mapping of high potential areas for terrestrial lichens is still preliminary in nature (Appendix 1). Addition of data from the Terrestrial Ecosystem Mapping currently in progress, as well as several other criteria (e.g. slope, aspect etc), will allow further refinement for future terrestrial lichen habitat areas.

3.2 ARBOREAL LICHENS

A total of 600 trees were measured and classified over the course of the lichen surveys. Maps of each transect are provided in Appendix 1. Photos of each lichen class, tree species, and general habitat types are provided in Appendix 2.

Four tree species were encountered, three which were present in all four transects. Subalpine fir (*Abies lasiocarpa*) was the most common tree encountered (n=363), lodgepole pine (*Pinus contorta*) (n=112), had just a few more occurrences than Engelmann spruce (*Picea engelmannii*) (n=103). Transect TMP03 went through an area of white-bark pine (Table 2); 20 white-bark pine were included in the transect. Two of the trees (snags) were not identified because they had lost too much bark to be confident in their identification. In general, trees in higher lichen classes had larger diameters (Table 2). Lodgepole pine is an exception to this, because the trunks often lacked branches below 4.5 m, and thus had fewer lichens.

Table 2: Number of trees and mean diameter at breast height (DBH) of each tree species in each lichen classes for arboreal lichen transects. Mean DBH in cm.

Transect	Species	Lichen class 1		2		3		4		5		Tree species total
		#	DBH	#	DBH	#	DBH	#	DBH	#	DBH	
TMP01	Subalpine fir	39	(13.9)	55	(20.7)	13	(27.5)					107
length:	Lodgepole pine	4	(38.2)	4	(19. 6)	2	(34.1)					10
1.0 km	Spruce	4	(27.2)	23	(25.0)	6	(36.3)					33
	total	**47**	**(17.1)**	**82**	**(21.8)**	**21**	**(30.7)**					
TMP02	Unknown	1	(29.9)									1
length:	Subalpine fir			63	(13.4)	41	(17.8)	4	(28.7)			108
1.2 km	Lodgepole pine	8	(27.7)	12	(23.5)							20
	Spruce	1	(15.3)	13	(16.6)	5	(19.5)	2	(28.9)			21
	total	**10**	**(26.6)**	**88**	**(15.3)**	**46**	**(18.0)**	**6**	**(28.8)**			
TMP03	Unknown			1	(57.3)							1
length:	Subalpine fir	3	(9.73)	74	(17.6)	33	(17.4)	1	(24.1)			111
2.5 km	Lodgepole pine	1	(32.5)	4	(30.0)	3	(29.5)	2	(31.9)			10
	White-bark pine	2	(10.2)	4	(17.3)	9	(22.9)	3	(29.7)	2	(53.6)	20
	Spruce			3	(32.9)	3	(41.8)	2	(16.6)			8
	total	**6**	**(13.7)**	**86**	**(19.2)**	**48**	**(20.7)**	**8**	**(26.3)**	**2**	**(53.6)**	
TMP04	Subalpine fir	10	(9.6)	23	(14.1)	4	(27.0)					37
length:	Lodgepole pine	21	(17.4)	51	(20.0)							72
3.0 km	Spruce	2	(15.3)	26	(18.0)	13	(26.3)					41
	total	**33**	**(14.9)**	**100**	**(18.1)**	**17**	**(26.4)**					
Overall		**96**	**(17.1)**	**356**	**(18.5)**	**132**	**(22.1)**	**14**	**(27.3)**	**2**	**(53.6)**	**600**

The branches on most of the trees surveyed were either dead or a mixture of live a dead branches (Table 3). Some of the trees had no branches below 4.5 m; typically lodgepole pines. Trees with only live branches tended to be small and usually had a low lichen load.

Table 3: Tree class totals (indicating live or dead branches) for each lichen transect survey.

Transect	Tree Class A (live branches)	Tree Class B (live and dead branches)	Tree Class C (dead branches)	N/A (no branches)
TMP01	14	80	52	4
TMP02	6	77	65	2
TMP03	12	72	66	
TMP04	6	69	74	1
Totals	**38**	**298**	**257**	**6**

Bryoria was much more common than *Alectoria* (Table 4) in all of the surveys conducted. *Alectoria* was present to some degree in each transect, and *Alectoria* was visible (but seldom dominant) on many trees that were not surveyed.

Table 4: Dominant arboreal lichen species found on each tree by transect.

Transect	*Alectoria*	*Alectoria & Bryoria*	*Bryoria*
TMP01		17	133
TMP02	1	11	138
TMP03		2	148
TMP04		10	140

Transect 3 appears to have the most arboreal lichen forage available. Each tree plot for each transect was assigned a lichen forage ranking: Low (<30% lichen class 3), Medium (40-60% lichen class 3 or higher) or High (>60% lichen class 3 or higher) quality lichen forage (Table 5). These rankings are derived from the proportion of trees within the plot that are lichen class 3 or higher, because these are the trees that are caribou are most likely to forage on (Stevenson et al 1998). The tree plot scores are also shown on the maps of the individual transects in Appendix 1.

Table 5: Number of tree plots in each transect ranked as low (<30% lichen class 3), medium (40-60% lichen class 3 or higher) or high (>60% lichen class 3 or higher) quality lichen forage.

Transect	Low		Medium		High		Total
TMP01	21	95.5%	1	4.5%			**22**
TMP02	7	46.7%	8	53.3%			**15**
TMP03	15	50.0%	9	30.0%	6	20.0%	**30**
TMP04	24	80.0%	6	20.0%			**30**
Total	**67**	**69.1%**	**24**	**24.7%**	**6**	**6.2%**	**97**

4 DISCUSSION

Large sections of Transects TMP01 and TMP04 traversed areas that were identified as 'medium' potential for ground lichens during the preliminary mapping. This may have contributed to the lower scores for arboreal lichens for these transects, as one of the main determinants of terrestrial lichen potential is the presence of lodgepole pine the canopy; lodgepole pine are poor arboreal lichen trees due to their usual lack of lower branches. TMP04 had the most lodgepole pines of any transect, however TMP01 was tied for the fewest. One possible explanation for this transect is that the generally southern aspect of the slope resulted in lower moisture levels and thus less abundant lichen growth. In addition, it passed through an area of ESSFmv3 site series 03, which may also reflect a drier climate.

Transects TMP02 and TMP03 had at least 50% of the tree plots ranked as medium or high lichen amounts. All of the tree plots except for one that received a high lichen abundance ranking were in the ESSFmvp biogeoclimatic zone on Transect TMP03. The ESSFmvp is higher in elevation and more open

than the areas lower on the slope. The abundant *Bryoria* present may be responding to the higher light levels present in this area. Also, as the area surveyed has a northern aspect, it may retain more humidity than other areas. It should be noted that the area surveyed was very close to the ESSFmv1 biogeoclimatic zones. If the survey had continued further up the mountain to the higher elevations of ESSFmvp, a decrease in the abundance of lichens may have resulted as the trees became smaller (stunted) and more spread out. The presence of mature white-bark pine in the ESSFmvp influenced the rankings, as these trees were often multiple-trunked, curved, and had abundant branches, allowing more surface area for attachment of lichens.

Although Transect TMP02 did not have any tree plots ranked 'high', it had a high proportion (53.3%) ranked 'medium'. The lower section of the transect was in a fairly wet and open area which may have resulted in the corresponding lichen abundance in that area. The remainder of the transect was on northern aspect.

In the areas surveyed, the amount of *Bryoria* far surpassed the amount *Alectoria*. There is evidence that caribou prefer *Bryoria* to *Alectoria* if both are available (Rominger et al 1996). Only one tree out of 600 trees was found to have *Alectoria* as the dominant lichen species (> 70%). This is indicative of environmental conditions in the study area favouring *Bryoria.*

Terrestrial lichens were present in small patches in most areas surveyed; however the amount available for forage was likely too small to provide benefits to caribou. Only a few areas visited had abundant terrestrial lichens. These areas tended to be in areas where lodgepole pine was abundant and were well drained (e.g. tops of small eskers, other small hills). This suggests that more detailed stand spatial data (possibly available with the new TEM) could allow better predictive modelling of the location of high-potential terrestrial lichen areas.

5 SUMMARY

- Transect areas varied in terms of lichen forage abundance;
  - ESSFmvp and northern aspects were highest;
  - Lodgepole pine drier areas were lowest.
- *Bryoria* was much more common than *Alectoria*.
- Lodgepole pine were poor lichen hosts.
- White-bark pine was abundant in ESSFmvp areas and generally provided excellent lichen abundance.
- Preliminary mapping of terrestrial lichen habitat areas should be refined with more detailed spatial data (e.g. TEM) when available, and additional parameters (e.g. slope, aspect) added to provide better resolution for mapping potential high value terrestrial lichens habitats.

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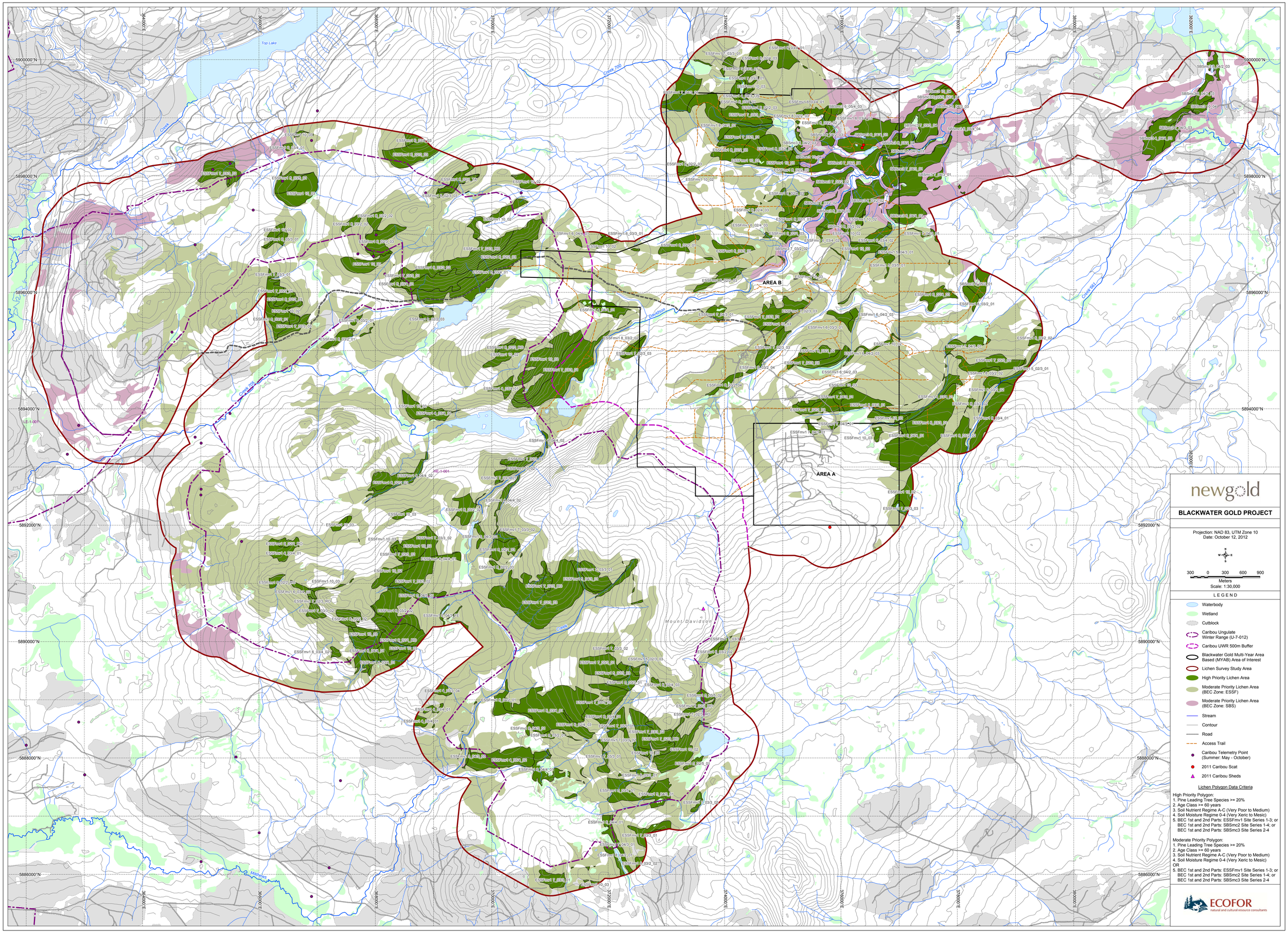
7 APPENDICES

7.1 APPENDIX 1 – MAPPING



newgold

BLACKWATER GOLD PROJECT

Projection: NAD 83, UTM Zone 10
Date: October 12, 2012

300 0 300 600 900
Meters
Scale: 1:30,000

LEGEND

- Waterbody
- Wetland
- Cutblock
- Caribou Ungulate Winter Range (U-7-012)
- Caribou UWR 500m Buffer
- Blackwater Gold Multi-Year Area Based (MYAB) Area of Interest
- Lichen Survey Study Area
- High Priority Lichen Area
- Moderate Priority Lichen Area (BEC Zone: ESSF)
- Moderate Priority Lichen Area (BEC Zone: SBS)
- Stream
- Contour
- Road
- Access Trail
- Caribou Telemetry Point (Summer: May - October)
- 2011 Caribou Scat
- 2011 Caribou Sheds

Lichen Polygon Data Criteria

High Priority Polygon:
1. Pine Leading Tree Species >= 20%
2. Age Class >= 60 years
3. Soil Nutrient Regime A-C (Very Poor to Medium)
4. Soil Moisture Regime 0-4 (Very Xeric to Mesic)
5. BEC 1st and 2nd Parts: ESSFmv1 Site Series 1-3; or BEC 1st and 2nd Parts: SBSmc2 Site Series 1-4; or BEC 1st and 2nd Parts: SBSmc3 Site Series 2-4

Moderate Priority Polygon:
1. Pine Leading Tree Species >= 20%
2. Age Class >= 60 years
3. Soil Nutrient Regime A-C (Very Poor to Medium)
4. Soil Moisture Regime 0-4 (Very Xeric to Mesic)
OR
5. BEC 1st and 2nd Parts: ESSFmv1 Site Series 1-3; or BEC 1st and 2nd Parts: SBSmc2 Site Series 1-4; or BEC 1st and 2nd Parts: SBSmc3 Site Series 2-4

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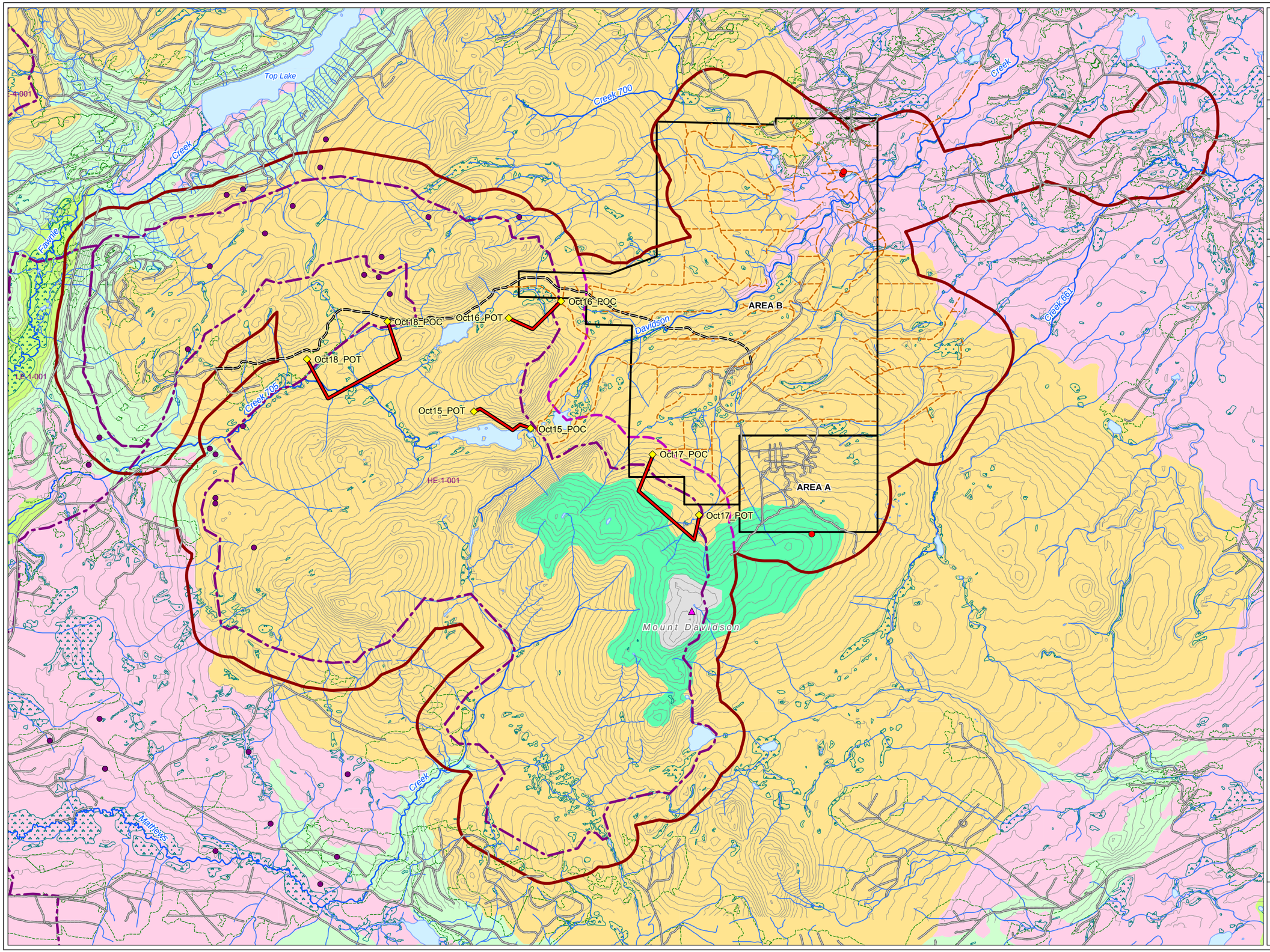

newgold

BLACKWATER GOLD PROJECT

2012 LICHEN SURVEY

Projection: NAD 83, UTM Zone 10
Date: December 7, 2012

650 0 650 1300 1950
Meters
Scale: 1:65,000

LEGEND

- Waterbody
- Wetland
- Cutblock
- Caribou Ungulate Winter Range (U-7-012)
- Caribou UWR 500m Buffer
- Blackwater Gold Multi-Year Area Based (MYAB) Area of Interest
- Lichen Survey Study Area
- Lichen Survey Transect
- Stream
- Contour
- Road
- Access Trail
- Lichen Survey POC/POT
- Caribou Telemetry Point (Summer: May - October)
- 2011 Caribou Scat
- 2011 Caribou Sheds

Biogeoclimatic Zones

- BAFAun
- ESSFmvp
- ESSFmv 1
- SBPSmc
- SBSmc 2
- SBSmc 3

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BLACKWATER GOLD PROJECT

2012 LICHEN SURVEY TRANSECT TMP01

Projection: NAD 83, UTM Zone 10
Date: December 7, 2012

N
W E
S

50 0 50 100 150
Meters
Scale: 1:5,000

LEGEND

- Waterbody
- Wetland
- Caribou Ungulate Winter Range (U-7-012)
- Caribou UWR 500m Buffer
- PEM Polygon
- Lichen Survey Transect
- Stream
- Contour
- Road
- Access Trail
- Lichen Survey POC/POT
- Lichen Forage Abundance
  - Low
  - Medium
  - High

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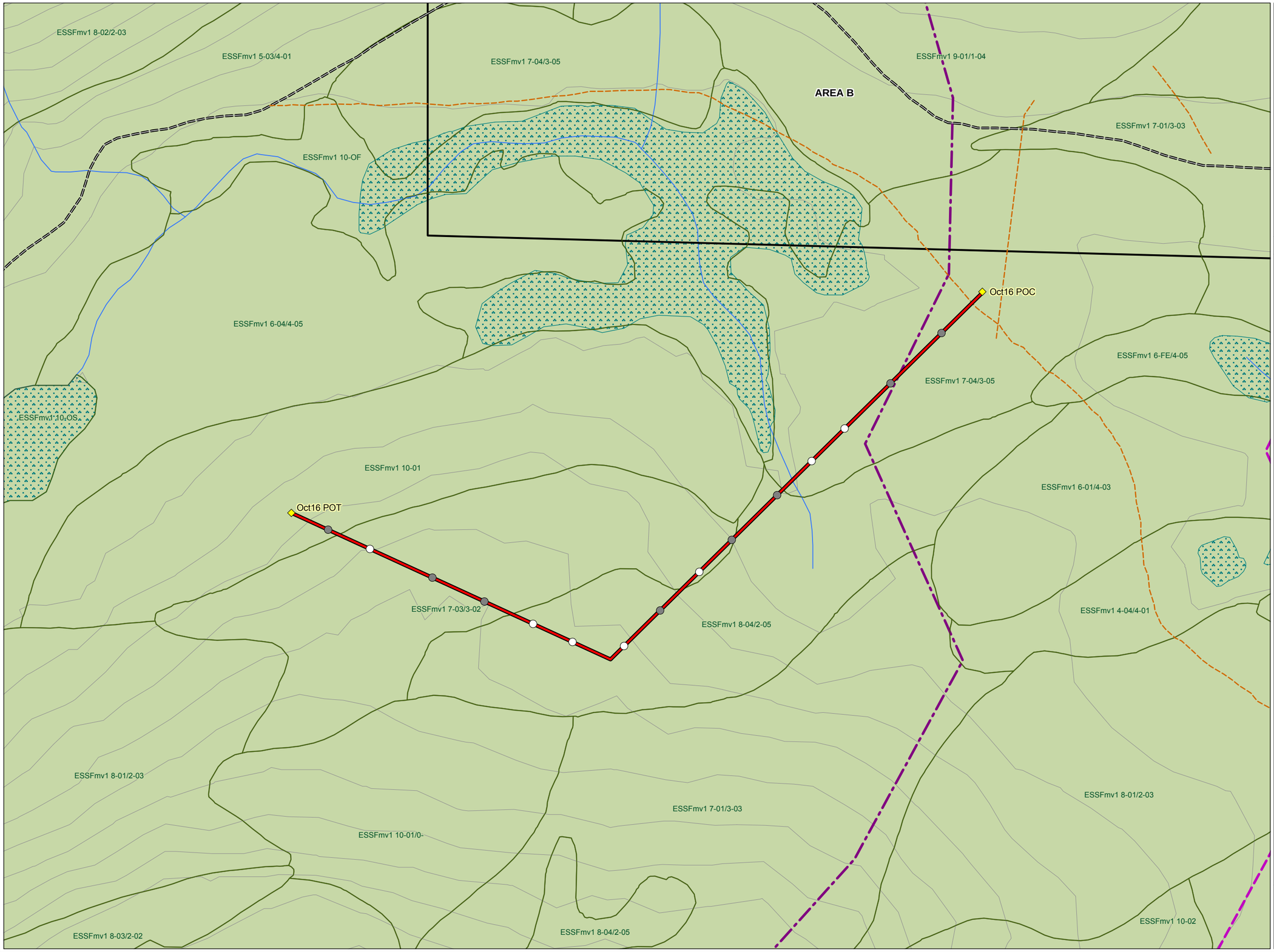
ESSFmv1 7-02/3-03
ESSFmv1 10-01
ESSFmv1 10-02
ESSFmv1 8-01/2-03
ESSFmv1 10-02/0-
ESSFmv1 10-02
ESSFmv1 8-04/2-05
ESSFmv1 8-01/2-04
ESSFmv1 4-03/4-01
Oct15 POT
ESSFmv1 10-02
ESSFmv1 7-03/3-01
ESSFmv1 8-01/2-04
Oct15 POC
ESSFmv1 6-01/3-03
ESSFmv1 10-LA
ESSFmv1 10-04
ESSFmv1 7-OS/3-OW
ESSFmv1 10-01
ESSFmv1 10-04
ESSFmv1 8-FE/2-05
ESSFmv1 4-04/4-02
ESSFmv1 10-04
ESSFmv1 8-01/2-03



newgold

BLACKWATER GOLD PROJECT

2012 LICHEN SURVEY TRANSECT TMP02

Projection: NAD 83, UTM Zone 10
Date: December 7, 2012

N
W E
S

50 0 50 100 150
Meters
Scale: 1:5,000

LEGEND

- Waterbody
- Wetland
- Caribou Ungulate Winter Range (U-7-012)
- Caribou UWR 500m Buffer
- Blackwater Gold Multi-Year Area Based (MYAB) Area of Interest
- PEM Polygon
- Lichen Survey Transect
- Stream
- Contour
- Road
- Access Trail
- Lichen Survey POC/POT
- Lichen Forage Abundance
  - Low
  - Medium
  - High

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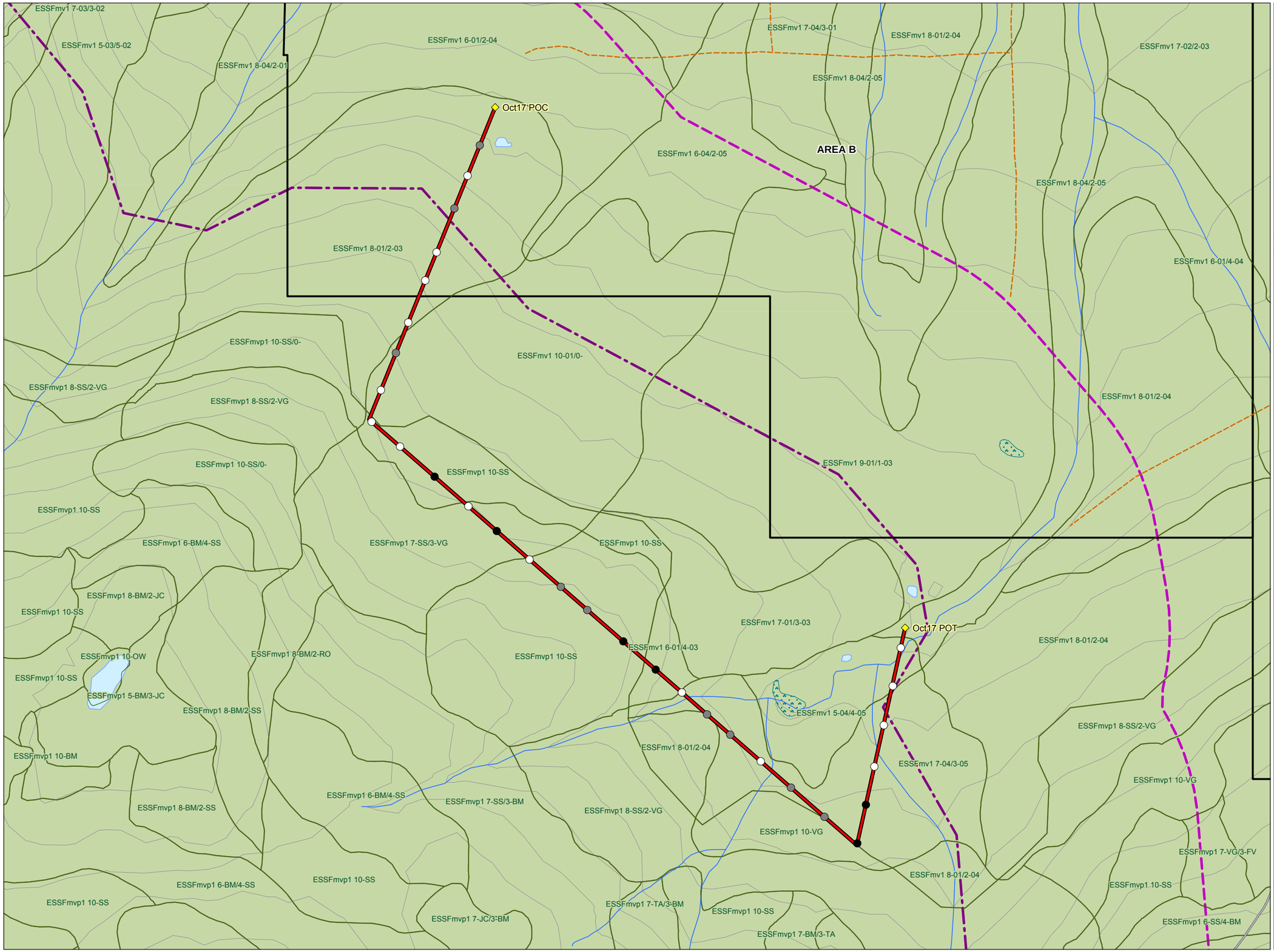

newgold

BLACKWATER GOLD PROJECT

2012 LICHEN SURVEY TRANSECT TMP03

Projection: NAD 83, UTM Zone 10
Date: December 7, 2012

N
W E
S

75 0 75 150 225
Meters
Scale: 1:7,500

LEGEND

- Waterbody
- Wetland
- Caribou Ungulate Winter Range (U-7-012)
- Caribou UWR 500m Buffer
- Blackwater Gold Multi-Year Area Based (MYAB) Area of Interest
- PEM Polygon
- Lichen Survey Transect
- Stream
- Contour
- Road
- Access Trail
- Lichen Survey POC/POT
- Lichen Forage Abundance
  - Low
  - Medium
  - High

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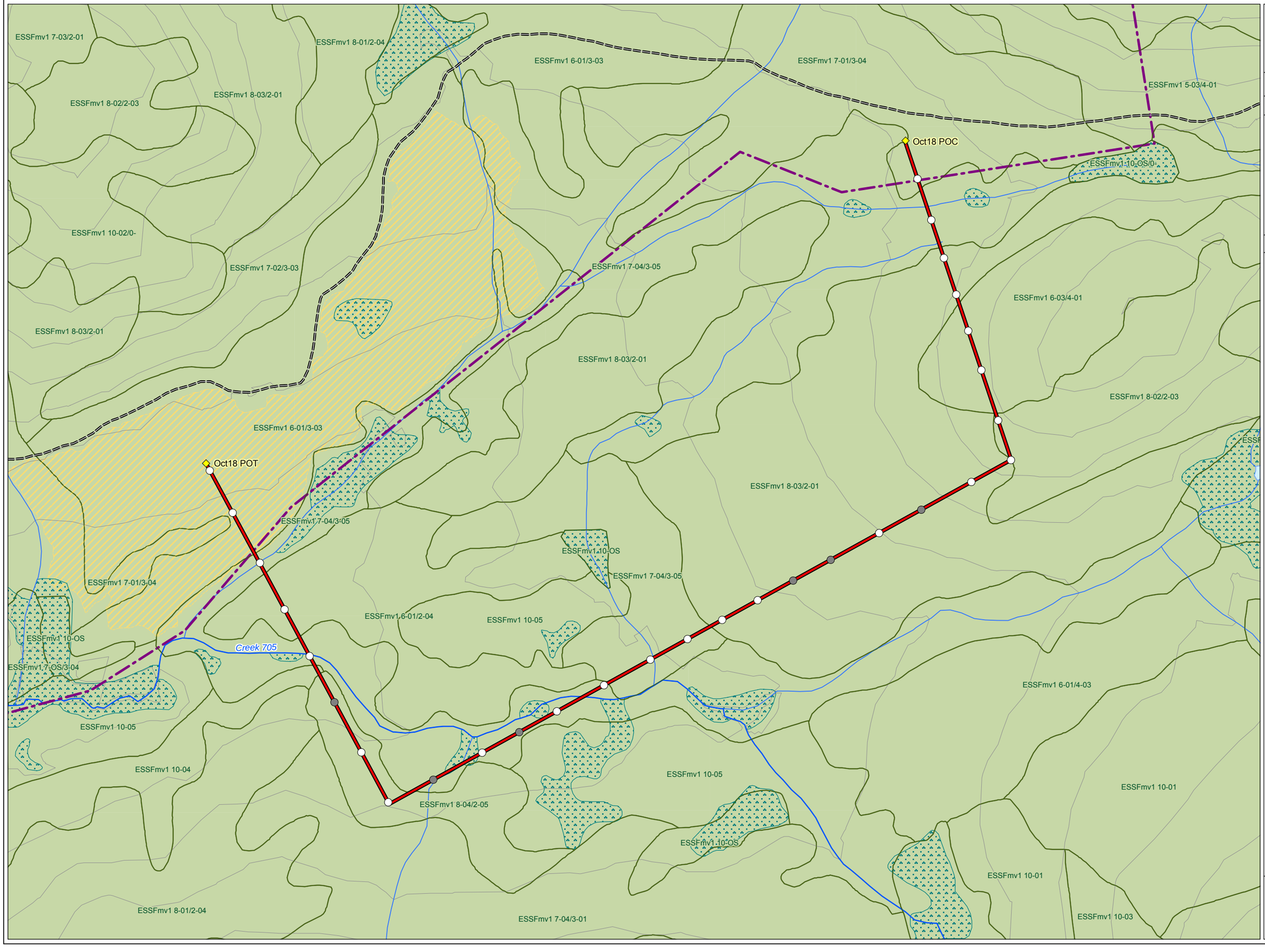

newgold

BLACKWATER GOLD PROJECT

2012 LICHEN SURVEY TRANSECT TMP04

Projection: NAD 83, UTM Zone 10
Date: December 7, 2012

N
W E
S

75 0 75 150 225
Meters
Scale: 1:7,500

LEGEND

- Waterbody
- Wetland
- Caribou Ungulate Winter Range (U-7-012)
- PEM Polygon
- Cutblock
- Lichen Survey Transect
- Stream
- Contour
- Road
- Lichen Survey POC/POT

Lichen Forage Abundance

- Low
- Medium
- High

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7.2 APPENDIX 2 – PHOTODOCUMENTATION

2012 Arboreal Lichen Surveys
Blackwater Project

ECOFOR
natural and cultural resource consultants

Date: October 17, 2012
Comments:
Bryoria lichen species on several dead tree branches.

Date: October 15, 2012
Comments:
Alectoria lichen species (light coloured) on dead tree branches.

Date: October 17, 2012
Comments:
Both *Bryoria* and *Alectoria* lichen species on a dead tree branch.

2012 Arboreal Lichen Surveys
Blackwater Project

ECOFOR
natural and cultural resource consultants

Date: October 18, 2012
Comments:
Spruce tree of Lichen Class 1.

Date: October 15, 2012
Comments:
Subalpine fir tree of Lichen Class 2.

Date: October 16, 2012
Comments:
Subalpine fir with Lichen Class 3.

2012 Arboreal Lichen Surveys
Blackwater Project

ECOFOR
natural and cultural resource consultants

Date: October 17, 2012
Comments:
Subalpine fir of Lichen Class 4.

Date: October 17, 2012
Comments:
White-barked pine of Lichen Class 5

Date: October 17, 2012
Comments:
Dead trees also had variable lichen coverage. Those with many intact branches tended to have higher lichen loads.

2012 Arboreal Lichen Surveys
Blackwater Project

ECOFOR
natural and cultural resource consultants

Date: October 16, 2012
Comments:
Lichens on a small spruce tree near a wetland area.

Date: October 17, 2012
Comments:
Lichen on live branches and trunk of a subalpine fir.

Date: October 17, 2012
Comments:
White-barked pine often had multiple gnarled trunks, and abundant *Bryoria* lichens.

2012 Arboreal Lichen Surveys
Blackwater Project

ECOFOR
natural and cultural resource consultants

Date: October 17, 2012
Comments:
Where one lichen transect entered the ESSFmvp biogeoclimatic zone, there was abundant white-barked pine, and the tree canopy was quite open (i.e. parkland).

Date: October 16, 2012
Comments:
Some areas were spruce-dominated; especially lower areas and those near wetlands.

Date: October 17, 2012
Comments:
Subalpine fir was the most dominant tree within the study area.

2012 Arboreal Lichen Surveys
Blackwater Project

ECOFOR
natural and cultural resource consultants

Date: October 18, 2012
Comments:
Occasional areas had abundant terrestrial lichens; typically flat areas, or those at the top of eskers where the forest was mainly lodgepole pine.

Date: October 15, 2012
Comments:
Many areas had a few terrestrial lichens, but not really enough to provide forage for caribou.

Date: October 15, 2012
Comments:
In other areas, terrestrial lichens were very sparse.

Annex 8
2011-2012 Blackwater Gold Environmental Assessment Invertebrate Inventory

ECOFOR
natural and cultural resource consultants

Blackwater Gold Environmental Assessment Invertebrate Inventory

Date: November 30th , 2012

Project No.: 2012-2071-14

Prepared for:

AMEC
Vancouver Environmental
Environment & Infrastructure
4445 Lougheed Highway
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Prepared by:

Ecofor Consulting Ltd.
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1 INTRODUCTION

1.1 SETTING

The Blackwater Gold Project (Project) of New Gold Inc. is located in central British Columbia approximately 160 km south of Vanderhoof, British Columbia. The Project area is focused on the headwaters of Davidson Creek, on the north side of Mount Davidson near the east end of the Fawnie Range. To the south of Mount Davidson is the upper Blackwater (West Road) River watershed, with the First Nations village of Kluskus about 35 km to the southeast of the Project. Road access to the Project is from Vanderhoof via the Kenny Dam Road and the Kluskus Forest Service road to 146.1 km by the road markers; the Blackwater Camp road is then an additional 17 km in length. The Project area consists of a predominantly forested subalpine exploration area, with small non-forested wetlands. Lower elevation areas are present in parts of the Local Study Area (LSA) and Regional Study Area (RSA).

1.2 PROJECT SUMMARY

The Project consists of a proposed open pit, hard rock gold mine and associate infrastructure. The mine and much of the infrastructure such as camps and waste sites will be located in the subalpine on the north side of Mount Davidson, with the access road and power transmission line heading north to join Highway 16 near Vanderhoof. The primary effects on butterfly and dragonfly / damselfly habitat will be complete removal of habitat in the primary mine development area, a relatively small amount of removal of habitat through access road development, and clearance of forest beside roads and for the power transmission line.

1.3 ECOSYSTEMS AND VEGETATION

The varied topography of the study area results in a variety of Biogeoclimatic Ecosystem Classification (BEC) subzones and variants being present. Mount Davidson has BAFAun (Boreal Altai Fescue Alpine Undifferentiated subzone) at the highest elevations, which is alpine tundra with scattered patches of stunted conifers. Below that is the BAFAmvp (BAFA moist very cold parkland subzone), which is alpine meadows with some short white spruce and pine (lodgepole and white bark) trees. Most of the exploration area is within the ESSFmv1 (Englemann Spruce - Subalpine Fir moist very cold subzone, Nechako variant), which is mostly dense white spruce forest with some lodgepole and white bark pine. The lower edge of the exploration area is dominated by the SBSmc3 (Sub-boreal Spruce moist cold subzone, Kluskus variant), which is dominated by lodgepole pine and spruce. The transmission line passes through that area and the SBSdk (Sub-boreal Spruce dry cool subzone), which again is dominated by lodgepole pine and spruce forest. The southwest edge of the Project, along the access road has the SBSdw2 (Sub-boreal Spruce dry warm subzone, Blackwater variant), and the SBPSmc (Sub-boreal Pine - Spruce moist cold subzone), both of which are dominated by lodgepole pine and spruce forests.

The topography is generally rolling at lower elevations, with shallow valleys cut by the major streams. The higher elevations are north-aspect moderate to steep slopes within the study area. There are occasional naturally non-forested grass/shrub habitats on southerly aspect steep dry slopes below the ESSF. There are numerous clearcuts in various stages of regeneration in the SBS and SBPS, with an associated network of forest industry roads. Non-forested wetlands are present, but comprise a low proportion of the landscape.

1.4 OBJECTIVES

Baseline surveys were designed to investigate the terrestrial and aquatic butterfly and dragonfly / damselfly communities within and near the Project area. Specific objectives were to:

- Determine the presence and distribution of invertebrate species;
- Determine the species of conservation concern in the area, and their habitats.
- Assess the potential impacts of Project developments on invertebrate species of conservation concern.

Baseline surveys were done for invertebrates in both 2011 and 2012 to achieve these objectives.

1.5 INVERTEBRATE SPECIES

Inventory of invertebrates, with emphasis on Species at Risk, is an important component of baseline studies used for Environmental Assessments such as for the current Project. The Project area includes the access road, exploration area, and proposed power transmission line route. There are very few previous records of invertebrates within at least a 100 km radius of the Project site; hence prediction of what species, especially Species at Risk, may be present in the area was very uncertain.

Butterflies and dragonflies / damselflies were the groups of invertebrates considered for inventory in the study area. The BC Conservation Data Centre does not list any species from other invertebrate groups as potentially occurring in the three forest districts that are nearby and have similar ecosystems (Vanderhoof, Quesnel, and Chilcotin Forest Districts). As a result these two groups of insects are treated as indicators of the number of rare insect species in general that may be affected by development in an area. There were no previous records of any species in these two invertebrate groups from the study area.

1.5.1 BUTTERFLIES

Butterflies are among the best known groups of insects, with respect to taxonomy, ecology, biology, and conservation status. The skippers are distinct subgroup that is commonly lumped in with the butterflies (as in this report), because they are also day-flying. The relatively large amount of knowledge regarding butterflies means that it is possible to assign a conservation status to most species with a reasonable degree of certainty. None of the butterflies in central British Columbia are nationally of conservation

concern according to the Committee on the Status of Wildlife in Canada (COSEWIC) or the Species at Risk Act (SARA).

The BC Conservation Data Centre lists two butterfly species at risk for the Chilcotin, Quesnel, and/or Vanderhoof Forest Districts. The two species are *Oeneis jutta chemocki* (blue-list) and *Hesperia assiniboia* (red-list). Butterfly inventory focussed on documenting whether these species, or any others of conservation concern, occur within the Project study area.

1.5.2 DRAGONFLIES AND DAMSELFLIES

Dragonflies and damselflies (odonates) are among the best known groups of insects, with respect to taxonomy, ecology, biology, and conservation status. The relatively large amount of knowledge of odonates means that it is possible to assign a conservation status to most species with a reasonable degree of certainty. None of the dragonflies / damselflies in central British Columbia are nationally of conservation concern according to COSEWIC or SARA.

The BC Conservation Data Centre lists four dragonfly / damselfly species at risk for the Chilcotin, Quesnel, and/or Vanderhoof Forest Districts. The four species are *Enallagma hageni*, *Epitheca canis*, *Somatochlora forcipata*, and *Somatochlora kennedyi* . These four species are all blue-listed, indicating they are special concern / sensitive but not endangered or threatened. Dragonfly / damselfly inventory focussed on documenting whether these species, or any others of conservation concern, occur within the Project study area.

1.6 HABITATS FOR INVENTORY - WETLANDS, STREAMS, LAKES AND GRASSLANDS

1.6.1 BUTTERFLIES

Butterflies in temperate climates usually live and breed in habitats where sunshine reaches the ground. In the Blackwater Gold area this means naturally non-forested areas such as grass/shrub slopes, subalpine meadows, alpine tundra, and grass/sedge wetlands. In addition dry, open pine or aspen forests and open black spruce wetlands are suitable habitat for some butterflies. Clearcuts and roadsides are excellent habitat for a large proportion of the butterflies that use naturally non-forested areas other than wetlands. Closed canopy conifer forests are completely unsuitable as butterfly habitat in the Blackwater Gold area.

Wet subalpine (ESSF) meadows and lower elevation wet grass meadows are generally lush with a diversity of flowering herbaceous vegetation, and superficially appear to be good butterfly habitat. Only a few species actually use such habitats, apparently because the wet ground conditions make it difficult for the immature stages to overwinter.

1.6.2 DRAGONFLIES AND DAMSELFLIES

Dragonflies and damselflies usually live in habitats where sunshine reaches the ground, and require aquatic habitats for breeding. In the Blackwater Gold area this means that breeding occurs in wetlands, ponds, lakes, and streams. Adults are also found in the same naturally open areas, clearcuts, and roadsides as butterflies; they are hunting for insects, basking for warmth, or just "living" in those areas. Dragonflies and damselflies found in dry habitats will have flown from aquatic habitats up to a kilometer or more away, and indicate the existence of breeding populations in aquatic habitats somewhere nearby. Closed canopy conifer forests are completely unsuitable as dragonfly habitat.

2 METHODS

Inventory consisted of visually searching for adult butterflies and dragonflies along transects through selected habitat patches; the locations and routes of the transects were chosen within each patch of habitat to maximize coverage. Habitat patches were both undisturbed (forests, wetlands, lakeshores, etc.) and disturbed (roadsides, clearcuts). In the study area, primarily non-forested areas (including roadsides, clearcuts, wetlands, and rock outcrops) are suitable habitat for butterflies and dragonflies, although open upland forest and open forested wetlands are also suitable for some butterfly species. Butterfly and dragonfly inventory is most productive between 10:00 AM and 5:00 PM during sunny weather, but, especially in warm weather, can start as early as 8:00 AM and end as late as 8:00 PM. During the inventory days in 2011 the weather was frequently partly or even entirely cloudy and cool, and the flight seasons for most butterfly species was delayed by up to a month. The weather was generally sunnier in 2012, and the flight seasons were closer to normal.

Representative samples of specimens were netted and preserved when needed for later identification (all dragonflies / damselflies and most of the butterflies). Location data included the UTM coordinates for each specimen from a GPS, with an accuracy of 10 m or better. The field work was done by Crispin Guppy and Kevin Mernickle in 2011, and by Kevin Mernickle and Robert Prince in 2012.

The general standards for invertebrate inventory are provided by Ministry of Environment, Lands and Parks (1998), but that publication lacks detailed methods. Specimen collection methods are provided in Appendix 1 for butterflies and Appendix 2 for dragonflies and damselflies.

2.1 BUTTERFLIES

Butterflies were generally collected in the field for later laboratory identification, although some were identified in the field and released unharmed. Specimen collection was done using standard insect aerial nets, with specimens stored in envelopes while in the field. Butterfly identification was done by Crispin Guppy in the field, with samples collected for laboratory verification and as a permanent voucher collection. The standard identification guides for butterflies in BC are Layberry et al. (1998) and Guppy and Shepard (2001). The locations in which butterflies were recorded are shown in Appendix 3.

2.2 DRAGONFLIES AND DAMSELFLIES

Dragonflies were collected in the field for later laboratory identification. Specimen collection was done using standard insect aerial nets, with specimens stored in envelopes while in the field. Specimen preservation and data collection was done according to the standards of the Royal British Columbia Museum (Appendix 2). Dragonfly identifications were done by Sydney Cannings and Crispin Guppy in 2011 and by Crispin Guppy in 2012. The standard identification guides for dragonflies and damselflies in BC are Cannings and Stewart (1974) and Cannings (2008). The locations in which dragonflies / damselflies were recorded are shown in Appendix 3.

2.3 TIMELINES

There were twenty-two days on which butterfly and/or dragonfly inventory observations were made, spread over two years (Table 1). Many of the days were not full inventory days, due to poor weather or other work that was being done.

Table 1. Days with Butterfly Inventory

2011		2012	
June 27	August 1	July 3	August 10
July 9	August 2	July 4	August 11
July 10	August 3	July 5	August 12
	August 4	July 6	August 13
	August 18	July 7	August 14
	August 19		August 15
	August 20		August 16

3 RESULTS AND DISCUSSION

Butterfly and dragonfly inventory can only be successful in warm, sunny weather. The weather was very poor all summer in 2011, with cool, wet weather predominating. The weather was warmer and sunnier in 2012, although the summer was overall still cooler than optimal for butterflies and dragonflies. As a result, the August 10 capture in 2011 of the red-listed butterfly *Hesperia assiniboia* was right at the start of the flight season, but the two August 15 captures in 2012 were past the middle of the flight season (based on butterfly gender and wing wear). Flight seasons of butterflies are generally about six weeks long.

The exploration area and much of the LSA are at relatively high elevations, resulting in a greater predominance of poor weather than at lower elevations. In 2011, dragonflies were not yet in flight on the first field day at low elevation (June 27) and not until the August field work at high elevations. A "normal" year would have seen most species of butterflies and dragonflies in flight several weeks earlier in 2011, more similar to what was seen in 2012.

3.1 BUTTERFLIES

All butterfly species seen had at least one specimen captured for identification. There are 631 records of butterfly occurrences, with a total of 39 species of butterflies (Table 2). Two species are of conservation concern, including one red-listed species and one blue-listed species. The locations in which butterflies were recorded are shown in Appendix 3.

The Assiniboine Skipper, *Hesperia assiniboia*, is red-listed, with a provincial rank of S2, equivalent to *Threatened* within British Columbia. The Conservation Data Centre based this rank primarily on the location records for the species that are mapped in Guppy and Shepard (2001) and Layberry et al. (1995). In those publications the distribution of the butterfly is shown as being limited to the Peace River canyon and immediately adjacent areas, downstream of Taylor; the limited distribution has resulted in the red-listing. Since those publications, *Hesperia assiniboia* has been recorded in central BC -- at several sites west and southwest of Quesnel, near Bear Lake, near Burns Lake, near Lac La Hache, and in this project (C.S. Guppy, pers. comm.). The central BC populations are an undescribed subspecies, and hence do not have a conservation ranking other than at the species level. Assiniboine Skippers are likely present in scattered locations throughout the lower elevation clearcuts and roadsides. The species is apparently uncommon in the study area, but apparently breeds in "weedy" clearings in the project area. They are likely to colonize lower elevation Project clearings such as for the transmission line and roadsides.

Assiniboine Skipper habitat - old forestry road and clearcut

Assiniboine Skipper habitat - old forestry road and clearcut

The Jutta Arctic, *Oeneis jutta chermocki*, is blue-listed (equivalent to *special concern* or *sensitive*) and is wide-spread in forested wetlands and wet forest at low elevations near the project area. It is unlikely to occur in the subalpine within the exploration area, because that area is all cold north-aspect habitats. The Jutta Arctic was found in much greater numbers in 2011 than in 2012. The species is biennial and in the Project area apparently flies primarily in odd-numbered years, with only low population densities in even-numbered years. The blue-listed conservation status of this subspecies is primarily due to there

being relatively few records on the species in central BC. This lack of records appears to be entirely due to lack of butterfly inventory in black spruce wetlands; the subspecies is apparently common and widely distributed in that habitat in central BC (C.S. Guppy, pers. comm.). Clearance of trees from its wet forested habitats, such as for the transmission line, will generally make the habitat unsuitable for this species; trees are an essential component of the habitat even though egg laying and larval feeding occurs on sedges rather than the trees (C.S. Guppy, pers. comm.).

Jutta Arctic habitat - black spruce forest along shrub wetland edge

Table 2. Butterfly Species

Butterfly Families and Species	Number		
	2011	2012	Total
Family Hesperiidae			
Carterocephalus palaemon	10	5	15
Erynnis icelus	2	0	2
Hesperia assiniboia new subspecies[1]	1	2	3
Hesperia colorado	0	1	1
Pyrgus centaureae	2	7	9
Family Lycaenidae			
Celastrina lucia	2	0	2
Epidemia dorcas	2	7	9
Epidemia mariposa	20	4	24
Incisalia eryphon	10	0	10
Lycaeides idas	32	20	52
Plebejus glandon	1	0	1
Plebejus saepiolus	17	36	53
Family Nymphalidae			
Aglais milberti	4	3	7
Boloria bellona	0	1	1
Boloria chariclea grandis	16	75	91
Boloria eunomia	5	0	5
Boloria freija	18	13	31
Boloria frigga	3	5	8
Boloria selene	39	1	40
Limenitis arthemis	6	0	6
Nymphalis antiopa	3	0	3
Oeneis jutta chermocki [1]	14	1	15
Phyciodes cocyta	19	2	21
Phyciodes pulchellus	88	21	109
Polygonia faunus	0	1	1
Polygonia gracilis	8	0	8
Polygonia satyrus	2	0	2
Speyeria atlantis	1	2	3
Speyeria hesperis	8	8	16
Speyeria hydaspe	1	0	1
Family Papilionidae			
Papilio canadensis	12	2	14
Papilio zelicaon	10	0	10
Family Pieridae			
Anthocharis stella	5	0	5
Colias interior	9	5	14
Colias nastes	4	0	4
Colias philodice	11	7	18
Euchloe ausonides	11	0	11
Pieris marginalis	1	0	1
Pieris oleracea	5	0	5
Total Butterfly Specimens	402	229	631
Total Butterfly Species	36	23	39

[1] *Hesperia assiniboia* is red-listed; *Oeneis jutta chermocki* is blue-listed.

3.2 DRAGONFLIES AND DAMSELFLIES

All dragonfly and damselfly species seen had at least one specimen captured for identification. There are 331 records of dragonfly and damselfly occurrences, with a total of 28 species of dragonflies (Table 3). One species is of conservation concern; it is a blue-listed species. The locations in which dragonflies / damselflies were recorded are shown in Appendix 3.

The blue-listed species is the damselfly Hagen's Bluet, *Enallagma hageni*. These are small damselflies that normally perch with wings closed above the abdomen, and the males are blue marked with black. Species identification in this genus is difficult. They are an uncommon inhabitant of marshy, frequently somewhat acid, lakes and ponds. The eggs are laid in the tissues of water plants. They occur widely throughout the central part of BC, north of Kamloops, and are most often seen in the Cariboo Region. The species is only maintained on the Blue List because of its uncommonness over a relatively restricted area of BC, and because there is difficulty in confidently predicting where it might be found.

In this inventory, Hagen's Bluet was only found in two locations. One specimen was found in a clearcut near a wetland on the east side of the study area, where no development is presently proposed. Most of the specimens were captured in a wetland near where the transmission line exits the Local Study Area. The transmission line, if aligned with the wetland, will likely span it without affecting the population of Hagen's Bluet; only alteration of the hydrology, or removal, of the wetland is likely to affect the population. There are likely to be a few other populations of this species in wetlands at lower elevations

in the study area; none are likely to be adversely affected unless low elevation sedge wetlands are altered.

Hagen's Bluet habitat

Hagen's Bluet habitat

Table 3. Dragonfly Species

Dragonfly and Damselfly Families and Species	Number 2011	2012	Total
Family Aeshnidae			
Aeshna eremita	4	9	13
Aeshna juncea	1	10	11
Aeshna palmata	1	4	5
Aeshna sitchensis	0	21	21
Family Coenagrionidae			
Coenagrion interrogatum	2	0	2
Coenegrion resolutum	10	6	16
Enallagma annexum	11	0	11
Enallagma annexum?	1	0	1
Enallagma boreale	34	23	57
Enallagma carunculatum	0	6	6
Enallagma cyathigerum	0	2	2
Enallagma ebrium	1	0	1
Enallagma hageni [1]	0	24	24
Enallagma sp.	3	0	3
Family Cordulidae			
Cordulia shurtleffii	42	7	49
Somatochlora albicincta	1	0	1
Somatochlora franklini	2	1	3
Somatochlora hudsonica	11	7	18
Somatochlora minor	2	0	2
Somatochlora semicircularis	1	9	10
Somatochlora walshi	0	2	2
Somatochlora whitehousei	0	1	1
Family Lestidae			
Lestes disjunctus	4	36	40
Lestes dryas	18	4	22
Family Libellulidae			
Leucorrhinia borealis	3	0	3
Leucorrhinia hudsonica	45	32	77
Leucorrhinia proxima	1	2	3
Libellula quadrimaculata	5	1	6
Sympetrum corruptum	0	6	6
Sympetrum internum	0	7	7
Sympetrum obtrusum	2	16	18
Total Dragonfly / Damselfly Specimens	205	236	441
Total Dragonfly / Damselfly Species	22	21	30

[1] *Enallagma hageni* is blue-listed.

4 SUMMARY

There were 39 species of butterflies and 30 species of dragonflies / damselflies found during inventory over two years for the Blackwater Gold project, which likely represents most of the species that occur in the area. There were no previous records for any species of butterflies or dragonflies / damselflies from the Project area. Only two species of butterflies and one species of damselfly are listed as species at risk by the BC Conservation Data Centre. Two of the species are blue-listed (special concern or sensitive); one butterfly is red-listed (threatened).

The red-listed butterfly, the Assiniboine Skipper, was found living in three forestry clearcuts at lower elevations (Appendix 3, Butterfly Map 1), and is likely present in other clearcuts. The primary mine development is unlikely to affect any populations of the Assiniboine Skipper, because of the relatively high elevation and generally dense conifer forest. Clearing of forest for the power transmission line will provide additional clearcut area, some of which is likely to be colonized by this species. The overall effect of the proposed development on this species is likely to be an increase in area of suitable habitat and increased population size.

The blue-listed butterfly, the Jutta Arctic, was found living in six black spruce wetlands at lower elevations (Appendix 3, Butterfly Maps 1, 2), and is likely found in most of the other lower elevation black spruce wetlands in the area. The primary mine development is unlikely to affect any populations of the Jutta Arctic, because of the relatively high elevation and generally dense conifer forest. Clearing of trees from black spruce wetlands for the power transmission line may adversely affect some populations of this species, but there are likely many additional populations in the general area that will not be affected. The overall effect of the proposed development on this species is likely to be a slight decrease in area of suitable habitat and a decrease in the local number of individuals.

The blue-listed damselfly, Hagen's Bluet, was found living in two sedges wetlands at lower elevations (Appendix 3, Dragonfly Map 1), and may occur in some other wet sedge wetlands in the area. The primary mine development is unlikely to affect any populations of Hagen's Bluet, because of the relatively high elevation and generally dense conifer forest. Clearing for the transmission line is unlikely to affect any populations, because the sedge wetlands will be spanned by the line. The overall effect of the proposed development on this species is likely to be no change in area of suitable habitat and no change in the number of populations.

5 REFERENCES

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6 APPENDICES

APPENDIX 1. COLLECTING AND PRESERVING BUTTERFLIES

Crispin S. Guppy, M.Sc., RPBio, PBio., Senior Biologist, Ecofor Consulting BC Ltd., cris@ecofor.ca.

COLLECTING

Collection Data

Record exact locality including UTM or lat/long coordinates, date, collector's name, and any pertinent habitat and behavioural information -- type of habitat, dominant plants, reproductive behaviour, and other pertinent information. The coordinates should ideally be Always record this collection information and ensure that it is easily related to each specimen (see below).

Eggs and Caterpillars

Butterfly eggs and caterpillars are rarely seen and their inventory is generally too labour-intensive to be worthwhile; pupae are almost never found. The caterpillars of a few species are worth searching for while doing inventory for adults. Butterfly caterpillars that feed on the leaves of stinging nettle are easily found and reasonably easy to identify. Eggs and caterpillars of Anise Swallowtails, Old-world Swallowtails, and Oregon Swallowtails can frequently be found on their foodplants (most commonly cow parsnip and tarragon). Eggs and larvae of Mustard Whites, Margined Whites, Orange-tips, and Marbles can often be found on the wild mustards used as foodplants (most commonly *Arabis* spp.). The larvae can be collected and reared to produce adults if desired, but photographs are usually a sufficient record for identification.

Adults

Use a professional aerial insect net (not a children's toy net). A net opening of at least 18" is recommended, and the handle should be at least a meter long. A fairly fine mesh that is reasonably soft is preferred to reduce damage to the wings during capture, but, the mesh should be open enough to reduce air resistance and allow a fast swing.

Observing the flight path of butterflies before starting a chase often allows for a chase route that is shorter and faster than actually following the butterfly. Keep the net as inconspicuous as possible by avoiding waving the net around, keeping it as low as possible, and hold the net bag against the handle until preparing to swing. If possible, swing at the butterfly from behind and below as they fly by; this reduces their ability to dodge the net.

When a specimen is captured, while it is still in the net fold its wings over its back and use your thumb *nail* and fore finger (or stamp tongs) to pinch the sides of the thorax at the base of the wings. It takes practice to do it hard enough to stun or kill the butterfly without squashing it; using your nail rather than the thumb itself results in more sensitivity while pinching. Avoid squeezing the abdomen, which will squash very easily. Place the specimen in a glassine envelope for field storage (available in several sizes at stamp and coin stores -- the most versatile size is 3.5” x 2.25”). Alternatively it can be placed alive in a glassine envelope with the wings over the back. Several pinched specimens can be placed in each envelope, depending on their size, they seldom damage each other. Place mating pairs by themselves in the same envelope and write "in copula" on the envelope. Generally only a field collection number is written on the envelope, which is cross-referenced to field notes, although the full collection data can be written on the envelope if preferred. Use soft pencil to write on the envelope, not ink. A typical collection number should incorporate the collector’s initials, the year and the data. An example is CG12-25, where "CG" is the collector's initials, "12" is the year 2012, and "25" is the cross-reference to the field notes for site 25 on a specific date. Create a new field number for each date that you visit a site, to ensure that the dates that specimens are collected on remain separate. It is usually desirable to only write the number on the envelope, because envelopes can be reused many times and the less that is written on them the better.

PREPARING ADULT SPECIMENS

In the field keep the envelopes containing butterflies as cool as possible. Store them in a non-crushable box, such as a plastic food freezer or sandwich box. Once returned from the field, place the box of specimens in a freezer to complete the killing process (pinching sometimes stuns but does not kill the specimen). Freezing also reduces the rate at which specimens dry out and become brittle. It is generally a good idea to remove the specimens from the freezer the next day, briefly thaw them, and, while using stamp tongs while handling them, straighten out any wings that are not neatly folded over the back. They can then be either re-frozen permanently or for later pinning and spreading of the wings, or pinned and the wings spread immediately.

The colours of butterflies are mostly the result of pigments. As with the pigments in fabrics, the colours fade with time. The fading can be minimized by storing the specimens in the dark; sunlight and other strong lights will start fading the colours in a matter of weeks.

Specimens can be shipped by mail safely and efficiently in the glassine envelopes. Simply make certain they will not shift or slide around in the container (pack with tissue if necessary) and nest the box in a larger box, protected on all sides by three or four inches of packing material. This "double container" arrangement is critical to prevent impact vibrations from reaching the specimens and causing the brittle legs and antennae to shatter. Once the specimens have been pinned, they are more difficult to ship safely but they can still be sent through the mail.

PERMANENT STORAGE

There are several options for permanent storage:

1. Store them long-term in a household deep freeze. The advantage with this is that they will not get eaten by pest insects, they do not get broken from accidents, and (most importantly) their DNA will be preserved reasonably well, for later analysis, for a decade or more (DNA degradation is a continuous process, so there is really no fixed length of time). Frozen specimens will gradually dry out through the process of "freezer burn" over a period of six months or so. This can be avoided by wrapping the freezer box of specimens in wet paper towel, and placing it all in a larger box or a sealed plastic bag. However, if the purpose is to preserve the DNA, it is probably best to let them dry (water degrades DNA).
2. Store the envelopes with specimens long-term in sealed plastic freezer boxes in a dry, cool, dark location in the house. Before storing them, ensure that the specimens are completely dry by leaving the box open in the house for at least a week. It is then best to place the sealed boxes in a deep freeze for several days before storing, to ensure that any pest insects in the box have been killed.
3. Pin the specimens, spread the wings, let them dry, and add data labels to the pins below the specimens. Then store as museum specimens. This process is takes practice to become skilled, and the details are too much to include here. Museum-style collections should be donated to a public museum collection (they rarely have funds to purchase them), when you lose interest in the collection or are no longer able to care for it. That way the specimens can continue to contribute to scientific knowledge for centuries to come.
4. It is a good idea to develop a computer database (MS Excel spreadsheet is usually the best). You can maintain records of your sight records, as well as of your specimens.

ADDITIONAL INFORMATION

The *Butterflies of America* and *E-fauna BC* websites are useful sources of information regarding butterflies. The ethics of a collecting (Collecting Guidelines) are provided by *the Lepidopterists' Society*. http://butterfliesofamerica.com/; http://www.geog.ubc.ca/biodiversity/efauna/; http://www.lepsoc.org/statement_on_collecting.php. The books by Guppy and Shepard (2001) and Layberry et al. (1998) are useful for identifications (see references).

APPENDIX 2. COLLECTING AND PRESERVING ODONATA (DRAGONFLIES AND DAMSELFLIES)

Dr. Rob Cannings, Curator of Entomology, Royal British Columbia Museum. rcannings@royalbcmuseum.bc.ca

COLLECTING

Always gather collection information and ensure that it is easily related to each specimen (see below). Record exact locality (including, if possible, UTM or lat/long coordinates), date, time, collector's name, and any pertinent habitat and behavioural information -- data on the type of water body, dominant plants, reproductive behaviour, and other pertinent information are extremely useful.

Larvae

Collect live larvae by sweeping aquatic habitats with a dip net. Anisoptera larvae are best kept temporarily in containers with a bit of wet moss or other vegetation to keep the humidity high. Back at camp or home, drop them in water that has just come off the boil; leave them for 30 seconds, remove and place on paper towelling to remove excess water. Store in vials of 70% ethanol. In vials with narrow openings, insert the larvae head up (This orientation makes removal later much easier). Specimen death in hot water is extremely quick. It also coagulates the protein (preventing the disintegration of internal tissues) and preserves the colour pattern much better than does placement directly into alcohol. On the other hand, hot water wrecks the caudal lamellae of Zygoptera (damselflies). I put damselfly larvae directly into 70% ethanol in the field, then replace it with fresh ethanol after returning to base. Write the collection number on a label and place it in the vial with the specimen(s).

Exuviae (cast larval skins) should also be collected from aquatic plants, rocks, logs and other supports. This is a useful activity (along with sweeping for live larvae) when the weather is poor and adults are not flying. I prefer to keep most exuviae in 70% ethanol because in liquid they are more pliable -- the dorsal structures of the labium and structures such as abdominal spines (often covered with matted hairs or algae in dried exuviae) are more easily examined. The main problem with this technique is the placement of brittle exuviae in the alcohol vial. Frequrntly, the exuviae must be relaxed (soaked in hot water) before they are put in the vial. Place the exuviae head up in the vial.

I always preserve Zygoptera exuviae in ethanol because of their fragility. Many collectors preserve Anisoptera exuviae by pinning them through the base of the wing cases, with a small drop of white glue placed at the point where the pin exits the base of the thorax ventrally. Leave about 1 cm of the pin extending above the specimen. Pinning is a convenient way of handling the Aeshnidae because liquid storage is not necessary for the clear observation of useful taxonomic characters. These exuviae lack the matted hairs often found in the Corduliidae and Libellulidae, for example, and the important characters of the labium can be seen without extending it.

Adults

Use a long-handled aerial net. A net opening of at least 18" is recommended. Some collectors feel that a dark net bag (black or green) is less conspicuous to dragonflies, and thus is more effective than a white one. White nets make it easier to find the specimen in the net. A wide mesh (but small enough to hold the smallest specimens) is preferred because this reduces air resistance and allows a faster swing. A large mesh may not be satsifactory if you're also collecting insects other than Odonata.

Observing patrolling dragonflies before swinging away often pays; positioning yourself in the most advantageous location, especially if it is somewhat concealed, is usually fruitful. Move deliberately. Refrain from waving the net around; keep it as inconspicuous as possible. Swing at fast-flying agile species from behind as they fly by; many will easily dodge a net swung head-on.

When an adult specimen is captured, place it alive in a glassine envelope (available in several sizes -- the most versatile is 3.5” x 2.25” -- at stamp collector or hobby stores). The wings should be together above the back. In general, put only one

specimen in each envelope; they can damage each other. But place pairs caught in tandem or in copula in the same envelope if possible; face them away from each other. If they are too large to go together in a single envelope, make certain that the fact they were mating is indicated on both envelopes**. The collection number (cross-referenced to field notes or fully-entered data sheets) must be written on the envelope in soft pencil, India ink or other ink that is insoluble in acetone (if the acetone treatment describe below is used).** The collection number should be in a form incorporating the collector's initials, the year and the actual locality/date, e.g.: RAC03-25. The number 25 here refers to a particular locality on a particular date (data recorded elsewhere) – the number thus represents the 25th collection made in 2003 by Rob Cannings. Write only the number on the envelope – envelopes can be reused many times and the less that is written on them the better. **Cross out any old writing on the envelope before adding your new number**. Specimen identifications should be written on a separate small label placed inside the envelope.

Teneral (recently emerged) adults are fragile and preserve poorly – they tend to shrivel as they dry. If your collection has an alcohol vial component, you might want to preserve tenerals in vials of 70% ethanol (this is what I prefer). Alternatively, if you want a dry specimen, place it alive in a paper bag for a day or two so that the cuticle hardens and the colour pattern develops. If collected while emerging, the adult should be placed in a bag and the associated exuviae should be kept and cross- referenced to the adult specimen. Or both can be preserved together in a vial of 70% ethanol. Like larvae, any adult put in a vial should be inserted carefully, wings back and head up.

PREPARING ADULT SPECIMENS

While in the field keep the envelopes containing live dragonflies as cool as possible. Store them in a non-crushable box. Tupperware boxes of the proper size are excellent for this purpose.

For convenience, specimens are usually kept alive in the envelopes until the collector returns to base. This also allows time for the specimens to empty their digestive tracts; colour is usually preserved better in a specimen with an empty gut.

The colour pattern of some species, especially some blue ones (e.g. *Aeshna eremita, A. constricta, A. canadensis*) fades soon after capture. This fading can often be reversed by exposing the specimen to sunlight. However, if possible, such species should be treated in acetone immediately.

Acetone treatment: Acetone dehydrates the specimen and dissolves fat, reducing the decomposition of colour pigments. Acetone is flammable; use caution. Avoid breathing the fumes and absorbing the liquid through your skin. Acetone can be purchased at most hardware or paint stores.

Keep the acetone in a wide-mouth plastic or glass jar or other container (such as Tupperware©) inert to the solvent. The wider the mouth, the better. Make sure that the lid is leak-proof. Pack the jar(s) snugly in a box for stability.

Acetone is one of those substances that is difficult to carry on scheduled airline flights. It is best to get it after you arrive at your destination. Try to take along the necessary jars or containers, though -- it is normally harder to find a good jar with the right dimensions than it is to find acetone.

The dragonfly must be killed and its body arranged in the proper configuration before treating it in acetone, otherwise it may dry with abdomen curled and wings and legs awry. I prefer to do this by placing a few drops of my usual insect killing agent, ethyl acetate, in the envelope containing the specimen. As soon as the insect is dead, the abdomen should be straightened (to make measuring it easier) and the legs should be brought forward (so that they do not obscure the base of the abdomen). The envelope containing the dragonfly then is immersed, on edge, in the acetone. **Do not force too many envelopes into the jar – envelopes should have circulating liquid around them**. Tightly packed specimens do not absorb enough acetone and, moreover, can be flattened by the pressure.

If ethyl acetate is not available, the envelope and dragonfly can be placed in the acetone, killing the dragonfly. However, if this is done, you will have to remove the envelope from the jar after a minute or so; straighten the abdomen and arrange legs before replacing the envelope in the acetone. This method is a bit messier and subjects you to more

acetone exposure, which is best avoided, but it does do away with carrying other chemicals.

Some collectors kill dragonflies, especially larger species, by injecting acetone into the thorax and base of abdomen with a hypodermic needle. This introduces the chemical into the muscles and organs faster than simple soaking, and some swear that it improves colour retention.

Leave the dragonflies in the acetone for about 24 hours. The usual procedure is to remove the envelopes out for drying when the next day's catch is ready to go into the jar(s). The acetone should be replaced after a few batches of specimens have been processed, i.e. when it becomes pale yellow (indicating considerable dissolved fat**). The fresher the acetone used, the better the specimens produced.**

Drain the acetone out of the envelopes back into the jar (some collectors snip a little bit off the bottom corners of the envelopes to facilitate drainage, but I don't do this because small specimens can protrude or fall out) and dry them (containing the specimens) in a well-ventilated place. When possible, I do this outside in the sun and breeze.

When the envelopes are very dry, store them in Tupperware© or cardboard boxes that will withstand crushing. Store the envelopes vertically, like a card file, and **do not pack them tightly**. At this stage, too, specimens can be squeezed and flattened if jammed too closely together. Tupperware© containers are good because their tight seal prevents most pests from attacking the specimens. In humid climates, the inclusion of silica gel desiccating packets helps keep the specimens dry.

Specimens can be shipped by mail safely and efficiently in the glassine envelopes. Simply make certain they will not shift or slide around in the container (pack with tissue if necessary) and nest the box in a larger box, protected on all sides by three or four inches of packing material.

Drying by acetone is by far the preferred treatment, but if this is impossible, simply dry the specimens as rapidly as possible after they have been killed. Placing the boxes containing specimen envelopes at close range over or under electric lights is helpful. Or put them on the dashboard of your car in the sun. The faster the drying occurs, the better the colour preservation. In the tropics, acetone is invaluable, since air-drying specimens is difficult and specimen damage is common. Acetoned dragonflies may even resist damage by pests (ants, carpet beetles, psocids, mice) more than untreated ones.

Another alternative is storage in 70-80% ethanol, either in envelopes or without them. If envelopes are not used, specimens may later be removed from the alcohol and dried in envelopes in the correct position. It's also all right to keep specimens permanently in vials of ethanol. Most collectors consider both air-drying and alcohol storage less desirable than the acetone treatment.

PERMANENT STORAGE

Once the specimens arrive at a museum or other collection, they are taken out of the glassine envelopes and stored permanently in clear envelopes made of cellophane, Mylar, polyethylene or polypropylene. The identification and collection data are printed on 3" x 5" cards, which are inserted in the envelopes behind the specimen. The envelopes are then stored like a card file in cabinets. Most collections now have a computer database of specimens; the collection data are entered into a database and the specimen cards are printed directly from the computer.

ADDITIONAL INFORMATION

The Dragonfly of the Americas site contains a useful section on the purposes and ethics of collecting (Collecting Guidelines). [http://www.odonatacentral.org/index.php/PageAction.get/name/DSACollectingPolicy]

APPENDIX 3. MAPS

newgold

BLACKWATER GOLD PROJECT

BUTTERFLY 2011 - 2012 INVENTORY MAP 1

Map Projection: NAD 83, UTM Zone 10
Date: November 29, 2012

N
W E
S

750 0 750 1500 2250
Meters
Scale: 1:75,000

LEGEND

- Lake/River
- Wetland
- RSA
- LSA
- LSA Extension
- Private Land
- First Nations Reserve
- Existing Cutblock
- Stream
- Contour
- Road
- Proposed Mine Site Access Road
- Proposed Transmission Line
- Butterfly: Red-list
- Butterfly: Blue-list
- Butterfly: Common Species

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BLACKWATER GOLD PROJECT

BUTTERFLY 2011 - 2012
INVENTORY MAP 2

Map Projection: NAD 83, UTM Zone 10
Date: November 29, 2012

N
W E
S

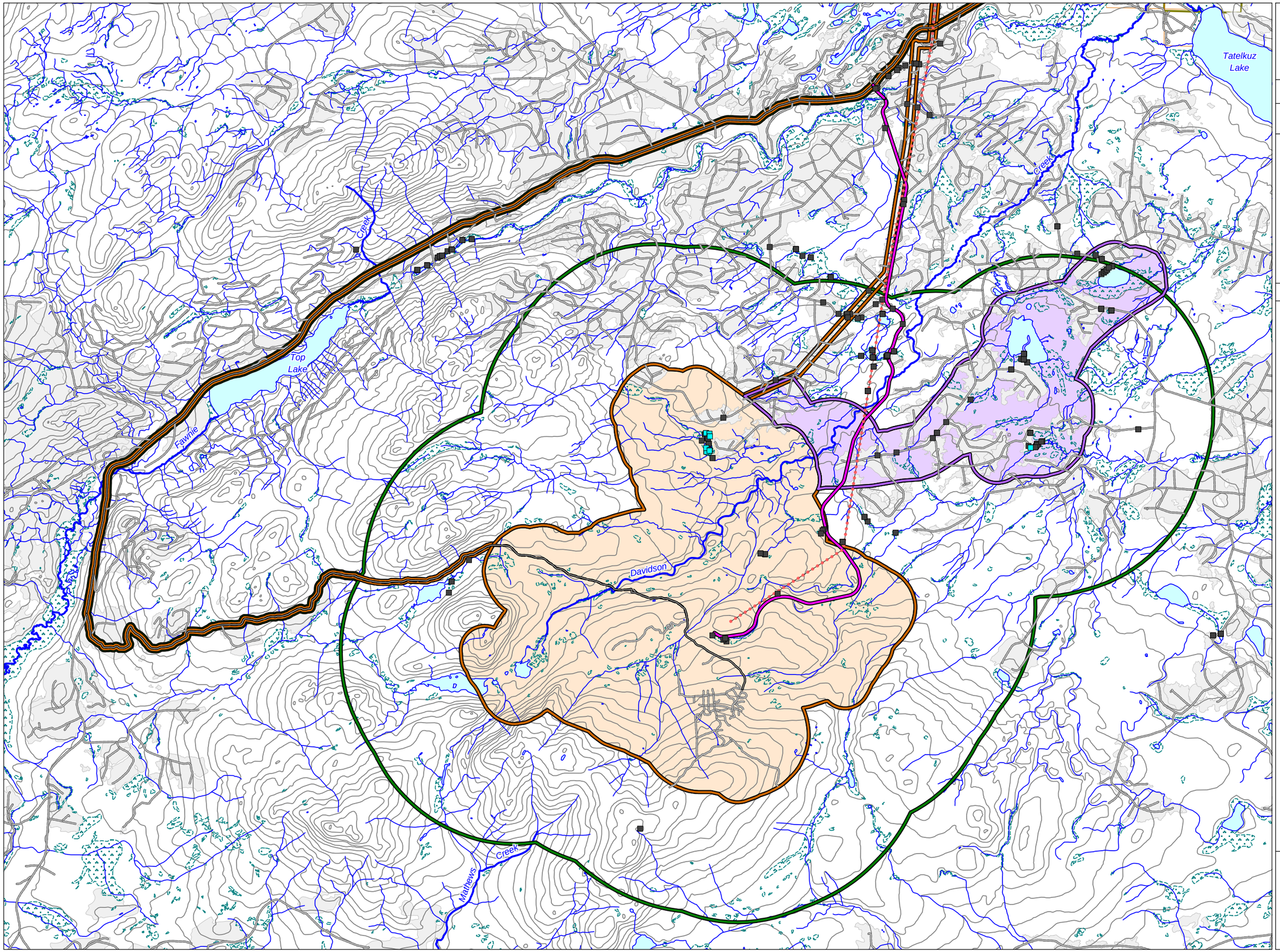
750 0 750 1500 2250
Meters
Scale: 1:75,000

LEGEND

- Lake/River
- Wetland
- RSA
- LSA
- Woodlot
- Private Land
- First Nations Reserve
- Existing Cutblock
- Stream
- Contour
- Road
- Proposed Mine Site Access Road
- Proposed Transmission Line
- Butterfly: Blue-list
- Butterfly: Common Species

ECOFOR
natural and cultural resource consultants

Ethorni
Creek
Esker
Creek
Chedakuz
Creek
Creek
Davidson
Tatelkuz
Lake



newgold

BLACKWATER GOLD PROJECT

DRAGONFLY 2011 - 2012 INVENTORY MAP 1

Map Projection: NAD 83, UTM Zone 10
Date: November 29, 2012

N
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750 0 750 1500 2250
Meters
Scale: 1:75,000

LEGEND

- Lake/River
- Wetland
- RSA
- LSA
- LSA Extension
- Private Land
- First Nations Reserve
- Existing Cutblock
- Stream
- Contour
- Road
- Proposed Mine Site Access Road
- Proposed Transmission Line
- Dragonfly: Blue-list
- Dragonfly: Common Species

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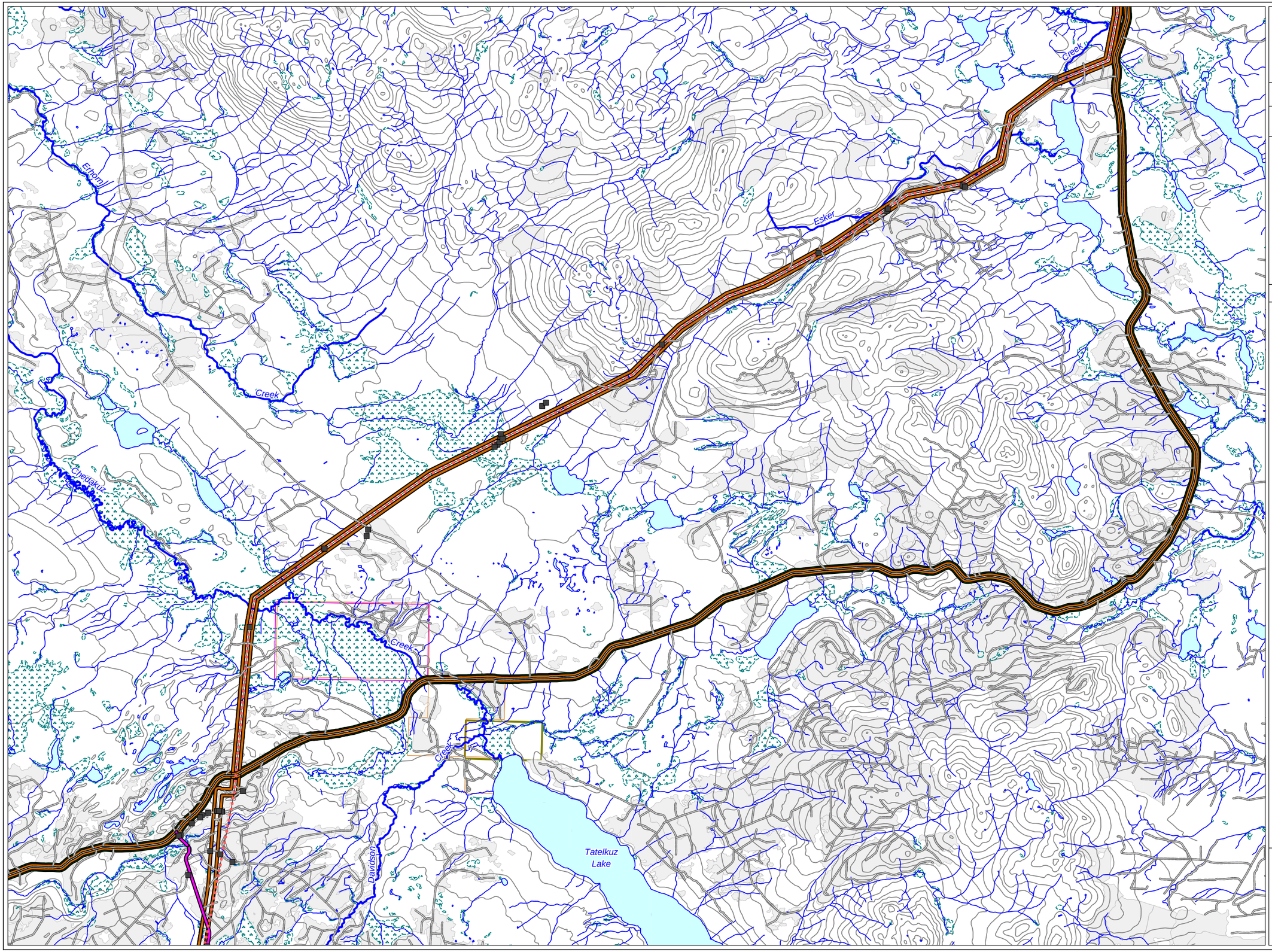

newgold

BLACKWATER GOLD PROJECT

DRAGONFLY 2011 - 2012
INVENTORY MAP 2

Map Projection: NAD 83, UTM Zone 10
Date: November 29, 2012

N
W E
S

750 0 750 1500 2250
Meters
Scale: 1:75,000

LEGEND

- Lake/River
- Wetland
- RSA
- LSA
- Woodlot
- Private Land
- First Nations Reserve
- Existing Cutblock
- Stream
- Contour
- Road
- Proposed Mine Site Access Road
- Proposed Transmission Line
- Dragonfly: Common Species

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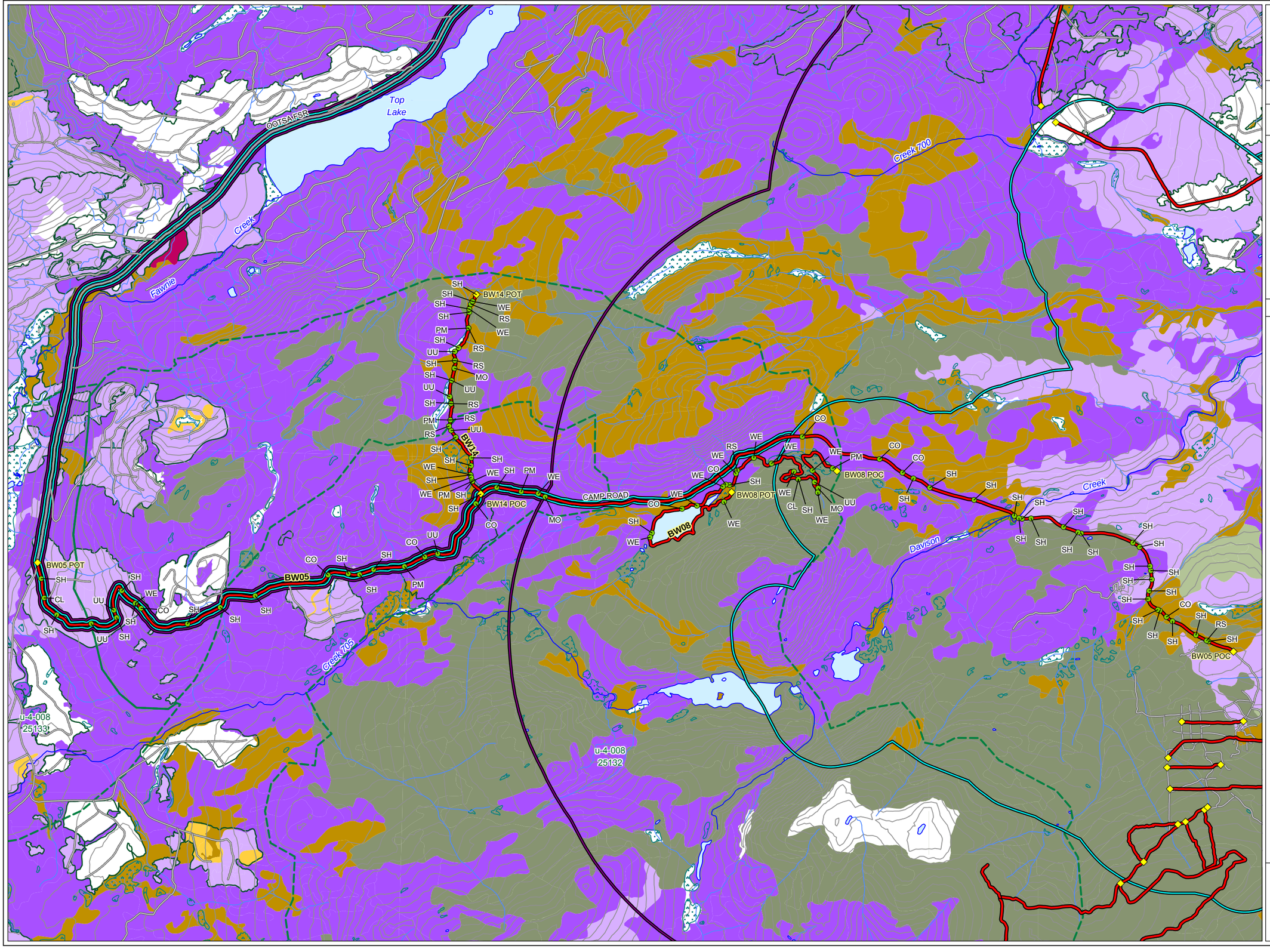

BLACKWATER GOLD PROJECT

2012 Winter Track Count Survey
Track Number: BW05, BW08, BW14

Map Projection: NAD 83, UTM Zone 10
Date: May 4, 2012

400 0 400 800 1200
Meters
Scale: 1:40,000

LEGEND

- Lake/River
- Wetland
- Blackwater RSA
- Blackwater LSA
- Caribou Ungulate Winter Range
- Cutblock
- Gazetted Stream
- Stream
- Contour
- Road
- 2012 Track Transect
- Transect POC/POT
- Wildlife Track Point

Forest Cover Information

- Immature Coniferous (Pine Leading)
- Immature Coniferous (Fir Leading)
- Immature Coniferous (Spruce Leading)
- Mature Coniferous (Pine Leading)
- Mature Coniferous (Fir Leading)
- Mature Coniferous (Spruce Leading)
- Deciduous Tree Species

Wildlife Identification

PM - Marten
MO - Moose
SM - Small Mammal (Rodents etc)
SH - Snowshoe Hare
RS - Red Squirrel
RF - Red Fox
CO - Coyote
WV - Wolverine
UU - Unknown Ungulate
WE - Weasel sp.
CL - Canada Lynx

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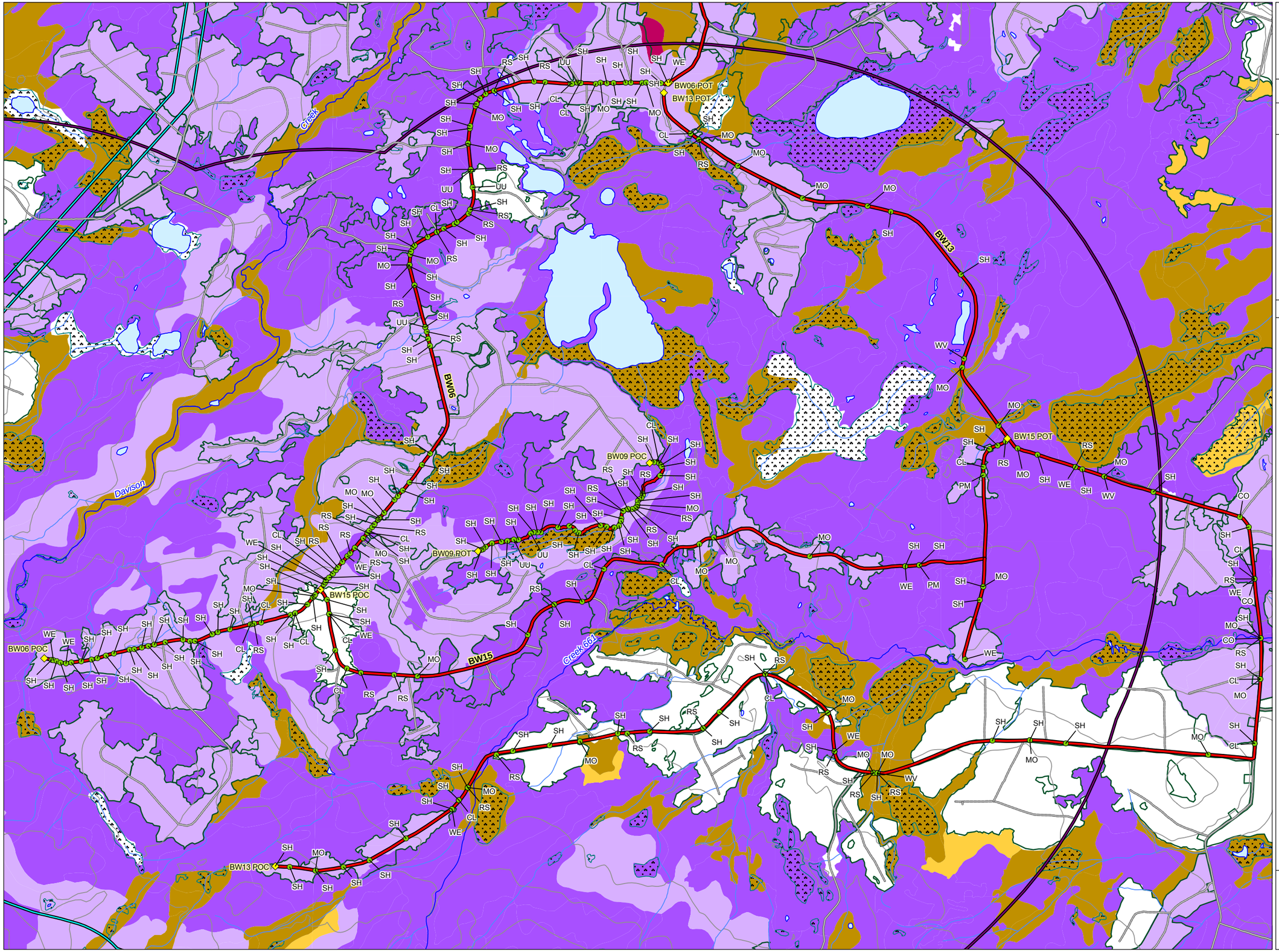

newgold

BLACKWATER GOLD PROJECT

2012 Winter Track Count Survey
Track Number: BW06, BW09, BW13, BW15

Map Projection: NAD 83, UTM Zone 10
Date: May 4, 2012

250 0 250 500 750
Meters
Scale: 1:25,000

LEGEND

- Lake/River
- Wetland
- Blackwater RSA
- Blackwater LSA
- Caribou Ungulate Winter Range
- Cutblock
- Gazetted Stream
- Stream
- Contour
- Road
- 2012 Track Transect
- Transect POC/POT
- Wildlife Track Point

Forest Cover Information

- Immature Coniferous (Pine Leading)
- Immature Coniferous (Fir Leading)
- Immature Coniferous (Spruce Leading)
- Mature Coniferous (Pine Leading)
- Mature Coniferous (Fir Leading)
- Mature Coniferous (Spruce Leading)
- Deciduous Tree Species

Wildlife Identification

PM - Marten
MO - Moose
SM - Small Mammal (Rodents etc)
SH - Snowshoe Hare
RS - Red Squirrel
RF - Red Fox
CO - Coyote
WV - Wolverine
UU - Unknown Ungulate
WE - Weasel sp.
CL - Canada Lynx

ECOFOR
natural and cultural resource consultants

Annex 9
2011-2013 Blackwater Gold Environmental Assessment Invertebrate Inventory

ECOFOR
natural and cultural resource consultants

Blackwater Gold Environmental Assessment
Invertebrate Inventory

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1 INTRODUCTION

1.1 SETTING

The Blackwater Gold Project (Project) of New Gold Inc. is located in central British Columbia approximately 160 km south of Vanderhoof, British Columbia. The Project area is focused on the headwaters of Davidson Creek, on the north side of Mount Davidson near the east end of the Fawnie Range. A power transmission line is proposed to run north and westward to join the existing transmission line just south of Highway 16, south of the town of Fraser Lake. To the south of Mount Davidson is the upper Blackwater (West Road) River watershed, with the First Nations village of Kluskus about 35 km to the southeast of the Project. Road access to the Project is from Vanderhoof via the Kenny Dam Road and the Kluskus Forest Service road to 146.1 km by the road markers; the Blackwater Camp road is then an additional 17 km in length.

The immediate vicinity of the Project mine site consists of predominantly forested subalpine habitats, with small non-forested wetlands. Extensive lower elevation areas occur north of the mine site, north through additional exploration areas and along the transmission line to Fraser Lake.

1.2 PROJECT SUMMARY

The Project consists of a proposed open pit, hard rock gold mine and associate infrastructure. The mine and much of the infrastructure such as camps and waste sites will be located in the subalpine on the north side of Mount Davidson, with the access road and power transmission line heading north to join Highway 16 near Fraser Lake. The primary effects on butterfly and odonate (dragonfly and damselfly) habitat will be complete removal of habitats in the primary mine development area, access road development, and airstrip development; and alteration of habitats through clearance of forest beside roads and for the power transmission line.

1.3 ECOSYSTEMS AND VEGETATION

The topography is generally rolling, with shallow valleys cut by the major streams. The higher elevations are north-aspect moderate to steep slopes within the study area. There are occasional naturally non-forested grass/shrub habitats on southerly aspect steep dry slopes below the Englemann Spruce - Subalpine Fir (ESSF) Zone of the Biogeoclimatic Ecosystem Classification (BEC) System. There are numerous clearcuts in various stages of regeneration in the Sub-boreal Spruce (SBS) and Su-boreal Pine-Spruce (SBPS), with an associated network of forest industry roads. Non-forested wetlands are present, but comprise a low proportion of the landscape.

The varied topography of the study area results in a variety of BEC subzones and variants being present. Mount Davidson has BAFAun (Boreal Altai Fescue Alpine Undifferentiated subzone) at the highest elevations, which is alpine tundra with scattered patches of stunted conifers. Below that is the BAFAmvp

(BAFA moist very cold parkland subzone), which is alpine meadows with some short white spruce and pine (lodgepole and white bark) trees. Most of the exploration area is within the ESSFmv1 (Englemann Spruce - Subalpine Fir moist very cold subzone, Nechako variant), which is mostly dense white spruce forest with some lodgepole and white bark pine. The transmission line route passes through the SBSmc3 (Sub-boreal Spruce moist cold subzone, Kluskus variant), SBSdw3 (Sub-boreal Spruce dry warm subzone, Sewart variant), and the SBSdk (Sub-boreal Spruce dry cool subzone) all of which are dominated by lodgepole pine and white spruce forest. The southwest edge of the Project, along the access road is in SBSdw2 (Sub-boreal Spruce dry warm subzone, Blackwater variant), and the SBPSmc (Sub-boreal Pine - Spruce moist cold subzone), both of which are dominated by lodgepole pine and spruce forests.

1.4 OBJECTIVES

Baseline surveys were designed to investigate the terrestrial and aquatic butterfly and dragonfly / damselfly communities within and near the Project area. Specific objectives were to:

- Determine the presence and distribution of invertebrate species;
- Determine the species of conservation concern in the area, and their habitats; and
- Assess the potential impacts of Project developments on invertebrate species of conservation concern.

Baseline surveys were done for invertebrates in the summers of 2011, 2012, and 2013 to achieve these objectives.

1.5 INVERTEBRATE SPECIES

Inventory of invertebrates, with emphasis on Species at Risk, is an important component of baseline studies for major Environmental Assessments. The Environmental Assessment for the Project area includes the access road, the exploration area, and the proposed power transmission line route. There are very few previous records of invertebrates within at least a 100 km radius of the Project site; what few records are present are near Highway 16. Hence prediction of the species, especially Species at Risk, that may be present in the area was very uncertain.

Butterflies and odonates (dragonflies and damselflies) were the groups of invertebrates considered for inventory in the study area, because they are the only invertebrate groups for which the BC Conservation Data Centre lists any species as potentially occurring in the three forest districts that are nearby and have similar ecosystems (Vanderhoof, Quesnel, and Chilcotin Forest Districts). There were no previous published records of any Species at Risk in these two invertebrate groups from the study area.

1.5.1 BUTTERFLIES

Butterflies are among the best known groups of insects, with respect to taxonomy, ecology, biology, and conservation status. The skippers are distinct group that is commonly lumped in with the butterflies (as in this report), because they are also day-flying members of the insect Order Lepidoptera. The relatively large amount of knowledge regarding butterflies means that it is possible to assign a conservation status to most species with a reasonable degree of certainty. None of the butterflies in central British Columbia are nationally of conservation concern according to the *Committee on the Status of Wildlife in Canada* (COSEWIC) or the *Species at Risk Act* (SARA). The author of this report (Crispin S. Guppy), who also lead most of the field work, is a recognized authority on butterflies (Guppy and Shepard 2001) and contributes information from his unpublished database and knowledge to this report.

The BC Conservation Data Centre lists two butterfly Species at Risk for the Chilcotin, Quesnel, and/or Vanderhoof Forest Districts. The two species are the Jutta Arctic, *chermocki* subspecies (*Oeneis jutta chemocki*, blue-list) and Assiniboine Skipper (*Hesperia assiniboia*, red-list). Field work focussed on documenting whether these species, or any others of conservation concern, occur within the route of the power transmission line. Despite the relatively high level of knowledge regarding butterflies, compared to most other groups of insects, there are also unresolved taxonomic issues for some species (as discussed below).

1.5.2 DRAGONFLIES AND DAMSELFLIES

Dragonflies and damselflies (odonates) are also among the best known groups of insects; in many ways they are better known than butterflies because there are relatively few species and almost no subspecies recognized. The relatively large amount of knowledge of odonates means that it is possible to assign a conservation status to most species with a reasonable degree of certainty. None of the dragonflies / damselflies in central British Columbia are nationally of conservation concern according to COSEWIC or SARA.

The BC Conservation Data Centre lists four dragonfly / damselfly Species at Risk for the Chilcotin, Quesnel, and/or Vanderhoof Forest Districts. The four species are the damselflies *Enallagma hageni* and *Epitheca canis*, and the dragonflies *Somatochlora forcipata*, and *Somatochlora kennedyi* . These four species are all blue-listed, indicating they are special concern or sensitive but not endangered or threatened. Dragonfly / damselfly inventory focussed on documenting whether these species, or any others of conservation concern, occur within the route of the power transmission line.

1.6 HABITATS FOR INVENTORY

1.6.1 BUTTERFLIES

Butterflies in temperate climates usually live and breed in habitats where sunshine reaches the ground. In the Blackwater Gold area this includes naturally non-forested areas such as grass/shrub slopes, subalpine meadows, alpine tundra, and grass/sedge wetlands; dry, open pine or aspen forests and open black spruce wetlands are also suitable habitat for some butterflies. Clearcuts and roadsides are excellent habitat for most species of butterflies, and provide excellent representation of most species that inhabit open forests and forest openings.

Closed canopy conifer forests, other than forest openings, are completely unsuitable as butterfly habitat in the Blackwater Gold area. Wet subalpine (ESSF) meadows and lower elevation wet grass meadows are frequently lush with a wide diversity of flowering herbaceous vegetation, and superficially appear to be good butterfly habitat. However, only a few species actually use such habitats, apparently because the wet ground conditions make it difficult for the immature stages to overwinter (C. Guppy pers. comm.).

1.6.2 DRAGONFLIES AND DAMSELFLIES

Dragonflies and damselflies also usually live in habitats where sunshine reaches the ground, and require aquatic habitats for breeding. In the Blackwater Gold area this means that breeding occurs in non-forested wetlands, ponds, lakes, and streams. Adults are also found in the same naturally open areas, clearcuts, and roadsides as butterflies; they are hunting for insects (including butterflies), basking for warmth, or just "living" in those areas. Dragonflies and damselflies found in dry habitats will have flown from aquatic habitats up to a kilometer or more away, and indicate the existence of breeding populations in aquatic habitats somewhere nearby.

Closed canopy conifer forests are completely unsuitable as dragonfly habitat, however non-forest *Sphagnum* bog habitats within such forests may support rare species.

2 METHODS

Field work consisted of visually searching for adult butterflies and dragonflies along transects through selected habitat patches; the locations and routes of transects were chosen within each patch of habitat to maximize coverage. Roads were usually selected as transect routes, because roadside clearances usually contain a representative selection of the butterflies and dragonflies living in nearby natural habitats, and walking is easy. Habitat patches were both undisturbed (forests, wetlands, lakeshores, etc.) and disturbed (roadsides, clearcuts). In the study area, primarily non-forested areas (including roadsides, clearcuts, wetlands, and rock outcrops) are suitable habitat for butterflies and dragonflies, although open-canopy upland forest and open-canopy forested wetlands are also suitable for some butterfly species. Butterfly and dragonfly inventory is most productive between 10:00 AM and 5:00 PM during sunny weather, but, in warm weather, can start as early as 8:00 AM and end as late as 8:00 PM.

Representative samples of specimens were netted using a standard aerial insect net and preserved for later identification. Some butterflies were identified in the field and released again ("sight observations"). Location data included the UTM coordinates for each specimen from a Garmin recreational GPS, with an accuracy of 10 m or better. The field work was done by Crispin Guppy, Kevin Mernickle, Robert Prince, Breanne Patterson, Joe Fairbairn, and Kaitlin Yehle (Table 1).

General standards for invertebrate inventory are provided by Ministry of Environment, Lands and Parks (1998), but that publication lacks detailed methods. Detailed specimen collection methods are provided in Appendix 1 for butterflies and Appendix 2 for dragonflies and damselflies.

2.1 BUTTERFLIES

Adult butterflies were generally collected in the field for later laboratory identification, although some were identified in the field and released unharmed. Specimen capture was done using standard insect aerial nets, with specimens stored in glassine stamp envelopes while in the field. All butterfly identification was done by Crispin Guppy, with the standard identification guides for butterflies in BC being Layberry et al. (1998) and Guppy and Shepard (2001). The locations in which butterflies were recorded are shown in Appendix 4. Two caterpillars of one butterfly species were collected in 2013, preserved in alcohol, and provided to C. Guppy by a local rancher, from locations about 9 km east of the transmission line route.

2.2 DRAGONFLIES AND DAMSELFLIES

Dragonflies were collected in the field for later laboratory identification. Specimen collection was done using standard insect aerial nets, with specimens stored in glassine stamp envelopes while in the field. Specimen preservation and data collection was done according to the standards of the Royal British Columbia Museum (Appendix 2). Dragonfly identifications were done by Sydney Cannings and Crispin Guppy in 2011, and by Crispin Guppy in 2012 and 2013. The standard identification guides for

dragonflies and damselflies in BC are Cannings and Stewart (1974) and Cannings (2008). The locations in which dragonflies / damselflies were recorded are shown in Appendix 4.

2.3 TIMELINES

Butterfly and/or dragonfly inventory observations were made on 34 days, in July and August (Table 1) of 2011 to 2013. Some of the days were not full inventory days, with as few as one specimen collected, due to poor weather (see separate data spreadsheet). Spring-flying butterfly species, with flight seasons from about May 1 to June 15, were not targeted because none potentially in the area are Species at Risk. Despite this, some spring flying species were detected in 2011 due to the delayed flight periods of that year. Dragonflies do not have spring-flying species, thus the flight seasons of all species were included in the field work. However, in 2011 late-season dragonflies were under-represented in the field collections due to the delayed flight season.

Table 1. Butterfly Inventory Dates and Personnel

2011		2012		2013	
Date	Collectors	Date	Collectors	Date	Collectors
June 27	C.Guppy; K.Mernickle	July 3	C.Guppy; K.Mernickle	July 8	C.Guppy; B.Patterson
July 9	C.Guppy; K.Mernickle	July 4	C.Guppy; K.Mernickle	July 9	C.Guppy; B.Patterson
July 10	C.Guppy; K.Mernickle	July 5	C.Guppy; K.Mernickle	July 10	C.Guppy; B.Patterson
August 1	C.Guppy; K.Mernickle	July 6	C.Guppy; K.Mernickle	July 11	C.Guppy; B.Patterson
August 2	C.Guppy; K.Mernickle	July 7	C.Guppy; K.Mernickle	July 17	B.Patterson; J.Fairbairn
August 3	C.Guppy; K.Mernickle	August 10	K.Mernickle; R.Prince	July 18	B.Patterson; J.Fairbairn
August 4	C.Guppy; K.Mernickle	August 11	K.Mernickle; R.Prince	July 19	B.Patterson; J.Fairbairn
August 18	C.Guppy; K.Mernickle	August 12	K.Mernickle; R.Prince	August 5	C.Guppy; K.Yehle
August 19	C.Guppy; K.Mernickle	August 13	K.Mernickle; R.Prince	August 6	C.Guppy; K.Yehle
August 20	C.Guppy; K.Mernickle	August 14	K.Mernickle; R.Prince	August 7	C.Guppy; K.Yehle
		August 15	K.Mernickle; R.Prince	August 8	C.Guppy; K.Yehle
		August 16	K.Mernickle; R.Prince	August 9	C.Guppy; K.Yehle

3 RESULTS AND DISCUSSION

3.1 WEATHER

Butterfly and dragonfly adults are in flight during specific time periods through the summer, with three typical flight seasons (early, mid- and late summer) in the months of May through August in central BC. However, these flight periods are strongly affected by the seasonal weather. In 2011 the weather was mostly cloudy and cool through the entire summer; as a result the flight seasons for most butterfly species were delayed by up to a month. In 2012 there was more sunny weather during the summer, and the flight seasons were close to average. In 2013 the weather was very warm and sunny during the summer, such that the flight seasons were somewhat early. These flight season assessments are estimates by C. Guppy, based on over 20 years of collecting butterflies and dragonflies in central BC.

3.2 BUTTERFLIES

All butterfly species seen had at least one specimen captured. There are 1055 records of butterfly occurrences, with a total of 45 species of butterflies (Table 2). The locations in which butterflies were recorded are shown in Appendix 3.

There are one new species (n.sp.) and three new subspecies (n.ssp.) new to science ("undescribed") in the area. These species have not yet been named, and are indicated in red font colour in Table 2. Three species are of conservation concern, including two red-listed species and one blue-listed species (highlighted in red and blue respectively in Table 2). The butterfly Species at Risk and the new (undescribed) subspecies and species are discussed below.

3.2.1 MANDAN SKIPPER (UNNAMED SUBSPECIES)

The Mandan Skipper, *Carterocephalus mandan*, is currently treated by the BC Conservation Data Centre as red-listed, with a provincial rank of S2 equivalent to “Threatened”, under the name "Arctic Skipper, *mandan* subspecies, *Carterocephalus palaemon mandan*". In the Peace River of BC "*mandan*" and "*palaemon*" fly together in many locations. In those locations they can be quite easily distinguished by different wing patterns that are fully correlated with different structures of mitochondrial DNA (C. Guppy, unpublished data). The taxa *mandan* and *palaemon* are clearly different species that do not interbreed when living in the same locations, and, for that reason, the Mandan Skipper has recently been recognized as a full species separate from the Arctic Skipper (Pohl et al 2010).

In 2011, C.S. Guppy collected a single specimen of Mandan Skipper near Bear Lake (north of Prince George), the only record in BC outside the Peace River. The wing pattern and mitochondrial DNA is distinct from the populations in the Peace River, as well as distinct from the Arctic Skipper. It is a new (undescribed) subspecies of Mandan Skipper. In 2013 C.S. Guppy collected one more Mandan Skipper specimen near Bear Lake, and two more south of Fraser Lake near the transmission line route. They are all the new subspecies of Mandan Skipper.

The central BC populations of Mandan Skipper are an undescribed subspecies, and hence do not have a conservation ranking other than as *C. palaemon mandan*. Mandan Skippers are likely present in scattered locations throughout the lower elevation clearcuts and roadsides of central BC, from the Quesnel Forest District northward. The species is apparently uncommon in the study area, but breeds in wet hollows of deactivated roads and roadside ditches; wet hollows in clearcuts and wet forest openings are also likely. They are likely to colonize wet hollows in the transmission line clearance area. The clearance of forest for the transmission line and associated access roads, and the long-term maintenance of that cleared area, is likely to result in an overall increase in suitable habitat for the Mandan Skipper.

In the opinion of C. Guppy, the distribution and abundance of the unnamed subspecies of Mandan Skipper in central BC is too poorly known to establish whether or not it is a Species at Risk. The BC Conservation Data Centre is not likely to establish a conservation status until the subspecies is described in a publication.

Table 2. Butterfly Summary, Blackwater Gold Project 2011 to 2013

Butterfly Families and Species	Number			
	2011	2012	2013	Total
Family Hesperiidae				
Carterocephalus palaemon	10	3	0	**13**
Carterocephalus mandan[1] *n.ssp.*	0	0	2	**2**
Erynnis icelus	2	0	0	**2**
Erynnis n.sp.	0	0	2	**2**
Hesperia assiniboia[1] *n.ssp.*	1	2	6	**9**
Hesperia colorado	0	1	0	**1**
Pyrgus centaureae	2	7	0	**9**
Thymelicus lineola	0	0	1	**1**
Family Lycaenidae				
Celastrina lucia	2	0	0	**2**
Epidemia dorcas	2	7	5	**14**
Epidemia mariposa	20	4	21	**45**
Everes amyntula	0	0	3	**3**
Incisalia eryphon	10	0	0	**10**
Lycaeides idas	32	20	45	**97**
Plebejus glandon	1	0	0	**1**
Plebejus saepiolus	17	36	16	**69**
Family Nymphalidae				
Aglais milberti	4	3	5	**12**
Boloria bellona	0	1	0	**1**
Boloria chariclea grandis	16	75	70	**161**
Boloria eunomia	5	0	0	**5**
Boloria freija	18	13	0	**31**
Boloria frigga	3	5	0	**8**
Boloria selene	39	1	0	**40**

Butterfly Families and Species	Number			
	2011	2012	2013	Total
Limenitis arthemis	6	0	5	**11**
Nymphalis antiopa	3	0	13	**16**
Nymphalis vaualbum	0	0	12	**12**
Oeneis jutta n.ssp. (="chermocki")[1]	14	1	1	**16**
Phyciodes cocyta	19	2	38	**59**
Phyciodes pulchellus	88	21	3	**112**
Polygonia faunus	0	1	10	**11**
Polygonia gracilis	8	0	13	**21**
Polygonia progne	0	0	2	**2**
Polygonia satyrus	2	0	8	**10**
Speyeria atlantis	1	2	19	**22**
Speyeria hesperis	8	8	45	**61**
Speyeria hydaspe	1	0	0	**1**
Family Papilionidae				
Papilio canadensis	14	2	0	**16**
Papilio zelicaon	10	0	0	**10**
Family Pieridae				
Anthocharis stella	5	0	0	**5**
Colias interior	9	5	21	**35**
Colias nastes	4	0	0	**4**
Colias philodice	11	7	56	**74**
Euchloe ausonides	11	0	0	**11**
Pieris marginalis	1	0	0	**1**
Pieris oleracea	5	0	2	**7**
Total Butterfly Individuals	**404**	**227**	**424**	**1055**
Total Butterfly Species	**36**	**23**	**26**	**45**

[1] *Hesperia assiniboia* is red-listed at the species level; *Carterocephalus mandan* n.ssp. is red-listed under the name *Carterocephalus palaemon* ssp. *mandan*; and *Oeneis jutta n.ssp.* is blue-listed under the name ssp. *chermocki*.

3.2.2 DUSKYWING SKIPPER (UNNAMED SPECIES)

A species of Duskywing (*Erynnis* n.sp.) new to science ("undescribed") has been collected by C.S. Guppy during the last 10 years at several locations in central BC. It is related to the Wild Indigo Duskywing, *Erynnis baptisiae*, of eastern North America, and the caterpillars feed on the leaves of columbine (*Aquilegia formosa* and garden variety columbine). The male genitalia are distinctly different from the widespread Persius Duskywing (*Erynnis persius*), from which the new species is very difficult to distinguish by wing pattern. Known locations include New Hazelton (in error as *E. afranius* in Guppy and Shepard 2001), Quesnel, north of Quesnel along the Fraser River, and Eskers Provincial Park near Prince George. There may be additional specimens in public museums that have been misidentified as the Persius Duskywing.

In June 2013 local rancher Wayne Ray photographed some live adults of the new species of Duskywing and in July preserved some caterpillars (now in the collection of C. Guppy) in an area south of Fort Fraser, about 9 km east of the transmission line route. The undescribed species of Duskywing is almost certain to be present within the clearance area of the transmission line, although it was not found because of its early flight season.

In the opinion of C.S. Guppy, the undescribed species of Duskywing is widespread in central BC (and likely south to Oregon) and is unlikely to be of conservation concern. The BC Conservation Data Centre will not assign a conservation status the species has been described in a publication.

3.2.3 ASSINIBOINE SKIPPER

The Assiniboine Skipper, *Hesperia assiniboia*, is red-listed, with a provincial rank of S2, equivalent to *Threatened* within British Columbia. The Conservation Data Centre bases this rank primarily on the location records for the species that are mapped in Guppy and Shepard (2001) and Layberry et al. (1995). In those publications the distribution of the butterfly is shown as being limited to the Peace River canyon and immediately adjacent areas, downstream of Taylor; the limited distribution has resulted in the red-listing. Since those publications, *Hesperia assiniboia* has been recorded by C. Guppy (personal database) in central BC -- at several sites west and southwest of Quesnel, near Bear Lake, near Burns Lake, near Lac La Hache, and in this project (C. Guppy, pers. comm.). The central BC populations of Assiniboine Skipper are an undescribed subspecies (C. Guppy, pers. comm.), and hence do not have a conservation ranking other than at the species level (red-listed). Assiniboine Skippers are likely present in scattered locations throughout the lower elevation clearcuts and roadsides of most of central BC. The species is apparently uncommon but widely distributed in the study area, and apparently breeds in "weedy" clearings and roadsides. They are likely to colonize parts of the transmission line clearance area. The clearance of forest for the transmission line and associated access roads, and the long-term maintenance of that cleared area, is likely to result in an overall increase in suitable habitat for the Assiniboine Skipper.

In the opinion of C. Guppy, the Assiniboine Skipper is widespread in central BC and of little or no conservation concern, both at the species level and at the (unnamed) subspecies level. The BC Conservation Data Centre may not change the conservation status until the central BC collection records by C. Guppy of the species are published.

Assiniboine Skipper habitat - old forestry road and clearcut

Assiniboine Skipper habitat - old forestry road and clearcut

3.2.4 JUTTA ARCTIC

The Jutta Arctic, *Oeneis jutta* n.ssp., is blue-listed (equivalent to *special concern* or *sensitive*) under the name *Oeneis jutta* ssp. *chermocki*, and is wide-spread in forested wetlands at lower elevations in the Project area. The central BC populations of Jutta Arctic, although considered the same as the Rocky Mountain subspecies *chermocki* in existing publications, are actually an undescribed subspecies (C. Guppy, pers. comm.). The species is biennial (takes two years to grow from egg to adult) and in the Project area apparently flies primarily in odd-numbered years, with only low population densities in even-numbered years. Despite 2013 being an odd-numbered year (when the species should be abundant), Jutta Arctic was found only once in 2013. This was likely due to a combination of an earlier than average flight season, poor weather early in July, and a general infrequency of its black spruce wetland habitat along the transmission line route (the focus of the 2013 field work).

The blue-listed conservation status of this subspecies is primarily due to there being relatively few records of the species in central BC. This lack of records appears to be entirely due to lack of butterfly inventory in black spruce wetlands; the butterfly is apparently common and widely distributed in that habitat in central BC (C. Guppy, pers. comm.). Clearance of trees from its wet forested habitats, such as for the transmission line, will generally make the habitat unsuitable for this species; trees are an essential component of the habitat even though egg laying and larval feeding occurs on shrubs such as Labrador tea (*Ledum groenlandicum*) rather than trees (C. Guppy, pers. comm.).

In the opinion of C.S. Guppy, the Jutta Arctic (new subspecies) is widespread in central BC and not of conservation concern, both at the species level and at the (unnamed) subspecies level. The BC Conservation Data Centre may not change the conservation status until the central BC collection records by C.S. Guppy of the species are published.

Jutta Arctic habitat - black spruce forest wetland

3.3 DRAGONFLIES AND DAMSELFLIES

All dragonfly and damselfly species seen had at least one specimen captured. There are 612 records of dragonfly and damselfly occurrences, with a total of 40 species of dragonflies and damselflies (Table 3). The locations in which dragonflies and damselflies were recorded are shown in Appendix 3.

One species of conservation concern, a one blue-listed species of damselfly, *Enallagma hageni* (highlighted blue in Table 3), was found. This damselfly Species at Risk is discussed below.

Table 3. Dragonfly Summary, Blackwater Gold Project 2011 to 2013

Dragonfly and Damselfly Families and Species	Number 2011	2012	2013	Total
Family Aeshnidae				
Aeshna californica	0	0	1	**1**
Aeshna eremita	4	9	17	**30**
Aeshna interrupta	0	0	22	**22**
Aeshna juncea	1	10	8	**19**
Aeshna multicolor	0	0	1	**1**
Aeshna palmata	1	4	0	**5**
Aeshna sitchensis	0	21	0	**21**
Aeshna subarctica	0	0	4	**4**
Aeshna tubiculifera	0	0	2	**2**
Aeshna umbrosa	0	0	30	**30**
Family Coenagrionidae				
Coenagrion interrogatum	2	0	0	**2**
Coenegrion resolutum	10	6	1	**17**
Enallagma annexum	11	0	0	**11**
Enallagma annexum?	1	0	0	**1**
Enallagma boreale	34	23	12	**69**
Enallagma carunculatum	0	6	0	**6**
Enallagma cyathigerum	0	2	0	**2**
Enallagma ebrium	1	0	2	**3**
Enallagma hageni [1]	0	24	0	**24**
Enallagma sp.	3	0	0	**3**
Family Cordulidae				
Cordulia shurtleffii	42	7	4	**53**
Somatochlora albicincta	1	0	0	**1**
Somatochlora franklini	2	1	1	**4**
Somatochlora hudsonica	11	7	0	**18**
Somatochlora minor	2	0	0	**2**
Somatochlora semicircularis	1	9	0	**10**
Somatochlora walshi	0	2	0	**2**
Somatochlora whitehousei	0	1	0	**1**
Family Gomphidae				
Ophiogomphus severus	0	0	24	**24**
Family Lestidae				
Lestes congener	0	0	4	**4**
Lestes disjunctus	4	36	5	**45**
Lestes dryas	18	4	0	**22**
Family Libellulidae				
Leucorrhinia borealis	3	0	0	**3**
Leucorrhinia hudsonica	45	32	0	**77**
Leucorrhinia proxima	1	2	0	**3**
Leucorrhinia patricia	0	0	9	**9**
Libellula quadrimaculata	5	1	2	**8**
Sympetrum corruptum	0	6	0	**6**
Sympetrum internum	0	7	0	**7**
Sympetrum obtrusum	2	16	22	**40**
Total Dragonfly / Damselfly Specimens	**205**	**236**	**171**	**612**
Total Dragonfly / Damselfly Species	**23**	**23**	**19**	**40**

[1] *Enallagma hageni* is blue-listed.

HAGEN'S BLUET

Hagen's Bluet, *Enallagma hageni*, is blue-listed (equivalent to *special concern* or *sensitive*). These are small damselflies that normally perch with wings closed above the abdomen, and the males are blue marked with black. Species identification in this genus is difficult. They are an uncommon inhabitant of marshy, frequently somewhat acid, lakes and ponds. The eggs are laid in the tissues of water plants. They occur widely throughout the central part of BC, north of Kamloops, and are most often seen in the Cariboo Region (Cannings and Stuart 1977; Cannings 2002). The species is maintained on the Blue List because of its uncommonness over a relatively restricted area of BC, and because there is difficulty in confidently predicting where it might be found.

Hagen's Bluet was found in two locations about 6.5 km apart. One location was a large sedge wetland, with seven collection sites within the wetland. The sedge wetland is clearly the reproductive habitat for this population. The specimens were captured in a wetland near where the transmission line exits the Local Study Area. The transmission line, if aligned with the wetland, will likely span it without affecting the population of Hagen's Bluet; only alteration of the hydrology of the wetland, or removal of the wetland is likely to affect the population. The other location was a single specimen collected in a regenerating clearcut on the edge of black spruce forest, with sedge wetland nearby. The clearcut is clearly not the reproductive habitat for this population; the population likely breeds in a nearby wetland.

Hagen's Bluet habitat

Hagen's Bluet habitat

4 SUMMARY

There were 45 species of butterflies and 40 species of dragonflies / damselflies found over the three years of inventory for the Blackwater Gold project. There were few previous records for any species of butterflies or dragonflies / damselflies from the Project area, all of which were near Highway 16. Three species of the butterflies are listed as Species at Risk by the BC Conservation Data Centre; one species of dragonfly / damselfly is a Species at Risk. One butterfly and one damselfly are blue-listed (Special Concern or Sensitive) and two are red-listed (Threatened). One butterfly species and three subspecies new to science ("undescribed") live in the area.

The red-listed Mandan Skipper butterfly was found in one area living in two wet grass/sedge hollows in a deactivated forestry road. Clearing of forest for the power transmission line will likely provide additional suitable wet cleared hollows for this species. The overall effect of the proposed development on this species is likely to be an increase in area of suitable habitat and increased population size. In the opinion of C. Guppy, the distribution and abundance of the Mandan Skipper is too poorly known to assess its conservation status in central BC.

The red-listed Assiniboine Skipper butterfly was found in living along roadsides and in forestry clearcuts at lower elevations in nine locations. Clearing of forest for the power transmission line will likely provide additional suitable clearcut and roadside area for this species. The overall effect of the proposed development on this species is likely to be an increase in area of suitable habitat and increased population size. In the opinion of C. Guppy, the Assiniboine Skipper is widespread in central BC and of little or no conservation concern.

The blue-listed butterfly, the Jutta Arctic, was found living in seven black spruce wetlands at lower elevations, and is likely present in most of the other lower elevation black spruce wetlands in the area. The primary mine development is unlikely to affect any populations of the Jutta Arctic, because of the relatively high elevation and generally dense conifer forest. Clearing of trees from black spruce wetlands for the power transmission line may adversely affect some populations of this species. The overall effect of the clearing of trees from black spruce wetlands for the power transmission line is likely to be a slight decrease in area of suitable habitat and a decrease in the local number of individuals. In the opinion of C.S. Guppy, the Jutta Arctic is widespread in central BC and is not of conservation concern.

The blue-listed damselfly, Hagen's Bluet, was found living in two sedges wetlands at lower elevations (Appendix 3, Dragonfly Map 1), and may occur in some other wet sedge wetlands in the area. The primary mine development is unlikely to affect any populations of Hagen's Bluet, because of the relatively high elevation and generally dense conifer forest. Clearing for the transmission line is unlikely to affect any populations, because the sedge wetlands will be spanned by the line. The overall effect of the proposed development on this species is likely to be no change in area of suitable habitat and no change in the number of populations.

5 REFERENCES

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6 APPENDICES

APPENDIX 1. COLLECTING AND PRESERVING BUTTERFLIES

Crispin S. Guppy, M.Sc., RPBio, PBio., Senior Biologist, Ecofor Consulting BC Ltd., cris@ecofor.ca.

COLLECTING

Collection Data

Record exact locality including UTM or lat/long coordinates, date, collector's name, and any pertinent habitat and behavioural information -- type of habitat, dominant plants, reproductive behaviour, and other pertinent information. The coordinates should ideally be Always record this collection information and ensure that it is easily related to each specimen (see below).

Eggs and Caterpillars

Butterfly eggs and caterpillars are rarely seen and their inventory is generally too labour-intensive to be worthwhile; pupae are almost never found. The caterpillars of a few species are worth searching for while doing inventory for adults. Butterfly caterpillars that feed on the leaves of stinging nettle are easily found and reasonably easy to identify. Eggs and caterpillars of Anise Swallowtails, Old-world Swallowtails, and Oregon Swallowtails can frequently be found on their foodplants (most commonly cow parsnip and tarragon). Eggs and larvae of Mustard Whites, Margined Whites, Orange-tips, and Marbles can often be found on the wild mustards used as foodplants (most commonly *Arabis* spp.). The larvae can be collected and reared to produce adults if desired, but photographs are usually a sufficient record for identification.

Adults

Use a professional aerial insect net (not a children's toy net). A net opening of at least 18" is recommended, and the handle should be at least a meter long. A fairly fine mesh that is reasonably soft is preferred to reduce damage to the wings during capture, but, the mesh should be open enough to reduce air resistance and allow a fast swing.

Observing the flight path of butterflies before starting a chase often allows for a chase route that is shorter and faster than actually following the butterfly. Keep the net as inconspicuous as possible by avoiding waving the net around, keeping it as low as possible, and hold the net bag against the handle until preparing to swing. If possible, swing at the butterfly from behind and below as they fly by; this reduces their ability to dodge the net.

When a specimen is captured, while it is still in the net fold its wings over its back and use your thumb *nail* and fore finger (or stamp tongs) to pinch the sides of the thorax at the base of the wings. It takes practice to do it hard enough to stun or kill the butterfly without squashing it; using your nail rather than the thumb itself results in more sensitivity while pinching. Avoid squeezing the abdomen, which will squash very easily. Place the specimen in a glassine envelope for field storage (available in several sizes at stamp and coin stores -- the most versatile size is 3.5” x 2.25”). Alternatively it can be placed alive in a glassine envelope with the wings over the back. Several pinched specimens can be placed in each envelope, depending on their size, they seldom damage each other. Place mating pairs by themselves in the same envelope and write "in copula" on the envelope. Generally only a field collection number is written on the envelope, which is cross-referenced to field notes, although the full collection data can be written on the envelope if preferred. Use soft pencil to write on the envelope, not ink. A typical collection number should incorporate the collector’s initials, the year and the data. An example is CG12-25, where "CG" is the collector's initials, "12" is the year 2012, and "25" is the cross-reference to the field notes for site 25 on a specific date. Create a new field number for each date that you visit a site, to ensure that the dates that specimens are collected on remain separate. It is usually desirable to only write the number on the envelope, because envelopes can be reused many times and the less that is written on them the better.

PREPARING ADULT SPECIMENS

In the field keep the envelopes containing butterflies as cool as possible. Store them in a non-crushable box, such as a plastic food freezer or sandwich box. Once returned from the field, place the box of specimens in a freezer to complete the killing process (pinching sometimes stuns but does not kill the specimen). Freezing also reduces the rate at which specimens dry out and become brittle. It is generally a good idea to remove the specimens from the freezer the next day, briefly thaw them, and, while using stamp tongs while handling them, straighten out any wings that are not neatly folded over the back. They can then be either re-frozen permanently or for later pinning and spreading of the wings, or pinned and the wings spread immediately.

The colours of butterflies are mostly the result of pigments. As with the pigments in fabrics, the colours fade with time. The fading can be minimized by storing the specimens in the dark; sunlight and other strong lights will start fading the colours in a matter of weeks.

Specimens can be shipped by mail safely and efficiently in the glassine envelopes. Simply make certain they will not shift or slide around in the container (pack with tissue if necessary) and nest the box in a larger box, protected on all sides by three or four inches of packing material. This "double container" arrangement is critical to prevent impact vibrations from reaching the specimens and causing the brittle legs and antennae to shatter. Once the specimens have been pinned, they are more difficult to ship safely but they can still be sent through the mail.

PERMANENT STORAGE

There are several options for permanent storage:

1. Store them long-term in a household deep freeze. The advantage with this is that they will not get eaten by pest insects, they do not get broken from accidents, and (most importantly) their DNA will be preserved reasonably well, for later analysis, for a decade or more (DNA degradation is a continuous process, so there is really no fixed length of time). Frozen specimens will gradually dry out through the process of "freezer burn" over a period of six months or so. This can be avoided by wrapping the freezer box of specimens in wet paper towel, and placing it all in a larger box or a sealed plastic bag. However, if the purpose is to preserve the DNA, it is probably best to let them dry (water degrades DNA).
2. Store the envelopes with specimens long-term in sealed plastic freezer boxes in a dry, cool, dark location in the house. Before storing them, ensure that the specimens are completely dry by leaving the box open in the house for at least a week. It is then best to place the sealed boxes in a deep freeze for several days before storing, to ensure that any pest insects in the box have been killed.
3. Pin the specimens, spread the wings, let them dry, and add data labels to the pins below the specimens. Then store as museum specimens. This process is takes practice to become skilled, and the details are too much to include here. Museum-style collections should be donated to a public museum collection (they rarely have funds to purchase them), when you lose interest in the collection or are no longer able to care for it. That way the specimens can continue to contribute to scientific knowledge for centuries to come.
4. It is a good idea to develop a computer database (MS Excel spreadsheet is usually the best). You can maintain records of your sight records, as well as of your specimens.

ADDITIONAL INFORMATION

The *Butterflies of America* and *E-fauna BC* websites are useful sources of information regarding butterflies. The ethics of a collecting (Collecting Guidelines) are provided by *the Lepidopterists' Society*. http://butterfliesofamerica.com/; http://www.geog.ubc.ca/biodiversity/efauna/; http://www.lepsoc.org/statement_on_collecting.php. The books by Guppy and Shepard (2001) and Layberry et al. (1998) are useful for identifications (see references).

APPENDIX 2. COLLECTING AND PRESERVING ODONATA (DRAGONFLIES AND DAMSELFLIES)

Dr. Rob Cannings, Curator of Entomology, Royal British Columbia Museum. rcannings@royalbcmuseum.bc.ca

COLLECTING

Always gather collection information and ensure that it is easily related to each specimen (see below). Record exact locality (including, if possible, UTM or lat/long coordinates), date, time, collector's name, and any pertinent habitat and behavioural information -- data on the type of water body, dominant plants, reproductive behaviour, and other pertinent information are extremely useful.

Larvae

Collect live larvae by sweeping aquatic habitats with a dip net. Anisoptera larvae are best kept temporarily in containers with a bit of wet moss or other vegetation to keep the humidity high. Back at camp or home, drop them in water that has just come off the boil; leave them for 30 seconds, remove and place on paper towelling to remove excess water. Store in vials of 70% ethanol. In vials with narrow openings, insert the larvae head up (This orientation makes removal later much easier). Specimen death in hot water is extremely quick. It also coagulates the protein (preventing the disintegration of internal tissues) and preserves the colour pattern much better than does placement directly into alcohol. On the other hand, hot water wrecks the caudal lamellae of Zygoptera (damselflies). I put damselfly larvae directly into 70% ethanol in the field, then replace it with fresh ethanol after returning to base. Write the collection number on a label and place it in the vial with the specimen(s).

Exuviae (cast larval skins) should also be collected from aquatic plants, rocks, logs and other supports. This is a useful activity (along with sweeping for live larvae) when the weather is poor and adults are not flying. I prefer to keep most exuviae in 70% ethanol because in liquid they are more pliable -- the dorsal structures of the labium and structures such as abdominal spines (often covered with matted hairs or algae in dried exuviae) are more easily examined. The main problem with this technique is the placement of brittle exuviae in the alcohol vial. Frequrntly, the exuviae must be relaxed (soaked in hot water) before they are put in the vial. Place the exuviae head up in the vial.

I always preserve Zygoptera exuviae in ethanol because of their fragility. Many collectors preserve Anisoptera exuviae by pinning them through the base of the wing cases, with a small drop of white glue placed at the point where the pin exits the base of the thorax ventrally. Leave about 1 cm of the pin extending above the specimen. Pinning is a convenient way of handling the Aeshnidae because liquid storage is not necessary for the clear observation of useful taxonomic characters. These exuviae lack the matted hairs often found in the Corduliidae and Libellulidae, for example, and the important characters of the labium can be seen without extending it.

Adults

Use a long-handled aerial net. A net opening of at least 18" is recommended. Some collectors feel that a dark net bag (black or green) is less conspicuous to dragonflies, and thus is more effective than a white one. White nets make it easier to find the specimen in the net. A wide mesh (but small enough to hold the smallest specimens) is preferred because this reduces air resistance and allows a faster swing. A large mesh may not be satsifactory if you're also collecting insects other than Odonata.

Observing patrolling dragonflies before swinging away often pays; positioning yourself in the most advantageous location, especially if it is somewhat concealed, is usually fruitful. Move deliberately. Refrain from waving the net around; keep it as inconspicuous as possible. Swing at fast-flying agile species from behind as they fly by; many will easily dodge a net swung head-on.

When an adult specimen is captured, place it alive in a glassine envelope (available in several sizes -- the most versatile is 3.5” x 2.25” -- at stamp collector or hobby stores). The wings should be together above the back. In general, put only one

specimen in each envelope; they can damage each other. But place pairs caught in tandem or in copula in the same envelope if possible; face them away from each other. If they are too large to go together in a single envelope, make certain that the fact they were mating is indicated on both envelopes**. The collection number (cross-referenced to field notes or fully-entered data sheets) must be written on the envelope in soft pencil, India ink or other ink that is insoluble in acetone (if the acetone treatment describe below is used).** The collection number should be in a form incorporating the collector's initials, the year and the actual locality/date, e.g.: RAC03-25. The number 25 here refers to a particular locality on a particular date (data recorded elsewhere) – the number thus represents the 25th collection made in 2003 by Rob Cannings. Write only the number on the envelope – envelopes can be reused many times and the less that is written on them the better. **Cross out any old writing on the envelope before adding your new number**. Specimen identifications should be written on a separate small label placed inside the envelope.

Teneral (recently emerged) adults are fragile and preserve poorly – they tend to shrivel as they dry. If your collection has an alcohol vial component, you might want to preserve tenerals in vials of 70% ethanol (this is what I prefer). Alternatively, if you want a dry specimen, place it alive in a paper bag for a day or two so that the cuticle hardens and the colour pattern develops. If collected while emerging, the adult should be placed in a bag and the associated exuviae should be kept and cross- referenced to the adult specimen. Or both can be preserved together in a vial of 70% ethanol. Like larvae, any adult put in a vial should be inserted carefully, wings back and head up.

PREPARING ADULT SPECIMENS

While in the field keep the envelopes containing live dragonflies as cool as possible. Store them in a non-crushable box. Tupperware boxes of the proper size are excellent for this purpose.

For convenience, specimens are usually kept alive in the envelopes until the collector returns to base. This also allows time for the specimens to empty their digestive tracts; colour is usually preserved better in a specimen with an empty gut.

The colour pattern of some species, especially some blue ones (e.g. *Aeshna eremita, A. constricta, A. canadensis*) fades soon after capture. This fading can often be reversed by exposing the specimen to sunlight. However, if possible, such species should be treated in acetone immediately.

Acetone treatment: Acetone dehydrates the specimen and dissolves fat, reducing the decomposition of colour pigments. Acetone is flammable; use caution. Avoid breathing the fumes and absorbing the liquid through your skin. Acetone can be purchased at most hardware or paint stores.

Keep the acetone in a wide-mouth plastic or glass jar or other container (such as Tupperware©) inert to the solvent. The wider the mouth, the better. Make sure that the lid is leak-proof. Pack the jar(s) snugly in a box for stability.

Acetone is one of those substances that is difficult to carry on scheduled airline flights. It is best to get it after you arrive at your destination. Try to take along the necessary jars or containers, though -- it is normally harder to find a good jar with the right dimensions than it is to find acetone.

The dragonfly must be killed and its body arranged in the proper configuration before treating it in acetone, otherwise it may dry with abdomen curled and wings and legs awry. I prefer to do this by placing a few drops of my usual insect killing agent, ethyl acetate, in the envelope containing the specimen. As soon as the insect is dead, the abdomen should be straightened (to make measuring it easier) and the legs should be brought forward (so that they do not obscure the base of the abdomen). The envelope containing the dragonfly then is immersed, on edge, in the acetone. **Do not force too many envelopes into the jar – envelopes should have circulating liquid around them**. Tightly packed specimens do not absorb enough acetone and, moreover, can be flattened by the pressure.

If ethyl acetate is not available, the envelope and dragonfly can be placed in the acetone, killing the dragonfly. However, if this is done, you will have to remove the envelope from the jar after a minute or so; straighten the abdomen and arrange legs before replacing the envelope in the acetone. This method is a bit messier and subjects you to more

acetone exposure, which is best avoided, but it does do away with carrying other chemicals.

Some collectors kill dragonflies, especially larger species, by injecting acetone into the thorax and base of abdomen with a hypodermic needle. This introduces the chemical into the muscles and organs faster than simple soaking, and some swear that it improves colour retention.

Leave the dragonflies in the acetone for about 24 hours. The usual procedure is to remove the envelopes out for drying when the next day's catch is ready to go into the jar(s). The acetone should be replaced after a few batches of specimens have been processed, i.e. when it becomes pale yellow (indicating considerable dissolved fat**). The fresher the acetone used, the better the specimens produced.**

Drain the acetone out of the envelopes back into the jar (some collectors snip a little bit off the bottom corners of the envelopes to facilitate drainage, but I don't do this because small specimens can protrude or fall out) and dry them (containing the specimens) in a well-ventilated place. When possible, I do this outside in the sun and breeze.

When the envelopes are very dry, store them in Tupperware© or cardboard boxes that will withstand crushing. Store the envelopes vertically, like a card file, and **do not pack them tightly**. At this stage, too, specimens can be squeezed and flattened if jammed too closely together. Tupperware© containers are good because their tight seal prevents most pests from attacking the specimens. In humid climates, the inclusion of silica gel desiccating packets helps keep the specimens dry.

Specimens can be shipped by mail safely and efficiently in the glassine envelopes. Simply make certain they will not shift or slide around in the container (pack with tissue if necessary) and nest the box in a larger box, protected on all sides by three or four inches of packing material.

Drying by acetone is by far the preferred treatment, but if this is impossible, simply dry the specimens as rapidly as possible after they have been killed. Placing the boxes containing specimen envelopes at close range over or under electric lights is helpful. Or put them on the dashboard of your car in the sun. The faster the drying occurs, the better the colour preservation. In the tropics, acetone is invaluable, since air-drying specimens is difficult and specimen damage is common. Acetoned dragonflies may even resist damage by pests (ants, carpet beetles, psocids, mice) more than untreated ones.

Another alternative is storage in 70-80% ethanol, either in envelopes or without them. If envelopes are not used, specimens may later be removed from the alcohol and dried in envelopes in the correct position. It's also all right to keep specimens permanently in vials of ethanol. Most collectors consider both air-drying and alcohol storage less desirable than the acetone treatment.

PERMANENT STORAGE

Once the specimens arrive at a museum or other collection, they are taken out of the glassine envelopes and stored permanently in clear envelopes made of cellophane, Mylar, polyethylene or polypropylene. The identification and collection data are printed on 3" x 5" cards, which are inserted in the envelopes behind the specimen. The envelopes are then stored like a card file in cabinets. Most collections now have a computer database of specimens; the collection data are entered into a database and the specimen cards are printed directly from the computer.

ADDITIONAL INFORMATION

The Dragonfly of the Americas site contains a useful section on the purposes and ethics of collecting (Collecting Guidelines). [http://www.odonatacentral.org/index.php/PageAction.get/name/DSACollectingPolicy]

APPENDIX 3. BUTTERFLY LOCATION MAPS

newgold

BLACKWATER GOLD PROJECT

BUTTERFLY 2011 - 2012 INVENTORY MAP 1

Map Projection: NAD 83, UTM Zone 10
Date: November 29, 2012

N
W E
S

750 0 750 1500 2250
Meters
Scale: 1:75,000

LEGEND

- Lake/River
- Wetland
- RSA
- LSA
- LSA Extension
- Private Land
- First Nations Reserve
- Existing Cutblock
- Stream
- Contour
- Road
- Proposed Mine Site Access Road
- Proposed Transmission Line
- Butterfly: Red-list
- Butterfly: Blue-list
- Butterfly: Common Species

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newgold

BLACKWATER GOLD PROJECT

BUTTERFLY 2011 - 2012
INVENTORY MAP 2

Map Projection: NAD 83, UTM Zone 10
Date: November 29, 2012

N
W E
S

750 0 750 1500 2250
Meters
Scale: 1:75,000

LEGEND

- Lake/River
- Wetland
- RSA
- LSA
- Woodlot
- Private Land
- First Nations Reserve
- Existing Cutblock
- Stream
- Contour
- Road
- Proposed Mine Site Access Road
- Proposed Transmission Line
- Butterfly: Blue-list
- Butterfly: Common Species

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natural and cultural resource consultants

Ethorni
Creek
Esker
Creek
Chedakuz
Creek
Creek
Davidson
Tatelkuz
Lake

BUTTERFLY INVENTORY SITES 2013 PROPOSED TRANSMISSION LINE AND AIRSTRIP

3.5 0 3.5 7 10.5

Kilometers

Scale: 1:350,000

Date: September 2013

Projection: UTM Zone 10, NAD27

LEGEND

- Transmission Line
- Transmission Line-Stellako Re-Route
- Transmission Line-Mills Ranch Re-Route
- Airstrip
- Airstrip Access Road
- Butterfly Inventory Sites
  - Blue-list Status
  - Red-list Status
  - Not of Conservation Concern

Mandan Skipper- new subspecies

Mandan Skipper- new subspecies

Duskwing Skipper- new species

Duskwing Skipper- new species

Assiniboine Skipper- new subspecies

Assiniboine Skipper- new subspecies

Assiniboine Skipper- new subspecies

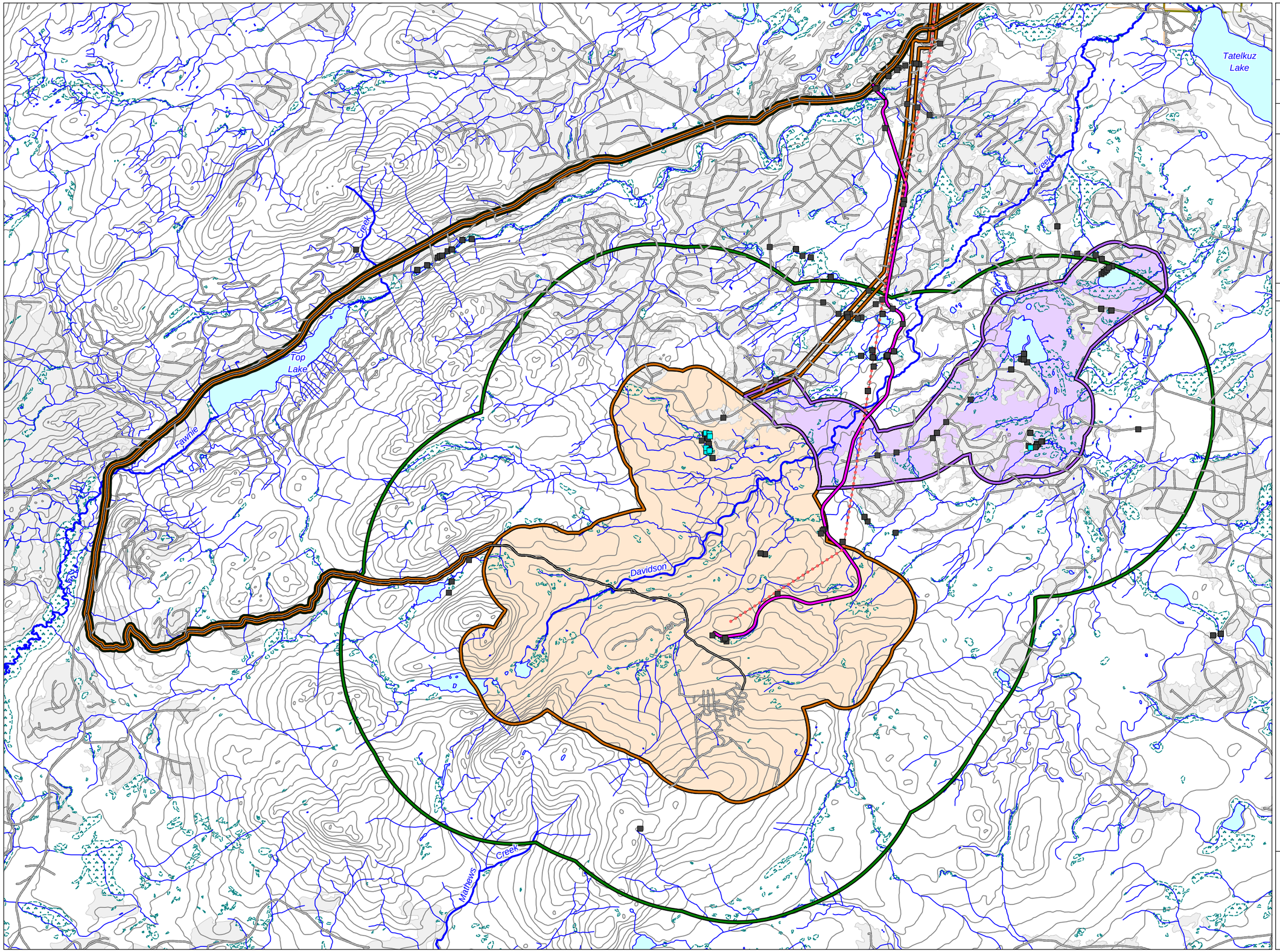
Assiniboine Skipper- new subspecies

Jutta Arctic

Assiniboine Skipper- new subspecies

Assiniboine Skipper- new subspecies

APPENDIX 3. DRAGONFLY / DAMSELFLY LOCATION MAPS



newgold

BLACKWATER GOLD PROJECT

DRAGONFLY 2011 - 2012 INVENTORY MAP 1

Map Projection: NAD 83, UTM Zone 10
Date: November 29, 2012

N
W E
S

750 0 750 1500 2250
Meters
Scale: 1:75,000

LEGEND

- Lake/River
- Wetland
- RSA
- LSA
- LSA Extension
- Private Land
- First Nations Reserve
- Existing Cutblock
- Stream
- Contour
- Road
- Proposed Mine Site Access Road
- Proposed Transmission Line
- Dragonfly: Blue-list
- Dragonfly: Common Species

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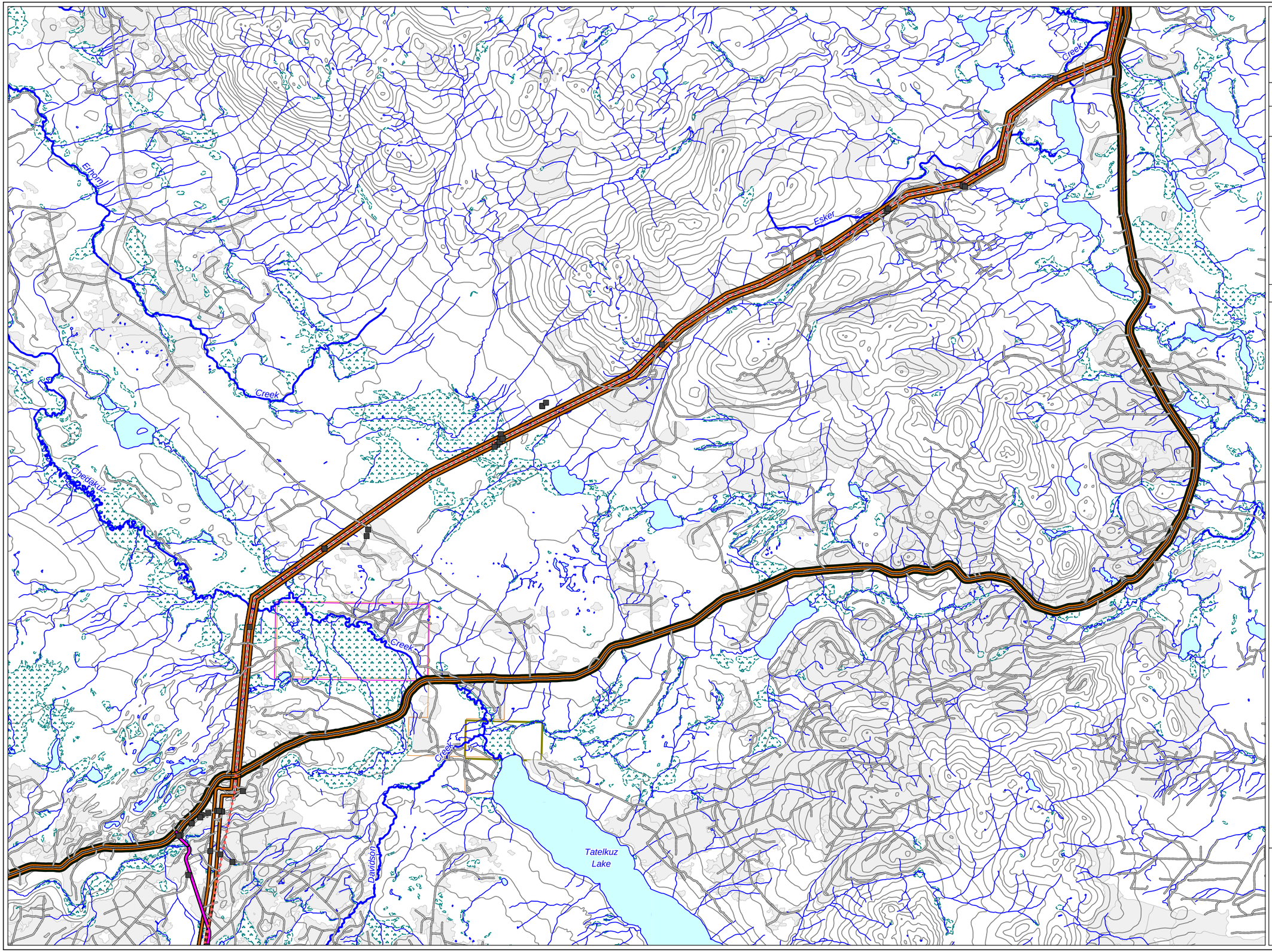

newgold

BLACKWATER GOLD PROJECT

DRAGONFLY 2011 - 2012
INVENTORY MAP 2

Map Projection: NAD 83, UTM Zone 10
Date: November 29, 2012

N
W E
S

750 0 750 1500 2250
Meters
Scale: 1:75,000

LEGEND

- Lake/River
- Wetland
- RSA
- LSA
- Woodlot
- Private Land
- First Nations Reserve
- Existing Cutblock
- Stream
- Contour
- Road
- Proposed Mine Site Access Road
- Proposed Transmission Line
- Dragonfly: Common Species

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DRAGONFLY INVENTORY SITES 2013 PROPOSED TRANSMISSION LINE AND AIRSTRIP

3.5 0 3.5 7 10.5

Kilometers

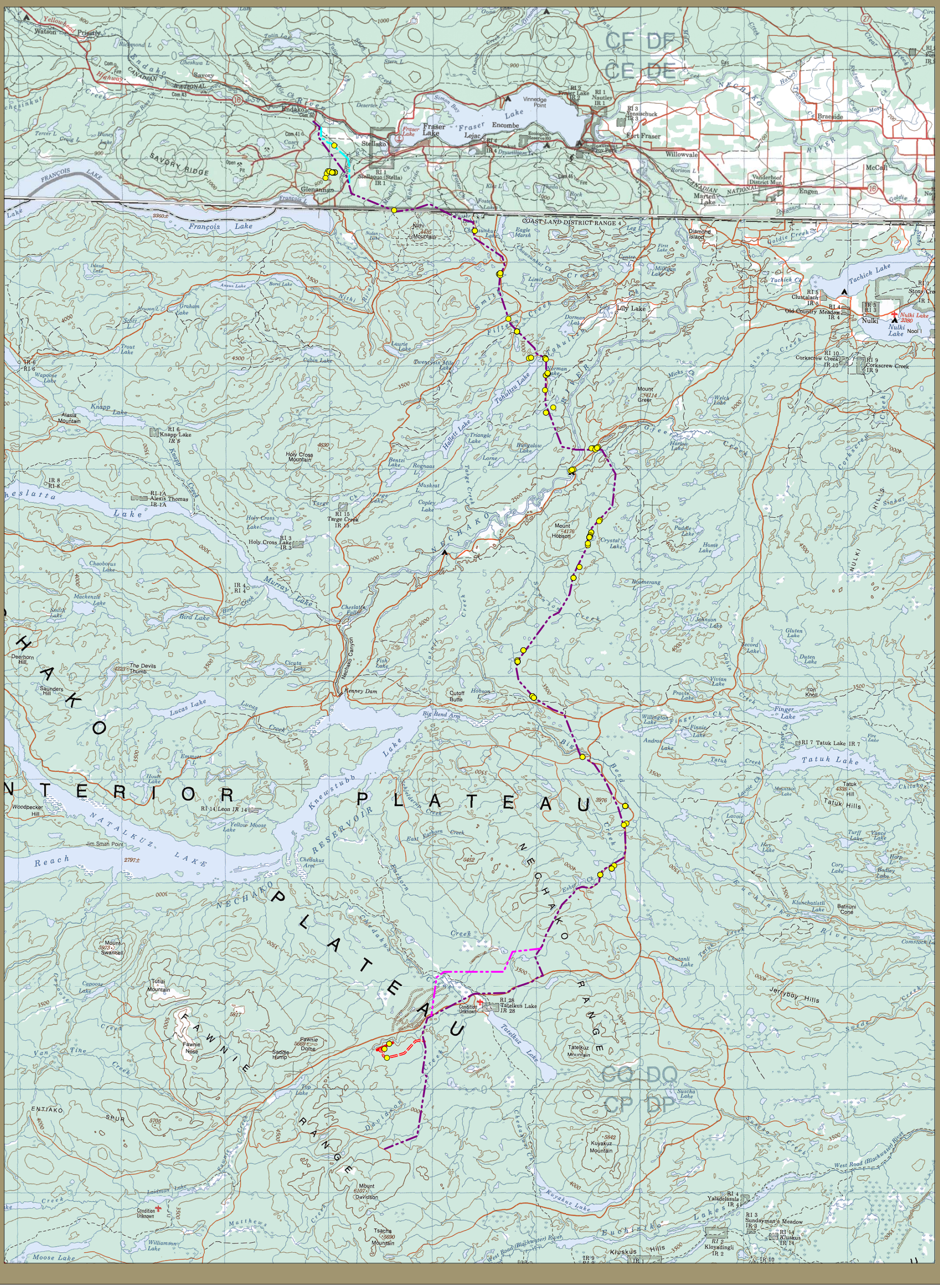
Scale: 1:350,000

Date: September 2013

Projection: UTM Zone 10, NAD27

LEGEND

- Transmission Line
- Transmission Line-Stellako Re-Route
- Transmission Line-Mills Ranch Re-Route
- Airstrip
- Airstrip Access Road
- Dragonfly Inventory Sites



Annex 10
Summary of Forest and Grassland Songbird Detections for each of the Blackwater Project Areas, 2011-2013

Table 1. Summary of Forest and Grassland Songbirds detected within each of the Blackwater Project Areas from 2011 to 2013

Common Name	Scientific Name	Mine Site and LSA	Transmission Line and LSA	Mine Access Road and LSA	Kluskus FSR and LSA	Water Pipeline and LSA	Airstrip and LSA	RSA
Alder Flycatcher	*Empidonax alnorum*		10	2	23		1	1
American Crow	*Corvus brachyrhynchos*	1						1
American Kestrel	*Falco sparverius*		2			1	1	4
American Pipit	*Anthus rubescens*							4
American Redstart	*Setophaga ruticilla*		31		10			
American Robin	*Turdus migratorius*	33	40	6	52	3	6	62
American Three-toed Woodpecker	*Picoides dorsalis*	2	4		3			4
Bald Eagle	*Haliaeetus leucocephalus*	2	1		4			6
Barn Swallow	*Hirundo rustica*	17	2	1	5			2
Barred Owl	*Strix varia*		3			1		2
Barrow's Goldeneye	*Bucephala islandica*	5			3			31
Belted Kingfisher	*Megaceryle alcyon*		4		1			
Black Swift	*Cypseloides niger*							3
Black-billed Magpie	*Pica hudsonia*		1					
Black-capped Chickadee	*Poecile atricapillus*		2		1			
Bohemian Waxwing	*Bombycilla garrulus*							3
Bonaparte's Gull	*Chroicocephalus philadelphia*		1			10		9
Boreal Chickadee	*Poecile hudsonicus*	11	1		2	1		4
Boreal Owl	*Aegolius funereus*		1		1			2
Brewer's Blackbird	*Euphagus cyanocephalus*				2			
Brown Creeper	*Certhia americana*	1	1					1
Brown-headed Cowbird	*Molothrus ater*				1			
Bufflehead	*Bucephala albeola*	1	18		1	1		46
Canada Goose	*Branta canadensis*		1	1		1		57
Cassin's Vireo	*Vireo cassinii*		1		3			1
Cedar Waxwing	*Bombycilla cedrorum*		3		1			4
Chipping Sparrow	*Spizella passerina*	36	48	7	42	5		41
Clark's Nutcracker	*Nucifraga columbiana*	11	3					3
Clay-colored Sparrow	*Spizella pallida*				5			
Common Goldeneye	*Bucephala clangula*				2			
Common Loon	*Gavia immer*	2	5		2	5		21
Common Merganser	*Mergus merganser*	1						22
Common Nighthawk	*Chordeiles minor*	1			1			
Common Raven	*Corvus corax*	23	9	2	20		1	11
Common Yellowthroat	*Geothlypis trichas*		10		14	1		
Cooper's Hawk	*Accipiter cooperii*	1	1		2			
Dark-eyed Junco	*Junco hyemalis*	127	78	19	45	14	13	104
Dusky Flycatcher	*Empidonax oberholseri*		12		6		3	9
Dusky Grouse	*Dendragapus obscurus*							1
Eastern Kingbird	*Tyrannus tyrannus*					1		
Fox Sparrow	*Passerella iliaca*	4						6
Golden-crowned Kinglet	*Regulus satrapa*	16	19		10		1	12
Golden-crowned Sparrow	*Zonotrichia atricapilla*	1						4
Gray Jay	*Perisoreus canadensis*	45	26	4	18	8	1	57
Great Gray Owl	*Strix nebulosa*				1			
Great Horned Owl	*Bubo virginianus*					3		6
Great White-fronted Goose	*Anser albifrons*		20		20			
Greater Yellowlegs	*Tringa melanoleuca*	5	6	1	7	6		19
Green-winged Teal	*Anas crecca*							10
Hairy Woodpecker	*Picoides villosus*	3	1					2
Hammond's Flycatcher	*Empidonax hammondii*		14		3		1	4
Hermit Thrush	*Catharus guttatus*	29	49	11	52	8	3	50

Common Name	Scientific Name	Mine Site and LSA	Transmission Line and LSA	Mine Access Road and LSA	Kluskus FSR and LSA	Water Pipeline and LSA	Airstrip and LSA	RSA
Herring Gull	*Larus argentatus*							1
Hooded Merganser	*Lophodytes cucullatus*							2
Horned Lark	*Eremophila alpestris*							1
Killdeer	*Charadrius vociferus*				1			
Least Flycatcher	*Empidonax minimus*		5		7	1		1
Lesser Yellowlegs	*Tringa flavipes*							1
Lincoln's Sparrow	*Melospiza lincolnii*	7	27	2	29		2	22
Long-eared Owl	*Asio otus*		1					
MacGillivray's Warbler	*Geothlypis tolmiei*		37		10		1	4
Magnolia Warbler	*Setophaga magnolia*	1	6					
Mallard	*Anas platyrhynchos*				21			14
Merlin	*Falco columbarius*	1	2		1			3
Mountain Bluebird	*Sialia currucoides*		1	2				3
Northern Flicker	*Colaptes auratus*	2	11	2	7	1		16
Northern Goshawk	*Accipiter gentilis*	3						1
Northern Harrier	*Circus cyaneus*				2	1		5
Northern Pygmy-Owl	*Glaucidium gnoma*		2					
Northern Saw-whet Owl	*Aegolius acadicus*		6		1			2
Northern Shoveler	*Anas clypeata*		1		1			
Northern Waterthrush	*Parkesia noveboracensis*	2	21	1	21	1	2	6
Olive-sided Flycatcher	*Contopus cooperi*	3	30	3	16	9	6	19
Orange-crowned Warbler	*Oreothlypis celata*		33		16			7
Osprey	*Pandion haliaetus*		1		2			5
Owl Species	*Owl sp.*				1			
Pacific Wren	*Troglodytes pacificus*	32	9		2			11
Pacific-slope Flycatcher	*Empidonax difficilis*				2			
Pileated Woodpecker	*Dryocopus pileatus*		1		1			
Pine Grosbeak	*Pinicola enucleator*	3						
Pine Siskin	*Spinus pinus*	35	23	6	63	6		47
Purple Finch	*Carpodacus purpureus*							3
Red Crossbill	*Loxia curvirostra*	40	27	6	20	1		20
Red-breasted Merganser	*Mergus serrator*							1
Red-breasted Nuthatch	*Sitta canadensis*	5	4	1	6	4		14
Red-breasted Sapsucker	*Sphyrapicus ruber*		9					
Red-naped Sapsucker	*Sphyrapicus nuchalis*		1					
Red-tailed Hawk	*Buteo jamaicensis*	3	5	2	14	4	1	15
Red-winged Blackbird	*Agelaius phoeniceus*		2			2		6
Ring-necked Duck	*Aythya collaris*		23		5			49
Rough-legged Hawk	*Buteo lagopus*							1
Ruby-crowned Kinglet	*Regulus calendula*	15	48	5	50	7	2	29
Ruffed Grouse	*Bonasa umbellus*	1	9	1	6	1	1	7
Rufous Hummingbird	*Selasphorus rufus*	2	4			1		1
Rusty Blackbird	*Euphagus carolinus*		3			7		9
Sandhill Crane	*Grus canadensis*	1	2		1	2	3	28
Savannah Sparrow	*Passerculus sandwichensis*	3		3	24	3		29
Sharp-shinned Hawk	*Accipiter striatus*	1	2					3
Sharp-tailed Grouse ssp. columbianus	*Tympanuchus phasianellus columbianus*							6
Short-eared Owl	*Asio flammeus*		1		1			
Solitary Sandpiper	*Tringa solitaria*	3	1		1	2		11
Song Sparrow	*Melospiza melodia*		7	1	10			3
Spotted Sandpiper	*Actitis macularius*	1	2		4			2
Spruce Grouse	*Falcipennis canadensis*	11	1		2			8
Swainson's Thrush	*Catharus ustulatus*	14	128	4	27	5	3	35
Townsend's Solitaire	*Myadestes townsendi*	1	2				4	3

Common Name	Scientific Name	Mine Site and LSA	Transmission Line and LSA	Mine Access Road and LSA	Kluskus FSR and LSA	Water Pipeline and LSA	Airstrip and LSA	RSA
Townsend's Warbler	*Setophaga townsendi*	3	14		2			5
Tree Swallow	*Tachycineta bicolor*	2	13		8	1		4
Unknown Duck Species								1
Varied Thrush	*Ixoreus naevius*	64	22	2	4		1	18
Vesper Sparrow	*Pooecetes gramineus*				1			
Violet-green Swallow	*Tachycineta thalassina*	1						
Warbling Vireo	*Vireo gilvus*		65	3	46		2	9
Western Tanager	*Piranga ludoviciana*		13		3			
Western Wood-Pewee	*Contopus sordidulus*	1	3		8	3	1	3
White-crowned Sparrow	*Zonotrichia leucophrys*		1					2
White-throated Sparrow	*Zonotrichia albicollis*		12		9			
White-winged Crossbill	*Loxia leucoptera*		9		3			10
Willow Ptarmigan	*Lagopus lagopus*		5					1
Wilson's Snipe	*Gallinago delicata*	13	17	1	6	2	3	24
Wilson's Warbler	*Cardellina pusilla*	2	21	3	15		1	5
Yellow Warbler	*Setophaga petechia*				2			
Yellow-rumped Warbler	*Setophaga coronata*	101	88	10	45	14	6	99
Total Detections		755	1209	112	890	147	70	1264

Annex 11
Trapping Dates

Dates for wildlife species trapped in Region 6-1 are summarized in **Table 1** and dates for species hunted in Region 6-1 are summarized in **Table 2**.

Table 1 Trapping Season in Management Units (6-1, 5-12, 5-12, 7-11 and 7-12) for Furbearer species hunted and applicable season (BC MFLNRO 2012b)

	WMU				
Mammal Species	**WMU 6-1**	**WMU 5-12**	**WMU 5-13**	**WMU 7-11**	**WMU 7-12**
Black Bear	Oct 1 – May 31	Oct 1 – May 15	Oct 1 – May 15	Sep 1 – May 31	Sep 1 – May 31
Beaver	Oct 1 – May 31	Oct 15 – Apr 30	Oct 15 – Apr 30	Oct 1 – May 31	Oct 1 – May 31
Marten	Nov 1 – Feb 28	Nov 1 – Feb 15	Nov 1 – Feb 15	Nov 1 – Feb 28	Nov 1 – Feb 28
Wolverine	Nov 1 – Feb 28	Nov 1 – Jan. 31	Nov 1 – Jan 31	Nov 1 – Feb 28	Nov 1 – Feb 28
Fisher	Nov 1 – Feb 15	Nov 1 – Feb 15	Nov 1 – Feb 15	Nov 1 – Feb 15	Nov 1 – Feb 15
Mink	Nov 1 – Feb 28	Nov 1 – Feb 15	Nov 1 – Feb 15	Nov 1 – Feb 15	Nov 1 – Feb 15
Wolf	Oct 15 – Mar 31	Oct 15 – Mar 31, no closed season on private land and use of modified leg hold trap Apr.1 – Oct 14	Oct 15 – Mar 31, no closed season on private land and use of modified leg hold trap Apr.1 – Oct 14	Oct 15 – May 31	Oct 15 – May 31
Coyote	Oct 15 – Mar 31	Oct 15 – Mar 31	Oct 15 – Mar 31	Oct 15 – Mar 31	Oct 15 – Mar 31
Fox	Oct 15 – Feb 28	Oct 15 – Mar 31	Oct 15 – Mar 31	Oct 15 – Feb 28	Oct 15 – Feb 28
Lynx	Nov 1 – Feb 15	Nov 15 – Feb 15	Nov 15 – Feb 15	Nov 1 – Feb 15	Nov 1 – Feb 15
Bobcat	na	Nov 15-Feb 15	na	na	na
Muskrat	Oct 1 – May. 31	Oct 1 – Apr 30	Oct 1 – Apr 30	Oct 1 – May. 31	Oct 1 – May 31
Weasel	Nov 1 – Feb 28	Nov 1 – Feb 15	Nov 1 – Feb 15	Nov 1 – Feb 28	Nov 1 – Feb 28
Racoon	Oct 1 – Mar 31	Oct 1 – Mar 31	Oct 1 – Mar 31	Oct 1 – Mar 31	Oct 1 – Mar 31
River Otter	Oct 1 – May 31	Oct 15 – Apr 30	Oct 15 – Apr 30	Oct 1 – May 31	Oct 1 – May 31
Skunk	Oct 15 – Feb 28	Oct 15 – Feb 28	Oct 15 – Feb 28	Oct 15 – Feb 28	Oct 15 – Feb 28
Squirrel	Nov 1 – Mar 30	Nov 1 – Mar 15	Nov 1 – Mar 15	Nov 1 – Mar 30	Nov 1 – Mar 30

Table 2: Hunting Season in Management Units (6-1, 5-12, 5-12, 7-11 and 7-12) for Furbearer Species Hunted and Applicable Season

Furbearer Species	WMU				
	6-1	**5-12**	**5-13**	**7-11**	**7-12**
Black Bear	Sep 1 – Nov 30, and Apr 1-Jun 30	Sep 1 – Nov 30, and Apr 1-Jun 30	Sep 1 – Nov 30, and Apr 1-Jun 30	Aug 15 – Nov 15, and Apr 1-Jun 15	Aug 15 – Nov 15, and Apr 1-Jun 15
Wolf	Aug 1 – Jun 15	Aug 1 – Mar31, Apr 1-Jun 15 15	Aug 1 – Mar 31, Apr 1-Jun 15 15	Aug 1 – June 15	Aug 1 – Jun 15
Cougar	Sep 10 – Apr 30	Sep 10 – Apr 30	Sep 10 – Apr 30	Sept. 10 – Mar 31	Sep 10 – Mar 31
Racoon	Sep 1 – Mar 31	N/A	N/A	Sep 1 – Mar 31	Sep 1 – Mar 31
Coyote	Nov 1 – Feb 15	Sep 1 – Mar 31	Sep 1 – Mar 31	Sep 1 – Mar 31	Sep 1 – Mar 31
Wolverine	Sep 15 – Jan 15	N/A	N/A	N/A	N/A
Lynx	Nov. 15 – Feb 15	Nov 15 – Feb 15	Nov 15 – Feb 15	Nov 1 – Feb 15	Nov 1 – Feb 15
Bobcat	N/A	Dec 1- Dec 31	Dec 1- Dec 31	N/A	N/A
Snowshoe Hare	Aug. 1 – Apr. 30	Aug 1 – Apr 30	Aug 1 – Apr 30	Aug 1 – Apr 30	Aug 1 – Apr 30

Table 3: List of Traplines and Guide Outfitter Operations that Cross or are Adjacent to the Project

	Mine Site	Transmission Line	Kluskus FSR
Trapline			
TR0512T014	x		
TR0512T027	x	x	
TR0601T002	x		
TR0601T003	x	x	x
TR0601T006		x	
TR0604T053		x	
TR0711T006		x	x
TR0711T007		x	x
TR0712T029		x	
TR0712T035		x	
TR0712T039		x	
TR0712T040		x	
TR0712T043		x	x
TR0713T017		x	
Guide Outfitter			
500929	x		
600384	x	x	x
601039	x	x	x
601048		x	
701137		x	
701156			x
701166		x	x

Annex 12
Itcha-Ilgachuz Seasonal Caribou Calf Survival Inventory

Itcha-Ilgachuz Seasonal Caribou Calf Survival Inventory

DATE: October 25, 2013

PERSONNEL: T. Arduini – Arduini Helicopters
Dr. D. Hebert
D. Lay
Becky Cadsand

WEATHER: Clear / Perfect
Unlimited visibility
Skiff of snow on the Mtn tops
Temp. 10° - 12° C

FLIGHT TIME: 10:30 am – 3:30 pm (approx)

This flight was a continuation of the calf survival flight conducted in 2012. Conditions were ideal. Radio signals were assessed to determine which radios were still active.

The Itcha-Ilgachuz caribou population has declined approximately 52% between 2003 and 2010. Although there are a range of cumulative effects, the precise cause is unclear.

Mining, logging, roads, mountain pine beetle and fire may reduce habitat quality and quantity through the medium and long term, while wolf predation may act through the short and medium term. Cause and effect changes through habitat supply are more difficult to assess, while population changes through wolf predation may be more obvious.

OBJECTIVES

The purpose of the present survey was to assess population parameters and change between years 2012 – 2013, through the calf component. In the past few years, few seasonal calf indices have been obtained.

SURVEY

The survey was conducted on October 25, using 2 observers and 1 pilot/observer and 1 person checking radio collar signals, between 10:30 am and 3:30 pm (approximately).

During the 2013 survey, there were no animals at high elevation. All animals were at mid elevation on gentle slopes or in mid to upper elevation meadows and creek bottoms.

According to the Ministry of Environment caribou survey reports, the Itcha-Ilgachuz caribou population has declined approximately 52% between 2003 and 2010. During that time, the June age ratio has remained relatively stable ranging between 42 – 55 calves/100 cows. This might suggest that carrying

capacity and habitat have remained consistent. Similarly, the bull/cow ratio has remained relatively stable and both ratios suggest adequate to good reproductive success. However, there have been few seasonal surveys to assess either sex or age ratio changes.

The yearling to adult female ratio conducted during the June surveys (yearlings are difficult to identify at 1 year of age) (2003, 2009, & 2010) indicates a potential decline in annual survival (9 yrl/100 cows, 5.17 yrl/100 cows and 3.9 yrl/100 cows).

This year, although yearlings were not specifically counted, to reduce the level of harassment, there were only, about 6 yearlings observed (0.9 yrl/100 cows)

The October 25, 2013 survey obtained a sample of 616 caribou, which resulted in an age ratio of 3.36 ca/100 cows (Table 1). In order to maintain the Itcha-Ilgachuz caribou population, the age ratio at 1 year of age should be approximately 10 – 15 calves (yrl)/100 cows. Combining the October 2012 fall ratio with the previous recruitment ratios of 2003 – 2012, would suggest that the population is continuing to decline rapidly. Based on an age ratio of 3.36 ca/100 cows in October, the recruitment rate in March to June will likely drop to 0 yrl/100 cows.

Area	Cows	Calves	Bulls	Totals
Itcha Flats	107	3	5	115
Itcha N. Mts.	141	5	14	160
Itcha NW	14	1	5	20
TOTALS	**262**	**9**	**24**	**295**
Ilgachuz Flats Between the Ithcha & Ilgachuz Mts.	42	1	3	46
Itchas	232	8	35	275
TOTALS	**274**	**9**	**38**	**321**
TOTAL (ALL AREAS)	**536**	**18**	**62**	**616**

18/536 = 3.36 Calves/100 Cows
62/536 = 11.7 Bulls/100 Cows
18/598 = 3% Calves in total population

Table 1. Caribou Population Ratio Survey – October 25, 2013

The cow/calf ratio declined significantly between 2012 and 2013, from 13.2 ca/100 cows to 3.36 ca/100 cows. It also appears that recruitment is continuing to decline. The spatial distribution of caribou was also significantly different between years. Wheras there were only 88 caribou observed in the Itcha mountains in 2012 and 298 observed in the Ilgachuz mountains, there were 614 seen in the Itcha mountains in 2013, and only 2 in the Ilgachuz mountains. There were a few caribou using the flats and meadows between the two mountain ranges and these animals may have come from the Ilgachuz range.

The bull/cow ratio is a bit low, but relatively consistent between years.

Although more surveys and/or more research could aid in the assessment of cause and effect, it is hard to imagine that the population could survive the exercise. It is imperative that a wolf predation assessment program be initiated immediately. It is possible and highly likely that wolf predation could reduce the caribou population and allow the remaining cumulative effects (mining, logging, roads, fire, mountain pine beetle) to curtail the opportunity for recovery.

Similarly, unless the SARA recovery plan and action plan are completed within the next year, and action undertaken, it is unlikely that this population will be given an opportunity to recover.

ASSOCIATED OBSERVATIONS

Although mountain goats were not specifically counted, to minimize harassment levels, the number of kids/100 females was considerably higher than that for the caribou population. Most mountain goats were on gentle terrain, at variable distances from escape terrain.

As well, the game trails throughout the Ilgachuz appeared to have little relative use, compared to past years. The temporal/monthly pattern of use throughout this range is unknown.

TWEEDSMUIR-ENTIAKO CARIBOU

Fall 2013 calf survival flight

Prepared for: Ulkatcho First Nations
New Gold Inc.

Prepared by: Deborah Cichowski
Caribou Ecological Consulting

Date: October 27, 2013

Observers: Deborah Cichowski, Caribou Ecological Consulting, Smithers, B.C.
Tom Smith, Smithers, B.C.
Conrad Thiessen, Ministry of Forests, Lands and Natural Resource Operations, Smithers, B.C.

Aircraft Company: Canadian Helicopters, Bell 206, Tom Brooks --- pilot

Objective: To determine fall calf survival for the Tweedsmuir---Entiako caribou population based on caribou seen in rutting aggregations in the Quanchus Mountains.

Weather: Morning: ---4 to 0°C; overcast with ceiling at about 6000 ft
Afternoon: 0°C; sunny/broken overcast

Methods:

A Bell 206 helicopter was used to search alpine areas and subalpine meadows/wetlands in the four alpine blocks in the Quanchus Mountains: Mt. Wells/Tweedsmuir Peak; Michel Peak; Wells Gray Peak; and, Eutsuk Peak. Each group of caribou was counted and classified as bulls, cows and calves. Other species of wildlife were also recorded. In addition, we also listened for frequencies of 12 radio---collared caribou from a study that ended in March 2009 during the survey to opportunistically assess how many were still alive and functioning.

Results and Discussion:

Cloud cover at the beginning of the survey prevented searches of higher elevation portions of the survey area in the Mt. Wells/Tweedsmuir Peak and Michel Peak blocks. However, by the end of the survey, the cloud layer lifted and we were able to survey the remaining portions of those blocks.

A total of 94 caribou were counted in 5 groups in the Quanchus Mountains (Table 1). All caribou were found in the Mt. Wells/Tweedsmuir Peak and Wells Gray Peak mountain blocks. Fall calf survival was 10.6% calves and 16.7 calves/100 cows. The bull cow ratio was 40 bulls/100 cows.

Table 1. Caribou counted during a survey of the Quanchus Mountains in northern Tweedsmuir Park, October 27, 2013.

Survey Block	Total	# bulls	# cows	# calves	Comments
Mt. Wells/ Tweedsmuir Peak	37	8	25	4	One cow with two yellow eartags
	3	3			
Michel Peak	0				
Wells Gray Peak	12	4	8		
	1	1			
	41	8	27	6	Includes collar 148.730
Eutsuk Peak	0				
Total	94	24	60	10	

Nine of the 12 caribou that had functioning collars (VHF) at the end of March 2009 were contacted during the flight. Five of those 9 were on mortality mode and 4 were still alive. One of the 4 caribou (148.730) was seen in a group of 41 caribou in the Wells Gray Peak area. Signals from the other 3 radio---collars on live caribou indicated that those caribou were in the area west of the Quanchus Range. Of the 3 radio---collars not contacted during the flight, one was collared in 2000 so that collar had likely stopped functioning; the other 2 were both collared in January 2007 and both were found alive during a survey in March 2012. Although the 2 caribou were not heard during the flight, they may have been out of detection range and could potentially still be alive.

Other wildlife observed during the survey included:

- 2 moose (2 bulls)
- 15 mountain goats (1 adult male, 14 unidentified adults)
- 7 grizzly bears (1 unidentified adults, 2 sows, 4 cubs)
- 6 wolves (4 black, 2 grey)