APPENDIX 11

Environmental Baseline Report: Vegetation

Victoria GOLD CORP

Stantec

EAGLE GOLD PROJECT

Environmental Baseline Report: Vegetation

FINAL REPORT

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EXECUTIVE SUMMARY

This report presents results of the baseline vegetation assessment completed in 2009 by Stantec for the Eagle Gold Project proposed by Victoria Gold Corporation. The baseline assessment includes terrestrial ecosystem mapping and a rare plant survey and foliar sampling for the area of proposed Project including the mine site and access road. Vegetation field surveys were undertaken in August 2009 to gather data necessary for preparation of terrestrial ecosystem mapping and rare plant survey. Foliar samples of commonly occurring shrubs, grasses or sedges were collected at ten sites for metals analysis.

Terrestrial ecosystem mapping was completed for an area of approximately 7,538 ha surrounding the proposed Project. Ecosystem mapping was also prepared for a 1 km wide corridor along the 44.8 km long access road (4,580 ha). A Project specific ecosystem classification system, based on field data and literature review, was developed for the study areas. A total of 21 vegetated ecosystem units and nine non-vegetated units have been mapped in the study areas.

Terrestrial ecosystem maps were analyzed to determine the abundance of ecosystems in the study areas at Baseline (2009). Three separate study areas have been defined for the purposes of this baseline reporting. These include the local study area, regional study area), and road corridor study area. The study areas include both forested and subalpine areas. They are composed of about 7,676 ha of coniferous forest ecosystems and 1,288 ha of dwarf birch ecosystems. Riparian areas and wetlands occupy about 1,184 and 669 ha, respectively. Deciduous dominated forest types cover about 834 ha. About 1,506 ha of old forest is present within the three study areas.

Five forest productivity classes have been defined for the study areas. The majority of the land has been classed with moderate (22%) and low productivity (33%). Eight percent is rated as highly productive while <1 is rated as very low. The remaining area (37%) is classed as non-productive for timber because of the presence of non-forested ecosystems or disturbances. Timber volumes have also been estimated for the forested lands within the study areas.

One rare plant, island purslane (*Koenigia islandica*), was found within the local study area. This plant is considered “imperiled” in the Yukon.

All foliar samples analyzed in 2009 contained metal concentrations below levels considered toxic for cattle.

ABBREVIATIONS AND ACRONYMS

asl ..... above sea level
BC MoF ..... British Columbia Ministry of Forests
BEC ..... biogeoclimatic ecosystem classification
DEM ..... digital elevation model
ha ..... hectares
HKP ..... Hallam Knight Piésold
HD-MAPP ..... high definition mapping and applications
ICP- MS ..... inductively coupled plasma mass spectrometry
LIDAR ..... Light Detection and Ranging
LSA ..... local study area
QA/QC ..... quality assurance/quality control
RCSA ..... road corridor study area
RSA ..... regional study area
RIC ..... Resource Inventory Committee (British Columbia)
SIBEC ..... Site Index using Biogeoclimatic Ecosystem Classification
SIL ..... survey intensity level
TEM ..... terrestrial ecosystem mapping
UTM ..... Universal Transverse Mercator
YESAA ..... *Yukon Environmental and Socio Economic Assessment Act*
YESAB ..... Yukon Environmental and Socio-economic Assessment Board

TREE SPECIES CODES

Ac ..... balsam poplar (cottonwood)
At ..... trembling aspen (white aspen)
Bl ..... subalpine fir (balsam)
Ep ..... Alaska birch
Sb ..... black spruce
Sw ..... white spruce

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1 INTRODUCTION

This report presents results of the baseline vegetation assessment completed by Stantec for the Eagle Gold Project proposed by Victoria Gold Corporation. The Eagle Gold Project is a proposed open pit gold mine within the Dublin Gulch watershed located 85 km northeast of the Village of Mayo, Yukon Territory.

Stantec was contracted by the Stratagold Corporation to begin environmental baseline studies in 2007. In 2009, Stratagold Corporation was acquired by Victoria Gold Corporation. During this time, the project was renamed from Dublin Gulch to Eagle Gold and the local study area was updated to reflect any changes to the geographic extent of the proposed Eagle Gold Project.

This report presents background information, methods, and results for the baseline vegetation studies conducted during 2009 for Victoria Gold related to its Eagle Gold Project. The vegetation baseline is intended to provide information sufficient to support an environmental assessment under the *Yukon Environmental and Socio-economic Assessment Act* (YESAA). Existing vegetation information on the Project area was updated to 1:20,000 scale terrestrial ecosystem mapping following BC Resource Inventory Committee (RIC) Standard and expanded to cover approximately 7,500 ha and be coincidental with the existing terrain mapping boundaries for the Project. Collection and analysis of vegetation samples to determine baseline trace metals content was also completed. In addition, a rare plant survey was conducted in areas with the greatest potential for rare plants (e.g., wetlands, subalpine areas, and rock outcrops).

Field programs were undertaken to describe and characterize the ecosystems in conjunction with the terrain and soils discipline, to support interpretations for wildlife and First Nations interests, and to gather vegetation samples for metals analysis. Terrestrial ecosystem mapping was completed to describe the spatial distribution and abundance of terrestrial ecosystems within the study areas. A separate summer rare plant survey was completed to identify rare vegetation elements.

2 METHODS

Vegetation resources have been characterized through a combination of field inventory and 1:20,000 scale terrestrial ecosystem mapping. The methods used to characterize vegetation resources in the study areas are describe in detail below.

2.1 Review of Existing Literature

Background information on the ecology of the Project area was compiled from broader regional or Yukon Territory studies. General information on the Yukon Plateau-North Ecoregion (formerly the Mayo Lake – Ross River Ecoregion) was acquired from the *Ecoregions of the Yukon Territory* (Yukon Ecoregions Working Group 2004) and *Ecoregions of Yukon Territory* (Oswald and Senyk 1977). Information on the condition of the northern boreal forest was obtained from the report *Criteria and Indicators of Sustainable Forest Management in Canada* (Canadian Council of Forest Ministers 2006).

Yukon Government does not have a territory wide ecological land classification system. Some regional classification projects have been completed as well as those associated with assessment of other resource development projects. A detailed classification system has been developed for the southeast corner of Yukon (Geomatics International 1995), and a general ecological classification has been used to describe the resources of the Peel River area to the north of the Project site (Meikle, J. and M. Waterreus 2008). Other local ecosystem/ecological land classification systems have been developed for specific projects such as Wolverine (Yukon Zinc 2005) and Mactung (EBA 2008).

Several companies have worked and completed various environmental studies in the study areas. An Initial Environmental Evaluation (IEE) was completed in 1996 for the Dublin Gulch Project (mineral mine) which was proposed in the present location of the Eagle Gold Project. Part of the IEE involved the description of vegetation resources, the development of a vegetation classification system and vegetation mapping (Hallam Knight Piésold Ltd. 1996) (Appendix A). The vegetation mapping prepared by Hallam Knight Piésold (1996) was not available in digital format and was used for reference purposes only.

2.1.1 Terrestrial Ecosystem Mapping

Terrestrial ecosystem mapping (TEM) is a hierarchical framework that combines topographic, terrain, soils, and vegetative features of the landscape to produce an integrated ecological product that can be used for measuring the distribution and abundance of ecosystems in a landscape, and form the basis for various interpretations (e.g., productivity, wildlife habitat, and soil modeling). Terrestrial ecosystem mapping was completed for the Project area by applying relevant principles and methods contained in *Standard for Terrestrial Ecosystem Mapping in BC* (RIC 1998).

The following information was utilized or reviewed during preparation of the Environmental Baseline Report for terrestrial ecosystem classification and mapping:

- *Dublin Gulch Initial Environmental Evaluation – Volume II Environmental Setting (*Hallam, Knight Piésold 1996) for 1995 vegetation field plot locations and ecosystem descriptions. Section 9 of this report describes the vegetation features of the Eagle Gold Project area.
- *Ecosystem Classification for the Southeast Yukon* (Geomatics International 1995). This report was consulted to obtain information on the classification that was developed for South-eastern Yukon, and to assess its applicability to the Eagle Gold Project.
- *Ecoregions of Yukon Territory* (Oswald and Senyk 1977). This report was reviewed to obtain general information on the physiography, soils, and terrain of the Eagle Gold study areas.
- *Ecosystems of the Peel Watershed: A Predictive Approach to Regional Ecosystem Mapping* (Meikle and Waterreus 2008). The southern boundary of the Peel Watershed Regional Ecosystem Mapping area lies approximately 25 km to the north of the Eagle Gold Project. The units used in this classification are more general than those used for Eagle Gold; however this report was still useful to review.

- *Wolverine Project Environmental Assessment Report* (Yukon Zinc Corporation 2005). An ecosystem classification was developed for the Wolverine mine in the Finlayson District of South east Yukon. The classification was reviewed as well as the mapping methods used.
- A Field Guide to Site Identification and Interpretation for the Prince Rupert Forest Region. (Banner, et al. 1993). This field guide was consulted for information on alpine and subalpine ecosystems in the boreal forest zone of northern BC.
- Mayo Airport and Mayo Road weather station climate normals and averages from 1971 – 2000 (Environment Canada 2000) to obtain climate data.

2.1.2 Rare Plant Survey

A previous rare plant survey conducted for the Dublin Gulch area (Hallam Knight Piésold 1996) reported that no rare plants were identified in the their study area.

Prior to embarking on the summer 2009 rare plant survey, a list of potential rare plants of the Nacho Nyak Dun traditional territory was obtained from Bruce Bennett, Vascular Plant Specialist (Personal Communication). This list, presented in Table 1, consists of plant species which are considered rare in the Yukon Territory and which have the greatest likelihood of occurring in the Dublin Gulch area. The *Flora of the Yukon Territory* (Cody 2000) was used as the plant nomenclature reference for the Project.

Table 1: Rare Plants of the Nacho Nyak Dun Region, Yukon Territory

Family	Species	Ecology
Apiaceae	*Podistera macounii* (Coult. & Rose) Mathias & Const.	Turfy tundra and stony slopes
Aspleniaceae	*Asplenium trichomanes-ramosum* L.	Talus; crevices of limestone
Asteraceae	*Antennaria media* Greene	Moist rocky alpine tundra; below snow masses
Asteraceae	*Antennaria microphylla* Rydb.	Floodplains; dry alkaline basins
Asteraceae	*Erigeron yukonensis* Rydb.	Calcareous stony slopes
Boraginaceae	*Eritrichium splendens* Kearney	Alpine slopes
Brassicaceae	*Draba porsildii* G.A. Mulligan	Limestone slopes
Brassicaceae	*Draba stenopetala* Trautv.	Alpine scree and turfy slopes
Campanulaceae	*Campanula rotundifolia* L. sens. lat.	Rocky, gravelly, turfy
Caryophyllaceae	*Arenaria longipedunculata* Hultén	Gravel wash
Caryophyllaceae	*Silene uralensis* (Rupr.) Bocquet ssp. *ogilviensis* (Porsild) Brunton	Calcareous soils
Caryophyllaceae	*Stellaria dicranoides* (Cham. & Schlecht.) Fenzl	Dolomite scree slopes
Caryophyllaceae	*Stellaria umbellata* Turcz.	Moist alpine slopes
Ceratophyllaceae	*Ceratophyllum demersum* L.	Small lakes
Cyperaceae	*Carex deweyana* Schw. var. *deweyana*	Moist stream bank

Family	Species	Ecology
Cyperaceae	*Carex heleonastes* L. f.	Bog
Cyperaceae	*Carex lapponica* O.F. Lang	Woodland meadow; bog
Cyperaceae	*Carex lasiocarpa* Ehrh. ssp. *americana* (Fern.) Hultén	Peat bog pond
Cyperaceae	*Carex laxa* Wahlenb.	Tundra bog
Cyperaceae	*Carex marina* Dewey	Bog
Cyperaceae	*Carex oligosperma* Michx.	Bogs; poor fens
Cyperaceae	*Carex viridula* Michx. ssp. viridula	Lakeshore; wet meadow; calcareous
Dryopteriaceae	*Athyrium americanum* (Butters) Maxon	Open, rocky subalpine slope
Dryopteriaceae	*Dryopteris expansa* (Presl) Fraser-Jenkins & Jermy	Woods and thickets
Dryopteriaceae	*Polystichum lonchitis* (L.) Roth	Limestone cliffs; moist rocky slopes; talus slopes
Fabaceae	*Lathyrus maritimus* Bigelow ssp. *pubescens* (Hartman) Regel	Sandy or gravelly beaches
Fabaceae	*Oxytropis mertensiana* Turcz.	Moist alpine slopes; gravel bars
Geraniaceae	*Geranium richardsonii* Fisch. & Trautv.	Moist thickets; hotsprings
Juncaceae	*Luzula groenlandica* Böcher	Lakes; ponds; gravelly alpine flats
Ophioglossaceae	*Botrychium alaskense* W.H.Wagner & Grant	Moist, grassy sites in open forests; closed-canopy forests
Ophioglossaceae	*Botrychium lanceolatum* (Gmel.) Angstr. var. *lanceolatum*	Alpine meadows; grassy places
Ophioglossaceae	*Botrychium multifidum* (Gmel.) Rupr.	Gravel roadbed
Ophioglossaceae	*Botrychium pinnatum* St. John	
Orchidaceae	*Coeloglossum viride* (L.) Hartm. ssp. *bracteatum* (Muhl.) Hultén	Moist meadows; tundra
Orchidaceae	*Cypripedium guttatum* Sw. var. *guttatum*	Open mossy woods; calcareous
Orchidaceae	*Cypripedium parviflorum* Salisb.	Calcareous woodlands
Orchidaceae	*Malaxis paludosa* (L.) Sw.	Bog
Plumbaginaceae	*Armeria maritima* (Mill.) Willd. ssp. *arctica* (Cham.) Hultén	Sanddunes
Poaceae	*Koeleria asiatica* Domin	Moist tundra; burrows; scree
Poaceae	*Koeleria macrantha* (Ledeb.) Schultes	Dry grassland; roadsides
Poaceae	*Phippsia algida* (Soland.) R. Br.	Wet slopes; river flats
Poaceae	*Poa abbreviata* R. Br. ssp. *abbreviata*	Limestone tundra
Poaceae	*Scolochloa festucacea* (Willd.) Link	Shallow water; wet marshes
Polygonaceae	*Koenigia islandica* L.	Wet moss; spring; small lakes

Family	Species	Ecology
Polygonaceae	*Polygonum lapathifolium* L. sens. lat.	Lake margin
Polypodiaceae	*Polypodium sibiricum* Siplivinsij	Rocks; woodland banks
Potamogetonaceae	*Potamogeton foliosus* Raf.	Muddy bottoms
Potamogetonaceae	*Potamogeton natans* L.	Lakes; streams
Potamogetonaceae	*Potamogeton strictifolius* A. Benn.	Lakes
Potamogetonaceae	Potamogeton subsibiricus Hagstr.	Shallow water
Primulaceae	*Dodecatheon pulchellum* (Raf.) Merr. var. *pulchellum*	Wet meadows
Primulaceae	*Primula mistassinica* Michx.	Meadows; riverbanks; lakeshores
Primulaceae	*Trientalis borealis* Raf. ssp. *latifolia* (Hook.) Hultén	Moist woods
Pteridaceae	*Cryptogramma crispa* (L.) R. Br. var. *acrostichoides* (R. Br.) C.B. Clarke	Crevices
Pteridaceae	*Cryptogramma crispa* (L.) R. Br. var. *sitchensis* (Rupr.) C. Chr.	Crevices
Pteridaceae	*Cryptogramma stelleri* (Gmel.) Prantl	Crevices
Ranunculaceae	*Anemone multiceps* (Greene) Standl.	Scree slopes
Ranunculaceae	*Caltha natans* Pallas ex Georgi	Ponds; ditches; wet meadow
Rosaceae	*Rubus arcticus* L. ssp. *stellatus* (J.E. Sm.) Boivin	Subalpine meadows
Salicaceae	*Salix farriae* Ball	Rivers; streams
Salicaceae	*Salix pedicellaris* Pursh	Wet fen; muskeg
Salicaceae	*Salix pyrifolia* Anderss.	Moist clearings
Scheuchzeriaceae	*Scheuchzeria palustris* L. ssp. *americana* (Fern.) Hultén	Cogs
Typhaceae	*Typha latifolia* L.	Wetlands

The following sources of information were consulted while undertaking the rare plant study:

- Bruce Bennett (pers. comm. 2009) Yukon, Yukon Vascular Plant Specialist
- http://www.environmentyukon.gov.yk.ca/wildlifebiodiversity/plants.php regarding plant diversity in Yukon.

2.1.3 Forest Productivity and Timber Volume

Forest productivity is included in the vegetation baseline since one of the objectives of reclamation will be to restore soil productivity and associated forest productivity. Forest productivity is a forest ecosystem's natural capacity to capture energy, sustain life and produce forest resources. Productivity can be categorized as gross, net, primary or secondary, and it can be quantified for specific components (leaves, wood, and above-ground or below-ground constituents). Productive

forests provide economic value by providing commercial timber, and forest, and soils can be valuable carbon sinks that offset the effects of climate change. The more productive a forest ecosystem is the greater it's commercial timber value and capacity to act as a carbon sink (Natural Resources Canada 2009). Site productivity depends on both natural factors and also on management related factors (Skovsgaard and Vanclay 2007). Timber volume depends on the site's capability to support forest and the area's forest productivity.

Baseline forest productivity and timber volume were assessed in relation to the Project area's forest production capability. The biomass production capability of the non-forest ecosystems are not discussed in this report.

The following information sources were considered in the estimation of forest productivity and volumes:

- Banner, A., W. MacKenzie, S. Haeussler, S. Thomson, J. Pojar, and R. Trowbridge. 1993. A field guide to site identification and interpretation for the Prince Rupert Forest Region, Land Mgt. Handbook No. 26.
- British Columbia Ministry of Forests. 1997. Site index by site series for coniferous tree species in British Columbia.
- British Columbia Ministry of Forests. 1995. Summary of British Columbia Forest inventory statistics by land administration class, Vol. 5. Prince Rupert Forest Region. Res. Br. B.C. Min. For., Victoria, B.C. Work. Pap. 10/1995.
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- Mah, S. and G. D. Nigh. 2003. SIBEC site index estimates in support of forest management in British Columbia. Tech. Rep. 004.
- Natural Resources Canada accessed online at http://cfs.nrcan.gc.ca/subsite/ecoleap/definitions on November 27 2009.
- Forestry Handbook for British Columbia Fourth Edition, 1983. Forestry Undergraduate Society, Faculty of Forestry, University of British Columbia, Vancouver.

2.2 Study Area Boundaries

The Project study area has been sub-divided into three areas for analysis and discussion: the local study area (LSA), regional study area (RSA), and road corridor study area (RCSA). These study areas are defined based on the proposed development and by landscape features.

2.2.1 Local Study Area

The vegetation local study area (LSA) is the area in which Project effects could potentially occur. The LSA includes the Dublin Gulch watershed and several smaller sub-watersheds on the western boundary (Figure 2-1). The vegetation LSA is approximately 1,606 ha in size. The vegetation field work conducted to support the Project assessment focused on the LSA.

2.2.2 Regional Study Area

The vegetation regional study area (RSA) is defined to include an area of the surrounding landscape to provide regional context for Project effects. The vegetation RSA includes the LSA and extends to the boundary of Lynx Creek to the south, to Haggart Creek to the north and to the height of land for the small sub-watersheds located to west of the Haggart Creek and the LSA (Figure 2-1). The total area of the RSA, including the LSA, is 7,538 ha.

2.2.3 Road Corridor Study Area

The Road Corridor Study Area (RCSA) is designed to assess the potential effects associated with the access road upgrade (Figure 2-1). The RCSA was created by buffering the South McQuesten Road (SMR) and the Haggart Creek Access Road (HCAR) by 500 m on each side up to the existing Eagle Gold camp site. The RCSA is approximately 44.8 km in length and 4,580 ha in area. The road corridor study area is intended to capture any potential disturbance to vegetation resources that may occur due to realignment of the Project access road.

2.3 Field Programs

Two separate field programs were conducted in 2009 to determine baseline conditions for vegetation resources in the study areas. These programs involved the following:

1. Vegetation field survey to characterize vegetation resources, collect foliar samples for metal analysis, and gather data on terrestrial ecosystems for use in preparation of terrestrial ecosystem mapping
2. Rare plant field survey.

These field programs are further described below.

2.3.1 Ecological Mapping Field Program

A terrestrial ecosystem mapping (TEM) product was developed for the three Project study areas following the methods developed per the *Standard for Terrestrial Ecosystem Mapping in BC* (RIC 1998). Preliminary delineation of bio-terrain polygons was completed for the RSA and LSA prior to the initiation of field work. These polygons were used to pre-select candidate field inspection sites. Field maps, displaying the bio-terrain polygons and potential inspection sites overlain on a Project ortho-photograph, were prepared to assist in the field program. The geo-spatial coordinates of the pre-selected sampling points were loaded to GPS units. Sampling points were selected to capture the range of ecosystem units present within the LSA and RSA. Air photographs and preliminary bioterrain mapping were not available for the RCSA during the field program.

The field data for vegetation characterization and preparation of ecosystem mapping were collected during one field program conducted August 11 through 16, 2009. Two field crews, each consisting of a soil/terrain scientist and a vegetation ecologist conducted the field surveys. One crew focused on the inspections within the LSA while the other surveyed the RSA and RCSA. Field inspections were

largely completed through the use of foot traverses from existing roads; helicopter drop-off and pick-up was used to access some portions of the RSA.

Two types of inspections were completed: detailed ground inspections and visual inspections. The majority of the sites utilized ground inspections. Visual inspections were completed to assist with mapping of terrain and ecosystem units. The locations of the ground inspection sites were selectively chosen. An effort was made to ensure that the sample sites were homogeneous with respect to site, soil and vegetation characteristics. The Terrestrial Ecosystem Mapping Ground Inspection Form was used for recording ground inspection data. The Field Manual for Describing Terrestrial Ecosystems (Ministry of Forests and BC Environment 1998) provided a detailed method for data collection at ground inspections locations.

The following information was collected at the each of the ground inspection sites:

- UTM coordinates
- Slope/topographic position
- Aspect
- Gradient (percent slope)
- Drainage
- Nutrient regime
- Moisture regime
- Percent cover by species
- Additional notes.

In addition to the above, a suite of information on soils and terrain attributes were collected at the ground inspection sites (see Surficial Geology, Terrain and Soils Baseline report). Site photographs were taken at the majority of ground inspection sites. Tree mensuration data (height, diameter at breast height, and age) were collected at selected sites along with foliar samples for metals analysis.

At total of 142 field inspections were completed within the Project area to support the ecosystem mapping product (Table 2). A survey inspection level (SIL) 4 was completed for the LSA; 15 – 25% of the map polygons were inspected (RIC 1998). This level of inspection is considered sufficient for interpretations associated with wildlife capability ecosystem representation, and general forest productivity (RIC 1998).

Table 2: Distribution of Vegetation Inspection Sites

Study Area	Area (ha)	Number of Polygons	Number of Polygons with Inspections	Survey Intensity Level	
				Percent of Inspected Polygons	Hectares per Inspection
LSA	1,606	224	52	23	31
RSA	7,538	693	94	14	8
RSCA	4,580	277	27	10	170

NOTE:
The number of polygons and inspections reported for the RSA includes the LSA polygons and inspection numbers, while the RCSA includes polygons and inspections that overlap with the LSA and RCSA. The RSA is 5,932 ha in area if the LSA is removed.

A list of the plant species found during the rare plant and mapping field surveys is presented in Appendix B. Upon completion of the field studies, data from the inspections were recorded in database format.

2.3.2 Rare Plant Field Survey

The summer rare plant survey was conducted from August 6 through August 10, 2009 by Jacqueline Shaben M.Sc. (Stantec) and Stuart Withers (Laberge Environmental Services). Prior to embarking on the field survey, digitized air photos were analyzed in the HD-MAPP system (3-D stereographic images) to pre-select survey locations, targeting areas with higher rare plant potential such as rock outcrops wetlands and drainages. Sites were also chosen to represent areas of larger community types within the LSA.

A total of 29 rare plant inspections were completed in the LSA (Figure 2-2). At each rare-plant survey plot, the rare plant specialists thoroughly searched the site for rare plants, documenting all species until no new species were found. Site information was recorded at all sites including UTM coordinates, elevation, aspect, slope, moisture, and nutrient regime. In addition to surveys conducted at target plots, any potential rare plants encountered while in transit between sites were also inspected and identified, and site information collected. Specimens requiring further examination to confirm identification were collected where appropriate.

2.4 Data Analysis

The following section describes the methods used to prepare terrestrial ecosystem mapping for the three study areas. In addition, the procedures and data used to prepare estimates of timber productivity and standing timber volume are described, as well as the sources used to interpret metal concentrations in foliar samples.

2.4.1 Terrestrial Ecosystem Mapping

A terrestrial ecosystem mapping (TEM) product was developed for the three Project study areas following the methods developed per the *Standard for Terrestrial Ecosystem Mapping in BC* (RIC

1998). A mapping scale of 1:20,000 was set for polygon delineation and classification in the RSA and RCSA while more detailed mapping (1:10,000) was prepared for the LSA. A description of the ecosystem mapping process is provided in the following sections.

2.4.1.1 Pre-Field Bioterrain Mapping

Initial bioterrain mapping for the LSA and RSA was completed using 1:40,000 scale colour, and 1:10,000 scale black and white aerial photographs, both captured in 1995, and viewed in stereo using a HD-MAPP system for the LSA and RSA. A bioterrain map is a modified terrain map used as a base for terrestrial ecosystem mapping. Mapping for the RCSA was completed on 1996 black and white aerial photographs (1:20,000 scale) using a stereoscope. Following delineation of the polygons the bioterrain linework was transferred into digital format and merged into a seamless map with the LSA and RSA. These bioterrain polygons provide a strong foundation for the mapping of vegetation and ecosystems. A detailed description of the bioterrain mapping process and results is provided in the Surficial Geology, Terrain, and Soils Baseline Report.

2.4.1.2 Ecosystem Classification

Upon completion of the field studies, data from the inspections were recorded in VENUS (VTEM) database.

A project specific ecosystem classification was developed because an ecological land classification system has not been developed for this portion of Yukon Territory. The classification used for this Project was developed based on ecosystem data that were collected in the field, as well as reviewing four other ecosystem classifications used in the Yukon (Yukon Zinc Corporation 2005; Meikle and Waterreus 2008; Geomatics 1995; Hallam Knight, and Piésold 1996). Table 3 presents the equivalent units from each of these different classifications. Due to the objectives of the different classifications, the equivalencies are not always a perfect fit. For example the Peel River Classification was done at a much smaller scale, and the ecosystem units are more general (encompassing greater diversity within each unit). On the other hand, the Geomatics classification is very detailed, and the units are difficult to apply to a mapping project with a scale greater than 1:10,000.

Table 3: Ecosystem Unit Equivalents from Other Classifications

Eagle Gold Ecozone	Eagle Gold Ecosystem Name	Ecosystem Map Code	Peel River	SE Yukon (Geomatics 1995)	Wolverine (Best Fit)	Hallam Knight Piésold 1996 (Best Fit)
Subalpine/ Forest	Subalpine fir – Dwarf birch – Crowberry	FP		V120 – Coniferous Tall Shrub (*Abies lasiocarpa*)	Open subalpine forest	Subalpine ericaceous shrub/lichen
Subalpine	Mountain Avens – Dwarf willow	MW	High elevation dry sparse herb	V111 – Deciduous Dwarf Shrub (*Dryas*)	Heather/avens/ dwarf shrub; Alectoria/Cladina/ Cetraria	Alpine heather/forb

Eagle Gold Ecozone	Eagle Gold Ecosystem Name	Ecosystem Map Code	Peel River	SE Yukon (Geomatics 1995)	Wolverine (Best Fit)	Hallam Knight Piésold 1996 (Best Fit)
Subalpine	Mountain heather meadow	MM	High elevation dry sparse herb	V170 – Ericaceous Shrub (*Cassiope tetragona*),	Heather/avens/ dwarf shrub	Alpine heather/forb
Subalpine/ Forest	Dwarf birch-Lichen	BL	Shrub-low	V110 – Deciduous Dwarf Shrub (*Betula glandulosa*)	Dwarf birch medium/tall shrub	Subalpine ericaceous shrub/lichen; Alpine sedge/Grass
Subalpine/ Forest	Dwarf birch-Northern rough fescue	SA	Tall shrub	V101 – Deciduous tall shrub (*Betula glandulosa*)	Dwarf birch medium/tall shrub	Subalpine ericaceous shrub/lichen; Alpine sedge/Grass
Subalpine/ Forest	Willow-Groundsel	WG	Tall shrub	V104 – Deciduous tall shrub (*Salix*)	Willow medium/ tall shrub	Riparian willow/sedge
Subalpine/ Forest	Willow-Mountain sagewort	WM	Tall shrub	V105 – Deciduous Tall Shrub (*Salix – Betula glandulosa*)	Willow medium/tall shrub	Riparian willow/sedge
Forest	Aspen - Kinnikinnick	AK	Broadleaf-open	V2 – Trees, Closed Deciduous (*Populus tremuloides*), V5 – Treed, Open Deciduous (*Populus tremuloides*)	Open trembling aspen – spruce forest	Trembling aspen
Forest	Alaska birch-White spruce-Willow	AW	Broadleaf-open	V1 – Treed, Closed Deciduous, (*Betula papryifera*) V4 – Treed, Open Deciduous (*Betula papyrifera*)	Open trembling aspen – spruce forest	Mixed conifer/ Deciduous
Forest	Black spruce-Sphagnum	BS	Wetland-shrub/treed	V18 – Treed, Open Coniferous (*Picea mariana*)	Open black spruce forest	Wetland sedge/ sphagnum moss
Forest	Subalpine fir-Cladina	FC	Coniferous -sparse	V15 – Treed Open Coniferous (*Abies lasiocarpa*)	Open subalpine forest	Subalpine fir/ Black spruce
Forest	Subalpine fir-Feathermoss	FF	Coniferous -dense	V8 – Treed Closed Coniferous (*Abies lasiocarpa*)	Open subalpine forest	Subalpine fir/ Black spruce

Eagle Gold Ecozone	Eagle Gold Ecosystem Name	Ecosystem Map Code	Peel River	SE Yukon (Geomatics 1995)	Wolverine (Best Fit)	Hallam Knight Piésold 1996 (Best Fit)
Forest	Subalpine Fir-Labrador tea	FM	Coniferous -open	V15 Treed Open Coniferous (*Abies lasiocarpa*)	Open black spruce forest	Black spruce/ Subalpine fir
Forest	Balsam poplar-Horsetail	PH	Coniferous -dense	V6 – Treed, Open Deciduous (*Populus balsamifera*)	Open white spruce forest	Mixed conifer/ Deciduous
Forest	White spruce-Feathermoss	SF	Coniferous -open	V9 – Treed, Closed Coniferous (*Abies lasiocarpa – Picea glauca*), V10 – Treed, Closed Coniferous (*Picea glauc*a),	Open white spruce forest	White spruce/ Black spruce
Forest	White spruce-Horsetail	SH	Coniferous -dense	V16 – Treed Coniferous (*Picea glauca*)	Open white spruce forest	White spruce/ Black spruce
Forest	Black spruce-Cladina	SC	Coniferous -sparse	V17 – Treed Coniferous (*Picea mariana*)	Open black spruce forest	Black spruce/ Feathermoss
Forest	Black spruce-Labrador Tea-Feathermoss	SL	Coniferous -open	V17 - Treed Coniferous (*Picea mariana*)	Open black spruce forest	Black spruce/ Feathermoss
Forest	Willow-Horsetail	WH	Tall shrub	V104 – Deciduous tall shrub (*Salix*)	Willow medium/ tall shrub	Riparian willow/sedge
Forest	Willow-Sedge	WS	Wetland – herb/shrub	V208 – Wet Sedge herb (*Carex*); V104 – Deciduous Shrub (*Salix*)	Wet sedge herb	Wetland sedge
Forest	Marsh	MA	Wetland – herb	V 205, 207 – Wet Graminoid Herb	Wet sedge herb	Wetland sedge

A detailed description of the each ecosystem unit used in Project mapping is provided in Appendix C. These descriptions provide the general characteristics for each unit as well as the dominant plant species. Six moisture classes have been adopted for this classification: very dry, dry, mesic, moist, wet, and very wet. Three soil nutrient classes have been used: poor, medium, and rich.

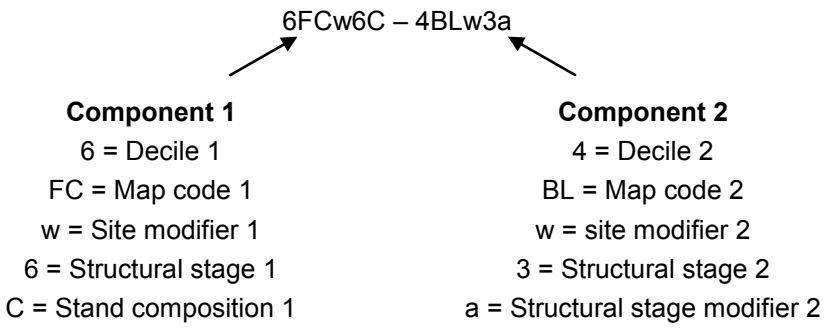
2.4.1.3 Final Ecosystem Mapping

The bioterrain mapping was revised, based on field observations, following the completion of the field program. Polygon attributes including surficial material, texture, surface expression, geomorphological process, and soil drainage were revised in the mapping geodatabase.

Ecosystem unit labels were created by the project ecologists. Ecosystem unit labels include an ecosystem unit, site modifier(s) (used to describe physical site characteristics) and a structural stage. Aerial photographs were examined to determine the labels for each polygon. Ecosystem labels may consist of simple units (one ecosystem unit) or be complex and consist of up to three ecosystem units.

Ecosystem unit and bioterrain labels were entered into the map geodatabase. Mapping standards provide a list of the core polygon attribute data that are required. Some of the core data found in the ecosystem database for each polygon include ecosystem labels [decile, site series, modifier(s), and structural stage, recorded up to three times per polygon] and stand composition. Terrain attributes were also entered in the database. Ecosystem labels and attributes are explained below.

Ecosystem maps were created in ARC geodatabase format by combining the polygon digital files and the ecosystem databases. An example of a polygon ecosystem label composed of two components is as follows:



Ecosystem Units

Each polygon was attributed with a minimum of one to a maximum of three ecosystem units. The ecosystems are ordered in the data based on their relative proportion within the polygons; component deciles indicate the percentage of the polygon occupied by each ecosystem unit. Hence, in the example shown above the first ecosystem occupies 60% of the polygon area while the second occupies 40%. The deciles total 100% for each polygon.

Site Modifiers

Site modifiers, where used, further denote specific conditions that are associated with individual ecosystem units within map polygons (Table 4). These modifiers describe features such as slope, aspect of terrain features. The following site modifiers have been used in the Project mapping:

Table 4: Site Modifier Definitions

Symbol	Criteria
a	Active floodplain
g	Gullying occurring with the ecosystem
h	Hummocky terrain
k	Cool, northerly or easterly aspect (285 – 135 degrees, slopes >25%)
n	Fan or cone
p	Peaty material on surface
r	Ridge top
t	Terrace
w	Warm, southerly or westerly aspect (135 – 285 degrees, slopes >25%)

Structural Stage

Structural stage describes the existing dominant stand appearance or physiognomy of the ecosystem unit (Table 5). One of six structural stage categories describing the current development stage is assigned to each ecosystem unit. The pole/sapling (stage 4) structural stage, as defined by RIC (1998), was not applied to the Project mapping.

Table 5: Structural Stage Definitions

Symbol	Structural Stage	Age Criteria and Description
1	Sparse/Bryoid	Initial stages of primary and secondary succession; total shrub and herb cover is less than 20%
1a	Sparse	Less than 10% vegetation cover. (Less than 20 years.)
1b	Bryoid	Bryophyte and lichen-dominated communities; >1/2 total vegetation cover (less than 20 years)
2	Herb	Early successional stages, and disclimax or climax sites, dominated by herbaceous vegetation (tree cover < 10%, shrub cover <= 20%, herb cover >20% or >= 33% of total cover) (less than 20 years for normal forest succession)
2a	Forb-dominated	Herbaceous communities dominated (>1/2 of total herb cover) by non-graminoid herbs, including ferns
2b	Graminoid-dominated	Herbaceous communities dominated [>1/2 of total herb cover by graminoids (grasses, sedges, reeds, and rushes)]
2d	Dwarf woody shrub dominated	Herbaceous communities dominated [>1/2 of total herb cover by dwarf woody species (mountain-heathers, mountain avens, dwarf willows)]
3	Shrub/Herb	Early successional stages, and communities dominated by shrub vegetation < 5m in height (tree cover <10%, shrub cover >20% or > = 33% of total cover). Used for communities that will be forested at climax (less than 20 years for normal forest succession)
3a	Low Shrub	Disclimax or climax communities dominated by shrub cover <2 m in height.

Symbol	Structural Stage	Age Criteria and Description
3b	Tall Shrub	Disclimax or climax communities dominated by shrub cover 2 – 5 m in height.
5	Young Forest	Self-thinning is usually evident and the forest canopy has begun differentiation into distinct layers (40 – 80 years).
6	Mature Forest	Trees established after the last disturbance have matured and a second cycle of shade tolerant trees may have established. (80 – 140 years for the coniferous stands).
7	Old Forest	Old structurally complex stands. (>140 years for the coniferous stands).

To summarize the area of each ecosystem unit in the Project study areas, it was necessary to "decompose" complex ecosystem units. For instance, a 10 ha polygon in the forested zone comprised of 50 percent FC and 50 percent SA would be broken into 5 ha of each ecosystem type in summary tables. The limitation of this approach is that it is not possible to be spatially explicit about where the component ecosystem types are located within a given polygon. In describing and summarizing Baseline conditions, it was necessary to reduce the ecosystem areas based on the disturbances present at Baseline. These disturbances include the features such as existing roads, exploration trails, seismic lines, drill pads, and trenches. For the purposes of the spatial analyses completed in support of the effects assessment. It is assumed that ecosystem types within a complex TEM polygon are distributed evenly. However, as ecosystem types are typically disproportionately distributed in nature, this assumption may overestimate or underestimate ecosystem Baseline availability in any one area.

2.4.1.4 Existing Disturbances

Mineral exploration has resulted in the creation of several exploration roads and trails, cutlines, well pads, and trenches in the study areas. A disturbance layer capturing these features was created from 2009 SPOT satellite imagery to ensure that this layer contained the most current data available.

This disturbance layer was overlain on the terrestrial ecosystem mapping to update the TEM layer (which was based on older air photography) to reflect current disturbance patterns (i.e., conditions in 2009). In the area of the recent burn in the Lynx Creek watershed, the structural stage of the forested ecosystems was reduced to structural Stage 3 to account for the removal of the tree canopy.

2.4.1.5 Rare Plant Survey

Plant identification was conducted using the Flora of the Yukon Territory (Cody 2000), the Flora of British Columbia (Douglas, et. al. 2001) and the online identification resource *Carex* Interactive Identification Key (Jones 2009). Confirmation of species identification was conducted by Bruce Bennett, Yukon Vascular Plant Specialist.

2.4.2 Forest Productivity and Timber Volume

The methods used for the determination of forest productivity and timber volume are presented in this section.

2.4.2.1 Forest Productivity

Measures of Forest Productivity

Measuring forest productivity is an important aspect of forest management. A site unit often refers to a geographic location that is considered to be homogeneous in terms of its physical and biological environment (Skovsgaard & Vanclay 2007). This includes classifying areas into units of similar climate, topography, soils, and vegetation as has been done in the terrestrial ecosystem mapping of the Eagle Gold study area. For this assessment, the site quality of the various ecosystems has been assessed and determined in relation to the site potential that is or expected to be realized by trees for wood production. Site productivity is often quantified as an ”index”, typically called ”site index” (Skovsgaard & Vanclay 2007).

The British Columbia Ministry of Forests (BC MoF) has used ”site index” as a measure of forest stand productivity for many years. It is based on the height and age of the dominant trees making up the forest stand or site unit (Natural Resources Canada 2009). Site index in British Columbia is a classification of dominant species given height potential (in meters) at a given reference age (normally 50 years) for various sites or management units.

In 1994 the BC MoF introduced the concept of ”Site Index Estimates by Site Series (SIBEC)” to provide better site index estimates than those obtained from the forest inventory for old-growth stands. SIBEC provides site index estimates tied to ecological equivalence of a site. In British Columbia the SIBEC model uses model-based inference to relate site index to biogeoclimatic ecosystem classification (the “site series” or ecosystem unit) for coniferous trees (BC MoF 1997). A strong relationship exists between site index and environmental factors such as soil moisture and nutrient regime. Therefore, potential productivity for a given species can be assigned a site index based on the BEC site series classification. The SIBEC model is appropriate for assigning site index (forest productivity estimates) to future stands once the over-mature stands are harvested, and for young stands carrying the site index attribute from the previous old-growth stand (BC MoF 2003).

For this assessment both traditional site index and SIBEC methods were used to determine the forest productivity for the Project study areas.

Forest Productivity Determination

Using the BC MoF’s site index equations, site index was calculated for selected trees measured in the TEM field survey. For each of the dominant tree species, these equations calculate site index based height and age samples from a very large database of growth and yield information taken for over 30 years by the Ministry. For this baseline report, site indices were calculated for both subalpine fir (balsam) and spruce (all) species using historical BC MoF whole stem cubic meter volume equations data from the most northern British Columbia Forest Inventory Zones (1983, Forestry Handbook for British Columbia Fourth Edition). Following this procedure, site index was calculated using the following BC MoF formula:

$$SI = H/b_1\ (1\text{-}e^{b2A})^{b3}$$

where:

SI – site index in metres
H – total tree height
e – base of natural logarithms
A – Age in years
b_1, b^2, and b^3 are regression coefficients (different by species)

In addition, available site productivity literature and information was reviewed for northern British Columbia. This included investigating the SIBEC site index approximations for similar biogeoclimatic (BEC) subzones to the Project area. The ecological subzones in BC most similar to the Project area and that also reported site index approximations (estimates) included the ESSFwv (the Engelmann Spruce Sub-alpine fir wet very cold subzone), and the BWBSdk1 (Boreal White and Black Spruce dry cool subzone, Stikine Variant). For more information on the climate and ecology of these subzones refer to Banner, et al. (1993). For these BEC units site index approximations were found in the literature for various individual ecosystem units (e.g., dry, moist, wet, and very wet ecosystem units). These were compared to the characteristics (such as soil moisture regime, soil nutrient regime, elevation) of these units with the ecosystems units mapped in the Project study areas. From this comparison the equivalent site index approximation were assigned to the mapped units.

This interim information (both the traditional site index calculation of the field plot data and the SIBEC approximation) were compared and analyzed to develop a final site index estimate for each forested ecosystem unit mapped in the Project area. The site index estimations were summarized into classes for interpretation purposes.

The site index classes are as follows:

- Nil – 0 (generally the non-forested ecosystems)
- Very Low (VL): <5
- Low (L): 5 – 10
- Medium (M): 11 – 14
- High (H): 15+.

The site index number reflects the anticipated (or potential) tree height for the leading species at 50 years of age.

2.4.2.2 Timber Volume

Timber volume for this Project is presented as cubic meters of gross wood production, usually reported on a per hectare basis for ease of comparison between areas and environmental conditions. Gross timber volume is the total available wood volume without taking into account normal timber defects and stem decay, nor the waste and/or breakage that naturally occurs during harvesting operations.

In this section of the report the methods for forest timber volume determination is discussed.

Timber Volume Determination

The timber volume of the forested ecosystem units were approximated based on mensurational and ecological data collected from the 2009 field survey. In addition, forest volume for the Project area was determined from literature searches and assessment of available information for similar forest types, conditions, and sites in northern British Columbia.

In support of the volume determination for selected sites, the field team collected attributes such as tree diameter, total tree height, tree age, tree species composition, leading or dominant species, tree cover, and elevation – in addition to many other related site, soil, and vegetation characteristics. This data was assessed and analyzed to determine individual tree gross volume estimates as well as general ecosystem unit tree density within the terrestrial ecosystem mapping. From this a forest density class (dense, open, sparse), and leading species were assigned to each mapped ecological site unit as an estimate representing tree stems per hectare and dominant tree species.

Since forest inventory information is lacking for the Yukon Territory, useful information and tree volume data was obtained from the BC MoF (BC MoF 1995) data for northern British Columbia as many of the species of interest in the Project area are present in both jurisdictions. This comprehensive British Columbia information provided gross volume per hectare (m^3/ha) ranges (minimum and maximum) for various tree species (such as spruce, subalpine fir, aspen, cottonwood, and birch) based on logical tree stand age groupings (successional stages). These successional stages are grouped as in the following manner:

- Young forest (< 40 years old)
- Early seral forest (40 – 80 years old)
- Maturing forest (80 – 140 years old)
- Old forest (140+ years old).

From this available information, a volume matrix table was developed which took into account dominant (or leading) species, tree density, and stand age (successional status). In addition, the collected field plot data (site, soil, and vegetation data, along with productivity potential) were used to further guide the selection of both the average volume per hectare estimates for this assessment and estimate of tree volume for the entire Project area. Overall, the intent was to provide realistic estimates – taking into account the latitude of the Project site compared to the available British Columbia information. Therefore, the lowest (or minimum) British Columbian volume estimates were used for each of the forest types/species groups in the Project area. This information was combined with the TEM database to determine the approximate gross volume per hectare and polygon volumes within the LSA, RSA, and road Project areas. The gross timber volumes were also classified for interpretive purposes into volume classes. The timber volume classes were assigned as:

- Nil = 0-10 m^3/ha (includes the non-forested ecosystems)
- VL (very low) = 11-74 m^3/ha
- L (low) = 75-174 m^3/ha
- M (moderate) = 175-289 m^3/ha
- H (high) ≥ 290+ m^3/ha.

2.4.3 Trace Metals Concentrations in Vegetation

A baseline measure of trace metal concentrations in vegetation is required in order to assess and monitor for any metal uptake by plants during operations and after closure. Vegetation samples for a full suite of metals analysis were collected at nine locations in and around the LSA during the ecological mapping field survey (Figure 2-2). At each sample site leafy branches or stems of common plant species were gathered, with preference given to commonly browsed plants. Species sampled include:

- Willow (*Salix* spp.)
- Sedge (*Carex* spp.)
- Blue-joint (*Calamagrostis canadensis*)
- Northern rough fescue (*Festuca altaica*).

All metals were analyzed using inductively coupled plasma mass spectrometry (ICP-MS) at CANTEST in Richmond, BC. Mercury concentrations were determined using Cold Vapour Atomic Absorption Spectrophotometry or Cold Vapour Atomic Flourescence Spectrophotometry. A full summary of analysis data is presented in Appendix D. Results were compared to dietary tolerances of cattle based on thresholds outlined in Puls (1994) and summarized in Table 6.

Table 6: Generalized Dietary Tolerance for Beef Cattle (Puls, 1994)

Element	Units	Normal/Adequate	High	Toxic/Excessive
Aluminum Al	ppm	<300	–	>1,200
Arsenic As	ppm	<10	–	**
Barium Ba	ppm	0.5 – 20	>20	–
Boron B	ppm	1 – 50	50 – 150	>200
Cadmium Cd	ppm	0.01 – 0.50	5 – 50	50 – 500
Calcium Ca	%	0.38 – 0.81	–	>1.4
Chromium Cr	ppm	0.1 – 0.5	–	>40
Cobalt Co	ppm	0.1 – 1.0	4 – 20	>30
Copper Cu	ppm	10 – 25	80 – 100	>100
Iron Fe	ppm	100 – 500	1,000 – 2,000	>4,000
Lead Pb	ppm	1	5 – 50	>100
Magnesium Mg	%	0.25 – 0.35	–	1 – 4
Manganese Mn	ppm	40 – 200	1,000	2,000 – 4,000
Mercury Hg	ppm	<0.01	1 – 5	4 – 30
Molybdenum Mo	ppm	0.5-3.5	>5	10 – 20
Nickel Ni	ppm	1 – 10	50 – 1,000	>1,500
Phosphorus P	%	0.35 – 0.45	0.40 – 1.0	>1.0
Potassium K	%	0.80 – 2.45	>4.0	–
Selenium Se	ppm	0.3 – 1.0	3 – 4	5 – 20

Element	Units	Normal/Adequate	High	Toxic/Excessive
Silicon Si	%	<6.5	–	–
Silver Ag	ppm	not reported	–	–
Sodium Na	%	0.18 – 0.67	3 – 5	>7
Strontium Sr	ppm	–	–	>2,000
Sulphur S	ppm	1,500 – 2,000	3,000 – 5,000	>5,000
Zinc Zn	ppm	50 – 100	600 – 5,000	>5,000

NOTE:
** Depends on form: trivalent As is 5 – 10 times more toxic than pentavalent form.
Elemental As is non-toxic

3 RESULTS

3.1 Project Area Description

The Project study areas, which total approximately 12,118 hectares, are located in the Yukon Plateau-North Ecoregion, Boreal Cordillera Ecozone (Yukon Ecoregions Working Group 2004). This ecoregion correlates to the Mayo Lake-Ross River Ecoregion described by Oswald and Senyk (19977). This ecoregion includes the MacMillan, Stewart and Pelly plateaus as well as the southern part of the Selwyn Mountains. The terrain in this ecoregion is primarily rolling upland plateaus and small mountain groups, with generally broad U-shaped valleys. Most of this ecoregion is higher than 900 m asl (meters above sea level).

The closest Environment Canada weather stations are located at the Mayo Airport and Mayo Road (45 km south of Eagle Gold by road). Data collected between 1971 and 2000 reports an average annual precipitation ranging from 313 – 322 mm, and an average annual snowfall ranging from 106 – 147 cm (Environment Canada 2000). Temperature information from Mayo Road (655 m asl) indicates July to be the warmest month with an average temperature of 14.9°C, and January the coldest with -17°C, for a yearly average of -0.7°C. Mayo Airport (503 m asl) has an average January temperature of -25.7°C, an average July temperature of 16°C, and a yearly average temperature of -3.1°C. Much of the Eagle Gold area is higher in elevation than these two weather stations, and would be expected, on average, to have colder temperatures.

In addition to these data provided by Environment Canada weather stations, Victoria Gold owns and maintains two weather stations on site. Detailed, site specific climate data is provided in the Climate Baseline Report produced under separate cover for the Eagle Gold Project.

A detailed description of physiography, terrain, and soils of the assessment area is provided in Surficial Geology, Terrain and Soils Baseline Report.

3.2 General Vegetation Features

Two ecological zones have been recognized for this Project: the higher elevation Subalpine zone and the lower Forested zone.

The Subalpine zone (1,502 ha) occurs on the ridge tops and high plateaus above about 1,225 masl. Tree cover is discontinuous or absent at this elevation, and the vegetation is dominated by dwarf birch, willows, ericaceous shrubs, herbs, mosses, and lichens. The highest points in the mapping area (1,520 masl) could be considered true alpine, but since this area is so small and still has vegetation cover, it is included in the Subalpine zone. Alpine dwarf-shrub heath and herb communities are common at these elevations. High elevation areas with large amounts of rock and rubble are vegetated by dwarf shrubs and lichens.

The Forested zone (11,450 ha) includes the valley bottoms, and the slopes of the mountains below the treeline. The elevation range of this zone is from the lowest point in the Project area (600 masl) up to the Subalpine zone – about 1,225 masl. In the valley bottoms, forests are dominated by open canopy stands of black spruce. However white spruce is found along creeks and rivers and the well drained slopes. On the mid to lower slopes, continuous stands of subalpine fir occur along with minor components of white spruce, Alaska birch, trembling aspen, and black spruce. On the upper slopes open subalpine fir stands are predominant with trees becoming smaller and more spread out with increasing elevation.

There are no large expanses of grasslands or herb meadows in the mapping area. However grass/herb patches are occasionally present where there are gaps in the forest or shrub canopy of non-permafrost upland ecosystems. Grasses and herbs become abundant following forest fires, as is the case where there have been recent fires in the Eagle Gold RSA.

Aspect plays an important role in the distribution of ecosystems. For example, deciduous trees (aspen and Alaska birch) are commonly found on warm, south-facing aspects where permafrost is absent (or deeper) and soils warm up earlier.

Balsam poplar, another deciduous tree, occurs immediately adjacent to the McQuesten River and Haggart and Lynx creeks.

Permafrost, occurring on north aspects and lower slopes without a significant warm aspect, is also an important factor in ecosystem distribution. On permafrost sites, the soils remain cold throughout the growing season due to the ice, but also as a result of the insulating capacity of the moss cover, the lack of soil oxygenation, and the low accumulation of heat units during the growing season. These ecosystems are dominated by black spruce (lower slopes) and subalpine fir (mid slopes). Permafrost depth is variable and is controlled by aspect, soil texture, and the amount of moisture within the soil profile. Within the LSA the permafrost is discontinuous. Signs of solifluction (permafrost melt) are seen at lower elevations, especially where the trees appear to be growing at unusual angles. These trees are often referred to as “drunken trees”, which has the following definition: “a group of trees leaning in a random orientation usually associated with thermokarst topography” (Oswald and Senyk 1977).

Fire is the most common natural disturbance in both the Forested and Subalpine zones of the study areas. Vegetation will reestablish itself quickly after fire, depending on the soils, aspect, and elevation. Typical post-fire vegetation consists of dense fireweed and other herbs, grasses, shrubs such as willows, and trees.

Soil disturbance as a result of placer mining and exploration is the most common manmade disturbance in the Project area. Once the activity is terminated, the exposed mineral soil and tailings appear to revegetate fairly quickly with herbs and shrubs, especially at lower elevations.

3.3 Ecosystem Summaries

3.3.1 Vegetated Ecosystem Summaries

This section presents the area summaries of vegetated and non-vegetated ecosystems in each of the Ecological zones (Forested and Subalpine) for the three Project study areas: the RSA (5,932 ha), the LSA (1,606 ha), and the RCSA access road (4,580 ha). The combined mapped area of all three study areas is 12,118 ha. Terrestrial ecosystem mapping for the LSA, RSA and RCSA are presented in Figures 3-1, 3-2 and 3-3, respectively.

Table 7 presents the area in hectares of mapped ecosystem units in each of the three study areas, as well as the combined area totals. The table also presents the area covered by disturbances such as main roads, exploration roads, seismic lines, and mining activity such as placer, trenching, or drilling.

The most common unit in the mapping area is the SL unit (Black Spruce – Labrador tea – Feathermoss) with 3,176 mapped hectares. The FC unit (Subalpine fir – Cladina) was also common with a total area of 2,131 ha. Other units of interest include the Balsam poplar – Horsetail unit (PH) with an area of 16 ha. This coverage is small, a reflection of the fact that it only occurs as a very narrow band along the rivers and larger streams. The SC unit (Black spruce – Cladina), with 419 ha, is also confined to a certain soil type, in this case coarse gravels in the valley bottom. The FF unit (Subalpine fir – Feathermoss), with 963 ha, consists of productive closed canopy forests in middle slope positions.

Table 7: Summary of Mapped Ecosystem Units within the Project Area

Ecological Zone	Map Code	LSA (ha)	RSA (ha)	RCSA (ha)	Totals (ha)
Forested	AK	13.7	63	47.7	124.4
Forested	AW	30.3	383.3	280.1	693.7
Forested	BL	10.4	31.6	0.1	42.1
Forested	BS	–	163.1	319.6	482.7
Forested	CL	–	0.3	–	0.3
Forested	ES	2.7	0.3	–	3.0
Forested	FC	353.6	1,363.7	59.7	1,777.0

Ecological Zone	Map Code	LSA (ha)	RSA (ha)	RCSA (ha)	Totals (ha)
Forested	FF	95.9	729.8	41.5	867.2
Forested	FM	93.9	1,012.7	116.8	1,223.4
Forested	FP	61.6	128.7	0.4	190.7
Forested	GB	0.1	0.1	16.1	16.3
Forested	MA	–	0.5	19.5	20.0
Forested	OW	–	–	66.2	66.2
Forested	PD	–	–	1.9	1.9
Forested	PH	–	–	16.0	16.0
Forested	PM	5.1	14.6	18	37.7
Forested	RI	0.1	30.2	75.4	105.7
Forested	RO	3.1	23.2	0.4	26.7
Forested	SA	35.3	93.4	–	128.7
Forested	SC	–	18.0	401.5	419.5
Forested	SF	4.6	–	374.9	379.5
Forested	SH	25.0	139.4	423.8	588.2
Forested	SL	166.7	852.7	1,989.8	3,009.2
Forested	TA	4.4	5.6	–	10.0
Forested	WG	28.1	70.1	11.3	109.5
Forested	WH	10.5		35.8	46.3
Forested	WM	–	67.3	–	67.3
Forested	WS herb stage	0.4	8.3	15.1	23.8
Forested	WS shrub stage	–	–	38.3	38.3
Subalpine	BL	60.8	151.2	–	212.0
Subalpine	ES	0.1	0.4	–	0.5
Subalpine	FP	56.4	232.4	–	288.8
Subalpine	MM	4.0	33.8	–	37.8
Subalpine	MW	7.3	32.6	–	39.9
Subalpine	RO	–	11.1	–	11.1
Subalpine	SA	249.2	176.7	–	425.9
Subalpine	TA	3.5	26.1	–	29.6
Subalpine	WG	11.8	–	–	11.8
Subalpine	WM	25.9	0.3	–	26.2
Subtotals		**1,364.7**	**5,853.7**	**4,370.1**	**11,588.5**
Disturbances		241.3	78.4	210.5	530.2
Totals		**1,606.0**	**5,932.1**	**4,580.5**	**12,118.6**

3.3.2 Non-vegetated Ecosystem Summaries

Non-vegetated areas within the Project area were also mapped. These are areas with very sparse vegetation (<5%) such as cliffs and rock. The description of these units is found below in Table 8. The total area of all non-vegetated areas in the Project area is 328 ha. The non-vegetated unit with the greatest area is RI (rivers) with 106 ha. This was followed by open water (66 ha), and placer mining (48 ha). The non-vegetated units with the least amount of area are ponds (2 ha) and cliffs (0.3 ha). However, cliffs are vertical features and when viewed from above, such as in a GIS setting, cover very little area.

Table 8: Non-vegetated Unit Mapping Codes and Definitions

Map Code	Definition	Description	Area Mapped (ha)
CL	Cliff	Vertical rock faces	0.3
ES	Exposed soil	Exposed mineral soil, usually on ridges; also includes disturbed soil as a result of mining exploration	6.4
GB	Gravel bar	Only found along rivers	16.5
RO	Rock	Exposed bedrock	40.9
PM	Placer mining	Placer mining activity areas including tailings	42.7
RI	Rivers and large creeks	Lynx, Haggart, and South McQuesten rivers	105.8
OW	Open Water	Small, shallow lakes	66.2
PD	Ponds	In valley bottoms	1.9
TA	Talus	Talus and scree slopes, mostly in the Subalpine zone	47.5
Total			**328**

3.3.2.1 Ecosystem Category Distribution

The mapped ecosystems were grouped into the following general ecological categories: conifer forest, dwarf birch dominated, riparian areas, deciduous forest, wetlands, old forest, rivers, rock/talus/exposed soil, dwarf shrub, and mining areas. The areas for each category are presented in Table 9.

Conifer forest (7,676 ha) is composed of subalpine fir, white spruce, and black spruce. The dwarf birch type (1,288 ha) refers to the wide expanses of this species in the Subalpine zone.

Riparian ecosystems (1,184.2 ha) are those that occur immediately adjacent to flowing water. For the purposes of this assessment, riparian areas have been defined based on a two step approach. Riparian areas capture the land occupied by specific ecosystems that are associated with water courses (i.e., SH, PH, WG,WM, RI, and, GB) as well as land located within 20 m of large watercourses (i.e., Lynx Creek and South McQuesten River) and within 10 m of smaller streams.

The distribution of riparian areas in the LSA, RSA, and RCSA is presented in Figures 3-4, 3-5, and 3-6, respectively.

The deciduous forests (834 ha) are dominated by trembling aspen, Alaska birch, and balsam poplar. Wetlands (669 ha) include sphagnum bogs, sedge fens, marshes, ponds, and areas of open water. The distribution of wetlands in the LSA, RSA and RSCA is represented in Figures 3-7, 3-8, and 3-9, respectively. The majority of wetlands in the mapping areas are associated with the poorly drained valley bottoms along Lynx Creek and the South McQuesten River.

Rivers (Lynx Creek, Haggart Creek and the South McQuesten River), occupy 106 ha of the mapping area. Rock, talus, and exposed soil occupy 81 ha. Dwarf shrub vegetated ecosystems (78 ha) are dominated by dwarf shrubs, alpine herbs, and lichens. Mining areas (38 ha) are predominantly placer mine locations (active and non-active), but do include some construction staging areas and exploration sites.

There is some overlap between the various categories. For example some of the exposed soil may be the result of mining exploration, and some of the conifer forest types (PH, SH) are also riparian ecosystems.

The LSA is dominated by two ecosystem types: conifer forest and dwarf birch shrubland. There is very little deciduous forest or wetlands in this area. Dwarf shrub ecosystems cover only 11 ha. The RSA is also dominated by coniferous forest, with moderate amounts of riparian areas, dwarf birch shrubland, and deciduous forest. The RCSA also has a large amount of conifer forest, but also has considerable areas of riparian ecosystems, wetlands, and deciduous forest.

Table 9: Ecosystem Category Summaries

Ecosystem Category	Map Codes	LSA (ha)	RSA (ha)	RCSA (ha)	Totals (ha)
Conifer forest	FC, FF, FM, SC, SF, SL	714.8	3,976.9	2,984.2	7,675.8
Dwarf birch dominated	BL, FP, SA	473.8	813.8	0.5	1,288.1
Riparian areas*	GB, PH, RI, SH, WG, WM	120.6	399.2	664.4	1,184.2
Deciduous forest	AK, AW, PH	44.0	446.3	343.8	834.1
Wetlands	BS, MA, OW, PD, WH, WS	10.8	161.5	496.5	668.9
Rivers	RI	0.1	30.2	75.4	105.7
Rock/talus/exposed soil	CL, ES, RO, TA	13.8	67.0	0.4	81.27
Dwarf shrub	MM, MW	11.3	66.4	0.00	77.7
Mining areas	PM	5.1	14.6	18.0	37.7

NOTE:
Only riparian ecosystems are listed in the table, although other ecosystems and non-vegetated units are present within the riparian corridors.

3.3.2.2 Old Forests

Old forest has been defined as forest areas composed of trees greater than 140 years old. Table 10 presents data on the amount of old forest in the Project area, as well as its distribution in each of the forested ecosystem units within the three study areas. The total area of old forest is 1,506 ha, representing about 12% of the total mapped area. The distribution of the old forest by study area is as follows: 986 ha of old forest are found in the RSA (65%), 291 ha in the RCSA (20%), and 230 ha in the LSA (15%). Table 10 also indicates the distribution of old forest. For example, both the RSA and LSA have old forest representation for each of the forested ecosystem units, however the RCSA only has representation from the SH, FC, and FM units.

The ecosystem unit with the greatest area of old forest is the FC unit with 556 ha. This unit also has the largest amount of old forest in both the LSA and RSA (133 and 419 ha). The SH unit has 390 ha of old forest. The SH unit also has the highest representation in the RSCA, with 265 ha, located primarily in the productive riparian ecosystems along rivers and streams.

The units with the smallest amount of area in old forest are the SL and SF units (32 and 8 ha). The SL is typically found on poor, very moist sites while the SF unit is one of the less common forest types in the mapped area.

The distribution of old forest patches in the LSA, RSA, and RCSA is shown in Figures 3-10, 3-11, and 3-12, respectively.

Table 10: Old Forest Distribution in the Project Study Area

Ecosystem Unit	Productivity Class	LSA (ha)	RSA (ha)	RCSA (ha)	Totals (ha)
SH	H	16.1	109	265	390
FC	L	133	419	5	556
FF	M	46.6	206	–	252
FM	M	1.1	120	21	142
FP	L	19.4	107	–	126
SL	M	11.8	21	–	32
SF	M	2.2	5	–	7
Totals		**230**	**986**	**291**	**1,505**

3.4 Rare Plant Survey

A total of 29 rare plant plots were surveyed during the summer rare plant survey. Locations of survey plots are provided in Figure 2-2 and a complete list of all species identified during the survey is provided in Appendix B.

One rare species, *Koenigia islandica* L. (island purslane) was located at a single location in the study area (Figure 2-2, plot EGRP28). The patch of purslane was approximately 2m x 2m.

Island purslane is a very small (2 – 15 cm high) and non-descript annual plant with a tiny taproot, thread-like stem and little (2 – 3 mm wide), fleshy, reddish leaves. Cryptic flowers are arranged terminally and produce tiny dry seeds in late summer (Photos 3-1, 3-2). This species is ranked as "imperiled" (S2) in the Yukon and its global rank is "apparently secure" (G4) (NatureServe 2009). It is considered as imperiled due to factors such as very restricted range, very few populations, steep declines, or other factors making it very vulnerable to extirpation from the jurisdiction. The "apparently secure" status in its' global range indicates that a plant may be uncommon but not rare; however, there may be some cause for long-term concern due to declines or other factors.

The results of a query of known local occurrences of *Koenigia islandica* made to Environment Yukon indicated that no other occurrences of this species were known in the area around Dublin Gulch.

Photo 3-1: Island purslane *(Koenigia islandica)*

Photo 3-2: Island purslane *(Koenigia islandica)* close-up

3.5 Forest Productivity and Timber Volume

This section of the vegetation baseline report discusses and presents estimates of forest productivity and timber volume for the Project area. Results are provided for the LSA, RSA, and RCSA.

3.5.1 Forest Productivity

Approximately two-thirds of the entire Project area are forested and have been assigned a forest productivity class. The vast majority of the three study areas have low to moderate forest productivity. Only 2% of the RSA is considered to be highly productive, while 10% of the RCSA is highly productive. Areas with a very low forest productivity class rating are limited to less than 1% of

the total Project area, and are located only in the road study area. The estimated forest productivity for the various study areas (RSA, LSA and RCSA) is presented below in Table 11. Figures 3-13, 3-14 and 3-15 display current forest productivity for the LSA, RSA and RCSA, respectively.

Table 11: Estimated Hectares by Site Index Class

Site Index Class	RSA		LSA		RCSA		Total	
	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)
High (15+)	168	2%	27	2%	424	10%	451	8%
Moderate (11 – 14)	2,504	35%	463	34%	801	18%	1,264	22%
Low (5-10)	2,371	33%	378	28%	1,488	34%	1,865	33%
Very low (<5)	0	0%	0	0%	20	<1%	20	<1%
Nil (0)	2,175	30%	494	36%	1,638	37%	2,132	37%
Total[1]	**7,218**	**100%**	**1,362**	**100%**	**4,370**	**100%**	**5,732.3**	**100%**

NOTE:
[1] Area totals may vary from actual sums due to rounding

Low productivity sites occupy approximately one-third of the study areas and are occupied by black spruce or subalpine-fir forest types. Moderately productive sites also occupy approximately one-third of the study areas and support both deciduous and coniferous forests on various well-drained and sloping sites – including forest types on warm aspects. The relatively small areas considered highly productive are the alluvial white spruce forest stands found adjacent to streams and rivers where moist, rich soil conditions prevail. Very low productivity sites are black spruce bogs with deep organic soils that have high water tables and remain cold most of the year. They are found only in the RCSA.

The „Nil' forest productivity class designation is applied to those ecosystems that do not support commercial tree species due to the existing ecological conditions. On these sites, moisture regimes are usually either very wet or very dry, and with a range of available nutrients. The non-forest vegetation on these sites ranges from wetland herb and shrub species to dry low shrubs and lichens growing on shallow rocky soils. For detailed descriptions of mapped ecosystems refer to Appendix C.

The forest productivity estimates are consistent with general expectations within this geographic region. Although this information provides useful guide for forest productivity estimation, these forest productivity approximations should only be used for general planning purposes. Additional detailed forest inventory information and subsequent soil and tree analysis will be required to provide the necessary statistical information for the reclamation of forested ecosystems.

3.5.2 Timber Volume

The timber volume results for the entire Project area are presented in this section. The approximations of gross timber volume by volume class are presented below (Table 12) for the various study areas (RSA, LSA and RCSA).

Table 12: Estimated Hectares by Timber Volume Class

Volume Class	RSA		LSA		Road		Total	
	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)
High	155	2%	27	2%	453	10%	292	8%
Moderate	915	13%	122	9%	265	6%	575	7%
Low	3,671	51%	684	50%	1,896	43%	2,580	45%
Very low	303	4%	35	3%	120	3%	155	3%
Nil	2,175	30%	494	36%	1,638	38%	2,132	37%
TOTAL[1]	**7,218**	**100%**	**1,362**	**100%**	**4,370**	**100%**	**5,734**	**100%**

NOTE:
[1] Area totals may vary from actual sums due to rounding

3.5.2.1 Volume Estimates by Ecosystem Type

As discussed in the methods, timber volumes have been estimated for the different species occurring in the Project area. Volume estimates have also been extrapolated to the ecosystem units where those tree species are most likely to occur (Table 13). The volume classes shown below are defined in Section 2.4.3.2 and in Table 12 above. It is important to note that the timber volumes presented in this section are estimates of gross volume only and further analysis would be required if more precise information is needed.

Table 13: Assigned Volume Class by Age Group Using Tree Density, Tree Species and Ecosystem Units

Forest Density Class	Leading Species	Ecosystem Map Code	Stand Appearance	Young Seral (<40 yrs)	Young Stage 5 (40 – 80 yrs)	Mature Stage 6 (80 – 140 yrs)	Old Stage 7 (>140 yrs)
Sparse*	Bl or Sb	FP	C	VL	VL	L	L
	Bl or Sb	BS	C	VL	VL	L	L
	AT	AK	B	VL	L	L	No data
	Mixed	FC	M	VL	VL	L	N/A
Open	Bl or Sb	FC	C	VL	L	L	M
	Bl or Sb	SC	C	VL	L	L	M
	Bl or Sb	FM	C	VL	L	L	M
	Bl or Sb	SL	C	VL	L	L	M
	Sx	SF	C	VL	L	M	M
	AT	AK	B	VL	L	M	No data
	EP	AW	B	VL	VL	L	M
	Mixed	AW	M	L	L	M	No data
	Mixed	PH	M	L	L	M	No data

Forest Density Class	Leading Species	Ecosystem Map Code	Stand Appearance	Young Seral (<40 yrs)	Young Stage 5 (40 – 80 yrs)	Mature Stage 6 (80 – 140 yrs)	Old Stage 7 (>140 yrs)
Dense	Bl or Sb	FF	C	L	L	M	M
	Sx	SH	C	L	L	M	H
	AT	AK	B	L	M	M	No data
	EP	AW	B	VL	VL	M	M
	AC	PH	B	VL	L	M	M
	Mixed	AW	M	L	L	M	No data
	Mixed	SF	M	L	L	M	No data

NOTE:
Stand Appearance: C – conifer; M – mixedwood; B – broadleaf

Using the classes identified in Table 13, total timber volume estimates were made for each ecosystem unit, and presented in Table 14.

The FC unit (Subalpine fir – Cladina) has the highest timber volumes (approximately 29,400 m^3) due to the fact that this unit is widespread across the LSA and RSA. The productivity of these open stands is considered to be low to moderate, due to poorer soils and higher elevation where these units usually occur.

The SL and FM units both have generally low productivity, often occurring on nutrient poor soils and on permafrost. However, both these units are widespread, and their combined timber volume is just over 450,000 m^3. Caution is advised when using these estimates as these ecosystems have very slow tree growth with diameters less than 25 cm.

SH is the only unit with a high rating for forest productivity, due the nutrient rich soils found in riparian areas. Individual trees in mature and old stands are large, with volumes up to 300 m^3 per hectare. While this unit is restricted in area, the total volume is nevertheless estimated to be almost 180,000 m^3.

The AK unit is composed primarily of trembling aspen. Compared to the SH stands that have large diameter trees, aspen stands are composed of a great many smaller diameter trees in dense stands. These forest types are restricted to warm aspects, and timber volumes are estimated at 19,000 m^3.

The Alaska birch – White spruce unit (AW) is also a deciduous forest unit. It is more widespread than the AK unit, and has an estimated timber volume of approximately 112,000 m^3. These stands are also frequently dense, with a high number of individual trees per hectare in younger stands.

White spruce stands are represented by the SH and SF units. Both these forest types are quite productive and their combined timber volume is estimated to be about 255,000 m^3. The SF unit occurs on lower slopes with favourable soils that contribute to higher volumes.

The lowest timber volumes are found in the Black spruce–Sphagnum unit (BS) and Balsam Poplar–Horsetail unit (PH). The BS units have a very low productivity, with small, slow growing black spruce trees, and an estimated total timber volume of about 1,200 m^3. The PH unit is moderately productive, but restricted in area, and has a timber volume of about 1,000 m^3.

Table 14: Summary of Approximated Timber Volumes by Ecosystem Type and Study Area

Map Unit	LSA	RSA	RCSA	Total Volume (m^3/ha)
FC	55,318	230,544	7,740	293,602
SL	26,819	120,771	124,579	272,169
FM	15,340	152,172	184,579	185,611
FF	21,116	146,571	10,304	177,991
SH	7,029	46,620	117,367	171,016
AW	6,445	71,634	33,618	111,697
SF	653	1,361	82,656	84,670
FP	10,065	35,701	18	45,784
SC	–	1,658	41,974	43,632
AK	1,879	10,244	6,879	19,002
BS	–	–	1,194	1,194
PH	–	–	1,038	1,038

3.5.2.2 Timber Volume Estimate by Project Study Area

Of the Project area's three study areas: RSA (5,932 ha), the LSA (1,606 ha), and RCSA (4,580 ha) with a combined total of 12,118 ha, the largest the RSA, has the highest timber volumes and the highest average timber volume per hectare (138 m^3/ha) (Table 15). This is due to the large amount of moderately productive forest land occurring on the lower slopes of the mountains in this area, especially on warm aspects. The LSA has the lowest average timber volume per hectare (18 m^3/ha), a reflection of the high amount of non-forested subalpine in this area. The RCSA has average timber volumes of 99 m^3 per ha, a reflection of the high amount of low productivity forest types (SL and SC map codes) and non-forested ecosystem in this area (Table 6) associated with the wet valley floors. The RCSA also has some area of high forest productivity (SH and PH map codes), but these forest types are confined to riparian areas. When considering only forested areas, the timber volume of forest lands in the RSA is about 218 m^3 per hectare while the average for forest lands in the LSA is 26 m^3 per hectare. For the RCSA, the timber volume estimate for forested lands is 155 m^3 per hectare.

The total approximated timber volume in the entire Project area is just under 1.3 million gross cubic metres (Table 13). The overall estimated average timber volume per hectare in the three Eagle Gold study areas is 110 m^3.

Table 15: Summary of Estimated Timber Volume by Study Area

Study Area	Total Timber Volume (m^3)	Total Non-forested Area (ha)	Forested Area (ha)	Total Area (ha)	Average Volume/ha (m^3/ha)	Volume for Forested Areas (m^3/ha)
LSA	28,699	494	1,112	1,606	18	26
RSA	817,280	2,175	3,757	5,932	138	218
Road	445,472	1,639	2,869	4,508	99	155
Totals	**1,291,452**	**4,308**	**7,738**	**12,046**	**Avg: 107.21**	**Avg: 133**

As with the "site index" results, the timber volume estimates are consistent with general expectations within this geographic region. Although this information provides a useful guide for timber volume estimation, these approximations should only be used for general planning purposes.

3.6 Trace Metals Concentrations in Vegetation

The dietary tolerances of wild ungulates for the elements considered are not known due to the difficulties associated with sampling large populations of wild mammals. Consequently, the dietary guidelines established for domestic cattle have been used to predict effects on wild ungulates. This approach has been used in the assessment of mine projects in British Columbia. All elements were below toxic levels for dietary intake by cattle for all sites and species based on dietary guidelines outlined in Puls (1994) (See Appendix D). Barium concentration was high, but not toxic/excessive, in grasses at one site (ELG-10) and willows at another (EGL50). Phosphorus and potassium concentrations were deficient for all sites and species. Moose are present and forage in the Project study areas, year round, and Caribou are known to be occasionally present (see Baseline Environmental Report: Wildlife).

3.7 Ecological Reserves

Two ecological reserves that were proposed in the 1970s as part of the International Biological Program (IBP) are located in the region of the Project (Figure 3-16). The international program's objectives included support of long-term, large-scale research projects focused on biological resources, environmental change, and human adaptability to environmental change around the world (Beckel 1975). A total of 68 sites with biological, geological, and historical importance within Yukon and forested parts of Northwest Territories were selected.

The Mayo Swampland site (IBP Site No. 46), which lies to the south of the LSA, was selected for its rich plant communities, with many rare Yukon plant species. It is about 214.3 km^2. It is located north of Mayo adjacent to the Silver Trail Highway (Highway 11) to a point just north of the South McQuesten River. A portion of the existing road and the RCSA, crosses this proposed reserve (Figure 3-16).

The Wernecke Mountains (IBP Site No. 77) site, which covers an area of 974.8 km^2 approximately 50 km to the north of the RSA, includes a portion of the Wernecke Mountains, the Hart River, and

Beaver Rivers. These features are located within the Peel River watershed. This IBP site was selected for its potential as an important ecological research station capable of representing a complete sub-arctic, montane ecosystem. This portion of the Wernecke Mountains contains a great diversity of habitat types and undisturbed game populations, including part of the winter range of the Porcupine caribou herd. The Eagle Gold Project area lies well outside this site within a separate major watershed.

4 CLOSURE

Stantec has prepared this report for the sole benefit of Victoria Gold for the purpose of documenting baseline conditions in anticipation of an environmental assessment under the Yukon *Environmental and Socio-economic Assessment Act*. The report may not be relied upon by any other person or entity, other than for its intended purposes, without the express written consent of Stantec and Victoria Gold. Any use of this report by a third party, or any reliance on decisions made based upon it, are the responsibility of such third parties.

The information provided in this report was compiled from existing documents and data provided by Victoria Gold, field data compiled by Stantec (formerly Jacques Whitford AXYS Ltd.), and by applying currently accepted industry practices. This report represents the best professional judgment of our personnel available at the time of its preparation. Stantec reserves the right to modify the contents of this report, in whole or in part, to reflect any new information that becomes available. If any conditions become apparent that differ significantly from our understanding of conditions as presented in this report, we request that we be notified immediately to reassess the conclusions provided herein.

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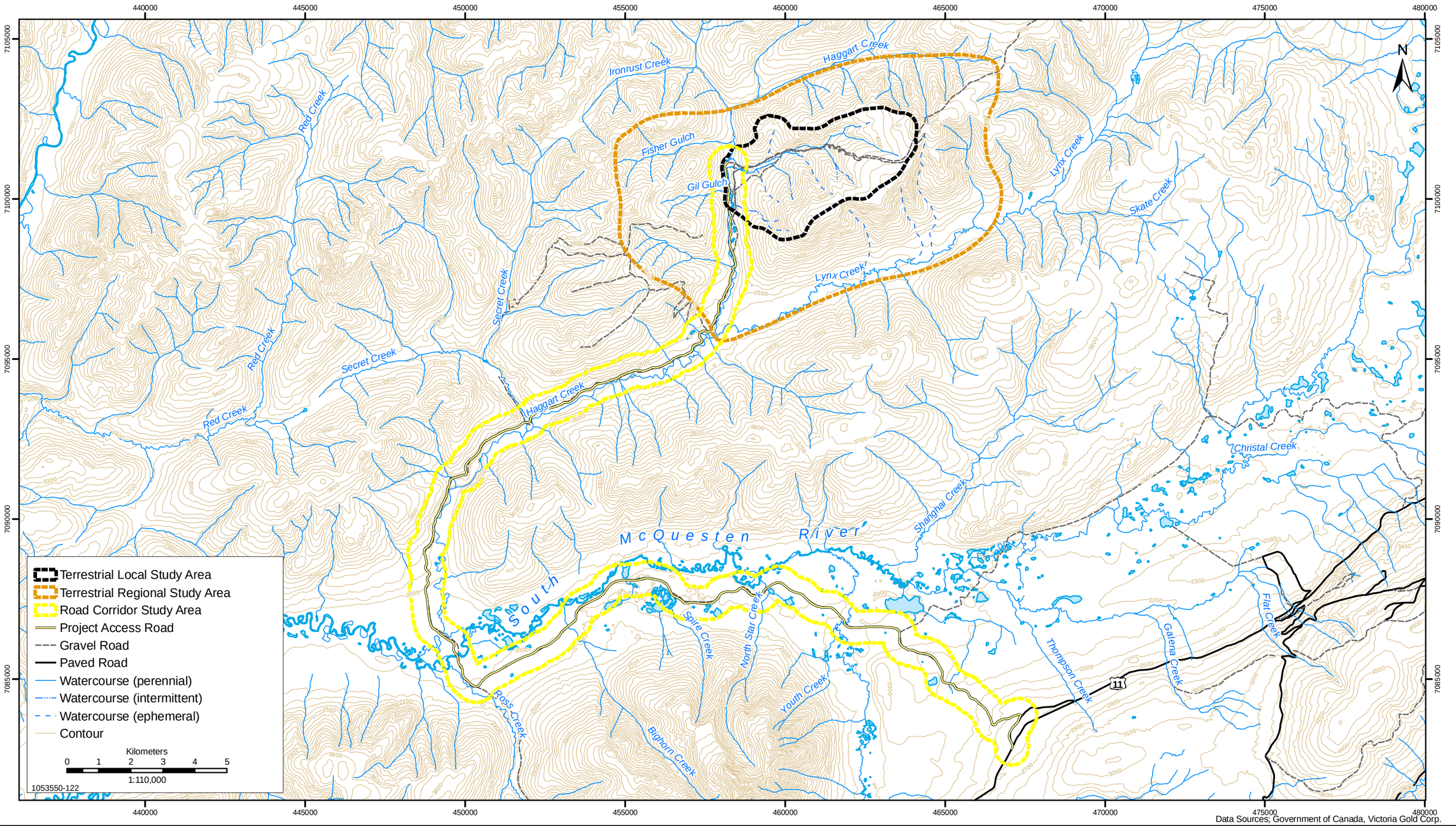
6 FIGURES

Please see the following pages.



Data Sources; Government of Canada, Victoria Gold Corp.

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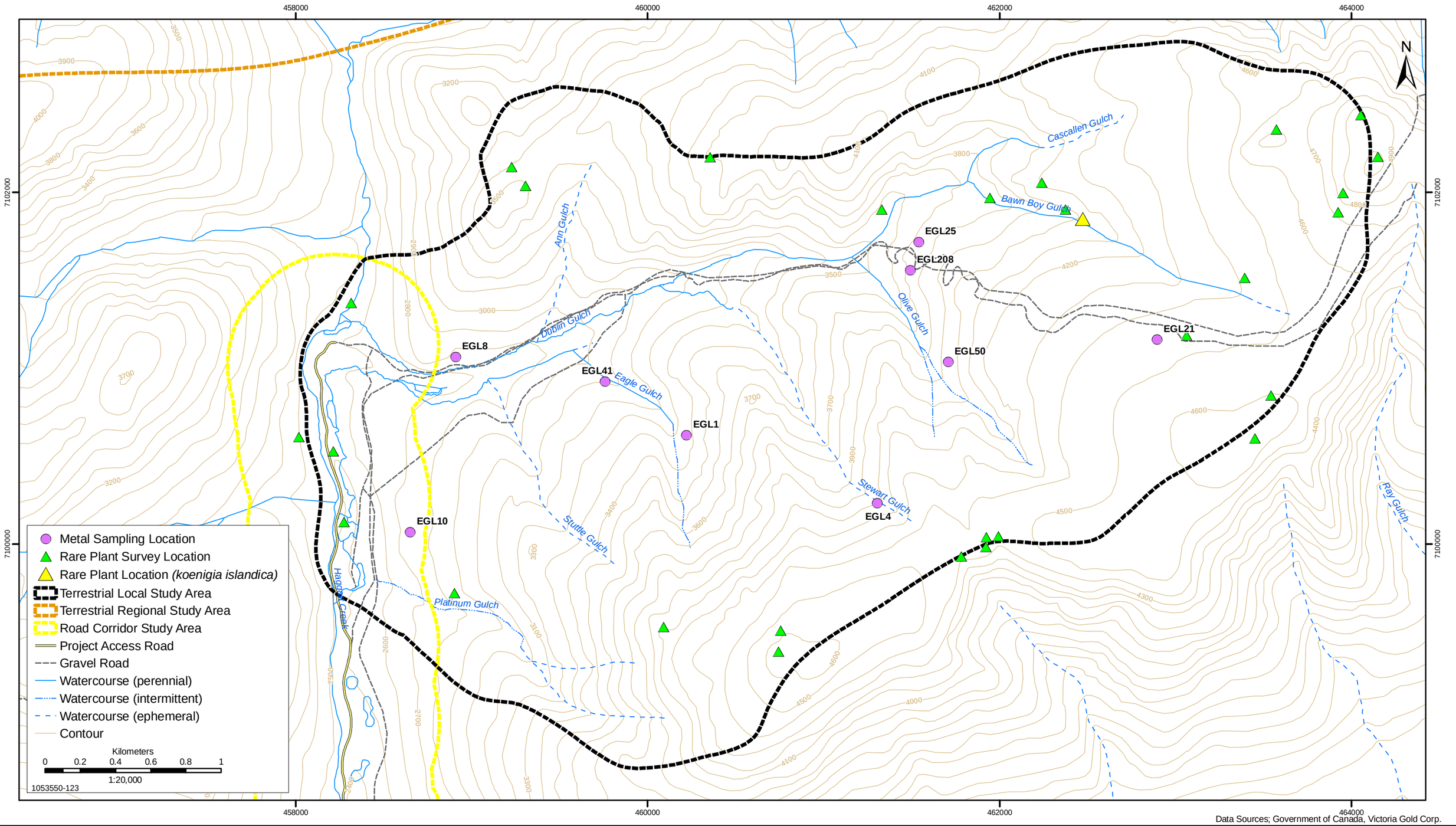
FIGURE 2-1
VEGETATION STUDY AREA BOUNDARIES

EAGLE GOLD PROPERTY
YUKON TERRITORY

PROJECTION: UTM - ZONE 8	DRAWN BY: LS
DATUM: NAD 83	CHECKED BY: RS
DATE: 02-December-2009	FIGURE NO.: 2-1



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Victoria GOLD CORP

FIGURE 2-2
RARE PLANT SURVEY AND VEGETATION METALS SAMPLE LOCATIONS
EAGLE GOLD PROPERTY
YUKON TERRITORY

PROJECTION: UTM - ZONE 8	DRAWN BY: LS
DATUM: NAD 83	CHECKED BY: RS
DATE: 06-December-2009	FIGURE NO.: 2-2

458000 460000 462000 464000

7102000 7100000

N

Dominant Map Code

AK	FM	SF	
AW	FP	SH	
BL	GB	SL	
ES	MM	WG	
FC	PM	WM	
FF	RI	WS	
	SA		

Ecosystem Label

e.g. 168
10SLk6

168 = Polygon Number
10 = decile
SL = map code
k = map code modifier
6 = structural stage

- TEM / Soils Sample Location (2009)
- Terrestrial Local Study Area
- Terrestrial Regional Study Area
- Road Corridor Study Area
- Project Access Road
- Gravel Road
- Watercourse (perennial)
- Watercourse (intermittent)
- Watercourse (ephemeral)
- Contour

Kilometers
0 0.2 0.4 0.6 0.8 1
1:20,000

1053550-119

EGL206 EGL33 EGL35 EGL34 EGL36 EGL32 EGL37 EGL31 EGL30 EGL213 EGL207 EGL38 EGL39 EGL313 EGL214A EGL50A EGL216 EGL8 EGL6 EGL41 EGL47 EGL1 EGL63 EGL46 EGL48 EGL9 EGL10 EGL11 EGL66 EGL311 EGL12 EGL214 EGL215 EGL310 EGR414 EGL309 EGL68 EGL61 EGL308 EGL60 EGL212 EGL28 EGL22 EGL26 EGL25 EGL211 EGL208 EGL209 EGL210 EGL50 EGL49 EGL16 EGL15 EGL17 EGL18 EGR419 EGL20 EGL19 EGL21 EGL200 EGL58 EGL203 EGL5 EGL201 EGL202 EGL53 EGL52 EGL307 EGL312 EGL205 EGL3 EGL204 EGL4

Cascallen Gulch Bawn Boy Gulch Olive Gulch Ann Gulch Dublin Gulch Eagle Gulch Stewart Gulch Skittle Gulch Hayden Creek Platinum Gulch Ray Gulch

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Victoria GOLD CORP

FIGURE 3-1
TERRESTRIAL ECOSYSTEM MAPPING IN THE LOCAL STUDY AREA

EAGLE GOLD PROPERTY
YUKON TERRITORY

PROJECTION: UTM - ZONE 8	DRAWN BY: LS
DATUM: NAD 83	CHECKED BY: RS
DATE: 24-November-2009	FIGURE NO.: 3-1

455000 460000 465000

7335000

N

EGR69 EGR91 EGR96 EGR81 EGR92 EGR93 EGR94 EGR95 EGR80 EGR98 EGR79 EGR97 EGR450 EGR76 EGR420 EGR74 EGR73 EGR71 EGR72 EGR70 EGR451 EGR301 EGR302 EGR306 EGR409 EGR408 EGR407 EGR406 EGR405 EGR404 EGR403 EGR402 EGR401 EGR400 EGR410 EGR413 EGR412 EGR411 EGR414 EGR417 EGR416 EGR418 EGR305 EGR304 EGR415 EGR303 EGR413

Haggart Creek
Cascallen Gulch
Brown Boy Gulch
Ann Gulch
Dolan Gulch
Swale Gulch
Cove Gulch
Stanley Gulch
Roy Gulch
Hunker Gulch
Platinum Gulch
15 Pup
Lynx Creek
Ski Creek
Snowshoe

TEM / Soils Sample Location (2009)
Project Access Road
Terrestrial Local Study Area
Terrestrial Regional Study Area
Gravel Road
Contour
Watercourse (perennial)
Watercourse (intermittent)
Watercourse (ephemeral)

Kilometers
0 0.5 1 1.5
1:17,500

Dominant Map Code

AK FM SC
AW FP SF
BL GB SH
BS MM SL
ES MW TA
FC PM WG
FF RI WM
SA WS

Ecosystem Label

e.g. 168
10SLk6

168 = Polygon Number
10 = decile
SL = map code
k = map code modifier
6 = structural stage

1053550-108

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Victoria GOLD CORP

FIGURE 3-2
TERRESTRIAL ECOSYSTEM MAPPING IN THE REGIONAL STUDY AREA
EAGLE GOLD PROJECT
YUKON TERRITORY

PROJECTION: UTM - ZONE 8	DRAWN BY: RS
DATUM: NAD 83	CHECKED BY:
DATE: 24-November-2009	FIGURE NO.: 3-2

445000 450000 455000 460000 465000 470000

7030000 7025000 7020000 7015000

N

Fisher Gulch
Gil Gulch
Secret Creek
Red Creek
Goodman Creek
Lynx Creek
Play Gulch
Skate Creek
Azmz Creek
Hanjin Creek
Shangrila Creek
South McQuesten River
North Star Creek
Youth Creek
Stake Creek
Bigfoot Creek
Rose Creek
Thompson Creek
Gueins Creek
Flat Creek

EGR410 EGL50A EGR411 EGL216 EGL10 EGL9 EGL12 EGL214 EGR414 EGR413 EGR412 EGR411 EGR410 EGR409 EGR408 EGR407 EGR406 EGR405 EGR404 EGR403 EGR402 EGR401 EGR400 EGR450 EGR415 EGR416 EGR451 EGR417 EGR418 EGR419 EGR420

11

TEM / Soils Sample Location (2009)
Terrestrial Local Study Area
Terrestrial Regional Study Area
Road Corridor Study Area
Project Access Road
Gravel Road
Paved Road
Watercourse (perennial)
Watercourse (intermittent)
Watercourse (ephemeral)
Waterbody
Contour

Kilometers
0 1 2 3 4
1:40,000

Dominant Map Code

AK	GB	SF
AW	MA	SH
BS	OW	SL
CF	PD	TA
FC	PM	WG
FF	RI	WH
FM	SA	WM
	SC	WS

Ecosystem Label

e.g. 168
10SLk6

168 = Polygon Number
10 = decile
SL = map code
k = map code modifier
6 = structural stage

1053550-121

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FIGURE 3-3
TERRESTRIAL ECOSYSTEM MAPPING IN THE ROAD CORRIDOR STUDY AREA
EAGLE GOLD PROPERTY
YUKON TERRITORY

PROJECTION: UTM - ZONE 8	DRAWN BY: LS
DATUM: NAD 83	CHECKED BY: RS
DATE: 24-November-2009	FIGURE NO.: 3-3

Data Sources; Government of Canada, Victoria Gold Corp.

458000 460000 462000 464000

7102000

7100000

N

Ann Gulch
Dublin Gulch
Eagle Gulch
Olivia Gulch
Stewart Gulch
Ray Gulch
Hard Creek
Platinum Gulch

Riparian Area
Terrestrial Local Study Area
Terrestrial Regional Study Area
Road Corridor Study Area
Project Access Road
Gravel Road
Watercourse (perennial)
Watercourse (intermittent)
Watercourse (ephemeral)
Contour

Kilometers
0 0.2 0.4 0.6 0.8 1
1:20,000

1053550-113

Data Sources; Government of Canada, Victoria Gold Corp.

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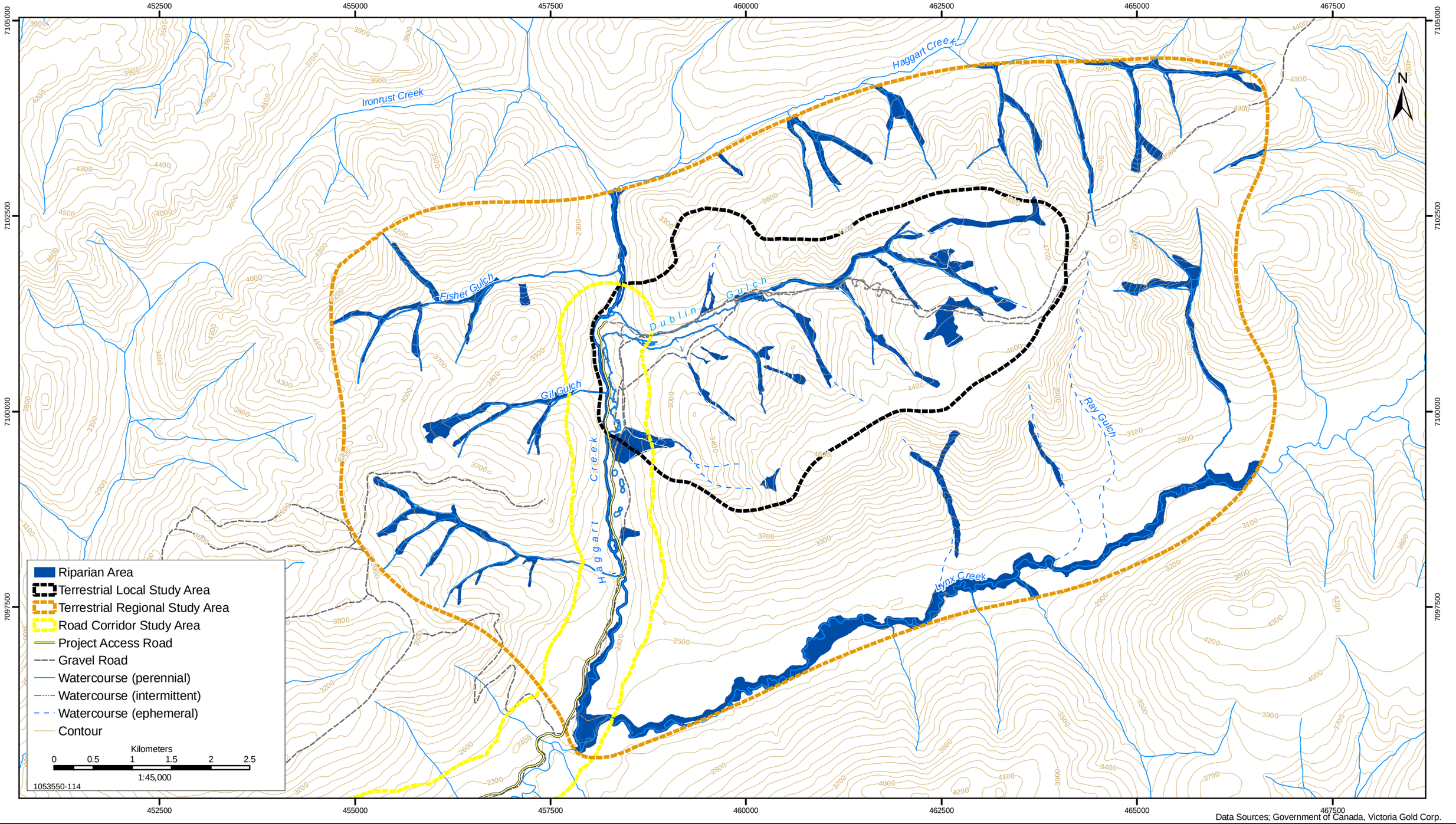
FIGURE 3-4
RIPARIAN AREAS IN THE LOCAL STUDY AREA
EAGLE GOLD PROPERTY
YUKON TERRITORY

PROJECTION	DRAWN BY
UTM - ZONE 8	LS
DATUM	CHECKED BY
NAD 83	RS
DATE	FIGURE NO.
24-November-2009	3-4



Data Sources; Government of Canada, Victoria Gold Corp.

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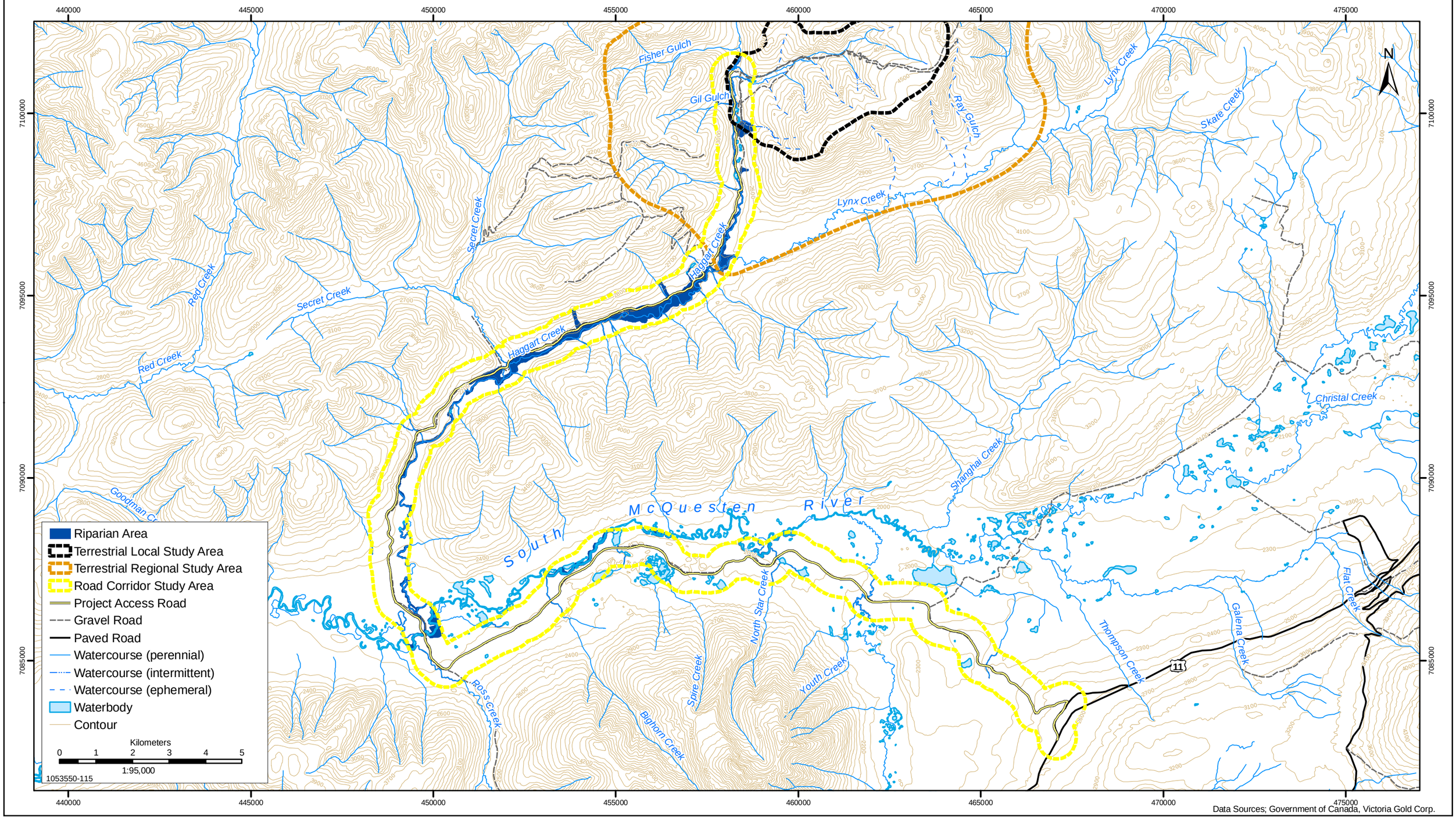
Victoria GOLD CORP

FIGURE 3-5
RIPARIAN AREAS IN THE REGIONAL STUDY AREA

EAGLE GOLD PROPERTY
YUKON TERRITORY

PROJECTION: UTM - ZONE 8	DRAWN BY: LS
DATUM: NAD 83	CHECKED BY: RS
DATE: 02-December-2009	FIGURE NO.: 3-5



Data Sources; Government of Canada, Victoria Gold Corp.

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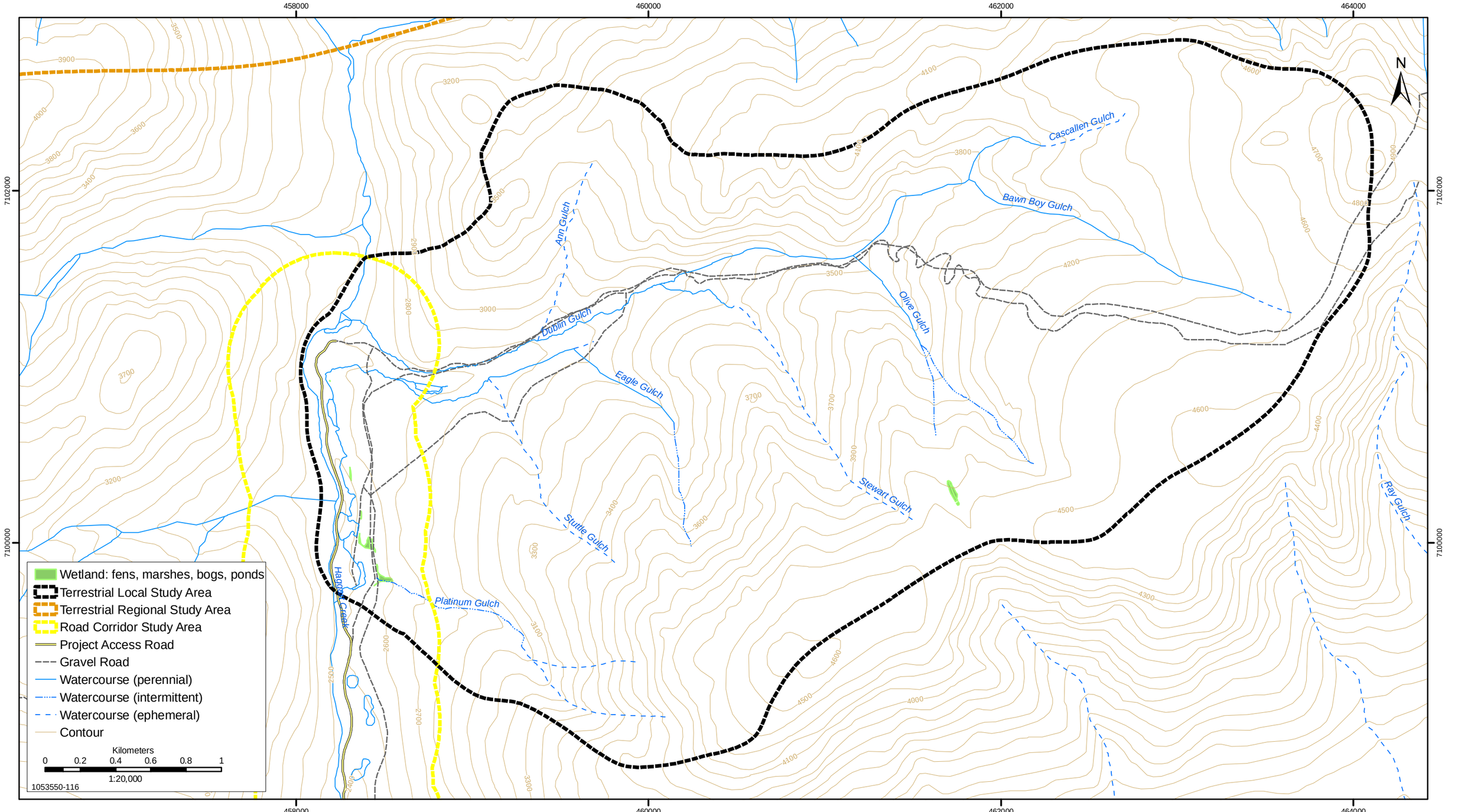
Victoria GOLD CORP

FIGURE 3-6
RIPARIAN AREAS IN THE ROAD STUDY AREA
EAGLE GOLD PROPERTY
YUKON TERRITORY

PROJECTION: UTM - ZONE 8	DRAWN BY: LS
DATUM: NAD 83	CHECKED BY: RS
DATE: 02-December-2009	FIGURE NO.: 3-6



Data Sources; Government of Canada, Victoria Gold Corp.

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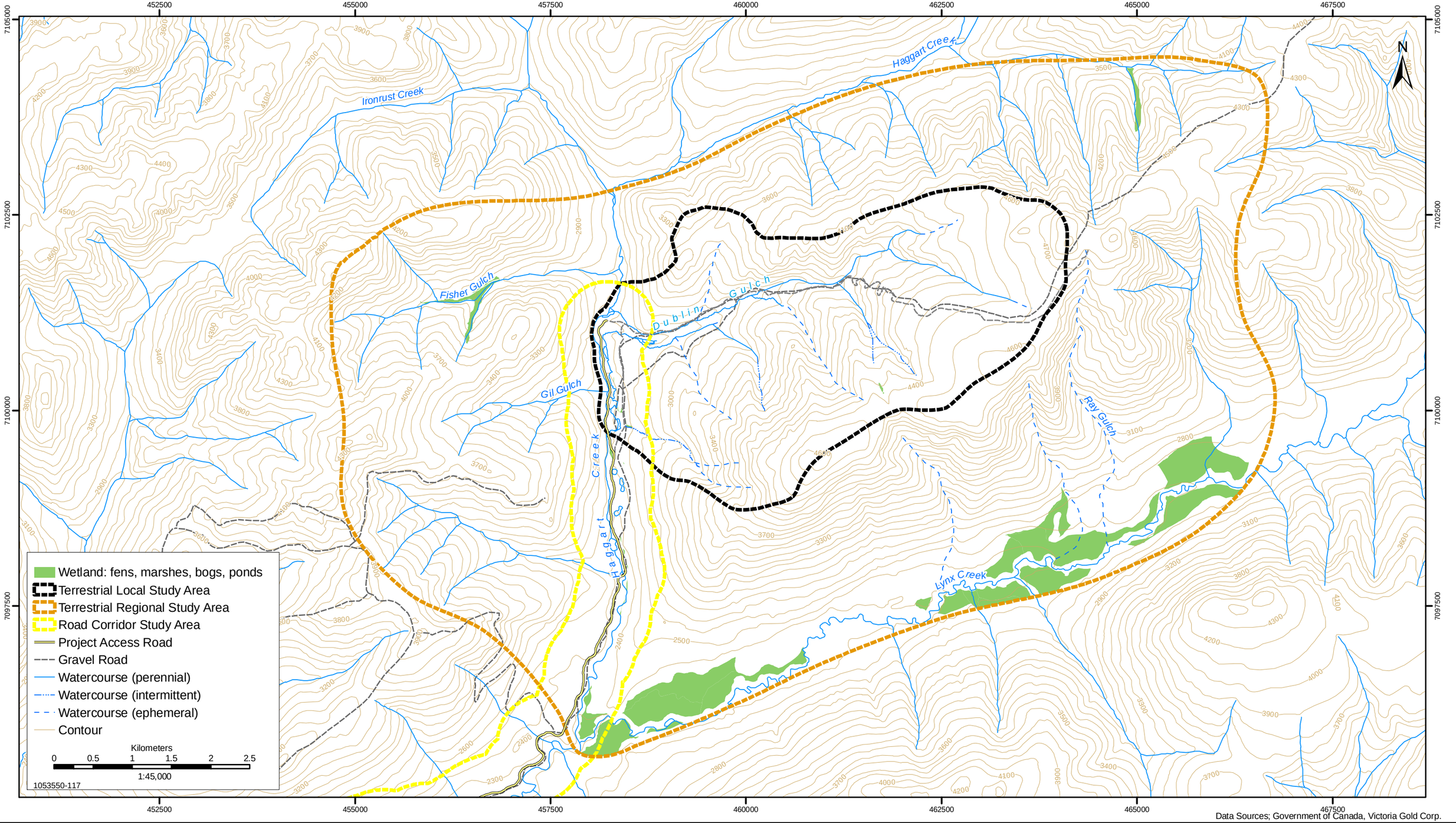
Victoria GOLD CORP

FIGURE 3-7
WETLANDS IN THE LOCAL STUDY AREA
EAGLE GOLD PROPERTY
YUKON TERRITORY

PROJECTION: UTM - ZONE 8	DRAWN BY: LS
DATUM: NAD 83	CHECKED BY: RS
DATE: 24-November-2009	FIGURE NO.: 3-7



Data Sources; Government of Canada, Victoria Gold Corp.

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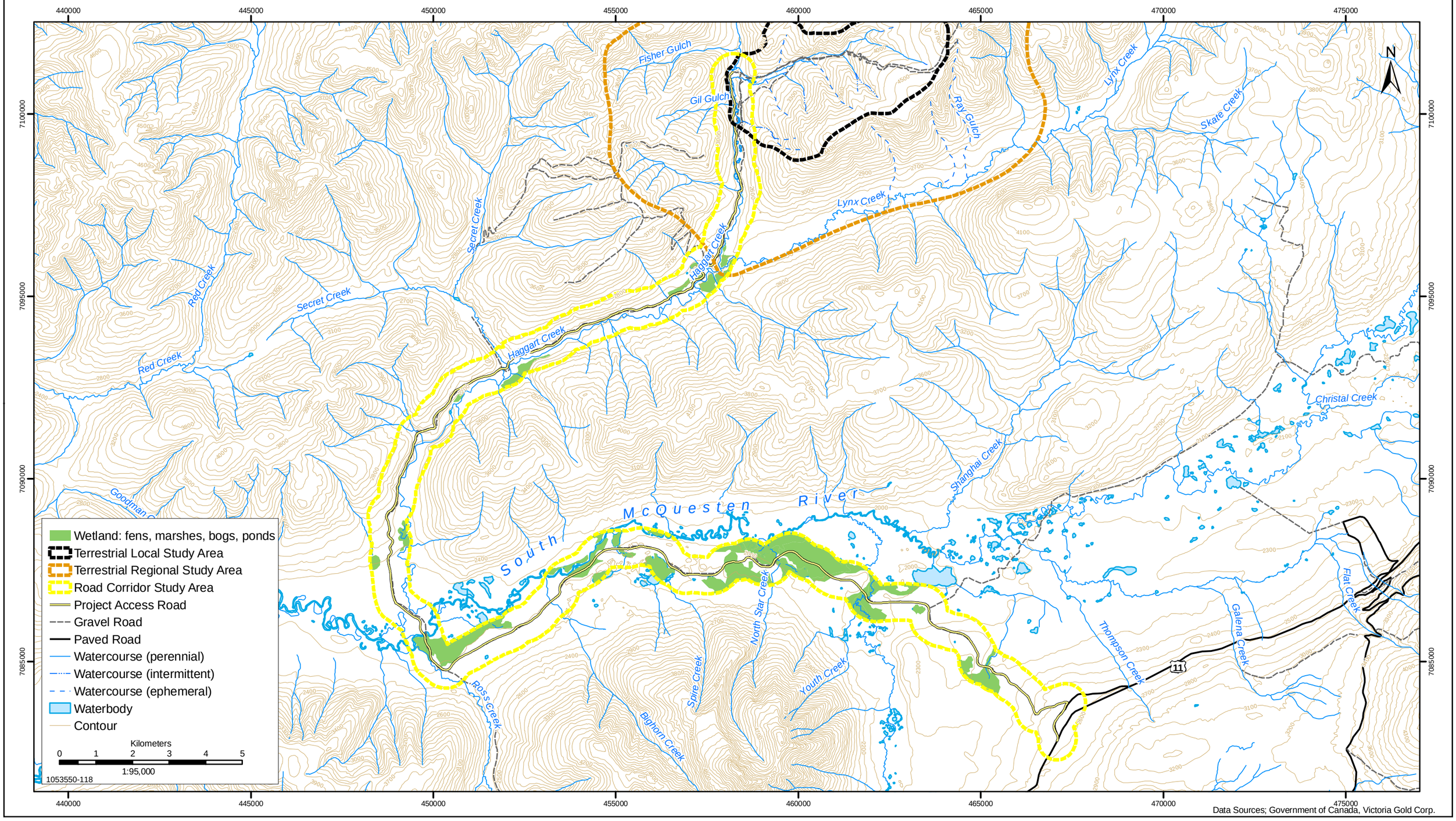
FIGURE 3-8
WETLANDS IN THE REGIONAL STUDY AREA
EAGLE GOLD PROPERTY
YUKON TERRITORY

PROJECTION: UTM - ZONE 8	DRAWN BY: LS
DATUM: NAD 83	CHECKED BY: RS
DATE: 02-December-2009	FIGURE NO.: 3-8



Data Sources; Government of Canada, Victoria Gold Corp.

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FIGURE 3-9
WETLANDS IN THE ROAD CORRIDOR STUDY AREA

EAGLE GOLD PROPERTY
YUKON TERRITORY

PROJECTION: UTM - ZONE 8	DRAWN BY: LS
DATUM: NAD 83	CHECKED BY: RS
DATE: 02-December-2009	FIGURE NO.: 3-9

458000 460000 462000 464000

7102000

7100000

N

Ann Gulch
Dublin Gulch
Eagle Gulch
Olive Gulch
Bawn Boy Gulch
Cascallen Gulch
Stewart Gulch
Sturtle Gulch
Platinum Gulch
Hagger Creek
Ray Gulch

- Major Component of Old Forest (>60% polygon area)
- Moderate Component of Old Forest (30-60% polygon area)
- Minor Component of Old Forest (<30% polygon area)
- Terrestrial Local Study Area
- Terrestrial Regional Study Area
- Road Corridor Study Area
- Project Access Road
- Gravel Road
- Watercourse (perennial)
- Watercourse (intermittent)
- Watercourse (ephemeral)
- Contour

Kilometers
0 0.2 0.4 0.6 0.8 1
1:20,000

1053550-110

Data Sources; Government of Canada, Victoria Gold Corp.

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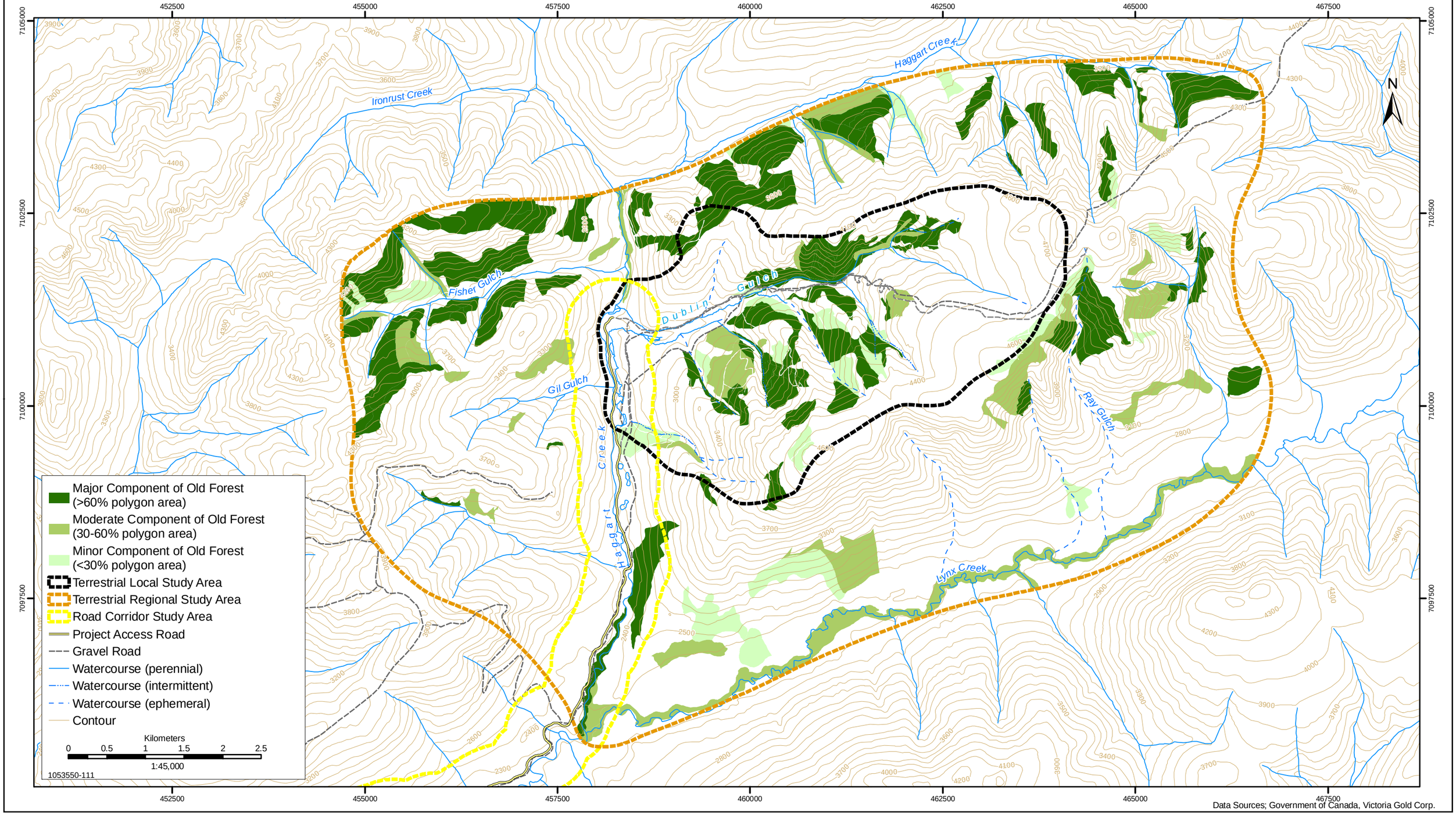
FIGURE 3-10
OLD FOREST IN THE LOCAL STUDY AREA
EAGLE GOLD PROPERTY
YUKON TERRITORY

PROJECTION: UTM - ZONE 8	DRAWN BY: LS
DATUM: NAD 83	CHECKED BY: RS
DATE: 24-November-2009	FIGURE NO.: 3-10



Data Sources; Government of Canada, Victoria Gold Corp.

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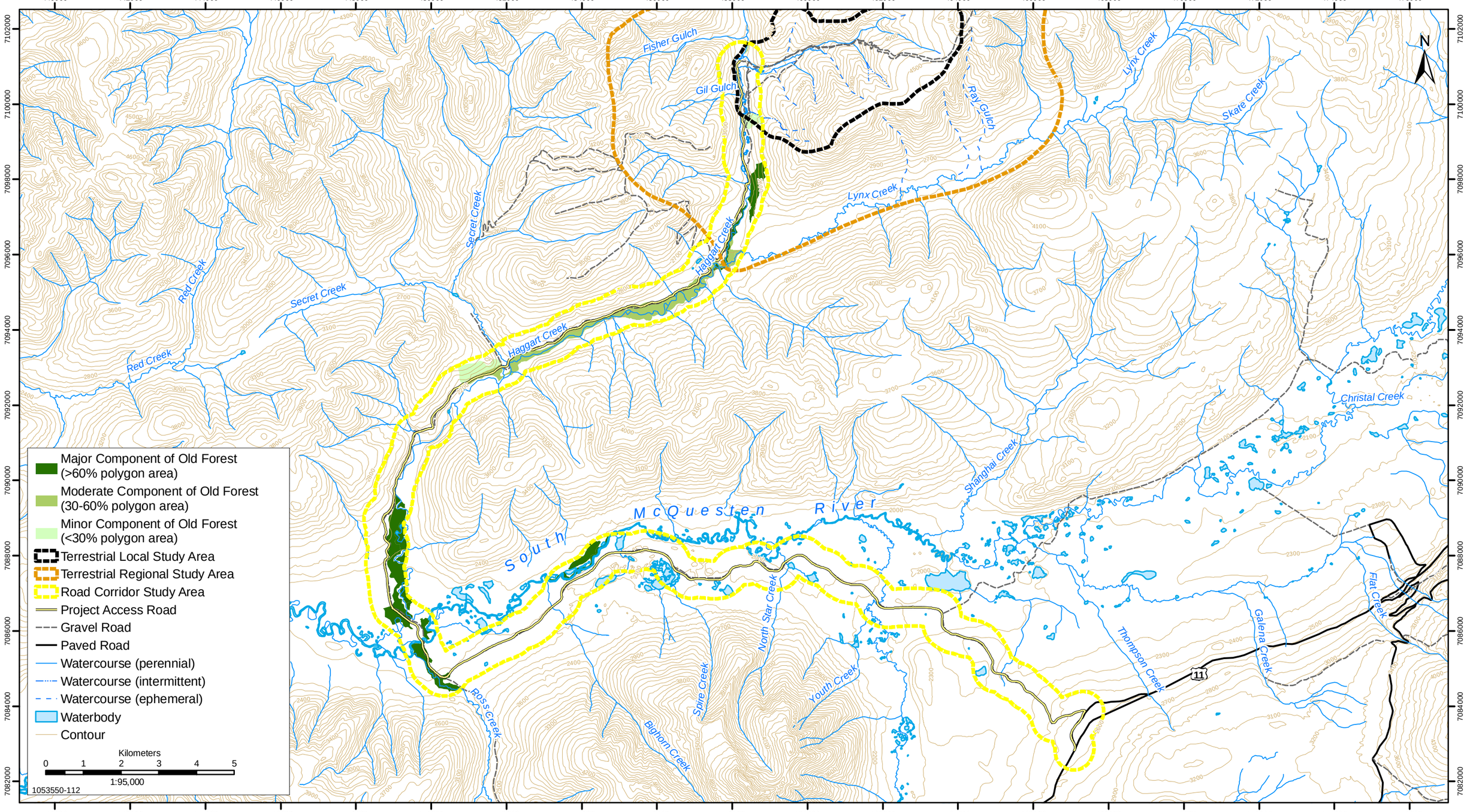
FIGURE 3-11
OLD FOREST IN THE REGIONAL STUDY AREA
EAGLE GOLD PROPERTY
YUKON TERRITORY

PROJECTION: UTM - ZONE 8	DRAWN BY: LS
DATUM: NAD 83	CHECKED BY: RS
DATE: 02-December-2009	FIGURE NO.: 3-11



Data Sources; Government of Canada, Victoria Gold Corp.

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FIGURE 3-12
OLD FOREST IN THE ROAD CORRIDOR STUDY AREA
EAGLE GOLD PROPERTY
YUKON TERRITORY

PROJECTION: UTM - ZONE 8	DRAWN BY: LS
DATUM: NAD 83	CHECKED BY: RS
DATE: 24-November-2009	FIGURE NO.: 3-12

458000 460000 462000 464000

7102000

7100000

N

Cascallen Gulch
Bawn Boy Gulch
Ann Gulch
Dublin Gulch
Olive Gulch
Eagle Gulch
Stewart Gulch
Stuttle Gulch
Platinum Gulch
Hagan Creek
Ray Gulch

Timber Productivity
- High Productivity
- Moderate Productivity
- Low Productivity
- Very Low Productivity
- Non-Productive
- Disturbed Land, Non-productive
- Terrestrial Local Study Area
- Terrestrial Regional Study Area
- Road Corridor Study Area
- Project Access Road
- Gravel Road
- Watercourse (perennial)
- Watercourse (intermittent)
- Watercourse (ephemeral)
- Contour

Kilometers
0 0.2 0.4 0.6 0.8 1
1:20,000

1053550-138

Data Sources; Government of Canada, Victoria Gold Corp.

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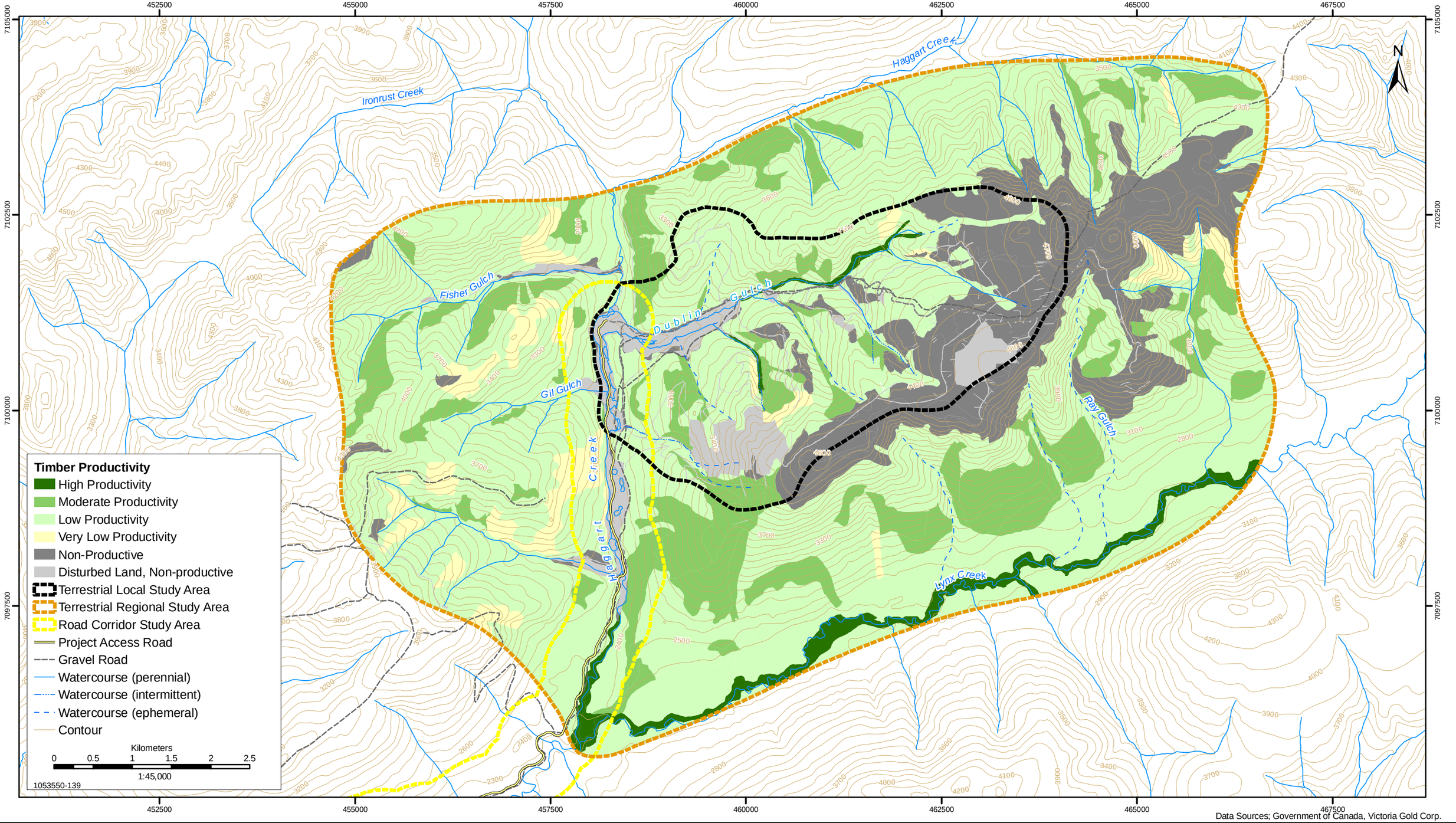
FIGURE 3-13
CURRENT TIMBER PRODUCTIVITY IN THE LOCAL STUDY AREA
EAGLE GOLD PROPERTY
YUKON TERRITORY

PROJECTION	DRAWN BY
UTM - ZONE 8	LS
DATUM	CHECKED BY
NAD 83	RS
DATE	FIGURE NO.
24-November-2009	3-13



Data Sources; Government of Canada, Victoria Gold Corp.

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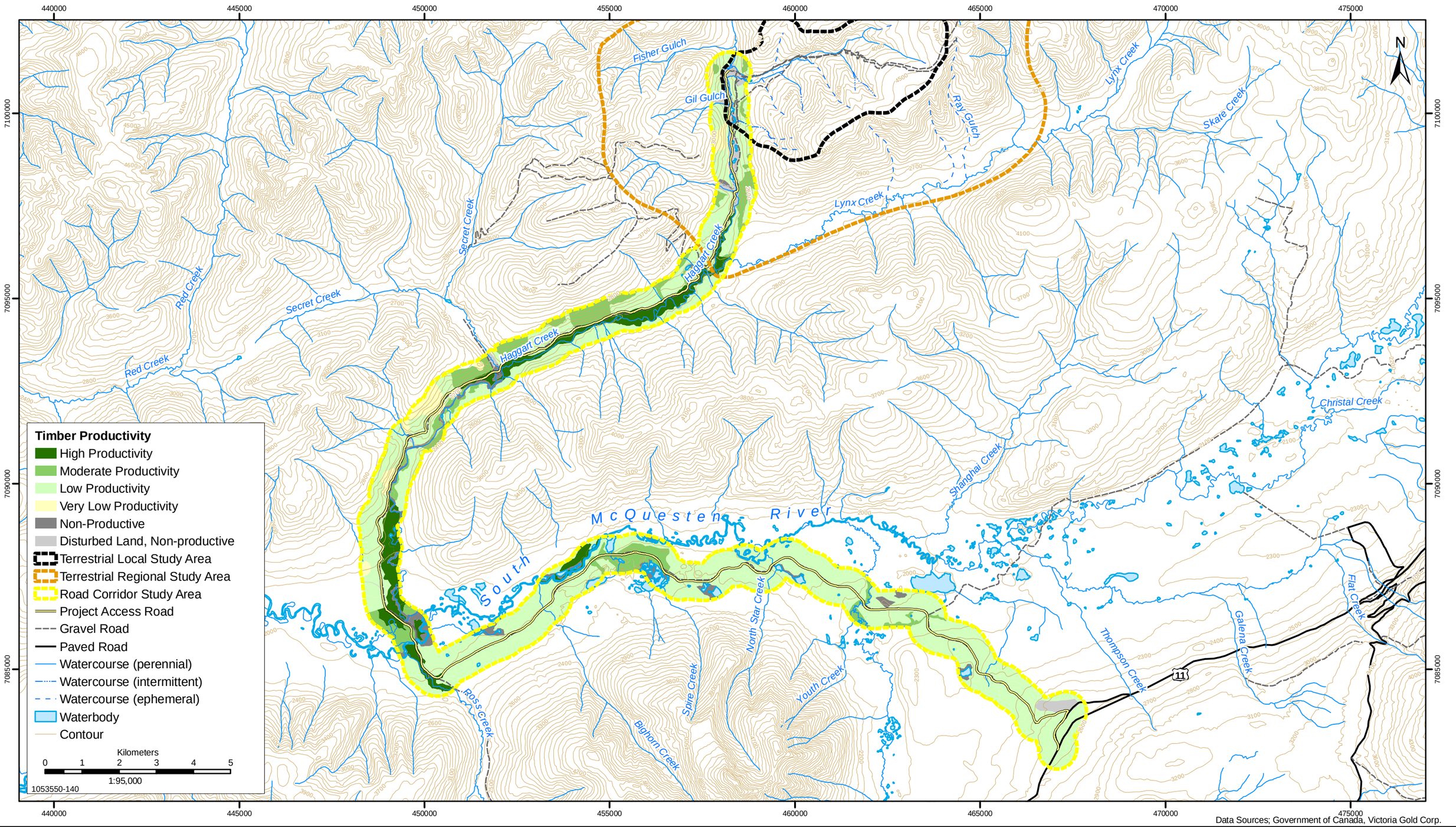
FIGURE 3-14
CURRENT TIMBER PRODUCTIVITY IN THE REGIONAL STUDY AREA
EAGLE GOLD PROPERTY
YUKON TERRITORY

PROJECTION: UTM - ZONE 8	DRAWN BY: LS
DATUM: NAD 83	CHECKED BY: RS
DATE: 02-December-2009	FIGURE NO.: 3-14



Data Sources; Government of Canada, Victoria Gold Corp.

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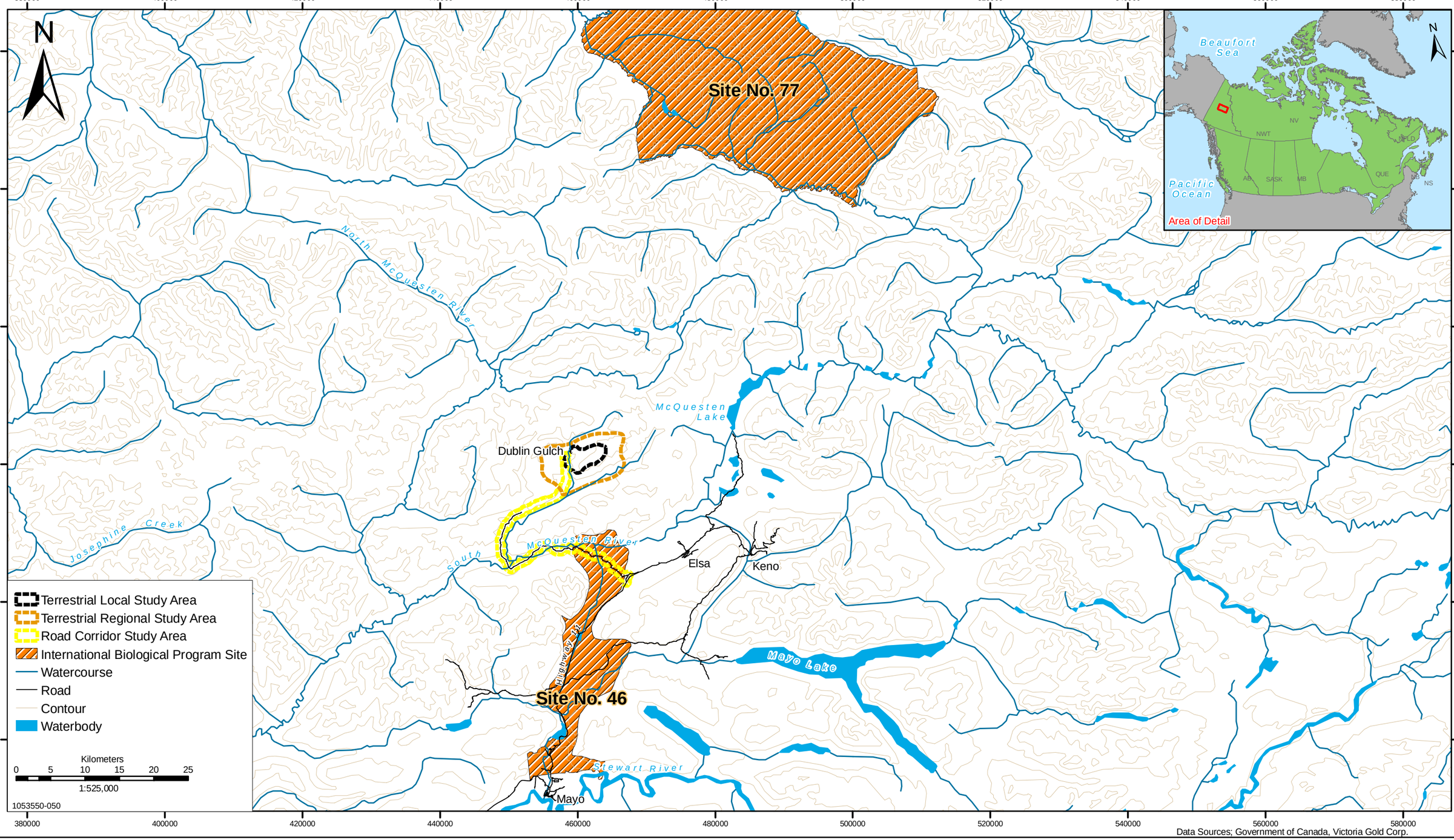
FIGURE 3-15
CURRENT TIMBER PRODUCTIVITY IN THE ROAD CORRIDOR STUDY AREA

EAGLE GOLD PROPERTY
YUKON TERRITORY

PROJECTION: UTM - ZONE 8	DRAWN BY: LS
DATUM: NAD 83	CHECKED BY: RS
DATE: 02-December-2009	FIGURE NO.: 3-15



Data Sources; Government of Canada, Victoria Gold Corp.

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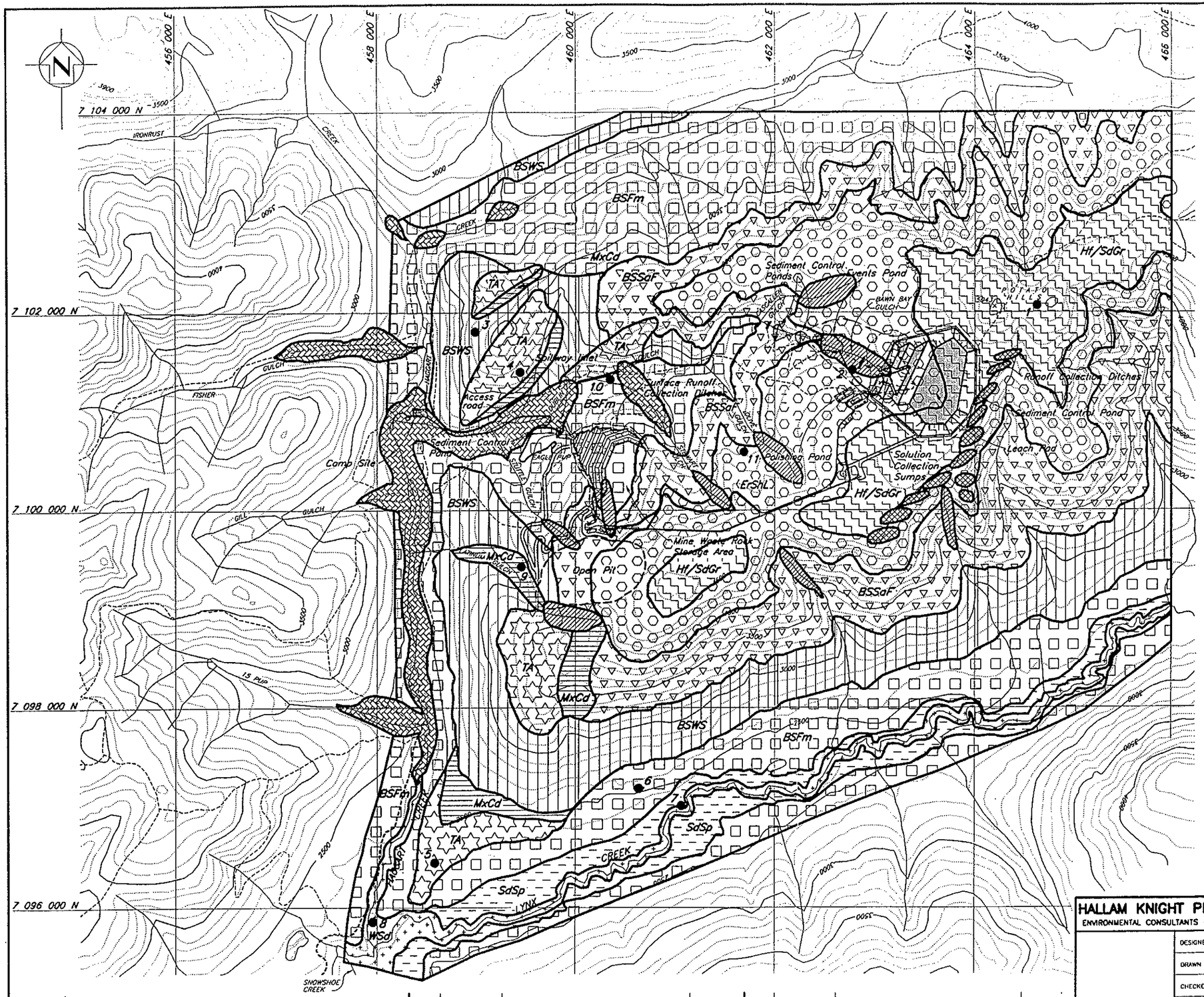
LOCATION OF INTERNATIONAL BIOLOGICAL PROGRAM SITES

EAGLE GOLD PROPERTY
YUKON TERRITORY

PROJECTION: UTM - ZONE 8	DRAWN BY: RS
DATUM: NAD 83	CHECKED BY:
DATE: 04-Jan-2009	FIGURE NO.: 3-16

APPENDIX A

Hallam Knight Piésold Vegetation Classification and Field Data



LEGEND

- Access Road
- Diversion Ditch
- 1 Vegetation Sample Sites
- HI/SdGr – heather/forb, sedge/grass
- ErShL – ericoceous shrub/lichen
- MxCD – mixed coniferous/deciduous
- TA – trembling aspen
- BSSoF – black spruce/subalpine fir
- BSWS – black spruce/white spruce
- BSFm – black spruce/feathermoss
- SdSp – sedge/sphognum moss
- WSd – willow/sedge
- Talus
- Bedrock
- Placer Activity

NOTE

1. Contour elevations are in feet.
2. Topography developed from NTS map sheets.

Scale 1000 500 0 1000 2000 m

CAD FILE: \PROJECTS\1000\H2811\VEG\D18 1:20000 Plot 1=20 OCT. 16, 1995

DRG. NO.	DESCRIPTION	REV.	DATE	DESCRIPTION	APPROVED	REV.	DATE	DESCRIPTION	APPROVED
REFERENCE DRAWINGS		REVISIONS				REVISIONS			

HALLAM KNIGHT PIESOLD LTD.
ENVIRONMENTAL CONSULTANTS – VANCOUVER, B.C.

FIRST DYNASTY MINES LTD.

DUBLIN GULCH PROPERTY

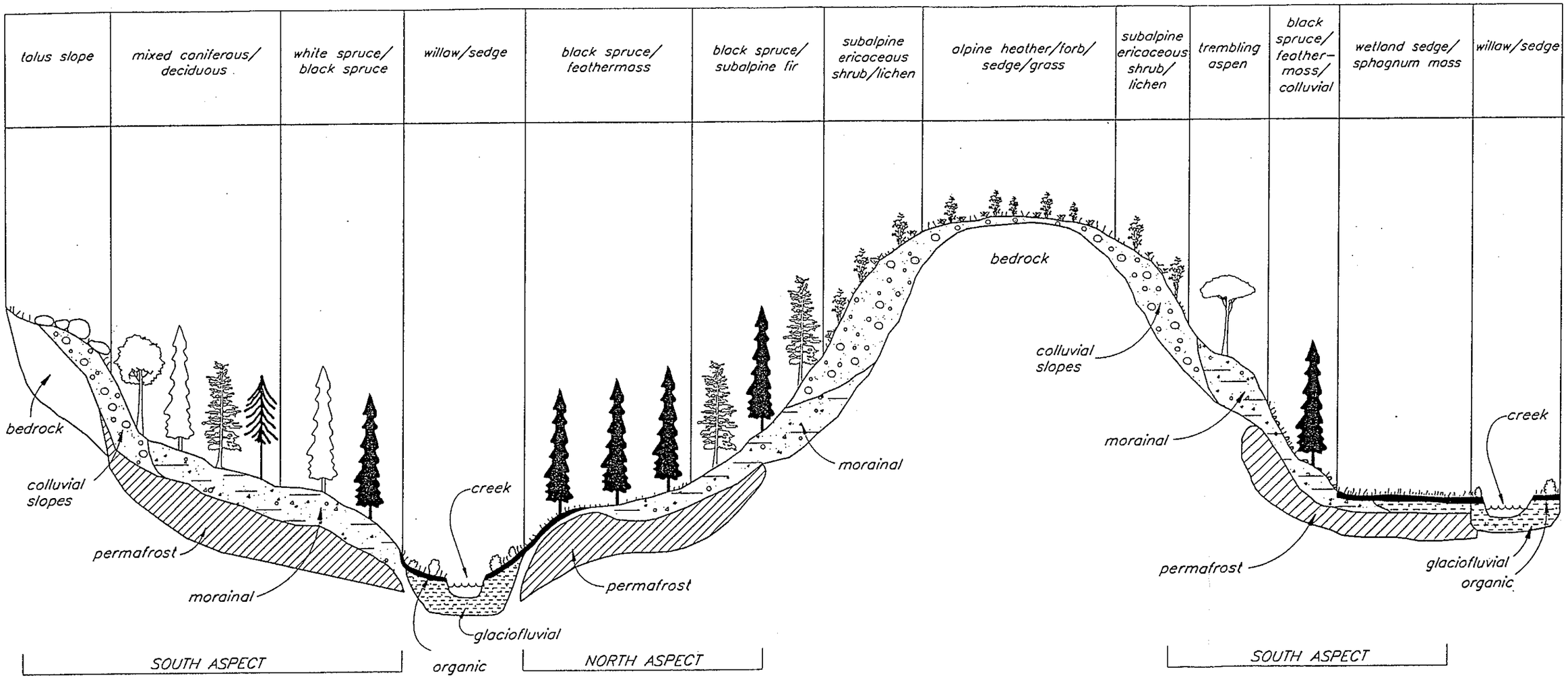
VEGETATION SAMPLE SITES
FIGURE 9.1

DESIGNED	SCB
DRAWN	MKS
CHECKED	
APPROVED	

DATE JAN. 15, 1996 | SCALE AS SHOWN | DRG. NO. H2811 | REV. –

H2811\FIG\81

FIRST DYNASTY MINES LTD
DUBLIN GULCH PROPERTY
SCHEMATIC VEGETATION AND LANDFORM RELATIONSHIPS



Adapted from: C. Kennedy, 1993

CAD FILE: \PROJECT\1000\H2811\DEL\81 Plot scale 1=1 STD. 1

Nov. 23, 1995

HALLAM KNIGHT PIESOLD LTD.
ENVIRONMENTAL CONSULTANTS

FIGURE 9.2

Site #1: Alpine zone; Potato Hills

Gradient 15% Altitude 1705 m (4900 ft) Aspect southwest

Observations 20% of ground is covered with talus rock, average diameter of 20 cm

Species present

Alpine sweetgrass
Alpine clubmoss
Arctic wormwood
Blistered rock tripe
Bluejoint
Bog blueberry
Curled cetraria
Few fingered lichen
Four-angled mountain heather
Glaucous gentian
Green reindeer lichen
Grey reindeer lichen
Lingonberry
Narcissus anemone
Red pixie-cup lichen
Scrub birch
Sidewalk moss
Sitka willow
Small flowered penstemon
Stoloniferous willow
Timber oatgrass
Tumble lichen
Two-tone sedge

Most Common

Tree layer-
none

Tall shrub layer-
none

Low shrub layer-
Scrub birch -50%
Narrow leaf willow-30%
Wide leaf willow-20%

Herb layer-
four-angled heather-40%
arctic wormwood -15%
narcissus anemone- 15%

Moss and lichen layer-
reindeer lichen- 30%
curled cetraria - 30%

Site #2: Bawn Bay Gulch

Gradient 22% Altitude 1479 m (4250 ft) Aspect north

Observations 64° 02 450' 135°46 431', talus rocks are large (>1 m diameter) and cover entire area, moss/lichen area is approx 45%, fills in cracks between rocks and creates substrate for vegetative growth

Species present

- Alpine fescue
- Alpine sweetgrass
- Barratt's willow
- Black spruce
- Bluegrass
- Blistered rock tripe
- Common coral lichen
- Curled cetraria
- Few fingered lichen
- Four-angled mountain-heather
- Fragile fern
- Freckled lichen
- Green kidney lichen
- Labrador tea
- Lingonberry
- Moonshine cetraria
- Mountain leafy liverwort
- Oval-leaved blueberry
- Red pixie cup lichen
- Pioneer cladonia
- Red-stemmed feathermoss
- Reindeer lichen
- Scrub birch
- Sidewalk moss
- Subalpine fir
- Variable willow
- White spruce

Most Common

Tree layer-
- Subalpine fir-95%

Tall shrub layer-
- Variable willow-60%
- Scrub birch-20%

Low shrub layer-
- Scrub birch-65%
- Labrador tea-25%

Herb layer-
- Four-angled mountain heather-30%
- Oval-leaved blueberry-15%

Moss and lichen layer-
- Reindeer lichen-55%
- Red-stemmed feathermoss-15%
- Curled cetraria-10%

Site #3: Tin Dome

Gradient 27% Altitude 1131 m (3250 ft) Aspect northwest

Observations Well developed lichen layer Soils have moderate moisture

Species present

- Altai fescue
- Bog blueberry
- Common Coral lichen
- Running clubmoss
- Crowberry
- Curled cetraria
- Dwarf blueberry
- Green kidney lichen
- Green reindeer lichen
- Lingonberry
- Red pixie cup lichen
- Scrub birch
- Sitka alder
- Labrador tea
- Subalpine fir
- White spruce

Most Common

Tree layer-
- Subalpine fir-70%

Tall shrub layer-
- Sitka alder-80%

Low shrub layer-
- Scrub birch-65%
- Labrador tea-25%
- Subalpine fir (juvenile)-10%

Herb layer-
- Crowberry-25%
- Lingonberry-10%

Moss/lichen layer-
- Reindeer lichen
- Common coral lichen

Site #4: Lower Tin Dome

Gradient 30% Altitude 818 m (3150 ft) Aspect southeast

Observations 64° 02 483' N 135° 49 824'W, signs of very old fire

Species present

- Arctic lupine
- Bastard toad-flax
- Bunchberry
- Crowberry
- Kinnikinnick
- Labrador tea
- Lingonberry
- Red-stemmed feathermoss
- Reedgrass
- Reindeer lichen
- Scrub birch
- Sitka alder
- Ground cedar
- Trembling aspen
- Wheatgrass
- Wild rose

Most common

Tree layer-
- Trembling aspen-92%

Tall shrub layer-
- Sitka alder-40%
- Scrub birch-40%
- Variable willow-20%

Low shrub layer-
- Labrador tea-50%
- Scrub birch-30%

Herb layer-
- Kinnikinnick-40%
- Bunchberry-40%

Moss/lichen layer-
- Reindeer lichen
- Ground cedar
- Coral lichen
- Red-stemmed feathermoss

Site #5: Slope above Lynx Creek

Gradient 30% Altitude 853 m (2450 ft) Aspect south southeast

Observations Extensive layer of leaf litter, some exposed ground, very little moss or lichen Soil very xeric

Species present

Arctic lupine
Bastard toad-flax
Bluejoint
Running club moss
Common juniper
Fireweed
Freckled lichen
Ground cedar
Kinnikinnick
Labrador tea
Little-tree willow
Orange foot lichen
Reindeer lichen
Soapberry
Heart-leaved arnica
Trembling aspen
Tall lungwort
Twinflower
Variable willow
White spruce
Wild rose

Most common

Tree layer-
Trembling aspen-93%

Tall shrub layer-
Little-tree willow-100%

Low shrub layer-
Trembling aspen (juvenile)-50%
Wild rose-25%
Labrador tea-25%

Herb layer-
Kinnikinnick-40%
Arctic lupine-10%
Tall lungwort-10%
Fireweed-10%

Moss/lichen layer-
Ground cedar-60%
Reindeer lichen
Freckled lichen

Site #6: Conifer forest near Lynx Creek

Gradient 5% Altitude 887 m (2550 ft) Aspect southeast

Observations 63° 59 640' N 135° 50 322' W, well developed moss layer, seepage areas and permafrost signs present

Species Present

Bog blueberry
Brittle horsehair lichen
Crowberry
Fire moss
Green kidney lichen
Green sphagnum moss
Labrador tea
Lingonberry
Little-tree willow
Meadow horsetail
Red-stemmed feathermoss
Reindeer lichen
Scrub birch
Black spruce
Sweet coltsfoot
Tea-leaved willow
Wild rose

Most common

Tree layer-
Black spruce-100%

Tall shrub layer-
Black spruce (juvenile)-90%
Scrub birch-5%

Low shrub layer-
Scrub birch-30%
Labrador tea-30%
Bog blueberry-20%

Herb layer-
Lingonberry
Sweet coltsfoot

Moss and lichen layer-
Red-stemmed feathermoss
Reindeer lichen

Site #7: Muskeg adjacent to Lynx Creek

Gradient 2 5% Altitude 818 m (2350 ft) Aspect south southeast

Observations Sedge tussocks overgrown with thick layer of red sphagnum moss

Species present

Awned sedge
Black spruce
Bog blueberry
Bog cranberry
Bog-rosemary
Cloudberry
Crowberry
Golden fuzzy fen moss
Green reindeer lichen
Grey reindeer lichen
Hairy butterwort
Labrador lousewort
Labrador tea
Little-tree willow
Red bearberry
Red sphagnum moss
Scandinavian sedge
Scrub birch
Cottongrass
Tea-leaved willow

Most common

Tree layer-
Black spruce-100%

Tall shrub layer-
Black spruce-100%

Low shrub layer-
Labrador tea-30%
Bog blueberry-30%

Herb layer-
Red bearberry
Cloudberry
Black sedge
Cottongrass

Moss and lichen layer-
Red sphagnum moss
Reindeer (green and gray) lichen

Site #8: Haggart Creek floodplain

Gradient <1 % Altitude 800 m (2300 ft) Aspect east

Observations Signs of freshet flooding, approximately 50% of the ground is absent of vegetation Many standing black spruce and balsam poplar are dead Many fallen trees Standing water present

Species present

Balsam poplar
Balsam groundsel
Black spruce
Bog blueberry
Common horsetail
Deflexed locoweed
Little tree willow
Mountain alder
Net-veined willow
Nothern grass-of-Parnassus
Northern water carpet
Russet sedge
Scandinavian sedge
Cottongrass
Scouring-rush
Shrubby cinquefoil
Single delight
Streamside moss
Variable willow

Most common

Tree layer-

Black spruce-85%
Balsam poplar-15%

Tall shrub layer-

Variable willow-90%
Balsam poplar (juvenile)-5%

Low shrub layer-

Shrubby cinquefoil-60%
Dwarf blueberry-20%
Bog blueberry-10%

Herb layer-

Scandinavian sedge
Russet sedge
Scouring-rush
Common horsetail

Moss and lichen layer-

none

Site #9: Steep slope adjacent to Platinum Gulch

Gradient 55% Altitude 1096 m (3150 ft) Aspect west

Observations signs of old fire, extensive leaf litter and humic layer present Soil moisture moderate to dry

Species present
- Bastard toad-flax
- Bluejoint
- Crowberry
- Fireweed
- Freckled lichen
- Ground-cedar
- Labrador tea
- Lingonberry
- Little-tree willow
- Northern black currant
- Paper birch
- Red-stemmed feathermoss
- Reindeer lichen
- Sidewalk moss
- Sitka alder
- Subalpine fir
- Tall lungwort
- Trembling aspen
- Twinflower
- Variable willow
- White spruce
- Wild rose

Most common

Tree layer-
- Trembling aspen-48%
- White spruce-29%

Tall shrub layer-
- Sitka alder-60%

Low shrub layer-
- Wild rose-30%
- Labrador tea-30%

Herb layer-
- Crowberry
- Lingonberry
- Bastard toadflax

Moss and lichen layer-
- Red-stemmed feathermoss
- Freckled lichen
- Reindeer lichen

Site #10: Adjacent to Dublin Gulch

Gradient 9% Altitude 1079 m (3100 ft) Aspect north northwest

Species present

Barratt's willow
Bluegrass
Broad-leaved willowherb
Bunchberry
Common coral lichen
Common horsetail
Crowberry
Large-leaved avens
Low-blueberry willow
Red-stemmed feathermoss
Scrub birch
Sidewalk moss
Sitka alder
Subalpine fir
Variable willow
Water birch
White spruce

Most common

Tree layer-
- Subalpine fir-90%
- White spruce-10%

Tall shrub layer-
- Barratt's willow
- Sitka alder
- Subalpine fir (juvenile)
- White spruce (juvenile)

Low shrub layer-
- Scrub birch
- Variable willow
- Low-blueberry willow

Herb layer-
- Common horsetail
- Broad-leaved willowherb

Moss and lichen layer-
- Sidewalk moss
- Red-stemmed feathermoss

Site #11: Subalpine near Olive Zone

Gradient 15% Altitude 1427 m (4100 ft) Aspect north

Species present

- Alpine sweetgrass
- Common coral lichen
- Crowberry
- Labrador lousewort
- Labrador tea
- Lingonberry
- Mountain bilberry
- Pixie cup lichen
- Red-stemmed feathermoss
- Reindeer lichen
- Scrub birch
- Sidewalk moss
- Streamside moss
- Subalpine fir
- Tumble lichen

Most common

Tree layer-
- Subalpine fir-100%

Tall shrub layer-
- Scrub birch-99%

Low shrub layer-
- Labrador tea-75%

Herb layer-
- Crowberry
- Lingonberry

Moss and lichen layer-
- Sidewalk moss
- Streamside moss

Site #12: Conifer forest near Olive Gulch

Gradient 20% Altitude 1183 m (4100 ft) Aspect south

Observations 30 m transect conducted

Species present
- Brittle horsehair lichen
- Bunchberry
- Crowberry
- Green kidney lichen
- Green reindeer lichen
- Green sphagnum moss
- Grey reindeer lichen
- Labrador tea
- Lingonberry
- Red sphagnum moss
- Red-stemmed feathermoss
- Scrub birch
- Sitka alder
- Black spruce
- Subalpine fir
- Sweet coltsfoot
- Variable willow
- White spruce
- Wild rose

Most common

Tree layer-
- Black spruce-40%
- White spruce-35%

Tall shrub layer-
- Scrub birch

Low shrub layer-
- Labrador tea
- Wild rose

Herb layer-
- Crowberry
- Lingonberry

Moss and lichen layer-
- Sphagnum moss
- Red-stemmed feathermoss

APPENDIX B

Plant Species List

Appendix B: Eagle Gold Project Plant Species List

Latin Name	Common Name	Growth Form
Abies lasiocarpa	subalpine fir	tree, conifer
Picea glauca	white spruce (hybrid spruce)	tree, conifer
Picea mariana	black spruce	tree, conifer
Pinus contorta	lodgepole pine (jack pine)	tree, conifer
Betula papyrifera	paper birch	tree, deciduous
Betula neoalaskana	Alaska birch	tree, deciduopus
Populus balsamifera	balsam poplar (cottonwood)	tree, deciduous
Populus tremuloides	trembling aspen (white aspen)	tree, deciduous
Alnus incana	mountain alder	shrub
Alnus viridis ssp. *crispa*	green alder	shrub
Alnus viridis ssp. *sinuata*	Sitka alder	shrub
Andromeda polifolia	bog rosemary	shrub
Betula nana	scrub birch	shrub
Betula occidentalis	water birch	shrub
Betula glandosa	dwarf birch	shrub
Chamaedaphne calyculata	leatherleaf daphne	shrub
Comarum palustre	marsh cinquefoil	shrub
Juniperus communis	common juniper	shrub
Kalmia microphylla	bog-laurel	shrub
Ledum groenlandicum	Labrador tea	shrub
Ledum palustre ssp. *decumbens*	northern Labrador tea	shrub
Pentaphylloides floribunda	shrubby cinquefoil	shrub
Rhododendron lapponicum	Lapland rosebay	shrub
Ribes hudsonianum	northern black currant	shrub
Ribes triste	red swamp currant	shrub
Rosa acicularis	prickly rose	shrub
Rubus idaeus	red raspberry	shrub
Salix arbusculoides	northern bush willow	shrub
Salix athabascensis	Athabasca willow	shrub
Salix barclayi	Barclay's willow	shrub
Salix barrattiana	Barrat's willow	shrub
Salix bebbiana	Bebb's willow	shrub
Salix commutata	Variable willow	shrub
Salix glauca	grey-leaved willow	shrub
Salix myrtillifolia	bilberry willow	shrub

Latin Name	Common Name	Growth Form
Salix planifolia	plane-leaved willow	shrub
Salix polaris	polar willow	shrub
Salix pseudomonticola	serviceberry willow	shrub
Salix pseudomyrsinites	tall blueberry willow	shrub
Salix pulchra	diamond-leaved willow	shrub
Salix scouleriana	Scouler's willow	shrub
Salix sitchensis	Sitka willow	shrub
Shepherdia canadensis	soopolallie	shrub
Spiraea betulifolia	birch-leaved spirea	shrub
Vaccinium membranaceum	moutain bilberry	shrub
Vaccinium ovatum	oval-leaved blueberry	shrub
Viburnum edule	high bush cranberry	shrub
Arctostaphylos alpina	alpine bearberry	dwarf shrub
Arctostaphylos alpina var. rubra	alpine bearberry	dwarf shrub
Arctostaphylos uva-ursi	kinnikinnick, bearberry	dwarf shrub
Cassiope tetragona	four-angled mountain-heather	dwarf shrub
Dryas integrifolia	smooth-leaved mountain avens	dwarf shrub
Dryas octopetala	white mountain avens	dwarf shrub
Dryas octopetala	white mountain-avens	dwarf shrub
Empetrum nigrum	crowberry	dwarf shrub
Loiseleuria procumbens	alpine azalea	dwarf shrub
Oxycoccus oxycoccus	bog cranberry	dwarf shrub
Penstemon procerus	small-flowered penstemon	dwarf shrub
Salix arctica	arctic willow	dwarf shrub
Salix reticulata	net-veined willow	dwarf shrub
Vaccinium uliginosum	bog blueberry	dwarf shrub
Vaccinium vitis-idaea	lingonberry	dwarf shrub
Achillea millefolium	yarrow	herb
Achillea sibirica	Siberian yarrow	herb
Aconitum delphiniifolium	mountain monkshood	herb
Anemone drummondii	alpine anemone	herb
Anemone multifida	cut-leaved anemone	herb
Anemone narcissiflora	narcissus anemone	herb
Anemone parviflora	northern anemone	herb
Anemone richardsonii	yellow anemone	herb
Antennaria rosea	rosy pussytoes	herb
Antennaria sp.	antennaria sp.	herb

Latin Name	Common Name	Growth Form
Arnica angustifolia	alpine arnica	herb
Arnica cordifolia	heart-leaved arnica	herb
Arnica lessingii	purple arnica	herb
Artemisia arctica	arctic wormwood	herb
Artemisia norvegica	mountain sagewort	herb
Aster sp.	aster sp.	herb
Astragalus alpinus	alpine milk-vetch	herb
Campanula lasiocarpa	mountain harebell	herb
Chrysosplenium tetrandrum	northern water-carpet	herb
Cornus canadensis	bunchberry	herb
Corydalis sempervirens	pink corydalis	herb
Delphinium glaucum	tall larkspur	herb
Dodecatheon frigidum	northern shootingstar	herb
Draba sp.	whitlow grass	herb
Epilobium angustifolium	fireweed	herb
Epilobium latifolium	broad-leaved willowherb	herb
Erigeron compositus	cut-leaved daisy	herb
Erigeron sp.	daisy sp.	herb
Galium trifidum	small bedstraw	herb
Gentiana glauca	glaucous gentian	herb
Gentiana sp.	gentian sp.	herb
Geocaulon lividum	false toad-flax	herb
Hedysarum alpinum	alpine hedysarum	herb
Hieracium sp.	hawkweed sp.	herb
Koenigia islandica	Iceland koenigia	herb
Lathyrus ochroleucus	creamy peavine	herb
Linnaea borealis	twinflower	herb
Lupinus arcticus	arctic lupine	herb
Mertensia paniculata	tall bluebells	herb
Moneses uniflora	single delight	herb
Orthilia secunda	one-sided wintergreen	herb
Oxytropis deflexa	deflexed locoweed	herb
Parnassia palustris	northern grass-of-Parnassus	herb
Parrya nudicaulis	northern parrya	herb
Pedicularis capitata	capitate lousewort	herb
Pedicularis groenlandica	elephant's-head lousewort	herb
Pedicularis labradorica	Labrador lousewort	herb

Latin Name	Common Name	Growth Form
Petasites frigidus	sweet coltsfoot	herb
Petasites sagittatus	arrow-leaved coltsfoot	herb
Pinguicula villosa	hairy butterwort	herb
Platanthera sp.	bog-orchid sp.	herb
Polemonium acutiflorum	tall Jacob's-ladder	herb
Polemonium boreale	northern Jacob's-ladder	herb
Potentilla norvegica	Norwegian cinquefoil	herb
Pyrola asarifolia	pink wintergreen	herb
Ranunculus gmelinii	small yellow water-buttercup	herb
Rorippa palustris	marsh yellow cress	herb
Rubus arcticus ssp. *acaulis*	nagoonberry	herb
Rumex arcticus	arctic dock	herb
Saussurea angustifolia var. *angustifolia*	northern sawwort	herb
Saxifraga lyallii	red-stemmed saxifrage	herb
Saxifraga tricuspidata	three-toothed saxifrage	herb
Sedum integrifolium ssp. *integrifolium*	roseroot	herb
Senecio lugens	black-tipped groundsel	herb
Senecio sp.	groundsel sp.	herb
Senecio triangularis	arrow-leaved groundsel	herb
Sibbaldia procumbens	creeping sibbaldia	herb
Solidago multiradiata	northern goldenrod	herb
Stellaria longipes	long-stalked starwort	herb
Taraxacum officinale	common dandelion	herb
Triglochin palustris	marsh arrrow-grass	herb
Trimorpha acris	bitter fleabane	herb
Veronica wormskjoldii	alpine speedwell	herb
Viola sp.	violet sp.	herb
Wilhelmsia physodes	merckia	herb
Zigadenus elegans	mountain death-camas	herb
Rubus chamaemorus	cloudberry	herb/dwarf shrub
Agropyron sp.	wheatgrass	graminoid
Agrostis mertensii	northern bentgrass	graminoid
Agrostis scabra	hair bentgrass	graminoid
Bromus sp.	brome sp. (grass)	graminoid
Calamagrostis canadensis	bluejoint reedgrass	graminoid
Calamagrostis lapponica	Lapland reedgrass	graminoid
Calamagrostis purpurascens	purple reedgrass	graminoid

Latin Name	Common Name	Growth Form
Calamagrostis stricta	slimstem reedgrass	graminoid
Calamagrostis stricta ssp. *inexpansa*	slimstem reedgrass	graminoid
Carex albonigra	two-toned sedge	graminoid
Carex aquatilis	water sedge	graminoid
Carex atherodes	awned sedge	graminoid
Carex aurea	golden sedge	graminoid
Carex capillaris	hairlike sedge	graminoid
Carex garberi	Garber's sedge	graminoid
Carex lugens	spruce muskeg sedge	graminoid
Carex media	Scandinavian sedge	graminoid
Carex podocarpa	graceful mountain sedge	graminoid
Carex rostrata	swollen beaked sedge	graminoid
Carex saxatilis	russet sedge	graminoid
Carex scirpoidea	single-spike sedge	graminoid
Carex sp.	sedge sp.	graminoid
Carex spectabilis	showy sedge	graminoid
Danthonia intermedia	timber oatgrass	graminoid
Deschampsia cespitosa	tufted hairgrass	graminoid
Eriophorum angustifolium	narrow-leaved cottongrass	graminoid
Eriophorum scheuchzeri	Scheuchzer's cotton-grass	graminoid
Eriophorum sp.	cotton-grass	graminoid
Eriophorum vaginatum	sheathed cotton-grass	graminoid
Festuca altaica	Altai fescue	graminoid
Festuca brachyphylla	alpine fescue	graminoid
Festuca saximontana	Rocky Mountain fescue	graminoid
Hierochloë alpina	alpine sweetgrass	graminoid
Hordeum jubatum	foxtail barley	graminoid
Juncus balticus	Baltic rush	graminoid
Juncus bufonius	toad rush	graminoid
Juncus canadensis	Canadian rush	graminoid
Juncus castaneus	chestnut rush	graminoid
Juncus drummondii	Drummond's rush	graminoid
Luzula arcuata	curved wood-rush	graminoid
Luzula confusa	northern wood-rush	graminoid
Luzula groenlandica	Greenland wood-rush	graminoid
Luzula parviflora	small-flowered wood-rush	graminoid
Luzula spicata	spiked wood-rush	graminoid

Latin Name	Common Name	Growth Form
Poa alpina	alpine bluegrass	graminoid
Poa arctica	arctic bluegrass	graminoid
Poa glauca	glaucous bluegrass	graminoid
Poa sp.	Poa sp.	graminoid
Trisetum spicatum	spike trisetum	graminoid
Cystopteris fragilis	fragile fern	fern
Diphasiastrum alpinum (Lycopodium alpinum)	alpine club mosss	fern
Diphasiastrum complanatum	ground cedar	fern
Dryopteris fragrans	fragrant wood fern	fern
Equisetum arvense	common horsetail	fern
Equisetum fluviatile	swamp horsetail	fern
Equisetum scirpoides	dwarf scouring-rush	fern
Equisetum sylvaticum	wood horsetail	fern
Equisetum variegatum	northern scouring-rush	fern
Huperzia selago	fir clubmoss	fern
Lycopodium annotinum	stiff club-moss	fern
Lycopodium clavatum	running club-moss	fern
Woodsia glabella	smooth cliff fern	fern
Aulacomnium palustre	glow moss	moss
Brachythecium sp.	ragged moss sp.	moss
Bryaceae sp.	Bryum sp.	moss
Bryoria lanestris	speckled horsehair	moss
Ceratodon purpureus	fire moss	moss
Dicranum sp.	heron's-bill moss	moss
Drepanocladus sp.	hook moss sp.	moss
Hylocomium splendens	step moss	moss
Pleurozium schreberi	red-stemmed feathermoss	moss
Polytrichum juniperinum	juniper haircap moss	moss
Polytrichum sp.	haircap moss	moss
Ptilium crista-castrensis	knights plume moss	moss
Racomitrium lanuginosum	hoary rock moss	moss
Rhizomnium sp.	leafy moss	moss
Rhytidiopsis robusta	pipecleaner moss	moss
Scouleria aquatica	streamside moss	moss
Sphagnum capillaceum	common red sphagnum	moss
Sphagnum capillifolium	acute-leaved peat-moss	moss

Latin Name	Common Name	Growth Form
Sphagnum girgensohnii	common green sphagnum	moss
Sphagnum sp.	peat-moss	moss
Tomenthypnum nitens	golden fuzzy fen moss	moss
Tortula ruralis	sidewalk moss	moss
Cetraria cucullata	curled cetraria	lichen
Cetraria islandica	icelandmoss	lichen
Cetraria nivalis	ragged paperdoll	lichen
Cetraria pinastri	moonshine cetraria	lichen
Cetraria sp.	cetraria lichen	lichen
Cladina mitis	green reindeer lichen	lichen
Cladina rangiferina	grey reindeer	lichen
Cladina stellaris	star-tipped reindeer	lichen
Cladonia borealis	red pixie-cup lichen	lichen
Cladonia cornuta	pioneer cladonia	lichen
Cladonia ecmocyna	Orange-foot lichen	lichen
Dactylina arctica	few-fingered lichen	lichen
Flavocetraria nivalis	flattened snow lichen	lichen
Flavocetraria sp.	snow lichen	lichen
Masonhalea richardsonii	arctic tumbleweed	lichen
Nephroma arcticum	green kidney lichen	lichen
Nephroma sp.	paw lichens	lichen
Peltigera canina	dog pelt	lichen
Peltigera aphthosa	freckle pelt	lichen
Peltigera sp.	pelt lichen	lichen
Stereocaulon paschale	cottontail coral lichen	lichen
Stereocaulon tomentosum	eyed foam-lichen	lichen
Umbilicaria hyperborea	blistered rock tripe	lichen

NOTE:
Sources: include Hallam Knight Piésold (1996); Stantec 2009 rare plant survey and terrestrial mapping field programs

APPENDIX C

Ecosystem Unit Descriptions

1 ECOSYSTEM DESCRIPTIONS FOR THE EAGLE GOLD PROJECT AREA

1.1 Subalpine Zone

Seven ecosystem units are recognized within the Subalpine Zone.

1.1.1 Subalpine Fir – Dwarf Birch – Crowberry

Map Code: FP

Description: This unit is the only recognized treed unit in the Subalpine zone, and represents open canopy forests of subalpine fir. The trees are often uniformly spread out, with a canopy cover of 10-25%. Tree height rarely exceeds 7m due to the severe conditions in this zone as well as stand age and soil conditions. Occurring on upper ridges and high plateaus, the parent materials for this unit is weathered bedrock or colluvium. In some locations this unit does extend into the forested zone.

Overstorey Species: *Abies lasiocarpa*

Shrubs: *Betula glandulosa; Vaccinium uliginosum, Vaccinium vitis-idaea, Empetrum nigrum, Salix* spp.

Herbs: *Festuca altaica, Calamagrostis canadensis, Artemisia arctica, Festuca altaica, Pedicularis labradorica, Epilobium angustifolium*

Mosses: *Hylocomium splendens, Pleurozium schreberi, Polytrichum* spp.

Lichens: *Cladina stellaris, Cladina rangiferina, Peltigera* spp.

Soil/Site Characteristics:

Moisture regime:	dry to moist
Nutrient regime:	poor to medium
Parent material:	weathered bedrock or colluvium
Slope:	10-35
Aspect:	variable
Elevation:	1175-1350
No. of plots:	5
Reference plots:	EGR97, EGL15, and EGR304

Disturbances: Fires do occur in this unit, due to its position adjacent to forested areas lower down.

Comments: The vegetation for this unit is similar to the SA unit, but with 10-25 cover of subalpine fir. The cover of dwarf birch in both units is usually > 50%.

1.1.2 Mountain Avens – Dwarf Willows

Map Code: MW

Description: This subalpine dwarf shrub/sparse herb unit is dominated by mountain avens and dwarf willow. It occurs on the highest, exposed locations in the study area with dry, shallow, often rubbly soils such as ridge tops and hummocky areas. The height of the dwarf shrubs is very low, usually < 5 cm. Moss cover is low but lichen cover is high. The parent material is colluvium or weathered bedrock, and soil development is weak. Mounds of rocks and stones created by cryoturbation (frost heave) are common in these areas. Herbs are more abundant on warm aspects in the area of transition to open forest (mapped as MWw2d).

Shrubs: *Dryas integrifolia, Dryas hookeriana, Vaccinium uliginosum, Arctostaphylos rubra, Empetrum nigrum, Salix reticulata*

Herbs: *Festuca altaica, Polygonum viviparum, Pedicularis lanata, Hedysarum alpinum, Silene acaulis*

Mosses: *Racomitrium lanuginosum*

Lichens: *Cetraria* spp.*, Masonhalea richardsonii, Stereocaulon* spp.*, Umbilicaria hyperborea, Dactylina artica*

Soil/Site Characteristics:

Moisture regime:	very dry to dry (although seasonally moist with snowmelt)
Nutrient regime:	poor to medium
Parent material:	weathered bedrock or colluvium
Slope:	10-35
Aspect:	variable
Elevation:	1350-1500
No. of plots:	0
Reference plots:	Ecological information derived from EGL206, EGR74

Disturbances: The exposure level is high and includes wind, extreme cold, cryoturbation, and occasionally animal browse (caribou).

Comments: Differs from MM by occurring in convex slope positions (instead of concave late snowmelt areas), and lacking significant cover of mountain heathers.

1.1.3 Mountain Heather Meadow

Map Code: MM

Description: Arctic white heather (four-angled mountain heather) and crowberry are the primary dwarf shrubs in this subalpine ecosystem type. The mats of heathers are often quite dense, but usually less than 15 cm in height. Herbs are sparse but diverse; and alpine mosses and lichens are common. The unit occurs in concave late snow-melt areas, and often on north aspects. Mounds of

rocks and stones created by cryoturbation (frost heave) are common in these areas. The parent material is colluvium or weathered bedrock, and soil development is weak.

Shrubs: *Cassiope tetragona, Empetrum nigrum, Vaccinium uliginosum, Empetrum nigrum, Salix arctica, Dryas hookeriana, Sibbaldia procumbens*

Herbs: *Festuca altaica, Gentiana glauca, Lycopodium alpinum, Hierchloe alpina, Anemone narcissiflora*

Mosses: *Polytrichum* spp., and *Racomitrium lanuginosum* (low cover)

Lichens: low to moderate cover of *Cladina* spp. and *Cetraria* spp.,

Soil/Site Characteristics:

Moisture regime:	dry to moist (late snowmelt areas)
Nutrient regime:	poor
Parent material:	weathered bedrock or colluvium
Slope:	10-50
Aspect:	variable, but usually north
Elevation:	1250-1500
No. of plots:	2
Reference plots:	EGL206, EGR74

Disturbances: Once established, heather communities are quite stable. Disturbances include frost heave and rock slides.

Comments: Differs from the MW by the high cover of dwarf mountain heathers.

1.1.4 Dwarf Birch – Lichen (low shrub)

Map Code: BL

Description: This unit is dominated by dwarf birch and lichens, with the dwarf birch typically being less than 100 cm in height. The distribution of the dwarf birch is often patchy, providing light and space for lichens to develop. Willows are also common but typically have <10% cover. Lichen cover increases on drier areas such as exposed weathered bedrock and bouldery areas. Moss cover is low to moderate. The parent materials are colluvium, weathered bedrock and bedrock.

Shrubs: *Betula glandulosa, Vaccinium uliginosum, Vaccinium vitis-idaea, Empetrum nigrum, Salix* spp.

Herbs: *Festuca altaica, Hierchloe alpina, Lupinus arcticus, Pedicularis labradorica, Poa arctica, Polygonum viviparum*

Mosses: *Polytrichum juniperinum, Hylocomium splendens, Racomitrium canescens*

Lichens: *Cetraria* spp.*, Cladina mitis, Cladina rangiferina, Cladina stellaris, Stereocaulon* spp.

Soil/Site Characteristics:

Moisture regime:	very dry to mesic
Nutrient regime:	poor
Parent material:	weathered bedrock or colluvium
Slope:	0-55
Aspect:	variable
Elevation:	1175-1450
No. of plots:	10
Reference plots:	EGR76, EGL307, EGR71

Disturbances: Fire occurs adjacent to forested areas

Comments: Differs from the SA in that the dwarf birch height is usually less than 100 cm and has a patchier, non-continuous distribution. The lower height is the result of growing in drier, more exposed situations such as in rocky areas, the tops of hummocks or knolls, or areas with a high cover of weathered bedrock.

1.1.5 Dwarf Birch – Northern Rough Fescue (tall shrub)

Map Code: SA

Description: This unit consists of extensive, continuous tall thickets of dwarf birch with heights typically between 1 and 2 m. Scattered willows and dwarf shrubs also occur, but dwarf birch dominates. Northern rough fescue (Altai fescue) is present throughout, but its cover increases in gaps, and following fires. The SA unit shares many of the same species as the BL unit but the high cover of dwarf birch creates more shade which in turn discourages the lichens, resulting in a high cover of mosses. Parent materials are dominantly weathered bedrock, although pockets of colluvium and till also occur.

Overstorey Species: scattered *Abies lasiocarpa* (< 10%)

Shrubs: *Betula glandulosa; Vaccinium uliginosum, Vaccinium vitis-idaea, Empetrum nigrum, Salix glauca, Salix planifolia*

Herbs: *Festuca altaica, Calamagrostis canadensis, Artemisia arctica, Pedicularis labradorica*

Mosses: *Hylocomium splendens, Pleurozium schreberi, Polytrichum juniperinum*

Lichens: *Peltigera* spp., *Cladina stellaria*

Soil/Site Characteristics:

Moisture regime:	dry to mesic
Nutrient regime:	medium
Parent material:	weathered bedrock or colluvium
Slope:	5-45

Aspect:	variable
Elevation:	1175-1410
No. of plots:	11
Reference plots:	EGL52, EGR306

Disturbances: Locations occurring near forested areas will burn at regular intervals. Dwarf birch burns readily, allowing ample light onto the soil surface, and resulting in a rapid cover of grasses such as northern rough fescue, and herbs such as fireweed.

Comments: Differs from the BL by having a taller and more continuous cover of dwarf birch, and a greater moss to lichen ratio.

1.1.6 Willow – Groundsel

Map Code: WG

Description: This unit has an almost continuous cover of tall willows (1.5 to 5 m). Several species of willows are typically present. Herb cover is moderate, with high cover within gaps. The WG unit is found in moist to wet draws, gulley bottoms, and riparian areas along streams and creeks.

Overstorey Species: typically none

Shrubs: *Salix* spp. *(planifolia, glauca, pulchra, arbusculoides, bebbiana), Alnus incana, Rosa acicularis, Picea glauca*

Herbs: *Calamagrostis canadensis, Senecio triangularis, Aconitum delphinifolium, Equisetum arvense, Mitella nuda, Festuca altaica, Mertensia paniculata*

Mosses: *Aulocomnium palustre, Hylocomium splendens, Sphagnum* spp.

Lichens: often absent

Soil/Site Characteristics:

Moisture regime:	moist to very wet
Nutrient regime:	medium to rich
Parent material:	fluvial
Slope:	0-15
Aspect:	variable
Elevation:	1150-1350
No. of plots:	2
Reference plots:	EGL19, EGL58

Disturbances: Fire less likely due to moisture.

Comments: Differs for WM by being restricted to riparian areas and wet draws.

1.1.7 Willow – Mountain Sagewort

Map Code: WM

Description: This is also a shrub unit, dominated by willows, and occurring on lower slopes, sides of gullies, or in high plateau areas where the willow out-competes the dwarf birch on slightly richer and wetter sites. At high elevations trees are absent; at lower elevations subalpine fir or spruce may be present.

Overstorey Species: *Abies lasiocarpa, Picea glauca*

Shrubs: *Salix* spp*. (pulchra, planifolia, glauca, arbusculoides, bebbiana), Alnus incana, Vaccinium vitis-idaea, Picea glauca, Betula glandulosa, Ledum groenlandicum*

Herbs: *Festuca altaica, Mertensia paniculata, Artemisia arctica, Epilobium angustifolium, Aconitum delphinifolium, Calamagrostis canadensis, Lupinus arcticus*

Mosses: *Hylocomium splendens, Pleurozium schreberi*

Lichens: *Peltigera apthosa, Cladina* spp.

Soil/Site Characteristics:

Moisture regime:	mesic to moist
Nutrient regime:	medium
Parent material:	weathered bedrock or colluvium, occasionally on till
Slope:	10-35
Aspect:	variable
Elevation:	1150-1300
No. of plots:	2
Reference plots:	EGL205

Disturbances: Fire history

Comments: Differs from WG by occurring in upland areas; shrub height often lower than 1.5 m, with frequent gaps.

1.2 Forested Zone

The forested zone has 20 recognized ecosystem types, although a number of them also occur in the Subalpine zone (see above).

1.2.1 Trembling Aspen – Kinnikinnick

Map Code: AK

Description: This unit is relatively common in the forested zone, but generally as discreet groves of trees, and never covering large areas. White spruce and Alaska birch are also frequently found mixed in or adjacent to the aspen. A variety of shrubs are also found in these stands, as listed below. Moss and lichen cover is generally low. Trembling aspen always grows on warm sites with good soil drainage. This species can be also found at quite high elevations as long as the aspect is favorable; however at this height the aspen is more shrub-like in appearance. Scattered trembling aspen is also found extensively on soil disturbed by placer mining and gravel waste piles.

Overstorey Species: *Populus tremuloides, Picea glauca, Betula neoalaskana*

Shrubs: *Arctostaphylos uva-ursi, Shepherdia canadensis, Vaccinium vitis-idaea, Rosa acicularis*

Herbs: *Geocaulon lividum, Rubus pubescens, Linnaea borealis, Cornus canadensis, Pyrola secunda, Lycopodium annotinum*

Mosses: *Hylocomium splendens*

Lichens: *Peltigera apthosa*

Soil/Site Characteristics:

Moisture regime:	dry to mesic
Nutrient regime:	medium to rich
Parent material:	colluvium
Slope:	30-70
Aspect:	warm
Elevation:	700-1100
No. of plots:	3
Reference plots:	EGR402, EGL39

Disturbances: As an early successional species, aspen can come in thickly after fire, to be eventually overtopped by white spruce. Aspen can continue to persist on warm aspects and steep slopes with unstable soils and colluvium.

Comments: This is the only unit where trembling aspen is the dominant species.

1.2.2 Juniper – Kinnikinnick

Map Code: JK

Description: This unit is very uncommon in the mapping area and is only mapped present as very small patches; as such it has not been mapped. It is essentially the same as the AK unit (above) but lacks the tree cover, and has a high cover of shrubs (listed below). Lichens are present but scattered.

Shrubs: *Juniperus communis, Arctostaphylos uva-ursi, Shepherdia canadensis, Vaccinium vitis-idaea, Rosa acicularis*

Herbs: *Geocaulon lividum, Rubus pubescens, Linnaea borealis, Cornus canadensis, Pyrola secunda, Lycopodium annotinum*

Mosses: none

Lichens: *Cladina* spp.

Soil/Site Characteristics:

Moisture regime:	dry to mesic
Nutrient regime:	medium to rich
Parent material:	colluvium
Slope:	30-70
Aspect:	warm
Elevation:	700-1100
No. of plots:	0 (information on this unit was derived from field notes)
Reference plots:	EGR402, EGL39

Disturbances: Localized soil disturbance keeps trees from establishing.

Comments: This unit grows in the warmest microclimates in the study area: steep, south-facing slopes at low elevation.

1.2.3 Alaska Birch – White Spruce – Willow

Map Code: AW

Description: This unit occurs on well-drained slopes with warm aspects. In the mapping area, such sites typically occur on mid-slope positions; however they will also occur on coarse soils, or rocky knolls. The parent material is typically stabilized colluvium or shallow soils over bedrock. Alaska birch is the leading tree but, although pure stands exist, most stands have a minor component of white spruce, subalpine-fir, or aspen (or all three). Stands typically have a canopy cover of between 10 and 40%. The AW and the AK unit are the only hardwood dominated upland units in the study area (the PH unit – Balsam poplar-Horsetail- occurs along rivers and creeks).

Overstorey Species: *Betula papyrifera, Picea glauca, Abies lasiocarpa*

Shrubs: *Picea glauca, Vaccinium vitis-idaea, Alnus crispa, Rosa acicularis, Viburnum edule, Salix scouleriana*

Herbs: *Cornus canadensis, Mertensia paniculata, Pyrola secunda, Linnaea borealis, Geocaulon lividum, Epilobium angustifolium*

Mosses: *Hylocomium splendens, Pleurozium schreberi*

Lichens: *Peltigera* spp.

Soil/Site Characteristics:

Moisture regime:	dry to mesic
Nutrient regime:	rich
Parent material:	colluvium or till
Slope:	30-70
Aspect:	warm
Elevation:	700-1100
No. of plots:	7
Reference plots:	EGL213; EGR403; EGR405

Disturbances: Fire is the most likely disturbance. Birch will also regenerate quickly following fire, and will persist for many years in many stands.

Comments: This is the only unit where Alaska birch is the dominant species. The AW unit is also much more common and widespread than the AK unit. Note: in the ecosystem map data base, pure stands are indicated by the letter B (broadleaf) in the column “Stand Appearance”, and mixed stands are indicated with the letter M (mixed).

1.2.4 Dwarf Birch – Lichen

Map Code: BL

Description: This is the same unit as described for the Subalpine zone.

Vegetation: same as the BL unit in Subalpine zone

Soil/Site Characteristics:

Moisture regime:	dry to moist
Nutrient regime:	poor to medium
Parent material:	colluvium
Slope:	10-60
Aspect:	variable
Elevation:	1100-1250
No. of plots:	3 plots (in Forested Zone)
Reference plots:	EGL50, EGL309

Successional Status: Fire

Comments: This unit is considered to be subalpine unit, but with occasional incursions into the forested areas.

1.2.5 Black Spruce – Sphagnum

Map Code: BS

Description: This is bog unit, with open canopy black spruce. These trees are usually stunted (trees 0.5 to 5 m). Occurring on organic soils; this unit is found in flat to gently sloping areas in the valley bottoms.

Overstorey Species*: Picea mariana* (generally < 5m in height)

Shrubs: *Picea mariana, Ledum groenlandicum, Betula glandulosa, Oxycoccus microcarpus, Empetrum nigrum, Salix myrtillifolia, Andromeda polifolia, Rhododendron lapponicum, Arctostaphylos rubra, Vaccinium vitis-idaea*

Herbs: *Rubus chamaemorus, Eriophorum* spp*., Equisetum scirpoides, Carex aquatilis, Equisetum sylvaticum*

Mosses: *Sphagnum* spp*., Hylocomium splendens, Aulocomnium palustre*

Lichens: *Cladina stellaris, Cladina mitis*

Soil/Site Characteristics:

Moisture regime:	wet to very wet
Nutrient regime:	poor
Parent material:	organic
Slope:	level to 4 %
Aspect:	n/a
Elevation:	625-800
No. of plots:	3
Reference plots:	EGR419, EGR107

Disturbances: Fires are rare in these wet areas but do occur on occasion.

Comments: Differs from the SL unit by growing on organic soils.

1.2.6 Subalpine Fir – Crowberry – Lichens

Map Code: FC

Description: This unit has open forests of subalpine fir, with a canopy cover between 10 - 25% and tree heights between 5-8 m. These ecosystems are found on mid to upper slope positions (such as ridges); and also on gravelly soils along gullies at lower elevations. Due to the open canopy,

crowberry and lichen cover is high, particularly on the drier sites where tree cover is low and patches of exposed mineral soil occur. Shrub cover increases with soil moisture and can be high in places.

Overstorey Species: *Abies lasiocarpa*

Shrubs: *Empetrum nigrum, Betula glandulosa, Betula papyrifera, Vaccinium vitis-idaea, Ledum groenlandicum, Vaccinium uliginosum, Vaccinium caespitosum, Salix* spp. (*glauca, planifolia, pulchra*)

Herbs: *Festuca altaica, Linnaea borealis, Artemisia arctica, Epilobium angustifolium, Pyrola secunda, Lycopodium complanatum, Aconitum delphinifolium*

Mosses: *Hylocomium splendens, Pleurozium schreberi*

Lichens: *Cladina stellaris, Cladina rangiferina, Cladina mitis, Peltigera* spp., *Stereocaulon* spp.

Soil/Site Characteristics:

Moisture regime:	dry to mesic
Nutrient regime:	poor
Parent material:	colluvium, or glacial-fluvial gravels (at lower elevations)
Slope:	10-80
Aspect:	variable
Elevation:	950-1350
No. of plots:	24
Reference plots:	EGR 93; EGL 63; EGL210: EGR120

Disturbances: The most common disturbance is fire. Following fire more deciduous shrubs and herbs develop.

Comments: Differs from the FF unit by having open canopy, drier soils, and high lichen and crowberry cover. It differs from the FP by having less dwarf birch, and usually occurring at lower elevations. This unit has the second highest coverage in the mapping area.

1.2.7 Subalpine Fir – Feathermoss

Map Code: FF

Description: These units are open to closed canopy forest of subalpine fir, occurring on sloping sites above the valley floor. A minor component of white spruce or Alaska birch may be present in some locations, particularly on warmer, richer sites. These stands are the one of most productive forests in study area at moderate elevations. Large areas of this unit occurring on the slopes south of the LSA have recently had forest fires, resulting in a thick cover of herbs and young shrubs and trees.

Overstorey Species: *Abies lasiocarpa* (*Betula neoalaskana, Picea glauca*)

Shrubs: *Alnus crispa, Ribes triste, Vaccinium vitis-idaea, Rosa acicularis*

Herbs: *Cornus canadensis, Geocaulon lividum, Equisetum sylvaticum*

Mosses: *Hylocomium splendens, Pleurozium schreberi, Ptilium crista-castrensis, Dicranum* spp.

Lichens: *Peltigera* spp. (*apthosa, canina*), *Nephroma arcticum*

Soil/Site Characteristics:

Moisture regime:	mesic to moist
Nutrient regime:	medium to rich
Parent material:	till or stabilized colluvium
Slope:	5-45
Aspect:	variable
Elevation:	850-1300
No. of plots:	5
Reference plots:	EGL 49, EGR111

Disturbances: Fire is the most common disturbance, although trees may be damaged by localized snow slides in some locations.

Comments: Differs from the FC by having a more closed canopy and fewer herbs and shrubs as a result of more shade on the forest floor. It differs from the FM by occurring on drier sites or those generally lacking in permafrost.

1.2.8 Subalpine Fir – Labrador Tea

Map Code: FM

Description: This unit occurs on lower slopes and north aspect slopes with permafrost. Sub-alpine fir is the leading tree species. Trees are often growing at random angles due to the uneven melting of the permafrost. There is a high cover of mosses.

Overstorey Species: *Abies lasiocarpa*

Shrubs: *Ledum groenlandicum, Betula glandulosa, Vaccinium vitis-idaea, Picea mariana, Empetrum nigrum, Salix* spp.

Herbs: *Equisetum scirpoides, Equisetum sylvaticum, Cornus Canadensis, Rubus chamaemorus*

Mosses: *Hylocomium splendens, Pleurozium schreberi, Sphagnum* spp., *Dicranum* spp.

Lichens: *Peltigera apthosa, Nephroma arcticum, Cladina stellaris*.

Soil/Site Characteristics:

Moisture regime:	moist to wet
Nutrient regime:	poor
Parent material:	organic veneers
Slope:	10-55

Aspect:	variable, but often cool
Elevation:	900-1150
No. of plots:	8
Reference plots:	EGL26, EGR124

Disturbances: Permafrost, and forest fire

Comments: Differs from the SL unit by having subalpine fir as the leading species, otherwise the vegetation is similar. On the landscape this unit occurs on mid slopes above the SL unit. On north aspects it can occur on upper slopes.

1.2.9 Subalpine Fir – Dwarf Birch – Crowberry – Lichens

Map Code: FP

Description: This unit is essentially a subalpine unit, but does occur occasionally on the upper slopes of the Forested zone. The unit consists of open canopy of subalpine fir growing in association with dwarf birch dominated ecosystems (SA unit). See the description for this unit in the preceding section.

Soil/Site Characteristics:

Moisture regime:	dry to mesic
Nutrient regime:	medium
Parent material:	colluvium or weathered bedrock
Slope:	10-55
Aspect:	variable
Elevation:	1050-1225
No. of plots:	3 (in forested zone)
Reference plots:	EGL3, EGR 123

Disturbances: Areas of FP that occur close to forested areas may experience forest fires. This is the case on the slopes just south of the LSA where fire has resulted in a thick growth of deciduous shrubs and herbs.

1.2.10 Balsam Poplar – Horsetail

Map Code: PH

Description: This unit occurs on the active floodplains of streams and rivers. Balsam poplar is present but often mixed with white spruce, trembling aspen or Alaska birch, mountain alder and willows. Flooding on these sites may be frequent. The balsam poplar, as well as the white spruce, can grow up to 20 m in height if undisturbed. These sites are considered to be rich due to the frequent deposition of silt and clay, good soil drainage, and nutrients brought by flowing waters.

Overstorey Species: *Populus balsamifera, Picea glauca* (*Populus tremuloides, Betula neoalaskana*)

Shrubs: *Rosa acicularis, Viburnum edule, Alnus incana, Cornus stolonifera, Salix* spp*., Ribes triste, Picea glauca*

Herbs: *Equisetum arvense, Fragaria virginiana, Rubus pubescens, Cornus canadensis, Mitella nuda, Mertensia paniculata, Calamagrostis canadensis, Pyrola asarifolia*

Mosses: *Ptilium crista-castrensis, Hylocomium splendens*

Soil/Site Characteristics:

Moisture regime:	moist to wet
Nutrient regime:	rich
Parent material:	fluvial
Slope:	level
Aspect:	n/a
Elevation:	600 – 750
No. of plots:	1
Reference plots:	EGR404

Disturbances: Overbank flooding; frequent deposition of silt and clay; occasionally shifts in the river channel; placer mining

Comments: This unit occurs in the riparian areas of active streams and rivers.

1.2.11 Dwarf Birch – Northern Rough Fescue

Map Code: SA

Description: This unit is a subalpine unit that is sometimes found in the upper portions of the Forested zone. See the full description for this unit in the preceding section.

Soil/Site Characteristics:

Moisture regime:	dry to mesic
Nutrient regime:	medium
Parent material:	colluvium
Slope:	10-50
Aspect:	variable
Elevation:	850-1325
No. of plots:	1 (in forested zone)
Reference plots:	EGR113

1.2.12 White spruce – Feathermoss

Map Code: SF

Description: This unit represents stands dominated by white spruce. While this species is common throughout the study area, it usually only forms a minor component of the stands where it occurs. In this unit, the forest stands are dominated by white spruce, and tend to occur on mid to lower slopes with rich soils and warm aspects (likely lacking permafrost). On these sites the white spruce can reach up to 20 m in height and with diameters of up to 65 cm. The conifer trees form a closed canopy, allowing little light to rich the forest floor, resulting in a high cover of feathermosses.

Overstorey Species: *Picea glauca, Abies lasiocarpa*

Shrubs: *Abies lasiocarpa, Alnus crispa, Vaccinium vitis-idaea, Shepherdia canadensis, Viburnum edule*

Herbs: *Cornus canadensis, Linnaea borealis, Mitella nuda, Geocaulon lividum, Mertensia paniculata*.

Mosses: *Pleurozium schreberi, Ptilium crista-castrensis*

Lichens: *Peltigera apthosa*

Soil/Site Characteristics:

Moisture regime:	mesic
Nutrient regime:	medium to rich
Parent material:	till or stabilized colluvium
Slope:	5-65
Aspect:	warm
Elevation:	625-1050
No. of plots:	6
Reference plots:	EGR401, EGR413

Disturbances: Forest fire

Comments: Differs from other upland units by the amount of white spruce

1.2.13 White Spruce – Horsetail

Map Code: SH

Description: This unit occurs in and immediately adjacent to riparian areas along creeks, streams, and moist draws - often occurring as very narrow band and occupying little area. The canopy is closed, resulting in an almost continuous cover of mosses, and a low cover of lichens. Soils in riparian areas are generally quite rich, so the tree growth is quite productive, with trees reaching over 20 m in height. Balsam poplar may be present.

Overstorey Species: *Picea glauca* (*Picea mariana, Abies lasiocarpa*)

Shrubs: *Rosa acicularis, Alnus incana*

Herbs: *Mertensia paniculata, Equisetum* spp. (*arvense, scirpoides, sylvaticum*), *Cornus canadensis, Linnaea borealis, Petasites palmatus*

Mosses: *Hylocomium splendens, Pleurozium schreberi, Sphagnum* spp., liverworts

Lichens: *Peltigera* spp.

Soil/Site Characteristics:

Moisture regime:	moist to wet
Nutrient regime:	medium to rich
Parent material:	fluvial
Slope:	0-15
Aspect:	variable (no aspect effect)
Elevation:	800-1075
No. of plots:	4
Reference plots:	EGL22, EGR400

Disturbances: overbank flooding, mining activities

Comments: This unit does occur along streams and rivers, but differs from the PH unit by being dominated by white spruce. It is also found along small creeks and streams.

1.2.14 Black Spruce – Cladina

Map Code: SC

Description: This unit occurs on the glacial-fluvial gravels in valley bottom positions. The soils are dry and rapidly drained, resulting in an open canopy forest with a low cover of herbs and mosses. Conversely, the abundant light on the forest floor produces a high cover of lichen. Hummocky areas may have a deciduous component of Alaska birch or trembling aspen.

Overstorey Species: *Picea mariana (Abies lasiocarpa)*

Shrubs: *Empetrum nigrum, Betula glandulosa, Betula neoalaskana, Vaccinium vitis-idaea, Ledum groenlandicum, Vaccinium uliginosum, Vaccinium caespitosum, Salix* spp.

Herbs: *Linnaea borealis, Artemisia arctica, Epilobium angustifolium, Pyrola secunda, Lycopodium complanatum*

Mosses: *Hylocomium splendens, Pleurozium schreberi*

Lichens: *Cladina stellaris, Cladina rangiferina, Cladina mitis, Peltigera* spp., *Stereocaulon* spp.

Soil/Site Characteristics:

Moisture regime:	dry to mesic
Nutrient regime:	poor to medium
Parent material:	glacial-fluvial gravels
Slope:	< 10%
Aspect:	n/a
Elevation:	600-700
No. of plots:	2
Reference plots:	EGR416, EGR417

Disturbances: The most common disturbance is fire, with herbs and deciduous shrubs regenerating following fire occurrences.

Comments: Differs from the units by having open canopy forests occurring on dry gravel deposits in the valley bottom. They also have a high cover of lichen and crowberry.

1.2.15 Black Spruce – Labrador Tea – Feathermoss

Map Code: SL

Description: This unit represent stands of black spruce growing on permafrost on lower slopes. These ecosystems are common throughout the study area and often occur in areas with cold air accumulation. Moss cover is high. The soils remain cold throughout the growing season as a result of the frozen soils, insulating properties of the moss, lack of soil oxygenation, and low accumulation of heat units. This unit is the most common mapped ecosystem in the project area.

Overstorey Species: *Picea mariana, Abies lasiocarpa*

Shrubs: *Vaccinium vitis-idaea, Picea mariana, Ledum groenlandicum, Betula glandulosa, Empetrum nigrum, Salix* spp.

Herbs: *Equisetum scirpoides, Cornus Canadensis, Rubus chamaemorus*

Mosses: *Hylocomium splendens, Pleurozium schreberi, Sphagnum* spp., *Dicranum* spp.

Lichens: *Peltigera apthosa, Nephroma arcticum, Cladina stellaris*.

Soil/Site Characteristics:

Moisture regime:	wet
Nutrient regime:	poor
Parent material:	till or organic veneers over till
Slope:	10-30
Aspect:	variable
Elevation:	675-1050

No. of plots: 20
Reference plots: EGL 91, EGL215

Disturbances: Permafrost melting

Comments: Differs from the FM unit by having a high cover of black spruce, and occurring on lower and gentle slopes.

1.2.16 Willow – Groundsel

Map Code: WG

Description: This riparian unit is also present in the Subalpine zone and a detailed description is found in the preceding section.

1.2.17 Willow – Horsetail

Map Code: WH

Description: The Willow - Horsetail ecosystem is a low to moderately-tall, shrub unit that occurs on low benches, or in draws and depressions adjacent to flowing water. Soils are often sandy or loamy and some water movement through the soil profile is present. Gaps in the willow canopy are filled with herbs. Scattered white spruce may be present. This unit is most frequently found along the access road.

Shrubs: *Salix* spp*., Alnus tenuifolia, Rosa acicularis*

Herbs: *Carex aquatilis, Carex atherodes, Equisetum fluviatile, Galium trifidum, Calamagrostis canadensis, Glyceria borealis*

Mosses: *Mnium sp., Brachythecium* sp*.*

Soil/Site Characteristics:

Moisture regime: very wet
Nutrient regime: medium to rich
Parent material: fluvial
Slope: level
Aspect: n/a
Elevation: 600-850
No. of plots: 1
Reference plots: EGR415

Disturbances: Flooding, Placer miner

Comments*:* Differs from the WS by being drier (no standing water).

1.2.18 Willow – Mountain Sagewort

Map Code: WM

Description: This unit also occurs in the Subalpine zone. See preceding section for the detailed description.

1.2.19 Willow – Sedge Wetland

Map Code: WS

Description: Willow – Sedge wetlands occur in level areas in the valley bottom. Such wetlands may occur at higher locations but are small and localized. These wetland types can develop on lake shores, and floodplains, as well as in old river channels (oxbows). Several occurrences were also found in water collecting areas created by placer mining (depressions in the mine tailings). This unit recognizes two phases, sedge wetlands that are dominated by herbs (sedges and horsetails), and those that have > 20% shrubs (willows and dwarf birch in addition to the sedges).

Shrubs: *Betula glandulosa, Potentilla palustris, Salix* spp*., Ledum groenlandicum*

Herbs: *Carex aquatilis, Carex limosa, Equisetum fluviatile, Galium trifidum, Calamagrostis canadensis, Glyceria borealis*

Mosses: *Tomenthypnum nitens, Drepanocladus uncinatis, Sphagnum* spp.

Soil/Site Characteristics:

Moisture regime:	very wet
Nutrient regime:	rich
Parent material:	organic
Slope:	level
Aspect:	n/a
Elevation:	600-900
No. of plots:	2
Reference plots:	EGL12, EGR450

Disturbances: Flooding, Placer mining

Comments: Differs from marshes by being shallower, and having a continuous cover of emergent vegetation (no areas of open water).

1.2.20 Marsh

Map Code: MA

Description: Marshes occur infrequently in level areas in the valley bottom. These wetland types can develop in kettled landscape, on lake shores and depressions. They are characterized by areas of open water, with a fringe of emergent plants.

Shrubs *Potentilla palustris, Salix* spp. *(Myrica gale)*

Herbs: *Carex* spp., *Equisetum fluviatile* (*Scirpus* spp*., Menyanthes trifoliata, Triglochin maritima*)

Mosses: *Tomenthypnum nitens, Drepanocladus spp., Sphagnum* spp.

Soil/Site Characteristics:

Moisture regime:	very wet
Nutrient regime:	rich
Parent material:	organic
Slope:	level
Aspect:	n/a
Elevation:	600-900
No. of plots:	1
Reference plots:	EGR420

Disturbances: Changes in water level (such as from beavers)

Comments: Only found at lower elevations along access road.

APPENDIX D

Foliar Metal Analysis

Table D1: Summary of Metals Concentrations in Foliar Tissue Collected in the Eagle Gold Local Study Area in 2009

Sample ID		EGL8 Salix	EGL208 Salix	EGL41 Grass	EGL10 Salix	EGL10 Grass	EGL21 Fest	EGL4 Grass	EGL25 Grass	EGL208 Grass	EGL25 SP	EGL21 Salix	EGL8 Carex	EGL1 Salix	EGL41 SP	EGL50 Salix	EGL4 Salix
CANTEST ID		909050199	909050210	909050211	909050212	909050213	909050214	909050215	909050216	909050217	909050218	909050219	909050220	909050221	909050222	909050223	909050224
Date Sampled		8/16/2009	8/15/2009	8/16/2009	8/16/2009	8/16/2009	8/11/2009	8/12/2009	8/15/2009	8/15/2009	8/15/2009	8/11/2009	8/16/2009	8/14/2009	8/16/2009	8/15/2009	8/12/2009
Parameter	**Units**																
Metals Analysis																	
Aluminum Al	ug/g	5.6	13.5	8.4	12.7	14.3	11.3	3.7	4	5.7	5.2	43.2	9.4	7.3	10.8	9.3	5
Antimony Sb	ug/g	< 0.1	< 0.1	0.1	< 0.1	0.2	< 0.1	0.1	< 0.1	0.2	< 0.1	< 0.1	0.3	< 0.1	< 0.1	< 0.1	< 0.1
Arsenic As	ug/g	0.1	< 0.1	0.1	0.2	0.4	< 0.1	0.2	0.1	< 0.1	< 0.1	< 0.1	0.1	0.2	0.2	< 0.1	0.1
Barium Ba	ug/g	3.1	9.4	11.9	14.5	24.4	12.6	15	11.2	10.7	14.5	18.1	8.3	11.4	8.5	23.7	7.6
Beryllium Be	ug/g	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Boron B	ug/g	2	< 2	< 2	3	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	3	2	< 2	3
Cadmium Cd	ug/g	0.52	0.39	< 0.02	1.46	0.04	< 0.02	0.03	< 0.02	< 0.02	1.23	0.26	0.03	2.67	0.81	0.33	3
Calcium Ca	ug/g	2790	2000	950	2160	1090	752	1230	1110	512	4840	2030	1380	4000	2420	3210	2940
Calcium Ca	%	0.279	0.2	0.095	0.216	0.109	0.0752	0.123	0.111	0.0512	0.484	0.203	0.138	0.4	0.242	0.321	0.294
Chromium Cr	ug/g	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Cobalt Co	ug/g	0.1	1	< 0.1	1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.5	1.1	< 0.1	0.1	0.6	0.2	0.3
Copper Cu	ug/g	0.9	1	1.6	1.4	1.7	0.7	1.1	1.2	0.7	0.9	2	1.1	1.1	1.1	0.9	1.3
Iron Fe	ug/g	22	28	12	42	30	15	9	14	17	26	32	29	24	35	13	19
Lead Pb	ug/g	< 0.1	< 0.1	0.1	< 0.1	< 0.1	< 0.1	0.2	0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Magnesium Mg	ug/g	1190	405	485	903	463	341	258	392	253	1230	649	559	804	996	873	425
Magnesium Mg	%	0.119	0.0405	0.0485	0.0903	0.0463	0.0341	0.0258	0.0392	0.0253	0.123	0.0649	0.0559	0.0804	0.0996	0.0873	0.0425
Manganese Mn	ug/g	92.5	223	84.6	418	144	459	92.8	128	280	316	222	162	121	237	65.5	240
Mercury Hg	ug/g	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Molybdenum Mo	ug/g	< 0.1	< 0.1	< 0.1	0.1	0.1	< 0.1	< 0.1	0.2	< 0.1	0.1	< 0.1	0.1	< 0.1	< 0.1	0.4	< 0.1
Nickel Ni	ug/g	0.6	1.3	0.5	1	0.4	0.1	0.2	0.5	0.1	1.5	1.5	0.7	0.4	1.1	0.7	0.9
Phosphorus P	ug/g	220	996	200	485	268	384	225	302	322	825	728	270	227	336	349	746
Phosphorus P	%	0.022	0.0996	0.02	0.0485	0.0268	0.0384	0.0225	0.0302	0.0322	0.0825	0.0728	0.027	0.0227	0.0336	0.0349	0.0746
Potassium K	ug/g	1960	5600	3000	2560	3650	4640	5040	3270	4030	3280	3210	3590	3210	2180	4320	5860
Potassium K	%	0.196	0.56	0.3	0.256	0.365	0.464	0.504	0.327	0.403	0.328	0.321	0.359	0.321	0.218	0.432	0.586
Selenium Se	ug/g	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Silicon Si	ug/g	20	28	331	26	242	384	153	329	306	29	26	293	27	26	21	18
Silver Ag	ug/g	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Sodium Na	ug/g	4	2	7	13	10	3	5	6	11	6	1	7	7	6	4	5
Strontium Sr	ug/g	16.6	15	5.11	18.4	9.72	4.88	7.39	6.2	2.92	26.8	25.7	7.81	16.9	13.3	22	15.4
Tellurium Te	ug/g	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Thallium Tl	ug/g	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Tin Sn	ug/g	< 0.1	< 0.1	0.1	< 0.1	< 0.1	< 0.1	0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Titanium Ti	ug/g	0.4	0.8	0.6	0.5	0.7	0.5	0.3	0.4	0.5	0.8	0.6	0.6	0.6	0.7	0.4	0.5
Uranium U	ug/g	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
Vanadium V	ug/g	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Zinc Zn	ug/g	34.9	33.4	16.6	78.9	15.6	7.8	19.5	16.3	6.2	50	17.9	21.9	98.8	46.7	15.2	117
Zirconium Zr	ug/g	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 3

Criteria: Puls (1994)

Toxic/Excessive

High

> Normal, < High

Deficient

Analysis Report

REPORT ON: Analysis of Soil, Tissue Samples

REPORTED TO: Stantec
11-2042 Mills Rd
Sidney, BC
V8L 5X4

Att'n: Natalie Tashe

PROJECT NAME: Eagle Gold
PROJECT NUMBER: 153550.03

NUMBER OF SAMPLES: 39

REPORT DATE: October 7, 2009

DATE SUBMITTED: September 4, 2009

GROUP NUMBER: 100905040

SAMPLE TYPE: Tissue, Soil

NOTE: Results contained in this report refer only to the testing of samples as submitted. Other information is available on request.

TEST METHODS:

pH in Soil or Solid - analysis was performed based on procedures described in the "Manual on Soil Sampling and Methods of Analysis" (1993) published by the Canadian Society of Soil Science. The test was performed using a deionized water leach with measurement by pH meter.

Mercury in Tissue - samples were digested using a nitric acid-hydrogen peroxide digestion procedure based on EPA Method 200.3. Analysis was performed using Cold Vapour Atomic Absorption Spectrophotometry or Cold Vapour Atomic Fluorescence Spectrophotometry.

Metals in Tissue - samples were digested using a nitric acid-hydrogen peroxide digestion procedure based on EPA Method 200.3. Analysis was performed using Inductively Coupled Argon Plasma Spectroscopy (ICP), or ICP Mass Spectrometry (ICP/MS).

Particle Size Analysis - The particle size distribution is determined in accordance with Methods of Soil Analysis Part 1-Physical and Mineralogical Methods(2nd Ed), UBC Methods Manual for Soil Analysis(1981) and Soil Sampling and Methods of Analysis(1993). The % gravel, sand, silt and clay are determined by a combination of a standard dry sieve, wet sieve and pipetting techiques. Particle size limits used to define size fractions are based according to Canadian Soil Survey Committee(CSSC) and U.S. Department of Agriculture(USDA) classification scheme. Winnipeg Lab D-675 Berry St. Wpg, MB R3H1A7

CSSC Textural Category - C = Clay, S = Sand, SI = Silt, L = Loam, CL = Clay Loam, SC = Sandy Clay, SIL = Silt Loam, SIC = Silty Clay, LS = Loamy Sand, SL = Sandy Loam, HC = Heavy Clay, SCL = Sandy Clay Loam, SICL = Silty Clay Loam.Performed at Cantest Ltd Winnipeg, Unit-D Berry St, Winnipeg, Manitoba R3H 1A7.

(Continued)

CANTEST LTD.

Anna Becalska, PhD
Trace Metals Coordinator

4606 Canada Way, Burnaby, BC V5G 1K5
Tel: 604 734 7276 Fax: 604 731 2386

Silver in Soil - analysis was performed using Inductively Coupled Plasma Mass Spectrometry (ICP/MS).

Arsenic in Soil - analysis was performed using Inductively Coupled Plasma Mass Spectrometry (ICP/MS).

Cadmium in Soil - analysis was performed using Inductively Coupled Plasma Mass Spectrometry (ICP/MS).

Mercury in Soil - analysis was performed using Cold Vapour Atomic Fluorescence.

Molybdenum in Soil - analysis was performed using an acid digestion followed by determination using Inductively Coupled Plasma Mass Spectrometry (ICP/MS).

Strong Acid Leachable Metals in Soil - analysis was performed using B.C. MOELP Method "Strong Acid Leachable Metals in Soil, Version 1.0". The method involves drying the sample at 60 C, sieving using a 2 mm (10 mesh) sieve and digestion using a mixture of hydrochloric and nitric acids. Analysis was performed using Inductively Coupled Argon Plasma Spectroscopy (ICAP) or by specific techniques as described.

Selenium in Soil - analysis was using Inductively Coupled Plasma Mass Spectrometry (ICP/MS).

Thallium in Soil - analysis was performed using Inductively Coupled Plasma Mass Spectrometry (ICP/MS).

Particle Size Analysis - Standard - This analysis is appropriate for most samples. These particle size limits are used to define the size fractions: gravel, coarse to medium sand, fine sand, silt and clay, according to the CSSC and USDA Classification schemes. Soil testure is determined according to CSSC definition of texture. The size fractions that are analyzed are 2.0, 0.250, 0.125, 0.053 and 0.002 mm. The % Sand, % Silt and % Clay are based on the <2mm fraction of the sample by weight. Analysis was performed at CANTEST LTD., Unit "D" 675 Berry Steet, Winnipeg, Manitoba R3H 1A7.

TEST RESULTS:

(See following pages)

REPORTED TO: Stantec

REPORT DATE: October 7, 2009

GROUP NUMBER: 100905040

CANTEST

Metals Analysis in Tissue

CLIENT SAMPLE IDENTIFICATION:		EGL8-Salix	EGL208-Salix	EGL41-Grass	EGL10-Salix	
DATE SAMPLED:		Aug 16/09	Aug 15/09	Aug 16/09	Aug 16/09	REPORTING LIMIT
CANTEST ID:		909050199	909050210	909050211	909050212	
Aluminum	Al	5.6	13.5	8.4	12.7	0.5
Antimony	Sb	<	<	0.1	<	0.1
Arsenic	As	0.1	<	0.1	0.2	0.1
Barium	Ba	3.1	9.4	11.9	14.5	0.1
Beryllium	Be	<	<	<	<	0.02
Boron	B	2	<	<	3	2
Cadmium	Cd	0.52	0.39	<	1.46	0.02
Calcium	Ca	2790	2000	950	2160	1
Chromium	Cr	<	<	<	<	0.1
Cobalt	Co	0.1	1	<	1	0.1
Copper	Cu	0.9	1	1.6	1.4	0.1
Iron	Fe	22	28	12	42	5
Lead	Pb	<	<	0.1	<	0.1
Magnesium	Mg	1190	405	485	903	0.5
Manganese	Mn	92.5	223	84.6	418	0.1
Mercury	Hg	<	<	<	<	0.01
Molybdenum	Mo	<	<	<	0.1	0.1
Nickel	Ni	0.6	1.3	0.5	1	0.1
Phosphorus	P	220	996	200	485	0.5
Potassium	K	1960	5600	3000	2560	1
Selenium	Se	<	<	<	<	0.2
Silicon	Si	20	28	331	26	10
Silver	Ag	<	<	<	<	0.01
Sodium	Na	4	2	7	13	1
Strontium	Sr	16.6	15	5.11	18.4	0.05
Tellurium	Te	<	<	<	<	0.1
Thallium	Tl	<	<	<	<	0.02
Tin	Sn	<	<	0.1	<	0.1
Titanium	Ti	0.4	0.8	0.6	0.5	0.3
Uranium	U	<	<	<	<	0.04
Vanadium	V	<	<	<	<	0.5
Zinc	Zn	34.9	33.4	16.6	78.9	0.5
Zirconium	Zr	<	<	<	<	3

Results expressed as micrograms per gram, dry basis (µg/g)
< = Less than reporting limit

Metals Analysis in Tissue

CLIENT SAMPLE IDENTIFICATION:		EGL10-Grass	EGL21-Fest	EGL4-Grass	EGL25-Grass	
DATE SAMPLED:		Aug 16/09	Aug 11/09	Aug 12/09	Aug 15/09	REPORTING LIMIT
CANTEST ID:		909050213	909050214	909050215	909050216	
Aluminum	Al	14.3	11.3	3.7	4	0.5
Antimony	Sb	0.2	<	0.1	<	0.1
Arsenic	As	0.4	<	0.2	0.1	0.1
Barium	Ba	24.4	12.6	15	11.2	0.1
Beryllium	Be	<	<	<	<	0.02
Boron	B	<	<	<	<	2
Cadmium	Cd	0.04	<	0.03	<	0.02
Calcium	Ca	1090	752	1230	1110	1
Chromium	Cr	<	<	<	<	0.1
Cobalt	Co	<	<	<	<	0.1
Copper	Cu	1.7	0.7	1.1	1.2	0.1
Iron	Fe	30	15	9	14	5
Lead	Pb	<	<	0.2	0.1	0.1
Magnesium	Mg	463	341	258	392	0.5
Manganese	Mn	144	459	92.8	128	0.1
Mercury	Hg	<	<	<	<	0.01
Molybdenum	Mo	0.1	<	<	0.2	0.1
Nickel	Ni	0.4	0.1	0.2	0.5	0.1
Phosphorus	P	268	384	225	302	0.5
Potassium	K	3650	4640	5040	3270	1
Selenium	Se	<	<	<	<	0.2
Silicon	Si	242	384	153	329	10
Silver	Ag	<	<	0.01	<	0.01
Sodium	Na	10	3	5	6	1
Strontium	Sr	9.72	4.88	7.39	6.2	0.05
Tellurium	Te	<	<	<	<	0.1
Thallium	Tl	<	<	<	<	0.02
Tin	Sn	<	<	0.1	<	0.1
Titanium	Ti	0.7	0.5	0.3	0.4	0.3
Uranium	U	<	<	<	<	0.04
Vanadium	V	<	<	<	<	0.5
Zinc	Zn	15.6	7.8	19.5	16.3	0.5
Zirconium	Zr	<	<	<	<	3

Results expressed as micrograms per gram, dry basis (µg/g)
< = Less than reporting limit

REPORTED TO: Stantec

REPORT DATE: October 7, 2009

GROUP NUMBER: 100905040

Metals Analysis in Tissue

CLIENT SAMPLE IDENTIFICATION:		EGL208-Grass	EGL25-SP	EGL21-Salix	EGL8-Carex	
DATE SAMPLED:		Aug 15/09	Aug 15/09	Aug 11/09	Aug 16/09	REPORTING LIMIT
CANTEST ID:		909050217	909050218	909050219	909050220	
Aluminum	Al	5.7	5.2	43.2	9.4	0.5
Antimony	Sb	0.2	<	<	0.3	0.1
Arsenic	As	<	<	<	0.1	0.1
Barium	Ba	10.7	14.5	18.1	8.3	0.1
Beryllium	Be	<	<	<	<	0.02
Boron	B	<	<	<	<	2
Cadmium	Cd	<	1.23	0.26	0.03	0.02
Calcium	Ca	512	4840	2030	1380	1
Chromium	Cr	<	<	<	<	0.1
Cobalt	Co	<	0.5	1.1	<	0.1
Copper	Cu	0.7	0.9	2	1.1	0.1
Iron	Fe	17	26	32	29	5
Lead	Pb	<	<	<	<	0.1
Magnesium	Mg	253	1230	649	559	0.5
Manganese	Mn	280	316	222	162	0.1
Mercury	Hg	<	<	<	<	0.01
Molybdenum	Mo	<	0.1	<	0.1	0.1
Nickel	Ni	0.1	1.5	1.5	0.7	0.1
Phosphorus	P	322	825	728	270	0.5
Potassium	K	4030	3280	3210	3590	1
Selenium	Se	<	<	<	<	0.2
Silicon	Si	306	29	26	293	10
Silver	Ag	<	<	<	<	0.01
Sodium	Na	11	6	1	7	1
Strontium	Sr	2.92	26.8	25.7	7.81	0.05
Tellurium	Te	<	<	<	<	0.1
Thallium	Tl	<	<	<	<	0.02
Tin	Sn	<	<	<	<	0.1
Titanium	Ti	0.5	0.8	0.6	0.6	0.3
Uranium	U	<	<	<	<	0.04
Vanadium	V	<	<	<	<	0.5
Zinc	Zn	6.2	50	17.9	21.9	0.5
Zirconium	Zr	<	<	<	<	3

Results expressed as micrograms per gram, dry basis (µg/g)
< = Less than reporting limit

REPORTED TO: Stantec

REPORT DATE: October 7, 2009

GROUP NUMBER: 100905040

Metals Analysis in Tissue

CLIENT SAMPLE IDENTIFICATION:		EGL1-Salix	EGL41-SP	EGL50-Salix	EGL4-Salix	
DATE SAMPLED:		Aug 14/09	Aug 16/09	Aug 15/09	Aug 12/09	REPORTING LIMIT
CANTEST ID:		909050221	909050222	909050223	909050224	
Aluminum	Al	7.3	10.8	9.3	5	0.5
Antimony	Sb	<	<	<	<	0.1
Arsenic	As	0.2	0.2	<	0.1	0.1
Barium	Ba	11.4	8.5	23.7	7.6	0.1
Beryllium	Be	<	<	<	<	0.02
Boron	B	3	2	<	3	2
Cadmium	Cd	2.67	0.81	0.33	3	0.02
Calcium	Ca	4000	2420	3210	2940	1
Chromium	Cr	<	<	<	<	0.1
Cobalt	Co	0.1	0.6	0.2	0.3	0.1
Copper	Cu	1.1	1.1	0.9	1.3	0.1
Iron	Fe	24	35	13	19	5
Lead	Pb	<	<	<	<	0.1
Magnesium	Mg	804	996	873	425	0.5
Manganese	Mn	121	237	65.5	240	0.1
Mercury	Hg	<	<	<	<	0.01
Molybdenum	Mo	<	<	0.4	<	0.1
Nickel	Ni	0.4	1.1	0.7	0.9	0.1
Phosphorus	P	227	336	349	746	0.5
Potassium	K	3210	2180	4320	5860	1
Selenium	Se	<	<	<	<	0.2
Silicon	Si	27	26	21	18	10
Silver	Ag	<	<	<	<	0.01
Sodium	Na	7	6	4	5	1
Strontium	Sr	16.9	13.3	22	15.4	0.05
Tellurium	Te	<	<	<	<	0.1
Thallium	Tl	<	<	<	<	0.02
Tin	Sn	<	<	<	<	0.1
Titanium	Ti	0.6	0.7	0.4	0.5	0.3
Uranium	U	<	<	<	<	0.04
Vanadium	V	<	<	<	<	0.5
Zinc	Zn	98.8	46.7	15.2	117	0.5
Zirconium	Zr	<	<	<	<	3

Results expressed as micrograms per gram, dry basis (µg/g)
< = Less than reporting limit

REPORTED TO: Stantec

REPORT DATE: October 7, 2009

GROUP NUMBER: 100905040

CANTEST

Batch Quality Control for Dissolved Metals Analysis in Tissue (QC# 126868)

Parameter		Blank (ug/g)	Blank Limits	Duplicate (R.P.D.) 909050199	Duplicate Limits	Duplicate (R.P.D.) 909050219	Duplicate Limits
Aluminum	Al	< 0.5	0.2	14.3	20	12	20
Antimony	Sb	< 0.1	0.001	NC	20	NC	20
Arsenic	As	< 0.1	0.002	PASS	20	NC	20
Barium	Ba	< 0.1	0.001	0	20	8.8	20
Beryllium	Be	< 0.02	0.001	NC	20	NC	20
Boron	B	< 2	0.02	PASS	20	NC	20
Cadmium	Cd	< 0.02	0.0004	1.9	20	3.9	20
Calcium	Ca	< 1	0.3	2.2	20	7.9	20
Chromium	Cr	< 0.1	0.001	NC	20	NC	20
Cobalt	Co	< 0.1	0.001	PASS	20	8.7	20
Copper	Cu	< 0.1	0.001	0	20	PASS	20
Iron	Fe	< 5	0.05	PASS	20	18.8	20
Lead	Pb	< 0.1	0.002	NC	20	NC	20
Magnesium	Mg	< 0.5	0.2	5	20	1.8	20
Manganese	Mn	< 0.1	0.01	2.3	20	8.5	20
Mercury	Hg	< 0.01	0.01	NC	20	NC	20
Molybdenum	Mo	< 0.1	0.002	NC	20	NC	20
Nickel	Ni	< 0.1	0.003	0	20	13.3	20
Phosphorus	P	< 0.5	0.1	2.7	20	10.4	20
Potassium	K	< 1	0.3	3.6	20	4.7	20
Selenium	Se	< 0.2	0.004	NC	20	NC	20
Silver	Ag	< 0.01	0.001	NC	20	NC	20
Sodium	Na	< 1	0.5	PASS	20	PASS	20
Strontium	Sr	< 0.05	0.002	0	20	2.3	20
Tellurium	Te	< 0.1	0.002	NC	20	NC	20
Thallium	Tl	< 0.02	0.002	NC	20	NC	20
Tin	Sn	< 0.1	0.01	NC	20	NC	20
Titanium	Ti	< 0.3	0.01	PASS	20	PASS	20
Uranium	U	< 0.04	0.002	NC	20	NC	20
Vanadium	V	< 0.5	0.002	NC	20	NC	20
Zinc	Zn	< 0.5	0.04	2	20	8.9	20
Zirconium	Zr	< 3	0.04	NC	20	NC	20

ug/g = micrograms per gram, dry basis
R.P.D. = Relative Percent Difference
PASS = Duplicate sample results were in the range of one to five times the detection limit. R.P.D. calculation is not applicable in this range. Acceptance criteria is a maximum difference between the duplicates equivalent to the value of the detection limit.
NC = Not Calculated. Duplicate sample results were less than the detection limit. Relative Percent Difference calculation is not defined for analyte levels of less than detection limit.

Batch Quality Control for Dissolved Metals Analysis in Tissue (QC# 126868)

Parameter		NIST1570a Spinach Leaves (% Recovery)	NIST1570a Spinach Leaves Limits	NIST1573a Tomato Leaves (% Recovery)	NIST1573a Tomato Leaves Limits
Aluminum	Al	36	17 - 93	31	7 - 91
Arsenic	As	-	-	179	80 - 283
Boron	B	101	63 - 143	96	62 - 142
Cadmium	Cd	84	39 - 114	82	30 - 124
Calcium	Ca	88	60 - 120	93	60 - 120
Chromium	Cr	-	-	50	28 - 97
Cobalt	Co	103	50 - 150	105	50 - 150
Copper	Cu	90	62 - 124	81	59 - 125
Iron	Fe	-	-	78	52 - 167
Manganese	Mn	92	53 - 134	89	62 - 131
Mercury	Hg	97	59 - 119	94	88.24 - 111.8
Nickel	Ni	84	58 - 126	63	28 - 143
Phosphorus	P	89	60 - 120	89	60 - 120
Potassium	K	96	60 - 120	85	60 - 120
Sodium	Na	97	60 - 120	88	60 - 120
Strontium	Sr	108	60 - 120	-	-
Vanadium	V	70	50 - 150	55	50 - 150
Zinc	Zn	81	48 - 110	77	49 - 109

ug/g = micrograms per gram, dry basis

Instrument Quality Control for the Mercury Monitor (QC# 246428)

QC Type: Calibration Verification

Parameter		% Recovery	Limits
Mercury	Hg	108	90 - 110

Batch Quality Control Frequency Summary

SALM in Soil Digestion (Batch# 126444)

QC Type	No. Samples
CAN MET Till-1	1
Blank	3
Duplicate	6

Metals Plant Tissue Digestion (Batch# 126868)

QC Type	No. Samples
NIST1570a Spinach Leaves	1
NIST1573a Tomato Leaves	1
Blank	2
Duplicate	2

Particle Size Prep - Winnipeg (Batch# 127662)

QC Type	No. Samples
Duplicate	3
Soil Pipette Verif %<53um	21

SALM Metals in Soil Sieve (Batch# 126426)

QC Type	No. Samples
Batch Size	67

SALM in Soil Digestion (Batch# 126444)

QC Type	No. Samples
Batch Size	67

(Continued on next page)

Batch Quality Control Frequency Summary

Metals Plant Tissue Digestion (Batch# 126868)

QC Type	No. Samples
Batch Size	16

Particle Size Prep - Winnipeg (Batch# 127662)

QC Type	No. Samples
Batch Size	23